

**elementenergy**



***Energy Infrastructure  
Strategy for Leicester  
and Leicestershire***

commissioned by

**Leicester and  
Leicestershire  
Enterprise Partnership  
(LLEP)**

November 2018

Element Energy Limited  
Suite 1  
Bishop Bateman Court  
Thompson's Lane  
Cambridge CB5 8AQ

Tel: 01223 852499

## Authors

For comments or queries please contact:

Name	Email
<b>Sam Foster</b>	<a href="mailto:Sam.Foster@element-energy.co.uk">Sam.Foster@element-energy.co.uk</a>
<b>Ian Walker</b>	<a href="mailto:Ian.Walker@element-energy.co.uk">Ian.Walker@element-energy.co.uk</a>
<b>Nicolas Jennison</b>	<a href="mailto:Nicolas.Jennison@element-energy.co.uk">Nicolas.Jennison@element-energy.co.uk</a>

## Version Control

Version	Date	Comments
<b>1.0</b>	24/09/2018	First version for client review
<b>2.0</b>	23/10/2018	Second version for client review
<b>3.0</b>	16/11/2018	Final version

## Acknowledgements

The authors would like to thank the organisations that took part in workshops and provided feedback and vital input for this work: Leicester and Leicestershire Enterprise Partnership, Leicester City Council, Leicestershire County Council, Harborough Energy, Western Power Distribution, National Forest, Loughborough University, Intelligent Energy, GenGame Ltd, NW Leicestershire District Council, Leicester Energy Agency, Melton Borough Council, Harborough District Council, National Farmers' Union, Energy Technologies Institute, Hinckley & Bosworth Borough Council, Rockhaus Development, Cenex, PyroGenesys, Charnwood Borough Council, Pick Everard, National Space Centre and Electrical Design & MFG.

## Abbreviations

AFV	Alternative fuel vehicle	FCEV	Fuel cell electric vehicle
BEIS	Buildings, Energy and Industrial Strategy (Department of)	GVA	Gross Value Added
BREEAM	Building Research Establishment Environmental Assessment Method	HGV	Heavy goods vehicle
BSP	Bulk Supply Point	H <sub>2</sub>	Hydrogen
CCS	Carbon capture and storage	LLEP	Leicester and Leicestershire Enterprise Partnership
CGR	Clean Growth Strategy	LNG	Liquefied natural gas
CSH	Code for Sustainable Homes	LA	Local authority
CNG	Compressed natural gas	MHCLG	Ministry of Housing, Communities and Local Government
DSR	Demand side response	NPPF	National Planning Policy Framework
DfT	Department for Transport	OLEV	Office for Low Emission Vehicles
DNO	Distribution network operator	RTFO	Renewable Transport Fuels Obligation
EV	Electric vehicle	SEP	Strategic Economic Plan
ECO	Energy Company Obligation	SGP	Strategic Growth Plan
EPC	Energy Performance Certificate	ULEV	Ultra-low emissions vehicle
EPBD	Energy Performance in Buildings Directive	WPD	Western Power Distribution

Contents

1 Executive summary ..... 1

    1.1 Summary of context and objectives ..... 1

    1.2 Carbon targets and decarbonisation scenarios..... 1

    1.3 Summary of approach ..... 3

    1.4 Study findings and recommended actions ..... 3

2 Introduction ..... 14

    2.1 Context and objectives ..... 14

    2.2 Approach ..... 15

3 Policy review..... 17

    3.1 National policy ..... 17

    3.2 Local policy..... 19

4 Current and future energy use ..... 26

    4.1 Current energy use..... 26

    4.2 Future energy scenarios..... 28

5 Implementation strategy ..... 36

    5.1 Improving the energy efficiency of our homes and businesses, and supporting clean growth ..... 36

    5.2 Accelerating the shift to Low Carbon Transport ..... 54

    5.3 Delivering Clean, Smart, Flexible Power..... 69

6 Bibliography..... 84

## 1 Executive summary

### 1.1 Summary of context and objectives

The Leicester and Leicestershire Enterprise Partnership (LLEP), in partnership with Leicester City Council & Leicestershire County Council, have commissioned Element Energy and Cambridge Econometrics to develop and deliver an *Energy Infrastructure Strategy* and implementation plan for the LLEP area. The *Energy Infrastructure Strategy* sets the level of ambition, and guides investment in the low carbon energy sector, which has been identified as one of the LLEP's priority sectors for economic growth. The strategy identifies a set of concrete project opportunities that can be pursued immediately and over the coming years. The projects proposed span the LLEP area, and involve a wide range of sectors including homes, businesses, transport, power generation and energy networks. The strategy takes into account national policy (including the *Clean Growth Strategy*) and local policies and will feed into the development of the LLEP's Industrial Strategy.

### 1.2 Carbon targets and decarbonisation scenarios

In 2008, the Climate Change Act established a legally-binding requirement for the UK to reduce CO<sub>2</sub> emissions by at least 80% by 2050 compared to 1990 levels. To meet the carbon budgets, the Government sees a growing role for local authorities and local enterprise partnerships, as presented in its recent Clean Growth Strategy<sup>1</sup> and Industrial Strategy<sup>2</sup>. The Clean Growth Strategy explains that '*moving to a productive low carbon economy cannot be achieved by central government alone*' and that '*local areas are best placed to drive emission reductions through their unique position of managing policy on land, buildings, water, waste and transport*'.

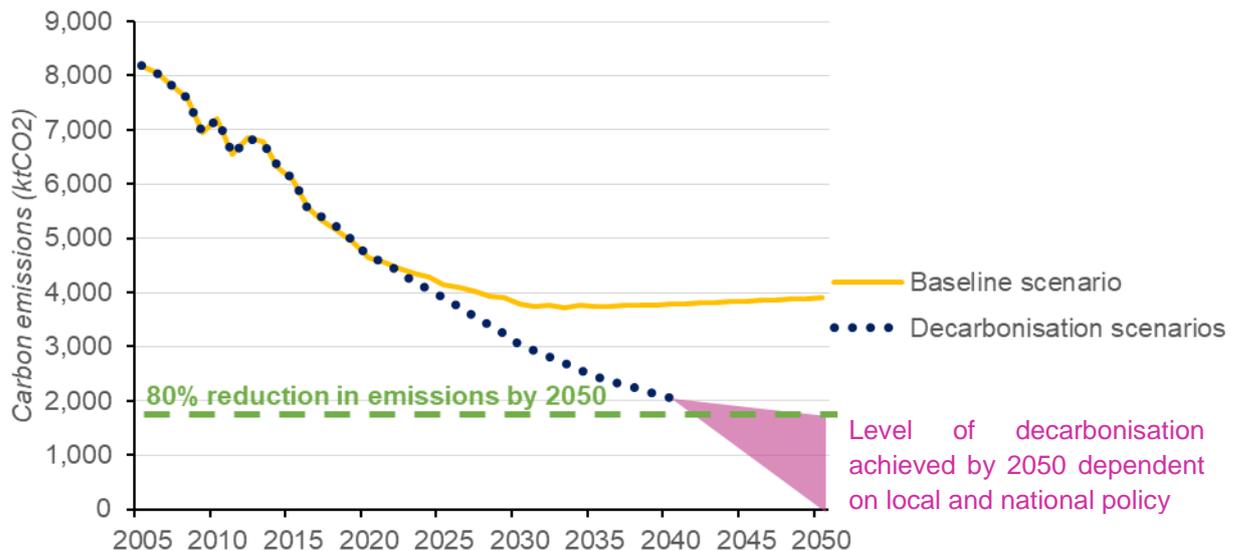
Leicester City Council and Leicestershire County Council have both committed to reaching 100% clean energy by 2050 as part of the UK100 Pledge. While it is not clear what this will mean in practice, it is unlikely that any remaining fossil fuel consumption (without carbon capture and storage) will be compatible with this. As such, it is likely that the energy system will need to be decarbonised by 2050 to an extent where it reaches the lower level of the purple wedge indicated in Figure 1-1. Through the UK100 Pledge, there will be opportunities to bring together private and public-sector organisations and to work with other UK100 members to share learning and influence national policy. In addition to its UK100 Pledge, the City Council has also pledged to reduce its carbon emissions by 50% by 2025, from a 1990 baseline.

To understand the local implications of the Climate Change Act and the UK100 Pledge, we have developed a Baseline scenario, which projects the future level of carbon emissions in the LLEP area based on current and planned policy as of July 2017, and two Decarbonisation scenarios, which achieve a level of emissions reduction locally that is in line with, as a minimum, the current UK-wide 2050 obligations. The resulting carbon emission trajectories for these scenarios is presented in Figure 1-1.

<sup>1</sup> HM Government, The Clean Growth Strategy: Leading the way to a low carbon future (October 2017)

<sup>2</sup> HM Government, Industrial Strategy Building a Britain fit for the future (November 2017)

Figure 1-1: Comparison of CO<sub>2</sub> emissions in the Baseline and decarbonisation scenarios<sup>3</sup>. The 80% emissions reduction target in 2050 is relative to 1990 levels.



In the Baseline scenario, energy demand grows to 2050, despite some energy efficiency, due to increasing population and economic activity. Electricity and gas demand increase accordingly whilst petroleum demand falls slightly as vehicle efficiency increases.

Despite the energy demand growth over the period to 2050, we see substantial carbon emissions reduction in the Baseline scenario, with emissions in the LLEP area falling from just over 8,000 ktCO<sub>2</sub> to under 4,000 ktCO<sub>2</sub> by 2030. This is due mainly to decarbonisation of the electricity grid. In the Baseline scenario, it is assumed that the electricity grid carbon intensity falls nearly to zero by 2030. To reach this level of grid decarbonisation, changes on the national scale will be required and could occur largely independent of local initiatives. **Renewable resources**, in particular wind and solar, will need to be exploited and accompanied by **smart technologies and demand flexibility** to enable renewable generation. There is economic value to be gained on a local level from decarbonising the grid through the exploitation of local renewable energy resources. Even with the electricity grid decarbonisation assumed in the Baseline scenario, approximately 4,000 ktCO<sub>2</sub> are still emitted annually in 2030, mostly associated with the combustion of fossil fuels (mainly oil and gas) for transport and heating. The Baseline scenario falls well short of the target for 80% emissions reduction over the period 1990 to 2050 as set (UK-wide) in the Climate Change Act.

The Decarbonisation scenarios suggested in this analysis achieve the 2050 target and have the potential to achieve net zero emissions, dependent on national and local policy. Relative to the Baseline scenario, the Decarbonisation scenarios require a further 2,300 ktCO<sub>2</sub> to 3,900 ktCO<sub>2</sub> of carbon emissions savings. The ‘gap’ in emissions between the Baseline and Decarbonisation scenarios from 2025 to 2050 is mainly associated with the continued combustion of fossil fuels for transport and heating. In the Baseline, natural gas is consumed mostly to meet heating and hot water demand in homes, businesses and industry, and oil is consumed mainly in the transport sector. In order to decarbonise these sectors, further **energy efficiency** and a transition to **alternative, low carbon fuels for heating and**

<sup>3</sup> Local Authority level emission projections are only available from 2005 onwards. The 80% emissions reduction target in 2050 is relative to 1990 levels and UK-level growth in emissions over 1990-2005 is used to extend backwards the time-series for CO<sub>2</sub> emissions in Leicestershire. Using this method, emissions in Leicestershire in 1990 are estimated to be 9,050 ktCO<sub>2</sub> and the 80% reduction target for 2050 is therefore set at 1,810 ktCO<sub>2</sub>.

**transport** are necessary. For heating, this could include electricity (in heat pumps or modern electric heating), bioenergy (solid biomass or renewable gas), waste heat and/or low carbon hydrogen; for transport, this could be achieved by deploying electric vehicles (EVs) and/or hydrogen-based fuel cell electric vehicles (FCEVs).

### 1.3 Summary of approach

In this Energy Infrastructure Strategy, we present a range of recommended ‘low regrets’ actions that will allow Leicester and Leicestershire to make progress towards achieving the necessary decarbonisation discussed above. The recommendations are valid regardless of national decisions that may affect the decarbonisation pathway in the longer term. Some of these recommendations support the electricity grid decarbonisation already assumed in the Baseline scenario, while others will drive the additional decarbonisation in the heat and transport sectors necessary to meet long-term energy and climate targets. An important finding of the scenario analysis presented above is that much of the required carbon emissions reduction to date has been achieved through decarbonisation of the grid, without the need for a high level of policy effort locally. However, around half of the required emissions reduction to 2050 will require much greater change at the local level, to impact the use of energy in homes, businesses and all modes of transport. Local Government has a key role to play in achieving this deeper level of carbon emissions reduction. In this report, we present in detail the actions that can be undertaken by the local governing authorities in Leicester and Leicestershire.

We present these recommendations through specific project opportunities. The process used to come to the shortlist of project opportunities involved a combination of our own expert judgement and feedback from the LLEP steering group and the wider stakeholder group.

The projects proposed span the LLEP area and are cross-sectoral, covering homes, businesses, transport, power generation and energy networks. The potential benefits to the local region of delivering the projects are outlined, including the potential contributions to:

- carbon emissions reduction;
- reduced energy costs;
- increased energy productivity; and
- local economic growth and employment.

The list of projects described in this study are proposed as high priority, highly relevant to the local region and projects that the LLEP could have a tangible and important role in helping to deliver. However, the projects are certainly not an exhaustive list of the potential beneficial activities in the energy sector, and are not intended to be those that the LLEP should pursue exclusively. Throughout this report, we recommend further initiatives that the governing local authorities should pursue to help deliver a low cost, low carbon and resilient energy sector within a growing, competitive and productive local economy.

### 1.4 Study findings and recommended actions

We have segmented the Energy Infrastructure Strategy into three targeted themes:

- Improving the energy efficiency of our homes and businesses, and supporting clean growth;
- Accelerating the shift to low carbon transport;
- Delivering clean, smart, flexible power.

These themes are aligned with those in the Clean Growth Strategy<sup>4</sup>.

### 1.4.1 Improving the energy efficiency of our homes and businesses and supporting clean growth

The reasons for improving energy efficiency in businesses and homes are many<sup>5</sup>, including reducing fuel bills, thereby alleviating fuel poverty and improving health and well-being in the residential sector, and increasing competitiveness, profitability and productivity in businesses; reducing carbon emissions; improving air quality; better managing local resources and reducing the reliance on imported energy sources.

Local authorities are uniquely placed to improve energy efficiency in homes and business. Maximising the strength of low carbon building planning policy will ensure that the energy demand of new buildings is kept to a minimum. Project opportunities 1 and 2 describe potential actions to improve the energy and carbon performance of new buildings, and quantifies the benefits of these actions.

Although it is important that the carbon emissions associated with new buildings are minimised, our analysis suggests that 74% of homes likely to be standing in 2050 have already been built. It is therefore also crucial to take steps to reduce the energy demand of the existing building stock. Project opportunity 3 presents the potential benefits of this, and offers suggestions for how to unlock the energy efficiency potential and promote deep retrofits in the homes where this is most needed and which are most difficult to decarbonise.

#### Project opportunity 1: Planning policy to improve our homes

The revised National Planning Policy Framework (NPPF) states that ‘any local requirements for the sustainability of buildings should reflect the Government’s policy for national technical standards’. This does not appear to support local authorities that may wish to require developers, through planning policy, to go beyond national building regulations, and it is likely that if such requirements were placed on developers that these could be challenged. Under the NPPF, tighter standards for energy efficiency and requirements for low carbon heating sources such as heat pumps in new buildings are therefore likely to require an update to national building regulations.

In the short term, more stringent building regulations are unlikely to translate into lower costs on a lifetime cost of energy basis, since the additional savings on consumer fuels are likely to be relatively small. However, if buildings constructed today are built to a lower carbon emissions standard than will be required to achieve long-term decarbonisation targets, they will either need to be retrofitted at a future date, or their emissions will need to be offset in future with negative emissions technologies. Our analysis suggests that the additional cost of building all new homes in Leicester and Leicestershire to 2050 to the ‘zero carbon’ standard would be in the region of £560m, and the additional carbon saved approximately 3.3 MtCO<sub>2</sub>. This corresponds to an average cost of carbon abated to 2050 of £171/tCO<sub>2</sub>. For comparison, the ‘target-consistent’ carbon price for 2050, used by the Government for policy appraisal, is currently set at £227/tCO<sub>2e</sub>, indicating that implementing a higher level of carbon emissions standards now could make economic sense in the long-term. A summary table of the main benefits of Project opportunity 1 against Leicester and Leicestershire’s key objectives is given in Table 1-1.

<sup>4</sup> HM Government, The Clean Growth Strategy - Leading the way to a low carbon future (October 2017)

<sup>5</sup> IEA, Capturing the Multiple Benefits of Energy Efficiency (2014)

**Table 1-1: Modelled economic and carbon impacts of building all new homes to the zero carbon standard**

Objective	Impact
CO <sub>2</sub> reduction	Up to 200 ktCO <sub>2</sub> saved annually by 2050
Lowering energy costs	Up to £11.9m domestic fuel bill savings annually by 2050. Total capital investment of £560m required.
Economic growth and employment	Additional jobs in construction (where higher thermal efficiency standards require additional labour, and for the installation of renewable heat technologies such as heat pumps, rooftop solar PV or solar thermal)

We recommend that the LLEP and the relevant local authorities take the following actions:

- Given the limits imposed by the NPPF, and the ambition to deliver low cost energy for consumers, we suggest that the most appropriate role for the LLEP and local authorities to take at this stage is to demonstrate exemplar low carbon development in certain circumstances where there is a willingness-to-pay on the part of consumers and/or the local authority through, for example, subsidising with lower land sale values – see project opportunity 2 below.
- In relation to the use of planning policy, the LLEP and local authorities could also lobby the Government to consider implementing more ambitious standards for new buildings, in order to future-proof homes against the need for retrofit in the coming decades.

### **Project opportunity 2: Exemplar low carbon development on local authority owned land**

One of the recommended actions proposed above in relation to Project opportunity 1 is to demonstrate exemplar low carbon development where there is a willingness-to-pay on the part of consumers and/or the local authority through, for example, subsidising with lower land sale values. Project opportunity 2 explores the most suitable approaches to delivering exemplar low carbon developments on local authority-owned land and potentially suitable sites across Leicester and Leicestershire.

The three criteria used to identify the five sites for low carbon potential were a) proximity to economic growth areas, b) capacity of local electrical substations to cope with added electrical load, and c) existence and status of local-authority owned land. The four identified sites were:

- Land at Theddingworth Road Lubenham, Former laundry St Luke’s hospital and land at Jerwood way Market Harborough former railway in Market Harborough;
- Coalville workspace 17<sup>6</sup> in North West Leicestershire;
- Groby land off Blue Bell Drive, land at Desford Lane Ratby and former Holliers Walk primary school in Hinckley & Bosworth;
- Silverdale Hostel in Melton.

Although it is not possible to quantify the carbon and economic impacts until the terms of a low carbon development are agreed, the benefits of Project opportunity 2 would be similar to those in Project opportunity 1 (carbon emissions savings, job creation, fuel savings for the consumer). Specifically, local economic value would be created through the construction

<sup>6</sup> It is understood that a development proposal at this site has already been made, however, there may still be potential for low carbon development at this site.

of the development, direct benefits would include job creation in the construction sector. If the region were able to generate low carbon construction expertise, this expertise could then be applied to surrounding regions, bringing further local value.

We recommend that the LLEP and the relevant local authorities take the following actions:

- Consult with real estate developers and businesses to determine the type, scale, approximate investment and projected energy consumption of the new development they wish to build;
- Undertake a more detailed assessment of the shortlisted sites listed above to identify the most suitable locations for a further exemplar low carbon development on local authority owned land. Factors for site assessment could include:
  - Total additional investment required to reach the higher carbon emissions standards, and the associated fuel and CO<sub>2</sub> emissions savings;
  - Impact on property sale value and economic viability of the development given consumer demand;
  - Loss of value of asset (or lost revenues from leasing it) if contractual obligations on the developer are required
  - Potential to refurbish any existing buildings on site, cost to demolish any unusable assets;
  - Demand headroom at local electricity substation.
- Further investigate the project on Saffron Lane where 68 new ‘eco homes’ were built for the social housing provider EMH Group to determine best practices and learnings;
- Identify which low carbon standard the LA wishes to include in its contractual obligations to the tenant or buyer (examples include Passivhaus, BREEAM (Building Research Establishment Environmental Assessment Method), Zero Carbon Hub versions of Zero Carbon Homes<sup>1</sup>, zeroHaus, Plusenergiehaus, the German KfW-building standard or Minergie from Switzerland)<sup>1</sup>.

### **Project opportunity 3: One-stop shop for energy efficiency retrofit**

Improving the energy efficiency of our homes and businesses is a national priority. The reasons for improving energy efficiency in businesses and homes are many, and include reducing fuel bills, thereby alleviating fuel poverty and improving health and well-being in the residential sector, and increasing competitiveness, profitability and productivity in businesses; reducing carbon emissions; improving air quality; better managing local resources and reducing the reliance on imported energy sources.

Our analysis suggests that 99,000 solid walls, 73,000 cavity walls, 147,000 lofts, 278,000 floors and 267,000 windows have further potential for insulation in Leicester and Leicestershire’s domestic stock (where the total stock size in 2018 has been estimated at 424,000 homes). If energy efficiency measures in the domestic and non-domestic sectors were deployed to their full potential today, close to 500 ktCO<sub>2</sub> could be saved annually, bringing annual fuel bill savings in the region of £100m for domestic consumers and £50m for businesses. A summary table of the potential benefits of Project opportunity 3 against Leicester and Leicestershire’s key objectives is given in Table 1-2.

**Table 1-2: Economic and carbon impacts of creating a one-stop shop for energy efficiency retrofit**

Objective	Impact
CO <sub>2</sub> reduction	Up to 500 ktCO <sub>2</sub> saved annually
Lowering energy costs	Annual fuel bill savings of up to £100m for domestic consumers and £50m for businesses. Total capital investment of £2,350m in the domestic sector, and £200m in the non-domestic sector.
Economic growth and employment	Additional jobs in construction (installation of insulation and other thermal efficiency measures, installation of renewable heat technologies such as heat pumps, solar PV and solar thermal)
Increased energy productivity	Same output generated by businesses with annual savings of £50m, leading to increased competitiveness and wider benefits to employees including health

In order to take advantage of these benefits locally, we recommend that the following actions be taken by the LLEP and/or the local authorities:

- Create a locally-led ‘one stop shop’ for energy efficiency retrofit, aiming to:
  - Bring together local suppliers and installers with potential customers;
  - Partner with investors to provide low-interest loans for efficiency projects;
  - Ensure that all the market is made aware of potential funding sources;
  - Actively identify households eligible for national schemes (such as the Energy Company Obligation);
  - Help unlock deep energy efficiency measures that are less cost-effective than e.g. loft insulation but that are still necessary for deep decarbonisation;
  - Promote policies to support sub-groups of the market in most need of support e.g. fuel poor, social housing, public sector and SMEs;
  - Support the generation of local expertise in the installation and maintenance of energy efficiency technologies such as heat pumps; this could be done by liaising with local colleges;
- Set up workshops to share best practices and inspire stakeholders;
- Search for funding sources available nationally; partner with local banks;
- Assign a team to set up the one-stop shop as a not-for-profit financial facilitator.

### 1.4.2 Accelerating the shift to low carbon transport

Road transport accounts for 35% of energy use in Leicester and Leicestershire. In the UK as a whole, the transport sector is responsible for 24% of CO<sub>2</sub> emissions. The road transport sector also accounts for the majority of air pollution in Leicester and Leicestershire. Reducing vehicle emissions by accelerating the shift to low carbon transport is integral to decarbonisation and improving air quality. Local authorities can play an active role in accelerating this shift, particularly by supporting the infrastructure changes necessary for the uptake of alternative fuel vehicles (AFVs).

Project opportunities 4 and 5 suggest targeted approaches towards supporting infrastructure to decarbonise key vehicle stock segments: cars and vans, and Heavy Goods Vehicles (HGVs). These projects have been chosen to provide solutions to key issues local to Leicester and Leicestershire. However, they are not intended to be exhaustive. In addition to these projects, the Councils can apply for funding from national schemes to retrofit old buses to a low carbon standard, and purchase new low emission buses, as buses are large contributor to road transport emissions. Behavioural change will be important and the Councils should continue to provide information to increase cycling and walking for shorter journeys, as these should also lead to health benefits. Investments in cycling lane provision

and green spaces for walking are also important. We highlight in this work that the low carbon transport sector is evolving rapidly, especially with automated vehicles and ride sharing. Local authorities must therefore have mechanisms in place to anticipate and adapt to market changes and formulate policy that is both effective and flexible.

**Project opportunity 4: Supporting electric cars and vans**

Reducing vehicle emissions by accelerating the shift to low carbon transport is integral to decarbonisation and improving air quality. Local authorities can play an active role in accelerating this shift, particularly by supporting the infrastructure changes necessary for the uptake of alternative fuel vehicles (AFVs). We have identified a clear opportunity for the local authority to support EV charging in the short term. Locations for future rapid charging sites have been selected based several criteria, including sites of economic growth, capacity of electricity grid to cope with added load, proximity to existing rapid charge sites, availability of local-authority owned land and connectivity of arterial road transport links. By supporting rapid charging infrastructure at the selected sites, LAs will be providing benefit both residents and businesses.

The annual emissions savings from the decarbonisation of cars and vans is estimated at 900 ktCO<sub>2</sub> in 2050. This decarbonisation would incur savings from reduced energy costs of £700m annually in 2050. A summary table of the potential benefits of shifting to electric cars and vans in Leicester is shown in Table 1-3.

**Table 1-3: Economic and carbon impacts of switching to electric cars and vans**

Objective	Impact
CO <sub>2</sub> reduction	Up to 900 ktCO <sub>2</sub> saved annually
Lowering energy costs	Up to £700m fuel cost savings annually
Increased energy productivity	Increased energy productivity for van freight; improved competitiveness for businesses due to lower spend on fuel

We recommend that the LLEP and the relevant local authorities take the following actions:

- Coordinate best practices between local authorities in Leicester and Leicestershire, including:
  - Salary sacrifice schemes for purchasing cars that emit <120 gCO<sub>2</sub>/km;
  - Adding EVs to local authority-owned car fleet.
- Formulate more ambitious policy to promote the uptake of low emissions vehicles based on exemplar policy elsewhere; this could include:
  - Consider free parking for ULEVs in council-owned car parks;
  - Establish standards for the number or proportion of required charging points in car parks. This could be made a requirement through the planning control process;
  - Provide free accredited training to mechanics in the borough to ensure ULEVs can be safely and easily serviced in the area;
  - Initiate support programmes that let local companies ‘try before they buy’ ULEVs in their fleet.
  - Further incentivise charge points at work by ‘topping up’ national Grants;
  - Consider launching an Electric Vehicle Experience Centre – this centre would be a one-stop shop for customers interested in experiencing, leasing or purchasing a new EV. NB this would require significant funding and it may be attractive to partner with other LAs outside of Leicester and Leicestershire to attract a larger sum of money.

- Undertake a more detailed analysis of the five recommended sites (Exit 20 on the M1, Exit 23 on the M1, Melton Mowbray, Market Harborough and Leicester East – close to Leicester East BSP on Wakerley Rd/Broad Avenue) to gain a more thorough assessment of the need, of the most suitable location(s) and of the business case for EV rapid charging points.
- Analyse the current EV uptake and provision of off-street parking across the region to understand where potential EV buyers without off-street parking are likely to be and the level of local charging infrastructure they might need. This could support a funding application under the On-street Residential Chargepoint Scheme<sup>7</sup>; such a scheme has been utilised by Leicester City Council in Clarendon Park where additional charge points are expected to become operational by 2019.
- Once a site has been chosen, investigate the LLEP and/or local authority role further. We suggest that this could be in its capacity as an investor in the project, through its land ownership or by subsidising electricity provided to rapid charging users at a discounted rate at this site. Currently, there is one rapid charging station that is free to use, it is operated by Nissan.

**Project opportunity 5: Strategic plan for HGV refuelling and rapid charging hubs**

Road freight contributes £11bn to the UK economy and although, in 2014, HGVs only made up 1.5% of road vehicles, they contributed to 21% of surface transport CO<sub>2</sub> emissions. HGVs contribute significantly to poor air quality, accounting for 28% of NO<sub>x</sub> emissions and 16% of particulate matter emissions. Given the local presence of the East Midlands Airport, which is connected to the rest of the UK via the M1, there is an opportunity to target the decarbonisation of HGV traffic through a locally led initiative. In addition, advanced logistics is important to the Leicester and Leicestershire economy, and this sector also attracts significant HGV movements.

An area that appears suitable for a strategic HGV refuelling/recharging station is close to Exit 23A on the M1, at Moto Donington Services. At first, this site would provide bio-CNG/LNG and could later be adapted to accommodate electric HGVs and finally hydrogen fuel cell electric HGVs in the longer term.

The annual emissions savings from the decarbonisation of HGVs is estimated<sup>8</sup> at 200 ktCO<sub>2</sub> in 2050. This decarbonisation would incur savings from reduced energy costs of £150m annually in 2050. A summary table of the potential benefits of decarbonising freight transport in Leicester and Leicestershire is shown in Table 1-4.

**Table 1-4: Economic and carbon impacts of shifting HGVs to low carbon fuel sources**

Objective	Impact
CO <sub>2</sub> reduction	Up to 200 ktCO <sub>2</sub> saved annually
Lowering energy costs	Up to £150m fuel cost savings annually
Increased energy productivity	Increased productivity due to lower cost of freight for HGVs, improved competitiveness for businesses due to lower spend on fuel

<sup>7</sup> Office for Low Emission Vehicles, On-street Residential Chargepoint Scheme guidance for local authorities <https://www.gov.uk/government/publications/grants-for-local-authorities-to-provide-residential-on-street-chargepoints>

<sup>8</sup> Based on national share of road transport fuel consumption by vehicle type. This could be even higher given the high HGV traffic in the local area.

We recommend the following actions be taken by the LLEP and the local authorities (particularly Leicestershire County Council and North West Leicestershire District Council):

*Identifying potential customers and suppliers*

- Begin discussions with major freight customers of the East Midlands Airport (such as UPS, DHL, TNT and Royal Mail) to identify opportunities for pilot test initiatives in their fleet of vehicles.
- Begin discussions with Calor Gas (LNG gas supplier at Moto Donington Services) and others for a joint partnership to step-up sales of LNG/CNG.

*Identifying most promising opportunities*

- Commission a more detailed study to identify
  - the benefits of turning Moto Donington Services station into an HGV recharging and CNG + H2 refuelling hub;
  - Other possible locations for the hub.
- Identify opportunities to create new biomethane production plants in the Leicestershire area.
- Identify opportunities to grow current installations further and promote them to inject biomethane into the gas grid or sell biomethane directly to gas refuelling station operators
- Investigate the feasibility of a hydrogen station to be included on the same site, smaller in scale but serving particular fleets of HGVs as part of a funded project.

*Identifying sources of funding and delivery model*

- Identify sources of funding for such projects (DfT grants such as Integrated Delivery Programme)
- Learn from best practices at Tyseley Refuelling Hub.

### 1.4.3 Delivering clean, smart, flexible power

The national ambition is to transition to an electricity system that supplies our homes and businesses with secure, affordable and clean power. In order to decarbonise the power sector to essentially zero emissions by 2050 (which is the expected requirement<sup>9</sup>), the Government will phase out unabated coal power by 2032 and continue to support the growth of electricity generation from renewable resources. These changes are expected to occur on the national level, largely irrespective of local policy. However, opportunities for local deployment of renewable generation have been identified in this study, and we cite prior studies that suggest the potential local economic benefits of this are substantial.

There is a vast wind resource in the region, which is the focus of Project opportunity 8. However, other renewable energy sources, such as biomass, waste, biogas, hydro and solar PV, should also be exploited where possible.

Regarding electricity distribution the City and County Councils in the region are in the process of setting up a ‘white label’ energy supply scheme. We support this endeavour and suggest that efforts should be made to ensure that the provenance of the energy is from local renewable sources where possible.

To accompany the renewable electricity generation, it will be important to create a flexible electricity grid. A central objective set out in the Clean Growth Strategy is to enable a smarter, more flexible system by expanding interconnection, electricity storage and demand side response (DSR). A smarter, more flexible grid can benefit consumers, the system and the wider economy. One study<sup>10</sup> found that the UK economy could stand to benefit between

<sup>9</sup> BEIS internal analysis of 2050 pathways

<sup>10</sup> Carbon Trust and Imperial College London, An analysis of electricity system flexibility for Great Britain (2016)

£17 billion and £40 billion to 2050 from a smart energy system, due to avoided or deferred network reinforcements, avoided generation capacity, avoided curtailment of low carbon generation, and optimised system operation. The Government suggests that innovation in this sector is key; Leicester and Leicestershire’s governing authorities should support innovation in technologies including energy storage, demand response and grid balancing technologies, among others. This could be done by introducing smart streets (demonstration sites or whole streets showcasing the latest options for energy efficiency, smart controls, batteries and other innovative technologies such as induction charging), supporting battery demonstration projects, and hosting national demonstrator projects for innovative technologies. In Leicester City, a small ‘Vehicle to Building’ pilot project is being undertaken which includes smart charging and battery storage. In the future, smart streets could be integrated into sites allocated for new housing in Leicester and Leicestershire’s Strategic Growth Plan (2018).

**Project opportunity 6: Providing low cost and low lead time connections for new demand customers**

An important challenge is coordinating the reinforcement of the electricity grid to accommodate plans for new development and/or expansion of existing demand without introducing avoidable delays, whilst also ensuring that any investments in the grid are required and will not be ‘stranded assets’, since the costs will be borne by the customer. Under the current regulatory framework, the distribution network operator (DNO), Western Power Distribution (WPD), is only permitted to invest ahead of need where it can show that this provides a benefit to the customer. This usually means that the DNO is not incentivised to do so or that it cannot take the risk. Therefore in practice, DNOs do not invest ahead of need, which is a significant factor contributing to long lead times for connections.

In order to help address this challenge, we see a specific role for the LLEP as a facilitator between new customers and the network operator. In certain situations, the LLEP could potential share the risk and cost of upgrading the network.

The benefits that would be brought to the region from these changes are summarised in Table 1-5.

**Table 1-5: Economic and carbon impacts of providing low cost lead time connections for new demand customers**

Objective	Impact
CO <sub>2</sub> reduction	Indirectly beneficial – coordinated planning will allow the network operator to have more certainty on future demand, which will help to plan and manage the transition to low carbon electricity grid
Reducing costs	Reduced risk of stranded assets, process optimisation through coordination and planning will save money
Economic growth and employment	Reduced risk of delays to new development hindering economic growth, increased attractiveness of region to investment
Increased productivity	Reduced risk of delays to new development leading to increased costs

We recommend the following actions are taken in the short term:

- Discuss possible case studies that could be undertaken in Leicester and Leicestershire with WPD to identify whether solutions where investment is made ahead of need are possible whilst staying within current regulation. Possibilities include:
  - The DNO funds the anticipatory investment;

- The DNO funds initial investment, but recovers this from connection customers;
- A third-party funds the initial investment, but recovers this from subsequent connection of customers through the existing 'second comer' regulation.
- These case studies should initially be targeted at areas where electricity demand is expected to exceed capacity the soonest (suggested to be the Northern Gateway and Southern Gateway). These steps should be closely coordinated with Leicester and Leicestershire's Strategic Growth Plan;
- Lobby national government for changes to the regulations to allow DNOs greater scope to make investments ahead of need, particularly in areas where strong growth is expected and network capacity is limited.

**Project opportunity 7: Flexibility based connection offers for new electricity demand loads**

We propose a mechanism to alleviate the high connection cost offers that are currently being offered to new connection customers, based on use of flexibility. In this scenario, new customers would be given the choice of investing in necessary grid reinforcements, i.e. a conventional connection offer, or to agree to a certain level of demand (or generation) flexibility thereby reducing or avoiding network upgrades. Extending this further, were there a local market for flexibility, customers seeking a connection could agree to purchase flexibility on the market in order to gain a lower cost connection offer (e.g. due to reduced need for reinforcement). The LLEP could have a role here in bringing together flexibility providers with connection customers.

The benefits that would be brought to the region from this suggested project are summarised in Table 1-6.

**Table 1-6: Economic and carbon impacts of providing flexibility based connection offers for new electricity demand loads**

Objective	Impact
CO <sub>2</sub> reduction	Demand side flexibility is an important enabler of intermittent renewable electricity generation
Reducing costs	Demand side flexibility allows the peak electricity supply to be lower than it otherwise would be for a non-flexible (standard) connection. Energy costs are reduced due to avoided network reinforcement costs
Economic growth and employment	Attracts businesses that can be flexible with their energy demand.
Increased productivity	Promotes purchase of lower cost electricity at non-peak hours

We suggest a number of areas that would need to be explored further before a trial project is undertaken. In order to better understand the viability of this mechanism, we recommend the LLEP take the following actions:

- Begin discussions with WPD to assess whether current regulation would allow WPD to offer flexibility based connections to new non-domestic demand customers;
- Host consortiums bringing flexibility providers, demand customers and WPD together; propose suitable LA owned assets to be included in DSR projects;
- Explore funding opportunities (BEIS, Network Innovation Stimulus Package) for a trial project in Leicestershire;
- Create competitions within the LLEP for innovative exemplar DSR opportunities based on flexibility based connections;

- Raise awareness of the benefits of DSR to Leicestershire’s residents, businesses and industries through informational campaigns and LA websites.

**Project opportunity 8: Strategic plan for renewable electricity generation deployment**

Comparison of the current level of deployment of renewable electricity generation and the technical potential in Leicester and Leicestershire, as estimated in previous studies, indicates that the majority of the technical potential for renewable electricity in the region remains unexploited. The remaining potential across a range of renewable electricity sources is in the region of 6,700 GWh/yr, comparable with the total electricity demand in the region today, and also to the total electricity demand likely to be required in 2050. This potential is dominated by wind (6,000 GWh/yr remaining potential) with the remainder from solar PV, biomass, energy-from-waste and other sources. If deployed to its full potential, this would require 125 MW to be installed annually in the Leicester and Leicestershire region between now and 2050.

In addition to helping to deliver on the pledge to run on 100% clean energy by 2050, there is significant value to be gained from generating this energy locally. Deployment of the full potential for wind power could generate in the region of £600m GVA in the local economy and more than 1,000 jobs, depending on the share of the construction, development and operation value chain captured in the area. A summary table of the potential benefits of Project opportunity 8 against Leicester and Leicestershire’s key objectives is given in Table 1-7.

**Table 1-7: Economic and carbon impacts of deploying wind power to its full potential in Leicester and Leicestershire**

Objective	Impact
CO <sub>2</sub> reduction	Up to 1,500 ktCO <sub>2</sub> savings annually
Economic growth and employment	Up to £600m GVA and more than 1,000 jobs generated in the local economy

In order to unlock these benefits, we recommend that the LLEP and/or the local authorities take the following actions:

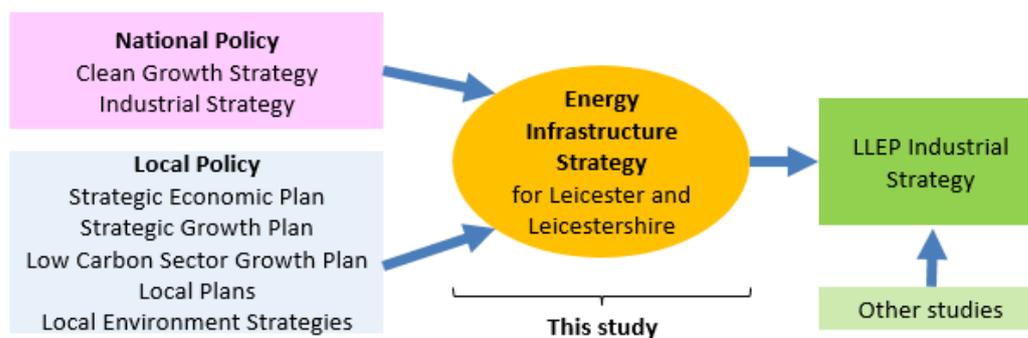
- Set specific targets in each LA for the uptake of each renewable energy resource (noting that this has already been done in certain LAs, though these may need to be adapted), identifying clearly the sites that could host the generation plant and undertaking to safeguard these areas as appropriate.
- Take steps to ensure that the local economy is well-positioned to generate value from the deployment of renewable energy in the region, by ensuring that the associated skills are available in, for example, the construction industry and in the operation and maintenance of renewable energy systems.

## 2 Introduction

### 2.1 Context and objectives

The Leicester and Leicestershire Enterprise Partnership (LLEP), in partnership with Leicester City Council & Leicestershire County Council, have commissioned Element Energy and Cambridge Econometrics to develop and deliver an *Energy Infrastructure Strategy* and implementation plan for the LLEP area. The *Energy Infrastructure Strategy* sets the level of ambition, and guides investment in the low carbon energy sector, which has been identified as one of the LLEP’s priority sectors for economic growth. The strategy identifies a set of concrete project opportunities that can be pursued immediately and over the coming years across the LLEP area. The strategy takes into account national and local policies and will, along with other studies, feed-in to the development of the LLEP Industrial Strategy, as shown in Figure 2-1.

**Figure 2-1: Schematic of studies relating to the Energy Infrastructure Strategy**



The ‘Low Carbon’ sector is one of the LLEP’s eight priority sectors and presents significant potential for economic growth in the area. It is also a cross-cutting theme of great importance to the LLEP’s Strategic Economic Plan (SEP). The 2015 *Leicester and Leicestershire Low Carbon Sector Growth Plan*<sup>11</sup> highlighted that many companies in this sector are already taking advantage of the various incentives for renewable energy technologies such as solar PV, biomass, anaerobic digestion and wind energy. The LLEP’s European Structural and Investment Funds (ESIF) Strategy also aims to increase investment in a low carbon economy to increase productivity, economic resilience and to support innovation in companies; and to stimulate innovation in the sectors in which Leicester and Leicestershire already has a competitive advantage. Nationally, the Government’s *Clean Growth Strategy* provides an opportunity to embed a low carbon approach to economic development, energy and infrastructure provision.

The Consultation Draft of the *Strategic Growth Plan*<sup>12</sup> for Leicester and Leicestershire, published earlier this year, sets out a vision for development in the region to 2050, the areas where this growth might take place and the infrastructure that would be required to support it. A *Leicester and Leicestershire Utilities Infrastructure Capacity Study*<sup>13</sup> was produced to support the development of the *Strategic Growth Plan*. This *Energy Infrastructure Strategy* aims to guide decision-making and investment to achieve the key objectives of supporting low carbon economic growth, lowering energy costs and increasing energy productivity.

<sup>11</sup> LLEP, *Leicester & Leicestershire Low Carbon Sector Growth Plan* (July 2015)

<sup>12</sup> *Leicester and Leicestershire 2050: Our Vision for Growth*, Consultation Draft (January 2018)

<sup>13</sup> Peter Brett Associates on behalf of The Leicestershire Commissioning Group - Leicester and Leicestershire Utilities Infrastructure Capacity Study (November 2017)

## 2.2 Approach

An important aspect of the LLEP's brief for the development of this *Energy Infrastructure Strategy* (EIS) was to generate a shortlist of concrete project opportunities, consistent with a future energy system able to support low carbon economic growth.

The shortlisted projects should guide decision-making and investment immediately and over the coming years, and suggest priority areas for the funding that the LLEP is expected to be able to access as part of the development of the region's *Local Industrial Strategy*.

The EIS was produced according to a two-phase process. In the first phase, in addition to undertaking our own desk-based research and analysis, we engaged with public and private sector stakeholders across Leicester and Leicestershire to gain an understanding of the main issues, challenges and opportunities relating to energy infrastructure in the region. We also carried out original analysis to generate a set of future energy scenarios for the area, to quantify the likely energy needs. Through this process, we produced an *Energy Challenge Paper*<sup>14</sup> for Leicester and Leicestershire. This paper included a long list of potential energy infrastructure projects and ideas, including suggestions proposed by stakeholders. The *Challenge Paper* was published on the LLEP's website and circulated to a wide range of stakeholders for further consultation. The aim of the second consultation round was to request feedback and input on the priority themes for the EIS, and to inform the selection of a shortlist of concrete project opportunities that would be taken forward for more detailed consideration of the potential benefits and impacts in the Energy Infrastructure Strategy.

The process used to come to the shortlist of project opportunities was derived through a combination of the scoring and ranking procedure, our own expert judgement and feedback from the steering group and the wider stakeholder group. The scoring and ranking procedure was based on a qualitative assessment of the performance of the project ideas against four criteria, covering the range of priorities for energy infrastructure as identified during the stakeholder consultation process:

1. Contributing to decarbonisation
2. Increasing local productivity
3. Improving health and wellbeing
4. Scalability and potential impact

The priority rating of the projects was further informed by feedback received on the Energy Challenge Paper, along with our own further analysis.

In the second phase, we developed a high-level implementation plan for each of the shortlisted project opportunities. The projects selected are in line with the key objectives of supporting low carbon economic growth, lowering energy costs and increasing energy productivity, and can be actioned immediately and over the coming years. The potential benefits to the local region of delivering the projects are outlined, including the potential contributions to carbon emissions reduction, reduced energy costs, increased energy productivity, and local economic growth and employment.

The projects proposed span the LLEP area and are cross-sectoral, covering homes, businesses, transport, power generation and energy networks.

The list of projects described in this study are proposed as high priority, highly relevant to the local region and projects that the LLEP could have a tangible and important role in

<sup>14</sup> Element Energy and Cambridge Econometrics, *Energy Challenge Paper: An ideas paper for consultation to inform the development of the Energy Infrastructure Strategy for Leicester and Leicestershire* (July 2018). See: <https://www.llep.org.uk/wp-content/uploads/2018/08/Energy-Challenge-Paper.pdf>

helping to deliver. However, the projects are certainly not an exhaustive list of the potential beneficial activities in the energy sector, and are not intended to be those that the LLEP should pursue exclusively. Throughout this report, we recommend further initiatives that the governing local authorities should pursue to help deliver a low cost, low carbon and resilient energy sector within a growing, competitive and productive local economy.

## 3 Policy review

### 3.1 National policy

In 2008, the Climate Change Act established a legally-binding requirement for the UK to reduce CO<sub>2</sub> emissions by at least 80% by 2050 compared to 1990 levels. Following the Climate Change Act, the UK set five legally binding carbon budgets each covering 5 years from 2008 to 2032. The fifth carbon budget (2028-2032) targets a 57% reduction in GHG emissions from 1990 levels. To achieve this target the pace of decarbonisation needs to be accelerated significantly. In 2015, as part of the Paris Agreement, Governments agreed 'a long-term goal of keeping the increase in global average temperature to well below 2°C above pre-industrial levels'<sup>15</sup>. The national targets are not yet high enough to achieve this target.

To meet the carbon budgets, the Government sees a growing role for local authorities and Local Enterprise Partnerships, and is supporting a localised approach to decarbonisation, as presented in the *Clean Growth Strategy*<sup>16</sup> and *Industrial Strategy*<sup>17</sup>. Local stakeholders are well placed to identify local opportunities and constraints in relation to infrastructure, skills and resources, and the Government plans to provide support to help deliver local projects. Clean growth will not only provide environmental benefits but is also an opportunity to drive economic growth, both locally and nationally. The Clean Growth Strategy estimates that the low carbon economy could grow at a rate four times faster than that projected for the economy as a whole between 2015 and 2030.

#### 3.1.1 Clean Growth Strategy

The **Clean Growth Strategy** sets out the Government's ambitions in a number of key areas. A selection of the policies and proposals most relevant for Leicester and Leicestershire are summarised below:

##### Improving Business and Industry Efficiency and Supporting Clean Growth

- Support businesses to improve their energy productivity by at least 20% by 2030
- Improve energy efficiency in new and existing commercial buildings
- Phase out high carbon fossil fuel heating in businesses off the gas grid
- Industrial Energy Efficiency scheme and new industrial heat recovery programme
- International leadership in carbon capture usage and storage (CCUS)
- Invest in research and innovation in energy, resource and process efficiency

##### Improving Our Homes

- Support for home energy efficiency under the Energy Company Obligation (ECO) extended
- Focus on fuel poor homes to be upgraded to Energy Performance Certificate (EPC) Band C by 2030
- Aspiration for as many homes as possible to be EPC Band C where cost-effective
- Strengthening of energy performance standards for energy efficiency, low carbon heating and renewable energy, in new and existing homes
- Invest in low carbon heating under a reformed Renewable Heat Incentive (RHI) scheme focusing on long-term decarbonisation, including heat pumps and biomethane
- Phase out installation of high carbon fossil fuel heating in off-gas homes in 2020s

<sup>15</sup> [https://ec.europa.eu/clima/policies/international/negotiations/paris\\_en](https://ec.europa.eu/clima/policies/international/negotiations/paris_en)

<sup>16</sup> *The Clean Growth Strategy: Leading the way to a low carbon future*, HM Government (2017)

<sup>17</sup> *Industrial Strategy: Building a Britain fit for the future*, HM Government (2017)

- Provide public funding to support construction and extension of heat networks

### Accelerating the Shift to Low Carbon Transport

- End the sale of all new conventional petrol and diesel cars and vans by 2040
- Support the uptake of ULEVs through a variety of schemes
- Make the UK's electric vehicle charging network one of the best in the world through investment and new powers under the Automated & Electric Vehicles Bill
- Support the uptake of low emission taxis through the Plug-in Taxi programme
- Provide funding support for retrofitting and new low emission buses
- Provide investment to increase cycling and walking for shorter journeys
- Invest in innovation in technologies including electric batteries

### Delivering Clean, Smart, Flexible Power

- Reduce power costs for homes and businesses through measures including the smart systems plan to help consumers use energy more flexibly
- Improve the route to market for renewable generation technologies, phasing out the use of unabated coal
- Increase deployment of small scale power generation including solar PV
- Invest in innovation in technologies including energy storage, innovative demand response and grid balancing technologies, nuclear power and renewables
- Work towards zero avoidable waste by 2050 and maximise the value extracted from resources, and publish a new Resources and Waste Strategy

### Leading in the Public Sector

- Voluntary wider public and higher education sector carbon reduction targets
- New funding for public sector energy efficiency across the UK
- Support a local approach to reducing emissions

The **Industrial Strategy** identifies 5 key foundations on which to build local economies and help the UK to prosper<sup>18</sup>:

- **Ideas**; the world's most innovative economy
- **People**; good jobs and greater earning power for all
- **Infrastructure**; a major upgrade to the UK's infrastructure
- **Business environment**; the best place to start and grow a business
- **Places**; prosperous communities across the UK

Key strategies presented in the Industrial Strategy include:

### Research and Innovation

- Invest in innovation through the new Industrial Strategy Challenge Fund
- Raise total R&D investment and increase the R&D tax credit to 12%
- Invest in education, especially in maths, science, digital and technical disciplines
- Support people to re-skill through a new National Retraining Scheme

### Infrastructure

- Support investment in transport, housing and digital infrastructure through increased investment in the National Productivity Investment Fund
- Encourage the uptake of electric vehicles via investment in charging infrastructure
- Invest in intra-city transport through the Transforming Cities fund

<sup>18</sup> *Industrial Strategy: Building a Britain fit for the future*, HM Government (2017)

**Productivity**

- Increase sector productivity through Sector Deals
- Support SMEs growth and improve their productivity
- Agree on Local Industrial Strategies

**3.1.2 National Planning Policy Framework**

The revised National Planning Policy Framework (NPPF) was released in July 2018, and provides a framework within which Local Plans for domestic and non-domestic development can be produced. All local governments in England are bound by this framework.

A summary of the current status of local planning policy in Leicester and Leicestershire is provided in section 3.2, and a description of the constraints the NPPF places on local authorities wishing to drive low carbon development through planning policy is provided in section 5.1.2.

**3.2 Local policy**

**Targets**

In 2008, the Climate Change Act established a legally-binding requirement for the UK to reduce CO<sub>2</sub> emissions by at least 80% by 2050 compared to 1990 levels. To meet the carbon budgets, the Government sees a growing role for local authorities and local enterprise partnerships, as presented in its recent Clean Growth Strategy<sup>19</sup> and Industrial Strategy<sup>20</sup>.

**County and City level**

In light of Government objectives, the City and County Councils of Leicester and Leicestershire have both committed to reach 100% clean energy by 2050 as part of the UK100 Pledge. This will be achieved by bringing together private and public-sector organisations and working with other UK100 members to share learning and influence national policy. The City Council has also pledged to reduce its carbon emissions by 50% by 2025, from a 1990 baseline. County-wide carbon emission reduction targets were previously published in the Leicestershire Carbon Reduction Strategy. This strategy has now been replaced with the new Environment Strategy. However, county-wide carbon emission reduction targets have not been set in the new Environment Strategy due to the County Council’s lack of control over county-wide emissions. Although county-wide targets have not been set, the County Council has made commitments to reduce CO<sub>2</sub> emissions generated by the Council. In the new Environment Strategy, approved in July 2018, a target of 38% reduction in Council-generated GHG emissions by 2030 (compared to a 2016/17 baseline) was agreed. This is in line with the national target of 80% reduction by 2050.

**Local authority level**

In order to achieve the City and County level targets described above, it is important for the local authorities to set interim targets for carbon emission reductions and clean energy uptake on a local level. At this level, the City of Leicester is a unitary authority, whereas the tier below County level comprises seven district councils.

Melton Borough, Harborough District, North West Leicestershire District, Blaby District, Hinckley & Bosworth Borough and Charnwood Borough Councils, along with Leicester City

<sup>19</sup> HM Government, The Clean Growth Strategy: Leading the way to a low carbon future (October 2017)

<sup>20</sup> HM Government, Industrial Strategy Building a Britain fit for the future (November 2017)

Council and the County Council, had all previously made commitments to tackle Climate Change locally by signing up to the Climate Local Commitment<sup>21</sup>. Climate Local was a Local Government Association initiative aiming to help local councils address climate change. A requirement of the scheme was for local authorities to publish specific, measurable and determined climate change commitments for which they were accountable. However, this initiative was ended in March 2016. Although it has now ended, some planning authorities continue to report on the commitments made.

Blaby District Council has made a specific commitment to reduce carbon emissions by 34% by 2020 from a 2010 baseline<sup>22</sup>, whilst in 2015, Charnwood Borough Council made a carbon pledge to reduce its carbon footprint by 15% by 2020, from a 2012/13 baseline. A 2016/17 interim progress report<sup>23</sup> also commissioned by the Borough shows that Charnwood had already achieved a 21% carbon footprint reduction by this date. The Council, however, also suggests that only 9% of the 21% was due to locally led initiatives, and that the remaining 12% resulted from the decarbonisation of the national electricity grid. Setting clear local targets relating to CO<sub>2</sub> emissions reductions is important as it helps local regions understand the scale of what needs to be done to stay in line with national objectives. From these targets, it is then possible to set uptake targets for specific technologies (e.g. energy efficiency rollout, renewable generation installed capacity, heat pump installation etc.) for specific sectors (e.g. domestic, commercial etc.). Measuring the progress of a region's emissions reduction can be difficult due to the dependence of progress on national changes such as grid decarbonisation. An approach used by certain LAs is a 'bottom-up' approach, where savings are estimated on a 'per measure installed' basis.

### Strategic growth and planning policy

Leicester and Leicestershire released for consultation a draft Strategic Growth Plan<sup>24</sup> to 2050 in January 2018. The vision of the ten partner organisations preparing the Plan is that it will address challenges and bring opportunities to light that all nine of the planning authorities within Leicester and Leicestershire face. In its final version it will identify broad locations where development might take place and the infrastructure necessary to deliver this development. *The Strategic Growth Plan is the overarching plan which will set out the aspirations for delivering growth (housing, economic, infrastructure) in Leicester and Leicestershire until 2050. The Strategic Growth Plan will:*

- *Give confidence, to the market, Government, local businesses and residents, that the Councils and the LLEP are working together effectively on a shared ambition that is based on a solid understanding of the opportunities and risks;*
- *Provide businesses and other organisations in Leicester and Leicestershire, with some direction and certainty, when they are planning for their own growth.*

New Local Plans are currently being prepared for the majority of the local authority areas in Leicester and Leicestershire. Leicester City Council is preparing a Draft Local Plan; Harborough and Melton District Councils and Oadby & Wigston Borough Council have submitted new Local Plans for assessment by the Ministry of Housing, Communities and Local Government (MHCLG); and Hinckley & Bosworth District Council is preparing a new Local Plan to be adopted in 2021.

<sup>21</sup> Local Government Association, Climate Local Annual report 2015/16

<sup>22</sup> Blaby District Council Climate Local Commitment Plan (June 2013)

<sup>23</sup> Charnwood Borough Council and the Carbon Trust – Carbon Management Plan 2015-2020 – FY 2016/17 Monitoring Report (May 2018)

<sup>24</sup> Leicester & Leicestershire 2050: Our vision for growth, Consultation Draft (September 2018)

### **Leicester City Council**

The City Council's planning policy encourages low carbon development, in particular regarding the use of CHP, district heating networks and renewable energy generation. In their Core Strategy adopted in 2014<sup>25</sup>, Policy 2 on 'Addressing Climate Change and Flood Risk' states that:

- *Wherever feasible, development should include decentralised energy production or connection to an existing Combined Heat and Power or Community Heating System.*
- *Development should provide for and enable, commercial, community and domestic scale renewable energy generation schemes.*

Leicester City Council recently published their Development Management Policies document (July 2017) as part of their new Local Plan consultation process, having released an Emerging Options document in 2017 which sets out in broad terms how the city is expected to change during the period to 2031. In this Development Management Policies document, LCC suggests policy formulation that addresses climate change. Planning policy for major new developments will follow an energy hierarchy in which firstly energy use is minimised, secondly energy is supplied efficiently and thirdly energy is supplied through renewable sources.

Regarding policy surrounding minimizing energy consumption, Leicester City Council refers to a "fabric first" approach in their Development management policies reference document<sup>26</sup>. This approach is one where buildings 'must be constructed of high quality energy efficient fabric before the energy efficiency of heating systems is considered'<sup>27</sup>. Leicester City Council is considering options for ensuring a high level of energy efficiency in new build as part of its new Local Plan, including criteria based on the BREEAM<sup>28</sup> and Code for Sustainable Homes (CSH)<sup>29</sup> schemes of building sustainability assessment and certification.

### **Harborough District Council**

In March 2018, the district of Harborough submitted a revised version of the Harborough Local Plan 2011 to 2031 to the Secretary of State. In this draft revised Local plan, Harborough district lists improved resilience to the impacts of climate change by 2031 as one of its main visions; the District Council aims to achieve this through energy efficient design and through the use of low carbon design technologies and techniques in new developments. Specifically, the Council will ensure that new developments are designed with the following energy considerations, in priority order: passive design, energy efficient design of building services including decentralised networks and finally the inclusion of renewable energy at building or site level. Regarding the energy efficiency of buildings, the Council will at a minimum adopt the energy efficiency requirements described in Building Regulations Part L but will also support the higher standards set out in BREEAM, Passivhaus and the new home Quality Mark schemes. Regarding decentralised energy systems, Harborough District Council has identified Strategic Development Areas (SDAs), inside of which a feasibility study for the provision of a local network must be undertaken. If a decentralised system is not included, the promoter must 'demonstrate that it is not practical or feasible'.

<sup>25</sup> Core Strategy – adopted July 2014, Leicester City Council (2014)

<sup>26</sup> Draft development management policies, Leicester City Council

<sup>27</sup> Leicester City Council - Development management policies reference document (July 2017)

<sup>28</sup> <https://www.breeam.com/>

<sup>29</sup> The CSH is a method of assessing and certifying the sustainable design and construction of new homes. Link:

The planning policy surrounding renewable and low carbon energy generation is also addressed in the Council's revised Local Plan. The District Council permits renewable and low carbon energy generation as long as a number of criteria are met, e.g. it avoids harm to species, it minimises visual and audible impact etc. In light of these criteria, the District Council commissioned a study, the Landscape Sensitivity to Renewable Energy in Harborough District (July 2016), to identify suitable areas within Harborough for renewable energy generation. The study identified the areas with the largest capacity to accommodate renewable energy generation to be Upper Soar and Lutterworth Lowlands Landscape Character Areas.

Harborough Energy, a private, not for profit company, co-ordinates the energy co-ops around Harborough and provides them with support. Through their successful solar-electricity co-operative, Harborough Solar One, they are providing low-cost, low-carbon electricity to two local schools. Further projects are being launched and will contribute towards Harborough Energy's Community Fund. However, the organisation is predominantly run by volunteers and ambitions currently outstrip the ability to deliver due to reduced subsidy support and limited potential to bring in technical and governance expertise.

Regarding sustainable transport, in order for commercial and residential developments to be permitted, Harborough District Council requires the provision of 'electric vehicle (EV) recharging facilities where appropriate'.

**Melton Borough Council**

Melton Borough Council's Local Plan is due to be adopted in autumn 2018. The revised Local Plan proposes largely similar planning policy to Harborough District Council in terms of energy efficiency, decentralised energy, renewable electricity generation and EV charging stations.

Melton Borough Council also encourages that a holistic view be taken on energy requirements of a development to include the construction and lifetime energy demand. The Borough Council requires development proposals, including refurbishments, to demonstrate that they have sourced their materials locally and through reused, recycled and renewable sources, and that these materials have been 'transported in the most sustainable manner and have low embodied energy'.

The Borough Council has produced the Melton and Rushcliffe Landscape Sensitivity Plan (2014), which indicates the areas which have the most capacity and are the least sensitive for renewable wind energy development in terms of impact on the landscape.

Grid capacity constraint issues have been highlighted over the course of this study in Leicester and Leicestershire. It is important for districts to be aware of these so that their planning policy can be written to highlight the areas best suited to new development. Melton Borough Council is considering a Utility Master plan to identify infrastructure improvements required to support future growth<sup>30</sup>.

**Oadby & Wigston Borough Council**

Oadby & Wigston Borough Council submitted its revised 2011 – 2031 Local Plan to the Secretary of State for MHCLG in January 2018. In support of this submission, the District

<sup>30</sup> LLEP Energy Strategy - Melton Borough Response

Council commissioned a joint Climate Change Evidence Base Study<sup>31</sup> with Leicester City Council which was published in December 2015.

The policies which Oadby & Wigston Borough Council has implemented reflect the Council's fundamental vision regarding climate change 'to reduce energy consumption and increase efficiency, to reduce our carbon emissions, associated costs, and to act as an exemplar for the wider community'<sup>32</sup>.

The output of the joint Climate Change Evidence Base Study with LCC included the formulation of two draft policies that have been adapted and incorporated in Oadby and Wigston Borough Council's revised Local Plan. The first, regarding renewable and low carbon energy, suggests that 'all developments greater than one hectare in size will be required to incorporate on-site renewable energy generation or on-site provision of buildings that reduce the need for non-renewable energy use'. The second requires all major-scale planning applications, including refurbishments, to be accompanied by a Sustainability / Energy Statement. This statement should 'demonstrate how (potential) harmful emissions will be reduced by addressing issues, including energy efficiency, water conservation, sourcing of construction materials, giving consideration to site orientation aspects of a scheme, promoting sustainable means of transport, sustainable waste management solutions (during and post-construction), and the feasibility of integrating renewable energy solutions into the development'.

#### ***Hinckley & Bosworth Borough Council***

Hinckley & Bosworth Borough Council is currently updating its evidence base and supporting studies ahead of making revisions to its Local Plan. The council aims to submit the new Local Plan for examination by the Planning Inspector in 2020 and adopt it in 2021.

Hinckley & Bosworth's Climate Change Strategy and Action Plan 2014 – 2017 outlines the steps that the Borough has taken to address Climate change in recent years, a number of which are included below:

- Signing Climate Local;
- Introducing a Carbon Management Plan;
- Undertaking a Renewable Energy Capacity Study;
- Adopting the Leicestershire Municipal Waste Management Strategy Update 2011;
- Implementing the Hinckley and Bosworth Green Travel Plan;
- Developing a Sustainable Purchasing Policy;
- Co-founding the Climate Mitigation and Adaption group (CLIMA).

#### ***Blaby District Council***

Blaby District Council adopted the most recent version of its Local Plan in February 2013. Ahead of its adoption, the District Council also commissioned a Climate Local Commitment Plan in June 2011 as part of the evidence base for its Local Plan. Policy 21 in Blaby's Climate Local Commitment Plan sets out requirements for developments to mitigate climate change. The policy encourages items such as reducing energy demand through siting, layout and design of new development as well as the provision of renewable, low carbon and decentralised energy generation. Largely, the planning policies regarding climate change in Blaby's Local Plan are consistent with those mentioned above; however, in Blaby District's Local Plan, there appears to be a specific focus on the locating new developments in 'the

<sup>31</sup> Climate Change Evidence Base Study, Leicester City Council and Oadby & Wigston Borough Council (December 2015)

<sup>32</sup> Borough of Oadby & Wigston, Carbon Management Plan (June 2010)

most sustainable locations'. Blaby District Council has acted on this by commissioning studies to identify these locations, including the Blaby District: Assessment of Key Employment Sites in September 2016.

### ***Charnwood Borough Council***

The Charnwood Local Plan 2011 to 2028 was adopted in November 2015. Charnwood Borough Council highlights the opportunity to go beyond energy efficiency requirements set out nationally in the Building Regulations. Charnwood Borough Council aspires that the low carbon initiatives it proposes will result in a 10% reduction in CO<sub>2</sub> emissions 'when compared to the Building Regulations prevailing at the time when the scheme is proposed'. Regarding renewable energy generation, Charnwood Borough Council has included specific numerical targets alongside its policies. For example Policy CS16, which promotes provision of energy from renewable or low carbon energy developments, sets out a specific target: that 27.5 MW of energy will be provided by decentralised and renewable sources by 2028.

### ***North West Leicestershire District Council***

The North West Leicestershire Local Plan was adopted in November 2017 and it sets out local strategy for delivering homes, jobs and infrastructure in the district between 2011 and 2031. The Local Plan is currently undergoing a partial review (as of February 2018). The planning policies described in the Local Plan are largely consistent with those mentioned above. In its current form, the North West Leicestershire Local Plan allows micro renewable energy installations, such as solar panels, at the household level without a requirement for specific planning permission. Interestingly, this is not the case in other councils in the UK, for example in Bristol, where homeowners must apply for planning permission for residential solar installations.

The North West Leicestershire Local Plan also notes other interesting findings, including the potential for renewables to meet energy demand in the district. There is the potential for over 255 MW of renewably electricity and 217 MW of renewable heat in 2020 in the district. Wind energy shows the greatest potential within this, making up 80% of the renewable electricity potential. In light of this finding, North West Leicestershire District Council has published maps showing the areas with the most potential for small and medium/large scale wind energy projects. The District Council is able to use these maps to designate specific sites on which wind electricity generation is encouraged and distribute planning permits for wind turbines accordingly. Other planning authorities in the Leicester and Leicestershire area have undertaken similar studies.

### **Other locally-led initiatives**

Leicester City Council is supporting the supply of affordable, low carbon energy to almost 3,000 homes and public-sector buildings through the Leicester District Energy Scheme. The scheme is operated by ENGIE in partnership with Leicester City Council and the University of Leicester. The scheme includes more than 14km of district heating pipework and serves council homes across six housing estates as well as De Montfort Hall, the Town Hall, a number of schools, community centres and libraries. The heat is supplied by CHP and biomass boiler plant and saves over 15.4 thousand tonnes of CO<sub>2</sub> emissions per year.

The Energy Projects team, part of Leicester City Council's Energy and Sustainability Department, runs a number of projects to help the city achieve its 2025 decarbonisation target. Current projects include Green BELLE, which provides SMEs with grants of up to £10,000 to install low carbon and energy efficient measures in their premises, including heating, insulation, lighting and renewable energy, and SET-UP, which is looking at the implementation of smart grid technologies in local authorities and regions across Europe.

The Energy projects team’s role in SET-UP is to participate in a number of knowledge exchange meetings, as well as setting up a local stakeholder group in Leicester to share knowledge and produce a local action plan<sup>33</sup>.

The City Council has identified the need for a smart, connected approach with one of their ‘Great City’ priorities to *‘be recognised as a SMART, connected city that uses technology to deliver better services and reduce our carbon footprint’*<sup>34</sup>. They are supporting the uptake of EVs in the area through increased public charge points, a grant scheme providing up to 40% of the difference between a diesel and ULEV and salary sacrifice schemes for purchasing cars that emit <120 gCO<sub>2</sub>/km<sup>35</sup>. The Council has temporarily suspended the maximum age at which a taxi can be licensed to delay the replacement of old vehicles until the end of March 2019 when it is expected that ULEVs will be available for hackney carriage operators. The Council is also leading by example and has added 17 electric vehicles to its own office car share fleet and has purchased a ULEV hackney cab to be used as a demonstrator to local drivers interested in buying one.

North West Leicestershire Council has committed to replacing all solid fuel heating within council-owned properties by 2025. Many of these properties are off-gas grid so alternative, low carbon options need to be considered. The Government is currently gathering evidence on options for off-gas grid buildings<sup>36</sup>.



**Figure 3-1: Leicester City Council have added 17 electric vehicles to their fleet<sup>37</sup>**

In 2012, Market Harborough won Big Lottery Fund’s Communities Living Sustainably Programme which was used to fund Sustainable Harborough (ended in December 2017). One of the outputs of the project was to deploy a demonstration EcoHouse to monitor energy consumption in households. Raising awareness of energy demand, showcasing energy efficient development and raising community engagement are important activities that districts can engage in to support climate change mitigation.

<sup>33</sup> Projects, Leicester Energy Agency website

<sup>34</sup> *Leicester: Great City – Economic Action Plan 2016-2020*, City Mayor (2016)

<sup>35</sup> Weblinks: <https://www.ss4c.com/news-articles/leicester-city-council-shortlisted-for-green-salary-sacrifice-car-scheme.html>

<https://www.ss4c.com/news-articles/leicester-city-council-completes-transport-offering-to-employees-with-tusker.html>

<sup>36</sup> *A future framework for heat in buildings: call for evidence*, BEIS (2018)

<sup>37</sup> BBC Local Live

## 4 Current and future energy use

### 4.1 Current energy use

The figures below show the current energy use in Leicester and Leicestershire by sector, fuel type and local authority area. The total energy use across domestic, non-domestic and road transport sectors in Leicester and Leicestershire is currently 22,100 GWh/yr. Figure 4-1 shows the split of energy use by sector; domestic, non-domestic and road transport.

Figure 4-1: Energy use in Leicester and Leicestershire by sector<sup>38,39,40,41</sup>

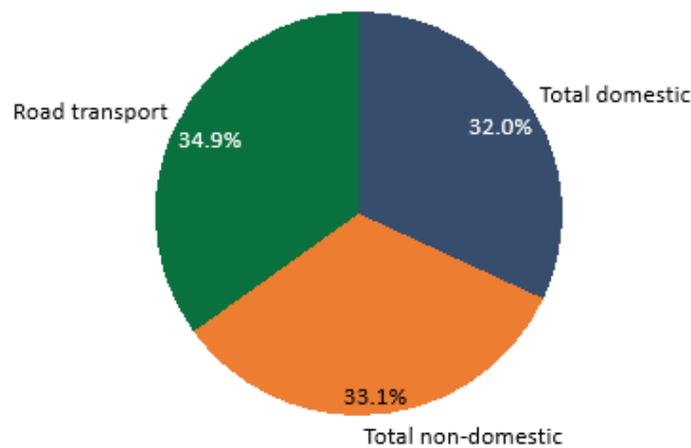
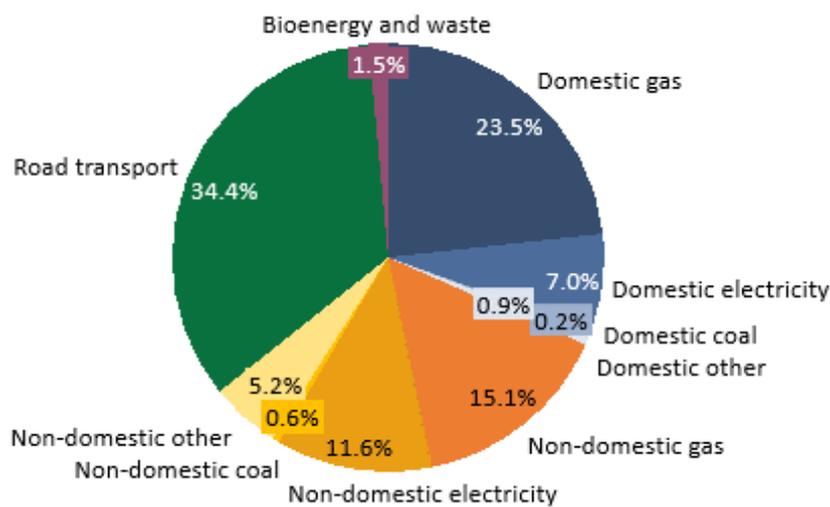


Figure 4-2: Total energy use by sector and type for Leicester and Leicestershire<sup>43,44,45,46</sup>



<sup>38</sup> Sub-national gas sales and numbers of customers: 2005-2016, BEIS (2018)

<sup>39</sup> Sub-national electricity sales and numbers of customers: 2005-2016, BEIS (2018)

<sup>40</sup> Sub-national road transport fuel consumption: 2005-2015, BEIS (2017)

<sup>41</sup> Sub-national residual fuel consumption in the United Kingdom: 2005-2015, BEIS (2017)

Figure 4-2 shows the total energy use broken down by sector and fuel type. Gas is the dominant fuel used in both the domestic and the non-domestic sector, followed by electricity. Domestic coal use is low, at just 0.2% of the domestic use and 0.6% of the non-domestic. This is slightly lower than average for England where coal use makes up 0.3% and 1.0% of domestic and non-domestic fuel use respectively. Bioenergy and waste use makes up just 1.5% of the total fuel use across all sectors. This is significantly lower than the average for England of 2.9%.

Energy use by sector and local authority area is shown in Figure 4-3. The total energy use in Leicester and Leicestershire is 22,100 GWh/yr. Leicester has the largest total energy use of the local authority areas at 5,572 GWh/yr, in line with the large number of homes and businesses located in the city. Energy use for road transport is high in Blaby and North West Leicestershire, relative to the other sectors; this is likely to be due to vehicles using the M1, A40 and accessing East Midlands International Airport.

Figure 4-3: Total energy use by sector and local authority area, GWh/yr <sup>43,44,45,46</sup>

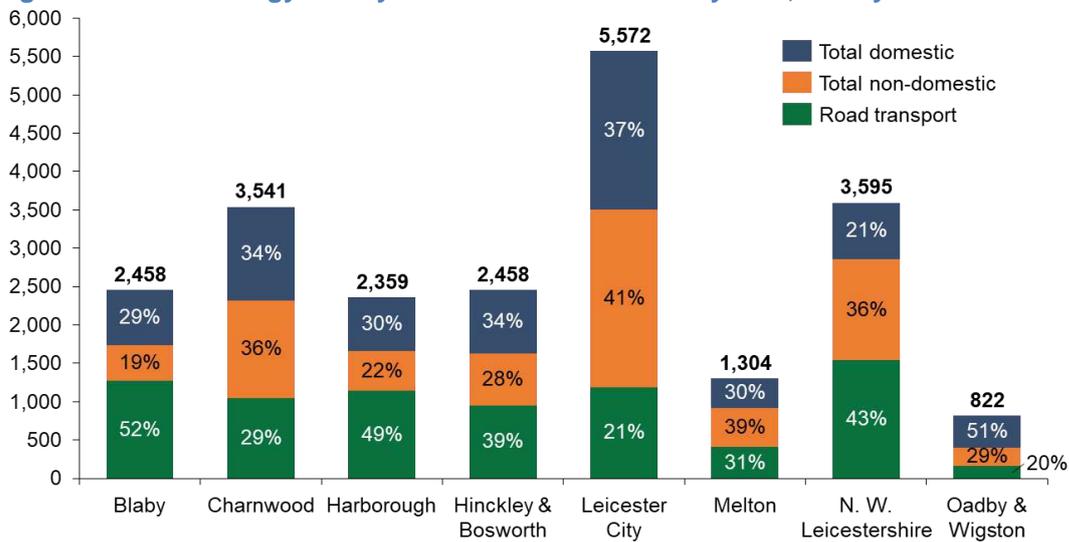
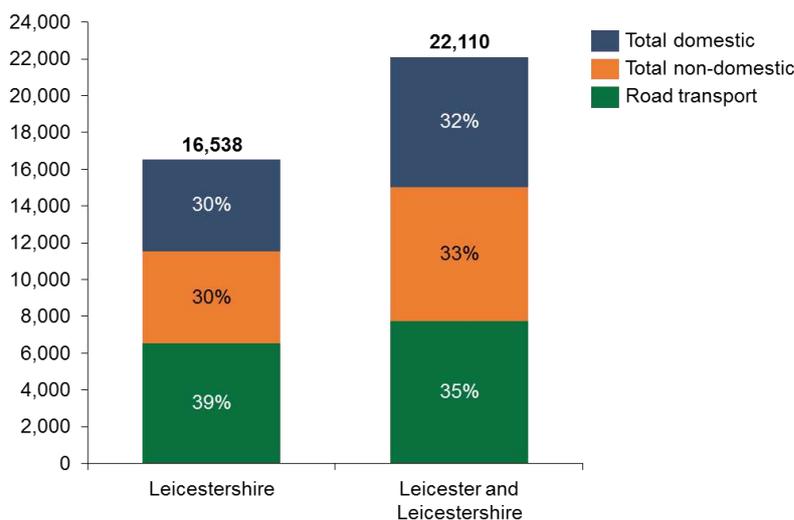


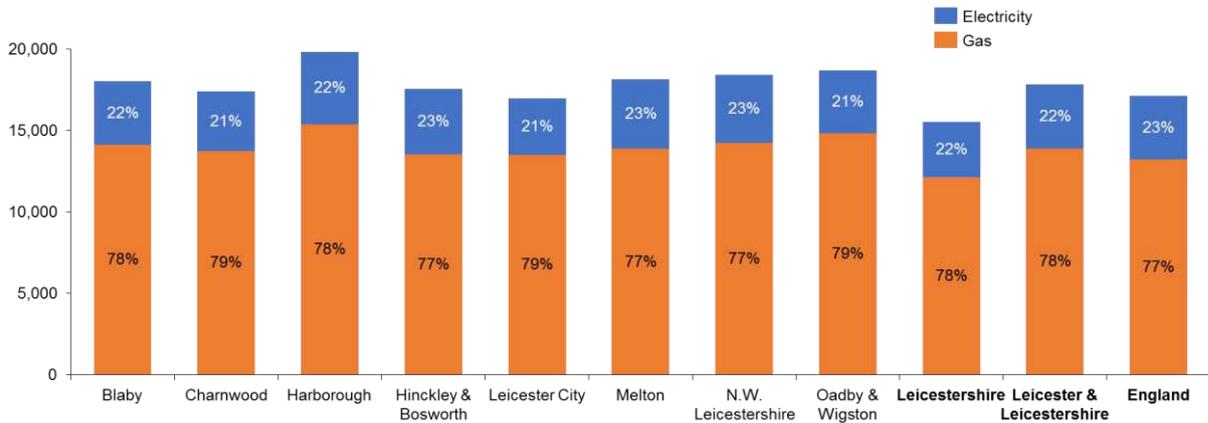
Figure 4-4: Total energy use by sector for agglomerated areas, GWh/yr <sup>43,44,45,46</sup>



The average use of gas and electricity per household is shown for each local authority area in Figure 4-5. The dashed lines show the average use per household for England. Domestic fuel use per household in Leicester is slightly below the average for England but for all other

districts in Leicestershire it is higher. Harborough has the highest average fuel use per household, 16% higher than the England average.

Figure 4-5: Mean energy use per household by local authority area, kWh/yr<sup>43,44,45,46</sup>



## 4.2 Future energy scenarios

In this section the future energy demand for Leicester and Leicestershire is explored for three potential future energy scenarios. The objective of the energy scenario modelling exercise is to present a range of potential visions for the future energy system in the area, and to use these to highlight the potential challenges and opportunities that could arise due to the changes the energy transition may bring about.

The scenarios are not intended to present a detailed view of the potential for deployment of specific technologies in Leicester and Leicestershire, or an ‘optimum’ future energy system. Rather, they represent a high-level vision of a possible future energy system consistent with the UK’s decarbonisation obligations, within which the role of specific technologies can be understood. The potential energy infrastructure project opportunities described in a later section of this paper will be viewed in the context of these scenarios, to understand how these projects might fit into the future energy system in Leicester and Leicestershire.

The first scenario is a ‘Baseline scenario’ based on the BEIS ‘Reference Case’<sup>42</sup>. The scenario projects the future final energy demand based on current and planned policy as of July 2017. The electricity generation projections are based on a model of supplier behaviour, which reflects current policy up to 2020 and assumptions that go beyond current policy over the period to 2035<sup>43</sup>. The BEIS reference scenario is only available up to 2035 and is extended out to 2050, assuming a continuation of trends in energy intensity. This scenario does not achieve the UK’s decarbonisation targets, missing the 2050 target of 80% reduction in carbon emissions versus 1990 level. However, the scenario does include current and planned policy measures that deliver energy savings in the short to medium-term. Increases in energy consumption in the longer term over the 2030-2050 period reflect increases in economic activity and population growth, with limited change in energy intensity over the period.

Two decarbonisation scenarios are presented, both of which achieve high levels of decarbonisation consistent with the UK’s current 2050 obligations. However, they encompass different approaches to achieve this goal, reflecting the current uncertainties

<sup>42</sup> Updated Energy and Emissions Projections 2017, BEIS (2018)

<sup>43</sup> For more information about the BEIS reference scenario, see:

[https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/671187/Updated\\_energy\\_and\\_emissions\\_projections\\_2017.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/671187/Updated_energy_and_emissions_projections_2017.pdf)

around national low carbon policy and the decarbonisation pathway for key sectors of energy use.

The first scenario is based on extensive electrification of energy demand for heating and transport, and the other involves the widespread deployment of decarbonised gas (biogas and hydrogen) to meet those demands. These scenarios are designed to represent two distinct potential future scenarios, which will each bring distinct challenges and opportunities, and require different types of infrastructure investment. It is important to note that, even at the local level, the 'electrification' and 'decarbonised gas' options could coexist to some degree. The two scenarios shown here are defined to contrast strongly in the decarbonisation approach taken, in order to highlight the different implications of the electrification and decarbonised gas options.

All scenarios and underlying energy demand forecasts are based on national-level scenarios from which local projections are derived based on regional GVA and population growth.

The high electrification scenario is based on the Committee on Climate Change's 'Central' scenario from the analysis underpinning the 5<sup>th</sup> Carbon Budget<sup>44</sup>. It is consistent with a future where one in six cars are fully electric by 2030 and all cars are electric by 2050. A small amount of petrol and diesel consumption by road transport in 2050 reflects use by heavy-duty vehicles that are more difficult to decarbonise. The electrification scenario also assumes high electrification of heating and industry, with electricity reflecting around 40% of total industrial energy demand by 2050. The scenario does not include any hydrogen but does include 950 GWh consumption of biogas and biomethane consumption across Leicestershire by 2050.

The Decarbonised Gas scenario is an alternative low-carbon scenario which assumes high roll-out of hydrogen gas, so that, by 2050, hydrogen provides 100% of gas demand in the agriculture, domestic and services sector. The re-purposing of the gas grid mostly happens in the 2040s, with limited hydrogen blend in the gas grid before this date. In this scenario, hydrogen would likely be produced using steam methane reformation combined with carbon capture and storage (CCS). Recent reports have suggested that this is likely to be the most cost-effective method of producing low carbon hydrogen at scale<sup>45</sup>. However, CCS has not yet been proven commercially viable. Therefore, although literature<sup>46,47,48,49</sup> suggests that the hydrogen for heating pathway shows promise and merits further development and demonstration, there is still significant uncertainty around the viability of delivering hydrogen at scale and the associated costs. In this scenario, hydrogen also has an important role in the road transport sector, which is assumed to decarbonise through roll-out of fuel-cell electric vehicles (FCEVs). By 2050, it is assumed that hydrogen accounts for 80% of energy demand in road transport. Similar to the Electrification scenario, there is also an increase in the share of demand met by biogas and biomethane in the medium-term. However, it is assumed that no new biogas or biomethane capacity is built post-2030, as hydrogen begins to be rolled out.

<sup>44</sup> Fifth Carbon Budget Dataset, Committee on Climate Change (2016)

<sup>45</sup> Figure 10, The Royal Society, Options for producing low-carbon hydrogen at scale (policy briefing) <https://royalsociety.org/~media/policy/projects/hydrogen-production/energy-briefing-green-hydrogen.pdf>

<sup>46</sup> Element Energy & E4tech for the NIC, Cost analysis of future heat infrastructure options (March 2018)

<sup>47</sup> Imperial College London for the CCC, Analysis of alternative UK heat decarbonisation pathways (August 2018)

<sup>48</sup> H21 Leeds City Gate team, H21. Link: <https://www.northerngasnetworks.co.uk/wp-content/uploads/2017/04/H21-Report-Interactive-PDF-July-2016.compressed.pdf>

<sup>49</sup> The Liverpool-Manchester Hydrogen Cluster: a low cost deliverable project (August 2017)

### 4.2.1 Baseline scenario

In the Baseline scenario, energy demand falls slightly in the medium term, as planned policies are implemented, but then picks up in the period post-2030, reflecting growth in population and economic activity, with limited further change in energy intensity. By 2030, total energy demand in the LLEP area falls to 21.7 TWh but then starts to increase, reaching 24 TWh by 2050. The share of energy by sector remains fairly steady over the projection period, with road transport, industry and household each consuming around one third of final energy in Leicestershire. The road transport sector remains dependent on petroleum in the long term and, although there is some limited electrification of heating and industry. Natural gas continues to play an important role in the energy mix.

Figure 4-6: Energy demand by sector (Baseline Scenario)

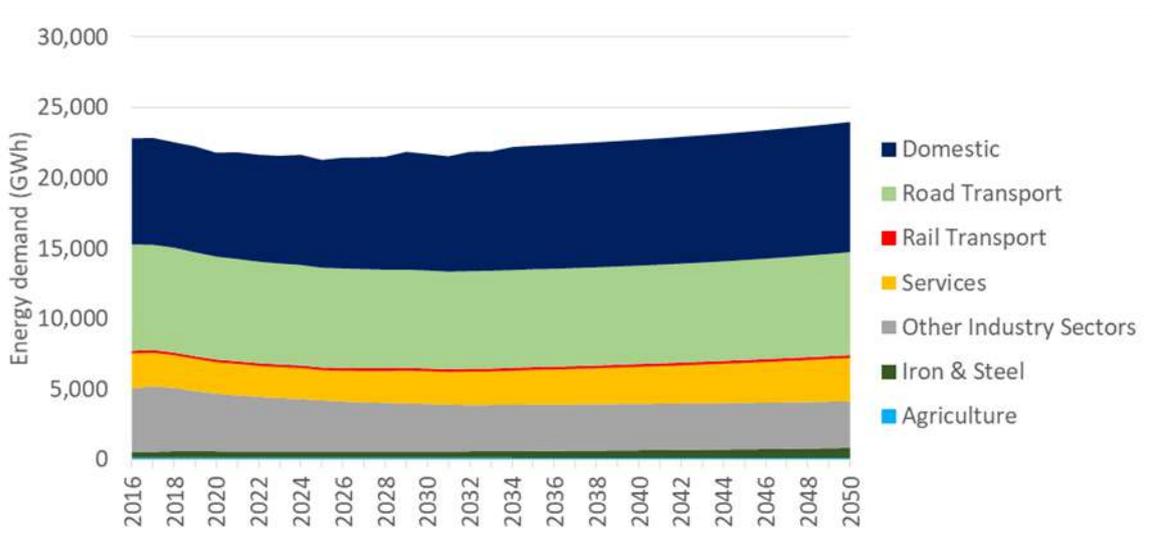
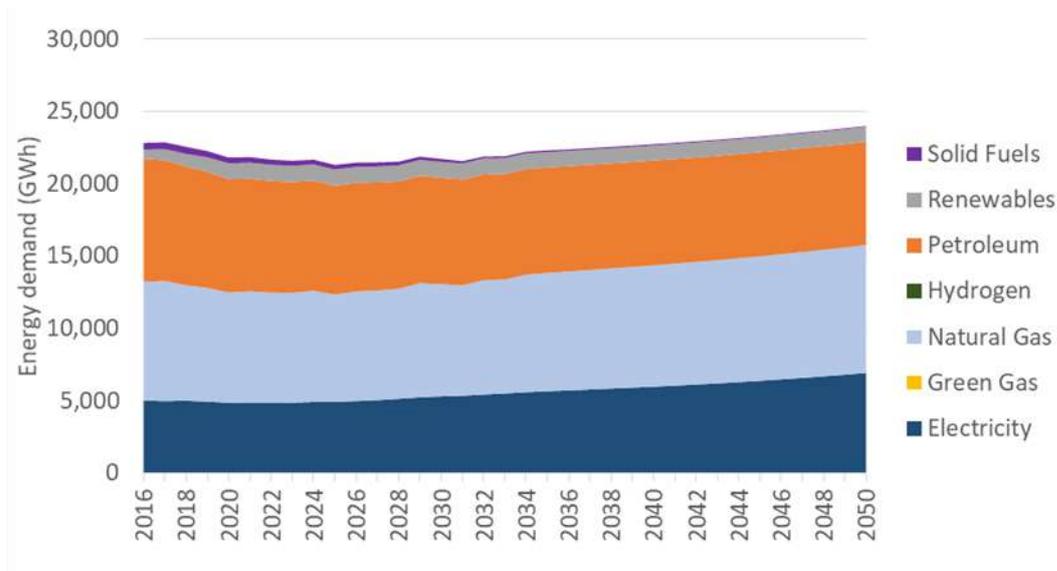


Figure 4-7: Energy demand by fuel (Baseline Scenario)



### 4.2.2 Decarbonisation scenarios

#### Electrification scenario

In the Electrification scenario, there is a steady fall in final energy demand, reflecting energy efficiency improvements and fuel switching (from petrol/diesel to electricity in road transport, and from gas to electricity for heating). By 2050, energy demand falls to 12.8TWh, of which around 45% is derived from the domestic sector, 13% in road transport and 42% in industry and service sectors. The share of electricity in final energy demand increases from the 22%, in 2016, to 58% by 2050, reflecting electrification of heating, industry and road transport.

Figure 4-8: Energy demand by sector (Electrification Scenario)

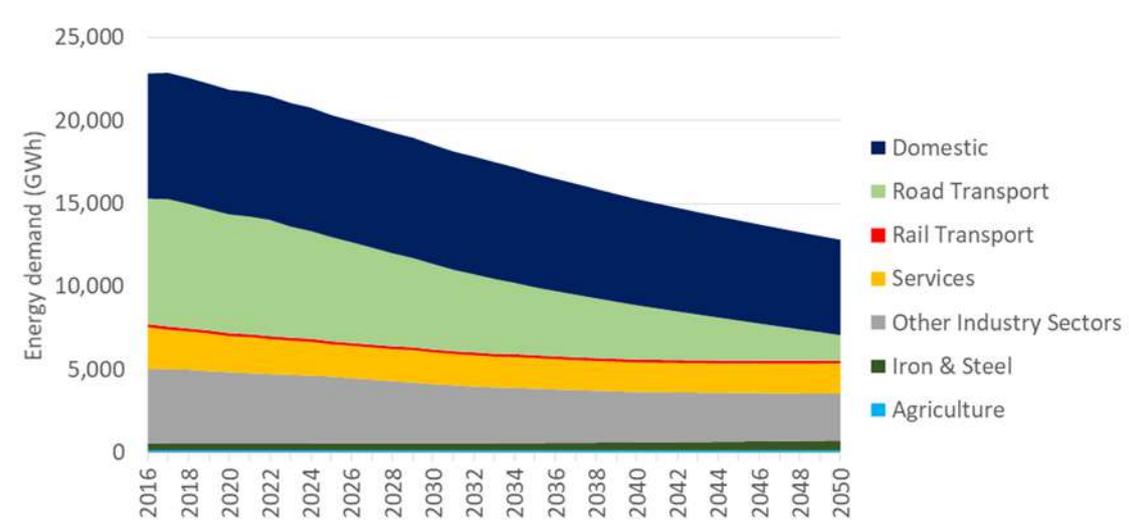
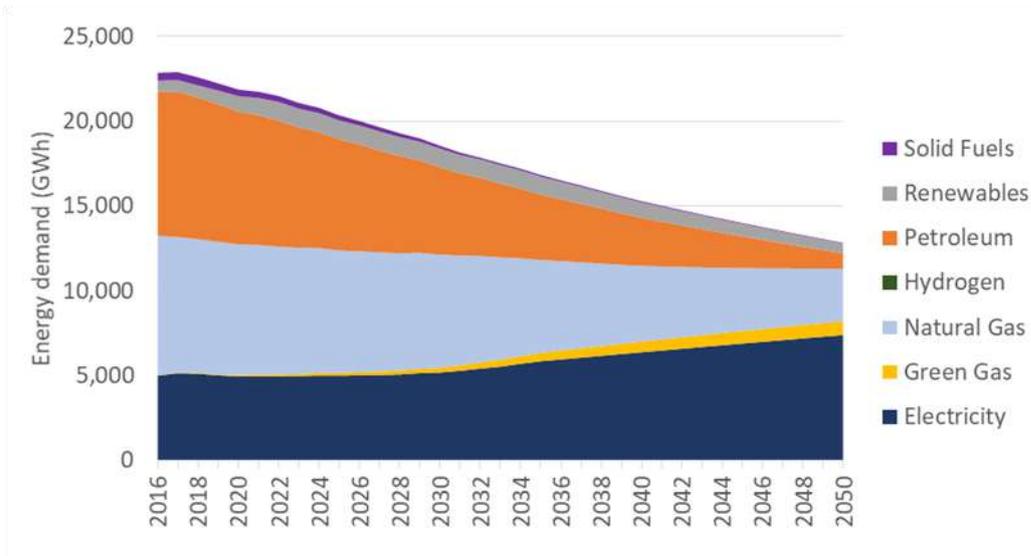


Figure 4-9: Energy demand by fuel (Electrification Scenario)



**Decarbonised gas scenario**

The Decarbonised Gas scenario is characterised by energy efficiency improvements and electrification in the medium-term, with hydrogen deployment playing an important role in the energy system in the longer term. By 2050, hydrogen accounts for around one third of final energy demand, following large investments to repurpose the gas grid to transport hydrogen at concentrations of up to 100%. This hydrogen transition mostly takes place after 2040, with the gas grid only assumed to be able to support hydrogen gas blends of <10% in the years before 2040. Similar to the Electrification scenarios, the road transport sector sees the largest fall in energy demand, due to efficiency improvements associated with the switch to fuel-cell electric vehicles in the medium to long-term.

Figure 4-10: Energy demand by sector (Decarbonised Gas Scenario)

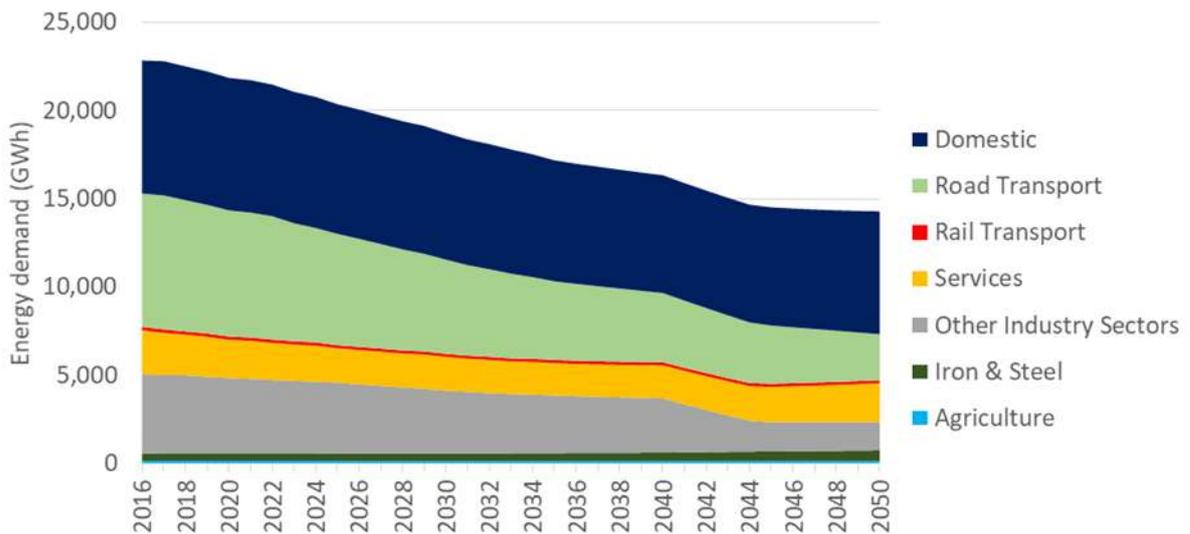
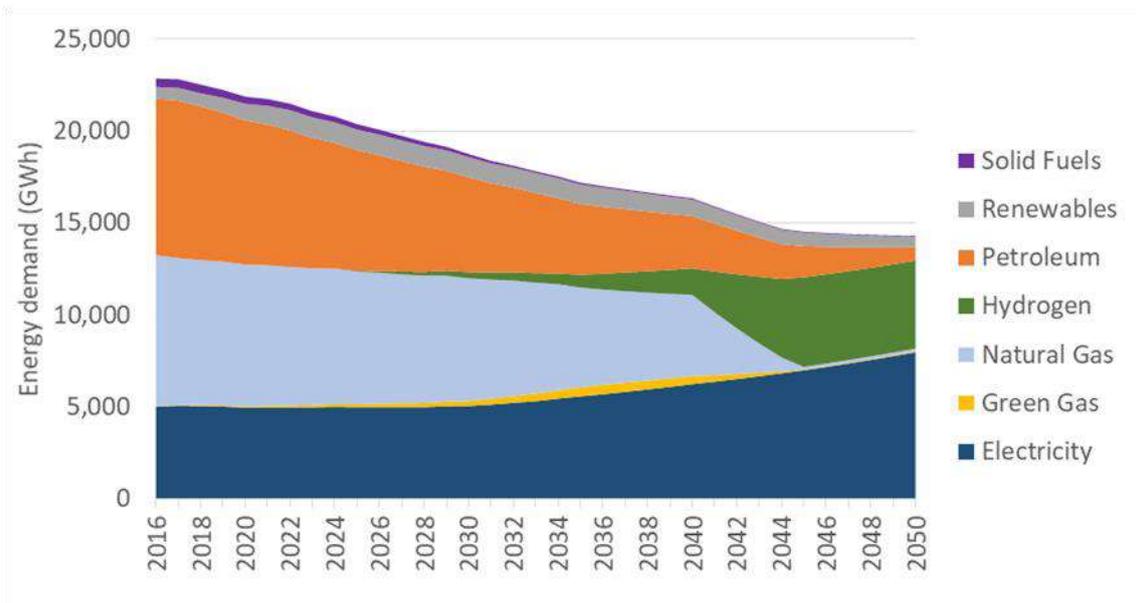


Figure 4-11: Energy demand by fuel (Decarbonised Gas Scenario)

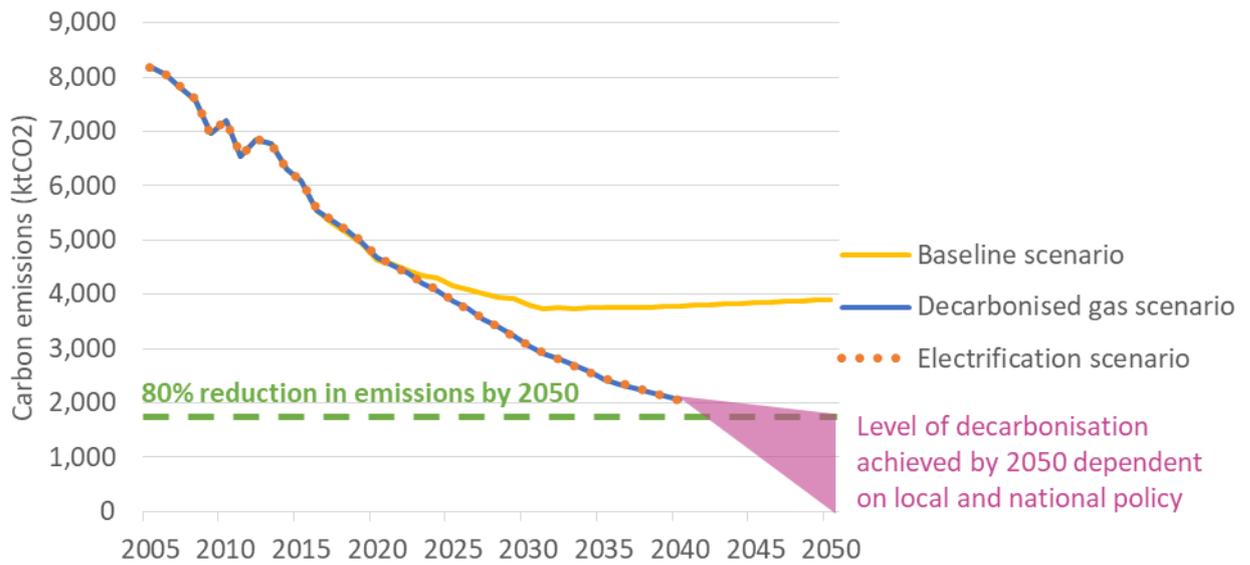


### 4.2.3 CO<sub>2</sub> emissions

The UK Climate Change Act requires the UK to reduce its carbon emissions by at least 80% by the year 2050, from a 2008 baseline. The Leicester and Leicestershire area is required to play its part in this reduction. As shown in Figure 4-12, the two low-carbon scenarios meet the 2050 emissions target, whilst the Baseline scenario falls short of meeting this target. Regarding interim milestones, the City Council has pledged to halve the City’s carbon emissions by 2025, from a 1990 baseline, through its Sustainability Action Plan<sup>50</sup>. This is consistent with the UK Climate Change Act commitment. According to Figure 4-12, this level of decarbonisation is also achieved as far as the whole region is concerned in all scenarios, even the Baseline (assuming that carbon emissions in 1990 were higher than in 2005). This is a very important point, as it shows the extent to which progress towards reducing emissions to date has been due to electricity grid decarbonisation, which has taken place on a national level.

<sup>50</sup> Leicester City Council, Leicester’s Sustainability Action Plan 2016 – 2019 (updated 2017)

Figure 4-12: Comparison of CO<sub>2</sub> emissions in each scenario<sup>51</sup>



In the Baseline scenario, there is a gradual fall in CO<sub>2</sub> emissions over the period to 2030, reflecting the implementation of planned policies, including transport and product efficiency policies, industrial energy efficiency policy (e.g. Climate Change Agreements), as well as policies affecting the power sector (the Industrial Emissions Directive, EU ETS, Carbon Price Support, Contracts for Difference and Renewables Obligation, among others). In line with the BEIS Reference scenario, the carbon intensity of electricity is assumed to fall to nearly zero (74 gCO<sub>2</sub>/kWh by 2035 and then is assumed to remain at this level in subsequent years). Over the period post 2035, we assume no further policies are put in place to further decarbonise the economy and so there is a gradual increase in CO<sub>2</sub> emissions over this period, reflecting an increase in economic activity and population growth. As shown in Figure 4-12, this scenario falls short of meeting the target for 80% emissions reduction as set of in the UK Climate Change Act 2008.

By contrast, the continued low carbon policy in the Decarbonised gas and Electrification scenarios means that emissions fall below the 80% reduction target level by 2050, and these scenarios are both in principle consistent with the national emissions pathway to meet the 2050 climate targets. The level of carbon emissions reduction achieved by 2050 – that is, whether this falls to zero or somewhere between zero and the 80% reduction target level – will be dependent on national, as well as local policy. This remains highly uncertain at the current time, and this modelling does not attempt to design scenarios around a specific 2050 target.

Leicester City Council and Leicestershire County Council have pledged to reach 100% clean energy by 2050 as part of the UK100 Pledge. While it is not clear what this will mean in practice, it is unlikely that any remaining fossil fuel consumption will be compatible with this. As such, it is likely that the energy system will need to be decarbonised by 2050 to an extent where it reaches the lower level of the purple wedge indicated in Figure 4-12.

<sup>51</sup> Local Authority level emission projections are only available from 2005 onwards. The 80% emissions reduction target in 2050 is relative to 1990 levels and UK-level growth in emissions over 1990-2005 is used to extend backwards the time-series for CO<sub>2</sub> emissions in Leicestershire. Using this method, emissions in Leicestershire in 1990 are estimated to be 9,050 ktCO<sub>2</sub> and the 80% reduction target for 2050 is therefore set at 1,810 ktCO<sub>2</sub>.

It is also useful to highlight the UK's commitment to the UN Framework Convention on Climate Change (COP21) that was agreed in Paris in December 2015. Following this convention, the UK government has announced<sup>52</sup> that by 2020 it will disclose how it proposes to meet the target of keeping the increase in global average surface temperatures to well below 2°C above pre-industrial levels, and pursuing efforts to limit the temperature increase to 1.5°C. This information will be useful for local councils around the country to adapt their decarbonisation strategies to be coherent with policies at the national level. Though the decision in 2020 at the national level will likely affect the pathway from 2035-40 onwards, there are many actions that can be undertaken today (e.g. uptake of energy efficiency, heat networks, heat pumps, renewable generation etc.) that are seen as 'low regrets', and that are valid irrespective of the longer-term pathway chosen. In the following sections we list recommended steps specific to Leicester and Leicestershire which are robust to any pathway chosen.

---

<sup>52</sup> Committee on Climate Change, UK climate action following the Paris Agreement (October 2016)

## 5 Implementation strategy

We have segmented Leicester and Leicestershire's Energy Infrastructure Strategy into three targeted themes:

- Improving the energy efficiency of our homes and businesses, and supporting clean growth;
- Accelerating the shift to low carbon transport;
- Delivering clean, smart, flexible power.

These themes are aligned with the national Clean Growth Strategy<sup>53</sup>.

### 5.1 Improving the energy efficiency of our homes and businesses, and supporting clean growth

#### 5.1.1 Introduction

Improving the energy efficiency of our homes and businesses is a national priority. In the non-domestic sector, the Government's Clean Growth Strategy suggests that, at the national level, £3 billion could be saved annually through improving the efficiency of buildings and processes, including fitting better insulation and smarter energy controls. This same report suggests that a further £3 billion could be saved from eliminating electricity waste in business, including through more efficient lighting and energy management. Accordingly, the Government's ambition is to improve energy efficiency by at least 20% by 2030 in business and industry.

The retrofit of homes with wall, loft and floor insulation, and other improvements to the fabric of the building, not only creates better quality homes but cuts the costs of heating them and reduces carbon emissions. There are health advantages to improved energy efficiency too: cold homes can exacerbate existing poor health conditions. The Government aims to upgrade all fuel poor homes to Energy Performance Certificate (EPC) Band C by 2030, and has an aspiration for as many homes as possible to be EPC Band C by 2035 where practical, cost-effective and affordable.

Support for home energy efficiency through the Energy Company Obligation (ECO) has been extended, but with a reduced level of funding compared with the period up to 2017 and, accordingly, a focus on fuel poor homes. There remains a large gap in energy efficiency policy relating to non-fuel poor homes since the Green Deal was abandoned in 2015.

In terms of heating fuels and technologies for homes, a reformed Renewable Heat Incentive (RHI) was introduced in May 2018 with a focus on long-term decarbonisation, including biomass heating, heat pumps, solar thermal and biomethane.

Several actions have been taken at the national level that are relevant to business and industry in Leicester and Leicestershire. Firstly, the Government has committed to establishing an Industrial Energy Efficiency scheme to help large companies install measures to cut their energy use and bills. Secondly, in August 2018 the Government confirmed that it is implementing an Industrial Heat Recovery Support Programme, through which £18m funding will be available to '*encourage investment by manufacturers to recover and reuse heat from industrial processes that would otherwise be wasted*'.

<sup>53</sup> HM Government, The Clean Growth Strategy - Leading the way to a low carbon future (October 2017)

### 5.1.2 Policy context

Local planning policy can be applied to promote cost-effective energy efficient development and will be an important lever to support any energy infrastructure strategy in Leicester and Leicestershire. The National Planning Policy Framework (NPPF), released in July 2018, provides guidelines on the requirements that Local Plans can set for new development, and on the limits of what Local Plans can stipulate.

Current planning policy in the NPPF allows local authorities to impose restrictions on new developments both in terms of the level of energy efficiency to which buildings must be constructed and the way in which energy demand of the buildings is supplied.

The NPPF suggests that the level of energy efficiency should adhere to national standards (i.e. those set out in Building Regulations). However, local authorities are able to use their existing powers under the Planning and Energy Act 2008<sup>54</sup> to 'impose reasonable requirements for development to comply with energy efficiency standards that exceed the energy requirements of building regulations'.

Regarding energy provision, the revised NPPF makes specific reference to decentralised energy supply and suggests that *'in determining planning applications, local planning authorities should expect new development to comply with any development plan policies on local requirements for decentralised energy supply unless it can be demonstrated by the applicant, having regard to the type of development involved and its design, that this is not feasible or viable'*. However, the revised NPPF does not make provision for other low carbon heating systems (e.g. heat pumps, hybrid heat pumps, hydrogen and biomass boilers) to replace traditional gas boilers and direct electric heaters. Nor does the revised NPPF *'require applicants to demonstrate the overall need for renewable or low carbon energy'*.

It is worth noting that although the NPPF makes no explicit reference to the low carbon heating technologies outlined above (e.g. heat pumps), their uptake may be supported through energy efficiency clauses in Local Plans. Heat pumps, for example, are a heating technology that extract heat from the environment, typically the air or ground, and in some cases water sources, and transfer this heat to where it is needed. The heat transferred from the environment is considered a renewable source of heat. A heat pump requires energy to achieve this heat transfer, usually in the form of electricity. Heat pumps are several times more efficient than traditional direct electric or storage heaters (where efficiency is defined as useful heat delivered per unit of electrical energy input<sup>55</sup>). Therefore, if stringent energy efficiency requirements are imposed on a development, only a combination of high efficiency construction materials and efficient heating technologies, such as heat pumps, may meet these. So, the uptake of heat pumps may be supported implicitly if Local Plans require energy efficiency standards that exceed Building Regulations, as they are able to via the Energy Act.

### 5.1.3 Rationale and constraints

The reasons for improving energy efficiency in businesses and homes are many, including<sup>56</sup> reducing fuel bills, thereby alleviating fuel poverty and improving health and well-being in the residential sector, and increasing competitiveness, profitability and productivity in

<sup>54</sup> Chapter 21, Planning and Energy Act 2008

<sup>55</sup> Electrical resistive heating is 100% efficient. Heat pumps usually have a seasonal efficiency approximately in the range 250% to 400%. For each unit of energy (usually electricity) required to drive the heat pump 2.5 to 4 units of useful heat are produced.

<sup>56</sup> IEA, Capturing the Multiple Benefits of Energy Efficiency (2014)

businesses; reducing carbon emissions; improving air quality; better managing local resources and reducing the reliance on imported energy sources.

However, there exist constraints and barriers to putting energy efficiency into practice. Those most pertinent to Leicester and Leicestershire include the following:

- National standards for building energy performance could be more ambitious;
- Funding sources for financing energy efficiency projects are scattered for different building segments; there is no single body bringing together consumers and investors;
- Businesses and homeowners can have difficulty identifying where they can save energy and find certain energy efficiency measures too disruptive to install;
- The payback periods for certain energy efficiency measures are too long for many consumers across all sectors;
- ‘Split incentives’ in relation to energy efficiency measures in the private rented sector. This refers to the observation that tenants may be reluctant to pay the initial capital expenditure of such measures, because the payback period may be longer than they expect to stay in the home, and landlords can be reluctant to do the same because they do not directly incur the bill savings or comfort benefits.

#### 5.1.4 Suggested solutions with specific project examples

#### 5.1.5 Project opportunity 1: Planning policy to improve our homes

##### The economic impact of going beyond the Building Regulations

During the period 2006-2015, Government was committed under the Zero Carbon Homes policy for all new homes to be zero carbon from 2016, and (from 2008) for all new non-domestic buildings to be zero carbon from 2019. However, the Zero Carbon Homes policy was dropped in 2015 to reduce regulations on housebuilders. The current building regulations remain substantially less stringent in terms of carbon emissions performance than the Zero Carbon standard. Under the Energy Performance in Buildings Directive (EPBD), the UK is obligated to ensure all new buildings are ‘nearly-zero energy’ buildings by the end of 2020; it is not currently clear how the Government intends to fulfil this requirement, and indeed whether it intends to fulfil it, in light of the UK’s planned departure from the EU.

In 2014, the Zero Carbon Hub undertook a cost analysis<sup>57</sup> of meeting the zero carbon standard for a selection of different building archetypes. The report concluded that cost allowances considered to be reasonable for achieving the proposed Zero Carbon Standard varied in the range ~£6,700-7,500 for detached homes, ~£3,700-4,700 for semi-detached and mid-terraced properties and ~£2,200-2,400 for low-rise apartments. These are the estimated costs above Part L1A 2013 building standards for achieving the Zero Carbon standard. Our analysis shows that if all new buildings in Leicester and Leicestershire between now and 2050 were built to the zero carbon standard, the cumulative CO<sub>2</sub> savings would be in the region of 3.3 MtCO<sub>2</sub> and the required investment would be approximately £560 m<sup>58</sup>.

<sup>57</sup> Zero Carbon Hub in partnership with Sweett, Cost analysis: meeting the zero carbon standard (February 2014)

<sup>58</sup> Calculated assuming the expected growth rate to 2036 is maintained to 2050. Calculation also assumes the building type split of flats/maisonettes to houses/bungalows is 31% to 69% (based on data from the 2011 Housing Census by the Office for national statistics).

In 2013, the UK Government published a separate study<sup>59</sup> to determine the cost-optimal level of energy efficiency in new buildings, the emissions levels from these buildings are shown in Table 5-1. The cost-optimal level for a given house type is defined as ‘*the energy performance level which leads to the lowest cost during the estimated economic lifecycle*’<sup>60</sup>. The standard of energy efficiency to which buildings are constructed today, as outlined in the Building Regulations, is similar to the cost-optimal level calculated in this 2013 study (in fact, the current standards are more energy efficient than the cost optimal level, however, they are very close with uncertainty sensitivity).

Even higher energy efficiency standards, such as those required for the Passivhaus certification, could also be supported, even though they incur a positive cost for the carbon saved. One reason for considering these higher levels is to use them in exemplar developments to better understand customers’ willingness to pay for a level of energy efficiency that goes beyond the (current) cost-optimal level. Another reason arises from the consideration that buildings constructed today will still be in use in 50 years. By that stage, net emissions from the building stock will need to fall to very low levels, and potentially to zero. Therefore, if buildings constructed today are built at a level less efficient than the zero carbon level, they may either need to be retrofitted at a future date, or their emissions will need to be offset in future with negative emissions technologies<sup>61</sup>. Our analysis above demonstrates the additional cost (£560m) and carbon saved (3.3 MtCO<sub>2</sub>) by building homes to the zero carbon standard. This corresponds to an average cost of carbon abated to 2050 of £171/tCO<sub>2</sub>. For comparison, the ‘target-consistent’ carbon price for 2050, used by the Government for policy appraisal, is currently set at £227/tCO<sub>2e</sub><sup>62,63</sup>. The cost of these alternatives may be higher than the additional cost of constructing to the zero carbon level today. This trade-off between investment today and at a future date depends on many different factors and carries high uncertainty, but is something we propose the Government should be considering when setting national standards today. We suggest that the most appropriate role for the LLEP and local authorities to take at this stage is to demonstrate low and zero carbon homes in certain circumstances where there is a willingness-to-pay (on the part of consumers and/or the local authority through, for example, subsidising with lower land sale values – see section below), and to lobby the Government to consider implementing more ambitious standards for new buildings.

In Leicester City, the Council sold its Saffron Lane site to the Saffron Lane Neighbourhood Council, who then leased the land to EMH Group. The transaction was conditional on new development being constructed to a low carbon standard. Today, 68 new affordable ‘eco homes’ have been built to Passivhaus standard. This is a best-practice example of using local authority owned land to showcase exemplar low carbon development.

<sup>59</sup> Department for Communities and Local Government (DCLG), Cost optimal calculations: UK report for the European Commission (2013)

<sup>60</sup> European Union Energy Performance of Buildings Directive, Article 2.14

<sup>61</sup> Negative emissions technologies encompass a wide variety of technologies or processes, some of which are already available (e.g. CO<sub>2</sub> capture through soil, afforestation and reforestation) but many of which are at an early stage of technological development (e.g. the combustion of bioenergy combined with carbon capture and storage (CCS), direct air capture and enhanced weathering).

<sup>62</sup> HM Treasury Green Book supplementary appraisal guidance on valuing energy use and greenhouse gas (GHG) emissions supporting tables, Table 3 (December 2017).

<sup>63</sup> Note: the cost calculated here is the investment cost only and excludes the cost savings due to energy bill reduction

Table 5-1: Cost-optimal performance standards suggested by the DCLG<sup>64</sup>

Sector	Building type	CO <sub>2</sub> emissions <sup>65</sup> (kgCO <sub>2</sub> /m <sup>2</sup> /yr)
Domestic	Semi-detached	19
	Mid-floor apartment	16
Non-domestic	Office (AC)	24
	Office (NV)	14
	Secondary school	21
	Hospital	38
	Hotel (AC)	78
	Distribution warehouse	22
	Retail warehouse	35

### Best practice examples across the Leicester and Leicestershire planning authorities

Although the policies in the Local Plans of each of the eight planning authorities promote broadly similar themes, we have highlighted several aspects that we deem particularly effective, as follows:

- **Energy hierarchy.** Leicester City Council released a Development Management Policies document (July 2017) as part of its new Local Plan consultation process. In this document, LCC suggests that planning policy for major new developments will follow an energy hierarchy in which firstly energy use is minimised, secondly energy is supplied efficiently and thirdly energy is supplied through renewable sources. This energy hierarchy is one which several other local authorities in the UK promote, for example including Bristol City Council<sup>66</sup>.
- **Fabric first.** Leicester City Council supports a ‘fabric first’ approach where buildings ‘must be constructed of high quality energy efficient fabric before the energy efficiency of heating systems is considered’<sup>67</sup>.
- **Explicitly supporting energy efficiency standards that go beyond Building Regulations.** Leicester City Council is also considering BREEAM as part of its New Local Plan, though one stakeholder suggests this will need viability testing along with fabric efficiency CSH levels 4, 5 and 6. Harborough District may also support the higher standards set out in BREEAM, Passivhaus and the new home Quality Mark schemes in its revised Local Plan.
- **A holistic approach.** Melton Borough encourages that a holistic view be taken on energy requirements of a development to include the construction and lifetime energy demand. The Borough Council requires development proposals, including refurbishments, to demonstrate that they have sourced their materials locally and through reused, recycled and renewable sources, and that these materials have been ‘transported in the most sustainable manner and have low embodied energy’.

### Promoting low carbon heat networks through planning policy

Planning policy to encourage or require new buildings, particularly large new developments, to connect to heat networks is instrumental in initiating their deployment, as the guarantee

<sup>64</sup> Department for Communities and Local Government (DCLG), Cost optimal calculations: UK report for the European Commission (2013)

<sup>65</sup> Calculated assuming fossil fuel is natural gas

<sup>66</sup> Bristol City Council, Bristol Core Strategy Development Framework (2011)

<sup>67</sup> Leicester City Council - Development management policies reference document (July 2017)

of demand for heat reduces the risk to developers and investors. In cities that already have extensive heat networks, such as Copenhagen, Gothenburg, Amsterdam and Seoul, city planning or heat zoning has commonly played an effective role in creating efficient heat networks with high connection rates. Within heat network zones, connection policy can ensure that the majority of consumers connect to the heat network in the long run. Connection policy is most easily applied to new development, but for the heat network to expand more substantially, the policy often extends to existing buildings including domestic properties. In Paris, for example, heat network zones are defined within which all new buildings must connect and all existing buildings must connect within a certain timeframe, unless deemed to be economically unfeasible.

In Leicester and Leicestershire, the aim for the deployment of heat networks is to provide affordable, secure low or zero carbon heat to users. It is therefore critical that heat supplied to the heat networks is sourced from a low carbon heat source, or that there is a viable and low risk opportunity to transition to a low carbon heat source in the near future. Another important consideration is the natural monopoly characteristics of a heat network which can mean that customers connected to a network have no option to switch supplier. Accordingly, it will be crucial to ensure value and quality of service for customers, most likely through some form of oversight or regulation.

In France, to address these issues, a heat network 'classification' framework is in place that means heat networks are only able to take advantage of the type of mandatory connection policy described above if they meet the following criteria:

- The network is supplied by at least 50% renewable or recovered energy sources and will be able to retain this proportion as demand increases;
- There are no constraints to growth of the network in terms of infrastructure capacity;
- The network will supply heat at a 'reasonably cost effective' price;
- There is a system to record the amount of heat delivered at each 'node'.

**Summary and recommended actions – Planning policy to improve our homes**

The revised National Planning Policy Framework (NPPF) states that ‘any local requirements for the sustainability of buildings should reflect the Government’s policy for national technical standards’. This does not appear to support local authorities that may wish to require developers, through planning policy, to go beyond national building regulations, and it is likely that if such requirements were placed on developers that these could be challenged. Under the NPPF, tighter standards for energy efficiency and requirements for low carbon heating sources such as heat pumps in new buildings are therefore likely to require an update to national building regulations.

In the short term, more stringent building regulations are unlikely to translate into lower costs on a lifetime cost of energy basis, since the additional savings on consumer fuels are likely to be relatively small. However, if buildings constructed today are built to a lower carbon emissions standard than will be required to achieve long-term decarbonisation targets, they will either need to be retrofitted at a future date, or their emissions will need to be offset in future with negative emissions technologies. Our analysis suggests that the additional cost of building all new homes in Leicester and Leicestershire to 2050 to the ‘zero carbon’ standard would be in the region of £560m, and the additional carbon saved approximately 3.3 MtCO<sub>2</sub>. This corresponds to an average cost of carbon abated to 2050 of £171/tCO<sub>2</sub>. For comparison, the ‘target-consistent’ carbon price for 2050, used by the Government for policy appraisal, is currently set at £227/tCO<sub>2e</sub>, indicating that implementing a higher level of carbon emissions standards now could make economic sense in the long-term.

Given the limits imposed by the NPPF, and the ambition to deliver low cost energy for consumers, we suggest that the most appropriate role for the LLEP and local authorities to take at this stage is to demonstrate low and zero carbon homes in certain circumstances where there is a willingness-to-pay on the part of consumers and/or the local authority through, for example, subsidising with lower land sale values – see project opportunity 2 below.

In relation to the use of planning policy, the LLEP and local authorities could also lobby the Government to consider implementing more ambitious standards for new buildings, in order to future-proof homes against the need for retrofit in the coming decades.

### 5.1.6 Project opportunity 2: Exemplar low carbon development on local authority owned land

The Clean Growth Strategy states that local authorities are best placed to drive emission reductions through their role as substantial landowners. We therefore see opportunity for the local authorities in Leicester and Leicestershire to showcase low carbon development achieved through contractual obligations on developers building on local authority owned land or as conditions of land sale. Ambitious action from the public sector may catalyse similar projects in the private sector, fuel bills would be reduced and carbon emissions savings would be made.

In this study we have investigated suitable locations for this type of project. We describe the criteria used to determine these locations in Table 5-2 and explain the rationale and data sources used. A map with the data layers for each criteria is shown in Figure 5-1 and accompanying map key is shown in Table 5-3. Based on these data sources and analysis,

Table 5-4 finally shows our short list of nine sites in five<sup>68</sup> different locations for LAs to take forward for further consideration for exemplar low carbon development. These include:

- Land at Theddingworth Road Lubenham, Former laundry St Luke’s hospital and land at Jerwood way Market Harborough former railway in Market Harborough;
- Coalville workspace 17 in North West Leicestershire;
- Groby land off Blue Bell Drive, land at Desford Lane Ratby and former Holliers Walk primary school in Hinckley & Bosworth;
- Silverdale Hostel in Melton.

This list will evolve as time passes, and so we suggest that local authorities implement a system to reevaluate their assets for such projects in the future.

**Table 5-2: Criteria used to investigate sites for exemplar low carbon development on local authority owned land**

Criterion	Rationale	Data source
Proximity to economic growth areas	It is predicted that over 115,000 dwellings and nearly 500 hectares of employment land are required between 2011 and 2036 across Leicester and Leicestershire. This will be targeted towards specific areas.	Leicester and Leicestershire Strategic Growth Plan (2018)
Capacity of local electrical substations to cope with added electrical load	Over half of the substations in the Leicester and Leicestershire area are red RAG constrained: they function at capacity and the connection of a significant new load may require the substation to be upgraded. This may be cost and time prohibitive. In these areas there is therefore extra rationale to build high efficiency development.	Western Power Distribution <sup>69</sup>
Existence and status of local-authority owned land	In order for new development to be constructed, the land must not be currently in use	Planning teams within Leicester and Leicestershire

<sup>68</sup> In our initial assessment, the land at Franklyn Fields in the City of Leicester was identified as a site that should be taken forward for consideration of exemplar low carbon development. It came to our attention that a contract of this nature has already been agreed. As part of the contract of sale of the land to the developer, 100 homes will meet Code for Sustainable Homes Level 4. Work is expected to commence on the site in December 2018.

<sup>69</sup> Data published on <http://www.westernpower.co.uk/>

Figure 5-1: Map of local authority owned assets that should be taken forward for further consideration for the construction of low carbon development.

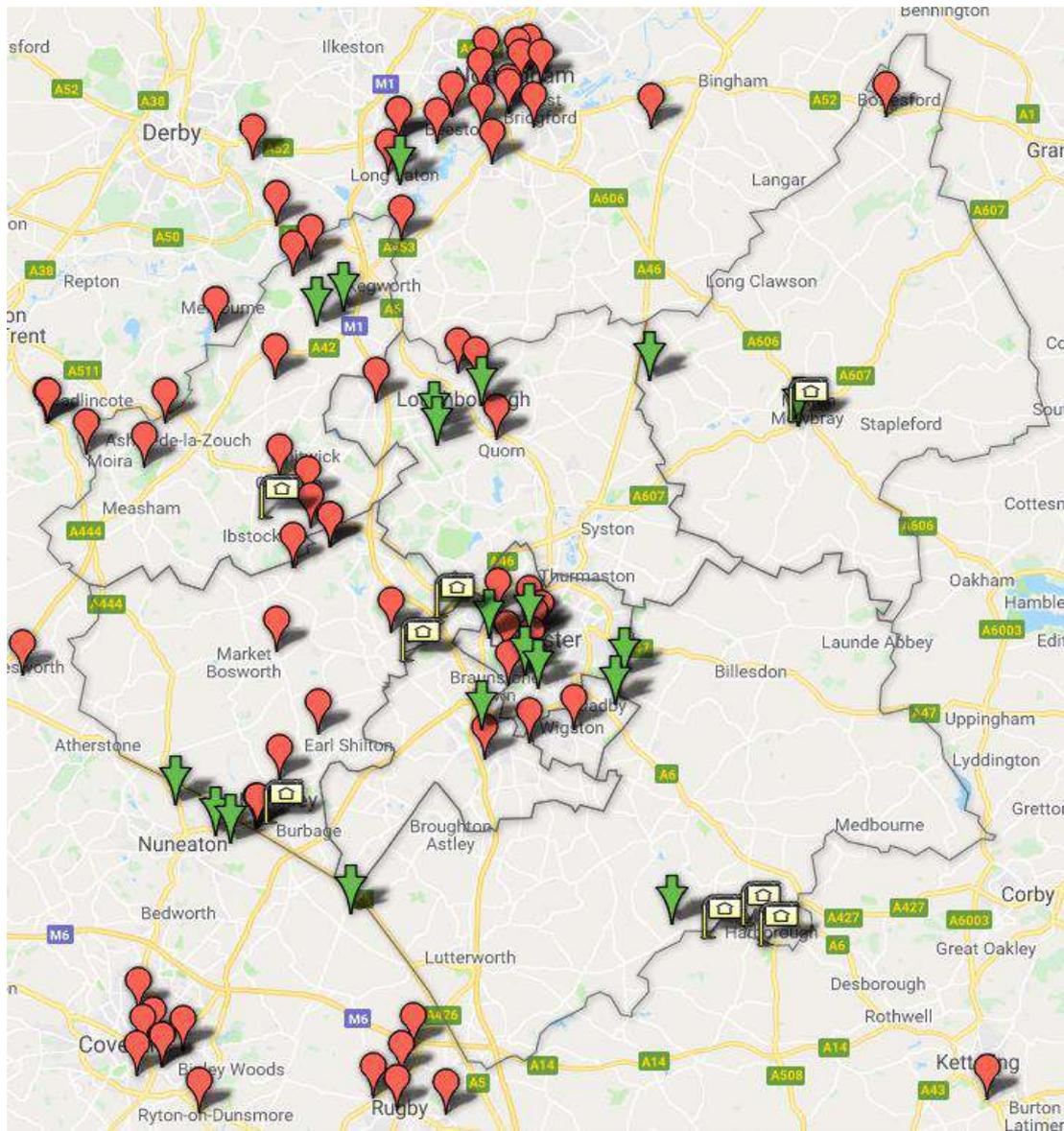


Table 5-3: Map key

Category	Symbol	Description
Electricity grid substation		Aggregate demand red RAG constrained substation (BSPs and Primaries)
Economic growth area		Economic growth area highlighted in Leicester and Leicestershire's Strategic Growth Plan (2018)
Local authority owned asset		These sites are closed and have been declared surplus

**Table 5-4: Suggested shortlist of exemplar low carbon development sites**

<b>Suggested sites</b>	<b>Rationale and constraints</b>
<i>Harborough</i>	
Land at Theddingworth Rd; Former laundry St Luke's hospital; Land at Jerwood Way	<p><b>Rationale</b></p> <ul style="list-style-type: none"> <li>• Expected construction of 514 new homes per year 2011-2036 in Harborough District</li> <li>• Market Harborough is a target site for development;</li> <li>• Good connectivity to the A6</li> <li>• Spare aggregate demand headroom at Farndon Road 33/11kv primary</li> <li>• Status of sites: declared as surplus, freehold with possession and not currently in use</li> </ul>
<i>North West Leicestershire</i>	
Coalville workspace 17	<p><b>Rationale</b></p> <ul style="list-style-type: none"> <li>• Expected construction of 448 new homes per year 2011-2036 in North West Leicestershire DC area</li> <li>• Site is not currently in use;</li> <li>• Good road transport links North-South (M1) and East-West (A511)</li> </ul> <p><b>Constraints</b></p> <ul style="list-style-type: none"> <li>• Constraint on development: local substations have limited aggregate demand headroom – they are red RAG constrained</li> <li>• Constraint on higher emissions standards: site is mixed tenure – would require agreement/coordination between owners.</li> </ul>
<i>Hinckley and Bosworth</i>	
Groby land off Blue Bell Drive	<p><b>Rationale</b></p> <ul style="list-style-type: none"> <li>• Status of sites: declared surplus, not currently in use</li> <li>• Close proximity to Leicester City where 1,688 homes will be constructed per year to 2036</li> </ul>
Land at Desford Lane Ratby	<p><b>Constraints</b></p> <ul style="list-style-type: none"> <li>• Constraint on higher emissions standards: permit laws may exclude new development on this land; sites are land only therefore they may not be suitable for new construction</li> <li>• Constraint on development: local Primaries (Desford 33/11kV and Groby Road 33/11kV) have limited aggregate demand headroom – they are red RAG constrained</li> </ul>
Former Holliers Walk primary school	<p><b>Rationale</b></p> <ul style="list-style-type: none"> <li>• Asset status: not currently in use and freehold with possession</li> <li>• Expected construction of 454 new homes per year 2011-2036 in Hinckley &amp; Bosworth</li> <li>• Proximity to A5 Improvement Corridor around Hinckley</li> <li>• Proximity to several key development sites: Centre for Connected Autonomous Vehicles, MIRA Enterprise Zone and the Engineering Skills Training Centre at MIRA</li> </ul> <p><b>Constraints</b></p> <ul style="list-style-type: none"> <li>• Constraint on development: local Primary (Middlefield 33/11kV) and local BSP (Hinckley 132/33/11kV) have limited aggregate demand headroom – they are red RAG constrained</li> </ul>
<i>Melton</i>	
Silverdale Hostel	<p><b>Rationale</b></p> <ul style="list-style-type: none"> <li>• Asset status: not currently in use, declared surplus and freehold with possession</li> <li>• Melton is a key centre for regeneration and growth</li> <li>• Close proximity to Agri-Food and Drink Processing, an economic growth area</li> <li>• Spare aggregated demand headroom (local substations are amber RAG constrained)</li> <li>• Close to Melton Mowbray train station (CrossCountry &amp; East Midlands Trains)</li> <li>• Expected construction of 170 new homes per year 2011-2036 in Melton district</li> </ul>

**Summary and recommended actions – Exemplar low carbon development on local authority owned land**

Our analysis undertaken in relation to Project opportunity 1 indicates that implementing a higher level of carbon emissions standards for new buildings today could make economic sense in the long-term, as this would mitigate the need to retrofit these homes to achieve the very deep levels of decarbonisation that will be required. Given the limits imposed by the NPPF, and the ambition to deliver low cost energy for consumers, we suggest that the most appropriate role for the LLEP and local authorities to take at this stage is to demonstrate low and zero carbon homes in certain circumstances where there is a willingness-to-pay on the part of consumers and/or the local authority through, for example, subsidising with lower land sale values.

Project opportunity 2 explores the most suitable approaches to delivering exemplar low carbon developments and potentially suitable sites across Leicester and Leicestershire. We recommend that the LLEP and the relevant local authorities undertake the following actions:

- Consult with real estate developers and businesses to determine the type, scale, approximate investment and projected energy consumption of the new development they wish to build;

Undertake a more detailed assessment of the shortlisted sites in

- Table 5 4 to identify the most suitable locations for a further exemplar low carbon development on local authority owned land. Factors for site assessment could include:
  - Total additional investment required to reach the higher carbon emissions standards, and the associated fuel and CO<sub>2</sub> emissions savings;
  - Impact on property sale value and economic viability of the development given consumer demand;
  - Loss of value of asset (or lost revenues from leasing it) if contractual obligations on the developer are required
  - Potential to refurbish any existing buildings on site, cost to demolish any unusable assets;
  - Demand headroom at local electricity substation.
- Further investigate the project on Saffron Lane where 68 new ‘eco homes’ were built for the social housing provider EMH Group to determine best practices and learnings;
- Identify which low carbon standard the LA wishes to include in its contractual obligations to the tenant or buyer (examples include Passivhaus, BREEAM (Building Research Establishment Environmental Assessment Method), Zero Carbon Hub versions of Zero Carbon Homes<sup>1</sup>, zeroHaus, Plusenergiehaus, the German KfW-building standard or Minergie from Switzerland)<sup>1</sup>.

### 5.1.7 Project opportunity 3: One-stop shop for energy efficiency retrofit

Using planning policy to require new developments to be built to a certain level of energy efficiency, as outlined above, is a useful mechanism for decarbonising the buildings sector. However, our analysis shows that energy demand remains dominated by existing buildings to 2050 and beyond. If the level of domestic building rate outlined in the Strategic Growth Plan is continued to 2050 (~150,000 new buildings to 2050), and these new homes are constructed to current standards outlined in Part L of Building Regulations, their energy demand will be 305 GWh/year in 2050. In comparison, energy demand from the existing stock is 7,070 GWh/year today – energy demand therefore, remains dominated by existing buildings to 2050 and beyond. Retrofit of the existing building stock, through the application of energy efficiency measures such as wall and loft insulation, more efficient glazing and others, is an effective means of reducing heat demand and therefore carbon emissions, whilst also lowering heating bills and in some cases improving thermal comfort.

In this analysis, we estimate the remaining potential for energy efficiency measures in the domestic and non-domestic stock and determine the potential energy and carbon emissions savings that would result from their installation. We also estimate the capital investment required to retrofit the building stock and the benefit to consumer by calculating the fuel bill savings.

#### **Domestic stock**

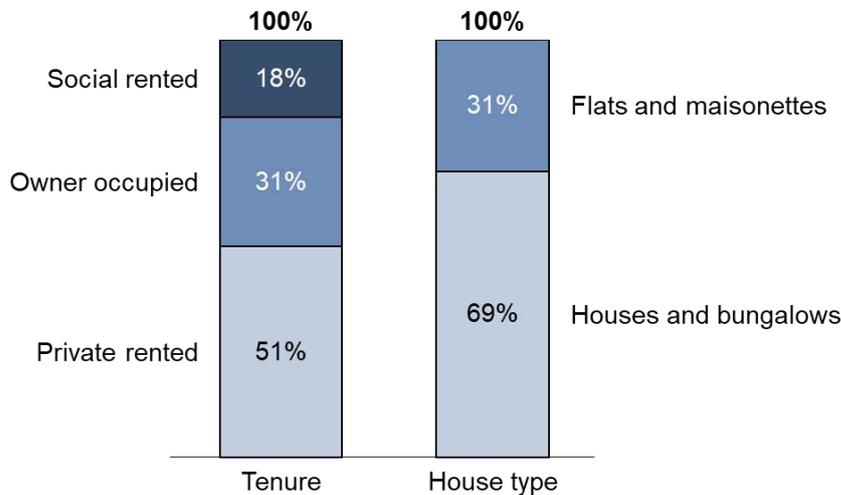
Our analysis shows that the domestic buildings sector in the Leicester and Leicestershire area currently accounts for one third of energy use and by 2050, under both decarbonisation scenarios, will account for close to 50% of energy use. Energy use in homes currently accounts for 31% of the region's carbon emissions, so decarbonising the domestic stock is crucial.

In order to gain an understanding of the remaining potential for retrofit of existing buildings in Leicester and Leicestershire, it is first interesting to analyse the building stock. In the domestic sector in 2011 there were close to 391,000 homes and 31% of these were in Leicester City, as shown in Table 5-5. It has been assumed in this analysis that buildings built between the years 2011-2018 have limited potential for retrofit, and so the remaining potential is based on dwellings built before 2011. Different building stock segments have different energy consumption profiles; local data on domestic tenure and house type was available and is displayed in Figure 5-2.

Table 5-5: Number of homes in Leicester and Leicestershire in 2011<sup>70</sup>

Local authority	Number of homes
Leicester City	123,104
Blaby	38,774
Charnwood	66,565
Harborough	35,018
Hinckley & Bosworth	45,464
Melton	21,532
North West Leicestershire	39,192
Oadby & Wigston	21,305
<b>Total</b>	<b>390,954</b>

Figure 5-2: Segmentation of households in Leicester and Leicestershire by tenure and house type in 2011<sup>71</sup>



Our domestic stock analysis is based on a 2013 Element Energy study for the Committee on Climate Change that investigated the potential carbon savings from residential energy efficiency in the UK. We have assumed that the remaining potential for energy efficiency in Leicester and Leicestershire’s building stock is representative of that in the UK building stock due to the absence of local studies on this matter.

Our analysis identified the remaining potential for key home insulation measures: wall, loft, floor and window insulations in Leicester and Leicestershire’s stock; the detailed results of which are shown in Table 5-6. We expect that, if all measures are applied, fuel savings amounting to approximately 1.65 TWh would be achieved, and the majority of these would be non-electrical fuel savings. Our analysis shows that solid wall (including internal and external) insulation has the greatest potential for reducing energy demand. The results of the potential fuel savings are shown in Figure 5-3. The benefits and costs of these installations are shown in Table 5-7. In total we expect that annually, 0.3 MtCO<sub>2</sub> and £97m could be saved from the installation of these measures, and that £2.4 billion of investment would be required. Over 40 years, which is the typical lifetime of these measures, £3.9 billion

<sup>70</sup> Leicester and Leicestershire Strategic Housing Market Assessment (July 2014)

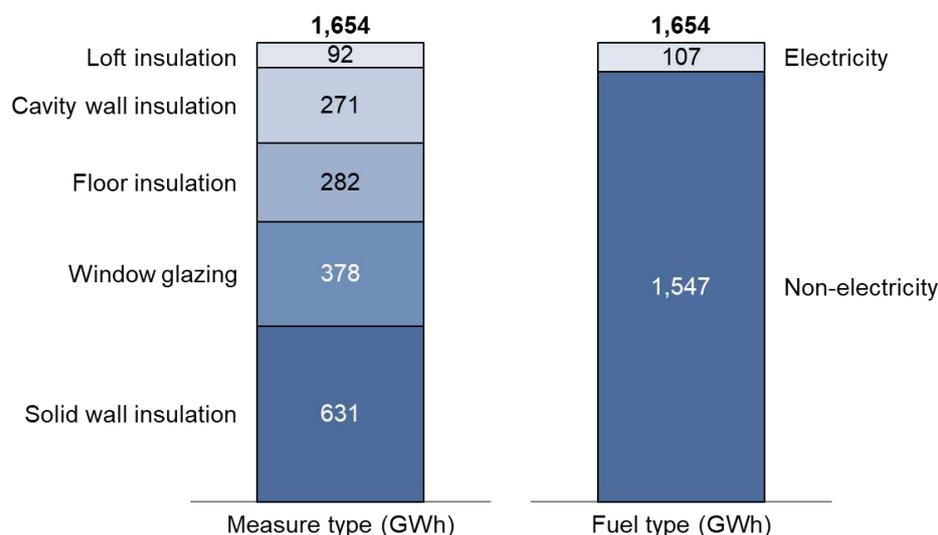
<sup>71</sup> Office for national statistics, Housing census (2011)

would be saved. It should be noted that some of these measures are more cost-effective than others (e.g. easy to treat cavities versus hard to treat cavities).

**Table 5-6: Estimated technical remaining potential for retrofit of homes with energy efficiency measures in Leicester and Leicestershire**

Measure type	Estimated number of homes to which measure could be applied (000s)	Share of the building stock to which the measure could be applied (total = 390,954)
Solid wall insulation	101	26%
Cavity wall insulation	74	19%
Loft insulation	149	38%
Floor insulation	283	72%
Window glazing	269	69%

**Figure 5-3: Estimated annual heating fuel savings if all measures were applied today (GWh)**



**Table 5-7: Estimated annual and lifetime carbon emissions savings and fuel bill savings, and lifetime investment required if all measures were applied today**

Measure type	Annual carbon emission savings (ktCO <sub>2</sub> )	Lifetime carbon emissions savings <sup>72</sup> (MtCO <sub>2</sub> )	Annual fuel bill savings (£m)	Lifetime fuel bill savings (£m)	Lifetime investment required (£m)
Solid wall insulation	125	5.0	37	1,480	864
Cavity wall insulation	52	2.1	15	600	200
Loft insulation	18	0.7	5	200	44
Floor insulation	55	2.2	16	640	302
Window glazing	76	3.0	23	920	944
<b>Total</b>	<b>326</b>	<b>13.0</b>	<b>97</b>	<b>3,380</b>	<b>2,354</b>

<sup>72</sup> Assuming the typical lifetime of wall, loft, floor and window insulation is 40 years.

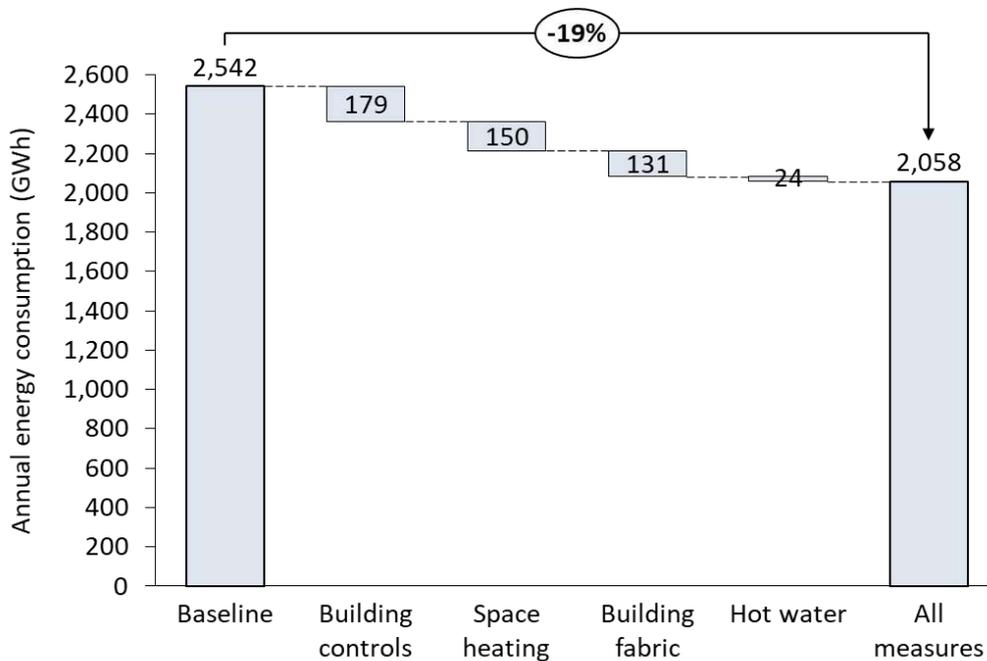
**Non-domestic stock**

Our analysis of the remaining potential for energy efficiency in the non-domestic is based on a combination of local and national data. Remaining potential for energy efficiency measures and savings potential in different building types was estimated from the Building Energy Efficiency Survey. Local floor space area for the office, storage and industry sectors were obtained from a Leicestershire Employment Land Study<sup>73</sup>, whilst a population based scaling approach was used for sectors where local specific data was unavailable.

The range of energy efficiency measures that were relevant in the context of a one-stop shop for energy efficiency retrofit was limited to building fabric, building instrumentation and control, space heating and hot water efficiency. It should be noted that further fuel saving can be made with other measures such as low energy lighting and appliances, however, these efficiency improvements are more likely to be achieved through product standards and regulation.

Based on our analysis, an estimated 484 GWh of energy savings can be made from the installation of these measures in the non-domestic stock, this is shown in Figure 5-4. The sub-sectoral breakdown of where these savings can be made within the stock is shown in Figure 5-5. However, we note that in the absence of a more complete local data set, significant uncertainty exists in these results. Table 5-8 shows that 129 ktCO<sub>2</sub> and £53m on fuel bills could be saved annually. Our analysis predicts that these retrofits will require an investment in the region of £200m. This equates to a payback period of only four years on average and thereafter £53m could be saved annually. This would contribute to improving business productivity, profitability and competitiveness. A payback period of four years is relatively low, which should encourage organisations to implement these measures. The LLEP is well placed to raise awareness of this opportunity.

**Figure 5-4: Abatement potential of energy consumption in the non-residential sector**



<sup>73</sup> PACEC for LLEP, Leicester and Leicestershire HMA Employment Land Study (2013)

Figure 5-5: Abatement potential (GWh) broken down by sub-sector in the non-residential buildings

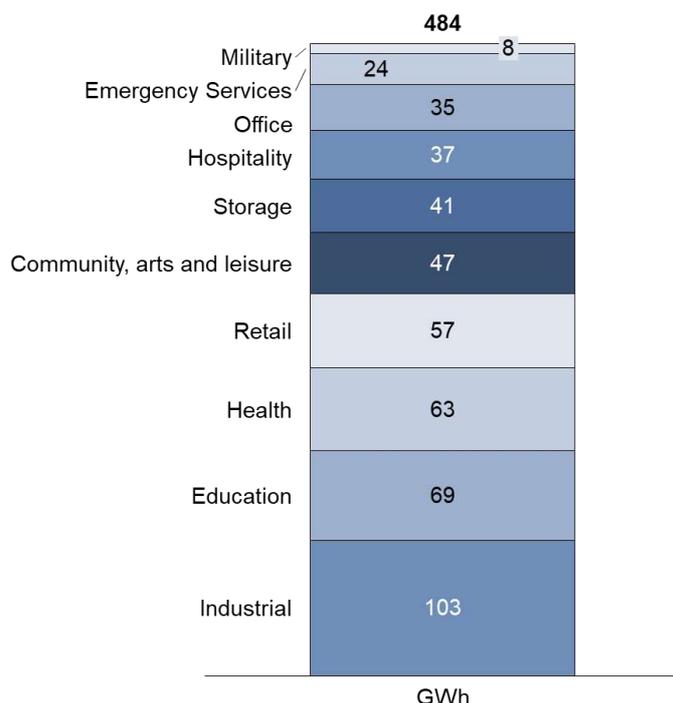


Table 5-8: Estimated annual carbon emissions savings, annual fuel bill savings and total investment required if all measures were applied today.

Annual carbon emission savings (ktCO <sub>2</sub> )	Lifetime <sup>74</sup> carbon emissions savings (MtCO <sub>2</sub> )	Annual fuel bill savings (£m)	Lifetime fuel bill savings (£m)	Lifetime investment required (£m)
129	2.58	53	1,060	200

### A locally-led initiative to increase the energy efficiency of the building stock

The analysis above shows that close to 500 ktCO<sub>2</sub> could be saved annually, bringing annual fuel bill savings in the region of £100m for domestic consumers and £50m for businesses, if energy efficiency measures were deployed to their full potential in Leicester and Leicestershire’s building stock today.

Although the LAs in Leicester and Leicestershire have already taken an active role in retrofitting the building stock, our analysis clearly suggests that more needs to be done. Under the 1995 Home Energy Conservation Act, Leicester City has been monitoring the progress of the retrofit of its stock. A 2013-2015 progress update report suggests that 1,320 solid walls, 9,357 windows 7,060 lofts and 3,020 cavity walls were insulated during the two year period. By applying the remaining potential share calculated above to Leicester City only, it would take 13-18 years to achieve the full potential of cavity wall, loft, floor and window insulations in the City stock at the rate described in this update report. These results demonstrate that efforts are being made, however, when the same calculation is applied to

<sup>74</sup> Assuming the average lifetime of controls, heating systems and insulation/fabric in the non-domestic sector is 20 years.

solid wall, the time taken is 48 years. The insulations reported in the Leicester City progress document<sup>75</sup>

The other LAs in the region have undertaken similar initiatives: N.W. Leicestershire published its Affordable Warmth Action Plan in October 2017, Oadby and Wigston released its Proposed Energy Efficiency Strategy in 2016, Charnwood keeps an updated energy efficiency advice webpage, Harborough District Council, Hinckley and Bosworth Council are in partnership with Harborough Energy to promote home insulation (with schemes called Warm Homes and Hinckley Health Homes) and Melton includes achieving affordable warmth for tenants as one of its key housing priorities.

Funding for energy improvements in community buildings is also available<sup>76</sup>. Funding sources include grants and low interest loans. Shire Climate Change grants of up to £5,000 are available from Leicestershire County Council, and other grants are available from the Awards for All Fund - a Big Lottery fund. Low interest loans are available from SALIX finance, the Rural Community Buildings Loan Fund and the Carbon Trust. Small and medium sized businesses may be eligible for the Carbon Trust Green Business Fund offering up to 0% interest loans. The Leicester Energy Agency assists SMEs in Leicester and Leicestershire to reduce fuel bills and CO<sub>2</sub> emissions by running a European Regional Development Fund project called the Green BELLE. This project offers grants and will run until September 2019.

We see an opportunity to instigate a renewed level of engagement in energy efficiency in Leicester and Leicestershire through the initiation of a 'one-stop shop' for energy efficiency retrofit. This locally-led initiative would work across the nine local authorities in the region to:

- Bring together local suppliers and installers with potential customers;
- Partner with investors to provide low-interest loans for efficiency projects;
- Ensure that all the market is made aware of potential funding sources;
- Actively identify households eligible for national schemes (such as the Energy Company Obligation)
- Help unlock deep energy efficiency measures that are less cost-effective than e.g. loft insulation but that are still necessary for deep decarbonisation;
- Promote policies to support sub-groups of the market in most need of support e.g. fuel poor, social housing, public sector and SMEs.

A successful example of this project has been demonstrated in Bordeaux where the Metropole has implemented a suite of measures to drive building renovation, including awareness raising, technical support and financial incentives, all delivered via a Local Energy Renovation Platform. Actions include a partnership with commercial banks to stimulate uptake of national 'eco-loans', and the implementation of a 'subsidy advance payment fund' to advance money to contractors to carry out energy efficiency retrofits for low income households.

<sup>75</sup> Leicester City Council, Update progress report on Home Energy Conservation Act 1995). Links: <https://www.leicester.gov.uk/media/179571/home-energy-conservation-act-1995-update-progress-report-march-2015.pdf> accessed via: <https://www.leicester.gov.uk/your-council/policies-plans-and-strategies/energy-efficiency/energy-at-home/>

<sup>76</sup> <https://www.cse.org.uk/thesource/download/funding-for-energy-efficiency-improvements-in-community-buildings-233>

**Summary and recommended actions – One-stop shop for energy efficiency retrofit**

Improving the energy efficiency of our homes and businesses is a national priority. The reasons for improving energy efficiency in businesses and homes are many, and include reducing fuel bills, thereby alleviating fuel poverty and improving health and well-being in the residential sector, and increasing competitiveness, profitability and productivity in businesses; reducing carbon emissions; improving air quality; better managing local resources and reducing the reliance on imported energy sources.

There are several barriers to installing energy efficiency measures in existing buildings. These include scattered funding sources, consumers having difficulty identifying where they can save energy, consumers finding certain energy measures too disruptive to install, long payback periods for certain measures, and split incentives for landlords and tenants.

Our analysis suggests that, if energy efficiency measures were deployed to their full potential in Leicester and Leicestershire’s building stock today, close to 500 ktCO<sub>2</sub> could be saved annually, bringing annual fuel bill savings in the region of £100m for domestic consumers and £50m for businesses. In order to take advantage of these benefits locally, we recommend that the following actions be taken by the LLEP and/or the local authorities:

- Create a locally-led ‘one stop shop’ for energy efficiency retrofit, aiming to:
  - Bring together local suppliers and installers with potential customers;
  - Partner with investors to provide low-interest loans for efficiency projects;
  - Ensure that all the market is made aware of potential funding sources;
  - Actively identify households eligible for national schemes (such as the Energy Company Obligation);
  - Help unlock deep energy efficiency measures that are less cost-effective than e.g. loft insulation but that are still necessary for deep decarbonisation;
  - Promote policies to support sub-groups of the market in most need of support e.g. fuel poor, social housing, private rented sector, public sector and SMEs;
- Set up workshops to share best practices and inspire stakeholders;
- Search for funding sources available nationally; partner with local banks;
- Assign a team to set up the one-stop shop as a not-for-profit financial facilitator.

## 5.2 Accelerating the shift to Low Carbon Transport

### 5.2.1 Introduction

Road transport accounts for 35% of energy use in Leicester and Leicestershire. In the UK as a whole, the transport sector is responsible for 24% of CO<sub>2</sub> emissions. The road transport sector also accounts for the majority of air pollution in Leicester and Leicestershire. In Leicester City, the statutory guidelines for NO<sub>2</sub> (nitrogen dioxide) emissions are exceeded in many areas<sup>77</sup>. In 2014, the East Midlands had the second highest vehicle road traffic of all regions in the UK, with a level 10% higher than the UK average<sup>78</sup>. Reducing vehicle emissions by accelerating the shift to low carbon transport is integral to decarbonisation and improving air quality. Local authorities can play an active role in accelerating this shift, particularly by supporting the infrastructure changes necessary for the uptake of alternative fuel vehicles (AFVs).

In addition to reducing emissions from cars, there is a specific opportunity to reduce emissions from freight transport in the region. Over 60km of the M1, or 20% of its total length, lies in the Leicester and Leicestershire area, and the East Midlands Airport, which lies in North West Leicestershire, is the second busiest airport for freight traffic in the UK with an average of 500 HGV movements per day. Furthermore, the strong local presence of companies in the food industry attracts freight transport to the region. Road freight contributes £11bn to the UK economy<sup>79</sup> and although, in 2014, HGVs only made up 1.5% of road vehicles, they contributed to 21% of surface transport CO<sub>2</sub> emissions<sup>80</sup>. HGVs contribute significantly to poor air quality, accounting for 28% of NO<sub>x</sub> emissions and 16% of particulate matter emissions.

In this study, we undertake a high-level analysis to identify opportunities to accelerate the shift to low carbon transport, including an initial assessment of strategic locations where local authorities in Leicester and Leicestershire can drive infrastructure changes to support these opportunities. We also suggest the formulation of policy to accelerate the shift to low carbon transport. It is important to highlight that the low carbon transport sector is evolving rapidly. Local authorities must therefore have mechanisms in place to anticipate and adapt to market changes and formulate policy that is both effective and flexible.

### 5.2.2 Policy context

#### Cars and vans

The UK government has made a pledge to end the sale of conventional petrol and diesel cars and vans by 2040, recently re-iterated in the *Road to Zero* strategy<sup>81</sup>. The *Road to Zero*, published in July 2018, explains the Government's vision for a future low carbon road transport sector. In order to support this policy financially, the national Government will spend £1 billion to drive the uptake of ultra-low emission vehicles (ULEVs). The national government's commitment to this has been made clear through, for example, the announcement in July 2018 of the £400m Charging Infrastructure Investment Fund (CIIF). This fund will support businesses to build electric vehicle charge points across the country and boost jobs in the industry. Another fund, the National Productivity Investment Fund

<sup>77</sup> Leicester City Mayor, Healthier Air for Leicester: Leicester's Air Quality Action Plan (2015-2026)

<sup>78</sup> Source: DfT, Road Use Statistics in Great Britain (2016)

<sup>79</sup> DfT, Road Use Statistics in Great Britain (2016)

<sup>80</sup> DfT, Low Emission HGV Task Force Recommendations on the use of methane and biomethane in HGVs (2014)

<sup>81</sup> HM Government, The Road to Zero Next steps towards cleaner road transport and delivering our Industrial Strategy (July 2018) <https://www.gov.uk/government/publications/reducing-emissions-from-road-transport-road-to-zero-strategy>

(NPIF), committed £290m to support low emission vehicles including £80m for ULEV charging infrastructure. In addition, the government will offer a 100% first year allowance to companies investing in

- cars with CO<sub>2</sub> emissions fewer than 50g/km;
- electric vehicle charging infrastructure<sup>82</sup>.

This means that the cost of the asset can be set against profits in the year of purchase of the asset, thereby reducing corporation tax payment.

The Government is currently seeking derogation from the European Commission to allow category B (car) licence holders to drive commercial vehicle up to 4.25t GVW, if it is powered by a low emission technology. This will encourage further uptake of cleaner goods vehicles.

The Government has recently created new powers under the Automated and Electric Vehicles Act, passed in July 2018<sup>83</sup>. Through this Act, the Government is now able to '*set specific requirements for the provision of EV charge points or hydrogen refuelling infrastructure at motorway service stations and at large fuel retailers*'. These requirements may be requested by elected mayors. This Act also ensures that '*charge points are convenient to access and work seamlessly across the UK*'. In the future, charge points may be required to have smart<sup>84</sup> capability.

Some of the local authorities in Leicester and Leicestershire have taken steps to facilitate infrastructure changes that support electric vehicles. Leicester City has already created public charge points and has a grants scheme for local organisations to help them purchase ULEVs. The council has applied for Government funds to support the introduction of 17 lamppost based EV chargers as part of on-street residential charging trial, which is expected to be operational at the end of March 2019. The Council has temporarily suspended the maximum age at which a hackney taxi can be licensed to delay the replacement of old vehicles until the end of March 2019 when it is expected that ULEVs will be available for hackney carriage operators. The council has also bought a ULEV hackney cab as a try before you buy demonstrator for interested drivers. Finally, the Council is leading by example via the addition of 17-electric vehicles to its own office car share fleet. In order for commercial and residential developments to be permitted in Harborough, the local planning authority requires the provision of '*electric vehicle (EV) recharging facilities where appropriate*'.

Local policy supporting ultra-low emission vehicles must also be consistent with national guidelines, as defined in the National Planning Policy Framework (NPPF). The NPPF requires that in setting local parking standards for new developments, local authorities should formulate policy that '*ensures an adequate provision of spaces for charging plug-in and other ultra-low emission vehicles*'.

## HGVs

A key component of the *Road to Zero* is setting a clear pathway to reducing emissions from HGVs and progressing towards zero emissions vehicles. The Government calls for a new industry-wide voluntary target of reducing HGV greenhouse gas emissions by 15% by 2025, from 2015 levels. The pathway to decarbonising freight transport is not as clear as for cars

<sup>82</sup> Office for Low Emission Vehicles, Tax benefits for ultra low emission vehicles (May 2018)

<sup>83</sup> Documents relating to the Automated and Electric Vehicles Act 2018 are available from here: <https://services.parliament.uk/Bills/2017-19/automatedandelectricvehicles/documents.html>

<sup>84</sup> Smart charging allows automatic temporal shifting of the electrical load, taking into account the electricity grid needs the vehicle owner's needs.

and vans, which is why the Government is supporting R&D, real-world trials and demonstrations for several technologies and alternative fuels to diesel, including gas<sup>85</sup>, hydrogen and electricity. In order to support this, the Government has committed significant funding (also backed with private investment). In 2017, OLEV and Innovate UK awarded £20m of grant funding to 20 projects, leveraging £12m in private investment. In July 2018, successful bidders for the Integrated Delivery Programme (IDP) 14 were announced and were awarded £18m to programmes accelerating the shift to low carbon transport. Nearly one third of this £18m was directed at projects specifically supporting the transition to zero emission trucks. In addition to Government-led initiatives, industry is also leading the way with innovative solutions both nationally and internationally: Cummins, Mercedes and Tesla have now announced plans to produce large electric battery trucks. The range of zero emissions trucks has been a barrier, however, recent truck concepts from Nikola and Tesla are raising interest in true long haul zero emission trucks. It is unclear at this point if there is a particular fuel or technology that will gain more traction than others, which is why the government is supporting all types of initiatives.

Plug-in van grants for vehicles up to 3.5 tonnes, which includes cars and light duty vans, have been available since 2012, and are worth 20% of the price up to a maximum of £8,000. In 2016, these were extended to heavier vehicles (gross vehicle weight of 3.5 tonnes or more), with the first 200 claims at £20,000. Once 200 successful claims have been made, the grant level will fall in line with current grant levels for light electric vans. However, none of the £20,000 grants have been delivered because the drive cycle that will be recommended to prove grant eligibility is still being developed. There are several policies and initiatives that support alternative fuels or support their development:

- Gas benefits from a fuel duty rebate compared to diesel (57.95p/l for diesel, 24.7p/kg for gas, corresponding to a 13p/km (21p/mile) saving on duty for a typical truck)
- In 2018, the Renewable Transport Fuels Obligation (RTFO) has been extended to 2032, and, among other changes, a new 'development fuel' sub-target has been introduced; that will foster the production of fuels not previously included in the RTFO, such as hydrogen, Synthetic Natural Gas and aviation fuels.
- The Government has relaunched the Future Fuels for Flight and Freight Competition – a £22m industry competition to encourage development of deployment of low carbon HGV and aviation fuels.

### 5.2.3 Exemplar initiatives driven by local government

The Office for Low Emission Vehicles (OLEV) ran the *Go Ultra Low City* competition from 2014 to 2016. Participating cities were asked to demonstrate proposals in their bids that would lead to a) a step-change in ULEV uptake and b) achieving exemplar status for adoption of ULEVs in a local area. In January 2016, London, Milton Keynes, Bristol, and Nottingham and Derby combined were announced as winners and a £35m grant was allocated between the cities. Leicester City participated in the competition and was unsuccessful; however, there are benefits to be gained from reviewing the projects implemented by winning cities and considering the implementation of similar schemes in Leicester and Leicestershire. As described above, some of these initiatives have already been implemented in Leicester and Leicestershire, but additional measures could be applied to extend this support.

<sup>85</sup> Note: Previous testing of gas vehicles commissioned by DfT has shown promising CO<sub>2</sub><sub>eq</sub> emission savings, on the basis of which testing of the latest generation of gas trucks is being conducted in 2018 (Emissions Testing of Gas-Powered Commercial Vehicles, 2017, and Road to Zero)

### Nottingham and Derby

Nottinghamshire and Derby received £6m of funding to install 230 charge points (35 of which are rapid chargers), offer ULEV owners discount parking and access to over 13 miles of bus lanes along key routes across the city. The investment paid for a new business support programme letting local companies 'try before they buy'.

A contractor (Chargemaster) was procured to provide and install the charge points at the beginning of 2018, and the installations started in April 2018, with a focus on Park & Ride locations. Some issues were encountered with the local Distribution Network Operator, who has seemed risk averse whenever negotiating connections for the charge points – this suggests that early engagement with the DNO is important when devising a charging infrastructure strategy.

Nottingham City Council (NCC) has also set a workplace Charging Grant scheme that provides £25,000 per business premises, for which they have had 10 applications between October 2017 and June 2018.

### London

London's £13m winning proposal included a specific focus on Harrow Town Centre to become a Neighbourhood of the Future; this proposal focuses on increasing the number of EV charge points. The Council's proposals and progress to date includes:

- Restricting usage of certain roads to ULEVs only. This proposal is currently in development, Automated Number Plate Recognition will likely be required to identify ULEVs;
- Providing rapid charging points at central shopping centres;
- Providing free accredited training to mechanics in the borough to ensure ULEVs can be safely and easily serviced in the area. This will support an increase in private ULEV ownership by removing a potential barrier over concerns about long term maintenance of the vehicles. In addition, the up skilling of local mechanics will support local businesses and boost the local economy. A 2017 information report<sup>86</sup> suggested that a Council-operated vehicle service centre to train mechanics was underway;
- Amending parking policies to incentivise ULEV ownership and providing parking discounts, for example, changing the charges for resident permits and "pay and display" to take account of vehicle emissions. Parking management policies have been revised to encourage ULEVs to park free of charge for up to 4 hours. Changes were made to allow dedicated parking bays for ULEVs and introduce lower charging incentives for ULEVs. As part of this process existing parking bays were reviewed and areas identified that can accommodate electric charging points;
- Enabling businesses to trial ULEVs in their fleet through temporary loans. This would be restricted to cars and possibly vans, and would depend on whether or not the business had the capacity to charge their vehicles off-street using cables. This could include offering subsidised workplace charging for ULEV.

### Milton Keynes

Milton Keynes received £9m to promote ULEVs and one specific project was to launch an Electric Vehicle Experience Centre. The centre is a one-stop shop for customers interested

<sup>86</sup> Harrow Council, Information report for the Traffic And Road Safety Advisory Panel, (Nov. 2017)

in experiencing, leasing or purchasing a new EV. Potential owners can gain expert impartial information and borrow vehicles under short and medium-term agreements so that they can gain confidence in the practicality of the vehicles.

#### 5.2.4 Suggested solutions with specific project examples

#### 5.2.5 Project opportunity 4: Supporting electric cars and vans

A March 2018 study<sup>87</sup> commissioned by the Leicester & Leicestershire authorities and the LLEP undertook a high level strategic transport modelling investigation to identify the impacts of the predicted growth in Leicester and Leicestershire (as predicted by the Strategic Growth Plan) on transport up to the year 2050. The study concluded that 'significant new development cannot be delivered in Leicester and Leicestershire in the planned spatial distribution based on a reliance on strategic sites beyond 2036 without significant investment in infrastructure and services'. The study highlights that the areas which will be most impacted by the expected growth are Central Leicester, S.E. Leicester and Fosse Way South. These areas will require significant transport infrastructure upgrades. This leads to a requirement – and an opportunity – to ensure that transport infrastructure upgrades in these areas in particular are undertaken with the aim to accommodate and promote the uptake of ULEVs. The recent trend in EV uptake and the government announcements (e.g. Road to Zero) indicate that a significant fraction of the population may be interested in driving electrically. To facilitate this, charging infrastructure will be needed.

It is expected that charging infrastructure requirements will vary by EV owner market segment. For individuals with off-street parking, rapid charging is the most useful and impactful complement. For people without off-street parking, there is uncertainty regarding the best strategy for location of the charging infrastructure and who pays for it. Location/charging type options broadly include:

- Public on-street charging, in their local area. Typical technologies are the 3 or 7kW posts and lamppost retrofits (<5 kW). Other technologies are being developed/trialled, e.g. grooves for cables to go from home to the street, pop-up charging units etc. the Innovate UK on-street charging competition will see many other technologies studied and demonstrated in 2018-2019,
- Local rapid charging hub (50kW+)
- Rapid charging hubs and destination charging, that are not in walking distance from home. Destination charging can be at shops, public car parks etc. and is typically at 7 kW whereas rapid charging is typically 50 kW and faster.
- Workplace charging, for commuters.

#### **Charging infrastructure to support EV owners without off-street parking:**

Despite the uncertainty, one action that can be taken today, as a first step, is to analyse where the issues are likely to be and size the scale of the network that might be needed in the coming 5-10 years. We outline below a suggested approach for this assessment.

In a first instance, a view of the current deployment of EVs would need to be established at a finely geographically disaggregated level; this could be done by requesting and analysing local data from the Department for Transport. Secondly, a view on future EV deployment

<sup>87</sup> Jacobs for the LLEP, Leicester and Leicestershire Strategic Growth Plan (Consultation Draft) - Strategic Assessment of Transport Impacts (March 2018)

would need to be created by considering several deployment scenarios and translating them to a local uptake, accounting for the present EV distribution across the region i.e. counting on areas with the highest uptake of EVs<sup>88</sup> to stay ahead. Such scenarios could be based on the ambition levels set out in the Road to Zero. Thirdly, the number of vehicles whose owners do not have access to off-street parking would need to be estimated. This step would require to determine the fraction of vehicles parked on-street; this can be estimated by considering information on house types and population density at a local level – this approach was for instance taken for the case of London<sup>89</sup>. Fourthly, the number of chargers required to meet the expected EV demand (whose owners do not have access to off-street parking) would need to be calculated. To translate “number of on-street EVs” to “number of public charge points”, different behaviour at various charging types should be considered, to capture the uncertainty over the split of charging over local charging, destination charging, rapid charging and workplace charging.

There is no hard evidence on people’s behaviour shall they be presented with these choices, and current deployment of these types of charging infrastructure is very limited. A model would likely need to be developed to take into account local characteristics in terms of share of commuters making trips by car, EV uptake (as discussed above, likely based on national deployment scenarios), data on charging profiles and charging behaviour scenarios. The model output would be the number of charging points needed.

This analysis could then support an application for funding for on-street charging, under the OLEV’s On-street Residential Chargepoint Scheme for local authorities<sup>90</sup>.

Some LAs in Leicester and Leicestershire have already taken steps to support charging infrastructure for owners without off-street parking. Leicester City is progressing with a trial scheme, which features EV charging from 17 LED converted lamp posts in the Clarendon Park and West End areas of the city. The project began with a public engagement exercise, which identified many potential and some actual EV users. An application has been made for OLEV funding, and the charge points are expected to be operational by March 2019.

**Charging infrastructure to support EV owners with off-street parking**

In this analysis we investigate, at a high level, possible locations most suitable for additional electric vehicle rapid charging sites, in the short term. We have based our analysis on five criteria:

- proximity to economic growth sites;
- capacity of local electrical substations to cope with added electrical load;
- proximity to existing rapid charging stations;
- connectivity to arterial road transport links; and
- availability of local-authority owned land.

The criteria chosen for site selection are shown in Table 5-9, together with the rationale for applying them and the data sources used. A map with the data layers for each criteria is shown in Figure 5-6. Note that the icons on the map are intended to represent charge sites, not charge points, as several charge points can exist at one charge site.

<sup>88</sup> Demographic data can be used to identify areas that are likely to contain early adopters of EVs  
<sup>89</sup> [Plug-in Electric Vehicle Uptake and Infrastructure Impacts Study](#), Element Energy and WSP, for Transport for London (2016)  
<sup>90</sup> Office for Low Emission Vehicles, On-street Residential Chargepoint Scheme guidance for local authorities <https://www.gov.uk/government/publications/grants-for-local-authorities-to-provide-residential-on-street-chargepoints>

Based on these data sources and analysis, we suggest a shortlist of sites for low carbon vehicle transport infrastructure shown in Table 5-11. The five selected sites include:

- Exit 20 on the M1;
- Melton Mowbray;
- Market Harborough;
- Leicester East (close to Leicester East BSP on Wakerley Rd/Broad Avenue); and
- Exit 23 on the M1.

The timescale over which this analysis is intended to apply is the short term, probably no more than two years. This is important for two reasons. Firstly, the headroom at electrical substations will change over time as assets are upgraded. The five selected sites appear to be sensible strategic locations for the LAs to initiate rapid charging sites today. However, charging sites are often developed in clusters and as the cluster grows, more headroom may be required. Additionally, it is likely that 50-120kW rapid charging sites will themselves be upgraded to ultra-rapid charging (up to 350kW) sites in the future, which may itself require electrical substations to be upgraded. Therefore, a charging site that is unconstrained in terms of electrical connection today may not be in two years. Secondly, the private sector is already leading the way with existing rapid charging sites and further development is expected. In the Leicester and Leicestershire region, the five existing rapid charging sites are operated by Ecotricity, Nissan and ChargePoint Services. Local efforts should be coordinated with, and not compete against, those made in the private sector so that there is a sensible geographic spread of charge sites in the region.

While the factors described above are likely to impact the location of the most suitable charging infrastructure sites over the coming years, the requirement for additional charging infrastructure in the broader region surrounding the selected locations is likely to persist. This is because the selection is also based on the location of economic growth areas, where there is expected to be additional employment opportunity. Provision of charge points at the workplace can make an attractive business case due to cheaper installation costs and the certainty of demand. In addition, there are national Government grants of £500 available for the construction of charge points at workplaces. Nottingham City Council has decided to further incentivise this by topping up national grants with local funds.

**Table 5-9: Criteria used to investigate strategic sites for rapid charging points**

<b>Criterion</b>	<b>Rationale</b>	<b>Data source</b>
Connectivity to arterial road transport links e.g. the M1	Ensures access to charging where there is a high demand from traffic	Google maps (accessed 2018)
Proximity to economic growth areas	Transport upgrades will likely need to be made anyway to support this regeneration. There is an opportunity to create charging points at the same time.	Leicester and Leicestershire Strategic Growth Plan (2018)
Capacity of local electrical substations to cope with added electrical load	Over half of the substations in the Leicester and Leicestershire area are red RAG constrained: they function at capacity and the connection of a significant new load would likely require the substation to be upgraded. This may be cost and time prohibitive.	Western Power Distribution (accessed 2018)
Location of existing rapid charging stations, so as to ensure appropriate provision of charge points across the wider region and avoid under-serviced areas	Strategic spatial distribution of charge points	Zapmap and Element Energy analysis (2018)
Availability of local-authority owned land	Opportunity for local authorities to contribute land for a rapid charging site if it is available. Finding available land for charging site and its cost is one of the key barrier to deployment.	Planning teams within Leicester and Leicestershire (2018)

Figure 5-6: Map of strategic sites to be taken forward for further consideration for the construction of an EV rapid charging station

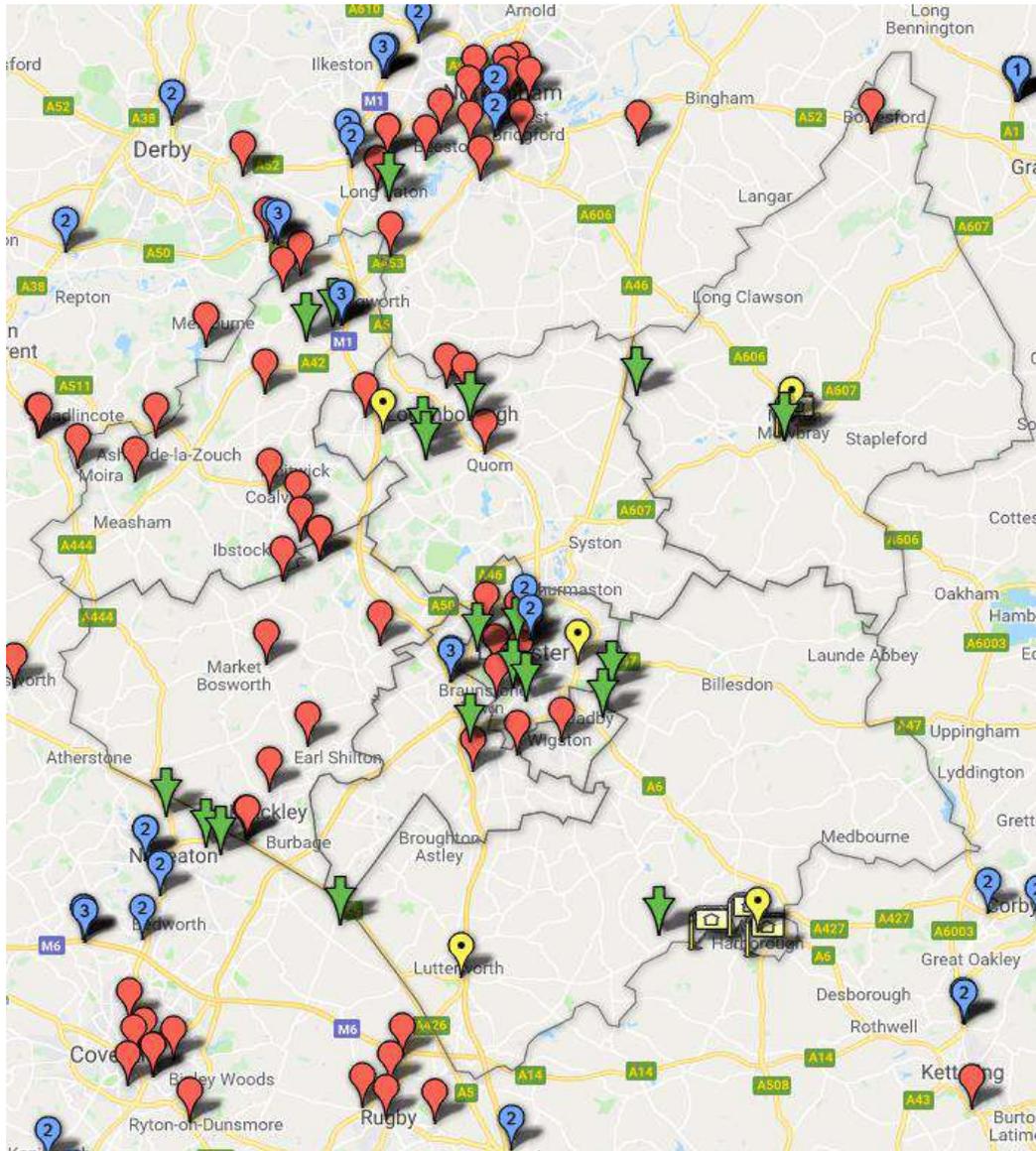


Table 5-10: Map key

Category	Symbol	Description
EV charging stations		Existing rapid charging (DC) 120kW
		Existing rapid charging (DC) 50kW
		Existing rapid charging (AC) 43kW
		<b>Shortlisted site for new EV rapid charging stations to support electric cars and vans over the next few years</b>
Electricity grid substation		Aggregate demand red RAG constrained substation (BSPs and Primaries)
Economic growth area		Economic growth area highlighted in Leicester and Leicestershire's Strategic Growth Plan (2018)
Local authority owned asset		These assets are closed and have been declared surplus

Table 5-11: Strategic charge point site recommendations.

Infrastructure	Rationale	Constraints
Rapid charging station at Exit 20 on the M1	<ul style="list-style-type: none"> <li>Proximity to A5 Improvement Corridor</li> <li>Magna Park Distribution Centre is a key economic growth area</li> <li>Road vehicle North-South movements along the M1 will require EV infrastructure</li> <li>Proximity to Pailton BSP</li> </ul>	<ul style="list-style-type: none"> <li>Pailton BSP is amber constrained for aggregate demand headroom</li> <li>Pailton BSP is located outside of the LLEP boundary</li> <li>Rapid charging site (50kW D.C.) already exists at Exit 18</li> </ul>
Rapid charging station at Melton Mowbray	<ul style="list-style-type: none"> <li>Melton Mowbray is a key centre for regeneration and growth</li> <li>Close proximity to Agri-Food and Drink processing, an economic growth area</li> <li>Melton Mowbray hospital could attract commuter traffic from patient visits</li> <li>Closest rapid charging station is far: in Central Leicester (19 km)</li> <li>Existence of Local authority owned land that is not in use in Melton Mowbray</li> </ul>	<ul style="list-style-type: none"> <li>Amber constrained Primaries and BSP</li> </ul>
Rapid charging station at Market Harborough	<ul style="list-style-type: none"> <li>Market Harborough is located on the A6, provides charging point for commuters travelling to S. E. Leicester</li> <li>Agri-Food and Drink Processing (an economic growth area) is located West of Market Harborough; this will result in increased commuter traffic along the A6 and increased demand for EV charge points</li> <li>Unconstrained BSPs and Primaries in the area</li> <li>Existence of Local authority owned land that is not in use (three assets declared surplus in Market Harborough)</li> </ul>	
Rapid charging station in Leicester East, close to Leicester East BSP on Wakerley Rd./Broad Avenue	<ul style="list-style-type: none"> <li>Unconstrained BSP located close to Crown Hills Community College, University of Leicester, Leicester General Hospital and Leicester station. All will attract vehicle traffic.</li> <li>Located in between several economic growth sites: University of Leicester, De Montfort University, Global Space Technologies Hub and IBM Client innovation Centre.</li> </ul>	<ul style="list-style-type: none"> <li>Densely populated area</li> <li>High cost of land</li> </ul>
Rapid charging station at exit 23 on the M1	<ul style="list-style-type: none"> <li>Located on M1</li> <li>Located very close to Loughborough University, and economic growth area.</li> </ul>	<ul style="list-style-type: none"> <li>Red RAG constrained Primary at Shepshed</li> </ul>

**Recommended actions – Supporting electric cars and vans**

Reducing vehicle emissions by accelerating the shift to low carbon transport is integral to decarbonisation and improving air quality. Local authorities can play an active role in accelerating this shift, particularly by supporting the infrastructure changes necessary for the uptake of alternative fuel vehicles (AFVs). We have identified a clear opportunity for the local authority to support EV charging in the short term. Locations for future rapid charging sites have been selected based several criteria, including sites of economic growth and additional housing. By supporting rapid charging infrastructure at the selected sites, LAs will be providing benefit both residents and businesses.

We recommend that the LLEP and the relevant local authorities should take the following actions:

- Coordinate best practices between local authorities in Leicester and Leicestershire, including:
  - salary sacrifice schemes for purchasing cars that emit <120 gCO<sub>2</sub>/km;
  - Adding EVs to local authority-owned car fleet.
- Formulate more ambitious policy to promote the uptake of low emissions vehicles based on exemplar policy elsewhere; this could include:
  - Consider free parking in council-owned car parks;
  - Establish standards for the number or proportion of required charging points in car parks. This could be made a requirement through the planning control process;
  - Provide free accredited training to mechanics in the borough to ensure ULEVs can be safely and easily serviced in the area;
  - Initiate support programmes that let local companies ‘try before they buy’ ULEVs in their fleet.
  - Further incentivise charge points at work by ‘topping up’ national Grants;
  - Consider launching an Electric Vehicle Experience Centre – this centre would be a one-stop shop for customers interested in experiencing, leasing or purchasing a new EV. NB this would require significant funding and it may be attractive to partner with other LAs outside of Leicester and Leicestershire to attract a larger sum of money.
- Undertake a more detailed analysis of the five recommended sites described above to gain a more thorough assessment of the need, of the most suitable location(s) and of the business case for EV rapid charging points.
- Analyse the current EV uptake and provision of off-street parking across the region to understand where potential EV buyers without off-street parking are likely to be and the level of local charging infrastructure they might need. This could support a funding application under the On-street Residential Chargepoint Scheme.
- Once a site has been chosen, investigate the LLEP and/or local authority role further. We suggest that this could be in its capacity as an investor in the project, through its land ownership or by subsidising electricity provided to rapid charging users at a discounted rate at this site. Currently, there is one rapid charging station that is free to use, it is operated by Nissan.

### 5.2.6 Project opportunity 5: Strategic plan for HGV refuelling and rapid charging hubs

The HGV sector is the most difficult transport segment to decarbonise since it has the most challenging requirements for range and carrying capacity. Among low carbon technologies (Table 5-12), battery electric vehicles are commercially available and well-suited for light, short-range transport sectors but there are no currently available options for long-haul freight. Hydrogen fuel cell electric vehicles (FCEVs) are expected to provide a solution in the long term but the technology readiness is low, and the timeframe is uncertain.

At present, methane – in the form of compressed natural gas (CNG) or liquefied natural gas (LNG) – is the only commercially available option for low carbon inter-city distribution vehicles. Natural gas is therefore a proven technology that represents a medium-term solution on the path to zero emissions, which can yield guaranteed emissions savings while other technologies mature. A comparative overview of the infrastructure available to support these technologies is shown in Table 5-13.

**Table 5-12: Comparison of range and availability of low carbon fuel technologies**

	Range			Vehicle availability					
	Short	Medium	Long	Cars & vans	3.5–8 tonnes	8–18 tonnes	18-26 tonnes	26-38 tonnes	> 38 tonnes
<b>Electric</b>	Green	White	White	Green	Green	Yellow	Pink	Pink	Pink
<b>CNG</b>	Blue	Blue	White	Yellow	Yellow	Yellow	Green	Green	Pink
<b>LNG</b>	Blue	Blue	Blue	Yellow	Yellow	Yellow	Green	Green	Green
<b>Hydrogen</b>	Blue	Blue	Blue	Yellow	Yellow	Pink	Pink	Pink	Pink

Key is for vehicle availability only. Green = good range of commercially available options; Yellow = some availability or vehicles in development; Pink = not currently available/limited driving range.

Table 5-13: Recharging and refuelling infrastructure options for HGVs

Technology	Usability	Compatibility	Future proofing
<b>CNG/LNG refuelling</b>	<ul style="list-style-type: none"> <li>Minimal disruption to vehicle operator as the refuelling process very similar to diesel</li> </ul>	<ul style="list-style-type: none"> <li>Suitable for all HGVs operating in all fields (urban, regional distribution and long-haul) but best advantage in regional/ long-haul</li> </ul>	<ul style="list-style-type: none"> <li>Gas is advantageous over diesel as it provides ca. 15% CO<sub>2</sub>eq emission savings on Well to Wheel basis, and ca. 85% if biomethane is used</li> </ul>
<b>Depot based charging</b>	<ul style="list-style-type: none"> <li>Installation results in high level of disruption in depot</li> <li>Chargers can reduce the number of spaces in all electric depots by as much as 10%</li> <li>Once plugged in, charging times and power can be automated and optimised</li> </ul>	<ul style="list-style-type: none"> <li>Suitable for most HGVs as they spend hours each day in the depot. Trucks up to 10 hour charging window.</li> <li>Vehicles travelling long distances will need additional charging infrastructure but are still expected to make use of depot charging (long-haul vehicles are often in the depot during the day for loading/unloading)</li> </ul>	<ul style="list-style-type: none"> <li>Charger technology can be scaled, however, &gt;10 chargers will require secondary substation upgrades and &gt;100 chargers will require primary substation upgrades</li> <li>Long charging times allow use of low power chargers suitable for charging future vehicles even if battery sizes increase</li> <li>Vehicles could be used to provide grid services</li> </ul>
<b>Public rapid charging</b>	<ul style="list-style-type: none"> <li>Installation causes no disruption for truck operators</li> <li>Chargers in motorway service stations can be used by all truck operators helping to increase utilisation</li> <li>Charging occurs automatically once vehicle is in place without driver input</li> </ul>	<ul style="list-style-type: none"> <li>Works alongside depot charging</li> <li>Compatible with trucks of all heights</li> <li>High powers allow electric trucks to cater to the medium to long haul sectors</li> <li>Even with rapid chargers EVs may be unsuitable for the heaviest truck categories</li> </ul>	<ul style="list-style-type: none"> <li>Chargers need to be sized in the 1MW range to be suitable for future long-haul vehicles with large batteries</li> </ul>
<b>Battery swapping</b>	<ul style="list-style-type: none"> <li>Swapping station requires completely new depot with much larger footprint</li> <li>Batteries are swapped automatically by robot but requires human supervision</li> </ul>	<ul style="list-style-type: none"> <li>Theoretically compatible with all trucks</li> <li>Significantly more standardisation is required before a battery swapping station open to multiple operators could be feasible</li> <li>Requires the station operator to own the batteries which could deter vehicle operators in a multi-operator system</li> </ul>	<ul style="list-style-type: none"> <li>Battery dimensions and position must stay the same for next generation of vehicles for the station to remain in use</li> <li>Charging station well positioned to supply grid services in the future</li> </ul>
<b>Hydrogen refuelling</b>	<ul style="list-style-type: none"> <li>Minimal disruption to vehicle operator as the refuelling process very similar to diesel</li> <li>Depot and service station refuelling is an option</li> </ul>	<ul style="list-style-type: none"> <li>Potential market players in disagreement about refuelling pressure</li> <li>Suitable for all types of HGVs operating in all fields (urban, regional distribution and long-haul)</li> </ul>	<ul style="list-style-type: none"> <li>Current refuelling stations sized for small demand. Stations would have to be refitted to meet future increases in hydrogen demand</li> </ul>

The comparison of the technology options and accompanying infrastructure shows that a CNG/LNG refuelling site would be most suitable in the short term, but that infrastructure for electric and hydrogen fuel cell HGVs should be considered in the longer term.

**Synergy with local biogas production**

There is local specialism in the area that could directly support the supply of gas that has been derived from biological sources to HGVs. There are a number of large food industries

based in Leicestershire. These industries produce a substantial amount of organic waste as by-products that could be used to produce biogas and/or biomethane through anaerobic digestion (AD). A number of AD plants have already been established in Leicestershire, but these are mainly farm based and small scale, with some exceptions. Walkers have added an AD plant to their crisp and snack production site in Leicester. The plant runs on organic waste from the crisp making process, including potato peelings, starch, crisps, and oils. The biogas produced is used to produce electricity for on-site use<sup>91</sup>. All the local AD plants use the biomethane they produce for electricity generation or Combined Heat and Power (CHP) i.e. the biogas produced is directly combusted onsite. For the biogas to be used as a fuel for HGVs, it would first need to be purified further to make it suitable for transport (as bio-CNG). It would then need to be:

- transported to the HGV gas refuelling site. There is no example of this in the UK, as the economics of transporting gas to a refuelling site by truck, unless very local, are challenging;
- injected into the gas grid. There are two ways of ensuring that every kWh delivered at the refuelling station is matched by a kWh injected into the grid:
  - a Green Gas certificate called the Renewables Gas Guarantees of Origin<sup>92</sup>;
  - having the biomethane production and supply chain accredited by the Department of Transport RTFO unit. Each kg of biomethane injected would receive a Renewable Transport Fuel Certificate.

Biogas injection into the grid exists at sites just outside of Leicestershire, including William Corbett Farms and Highwood farm in Warwickshire.

Under the Circular Economy Directive, the new proposals of which the UK Government has ratified, there is a requirement for all Member States to introduce separate household food waste collections by 2023. This will provide additional feedstock for AD plants. The Food Enterprise Zone in Melton District aims to incentivise growth in the food and farming sector in the area by reducing the barriers perceived to be created by the planning process. There may be an opportunity to further incentivise growth of the sector if businesses utilise their waste to produce alternative fuels. An area that appears suitable for a strategic HGV refuelling/recharging station is close to Exit 23A on the M1, at Moto Donington Services. At first, this site would provide bio-CNG/LNG and could later be adapted to accommodate electric HGVs and finally hydrogen fuel cell electric HGVs in the longer term. This site has been chosen because of its proximity to the East Midlands Airport, the existence of a publicly accessible LNG refuelling station for HGVs<sup>93</sup>, its proximity to the M1 and the existence of an EV 43 kW A.C. rapid charging station for passenger vehicles. Although after an initial high level analysis this area appears to be the most suitable, we suggest that a more detailed study on this topic is necessary to further assess the need and business case.

Fleet refuelling hubs exist elsewhere in the country. Birmingham is the most advanced city in this regard, with one multi fuel hub (biodiesel, rapid charging, hydrogen and CNG) opening in 2019 (in Tyseley<sup>94</sup>) and several more planned. The Tyseley site combines several elements identified as important criteria in the high level siting analysis above, namely: close to high traffic, area of HGV activity and filling a gap in the refuelling/recharging network. It also has an on-site biomass electricity plant. Creating fleet refuelling hubs such as the one in Tyseley is a significant project that would require stakeholder buy-in and external funding.

<sup>91</sup> Leicester Mercury, 20<sup>th</sup> May 2018 (online version).

<sup>92</sup> <https://www.greengas.org.uk/>

<sup>93</sup> NB the gas supplied to this site currently has 0% bio-content. Source: <http://gasvehiclehub.org>

<sup>94</sup> <https://www.tyseleyenergy.co.uk/tyseley-refuelling-hub/>

It would be most successful in Leicester and Leicestershire as part of a coordinated national approach which may attract external investors. The LLEP could take an active role in ensuring that the local economy benefits from this project and that value leakage is limited as far as possible. This may be most effective through partnership with local organisations for the construction and maintenance of the hubs.

**Recommended actions – Strategic plan for HGV refuelling and rapid charging hubs**

Road freight contributes £11bn to the UK economy and although, in 2014, HGVs only made up 1.5% of road vehicles, they contributed to 21% of surface transport CO<sub>2</sub> emissions. HGVs contribute significantly to poor air quality, accounting for 28% of NO<sub>x</sub> emissions and 16% of particulate matter emissions. Given the local presence of the East Midlands Airport, which is connected to the rest of the UK via the M1, there is an opportunity to target the decarbonisation of HGV traffic through a locally led initiative.

An area that appears suitable for a strategic HGV refuelling/recharging station is close to Exit 23A on the M1, at Moto Donington Services. At first, this site would provide bio-CNG/LNG and could later be adapted to accommodate electric HGVs and finally hydrogen fuel cell electric HGVs in the longer term.

We recommend the following actions be taken by the LLEP and the local authorities (particularly Leicestershire County Council and North West Leicestershire District Council):

*Identifying potential customers and suppliers*

- Begin discussions with major freight customers of the East Midlands Airport (such as UPS, DHL, TNT and Royal Mail) to identify opportunities for pilot test initiatives in their fleet of vehicles.
- Begin discussions with Calor Gas (LNG gas supplier at Moto Donington Services) and others for a joint partnership to step-up sales of LNG/CNG.

*Identifying most promising opportunities*

- Commission a more detailed study to identify
  - the benefits of turning Moto Donington Services station into an HGV recharging and CNG + H<sub>2</sub> refuelling hub;
  - Other possible locations for the hub.
- Identify opportunities to create new biomethane production plants in the Leicestershire area.
- Identify opportunities to grow current installations further and promote them to inject biomethane into the gas grid or sell biomethane directly to gas refuelling station operators
- Investigate the feasibility of a hydrogen station to be included on the same site, smaller in scale but serving particular fleets of HGVs as part of a funded project.

*Identifying sources of funding and delivery model*

- Identify sources of funding for such projects (DfT grants such as Integrated Delivery Programme)
- Learn from best practices at Tyseley Refuelling Hub.

## 5.3 Delivering Clean, Smart, Flexible Power

### 5.3.1 Introduction

The national ambition is to transition to a diverse electricity system that supplies our homes and businesses with secure, affordable and clean power. In order to decarbonise the power sector to zero by 2050 (which is the expected requirement<sup>95</sup>), the Government has proposed interim milestones to achieve by 2032. By this date, the Government will phase out unabated coal power and grow electricity generation from renewable resources. There will be a specific focus to improve the route to market for renewable generation technologies. The Government aims to increase the deployment of small scale power generation including solar PV. Waste is also a key theme in the Government's Clean Growth Strategy because generating energy from waste is part of the solution to providing clean power. Efforts will be made to maximise the value of any waste that is produced. The Government aims to publish a new Resources and Waste Strategy by the end of 2018.

A central point in the national strategy is to set out steps that will enable a smarter, more flexible system by expanding interconnection, electricity storage and demand side response (DSR); these are described in the Smart Systems and Flexibility Plan. A smarter, more flexible grid benefits consumers, the system and the wider economy. One study<sup>96</sup> found that the UK economy could stand to benefit between £17 and £40 billion to 2050 from a smart energy system, citing that benefits would come from avoided or deferred network reinforcements, avoided generation build, avoided curtailment of low carbon generation, and better operation of the system. The Government will invest in innovation in technologies including energy storage, innovative demand response and grid balancing technologies, and other technologies.

### 5.3.2 Rationale and constraints

In addition to adherence to the national objectives of delivering clean, smart, flexible power, an important additional rationale in Leicester and Leicestershire is related to the local electricity capacity constraints. During stakeholder consultations, electrical grid capacity was regularly cited as a key barrier to local low carbon energy generation. It was also cited as a barrier to connections for demand customers.

#### Reinforcement lead time constraints

An important challenge is coordinating the reinforcement of the electricity grid to accommodate plans for new development and/or expansion of existing demand without introducing avoidable delays, whilst also ensuring that any investments in the grid are required and will not be 'stranded assets', since the costs will be borne by the customer. Under the current regulatory framework, the distribution network operator (DNO), Western Power Distribution (WPD), is only permitted to invest ahead of need where it can show that this provides a benefit to the customer<sup>97</sup>. This usually means that the DNO is not incentivised to do so or that it cannot take the risk. Therefore in practice, DNOs do not invest ahead of need – it is this that drives much of the lead time constraints.

A strategic, forward-looking roadmap identifying the energy infrastructure that will be required to meet growing demand, combined with greater flexibility to allow investment in the network with a higher degree of forward planning, could go some way to addressing this

<sup>95</sup> BEIS internal analysis of 2050 pathways

<sup>96</sup> Carbon Trust and Imperial College London, An analysis of electricity system flexibility for Great Britain (2016)

<sup>97</sup> Ofgem, A guide to electricity distribution connections policy (2014)

constraint. A key challenge is how to ensure fairness in how the infrastructure is funded – that is, ensuring it is funded by those who stand to benefit from it.

### Reinforcement cost constraints

A high proportion of the electricity substations in Leicester and Leicestershire have little aggregate demand headroom. If a customer wishes to connect a new load to the network that requires network upgrades, the partition of cost between the customer and the DNO depends on the load requirements and whether the customer is existing or new. When the load growth is related to existing connections, the costs of any investment required will be socialised across the network users through the network charges in electricity bills. When a new customer requests a connection, they have to pay the upfront cost of the connection and any network reinforcements required up to one voltage above the level they connect at<sup>98</sup>. These reinforcements can be prohibitively expensive for an individual customer and hence, while the DNO does not refuse to connect new customers, the cost of connections can act as a barrier to development and growth.

### 5.3.3 Policy context

On the national level, the Government’s policies and proposals are to grow low carbon sources of electricity, deliver smart, more efficient energy, keep costs down for businesses and households, and invest public funds in research and innovation in the power sector.

Leicester and Leicestershire is not alone in experiencing the reinforcement lead time and cost constraints described above. Ofgem, the Government electricity regulator, is currently investigating the issue further to identify solutions available that are compatible with the current regulations. Investigations started in September 2015<sup>99,100</sup> and work is currently ongoing.

Demand side response can be used to reduce peak electricity demand and therefore reduce the magnitude of necessary grid upgrades, potentially freeing up capacity on existing networks to enable new demands to connect. BEIS has allocated a total of £15m of funding<sup>101,102</sup> to identify and test innovative approaches to DSR in domestic and non-domestic applications and further funding is available through the Ofgem Network Innovation Stimulus for network innovation projects, which includes trialling of DSR and other flexible network technologies and commercial arrangements.

<sup>98</sup> WPD, Statement of methodology and charges for connection to WPD (East Midlands) PLC’s electricity Distribution system (June 2018)

<sup>99</sup> Ofgem, Quicker and more efficient connections – next steps (September 2015)

<sup>100</sup> Ofgem, Quicker and more efficient connections – an update on industry progress (January 2016)

<sup>101</sup> BEIS, Domestic Demand Side Response (DSR) Competition - Guidance Notes (2017)

<sup>102</sup> BEIS, Innovative Non-Domestic DSR Competition - Guidance Notes (2017)

### 5.3.4 Suggested solutions with specific project examples

#### 5.3.5 Project opportunity 6: Providing low cost and low lead time connections for new demand customers

A key issue is the uncertainty in future demand growth and development. Until the new customers request a connection, WPD cannot under the current framework make the investment. WPD has previously attempted an approach in which prospective new demand customers are grouped into consortia, which could make an aggregated connection request and share the costs and risks across the consortium members. While these consortia have not resulted in successful connection offers to-date, consultation with WPD has revealed that they believe the approach is promising and could help to overcome the ‘first-comer’ costs that may currently be a barrier to connections.

We see a specific role for the Leicester and Leicestershire LLEP partnership as a facilitator between new customers and the network operator. The approach used up until now to pay for new connections has been that a customer is only charged for the network reinforcements needed for their connection. If subsequently another customer connects that benefits from upgrades that had been paid for by the first customer, a rebate mechanism is in place whereby the first customer recovers some their initial investment. The level of risk and investment for the first customer can be very high. The LLEP could help to overcome this barrier by playing the role of a trusted facilitator, bringing together groups of potential new demand customers and potentially providing an interface with the DNO. In certain situations, the LLEP may even share the risk and cost of upgrading the network through grants. Clearly, there would need to be a very strong case for this investment to justify spending the public funds in this way.

However, this is only a part solution as it still requires an application for a new connection from the customers, and the same lead time issues described above are likely to occur. In practice it could also be challenging to facilitate the coordination of customers, especially as it may be difficult for all the development timescales to align.

We suggest that a broader structure/regulatory change may be needed to overcome the lead time barrier. Ofgem, the electricity market regulator, has been investigating various options for how such a framework may be structured. In their September 2015 publication<sup>103</sup>, they outline three different models for how investment in anticipation of connections may be structured:

1. The DNO funds the anticipatory investment. The cost of the reinforcement is spread across all the DNO’s customers. Customers that wish to connect in the future do not have to pay (directly) for this reinforcement;
2. The DNO funds initial investment, but recovers this from connection customers;
3. A third party funds the initial investment, but recovers this from connection.

In order to assess these models further, Ofgem wished to use ‘real-life’ examples to understand what might be possible under current regulations/legislation. They invited DNOs to bring forward schemes that could serve as trials for anticipatory investment. The investigation is ongoing, however, a January 2016 update<sup>104</sup> pooled the trials into two broad types with a brief description of the models put forward, these are shown below for reference. Models 1 and 2 are undergoing assessment, it is unclear if model 1 was included in the

<sup>103</sup> Ofgem, Quicker and more efficient connections – next steps (September 2015)

<sup>104</sup> Ofgem, Quicker and more efficient connections – an update on industry progress (January 2016)

testing due to the high risk it places on the wider customer base having to pay for 'stranded assets'.

- I. **Significant numbers of distributed generation applicants in one area** (*network is already – or nearly, congested and in need of further management/reinforcement to accommodate new loads. Prohibitively high costs associated with the first connection in the area*).
  - *The DNO builds an enhanced scheme to connect an initial connection request (first comer). The costs of the enhanced scheme would be recovered from the first and subsequent connectees (using the Electricity Connection Charges Regulations 2002 (EccR))*
  - *The DNO advertises on its website its intent to create additional capacity in an area. It would invite developers who want to use this capacity to come forward and give some form of user commitment to show their intent. The DNO would then build an enhanced scheme to connect an initial connection request (first comer). The costs of the enhanced scheme would be recovered from the first and subsequent connectees (using the EccR).*
  - *A third variation would involve the DNO issuing prospective connection customers with a connection offer that is outside the standard connection agreement. This would indicate the cost of reinforcement they would have to pay. But the customer would be informed that they may also apply for an 'aggregate capacity' offer, which would share the costs of reinforcement with other connection customers. This would effectively be a DNO-led consortium. The scheme would only proceed once enough customers had signed up to justify the provision of a minimum level of capacity.*
- II. **Urban development** (*locations are long-term, large urban regeneration or new development projects that potentially involve many independent developers with different needs. There is an overarching body in place to co-ordinate redeveloping sites e.g. LAs*)
  - *DNO investment from a first-comer*
  - *Developer/third party funded*

In addition, the same publication analysed feedback from existing schemes with Northern Powergrid (NPg). The lessons learnt from these case studies were:

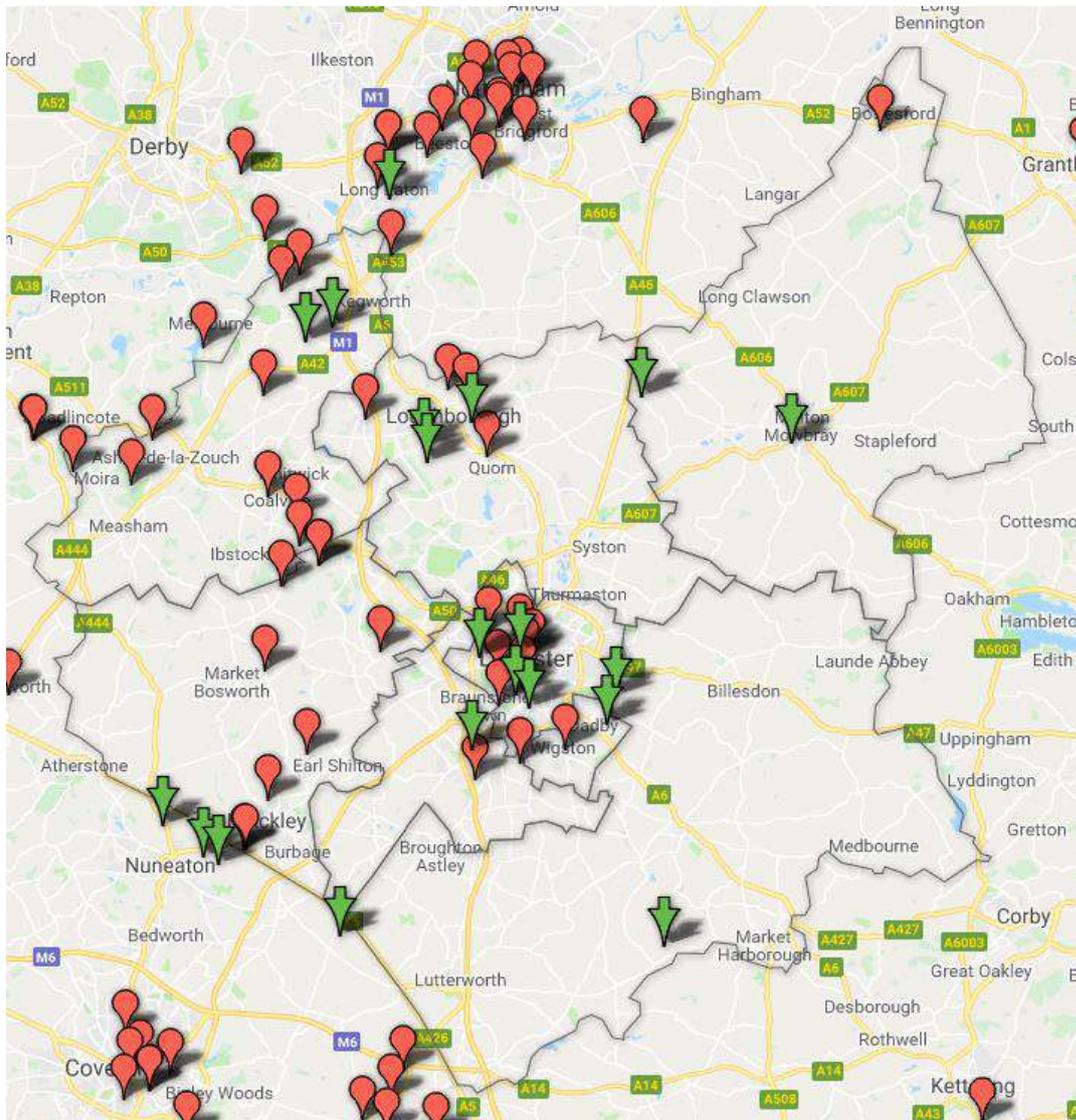
- *All these schemes took place within the existing regulatory framework and NPg was able to develop legal and connection agreements that sat outside the standard connection agreements.*
- *When real local load growth coincides with clear, staged development plans and connection offer activity, there is a much clearer case for the DNO to invest in significant reinforcement.*
- *Two of the three schemes were able to move forward as a result of third party European/local authority funding, with some additional funding provided by NPg on one of these schemes.*
- *However, the commercial aspects of all these arrangements were complicated and time-consuming for both the customer and DNO, but necessary in ensuring DUoS funding was adequately safeguarded.*

Clearly the issues being experienced in Leicester and Leicestershire are not unique and work is ongoing among the DNOs and the regulator to identify solutions, including connection offers that are non-standard but can be progressed within the existing regulatory framework. The most suitable approach will depend on the particular local circumstances, for example the number and type of prospective connection customers, the nature of the

network constraints, and so on. This suggests that a better understanding of the constraints by geography will be a useful first step toward identifying appropriate local solutions.

We have undertaken a high level analysis to better understand the constraints geographically. Data was provided by WPD showing the electrical substations that are red RAG constrained by aggregate demand headroom<sup>105</sup>. This data has been overlaid with economic growth areas, and is shown visually in Figure 5-7. Economic growth areas that will require electricity network upgrades, and that may therefore benefit from the type of project listed above, include: Hinckley, Coalville, Loughborough, Central, West and South Leicester City. These findings are consistent with a recent study<sup>106</sup> that aimed to identify the likely utilities infrastructure requirements and investment necessary to accommodate the expected growth in the Leicester and Leicestershire area.

**Figure 5-7: Map relating economic growth areas to electricity grid constrained areas**



<sup>105</sup> This means that the substation (or one operating at a voltage level above it that it is connected to) is operating very close to its capacity and has little demand headroom. Although this means that in order to cope with a significant new load the substation would need to be upgraded, it also represents the most efficient way of operating a network: one in which demand is very closely matched by capacity to supply.

<sup>106</sup> Peter Brett Associates on behalf of The Leicestershire Commissioning Group - Leicester and Leicestershire Utilities Infrastructure Capacity Study (November 2017)

Table 5-14: Map key

Category	Symbol	Description
Electricity grid substation		Aggregate demand red RAG constrained substation (BSPs and Primaries)
Economic growth area		Economic growth area highlighted in Leicester and Leicestershire’s Strategic Growth Plan (2018)

**Summary and recommended actions – Providing low cost and low lead time connections for new demand customers**

An important challenge is coordinating the reinforcement of the electricity grid to accommodate plans for new development and/or expansion of existing demand without introducing avoidable delays, whilst also ensuring that any investments in the grid are required and will not be ‘stranded assets’, since the costs will be borne by the customer. Under the current regulatory framework, the distribution network operator (DNO), Western Power Distribution (WPD), is only permitted to invest ahead of need where it can show that this provides a benefit to the customer. This usually means that the DNO is not incentivised to do so or that it cannot take the risk. Therefore in practice, DNOs do not invest ahead of need, which is a significant factor contributing to long lead times for connections.

In order to help address this challenge, we see a specific role for the LLEP as a facilitator between new customers and the network operator. In certain situations, the LLEP could potential share the risk and cost of upgrading the network. We recommend the following actions are taken in the short term:

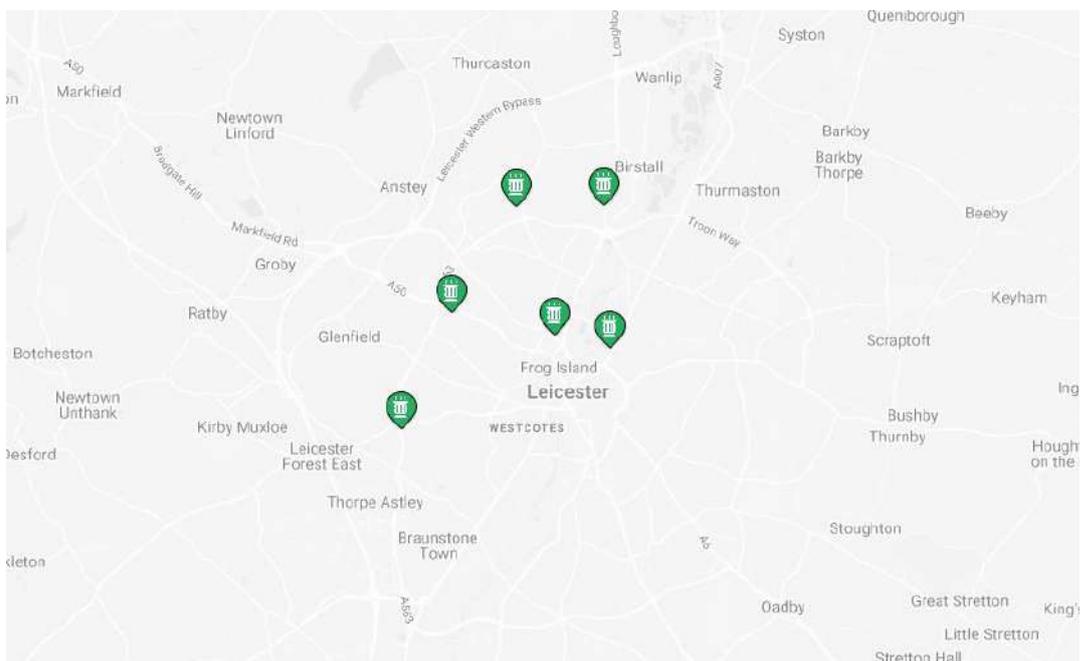
- Discuss possible case studies that could be undertaken in Leicester and Leicestershire with WPD to identify whether solutions where investment is made ahead of need are possible whilst staying within current regulation. Possibilities include:
  - The DNO funds the anticipatory investment;
  - The DNO funds initial investment, but recovers this from connection customers;
  - A third-party funds the initial investment, but recovers this from subsequent connection of customers through the existing ‘second comer’ regulation.
- These case studies should initially be targeted at areas where electricity demand is expected to exceed capacity the soonest (suggested to be the Northern Gateway and Southern Gateway);
- Lobby national government for changes to the regulations to allow DNOs greater scope to make investments ahead of need, particularly in areas where strong growth is expected and network capacity is limited.

### 5.3.6 Project opportunity 7: Flexibility based connection offers for new electricity demand loads

Flexibility based connection offers are a way of maximising existing capacity by changing consumer behaviour on the demand side; they are an example of demand side response (DSR), where peak electricity demand is offset temporally.

WPD has identified six electricity substations in Leicester and Leicestershire that could benefit from demand side flexibility, these are shown in Figure 5-8. The names of the six substations are: Birstall 33/11kV, Leicester North 11kV South Station, Lero 33/6.6kV, Beaumont Lays 33/11kV, Groby Road 33/11 kV and Hockley Farm Road 33/11kV.

**Figure 5-8: electrical substations which would benefit from demand flexibility in the LLEP area<sup>107</sup>**



In this suggested project, we propose a mechanism to alleviate the high connection cost offers that are currently being offered to new connection customers, based on use of flexibility. In this scenario, new customers would be given the option to invest in grid reinforcements, i.e. a conventional connection offer, or to agree to a certain level of demand (or generation) flexibility thereby reducing or avoiding network upgrades.

From our stakeholder consultations, we are aware that WPD is interested in using demand flexibility within the Leicester and Leicestershire network. WPD procures demand flexibility elsewhere in the country through an initiative called Flexible Power<sup>108</sup>; helping business customers make the most of their demand flexibility by providing services to WPD. The proposed project opportunity is similar to the Flexible Power offering, however, would explore whether demand flexibility could be used to create capacity for new connection customers resulting in lower cost connection offers as an alternative to conventional reinforcement based offers.

A flexibility based connection offer project may be facilitated by a body bringing flexibility providers, demand customers and WPD together. Energy-software companies exist in the

<sup>107</sup> Source: <https://flexibilitymap.westernpower.co.uk/>

<sup>108</sup> <https://www.flexiblepower.co.uk/>

UK that solve some of these issues by providing an online marketplace for distribution system operators (DSOs)<sup>109</sup>. Such marketplaces can match flexibility providers (e.g. aggregators, battery owners, EV owners) with buyers (transmission system operators (TSOs), DSOs). The potential role for the LLEP here would be to draw on its influence to bring stakeholders together, including connection customers and flexibility providers. The LLEP could increase awareness of the potential for such flexibility based connection offers and, through its involvement, instil confidence in participants who might otherwise be reluctant to become involved.

We suggest a number of areas that would need to be explored further before a trial project is undertaken. Firstly, it is not evident whether this type of connection offer would be feasible within the current regulatory framework. If not currently feasible, it may be possible to get a special dispensation to trial the arrangement as part of an innovation project. Research<sup>110</sup> suggests that DNOs are offering or trialling this type of flexible connection to distributed generators (where small-scale electricity is generated on or near to the end user at times of peak demand). Secondly, the risk associated with flexible connection offers for connection customers needs further investigation. This is especially true in case of unexpected changes in customers' ability to be responsive with their demand, particularly if this results in the need for conventional reinforcement at a later date (as it is not clear how the costs of such reinforcement should be allocated). To resolve these issues will require detailed consideration of the commercial and regulatory issues, modelling and physical trials. The Innovation Stimulus Package (i.e. the Network Innovation Allowance and Innovation Competition) might provide suitable sources of funding for this investigation. Flexibility based connection offers of various types are already offered by certain DNOs (including WPD). However, these are currently at the trial stage, and the effectiveness of this approach is not fully understood. Nonetheless, we suggest that flexibility based connection offers have the potential to alleviate grid reinforcement constraints and that it is worthwhile to better understand the potential of this approach through further trialling and testing.

---

<sup>109</sup> As DNOs start playing a more active role in managing flexible demand on their networks, they are transitioning to become distribution system operators (DSOs) – however, they remain the same organisations (i.e. WPD in Leicester and Leicestershire).

<sup>110</sup> <http://www.energynetworks.org/electricity/futures/flexible-connections.html>

**Summary and recommended actions – Flexibility based connection offers for new electricity connection customers**

We propose a mechanism to alleviate the high connection cost offers that are currently being offered to new connection customers, based on use of flexibility. In this scenario, new customers would be given the choice of investing in necessary grid reinforcements, i.e. a conventional connection offer, or to agree to a certain level of demand (or generation) flexibility thereby reducing or avoiding network upgrades. Extending this further, were there a local market for flexibility, customers seeking a connection could agree to purchase flexibility on the market in order to gain a lower cost connection offer (e.g. due to reduced need for reinforcement). The LLEP could have a role here in bringing together flexibility providers with connection customers.

We suggest a number of areas that would need to be explored further before a trial project is undertaken. In order to better understand the viability of this mechanism, we recommend the LLEP take the following actions:

- Begin discussions with WPD to assess whether current regulation would allow WPD to offer flexibility based connections to new non-domestic demand customers;
- Host consortiums bringing flexibility providers, demand customers and WPD together; propose suitable LA owned assets to be included in DSR projects;
- Explore funding opportunities (BEIS, Network Innovation Stimulus Package) for a trial project in Leicestershire;
- Create competitions within the LLEP for innovative exemplar DSR opportunities based on flexibility based connections;
- Raise awareness of the benefits of DSR to Leicestershire's residents, businesses and industries through informational campaigns and LA websites.

### 5.3.7 Project opportunity 8: Strategic plan for renewable electricity generation deployment

The CO<sub>2</sub> emissions reduction targets described in detail in section 3.2 and region-wide UK100 Pledge to reach 100% clean energy by 2050 are crucial. However, it is also important, from the perspective of understanding how these targets can be achieved, to set interim targets for installed capacity of specific renewable resources at a local level. In 2008, Hinckley & Bosworth Borough, Blaby District, Oadby & Wigston Borough, N.W. Leicestershire District, Harborough District and Melton Borough Councils undertook a joint renewable energy assessment<sup>111</sup>. This report includes capacity maps for wind and hydro energy, with specific site analyses. The report also includes capacity data for biomass, biogas and solar energy by LA. In 2011, a report prepared for the East Midlands Councils<sup>112</sup> gives a geographic assessment for the technical potential of renewable energy in each LA in the region. In 2012, Charnwood LA commissioned a piece of work<sup>113</sup> identifying renewable energy targets and the study includes a geographic assessment of the potential of wind and hydro energy. A 2014 report<sup>114</sup> commissioned by Hinckley and Bosworth gives a detailed geographic analysis of a range of renewable energies and states recommended uptake targets for each resource. In summation, there is already a good understanding of the technical potential for deployment of renewable power sources by LA. However, specific targets for the deployment of renewables, and a strategy for how these resources can help deliver the pledge on 100% clean energy by 2050, have not been set by all LAs.

In section 4 we presented an analysis of future energy use in Leicester and Leicestershire, which found that in 2050 electricity consumption will be in the range 6,900 to 8,000 GWh per year, depending on the pathway chosen and level of decarbonisation achieved. The results from the analysis undertaken for the East Midlands report found that the technical potential for renewable electricity generation in Leicester and Leicestershire is 7,100 GWh per year in 2020. This is shown graphically by technology type in Figure 5-9.

---

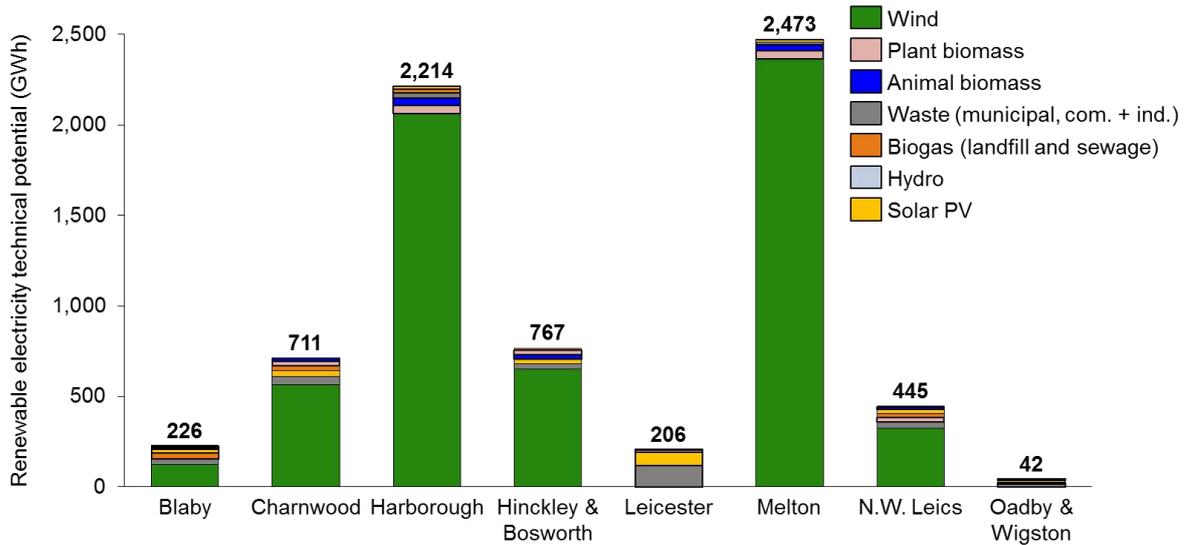
<sup>111</sup> IT Power, Renewable Energy Opportunities for Blaby, Harborough, Hinckley and Bosworth, Melton, North West Leicestershire, Oadby and Wigston and Rutland (2008)

<sup>112</sup> Land Use Consultants, Centre for Sustainable Energy and SGW for East Midlands Councils, Low Carbon Energy Opportunities and Heat Mapping for Local Planning Areas Across the East Midlands: Final Report (March 2011)

<sup>113</sup> Targets for Large Scale Renewable Energy Installations and Sustainability Standards in New Buildings: Background Papers (2012)

<sup>114</sup> LUC, Hinckley and Bosworth Renewable Energy Capacity Study (2014)

Figure 5-9: The technical potential of renewable electricity generation in Leicester and Leicestershire (GWh per year)<sup>115</sup>

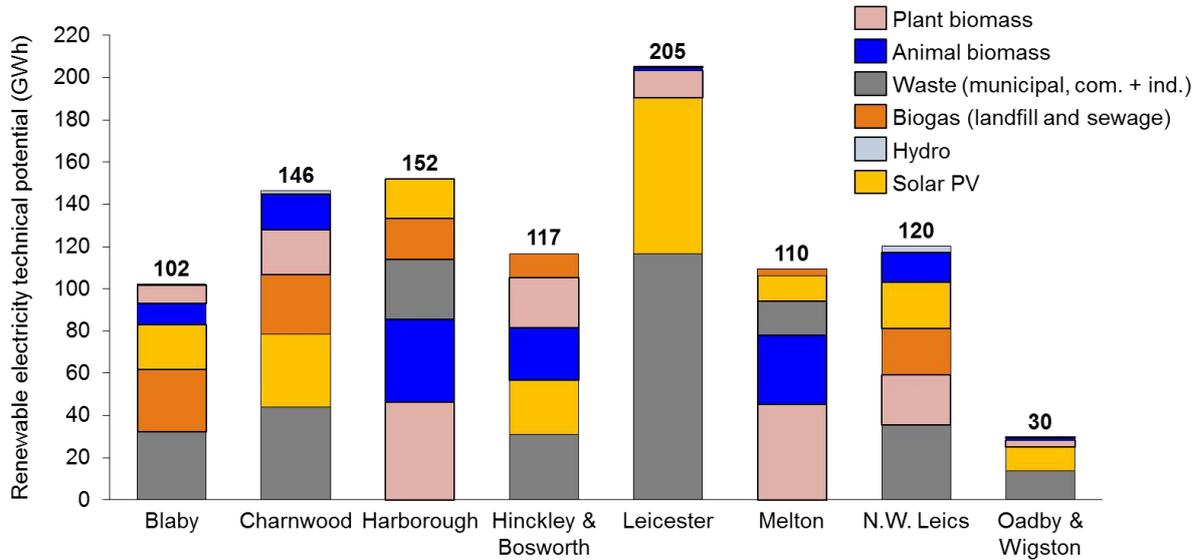


We see that the majority (86%) of the technical potential comes from wind energy, with an estimated potential of 6,100 GWh per year. If exploited to its technical potential, wind energy alone could meet 76% to 88% of Leicester and Leicestershire’s electricity requirements by 2050.

In order to see the remaining 14% of the renewable electricity generation potential more clearly, the technical potential in 2020 of renewables excluding wind energy is shown in Figure 5-10. From this figure we see that power generation from Waste (318 GWh/yr), Solar PV (220 GWh/yr) and Plant biomass (185 GWh/yr) are the next most important contributors. Figure 5-10 is particularly relevant to Leicester City because the densely populated area is largely unsuitable for wind turbines, compared to other LAs in the region. Findings from the East Midlands report indicate that the technical potential for the regions as a whole is unlikely to change by a significant amount to 2030.

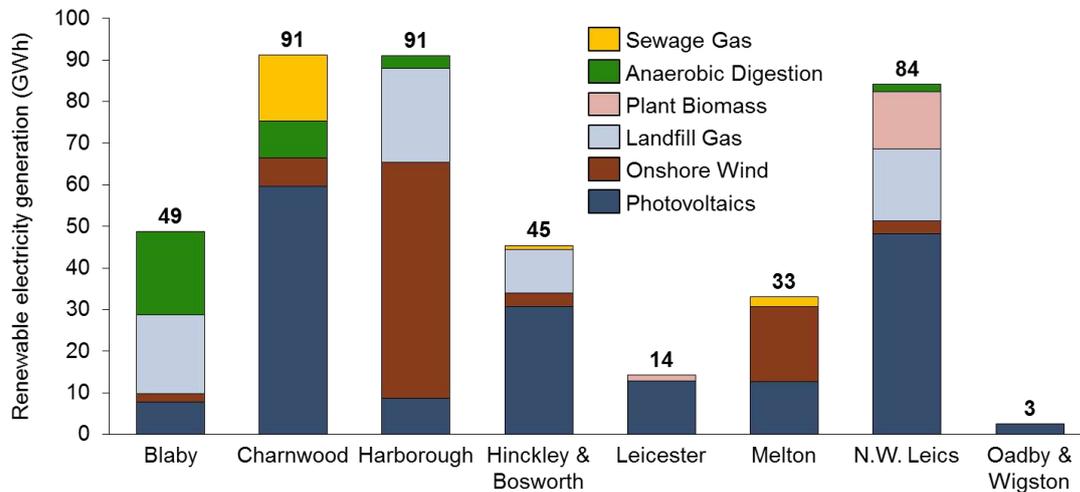
<sup>115</sup> Data obtained from: Land Use Consultants, Centre for Sustainable Energy and SGW for East Midlands Councils, Low Carbon Energy Opportunities and Heat Mapping for Local Planning Areas Across the East Midlands: Final Report (March 2011)

Figure 5-10: The technical potential of renewable electricity generation excluding wind energy in Leicester and Leicestershire (GWh per year)<sup>116</sup>



The installed capacity at the end of 2016 is shown in Figure 5-11<sup>117</sup>. The comparison of Figure 5-9 and Figure 5-11 shows that wind energy is vastly underexploited, with only 90 GWh/yr wind energy generated compared with the estimated technical potential of 6,100 GWh/yr.

Figure 5-11: Expected renewable electricity generation from installed capacity at the end of 2016<sup>118</sup>



It is interesting to compare the level of renewable electricity generation in Leicester and Leicestershire with the rest of the UK. The Leicester and Leicestershire region makes up 1.6% of the UK’s population and 0.9% of its land area. In Figure 5-12 we see that the share of the total UK renewable electricity generated in Leicester and Leicestershire is higher than 1.6% - suggesting deployment above the national average – for photovoltaics, anaerobic

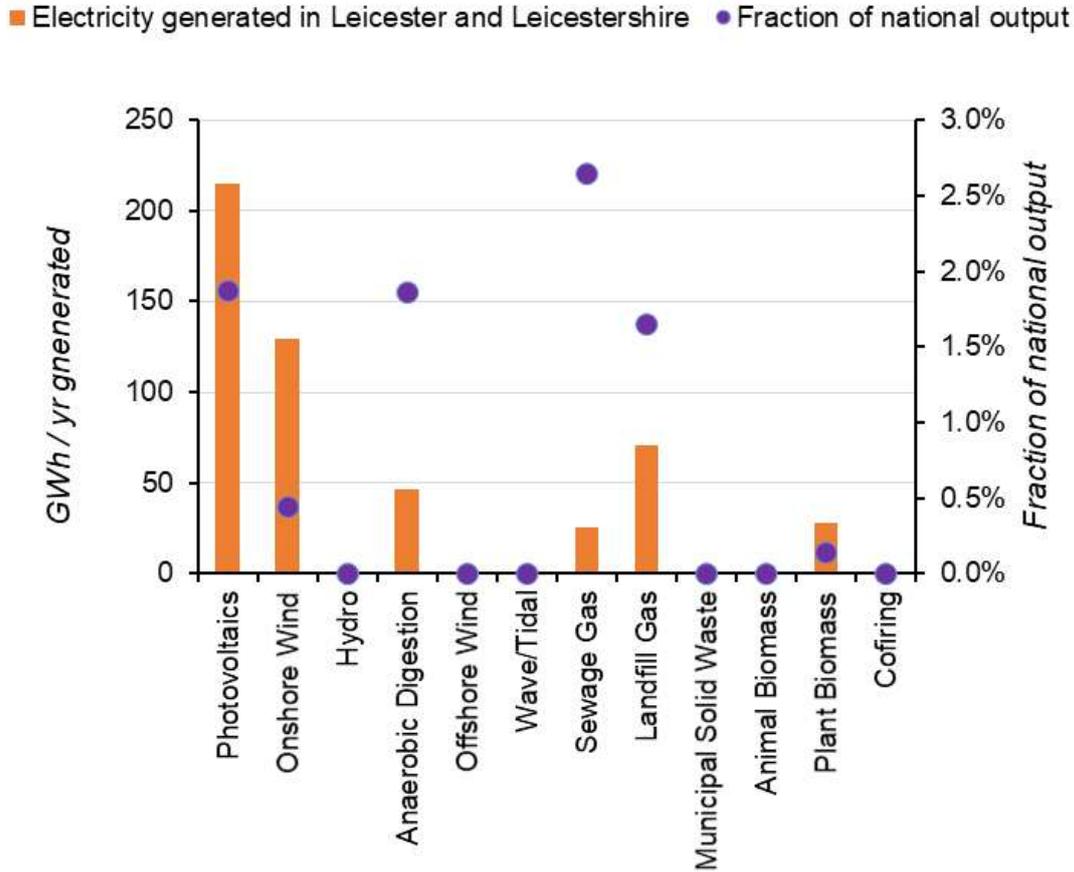
<sup>116</sup> Data obtained from: Land Use Consultants, Centre for Sustainable Energy and SGW for East Midlands Councils, Low Carbon Energy Opportunities and Heat Mapping for Local Planning Areas Across the East Midlands: Final Report (March 2011)

<sup>117</sup> We note that that installed capacity includes capacity from large scale solar projects, which was excluded in the East Midlands report.

<sup>118</sup> Data obtained from BEIS, Regional Renewable Statistics (2016 data)

digestion, sewage gas and landfill gas. However, deployment of other renewable generation is below the national average.

Figure 5-12: Renewable electricity generation in Leicester and Leicestershire compared to national output



Local generation of renewable electricity would avoid the “leakage” of some of the value chain, including the development, construction, operation & maintenance, decommissioning and repowering of wind turbines, to other regions. Based on a study that identified the potential economic value of onshore wind in the UK<sup>119</sup>, we have estimated the value that could be brought to the Leicester and Leicestershire region through increased deployment of wind power. Our analysis suggests that, if the onshore wind resource were exploited fully, (i.e. if 3,800 MW were installed locally), up to £4 billion in national gross value add (GVA) would be created. The same study estimated average share of that value that is typically realised locally as approximately 15%, meaning that full exploitation of the local resource in Leicester and Leicestershire could generate in the order of £600m locally, mainly in construction, depending on the share of the value chain that can be captured. Our analysis based on the study also suggests that this would create 10,000 additional jobs, 1,400 of which may typically be expected to be created in locally<sup>120</sup>. This analysis is summarised in Table 5-15.

<sup>119</sup> Renewable UK, Onshore Wind Direct & Wider Economic Impacts (2012)

<sup>120</sup> Local value refers to GVA and jobs created inside of the perimeter of local authorities

**Table 5-15: Estimates of GVA and job creation from the construction of the remaining technical potential for renewable wind in Leicester and Leicestershire (3,800MW)**

Value chain segment	National GVA	Local GVA	National job creation	Local job creation
Development	£150m	£13m	2,500	200
Construction	£3,800m	£570m	6,529	960
O&M	£73m	£29m	921	267
<b>Total</b>	<b>£4,000m</b>	<b>£600m</b>	<b>10,000</b>	<b>1,400</b>

It is recognised that the deployment of onshore wind can be politically difficult, and that at present any national support for the technology through Contracts for Difference (CfD) is limited to areas not on the mainland<sup>121</sup>. On a local level, concerns have also previously been raised, including:

- wind turbines’ inadequacy during times of high and low wind speeds (i.e. intermittency);
- damage to the landscape; and
- noise and visual pollution.

There exist possible solutions to these concerns. Technological advances mean that today energy storage can be installed alongside wind turbines e.g. integrated wind-plus-storage, thereby addressing the intermittency, albeit at an additional cost. Energy storage is likely to play an increasing role in supporting renewable generation as the level of deployment increases. To reduce visual impact, planning policy can be carefully formulated to

- set minimum distance requirements between homes and turbines of a certain size;
- set minimum size requirements on turbines in certain areas.

In addition, vertical-axis turbines with a smaller cross section in onlookers’ field of view can be used as an alternative to traditional turbines, having the added benefit of reducing the impact on birds, but with the drawback of a lower efficiency. It must be recognised, nonetheless, that the landscape, noise and visual concerns may reduce the proportion of the estimated 6 TWh of wind generation potential that could be exploited.

An alternative approach is to put in place mechanisms to ensure that households impacted by wind turbines benefit from them financially. Community ownership schemes may be used to drive part of the revenues generated from electricity sold towards the households that are impacted. Inhabitants of the Danish island, Samsø, set a precedent for this by owning shares in 20 of the 21 on- and off-shore wind turbines that are dispersed on and around the island. The turbines have a total capacity of 34MW and have been generating electricity since the year 2000. Alternatively, other forms of incentive could be explored, such as compensation payments, or the opportunity to purchase the electricity generated by the turbine at a reduced price.

The assessment described above suggests a substantial value opportunity for Leicester and Leicestershire to further foster a local wind energy industry and ensure that a significant share of the clean electricity the region will need to be consuming in the coming decades can be generated locally. A similar argument applies to the other renewable generation

<sup>121</sup> See for example: <https://www.businessgreen.com/bg/news/3033768/government-greenlights-onshore-wind-for-remote-islands>

technologies, but as presented above the potential contribution of those in the Leicester and Leicestershire region is expected to be less significant.

**Summary and recommended actions – Strategic plan for renewable electricity generation deployment**

Comparison of the current level of deployment of renewable electricity generation and the technical potential in Leicester and Leicestershire, as estimated in previous studies, indicates that the majority of the technical potential for renewable electricity in the region remains unexploited. The remaining potential across a range of renewable electricity sources is in the region of 6,700 GWh/yr, comparable with the total electricity demand in the region today, and also to the total electricity demand likely to be required in 2050. This potential is dominated by wind (6,000 GWh/yr remaining potential) with the remainder from solar PV, biomass, energy-from-waste and other sources. If deployed to its full potential, this would require 125 MW to be installed annually in the Leicester and Leicestershire region between now and 2050.

In addition to helping to deliver on the pledge to run on 100% clean energy by 2050, there is significant value to be gained from generating this energy locally. Deployment of the full potential for wind power could generate in the region of £600m GVA in the local economy and more than 1,000 jobs, depending on the share of the construction, development and operation value chain captured in the area.

In order to unlock these benefits, we recommend that the LLEP and/or the local authorities take the following actions:

- Set specific targets in each LA for the uptake of each renewable energy resource (noting that this has already been done in certain LAs, though these may need to be adapted), identifying clearly the sites that could host the generation plant and undertaking to safeguard these areas as appropriate.
- Take steps to ensure that the local economy is well-positioned to generate value from the deployment of renewable energy in the region, by ensuring that the associated skills are available in, for example, the construction industry and in the operation and maintenance of renewable energy systems.

## 6 Bibliography

Department for Business, Energy and Industrial Strategy, A Future Framework for Heat in Buildings: Call for Evidence (2018)

Department for Business, Energy and Industrial Strategy, Domestic Demand Side Response (DSR) Competition - Guidance Notes (2017)

Department for Business, Energy and Industrial Strategy, Innovative Non-Domestic DSR Competition – Guidance Notes (2017)

Department for Business, Energy and Industrial Strategy, Regional Renewable Statistics (2016)

Department for Business, Energy and Industrial Strategy, Updated Energy and Emissions Projections 2017

Blaby District Council, Climate Local Commitment Plan (June 2013)

Bristol City Council, Bristol Core Strategy Development Framework (2011)

Carbon Trust & Imperial College London, An analysis of electricity system flexibility for Great Britain (2016)

Charnwood Borough Council & Carbon Trust, Carbon Management Plan 2015-2020 – FY 2016/17 Monitoring Report (May 2018)

Charnwood Borough Council, Targets for Large Scale Renewable Energy Installations and Sustainability Standards in New Buildings: Background Papers (2012)

Committee on Climate Change, UK climate action following the Paris Agreement (October 2016)

Committee on Climate Change, Fifth Carbon Budget (2016)

Department for Communities and Local Government, Cost-optimal calculations: UK report for the European Commission (2013)

Element Energy & E4tech for the NIC, Cost analysis of future heat infrastructure options (March 2018)

Element Energy & Cambridge Econometrics, Energy Challenge Paper: An ideas paper for consultation to inform the development of the Energy Infrastructure Strategy for Leicester and Leicestershire (July 2018)

Element Energy & WSP for Transport for London, Plug-in Electric Vehicle Uptake and Infrastructure Impacts Study (2016)

H21 Leeds Citygate team, H21 Report (2016)

Harrow Council, Information report for the Traffic and Road Safety Advisory Panel (2017)

HM Government, The Clean Growth Strategy: Leading the way to a low carbon future (2017)

HM Government, Industrial Strategy Building a Britain fit for the future (November 2017)

HM Government, The Road to Zero Next steps towards cleaner road transport and delivering our Industrial Strategy (July 2018)

HM Treasury Green Book supplementary appraisal guidance on valuing energy use and greenhouse gas (GHG) emissions supporting tables, Table 3 (December 2017).

International Energy Agency (IEA), Capturing the Multiple Benefits of Energy Efficiency (2014)

Imperial College London for the Committee on Climate Change, Analysis of alternative UK heat decarbonisation pathways (August 2018)

IT Power, Renewable Energy Opportunities for Blaby, Harborough, Hinckley and Bosworth, Melton, North West Leicestershire, Oadby and Wigston and Rutland (2008)

Jacobs for Leicester and Leicestershire Enterprise Partnership, Leicester and Leicestershire Strategic Growth Plan (Consultation Draft) – Strategic Assessment of Transport Impacts (March 2018)

Land Use Consultants, Centre for Sustainable Energy & SGW for East Midlands Councils, Low Carbon Energy Opportunities and Heat Mapping for Local Planning Areas Across the East Midlands: Final Report (March 2011)

Land Use Consultants, Hinckley and Bosworth Renewable Energy Capacity Study (2014)

Leicester and Leicestershire Enterprise Partnership, Leicester & Leicestershire 2050: Our vision for growth, Consultation Draft (September 2018)

Leicester and Leicestershire Enterprise Partnership, Energy Strategy – Melton Borough Response

Leicester and Leicestershire Enterprise Partnership, Leicester & Leicestershire Low Carbon Sector Growth Plan (July 2015)

Leicester and Leicestershire Strategic Housing Market Assessment (July 2014)

Leicester City Council, Core Strategy (July 2014)

Leicester City Council, Development Management Policies Reference document (July 2017)

Leicester City Council, Leicester’s Sustainability Action Plan 2016 – 2019 (updated 2017)

Leicester City Council and Oadby & Wigston Borough Council, Climate Change Evidence Base Study (December 2015)

Leicester City Council, Update progress report on Home Energy Conservation Act 1995)

Leicester City Mayor, Healthier Air for Leicester: Leicester’s Air Quality Action Plan (2015-2026)

Leicester City Mayor, Leicester: Great City – Economic Action Plan 2016-2020 (2016)

Local Government Association, Climate Local Annual report 2015/16

- Borough of Oadby & Wigston, Carbon Management Plan (June 2010)
- Office for Low Emission Vehicles, On-street Residential Chargepoint Scheme guidance for local authorities (<https://www.gov.uk/government/publications/grants-for-local-authorities-to-provide-residential-on-street-chargepoints>)
- Office for Low Emission Vehicles, Tax benefits for ultra-low emission vehicles (May 2018)
- Office for National Statistics, Housing Census (2011)
- Ofgem, A guide to electricity distribution connections policy (2014)
- Ofgem, Quicker and more efficient connections – an update on industry progress (January 2016)
- Ofgem, Quicker and more efficient connections – next steps (September 2015)
- Peter Brett Associates on behalf of The Leicestershire Commissioning Group - Leicester and Leicestershire Utilities Infrastructure Capacity Study (November 2017)
- Progressive Energy for Cadent, The Liverpool-Manchester Hydrogen Cluster: a low cost deliverable project, Technical Report (August 2017)
- Public and Corporate Economic Consultants (PACEC) for Leicester and Leicestershire Enterprise Partnership, Leicester and Leicestershire HMA Employment Land Study (2013)
- Renewable UK, Onshore Wind Direct & Wider Economic Impacts (2012)
- The Royal Society, Options for producing low-carbon hydrogen at scale (policy briefing)
- Sub-national electricity sales and numbers of customers: 2005-2016, BEIS (2018)
- Sub-national gas sales and numbers of customers: 2005-2016, BEIS (2018)
- Sub-national residual fuel consumption in the United Kingdom: 2005-2015, BEIS (2017)
- Sub-national road transport fuel consumption: 2005-2015, BEIS (2017)
- Department for Transport, Road Use Statistics in Great Britain (2016)
- Department for Transport, Low Emission HGV Task Force Recommendations on the use of methane and biomethane in HGVs (2014)
- Department for Transport, Road Use Statistics in Great Britain (2016)
- Western Power Distribution, Statement of methodology and charges for connection to WPD (East Midlands) PLC's electricity Distribution system (June 2018)
- Zero Carbon Hub in partnership with Sweett, Cost analysis: meeting the zero carbon standard (February 2014)