Leicester and Leicestershire

Utilities Infrastructure Capacity Study

On behalf of **The Leicestershire Commissioning Group**

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1.1.2 The primary aim of the UIC Study has been to establish the likely strategic utilities infrastructure requirements and investment necessary to support intermediate-term growth to 2031 and long-term growth to 2050 in the broad growth locations identified by the SGP.

1.1.3 The utilities infrastructure covered in the UIC Study includes gas and electricity supply networks; telecommunications networks (including broadband); and waste management infrastructure. The waste streams considered are Local Authority Collected Waste (LACW) and Commercial and Industrial (C&I) waste.

1.1.4 Leicester and Leicestershire is expected to experience significant growth to 2050, which will have implications for the utilities infrastructure in the area and its capacity to support growth.

1.2 Approach to the UIC Study

1.2.1 The UIC Study used local economic and development growth forecasts to predict future utility demands. These utility demands were mapped across the study area. These forward projections were compared to the incumbent utility network provider's growth plans. Further engagement was undertaken with the electrical distribution network operators (Western Power Distribution), local gas network operator (Cadent), Waste Authorities, and telecommunication strategy managers at the County Council.

1.3 Findings of the UIC Study

1.3.1 A qualitative appraisal was undertaken on the potential shortfalls in utility infrastructure provision between the current network capacities and the future growth demands. The findings of this appraisal are summarised below.

Electricity

1.3.2 From an assessment of Western Power Distribution's Long Term Development Statement and Network Capacity Map, some of the strategic growth areas are restricted, due to the level of remaining capacity that has already been committed for future developments. It should be noted at this stage that the lack of capacity currently available should not be seen as a constraint that would compromise development in these areas in the period beyond 2031.

1.3.3 The Study has identified the Northern and Southern Gateway to be the priority for further investigation to assess the potential time and cost implications of network capacity upgrades to support development in these areas. Whilst the area around Market Harborough is anticipated to have an excess of capacity.

Gas

1.3.4 From an assessment of National Grid and Cadent's asset maps, the county is well served by high-pressure assets. Through consultation with Cadent, the Study has identified the Northern Gateway, and southern area of the A46 corridor and Lutterworth to be the priorities for further investigation to assess the potential time and cost implications of network capacity upgrades to support development in these areas.

1.3.5 The information was unavailable for the Southern Gateway and so this should also be investigated in parallel to identify restrictions in this area and therefore priorities for further investigation.

Waste

1.3.6 The Leicestershire (outside the City of Leicester) and Leicester City waste authorities have both developed, and continue to develop, long-term waste management strategies for the area. Through their emerging Waste / Local Plans, both authorities will establish the waste infrastructure needs within their administrative boundaries to 2031.

1.3.7 As is to be expected, the existing and consented waste treatment facilities within Leicestershire are unlikely to have the capacity to treat waste arisings in 2050, as this period is beyond the existing waste planning framework (up to 2031). However, Leicestershire does have a strong recovery capacity, which could help to address any shortfall in landfill capacity.

1.3.8 Furthermore, in accordance with national waste policy, it is expected that both waste authorities in Leicestershire will strive to push waste up the waste hierarchy, thereby reducing reliance on landfilling by 2050.

1.3.9 Planning for future waste management (after 2031) will be taken forward in accordance with both waste authorities' statutory requirements. Where necessary, it is anticipated that both authorities will utilise waste management infrastructure outside of the county to meet the increasing waste treatment demands associated with growth.

Telecommunications

1.3.10 Beyond the existing copper telecommunications network, Leicestershire has a well-developed and growing superfast broadband network. Superfast Leicestershire, in part funded by the Leicester and Leicestershire Enterprise Partnership (LLEP), has a comprehensive fibre broadband roll-out scheme which is already increasing coverage and speeds throughout the county. By 2020, it is expected that coverage will be circa 98% with speeds of up to 30 mbps.

1.3.11 It is expected that all future residential and employment growth in the areas identified by the SGP will be connected to the superfast broadband network. This service is increasingly becoming the norm in new developments, and is considered an essential service for new homes and businesses. The broad growth areas identified in the SGP are primarily located in major conurbations with existing, or upcoming, fast download speeds.

1.3.12 For development outside of the SGP growth areas, including harder-to-reach rural areas such as the east of the county, emerging technologies such as satellite broadband and 5G mobile broadband will further support the county's communication platform. It is recommended that the LLEP track the evolution of satellite broadband and 5G delivery in the UK, and support the providers of these communication platforms in delivering their infrastructure.

1.4 The Future for Utility Infrastructure Growth in Leicestershire

1.4.1 The national capacity to supply future growth in Leicestershire is important when considering strategies for delivering utilities. This will allow target setting and development aspirations to form around regulatory certainty rather than outside this framework.

1.4.2 In delivering their statutory undertaking, utility companies will require support in implementing their long-term growth strategies, especially when taking into consideration innovation in future network design.

1.4.3 The provision of utility infrastructure should target reducing capital costs in the first instance and maximising environmental and social benefits, therefore creating true sustainability. A low cost clean infrastructure platform can deliver growth set out in the Clean Growth Plan, attracting investment benefiting from resource efficiency. Through this investment, Leicestershire would

become outward-looking in terms of utilities, whereby national infrastructure relies on the area to create system efficiencies that currently do not exist.

1.5 Low Carbon Energy Growth in Leicestershire

1.5.1 There are a wide number of opportunities for growing renewable and low carbon energy generation and supply in Leicestershire. These opportunities will be backed by new innovation in energy efficiency and modern energy supply networks being brought forward by the local energy network operators.

1.5.2 Traditionally, the delivery of large renewable energy projects has been undertaken independent of growth and development needs. An opportunity exists for future energy projects to be planned and developed in line with where local power and heat is needed. This would create a local power and heat network that would be more resilient to potential national capacity issues.

1.5.3 Future expansion of existing heat networks as a utility will need to focus on sources of waste heat in the first instance (rather than demand) to avoid the use of natural gas which is currently being explored by local authorities in Leicestershire.

1.5.4 A lack of 'local' renewable energy provision is unlikely, though, to hinder growth in Leicestershire due to the existing electricity capacity available and the long-term plans for decarbonising the National Grid. Focus on demand side management (reducing demand) will be critical, especially in light of energy inflation. Managing demand across Leicestershire and utilising grid management technologies such as energy storage, will play an important role in efficient energy distribution and may benefit business through obtaining low cost energy at the point of high demand.

1.5.5 By establishing a long-term vision for low carbon energy growth in Leicestershire, supported by leading infrastructure developers such as Western Power Distribution, sustainable economic growth can be achieved.

1.5.6 Establishing a future energy strategy for Leicestershire that focuses on inclusive growth will be key to meeting future utility needs.

1.6 Recommendations

1.6.1 Throughout this Study, there are a number of recommendations that target how future utility infrastructure could enable growth rather than constrict it. These recommendations are not exhaustive at this stage as the nature of utility investment will change in line with national, regional and local policy needs. These recommendations, therefore, target the next steps towards supporting utility providers in Leicestershire:

- It is recommended that on-going liaison is undertaken with all the statutory undertakers in Leicestershire to ensure that, as developments are brought forward, any changes to the capacity of the networks are reviewed and the delivery strategy updated;
- Further analysis is recommended of data to be supplied by the planning authorities to understand the exact locations and specific delivery timescales, especially for the electricity and gas networks. This is to understand at which point in time, and where, reinforcements and improvements are required within their networks;
- It is recommended that any funding that may be available through the LLEP is allocated to assist the utility providers in addressing these challenges through ongoing communication to provide better visibility in the planned developments across the county and committing at an early stage to the likelihood of developments coming to fruition;
- An alternative means of supporting growth in the area would be allocating funds to the developers to reduce their infrastructure connection costs. This may be on a site-specific basis if the development is key to meeting the LLEP's strategic goals;

- A utility and energy strategy should be established to set out an approach to managing utility and energy capacity short falls that targets unlocking growth in Leicestershire; and

- The LLEP should consider supporting private sector collaboration in ‘behind the substation energy demand management’ approaches targeting releasing capacity locally to support economic growth. Exploration of such opportunities should be defined with a wider energy strategy for the economic region.

2 Introduction

2.1 Introduction

2.1.1 Peter Brett Associates LLP (PBA) has been appointed by the Leicestershire Commissioning Group to undertake a Utilities Infrastructure Capacity (UIC) Study for the whole of Leicester and Leicestershire. The Leicestershire Commissioning Group comprises the following partners:

- Blaby District Council;
- Charnwood Borough Council;
- Harborough District Council;
- Hinckley and Bosworth Borough Council;
- Leicester City Council;
- Leicestershire County Council;
- Melton Borough Council;
- North West Leicestershire District Council;
- Oadby and Wigston Borough Council; and
- The Leicester and Leicestershire Enterprise Partnership.

2.1.2 The UIC Study will form part of the evidence-base for a non-statutory Strategic Growth Plan (SGP) covering the period to 2050. It will also inform the preparation of statutory local plans by the eight local authorities within Leicestershire.

2.1.3 The primary aim of the UIC Study is to establish the likely strategic utilities infrastructure requirements and investment necessary to support medium-term growth to 2031 and long-term growth to 2050 in the broad growth locations identified by the SGP.

2.2 Background and Context

Site Context and Anticipated Growth

2.2.1 Leicestershire comprises several market towns and many rural villages, with the City of Leicester at the centre of the county. The county borders Nottinghamshire and Derbyshire to the north, Northamptonshire to the south, Staffordshire to the north-west, Warwickshire to the south-west, and Rutland and Lincolnshire to the east. Leicestershire comprises seven non-unitary borough and district councils, Leicestershire County Council, and Leicester City Council unitary authority. These nine organisations, and the Leicester and Leicestershire Enterprise Partnership form The Leicestershire Commissioning Group (or partners) for this Study.

2.2.2 Leicester and Leicestershire is expected to experience significant growth to 2050, which will have implications for the utilities infrastructure in the area and its capacity to support growth.

2.2.3 A Housing and Economic Development Needs Assessment (HEDNA), published in January 2017, predicts that the area will experience a 20.5% increase in population in 2011-2026 (a 201,000 increase), suggesting a total population of 1,182,229 by 2036, and circa 1,295,000 by 2050 if similar growth rates are experienced.

2.2.4 Economic activity is also expected to increase over the same period, which the HEDNA predicts will provide 99,200 additional jobs (a 0.7% increase per annum). An estimated 969 hectares

(ha) of land will be required to support this growth. Key employment growth areas are expected to include: The City of Leicester; the East Midlands Gateway Strategic Rail-freight Interchange; the Loughborough University Science and Enterprise Parks; the Horiba-MIRA Technology Park Enterprise Zone and, in the longer term, potential growth associated with the East Midlands High Speed Rail 2 Hub at nearby Toton.

2.2.5 The partner local authorities are already planning to meet the anticipated medium-term growth, with all but Melton Borough Council and North West Leicestershire District Council having adopted plans with an end-date towards the latter part of the next decade. Emerging local plans are being prepared with an end-date of either 2031 or 2036.

The Strategic Growth Plan

2.2.6 The Leicestershire Commissioning Group (or partners) have a strong history of collaborative working, including producing joint studies to support plan-making, and have resolved to prepare a non-statutory SGP for Leicester and Leicestershire. The SGP will sit within the emerging regional growth framework; the Midlands Engine for Growth Strategy and associated Midlands Connect strategy were published in March 2017.

2.2.7 The SGP will cover the period to 2050, providing an agreed framework for local plans prepared by individual authorities, and focusing on four key matters: delivering housing, supporting the economy, identifying essential infrastructure, and protecting the environment and built heritage. The SGP identifies broad growth areas to 2050, which are summarised in the Sections below:

Primary Growth Areas

2.2.8 The A46 Growth Corridor is identified as a primary growth area with the potential accommodate circa 30,000 new homes and additional new jobs by 2050. A combination of new and improved transport infrastructure that is expected to be built by the early 2030s (including the proposed A46 and A5 Expressways), creates the opportunity for major development along a corridor extending from the M1 motorway in the west to the north-east fringes of Leicester.

2.2.9 With its rapidly increasing population, The City of Leicester itself will develop its role as a 'central city' that supports the market towns and areas around it by acting as a focal-point for more jobs, leisure, arts, culture, and entertainment facilities.

Secondary Growth Areas

2.2.10 The Northern Gateway, on the northern edges of the county and near to Loughborough, is identified as a secondary growth area. The Southern Gateway (comprising land to the east and west of Hinckley) is also expected to have scope for regeneration and development.

2.2.11 Development in these two growth areas will be supported by transport infrastructure improvements as part of the Midlands Connect Strategy. Together they are identified as having the potential to accommodate circa 26,000 new homes (9,000 to the north and 17,000 to the south).

Key Centres

2.2.12 Melton Mowbray and Lutterworth are identified as key centres with a combined notional capacity of circa 5,000 new homes. Melton Mowbray is at the centre of a largely agricultural area, but access is anticipated to be improved by the new A46 Expressway. In recent years, Lutterworth has become a focus for logistics and distribution industry, and therefore more homes in this area would allow employees to live closer to employment centres.

Areas of Managed Growth, Villages, and Rural Areas

2.2.13 The towns of Coalville, Loughborough, and Market Harborough are under intense pressure for development. Substantial provision for development has been made within and on the edges of these towns, though much of it is not yet built.

2.2.14 In recent years, the villages and rural areas throughout Leicestershire have been under intense pressure for growth. The SGP proposed to limit growth in these areas in the future.

Employment Land

2.2.15 As employment land is subject to market pressures to a greater extent, the SGP has not quantified the land required. However, this is expected to be development in similar locations, and at a similar rate, as identified above.

Growth Outside of Key Strategic Sites

2.2.16 It is understood that up to circa 35,000 new homes may also be delivered during the period 2031 to 2050 outside the key strategic sites identified above within the SGP period to 2050. This does not include short to medium term growth to 2031 as catered for in the existing/emerging local plans.

2.3 Aims, Objectives and Scope

2.3.1 The primary aim of the UIC Study is to establish likely strategic utilities infrastructure requirements and investment necessary to support intermediate term growth to 2031 and long-term growth to 2050 in the broad growth locations identified by the SGP.

2.3.2 To meet this aim, the key objectives of the Study are as follows:

- Collate and summarise the available existing evidence (including known development and investment commitments) to establish an up-to-date infrastructure baseline;
- Understand whether there is sufficient utilities investment and resilience to cater for the required levels of growth;
- Understand whether any constraints exist that would preclude or restrict strategic developments in the proposed growth locations;
- Review the statutory undertakers' requirements for delivering upgrades in capacity; and
- Identify opportunities that would support network capacity management outside the remit of the statutory undertakers.

2.3.3 The types of utilities infrastructure covered in this Study are: gas and electricity supply and infrastructure networks; telecommunications networks (including broadband); and waste management infrastructure. The waste streams considered are Local Authority Collected Waste (LACW), and Commercial and Industrial (C&I) waste.

2.3.4 A strategic review of renewable and low carbon energy provision, the use of smart networks, and options to reduce energy consumption and CO_2 emissions, is also undertaken. Transport infrastructure is outside the scope of this Study.

2.3.5 The UIC Study does not specifically identify strategic sites for development, because this is the role of the statutory local plan process that will follow this Study in each part of the study area.

2.4 Structure of Study

2.4.1 The following sections of this Study are structured as follows:

- **Section 3 National Policy Context** – Summarises the national infrastructure and decarbonisation strategy;
- **Section 4 Approach to Assessing Utilities Infrastructure Capacity** – Describes the method adopted in this strategy;

- **Section 5 Demand Modelling and Scenarios** – Presents growth forecasts for the intermediate and long term scenarios and associated utilities demand modelling scenarios;

- **Section 6 Existing Utilities Infrastructure Capacity** – Collates and summarises the existing available evidence to establish the utilities baseline, and provides a capacity assessment for the intermediate and long-term scenarios;

- **Section 7 Potential Physical Utilities Constraints to Growth** – Outlines potential physical constraints to growth from major utilities assets;

- **Section 8 Opportunities for Infrastructure Investment to Unlock Growth** – Explores the opportunities for infrastructure investment to support growth in Leicester and Leicestershire; and

- **Section 9 Conclusions and Recommendations** – Presents the conclusions and key recommendations of the Study.

3 National Planning Policy Context

3.1 Introduction

3.1.1 There are a wide range of regulations in place for controlling and managing utility assets and managing the markets they supply. The Gas Act 1986 and Electricity Act 1989 are primary legislative instruments for energy utilities which were brought together through the Utility Act 2000 and Energy Act 2004 (and subsequent acts). For waste the Waste Framework Directive 2008 is the primary legislative route which transposed the EU waste directive. The Communication Act 2003 is the primary act. In addition to these acts, there are a wide range of further acts, orders and directives that govern energy, communications and utilities.

3.1.2 The UK Government is also committed to the climate change agenda and a transition to a low carbon economy and society. The legally binding international Kyoto Protocol agreement is core to the Government's commitment to reducing carbon dioxide emissions, and this requires the UK to reduce greenhouse gas emissions by 12.5% below 1990 levels by 2008, increasing to an 80% cut by 2050. These commitments have triggered a series of national acts, plans and regulations relating to utility infrastructure that impact regional growth on top of the statutory regulatory acts that control our utility provision.

3.1.3 The following Section sets out the National planning policy regime that relate to energy, waste and communication policy that are of relevance to local authority spatial planning function.

3.2 National Policy Statements

3.2.1 The delivering of energy, waste and communication infrastructure is of national importance. To ensure an appropriate planning framework the Government developed, in 2011, a series of National Planning Statement (NPSs). The NPSs define projects of national significance that require determination by the Secretary of State. They also provide material consideration for local planning authorities in the forming of Local Plans.

3.2.2 For energy infrastructure, there are six NPSs as follows:

- Overarching Energy (EN-1);
- Renewable Energy (EN-2);
- Fossil Fuels (EN-3);
- Oil and Gas Supply and Storage (EN-4);
- Electricity Networks (EN-5); and
- Nuclear Power (EN-6).

3.2.3 Due to the dangerous nature of its disposal, a NPS for Hazardous Waste was published by the Government in 2013 setting out national regulations for its control. Hazardous waste is defined as waste that contains one or more hazardous properties that may cause harm to human health or the environment. The NPS aims are to; protect human health and the environment; implement the Waste Hierarchy to produce less hazardous waste; minimise greenhouse gas emissions and to provide sufficient disposal facilities to meet future demand.

3.3 National Policy for Energy Infrastructure

3.3.1 Both the Climate Change Act 2008 and Energy Act 2008, as amended, have sought to deliver on all-party commitments to reducing carbon emissions throughout the UK.

3.3.2 The future approach of utility services in the UK was described in the Low Carbon Transition Plan (2009), with the primary focus on reducing carbon emissions associated with resource use. This also sets targets for the delivery of emission cuts of 18% on 2008 levels by 2020 (and over one third reduction on 1990 levels).

3.3.3 The Low Carbon Transition Plan also sets out the Government's aim to decarbonise resource use through a mixture of the decarbonisation of energy generation, the development of a more efficient energy supply and distribution system, reducing consumption and, where consumption is unavoidable, ensuring that it is used as efficiently as possible.

3.3.4 A key policy initiative following the overarching plan was the Energy Act 2013, which established measures to attract the £110 billion investment to replace current generating capacity, to upgrade the grid by 2020, and to cope with a rising demand for electricity.

3.3.5 There are also several fiscal mechanisms and measures that have been established through the Electricity Market Reform (EMR), which are available to support energy generation deployment. Key mechanisms of the EMR includes:

- **Capacity Market**: A key mechanism to ensure power capacity is maintained within the UK at the lower price to the consumer. The market is open to new and existing power stations, energy storage plant and interconnections to 'bid' for supply capacity contracts through the National Grid. The suppliers in this market guarantee supply capacity in return of Capacity Payments. Included within the capacity market is also voluntary energy demand reduction. The Capacity Market works through an auction mechanism which is held four years ahead of the delivery to allow for new project development;

- **Renewables Obligation (RO) Certificates (2002-2017)**: This Office for Gas and Electricity Markets (OFGEM) scheme places an obligation on licensed electricity suppliers to source a proportion of electricity from renewable sources. Renewable electricity generators are given RO Certificates, which they can then sell to electricity suppliers;

- **Contracts for Difference (CfDs) (2014)**: Low carbon electricity generation projects can apply for a CfD and may have to compete in an auction to receive a contract. The long-term contract is based on a Feed-in Tariff and if the market price is lower than the agreed 'strike price', the Government pays that difference per kWh, and if the market is above the strike price the generator pays the Government;

- **Feed in Tariffs (FiTs) (2010)**: FiTs are available to anyone installing a supported renewable energy technology up to 5MW in size. The tariff is paid to the generator per kWh of electricity they generate and for a period of 20 years for most technologies and 25 years for solar photovoltaic technology; and

- **Renewable Heat Incentive (RHI) (2014)**: This scheme is available for renewable heat technologies amongst householders, communities, and businesses through financial incentives. RHI cash payments are made quarterly over seven years.

3.3.6 The EMR programme contains a significant amount of complexity, including; rapid change in subsidy support for renewable energy projects and significant ambiguity on guaranteeing investment returns (especially associated with the CfD).

3.3.7 In addition to energy specific national regulation, there are a wide-range of national strategies that impact energy utilities (specifically electricity). The recent announcements by the Department for Transport, for example, plans for all cars and vans to be zero emission by 2050[1]. Within this statement there is national view that electric vehicles will be a predominant technology to achieve this reality.

Department for Transport – UK Plan for Tackling Roadside Nitrogen Dioxide Concentrations. Available online: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/633269/air-quality-plan-overview.pdf (July 2017)

3.3.8 Initial estimates suggest this may add over 30 GW to National Grid capacity, all of which will be distributed through local network provision. This will need to be considered from a national perspective in the first instance, but it is noted the greatest constraint on networks will be in large urban areas reliant on vehicle movement.

3.4 OFGEM

3.4.1 The Office for Gas and Electricity Markets (OFGEM) is the Government body responsible for regulating policies on gas and electricity. To increase funding for new infrastructure, the following changes have been put in place: R110 regulated companies must jointly develop innovation strategies; companies must make 10% contributions to project costs; network companies can no longer recover National Infrastructure Commission (NIC) bid preparation costs; and funding for the Network Innovation Competition is lowered by £20 million.

3.4.2 OFGEM supports other bodies such as Gas and Electricity Market Authority (GEMA). GEMA's role is to regulate monopoly gas and electricity networks to protect consumers and their investments. Other bodies include The National Grid and The Department of Energy and Climate Change (DECC) who aim to create a bigger, smarter energy grid and keep electricity suppliers safe and secure by creating price signals and forecasts.

3.5 National Policy for Heat Networks

3.5.1 The UK national strategy for provision of heat is based on a national gas grid network, with a local distribution network connecting properties. Where properties are not on the national gas grid, alternative heating fuel is used such as fuel oil, wood, coal, and electric heating.

3.5.2 Electricity is generated at power stations that are typically remote from the point of use and this can lead to inefficiencies in the form of waste heat produced in the generation process and the losses associated with electricity transmission.

3.5.3 District heating networks are associated with the generation and distribution of heat from a central point to multiple buildings or uses by using waste heat sourced from industrial processes, power generation and/or direct heat generating facilities.

3.5.4 The source of heat is extremely important when considering heat networks over a longer strategic period. With a move away from natural gas from 2020 onwards, the priority should be to provide heat utilities from waste heat only, rather than heat generated from a natural gas local energy centre.

3.5.5 District heating networks are essentially insulated pipes which distribute hot water from a centralised heat source to a building(s) to provide space heating and hot water. The principal infrastructure of a heat network is presented in **Figure 3.1** below.

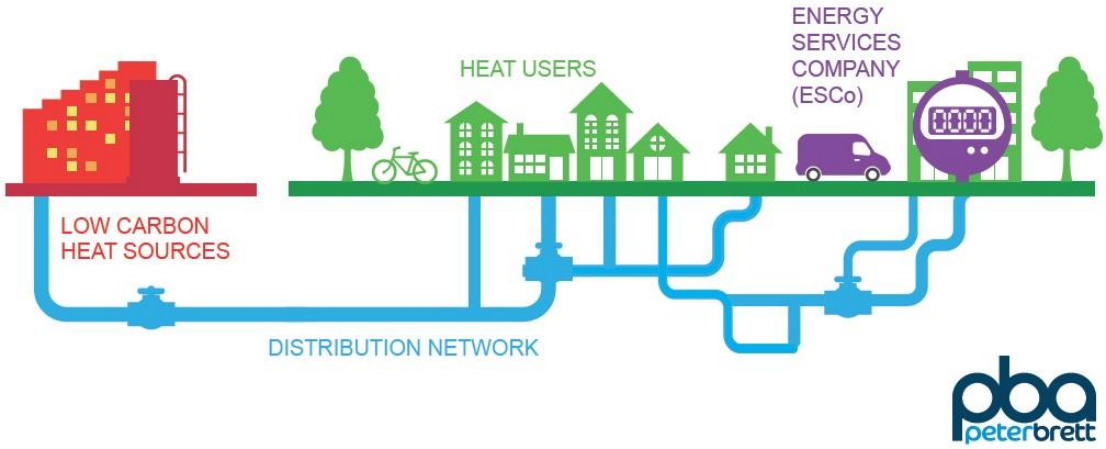


Figure 3.1: Principal infrastructure of a heat network

3.5.6 In 2013, the Government published the UK's low carbon heat vision[2] and created the Heat Network Delivery Unit (HNDU) at the Department of Energy and Climate Change (DECC) (now Department for Business, Energy and Industrial Strategy, DBEIS). The vision recognises that heat networks play an important role as an effective means of distributing heat energy in appropriate geographic contexts. A range of additional benefits exist which support the expansion and implementation of new heat networks, including:

- Improving the environmental performance of old building stock;
- Creating investment returns from energy consumption;
- Energy security from global geopolitical supply and pricing issues;
- Economic growth through investing in primary infrastructure; and
- Social improvement through lower energy bills and warmer homes.

3.5.7 In 2016, Government established the Heat Network Investment Programme (HNIP) which aims to provide £320m of capital support to increase the volume of heat networks being built, deliver carbon savings, and help create the conditions necessary for a self-sustaining heat network market to develop. The HNIP fund provides grants or low-cost loans to fund the capital costs of heat networks in the UK. The scheme is subject to key eligibility criteria.

3.5.8 It should be noted that there is no regulatory body in place to govern or manage heat providers as a utility.

3.6 National Policy for Waste Infrastructure

3.6.1 National Planning Policy for Waste was published in 2014 to compliment the Waste Hierarchy and delivers its own ambitions to local authorities. The ambitions of the planning policy are to deliver sustainable waste development whilst considering spatial concerns to optimise resource efficiency.

3.6.2 It is also states that a framework needs to be designed to engage communities and businesses in securing the re-use, recycling, and recovery of waste materials, without causing harm to the

[2]DECC - The Future of Heating: Meeting the Challenge (2013)

environment or humans. These aims can be achieved by incorporating sustainable waste management into the design of development proposals.

3.6.3 The Waste Hierarchy ranks and prioritises waste disposal options based upon their environmental impact. The emphasis, besides prevention, is disposing of waste in a way in which energy can be produced or materials can be recovered.

3.6.4 The Government places a Duty of Care for waste on producers to provide licenced handlers. Subsequently the handlers Duty of Care is to manage and separate waste thereby maximising the capacity to re-use, recycle or recover. This is monitored through take-up on sites, stock changes or counts of the amount of waste recycled or re-used. The Waste Hierarchy is illustrated in **Figure 3.2** below.

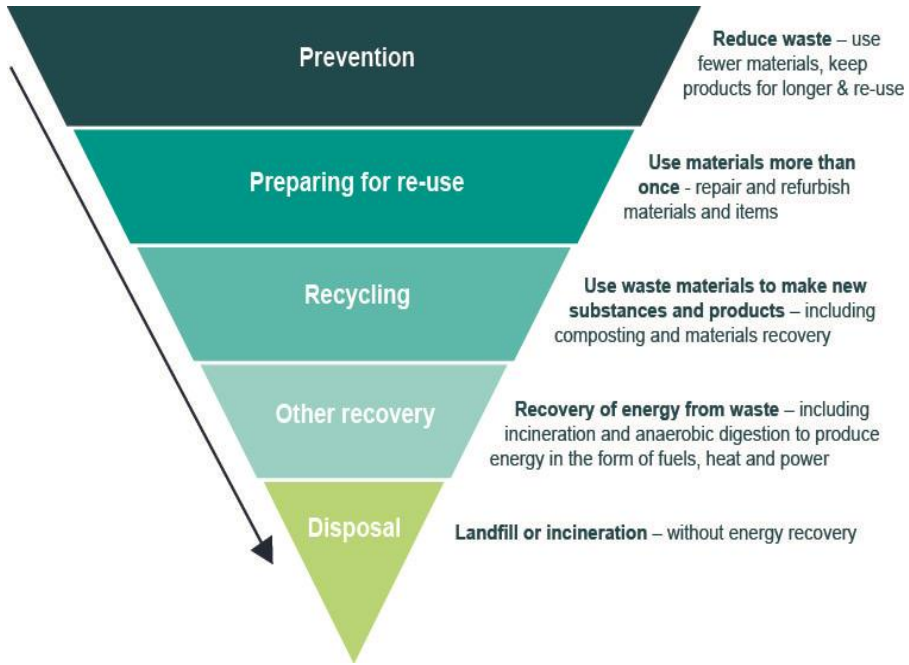


Figure 3.2: The Waste Hierarchy

3.6.5 With the referral of Government waste disposal policies to local authority, a framework was produced for the development of local plans to ensure similar key objectives and policies were consistent nationwide.

3.6.6 Local plans should ensure the capacity for new provisions based on analysis of data from the borough and collaboration with neighbouring boroughs where necessary. Local plans must consider spatial planning concerns and the need for additional waste management facilities in the future. Authorities are also advised to partake in meaningful engagement with local communities to tailor waste strategies to local demand. When identifying sites, the Government recommends considering: broad types of waste facilities; on-site management feasibility; a broad range of locations; and the ability to create sustainable movement of waste.

3.7 National Policy for Communication Infrastructure

3.7.1 In 2003, the UK Communications Act was released as a first attempt to apply regulations to telecommunications operators. However, with progression in the telecommunications industry, these regulations became obsolete and had to be replaced.

3.7.2 The 2010-2015 Communications and Telecommunications Policy was adopted to provide an adaptable framework moving forward. The aims of this report were: to ensure the customer remains the main focus of the industry; to ensure the Office of Communications (OFCOM) has

the power and funding to regulate legislations; and to support the introduction of the 4th Generation (4G) network.

3.7.3 With the emergence of hackers, the Government employed actions to promote greater equality and security to users of networks. These actions included protecting children online, funding of £150 million to improve mobile coverage to areas of the UK without coverage, and ensuring media and technology is accessible to a wider range of people.

3.7.4 The next step in mobile communications will be the delivery of the 5th Generation (5G) mobile network from 2020[3]. 5G will provide a mobile broadband platform targeting download speeds of up to 10 gigabytes per second.

3.7.5 The Government will be holding auctions for licenses for mobile communication airways to fulfil next generation mobile broadband towards 2020.

3.8 OFCOM

3.8.1 The Office of Communications (OFCOM) receives a £130 million budget to provide practical implementation of the regulations from Government policy. The Communications Act, 2003, abolished the need for operators to hold a licence to provide networks and services; so long as they comply to general conditions they can operate.

3.8.2 OFCOM has established 20 general conditions, regulated by their compliance unit, to provide a framework for providers of communications. These general conditions are regulated by market reviews, to prevent dominant operators with Significant Market Power (SMP), and by imposing specific conditions preventing the advantage of these SMPs.

3.9 Leicester and Leicestershire Enterprise Partnership

3.9.1 The Leicester and Leicestershire Enterprise Partnership (LLEP) has developed a strong vision for growth within Leicestershire through their Strategic Economic Plan (SEP). The SEP targets significant growth within the area, looking to attract over 45,000 jobs and increase the gross value added worth from £9 billion, to £19 billion, to £23 billion up to 2020.

3.9.2 The LLEP has also established a Low Carbon Sector Growth Plan (2015) which sets an agenda for growth of the low carbon economy within Leicestershire. The growth plan aligns to the National Low Carbon Transition Plans.

3.9.3 More than £3 million from the LLEP's Local Growth Deal has been invested into the Superfast Leicestershire project. This will be used to extend fibre broadband access of at least 24Mbps to the vast majority of Leicestershire and Leicester City by the end of 2017. The Superfast Leicestershire program, has the potential to generate economic growth of around £92 million within the local economy. This provides the basis for complete countywide coverage for superfast broadband by 2030.

[3] OFCOM – Update on 5G Spectrum in the UK. Available online: https://www.ofcom.org.uk/__data/assets/pdf_file/0021/97023/5G-update-08022017.pdf (February 2017)

4 Approach to Assessing Utilities Infrastructure Capacity

4.1 Introduction

4.1.1 The approach to assessing utilities infrastructure capacity followed five key stages:

1) Gathering information from the Commissioning Group and initial meeting;

2) Mapping direction of growth and demand forecasting;

3) Reviewing incumbent utility companies' growth plans (for electricity and gas), reviewing emerging Waste / Local Plans and associated data (for waste), and reviewing available data on superfast broadband (for telecommunications);

4) Stakeholder consultation and meetings; and

5) Infrastructure delivery schedules and reporting.

4.2 Gathering information from the Commissioning Group and Initial Meeting

4.2.1 An initial meeting was held with the Leicestershire Commissioning Group (the partners) on 26 June 2017 to agree the scope, method, and approach of the UIC Study.

4.2.2 Following the meeting, the Strategic Planning Team provided strategic growth information, including a plan showing growth opportunity areas, a schedule identifying the notional capacity of each area, and a draft summary version of the Strategic Growth Plan.

4.2.3 A letter of instruction was prepared and issued to the incumbent utilities providers (Western Power Distribution, WPD, and Cadent – formerly National Grid) in an attempt to arrange meetings to discuss the increasing utility demands across the county.

4.3 Mapping Directions of Growth and Demand Forecasts

4.3.1 The population trajectory information was then collated and displayed on an Ordnance Survey (OS) map background. This was referenced to a Microsoft Excel spreadsheet incorporating high-level utility demand assessments (electricity and gas) for the future growth plans, including residential, industrial, and commercial development.

4.3.2 The mapping was used as a visual aid in discussions with incumbent utilities providers, to help gather information on infrastructure requirements in the intermediate-term (to 2031) and long-term (to 2050).

4.4 Review of Incumbent Utilities Providers' Growth Plans

4.4.1 Following the mapping and demand forecasting exercise, a detailed review was undertaken of the incumbent utilities providers' short and long term commitments to network infrastructure improvements and constraints. This information was sourced from the public domain, including web-based searches.

4.4.2 A review of WPD's Long Term Development Statement (LTDS) was undertaken to determine existing capacity at each of the Bulk Supply Points (BSP) across the county. WPD's online network capacity map has been used to provide an indication of how much of the remaining capacity identified from the LTDS has been committed to future development, but is not yet being realised on the electricity network.

4.4.3 National Grid's (NG) transmission and Cadent's distribution high pressure networks have been mapped across the county to show the presence of these pipelines within each district and the surrounding areas.

4.4.4 For waste, a review of the waste generation and treatment trends presented in Leicestershire County Council's emerging Waste Local Plan (up to 2031), the associated Waste Needs Assessment (December 2015), and Leicester City Council's emerging Waste Plan to 2031 was undertaken.

4.4.5 A review of existing and upcoming superfast broadband coverage and speeds was undertaken using publicly available web-based information.

4.5 Stakeholder Engagement and Meetings

4.5.1 A meeting was held with WPD on 15 August 2017 to gather information on electricity demand and capacity.

4.5.2 A meeting was held with Cadent on 2 October 2017 to gather information on gas demand and capacity.

4.5.3 Consultation via telephone has been undertaken with the relevant waste managers at Leicestershire County Council and Leicester City Council (the two minerals and waste authorities for the county) in the period between July and October 2017.

4.5.4 Consultation via telephone has been undertaken with Leicestershire County Council's Broadband Manager, and representative of the Superfast Leicestershire scheme, in August 2017.

4.6 Infrastructure Delivery Schedules and Reporting

4.6.1 The findings were collated in a Microsoft Excel spreadsheet and, where relevant, referenced back to the OS mapping. This report presents the findings and recommendations of the Study.

5 Demand Modelling and Scenarios

5.1 Introduction

5.1.1 This Section presents the Leicester and Leicestershire growth forecasts for the intermediate-term (to 2031) and long-term (to 2050) scenarios, and the associated utilities demand modelling scenarios for electricity, gas, telecommunications, and waste infrastructure.

5.2 Leicester and Leicestershire Growth Forecasts and Scenarios

5.2.1 The various pieces of information that have been provided by the study commissioning group have been consolidated into a single data set. A number of assumptions on the growth rate between 2017 and 2050 have been made and are described in the following Sections.

Growth to 2031 (Intermediate-term)

5.2.2 The 2011-2031 housing trajectory was provided in the email dated 26/07/2017 and during the following weeks information was provided from each district council as to the progress that had been made against these plans up to July 2017 (i.e. completions against housing requirements). These interim progress figures were then taken from the anticipated total applied uniformly to the remaining years of 2017-2031.

5.2.3 **Table 5.1** shows a summary of the housing growth assumptions used for each of the districts from 2017-2031.

Table 5.1: Anticipated Growth by District to 2031

Authority	Completed to 2017[4]	OAN 2011-2031[5]	Anticipated 2017-2031
Blaby District Council	2749	7400	4651
Charnwood Borough Council	4259	20620	16361
City of Leicester	5543	33840	28297
Harborough District Council	2458	10640	8182
Hinckley and Bosworth Borough Council	2417	9420	7003
Melton Borough Council	639	3720	3081
North West Leicestershire District Council	3073	9620	6547
Oadby and Wigston Borough Council	578	2960	2382

[4] Email from Dave Nash (Strategic Planning Consultant, North West Leicestershire) 26/07/2017 – OAN/HEDNA and associated district responses for progress to 2017

[5] Associated district responses on progress from 2011-2017

Growth to 2050 (Long-term)

5.2.4 The anticipated growth from strategic sites was provided by email on 20/7/17 and separated the various strategic sites by district. A subsequent email received 6/9/17 identified a further 34,171 units that split across the various districts that were not part of the strategic sites.

5.2.5 The sum of both tables have then been applied uniformly to growth period of 2031-2050 and shown in the **Table 5.2**.

Table 5.2: Anticipated Growth by District from 2031-2050 [6]

Authority	Strategic Sites	Non-Strategic Sites	Total
Blaby District Council	16500	2052	18552
Charnwood Borough Council	10000	8892	18892
City of Leicester	0	10450	10450
Harborough District Council	17500	2926	20426
Hinckley and Bosworth Borough Council	9000	2584	11584
Melton Borough Council	2000	1605	3605
North West Leicestershire District Council	4000	4522	8522
Oadby and Wigston Borough Council	1500	1140	2640

5.3 Telecommunications Demand Modelling

5.3.1 For the purposes of this Study, it is assumed that there will be a linear relationship between residential and employment growth in accordance with the SGP, and connection to the telecommunications network (i.e. each new building will be connected to the fibre broadband network).

5.4 Waste Infrastructure Demand Modelling

5.4.1 Leicestershire County Council is responsible for minerals and waste planning in the administrative area of Leicestershire (outside the City of Leicester). As a unitary authority, Leicester City Council is responsible for minerals and waste planning within the City. This Section describes the demand modelling undertaken to estimate Local Authority Collected Waste (LACW) and Commercial and Industrial (C&I) waste arisings (and associated recycling, recovery, and residual treatment requirements) for the intermediate-term scenario (to 2031)[7] and the long-term scenario (to 2050).

[6] Notional Housing Need and Supply 2031-2050

[7] 2031 has been used as the 'intermediate-term' scenario to align with the emerging Waste / Local Plan documents.

Intermediate-term Scenario (to 2031)

Leicestershire (outside the City of Leicester)

5.4.2 Leicestershire County Council is currently preparing a new Minerals and Waste Local Plan (up to 2031). This is supported by a Waste Needs Assessment (WNA) (December 2015) which considers the following waste streams that the County Council will plan for: agricultural, C&I, construction & demolition, hazardous, LACW and low-level radioactive. For each waste stream, the WNA provides estimates of arisings until 2030/31, the methods of future management, current capacities, and requirements. The LACW and C&I waste data from the WNA has been used to represent the intermediate-term scenario for the County Council (outside the City of Leicester).[8]

5.4.3 **Table 5.3** below presents waste arisings and treatment requirements (recycling, recovery, and residual) for LACW in Leicestershire (outside the City of Leicester) to 2031, as taken from the WNA (2015). The figures are provided at three key years of five-year intervals to show the trends (these are 2020/21, 2025/26 and 2030/31).

Table 5.3: LACW arisings and recycling, recovery, and residual treatment requirements in Leicestershire (outside the City of Leicester) at key years to 2031 (Source: WNA 2015).

Key years	Arisings (tpa[9])	Recycling requirement (tpa)	Recovery requirement (tpa)	Residual requirement (tpa)
2020/21	361,140	209,461	75,840	75,840
2025/26	383,205	222,259	80,473	80,473
2030/31	407,121	236,130	85,495	85,495

5.4.4 Waste arisings and treatment requirements for C&I in Leicestershire (outside the City of Leicester) to 2031, as taken from the WNA (2015), are shown in **Table 5.4**.

Table 5.4: C&I waste arisings and recycling, recovery, and residual treatment requirements in Leicestershire (outside the City of Leicester) at key years to 2031 (Source: WNA 2015).

Key years	Arisings (tpa)	Recycling requirement (tpa)	Recovery requirement (tpa)	Residual requirement (tpa)
2020/21	834,545	417,273	84,456	332,817
2025/26	844,068	439,591	102,976	301,501
2030/31	854,011	462,532	121,953	269,526

[8] Construction and demolition waste, agricultural waste, and hazardous and radioactive wastes are outside the scope of this study.

[9] Tonnes per annum.

5.4.5 The combined arisings and treatment requirements for LACW and C&I waste for Leicestershire (outside the City of Leicester) to 2031 are presented in **Table 5.5** below.

Table 5.5: Combined waste arisings (LACW and C&I) and recycling, recovery, and residual treatment requirements in Leicestershire (outside the City of Leicester) at key years to 2031.

Key years	Arisings (tpa)	Recycling requirement (tpa)	Recovery requirement (tpa)	Residual requirement (tpa)
2020/21	1,195,685	626,734	160,296	408,657
2025/26	1,227,273	661,850	183,449	381,974
2030/31	1,261,132	698,662	207,448	355,021

City of Leicester

5.4.6 Leicester City Council is also preparing a new Waste Plan to 2031. This includes an estimate of likely C&I waste arisings by 2031 (350,734 tpa), however no data on LACW arisings and likely treatment requirements is available. Therefore, this Study provides only a qualitative assessment of waste infrastructure capacity for the City of Leicester.

2050 Scenario (Long-term)

5.4.7 There is currently no data available for predicted waste arisings and treatment requirements in the period between the intermediate-term scenario (2031) and the long-term scenario (2050) for the county or the City.

5.4.8 The volume and types of waste produced in a given area, and how they are treated, is linked to a number of economic, behavioural and technological factors, which are subject to change and policy intervention over time. Estimating future arisings and treatment requirements is, therefore, particularly challenging over long time periods, and is considered inappropriate for the 2050 scenario as the number of assumptions that would have to be used would make the data largely lack value.

5.4.9 As such, this Study provides only a qualitative assessment of waste infrastructure capacity for the county and City for the long-term scenario to 2050.

6 Existing Utilities Infrastructure Capacity

6.1 Introduction

6.1.1 The growth trajectory estimates described in **Section 5** have been used to anticipate additional demand that will need to be accommodated on the utility networks that are currently supplying electricity and gas to the county and surrounding areas. This Study has limited the assessment of the electricity networks' capacity to the bulk supply points at the various Grid substations that support various Primary substations throughout the county. The reason for this limit, is that any capacity issues at this level will likely require major investment, in terms of both time and cost. Such issues pose potentially significant risks to the overall delivery of the strategic growth areas, whilst reinforcement on the lower network voltages are seen to be the concern of an individual site development and not the growth area(s) as a whole. Reinforcement works at the lower voltages are generally a quicker and cheaper process, subject to the actual specific requirements, than those at the Grid supply level. Similarly, and for the same principals, the Study has limited the analysis of the gas network to the High-Pressure pipelines only and not considered the intermediate, medium or low pressure networks supplying the county.

6.1.2 Throughout the UK, the various Distribution Network Operators (DNOs) are privately owned. This means that, generally, the investment in upgrading the network to meet increased demand is done on a reactive basis. At some stage, there will be need for a significant financial expenditure, say for a new grid substation and supporting circuits which would be in the £millions, but this would need financial scrutiny and commitment from various end-users to justify this level of risk to the business. Additionally, as a 'monopoly' business, the DNOs are not allowed to forward fund assets in a particular area as there needs to be a competitive opportunity for other parties (Independent Distribution Network Operators – IDNOs) to supply new developments or future areas of growth. Again, the same principal applies to Cadent's gas distribution network and the competitive opportunities to Independent Gas Transporters (IGTs) for supplies to new developments. More information can be found on the competition for connections for energy supplies on the Ofgem website.

6.2 Electricity Transmission and Distribution Networks

6.2.1 This Section considers the electricity infrastructure requirement for Leicestershire's planned growth. The assessment is based on a review of the Long-Term Development Statement for WPD (East Midlands) and the online Network Capacity Map for the area.

6.2.2 WPD is the Distribution Network Operator (DNO) for Leicestershire's Districts and the City. It is responsible for reliability, capacity and maintenance and emergency response of electricity in the area.

How is the infrastructure structured?

6.2.3 National Grid are the electricity Transmission Network Operator (TNO) for England and Wales and supply electricity to regional Distribution Network Operators (DNOs) as the countrywide demand requires. In Leicestershire, Western Power Distribution are the DNO and they will take supply from the National Grid at 132kV. WPD's 132kV circuits will feed their Grid sites that transform the voltages from 132kV to 33kV and feed several circuits and associated Primary substations. The Primary Substations will transform the voltages down further from 33kV to 11kV and feed further circuits to Secondary substations. These Secondary substations transform the supply at 11kV to LV which then go on to feed domestic end-users.

6.2.4 The Grid substations described above are referred to as Bulk Supply Points for the purposes of this report and is the level at which this Study is focussed.

Consultation with WPD, Data Collection and Qualitative Appraisal

6.2.5 The following methodology of assessment was agreed by WPD as part of the consultation meeting on the 15th August 2017.

6.2.6 The network map provided as part of the LTDS shows the geographic relation of Grid and Primary substations in relation to one another. This was overlaid onto the county wide map that shows the district and city borders. This combined map was then reviewed and the location of the Primary substations were assessed to understand the number of circuits that were currently feeding the various districts and surrounding areas.

6.2.7 The LTDS provides information on the actual loads that are currently being supplied by the Grid substations, as well as the firm capacity that could be delivered from each of the bulk supply points. The difference has then been apportioned to each of the districts, based on the location of the Primary substations as described above. For example, Coalville BSP has the capability to supply a firm capacity of 117MW and at the time of the LTDS being published, had a peak demand of 87MW, meaning that a further 30MW could be taken from this BSP. Coalville currently supplies 8 individual Primary substations of which 3 are located within the district of Hinckley & Bosworth and 5 within North West Leicestershire. For the purposes of this Study, the remaining capacity at Coalville BSP has been apportioned as 11.25MW and 18.75MW to Hinckley & Bosworth and North West Leicestershire respectively. This principal has been applied to the BSPs that are currently supporting Primary substations within the county.

6.2.8 After review of capacity on the LTDS, the online Network Capacity Map was used to identify the level of commitment that has been made on this remaining capacity at each of the BSPs. At the time of writing this report, this map is a relatively new product for WPD and is not yet complete. The map applies a qualitative appraisal to a substation for capacity that has; been completely committed (dark green) to upcoming developments, is approaching toward committing its full capacity (green) or has a significant amount of capacity remaining that is not committed (light green). Some sites have not yet been assessed and are displayed as grey within the map. The BSPs in the area, along with the LTDS capacity and qualitative assessment taken from the WPD Network Capacity Map (at the time of writing this report), is shown in **Appendix A**.

6.2.9 When a new connection to the network is made to supply a site, the maximum capability of a new residential development (i.e. all houses having every electrical appliance running and plugged in, all lights on etc.) is not allowed for as this should not occur. There are daily peaks and troughs of demand seen on the network and some of the highest loads are seen in the winter months, after or during the interval of major sporting events. If the maximum load was applied for, for every unit in a development, the developer would be grossly overpaying for the connection capacity they require and restricting the network's capability of supplying electricity elsewhere in the region. When considering this for a new connection, a diversified demand is applied for and for residential sites of the scale of those in the Strategic Growth Plan, a diversified demand of 1.5kW is generally accepted for residential dwellings that have gas (or an electric alternative) source of central heating. Variables that are also assumed to be captured in this simplified factor include, but are not limited to the number of bedrooms and number of occupants, but also the working demographic of people in an area i.e. an area that is predominantly occupied by people who work shifts, is not likely to have the same peak demand as an area of people that all work 9am-5pm.

6.2.10 When considering the diversification at the BSP capacity level, a slightly lower allowance per unit may be considered due to the increased diversification over a larger geographic area and potential number of sites, however for the purposes of this Study we have remained conservative and kept the factor at 1.5kW per residential unit. Based on this assumption and using the growth trajectory figures described in **Section 5**, the increase in demand has been applied to each of the districts and **Table 6.1** shows the total demand estimate by district and the year in which the LTDS capacity available from the BSPs currently supplying that district are likely to be exceeded.

6.2.11 As stated previously, the LTDS shows actual load that is being supplied via the substation but not which is committed through ongoing new connection applications and agreements. Using

the information above, and in combination with the online network capacity map that gives an indication of this, a qualitative assessment criterion has been defined and applied to each of the districts.

6.2.12 The criteria has been set as follows and the rows coloured accordingly in **Table 6.1**:

- **Dark Green** – Some capacity available for development beyond 2031 from LTDS but BSPs supplying the area have committed this remaining capacity to upcoming developments from the online Network Capacity Map
- **Green** – Some capacity available for development beyond 2031 and 2050 from LTDS but at least one of BSPs supplying the area have committed this remaining capacity to upcoming developments. The other BSPs for the district are either approaching its capacity through its commitment to upcoming developments, or have not yet been assessed for the online Network Capacity Map.
- **Light Green** – Capacity is available for development beyond 2050 from LTDS and none of the BSPs supplying that district are known to be fully committed from the online Network Capacity Map.

Table 6.1: Capacity and Demand by District and Estimated Year that Capacity is exceeded

Authority	Estimated Demand to 2050 (MW)	Capacity Available (MW)	Estimated Year Exceeded
Blaby DC	34.8	33.8	2050
Charnwood	52.9	34.1	2037
Harborough District Council	42.9	114.5	beyond 2050
Hinckley & Bosworth BC	27.9	13.9	2034
Melton BC	10.0	18.0	beyond 2050
North West Leicestershire DC	22.6	41.2	beyond 2050
Oadby & Wigston BC	7.5	5.0	2038
City of Leicester	58.1	86.6	beyond 2050

6.2.13 A similar qualitative appraisal criterion has been applied to the strategic growth areas throughout the county. The criteria for this has been limited to the proximity of the bulk supply points to the development and the level of uncommitted capacity that is shown from the online Network Capacity Map. It should be noted at this stage that the lack of capacity currently available should not be seen as a constraint that would compromise development in these areas in the period beyond 2031. The assessment sets out the geographical areas in which further investigation should be made a priority to understand the limiting factors (i.e. equipment on the network) and the possible future solutions to resolve these issues and increase capacity. By having this information as early as possible, a realistic assessment of the potential time and cost investment required, to create sufficient capacity, can be made. Consideration should also be made toward the nature of this point in time assessment. As various developments are progressed between 2017-2031, the network will evolve to meet the increase demand. As the sites identified in the

SGP start to commence (2031), the electricity network will likely be different to how it is at the time of writing this report (2017). It is possible that additional BSPs may have been established in this period, similarly it is possible that new Primary substations and associated circuits will have been established by then and therefore the network has had to be re-arranged to support these increased, localised demands. As stated previously, the DNOs are not obliged to front fund network upgrades and need a level of financial commitment before taking the risk of significant investment on their network.

6.2.14 The criteria for this qualitative assessment is set out as follows and is provided in **Table 6.2**:

- The dark green identifies priority areas that need further investigation on the networks to identify the potential impacts (both in cost and time) on capacity upgrades to support these areas of growth. The nearest BSPs that would be expected to support growth in this area are fully committed.

- Green is less of a priority however this could change as sites are developed in the lead-up and early stages of the SGP. The nearest BSPs that would be expected to support growth in this area is fully committed but there is a nearby alternative that has some uncommitted capacity available.

- The light green identifies areas for which, at the time of writing this report, there are no known capacity issues anticipated, up to and during the SGP period. The nearest BSP has significant uncommitted capacity still available to support the anticipated growth in this area and there is also a nearby alternative BSP that has uncommitted capacity available.

Table 6.2: Electricity capacity qualitative appraisal for further investigation priority by growth area

Area		Assessment
Primary Growth Areas	Leicester	
	A46 Corridor	
Secondary Growth Areas	Northern Gateway	
	Southern Gateway	
Key Centres	Melton Mowbray	
	Lutterworth	

6.2.15 As can be seen from **Table 6.2,** the main areas that need to be considered further for electricity supply are the Northern and Southern Gateways. This is due the nearest BSPs to these areas (Spondon and Coalville for Northern Gateway and Hinckley and Coalville for the Southern Gateway) being fully committed on any remaining capacity that may have been available. **Table 6.2** is displayed geographically below in **Figure 6.1**.

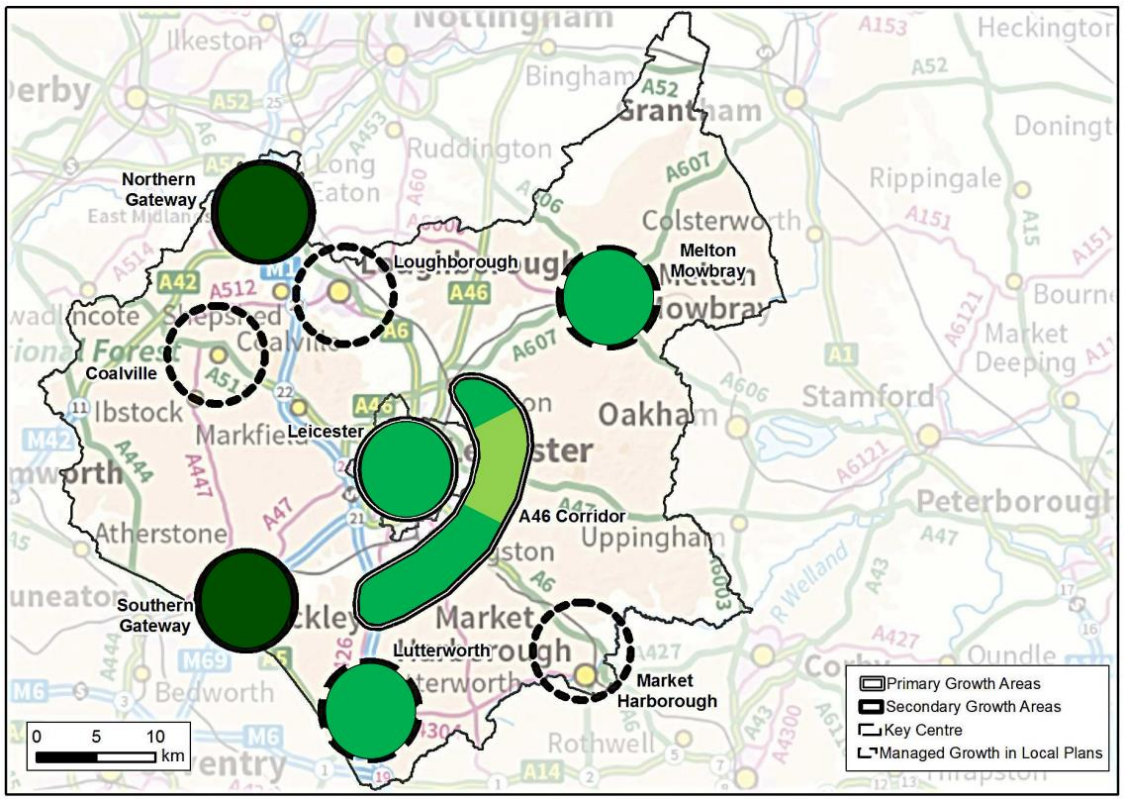


Figure 6.1: Electricity Qualitative Appraisal by Strategic Growth Area

6.3 Gas Transmission and Distribution Networks

Consultation with NGG, Data Collection and Modelling

6.3.1 Like the electricity network, there is a gas transmission network, owned by National Grid, that feeds distribution networks up and down the country. The transmission network runs the national high-pressure pipelines. The distribution networks then connect at local high-pressure before reducing the pressure to Intermediate (IP), Medium (MP) and Low pressure (LP) as required for the end-users. In this area, Cadent are the gas distribution network owners.

6.3.2 This Study is limited to the Pressure Reducing Installation (PRI) on the HP systems as it is assumed that anything below this is a concern of the specific developers and not the growth areas as whole. The PRI is the point at which the pressure is reduced from High to either Intermediate or Medium to then feed the low-pressure supplies for the majority of domestic end-users. The PRI's on the HP system are deemed to be the equivalent to the BSPs at Grid substations on the electricity network for the capacity considerations of this study.

6.3.3 This Study does not take into account the capacity in the pipes as this assessment will have to be made on a site-by-site basis as pressures can be altered to increase flow. Similarly, the permissions associated with the connections to the transmission system have not been considered as these would require further investigation and are not deemed a physical capacity issue. **Table 6.3** represents the anticipated demand by district and following the discussions with Cadent, the capacity available at the appropriate PRIs have been provided. Cadent have advised that they use 1 standard m^3/h per household with a diversification of 20% for strategic assessments. This assumption has been applied to the loadings for each of the district.

Table 6.3: Gas demand trajectory by district

Authority	Estimated Demand to 2050 (scm/h)	PRI Capacity Available (scm/h)
Blaby DC	18560	Countesthorpe 0 (over capacity)
Charnwood	28200	Thurcaston 0 (over capacity)
Harborough District Council	22890	Market Harborough 0 (over capacity)
Hinckley & Bosworth BC	14870	Hinckley town – unknown Hydes Pasture – unknown
Melton BC	5350	Melton 3000 Asforby 6000 Kirby 7000 Ashby 2000
North West Leicestershire DC	12055	Kegworth 0 (over capacity)
Oadby & Wigston BC	4020	Aylestone south 32000 Countesthorpe 0
City of Leicester	31000	Aylestone north 15000 Aylestone south 32000

6.3.4 The National and Local HP pipelines have been mapped and are shown in **Appendix B**. As illustrated, there are two National HP (transmission) pipelines that run across the southern districts of the county. There are two Local HP (distribution) pipelines within the county, one which runs north to south through the centre of the eastern districts and another that runs along and generally parallel to the south-western county border. These pipes both appear to be connected to the southernmost National HP pipeline. The PRI sites listed above have also been shown with the qualitative appraisal for the remaining capacity available at these locations. The capacity at these sites could be limited by a number of issues that need to be identified as part of future investigation. For example, if the filters at the PRI are limiting its capacity, the cost to replace these are in the c£100,000. However, if it is the regulators, the cost could be nearer £6,000,000 to replace.

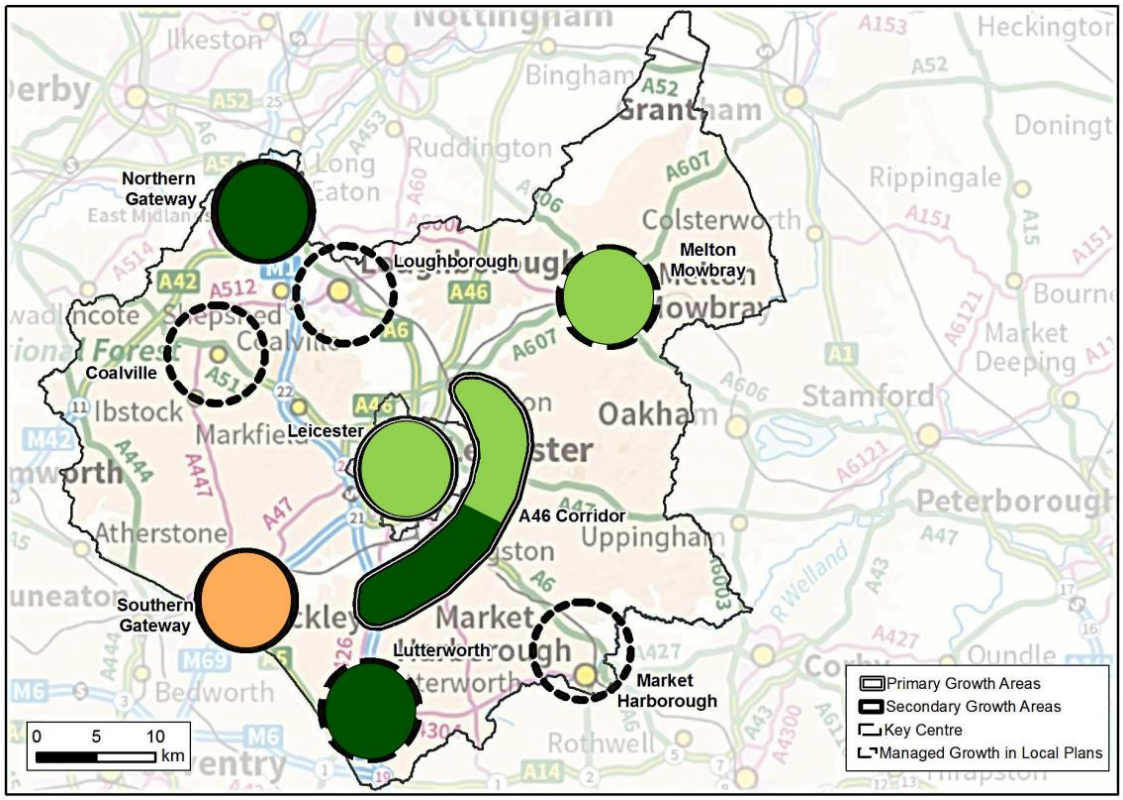
6.3.5 As per the electricity appraisal, dark green identifies the locations where priority should be given for further investigation into the cause of the capacity limit and to understand the costs associated with rectifying this. Light green are areas where there are no PRI capacity restrictions anticipated for the required demand. In this case, the orange identifies areas where the PRI capacity information was not available as these sites had not been assessed as part of Cadent's current model and so capacity limitations are unknown at the time of writing this report.

6.3.6 The Local HP pipeline to the west of county appears to support demand from the cities of Derby and Nottingham.

6.3.7 **Table 6.4** and **Figure 6.2** use the location and assessment of the PRI sites to apply a qualitative assessment for prioritising areas for further investigation.

Table 6.4: Gas Qualitative Appraisal for further investigation priority by growth area

Area		Assessment
Primary Growth Areas	Leicester	
	A46 Corridor	
Secondary Growth Areas	Northern Gateway	
	Southern Gateway	
Key Centres	Melton Mowbray	
	Lutterworth	



Service Layer Credits: Contains Ordnance Survey data © Crown copyright and database right [2017]

Figure 6.2: Gas Qualitative Appraisal by Strategic Growth Area

6.4 Telecommunications Networks

6.4.1 This Section provides a high-level assessment of existing superfast broadband coverage in Leicestershire, and proposed increases to coverage and speeds through the Superfast Leicestershire scheme. It is informed by discussions with a Superfast Leicestershire representative in August 2017, and information publicly available on their website (http://www.superfastleicestershire.org.uk/).

6.4.2 Beyond the existing copper telecommunications network, Leicestershire has a well-developed and growing broadband network. The vision of Leicestershire County Council and the Superfast

Leicestershire scheme is to ensure that all residents and businesses in Leicestershire have access to the broadband speeds they need.

6.4.3 The first phase of the scheme, completed in March 2016, increased superfast broadband coverage across Leicestershire from 81% to 96%. It enabled access for over 65,000 properties, and involved installation of over 200 miles of new fibre cable and more than 300 roadside fibre cabinets, reaching almost 150 towns and villages. The second phase (April 2016 to December 2017) seeks to achieve 97% coverage, all at speeds of 24 megabits per second (mbps). It is expected that, by 2020, coverage will be circa 98% with speeds of up to 30 mbps.

6.4.4 **Figure 6.3** displays existing and upcoming superfast broadband coverage, derived from the Superfast Leicestershire website, in relation to the SGP growth areas. This shows that superfast broadband is already available in much of the areas identified for primary growth (the City of Leicester and the A46 corridor). These areas also include pockets where superfast broadband is either expected by December 2017 or will be delivered commercially within the next two years. The areas identified for managed growth in Local Plans (Coalville, Loughborough and Market Harborough) also show widespread existing superfast broadband coverage, and further rollout expected within the next two years.

6.4.5 Most of Melton Mowbray (identified as a key centre for growth) already has superfast broadband coverage, and large areas outside the central conurbation already have partial coverage, or are expected to receive coverage by December 2017. The key centre of Lutterworth appears to have poorer broadband coverage, compared to the other major conurbations. However, the figure shows that there are large areas where superfast broadband is available (or partially available), and where coverage is expected to increase within the next two years. Similarly, the Northern and Southern Gateways (secondary growth areas) have reasonable existing superfast broadband coverage, and further rollout expected within the next two years.

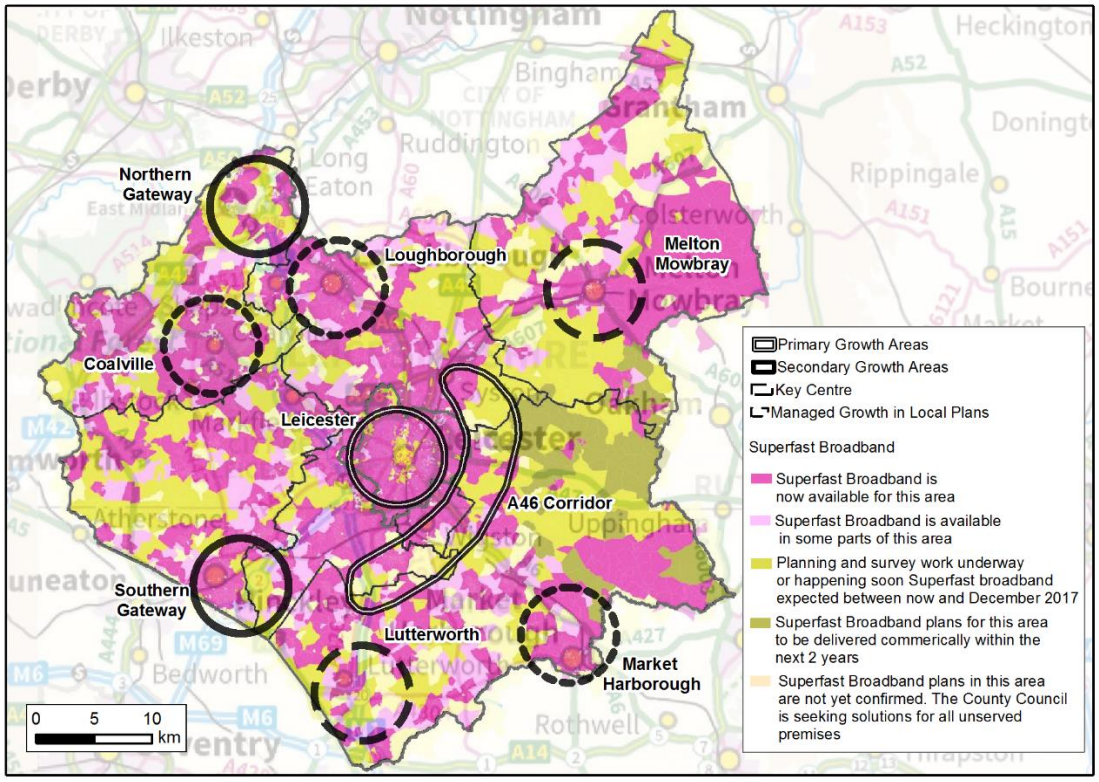


Figure 6.3: Map showing existing and upcoming superfast broadband coverage in Leicestershire in relation to the growth areas identified in the emerging SGP.

6.4.6 The eastern rural areas (e.g. within Harborough and Melton) have been the hardest to reach through the Superfast Broadband scheme. In rural areas, fibre wires typically go to a cabinet (Fibre-to-the-Cabinet, FTTC), which properties then connect to via copper wires. Fibre-to-the-Premises (FTTP) is less common. The distance between the asset and the property is a key challenge to the deployment of superfast broadband in rural areas, as download speeds are slower at longer distances from the cabinet.

6.4.7 As noted in **5.5.1**, it is expected that all future residential and employment growth in the areas identified by the SGP will be connected to the superfast broadband network. Superfast broadband is increasingly becoming the norm in new developments, and is considered an essential service for new homes and businesses. It is difficult to predict the amount of funding that will be available to support superfast broadband rollout in future growth areas. However, it is expected that this continue to be supported by the Leicester & Leicestershire Enterprise Partnership (LLEP) and the Superfast Broadband scheme and, in part, by developer contributions (such as Section 106 agreements).

6.5 Waste Collection and Treatment Infrastructure

6.5.1 This Section provides a high-level assessment of the capacity of waste treatment infrastructure within Leicestershire to meet the predicted waste arisings (and associated recycling, recovery, and residual treatment requirements) for the intermediate-term scenario (to 2031) and the long-term scenario (to 2050). As waste is not necessarily (or typically) treated where it arises, it is not appropriate to consider waste arisings and treatment capacity in terms of the SGP growth areas. Instead, this Section examines the overall capacity of waste treatment facilities within the City of Leicester and Leicestershire to meet the projected demand.

Capacity to 2031 (Intermediate-term)

Leicestershire (outside the City of Leicester)

6.5.2 **Table 6.5** below shows waste treatment requirements for LACW and C&I in Leicestershire (outside the City of Leicester) by 2031, based on the data presented in **Section 5.4**, and the existing and consented capacity of waste treatment facilities within Leicestershire, both of which are taken from the WNA (2015).

Table 6.5: Waste Treatment Requirements in Leicestershire (outside the City of Leicester) to 2031, compared to existing and consented treatment capacity in Leicestershire (Source: WNA 2015).

Waste stream	Estimated waste arisings by 2031 (tpa)	Existing and consented treatment capacity (tpa)	Estimated shortfall / surplus (tpa)
LACW recycling	236,130	367,000	+130,870
C&I recycling	462,532	500,000	+37,468
LACW and C&I recovery	207,448	494,000	+286,552
LACW and C&I residual	355,021	268,505	-86,516

6.5.3 The WNA (2015) estimates that the combined capacity for recycling, composting and transfer of waste at sites that principally managed municipal waste in Leicestershire is in the region of 367,000 tpa. Therefore, sufficient capacity appears to exist to manage the recycling and composting of LACW in Leicestershire until 2031.

6.5.4 The operational capacity for managing the recycling of C&I waste is estimated to be circa 411,000 tonnes. However, two sites have planning permission for the recycling of C&I waste, but are not yet operational. These offer a combined permitted capacity of 89,000 tonnes, which is sufficient to address the shortfall identified.

6.5.5 The recovery of LACW and C&I waste is considered together, given the similarities in technologies and facilities that may be utilised for both waste streams. The total available operational capacity in Leicestershire (outside the City of Leicester) for recovering non-inert, non-hazardous waste is 109,000 tpa[10]. There are also two recovery sites that have planning permission but are not yet operational. These offer a combined permitted capacity of 385,000 tonnes, which increases the recovery capacity in Leicestershire to circa 494,000 tpa, which is easily sufficient to address the identified shortfall.

6.5.6 Once the targets for recycling and recovery have been achieved, an amount of LACW and C&I waste will need to be disposed of. In the case of Leicestershire, residual waste principally goes to landfills. The WNA (2015) estimates that an annual landfill input of 268,505 tonnes will be possible by 2031, and thus there appears to be a shortfall in residual landfilling capacity. **However, the WNA notes that the permitted 385,000 tpa of recovery capacity is sufficient to manage both the recovery and residual shortfall identified.**

6.5.7 Through its emerging Minerals and Waste Local Plan, Leicestershire Council County is already planning how to manage the projected waste arisings in the county to 2031. It must also be noted that this assessment has excluded 'waste movements' (i.e. that waste management infrastructure is not necessarily constrained to arbitrary county boundaries). It is anticipated

[10] This excludes the Wanlip AD facility, which has a capacity of circa 30,000 tpa, as this has a long-term contract to manage the biodegradable fraction of Leicester City's LACW, and is therefore unavailable for much of the plan period to manage Leicestershire's LACW and C&I wastes,

that the county will continue to be reliant on waste management infrastructure and treatment facilities in other areas of the region and country in order to manage predicted waste arisings.

City of Leicester

6.5.8 Nearly all the city's LACW is processed at the Bursom Recycling Centre, at the Wanslip Anaerobic Digester or other private facilities. As a constrained urban authority, limited opportunities exist in the city's administrative boundary to provide final waste disposal (i.e. landfill).

6.5.9 Through its emerging Waste Plan, the city is already planning to meet predicted waste arisings resulting from growth by 2031. To meet this capacity, it is anticipated that the city will continue to be reliant on facilities in other areas of the region and country.

Capacity to 2050 (Long-term)

6.5.10 As is to be expected, the existing and consented waste treatment facilities within Leicestershire and the City of Leicester are unlikely to have capacity to treat waste arisings in 2050, as this period is beyond the existing waste planning framework (up to 2031). However, Leicestershire does have a strong recovery capacity, which could help to address any shortfall in landfill capacity.

6.5.11 Furthermore, in accordance with national waste policy, it is expected that both waste authorities in Leicestershire will strive to push waste up the hierarchy, thereby reducing reliance on landfilling by 2050.

6.5.12 Planning for future waste management (after 2031) will be taken forward in accordance with both waste authorities' statutory requirements. Where necessary, it is anticipated that both authorities will utilise waste management infrastructure outside of the county to meet the increasing waste treatment demands associated with growth.

6.6 Renewable and Low Carbon Energy Generation

6.6.1 In order to provide a high-level summary of existing and planned renewable and low carbon projects across the region, a review of the BEIS Renewable Energy Planning Database (June 2017) has been undertaken. The database tracks the progress of renewable energy projects across the UK from inception, through planning, construction, and operation to decommissioning.

6.6.2 Defining renewable energy capacity within a region is complicated, and must look beyond just the physical constraints of the environment (such as wind, sunlight, wood resource, landscape characteristics) and consider other factors that define regional generation capacity (i.e. how many wind turbines or solar panels can the region deliver).

6.6.3 Within Leicestershire, solar photovoltaics (PV) is the predominant installed technology, with a total of 49 projects and an installed capacity of 354 MW. On-shore wind closely follows this with 15 operational projects and a total installed capacity of 129 MW. Out of a total of 79 recorded projects in the region:

- 45 (57%) are operational or under construction;
- 11 (14%) are approved;
- 1 (1%) is awaiting determination;
- 9 (11%) are refused;
- 6 (8%) are abandoned/no application made; and

- 7 (9%) decommissioned.

6.6.4 The profile of installed technologies broadly aligns with the key technologies highlighted in a study of low carbon energy opportunities in Leicestershire[11]. It is considered that there is not a significant barrier in the planning system (i.e. projects being delayed or refused), as only 16% of projects have been refused between 1997 and 2015. It is noted that 15% of these rejections were in 2014 alone, suggesting a change in planning response to renewable energy projects at that time.

6.6.5 It is noted that renewable energy projects currently in the planning process (granted permission or awaiting determination) are larger schemes in terms of installed capacity. There are currently 45 projects that are operational or under construction, with a total installed capacity of 257 MW, and an average individual capacity of 6 MW.

Regional Comparison

6.6.6 **Table 6.6** compares the renewable and low carbon energy generation capacity of Leicestershire with two neighbouring counties with similar physical geographies (Northamptonshire and Warwickshire):

Table 6.6: Regional comparison of renewable and low carbon energy generation capacity

Variable	Northamptonshire	Warwickshire	Leicestershire
Installed capacity (MW)	719.2 MW Anaerobic Digestion (AD), landfill gas, solar photovoltaics, and on-shore wind	253.4 MW Landfill gas, solar photovoltaics, and on-shore wind	513.2 MW Landfill gas, solar photovoltaics, and on-shore wind
Renewable energy applications submitted	97 Capacity: 795.0 MW	43 Capacity: 317.9 MW	79 Capacity: 579.2 MW
Renewable energy projects approved or under construction	63 Total installed capacity: 504.5 MW	27 Total installed capacity: 146.0 MW	56 Total installed capacity: 382.4 MW
Renewable energy applications refused (number of projects)	16	10	9

6.6.7 Leicestershire has a strong track-record for supporting renewable energy projects when compared to these neighbouring regions, with only ~10% of schemes rejected at planning. This is likely to be because the local authorities in Leicestershire have strong planning policy for the strategic planning and delivery of energy projects. Leicestershire also has delivered a strong

[11] Low Carbon Energy Opportunities and Heat Mapping for Local Planning Areas Across the East Midlands: Final Report, March 2011.

capacity in solar technology projects, which have the capacity to link-in with the growth needs throughout the county.

6.6.8 Future renewable energy development has the capacity to unlock growth and development, if this is planned within the local development framework and to align with growth needs.

7 Potential Physical Utility Constraints to Growth

7.1 Introduction

7.1.1 Physical infrastructure has the capacity to sterilise land for development due to easements and stand-off requirement of the statutory undertakers and impact land values as land within the curtilage of infrastructure such as overhead pylons is considered low value.

7.1.2 Future planning and growth with need to consider this impact to ensure that future development is not impacted by physical infrastructure barriers.

7.1.3 These potential impacts are summarised below.

7.2 Electricity

7.2.1 The National Grid Electricity Network has been mapped in the region and three separate 400kV overhead circuits have been identified. Each run north to south, one to the east of the city and close to the west of Melton Mowbray and the east of Market Harborough. One circuit runs through Loughborough and then around the western edge of the city before heading toward Coventry. The third circuity passes through Coalville and towards Lutterworth. These assets are shown by the blue and red (400kV and 275kV respectively) lines in the asset plan presented in **Appendix C**.

7.2.2 The National Grid Assets will only be diverted/altered for developments that are classed by the Government as sites of National Strategic Importance. These circuits will likely have legal wayleave or easements rights as well as statutory electrical clearances. These will be specific to each of the circuits and so must be agreed with the asset owners in advance of any development commencing in proximity to the assets. Whilst not as onerous as National Grid's transmission circuits, the WPD circuits will also have legal and safety clearances, however there is more opportunity for these assets to be diverted if they cannot be accommodated within the site plans.

7.3 Gas

7.3.1 Both National Grid's National and Cadent's Local HP assets will likely have legal wayleave or easement rights. The HP pipelines are also assessed by the Health and Safety Executive (HSE) for the required stand-off distances for various types of developments. These distances are referred to as PADHI (Planning Advice for Developments near Hazardous Installations) Zones and are bespoke to each pipeline. The zones are based on several variables and research studies, but are generally governed by the pipeline wall thickness, material properties and operating pressure. The HSE are statutory consultees for planning applications within the HSE consultation zones and should be approached to find an acceptable site layout for sites that may be affected by these assets.

7.3.2 The HP gas pipelines are shown in the asset plan presented in **Appendix D**. The National HP pipelines are shown in yellow and the Local HP in blue.

8 Opportunities for Infrastructure Investment to Unlock Growth

8.1 Introduction

8.1.1 Economic growth will require investment into utility infrastructure. Whilst the statutory network asset owners have a duty under their regulatory requirements to invest in infrastructure to enable growth, there are wider opportunities that can be planned for through both public and private sector partnerships.

8.1.2 There is a level of uncertainty about whether the statutory undertakers can achieve all the required investment alone, without significant local action on issues such as reducing resource use, delivering new efficient infrastructure, and delivering renewable energy. This uncertainty, therefore, requires a platform to be created that galvanises a local response to these international needs, especially when planning future regeneration of key UK infrastructure assets.

8.1.3 Such a platform for Leicestershire would create an economy that profits and benefits out of resource efficiency through low carbon energy networks and reduced waste to landfill, all underpinned by superfast telecommunications networks. This platform does, however, require recognition that future policy may be driving alternative agendas and innovation may further elevate expectations of regeneration.

8.1.4 The following Sections explore opportunities for new infrastructure that would support growth. For energy, this includes investment into energy demand reduction and smart grid concepts. For telecommunications infrastructure and waste, a review of existing strategies and changing national trends has been undertaken through which growth opportunities are likely to evolve.

8.2 Opportunities in Energy Infrastructure

Energy Consumption Reduction in Leicestershire

8.2.1 As with the deployment of low carbon generation, discussed in **Section 6.6**, regional and local demand reduction will release utility network capacity. This in turn will not only enable cheaper and faster connections for strategic land development growth, but will also attract businesses looking for secure expansive grid capacity for their operations.

8.2.2 In addition, demand reduction also has the attractive proposition of reducing the costs associated with buying energy in the first instance. This reduces domestic and commercial overheads and frees-up money that would have otherwise have gone out of the region and to the national energy markets.

8.2.3 The above benefits are recognised at a national level with a range of regulatory measures associated with energy demand reduction set by OFGEM, the Department for Business, Energy & Industrial Strategy (BEIS) and the Department for Communities and Local Government (DCLG), such as the Energy Savings Opportunity Scheme (ESOS).

8.2.4 Many opportunities for demand reduction focus on buildings themselves, including the building fabric, building systems, services, and appliances. Retrofitting and physical improvements can be made to reduce energy demand and increase efficiency.

8.2.5 Organisations in both the public and private sector face challenges in improving their energy efficiency and achieving carbon targets. Often, this challenge is heightened by a lack of internal expertise and experience, or a lack of capital funding available for investment in improvement measures.

8.2.6 Energy Performance Contracting (EPC) is a solution to this challenge, and involves the use of an alternative financing mechanism to enable energy efficiency projects to progress. EPC involves the creation of a contract between an EPC provider and a client. The role of the EPC provider is to design and deliver the project, typically involving a comprehensive energy audit to determine the appropriate measures, and the arrangement of financing for the project. The EPC provider guarantees improvements will generate energy cost savings sufficient to pay for the project over the term of the contract. After the contract ends, all additional cost savings accrue to the client.

8.2.7 There are several commercial models that have been explored across the UK to expand EPC services within a region. Successful projects include the Greater London Authority's RE:FIT programme, which has saved over 30,000 tonnes of carbon per annum, with investment of over £66 million across the public sector estate portfolio[12].

8.2.8 In the domestic market, the Energy Company Obligation (ECO) scheme and the Green Deal have been the primary mechanisms for demand reduction.

8.2.9 Commercial and domestic energy efficiency refurbishment is an extremely large market, with numerous supply-products and services firms operating across the UK. It has already been noted in the Leicester & Leicestershire Enterprise Partnership (LLEP) Low Carbon Strategy that this market has excellent opportunities for economic growth and job creation.

8.2.10 In terms of new housing, the Building Regulations continue to demand greater energy demand reductions. Since 2002, a series of amendments to the Building Regulations has required all new developments to increasingly reduce heating, hot water, and auxiliary energy usage. New developments are therefore typically over 70% more resource-efficient than existing dwellings.

8.2.11 By 2030, innovation in building design is likely to have matured dramatically following the implementation of the Nearly Zero Energy Building Directive beyond 2019, with new buildings having significantly lower heat and power demands.

Smart Grids and Peak Demand Reduction

8.2.12 As noted in **Section 6**, there are a range of grid capacity issues relating to peak energy usage across the network which are currently constraining economic growth. Whilst traditional energy efficiency reduction will reduce overall energy usage, it is also important to consider peak demand usage (i.e. the period during which most power is drawn from the National Grid).

8.2.13 Smart grids can also be used as a means of managing forecasts of increased demand, using existing electrical connection infrastructure to the best effect and minimum cost. Such peak demand reduction mechanisms fall largely into two categories:

- Network demand-side management; and
- User demand-side management.

Network Demand-side Management

8.2.14 At a regional level, a challenge facing Western Power Distribution (WPD) is to balance the peaks from the generation of electricity supply with consumer demand peaks. This issue is complicated by the increase of intermittent low-carbon renewable energy, such as on-shore wind and solar photovoltaic (PV) energy generation.

8.2.15 It is understood that a major strategic issue for WPD and Leicestershire, which is linked to wider demand management issues, is the connection of more sustainable energy generation. The

[12] Greater London Authority – RE:FIT. Available online: https://www.london.gov.uk/what-we-do/environment/energy/energy-buildings/refit

network is well-equipped to deal with additional electricity demand however, for those wishing to generate electricity, the opportunities are quite limited.

8.2.16 Within their 2013 to 2023 Business Plan, WPD are developing alternative means of connecting future generation by utilising Active Network Management (ANM) techniques.

8.2.17 These techniques include 'smart grid connection agreements' combining monitoring and controlling supply and consumption, with additional ANM if necessary. This approach includes connection offers with curtailment agreements during peak hours.

8.2.18 Whilst strictly speaking this is a supply and capacity issue, reducing demand on the grid network at peak periods to distribute energy will help ensure the networks are balanced, thereby allowing more effective future connection opportunities.

8.2.19 WPD will need to engage with energy users to ensure their Business Plan is delivered more effectively, and have set up working groups in areas such as Lincolnshire (Low Carbon Hub[13]).

8.2.20 In order to expedite WPD's smart infrastructure plans, there is an opportunity for the local authorities to develop a smart infrastructure working group to support WPD in their initiatives. This may be of particular interest to large organisations with operations in Leicestershire, including National Grid who are based in Hinckley.

User Demand-side Response

8.2.21 On a smaller scale to region-wide network management, peak demand reductions can be achieved by removing unnecessary energy usage at peak periods. This is often referred to as 'load shedding'.

8.2.22 In partnership with a Distribution Network Operator (DNO), high energy users such as manufacturing, local authorities, and communication providers (data centres etc) adopt an Automated Demand Reduction (ADR) within their building management systems. The ADR sends information and signals via a 'gateway device' installed in the buildings to turn off non-critical energy use. This approach is sometimes referred to as 'behind the substation demand side management'.

8.2.23 Trials of ADR mechanisms, such as Southern Electric Power Distribution in partnership with local businesses in Bracknell, have shown that as much as 20% peak grid demand can be released[14].

8.2.24 Whilst ADR mainly focuses on high commercial usage, the same opportunities exist in the domestic market through intelligent controls. There are a range of smart meter products (such as PassivSystems[15]) on the market that support network optimisation through predicting energy use. Such products create digital communication links between consumption and generation (usually decentralised energy generation) to enable data and weather-compensated heat demand forecasts to be aggregated.

8.2.25 Ultimately, through demand forecasting and the control of domestic energy use, demand can be reduced during peak periods.

8.2.26 As with network-side management, the public sector and the LLEP have the opportunity to support WPD in establishing demand-side management through its commercial and domestic stakeholder networks.

[13] WPD – Innovation Strategy. Available online: http://www.westernpowerinnovation.co.uk/Projects/Low-Carbon-Hub.aspx

[14] Thames Valley Vision. Available online: http://www.thamesvalleyvision.co.uk/our-trials/understanding/

[15] PassivSystems. Available online: https://www.passivsystems.com/

8.2.27 There are also several opportunities for the local authorities in Leicestershire to capitalise on their own energy demand assets through reducing peak demand using the approaches discussed above. The value in doing so would be to create a more level demand profile, which has high value in the energy markets, therefore securing a better energy price for their demand.

8.2.28 This also presents the opportunity for the local authorities and the LLEP to support the delivery of battery technology, as part of the suite of technologies available to WPD to manage their network. This is discussed further in **Section 8.5**.

Strategic Energy Generation Deployment

8.2.29 Embedded generation also has a key role to play in balancing supply and demand. The role of embedded generation should be to ensure that the local distribution network benefits from additional capacity, particularly at peak times, to maintain the position closer to existing operating margins.

8.2.30 Smaller peaking plant-type generators (e.g. <20 MW) outputting into the local distribution network reduce the need for the DNO to draw supply from the National Electricity Transmission System (NETS), helping to increase security of supply in the local network and reduce the risk of blackouts. This in turn supports the National Grid.

8.2.31 It is National Grid's policy to operate with a supply margin (i.e. a supply capacity exceeding demand at all times). This margin is essential in seeking to eliminate, as far as possible, the risk of power shortages and blackouts, when there is an unexpected demand or sudden loss of supply. In common with many areas of the UK, a number of renewable energy schemes are operating or proposed in Leicestershire, delivering intermittently to the local grid (see **Section 6.6**).

8.2.32 In developing flexible generation assets (e.g. small peaking plants which can be rapidly started up or shut down), which connect directly to local or regional networks, local and regional consumption can be more easily balanced thereby taking stress off the National Grid. Furthermore, with embedded generation usually installed at or close to a connection point (e.g. a DNO 33 kV substation) much of the transmission losses traditionally associated with exporting power from large power stations on the national 400 kV network are significantly reduced, leading to greater efficiencies.

8.2.33 A major benefit of delivering embedded low carbon energy solutions is the ability for them to release capacity on the National Grid 400 kV system. Releasing grid capacity will support economic growth in terms of physical growth of towns, but also offers significant attraction to high energy demand business sectors such as data centres. The opportunity to connect at a low price to a secure power network is extremely attractive to many sectors, which in turn will support the diversification of Leicestershire's economy.

Battery Storage

8.2.34 Battery storage offers significant potential to reduce carbon emissions from generation by using more of the available energy from intermittent generation sources such as wind and solar. It also offers the potential to deliver a more balanced grid as power can be delivered as and when needed in order to 'fill gaps' when other technologies cannot generate or to reinforce the grid at times of peak demand.

8.2.35 Probably the most significant barrier to deployment is currently high capital costs. In comparison to other technologies used for grid balancing, such as embedded diesel-fired peaking plant (around £500,000 per MW installed capital cost) and demand-side response (£1000's per MW capital costs) the cost of storage (£millions per MW on average) is significantly higher.

8.2.36 Potential storage owners are therefore reluctant to consider the deployment of resources until they can be assured a predictable revenue stream.

8.2.37 Currently, there is a lack of clarity surrounding the functional classification of energy storage. If managed correctly, storage can be used to provide simultaneous services across different classifications of generation, transmission, and distribution.

8.2.38 At present, storage in the UK is classed as 'generation' and therefore is incentivised through open market trading, or schemes such as the Capacity Mechanism, where they are competing with traditional forms of generation, despite their wider potential application and benefits.

8.2.39 Furthermore, one of the main ways to maximise storage potential is by combining it with other intermittent technology types (e.g. wind and solar), or by developing storage capacity adjacent to substations to maximise the available substation capacity. However, as storage is defined as 'generation', a DNO such as WPD cannot own generation on their own network and so they cannot take responsibility for strategic grid management through their own assets.

8.2.40 Ultimately, this could create a market failure: the DNOs are in the best place to utilise electrical storage to balance their network, and therefore should really be in the position to dictate need and geographic preference.

Summary and High Level Action Plan

8.2.41 This Section has outlined a range of opportunities within Leicestershire to reduce energy demand and overall energy consumption.

8.2.42 Currently, the regulatory regime for enacting demand reduction activities are largely within the silos of regulated energy suppliers (the big 6 etc) through their energy company obligations (ECO), the DNOs (WPD) and high consumers. The primary stimulus for reducing energy demand is fiscal measures through both 'taxation' and subsidy provision.

8.2.43 The LLEP has recognised that they have an important strategic role in coordinating demand reduction measures within their county, beyond simply the implementation of national measures, through their Low Carbon Strategy.

8.2.44 Based on this initial high level review of energy demand reduction opportunities, there are a wide range of opportunities to support growth in Leicestershire through investing in energy infrastructure. The primary role of the local authorities within Leicestershire would be to act as a facilitator and conduit to investment for regional stakeholders.

8.2.45 Examples and actions that the LLEP and local authorities may want to consider implementing within an energy infrastructure investment programme are:

- Support WPD in developing a smart infrastructure hub with stakeholders to advance Active Network Management (ANM) measures;
- Work with the DNO in managing the role out of electric vehicle charging across the county both in domestic properties, car parking and commercial premises.
- Capitalise on smart technologies within the public sector estate to reduce demand and increase competitiveness of public sector energy demand as an asset;
- Support procurement of Energy Performance Contracting (EPC) to bridge the capital investment gap for both the private and public sector; and
- Assess the existing energy efficiency supply chain within Leicestershire to support its sectoral growth, both in the Leicestershire economy but also through national markets that can be serviced from Leicestershire.

8.3 Heat Networks as a Utility

8.3.1 Leicester City Council has progressed an energy partnership with ENGIE to develop a heat network within the city. The service is being delivered through a new subsidiary company, Leicester District Energy Company (LDEC), with an investment of £14 million from ENGIE and more than £1 million of Community Energy Saving Programme (CESP) funding to link Leicester City Council housing to the district heating networks. This provides consumers with significant carbon, energy and cost savings.

8.3.2 This experience and knowledge is valuable in the context of a move away from natural gas as a primary source of heating. Future growth of heat networks within Leicestershire should look to couple growth needs and waste heat as a priority. The strategic planning of future waste heat-producing development (such as heavy manufacturing industries) within the region, and consideration of their proximity to new heat demands (i.e. new development), would help to reduce reliance on fossil fuels.

8.4 Increasing Connectivity Throughout Leicestershire

8.4.1 Through the LLEP's investments and the work of the Superfast Broadband scheme, broadband communication is being successfully rolled-out through the county. It is expected that this infrastructure will provide suitable capacity for existing communication needs now and in the near future (see **Section 6.4**).

8.4.2 Capacity to meet future data and communication requirements is difficult to define. Advancements in our digital economy continue to focus on the need for data communication, whilst a wide range of activities and products needing data communication connections. This evolution in our digital economy is often referred to as the Internet of Things.

8.4.3 Some broadband providers, such as Avonline Broadband, can now use satellite technology to provide broadband. Satellite broadband is very like satellite television, in that a small dish installed on the property receives information and transfers it via a cable connected to the modem. Satellite broadband also sends out information to the satellite so that users can have a fast-two-way broadband connection. As such, it is anticipated that even the hardest-to-reach properties in Leicestershire could have access to fast broadband speeds in the near future.

8.4.4 OFGEM are currently establishing the next generation of mobile broadband ("5G"). The parameters through which 5G will be defined, will (like 4G) need to include a perception of 99.999% availability and 100% UK coverage. This national strategy will support Leicestershire in delivering-out the next generation of mobile communication. It is recommended that the LLEP track the evolution of satellite broadband and 5G delivery in the UK, and support the providers of these communication platforms in delivering their infrastructure.

Data Centre Provision

8.4.5 Data centres need to ensure that business capacity, service capacity and component and resource capacity meet current and future business requirements in a manner that is cost-effective for their customers.

8.4.6 Data centre infrastructure is now far more modular and distributed within the national networks than it has been previously. This means data centre providers are looking for development locations that have the required infrastructure in place that allows them to operate in a cost-effective manner, with a large customer base and secure energy infrastructure.

8.4.7 Linking the growth of data centre provision and capacity in Leicestershire with power capacity will be important in underpinning effective and secure regional business services.

Summary

8.4.8 Leicestershire has a progressive and effective digital strategy, with significant investment in superfast broadband. Based on the successful progression of the existing strategies, future capacity will be aligned to meet development need through both public and private sector collaboration.

8.4.9 In addition; the roll-out of more innovative services, such as satellite broadband and 5G, will further support the county's communication platform. Targeting and supporting the delivery of 5G communication across the county will support and grow Leicestershire's digital economy.

8.5 Waste Generation and Treatment

Towards a Circular Economy

8.5.1 Residential and commercial development in Leicestershire in the SGP period, and an increasing population, will inevitably increase the volume of waste generated within the county. However, the nature and composition of the waste generated is likely to change. In recent years, the concept of a 'circular economy' has been gathering momentum in the UK, indicating a shift away from a traditional linear economy (make, use, dispose). Many natural resources are finite, and there is increasing pressure to find an environmentally and economically sustainable way of using them. It is also in the economic interests of businesses to make the best possible use of their resources.

8.5.2 In a circular economy, the value of products and materials is maintained for as long as possible; waste and resource use are minimised, and resources are kept within the economy when a product has reached the end of its life, to be used again and again to create further value. This model can help create jobs, promote innovations that give a competitive advantage, and provide a level of protection for humans and the environment. It can also provide consumers with more durable and innovative products that provide monetary savings and an increased quality of life.[16]

8.5.3 The wider benefits of the circular economy also include lowering energy consumption and carbon dioxide levels. Hence, the move towards a circular economy has strong synergies with climate change, clean energy and sustainable development objectives at the UK, Leicestershire, and local authority level.

8.5.4 In December 2015, the European Commission adopted a package, to help support the transition towards a more circular economy in the European Union (EU). In the UK, the Waste & Resources Action Programme (WRAP) are also promoting the benefits of a circular economy in the UK, such as delivering a more competitive economy; being better positioned to address emerging resource security / scarcity issues; and helping to reduce the environmental impacts of our production and consumption. Major waste management companies in the UK (e.g. Suez, Veolia and Viridor) are also "thinking circular" to extract value from the supply chain.

8.5.5 As part of the longer-term vision, clearly the momentum towards a circular economy presents huge opportunities for Leicestershire's waste and materials to be managed in a more sustainable manner (pushing waste up the hierarchy), and reducing reliance on final disposal (i.e. landfill).

Reducing Reliance on Landfill

8.5.6 In Leicestershire, the priority is to prevent waste occurring and to re-use and recycle resources, but an element of genuine waste (i.e. waste that cannot be re-used or recycled) will always exist. In the case of Leicestershire, residual waste principally goes to landfill. However, increases in the capacity of recycling and recovery facilities has reduced the volume of waste

[16] European Commission – Fact Sheet; Circular Economy Package: Questions & Answers. Available online: http://europa.eu/rapid/press-release_MEMO-15-6204_en.htm (December 2015).

sent to landfill in recent years. Notwithstanding this trend, some reliance on landfill is still likely to be needed in the longer-term for waste that is left over after the treatment process.

8.5.7 Closely linked to the circular economy, it is anticipated that there will be ever-greater emphasis on reducing reliance on landfilling during the SGP period. National waste policy in the UK (see **Section 3.6**) already places a duty on waste producers and all handlers of waste to manage waste in accordance with the Waste Hierarchy (in order of preference: reduce, reuse, recycle, and energy recovery, before final disposal). There are also widespread reports that the UK is rapidly running out of landfilling space, with some predicting that landfill space will run out within the next ten years. Therefore, the unnecessary use of any existing void should be prevented.

8.5.8 As landfill space becomes increasingly "squeezed" in Leicestershire and the UK as a whole, and we move towards a more circular economy where waste is increasing treated as a valuable commodity, it is likely that reliance on landfilling as final disposal will reduce further.

Waste as a Commodity

8.5.9 It is important to note that waste can be a valuable commodity, and that the waste management industry is a market-driven entity that responds to meet the needs of the market. Furthermore, because of contractual arrangements, geography or the location of specialist waste treatment facilities, waste moves in and out of other administrative areas, and therefore is not necessarily treated in the area it is generated.

8.5.10 This Study has considered increasing waste arisings within Leicester and Leicestershire associated with growth set out in the SGP, and the capacity of the waste treatment facilities *within* the county to meet this demand. However, in reality, private waste contractors will adjust their services and, where necessary, increase their treatment capacity (be it in Leicestershire or outside the county) to meet the increased market demand. As such, waste infrastructure capacity is not considered to be a restraint to growth.

9 Conclusions and Recommendations

9.1 Utility Capacity

9.1.1 The primary aim of this Utility Infrastructure Capacity Study has been to establish the likely strategic infrastructure and investment likely to support intermediate-term growth to 2031 and long-term growth to 2050 in the broad growth locations identified by the emerging Strategic Growth Plan (SGP). The key findings of the utility capacity assessment for electricity, gas, waste, and telecommunications are summarised below.

Electricity

9.1.2 From an assessment of Western Power Distribution's Long Term Development Statement and Network Capacity Map, some of the strategic growth areas are restricted, due to the level of remaining capacity that has already been committed for future developments. It should be noted at this stage that the lack of capacity currently available should not be seen as a constraint that would compromise development in these areas in the period beyond 2031.

9.1.3 The Study has identified the Northern and Southern Gateway to be the priority for further investigation to assess the potential time and cost implications of network capacity upgrades to support development in these areas. Whilst the area around Market Harborough is anticipated to have an excess of capacity.

Gas

9.1.4 From an assessment of National Grid and Cadent's asset maps, the county is well served by high-pressure assets. Through consultation with Cadent, the Study has identified the Northern Gateway, and southern area of the A46 corridor and Lutterworth to be the priorities for further investigation to assess the potential time and cost implications of network capacity upgrades to support development in these areas.

9.1.5 The information was unavailable for the Southern Gateway and so this should also be investigated in parallel to identify restrictions in this area and therefore priorities for further investigation.

Waste

9.1.6 Leicestershire County Council is responsible for minerals and waste planning in Leicestershire (outside the City of Leicester) and is preparing a new Minerals and Waste Local Plan (up to 2031). Through this plan, and as part of their statutory obligation, the County Council are already planning for increasing waste arisings to 2031, and the required recycling, recovery, and residual treatment infrastructure capacity in the county.

9.1.7 As a unitary authority, Leicester City Council is responsible for minerals and waste planning within its administrative boundary. Through its emerging Waste Plan, the City is fulfilling its statutory obligation and is already planning how predicted waste arisings resulting from growth by 2031 will be managed. To meet this capacity, the City will continue to be reliant on facilities in other areas of the region and country.

9.1.8 As is to be expected, the existing and consented waste treatment facilities *within* Leicestershire and the City of Leicester are unlikely to have capacity to treat predicted waste arisings in 2050, as this period is beyond the existing waste planning framework (up to 2031). However, Leicestershire does have a strong recovery capacity, which could help to address any shortfall in landfill capacity.

9.1.9 Planning for future waste management (after 2031) will be taken forward in accordance with both waste authorities' statutory requirements. Where necessary, it is anticipated that both

authorities will utilise waste management infrastructure outside of the county to meet the increasing waste treatment demands associated with growth.

Telecommunications

9.1.10 Beyond the existing copper telecommunications network, Leicestershire has a well-developed and growing superfast broadband network. Superfast Leicestershire, in part funded by the Leicester and Leicestershire Enterprise Partnership (LLEP), has a comprehensive fibre broadband roll-out scheme which is already increasing coverage and speeds throughout the county. By 2020, it is expected that coverage will be circa 98% with speeds of up to 30 mbps.

9.1.11 It is expected that all future residential and employment growth in the areas identified by the SGP will be connected to the superfast broadband network. This service is increasingly becoming the norm in new developments, and is considered an essential service for new homes and businesses. The broad growth areas identified in the SGP are primarily located in major conurbations with existing, or upcoming, fast download speeds.

9.1.12 For development outside of the SGP growth areas, including harder-to-reach rural areas such as the east of the county, emerging technologies such as satellite broadband and 5G mobile broadband will further support the county's communication platform. It is recommended that the LLEP track the evolution of satellite broadband and 5G delivery in the UK, and support the providers of these communication platforms in delivering their infrastructure.

9.2 The Future for Utility Infrastructure Growth in Leicestershire

9.2.1 The national capacity to supply future growth in Leicestershire is important when considering strategies for delivering utilities. This will allow target setting and development aspirations to form around regulatory certainty rather than outside this framework.

9.2.2 Importantly, by 2030 the carbon intensity of the grid is likely to have dropped dramatically due to the impact of the Climate Change and Energy Acts. Whilst the exact figures can only be projected at this stage, it is likely that by 2030 electricity will be rated below 0.20 $kgCO_2/kWh$ and by 2050 below 0.02 $kgCO_2/kWh$. This is important when considering the use of gas for heating and power generation, which has a carbon intensity of 0.198kg CO_2/kWh, and hence the move away from fossil based fuel sources.

9.2.3 The platform for a modern utility network beyond 2030 will therefore need to think beyond the use of natural gas for power and heat generation. By 2030 innovation in building design is likely to have matured dramatically following the implementation of the Nearly Zero Energy Building Directive beyond 2019, with new buildings having significantly lower heat and power demands.

9.2.4 Innovation in response to the changes in the Building Regulations has established approaches to building design that go beyond using traditional utility connection. Examples of such approaches include building management systems that balance heat demand through thermal storage and ventilation. When considering infrastructure costs such an approach could potentially remove the need for connection to a heat utility, thereby saving millions of pounds in costs and reducing risks of issues such as fuel poverty and focusing investment on wider community assets.

9.2.5 The use of waste heat from industrial process could continue to offer bulk supply of low cost, low carbon heat stimulating a market demand from commercial and industrial sectors requiring such thermal demand. This creates the potential for new jobs from strategic green energy infrastructure investment. Potential opportunities are currently being explored by LCC for heat network provision as part of a wide local heat network energy strategy.

9.2.6 A smarter electrical grid infrastructure can be implemented across the growth area that would establish a flat constant electrical demand (rather than the "peaky" urban demand profiles of this and previous decades). Supplying flat electrical demand is significantly more cost and carbon efficient as it reduces the need to rely on peaking gas thermal plants power generation that are both costly and carbon intensive.

9.2.7 The efficiencies in selling a flat constant electrical demand to the energy market would allow power to be purchased at a lower wholesale rate for the development. In the first instance; such a low tariff would enable issues such as fuel poverty to be tacked. In addition, through the use of innovative pricing policies, managed through a new generation of smart metering, local energy revenues could be established through energy bills that can support community investment initiatives.

9.2.8 The vision for the utility infrastructure is one that is predicated in reducing capital costs in the first instance and maximising environmental and social benefits, therefore creating true sustainability. This infrastructure platform can deliver growth set out in the National Carbon Plan, attracting investment benefiting from resource efficiency. Through this investment, Leicestershire would become outward-looking in terms of utilities, whereby national infrastructure relies on the area to create establish system efficiencies that currently do not exist.

9.3 Low Carbon Energy Growth in Leicestershire

9.3.1 There are a wide number of opportunities for growing renewable and low carbon energy generation and supply in Leicestershire. These opportunities will be backed by new innovation in energy efficiency and modern energy supply networks being brought forward by the local energy network operators.

9.3.2 Traditionally the delivery of large renewable energy projects has been undertaken independent of growth and development needs. An opportunity exists for future energy projects to be planned and developed in line with where local power and heat is needed. This would create a local power and heat network that would be more resilient to potential national capacity issues.

9.3.3 Future expansion of heat networks as a utility should focus on sources of waste heat in the first instance rather than demand to avoid the use of natural gas.

9.3.4 A lack of 'local' renewable energy provision is unlikely to hinder growth in Leicestershire due to the existing electricity capacity available and the long-term plans for decarbonising the National Grid. Focus on demand side management will be critical, especially in light of energy inflation. Managing demand across Leicestershire's energy storage will play an important role in efficient energy distribution and may benefit business through obtaining low cost energy at the point of high demand.

9.3.5 By establishing a long-term vision for low carbon energy growth in Leicestershire, supported by leading infrastructure developers such as Western Power Distribution, sustainable economic growth can be achieved.

9.4 Recommendations

9.4.1 Throughout this Study, there are a number of recommendations that target how future utility infrastructure could enable growth rather than constrict it. These recommendations are not exhaustive at this stage as the nature of utility investment will change in line with national, regional and local policy needs. These recommendations, therefore, target the next steps towards supporting utility providers in Leicestershire:

- It is recommended that on-going liaison is undertaken with all the Statutory Undertakers in Leicestershire to ensure that, as developments are brought forward, any changes to the capacity of the networks are reviewed and the delivery strategy updated;

- Further analysis is recommended of data to be supplied by the planning authorities to understand the exact locations and specific delivery timescales, especially for the electricity and gas networks. This is to understand at which point in time, and where, reinforcements and improvements are required within their networks;

- It is recommended that any funding that may be available through the LLEP is allocated to assist the utility providers in addressing these challenges through ongoing

communication to provide better visibility in the planned developments across the county and committing at an early stage to the likelihood of developments coming to fruition;

- An alternative means of supporting growth in the area would be allocating funds to the developers to reduce their infrastructure connection costs. This may be on a site-specific basis if the development is key to meeting the LLEP's strategic goals;

- A utility and energy strategy should be established to set out an approach to managing utility and energy capacity short falls that targets unlocking growth in Leicestershire; and

- The LLEP should consider supporting private sector collaboration in 'behind the substation energy demand management' approaches targeting releasing capacity locally to support economic growth. Exploration of such opportunities should be defined with a wider energy strategy for the economic region.