Gedling, Broxtowe and Rushcliffe Local Area Energy Plan

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Contents

Executive summary

The Gedling, Broxtowe and Rushcliffe 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 Gedling, Broxtowe and Rushcliffe 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. Gedling, Broxtowe and Rushcliffe councils each declared a climate emergency in 2019, with all three local authorities setting targets to become carbon neutral for their internal operations and the services they deliver before 2030.

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 (particularly in off-gas-grid areas), 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 Gedling, Broxtowe and Rushcliffe'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 Gedling, Broxtowe and Rushcliffe 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 Nottinghamshire and 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 Gedling, Broxtowe and Rushcliffe concentrate resources on deliverable local actions.

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

DO NOTHING	2050 NET ZERO	2040 NET ZERO
Only decarbonisation activities between now and 2050 that are already legislated to happen	In line with national targets and guidelines including 6th Carbon Budget to 2035 and Distributed Future Energy Scenarios	Bespoke for D2N2 programme, set by EMCCA. Based on stakeholder preference and suitability of solutions.

Current Energy and Emissions Baseline

In 2023, Gedling, Broxtowe and Rushcliffe's total territorial emissions were approximately 1,765 $ktCO_2e$. The area's emissions profile is dominated by three key sectors: industry (17%), transport (35%), and domestic (25%).

Total energy consumption in buildings stood at 3,039 GWh, dominated by space heating (61%), followed by lighting (14%), equipment (12%) and domestic hot water (12%). Natural gas remains the dominant fuel, accounting for the majority of emissions from heating, with a smaller portion of heating supplied by electricity. For rural, off-gas-grid homes of which there are a high portion in southern Nottinghamshire and Rushcliffe specifically, oil, biomass and liquified petroleum gas (LPG) are also key fuel sources.

Energy Efficiency and Buildings Retrofit

Across Gedling, Broxtowe and Rushcliffe, approximately 125,000 buildings require some level of retrofit (either light retrofit only, deep retrofit only or both) to achieve the net zero scenarios. Modelling shows around 59,538 homes (40% of the housing stock) require light retrofit, while around 68,379 homes (46%) 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 108,707 suitable properties, early installations should be focused in areas where electricity network capacity coincides with existing funding eligibility. In parallel, exploring the feasibility of heat networks within Eastwood and Beeston in Broxtowe, and Stoke Bardolph and Colwick in Gedling should be pursued in the identified areas and leveraging the central government zoning programme.

Transport Electrification

Across the Gedling, Broxtowe and Rushcliffe areas the modelling shows the number of electric vehicle (EV) cars rising to about 178,500 vehicles by 2040 in the preferred scenario, with a planning assumption of one public charger for roughly 20 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 270 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 76% under the assumed fuel-switch scenarios. To make this 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 approximately 1500 MW of After Diversity Maximum Demand (ADMD) across Gedling, Broxtowe and Rushcliffe combined, which would exceed the capacity of the current infrastructure.

Close collaboration with the local distribution network operators (National Grid Electricity Distribution (NGED), Electricity Northwest Limited and Northern Powergrid) 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 £6.4 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 delivery partnership to progress the actions and focus zones outlined in the LAEP, particularly focusing on the regional challenges such as heritage or listed building designations and properties located rurally / at edge of the network, which were identified in the LAEP process as key challenges.
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 the areas Gedling, Broxtowe and Rushcliffe (GBR) in Nottinghamshire, supporting each 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 Gedling, Broxtowe and Rushcliffe make up one. This LAEP has therefore been prepared to be comparable to the other local plans, and to contribute to the wider regional one. This report presents the outcomes of the Gedling, Broxtowe and Rushcliffe LAEP, following a comprehensive process of data acquisition, scenario modelling, stakeholder engagement and collaboration, and spatial analysis.

1.1 What is a 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 operators, 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 a comprehensive net zero plan tailored to Gedling, Broxtowe and Rushcliffe's unique characteristics.

The LAEP will consider energy supply and demand, 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 will involve collaboration with various stakeholders to develop a realistic, data-driven action plan.

The primary goal of the Gedling, Broxtowe and Rushcliffe LAEP is to identify the most cost-effective ways to decarbonise each borough, aligning local plans and priorities with broader regional and national policies and strategies. It will provide a roadmap for Gedling, Broxtowe and Rushcliffe to achieve net zero emissions at the local level. Additionally, the LAEP will be coordinated alongside other areas within the wider EMCCA region to ensure a consistent and joined-up approach between Derby, Derbyshire, Nottingham, and Nottinghamshire (D2N2).

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

1.2 Geographical Boundary of the LAEP

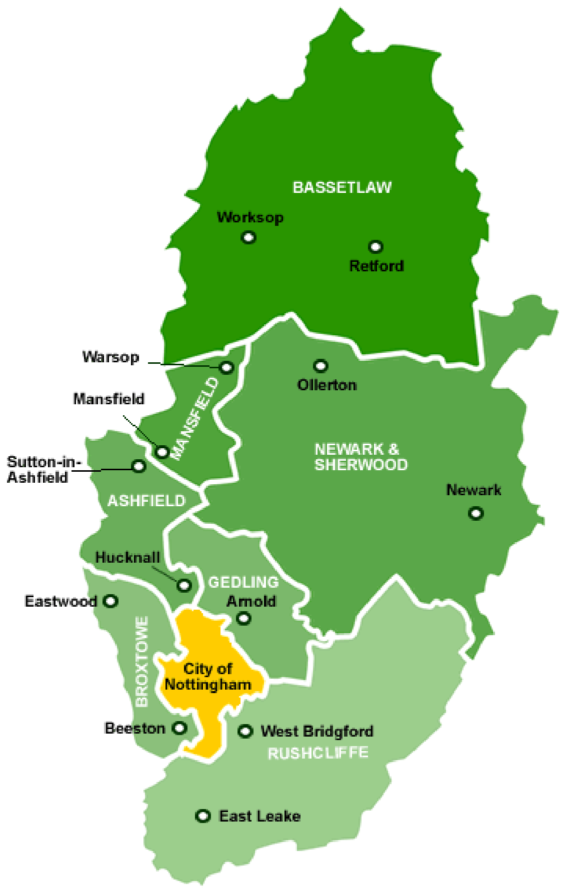
1.2.1 Gedling

Gedling is a borough located in Nottinghamshire, England, with a population of approximately 117,000 (ONS, 2021) and covers an area of 120 km². The borough is known for its rich history and green spaces, including Gedling Country Park and Newstead Abbey. Gedling has a diverse economy, with key sectors in retail, healthcare, and education. The borough is also home to several small and medium-sized enterprises, contributing to its vibrant local economy.

1.2.2 Broxtowe

The borough of Broxtowe is also located in Nottinghamshire, England, with a population of approximately 110,900 (ONS, 2021) and covers an area of 81 km². The borough is characterized by a mix of urban and rural areas, with key towns including Beeston, Eastwood, and Kimberley. Broxtowe has a diverse economy, with significant sectors in retail, education, and healthcare. The borough is also known for its green spaces and community initiatives, contributing to a high quality of life for its residents.

Figure 1.1: Gedling, Broxtowe and Rushcliffe Geographical Boundary in relation to Nottingham City and Nottinghamshire County[2]



1.2.3 Rushcliffe

Rushcliffe is a borough located in Nottinghamshire, England, with a population of approximately 119,100 (ONS, 2021) and covers an area of 409 km². The borough is known for its vibrant communities and green spaces, including Rushcliffe Country Park and the River Trent. Rushcliffe has a diverse economy, with key sectors in retail, education, and healthcare. The borough also supports a range of small and medium-sized enterprises, contributing to its dynamic local economy.

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.

[22] Nottinghamshire County Council - Development Planning

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 operators (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 Gedling, Broxtowe and Rushcliffe 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 Gedling, Broxtowe and Rushcliffe 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.

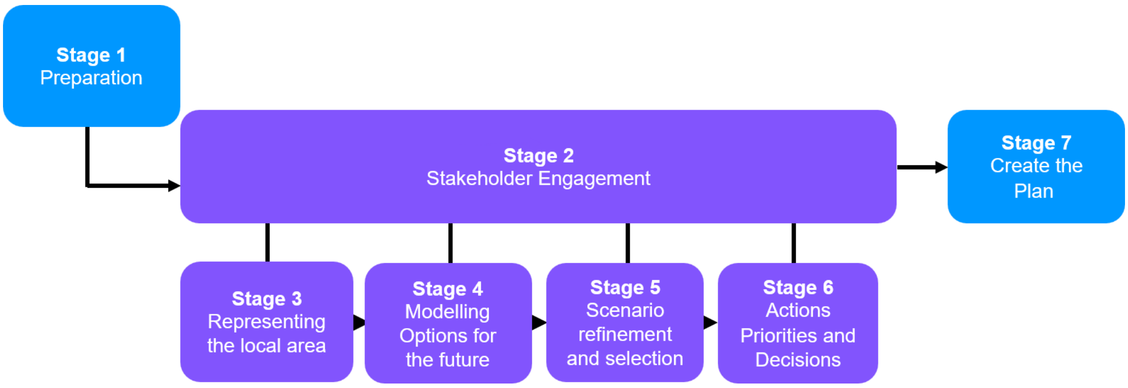
Note: other exclusions may exist, which will be presented in the technology intervention areas, and associated appendices.

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 through national infrastructure 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 GBR's target to reach net zero. This LAEP will be modelling specifically identified net zero 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 all three local authorities.

Figure 1.2: LAEP Summary Approach



2 Policy Context

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[3], 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[4]. 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), [5]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, including 2.1 GW of transmission-connected solar PV and 500 MW of battery storage in Central England, guiding local connection priorities.

To support delivery, the 2025 Planning and Infrastructure Bill[6] 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.

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

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

[5] UK Government, *Great British Energy Act 2025* (The Stationery Office, 2025)

[6] UK Government, *Guide to the Planning and Infrastructure Bill* (Department for Levelling Up, Housing & Communities, 2025)

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 2021 Heat and Buildings Strategy[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 2025 Future Homes and Buildings Standard [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. Homes built under the new standard are expected to produce 75–80% fewer emissions than those built under current regulations.

The 2025 Warm Homes Plan[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 Integrated National Transport Strategy[10] develops 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.

A pre-existing UK Transport Decarbonisation Plan[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 refuelling stations. Recent updates include the Zero Emission Vehicle mandate and Sustainable Aviation Fuel mandate from 2025.

The UK’s Modern Industrial Strategy[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)[13] has set ambitious goals to create a greener, more sustainable environment. In alignment with national targets, the EMCCA aims to be carbon neutral by 2050. To realise this ambition, some of opportunities have been identified which include building new low carbon homes, retrofitting existing home, 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.

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[7] HM Government, *Heat and Buildings Strategy* (Department for Business, Energy & Industrial Strategy, 2021)

[8] HM Government, *The Future Homes and Buildings Standards: 2023 Consultation* (Department for Levelling Up, Housing & Communities, 2023)

[9] HM Government, *Help to Save Households Money and Deliver Cleaner Heat to Homes* (Department for Energy Security and Net Zero, 2025)

[10] Integrated National Transport Strategy for England

[11] Transport decarbonisation plan

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

[13] East Midlands Combined County Authority, *Corporate Plan 2025–26* (EMCCA, 2025)

2.2.2 D2N2 LEP Energy Strategy

The D2N2 Local Enterprise Partnership [14](covering Gedling, Broxtowe and Rushcliffe, Nottingham, Nottinghamshire and Derbyshire) set out a regional energy strategy for 2019-2030 to support economic growth while reducing carbon emissions. It targets a 60% reduction in emissions from 1990 levels, 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 emission, 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 Nottinghamshire County Council Carbon Reduction Plan

The Nottinghamshire County Council Carbon Reduction Plan[15] provides a roadmap of how the area of Nottinghamshire County will reduce its carbon missions to become carbon neutral by 2030. It sets out a framework for action and scope for the activities for which greenhouse gas (GHG) emissions will be measured and reported in pursuit of the 2030 goal. The scope of the emissions is limited to activities related to energy use in buildings, highways assets (mainly street lighting), and work-related travel and transport.

2.2.4 The Nottinghamshire Plan

The Nottinghamshire Plan [16]covering the period from 2021 to 2031, sets out the long-term vision of creating a healthy, prosperous and green future for all residents. The key objectives focus on bringing improvements to health, wellbeing and living standards as well as growing the economy while achieving net zero carbon targets by 2030 through

- Reducing emissions across transport fleets, properties and highways
- Support and improve biodiversity
- Reduce waste and increase recycling
- Improve air quality
- Promote greener travel

2.2.5 Nottinghamshire's Electric Vehicle (EV) Charge Point Framework

The Nottinghamshire EV Strategy [17]sets out a clear vision and approach to expanding EV infrastructure by developing a comprehensive, accessible, and future-ready charging infrastructure across the county. It supports Nottinghamshire'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.

2.2.6 EMCCA Corporate Plan 2025-26

With EMCCA in its early years of operation, significant long-term policy is still in development. However, EMCCA have produced a Corporate Plan for 2025-26, which sets out several commitments on the net zero transition and climate resilience. These include developing a strategic vision and investment plan for clean energy across the EMCCA region, supporting investment in green industry,

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[14] D2N2 Local Enterprise Partnership, *D2N2 Energy Strategy 2019–2030* (D2N2 LEP, 2019)

[15] Nottinghamshire County Council, *Carbon Reduction Plan 2022–2032* (Nottinghamshire County Council, 2022)

[16] Nottinghamshire County Council, *The Nottinghamshire Plan: Our Plan for a Healthy, Prosperous and Greener Nottinghamshire 2021–2031* (Nottinghamshire County Council, 2021)

[17] Nottinghamshire County Council, *Electric Vehicle Charging Frameworks and Strategies* (Nottinghamshire County Council, 2025)

energy efficiency and low-carbon energy generation, leveraging the region's leading position in fusion, advanced nuclear and hydrogen industries, and establishing a nature and biodiversity taskforce.

2.2.7 East Midlands Local Retrofit Strategy

The East Midlands Local Retrofit Strategy (2025–2028)[18] 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 Gedling Borough Council Carbon Management Strategy

Gedling Borough Council declared a climate emergency in 2019 and set an ambitious target of achieving net zero carbon emissions by 2030. The council published its Carbon Management Strategy (2021 – 2030[19]) outlining the actions the Council will take to reduce its carbon emissions in response to the climate emergency. This was updated in 2025[20] to include the following targets:

- Consider the inclusion of local energy efficiency standards through Gedling's Local Development Plan.
- Maximise available funding (through EMCCA & other sources) promote schemes to help retrofit housing within the borough, by raising EPC standards to a minimum of a C or above.
- Further develop a strategy for EV charging points across Gedling owned car parks and explore external funding opportunities.
- Identify and work with key influencers/partners in the borough, such as the climate change groups, D2N2 LEAP to promote the climate change agenda.
- Delivery of Biodiversity Net Gain for new developments by at least 10%.

2.3.2 Broxtowe Borough Council Climate Change and Green Futures Strategy

In 2019, Broxtowe Borough Council declared a climate emergency and committed to becoming carbon neutral by 2027[21] and net zero beyond this. The council published this strategy to highlight key areas where stakeholders can work together to drive positive change, as well as setting out some important context in policy and emission data.

Within the strategy, the Council has pledged the following:

- Reduce its carbon emissions year on year as much as possible.
- Engage with all stakeholders on issues regarding climate change at every opportunity.
- Refresh the Climate Change and Green Futures Strategy and Carbon Management Action Plan regularly to ensure it remains relevant, up-to-date and fit for purpose.
- Review projects and approve investment based on a cost to benefit rationale.
- Look to work with external partners to seek investment, funding and professional advice.

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

[19] Gedling Borough Council, *Carbon Management Strategy 2021 to 2030* (Gedling Borough Council, 2021)

[20] Gedling carbon management actions - 2025-26 Update

[21] Broxtowe Borough Council, *Carbon Neutral by 2027: Climate Change and Green Futures Strategy* (Broxtowe Borough Council, Updated 2024)

2.3.3 Rushcliffe Borough Council Climate Change Strategy

In 2020, Rushcliffe Borough Council made a commitment to work towards becoming carbon neutral by 2030[22] for its own operations. The Council is also committed to supporting local residents and businesses reduce their own carbon footprint. The strategy highlights the three key areas of focus for the council:

- Reducing the emissions associated with buildings and activities
- Supporting residents and businesses to reduce their emissions
- Protecting and increasing green spaces and their ability to absorb CO_2

[22] Rushcliffe Borough Council, *Carbon Neutral 2030 – Council Strategy* (Rushcliffe Borough Council, 2020)

3 Current Emissions and Energy Use

This section presents an overview of the existing emissions and energy across the three LAEP local authorities, Gedling, Broxtowe and Rushcliffe with the intent of outlining the emissions and energy baseline for this LAEP.

3.1 The Energy Baseline Definition

The Local Area Energy Plan (LAEP) energy baseline for each local authority is a simulation of energy supply and demand across all buildings within each borough'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 approximately 147,000 buildings, 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, which visualises all buildings and energy assets across each local authority area.

A Middle-layer Super Output Area (MSOA) is a medium-sized statistical geography used in England and Wales, sitting between Lower-later Super Output Areas (LSOAs) and Local Authorities. Each MSOA contains around 5,000-15,000 residents or 2,000-6,000 households.

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, as well as industrial process load data from Cadent Gas. The modelling is organised by MSOAs, with each MSOA containing around 5,000 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

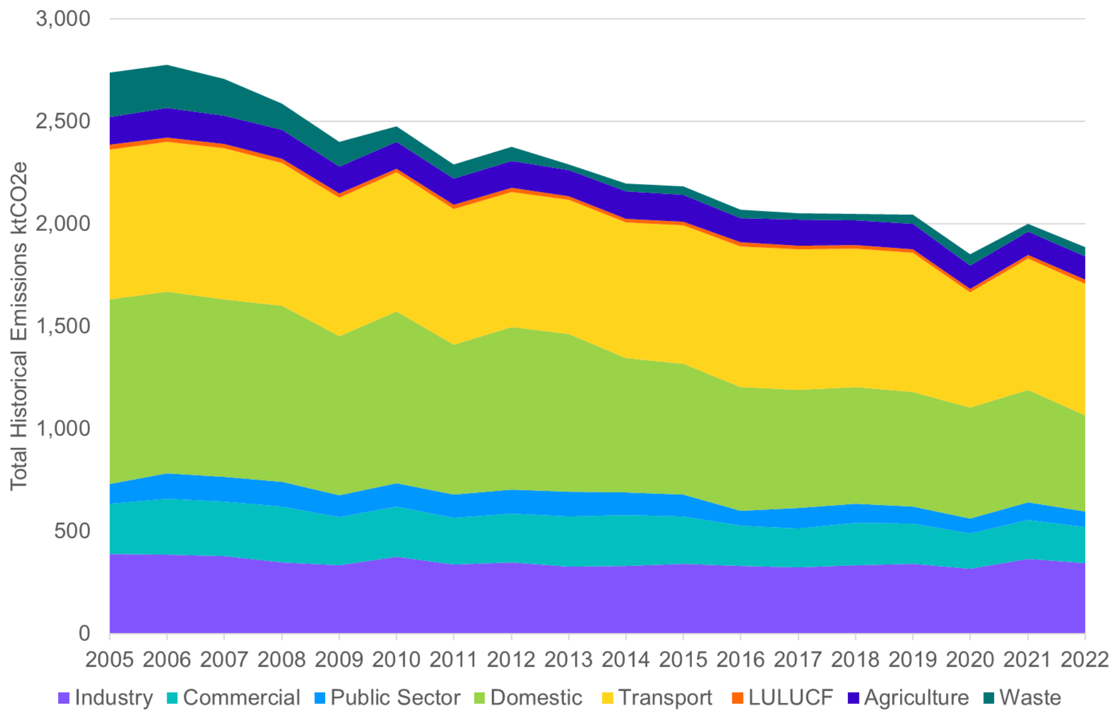
The total amount of emissions attributed to Gedling, Broxtowe and Rushcliffe is 1,765 ktCO2e, based on UK Government data for 2023[18].

Figure 3.1 illustrates the historical emissions of Gedling, Broxtowe and Rushcliffe from 2005 to 2023, split by sector. Over this period, each area has experienced a combined 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 34% of total emissions, followed by industry at 18%, the commercial sector at 10%, The public sector represented a smaller share at 4%, reflecting emissions from public buildings and services, agriculture at 6%, and waste-related emissions made up 2%, while land use, land-use change and forestry (LULUCF) accounted for the remaining 1%. The LAEP scope includes emissions from industry, commerce, public, and domestic sectors, targeting **57%** of Gedling, Broxtowe and Rushcliffe's total carbon emissions.

This targeted scope ensures that the LAEP focuses on the most significant local emission sources and supports the development of effective, evidence-based decarbonisation strategies.

Figure 3.1: Historical emissions of Gedling, Broxtowe and Rushcliffe from 2005 to 2023, split by sector



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

Please note that a breakdown of historic carbon emissions and building energy use according to local authority can be found in Appendix F.

Figure 3.2: Gedling, Broxtowe and Rushcliffe emissions breakdown in 2023, split by sector

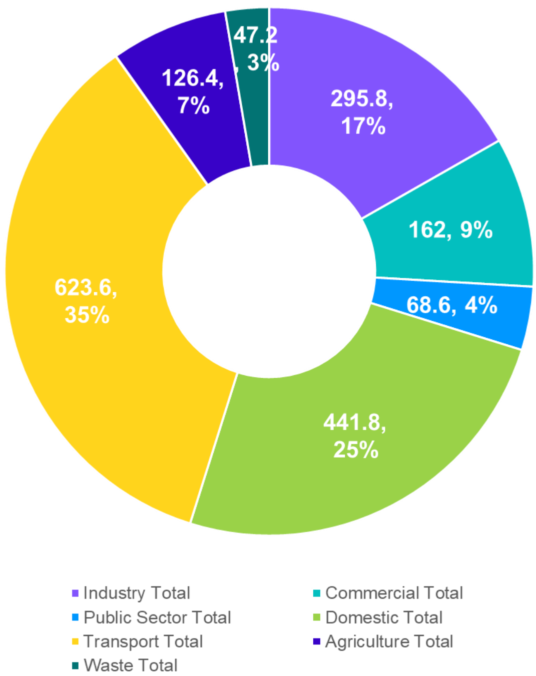
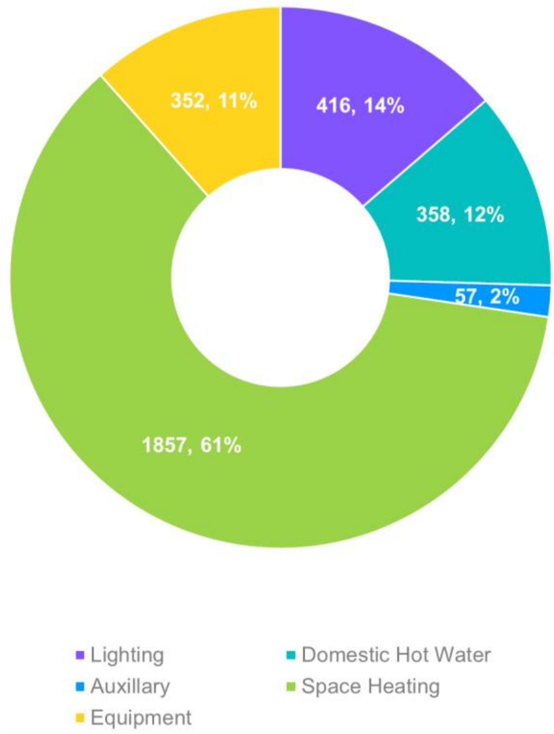


Figure 3.3: Gedling, Broxtowe and Rushcliffe Average Buildings Use Energy Breakdown (GWh)



Total building energy demand in Gedling, Broxtowe and Rushcliffe totalled 3,039 GWh in 2023, with energy demand slightly higher in Rushcliffe due to its higher concentration of rural areas and older, less efficient building archetypes. However, the proportionality of energy consumption end use is similar across all local authorities. Space heating was the dominant energy use at 61%, followed by lighting (14%), equipment (11%), domestic hot water (12%) 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.

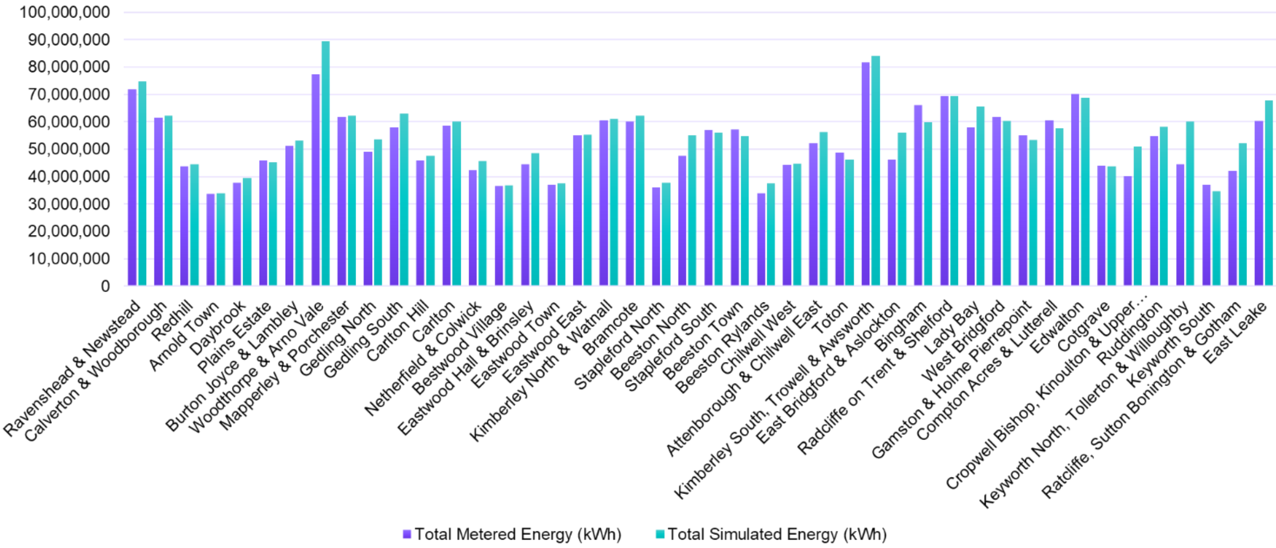
The split between the different sectors is generally consistent between districts. However, emissions in Broxtowe are strongly driven by Transport, with these emissions accounting for nearly half of the areas total emissions. This is likely due to the dense population as well as proximity to the Nottingham city. The split between industrial, commercial and domestic sectors differs slightly between districts, and most notably industrial emissions in Rushcliffe are higher than the other areas, with Ratcliffe-on-Soar making way for the East Midlands Freeport. In Gedling, emissions arise from a much broader range of sectors, with the transport and domestic sectors dominant, whilst the presence of agricultural operations in Rushcliffe contributes to the combined area's emissions, but Gedling and Broxtowe show minimal emissions in this sector.

3.4 Energy Baseline Validation

Data from the Energy Savings Trust was utilised to model energy use in the Digital Twin, and results from the Digital Twin were validated against UK Government data which includes only electricity and gas metered consumption. In terms of data accuracy, 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. This is not anticipated to be material in the case of Gedling, Broxtowe and Rushcliffe.

Below are the energy simulation results for electricity and gas consumption compared to government data at MSOA level for Gedling, Broxtowe and Rushcliffe's domestic buildings.

Figure 3.4: Energy simulation results for electricity and gas consumption compared to government data at MSOA level



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, and all MSOA results fall within this range. Detailed results of the validation for each MSOA are available in Annex D IES Baseline Validation by MSOA.

4 Stakeholder Engagement

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 Gedling, Broxtowe and Rushcliffe'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.
- Increase stakeholders' understanding of energy systems and the LAEP process.
- Develop stakeholder trust and buy-in to 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 targets of Gedling, Broxtowe and Rushcliffe Councils.
- Establish a sound foundation for effective and sustained local action to reduce carbon emissions in line with each borough's climate targets.

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. The grouping of stakeholders into the following categories ensured that each stakeholder group received tailored engagement and information regarding the scheme and its proposals. Definitions of each of the stakeholder groups is provided in the table below.

Table 4.1: Stakeholder Prioritisation

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

Steering Group (SG)

A small group of individuals who represent the local authorities, 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 Cadent Gas 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 and optimised pathways. These stakeholders included key council representatives, and relevant community groups.

Group 2: Secondary Stakeholders (SS)

Secondary stakeholders were not directly involved in the LAEP's core activities. They provided local insights, priorities, and data inputs. These stakeholders included large industry and/or commercial organisations such as the NHS, utility providers, and residents' groups. 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 LAEP development process.

Table 4.2: Summary Stakeholder Register

Stakeholder Category	**Organisations Engaged**
Steering Group	Gedling, Broxtowe and Rushcliffe Councils' Climate Change leads, D2N2/EMCCA representatives, Mott MacDonald, IES
Group 1 Stakeholders	National Grid, Cadent Gas, Local NHS boards, Nottinghamshire and Derbyshire County Councils

Primary and Secondary Stakeholders	• Employees from other teams within Gedling, Broxtowe and Rushcliffe councils • Local residents and resident groups • Local government organisations • Large industry commercial organisations (Boots, Saint Gobain, Warburtons) • Community energy organisations • Net-zero hub/local enterprise partnership (LEP) • Social housing providers and local council housing teams (Places for People, Uniper, EMH Homes) • Local organisations with energy/decarbonisation expertise (University of Nottingham) • Utility Providers (Severn Trent) • Local planners and developers • Public sector estates organisation

4.4 Stakeholder Engagements

The engagement process was designed to be iterative and two-way. 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 Cadent Gas, National Grid and UK Power Network 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 priority and non-priority groups 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.

This commits 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 using 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	Frequency	Description
Workshops	Bi-monthly	Virtual and/or in person. Working with Primary, Group 1 and Secondary stakeholders to gather insights on the LAEP and help refine future plans and discuss interventions and priorities both in groups and on 1:1 basis. 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. Other tools, such as MS Form surveys or polls, were used for additional input where relevant.
Written communications	Monthly	Written article and poster contributions for local area magazines, news outlets and community events. Contributions include submissions to the Gedling Contacts' Magazine, the Gedling Parish Council Forum and the Green Growth business events, with adapted language to enable local communities and stakeholders understand what a LAEP is. A QR code was included which linked more extensive information and/or a MS form questionnaire which enabled stakeholders to directly submit feedback and engage further.
Industry events	Ad-hoc	In person. External engagements at key regional industry events to gather specific perspectives and insights. Examples include; 1. East Midlands Hydrogen Summit - 8 November 2024 - Members of the Mott MacDonald and IES team presented to local industrial stakeholders on the LAEP process and discussed opportunities to represent hydrogen plans of local industry within the LAEP. This summit was the landmark event in the East Midlands Hydrogen calendar, where the hydrogen vision and ecosystem for the East Midlands took centre stage, with presentations from local business, local government, and workshops for delegates on a variety of topics around hydrogen. 2. Fast Followers Community Group Event - 7 February 2025 - A representative of the Mott MacDonald team presented to local community groups on the LAEP process and discussed opportunities for community energy groups and other interested parties to participate in area-specific LAEP stakeholder engagement. A number of stakeholders were registered with the programme to be added to specific LAEP stakeholder lists. The free-to-attend event was open to all community groups and other interested parties across the region

		and focussed on building knowledge, understanding and capacity across communities and community groups to tackle climate change and the wider sustainability agenda.
Direct Interaction – Email	Briefing information ahead of workshops.	Emailing to prepare stakeholders for the workshops by providing aims and objectives of the session, as well as key themes to encourage streamlined sessions. Allowing for two-way engagement if any questions arise. 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 Gedling, Broxtowe and Rushcliffe

Stakeholder	Insight
Heat Network developer	Understanding Gedling, Broxtowe and Rushcliffe'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.
University	Sharing their research into approach to tackling their buildings and housing stock offered useful insights for localised and bespoke approaches for retrofit.
Local 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 combined heat and power (CHP) engines and biomethane supported our understanding of which high-energy non-domestic consumers could be heat network or heat pump ready.
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

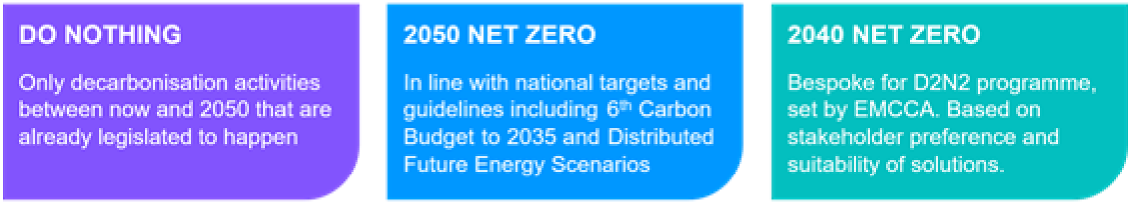
This section sets out the scenario constraints which frame the LAEP, and the approach to deciding which interventions underpin the fundamentals of the transition to net zero for Gedling, Broxtowe and Rushcliffe.

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 Gedling, Broxtowe and Rushcliffe.

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 Table 5.1: Do Nothing Modelling Assumptions.

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

The third scenario presented here is bespoke and was customised based on regional level discussions with EMCCA. This scenario accelerates the 2050 scenario to decarbonising the region, including GBR by 2040 through the selected interventions mechanisms.

It is based on technologies all available today and outcomes could be subject to change if not yet proven technologies are approved with a secure supply, such as hydrogen deployment. Uptake assumptions are based on conversations and discussions held with GBR and regional stakeholders.

5.2 Scenario Modelling Approach

Scenario modelling for LAEPs typically follows 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 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.

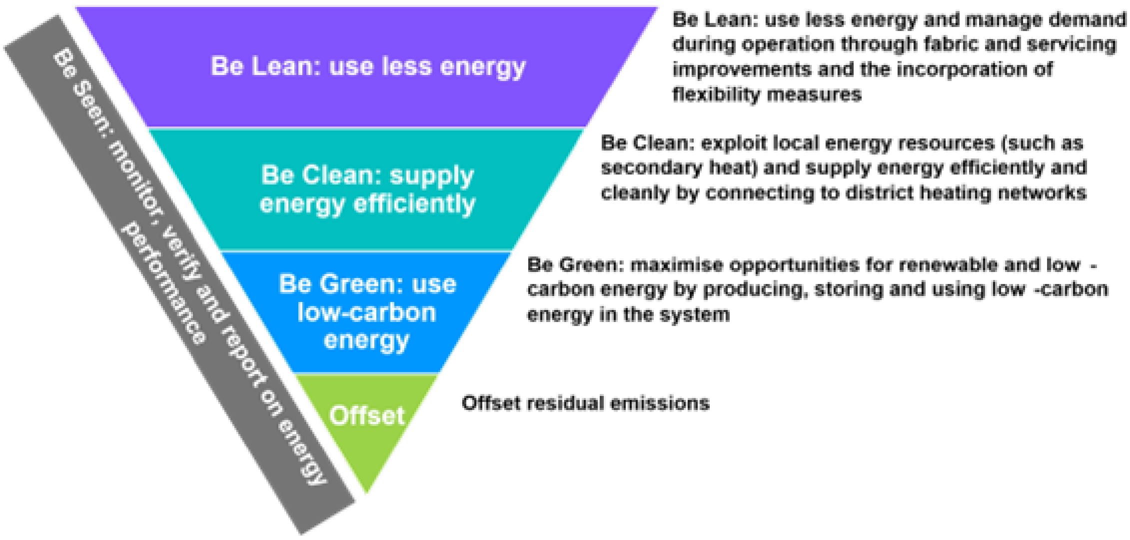
- For the **Net Zero by 2050 scenario**, the uptake curves typically follow the CCC's Balanced Pathway, with local adjustments.
- For the more ambitious **Net Zero by 2040 scenario**, the timeline is compressed by a factor of approximately 1.67 (25 years to 2050 vs. 15 years to 2040). This shifts data 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 Hierarchy offers an effective framework to guide sustainable energy policy and decision-making.

The Interventions identified for Gedling, Broxtowe and Rushcliffe therefore follow this hierarchy, starting with energy efficiency measures and then 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. 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.

Existing properties below EPC C	
Gedling	36,722
Broxtowe	35,286
Rushcliffe	30,761

Total required deep retrofits	
Gedling	25,671
Broxtowe	25,114
Rushcliffe	17,594

Total required light retrofits	
Gedling	22,080
Broxtowe	20,620
Rushcliffe	16,838

Energy savings from retrofits (GWh/yr)	
Gedling	177.0
Broxtowe	181.9
Rushcliffe	163.9

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 a 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 which is crucial to tackling climate change. 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 Chapter 7 Low Carbon Heating**.**

6.1 Existing Building Stock

6.1.1 Domestic Housing Stock

Domestic housing accounts for 94% of all buildings across the three boroughs of Gedling, Broxtowe and Rushcliffe, so targeted energy interventions here will have a significant impact on the local energy transition and carbon emissions. Domestic housing includes social housing, private rented and owner-occupied tenure types.

Gedling, Broxtowe and Rushcliffe's housing stock is diverse, including Victorian and Edwardian terraces, interwar council housing, post-war suburban estates, rural cottages, and more recent suburban developments from the 1990s onwards. Broxtowe and Gedling have larger concentrations of mid-20th century housing, while Rushcliffe includes a higher proportion of detached homes and newer build developments, particularly in areas like West Bridgford and Bingham.

Measures to reduce both thermal and electrical demand through improved fabric performance and targeted energy efficiency measures will help lower energy consumption, reduce carbon emissions, and support the transition to low-carbon heating and electrification across each borough.

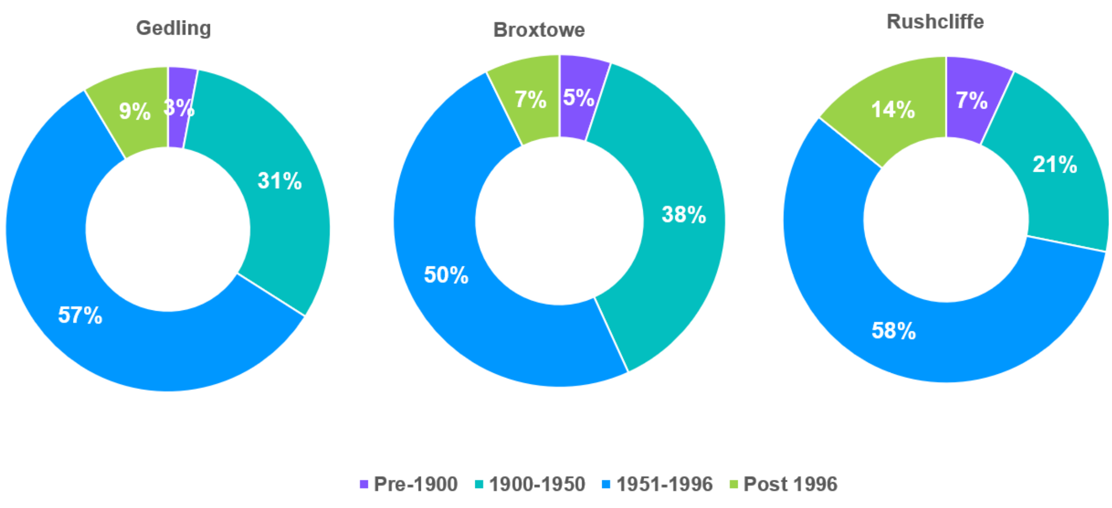
In the context of EMCCA and this LAEP, energy efficiency will play a critical role in demand reduction and heat decarbonisation across the area. Through following the first step of the Energy Hierarchy, “Be Lean”, it is possible to bring wider benefits such as creating warmer homes, improving internal air quality and thermal comfort, reducing energy use, all giving occupants more certainty over their energy bills, and a reduction in the risk of fuel poverty.

The UK’s Energy Performance Certificate (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 collects across building fabrics (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 as explored in Section 3 Current Emissions and Energy Use and the “tools” that the region authority might have at their disposal by way of energy interventions. The scale of retrofit needed to improve building energy efficiency levels is indicated by construction dates of existing housing, which will indicate what pre-existing energy-efficiency measures are in place.

Figure 6.1 displays the breakdown of age bands of properties across GBR. Properties built between 1900-1996 account for the vast majority of all housing, and housing built between 1951-1996 and 1900-1950 makes up 57% and 27% respectively. The year a property was built significantly influences the construction methods, materials and insulation levels within the property. Homes constructed pre-1900s are likely built with solid external walls and very little insulation which in turn means they can be draughty and not airtight, which means they are challenging to retrofit.

Figure 6.1: Split of domestic buildings by age band across Gedling, Broxtowe and Rushcliffe



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[23]. 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

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

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.[24]

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 ~10% 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.

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.

Applying external or internal wall insulation carries a significant financial cost, which is another barrier to more widespread installation.[25] It is therefore unsurprising that a substantial proportion of Gedling, Broxtowe and Rushcliffe's homes fall below the UK Government's recommended EPC rating of C or above. The proportion of homes rated D or lower is 57%, 66% and 55% across Gedling, Broxtowe and Rushcliffe respectively, evidencing their high energy demand and poor insulation levels. This further raises the importance of fabric retrofit and energy efficiency as a priority in the area.

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, which encapsulate a significant proportion of buildings in Gedling, Broxtowe and Rushcliffe. 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 retrofits may be suitable for more urban areas with newer housing stock, a targeted and tailored approach will be required.

The following sections breakdown each local authority's mix of housing stock construction dates and related EPC ratings, per MSOA for each borough.

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

[25] Department for Business, Energy and Internal Strategy, *Retrofit Internal Wall Insulation: Guide to Best Practice* (Publisher and year not specified)

Figure 6.2: Proportion of Age Band of Buildings across Gedling MSOAs

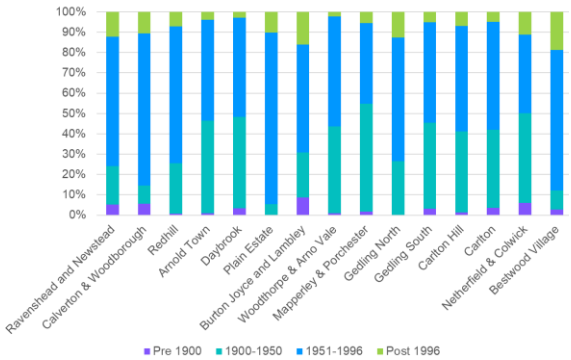


Figure 6.3: Proportion of EPC Ratings Across Gedling MSOAs

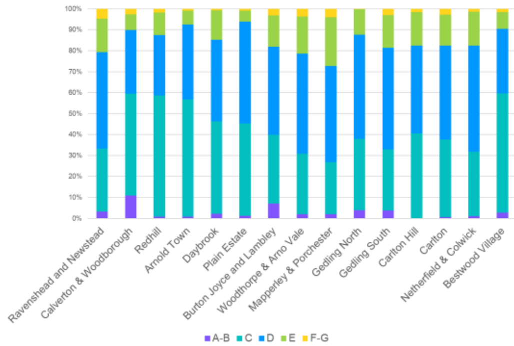


Figure 6.4: Proportion of Age Band of Buildings across Broxtowe MSOAs

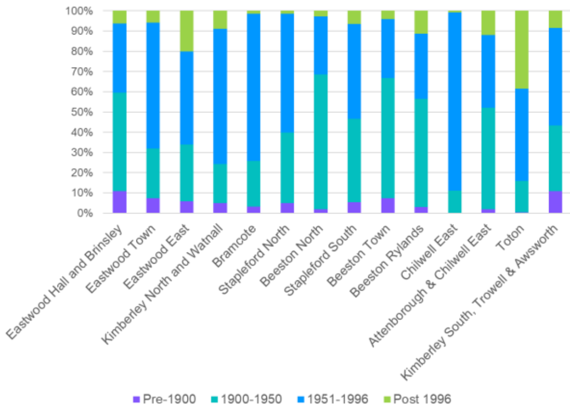
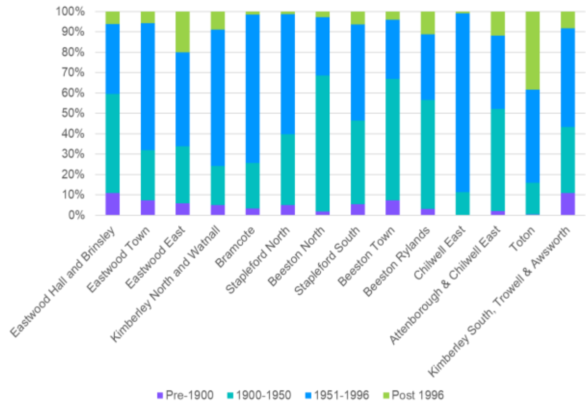


Figure 6.5: Proportion of EPC Ratings Across Broxtowe MSOAs



In Gedling, the housing stock comprises of a mix of post-war council housing, Victorian terraces and modern suburban developments. Gedling Borough Council has set out its own housing ambitions in the Gedling Local Development Plan to build 11,358 new homes in the period 2024-2043.

Broxtowe has an urban and rural mixed population, with 60% of the population living in urbanised areas compared to 40% living in the countryside. 60% of Broxtowe's housing is built between 1900-1966 and these are predominantly EPC rated D-G, implicating poor energy efficiency due to insufficient insulation and outdated heating systems. The borough council plans to build 250 new homes between 2025 and 2030 to align with its asset Management Strategy.[26]

Rushcliffe's population is largely rural and divided between six larger settlements[27] , with the largest being West Bridgford. The housing stock in Rushcliffe sees a mix of pre-1945 construction housing found in both older villages and town centres, as well as mid-20th century suburban growth in West Bridgford and Bingham initiating a larger portion of housing dated between 1945-1980s. Areas such

[26] Broxtowe Borough Council, Housing Delivery Plan 2025 – 2030. (Broxtowe Borough Council, 2025)

[27] Broxtowe Borough Council, Nottingham City Council, Rushcliffe Borough Council. Greater Nottingham Strategic Plan (2025)

as Edwalton and East Leake have many post-2000 constructed dwellings. The council proposes to build a further 830 houses per annum between 2024 and 2029.[28]

Figure 6.6: Proportion of Age Band of Buildings across Rushcliffe MSOAs

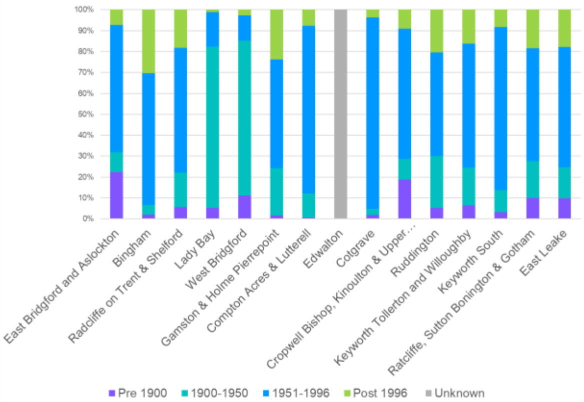
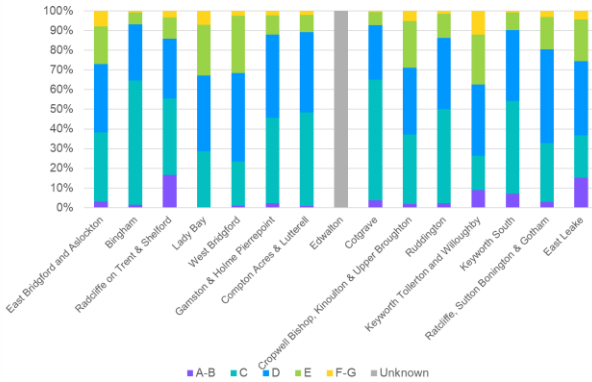


Figure 6.7: Proportion of EPC Ratings across Rushcliffe MSOAs

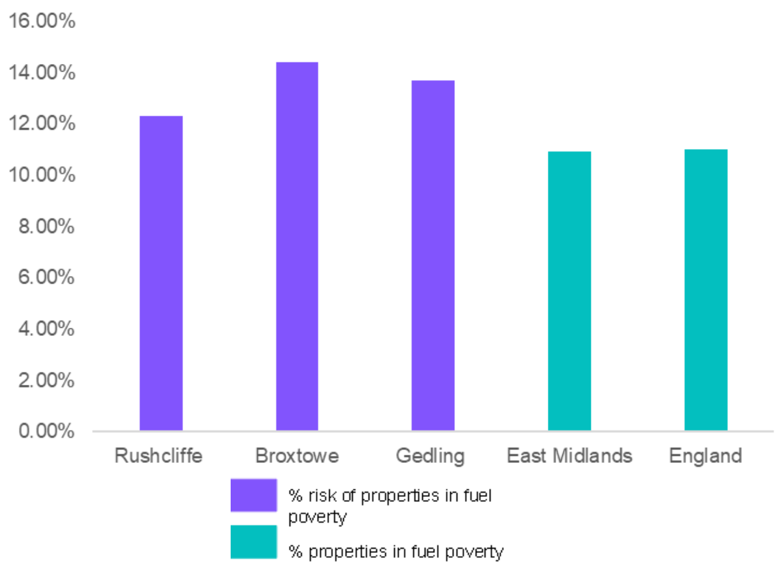


The home analytics dataset used within this LAEP did not include EPC ratings or age band data for Edwalton's building stock, therefore this area was excluded from retrofit modelling.

Homes constructed post year 2000 may only require minimal upgrades to reach beyond EPC rating C, 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 GBR'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.

It is likely that this challenge will continue to influence the level of fuel poverty experienced in the region. The current proportion of households at risk of being in fuel poverty across GBR sits at 13.5%, a rate higher than both the East Midlands average of 10.9% and the national average of 11%.

Figure 6.8: Proportion of Fuel Poor Households in GBR



The Low-Income Low Energy Efficiency (LILEE)[29] definition of fuel poverty was introduced in 2019 which classifies a household as fuel poor if it spends more than 10% of its annual income on space heating and energy services. This is more likely in a home rated EPC E or below due to lack of insulation and poor thermal retention capability.

[28] Rushcliffe Borough Council. Five Year Housing Land Supply Assessment. (Rushcliffe Borough Council, 2025)

[29] Department for Energy Security and Net Zero, *Fuel Poverty Methodology Handbook 2025: Low Income Low Energy Efficiency (LILEE)* (UK Government, 2025)

Fuel poverty currently contributes to around 155 excess winter deaths across EMCCA annually, which emphasises how retrofitting homes can have a huge impact on reducing this alongside reducing health inequalities and reducing absences from school and work arising from damp and cold air related illnesses.[30]

The darker blue areas on IES' digital twin map screenshot in Figure 6.9 illustrates that the risk fuel poverty varies around the region with increased likelihoods in both urban areas and rural areas. The areas most at risk of fuel poverty are Daybrook and Netherfield and Colwick in Gedling, West Bridgford and Ratcliffe, Sutton Bonnington and Gotham in Rushcliffe, and Beeston Town, Beeston North and Eastwood Town in Broxtowe.

Figure 6.9: Average Risk of Fuel Poverty per Household across GBR

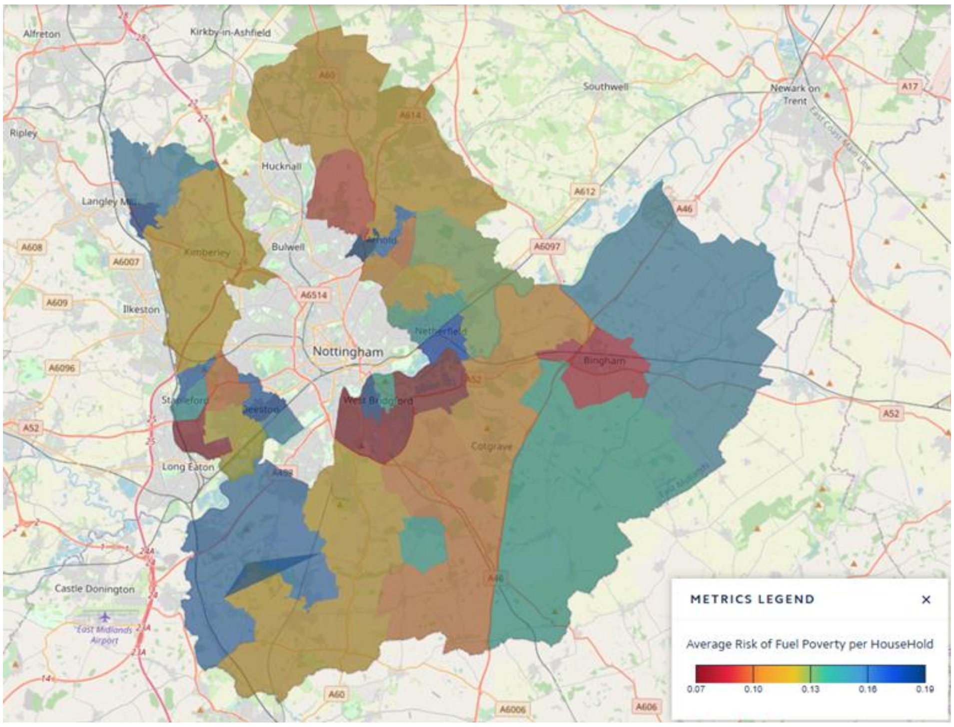


Figure 6.10 shows the tenure breakdown across the area. Of the homes within Gedling, Broxtowe and Rushcliffe, 84% of homes are owner-occupied, 10% are privately rented, and 7% are social housing. Owner-occupied properties account for the majority of domestic thermal demand across GBR.

This diversity in ownership is a strong influence on the scale and pace of fabric upgrades across the region's domestic housing. This is mostly due to incentives, availability of funding as well as the availability of skilled workers to deliver the upgrades.

Across all tenure types, lighter retrofit measures will understandably be more affordable and therefore have a shorter payback than deep retrofit. With typical payback periods of approximately five years, light retrofit is more likely to be affordable for homeowners especially those in the owner-occupied bracket. However, this intervention would not result in the same thermal or energy efficiency impacts as deep retrofit could, as the cost and payback is much less favourable to the homeowner.

There are currently, no incentives to upgrade fabrics exist for private landlords to raise the rating of their properties above an EPC E. Social housing providers have the ability to buy fabric upgrade measures in bulk and can manage procurement more effectively for their own energy efficiency programmes, which are often part or fully funded through public sector grant funding. Recently social

[30] East Midlands Combined County Authority, *East Midlands Retrofit Strategy* (East Midlands Combined County Authority, 2025)

housing has seen increased funding support from government through the Social Housing Decarbonisation Fund and the Warm Homes Social Housing funding.

6.1.3. Non-Domestic and Commercial Building Stock

The non-domestic sector accounts for 6% of the buildings across Gedling, Broxtowe and Rushcliffe. These buildings span the public and commercial sectors and are utilised for a variety of primary uses, as identified in Figure 6.12. Detailed in this figure is the total number of non-domestic building split by primary use case.

The EPC values of non-domestic properties were evaluated to identify priority areas, as highlighted in Figure 6.11 below. Approximately 81% of Gedling, Broxtowe and Rushcliffe's non-domestic buildings are rated EPC D and below. When compared to the domestic EPC ratings across different MSOAs, there is a much greater diversity in location and energy efficiency, with no pattern or consistency across the region.

Figure 6.10: Proportion of Tenure Types across Gedling, Broxtowe and Rushcliffe MSOAs

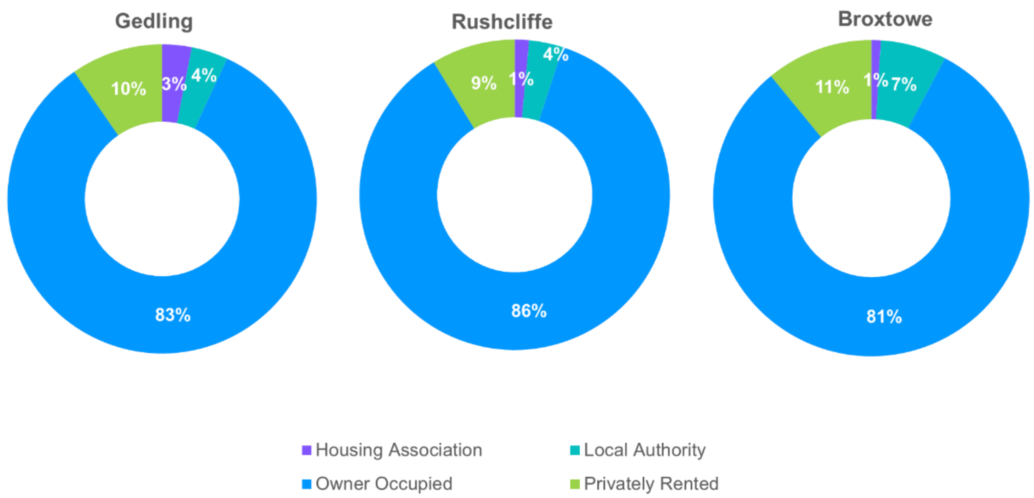
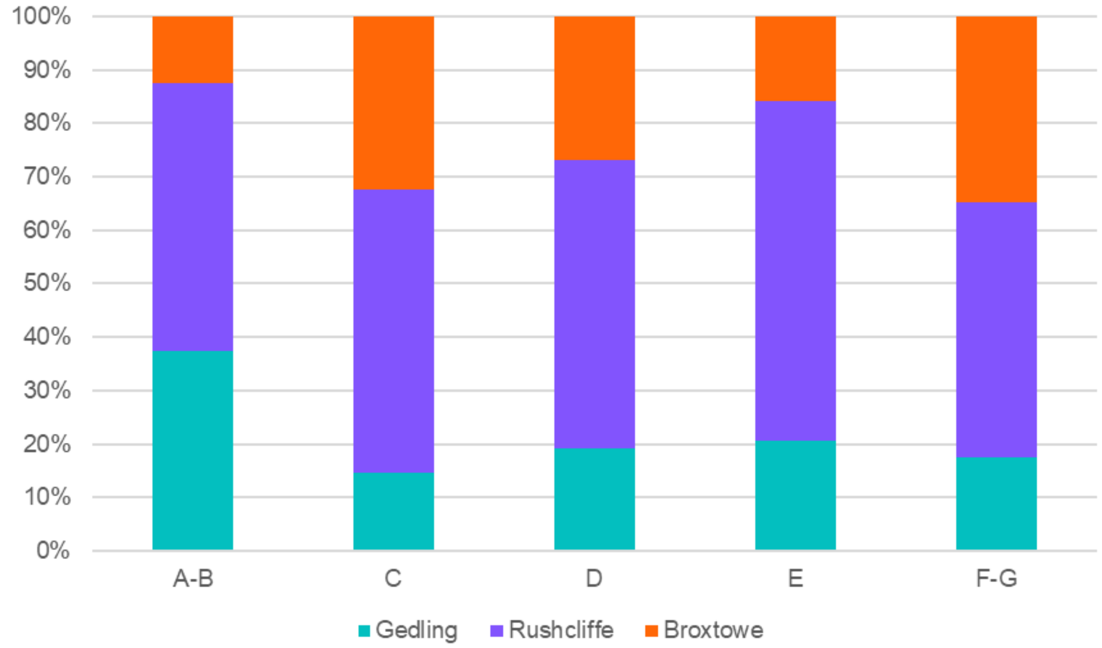


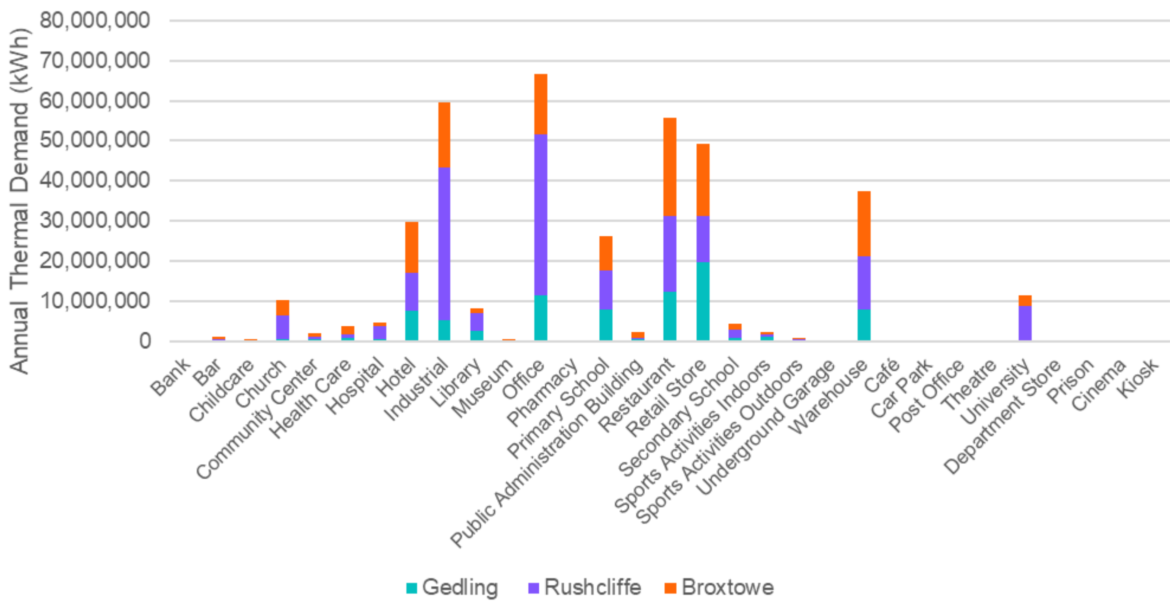
Figure 6.11: EPC Ratings of Non-Domestic Buildings across GBR



The thermal demand across different non-domestic building types is shown in Figure 6.12, which highlights the key building types in need of energy efficiency improvements. The office properties exhibit significantly higher thermal demand than the other building types, primarily due to the large volume of the properties across GBR, identifying this building type as a priority to retrofit.

The EPC dataset used in this assessment was limited and did not contain information on specific fabric condition and construction types. It is therefore unclear whether the increased demand in these building types is driven by operational systems and activities specific to each use, or by poor thermal efficiency of the buildings themselves.

Figure 6.12: Total thermal demand of non-domestic properties in Gedling, Broxtowe and Rushcliffe split by primary use



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 requires all rented commercial properties in the UK must have a minimum EPC rating of E. To progress energy efficiency in non-domestic building stock requires further energy studies on non-domestic buildings to provide more available data to aid in identifying and implementing energy efficiency measures across the properties.

Within the scope of this LAEP, the opportunity to accurately represent the decarbonisation of the non-domestic sector depends on the availability of 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 building will have significantly different building fabrics, equipment type and operational profiles, and occupancy patterns which will affect which measures are most suitable and effective 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, the Public Sector Decarbonisation Scheme is a good example of this type of funding support. 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.

During the LAEP development and through the stakeholder engagement with non-domestic stakeholders and estate managers, ongoing retrofit programmes amongst non-domestic buildings, such as schools, colleges and the NHS, where highlighted. All programmes mentioned were following fabric first approaches despite funding limitations. To ensure continued operation of such buildings out of hours periods (e.g. end of term) were being used to implement such measures or complete upgrades.

The fabric improvement principles of energy efficiency discussed in section 6.1.1 equally apply to non-domestic buildings to support their means to achieving net zero compliance and attain the same key benefits such as improved thermal comfort for building users. Office buildings tend to share similar characteristics, such as building envelopes, room layouts, and energy systems, presenting an opportunity for standardised retrofit approaches. Implementing retrofit at scale across these building type may pose a more straightforward opportunity 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 incurring further complexity and therefore costs.

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 space. This means that the ability of the local business or organisation within the space to effect energy efficiency change within their environment is relatively minimal compared to the domestic sector. 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.

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 GBR’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 using two energy efficiency interventions.

The specific fabric upgrades that were modelled into GBR's LAEP were split into the following Retrofit categories shown in Table 6.1. There are approximately 34,000 buildings in Gedling, 32,000 building in Broxtowe and 25,000 buildings in Rushcliffe requiring some degree of retrofit across these light and deep retrofit categories in order to meet MEES compliance as a minimum.

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 (excluding timber frame construction to avoid damp and moisture risk).	**Window Upgrades**: All single-glazed windows proposed to be upgraded to double glazing.
Full Loft Insulation: Targeted to properties where the predicted loft insulation depth is between 0–50mm, effectively meaning they have no insulation.	**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.

6.2.2 Building Fabric – Do Nothing

This scenario considers 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 Governments Minimum Energy Efficiency Standards (**MEES**) **regulations**[31], which applies to private-rented properties not owner-occupied, currently states that a property cannot 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.

The UK Government is encouraging the improvement of housing stock via these policies and incentives, the impacts of which have been incorporated into our modelling of the "do nothing" scenario. Some other means to improving energy efficiency are highlighted but have not been included as they are not mandated legislation.

The Social Housing Fund's (2025–2028+) front-load light measures on social housing stock (13% of the total housing stock), also aligns with the CCC 7th carbon budget Balanced Net Zero Pathway emphasising the rapid rollout of efficiency measures first such as extensive insulation by the mid-2030s followed by heat pumps.

[31] HM Government, *Improving the Energy Performance of Privately Rented Homes: 2025 Update* (Department for Energy Security and Net Zero, 2025)

The UK government is consulting on tightening MEES toward EPC C this decade for the Private rented sector (PRS), so modelling saw an acceleration for the wider PRS (15% of entire housing stock) from 2028–2030 without over-claiming a firm legal mandate.

6.3 Light Retrofit

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

It is important that this level of retrofit is made available especially to vulnerable individuals. The opportunity to complete light retrofit could result in long-term benefits such as warmer homes and reduced energy bills for residents, and greater energy resilience across the region.

In order to find which homes require light retrofits, the existing fabric levels were analysed using Home Analytics datasets to find where improvements are needed. The extent of the improvements required was assessed against the impacts of light and deep retrofit, described in Table 6.1, to quantify the extent of light retrofit needed.

Figure 6.13, identifies the intensity of light retrofit installations required across the three local authorities, where blue indicated a higher percentage requirement. This showcases Broxtowe to have the highest concentration for light retrofit installations, followed by the Southwestern area of Arnold in Gedling. The lower requirement areas are consistent with areas that have had recent housing developments such as Bingham and West Bridgford in Rushcliffe.

Figure 6.13: Number of homes requiring light retrofit across the three Local Authorities

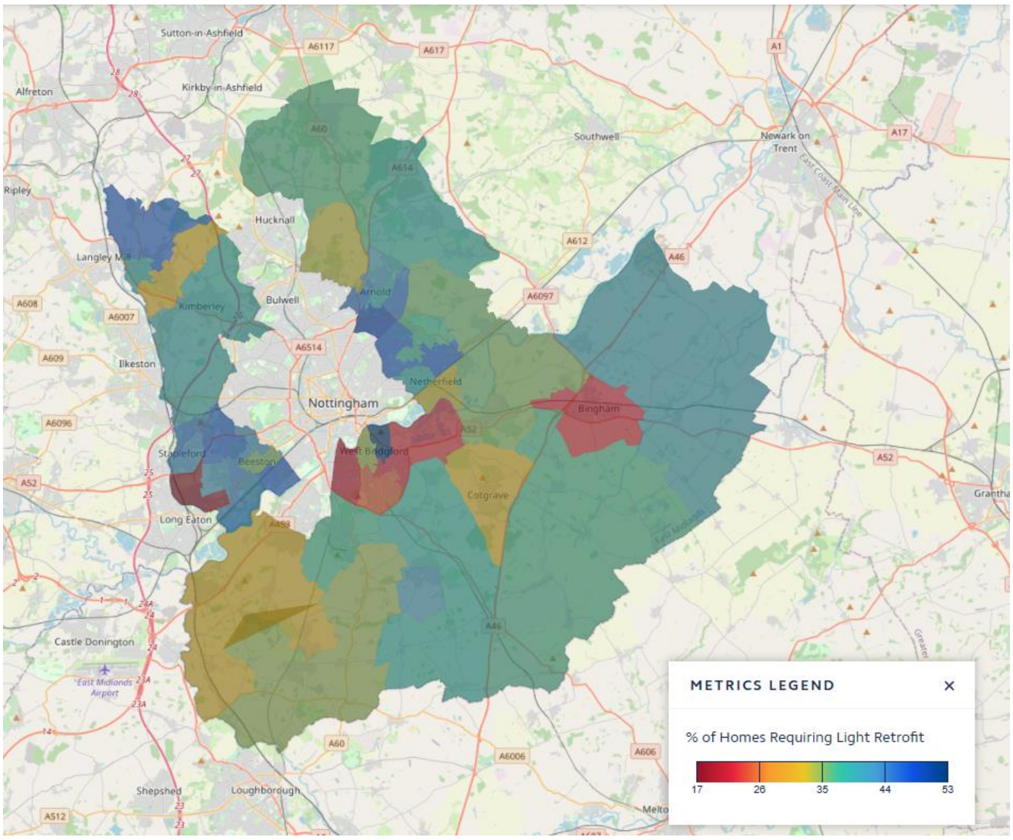


Figure 6.14: Cumulative uptake of light retrofit required per scenario

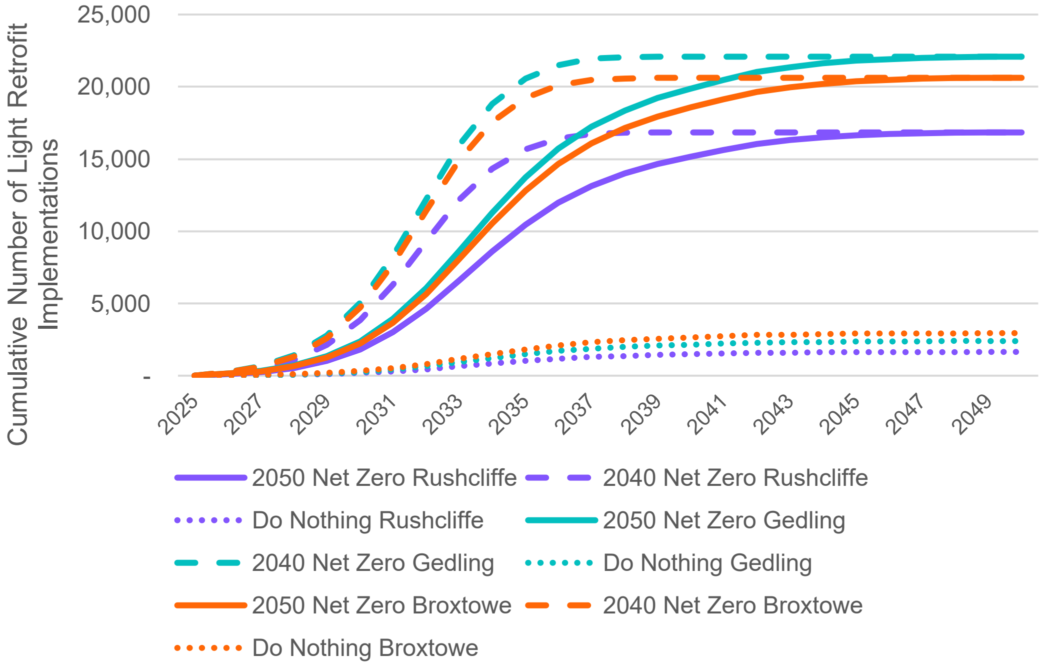


Figure 6.14 underlines the required year on year uptake of light retrofit for the 2050, 2040 and do-nothing scenarios. The do-nothing scenario considers the expected retrofit of private rented properties as part of MEES regulations and follows a similar update trajectory.

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, representing 6.6% of Gedling, Broxtowe and Rushcliffe's total housing stock.[32] Uptake rates are also aligned with the Climate Change Committee's Seventh Carbon Budget net zero pathway, which prioritises the rapid deployment of energy efficiency measures ahead of low-carbon heating installations.[33]

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

[32] Warm Homes: Local Grant policy guidance

[33] The Seventh Carbon Budget - Climate Change Committee

Figure 6.15: Annual light retrofit installations for preferred scenario

Year	Annual percentage uptake	Gedling	Broxtowe	Rushcliffe
		Annual uptake	Annual uptake	Annual uptake
2025	0%	0	0	0
2026	1%	265	247	202
2027	2%	375	351	286
2028	4%	773	722	589
2029	6%	1369	1278	1044
2030	10%	2252	2103	1717
2031	15%	3246	3031	2475
2032	18%	3930	3670	2997
2033	17%	3732	3485	2846
2034	13%	2848	2660	2172
2035	8%	1788	1670	1364
2036	4%	927	866	707
2037	2%	442	412	337
2038	0%	88	82	67
2039	0%	44	41	34
2040	0%	0	0	0

Figure 6.15 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 a similar update trajectory.

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

In both the 2040 and 2050 scenarios, a total of 59,538 homes are required to have light retrofit upgrades across the three local authorities, combined.

6.4 Deep Retrofit

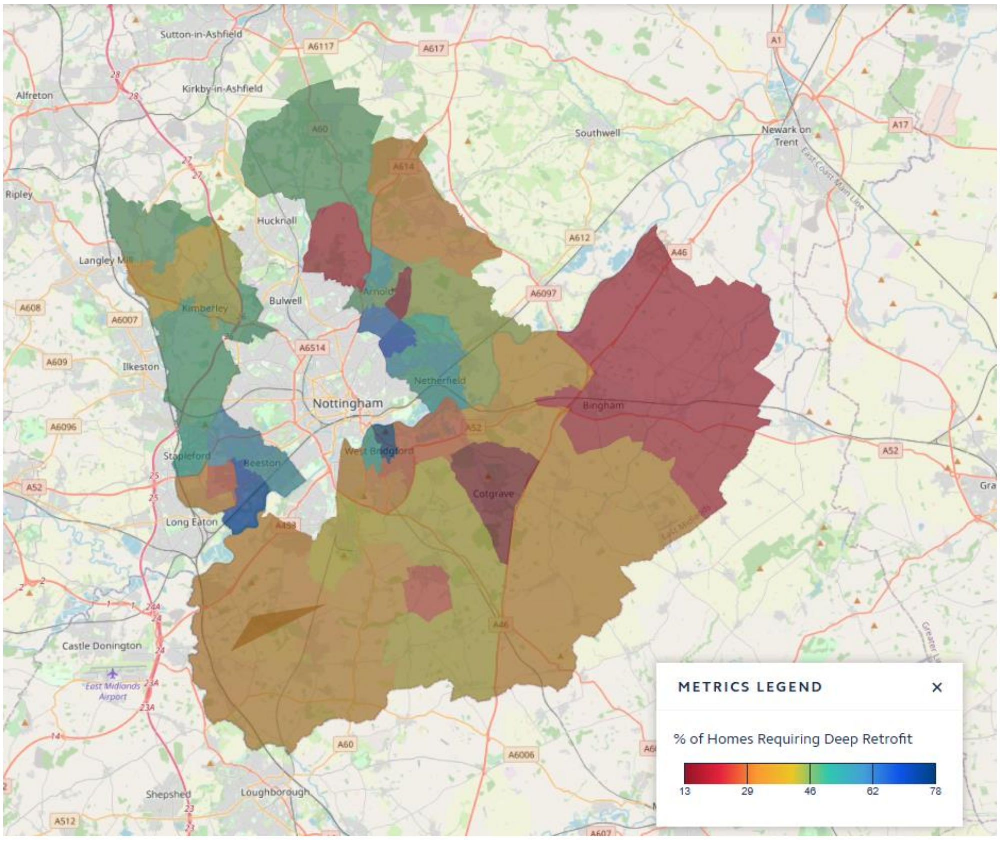
The deep retrofit option represents a more costly approach, requiring more intrusive insulation improvements. It is intended for homes that need significant enhancements in thermal efficiency.

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.

Similarly to light retrofit, the home analytics dataset within the digital twin of Gedling, Broxtowe and Rushcliffe 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 6.16 displays the MSOAs by percentage deep retrofit requirements across the three Local Authorities. These areas are concentrated around the inner city. The central urban zones of Gedling, Broxtowe and Rushcliffe, including Lady Bay, Attenborough and Chilwell East, Mapperley and Porchester, Woodthorpe and Arno Vale show the highest concentration of deep retrofit demand.

Figure 6.16: Homes Requiring Deep Retrofit by MSOA



These are historic industrial areas with large concentrations of pre-1940 terraced housing blocks. Properties here are made from solid masonry and are therefore challenging to insulate, however, the thermal mass of these properties can support better insulation due to the heavy stone. It is important in this instance to consider ensuring adequate airtightness for improved thermal efficiency, to ensure that when the low carbon heating systems are installed, they are effective. This is discussed further in Section 7.

It is vital to address older building types as they will be most at risk of poor thermal comfort levels as well as associated health risks. Deep retrofit measures in these properties will provide additional benefits through alleviating excess cold infiltration. Even without heating technology improvements, fabric upgrades enable resilience through reduced gas and electricity consumption, generating immediate energy savings benefits, reducing energy bills for homeowners or tenants and reducing carbon emissions.

Households with lower income levels will be the least likely to undertake and pay for the high cost of deep retrofit measures, so appropriate support must be offered in such circumstances to ensure a just transition. Retrofit programmes must be designed with support mechanisms for low-income households and incentives for landlords. 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.

Figure 6.17 underlines the annual deep retrofit uptake requirement 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.

Figure 6.17: Cumulative uptake of deep retrofit required per scenario

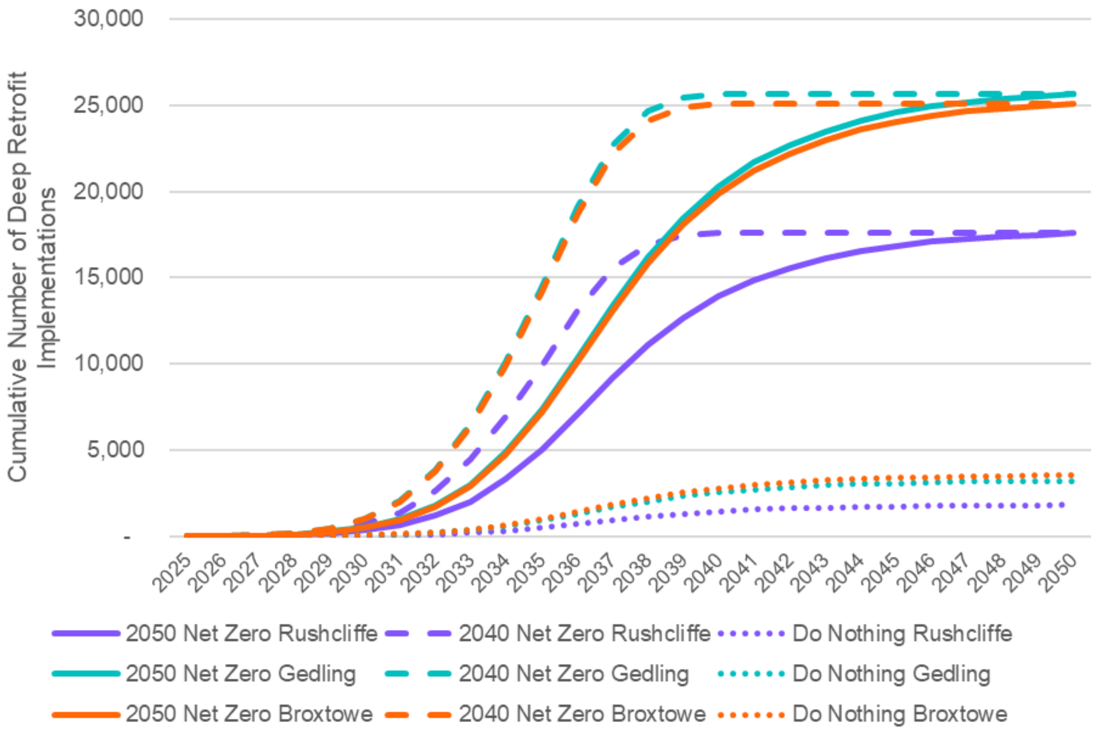


Figure 6.19 - Figure 6.21 display the total number of retrofit installations required across the region, highlighting the number of properties requiring either light, deep or no retrofit.

There is an additional category for the housing stock which will require both light and deep retrofits. Analysis from the home analytics data indicates that there is certain proportion of housing that will require a combination of light and deep retrofit to achieve sufficient energy efficiency.

Retrofit installations is expected to be widespread across the region, necessitating installations across all tenure types. This will require coordinated engagement from both the public and private sectors, including the development of incentives and potential funding mechanisms to support the transition. Since the capital expenditure will be the main hurdle for retrofits to be implemented, the funding mechanism will play a crucial part in facilitating the transition, especially for fuel poor homes and those at risk of being fuel poor due to the build quality of their homes.

Figure 6.18: Annual deep retrofit installations for preferred scenario

Year	Annual percentage uptake	Gedling	Broxtowe	Rushcliffe
		Annual uptake	Annual uptake	Annual uptake
2025	0%	0	0	0
2026	0%	26	25	18
2027	0%	51	50	35
2028	1%	128	126	88
2029	1%	282	276	194
2030	2%	539	527	369
2031	4%	1027	1005	704
2032	7%	1771	1733	1214
2033	10%	2670	2612	1830
2034	14%	3645	3566	2498
2035	17%	4364	4269	2991
2036	18%	4595	4495	3149
2037	14%	3620	3541	2481
2038	8%	1925	1884	1320
2039	3%	796	779	545
2040	1%	231	226	158

Figure 6.22 displays the projected annual thermal energy savings from domestic retrofits, driven by the reduced heat demand resulting from fabric upgrades. This identifies the significant increase in energy efficiency of homes, resulting from light and deep retrofits. The successful implementation of fabric retrofits across the region will bring a host of benefits including significant energy savings, carbon reductions, cost savings, energy resilience, as well as numerous health and wellbeing outcomes such as increased thermal comfort and improved internal air quality.

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

6.5 Impacts

Retrofit installations are expected to be widespread across the region, necessitating installations across primarily privately rented and owner-occupied tenure types. The building stock within social housing portfolios is primarily comprised of EPC C or above homes so retrofit will be less concentrated in this sector. Coordinated engagement from the private sector with support from the public sector will be required to develop the incentives, potential funding mechanisms and uplift awareness to support the transition. Since 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.

The high prevalence of homes considered as heritage, listed, within a conservation area or within a World Heritage site 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. Deep retrofit would be difficult for listed buildings, as many modern retrofit methods are not compatible and consents would be required. In addition, no blanket rules are applicable, and no two listed buildings are the same.

Broadly speaking, retrofits in 'hard-to-treat' homes require consideration on a 'case-by-case' basis. Local authorities and other stakeholders in Gedling, Broxtowe and Rushcliffe areas emphasised throughout the LAEP process that for residents of these buildings, it is largely unknown what interventions are allowable and with the additional complexity of navigating planning constraints, pursuing these measures is inaccessible or in the 'too-hard' basket for many.

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 6.19: Number of buildings requiring each kind of retrofit per MSOA for Gedling

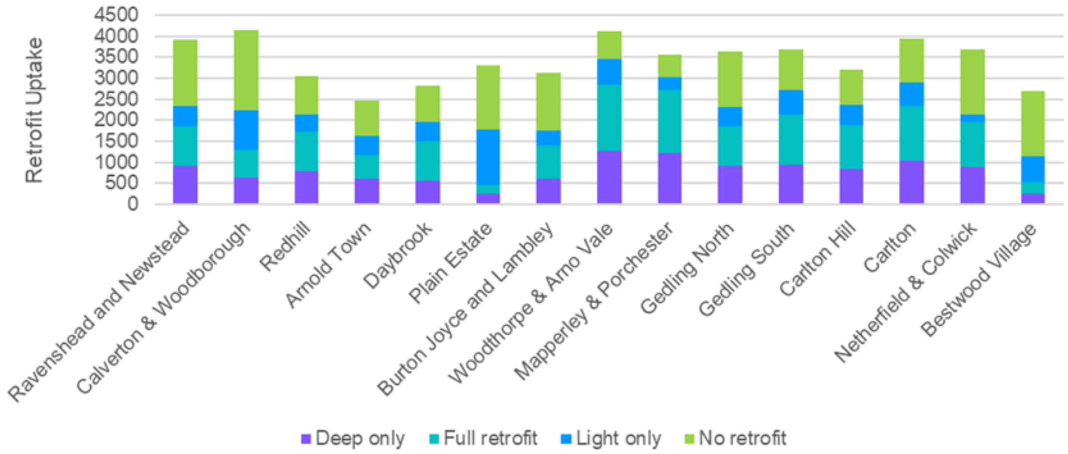


Figure 6.20: Number of buildings requiring each kind of retrofit per MSOA for Broxtowe

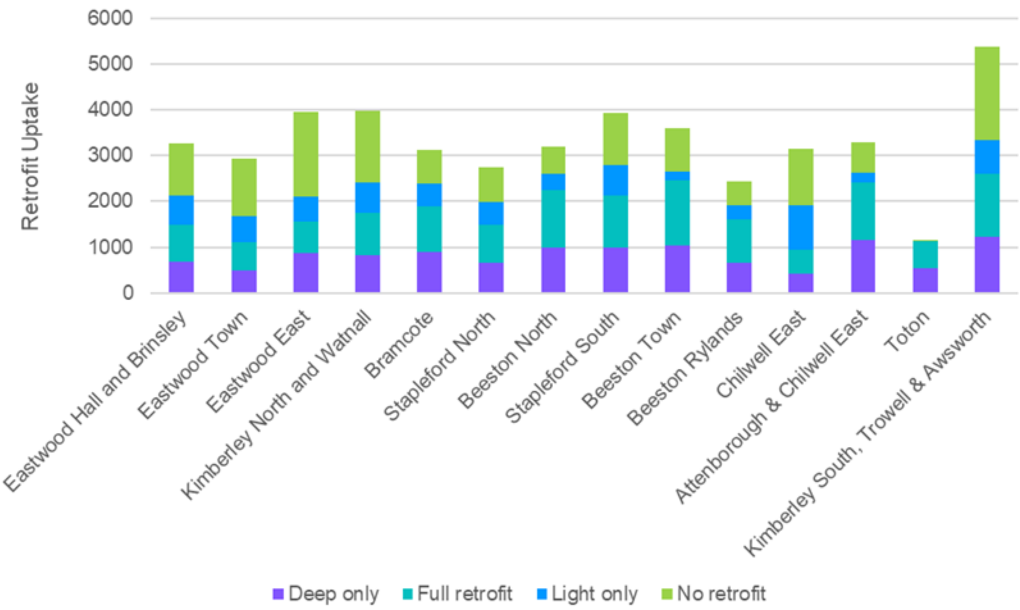
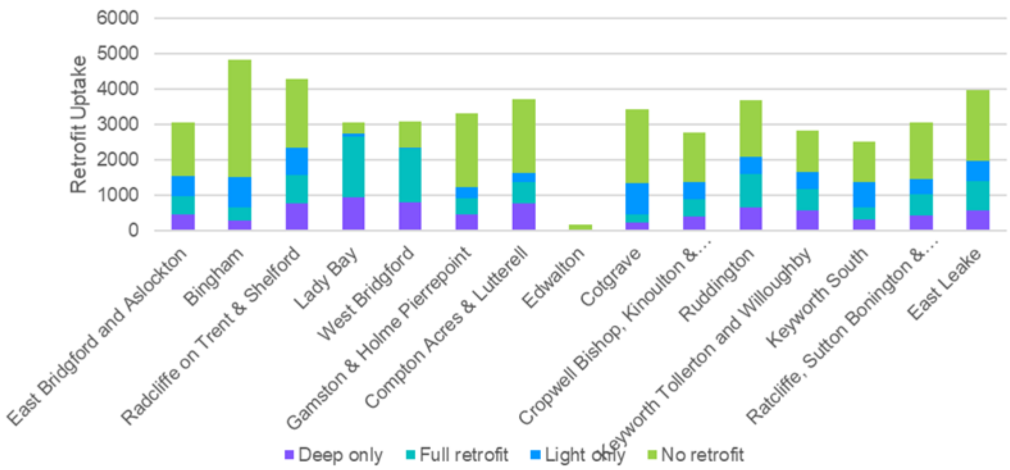


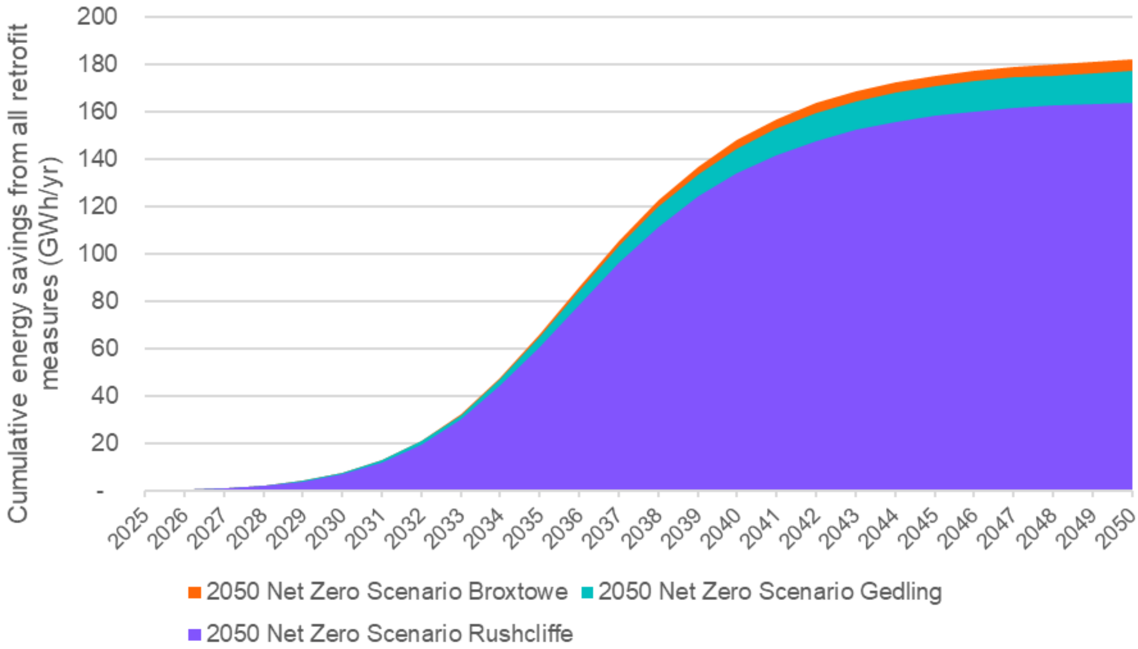
Figure 6.21: Number of buildings requiring each kind of retrofit per MSOA for Rushcliffe



The successful implementation of these retrofits will introduce significant energy savings across the region while satisfying thermal comfort levels within each property. Figure 6.22 displays the projected annual thermal energy savings from domestic retrofits, driven by the reduced heat demand resulting from fabric upgrades. 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 6.22: Annual Projected Combined Energy Savings of Deep and Light Retrofit



Additionally, these benefits will be extended as and when low-carbon heating technologies are deployed. As, the retrofit measures will act as a foundational step allowing the low carbon technologies to efficiently operate, allowing for further savings.

This would not only lead to immediate energy savings and lower utility bills for residents but also contributes to the reduction of carbon emissions associated with gas use. In addition, the resulting decrease in thermal demand will help reduce the anticipated strain on the local grid as the region transitions to a greater share of electrified heating systems in the future.

7 Low Carbon Heating

This section analyses how low carbon space heating technologies can be implemented to support Gedling, Broxtowe and Rushcliffe 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

Current share of electric heating	
Gedling	4%
Broxtowe	2%
Rushcliffe	3%

Required ASHPs for Net Zero	
Gedling	44,508
Broxtowe	17,695
Rushcliffe	43,629

Possible Heat Networks	
Gedling	Stolk Bardolph & Colwick
Broxtowe	Eastwood, Beeston
Rushcliffe	-

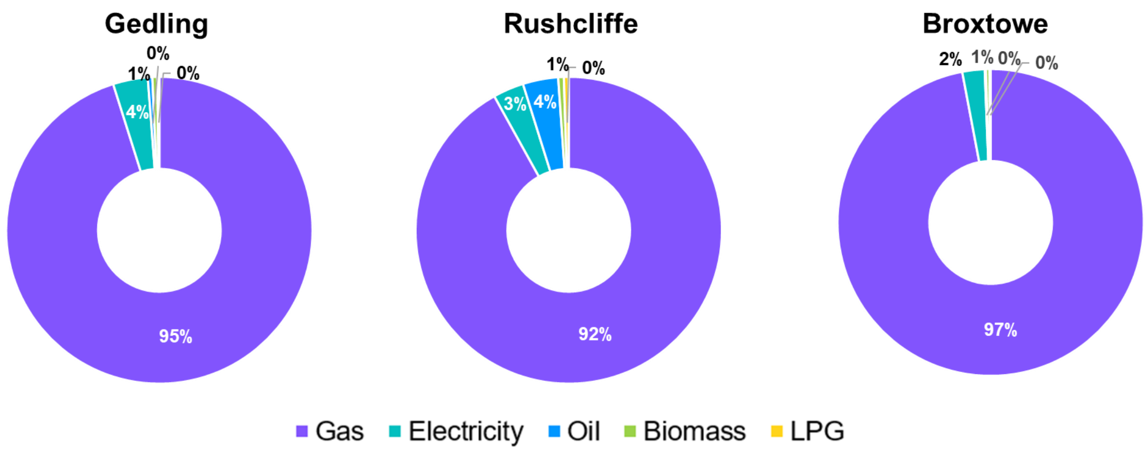
7.1.1 Existing system

Natural gas is the predominant fuel across Gedling Broxtowe and Rushcliffe, supplying space and water heating to approximately 93% of homes, primarily through gas-fired boilers. This reliance reflects the widespread availability of the gas network across the three areas and the predominance of existing housing stock connected to the mains. 2-4% of dwellings currently rely on electric heating systems, including both electric heat pumps and resistive electric heating. The remaining share consists of properties using oil or solid fuel, largely in rural areas without gas grid access. Around 2% of Gedling, Broxtowe and Rushcliffe homes use oil, liquefied petroleum gas (LPG), or biomass for heating. Most homes in this category will need to transition to a decarbonised heat source.

This profile closely mirrors national patterns, where around 85–88% of UK homes use gas as their main heating source, 9% use electricity, and the remainder rely on oil or other fuels[34]. The slightly higher gas dependency across Gedling, Broxtowe and Rushcliffe indicates a lower baseline of electric or low-carbon heating uptake compared to the national average, underlining the scale of the transition challenge ahead.

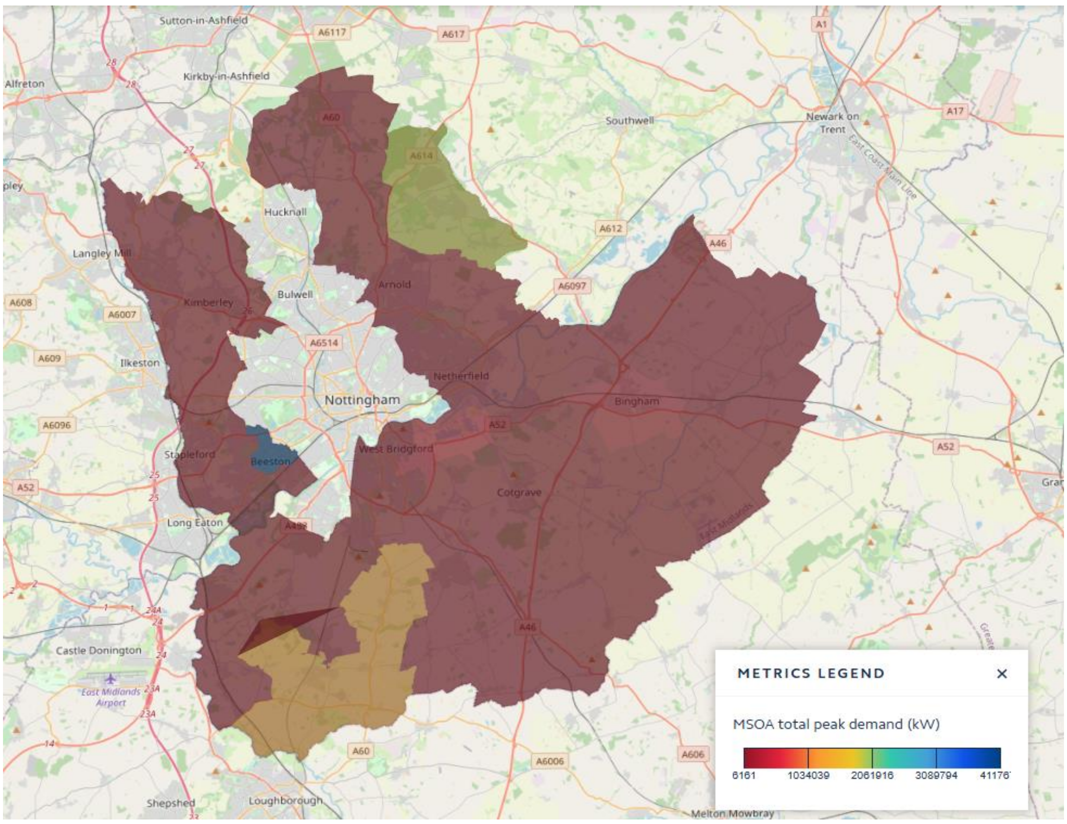
[34] Department for Energy Security and Net Zero (DESNZ), *Energy Consumption in the UK: Domestic Energy Data Tables (ECUK 2023)*.

Figure 7.1: Gedling, Broxtowe and Rushcliffe Domestic Heating Split by Fuel type (%)



Each borough exhibits subtle local differences driven by housing stock, urban density, and levels of gas network coverage. Gedling records a slightly higher proportion of electric heating, consistent with a greater number of off-gas properties and new-build developments adopting heat pumps. This reflects early progress toward decarbonised heating, particularly in areas undergoing regeneration or expansion beyond the mains gas network. Gedling has actively participated in retrofit programmes and has a notable share of homes not connected to the gas grid, making it suitable for low-carbon heating technologies.

Figure 7.2: Thermal heat demand per MSOA



Broxtowe aligns most closely with the Gedling, Broxtowe and Rushcliffe average, with natural gas remaining the dominant heating source. Its housing mix, spanning urban centres like Beeston and suburban areas such as Kimberley and Stapleford, has a balanced distribution of heating types. While electric heating uptake remains modest, Broxtowe has implemented several retrofit schemes and energy efficiency programmes, including Energy Company Obligation (ECO) grants and external wall insulation projects.

Rushcliffe displays a more uniform reliance on gas heating, despite being the most rural of the three boroughs. The borough includes a larger number of villages and dispersed settlements, with West Bridgford being the only distinctly urban centre. Its strong connectivity to the gas grid and fewer off-gas properties likely contribute to this consistency. Rushcliffe's rural housing profile presents challenges for heat pump adoption, including higher retrofit costs and insulation requirements, which may explain its slower transition toward low-carbon heating technologies compared to Gedling.

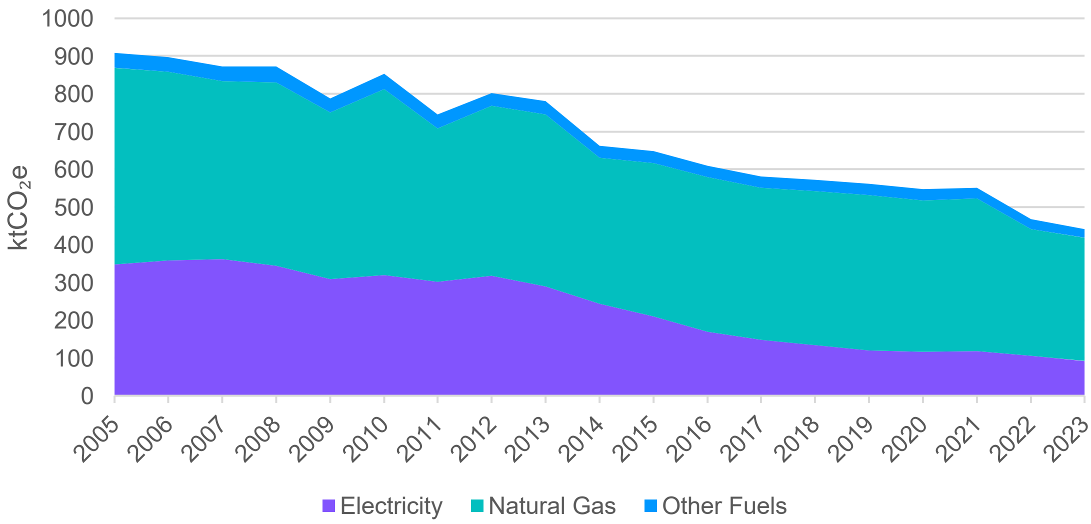
Despite these minor variations, the three areas share a common baseline of high gas dependency and limited early uptake of electric or low-carbon heating systems. This suggests that regional-scale interventions such as retrofit programmes, heat pump incentives, and local network upgrades will be critical in driving a coordinated transition across all three areas.

In terms of emissions, Figure 7.4 presents the historical carbon emissions associated with domestic fuel use across the combined GBR area. Emissions from natural gas have consistently been the largest contributor, amounting to approximately 326.6 ktCO_2e in 2022, followed by electricity-related emissions at around 92.4 ktCO_2e. Since 2005, total domestic emissions have declined substantially across all fuel types. The most pronounced reduction has occurred in electricity-related emissions, reflecting the decarbonisation of the national electricity grid.

Emissions from natural gas have also decreased, though more gradually. This reduction likely stems from improved energy efficiency standards, building insulation upgrades, and the replacement of older, inefficient boilers with modern condensing models. In addition, modest behavioural changes and local retrofit programmes may have contributed to lower overall gas consumption per household.

Each area follows the same overall downward trend in long-term emissions reductions across gas and electricity since 2005. Despite these gains, natural gas remains the dominant source of domestic carbon emissions, underlining the challenge of transitioning to low-carbon heating and improving building fabric performance at scale.

Figure 7.3: Domestic Historical Carbon Emissions Breakdown in Gedling, Broxtowe and Rushcliffe (ktCO_2e)



Gedling shows a slightly sharper fall in gas-related emissions, supported by its active participation in retrofit programmes such as the East Midlands Domestic Retrofit Project. The borough has targeted off-gas and low-efficiency homes for boiler replacements and insulation upgrades, contributing to a more rapid decline in gas consumption per household.

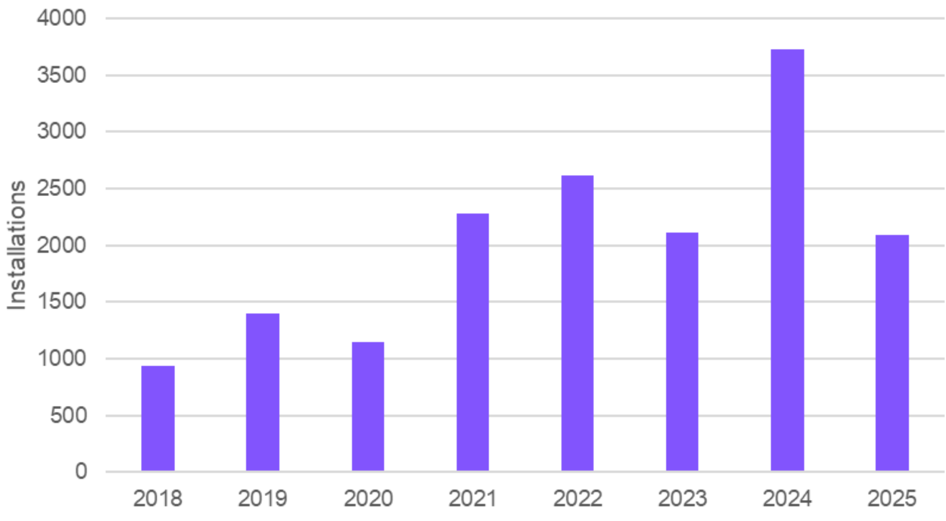
Broxtowe maintains a steadier decline in gas emissions, closely aligned with the Gedling, Broxtowe and Rushcliffe average. The borough has implemented multiple retrofit schemes, including external wall insulation for over 80 solid wall properties and energy upgrades to more than 350 council homes under the Warm Homes Social Housing Fund. These efforts reflect consistent progress without dramatic shifts.

Rushcliffe exhibits the highest residual gas emissions among the three, which corresponds with its larger population[35] and older housing stock. While the borough has adopted low-carbon planning policies, the pace of retrofit activity and boiler replacement has been slower compared to Gedling and Broxtowe.

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 GBR's 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 is illustrated in Figure 7.4. 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 both Local Authorities follows the regional trend, with an increasing trend in installation numbers.

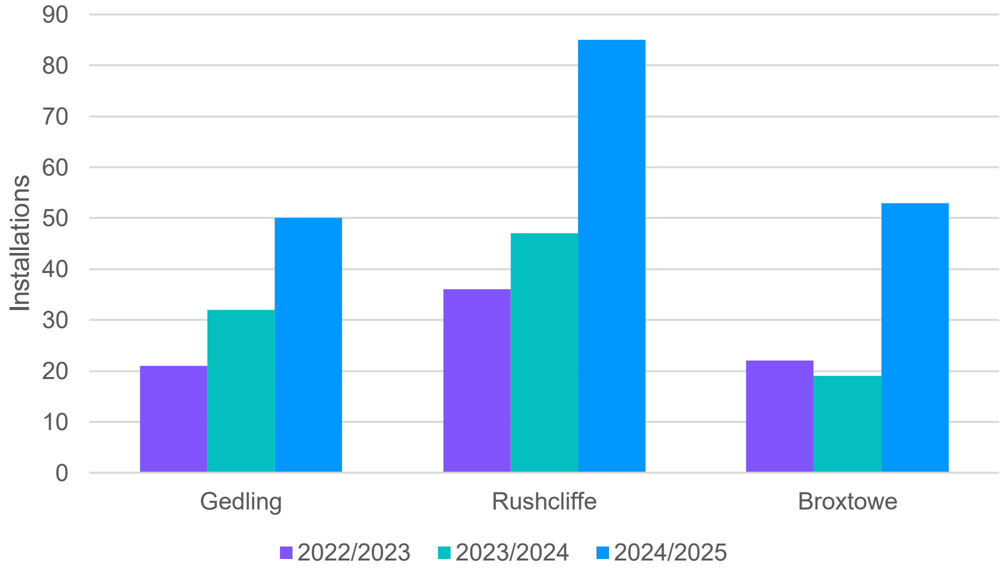
Figure 7.4: East Midlands historical heat pump installations



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

[35] Office for National Statistics (ONS) 2023, *How life has changed in Rushcliffe: Census 2021*, ONS.

Figure 7.5: Gedling, Broxtowe and Rushcliffe Boiler Upgrade Scheme Heat Pump Installations



Source: Boiler Upgrade Scheme statistics: August 2025 - GOV.UK[36]

The UK Government publishes quarterly data on heat pump deployment by region. As shown in Figure 7.5, there is a steadily growing uptake year on year of heat pumps since 2018 in the East Midlands. 3,726 installations were recorded in 2024 and projections for 2025 are on track to exceed this. While this upward trend is encouraging, heat pumps still represent a small fraction of space heating compared to the total housing stock.

Government data tracks heat pump installations at the local authority level through the Boiler Upgrade Scheme (BUS). Figure 7.5 presents the number of BUS-supported heat pump installations across all three boroughs based on BUS dataset. The three areas closely follow the wider East Midlands trend, with relatively modest but steadily increasing uptake since the scheme's launch.

In the 2024/25 financial year, Gedling, Broxtowe and Rushcliffe recorded 188 heat pump installations through the scheme with 50 heat pumps installed in Gedling, 53 in Broxtowe and a total of 85 deployed in Rushcliffe. With over 135,000 homes using natural gas and an average boiler lifespan of 15 years, GBR sees roughly 9,000 gas boiler replacements each year. However, approximately 2% of boiler replacements across the three boroughs currently result in a switch to heat pumps. This is largely due to the high upfront cost of installation, the complexity of the process, and the need for additional fabric improvements (each of which presents significant financial and technical barriers, as discussed in section 6.

While installation rates remain low compared to the scale of the existing gas boiler stock, this emerging growth in heat pump adoption is already beginning to contribute to the gradual reduction in natural gas demand as previously discussed in the observed domestic emissions data (Figure 7.3). Each new low-carbon heating system installed displaces a gas boiler, and although the overall impact on total emissions remains limited at present, it represents a tangible shift in heating technology choices across the GBR area.

To decarbonise domestic heating across GBR, the current share of electric heating must increase significantly. Even with potential future restrictions on boiler replacements in the 2030s, early and proactive measures are essential to accelerate the uptake of low-carbon heating technologies in the short term.

[36] Boiler Upgrade Scheme statistics: August 2025 - GOV.UK

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[37], 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 UK's 7th Carbon Budget, there is a planned phase-out of fossil fuel boilers by 2035. Installations of heat pumps in GBR have been modelled to reach a peak around 2032–2035 before tapering off.

This is based on policy including the Boiler Upgrade Scheme and £7,500 grants which will continue to be given out as advised by Ofgem. Both incentivise installation and thus improves the rate of near-term uptake. This is anticipated to be extended with a further £1.545 billion in additional funding projected for 2025-2028.

Other regulatory changes to permitted development rights for ASHPs will remove current installation barriers such as the 1-meter boundary rule for ASHPs, making installations easier for more types of homes and can boost uptake significantly.

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.

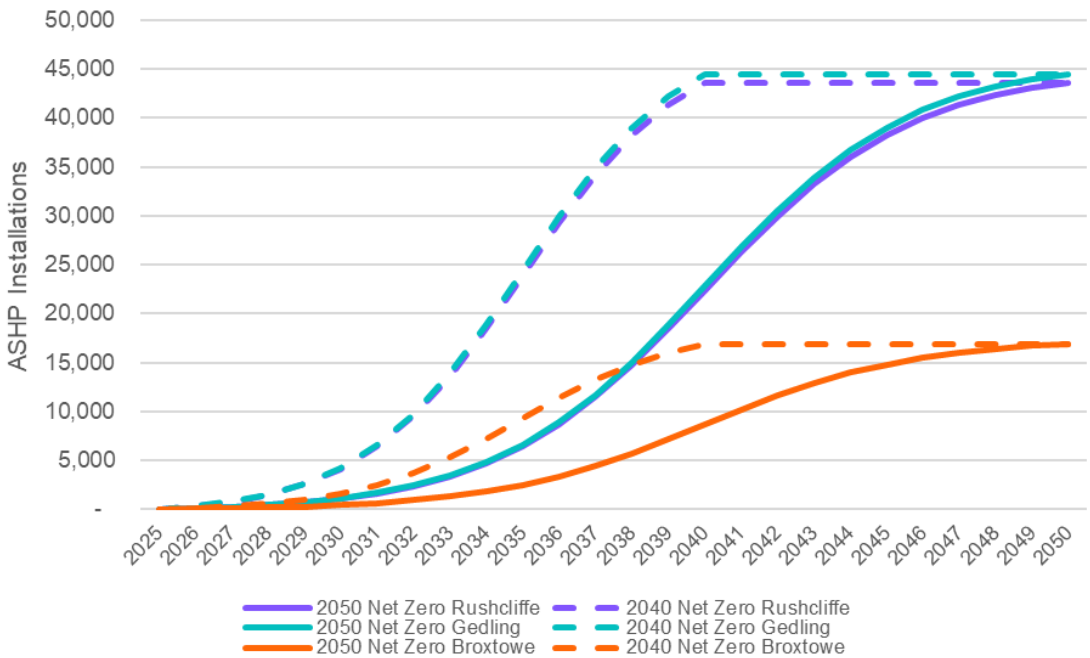
The digital twin has been used to model the changes in energy use and carbon emissions from the switching of fossil fuel boiler systems to heat pumps. The additional peak electrical demand and annual electricity consumption has been built into the projected modelling for carbon emissions reduction and impacts of the local grid. Therefore, the buildings' new total electricity consumption, post heat electrification, will equal "ASHP demand" plus "total electricity retrofit" (or the baseline total electricity for the buildings with no fabric improvements). For buildings that already use electric heating, it is assumed that this heating source will remain unchanged.

The two net zero compliant scenarios developed as part of this LAEP anticipate significantly more installations to take place compared to the counterfactual, by assuming all homes will have a net zero heating system by 2040 or 2050.

Nottinghamshire does not currently have a county-wide target for the deployment of low-carbon heating technologies including heat pumps. However, all three GBR councils have adopted planning guidance and climate strategies that actively support the rollout of heat pumps and energy efficiency improvements. These include commitments to zero-carbon new builds and retrofit programmes, as outlined in their respective climate action plans.

[37] 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 7.6: 2050 and 2040 domestic heat pump uptake projections



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 across all three boroughs.

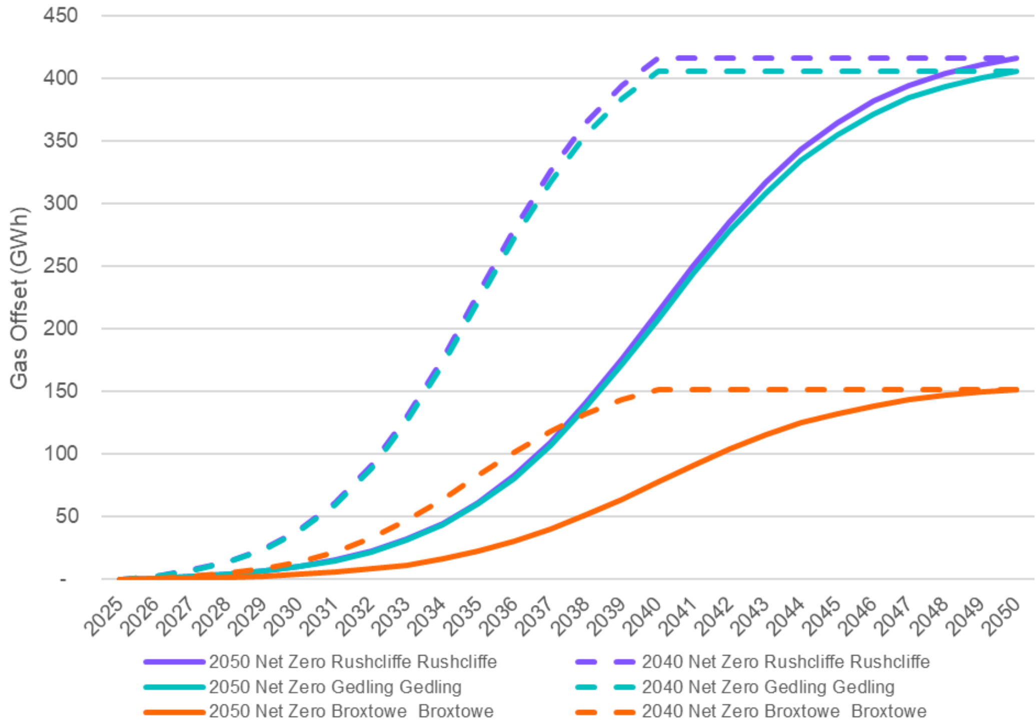
All new builds are assumed to have a low carbon heating system, as per the Future Homes Standard, however the challenges lie with existing housing due to space constraints and the need for fabric upgrades in older housing stock as discussed in Section 6.

Heat pumps tend to operate less efficiently in older buildings due to higher heat losses and limited insulation, which hinder thermal comfort during colder weather. Therefore, to ensure optimal performance of heat pumps, it is essential to carry out fabric retrofit improvements early. These upgrades help minimise heat loss, reduce running costs, and support the system in maintaining comfortable indoor temperatures, especially during colder periods.

Space limitations in existing homes (particularly flats and terraced houses) can make heat pump installation challenging, largely due to the need for a compatible hot water cylinder. Social housing providers may be able to install heat pumps alongside the necessary insulation upgrades.

Figure 7.7 illustrates the projected domestic gas savings resulting from heat pump deployment under the 2040 and 2050 decarbonisation scenarios for GBR. In each case, gas savings increase steadily through the late 2020s and 2030s before accelerating sharply in the 2040s as the rate of low-carbon heating installations scales up. The 2040 scenario achieves comparable cumulative savings approximately a decade earlier than the 2050 pathway, underscoring the effect of accelerated deployment on total reductions in gas demand.

Figure 7.7: 2050 and 2040 scenario domestic heat pump gas savings projections



The projections show a consistent pattern across all three boroughs; an initial period of gradual gas displacement followed by a rapid expansion as heat pumps become more prevalent and supporting market conditions strengthen. Although absolute savings differ slightly between areas (reflecting likely variations in housing stock composition, grid readiness, and retrofit uptake) the overall trend is uniform, with heat pump adoption emerging as a key driver of declining natural gas use in the domestic sector.

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.

7.1.5 Scenarios Overview

Figure 7.8: Annual domestic ASHP installations in preferred scenario

Year	Annual percentage uptake	Gedling Annual uptake	Broxtowe Annual uptake	Rushcliffe Annual uptake
2025	0%	0	0	0
2026	1%	307	122	301
2027	1%	472	188	462
2028	2%	721	287	707
2029	2%	1090	434	1069
2030	4%	1611	641	1579
2031	5%	2314	920	2269
2032	7%	3191	1269	3128
2033	9%	4144	1647	4062
2034	11%	4994	1985	4895
2035	12%	5510	2191	5401
2036	12%	5555	2208	5445
2037	11%	4954	1969	4856
2038	9%	4139	1646	4057
2039	7%	3191	1269	3128
2040	5%	2314	920	2269

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.

The 2040 and 2050 scenarios assume a full electrification of space heating, with no hybrid heat pump installations. The scenarios assumes a relatively consistent, steady uptake of heat pumps, which accelerates slightly in the mid-2030s in all three borough councils. The annual uptake rates for the 2040 Net Zero scenario are set out in Figure 7.8.

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, 105,038 domestic installations are modelled as required across the region by the net zero year. This is expected to reduce 972GWh of gas consumption and result in 378GWh 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: Modelled Interventions

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 County 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 GBR.
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.
District Heat Network Connection	Some buildings in GBR will likely be able to decarbonise their heat supply through connecting to a district heat network, instead of installing their own low carbon heating system. District heat networks supply heat to buildings via hot water in underground pipes, from a centralised plant. See Section 7.3 or more details.

Technology	Description
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 GBR LAEP, due to hydrogen for space heating not being considered viable as part of this programme, however it should be noted that potential industrial clusters that have been identified as having hydrogen as a possible alternative fuel source.

ASHPs are identified as the most viable and economical low-carbon heating option for the majority of homes within the GBR area. Their suitability reflects a combination of factors including:

- Continued decarbonisation of the national electricity grid,
- High seasonal efficiencies,
- Lower capital costs,
- Installation complexity compared with other low-carbon technologies.

ASHPs can be retrofitted to a broad range of existing property types, making them a scalable solution for widespread domestic decarbonisation.

7.2 Non-Domestic Sector

Current share of electric heating	
Gedling	44%
Broxtowe	40%
Rushcliffe	30%

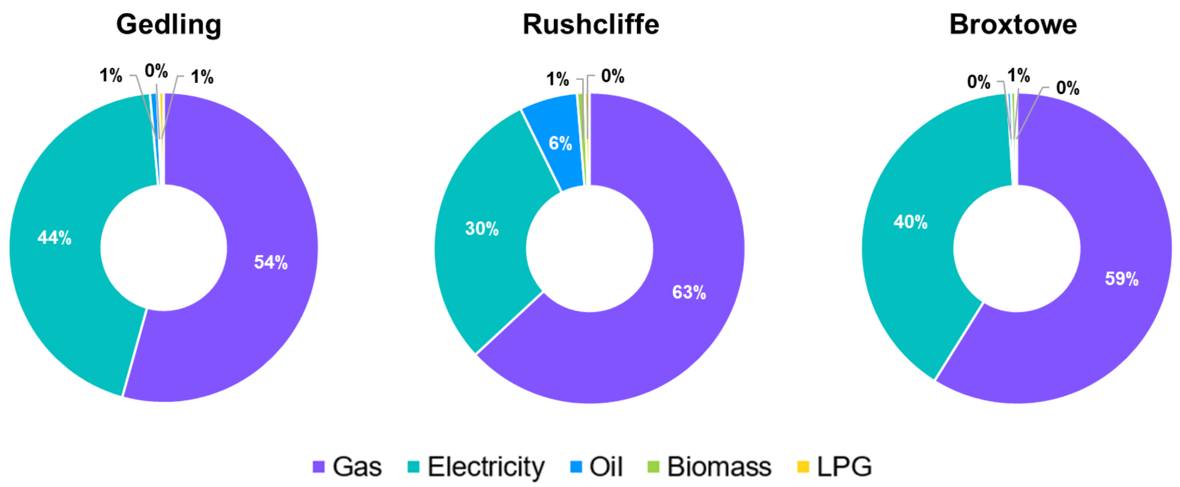
Required ASHPs for Net Zero	
Gedling	596
Broxtowe	790
Rushcliffe	1489

7.2.1 Existing System

In comparison to the domestic sector, there is an equal split between the heating fuel types in place in non-domestic properties in Gedling, Broxtowe and Rushcliffe, as shown in Figure 7.9. Around 54-63% of properties utilise natural gas for space heating and hot water, with 30-44% of properties use electricity for heating. breaks down heating fuel use by across Gedling, Broxtowe and Rushcliffe.

In comparison to the domestic sector, there is an equal split between the heating fuel types in place in non-domestic properties in Gedling, Broxtowe and Rushcliffe, as shown in Figure 7.9. Around 54-63% of properties utilise natural gas for space heating and hot water, with 30-44% of properties use electricity for heating. breaks down heating fuel use by across Gedling, Broxtowe and Rushcliffe.

Figure 7.9: Non-Domestic Heating Split by Fuel type for Gedling, Broxtowe and Rushcliffe (%)



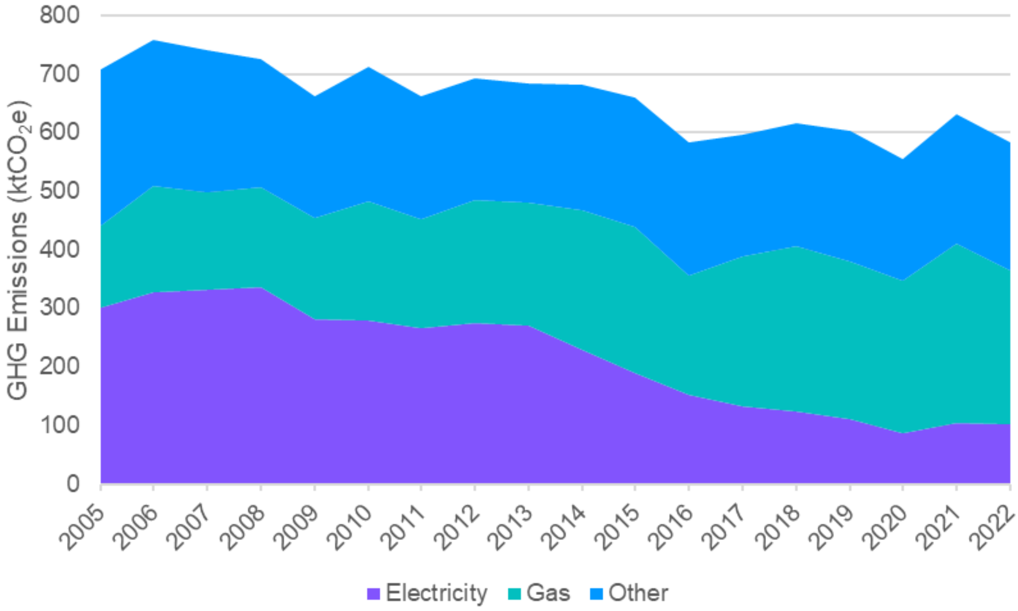
The electrically heated properties are considered to have low carbon heating systems, identifying only half of the properties require replacement of their heating systems.

There is also an additional proportion of properties using oil, liquefied petroleum gas (LPG), or biomass for heating, grouped under the ‘other’ category, with only 4.3% of properties currently relying on these sources which will need to transition to a decarbonised heat source.

A further breakdown of the heating fuel split between each local authority is displayed in Figure 7.9, identifying each area utilises a similar proportion of each heating fuel within their non-domestic buildings. Rushcliffe has the most unique fuel split with the most usage of the fuels in the ‘Others’ category of 7%, as well as the lowest reliance of electricity, accounting for only 30% of its total heating fuel.

Figure 7.10 outlines the historical carbon emissions associated within the non-domestic sector across Gedling, Broxtowe and Rushcliffe area, including emissions from industrial, commercial, and public sector activities. Historically, electricity consumption accounted for the largest share of non-domestic emissions, however, these have declined sharply since 2013 due to the progressive decarbonisation of the national electricity grid through renewable integration and improved energy efficiency within the commercial and public estate.

Figure 7.10: Non-Domestic Historical Carbon Emissions Breakdown for Gedling, Broxtowe and Rushcliffe (ktCO$_2$e)



Source: UK local authority and regional greenhouse gas emissions statistics, 2005 to 2022 - GOV.UK

In contrast, emissions from natural gas have reduced more gradually, reflecting the continued reliance on gas-fired heating systems across much of the industrial and commercial building stock. Other fuels now contribute only a small proportion of total non-domestic emissions, following a long-term shift away from high-carbon fuels.

As of 2023, electricity use accounted for approximately 370.3 ktCO$_2$e, natural gas for 370.2 ktCO$_2$e, and other fuels for 285.2 ktCO$_2$e across the area. Overall, non-domestic emissions have fallen substantially since 2005, driven by cleaner grid electricity, greater uptake of energy efficiency and process efficiency measures, and improved building management systems. Nevertheless, natural gas remains the single largest source of direct emissions in the non-domestic sector, underscoring the importance of decarbonising building heat, expanding low-carbon technologies such as heat pumps and heat networks, and supporting efficiency upgrades in commercial and industrial facilities.

Gedling shows a consistent decline in non-domestic emissions, with a particularly sharp reduction in electricity-related emissions. The borough's relatively modern commercial developments and regeneration projects may have contributed to lower overall emissions intensity. While natural gas remains the dominant source of direct emissions, its share is lower than in Broxtowe and Rushcliffe, suggesting early and proactive progress in transitioning to low-carbon heating systems. This reflects national grid decarbonisation and is locally supported by targeted interventions in council-owned buildings. Indeed, the Carbon Management Strategy 2021–2030 outlines over 100 targeted actions to reduce emissions from council operations with a significant focus on non-domestic buildings[38]. The borough's planning guidance also encourages low-carbon technologies in new commercial developments.

Broxtowe's non-domestic emissions have declined steadily. The borough's emissions profile reflects its mixed building stock, including older industrial premises and newer commercial developments. Broxtowe has adopted a Reduction of Carbon in New Development Supplementary Planning Document[39], which mandates passive design and low-carbon heating systems in new non-domestic

[38] Gedling Borough Council, *Carbon Management Strategy 2021–2030* (Gedling: Gedling Borough Council, 2021).

[39] Broxtowe Borough Council, *Reduction of Carbon in New Development: Supplementary Planning Document (SPD)* (Broxtowe: Broxtowe Borough Council, 2020)

developments. These measures have supported a steady pace of reduction, reflecting consistent improvements in building performance and planning policy.

Rushcliffe retains the highest non-domestic emissions among the three boroughs, reflecting its legacy of established industrial and commercial premises. The pace of transition to low-carbon heating has been slower, but recent initiatives mark a shift. The Low Carbon and Sustainable Design Supplementary Planning Document[40] sets out planning guidance for zero-carbon buildings, applicable to both commercial and employment developments. Additionally, Rushcliffe offers Low Carbon Grants[41] to SMEs to support upgrades such as smart heating controls and insulation.

7.2.2 Scenarios Overview

Building on the approach applied to the domestic sector (see Section 7.1), 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 and 2050 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.

[40] Rushcliffe Borough Council, *Low Carbon & Sustainable Design Supplementary Planning Document (SPD)* (Rushcliffe: Rushcliffe Borough Council, 2022

[41] Rushcliffe Borough Council, *Energy Efficiency, Grants and Renewables* (Rushcliffe: Rushcliffe Borough Council, 2025).

Figure 7.11: Annual installation of Non-Domestic ASHP in preferred scenario

Year	Annual percentage uptake	Gedling	Broxtowe	Rushcliffe
		Annual uptake	Annual uptake	Annual uptake
2025	0%	0	0	0
2026	1%	4	5	10
2027	1%	6	8	16
2028	2%	10	13	24
2029	2%	15	19	36
2030	4%	22	29	54
2031	5%	31	41	77
2032	7%	43	57	107
2033	9%	55	74	139
2034	11%	67	89	167
2035	12%	74	98	184
2036	12%	74	99	186
2037	11%	66	88	166
2038	9%	55	73	138
2039	7%	43	57	107
2040	5%	31	41	77

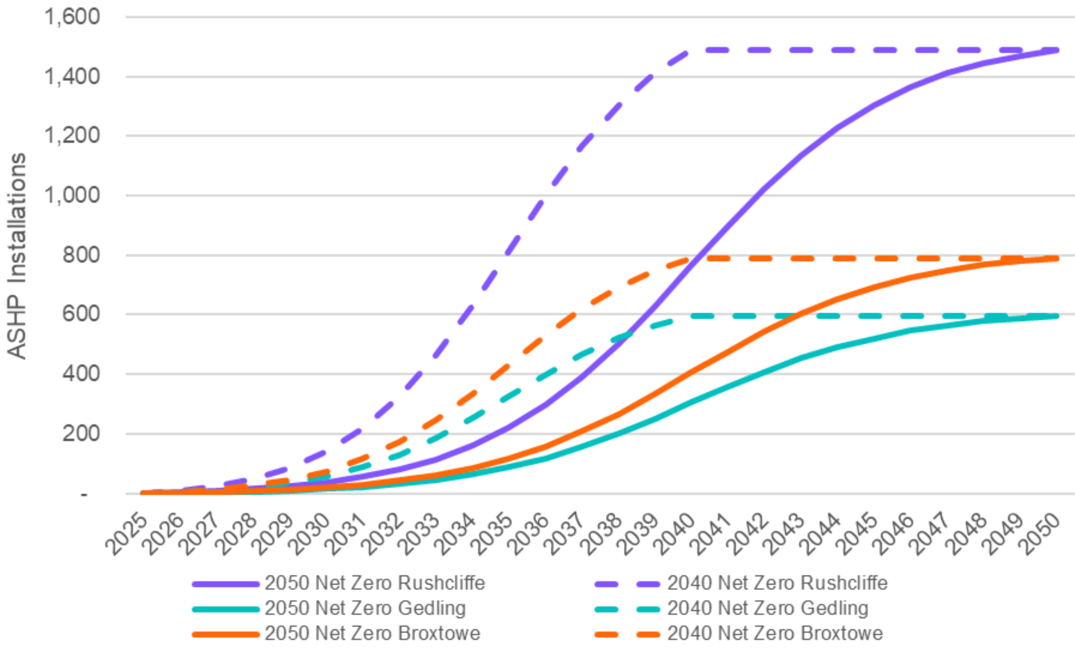
This is based on the replacement rate of boilers with a 15-20 year life span, using historic ASHP installation data to inform the rate at which heat pumps would be installed. Efficiency Assumption is 85% for gas boilers and overall CAPEX for boilers is £2–5k, and ASHPs (£10–15k). As heat pump technology 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 in communal form.

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 2,875 regional non-domestic ASHP installations, resulting in reduced gas demand of 227 GWh, and additional electricity demand of 71GWh. The 2040 pathway delivers substantial cumulative gas savings earlier than the 2050 scenario, reflecting faster adoption under more ambitious decarbonisation timelines. Differences between boroughs largely stem from variations in building stock, heating demand intensity and retrofit potential, but the overall trend remains consistent.

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 7.12: 2050 and 2040 scenario for non-domestic heat pump uptake projections



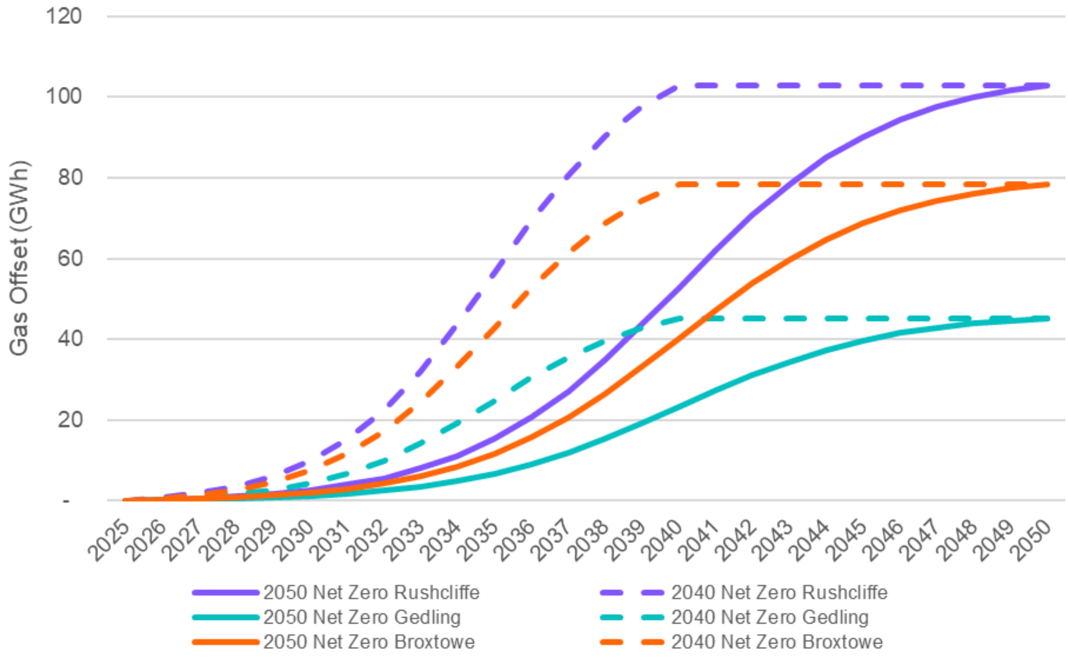
The non-domestic 2040 and 2050 scenarios assume full electrification of heating within commercial, industrial, and public sector buildings, with no hybrid systems retained beyond 2035. These projections represent the transition towards low-carbon heat in the service sector across GBR. Figure 7.11 shows the projected uptake of non-domestic heat pumps for GBR respectively, reflecting an initial steady rate of growth through the late 2020s and early 2030s, followed by a rapid increase in installations during the 2040s as policy support, technological maturity, and private investment accelerate deployment.

The 2040 scenario achieves near-complete uptake around a decade earlier than the 2050 pathway, demonstrating the impact of earlier intervention through national and local decarbonisation funding programmes. Key enablers have included the Industrial Energy Transformation Fund (IETF) for industrial sites, and the Energy Company Obligation for smaller non-domestic premises. The former Public Sector Decarbonisation Scheme (PSDS) would have been a key enabler for public buildings however this is now retired so a new mechanism must be found for this. The projections highlight the growing role of large commercial and public sector buildings in driving the transition, supported by corporate net zero commitments and local authority climate strategies.

Both pathways indicate that widespread non-domestic heat pump deployment will be essential to achieving borough-wide net zero targets, complementing domestic electrification and delivering substantial reductions in natural gas consumption across all three local authority areas.

The non-domestic gas savings projections indicate a clear reduction in fossil fuel consumption across GBR, driven by the progressive replacement of gas-based heating systems with electric heat pumps. As shown in Figure 7.12, both the 2040 and 2050 scenarios for GBR, respectively, exhibit a steady decline in gas demand through the late 2020s and 2030s, followed by a sharp acceleration once large-scale retrofit and installation programmes take effect.

Figure 7.13: 2050 and 2040 scenario domestic heat pump gas savings projections



The 2040 pathway delivers substantial cumulative gas savings earlier than the 2050 scenario, reflecting faster adoption under more ambitious decarbonisation timelines. The differences between area's projected gas savings stems from variations in building stock, heating demand intensity and retrofit potential, but the overall trend remains consistent - progressive reductions in non-domestic gas use as low-carbon heating scales up.

Overall, the projections highlight the significant volume of gas displaced from the non-domestic sector under both pathways. Early and widespread uptake of heat pumps in the 2040 scenario achieves deeper savings sooner, while the 2050 pathway reaches similar levels over a longer period, underscoring the cumulative value of sustained decarbonisation across commercial, industrial and public buildings.

It is essential that financial support mechanisms are available to help non-domestic buildings with good potential for heat pump installation to undertake the necessary fabric upgrades, enabling faster and more effective adoption of low-carbon heating technologies.

Buildings located outside potential district heat network zones have been identified as likely candidates for heat pumps. Those currently using older or less efficient electric systems may require additional improvements to ensure compatibility and optimal performance.

7.3 District Heating

At present, there are no operational large-scale authority-wide district heat networks any of the three boroughs. Heat provision across the area is dominated by individual gas boilers, 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.

Despite its larger population and proximity to urban centres, Rushcliffe presents limited opportunities for heat network deployment due to its predominantly rural settlement pattern and dispersed housing stock. The borough is characterised by a high proportion of villages and low-density developments, thus presenting limited opportunities for anchor loads with West Bridgford being the only distinctly urban area. This spatial distribution significantly reduces the feasibility of district-scale heat networks, which rely on dense clusters of heat demand to be economically viable.

As discussed, Rushcliffe's strong connectivity to the gas grid and relatively low number of off-gas properties has historically supported widespread use of individual gas boilers. While this infrastructure has contributed to a uniform reliance on gas heating, and the highest residual gas emissions among the three areas, it also presents a clear opportunity for targeted decarbonisation. Given this context, it is more appropriate to focus on low-carbon heating options tailored to individual properties particularly through the maximised deployment of ASHP for domestic buildings. This approach aligns with the borough's housing typology and offers a scalable pathway to decarbonisation, especially when paired with insulation upgrades and fabric first retrofit strategies. Future opportunities may emerge through targeted zoning or public sector decarbonisation, but these are likely to be site-specific rather than borough-wide.

Several other locations within Gedling and Broxtowe however have been assessed against key heat network feasibility criteria. Table 7, introduces and summaries the potential heat network opportunities that have then been further expanded on and included within the decarbonised heat modelling.

Table 7.2: Summary Table Potential Heat Network Zones

<table>
<tr><th>Zone</th><th>Low Carbon Heat Source</th><th>Anchor Loads</th><th>Key Constraints / Notes</th><th>Included in LAEP?</th></tr>
<tr><td>Broxtowe – Beeston</td><td>Yes</td><td>Yes</td><td>Using the adjacent Severn Trent water treatment facility as a heat source, there is an opportunity for a network starting at this location to serve Beeston Rylands as well as the Beeston industrial site. However, a key constraint to the growth of such a network would be the rail line immediately to the north of the site.</td><td>Yes</td></tr>
<tr><td>Broxtowe – Eastwood</td><td>Yes</td><td>Yes</td><td>Existing feasibility has been undertaken to assess the potential for a mine water heat source network to provide heat within Eastwood. The Mining Remediation Authority have conducted the investigation and made recommendations for a Phase 2 study.</td><td>Yes</td></tr>
<tr><td>Gedling - Colwick</td><td>No</td><td>Yes</td><td rowspan="2">Through the combined approach, between Colwick and Stoke Bardolph, an opportunity for a heat network has been identified to serve the areas and possibly extend into Carlton. The main barrier to this network, again, is the main railway line that branches between Colwick and Carlton.</td><td rowspan="2">Yes (combined zone)</td></tr>
<tr><td>Gedling – Stoke Bardolph</td><td>Yes</td><td>Yes</td></tr>
</table>

7.3.1 Emerging Heat Network Developments

7.3.1.1 Broxtowe: Eastwood Mine-Water Heat Network

Broxtowe Borough Council, in partnership with the Mining Remediation Authority, completed a Phase 1 feasibility study in September 2025 to assess the potential for a mine-water-sourced low-carbon heat network in Eastwood. The scheme proposes to repurpose flooded coal mine workings beneath the town to supply sustainable heat to key public-sector buildings, with potential future expansion to commercial and residential users.

Eastwood is located above 11 worked coal seams, with depths ranging from near surface to approximately 360 metres. The majority of these seams are flooded, which is a prerequisite for mine water heat extraction.

Mine water temperatures are estimated between 11°C and 17°C, based on depth and data from nearby sites. The proposed system would:

- Abstract ambient temperature mine water via boreholes,
- Upgrade heat using centralised water-source heat pumps to supply temperatures of 50 to 60°C,
- Distribute heat through a district-scale network to nearby domestic and non-domestic buildings,
- Re-inject cooled water underground, maintaining a closed-loop system.

Water quality data suggests elevated iron content and potentially brackish to saline conditions, which will require appropriate treatment and system design.

The study identified six cluster zones around key public buildings with strong anchor load potential:

1. Nottingham Road: Wellington Court, Eastwood Library, Lawrence View Primary School
2. Beauvale: Greasley Beauvale Primary School, Greasley Sports & Community Centre
3. Church Street: Eastwood Primary Care Centre, Springbank Primary School
4. Hall Park: Hall Park Academy, Meadowbank Way Industrial Estate
5. Coronation Park: Florence Nightingale Academy, Eastwood Community FC, Eastwood Fire Station
6. Commercial Zone: Additional commercial properties

Combined, these clusters represent a first-phase heat demand of approximately 30–40 GWh/year, equivalent to a continuous thermal load of around 4 MW. Future phases could double this output as more connections are added.

The indicative capital investment required for Phase 1 of the Eastwood Mine-Water Heat Network is estimated to be between £15 million and £30 million, covering the production and re-injection boreholes, the central energy centre, and the initial distribution network infrastructure. Individual boreholes are expected to cost between £50,000 and £200,000 each, depending on the depth (ranging from 50 to 265 metres) and the geological conditions encountered during drilling.

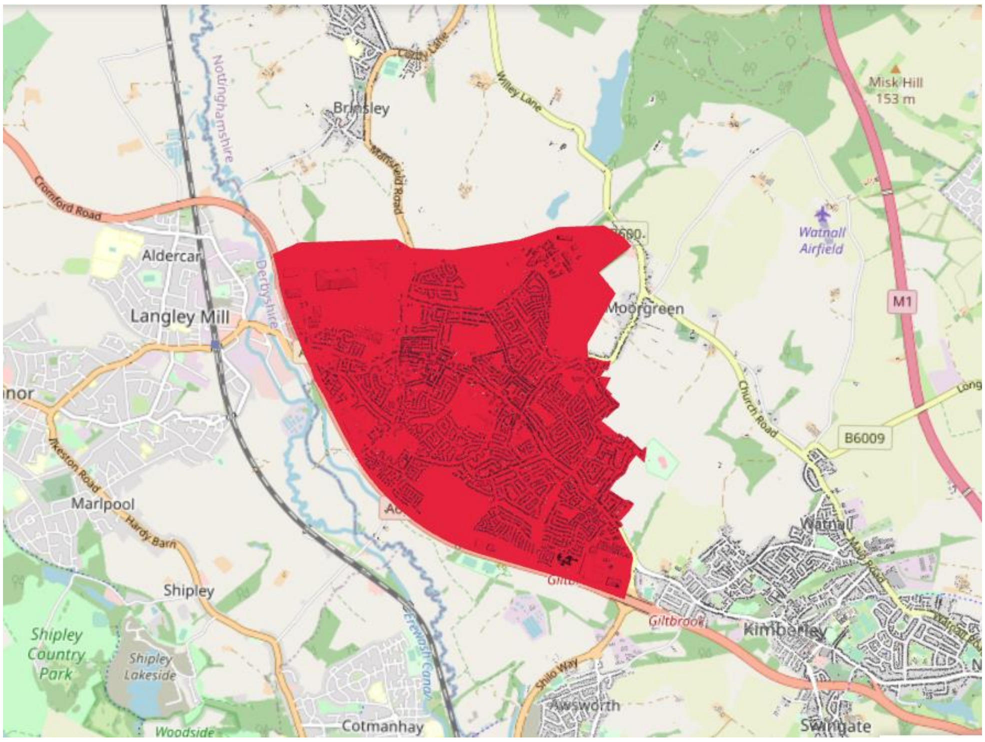
To support delivery, several funding mechanisms are being explored. These include the Green Heat Network Fund (GHNF), which provides capital support for low-carbon heat infrastructure, as well as potential public-private partnerships that could leverage investment and operational expertise. Additional funding may also be sourced from local and regional regeneration programmes, aligning the project with broader economic and environmental objectives in Broxtowe.

This scheme has been considered within the LAEP as a route to decarbonised heat through district heating growth. This network will likely represent a more cost-effective heat decarbonisation solution in this area than decentralised air source heat pumps, but development will depend on detailed feasibility.

Notably, in Gedling and Broxtowe community energy groups are supportive of the use of mine water district heating networks because of the knowledge of the many existing and disused mining shafts in the region, some of which are adjacent to domestic properties and filled with water.

Figure 7.14 presents the indicative district heating zone in Eastwood. This map highlights areas with concentrated heat demand and suitable building types for network deployment, providing a high-level perspective on where initial development could be most viable based on demand density and anchor load distribution. 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. Further refinement and feasibility studies should be completed to further verify its feasibility.

Figure 7.14: Map of proposed Eastwood Heat Network zone



7.3.1.2 Broxtowe: Beeston District Heating Network

The second locations within Broxtowe to be identified against key feasibility criteria, including the presence of low-carbon heat sources, suitable anchor loads, and geographic constraints, was Beeston. As summarised in Table 7.2, the potentially viable zone could use Severn Trent's water treatment facility as a heat source and provide heat to the industrial site in Beeston and the residential area around Beeston Rylands. The area offers strong industrial anchor loads, however the expansion of the network is constrained by the presence of the main railway line, which poses a geographical and commercial challenge in crossing. Overcoming this crossing would open up connection to further residential, commercial and institutional connections.

The future of this potential heat network would likely require the construction of an energy centre integrating large-scale heat pumps, thermal storage, pumping equipment and flexible backup generation to ensure reliability and cost optimisation. Development will require close collaboration between local authorities, developers, and energy providers to align planning policy, zoning, and investment strategies, especially as the delivery of heat as a service is new for the UK market and models of ownership, operation and maintenance are often complex and can involve many parties.

Figure 7.15 presents the indicative district heating zone in Beeston (lower red zone), with Eastwood shown in the north (upper red zone). This map highlights areas with concentrated heat demand and suitable building types for network deployment, providing a high-level perspective on where initial development could be most viable based on demand density and anchor load distribution. Further refinement and feasibility studies should be completed.

Figure 7.15: Map of Broxtowe and potential Beeston Heat Network zone

7.3.1.3 Gedling: Stoke Bardolph and Colwick District Heating Network

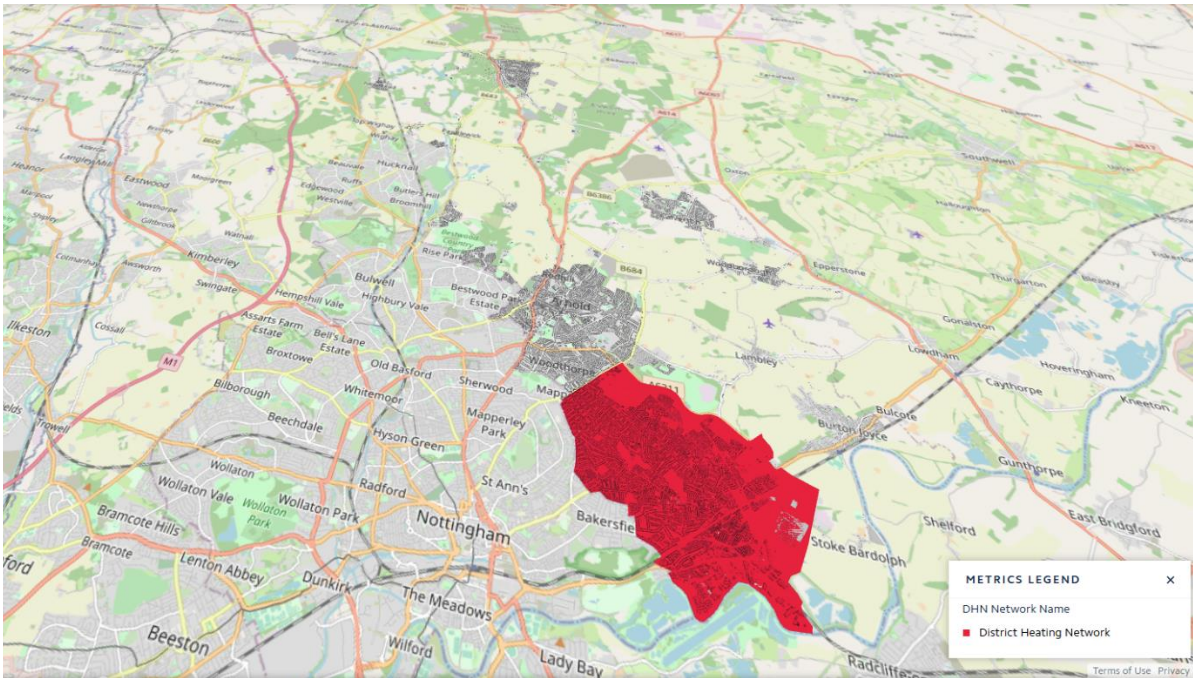
The final location identified against key feasibility criteria was the combined areas of Colwick and Stoke Bardolph in Gedling. The combined location benefits from a low-carbon heat source from Severn Trent's water treatment facility to the northwest of Stoke Bardolph. There are suitable industrial and commercial anchor loads, as well as close by residential areas that could be connected. However, similarly to Beeston, the location faces some geographic constraints with its proximity to a branching railway line. This can be perceived as a commercial constraint to a network as this often involves complex land rights negotiations.

The future of this heat network would likely require the construction of an energy centre integrating large-scale heat pumps to ensure the decarbonised heat source, thermal storage, pumping equipment and flexible backup generation to ensure reliability and cost optimisation. Development will require close collaboration between local authorities, developers, and energy providers to align planning policy, zoning, and investment strategies, especially as the delivery of heat as a service is new for the UK market and models of ownership, operation and maintenance are often complex and can involve many parties.

Figure 7.16Figure 7.16 presents the indicative district heating zone in Colwick and Stoke Bardolph. This map highlights areas with concentrated heat demand and suitable building types for network deployment, providing a high-level perspective on where initial development could be most viable based on demand density and anchor load distribution. Further refinement and feasibility studies should be completed.

Notably, it can be seen that the zone extends northwest towards the existing Enviroenergy Heat Network in St Ann's, Nottingham. A connection between the potential network and this existing network would provide greater diversity across a large heat network but feasibility and actual connection is not likely to occur in the near future.

Figure 7.16: Map of proposed Stoke Bardolph & Colwick Heat Network Zone



7.3.2 Policy and Market Drivers

The forthcoming UK Heat Network Zoning (HNZ) Regulations, set for rollout in 2026 under the Energy Act 2023, will be a key catalyst for local heat network delivery across the GBR area. 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 all three local authorities, zoning provides clear spatial and policy signals about where networks are technically and economically viable. Embedding this framework allows the boroughs 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 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 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, Nottinghamshire 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 required across stakeholders most notably in supporting zoning implementation, securing anchor load commitments, and aligning local planning and development policy with heat network rollout. Importantly, however, engaging an energy partner early to support the scoping of the delivery, operation and maintenance of any heat network development is proving to be a sure route to success. Similar approaches are being pursued across city and regional authorities within the UK and are viewed as a derisking heat network solutions.

As heat networks expands, they are anticipated to become a cornerstone of GBR’s sustainable infrastructure, enabling future connections and the integration of additional renewable and low-carbon heat technologies.

8 Industrial Decarbonisation

This section examines the current industrial process loads across the region and models the expected changes in energy sources required to achieve full decarbonisation. Data from Cadent Gas 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 across Gedling, Broxtowe and Rushcliffe, metered gas data from Cadent gas 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, 22 no. sites are within the area covered by this LAEP, with 10 in Broxtowe, 4 in Gedling and 8 in Rushcliffe.

The primary use of each connection was determined from their Standard Industrial Classification (SIC) code, which is an internal numbering system used by Cadent gas to assign the use of each commercial and industrial connection. A description of the primary uses matched to each code was also provided by Cadent to facilitate this process. Each industrial SIC code present in the GBR area was identified 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, we made an informed assessment 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 throughout GBR were modelled and mapped at MSOA layer. The projected additional electricity and hydrogen demand was then calculating 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

Gedling has a primarily service-based economy, closely integrated with Nottingham, with a large proportion of residents commuting out of the borough for higher-value employment. Professional, scientific and technical services are significant and growing sectors, reflecting a skilled resident workforce and proximity to Nottingham's office and business services market.

Construction and built environment is the largest sectors by business count and employment growth, linked to housing development and regeneration activity across Greater Nottingham. Retail and local services are concentrated in Arnold, Carlton and Netherfield town centres; largely dominated by

SMEs and community-scale employers. Creative and digital micro-businesses are an emerging but still small sector, supported through local business support programmes and improved digital connectivity.

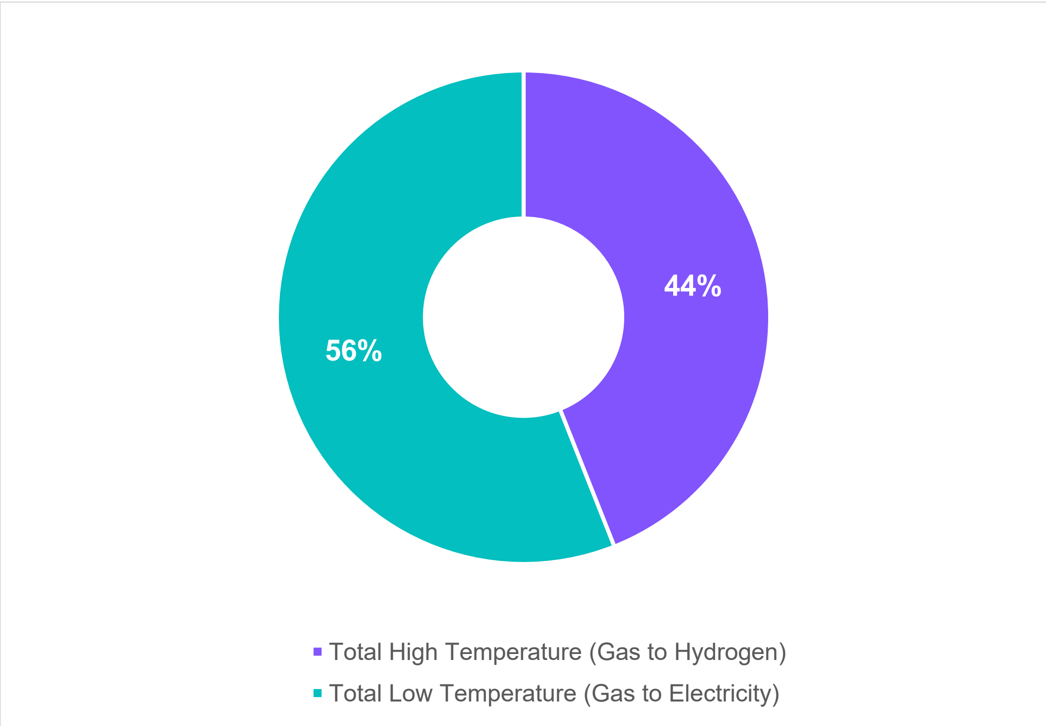
Broxtowe has the most industrially diverse and employment-dense economy of the three boroughs, supported by strong transport links (M1, A52) and established employment sites. Wholesale, retail and logistics are a dominant sector by company numbers and employment, including warehousing and supply-chain businesses located near strategic road corridors. Professional, scientific and technical services are a major contributor to employment growth, linked to the Nottingham, Derby and the East Midlands innovation ecosystem. Construction is a consistently strong sector, supported by regeneration initiatives and demand for industrial and commercial units. Advanced manufacturing and life sciences is smaller in scale but showing growth in medical devices, research tools and specialist manufacturing.

Rushcliffe's economy is high-skill, professional and increasingly knowledge-led, with strong performance indicators and a large commuter population centred on West Bridgford. Professional, scientific and technical services make up the largest sector by business count, reflecting high skill levels and strong links to Nottingham's professional economy. Clean energy and infrastructure is emerging), with future growth potential linked to the redevelopment of the Ratcliffe-on-Soar power station site and wider clean energy ambitions.

High gas consuming organisations such as Saint Gobain and Boots were engaged as part of this LAEP.

8.3 Existing System

Figure 8.1: Breakdown of Process Load 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 across Gedling, Broxtowe and Rushcliffe, segmented into low-temperature and high-temperature categories.

Notably, high-temperature processes dominate, accounting for 56% of total industrial gas use, while low-temperature processes make up the remaining 44%.

This disproportionate share is largely driven by Gedling, Broxtowe and Rushcliffe's industrial landscape, which includes major energy-intensive operations such as Saint Gobain, Boots HQ, and Ibstock Brick Manufacturing. Together, these industries represent 75% of all non-domestic process load gas consumption in the region.

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 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 in Gedling, Broxtowe and Rushcliffe.

8.4 Decarbonisation Requirements

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 80°C to 200°C.

A profile to project the rate of uptake of fuel switching for process loads was developed using the projections in the UK Government's 7th Carbon Budget scaled down appropriately to Gedling, Broxtowe and Rushcliffe. This profile includes a reduction in the total energy required for process loads due to energy efficiency, of around 6%. Efficiency improvements of electrical systems compared to fossil fuel boilers were also included in the consumption projections for low temperature loads.

The industrial decarbonisation projection from the 7th Carbon Budget included contributions from Carbon Capture and Storage. However, this technology was ruled out for Gedling, Broxtowe and Rushcliffe, as it is generally only suitable for extremely large industrial sites of national-level importance, infrastructurally. Based on the data available, no suitable sites were identified in the area.

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[42], 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.

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.

[42] 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 8.2: Annual conversion rates of process natural gas demand in preferred scenario

Year	Hydrogen		Electrification	
	Annual Percentage Conversion	Annual Conversion (MWh)	Annual Percentage Conversion	Annual Conversion (MWh)
2025	0.00%	0	1%	0
2026	0.00%	4,613	1%	0
2027	0.00%	9,226	2%	0
2028	0.00%	18,452	2%	0
2029	0.00%	27,678	4%	0
2030	2.00%	46,130	6%	0
2031	2.00%	73,808	6%	11,742
2032	2.00%	101,486	6%	23,484
2033	4.00%	129,165	8%	35,227
2034	4.00%	166,069	8%	58,711
2035	4.00%	202,973	8%	82,196
2036	8.00%	239,877	8%	105,680
2037	8.00%	276,781	8%	152,649
2038	8.00%	313,685	8%	199,618
2039	8.00%	350,589	4%	246,587
2040	8.00%	369,041	4%	293,556
2041	8.00%	387,494	4%	340,525
2042	8.00%	405,946	4%	387,494
2043	6.00%	424,398	2%	434,462
2044	6.00%	433,624	2%	469,689
2045	6.00%	442,850	2%	504,916
2046	4.00%	452,076	2%	540,142
2047	4.00%	461,302	0%	563,627
2048	0.00%	461,302	0%	587,111
2049	0.00%	461,302	0%	587,111
2050	0.00%	461,302	0%	587,111

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[43], 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. This follows the previously outlined assumptions. The ratio of hydrogen consumption to electricity consumption in 2050 is higher than the current ratio of high temperature to low temperature process loads, due to the system efficiency improvements when electrifying burners and other processes that previously combusted fuel.

[43] 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

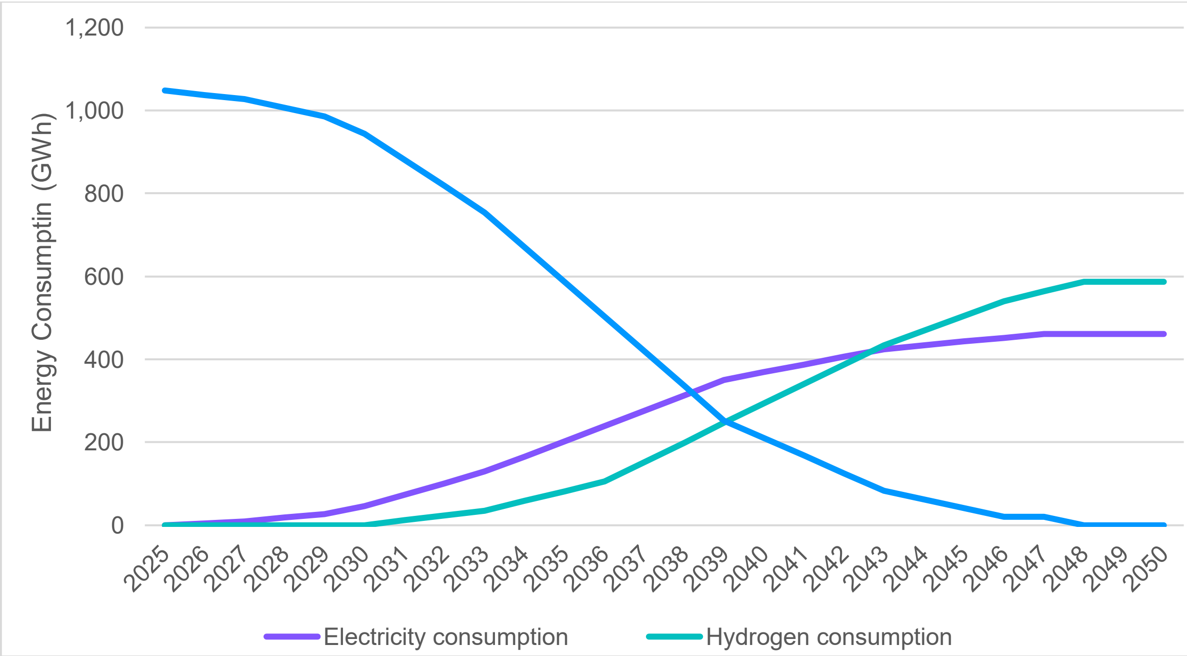
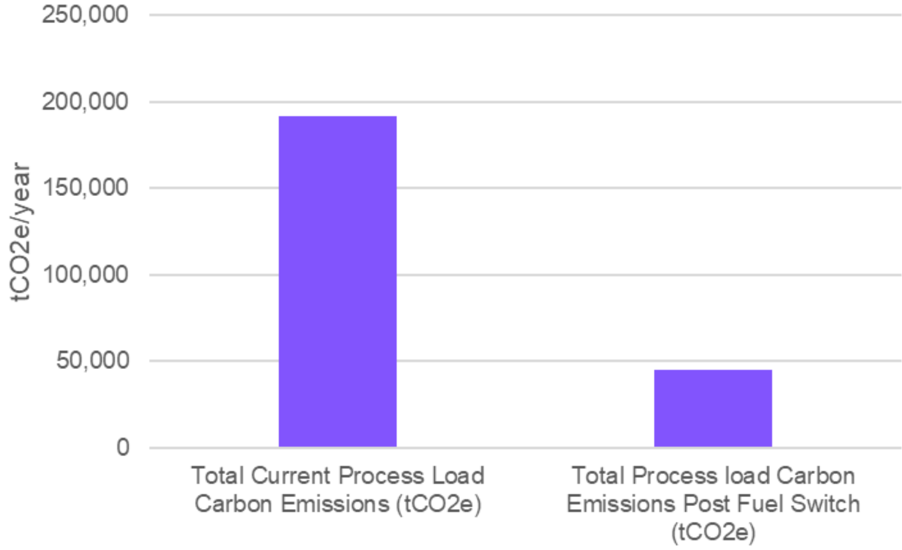


Table 8.1 provides a breakdown of carbon emissions from process loads after the removal of fossil fuels, showing the respective contributions of electricity and hydrogen consumption. Electrifying process loads wherever feasible is essential because electricity generally has a lower carbon intensity than green hydrogen.

Table 8.1: Summary of Process load Emission Post Fuel Switch

Gedling, Broxtowe and Rushcliffe 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 (%)
1,048,413	191,755	3,248	42,077	45,325	76%

Figure 8.4: Process Load Carbon Emission Post Fuel Switch



To ensure a structured transition, all industrial companies within the Gedling, Broxtowe and Rushcliffe LAEP area should be encouraged to develop comprehensive decarbonisation plans. These plans should be guided to 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.

8.4.1 East Midlands Freeport – Rushcliffe

East Midlands Freeport (EMF) is a government-designated growth and innovation zone centred on three tax sites: the East Midlands Airport and Gateway Industrial Cluster (EMAGIC), the Ratcliffe-on-Soar redevelopment area, and the East Midlands Intermodal Park. The Freeport brings together local authorities, landowners, occupiers, the East Midlands Combined County Authority, and national agencies to attract investment, support advanced manufacturing and logistics, and deliver low-carbon infrastructure.

For the D2N2 area, and particularly for Rushcliffe, EMF represents a significant strategic opportunity. The Ratcliffe-on-Soar site is undergoing transition from coal fired power generation to become a major low-carbon energy and innovation hub, with potential roles in hydrogen production, clean power, circular economy activity, and advanced manufacturing. EMF partners have also committed to ambitious Net Zero objectives and annual carbon reporting, supported by investment in enabling infrastructure funded through retained business rates.

The Freeport has the potential to support the Local Area Energy Plan by helping to concentrate low-carbon investment, strengthen regional energy infrastructure, stimulate clean-tech supply chains, and provide a platform for coordinated planning across transport, industry, and energy networks.

9 Electrification of Private Transport

This section outlines the current state of transport emissions across Gedling, Broxtowe and Rushcliffe and the role electrified transport plays in reducing these. This section details the interventions modelled in the net-zero aligned scenarios that prioritise a pathway to electric vehicle decarbonisation.

Existing Public Chargers (50kW and above)

Broxtowe	45
Gedling	16
Rushcliffe	52

Required Public Chargers for Net Zero

Broxtowe	2,848
Gedling	2,991
Rushcliffe	3,088

Required Private Chargers for Net Zero

Broxtowe	44,997
Gedling	47,252
Rushcliffe	48,798

Required New Electric Cars for Net Zero

Broxtowe	56,958
Gedling	59,812
Rushcliffe	61,769

9.1 Existing System

Currently transport accounts for 34% of GBR's emissions,[44] so supporting the decarbonisation of this sector is crucial in order 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 electric vehicles only as one part of this transport sector decarbonisation plan.

As of 2025, the number of licenced vehicles in GBR is 179,222[45], of which 96% are petrol- or diesel-powered internal combustion engine (ICE) run vehicles which directly release greenhouse gas emissions and pollute the air during operation. The number of licensed vehicles in GBR is expected to increase, primarily driven by car ownership which reflects both population growth and increased mobility demand across the region. Therefore, expanding the current makeup of electric vehicle (EV) ownership to beyond its current level of around 4% is key.

EVs produce zero tailpipe emissions, which contributes to improved local air quality by not emitting the high levels of nitrogen oxides and particulate matter released by internal combustion engine vehicles.

Alongside policy implementation, it must also become easier and more affordable to own or use an electric vehicle. The UK Government's confirmed policy[46] to end the sale of new petrol and diesel cars by 2030, with hybrids allowed until 2035, will accelerate the transition to electric mobility. This policy is expected to drive a significant shift in the fuel makeup of Gedling, Broxtowe and Rushcliffe's vehicle fleet over the coming decades as EV ownership becomes easier and more affordable.

9.2 Local Context

According to Midlands Connect[36], the Midlands could have over 2 million EVs on the road by 2030, representing 32.5% of all vehicles. To support this growth, the region will require 58,997 new public charging points by 2030, equivalent to installing 27 per day, 194 per week, and nearly 9,832 annually.

[44] UK local authority and regional greenhouse gas emissions statistics, 2005 to 2023 - GOV.UK

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

[46] UK Government; Phasing out the sale of new petrol and diesel cars from 2030 and support for zero emission vehicle (ZEV) transition

EV adoption is projected to rise sharply. Across Gedling, Broxtowe and Rushcliffe, the number of EVs is expected to increase by several hundred percent by 2030, driven by the UK Government's policy to end the sale of new petrol and diesel cars by 2030 (with hybrids allowed until 2035). This transition will require a significant expansion of charging infrastructure.

Current public charge point numbers in the three areas remain limited - Broxtowe has 71.6 publicly available electric vehicle charging devices at all speeds per 100,000 residents, Gedling has 56.6 per 100,000 people, and Rushcliffe leads at 74 chargepoints per 100,000 people. This is lower than the UK average of 113 charging devices per 100,000 people[47]. 34.2% of on-street Gedling households have an EV charger within walking distance, compared to 12.6% of Rushcliffe and 16.2% in Broxtowe[48]. Nonetheless, growth is underway through regional strategies such as the East Midlands LEVI programme, which promotes deployment of rapid and ultra-rapid charging hubs along key corridors and in residential areas to ensure equitable access.

The UK Department for Transport (DfT) provides funding and support mechanisms to help local authorities accelerate the rollout of electric vehicle (EV) charging infrastructure. In September 2023, the government allocated £40.3 million to 14 local authorities through the Local Electric Vehicle Infrastructure (LEVI) Fund, aimed at expanding public charging networks and improving accessibility for residents without off-street parking. Research by DfT[35] highlights that the need to change existing parking and refuelling habits is a major barrier to EV adoption. Among surveyed options, near-home on-street charging was rated most desirable, followed by rapid charging stations and workplace charging.

Building on these national and regional commitments, Nottinghamshire has established the Electric Vehicle ChargePoint Framework (NEVCF).[49] This framework aims to provide adequate charging provision to enable the public to make informed choices about vehicle type and to facilitate the replacement of petrol and diesel cars with EVs. It does so by supporting ChargePoint deployment across urban centres, rural areas, highways and public spaces.

Further policy relating to EV charging infrastructure targets and committed have also been developed in the Broxtowe Electric Vehicle Charging Infrastructure (BEVCI)[50] Strategy which aims to provide reliable, accessible, and inclusive EV infrastructure. The strategy aims to achieve the following objectives:

- Establish an annual installation target of 81–100 charge points (public and private stakeholders), based on growth projection scenarios.
- By 2035, ensure all Council owned car parking areas are equipped with appropriate EV charging facilities.
- By 2035, achieve 70% coverage: homes without driveways to be within a five-minute walk of a public charge point.
- Support the Council's fleet transition to achieve near-zero carbon emissions by 2027.

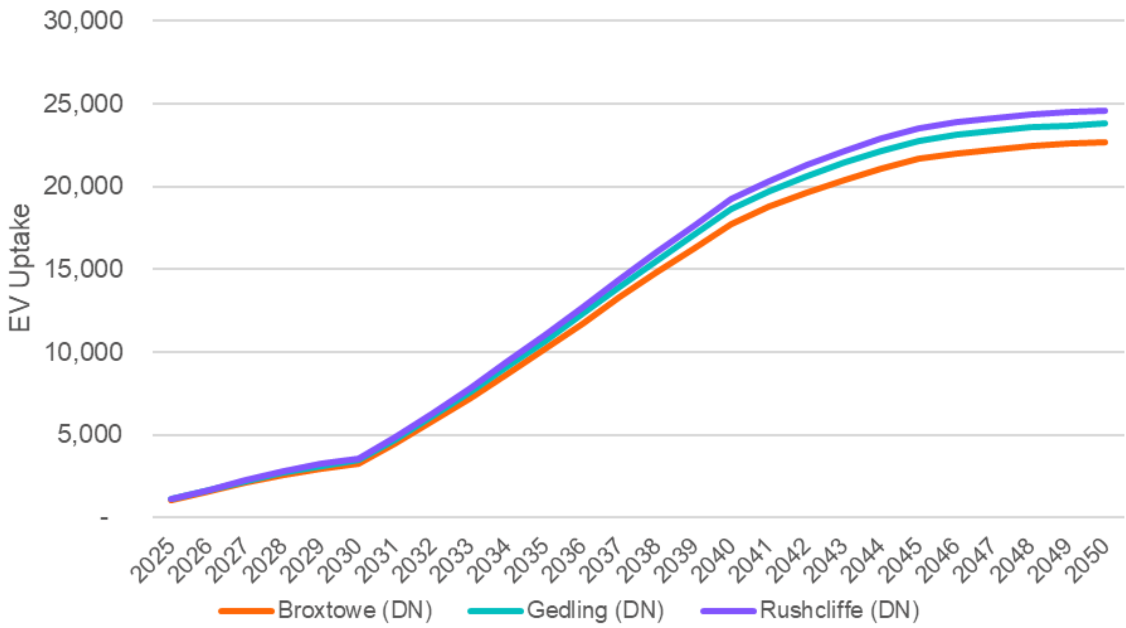
9.3 Do Nothing

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.[51]

[47] Electric vehicle public charging devices - ONS
[48] On Street Charging, ZapMap
[49] Electric vehicle charging frameworks and strategies | Nottinghamshire County Council
[50] Broxtowe Borough Council. Electric Vehicle Charging Infrastructure 2024-2027. (Broxtowe Borough Council, 2024)
[51] Phasing out sales of new petrol and diesel cars from 2030 and supporting the ZEV transition - GOV.UK

Whilst these existing policies would lead to the continued growth in trends of EV ownership, the insufficient charging infrastructure and lacking policy support would limit the rate of decarbonisation progress and petrol and diesel vehicles would continue to dominate GBR's roads. To evaluate this scale of intervention required, Midlands Connect conducted modelling to examine both the business-as-usual scenario (BAU) and an accelerated electric vehicle uptake scenario through to 2050, as illustrated below.[52]

Figure 9.1: Midlands Connect Modelled Business as Usual EV Uptake Scenario



Source: STB EV Charging Infrastructure Visualiser

'Do nothing' estimates that 22,657 electric vehicles would be adopted by 2050 in Broxtowe, 23,793 in Gedling and 24,571 in Rushcliffe, which represents 40% of GBR's currently licensed vehicles. This demonstrates that under existing policy conditions, Gedling, Broxtowe and Rushcliffe are likely to fall short of transitioning its entire vehicle fleet to zero-emissions models. As a result, the reduction in transport emissions under the do-nothing scenario will be insufficient to meet the UK net zero ambitions within the required timeframe.

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 Gedling, Broxtowe and Rushcliffe by 2040 and 2050, in line with the Climate Change Committee's Seventh Carbon Budget which is detailed in Section 9.4.

9.4 Modelling Methodology

This modelling approach used 2021 ONS population data for each district's MSOAs to allocate a share of the UK-wide projection of 37.4 million electric vehicles by 2050. By apportioning this national

[52] STB EV Charging Infrastructure Visualiser

projection according to the local population, the analysis provides district-specific estimates of EV uptake.

The uptake trends were modelled using the Climate Change Committees (CCC) seventh carbon budget[53]. The CCC pathway is slightly more ambitious than the EV mandate through to 2035, due to anticipated reductions in EV costs making this achievable. This pathway results in 97.5% of cars being battery electric by 2050. 2.5% of cars would be covered by other zero emission vehicle types including hydrogen fuel cell and biofuels. The final 1% of current transport emissions (made up of classic cars and 15-year-old ICE cars still in operation in 2050) would be covered by engineered removal methods like carbon capture.

In order to estimate the number of public EV chargers needed, a ratio of public chargers to number of EVs was taken from Midlands Connect 'Supercharging the Midlands' report[54] which cites 1-in-20 would be required. Since 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[55]. Further details of the assumptions used within the modelling are provided in Appendix C.

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 C.

9.5 Results

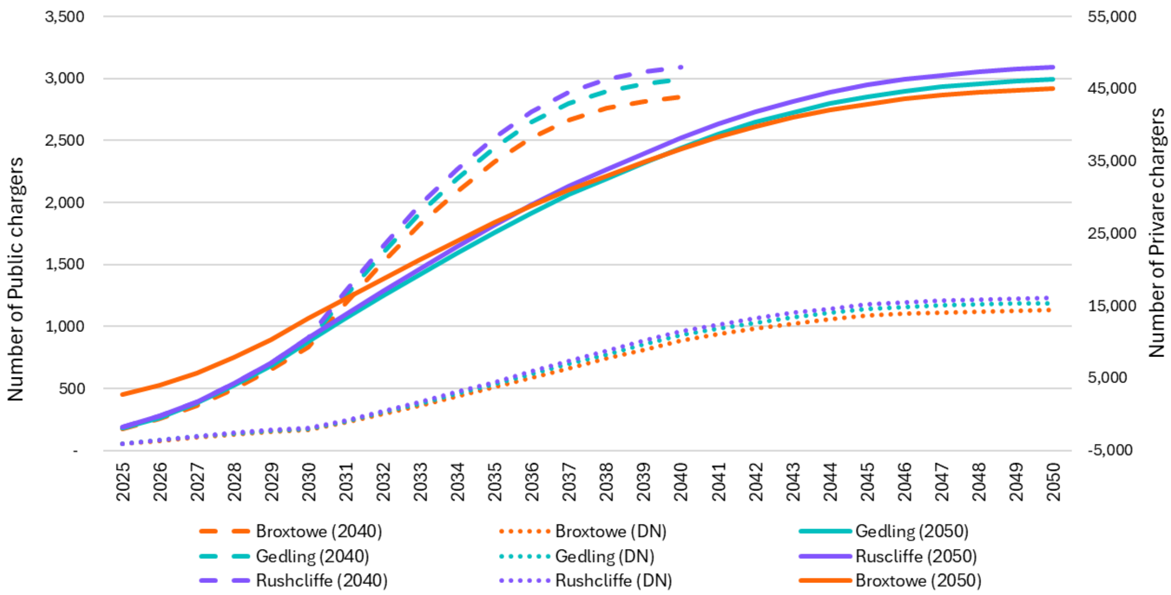
EV uptake required from present day are 56,958, 59,812 and 61,769 EVs in Gedling, Broxtowe and Rushcliffe, respectively, to achieve the 2050 and 2040 Net Zero scenarios.

These uptakes represent a significant proportion of the region's current fleet of vehicles, with the 2040 scenario requiring over 81% of the current fleet of vehicles to be replaced by 2035, and 59% in the 2050 scenario. To provide a sense of scale, a calculation based on the Society of Motor Manufacturers and Traders (SMMT)[56] and UK government[57] data shows that there are nearly 2 million cars registered a year and approximately 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.

[53] https://www.theccc.org.uk/wp-content/uploads/2025/02/The-Seventh-Carbon-Budget.pdf
[54] https://www.midlandsconnect.uk/media/i1spcsr1/mc-supercharging-the-midlands-document.pdf
[55] Home and community EV charging stats
[56] 2024 (Full Year) Britain: New Car Market Overview and Analysis - Car Sales Statistics
[57] Vehicle licensing statistics, United Kingdom: 2024 - GOV.UK

Figure 9.2 shows the number of public and private EV chargers required in Gedling, Broxtowe and Rushcliffe under the modelled scenarios to support EV uptake.

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.[58]

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 and inter-urban journeys. The LAEP pathway highlights that the rollout of public charging infrastructure must keep pace with the uptake of electric vehicles.

A total of 141,046 private and 8,927 public chargers were modelled for Gedling, Broxtowe and Rushcliffe 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 evenly 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

Gedling, Broxtowe and Rushcliffe 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. Locations such as Kimberley South, Trowell and Awsworth, and Beeston Town in Broxtowe; Woodthorpe and Arno Vale and Carlton in Gedling; and Bingham and Compton Acres and Luttrell in Rushcliffe, which have higher population densities and large coverage of flats and terraced housing, correlating with low percentages of off-street parking, should take priority.

It is crucial that collaboration takes place with the local DNO to ensure the grid is equipped to incorporate the extra demand an increase in EV use will bring, as well as the opportunities in Vehicle-

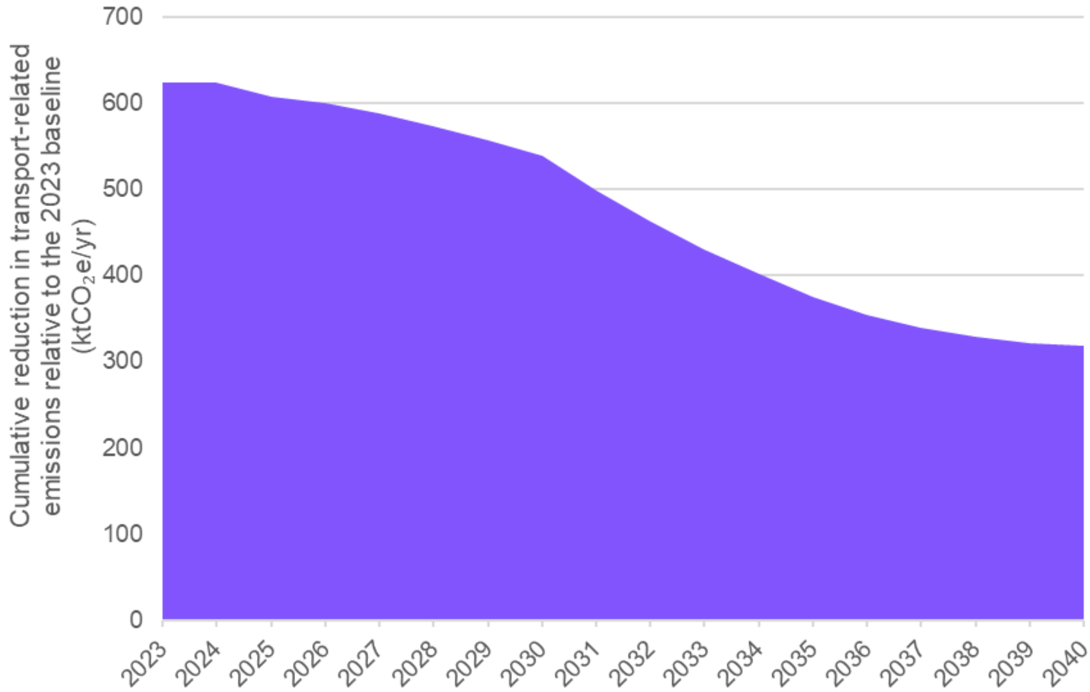
[58] Electric vehicle (EV) driver behaviours and attitudes tracker - GOV.UK

to-Grid storage flexibility. Low space availability as a result of the urban densities across GBR must be a key consideration when planning public EV charge point locations and rapid and ultra-rapid charging hubs. Refer to Section 11 to find more information regarding impacts to the grid infrastructure.

9.6.2 Carbon Impact of EV Infrastructure

Figure 9.3 illustrates the net abated carbon emissions resulting from the transition away from ICE vehicles across both scenarios. It presents the total carbon savings achieved through this transition factoring in both reduced ICE emissions and a change in emissions from electricity usage.

Figure 9.3: Total Abated Emissions from the transition away from Internal Combustion Engines (tCO_2e/year)



The analysis indicates that widespread uptake of electric vehicles could reduce transport related emissions by approximately 49%. Given that transport currently accounts for around 35% of the total territorial emissions, this reduction in private vehicle emissions alone is equivalent to approximately 17% of GBR's current total emissions. Since 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 data shows an overall reduction in emissions from GBR's vehicle fleet, influenced by two main factors: increased use of EVs and the ongoing decarbonisation of the electricity grid. In the 2040 and 2050 scenarios the final average emissions per vehicle are expected to be 15.5 and 2.5$kgCO_2$/year, respectively, down from 1,555 $kgCO_2$/year in 2025. Although this constitutes a significant reduction in emissions, projected residual emissions from the transport sector are expected to persist, primarily due to the carbon intensity of the electricity grid.

10 Local Generation

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

Number of properties with existing solar PV	
Broxtowe	3,006
Gedling	3,699
Rushcliffe	5,047

Contracted Generation Capacity (MW)	
Broxtowe	0
Gedling	90
Rushcliffe	50

Rooftop PV Potential (GWh)	
Broxtowe	129
Gedling	128
Rushcliffe	125

Energy Storage to Support PV (GWh)	
Broxtowe	71
Gedling	70
Rushcliffe	69

10.1 Existing System

Gedling, Broxtowe and Rushcliffe's electricity demand is primarily met by the national electricity grid, while heat demand is mostly supplied by the national gas grid. The East Midlands area is operated by five DNOs of which National Grid is the electricity provider for GBR. Most of the energy consumed is sourced from outside the region with 1.4GW of operational renewable generation capacity in the East Midlands. The majority of this capacity is located across Nottinghamshire and Lincolnshire where solar and onshore wind account for 1GW and 200MW respectively.[59]

While granular asset-level data for Gedling, Broxtowe and Rushcliffe is not publicly available, regional datasets provide useful proxies. The Embedded Capacity Register does indicate that 49.9 MW of solar generation is agreed to connect in Rushcliffe, and 90 MW of battery storage is agreed to connect in Gedling.

While there is currently no policy mandating installation of rooftop solar on homes, recent trends show that growth has been expanding in the region, with 685 properties in Gedling, 511 in Broxtowe Dales and 905 in Rushcliffe, fitted with rooftop solar PV panels from April 2025 to April 2026.[60]

Figure 10.1 displays the existing total solar capacity across Gedling, Broxtowe and Rushcliffe by MSOA. Most of Rushcliffe, in particular Cropwell Bishop, Kinoulton and Upper Broughton, stood out as having the highest total installed solar capacity. This is due to the fact that Rushcliffe has the largest proportion of rural areas with more single-family housing. Single family housing usually has more available roof space and less obstructions from neighbouring buildings, leading to more feasible installations on South, South-East and South-West facing roofs.

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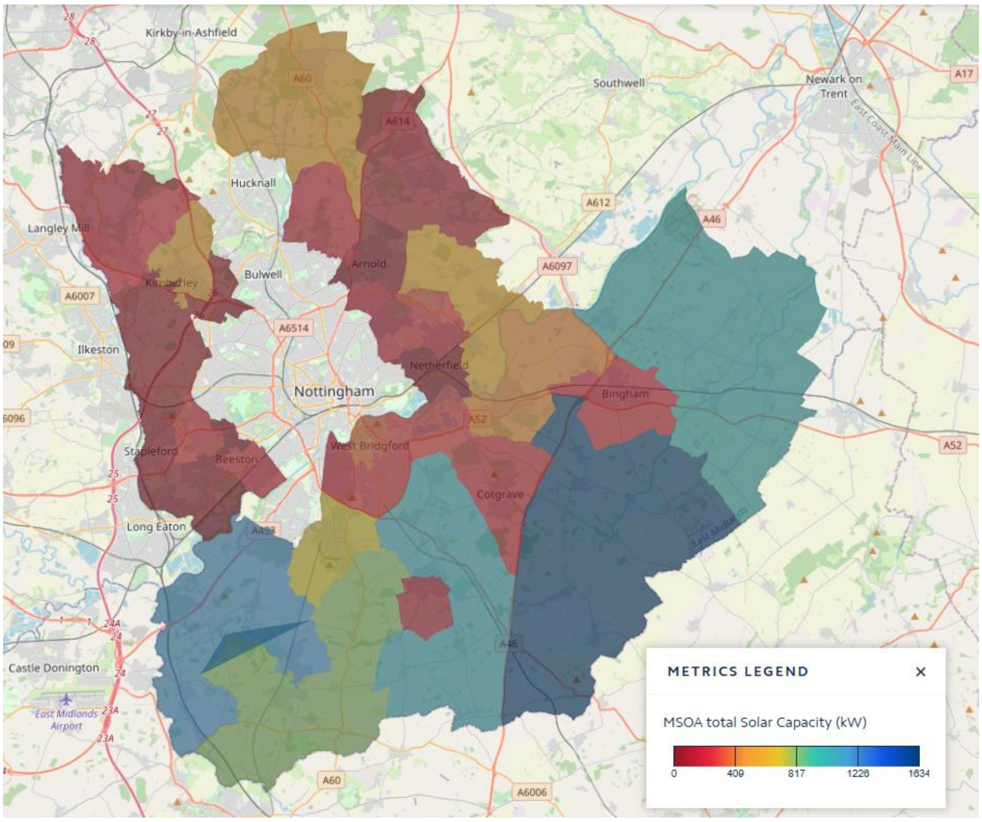
[59] NESO. The Nations and Regions Contexts are the first of four key components of transitional Regional Energy Strategic Planning (tRESP) . (NESO, 2025)

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

Figure 10.1: Total solar capacity in Gedling, Broxtowe and Rushcliffe (kW)



10.2 Do Nothing

As stated in Section 1, opportunities from large-scale distributed generation connected at the Grid Supply Point (GSP) level have been excluded from this LAEP 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.

Gedling, Broxtowe and Rushcliffe's LAEP therefore focuses on distribution-connected and locally influenced generation, such as rooftop solar and community-scale renewables.

While there is nothing legislated that mandates local generation, the government's Clean Power Action Plan does set out ambition for high level regions.

10.3 Context

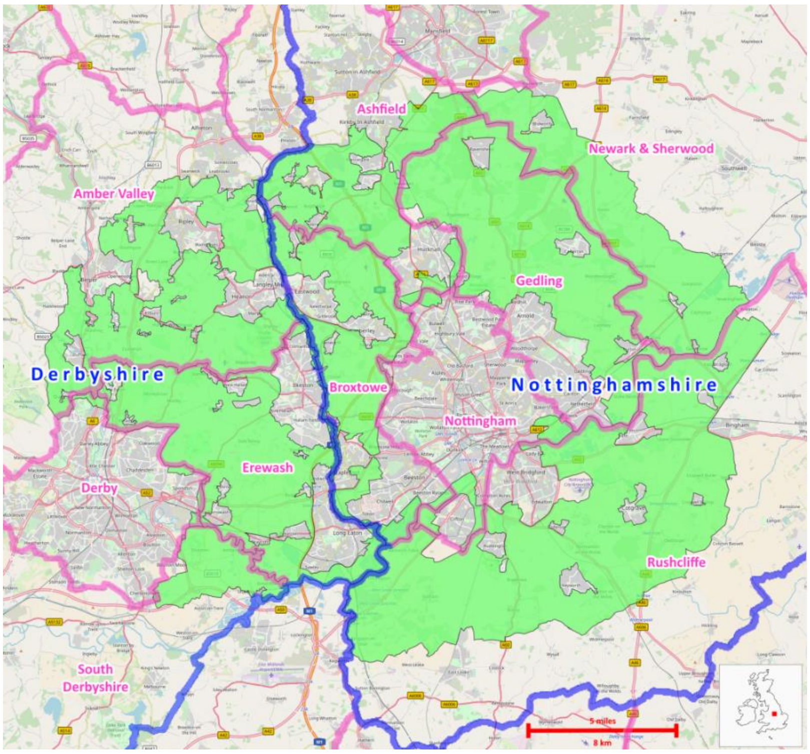
The Great Nottinghamshire Strategic Plan (GNSP) covering Broxtowe, Nottingham City and Rushcliffe, outlines its framework to support the transition to low carbon energy by introducing policies that promote low carbon renewable energy generation including solar, wind and other technologies. Though the plan does not yet detail specific projections for the improvements in renewable energy capacity, strategic allocations have been identified at the former Ratcliffe-on-Soar power station in Rushcliffe as well as in Field Farm, Toton and Bennerley Coal Disposal in Broxtowe.[61]

[61] Broxtowe Borough Council, Nottingham City Council, Rushcliffe Borough Council. Greater Nottingham Strategic Plan (2025)

Gedling pulled out of the GNSP in 2025, producing their own local energy plan. There are no specific targets set in here for renewable generation capacity, however the policy acts as a checklist of criteria that generation proposals must meet whilst considering the restrictions of the green belt. The policy also identifies the need for a Supplementary Planning Document to advise on renewable energy proposals on the limitations of specific potential landscapes.[62]

Proposed renewable generation capacity is defined by the Greater Nottinghamshire green belt whereby development for large-infrastructure projects, including renewable energy projects, is typically restricted if deemed an 'inappropriate development', unless significant environmental benefits can be proven. Rushcliffe has the largest non-green belt defined area as displayed in Figure 10.2 which explains why it has the biggest proposed renewable generation capacity of 300MW. Gedling and Broxtowe are more dominated by green-belt areas with 1.2MW and 0.6MW of proposed capacity respectively.

Figure 10.2: Nottinghamshire green belt in relation to borough council area boundaries



Source: Open Government Licence

Nottinghamshire is also home to one of the UK's most ambitious renewable energy projects, the Spherical Tokamak for Energy Production (STEP) which is a flagship energy fusion project aiming to demonstrate net energy fusion by the 2040s. The project is located at the former coal-fired power station in West Burton, at the heart of Nottinghamshire's Megawatt valley. Though the project has not been included in capacity forecasting in this LAEP, a successful outcome of this project would significantly impact both the area's contribution to the grid and the energy security of the region.[63]

[62] Gedling Borough. Local Planning Document Part 2 Local Plan. (Gedling Borough, 2018)

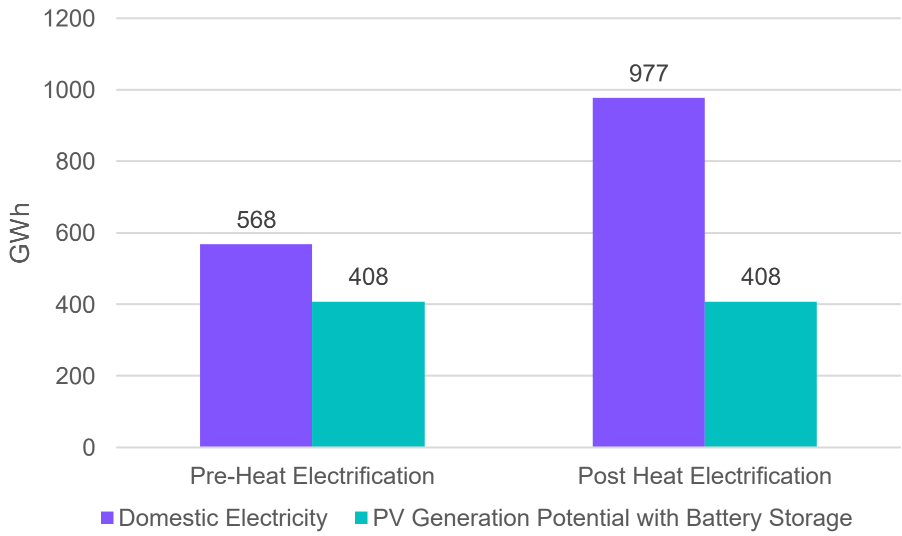
[63] Step Fusion. A Home For The Future. (Step Fusion, 2025)

10.4 Intervention Methodology

A suitability assessment was undertaken using the calculated areas of rooftop space available and the orientation of each building.

IES have modelled optimal uptake of solar PV panels to be installed on 80% of feasible South, South-East and South-West facing roofs, illustrated in Figure 10.3, which would enable up to 408 GWh of generation across domestic properties. This assumption is due to the prevalence of hipped and gabled roofs, chimneys, and skylights. It was determined that funding would come via Research and Development (R&D) funded projects.

Figure 10.3: Gedling, Broxtowe and Rushcliffe Domestic Electrical Demand and Potential PV Generation



The average efficiency of panels was modelled at 18%. Domestic and non-domestic buildings were divided into single dwellings/units and multi-dwellings/units, and the total energy generation was determined for each orientation (S, SE, SW).

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.

Ground Mount solar opportunities have been excluded from modelling due to the lack of suitable identified council-owned land in Gedling, Broxtowe and Rushcliffe.

10.5 Scenarios

Figure 10.4 and Figure 10.5 illustrate domestic and non-domestic rooftop solar uptake, and to support alignment with the net zero by 2040 and 2050 targets. Modelling of the uptake peaks in 2034 which aligns with the UK's anticipated grid decarbonisation.

Figure 10.4: 2050 and 2040 scenario domestic rooftop solar uptake projections

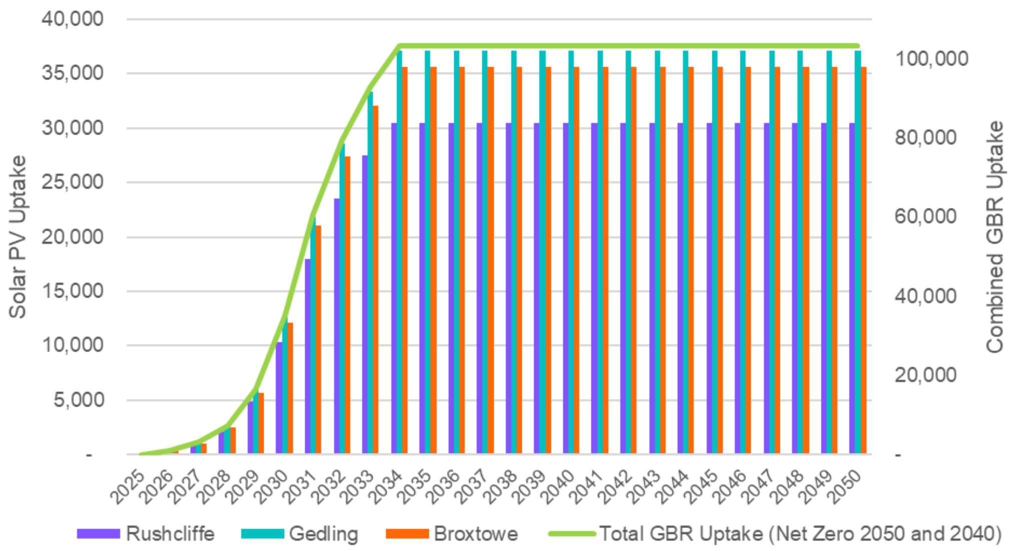
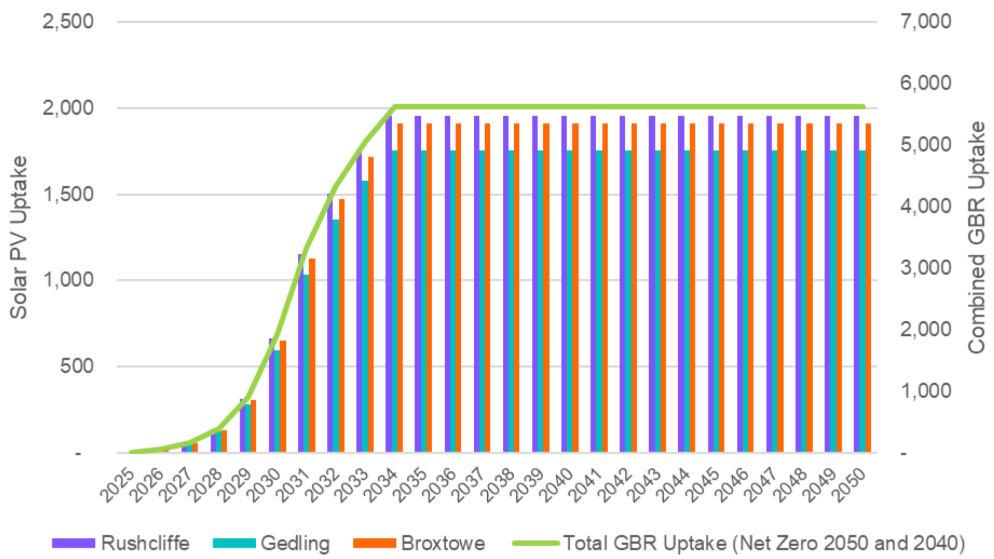


Figure 10.5: 2050 and 2040 scenario non-domestic rooftop solar uptake projection



These uptake curves have been modelled based on the understanding that following the decarbonisation of the electricity grid no further carbon benefit of rooftop PV would be realised. Nonetheless, local expansion of grid capacity and generation capability will continue to bring other benefits such as reduced consumer bills, reducing grid connection and capacity constraints which increased electrification brings such as from space heating and EV charging, and demand side response resilience with storage capacity.

Year	Annual Increase in Yield (MWh)			
	Annual Percentage Uptake	Gedling	Broxtowe	Rushcliffe
2025	1.0%	940	860	900
2026	0.7%	686	628	657
2027	1.1%	1,053	963	1,008
2028	2.0%	1,852	1,694	1,773
2029	3.4%	3,224	2,950	3,087
2030	5.8%	5,424	4,962	5,193
2031	9.1%	8,507	7,783	8,145
2032	12.7%	11,938	10,922	11,430
2033	15.3%	14,363	13,141	13,752
2034	15.3%	14,363	13,141	13,752
2035	12.7%	11,938	10,922	11,430
2036	9.1%	8,507	7,783	8,145
2037	5.8%	5,424	4,962	5,193
2038	3.4%	3,224	2,950	3,087
2039	2.0%	1,852	1,694	1,773
2040	1.1%	1,053	963	1,008
2041	0.0%	0.0	0.0	0.0
2042	0.0%	0.0	0.0	0.0
2043	0.0%	0.0	0.0	0.0
2044	0.0%	0.0	0.0	0.0
2045	0.0%	0.0	0.0	0.0
2046	0.0%	0.0	0.0	0.0
2047	0.0%	0.0	0.0	0.0
2048	0.0%	0.0	0.0	0.0
2049	0.0%	0.0	0.0	0.0
2050	0.0%	0.0	0.0	0.0

Figure 10.6: Rooftop PV annual uptake of installations in preferred scenario

If the price of solar PV panels and battery storage continues to drop at the current rate, then solar PV will likely become cost-effective for most households within the next 5-7 years, supporting necessary uptake as detailed in Figure 10.6.

There is currently no funding available from the UK Government for domestic solar panels, so homes at risk of fuel poverty may not be able to afford the up-front costs. This is where local government and social housing providers will need to step in to signpost funding pathways to PV installation across all socioeconomic groups.

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

Figure 10.7 and Figure 10.8 show annual yield projections for domestic and non-domestic PV.

Figure 10.7: 2050 and 2040 scenario domestic rooftop solar annual yield projections

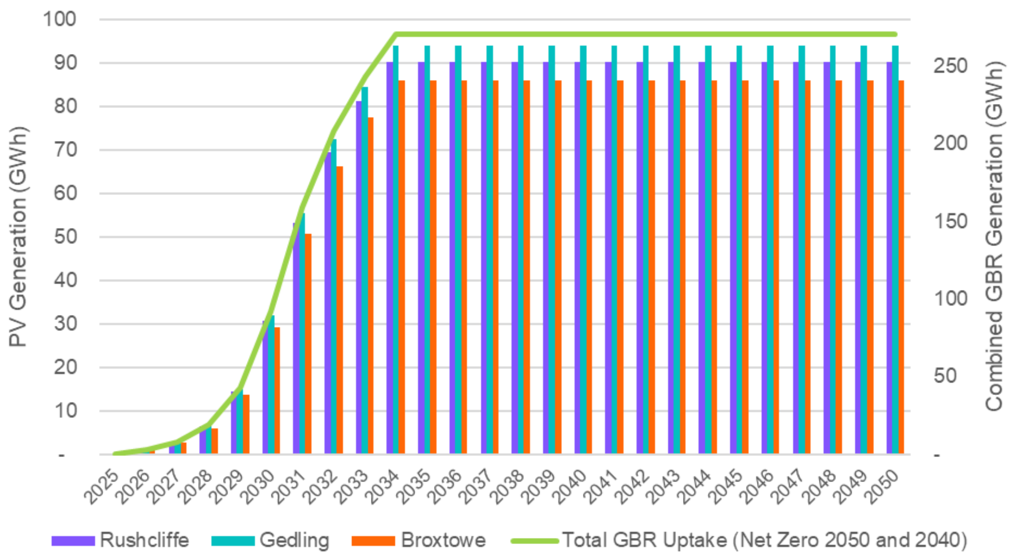
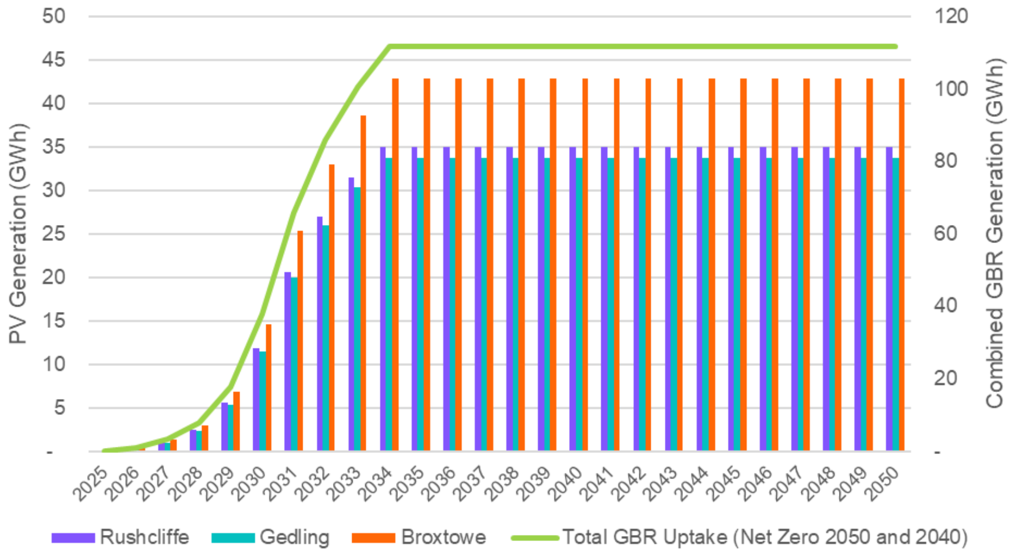


Figure 10.8: 2050 and 2040 scenario non-domestic rooftop solar annual yield projections



Across GBR, annual rooftop PV yield for both domestic and non-domestic properties is modelled to expand in 38.2 GWh increments to peak at 382 GWh in 2034. Non-domestic annual yield is similar to domestic properties despite significantly less installations. This is due to the larger roof spaces available on these properties, allowing for larger sized systems.

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[64], 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 Gedling, Broxtowe and Rushcliffe'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,

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

but also for middle-income families who may struggle with the upfront costs. This financial barrier risks slowing down the widespread adoption of PV across GBR.

11 Networks, Storage and Flexibility

This chapter explores the current state of the National Grid electrical network, planned infrastructure upgrades, and impact of Low Carbon Technologies on the local network planning in Gedling, Broxtowe and Rushcliffe. Nottinghamshire is expected to experience continued growth in population and housing, alongside the wider transition to electric vehicles and low-carbon heating systems. These factors will collectively drive a significant increase in local electricity demand, highlighting the need for the network's capacity and resilience to evolve to meet future requirements. At present, regional-level strategies do not yet include quantitative projections of future energy demand or network impacts. As such, forward-looking energy planning and modelling at the local level are essential to understand how heat pump uptake, electric vehicle adoption, and new housing growth will interact to shape Gedling, Broxtowe and Rushcliffe's future electrical and wider energy needs.

11.1 Existing Network Constraints

Gedling, Broxtowe and Rushcliffe's electricity distribution is operated by National Grid Electricity Distribution (NGED) as part of its East Midlands licence area. NGED is the Distribution Network Operator (DNO) responsible for maintaining and operating the local electricity network.

The local distribution grid connects to the National Grid Transmission System via Grid Supply Points (GSPs), which step down voltage from 400 kV/275 kV to 132 kV. From these GSPs, Bulk Supply Points (BSPs) (typically 132/33 kV) feed primary substations (usually 33 kV/11 kV), which then distribute electricity to homes, businesses, and industrial users across GBR and surrounding areas.

Of the East Midlands licence area's 14 GSPs, the following are the most relevant within or adjacent to the GBR area:

- Ratcliffe GSP: Located adjacent to the Ratcliffe-on-Soar Power Station site at the southern edge of Rushcliffe. This is one of the East Midlands' largest transmission nodes and will play a central role in future regional reinforcement, particularly as the Ratcliffe site transitions to a clean energy and innovation hub, under the East Midlands Freeport development.
- Stoke Bardolph GSP: Situated on the eastern boundary of Gedling Borough, serving parts of Gedling and eastern Nottingham. It is a key connection point for local substations and supports both residential and light-industrial demand in Gedling and neighbouring areas.
- Enderby GSP: Located further south-west but part of the wider network serving Broxtowe and southern Nottinghamshire, providing important interconnections and resilience.

Other East Midlands GSPs include Willington, Drakelow, and Chesterfield.These supply points are critical for ensuring network stability, regional resilience and headroom as electricity demand grows through heat electrification, EV charging, and increased local generation. Early and continued engagement with NGED is essential to understand available capacity, potential constraints on 11 kV and 33 kV feeders, and opportunities for strategic reinforcement or flexibility solutions to support low-carbon infrastructure deployment across the GBR area.

Figure 11.1: Average Utilisation Factor (%)

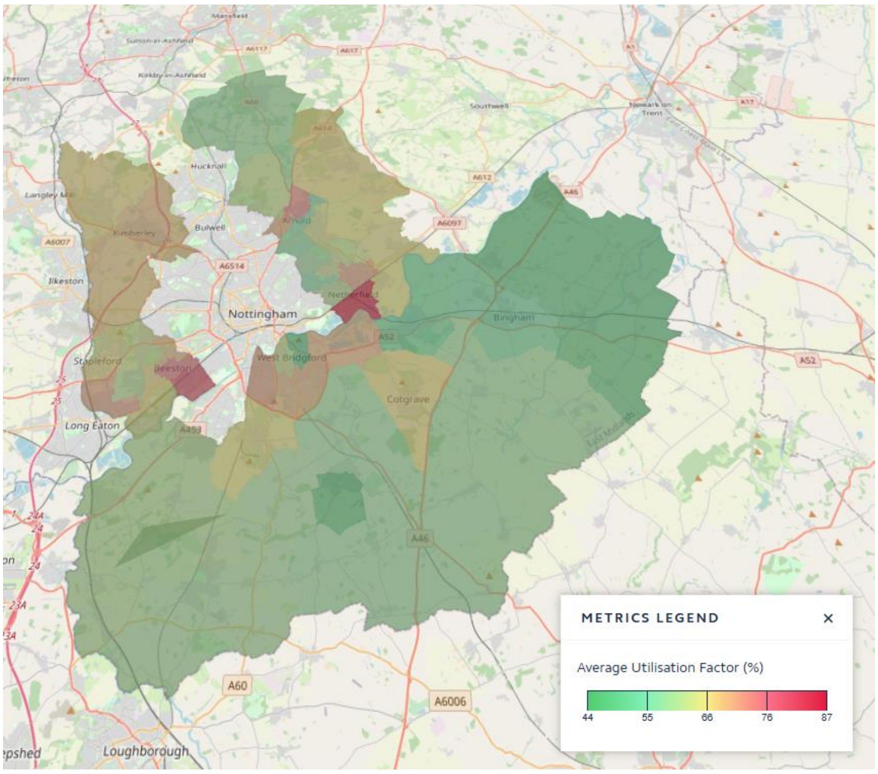


Figure 11.1 illustrates the average grid utilisation factor (%) across the electricity distribution network in GBR. The utilisation factor represents the ratio of maximum demand to the rated capacity of each local substation, providing an indication of how intensively the existing grid infrastructure is being used. Areas with higher utilisation (above 70%) are operating closer to capacity and are more likely to require reinforcement in the short-to-medium term as electrification increases, while areas with lower utilisation (below 55%) retain greater flexibility to accommodate new electrical loads.

Across the GBR area, utilisation levels range approximately from 44% to 87%, displaying clear spatial variation linked to settlement density and proximity to transmission assets.

- Higher utilisation zones are evident in southern Gedling and most prominently around Beeston Town and Beeston Rylands in parts of south-east Broxtowe near Kimberley and Eastwood, where utilisation factors typically fall between 70–85%. These areas correspond to dense residential and mixed-use zones where existing power demand is already high, and substation capacity is more constrained.
- Moderate utilisation (around 55–70%) occurs across much of Broxtowe, eastern Gedling in Calverton and Woodborough and northern Rushcliffe in Cotgrave and Ruddington, reflecting balanced suburban energy demand and established local distribution networks.
- Lower utilisation areas, typically below 55%, are concentrated across more rural areas southern and western Rushcliffe, extending towards Ruddington, East Leake, and the Ratcliffe-on-Soar Power Station corridor. These zones benefit from their proximity to the Ratcliffe GSP and lower population density, providing significant scope to accommodate electrified heat, transport, and distributed renewable generation without immediate reinforcement.

This variation highlights important opportunities for strategic sequencing of low-carbon deployment. Areas of lower utilisation can support early electrification and distributed energy schemes, while higher utilisation zones will require close collaboration with NGED to plan for reinforcement, flexibility services, or demand-side management.

Figure 11.2: Average Headroom (%)

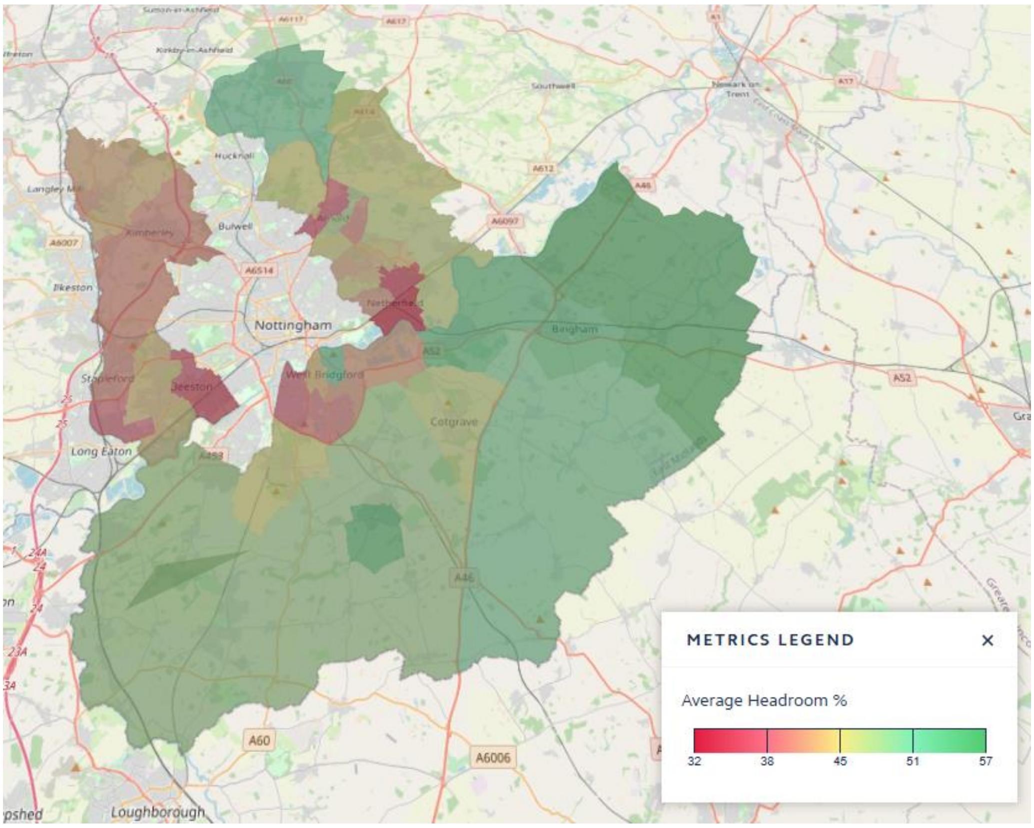


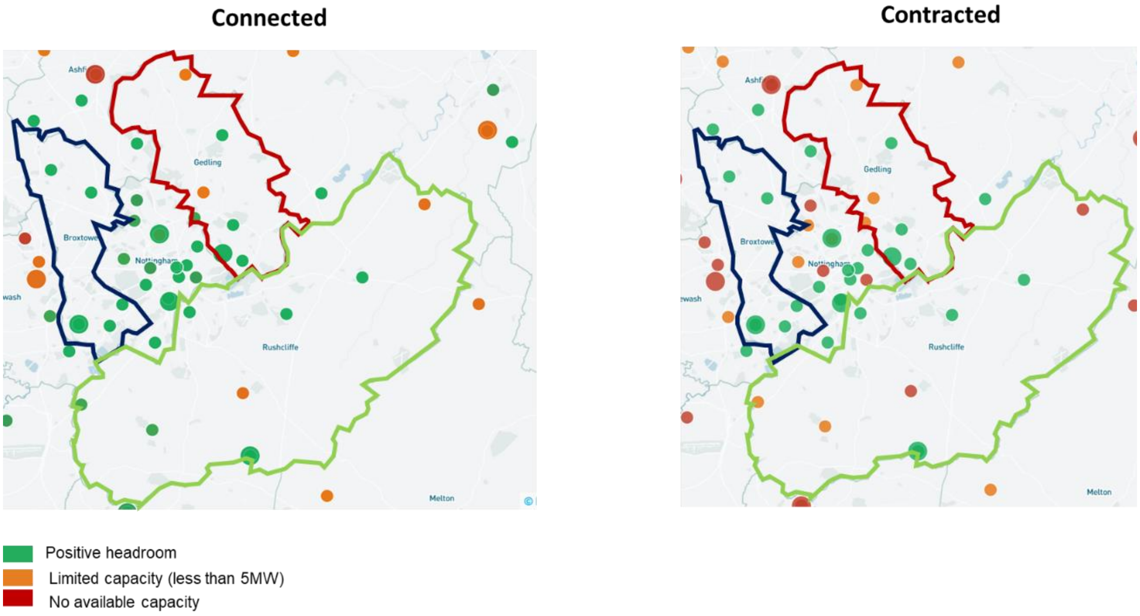
Figure 11.2 illustrates the average available headroom (%) across the electricity distribution network in GBR. Headroom represents the proportion of existing grid capacity that remains unused under normal operating conditions. This is a key indicator of the network's ability to accommodate future increases in demand from electrified heat, EVs, and new developments.

Across the GBR area, headroom levels vary notably by geography. The central and northern-eastern parts of Rushcliffe show the highest available capacity, with several zones displaying over 55% average headroom. This reflects their proximity to the Ratcliffe GSP and lower existing load densities. These areas are therefore well positioned to support early electrification and distributed generation without immediate reinforcement.

In contrast, northern Broxtowe (including areas around Kimberley and the fringes of Nottingham) and parts of central and eastern Gedling exhibit lower headroom levels (typically 30–40%), indicating a tighter network with limited spare capacity. These areas are more urbanised, containing denser residential development and higher commercial loads, which increase utilisation at local substations.

This spatial variation has important implications. Areas of high headroom should be prioritised for early deployment of low-carbon technologies such as heat pumps, EV charging infrastructure, and solar generation. Meanwhile, lower headroom zones will require targeted engagement with NGED to plan network reinforcement, flexibility solutions, or smart demand management ahead of widespread electrification.

Figure 11.3: Network Map: Primary Demand Headroom



Source: National Grid Network Opportunity Map

Figure 11.3 presents the Primary Demand Headroom across GBR, showing the estimated capacity available at each primary substation to accommodate new electrical demand without requiring immediate reinforcement.

Two scenarios are illustrated:

- Connected network position represents the capacity of the currently installed network infrastructure and mains.
- Contracted network position represents the connected network position plus all contracted future connections, reflecting the capacity impact of developments that have already been approved but not yet energised.

Each substation is colour-coded using a standard RAG rating:

- Green: Positive headroom (greater than 5 MW available)
- Amber: Limited headroom (less than 5 MW spare)
- Red: No available headroom (existing or contracted demand exceeds current capacity)

Across Gedling, Broxtowe and Rushcliffe, the connected position map indicates that most primary substations currently operate with positive headroom, particularly across southern and western Rushcliffe and parts of Broxtowe. These areas show relatively low existing load and are well placed to accommodate early low-carbon electrification and new housing growth without immediate reinforcement.

However, when contracted future connections are included, several substations, particularly in northern Gedling, the Nottingham fringe, and eastern Broxtowe, shift from green or amber to red, indicating that capacity is already constrained once future developments are accounted for. This includes areas near Arnold, Hucknall, and along the A52 corridor where planned residential and commercial growth will significantly increase electrical demand.

The transition between the connected and contracted positions highlights emerging network pinch points, where local reinforcement or flexibility solutions (e.g. demand-side response or storage) may be required to release capacity. These insights are essential for helping to:

- Prioritise “grid-ready” zones for early deployment of heat pumps, EV charging, and distributed generation.
- Identify strategic substations requiring reinforcement or flexibility investment.
- Align spatial development planning with network capacity and NGED’s future investment programmes.

Overall, the analysis suggests that while much of Rushcliffe retains healthy headroom, Gedling and Broxtowe face growing substation constraints under the contracted scenario. This emphases the importance of proactive grid planning to support the region’s net zero transition.

11.2 Network Impact

After Diversity Maximum Demand (ADMD) represents the maximum expected electrical demand, adjusted to reflect the fact that not all homes and businesses will use their peak load simultaneously. This diversity of usage (where appliances and systems are not all operating at full capacity at the same time) allows network planners to design infrastructure more efficiently, avoiding unnecessary oversizing while still ensuring reliability.

ADMD plays a crucial role in assessing the total connected capacity required at substations. By applying the ADMD value to the number of dwellings or technologies modelled, planners can estimate the aggregate peak demand that the substation must be capable of handling. This informs decisions about transformer sizing, cable ratings, and switchgear specifications.

We have modelled the After Diversity Maximum Demand (ADMD) for low carbon technology (LCT) adoption across Gedling, Broxtowe and Rushcliffe, focusing on ASHP and electric vehicle (EV) charging demand. This includes heat pumps for both domestic and non-domestic users, as well as public and private EV charging infrastructure. The modelling approach uses scenario-based uptake rates for EVs and heat pumps, applying diversity factors of 0.7 for EV chargers, 0.8 for non-domestic ASHPs, and 0.65 for domestic ASHPs.

Table 11.1: Estimated increase in ADMD across GBR attributed to adoption of LCTs (EV charging and ASHPs)

Scenario	2030	2035	2040	2050	Annual Growth (MW)
2040 Net Zero	748	1,100	1,452		88
2050 Net Zero	559	822	1,086	1,612	60

Figure 11.4: GBR aggregated ADMD increases (MW)

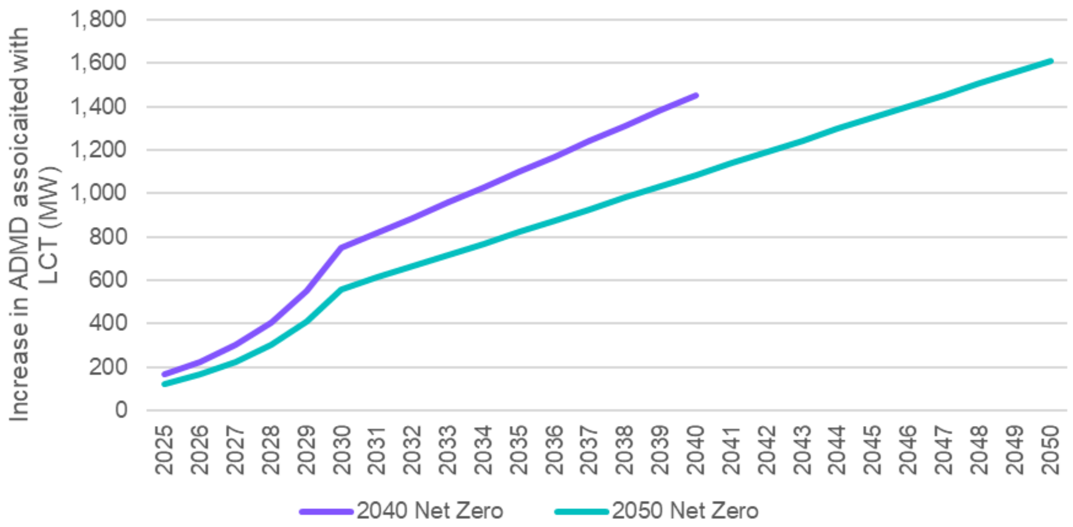


Figure 11.4 illustrates the projected increases in ADMD for the GBR area under the 2040 and 2050 decarbonisation scenarios.

Both scenarios show a significant rise in peak demand over the coming decades, reflecting widespread electrification of heat and transport alongside population and housing growth. Under a 2040 Net Zero pathway, demand growth accelerates sharply from the early 2030s, reaching its peak by the late 2030s. The 2050 pathway shows a more gradual increase, with similar demand levels reached approximately a decade later.

This model provides a robust case for proactive investment in distribution network upgrades. Bringing forward the Net Zero target by ten years roughly doubles the rate of load growth in the 2030s, reinforcing the need for proactive planning with NGED to deliver timely reinforcement and demand management.

11.2.1 Impact of Negative Headroom on Net Zero

As shown in the previous section, any net zero compliant scenario will result in 'negative headroom'. Negative headroom indicates that the projected ADMD exceeds the available network capacity at the substation level. In other words, the infrastructure is no longer sufficient to accommodate the expected load. This breach signals the need for reinforcement measures such as substation upgrades, or deployment of flexibility solutions to avoid constraints, maintain reliability, and support continued connections to the network.

Network constraints have direct consequences for how quickly and affordably new connections can be made to the electricity network. When substations are operating beyond their capacity, new connection requests, whether for new or existing domestic, new industrial or commercial connections, or LCT installations, may be delayed or queued until reinforcement works are completed. This can slow down the pace of electrification, decarbonisation and urban expansion, particularly in areas with high growth or ambitious Net Zero targets.

Financially, the breach of headroom often triggers the need for costly infrastructure upgrades. These may include installing new transformers, expanding substation capacity, or reinforcing feeder circuits. Under current regulatory frameworks, some of these costs may be passed on to the connecting customers, especially if the reinforcement is deemed customer-specific rather than strategic. For example, a large industrial site may apply to the DNO for additional electrical capacity, so that an industrial process and heating could be decarbonised. If this would cause a breach at the primary substation, and therefore negative headroom, a portion of the cost to upgrade the network infrastructure could be passed to the individual customer. Furthermore, the customer will need to wait for the DNO to carry out this work before the additional electrical capacity is released, potentially delaying the plan to align with network availability.

In areas with persistent constraints, alternative approaches such as flexibility services, energy storage, or demand-side management may be considered to defer or reduce the need for capital investment. However, these solutions require coordination, digital infrastructure, and regulatory support to be effective. The results shown in this LAEP, should be reviewed in detail by NGED and NESO, so that network improvements can be planned proactively and at a system level. This would reduce the risk that individual customers need to bear disproportionate costs or experience time delays, as electrical network infrastructure can stay ahead of decarbonisation and growth within the area.

11.3 Storage and Demand Side Response

Demand Side Response (DSR) refers to the strategic adjustment of electricity consumption patterns by end users in response to signals from the network operator. These signals may include price incentives, time-of-use tariffs, or direct requests to reduce or shift demand during peak periods. DSR enables the electricity system to operate more flexibly by aligning demand with available supply, particularly during times of network stress or limited capacity.

The implementation of DSR alongside stationary energy storage, particularly when integrated with PV systems, offers a powerful mechanism for managing grid constraints and enhancing local energy resilience. Solar PV enables sites to generate their own electricity, while battery storage captures surplus generation for later use.

This stored energy can then be discharged during peak demand periods, aligning on-site consumption with grid needs and reducing pressure on the network.

This coordinated flexibility helps lower peak demand during periods of increased demand, mitigating breaches of headroom and deferring the need for costly infrastructure upgrades such as transformer replacements or feeder circuit expansions. By generating low-carbon energy that is both affordable and secure, the combined use of DSR and storage contributes to addressing the energy trilemma.

In the context of GBR's Net Zero ambitions, DSR paired with stationary storage presents a financially beneficial solution. It empowers energy consumers to actively support grid stability while potentially accessing reduced energy costs and financial incentives. However, successful deployment depends on robust digital infrastructure, clear regulatory frameworks, and close collaboration between DNOs, aggregators, and end users.[65]

[65] 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[66] 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 £6.5 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 78% of the total investment (£4.5 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:** £1.7 billion for 2040 and £1.4 billion for 2050 (discounted) in carbon reduction driven primarily driven by the installation of domestic air source heat pumps.
- **Air quality improvements:** £22 million for 2040 and £15 million for 2050 (discounted) of benefits to human health, productivity, wellbeing, and the environment due to improvements in air quality.
- **Impact on bills:** £904 million for 2040 and £931 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 generate savings between £728 million and £1,325 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 £94 million to £97 million, with an aggregate impact of £2.5 billion to 2050.
- **Transition to EVs enabled by charging infrastructure could generate significantly greater benefits,** most notably additional £897 million to £1 billion of carbon reduction benefits. These enabled benefits are always shown separately in the subsequent analysis.

[66] 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)	4,892	4,410
Carbon savings	1,701	1,361
Air quality improvements	22	15
Impact on bills (ex VAT)	904	931
Capex (financial)	6,457	6,457
Average annual economic contribution (GVA)	88	90
Aggregated economic contribution (GVA) to 2050	2,298	2,335

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[67], 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[68], 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

[67] 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.

- **£6.5 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 nearly 70% 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	271	271	**4%**
Deep fabric retrofit	3,320	3,320	**51%**
Domestic solar PV	915	915	**14%**
Non-domestic solar PV	355	355	**6%**
Domestic air source heat pumps	771	771	**12%**
Non-domestic air source heat pumps	419	419	**6%**
EV chargers	406	406	**6%**
Total	**6,457**	**6,457**	**100%**

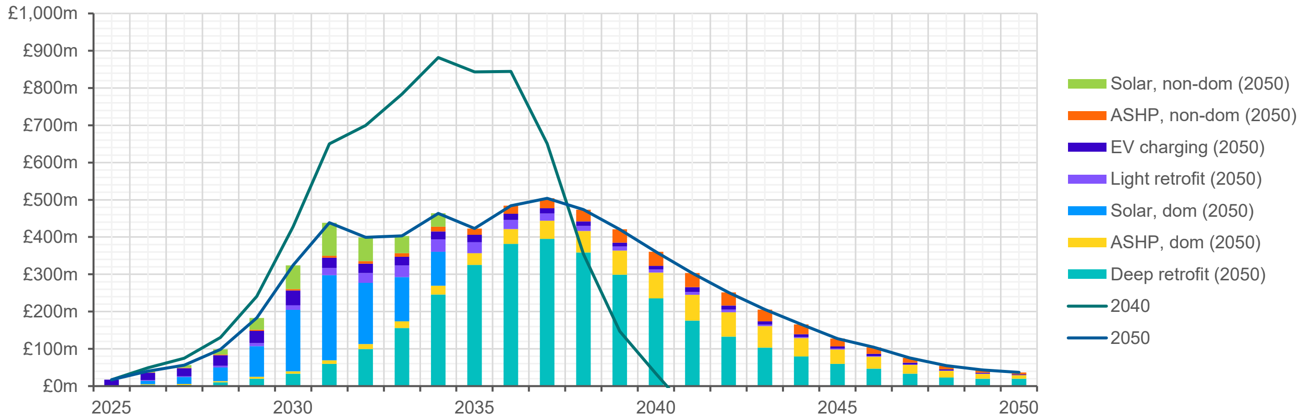
Early strategic assessments have uncertainty over future costs, therefore interval ranges have been applied to illustrate a possible range of investment, reflecting the AACE Class 4 expected accuracy ranges:

- **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 12.1 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 £882m per year, compared to a slower scale up and peak at £504m 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.

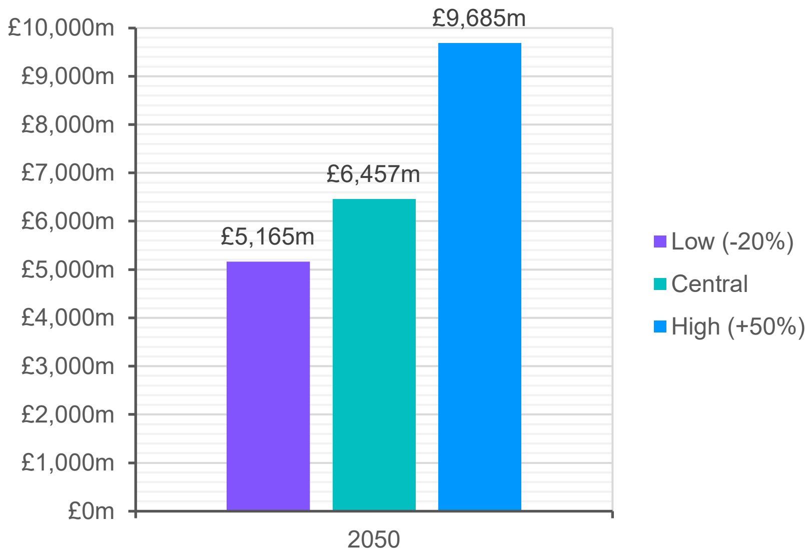
Figure 12.1: Capex, £' m, real, 2025, undiscounted



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 £4.9 bn (2040) and £4.4 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 10%, 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	214	194	4%
Deep fabric retrofit	2,402	2,163	49%
Domestic solar PV	742	742	17%
Non-domestic solar PV	288	288	7%
Domestic air source heat pumps	597	463	10%
Non-domestic air source heat pumps	303	251	6%
EV chargers	345	309	7%
Total	**4,892**	**4,410**	**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[69]. Both scenarios deliver over £1.0 billion of carbon savings compared to the counterfactual. These are presented in Table 12.5 and Figure 12.3, with the following key findings:

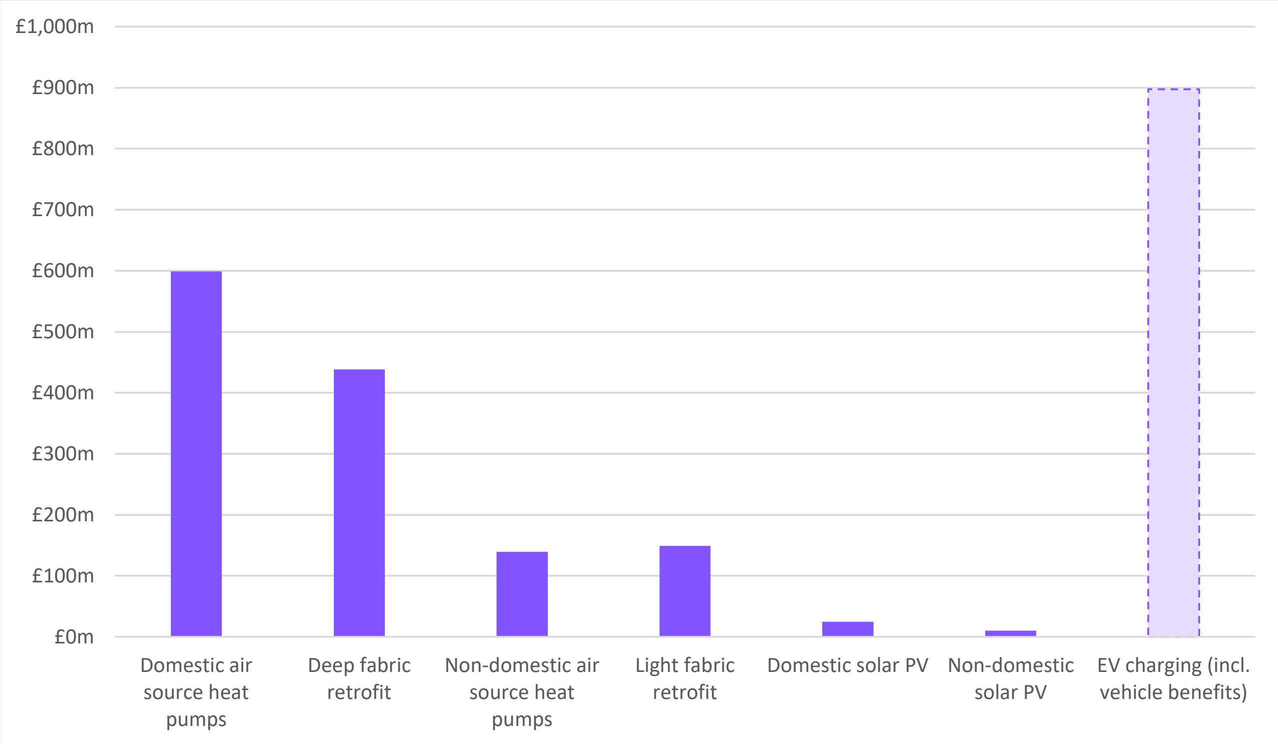
- **Early action drives greater carbon savings.** The 2040 scenario delivers greater carbon savings than the 2050 scenario (approximately £1.7 billion versus £1.4 billion), largely due to earlier deployment of key technologies like air source heat pumps and deep fabric retrofit. This means that accelerating implementation can yield stronger environmental benefits.
- **Domestic and non-domestic air source heat pumps are the most impactful intervention:** heat pumps are responsible for 54-60% of carbon savings in both scenarios, contributing between £738 million and £1,029 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 (£1,049 million in 2040 and £897 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	161	149	11%
Deep fabric retrofit	477	439	32%
Domestic solar PV	25	25	2%
Non-domestic solar PV	10	10	1%
Domestic air source heat pumps	834	599	44%
Non-domestic air source heat pumps	195	140	10%
EV charging (excl. vehicle benefits)	-	-	-%
Total	1,701	1,361	100%
EV charging (incl. vehicle benefits)	**1049**	**897**	

[69] 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[70]. 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 £56 million to £66 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.

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

[70] 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

	2040 (£' m)	2050 (£' m)	% total (2050 scenario)
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	18	12	81%
Non-domestic air source heat pumps	4	3	19%
EV charging (excl. vehicle benefits)	N/A	N/A	N/A
Total	22	15	100%
EV charging (incl. vehicle benefits)	**66**	**56**	

12.4.6 Impact on bills

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

The 2050 scenario delivers a slightly greater reduction in bills (£931 million) compared to the 2040 scenario (£904 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 £581 million for domestic and £175 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 £108 million to £127 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	82	74	8%
Deep fabric retrofit	236	212	23%
Domestic solar PV	581	581	62%
Non-domestic solar PV	175	175	19%
Domestic air source heat pumps	(155)	(102)	(11%)
Non-domestic air source heat pumps	(14)	(9)	(1%)

	2040 (£' m)	2050 (£' m)	% total (2050 scenario)
EV chargers	-	-	-
Total	904	931	100%
EV charging (incl. vehicle benefits)	**(127)**	**(108)**	

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 £394m** (+42%) for the 2050 scenario. Under this scenario, total savings reach £1,325 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 £168m** (-22%) for the 2050 scenario. Total savings are still positive, but lower at £728 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	74	116	52	+42	(22)
Deep fabric retrofit	212	332	147	+119	(65)
Domestic solar PV	581	546	618	(35)	+38
Non-domestic solar PV	175	165	191	(10)	+16
Domestic air source heat pumps	(102)	107	(229)	+208	(127)
Non-domestic air source heat pumps	(9)	60	(51)	+69	(42)
EV charging (excl. vehicle benefits)	-	-	-	-	-
Total	931	1,325	728	+394	(203)

Intervention			Impact on bills (£' m)		Variance to central assumptions (£' m)
EV charging (incl. vehicle benefits)	(108)	(65)	(175)	+43	(67)

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 ranges from an average annual value of £90 million, with aggregated figures to 2050 of £2.3 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 72% 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	93	93	4%
Deep fabric retrofit	1,143	1,143	47%
Domestic solar PV	294	294	12%
Non-domestic solar PV	114	114	5%
Domestic air source heat pumps	451	400	16%
Non-domestic air source heat pumps	229	209	9%
EV charging	208	183	8%
Total	2,531	2,436	100%
Average per year (2025 – 2050)	**97**	**94**	

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: Potential funding and financing sources 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[71]	Net Zero measure /technology	Potential funding/financing mechanisms
Private developers	£406m	EV Chargers (shared public)	Cost borne by private investment based on commercial viability
Self-funded, residents	£915m	Rooftop solar PV, domestic Private EV chargers	Self-funded Smart Export Guarantee (SEG) EV ChargePoint grant Warm Homes Plan
Grant-reliant, residents	£4,362m	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	£355m	Rooftop solar PV, non-domestic	Self-funded Smart Export Guarantee (SEG) Local Power Plan
Grant-reliant, public and private estates	£419m	Air source heat pumps, non-domestic	Local authority and regional grants
Total	**£6,457m**		

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

[71] 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)[72]

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)[73]

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)[74]

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

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

[74] 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[75]

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[76]

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[77]

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)[78]

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

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

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

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

[78] 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[79]

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)[80]

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[81]

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[82]

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

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[79] Electric Vehicle Chargepoint Grant, GOV.UK, available at: Electric vehicle chargepoint grants - GOV.UK

[80] National Wealth Fund, available at: National Wealth Fund | National Wealth Fund

[81] Local Climate Bonds, Green Finance Institute, available at: Green Finance Institute

[82] 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)[83]

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)[84]

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)[85]

[83] UK Municipal Bonds Agency, available at: Home - UK Municipal Bonds Agency - UKMBA
[84] Energy as a Service Pilot Phase Evidence Report, EON, available at: Energy as a Service: final report
[85] Energy as a Service Pilot Phase Evidence Report, EON, available at: Energy as a Service: final report

As above.

Pay As You Save (PAYS)[86]

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[87]

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

[87] 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 Gedling, Broxtowe and Rushcliffe LAEP, identifies projects for short-term and long-term action, outlines key focus zones, and addresses dependencies and uncertainties.

13.1 Prioritisation methodology

Interventions have been prioritised through a structured multi-criteria analysis that integrates both quantitative and qualitative considerations. This process was 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, including decarbonisation impact, cost-effectiveness, social equity, co-benefits, and deliverability. 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	What it measures	Why it matters	Ranking
Equity and fuel poverty	Extent of the measure of impact 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 / £/tCO_2e; affordability for end users	LAEP requires robust cost inputs and standardised assumptions to identify “most cost-effective combination of options”	Medium
Deliverability and readiness	Consenting, supply chain readiness, ease of installation	Ensures practical feasibility and timely deployment of measures	Medium
Local economic & health co-benefits	Job creation, reduced hospital admissions, local supply chain	Approach values wider factors beyond pure techno economics	Lower
Risk & uncertainty exposure	Technology maturity, future-proofing, reversibility	Reduces exposure to uncertainty and ensures 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 energy or 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.
Electricity network capacity and 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 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.
Supply chain and skills	Heat pump, insulation, delivery capacity may constrain pace	Policy considerations such as Training programmes, funding and incentives. Strategic partnerships between public and private sector. Leverage existing expertise in local community energy groups and engage with local manufacturers of heat pump technology.
Public trust and uptake	Public acceptance is essential to drive uptake	Community engagement and communication programmes to share good news stories. Work with community energy groups to support with messaging and delivery. Undertake demonstration/pilot projects to enable delivery of and showcase best practice.
Policy evolution	Changes to boiler phase out, 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 adaption of plans and projects to policy changes.
Hydrogen availability/cost	The industrial decarbonisation pathway is highly sensitive to hydrogen price, electricity grid carbon intensity, and technology costs. If hydrogen remains expensive, switching high-temperature processes may be delayed or limited.	Detailed engagement with key stakeholders in this space such as East Midland 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 across Gedling, Broxtowe and Rushcliffe, with all the areas reporting a higher proportion of households at risk compared to the East Midlands regional average and the English national average (Figure 6.8).

The Low-Income Low Energy Efficiency (LILEE) [88] definition of fuel poverty was introduced in 2019 which classifies a home as fuel poor if it spends more than 10% of its annual income on space heating and energy services. This is far more likely in a home rated EPC E or below due to lack of insulation and poor thermal retention capability.

The spatial distribution of fuel poverty in Gedling, Broxtowe and Rushcliffe is uneven - certain neighbourhoods experience disproportionately high rates. This disparity underscores the urgent need for targeted interventions that address energy affordability and thermal comfort. Analysis at the MSOA level indicates that neighbourhoods including Daybrook and Netherfield and Colwick in Gedling, West Bridgford in Rushcliffe and Beeston Town and Beeston North in Broxtowe exhibit the highest concentrations of households at risk of fuel poverty, as well as a significant proportion of homes with an EPC rating of D or below. Notably, stakeholder engagement sessions and discussions with the Gedling, Broxtowe and Rushcliffe LAEP Steering Group revealed that not all households within these MSOAs are typically recorded as having lower than average socio-economic status. Since this is one of the main variables in determining whether a household is fuel poor or not alongside building age and EPC rating, it must be assumed that other factors exist to influence this counter-trend such as a higher student population, or a high prevalence of historic and less energy efficient buildings, meaning a nuanced approach must be taken.

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. Figure 13.1 and Figure 13.2 below illustrates the average risk of fuel poverty per households and the percentage of homes below EPC C respectively.

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[88] Department for Energy Security and Net Zero, *Fuel Poverty Methodology Handbook 2025: Low Income Low Energy Efficiency (LILEE)* (UK Government, 2025)

Figure 13.1: Average risk of fuel poverty per household by MSOA

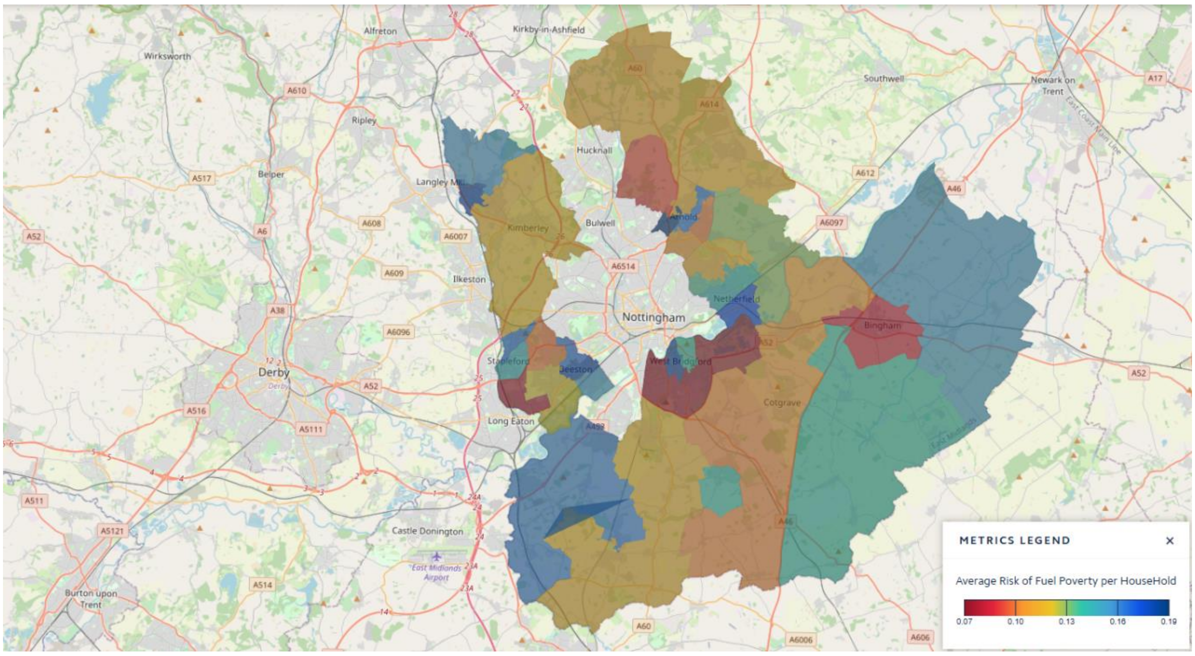
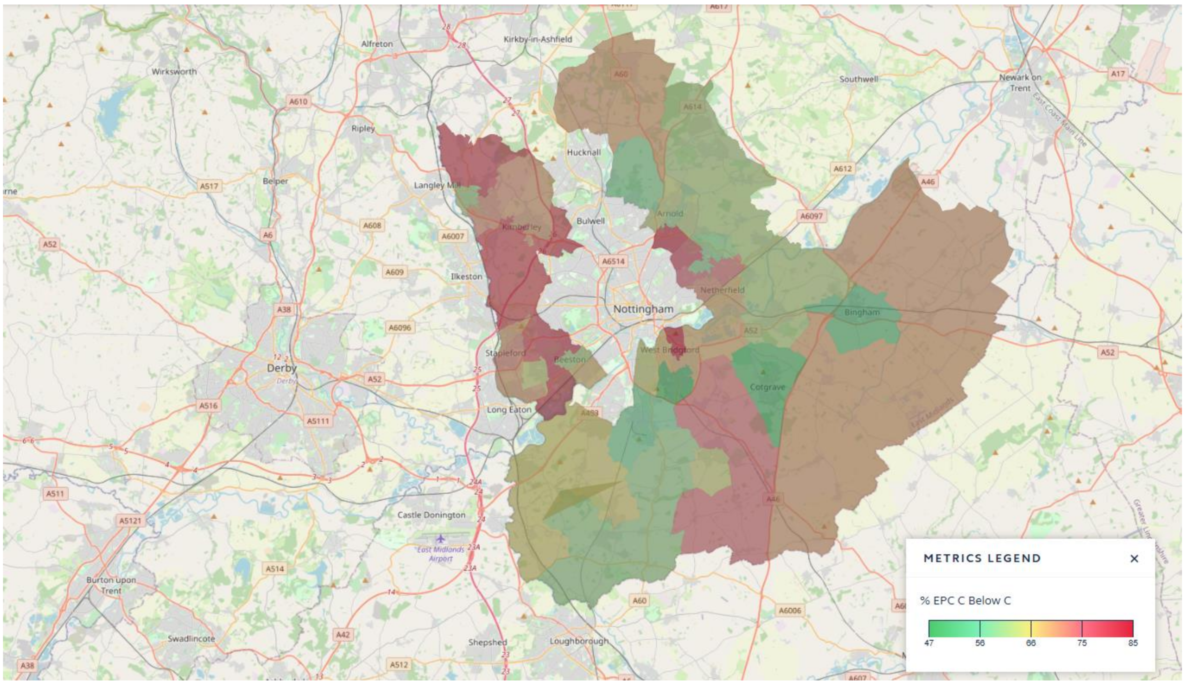


Figure 13.2: Percentage of households below EPC C by MSOA



13.3.2 Electricity Headroom Pockets

Electricity network capacity is a key determinant of where electrification measures, such as heat pump deployment, can be accelerated. Analysis of grid utilisation across GBR identifies pockets of available headroom where additional electrical load can be accommodated without immediate reinforcement. These areas represent prime opportunities for early heat pump rollout and other electrification measures, as they can be delivered with minimal infrastructure upgrades, reducing cost and complexity.

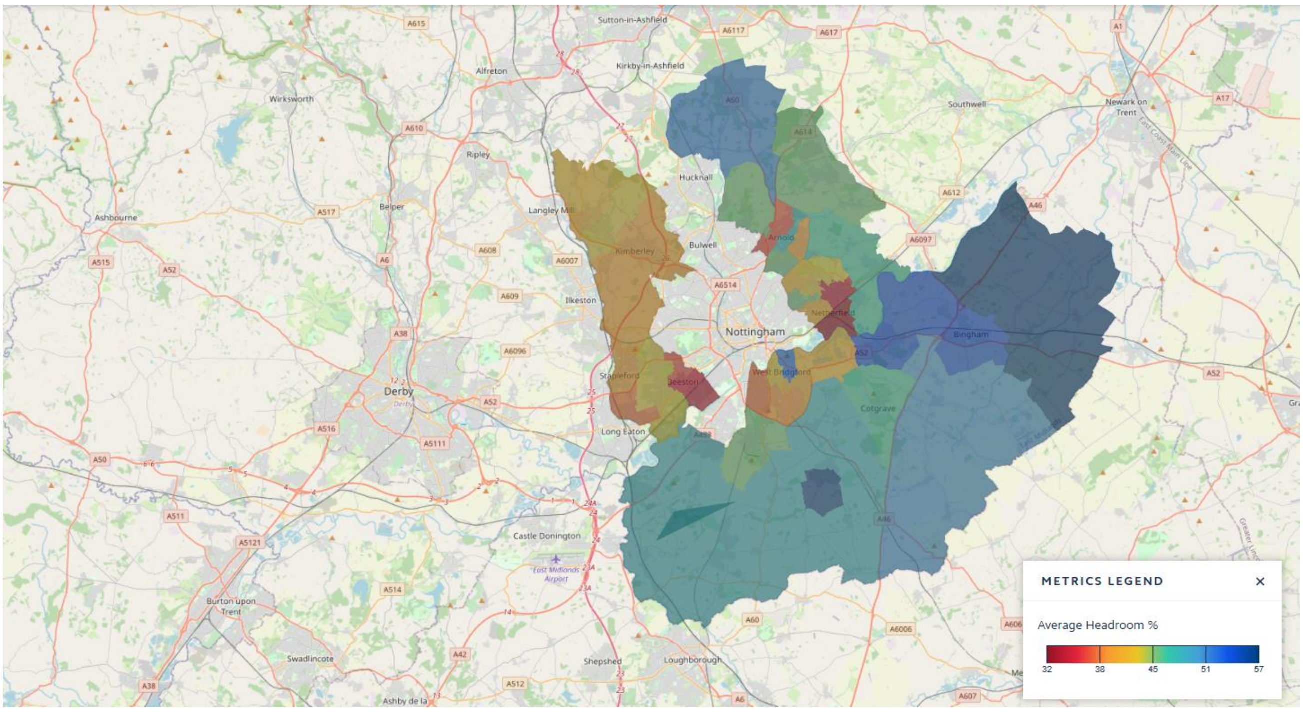
Demand headroom

Keyworth South, East Bridgford and Aslockton and Lady Bay in Rushcliffe all have more than 40% headroom availability, making them ideal for early deployment.

Areas with low headroom require a different approach. In these zones, demand-side response (DSR) strategies should be prioritised to manage peak loads and defer costly reinforcements such as in Netherfield and Colwick in Gedling and Beeston Rylands in Broxtowe. DSR measures may include PV paired with battery system. These interventions enhance flexibility, as we prepare the network for future electrification.

Figure 13.3 provides a spatial representation of average grid headroom, supporting evidence-based decision-making.

Figure 13.3: Average electricity headroom percentage by MSOA



This suggests a focus on energy efficiency and DSR delivery in this area in the short term, in conjunction with conversation with NGED, Electricity Northwest and Northern Powergrid around the timeline for accessing additional headroom in this area.

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.

13.3.3 Heat network zones

Certain building typologies across GBR such as high-density residential blocks, mixed-use developments, tower blocks, and clusters of public buildings, are particularly well-suited for communal heating solutions. These areas present opportunities to deploy shared heating infrastructure that achieves economies of scale, lowers per-unit costs, and maximises energy efficiency.

Small-scale communal heating systems work best in compact, high-density zones where multiple buildings or dwellings are located close together. They offer a scalable pathway for delivering low-carbon heating across these developments.

Such systems can utilise ground source heat pumps (GSHPs) or air source heat pumps (ASHPs).

13.3.4 Rapid roll out of ASHPs in low-complexity properties

Rapid roll out of ASHP should be prioritised in properties that present low installation complexity, specifically those with EPC ratings of C or above and minimal retrofit requirements as shown in Figure 13.2. These properties provide an ideal environment for early deployment because they require fewer preparatory measures, reducing installation time and cost. Targeting areas with lower grid constraints further enhances feasibility by ensuring that additional electrical load can be accommodated without immediate reinforcement. These roll outs will help build installer capacity, generate measurable performance data under real-world conditions, and inform best practice for future large-scale rollouts. They will also address current stakeholder concerns around ASHP, accelerate market confidence in heat pump technology, and create a robust evidence base to support city-wide scaling.

Keyworth South, East Bridgford and Aslockton and Lady Bay in Rushcliffe all have more than 40% headroom availability, making these MSOA areas prime candidates for early roll out.

Rushcliffe's strong connectivity to the gas grid and relatively low number of off-gas properties has historically supported widespread use of individual gas boilers. While this infrastructure has contributed to a uniform reliance on gas heating, and the highest residual gas emissions among the three boroughs, it also presents a clear opportunity for targeted decarbonisation. Given this context, it is more appropriate to focus on low-carbon heating options tailored to individual properties particularly through the maximised deployment of ASHP for domestic buildings. This approach aligns with the borough's housing typology and offers a scalable pathway to decarbonisation, especially when paired with insulation upgrades and fabric first retrofit strategies. Future opportunities may emerge through targeted zoning or public sector decarbonisation, but these are likely to be site-specific rather than borough-wide.

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 estate buildings, 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. This 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.

Table 13.3: Summary of public estate buildings with energy demand baseline and anticipated PV generation requirement

Local Authority	Primary Use Type	Number	Total Energy demand Baseline (MWh/yr)
Gedling	Commercial & Retail	1025	47,827
	Education & Childcare	153	5,788
	Health & Care	9	1,007
	Public, Community & Culture	82	6,763
	Industrial, Logistics & Infrastructure	215	18,006
Broxtowe	Commercial & Retail	1216	62,441
	Education & Childcare	157	7,079
	Health & Care	23	1,519
	Public, Community & Culture	103	5,374
	Industrial, Logistics & Infrastructure	320	45,155
Rushcliffe	Commercial & Retail	1696	59,088
	Education & Childcare	189	13,785
	Health & Care	20	4,204
	Public, Community & Culture	144	6,439
	Industrial, Logistics & Infrastructure	270	67,137

13.4.2 Fuel Poverty led private housing retrofit

Targeting fuel-poor households through private and social housing retrofit programmes, such as the Warm Homes Social Housing Fund, addresses both climate and social equity objectives by improving building fabric and thermal efficiency. This intervention not only cuts emissions but also addresses energy affordability, reducing household bills and improving health outcomes for more vulnerable residents. Targeting retrofit of privately-owned buildings could offer support to households where the lowest EPC ratings are seen, yet also the lowest availability of funding. The opportunity to deploy deep and light retrofit measures simultaneously with ASHPs was also noted as an option to reduce disruption.

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, each borough 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

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 13.5, 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

Enabler projects are interventions that do not necessarily deliver the largest immediate carbon savings but are critical for unlocking future opportunities and accelerating the transition at scale. These actions create the foundational conditions required for the successful deployment of more complex or high-impact measures.

Unlike quick wins, which focus on immediate and visible benefits, enablers are strategic investments in capability, infrastructure, and market readiness. They often involve activities such as upgrading grid capacity, developing supply chains, implementing supportive policy frameworks, and investing in workforce training. For example, large-scale electrification of heating systems cannot proceed without prior investment in grid reinforcement and installer skills development, both of which are typical enabling actions.

Enablers also include interventions that address systemic barriers, such as data gaps, regulatory constraints, and financing challenges. By resolving these issues early, enabler projects reduce uncertainty and dependency risks for subsequent interventions, ensuring that future programmes can be delivered efficiently and cost-effectively. These actions often require collaboration across multiple stakeholders, including local authorities, industry partners, and community organisations, to align priorities and secure long-term commitment. In many cases, enabler projects will require coordination with Distribution Network Operators (DNOs), regional authorities such as the East Midlands Combined County Authority, and private sector actors to ensure that technical, regulatory, and financial conditions are met.

13.5.1 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 local DNOs 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 and the open data portals provided by Northern Powergrid and Electricity Northwest. 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.

13.5.2 Education and Demonstrator projects

The successful delivery of the LAEP will depend on building public understanding and confidence in low-carbon technologies and retrofit measures. Education and demonstrator projects are essential to achieve this. Each borough council can lead targeted educational initiatives that explain the benefits of energy efficiency, renewable generation, and electrification, while addressing common concerns about cost, disruption, and reliability. This could involve public workshops, and online resources.

Alongside education, demonstrator projects will provide visible examples of best practice and allow residents to see successful implementations first-hand. These projects might include retrofit exemplars in council-owned housing, pilot schemes for technologies such as heat pumps and solar PV, and open-home events where early adopters share their experiences. Demonstrator projects not only help overcome scepticism but also provide valuable data and insights to inform wider rollout.

13.5.3 Local Bulk Procurement Frameworks for Retrofit and Heat Pumps

The establishment of local bulk procurement frameworks for retrofit measures, PV installation and heat pump installations is a strategic enabler that addresses cost, supply chain resilience, and delivery certainty. Aggregating demand across multiple projects and stakeholders unlocks economies of scale, reduces unit costs, and provides suppliers with greater confidence to invest in capacity. This approach also ensures consistent quality standards and accelerates market readiness for low-carbon technologies.

Bulk procurement frameworks can support smaller contractors by providing access to larger programmes, fostering local economic development and job creation. Delivery will require coordinated action between local authorities, housing providers, and private sector partners to design procurement processes that are transparent, efficient, and aligned with long-term decarbonisation objectives.

13.5.4 Targeted Grid Reinforcements

Targeted grid reinforcements are a fundamental enabler for the large-scale deployment of electrification technologies and distributed renewable generation. As electricity demand rises due to the adoption of heat pumps, electric vehicles, and rooftop solar PV, grid capacity constraints present a significant barrier to progress. Strategic reinforcement in areas with minimal existing constraints ensures that upgrades are delivered efficiently, cost-effectively, and in alignment with future demand growth.

13.5.5 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.

13.5.6 Financing Mechanisms for Low-income Households

Developing innovative financing mechanisms for low-income households is essential to ensure an equitable, inclusive and just 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 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.

13.5.7 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.

13.5.8 Industrial Decarbonisation and Hydrogen Readiness

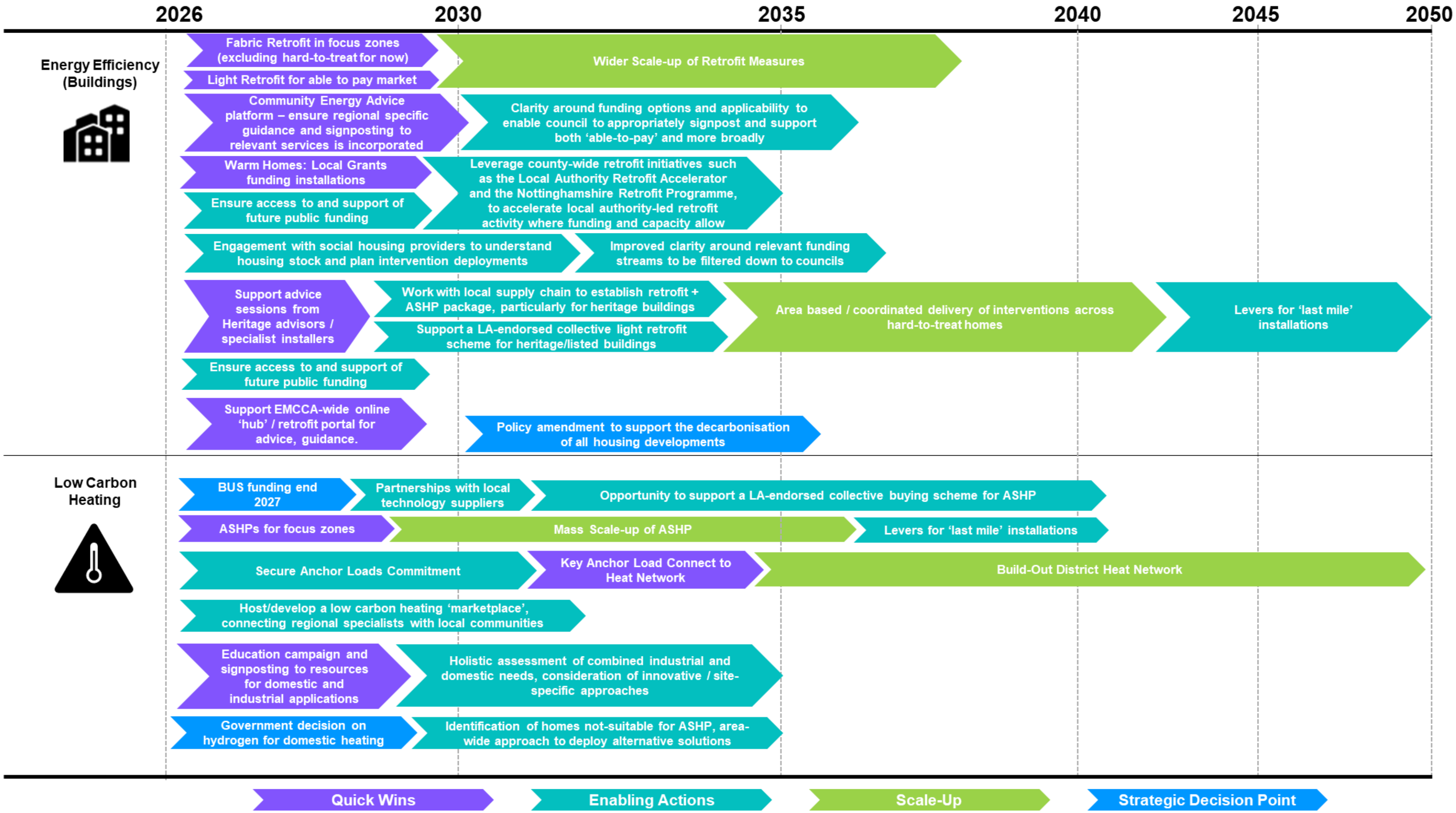
Industrial decarbonisation is essential for achieving Gedling, Broxtowe and Rushcliffe's net zero objectives while safeguarding productivity and competitiveness. The East Midlands Freeport development project is a great example of an industrial decarbonisation accelerator, focusing on skills, supply chains and economic advancements.

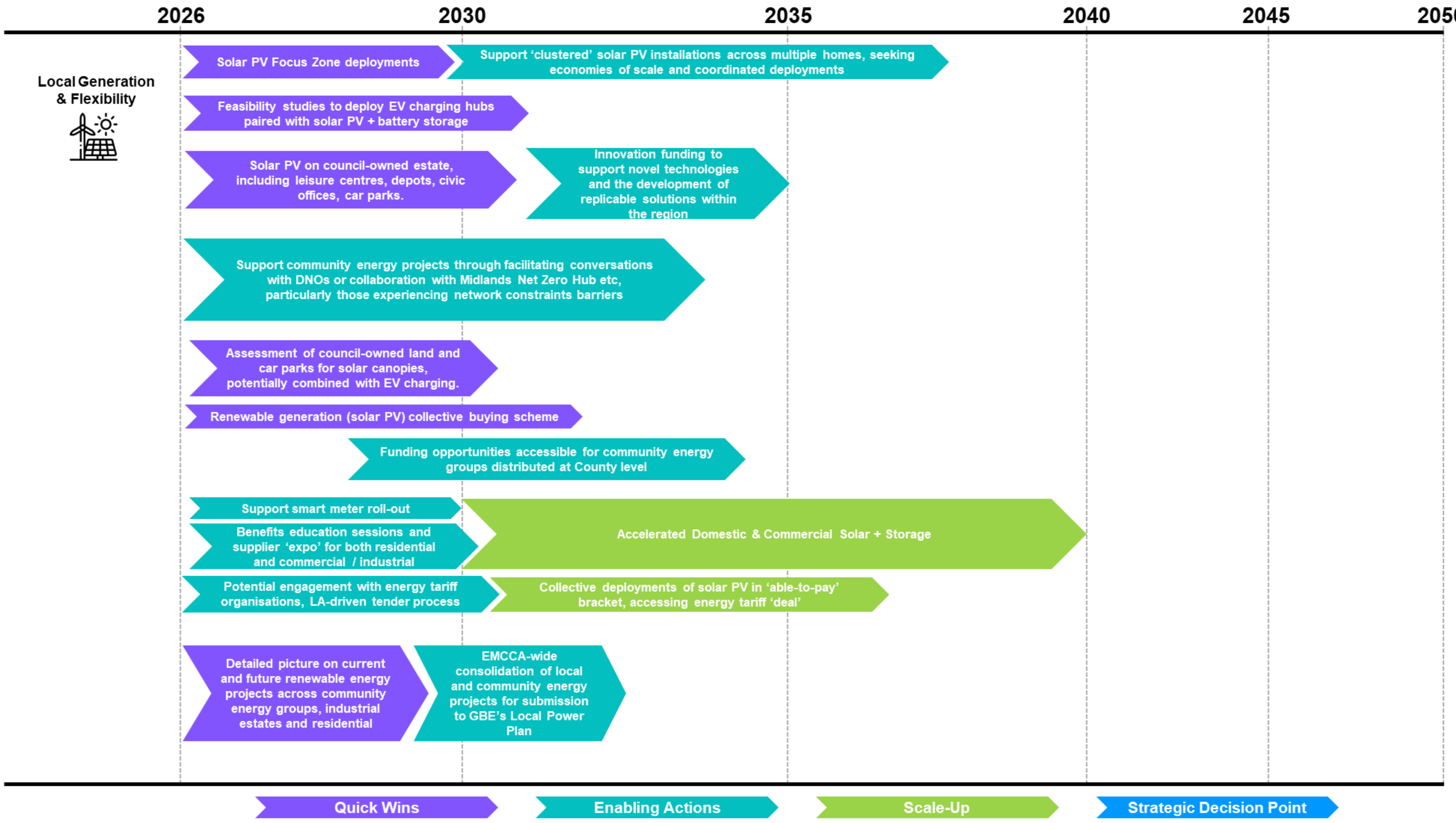
Hydrogen readiness is a critical enabling step for hard-to-abate industrial processes where direct electrification is technically challenging in the near term. Preparing demand, infrastructure, skills, governance, and finance in a coordinated manner reduces delivery risk, accelerates time to scale, and ensures that hydrogen deployment, when available at the right cost and carbon intensity, can be adopted efficiently. This measure complements a fabric-first and electrification-first approach by preserving optionality for processes that are best suited to low-carbon hydrogen in the medium to long term.

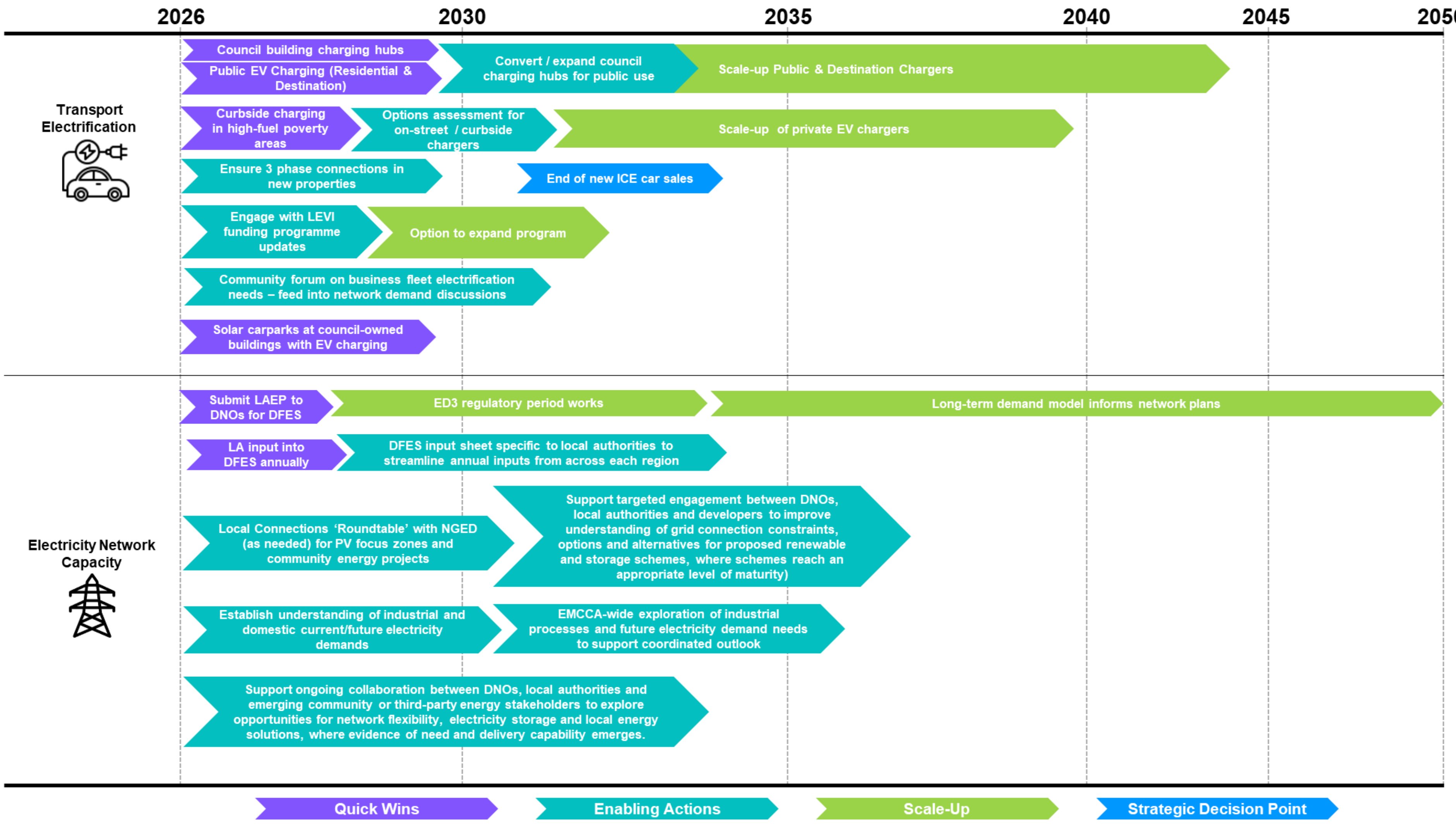
13.6 Phased Pathway

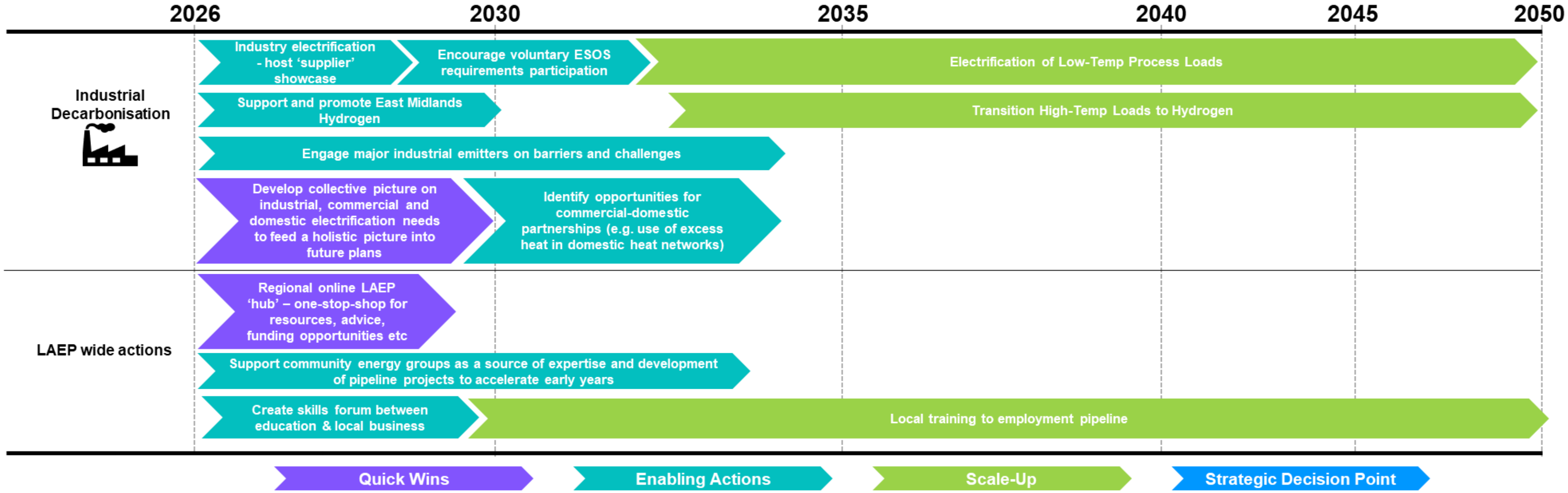
Figure 13.4 below sets out the delivery sequence for GBR's net zero interventions. Actions are phased to prioritise "quick wins" and "low regret" measures first which are cost-effective, widely supported, and deliver immediate benefits. Enabling actions and demonstrators lay the groundwork for larger-scale roll-out, while strategic decision points and uncertainties are highlighted to ensure the plan remains flexible and responsive as technologies and funding evolve. This approach maximises early impact, manages risk, and builds momentum for long-term transformation.

Figure 13.4: Delivery sequence for Gedling, Broxtowe and Rushcliffe's net zero interventions




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 Gedling, Broxtowe and Rushcliffe 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 Gedling, Broxtowe and Rushcliffe's local ambitions with regional and national policy objectives while tailoring interventions to the region's unique socioeconomic, infrastructural, and industrial characteristics.

The analysis presented throughout this plan confirms that Gedling, Broxtowe and Rushcliffe 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 reduction, cost efficiency, and community well-being.

14.1 Key Conclusions

Gedling, Broxtowe and Rushcliffe's Emissions Profile Reflects Both Challenge and Opportunity:

- The region's emissions are concentrated in a small number of high-impact sectors, transport, domestic heating, and industrial energy use, which collectively account for nearly 77% of total emissions. These same sectors offer the greatest potential for rapid and sustained decarbonisation when interventions are properly sequenced and targeted.

A Fabric-First Approach Is Foundational:

- The modelling clearly indicates that demand reduction through insulation, glazing upgrades, and efficient heating systems provides the most immediate and cost-effective emissions savings.
- These measures also help to alleviate fuel poverty, improve comfort, and reduce peak energy demand, providing a foundation for further electrification and flexibility measures.

Local Generation and Storage Will Underpin System Flexibility:

- Solar PV, battery storage, and demand-side response solutions will be essential to mitigate grid constraints, particularly under higher electrification scenarios.
- Local renewable generation also enhances energy resilience and can provide community-level co-benefits

Transport Decarbonisation Requires Integrated Infrastructure Planning:

- The transition to electric mobility will place significant pressure on Gedling, Broxtowe and Rushcliffe's electricity network.
- Coordinated planning between the local authority, the Distribution Network Operator, and private charging providers is critical to ensure grid readiness, equitable access, and optimisation of charging infrastructure locations.

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 Gedling, Broxtowe and Rushcliffe 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 and rural locations presents.

This Steering Group could comprise of representatives from Gedling Borough Council, Broxtowe Borough Council, Rushcliffe Borough Council, EMCCA, the local Distribution Network Operators, 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 the local DNOs 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.

Gedling, Broxtowe and Rushcliffe'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, Gedling, Broxtowe and Rushcliffe 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 Gedling, Broxtowe and Rushcliffe LAEP Delivery Partnership**: Create a cross-sector partnership chaired by Gedling, Broxtowe and Rushcliffe Council and supported by EMCCA, the Distribution Network Operator, local businesses, housing associations, and community representatives. This body should oversee programme coordination, track progress, and identify funding opportunities.
- **Launch Public Uptake and Engagement Programme:** Implement the recommended community engagement and communication strategy with urgency. This programme is vital to build public confidence, share good news stories, and drive the necessary adoption of low-carbon technologies like heat pumps. Priority should be given to demonstration and pilot projects that showcase best practice and real-world results.
- **Develop a Delivery Roadmap and Investment Plan**: Prioritise the short-, medium-, and long-term interventions identified in Chapter 13. This should include:
  - Quick wins: social housing retrofit, and solar deployment on public assets.
  - Enabler projects: grid reinforcement, and skills training programmes.
- **Secure Early-Stage Funding and Demonstrator Projects**: Identify and secure initial funding mechanisms (local, regional, and national) to kick-start demonstrator projects that can showcase tangible early benefits and build public support.
- **Hydrogen**: Initiate detailed engagement with key regional hydrogen stakeholders, such as East Midland Hydrogen, to better advise on Gedling, Broxtowe and Rushcliffe's specific industrial demand and the infrastructure development timeline. This will allow for informed decision-making regarding long-term solutions for high-temperature, hard-to-treat loads.
- **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.

Annexes

A. Glossary of Terms

Table A.1: Glossary of terms

After Diversity Maximum Demand (ADMD)	The estimated peak electrical demand per connection after accounting for diversity (i.e. the fact that not all devices run simultaneously); used by UK distribution network operators to size local network capacity and plan reinforcement for electrification from the installation of new technologies such as EVs and heat pumps
Air Source Heat Pump (ASHP)	An electrically driven heat pump that extracts heat from outside air to provide space heating and hot water; central to UK heat-electrification strategies but requires good insulation and grid planning.
Capital Expenditure (Capex)	One-off investment costs (e.g., buying heat pumps, building solar farms, grid upgrades) that are capitalised and influence project financing and payback.
Coefficient of Performance (COP)	Ratio of useful heat output to electrical input for a heat pump, equivalent to its efficiency when comparing to a typical boiler heating system. A key metric for system efficiency and running-cost/carbon calculations.
Combined Heat and Power (CHP)	Cogeneration that produces electricity and captures usable heat from the same fuel source, typically natural gas in UK installations.
Department for Energy Security and Net Zero (DESNZ)	UK government department responsible for energy security, energy policy and delivering the net-zero transition (policy, regulation, grants, standards).
Distributed Future Energy Scenarios (DFES)	Granular, licence-area forecasts produced by UK distribution system operators (DSOs) that model local uptake of EVs, heat pumps, storage and distributed generation to 2050 for network planning.
Ground Source Heat Pump (GSHP)	Heat pump that extracts heat from the ground via buried loops; typically higher and more stable COP than ASHPs but requires land/groundworks and different planning considerations in the UK.
Gross Value Added (GVA)	Economic measure of the value generated by goods and services (output minus intermediate consumption); used to assess economic impacts of decarbonisation policies and green investment.
Internal Combustion Engine (ICE)	Engine where fuel combustion occurs within the engine (petrol/diesel); ICE vehicles are a primary target for electrification to cut transport emissions in UK net-zero plans.

tCO_2e	One ton of equivalent carbon dioxide emissions. This unit aggregates greenhouse gasses using their Global Warming Potential, and is used to report on emissions at a project, local authority, or national scale. If prefixed with a k then it represents 1000 tonnes.
LULUCF	Land Use, Land-Use Change and Forestry sector covering emissions/removals from land management, afforestation, peatland restoration and land-use change — important for UK carbon accounting and sinks.
Minimum Energy Efficiency Standard (MEES)	UK legal minimum EPC rating for private rented properties (currently enforced thresholds with planned uplifts) to improve building efficiency and reduce emissions from the building stock.
Neso Future Energy Scenarios (FES)	Future Energy Scenarios (FES) published by the National Energy System Operator (formerly ESO/National Grid) — national, system-level pathways to 2050 used alongside DFES for planning and policy.
Operating Expenditure (Opex)	Recurring costs to run assets (energy, maintenance, staffing); critical for lifecycle carbon and cost modelling of low-carbon technologies.
W/m^2K	U-value unit (watts per square metre-kelvin) measuring thermal transmittance of building elements; a lower W/m^2K provides better insulation and lower heating demand. This is central to determining retrofit and heat-pump readiness of a building.

B. Data Types and Validation

B.1 Energy Savings Trust building attributes

Table B.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	✓	×

C. EV Modelling Datasets

C.1 Modelling Assumptions

C.1.1 Datasets

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

- Midlands Connect EV research on EV capacity[89]
- CCC 7th Carbon Budget[90]
- UK Government Electric Vehicle Public Charging Infrastructure Statistics (2025)[91]
- ONS Middle layer Super Output Area population estimates (supporting information)[92]
- NESO Electric Vehicles Estimates[93]

C.1.2 Socioeconomic Parameters

- To perform modelling, socioeconomic parameters have been retrieved from available statistics and datasets:
- Population of Gedling = 117,730 (ONS, 2021)
- Population of Broxtowe = 112,113 (ONS, 2021)
- Population of Rushcliffe = 121,582 (ONS, 2021)
- Average number of cars per household in the East Midlands (2023) = 1.26
- Average number of people in a East Midlands household, (2023) = 2.36
- Number of EVs in the UK by 2050 = 37,400,000
- Number of public chargers across GBR (2025) = 251

C.1.3 Assumptions and Exclusions

- Not all ICE vehicles are decommissioned within the 2040 and 2050 scenarios.
- The CCC EV uptake projection is assumed proportionate across the UK.
- 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.
- The model only considers private transport and therefore does not account for public transport, freight transport, or heavy-duty vehicles.
- Motorcycles, mopeds, and other forms of micro-mobility are excluded.
- 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.

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

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

[91] Electric vehicle public charging infrastructure statistics: January 2025 - GOV.UK

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

[93] Electric vehicles | National Energy System Operator

D. IES Baseline Validation by MSOA

Figure D.1: Results Validation - Gedling

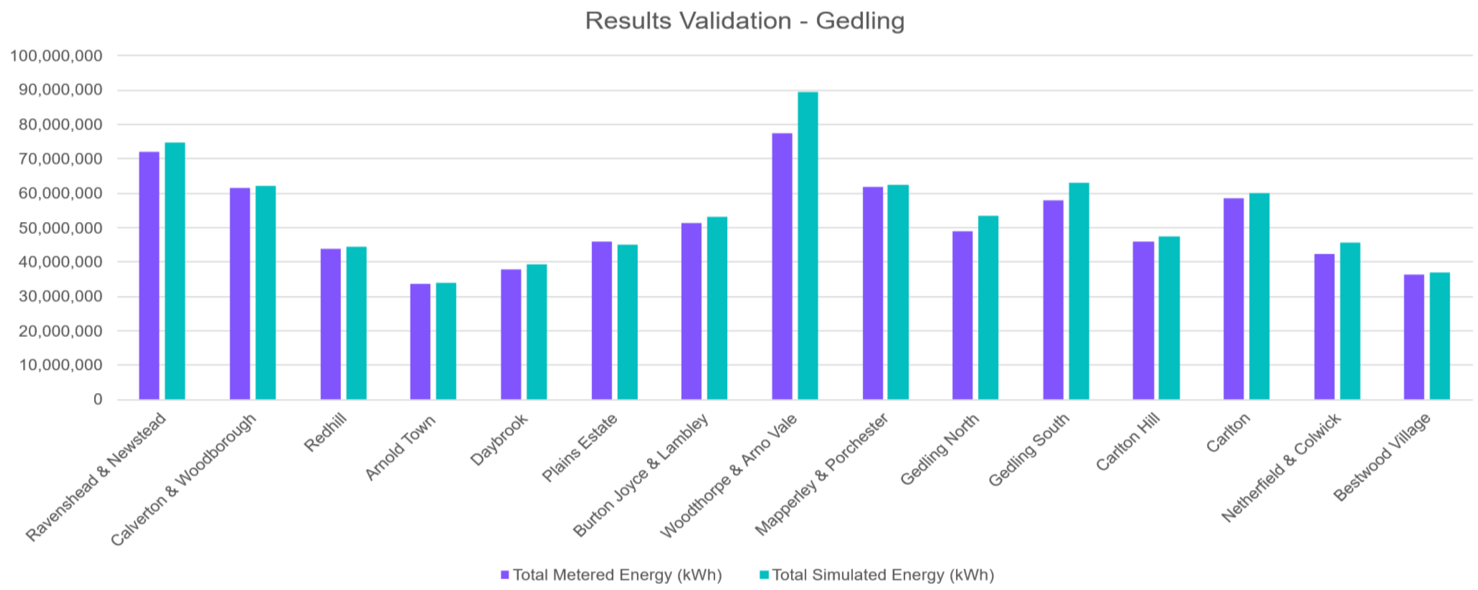


Figure D.2: Results Validation - Broxtowe

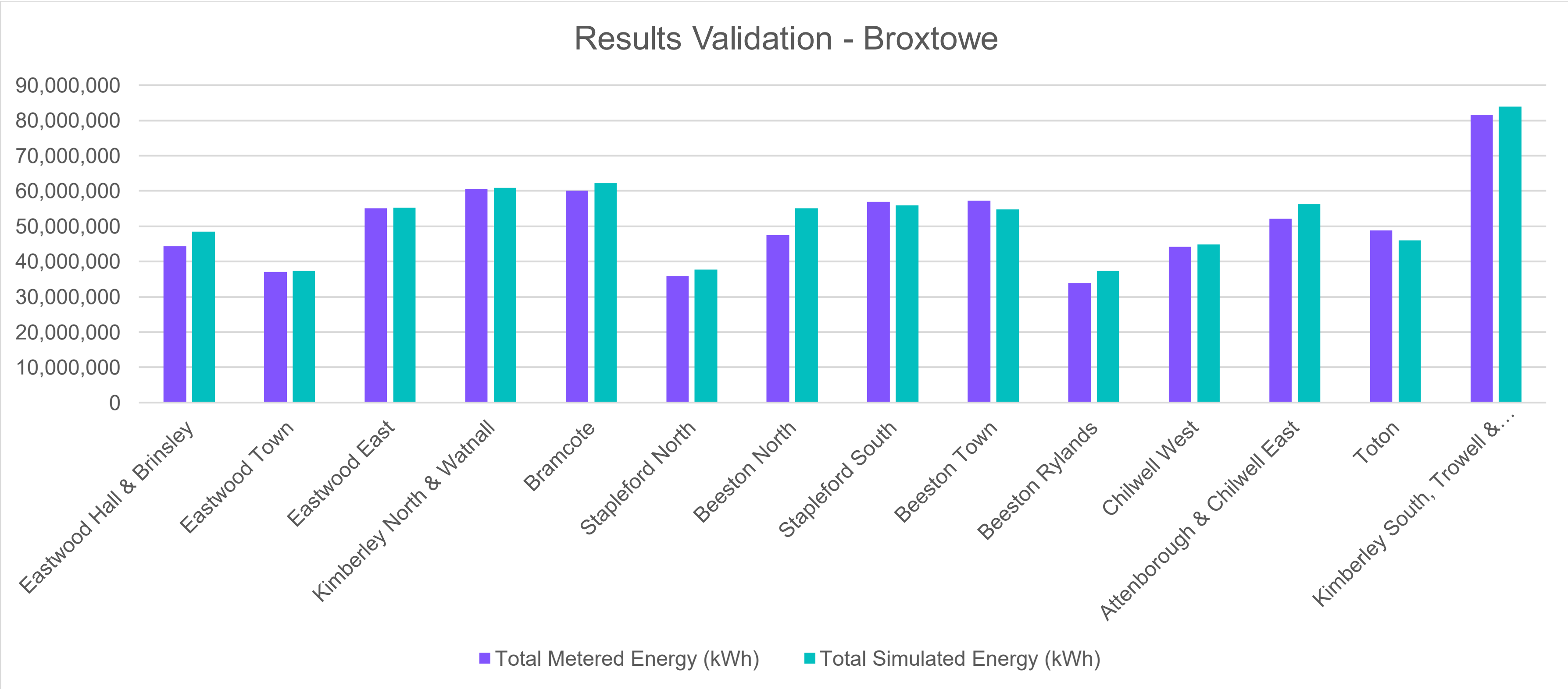
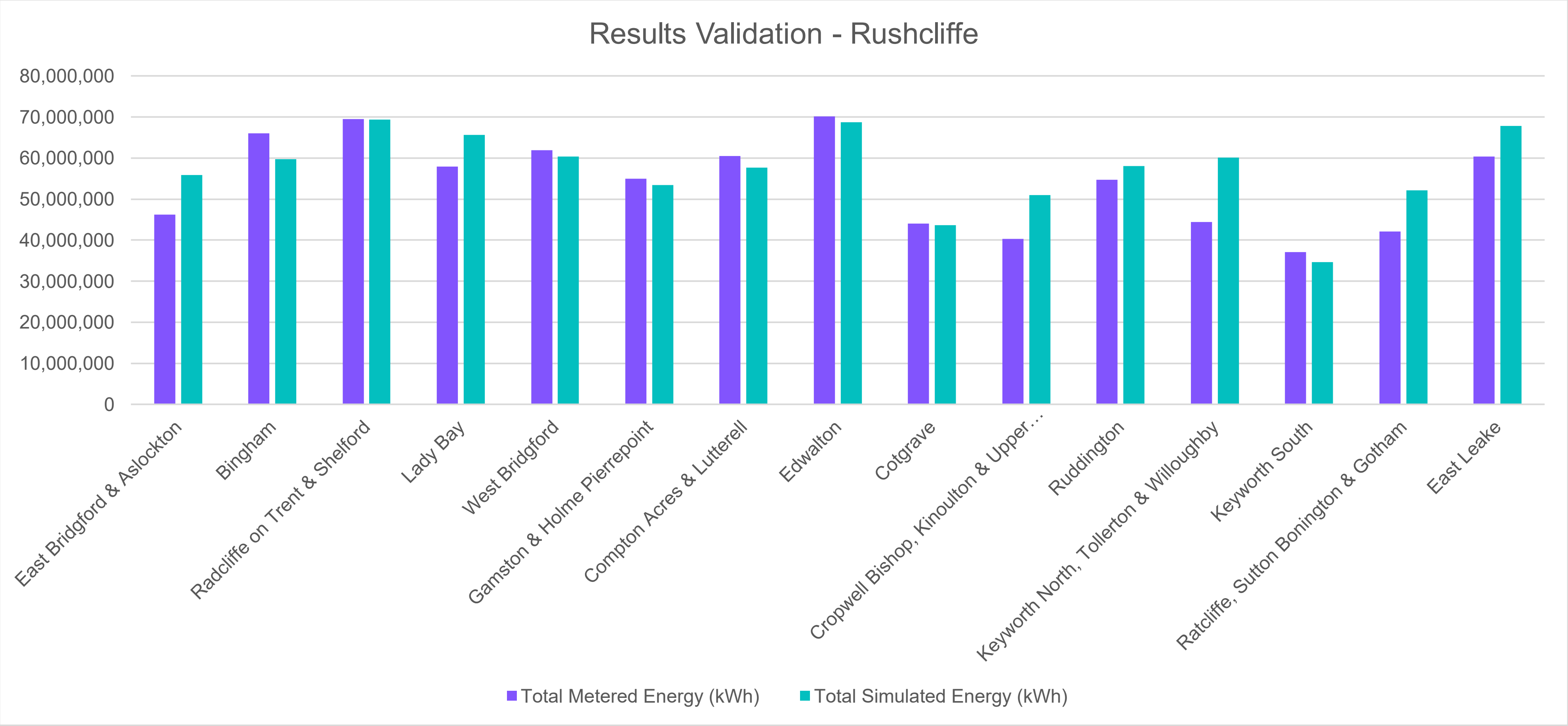


Figure D.3: Results Validation - Rushcliffe



E. Non-domestic top gas users

Table E.1: Non-domestic top gas users

Local Authority	Site Type/Organisation	Thermal Load (High Temp >80C)	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)
Broxtowe	Pharmaceutical Industrial Site		1,314	3,525	271,129	274,654	55,203
Broxtowe	Industrial Estate - Various		41	141	50,206	50,347	10,078
Broxtowe	Food Manufacturer	High	1,534	4,246	37,942	42,188	8,755
Broxtowe	Food Manufacturer	High	641	472	18,409	18,882	3,909
Broxtowe	Industrial Estate - Various		1,868	651	12,753	13,404	3,068
Broxtowe	Packaging site		494	1,397	8,220	9,617	2,026
Broxtowe	Mixed Retail Park		2,261	996	2,528	3,524	1,173
Broxtowe	Industrial Estate - Various		111	164	3,281	3,446	712
Broxtowe	Industrial Estate - Various		3,344	-	2,977	2,977	1,288
Broxtowe	Industrial Estate - Various		67	49	2,762	2,811	576
Gedling	Bio Energy Facility					130,524	26,105
Gedling	Construction Manufacturing Industrial Site	High	973	3904	83,034	86,939	17,589
Gedling	Construction Manufacturing Industrial Site		1,681	84	56,019	56,104	11,569
Gedling	Manufacturing Site		1170	-	10,326	10,326	2,307

Rushcliffe	Cement and lime Manufacturing Industrial Site	High	786	428	436,884	437,312	87,625
Rushcliffe	Educational Campus		5989	6564	22,116	28,680	6,976
Rushcliffe	Cement & lime Manufacturing Industrial Site	High	187	101	8,137	8,238	1,686
Rushcliffe	Institutional Public Secotr Building		105	336	7,329	7,664	1,555
Rushcliffe	Health - Public Sector Service Provider		3,991	-	6,008	6,008	2,028
Rushcliffe	Concrete Manufacturing Industrial Site		572	209	4,170	4,379	1,011
Rushcliffe	Educational facility - Public Sector		550	638	2,575	3,213	756
Rushcliffe	Commercial - Mixed Retail		1213	1367	1,607	2,973	846

F. Carbon emissions and energy use by local authority

This appendix provides a breakdown of historical carbon emissions and energy use by local authority – initially conveyed at the aggregated level in Figure F.1, Figure F.2 and Figure F.3.

Figure F.1: Gedling Historical Emissions (ktCO2e)

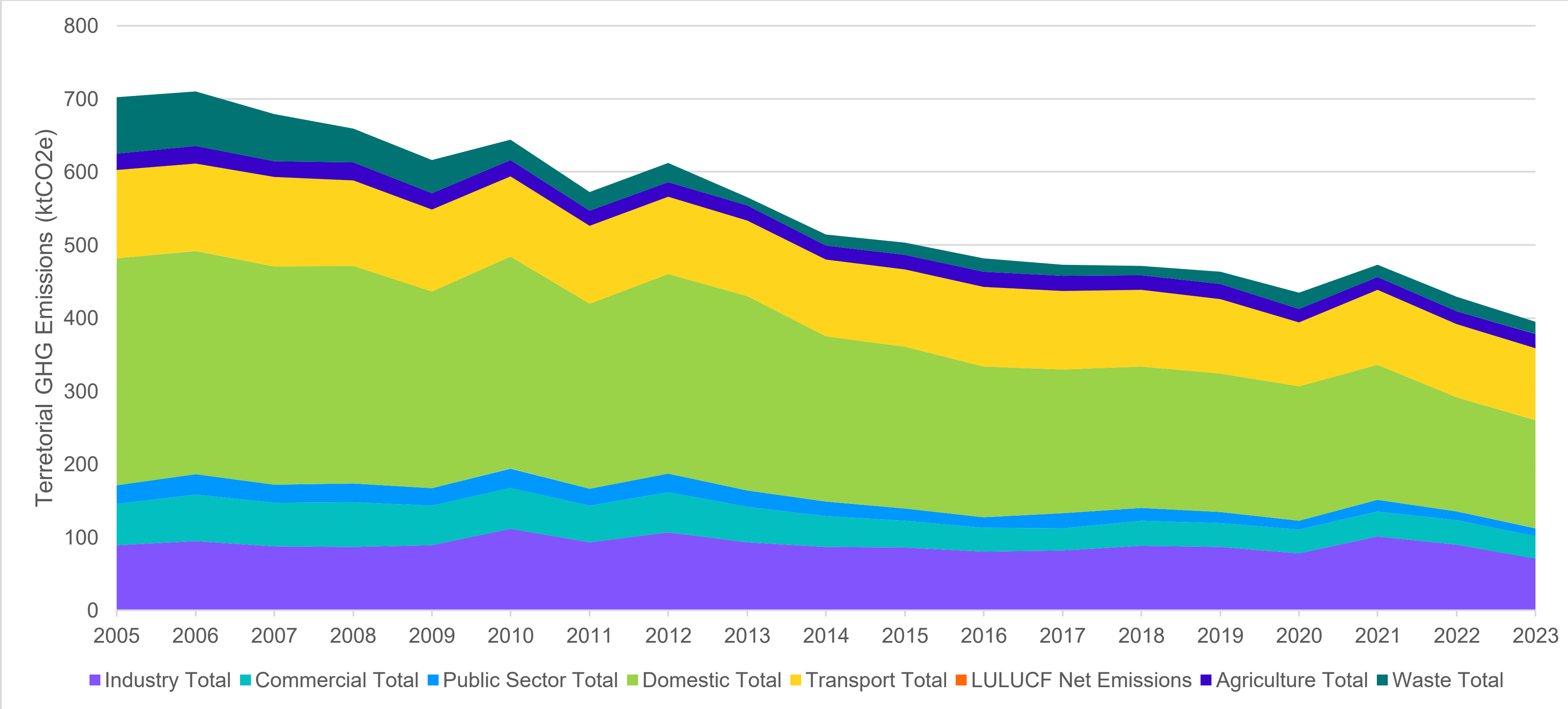


Figure F.2: Broxtowe Historical Emissions (ktCO2e)

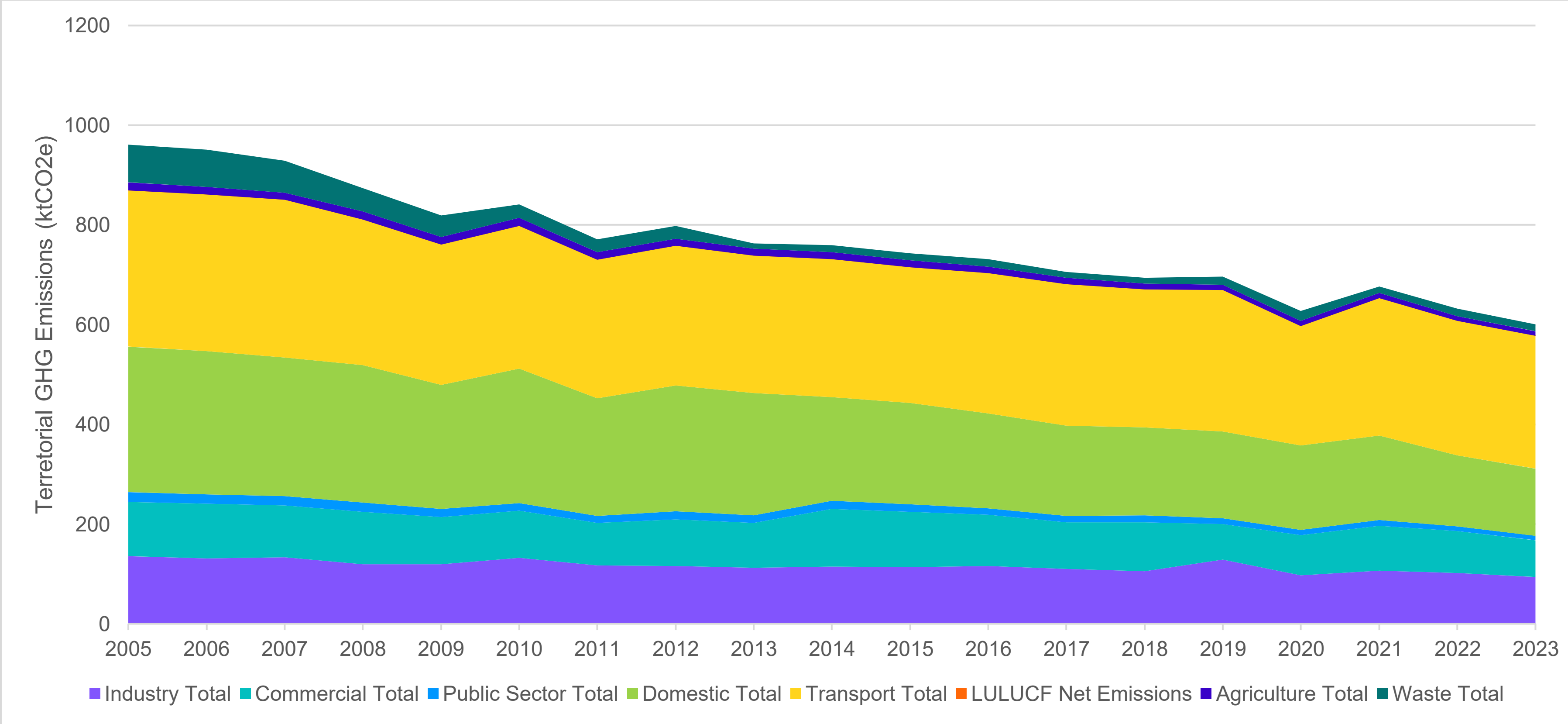


Figure F.3: Rushcliffe Historic Emissions (ktCO2e)

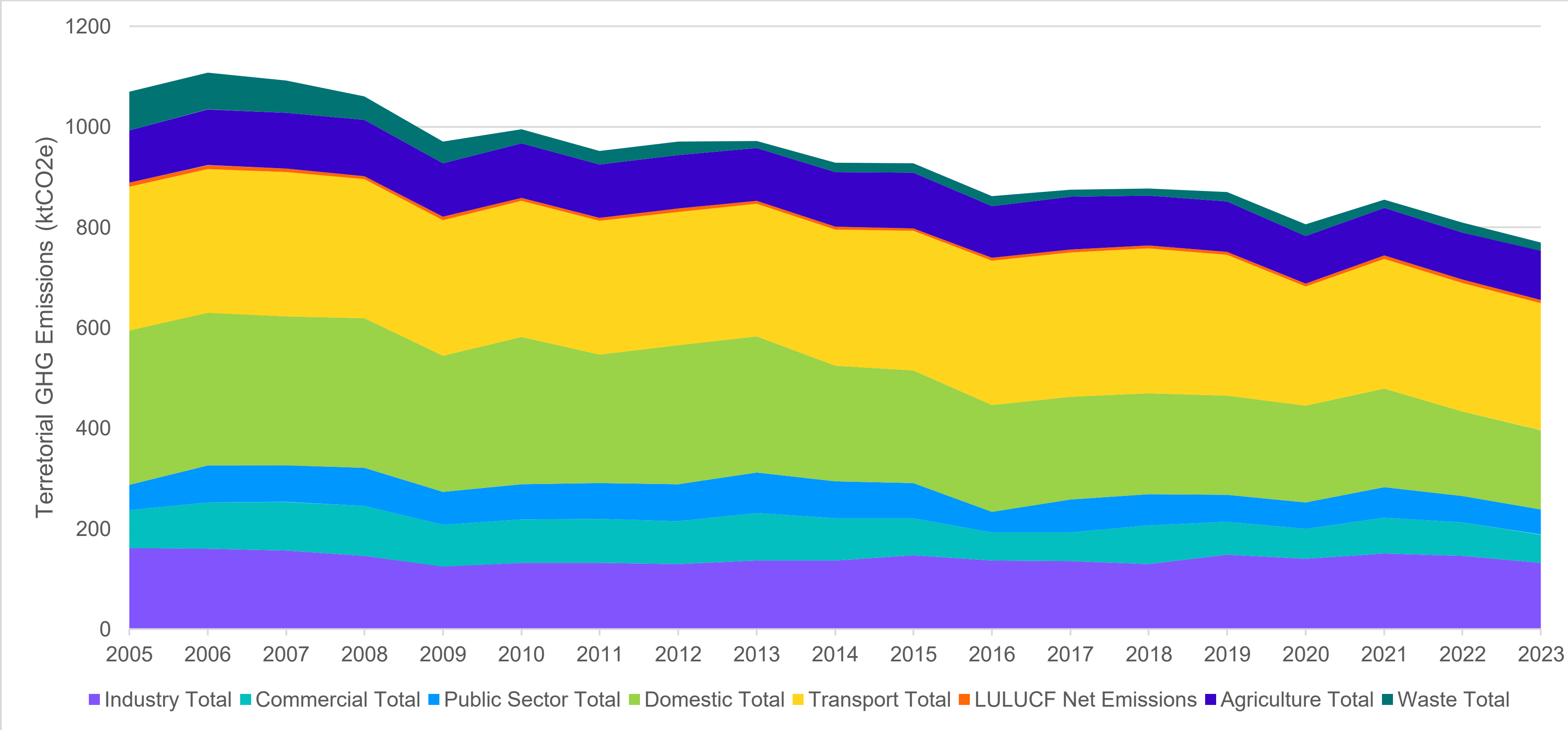


Figure F.4: Gedling, Broxtowe and Rushcliffe 2023 Carbon Emissions Breakdown by Sector and by Local Authority

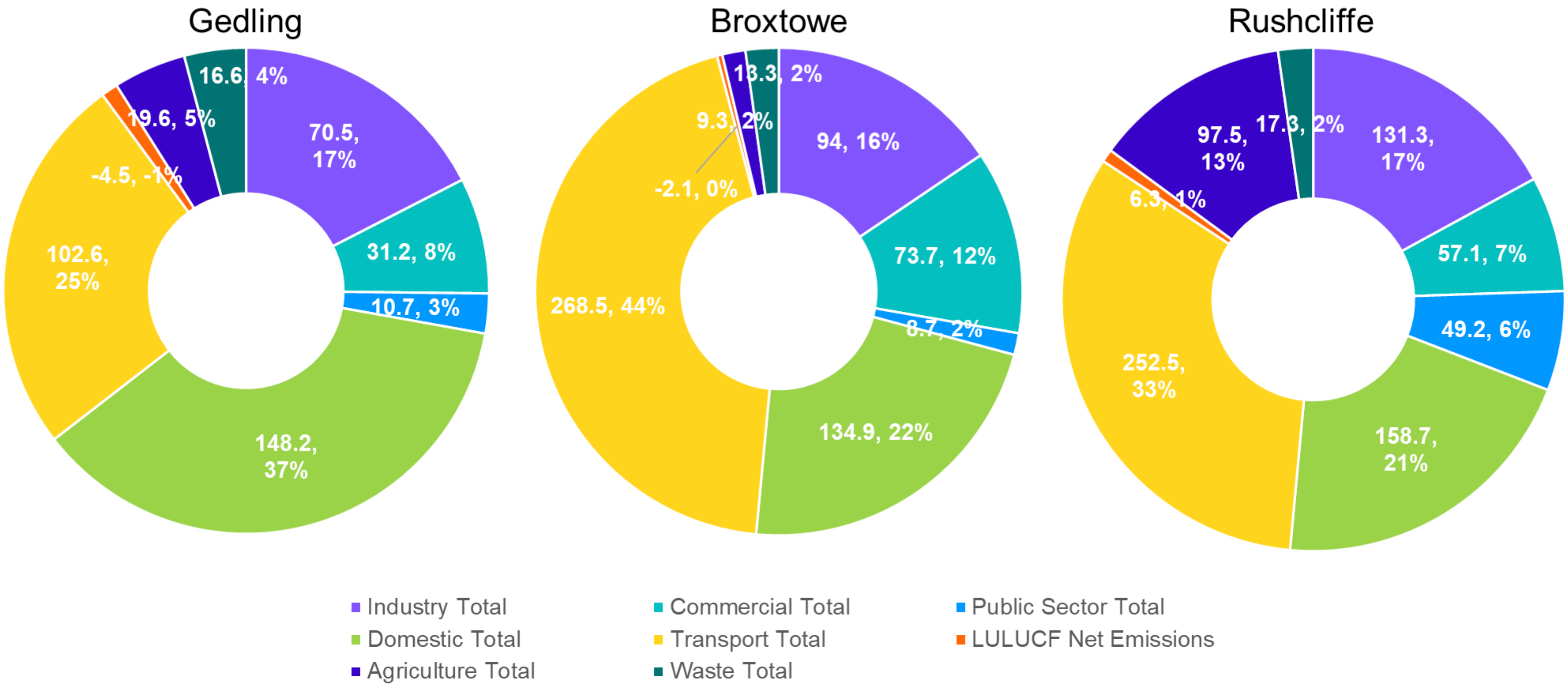
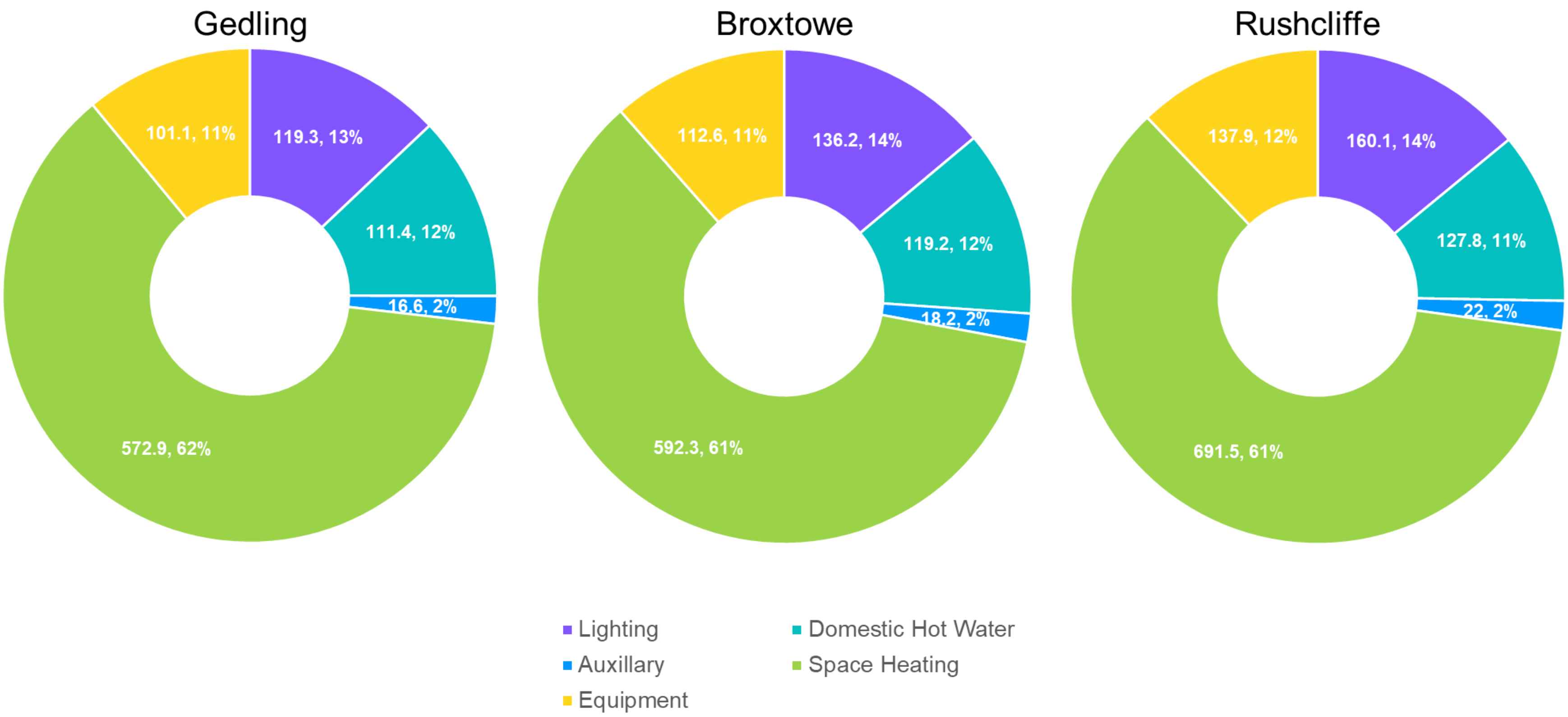


Figure F.5: Gedling, Broxtowe and Rushcliffe 2023 Building Energy Use Breakdown by Sector and by Local Authority



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