Stoke-on-Trent & Staffordshire Enterprise Partnership

Energy Strategy

Stoke-on-Trent and Staffordshire LEP Energy Strategy

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Executive Summary

Stoke-on-Trent and Staffordshire Local Enterprise Partnership (LEP) has recognised that future energy provision, both supply and demand is a key part of unlocking future growth potential. Current energy infrastructure will come under increasing strain as the area develops; this presents a threat to future business and housing development but also an opportunity to invest in innovation that can overcome these challenges, providing a unique selling point for investment in the local energy supply chain.

Stoke-on-Trent and Staffordshire are at the forefront of efforts to increase renewable energy supply and increase decentralised energy provision. This was demonstrated with the *Powerhouse Central* Stoke-on-Trent and Staffordshire City Deal, agreed in 2014. This provided almost £20 million of capital funding to help deliver the UK's first at-scale low-carbon heat network within Stoke-on-Trent. Local partners have also delivered a £140 million Energy from Waste Plant at Four Ashes in South Staffordshire, supported through the City Deal. This investment in energy infrastructure in the city has also created additional opportunities to accelerate local energy infrastructure improvements and use energy innovation and generation to power economic growth, address economic and health inequality and transform the city's labour market in the longer term.

There are a number of innovative projects of national importance within the county from the Stoke-on-Trent heat network fed by deep geothermal energy[1], to the Smart Energy Network Demonstrator (SEND) project at Keele University[2].

Nationally, central government have published an Industrial Strategy for the UK which focuses on growing national productivity and sets out the importance of clean growth, alongside this they have also published the Clean Growth Strategy. This sets out how the UK will grow the national income while cutting greenhouse gas emissions, in line with the target to reduce carbon emissions by 80% by 2050 and the five-year carbon budgets leading up to that.

The overall vision for Stoke-on-Trent and Staffordshire within the Local Enterprise Partnership's Strategic Economic Plan is to achieve an economy growth of 50% and generate 50,000 jobs over the 10 years from 2017. Energy has been identified as a priority area here due to the physical, locational and research assets, particularly in the energy sector and supply chain. The strong presence of energy generation companies highlights the possibility to expand the sector even further. There is an opportunity to build on the presence of established and growing companies such as Alstom, ABB, JCB, General Electric, Goodwin International Engineering, Siemens Wind Power and the sustainable energy programme centred around the City Deal.

Stoke-on-Trent and Staffordshire LEP have developed an energy vision to describe the future state of the local energy system in 2030 and put an action plan in place to achieve this.

[1] The District Heat Network is part funded by the Department for Business Energy and Industrial Strategy via the Stoke-on-Trent and Staffordshire Local Enterprise Partnership and the City Deal.
[2] The Smart Energy Network Demonstrator is part funded by the European Regional Development Fund as part of the English Growth Programme 2014-2020 and the Department for Business Energy and Industrial Strategy via the Stoke-on-Trent and Staffordshire Local Enterprise Partnership and the City Deal.

Energy Vision

2030 Vision Statement

Stoke-on-Trent and Staffordshire is a leader in smart energy and the development of smart cities. The county is a leader in community energy generation and has a secure, distributed energy generation and supply system based on low carbon and renewable participation backed by strong digital infrastructure, delivering reliable and low-cost energy to businesses and communities.

Smart	Integrate the UK's first fully integrated smart city network, building on expertise from Keele University's SEND
Heat	Build on the success of the Stoke-on-Trent city centre heat network and further district heat in Staffordshire
≤10%	Fuel poverty reduced below 10% by 2030
Generate	Increase low carbon and renewable energy generation proportion of Staffordshire energy consumption
57%	Carbon emissions reduced in line with UK targets, a 57% reduction on 1990 levels

To achieve the goals of the strategy, four separate sectors have been considered, which each have their own challenges and opportunities:

Residential

As set out in the evidence base, the residential sector accounts for over a quarter of energy demand within Stoke-on-Trent and Staffordshire, and there are a number of challenges within the sector that will become more apparent as our national energy system changes. Key priority areas in the residential sector are:

- Energy efficiency
- Addressing fuel poverty
- New build energy consumption and renewable energy

The evidence base sets out the poor energy efficiency levels of high proportions of homes in Stoke-on-Trent and Staffordshire; poor energy efficiency correlates with high levels of fuel poverty. Fuel poverty within Stoke-on-Trent and Staffordshire is

particularly high in some areas, with the majority of local authority areas above the national average and several also above the West Midlands average.

It is important to tie in the fuel poverty ambitions of this strategy with existing fuel poverty initiatives, in particular, the Stoke-on-Trent City Council Fuel Poverty Strategy 2016-2020. This sets out the ambitions to combat fuel poverty by focusing on reducing energy consumption through behavioural change and improvements of the building fabric, maximising the household's income, reducing fuel costs and increasing the amount of energy generated from renewable and low carbon sources. Nationally the target is to improve as many fuel poor properties as practicable to EPC C standard.

Linking the residential energy and health agendas together represents a key opportunity to improve outcomes. Fuel poverty can lead to residents living in cold homes, a situation which is linked with poor health outcomes; in winter 2016/17 there were 31,800 excess winter deaths among over 65s from cold-related illness, with analysis suggesting around a fifth of these can be attributed to living in cold homes. Bringing households out of fuel poverty therefore has wider benefits, and represents part of the drive to improve health outcomes. **Replicating or expanding a scheme such as the 'Saving Lives with Solar' project would be highly recommended as a key action.**

The target of reducing fuel poverty below 10% by 2030 represents a challenging aim, however, integrated initiatives supporting energy efficiency measures and targeted interventions represent a clear opportunity to achieve this goal. Stoke-on-Trent council are involved in a community energy offering with an energy supplier offering domestic solar installations and below market rate electricity tariffs aiming to roll out across an initial 10,000 properties. **Expanding this community energy offering is one route to mitigating the impacts of fuel poverty through the provision of more affordable energy.**

Energy efficiency of new build housing represents an important area of consideration, as houses built now need to be suitable for Stoke-on-Trent and Staffordshire's long-term energy and carbon reduction ambitions. In order to comply with the UK's 2050 carbon emission reduction targets, emissions from the built environment need to reduce substantially. Properties built to existing building regulation energy efficiency standards may require retrofitted energy efficiency improvements before 2050 in order to meet these targets.

There is an opportunity in future to take account of the revised National Planning Policy Framework (NPPF) of July 2018 which sets out the flexibility that local authorities have to set local energy efficiency standards. In light of this**, it may be appropriate to reassess the energy efficiency provisions within Stoke-on-Trent and Staffordshire planning policies** and consider where these may be improved. This could be addressed through the local plan process, strengthening energy efficiency standards.

Commercial and Industrial

- Smart energy sector
- Improved energy efficiency
- Ceramic sector decarbonisation
- Heat networks
- Renewable energy generation

There is an ongoing Keele University project to deliver a Smart Energy Network Demonstrator (SEND). This will provide a facility for trialling and evaluation of new and evolving energy technologies and provide the opportunity to assess their efficiencies, both individually and combined, in terms of energy reduction, cost, and CO_2 emissions, through real-life data analysis and scenario modelling. This is a flagship project, which has been supported under the City Deal and establishes Staffordshire as a leader in the smart energy sector. To fully leverage this work to grow the local low carbon economy, Stoke-on-Trent and Staffordshire aim to develop the UK's first fully integrated smart city network. Smart cities present an opportunity to optimise city functions and drive economic growth while improving the quality of life for its citizens using smart technology and data analysis.

Smart Energy Network Demonstrator (SEND)

Based on Keele University's privately owned and operated utility networks (power, gas, heat, telecoms, water and waste-water), the University is developing Europe's first 'at scale' multi-energy vector Smart Energy Network Demonstrator – a living laboratory where new low-carbon technologies and interventions can be researched, developed and tested in a real-world environment.

This is a landmark project for Staffordshire, representing the largest such demonstrator in Northern Europe.

The University is working with businesses, graduates and academics to research and develop a wide range of smart energy innovations, from cross-vector technologies and updated approaches to demand side management, through to behavioural interventions, new approaches to low-carbon generation and storage, and revised contexts for regulatory or business models. It will engage with an anticipated 270 businesses.

Commercial energy efficiency is another area where there are improvements that can be made; high energy costs to businesses represent a constraint on local economic growth. Businesses should be encouraged to examine their own processes to understand their energy usage and make efficiency improvements**. This is an area where the LEP can play a role to facilitate improvements and spread awareness, building on existing activities.**

Staffordshire Business Environment Network (sben)

Staffordshire Business & Environment Network (sben) was launched in 1992, providing a membership organisation, entitling members to subsidised and free initiatives from within the sben portfolio.

sben is managed by its Organisers Group made up of members of the network and lead by a Chairperson and Management committee and is supported by Staffordshire County. **sben** offers business support through the Low Carbon Business Evolution Programme (LCBEP) which helps businesses across Stoke-on-Trent and Staffordshire reduce their carbon footprint and increase energy efficiency, supported by European funding.

Organisations such as the Staffordshire Business Environment Network (sben) are active in engaging with SMEs to support energy efficiency and low carbon investment through the ERDF supported Low Carbon Business Evolution Programme. This offers free energy efficiency and environmental management reviews to identify investment opportunities for businesses. This is also supported by partial grant funding of eligible low carbon measures such as fabric energy efficiency measures, process optimisation and renewable energy technology. The ERDF Low Carbon Growth Support Project also provides energy efficiency advice and grant funding for equipment for SMEs in the transitional areas of the LEP.

Stoke-on-Trent and Staffordshire have a strong industrial heritage which continues to this day, one of the key sectors remains the ceramics sector. Decarbonisation of the ceramics sector is challenging and represents a key undertaking for Stoke-on-Trent and Staffordshire. The **Ceramic Sector Industrial Decarbonisation and Energy Efficiency Roadmap Action Plan** is a key collaboration between government and industry to help the ceramics industry make the low carbon transition while also maintaining its competitiveness. It has been developed through partnership between the British Ceramics Confederation (BCC) and the Department for Business, Energy and Industrial Strategy (BEIS). This should continue to be supported both at a sector-specific level and from wider energy efficiency measures.

The Stoke-on-Trent District Heat Network will use deep geothermal heat energy to produce up to 45 GWh a year, save 10,000 tonnes of CO_2 a year, and lower energy costs by up to 10 per cent. It's the UK's first ever low-carbon heat network system on this scale and will help heat thousands of homes and businesses in the city. The development of a heat network on this scale demonstrates a level of expertise that is nationally leading and represents an **opportunity to build on this success to further increase the levels of district heat within Stoke-on-Trent and Staffordshire.**

Stoke-on-Trent City Heat Network

The Stoke-on-Trent District Heat Network is the UK's **first** ever low-carbon heat network system on this scale, and will help heat thousands of homes and businesses in the city.

The planned heat source is geothermal and will tap into water that is almost 3km underground but has a high temperature to produce up to 45 GWh a year, save 10,000 tonnes of CO_2 a year, and lower energy costs by up to 10 per cent. The geothermal plant will transfer this heat to a closed loop of district network pipes which then provide heating across areas of the city. The city council will be an initial customer, with a range of other public and private sector customers subsequently due to come on board. It is expected that over 18km of piping will have been laid by 2021 in the city.

£500 Million investment is being leveraged through this project in the next 6-7 years in district heating, smart energy systems, and further energy generation opportunities.

This will lead ultimately to affordable and clean energy for the city, benefiting the local economy in many ways – employment, new housing, increased local skills and greater incoming investment.

Increasing the proportion of renewable energy generation in Stoke-on-Trent and Staffordshire is crucial to reducing overall carbon emissions from the area and making Stoke-on-Trent and Staffordshire more self-sufficient in energy generation. Of the energy resources within Stoke-on-Trent and Staffordshire that have been reviewed the greatest opportunities were identified as being in large-scale solar PV and onshore wind development. Total renewable electricity generation in Stoke-on-Trent and Staffordshire is 345 GWh, which represents just 7.2% of the 4,726 GWh of existing electricity consumption. There is **an opportunity for growth of solar deployment across local authority areas** that could contribute substantially to Staffordshire's ambitions of increasing local renewable energy supply.

Transport

- Sustainable transport use
- Low carbon transport infrastructure
- Improving air quality

Sustainable forms of transport include walking, cycling and public transport. Increasing access to sustainable transport is important from a number of aspects, including decarbonisation, energy use and improving health outcomes. Local transport plans set out the transport priorities for local authority areas and detail plans for future investment in infrastructure; only local authorities are able to effectively facilitate increases in the use of sustainable transport. **Undertaking a Strategic Transport Study to look at the feasibility and options for delivering parking and cycle banks around train stations could increase active travel.**

To enable the transition to lower carbon vehicles, appropriate electric vehicle infrastructure is required. Fast charging locations can be found at service stations on the M6, with a number of other charge points available in urban centres including

Stoke-on-Trent and Stafford. Beyond this, however, EV charge point availability is limited, particularly in rural areas, putting a barrier in place to widespread take-up of electric vehicles as a mobility solution. **There is an opportunity for Stoke-on-Trent and Staffordshire Authorities to secure central government funding for the cost of procuring and installing chargepoints through the government's On-Street Residential Chargepoint Scheme.** This could enable local authorities within Stoke-on-Trent and Staffordshire to support EV chargepoint deployment to enable the shift to lower carbon forms of transportation.

There are clearly opportunities to tie in the meeting of air quality targets with change in the transport system. Many urban areas across the country, including within Stoke-on-Trent and Staffordshire, have high levels of air pollution including pollutants such as nitric oxides and particulates; the entirety of Stoke-on-Trent has been declared an Air Quality Management Area. Electric vehicles have substantially lower air quality impacts than traditional vehicles, particularly diesel, and so the rise in the use of electric vehicles is likely to have a positive effect on these emissions.

Public sector

- Improved resource and energy efficiency
- Community energy
- Renewable energy generation
- Knowledge and skills
- Planning and development

Energy efficiency and resource efficiency are at the heart of public sector engagement with this energy strategy. Staffordshire County Council and Stoke-on-Trent City Council monitor ongoing carbon emissions related to their buildings and activities, with ongoing carbon reduction targets put in place. This drives best practice in emissions reduction associated with council activities and emissions related to subcontracted activities. Reductions in emissions have been achieved over time, using ongoing carbon management plans to establish targets and implementation. Both Authorities should continue to lead by example to become active demonstrators of behaviour initiatives and innovative technologies.

There are existing examples of good practice in the community energy sector, for example, the University Hospitals of North Midlands NHS Trust led 'Saving Lives with Solar Project, a community energy investment scheme into solar-generated energy. Southern Staffordshire Community Energy raised £335,600 investment from a local share offer to invest in the scheme. The project will save over £600,000 in electricity purchase costs over the twenty-year project life and offers the hospital added resilience against grid price increases, while also funding a £300,000 community fund. This is then diverted to Beat the Cold to tackle the effects and causes of fuel poverty in the area. The project also reduces carbon emissions by nearly 4,000 tonnes over the project lifetime. The successful engagement of community support and investment for this type of renewable energy project demonstrates what can be achieved locally, and the importance of linking public sector and community initiatives to deliver on overlapping priorities.

Skills development is particularly important, as many of the energy solutions included within this strategy are relatively new, and therefore there may only be a small pool of people who are able to offer maintenance or construction locally**. Creating an action plan for skills development in this area will be a good step to building the local knowledge base and translating this into supply chain development.**

Governance and implementation

To facilitate delivery of the strategy there are a number of initial and ongoing actions necessary which are set out below.

Action	Timescale	Owner
Adopt LEP Energy Strategy	December 2018	LEP Board
Establish ongoing steering group for monitoring of strategy implementation	2019	SSLEP
Reflect energy strategy into development of Local Industrial Strategy	2019-20	SSLEP
Produce dashboard for ongoing strategy monitoring of key indicators	2019	SSLEP
Monitor progress against targets using dashboard for LEP Board	Ongoing	SSLEP

Summary

Stoke-on-Trent and Staffordshire are uniquely placed to capture the opportunities of a rapidly changing energy system. From landmark smart energy projects through to comprehensive infrastructure investments, the region is poised to be at the forefront of the energy revolution. The LEP must continue to support and encourage the innovative and multi-vector solutions arising from the demonstrator models being developed to help to scale the solutions, upskilling the local workforce and growing the low carbon economy.

1. Introduction

Encraft have been commissioned to produce an Energy Strategy for Stoke-on-Trent and Staffordshire, supported by Sustainability West Midlands (SWM). The area includes Stoke-on-Trent Council, Staffordshire County Council and the district authorities.

The Stoke-on-Trent and Staffordshire Local Enterprise Partnership (LEP) has recognised that future energy provision, both the supply and demand is a key part of unlocking future growth potential. The current energy infrastructure is already at capacity in many areas and this presents both a threat to future business and housing development but also an opportunity to invest in innovation that can overcome these challenges providing a unique selling point for those in the energy supply chain to invest in the area.

This scope of this strategy encompasses a review of current energy consumption, carbon emissions and constraints within the energy system, an assessment of energy strengths and weaknesses within Staffordshire and projections of future energy consumption and carbon emissions in relation to future planned growth. This document also sets out the LEP's energy vision for the future and a plan of how to get there.

The strategy sets out the policy background to the study, the evidence base upon which this is built, an assessment of likely change in energy and carbon emissions out to 2030 and a strength, weaknesses, opportunities and threats analysis. This then feeds into the development of an energy vision for Stoke-on-Trent and Staffordshire.

1.1 National policy background

In recent years the government has been revising and updating its policies relating to the UK energy system. There has been renewed focus on the 2050 climate change targets with the signing of the Paris agreement, and an increased impetus looking at how these demanding targets for carbon emissions reduction – cuts of 80% on 1990 levels by 2050 - could be met. Figure 1 sets out the overall national policy landscape indicating how different parts of national and local policy fit together in the context of the energy strategy.

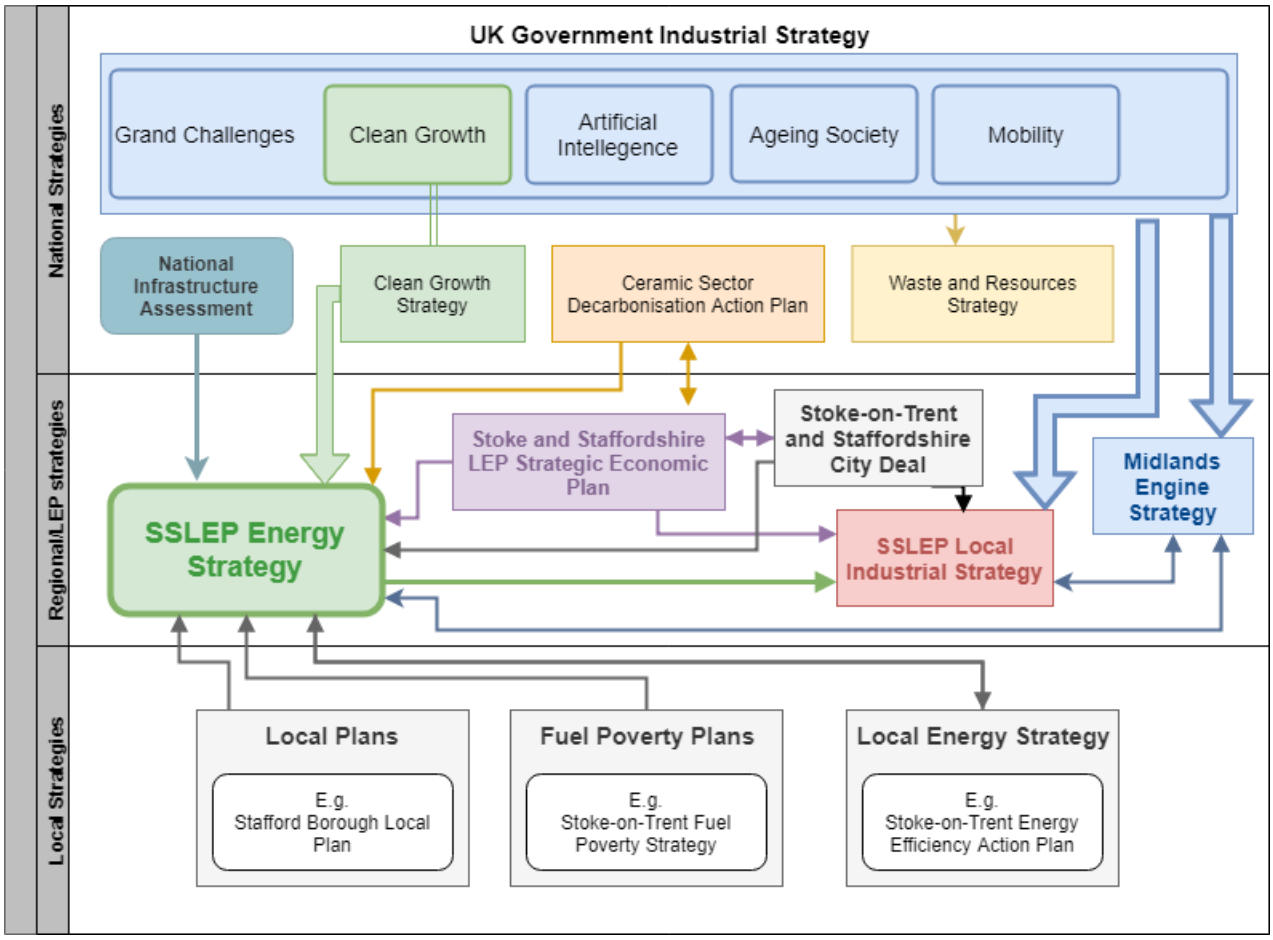

Figure 1: National, regional and local policy landscape

1.1.1 Industrial Strategy

The government's Industrial Strategy Green Paper of January 2017 (1) set out ten pillars to drive UK growth, including a particular focus on science, research and innovation. The Green Paper also set out a number of ways in which investment in energy infrastructure and support for the low carbon economy would play an important role in delivering the country's growth ambitions.

This was followed up by the Industrial Strategy White Paper (2) in November 2017 which set out five foundations of productivity to transform the economy. This also set 'Grand Challenges' to put the UK at the forefront of the industries of the future in areas of:

- Clean Growth
- AI and Data Economy
- Future of Mobility
- Ageing Society

The government committed to £725m of funding for challenges within the second wave of the Industrial Strategy Challenge Fund, to capitalise on Britain's strengths in research and innovation, and help deliver the Grand Challenges, potentially investing in areas such as:

- Clean Growth
  - Transforming construction
  - Prospering from the energy revolution
  - Transforming food production
- Artificial Intelligence and data
  - Audience of the future
  - Next generation services
- Ageing Society
  - Data to early diagnosis and precision medicine
  - Healthy ageing

1.1.2 Clean Growth Strategy

The Clean Growth Strategy sets out how the UK will grow the national income while cutting greenhouse gas emissions, in line with the target to reduce carbon emissions by 80% by 2050 and the five-year carbon budgets leading up to that. The Clean Growth Strategy covers the period up to and including the fourth and fifth carbon budgets, leading up to 2032.

There are a number of commitments in the energy sector made as part of this strategy, (3) in several key areas, including:

- Improving business and industry efficiency
- Improving homes
- Accelerating the shift to low carbon transport
- Delivering clean, smart, flexible power

A few of the key commitments are highlighted below.

Improving homes

- An extension of ECO[3] out to 2028 including a review of the best way to do this beyond 2022
- Consulting on the regulations requiring minimum energy efficiency standards in the Private Rented Sector (PRS) from April 2018 and developing a long-term trajectory to improve the energy performance of as many as possible to EPC Band C by 2030
- Phasing out the installation of high carbon fossil fuel heating in new and existing homes currently off the gas grid during the 2020s, starting with new homes

Most areas of the UK, including Staffordshire, have significant energy demands from domestic properties. The extension of ECO funding will enable more of the 'hard to treat' properties with poor energy efficiency to be targeted with retrofit measures to improve their energy consumption.

[3] Energy Company Obligation - government energy efficiency scheme to help reduce carbon emissions and tackle fuel poverty

Across the national housing stock, the sector with the highest proportion of F and G SAP ratings is the private rental sector (PRS). Conversely, councils and housing associations have been very proactive in upgrading their worst performing stock, typically with internal targets to achieve a SAP C rating across their portfolio within the near future. Owner-occupied properties are typically less likely to have undergone retrofit, but there has been more progress made here than in the private rental sector, where landlords have little to no incentive to improve the energy efficiency of their stock in a market where housing demand often exceeds supply. The minimum energy efficiency standards for the PRS have been signposted for some time and will make it illegal to rent out F and G rated properties, although whether this can be effectively enforced remains to be seen.

Plans to phase out the installation of high carbon fossil fuel heating in homes off the gas grid could be important for Staffordshire, given the rural nature of some of the area. The focus is initially on new homes, which are easier to tackle, but there will also be policies put in place to encourage retrofit of low carbon heating systems to existing properties using oil, LPG or solid fuels.

A contributing part of this will be the continuation of the Renewable Heat Incentive (RHI) to encourage take-up of technologies such as heat pumps, biomass boilers and biomethane. Beyond this government are considering a range of policy options and will involve consumers and industry in developing new policy.

Low carbon transport

- To meet the 2050 targets, almost every car and van will need to be zero emission by 2050. The government has announced an end to the sale of all new conventional petrol and diesel cars and vans by 2040
- The government will set out further detail on a long-term strategy for the UK's transition to zero road vehicle emissions by March 2018.

The end of petrol and diesel vehicle sales by 2040 will not mean an end to petrol and diesel vehicles on the roads immediately, however this policy means a decline in numbers of these vehicles is expected leading up to this date and an increase in alternatively fuelled vehicles, such as hydrogen and electric vehicles, is likely to be seen.

The major impacts of this are twofold, firstly the growth of electric vehicle numbers will need to be accompanied by a growth in charging points and associated infrastructure to ensure travel remains unimpeded. As electric vehicles are produced that can travel longer distances without recharging, the importance of rapid chargers increases. These are chargers such as the Tesla Supercharger that require over 50kW of power and can charge a battery to 80% in 30 minutes. The distribution of these chargers will potentially be limited by the pre-existing grid constraints in Staffordshire which could prevent the drawing of such significant amounts of power in certain areas, potentially requiring innovative solutions such as chargers co-located with generation and storage to make this viable. Charging solutions will also be required within residential properties, as charging at home will be a solution for many vehicle owners. However, there are constraints in place that could limit the take-up of this too, particularly for homes without off-street parking that are unable to fit a home charge point. Another potential issue is peak loading on the electricity network, as if electric vehicles were all charged during the existing evening times of peak demand this could prove challenging for the network to cope with. The likely solution to this

involves increased levels of smart control of charging combined with incentives that allow cars to respond to price signals to charge overnight when electricity is cheapest.

Almost all major car manufacturers have either already produced an electric vehicle or are working on their first model, which shows the direction of travel of the industry. While much of this was already underway, the government announcement has provided added impetus to manufacturers to manoeuvre themselves ahead of the competition. This represents both a problem and a potential opportunity, as new technology requires new supply chains to be put in place to deliver this. New and existing suppliers in the Staffordshire area could be well placed to fill newly emerging supply chain gaps and use their existing relationships with manufacturers to diversify.

Decarbonisation solutions for Heavy Goods Vehicles (HGVs) may involve electrification, which would require appropriate recharging infrastructure and logistics in place to deal with this, however, these could also utilise alternative fuels such as natural gas, biofuels or hydrogen which would require a different approach.

Business and Industry

- Enable businesses and industry to improve energy efficiency by at least 20% by 2030.
- To achieve this government will put in place a simpler, more ambitious and long-term regulatory framework to:
  - Make it easier for business to identify energy savings
  - Ensure improvements in the leasing sector and in new commercial and industrial buildings
  - Help to understand how the government can encourage greater investment in energy efficiency measures and technologies
- Phase out the installation of high carbon forms of fossil fuel heating in new and existing businesses off the gas grid during the 2020s, starting with new build

These policy areas are focused on helping businesses cut energy consumption, and through this cut energy costs, making them more competitive. Businesses in Staffordshire could benefit from energy efficiency support to become more competitive. A set of actions are already in place to decarbonise the ceramics industry in Staffordshire, which is one of the main industrial sectors in the area (4).

One of the options being considered is establishing a minimum energy performance standard for commercial buildings to incentivise landlords to invest in energy efficiency measures which could reduce energy consumption for their tenants.

Other than energy efficiency they are particularly interested in phasing out high carbon forms of heating, such as oil. This will initially be targeted using the Renewable Heat Incentive (RHI) but a successor policy to this is likely to be put in place, potentially including stronger carbon pricing.

Smart, flexible power

- Around £900 million of public funds between 2015 and 2021 in research and innovation invested in the power sector including:

  - £265 million in smart systems to reduce the cost of electricity storage, advance innovative demand response technologies and develop new ways of balancing the grid, and;
  - £177 million to further reduce the cost of renewables
- Implementing the smart systems plan, which will help consumers to use energy more flexibly and could unlock savings of up to £40 billion to 2050
- Target a total carbon price in the power sector which will give businesses greater clarity on the total price they will pay for each tonne of emissions.

Grid constraints within Staffordshire, as discussed in the following sections, mean that there could be opportunities for smart grids and flexible power provision to alleviate some of these constraints. Flexible power will support one of the main aims as set out in the strategic plan for Staffordshire to create sustainable energy infrastructure and develop more employment sites (5).

The Distribution Network Operator (DNO) that owns and operates the electricity infrastructure within Staffordshire is responsible for the network and is currently transitioning from DNO to Distribution System Operator (DSO) which will involve more active local management of network load, generation and constraints (6).

The government's investment in innovation includes £265 million in the area of smart systems aiming to reduce the cost of electricity storage, advance innovative demand response technologies and develop new ways of balancing the grid. These are technology areas that could prove beneficial to Staffordshire, and indeed it may be possible to identify sites within Staffordshire that could operate as pilot sites for feasibility studies investigating these opportunities.

The Feed-In Tariff is due to be phased out in 2019, so the update promised is welcome as it will provide clarity on the likely development of small-scale renewable generation beyond this. Renewable energy auctions – through the Contracts for Difference (CfD) mechanism will continue, these are focused on large-scale renewables.

Public Sector Leadership

- A commitment to introduce a voluntary public sector target of 30% reduction in carbon emissions by 2020-21
- Provide £255 million of funding for energy efficiency improvements in England and help public bodies access sources of funding

This is something that should be monitored closely, as while the initial proposed target is only voluntary there is likely to be a consultation on plans to introduce a mandatory target by 2025. This will require local authorities to review their Carbon Management Plans and take steps to reduce carbon emissions in line with the targets put in place. Funding for energy efficiency improvements will enable these targets to be met.

Local authorities in Stoke-on-Trent and Staffordshire already have their own Carbon Management Plans with their own targets, against which differing levels of progress have been made.

Local leadership

- Support for local energy strategy development

- Local Energy programme to support local areas to play a greater role in decarbonisation
- Support for LEPs and local authorities to access clean technology innovation funds

The Clean Growth Strategy recognises that moving to a productive low carbon economy cannot be achieved by central government alone; it is a shared responsibility across the country. Local areas are best placed to drive emission reductions through their unique position of managing policy on land, buildings, water, waste and transport. They can embed low carbon measures in strategic plans across areas such as health and social care, transport, and housing.

The government have recognised the importance of local action on decarbonisation and so are putting in place resource to support LEPs and local authorities to act.

1.1.3 National Infrastructure Assessment

The National Infrastructure Commission (NIC) was established in 2015 to provide independent, impartial advice on the UK's long-term infrastructure needs. It was established to address the problems with long-term infrastructure planning in the UK. The first National Infrastructure Assessment (NIA), published in July 2018, sets out the Commission's plan of action for the country's infrastructure over the next 10-30 years.

The Assessment includes a range of recommendations, including on low carbon energy. It sets out the case for making a switch to low-carbon and renewable sources for both the country's power and heating, combined with a move towards electric vehicles, which would mean the customer of 2050 would pay the same in real terms for their energy as today. It includes recommendations to deliver half of the UK's power from renewables by 2030 and to prepare for 100 per cent electric vehicle sales by 2030.

The government set out an interim response to the Assessment in October 2018 as part of the Autumn Budget, setting out how they are working to meet NIC priorities and committing to respond formally to the NIA in 2019. This will take the form of a comprehensive National Infrastructure Strategy which will set out their priorities for economic infrastructure and respond in depth to the NIC's recommendations.

The LEP should monitor the government response in this area as it is an important consideration in terms of future government policy and funding opportunities and will set out a pathway for long-term investment in infrastructure.

1.1.4 The Midlands Engine

The government wants the Midlands to become a growth engine for the whole UK. The Midlands is at the heart of the United Kingdom both geographically and economically. The region encompasses 11 cities, several important market towns, and a range of economically important rural areas. The Midlands Engine vision puts five themes at its forefront:

- Connecting the Midlands
- Investment in strategic infrastructure
- Growing international trade and investment

- Increasing innovation and enterprise
- Shaping great places

The Midlands Engine Strategy is a demonstration of the government's commitment to making the Midlands a powerful engine for economic growth, including Stoke-on-Trent and Staffordshire. As part of this, the government will invest £392 million in the Midlands through the Local Growth Fund and support the operation of the Midlands Engine Partnership to facilitate local growth. The government have also committed to publishing a refreshed Midlands Engine Strategy in 2019.

1.1.5 Waste and resources strategy

The government is developing a waste and resources strategy, due for publication in November 2018. The parliament Environmental Audit Committee has set out five pillars that the strategy will encompass:

- Achieving zero "avoidable" waste by 2050
- Phasing out "avoidable" plastic waste
- New targets for waste and recycling
- Stopping food waste to landfill by 2030
- Reforming the Packaging Recovery note (PRN) recycling system.

Environment Secretary Michael Gove has also confirmed that local authority recycling targets post-Brexit would be in line with that of the current recycling targets set out in the EU's Circular Economy Package – 60% of local authority collected waste by 2030.

1.1.6 Government support for local energy

BEIS local energy hubs
BEIS have identified that barriers to progression toward a low carbon economy at a local level include 'limited capacity and capability amongst LEPs and local authorities' to deliver local energy investment.

The BEIS Local Energy programme is designed to address the gap in the capacity and capability of LEPs and other local organisations. Part of this involves funding LEP Energy Strategies to understand the opportunities and challenges across each LEP area.

The overall aim of the BEIS proposal is to provide a series of local energy hubs across England (7) that, via staff and funding, will:

- Develop and prioritise a pipeline of local energy projects identified through LEP and partner energy strategies and take these projects from concept to business cases that attract investment and are then taken forwards to implementation by other partners.
- Help coordinate local action across several local LEP areas.
- Provide a local good practice link between local LEP activity, other local LEP areas, and national government.

- Energy Efficiency, generation and smart distribution across the public estate and social housing
- Building integrated clean and smart generation for larger sites and underused land, including heat and power networks and storage (electric/hydrogen)

There will also be capacity to enable better sharing of best practice in other areas between the local LEPS and local authorities.

Stoke-on-Trent and Staffordshire LEP will benefit from a two-year funded Energy Projects Officer to enable delivery of energy-related projects identified in the strategy. This position is envisaged to be self-financing at the end of the initial two-year period.

Heat network support

One element of government support for local energy that is well established is the funding from the Heat Network Development Unit (HNDU). This has been running since 2013 and was set up to address the capacity and capability challenges which local authorities identified as barriers to heat network deployment in the UK.

The government are keen to support the development of heat networks because they can enable a transition to lower carbon heating sources, and can be effectively implemented using a variety of different heat supply technologies. Once the infrastructure is in place, even if carbon-emitting fuel sources such as gas boilers are used to supply the heat initially, it will be possible in future to replace the central plant used to supply the heat with lower carbon options without causing any disruption to the homes or businesses supplied, therefore enabling easier decarbonisation of heat supply.

HNDU provides support to local authorities in England and Wales through the early stages of heat network development:

- Heat mapping
- Energy master planning
- Techno-economic feasibility
- Detailed project development
- Early commercialisation

This funding enables local authorities to explore the potential opportunities for heat networks within their towns and cities, and move from there through feasibility to initial commercialisation to a point where a local heat network may become commercially viable. Local authorities within Staffordshire have been proactive in exploring these opportunities.

Many of these studies have identified networks where the commercial returns are marginal and are unlikely to be taken forward by the private sector; this has led to capital funding being made available by the government to support these in order to overcome initial economic barriers to investment. This funding is known as the Heat Networks Investment Project (HNIP) and is a £320m capital investment programme providing support for the capital costs of heat networks. So far £24m of support has been provided to a total of nine local authority projects.

BEIS has appointed Triple Point Heat Networks Investment Management to the role of Delivery Partner. This is comprised of a number of professional firms with a demonstrable track record of engaging with investors and supporting project developers to deliver a wide range of infrastructure projects. Once the detailed project development has been completed, the project has entered commercialisation and may apply for HNIP funding. Investment costs eligible for support under the HNIP scheme include, but are not limited to:

- The building of new heat networks (generation, distribution and customer supply).
- Development of existing heat networks including expansions, refurbishment or the interconnection of existing networks where additional carbon savings can be demonstrated.
- Commercialisation phase and construction costs.
- Building connections (unless these fail the additionality test i.e. planning conditions would have already required the works).
- Works to access recoverable heat.

Projects will also need to satisfy the minimum eligibility criteria including, but not limited to:

- The heat network is of an eligible type (i.e. heat generated from 75% gas CHP or from 50% renewable, recovered heat or a combination).
- The heat network meets the technical and customer requirements
- Only eligible investment costs are included.
- The heat network demonstrates carbon savings and the heat price will be no more than the counterfactual.
- Evidence is provided of a funding gap at full application and projects pass at least one of the 'additionality' tests:
  - Economic/financial additionality route (for new networks): The sponsor could not raise the capital, and/or the project financials (i.e. internal rate of return), whilst positive, are not attractive enough to enable funding on the open market or through other available means alone.
  - Technical/commercial additionality route (for existing networks and networks directed through planning requirements): Funding for additional technical or commercial features where capital cost is currently a barrier to deployment and for additional features not required through planning obligations.

1.2 LEP policy and plans

1.2.1 Strategic Economic Plan

The Stoke-on-Trent and Staffordshire Strategic Economic plan dates from 2018 (5). The key focus is on developing strategic connections, creating more employment sites, improving digital connectivity and promoting sustainable energy infrastructure.

The focus of SEP is on two key centres:

- North of Staffordshire conurbation which includes Stoke-on-Trent and Newcastle-under-Lyme cities
- Additional strategic centres which include Stafford, Burton-on-Trent, Cannock, Lichfield and Tamworth

The overall vision for Staffordshire is to achieve an economy growth of 50% and generate 50,000 jobs in the next 10 years (this is also referred to as the 50:50:10 aim).

Also identified by the LEP are business and industrial clusters in growth sectors across and within key locations in Staffordshire that have significant potential, particularly the priority advanced manufacturing sectors of:

- Energy
- Auto-Aero
- Medical Technologies
- Agri-Tech
- Applied materials

Energy has been identified as a priority area here due to the physical, locational and research assets, particularly in the power generation sector. There is an opportunity to build on the long-standing presence of companies such as Alstom, ABB, Siemens Wind Power, General Electric, Goodwin International Engineering and the sustainable energy programme centred around the City Deal, including Europe's first at scale Smart Energy Network Demonstrator and Stoke-on-Trent's District Heat Network.

There is a priority around decarbonisation of the ceramics sector, with the development of a supportive and long-term policy framework, with stronger representation of the sector and enhanced collaboration with relevant governmental instruments. Focus is also drawn on research and innovation of manufacturing and operational technologies used (4).

There are plans on combating fuel poverty by focusing on reducing energy consumption through behavioural change and improvements of the building fabric, maximising the household's income, reducing fuel costs and increasing the amount of energy generated from renewable and low carbon sources (8).

District heating is currently enabled in Staffordshire through the development of a Low Carbon District Heat Network with a potential deep geothermal heat source. Future plans include a city-wide district heat network and biomass boilers, biomass CHP, micro CHP, air source heat pumps and photovoltaics. (9)

1.2.2 Stoke-on-Trent and Staffordshire EU Structural and Investment Fund Strategy

The LEP has developed a set of ambitions for use of ESIF funds which complement and reinforce the objectives within the Strategic Economic Plan. These include a focus on decarbonisation and building on established strengths in the energy generation sector. The ambitions are set out below: (10)

1. A more productive economy: Stoke-on-Trent and Staffordshire will make progress towards closing the existing productivity gap between itself (£14,900 per head)

and the national average (£21,300) by creating new, higher value-added jobs, and by helping the existing business base to grow and engage with emerging sectors.

2 A more diverse and resilient economy: building on established (and acknowledged) strengths in a number of high value-added priority sectors including Advanced Manufacturing, Advanced Materials, Creative Media and Energy Generation.

3 An innovation-driven economy: with established relationships between major companies, R&D functions and Higher Education and with an SME business base which has the capacity and knowledge to engage and add value to local and regional supply chains.

4 A strong and growing base of SMEs across both urban and rural areas: as a result of a comprehensive and joined-up approach to the provision of support.

5 A leading low carbon economy: driven by its unique approach to local energy generation and by an SME base which has evolved and embedded low carbon principles, practices and activities.

6 A well-qualified and adaptable workforce: with the skills sets appropriate to the needs of existing business sectors in Stoke-on-Trent and Staffordshire, as well as those in which we have aspirations for economic growth.

7 More inclusive communities: having made progress towards addressing issues of low aspirations and worklessness, through targeted approaches to engagement, training and employability.

8 A more attractive place to live, work and visit: renowned for its vibrant and diverse places, strong cultural and leisure offer in Stoke-on-Trent complemented by visitor attractions and a high-quality environment across the LEP area.

1.2.3 Stoke-on-Trent and Staffordshire City Deal

The Stoke-on-Trent and Staffordshire City Deal (11) is a deal to create more local jobs by encouraging economic growth. The city deal will take advantage of the area's natural resources, support Stoke-on-Trent and Staffordshire's world-famous advanced manufacturing and applied materials (e.g. ceramics) sectors, and the emerging energy and renewables growth sector.

It is based on four connected strands:

- Delivering a new and local approach to energy production;
- Providing local and incoming businesses with support to develop the next generation of products and materials;
- Developing local sites for new businesses or existing business to expand into, along with a strengthened local planning and development context and;
- Bringing employers and education together to ensure residents have the skills and training that they and local businesses need to drive the economy forward.

Support for energy under the City deal

There are several key energy projects that have been developed as part of the City Deal, including district heating, smart energy management and combined heat and power.

The City Deal has included support for the development of a large-scale, low carbon heat network system in Stoke-on-Trent city centre which is fed by deep geothermal energy that will produce up to 45GWh per annum and save approximately 10,000 tonnes of CO_2 per annum.

The deal also includes support to implement the Smart Energy Network Demonstrator (SEND) at Keele University for the testing and evaluation of new smart energy scenarios, the application of which has the potential to save between 1,700 tonnes and 77,000 tonnes of CO2 per annum if applied to households, business and other institutions connected to the Stoke-on-Trent District Heat Network (and more if applied to urban locations nationally and internationally).

Local partners have delivered a £140 million Energy from Waste Plant at Four Ashes in South Staffordshire. Through flexibilities agreed through the City Deal, a business case has been developed with government departments, including with the BEIS Heat Network Delivery Unit, to assess the future potential to offer Combined Heat and Power to local facilities and businesses. This project has the potential to lever £8 million in private investment.

There has been work towards the development of a Combined Cycle Gas Turbine power station at Meaford. This has the potential to add a Combined Heat and Power unit to a strategic employment site which could create 2,500 jobs. The scheme has obtained a development consent order and is currently being used as a basis to secure a supply contract.

1.2.4 Ceramic Sector Industrial Decarbonisation and Energy Efficiency Roadmap Action Plan

The Ceramic Sector Industrial Decarbonisation and Energy Efficiency Roadmap Action Plan (12) is a key collaboration between government and industry to help the ceramics industry make the low carbon transition while also maintaining its competitiveness. It has been developed through a partnership between the British Ceramics Confederation (BCC) and the Department for Business, Energy and Industrial Strategy (BEIS).

The ceramics sector is energy-intensive and consumes around 4.7 TWh of delivered energy per year, with gas accounting for 80 to 82% of the industry's overall energy mix. Total emissions in 2012 were 1.2 million tonnes CO_2, with the Roadmaps pathways showing a maximum technical abatement potential of up to 0.7 million tonnes CO_2 by 2050 if cost considerations are not taken into account. Most of this was through the electrification of heat and accompanying grid decarbonisation, although energy efficiency including heat recovery and the use of biofuels could also make significant contributions.

Energy costs are a major factor for the sector, accounting for as much as one-third of production costs, thereby naturally driving efficiencies and improvements. The UK's heavy clay sector, for example, has recently invested in some of the most energy- and carbon-efficient manufacturing ceramic operations in the world. Long-term planning is essential, however, as ceramics is a capital-intensive sector with long–investment cycles; a production plant can typically last more than 40 years.

The action plan will be delivered through a combination of government support, commitment from industry (BCC and its members) and involvement of other complementary organisations (such as Innovate UK, the Knowledge Transfer Network and academia). The action plan involves the following:

- Creation of a Decarbonisation Leadership Group to provide strategy and leadership for decarbonisation within the ceramic sector and to collaboratively develop a supportive, long-term policy framework for Energy Intensive Industries.
- Increase the adoption of state-of-the-art technology and existing energy-efficiency practices through sharing knowledge and bolstering financial support
- Define innovation requirements for the sector and implement mechanisms for collaborative innovation including funding to stimulate technology development, demonstration and implementation
- Increase RD&I with potential applications in the ceramic sector and maximise its funding from both government and the sector
- Develop and demonstrate advanced heat recovery technologies to increase the re-use of waste heat
- Increase the use of bioenergy in the sector
- Increase implementation of on-site renewables for self-generation of electricity requirements
- Collaborate with customers to create market pull for decarbonisation in the sector
- Develop a long-term engagement strategy with suppliers in the sector
- Increase skills and knowledge within the sector to enable an internationally competitive, energy / carbon-efficient future

1.2.5 Local Industrial Strategy

Stoke-on-Trent and Staffordshire LEP will be building on the national Industrial Strategy by producing a Local Industrial Strategy (LIS) in 2019-2020 to build productivity growth. Local Industrial Strategies will be long-term, based on clear evidence and aligned with the national Industrial Strategy. Government is committed to Local Industrial Strategies so that all places:

- **Are able to increase productivity and realise their potential**: building on well-evidenced and distinctive strengths aligned with the national Industrial Strategy.
- **Set out the spatial impacts of national and local policy across our cities, towns and rural areas**: informing priorities and choices and demonstrating how they will allow all communities to contribute to, and benefit from, economic prosperity

The LIS will set out clearly defined priorities for how cities, towns and rural areas will maximise their contribution to UK productivity. Local Industrial Strategies will allow places to make the most of their distinctive strengths. They will better coordinate economic policy at the local level and ensure greater collaboration across boundaries. Subject to Local Industrial Strategies being agreed in places by Government, they will help to inform local choices, prioritise local action and, where appropriate, help to inform decisions at the national level.

The LIS will also provide a strategic overview which will inform SSLEP's approach to any future local growth funding deployed through the LEP and will help Stoke-on-Trent and Staffordshire decide on their approach to maximising the long-term impact of the new UK Shared Prosperity Fund once details of its operation and priorities are announced following the Spending Review.

1.3 Policy summary

It is clear from the preceding sections that energy is becoming more of a priority at both a national and a local level. Meeting the UK's decarbonisation targets will be challenging, and requires a clear action plan to be put in place to ensure Stoke-on-Trent and Staffordshire contribute effectively. Furthermore, access to energy is crucial for growth. For large manufacturing within Staffordshire energy can represent a significant cost and access to low-cost energy is crucial to staying competitive. The Stoke-on-Trent City Deal aims to put Stoke-on-Trent at the forefront of the development of renewable and low carbon energy projects.

In this context it is clear that an energy strategy for Stoke-on-Trent and Staffordshire is needed in order to ensure that work done looking at different aspects of the energy system can be drawn together and a clear action plan put in place to help Stoke-on-Trent and Staffordshire reach a future with secure low carbon energy supply to drive local economic growth.

2. Evidence base review

This section collates available information about the Staffordshire energy system, covering energy consumption, heat demand, carbon emissions, renewable energy potential and deployment, fuel poverty and electrical grid capacity. A range of data sources have been reviewed, including national statistics, regional and local studies to produce the data in the following section, these have been referenced in Appendix IV.

2.1 Domestic Energy Efficiency

Stoke-on-Trent has had work done to assess the energy performance of domestic dwellings on a ward and Lower Super Output Area (LSOA) basis utilising data from Energy Performance Certificates (EPCs). This helps identify areas with poorer levels of energy efficiency and where energy efficiency levels are relatively higher.

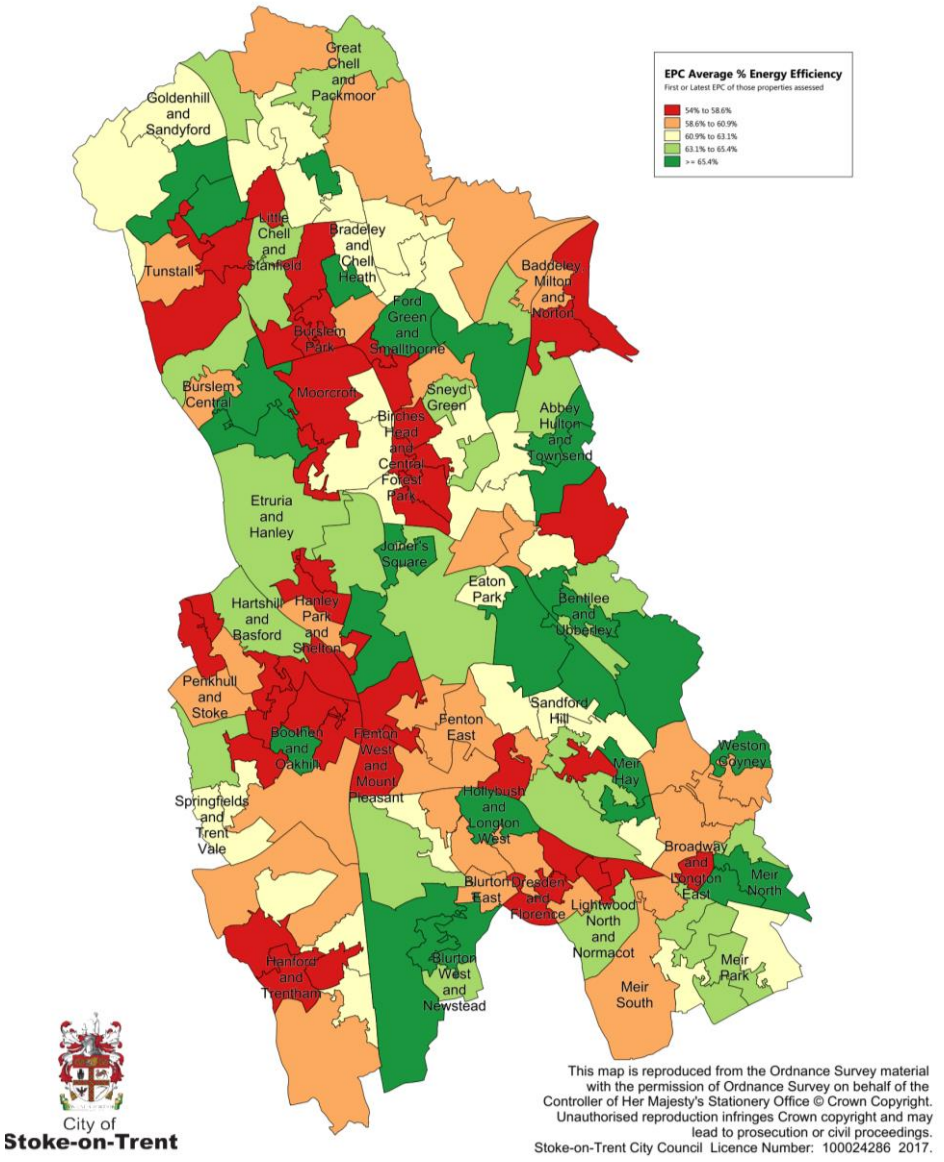

Figure 2: Energy efficiency levels across Stoke-on-Trent from EPC data (2017)

This energy efficiency data isn't available to this granularity for Staffordshire as a whole and so represents an area that could be improved to help target energy efficiency improvements. Figure 3 shows a breakdown of the number of properties at each EPC rating by local authority area.

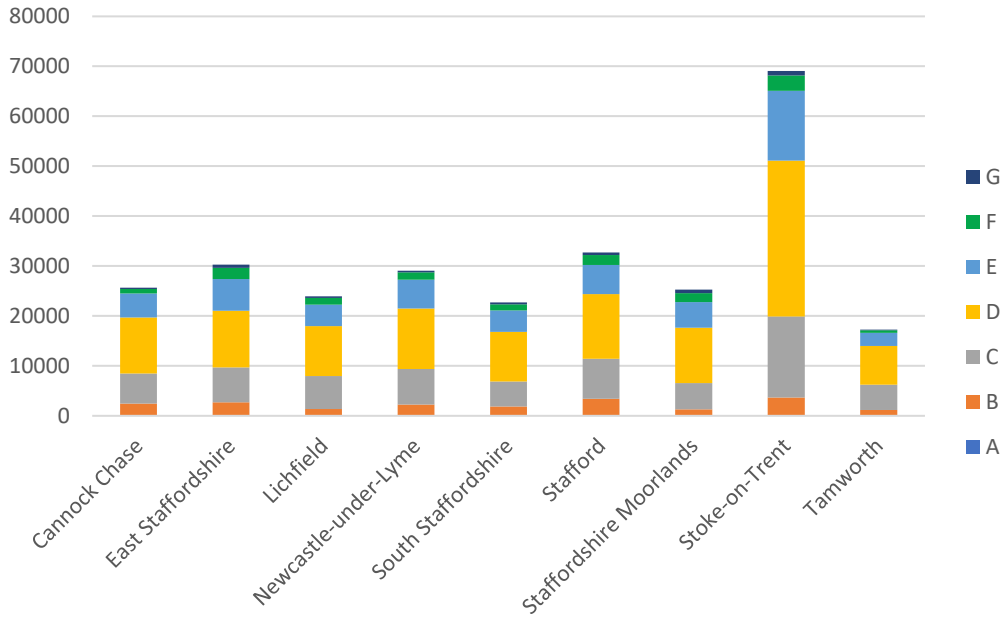

Figure 3: Number of domestic properties by EPC rating within each local authority area (2018) (13)

On average only 31.4% of domestic properties have an EPC rating of C or better, with the most common EPC rating being D, with 42.6% of properties rated D on average, and 26% of properties rated E or below, indicating particularly poor energy efficiency and high energy costs. The areas with the highest proportion of properties with poor energy efficiency are East Staffordshire and Staffordshire Moorlands, which both have over 30% of properties rated E or below and over 9% of properties rated F or G.

This data only reflects those properties which have an EPC; just over 276,000 properties have an EPC, around 57% of the estimated total 483,000 households in Stoke-on-Trent and Staffordshire.

2.2 Renewable energy potential

Total renewable energy resource across Staffordshire has been summarised based on existing analysis. This sets out the maximum possible energy generation resource from different technologies that could be reached in the future.

Table 1: Total renewables potential of each local authority area in MW by technology across Staffordshire (14)

		Stoke-on-Trent	Cannock Chase	East Staffordshire	Lichfield	Newcastle-under-Lyme	South Staffordshire	Stafford	Staffordshire Moorlands	Tamworth	Total (MW)
Onshore wind	Large scale	8	40	1209	1148	540	497	1901	1208	23	**6,566**
	Small scale	0	0	45	45	27	0	40	52	0	**209**
Hydro		0.1	0.02	2	0.4	0.05	0.3	2	3	0.2	**8**
Solar	Photovoltaics	55	22	32	26	28	27	40	29	15	**219**
	Water heating	46	18	25	21	24	22	34	22	12	**178**
Heat pumps	Ground source heat pumps	105	36	52	41	50	43	61	46	27	**356**
	Air source heat pumps	421	146	207	165	200	171	245	182	106	**1,422**
Biomass	Managed woodland – elec.	0.1	0.1	0.2	1	1	1	2	1	0.1	**6**
	Managed woodland - heat	0.1	0.2	1	1	1	1	2	2	0.1	**8**
	Energy crops – elec.	0.1									**0**
	Energy crops - heat	0									**0**
	Waste wood – elec.	2	1	1	1	1	0.5	1	0.5	0.5	**7**
	Waste wood - heat	1	0.5	1	0.5	0.6	0.4	1	0.4	0.4	**5**
	Agricultural arisings (straw)	0	0.1	1	2	0.2	2	2	0.1	0.1	**8**
	Animal waste (wet organic waste)	0.5	0.2	9	3	5	4	15	14	0.2	**50**
	Animal waste (poultry litter)	0	0	0.2	0	0	0.4	0.03	0.1	0	**1**
	Municipal solid waste	10	3	4	4	4	4	4	4	2	**29**
	Commercial & industrial waste	6	2	4	3	3	2	4	2	2	**22**
	Landfill gas	3	2	1	0	0	2	1	0.6	0.3	**7**
	Sewage gas	3	0	1	0	0	2	0.6	0.6	0	**4**
	Co-firing of biomass	0	0	0	106	0	0	0	0	0	**106**
Total	Electricity (MW)	85	70	1308	1339	609	541	2,012	1,315	43	**7,237**
	Heat (MW)	573	201	286	229	276	237	343	252	146	**1,970**
Overall	**Total (MW)**	**658**	**271**	**1,594**	**1,568**	**885**	**778**	**2,355**	**1,567**	**189**	**9,865**
	% of Staffordshire total	6.7	2.7	16.2	15.9	9.0	7.9	23.9	15.9	1.9	**100**
	% of West Midlands total	1.2	0.5	3.0	2.9	1.6	1.4	4.4	2.9	0.4	**18.3**

A 2011 study looking at renewable energy capacity for the West Midlands (14) summarises total renewables potential from different types of technologies across the different local authority areas.

The study follows a standard methodology that was published by the then Department of Energy and Climate Change (DECC) in 2010. This allows us to compare the current situation of renewable energy installations against this potential, and assess how much of this would need to be utilised to meet long-term carbon reduction targets.

From Table 1 it can be seen that Stafford, East Staffordshire, Lichfield and Staffordshire Moorlands have significant wind resources as well as some hydro, PV and biomass resources. The smaller land area of Tamworth leads to correspondingly lower potential generation from most of these technologies, with a contribution to the total West Midlands potential of only 0.4%.

There is potential for the development of other low carbon energy sources, particularly for electricity generation. There are high levels of potential for wind generation, and there is also significant potential solar resource that was not captured as part of this study, as standalone solar wasn't considered a viable generation technology at the time of the study.

Different technologies have different generation characteristics (such as intermittency) and, therefore, technologies with the same peak power output may not generate the same amount of energy in reality. For example, a 1 MW solar farm in Staffordshire with a typical capacity factor of 10.6% would generate 929 MWh of energy across the year, a 1 MW onshore wind farm with a capacity factor of 30% would generate 2,638 MWh, while a 1 MW Landfill gas generation site, operating similarly to an established facility in Stafford, would generate 3,645 MWh.

2.3 Renewable energy deployment

Total renewable energy deployment by local authority area is set out below. It can be seen that there is widespread deployment of solar PV generation, with installed capacity varying significantly by local authority area. Other technologies contributing significantly include landfill gas, anaerobic digestion, municipal solid waste and landfill gas, with some installation of onshore wind in places.

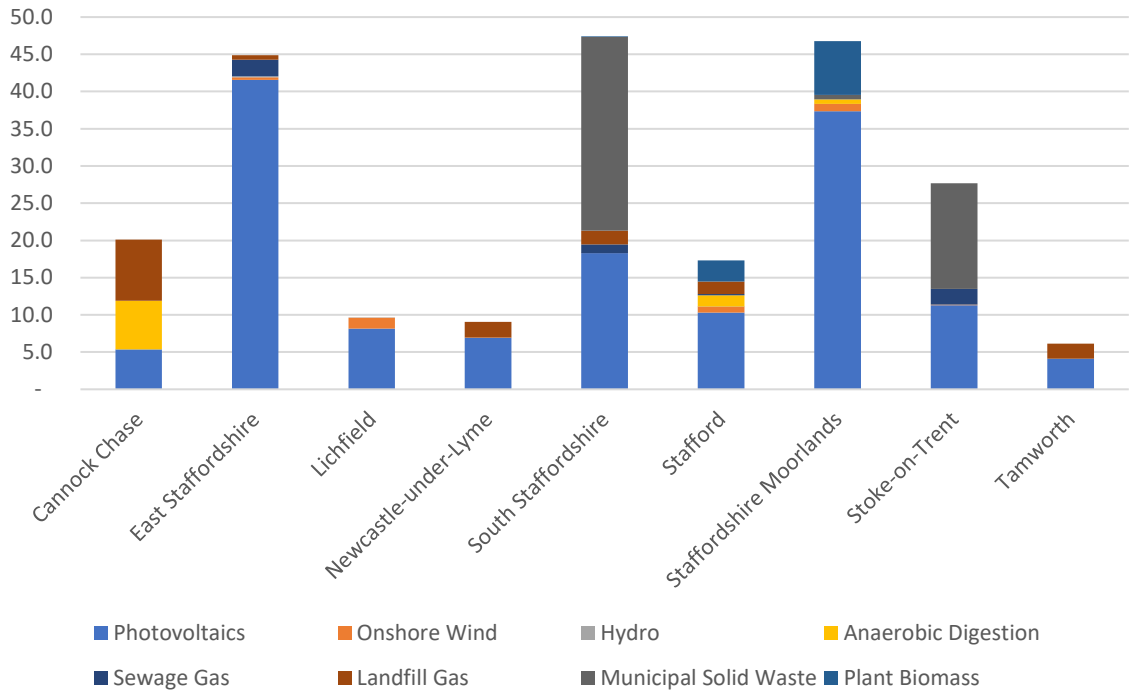

Figure 4: Renewable electricity generation installed capacity in MW by local authority area, 2016 (15)

Generation capacity is not directly correlated with generated energy, as different technologies have different capacity factors and operate for different amounts of the year, depending on resource availability. The technologies generating the most energy annually in the area are solar PV and landfill gas, as shown in Figure 5. Solar PV generation is driven by the large installed capacity of the technology, despite the low capacity factor of PV generation, while landfill gas and anaerobic digestion produce electricity year-round and so account for a high proportion of generated electricity despite their lower capacity factor.

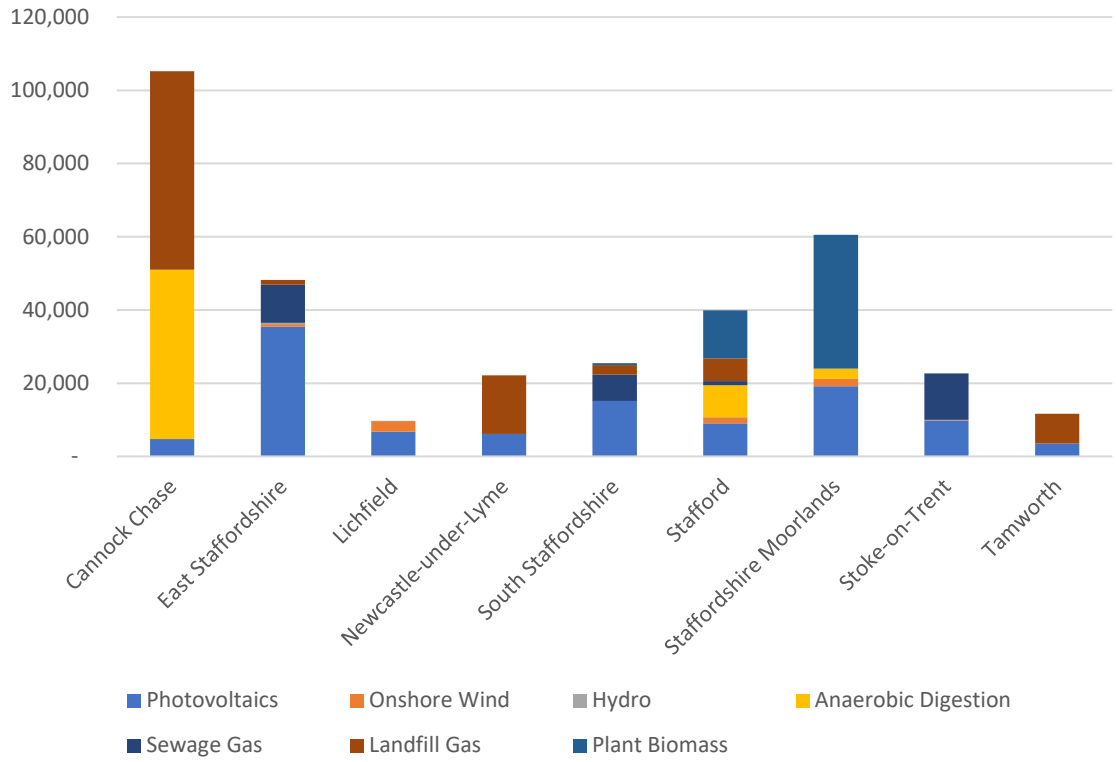

Figure 5: Electricity generation in MWh by technology type and local authority area, 2016 (15)

Large-scale (>1 MW) renewable deployment is mapped in Figure 6 below, as identified in the Renewable Energy Planning Database (REPD). This database covers all large-scale renewable development and is complied with reference to a number of data sources including feed-in tariff deployment and local authority planning data so should be comprehensive for large-scale projects.

From Figure 6 it can be seen that there are a wide range of renewable technology installations across Staffordshire. Schemes identified are all greater than 1 MW generation capacity. The black lines in Figure 6 show the local authority boundaries within Staffordshire.

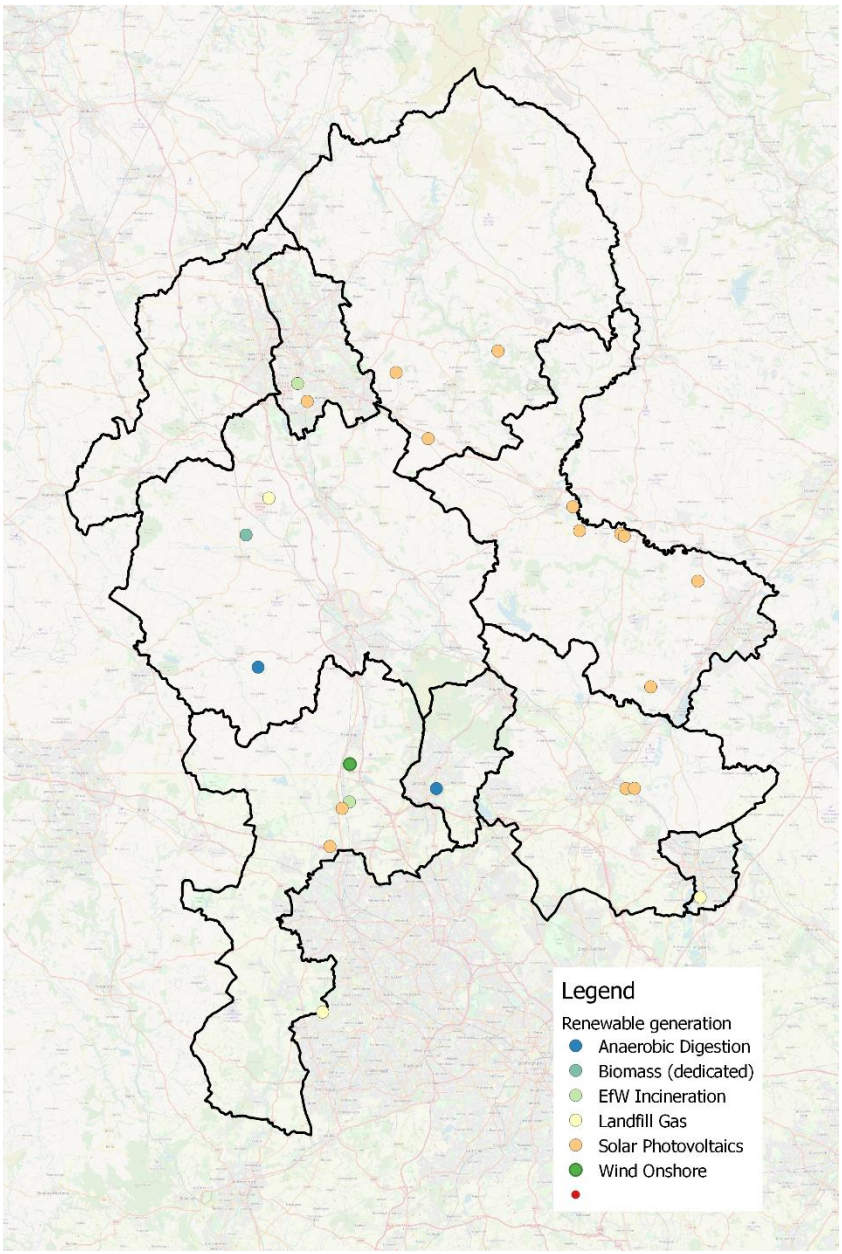

Figure 6: Staffordshire large-scale renewable deployment – operational sites (16)

There has been wider deployment of large-scale solar PV schemes within East Staffordshire and Staffordshire Moorlands. There is also an onshore wind turbine development, taking advantage of the significant wind resources in the county.

Other opportunities include anaerobic digestion (AD), biomass, landfill gas generation and Energy from Waste Incineration (EfW) developments, locations of which vary. There are some further projects that are either under construction or have secured planning permission and are awaiting construction that are summarised in the table below. Beyond this, other projects in the pipeline within Stoke-on-Trent in particular include a cumulative 40 MW of solar, 4 MW of Landfill gas, 1.4 MW of Anaerobic Digestion electrical generation and 500 m3/hr of gas to grid from Anaerobic Digestion.

Table 2: Summary of technology installations larger than 1 MW by planning status and local authority area (16)

	Stoke-on-Trent	Cannock Chase	East Staffordshire	Lichfield	Newcastle-under-Lyme	South Staffordshire	Stafford	Staffordshire Moorlands	Tamworth
Awaiting Construction (MW)	**45.4**		**10.0**	**1.7**		**2.5**			
Anaerobic Digestion	1.4					1.5			
Biomass (dedicated)						1.0			
Landfill gas	4								
Solar Photovoltaics	40		10.0	1.7					
Operational (MW)	**16.7**	**23.0**	**49.2**	**2.0**	**-**	**21.0**	**5.2**	**24.9**	**1.0**
Anaerobic Digestion			6.0				1.3		
Biomass (dedicated)							2.6		
Landfill Gas						4.4	1.3		1.0
Solar Photovoltaics	2.5		43.2	2.0		12.6		24.9	
Wind Onshore						4.0			
EfW Incineration	14.2	23.0							
Grand Total (MW)	**62.1**	**23.0**	**59.2**	**3.7**	**-**	**23.5**	**5.2**	**24.9**	**1.0**

2.4 Energy use in Stoke-on-Trent and Staffordshire

The graphs below summarise overall energy use across Staffordshire.

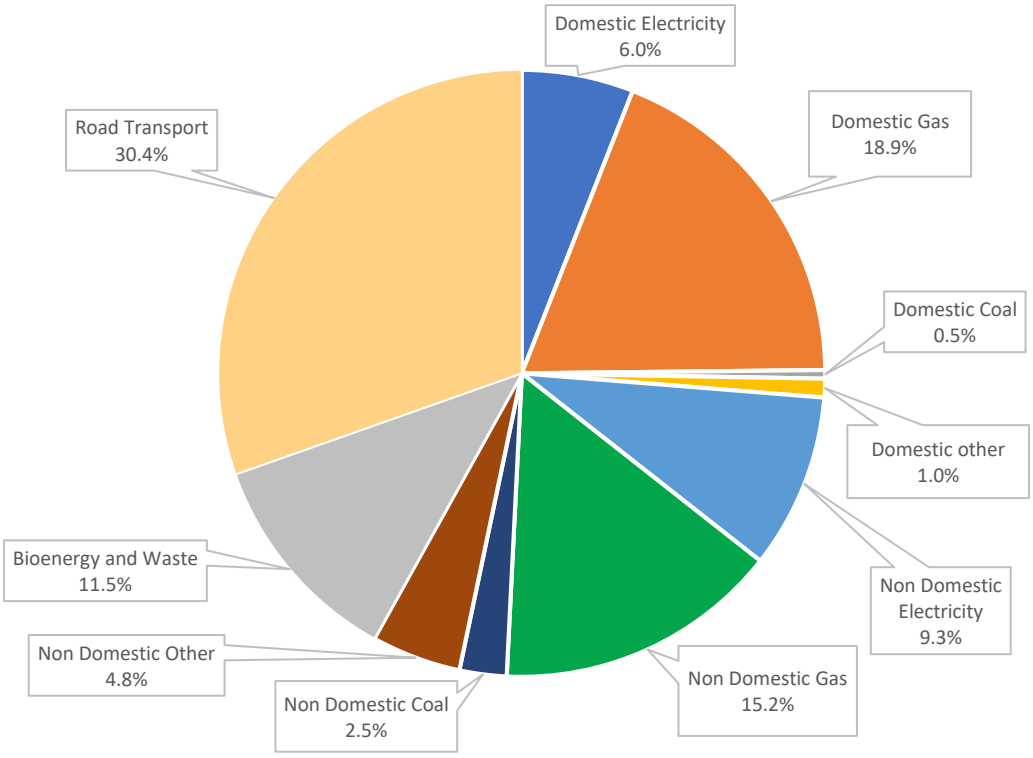

Figure 7: Energy use by fuel and sector in Staffordshire (17) (18) (19) (20)

Figure 7 shows the split of overall energy use by sector and fuel type in Staffordshire. This breaks down the consumption by domestic/non-domestic use and final fuel consumed, i.e. electricity, gas, coal, bioenergy and road transport fuels.

From this it can be seen that road transport makes up over a quarter of energy consumed in Staffordshire, the largest single energy use. This includes energy associated with transport on national through routes, for example the M6. Non-domestic energy consumption is higher than domestic energy consumption. Gas is the main fuel used, demonstrating the relatively wide access to the gas network within Staffordshire. Non-domestic 'other' and domestic coal together make up less than 6%, indicating there is still some energy demand that is met by high carbon fuels such as oil and coal rather than gas or electricity.

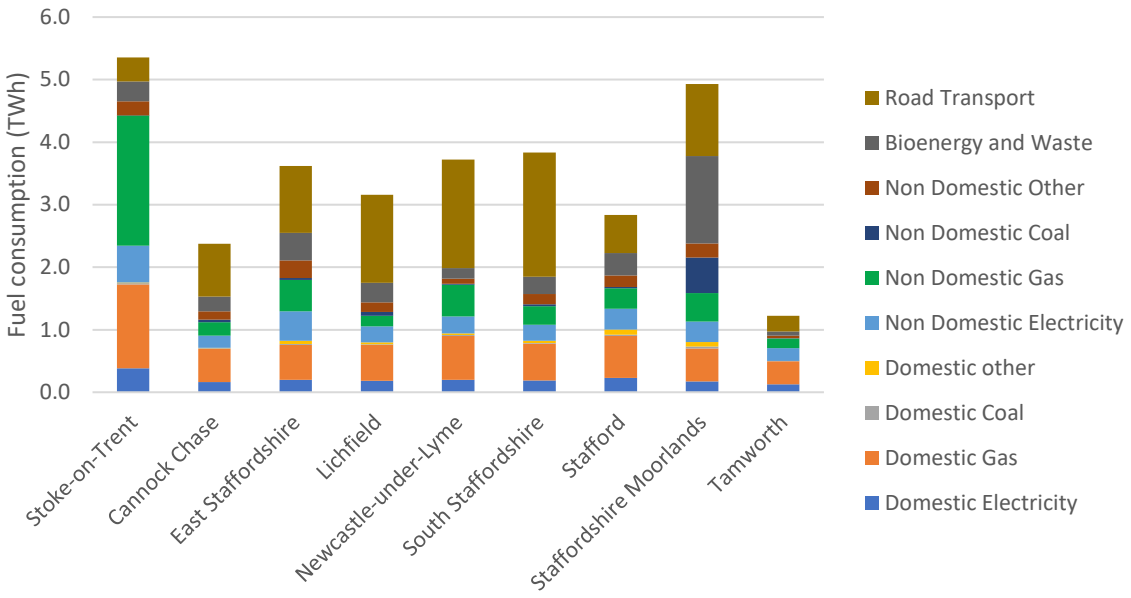

Figure 8: Energy consumption by fuel and by sector per local authority (17) (18) (19) (20)

From Figure 8 it can be seen that road transport is the single largest energy use in many of the local authority areas. Domestic gas consumption is significant, representing the large fuel demands for heating homes, while non-domestic energy demands vary with the levels of industry in the district. One of the highest non-domestic energy demands is seen in Stoke-on-Trent. Staffordshire Moorlands has significant consumption of bioenergy and waste for fuel.

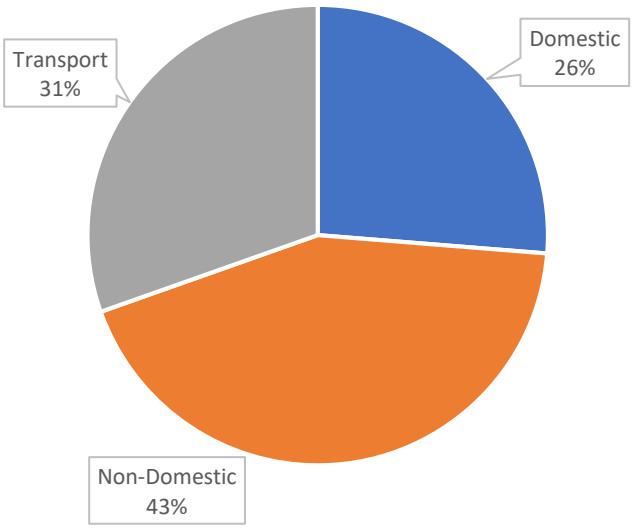

Figure 9: Energy use by sector (17) (18) (19) (20)

Energy use by sector is typically split approximately into thirds. Non-domestic here makes up 43% of total energy consumption. An increased proportion of non-domestic energy consumption compared to domestic and transport energy consumption could

represent a differing ratio of industry to population to the national norm. It could also point to a higher density of businesses that are large energy users.

Figure 10 shows the percentage of off-gas properties within each LSOA. Off-gas properties are those that are not connected to the gas network. LSOAs represent divisions of England for census purposes based on population, and so represent smaller geographical zones within urban areas than within rural areas. By comparing the number of domestic gas meters within each LSOA with the number of households from the previous census, the proportion of households that are connected to the gas network and are therefore capable of using gas for domestic heating purposes can be estimated.

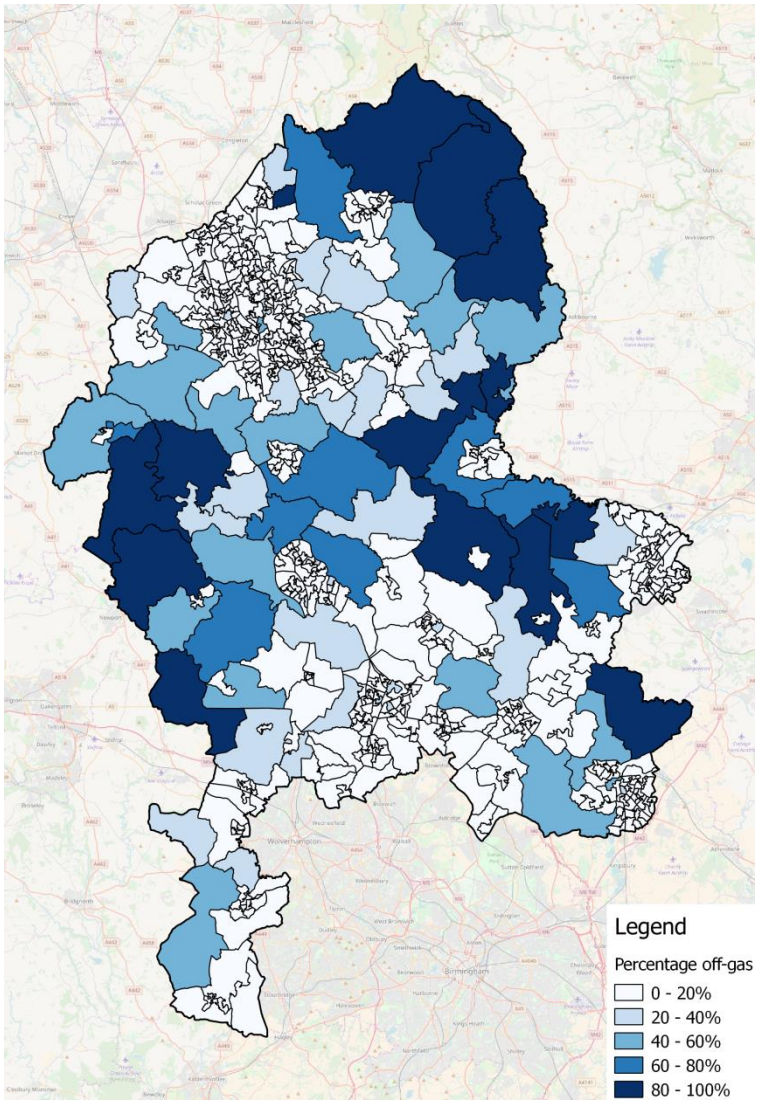

Figure 10: Percentage of off-gas properties by Lower Super Output Area (LSOA) (21)

From Figure 10 it can be seen that the majority of Staffordshire has below 40% of properties off-gas, with some of the more sparsely populated rural areas, particularly in Staffordshire Moorlands District and areas in Stafford District and East Staffordshire District off the gas grid presenting higher proportion of properties of the gas grid.

This lack of access to the gas network has major impacts for the heating fuels used, correlating with increased use of other more carbon emissions intensive fossil fuels

such as oil or coal within rural homes. Changing the heating fuels in these homes is one of the government's key plans for decarbonisation of heat within the UK as set out in the Clean Growth Strategy (3).

Table 3: Fuel poverty by local authority area, 2017 (22)

LA Name	Proportion of households fuel poor (%)
Cannock Chase	10.5%
East Staffordshire	13.8%
Lichfield	11.0%
Newcastle-under-Lyme	12.8%
South Staffordshire	10.7%
Stafford	12.5%
Staffordshire Moorlands	12.9%
Stoke-on-Trent	14.0%
Tamworth	10.8%
West Midlands	*13.5%*
England	**11.0%**

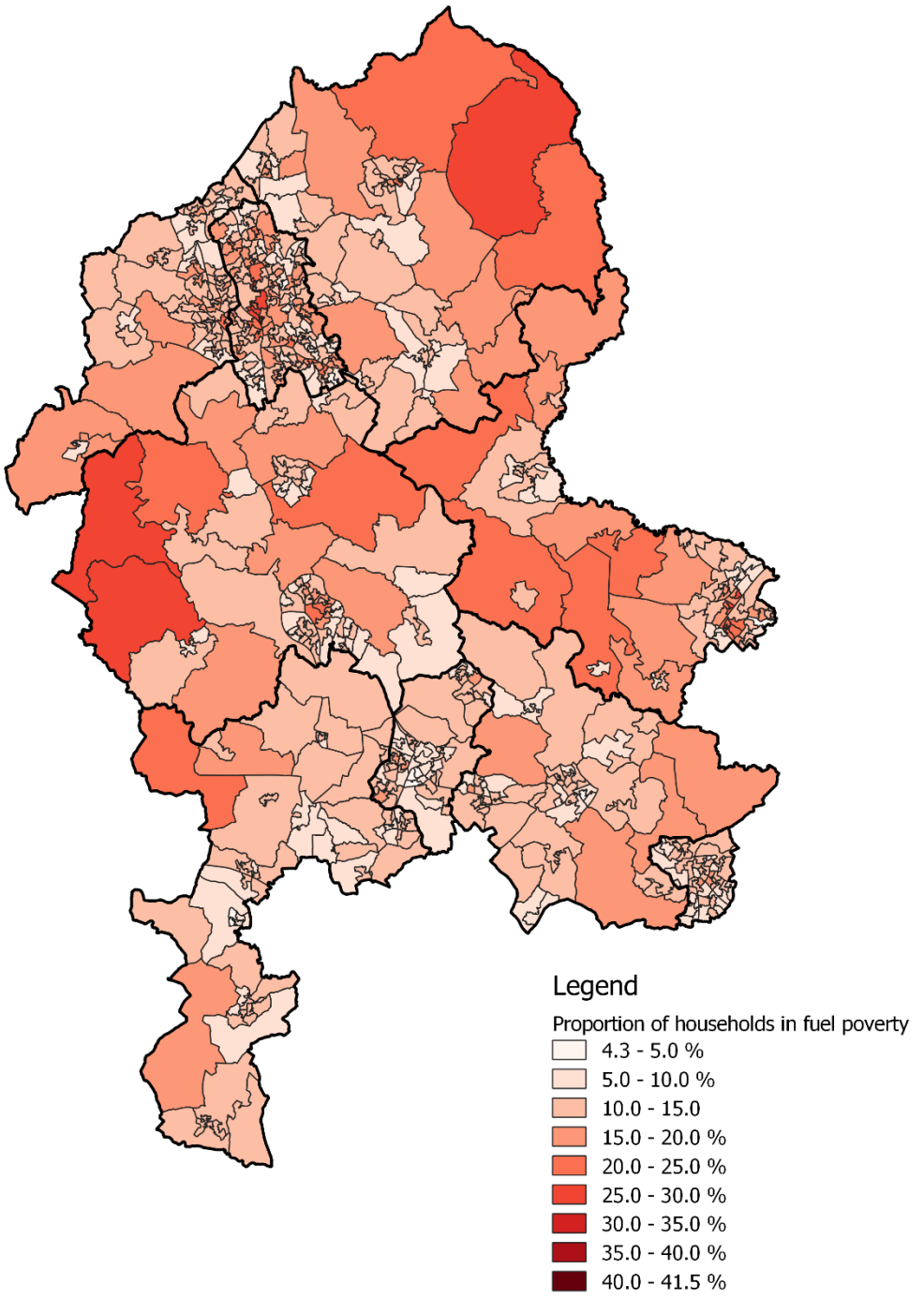

Figure 11: Fuel Poverty by Lower Super Output Area (LSOA), 2017 (22)

Fuel poverty within Stoke-on-Trent and Staffordshire is particularly high in some areas, with the majority of local authority areas above the national average and several also above the West Midlands average. On a more granular scale, some LSOAs have over 25% fuel poverty within East Staffordshire, Stafford and Staffordshire Moorlands. The peak proportion of households in fuel poverty in any individual LSOA occurs in Stoke-on-Trent, at a substantial 41% of households, highlighting the challenges faced in some local areas that can be masked by the average level across the local authority as a whole.

2.5 Heat demand

The heat demand of each local authority area has also been explored using the DECC (now BEIS) National Heat Map (23). This is a tool that has built up heat demand using a bottom-up approach assessing heat demand by building type and size and is useful on an aggregate level to assess expected heat demands.

Figure 12 below shows the total heat demands across all sectors for Staffordshire. The map is dominated by Birmingham south of Staffordshire, but there are important hotspots flagged up around Stoke-on-Trent, Stafford, Burton-on-Trent and Tamworth.

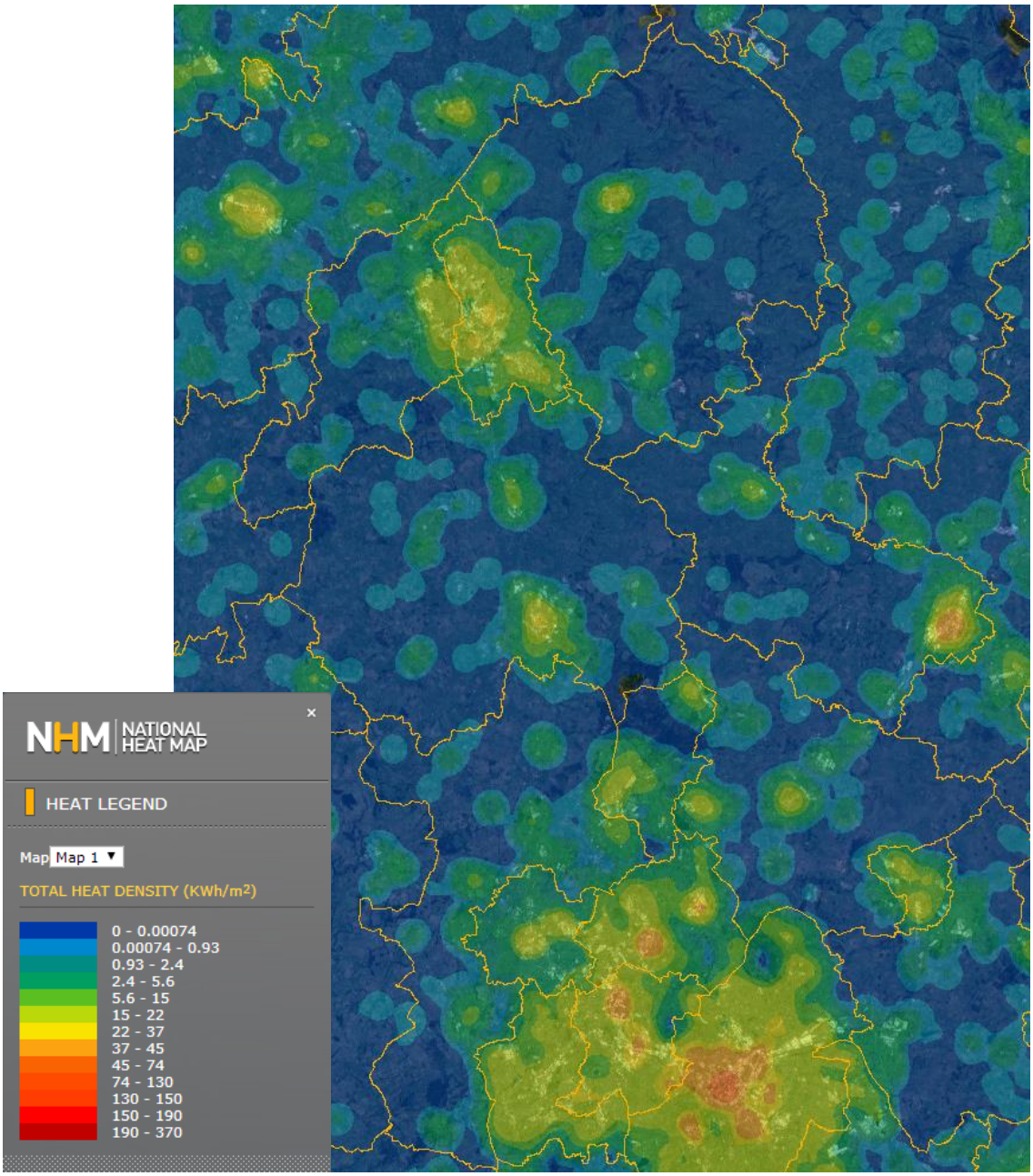

Figure 12: National heat map output for Staffordshire (23)

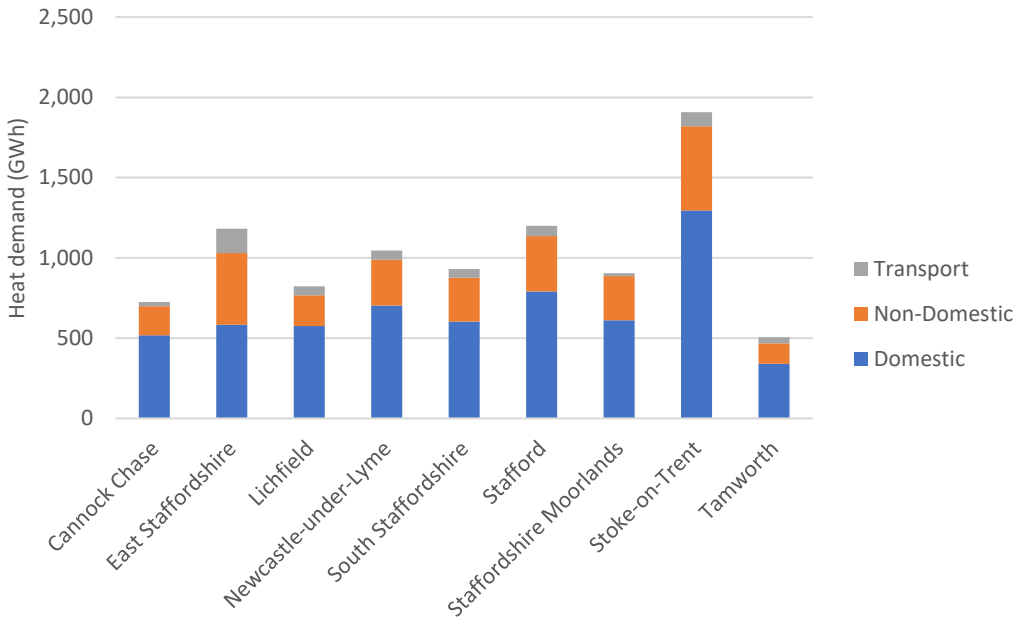

Figure 13: Heat demand by sector and local authority area (23)

Figure 13 shows that the majority of heat demand in each local authority area is for domestic premises, with the bulk of the rest made up of non-domestic demand with a small amount for transport. The domestic demand is easily understood and is made up of heat to people's homes, supplied by a range of different fuel sources, as explored in section 2.4.

The non-domestic heat demand is broken down further in Figure 14. From this it can be seen that the proportion of heat demand for industrial buildings is significant in many of the local authority areas, with other significant contributions to total heat demand from retail, hotels, health, education and transport.

This analysis helps to understand the potential opportunities that may be in place for heat networks or provision of alternative heating options in non-domestic premises.

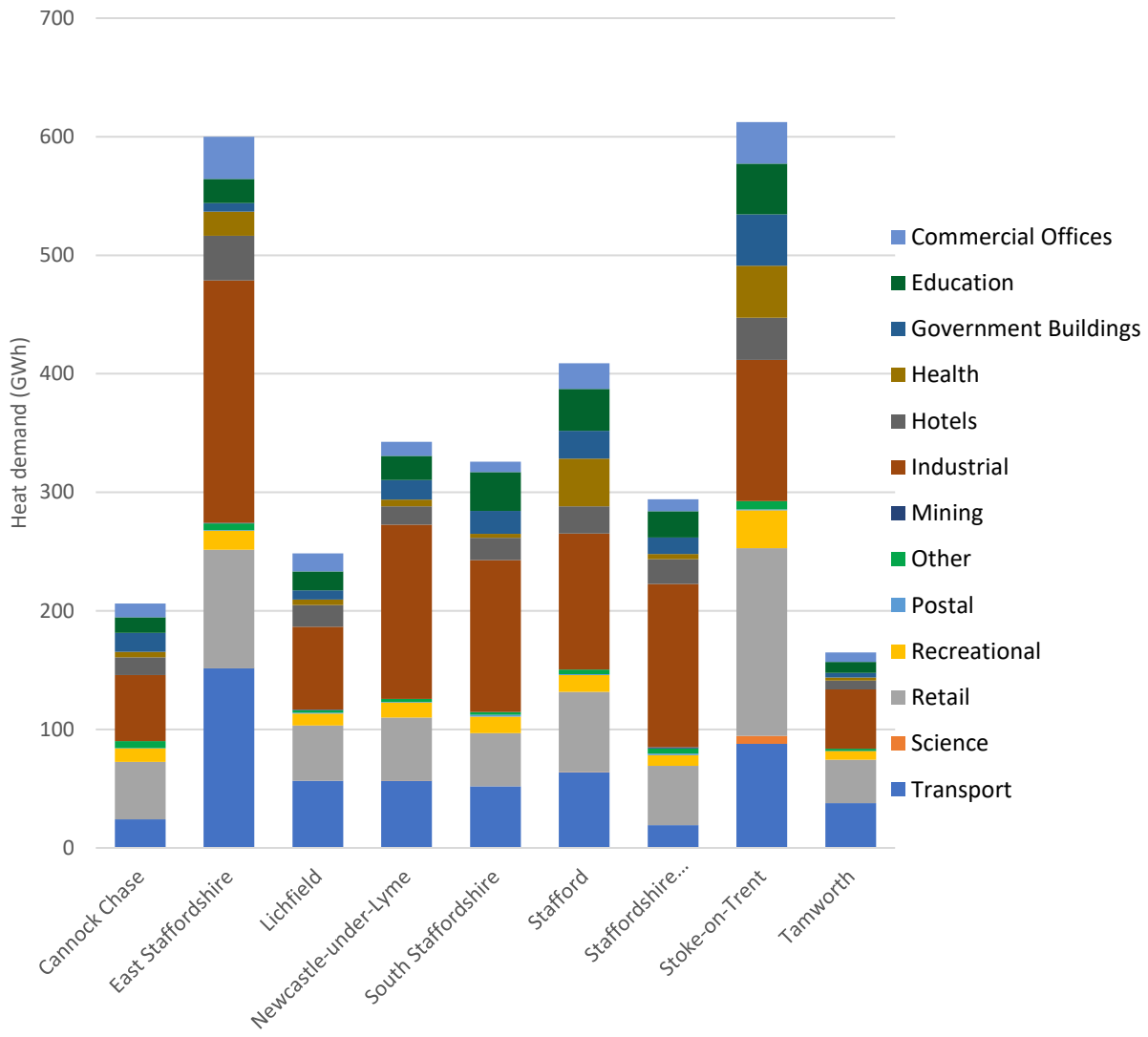

Figure 14: Non-domestic heat demand by industry and local authority area (23)

2.6 Carbon emissions

In this section carbon is used as shorthand for greenhouse gas emissions. This is made up primarily of Carbon Dioxide (CO_2), but also includes other major greenhouse gases weighted by global warming potential to produce a single aggregate figure known as Carbon Dioxide equivalent (CO_2e).

The following data comes from the National Statistics publication *'UK local authority and regional carbon dioxide emissions 2005-2015'* (24).

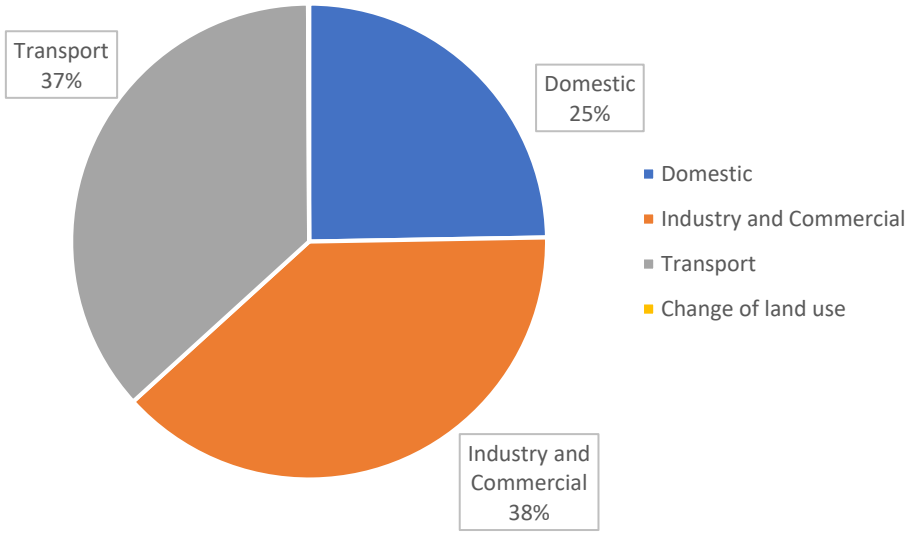

Figure 15: Staffordshire proportion of carbon emissions by sector, 2015 (24)

The industrial and commercial sector accounts for the majority of carbon emissions. The transport sector is the second largest sector in terms of carbon emissions. The domestic sector presents the lowest emissions out of the three and accounts for almost a quarter of the total emissions. Change of land use is a category that encompasses change of the sector utilisation of land including removal of forests. This is a small proportion of overall carbon emissions, but it useful to monitor particularly its impact within rural areas where there is significant potential for development on greenfield sites. In the case of Staffordshire, the proportion of carbon emissions that is assigned to the change of land use sector is almost null.

Transport emissions have grown relative to the proportion of total energy use, set out in Figure 7. This indicates that transport is a relatively high source of carbon emissions utilising primarily fossil fuels.

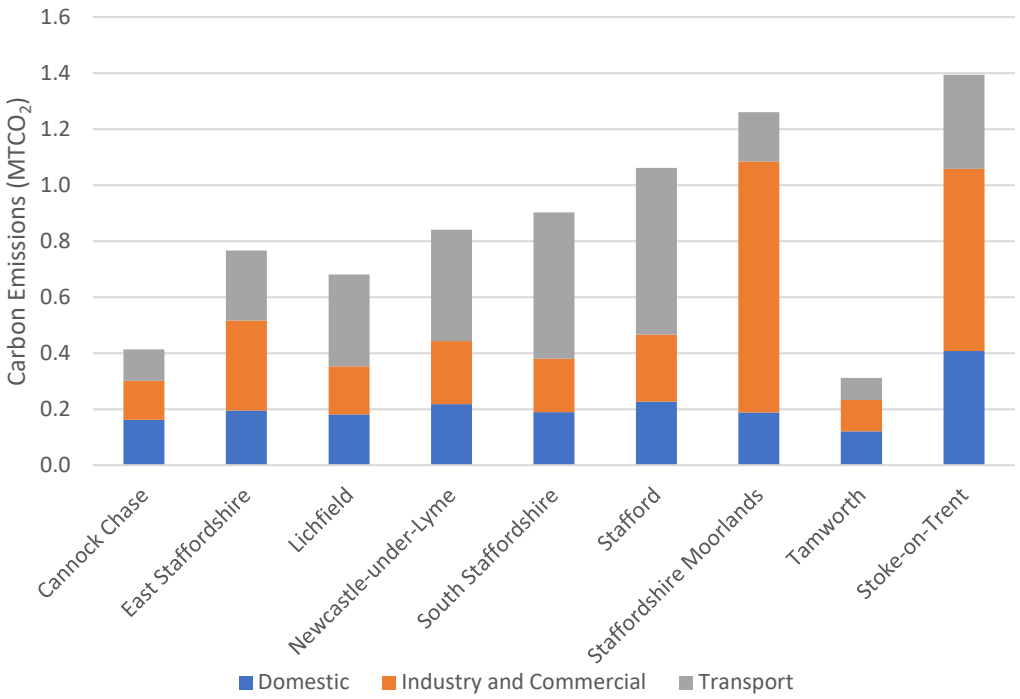

Figure 16: Total carbon emissions breakdown by sector and local authority area, 2015 (24)

Figure 16 shows the sectoral breakdown of carbon emissions between domestic, non-domestic and transport emissions. From this it can be seen that Staffordshire Moorlands and Stoke-on-Trent industrial carbon emissions are substantial. Stoke-on-Trent industrial emissions are driven by the high levels of local commercial and industrial development, while Staffordshire Moorlands emissions are primarily related to cement production, which is an industry with particularly high emissions.

Converting total carbon emissions figures for each local authority area to a normalised figure of tonnes emitted per person allows us to compare these figures on a more even footing, as well as comparison to national benchmarks.

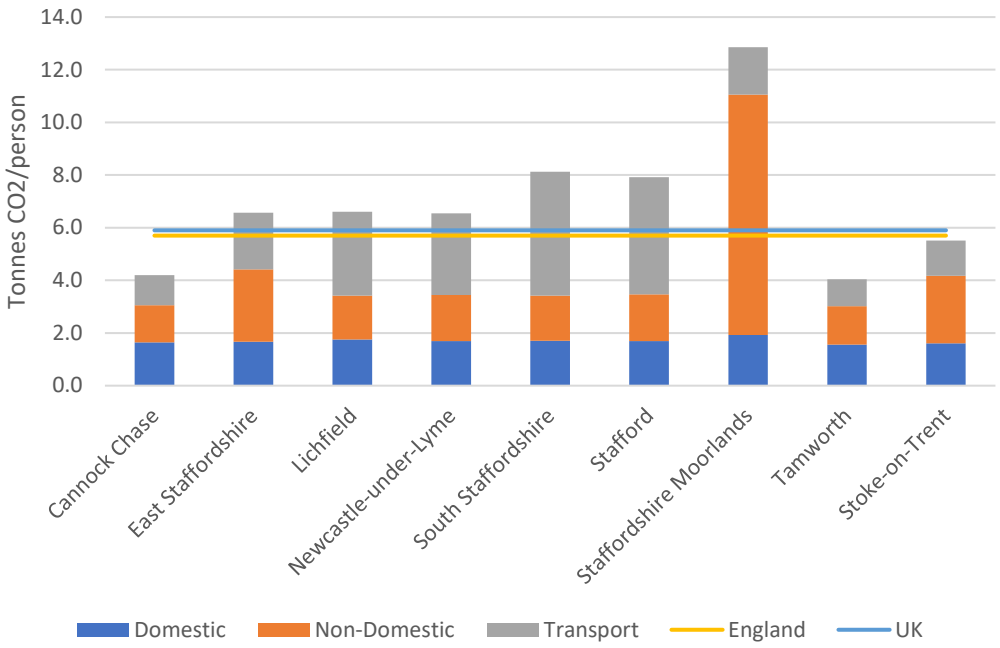

Figure 17: Carbon emissions per capita by category and local authority area compared to national benchmarks 2015 (24)

Figure 17 shows that that most of the local authority areas have emissions per capita figures around or below the national average. Carbon emissions on a domestic basis are similar, while non-domestic and transport emissions vary more widely. As seen in Figure 16, we can see the scale of the emissions from Staffordshire Moorlands. On this scale, they look even larger relative to the other areas due to the relatively low population of the area set against the substantial cement production emissions.

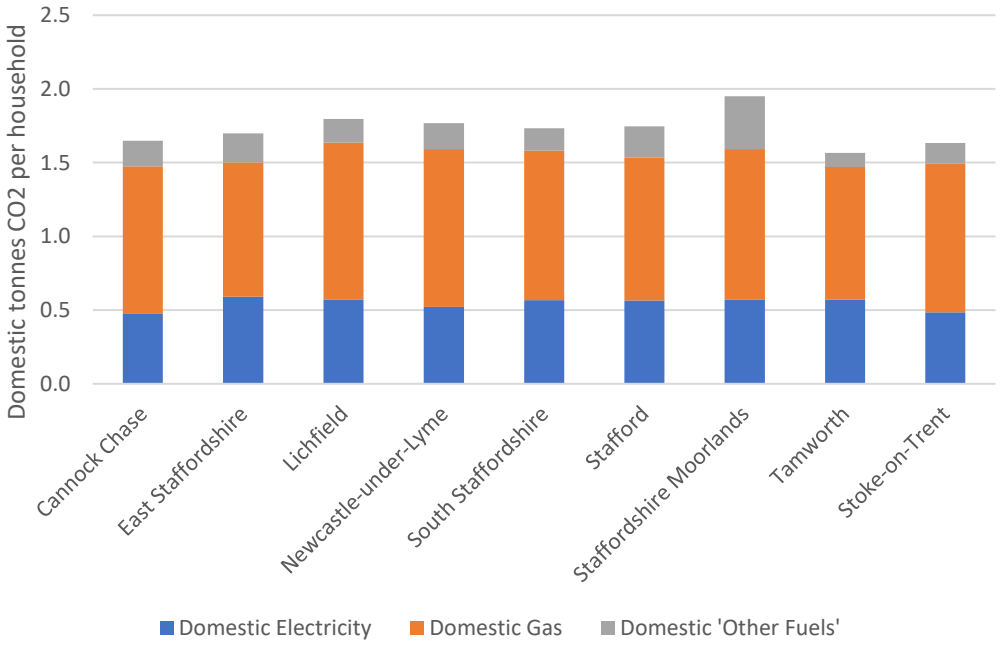

Figure 18: Domestic carbon emissions by household 2015 (24)

Figure 18 shows domestic carbon emissions split by fuel consumed on a per household basis. A per-household basis is most appropriate for comparison here as it is the number of households not the number of people that is more important in determining energy consumption.

Domestic electricity consumption carbon emissions are similar across all areas, with varying proportions from gas consumption. However, it can be seen that the prevalence of gas as the heating fuel of choice minimises the contribution to emissions from 'other fuels' such as coal and oil. Areas with higher proportion of non-access to the gas network, such as Staffordshire Moorlands, have higher emissions from 'other fuels.' This category includes oil and solid fuels such as coal which have significant carbon emissions and so will have a proportionately higher contribution to carbon emissions than to energy consumption alone.

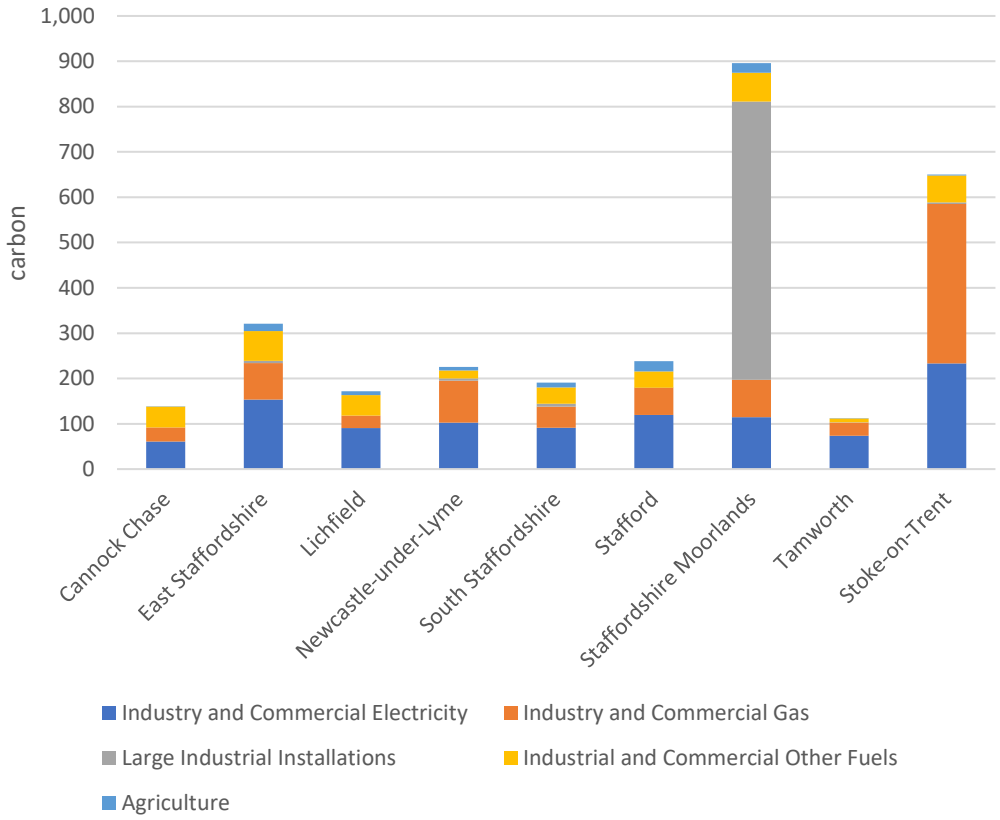

Figure 19: Non-domestic carbon emissions broken down by sector and local authority area 2015 (24)

Figure 19 shows non-domestic carbon emissions broken down by sector. From this it can be seen that the largest contributor to carbon emissions within each local authority area is typically industrial and commercial electricity use. The graph separates agriculture out specifically from other industrial and commercial carbon emissions. It can be clearly seen that agriculture contributes to emissions to an extent in the larger, more rural areas such as Staffordshire Moorlands and Stafford, but relatively little to that of more urban areas. Given the agricultural land within each local authority area this is to be expected, but it does highlight that for more rural areas to decarbonise they will need to tackle carbon emissions from agriculture.

The main stand out from the graph is again the carbon emissions contribution from Staffordshire Moorlands, categorised here as 'Large Industrial Installations', which skews the graph somewhat, and relates to cement production within the area. Across most districts, there is a substantial contribution to emissions from industrial use of 'Other fuels'. This highlights a potentially easy route for initial carbon reduction if some of this energy use could be switched to gas as a lower carbon fuel.

Carbon emissions from electricity use are not something that can be controlled on a local authority or regional level, given the interconnected nature of the electricity network and the responsibility of national government to set policy related to the electricity generation mix. However, current national projections show carbon emissions from electricity generation following the current trend and falling over time, indicating that carbon emissions from electricity use are likely to decrease.

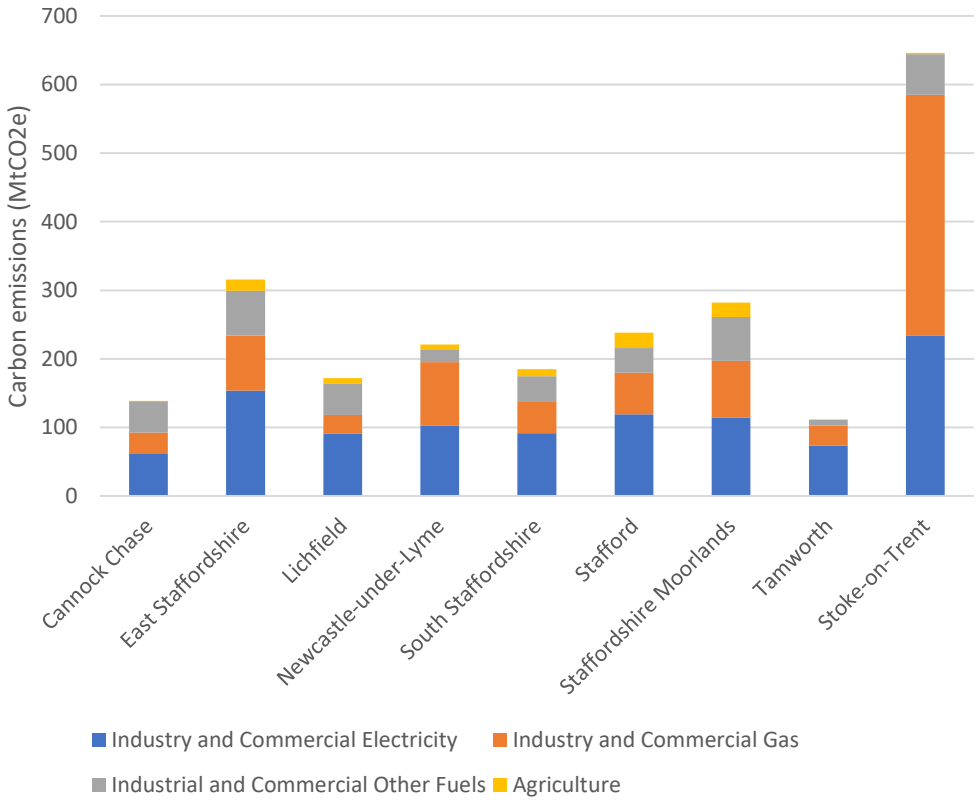

Figure 20: Non-domestic carbon emissions broken down by sector and local authority area 2015 (large industrial installations removed) (24)

Figure 20 shows the data from Figure 19 with the effect of large industrial installations stripped out for ease of comparison of some of the other figures. On this basis it is easier to interpret some of the data discussed above.

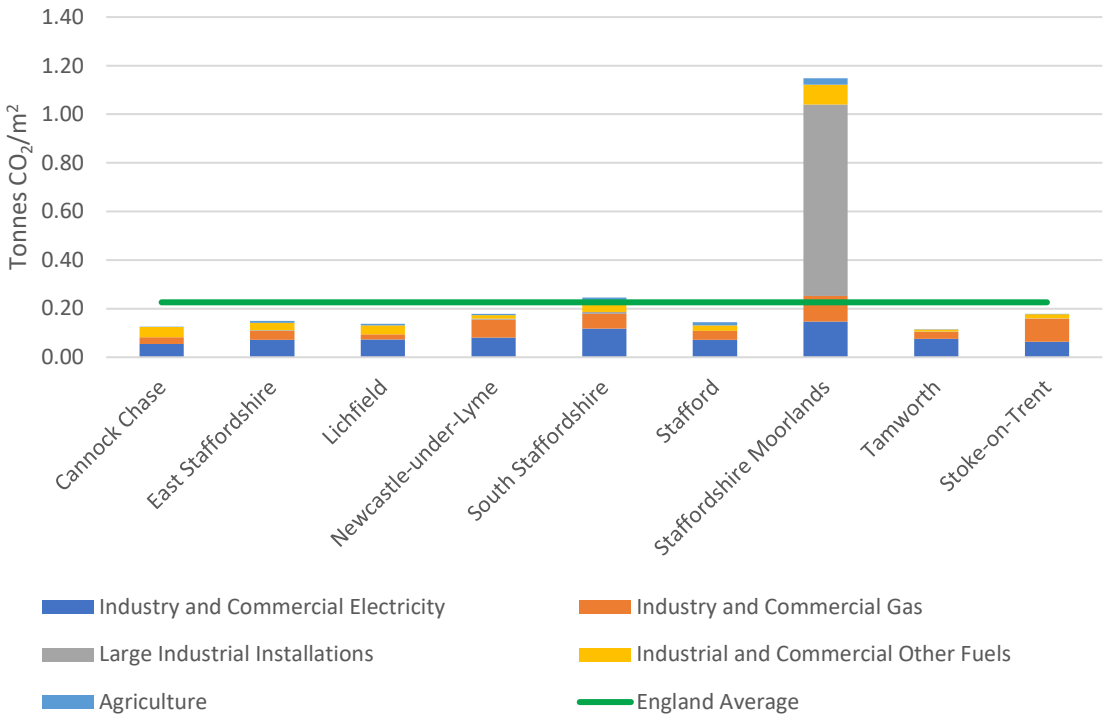

Figure 21: Non-domestic carbon emissions per metre squared of commercial floor area by sector and local authority area (25)

Figure 21 shows the same data as Figure 19 but presented on a normalised basis for ease of comparison. Total emissions have been set against total commercial floor area from Valuation Office Agency (VOA) statistics to produce a carbon emissions figure per metre squared of commercial floor area, which is then compared to the national figure.

From this it can be seen that the majority of the local authority areas have emissions below the national average on this basis, some substantially below. This indicates that in some places where emissions have been relatively higher this is due to a concentration of industry in these places.

Energy efficiency measures could help reduce industrial carbon emissions, and as set out in the Clean Growth Strategy (3), this is an area that the government is looking at.

2.7 Grid capacity review

The ability of the local electricity infrastructure to accept new connections, either to supply electricity in the instance of new commercial or domestic development, or to generate electricity, in the instance of renewable energy installations, is vital for business in Stoke-on-Trent and Staffordshire.

A review of the Long Term Development Statements from Western Power (26) are presented in this section, who are the Distributed Network Operator (DNO) responsible for Staffordshire. The substations of 33kV and 132kV have been colour coded within each region according to how feasible it is to connect additional generation to them (with green meaning feasible, amber not as feasible and red constrained). The black lines in Figure 22 show the local authority boundaries of Staffordshire.

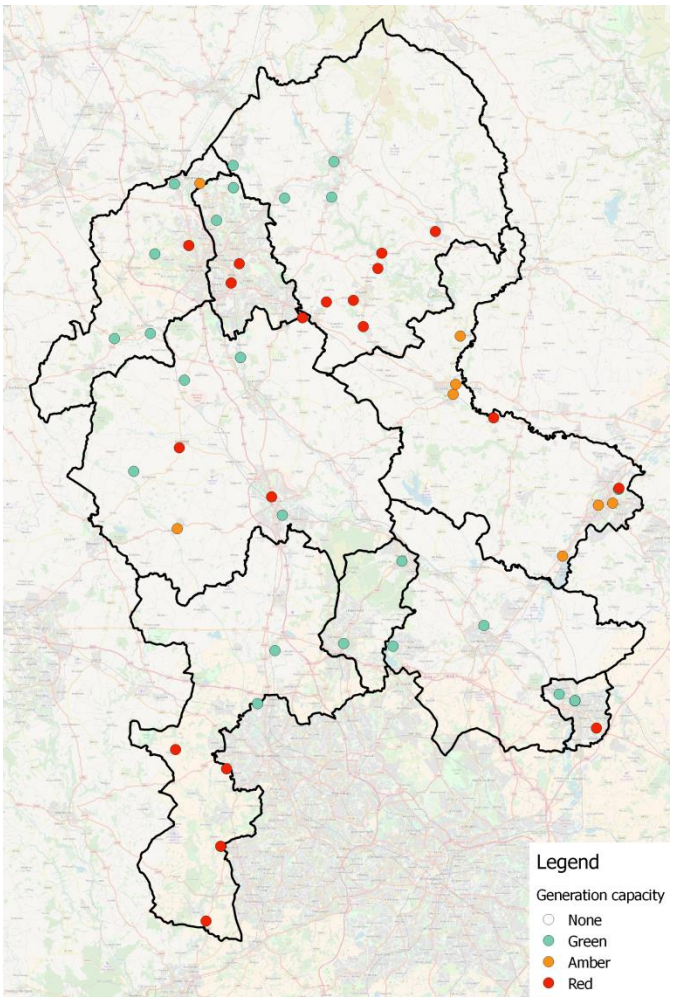

Figure 22: Staffordshire substation grid capacity review – generation headroom (26)

In Figure 22 it can be seen that, although a high proportion of substations can easily connect to the network (green points), almost half of substations within Staffordshire have generation constraints associated with them (amber and red). This means that large electricity generators, for example wind or solar farms, may be unable to secure a connection to the network without paying for significant reinforcement costs. This can impact on the potential future investment and expansion opportunities in the renewables sector across Staffordshire. Under the G83 protocols, very small-scale generation below 4kW, such as a domestic solar installation, does not need to apply to the DNO to connect and only needs to notify. If small-scale installations continue to proliferate this could further decrease the ability of large-scale generation to access an affordable connection.

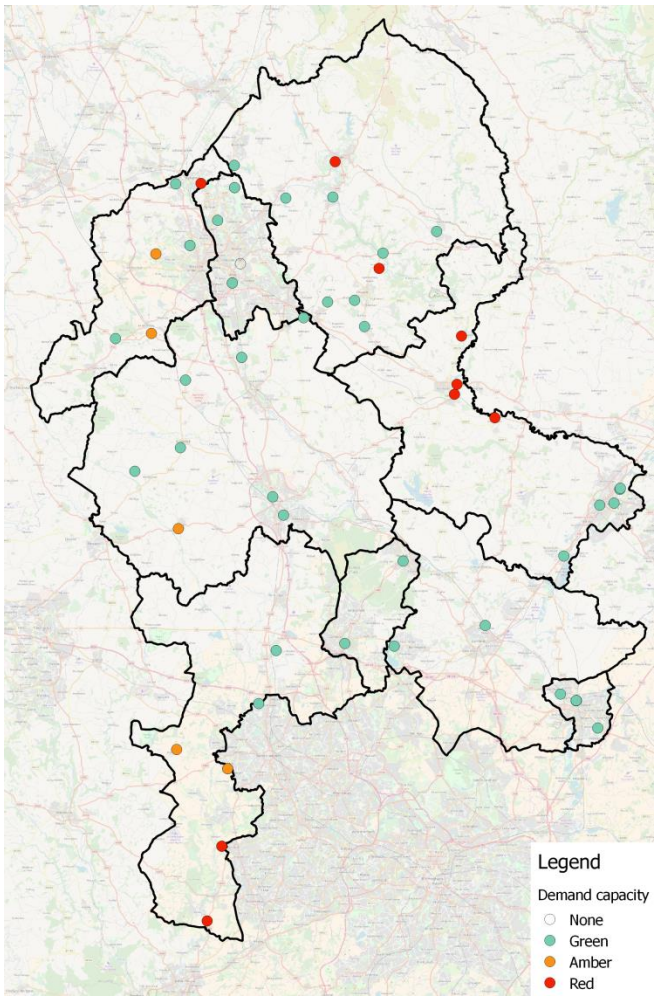

Figure 23: Staffordshire substation grid capacity review –demand headroom (26)

Figure 23 shows headroom by substation for additional demand, with red representing substations that have little available headroom for additional load to be connected. The black lines show the local authority boundaries of Staffordshire. The substations are less constrained when considering adding additional demand rather than generation. The main constraints are identified in the northern part of East Staffordshire and the southern parts of South Staffordshire.

This high-level analysis shows that new *generation* capacity is constrained but new *demand* capacity (i.e. the ability to supply new housing and commercial developments) look currently broadly feasible in the majority of locations in the region and should not cause a barrier to investment.

2.8 Electric vehicle charging

One important area to explore is the availability of electric vehicle charge points, as a lack of availability of these is likely to put consumers off electric vehicle ownership. The geographical spread of these is important, as is the power of the charger. The larger the power output of the chargers the faster cars will charge, and the shorter the waiting time for customers. However, the power of the chargers that it is possible to install is limited by the locally available grid capacity.

Electric vehicle chargepoint data comes from the National Chargepoint Registry (this incorporates all data included in Zap Map and Chargepoint databases). These are all charge points that can be accessed by the public, although some include restrictions. Domestic charge points installed by consumers at home are not included in this map. Electric vehicles can be charged from a domestic plug socket at up to 3kW, while a specially installed domestic charge point can charge the car at up to 7kW.

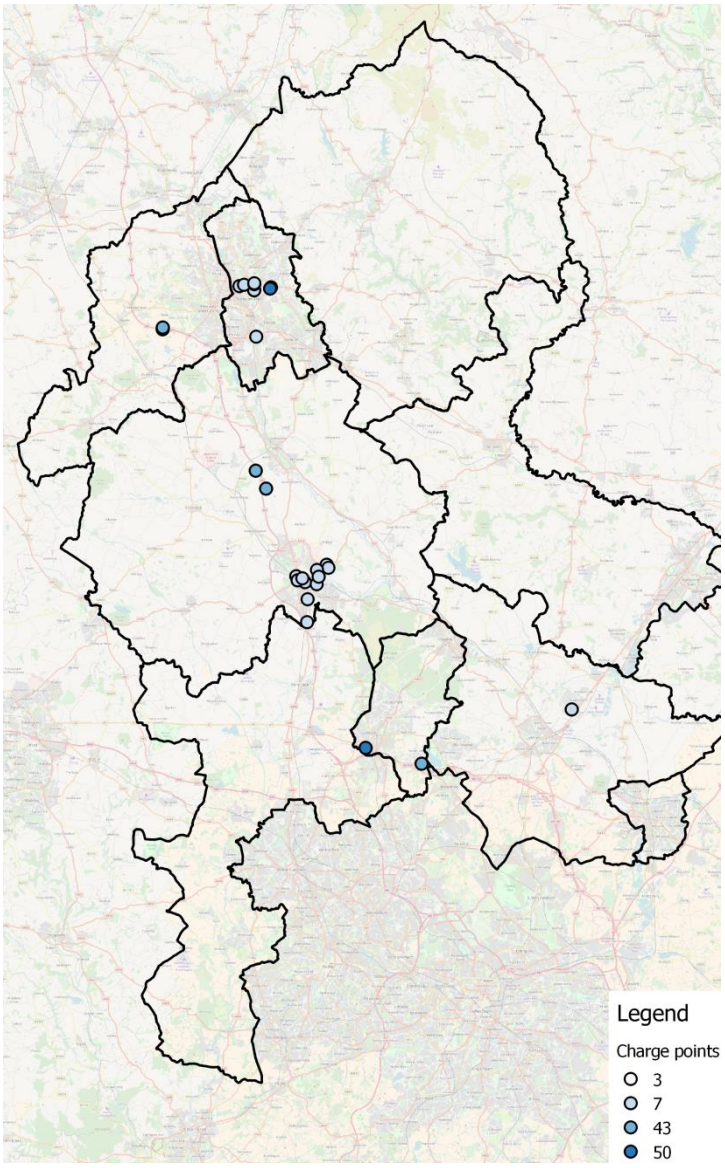

Figure 24: Electric vehicle charge point locations (27)

From Figure 24 it can be seen that there are charge points across Staffordshire, with 39 separate charging locations and 81 charge points. Fast charging locations can be found at service stations up the M6, these are operated by Ecotricity and account for 10 of the charging locations. Other sites include a Nissan, Toyota and Peugeot dealerships (for customers only) and several public car parks within Stoke-on-Trent and Stafford.

At each of the locations on the map there are up to three chargers per site, although not all of them will necessarily be the same capacity as the one denoted by the colour

of the dot on the map, for example at some of the Ecotricity sites two of the three charging points are 50kW while a third is 43kW.

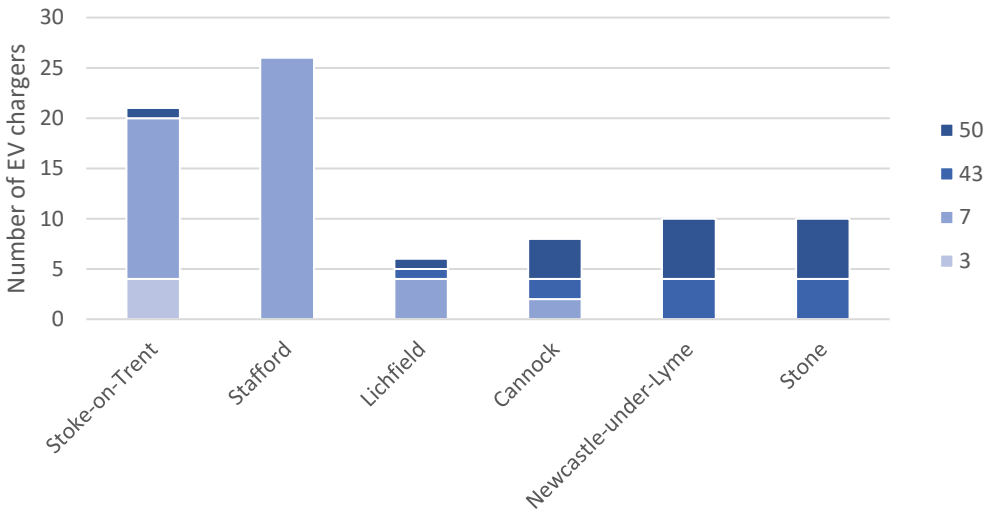

Figure 25: Electric vehicle charge point availability by local authority area (27)

Figure 25 shows the breakdown of charging point numbers by local authority area, this refers to total available charging points not charging locations, the number of charging points is greater than the number of locations as many locations have more than one available charger.

From Figure 24 and Figure 25 it can be seen that current charging provision for electric vehicles is limited, with a particular lack of fast charging provision across much of Staffordshire minimising the attractiveness of electric vehicles to consumers within Stoke-on-Trent and Staffordshire. This is an issue which the electric vehicle industry is currently grappling with in that consumer uptake of EVs will be slower while charging point infrastructure is inadequate. However, private charge point providers have no incentive to invest in charging point provision without the customers there to use them. This situation is slowly changing, particularly with the use of central government or European grant funding to deliver additional charging points.

2.9 Smart grids and flexibility

One potential route to circumvent network capacity restrictions as seen in areas of Staffordshire is the utilisation of smart grid technology and smart energy management. The inclusion of storage with smart controls within some of these opportunity areas may free up additional capacity.

The network operators already make connection offers to potential generators including ‘Alternative Connections’. This is a type of connection that involves a limit on the times that they are allowed to export on to the grid, so generators are able to connect if they won’t be exporting at the times of peak generation. This usually occurs during the day in the summer, when solar PV generation is at its peak.

The addition of flexibility and storage can present an opportunity for generators to circumvent expensive grid reinforcement options that would be involved in their site.

3. The future energy system

Both the national and local energy system is complex and highly interconnected. It is also going through a period of transformation due to emerging disruptive technologies and systems, such as the growth of local renewable energy production. The energy system is transitioning from a situation where there were under one hundred electricity generators on the UK electricity network – almost all large power stations – to the current state where there are thousands of smaller distributed generators such as wind and solar farms connected to the network, and domestic and industrial customers generating their own power.

Regulatory bodies such as OFGEM (Office of Gas and Electricity Markets) and the local DNOs are working hard to react to the changes whilst still safeguarding the integrity of the overall system; this can produce new opportunities but also unexpected barriers to new technology adoption. The rapid cost reduction of a number of technologies such as solar PV, combined with government support for low carbon energy, have led to economic investment and development opportunities, however, the regulatory regime can throw up barriers as new commercial models are appropriate for new technology which may not fit within the existing regulatory framework.

Against this context, it is very challenging to predict future energy consumption. The direction of travel is generally accepted, successive central governments stated commitment to a low carbon future is well documented, but the rate of change to achieve this is unknown. National Grid has therefore developed a number of Future Energy Scenarios (FES) to reflect the different ways the energy system could progress over the next thirty years. These have been considered to assess the likely future development of energy supply and demand within Stoke-on-Trent and Staffordshire.

Figure 26: National Grid Future Energy Scenarios 2017

These Energy Scenarios are laid out considering two axes, the horizontal axis focuses on 'green ambition' and the impetus from both consumers and government to reduce carbon emissions and improve energy efficiency. The vertical axis considers prosperity – with the assumption that in a more prosperous world with higher levels of economic growth there is more money available to be spent on the transition to cleaner, lower carbon forms of energy. Of the four scenarios, only the 'Two Degrees' scenario meets the UK's climate objectives under the Paris Agreement 2016 and is in line with domestic legal obligations under the Climate Change Act (2008).

These scenarios have been considered in relation to Staffordshire to understand in more detail the range of pathways along which energy consumption is likely to develop, focusing primarily on the Steady State and Two Degrees scenarios and the differences between these.

3.1 Pathways for change in Stoke-on-Trent and Staffordshire

Existing work has focused on projecting energy demand and CO_2 levels into the future, including:

1. Electricity demand projections by Western Power Distribution;
2. The Future Energy Scenarios by National Grid;
3. The BEIS greenhouse gas emissions by source;
4. The WSP and Parsons Brickenhoff & DNV GL industrial sector CO_2 emission projections.

However, the projections are done either at a whole UK level or at an Electricity Supply Area (ESA) level. In order to calculate the CO_2 emissions for the local government districts of Stoke-on-Trent and Staffordshire the published datasets were used together with the local government district 2015 baseline values to project into the next 15 years. Full methodology to calculate this is set out in an Appendix.

3.1.1 CO_2 emissions projections by sector

Figure 27 shows the Gone Green scenario projections of CO_2 emissions for the domestic and non-domestic sectors for electricity, gas and other fuel and for large industrial processes, change of land use, transport and agriculture sectors. Across all sectors a substantial decrease in the CO_2 emissions is projected, with a cut of -33% in the total CO_2 emission levels across all sectors between 2015 and 2030 (from 7,636 to 5,116 kTonnes CO_2e).

The most significant decrease is projected in the CO_2 emissions due to the use of other fuel in the domestic sector, with a drop of -86% in 2030 from the 2015 (baseline) values. This projection seems reasonable as it is envisioned that in the Gone Green scenario high carbon intensity fuel used in the domestic sector (such as heating oil) will be extensively replaced by greener low carbon alternatives. The second most significant decrease (-67%) is seen again in the domestic sector due to the use of electricity, followed by the use of electricity in the industry and commercial sector (-57%). The decrease in CO_2 emissions due to the use of gas in the domestic sector (-45%) results from a combination of energy demand reduction due to improvements in the buildings and the decarbonisation of the gas grid with the inclusion of low carbon fuel, such as biomethane. The least significant decrease in CO_2 emissions over the

projected years is due to change of land use, with a small drop of -7% from the baseline values.

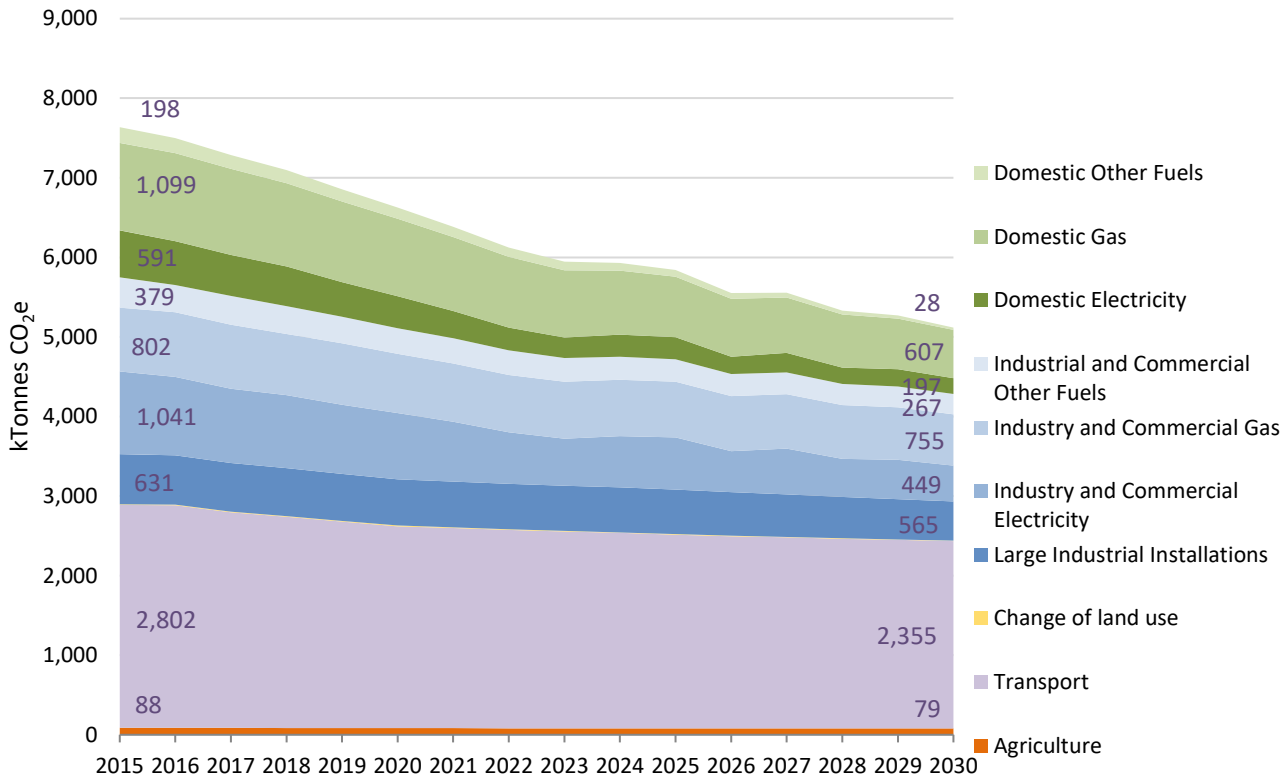

Figure 27: Gone green scenario - CO_2 emissions projections by sector

Figure 28 shows the Steady State scenario projections of CO_2 emissions for the domestic and non-domestic sectors for electricity, gas and other fuel and for large industrial processes, change of land use, transport and agriculture sectors. Across all sectors a small decrease in the CO_2 emissions is projected, with a cut of only -8% in the total CO_2 emission levels across all sectors between 2015 and 2030 (from 7,636 to 7,058kTonnes CO_2e). As this is the Steady State scenario, it is assumed that current practice will carry on in future years, with minimal additional integration of low carbon technologies and continuous use of high carbon intensity fuel. The change in the different sectors between the baseline year 2015 and 2030 ranges from -1% in CO_2 emissions due to electricity (domestic and non-domestic) to -29% in the case of industrial and commercial use of other fuel. The latter, a relatively significant decrease in emissions can be attributed to the uptake of lower carbon alternatives instead of the traditional high carbon intensity fuel in current practice, which is also maintained in the future years.

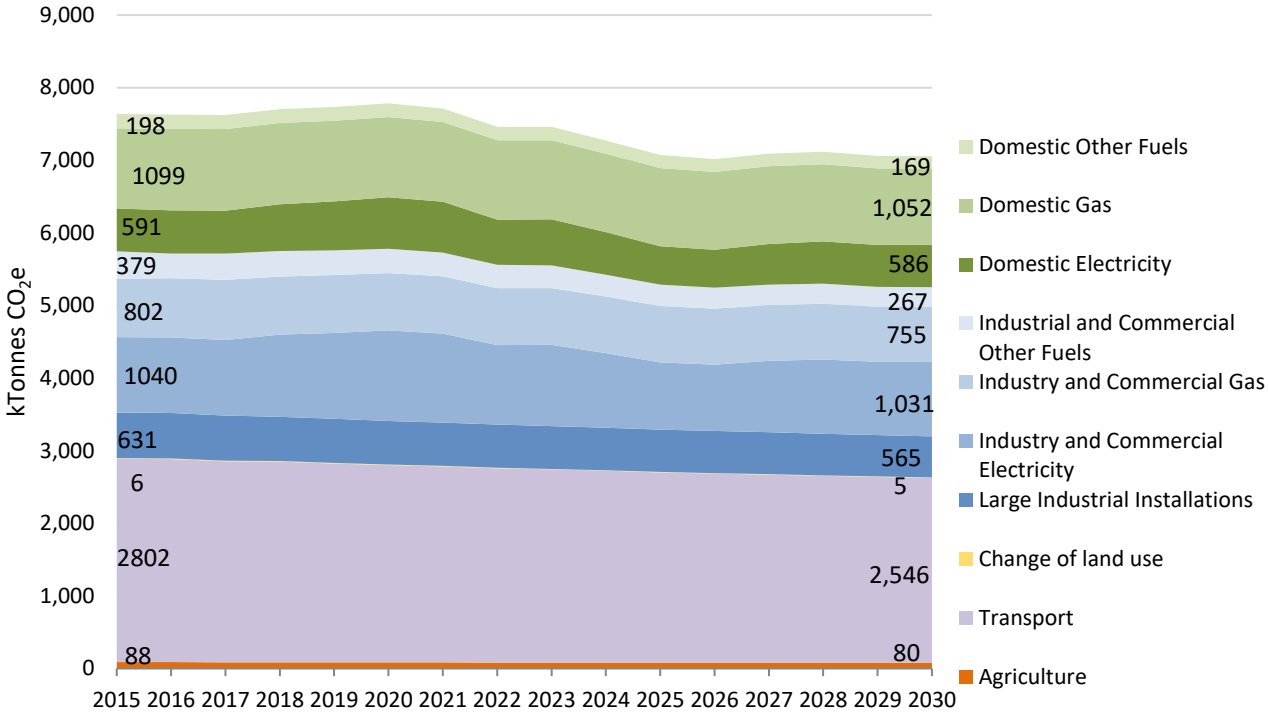

Figure 28: Steady state scenario - CO_2 emissions projections by sector

3.1.2 CO_2 emissions projections by district

Figure 29 shows the Gone Green scenario projections of CO_2 emissions for each of the local government districts in the Stoke-on-Trent and Staffordshire area. Similarly, to Figure 27, across all sectors a substantial decrease in the CO_2 emissions is projected, with a cut of -33% in the total CO_2 emission levels across all sectors between 2015 and 2030 (from 7,636 to 5,116kTonnes CO_2e). The projected decrease in CO_2 emissions across the districts ranges from -27% in South Staffordshire to -46% in Tamworth. Emissions from the large industrial facility in Staffordshire Moorlands have been modelled separately based on BEIS projections for this sector, leading to an anticipated 22% reduction in emissions from the large industrial installation, and an overall 30% reduction in emissions for the district under the Gone Green scenario.

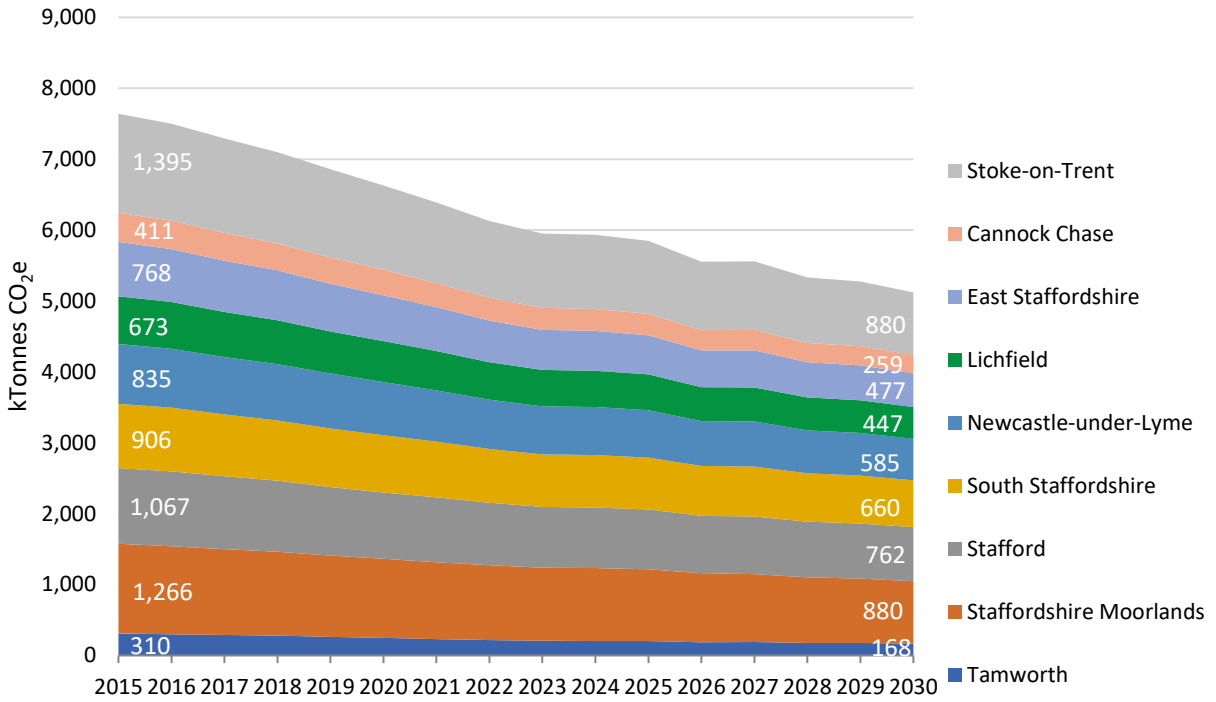

Figure 29: Gone green scenario - CO_2 emissions projections by county

Figure 30 and Figure 31 show the per sector breakdown of CO_2 emissions for the two districts with the minimum and maximum change identified above (South Staffordshire and Tamworth respectively) for the years 2015 and 2030. These graphs aim to provide some insight into the change over time of the composition of the CO_2 emissions in different districts. For better visualisation of the carbon reduction achieved in the Gone Green scenario, the pie chart sizes are proportionate to the total district CO_2 emissions for the year.

In Tamworth, a substantial increase can be seen in the transport sector, accounting for almost a quarter of the total district CO_2 emissions in 2015 and increasing by more than 50% in 2030. This is primarily due to the projected slower pace of change for emissions in the transport sector compared to other sectors. This is an indication that further focus on lowering carbon emissions in the transport sector would be advantageous for Tamworth. A significant decrease in the proportion of total CO_2 emissions due to electricity use can be seen in both the domestic and industrial and commercial sectors. This decrease shows that the policies and objectives set against electricity are more effective when compared to other sectors.

In South Staffordshire, the transport sector accounts for the majority of the district's CO_2 emissions and is projected to account for a higher percentage in 2030. The major contribution from transport is primarily due to the contribution to emissions from national through traffic on the M6 and M54. Similarly, to Tamworth, focusing on further actions for reducing the CO_2 emissions in transport would enable a substantial reduction in the total district emissions, however, for South Staffordshire this would require a more coordinated approach between national and local government given the contribution made from motorway traffic.

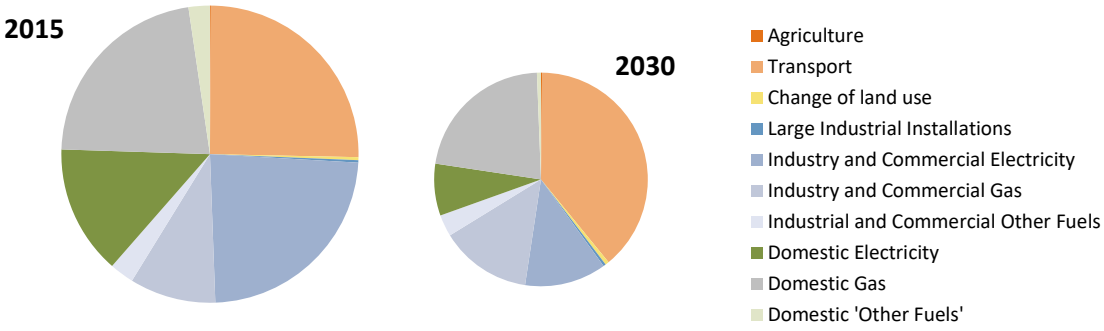

Figure 30: Gone green scenario - CO_2 emissions projections by sector for 2015 (left) and 2030 (right) in Tamworth

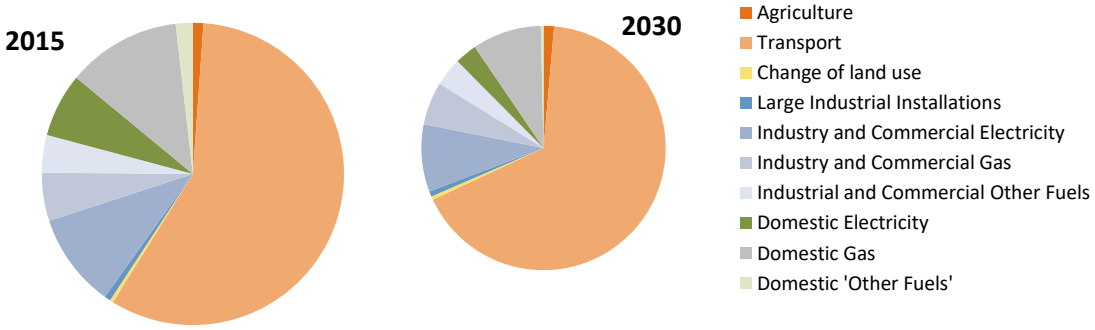

Figure 31: Gone green scenario - CO_2 emissions projections by sector for 2015 (left) and 2030 (right) in South Staffordshire

Figure 32 shows the per sector breakdown of CO_2 emissions for Stoke-on-Trent for the years 2015 and 2030 for the Gone Green scenario. An increase in the proportion of CO_2 emissions due to transport and industrial and commercial gas use and a decrease in the proportion of emissions due to electricity use are projected.

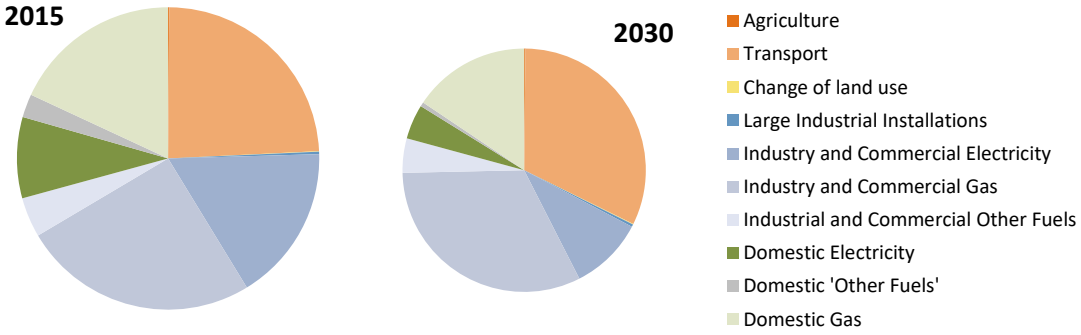

Figure 32: Gone green scenario - CO_2 emissions projections by sector for 2015 (left) and 2030 (right) in Stoke-on-Trent

Figure 33 shows the Steady State scenario projections of CO_2 emissions for each of the local government districts in the Stoke-on-Trent and Staffordshire area. Similarly, to Figure 28, across all sectors a small decrease in the CO_2 emissions is projected, with a cut of -8% in the total CO_2 emission levels across all sectors between 2015 and 2030 (from 7,636 to 7,058kTonnes CO_2e). The projected decrease in CO_2 emissions across the districts ranges from -6% in Tamworth to -9% in Staffordshire Moorlands.

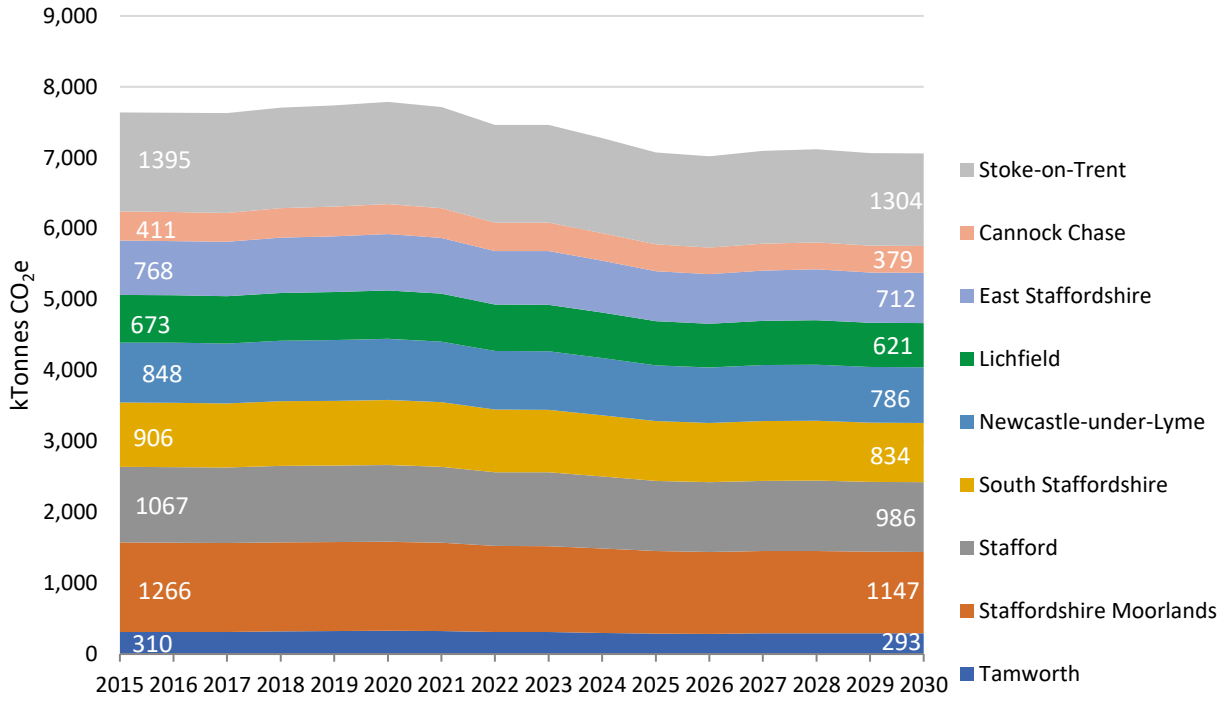

Figure 33: Steady state scenario - CO_2 emissions projections by county

3.1.3 Targets

In this section the projections in CO_2 emissions are compared against the targets as set out by the UK government to reduce the CO_2 emissions by at least 80% of 1990 levels by 2050 (28) and by 57% of 1990 levels by 2032 (29). Since the earliest available data for each of local government districts date back to 2005, the 1990 CO_2 emission levels were estimated based on the change in CO_2 levels between years 2005 to 2015 for which official data are available (30). In addition, as shown in previous sections, the CO_2 emission levels have been projected for years 2020, 2025 and 2030.

Figure 34 shows the Gone Green scenario projections of CO_2 emissions for each of the local government districts in the Stoke-on-Trent and Staffordshire area against the 2032 and 2050 targets. The projected 2030 CO_2 emission levels would come close to achieving the 2032 target (solid red line) and would achieve it by 2032. This is an indication that by focusing on green and low carbon technologies, Stoke-on-Trent and Staffordshire should be able to achieve significant cuts and contribute to the greenhouse gas reduction for the UK as a whole. As the projections stop at 2030, based on available data, direct comparison with 2050 targets is not feasible. However, the trajectory of the emissions cut based on the 5-year steps provides some indication that the 2050 aim could be a tangible target for the Stoke-on-Trent and Staffordshire area, assuming that green ambition is maintained.

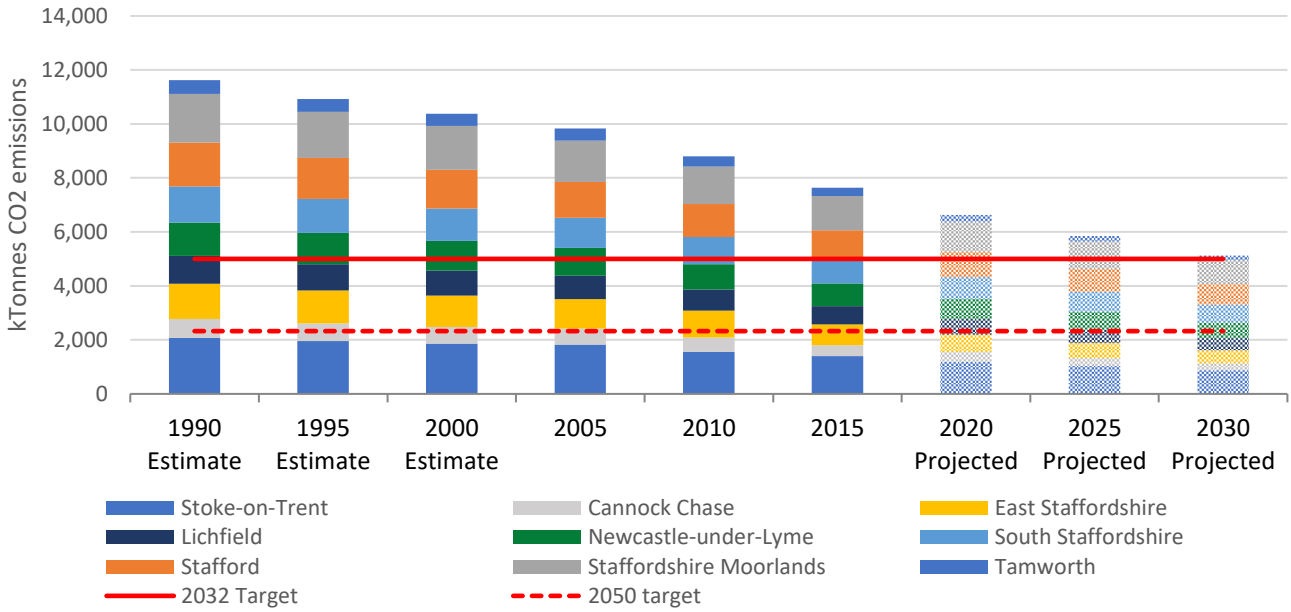

Figure 34: Gone Green scenario - CO_2 emissions projections against targets

Figure 35 shows the Steady State scenario projections of CO_2 emissions for each of the local government districts in the Stoke-on-Trent and Staffordshire area against the 2032 and 2050 targets. In this scenario, the projected 2030 CO_2 emission levels fail to hit the 2032 target (solid red line). As expected, the projections in this scenario fail to reach the targets for 2032. This indicates that current practices are unlikely to ensure sufficient emissions cuts for Stoke-on-Trent and Staffordshire. To be able to contribute towards the national emissions cut targets more focus on green growth will be required. A 57% reduction in emissions by 2030 requires meeting the trajectory under this Gone Green scenario, which involves a reduction in emissions of 2,640 kTonnes CO_2 between 2015 and 2030, averaging a 176 tonnes reduction annually.

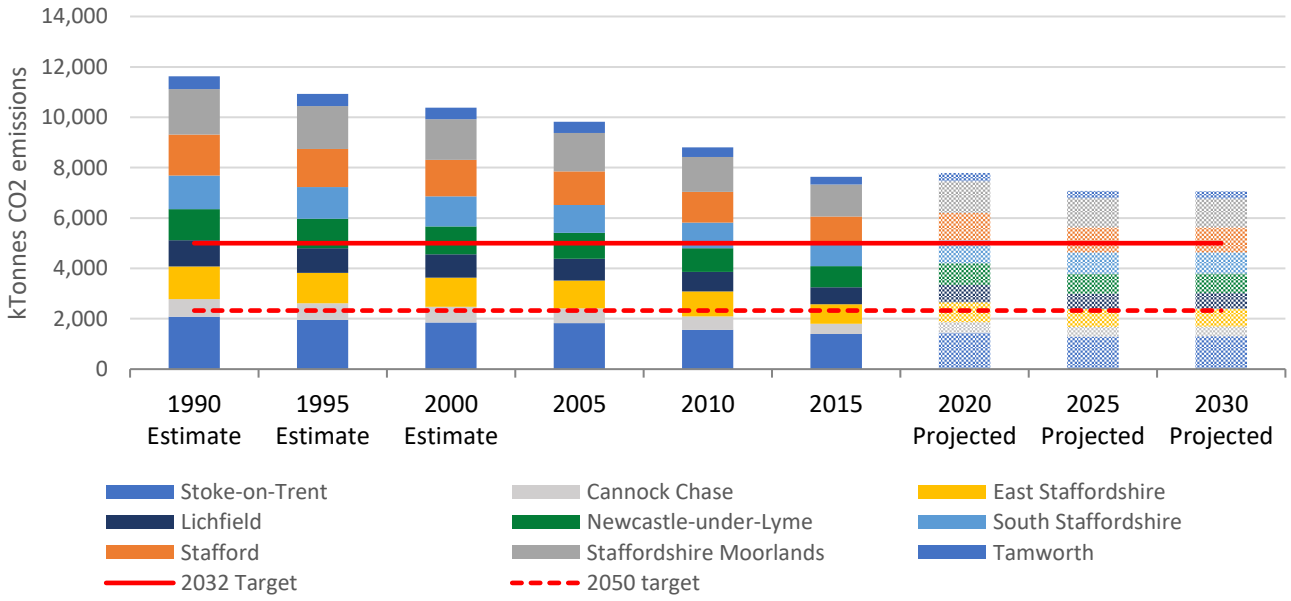

Figure 35: Steady state scenario - CO_2 emissions projections against targets

3.2 Stakeholder engagement

In order to ensure that the energy strategy reflected local issues and was a collaborative effort, two stakeholder engagement workshops were held, one in Stoke-on-Trent and the other in Lichfield to ensure stakeholders from across both northern and southern Staffordshire could be represented. The strategy work was also presented to the LEP Board at an early stage to encourage input.

The workshops had a combined total of over 50 attendees from a range of public, private and third sector organisations. These included representation from most of the district councils, Stoke-on-Trent City Council, Staffordshire County Council and the Local Enterprise Partnership. Also represented were local universities, the NHS, and local electricity network operators Western Power Distribution. A full summary of organisations engaged with and attending the workshops is set out in Appendix II.

The workshops were promoted by Staffordshire Business Environment Network (sben) which encouraged significant uptake from local private sector companies who are involved in the energy sector or are major energy users. These attendees represented around 40% of the total attendee list and demonstrated the strong local interest in energy within Stoke-on-Trent and Staffordshire.

The workshops helped input to the different theme areas for the strengths, weaknesses, opportunities and threats for Stoke-on-Trent and Staffordshire as a result of external changes in the energy system, as well as highlighting potential project opportunities.

3.3 Strengths, Weaknesses, Opportunities and Threats

The integration of the policy review with the development of the evidence base has revealed a number of results for Staffordshire, which have been categorised into strengths, weaknesses, opportunities and threats (SWOT). These have been considered in the context of the future energy scenarios discussed in the previous section, focussing primarily on the Steady State and Two Degrees scenarios. These have been informed through engagement with the Energy Strategy steering group and the stakeholder workshops including a range of attendees from public, private and third sectors.

3.3.1 Strengths

Staffordshire has substantial local renewable energy resources including wind, solar and forms of biomass. There have been installations of a wide range of renewable energy technologies that have delivered on their potential, demonstrating their applicability to the local area.

Existing networks such as the Staffordshire Business Environment Network (sben) demonstrate local business engagement with the low carbon sector and interest in energy issues. These networks have facilitated the delivery of low carbon and renewable technology interventions, improved business energy efficiency and reduced carbon emissions. Staffordshire is home to many large businesses who are significant energy users as well as those involved in energy as part of their core business such as GE. This means that the county is well placed to benefit from developments and innovation in the energy sector that can boost economic growth.

There is existing strength in the transport sector, with local organisations involved in transport innovation focusing on Smart Transport and the potential development of live labs for the deployment of smart materials, smart communications and smart energy solutions.

Stoke-on-Trent and Staffordshire are home to high levels of innovation in the energy sector, often involving coordination between public, private and research institutions. These include landmark trials such as the SEND Project, Hydeploy and work in the smart transport sector, some of these are highlighted below.

Institute for Sustainable Futures

The Institute for Sustainable Futures at Keele University contributes to research, education and training that has a positive impact on the long-term sustainability of our societies, environments and ecosystems across local to global scales. The Institute co-ordinates its work around six challenges. These challenges have been chosen to both highlight existing research expertise in sustainability, and to help frame existing research strengths around the applied sustainability challenges that our society and environment face.

Each challenge is inherently interdisciplinary and is being approached at Keele already from several different perspectives, hence providing areas around which new interdisciplinary teams may coalesce to create further collaborative projects. There is also inevitably overlap between each theme.

Finding ways to fuel our society while reducing carbon emissions and avoiding other negative environmental and social impacts, while providing access to the energy resources needed for healthy lives and economy locally and globally, is imperative. We are entering a paradigm shift into new ways of generating, regulating, governing and using energy, covering electricity, heat, and transport.

Hydeploy

Keele University is hosting the HyDeploy project. This is an energy trial supported by innovation funding to establish the potential for blending hydrogen, up to 20%, into the normal gas supply to reduce carbon dioxide (CO_2) emissions. Over 80% of UK homes are heated by gas, with heat accounting for around one-third of UK CO_2 emissions. Progress has been made to decarbonise electricity, but very little on decarbonising heat.

HyDeploy is being hosted at Keele University in Staffordshire and aims to run a year-long live trial of blended gas on part of the Keele gas network in Phase 3 in 2019. It could be the first project in the UK to inject hydrogen into a natural gas network. This will determine the level of hydrogen which could be used by gas consumers safely and with no changes to their behaviour or existing domestic appliances.

Although the gas network already delivers some green gases, like biomethane, further research is needed to understand the potential of other zero or low carbon gases to meet heat demand. HyDeploy is one of a number of research projects investigating the potential of hydrogen to help meet this challenge. Many experts see hydrogen as an adaptable alternative to fossil fuels. This is because when hydrogen is burned it doesn't produce CO_2, just water and heat. This means it could be a way to deliver low carbon energy.

Smart Energy Network Demonstrator (SEND)
Based on Keele University's privately owned and operated utility networks (power, gas, heat, telecoms, water and waste-water), the University is developing Europe's first 'at scale' multi-energy vector Smart Energy Network Demonstrator – a living laboratory where new low-carbon technologies and interventions can be researched, developed and tested in a real-world environment.

The project aims to demonstrate the application of a multi-vector Smart Energy Grid and how it can be used to efficiently manage and distribute energy generated from a range of supply solutions and technologies, thus stimulating the concept of "Local Smart Energy Grids" as a transferable solution which can be implemented in other areas. This is a landmark project that could bring significant benefits to Staffordshire as solutions are tested and deployed.

3.3.2 Weaknesses

It is clear that in order to meet challenging decarbonisation targets retrofit of existing housing stock will be necessary. Current central government policy support for energy efficiency improvement through the Energy Company Obligation (ECO) does not adequately meet the needs of many areas of Stoke-on-Trent and Staffordshire, where rural buildings, particularly those built before 1919 with solid wall construction are unable to be supported with current policy constraints.

There are a number of properties in the domestic sector still using coal or oil for heating which is both a high carbon fuel and can be expensive. There is a need for appropriate solutions for these properties delivering low-cost energy without substantial carbon emissions. Another local issue is high levels of fuel poverty, with this representing a real challenge in many areas, leading to residents living in cold homes which is linked to poor health outcomes.

The electricity grid nationally was not designed as a 'smart' network in either direction, either for the supply of power or receiving electricity generated from new sources, this has caused issues in many areas where substantial amounts of generation have been connected, for example in East Staffordshire where there has been significant solar deployment. The existing regulatory framework that guides network investment can put barriers in place to deploying further renewable energy generation.

Within the transport sector, electric vehicle chargepoints are not widely distributed outside of motorway through routes and the major urban areas of Stoke-on-Trent and Stafford, which can put barriers in place to the take-up of electric vehicles.

3.3.3 Opportunities

Key opportunities include the possibility of public community energy schemes, district heat networks and joining sectors creating mutual benefits for all. The integration of battery storage with residential solar provides an opportunity to increase local take-up of renewables and increase local consumption of generation. Existing strengths in the heat network sector, with the development of Stoke-on-Trent' city-wide network, mean that there is an opportunity to disseminate this knowledge more widely.

Stoke-on-Trent College will be the UK's first District Heat Skills Academy; it has been identified as a key provider of the training that will be required over the coming

decades to meet the skills needs of such a large infrastructure project and will become the designated Skills Training Academy for the project. The College is already working in collaboration with Stoke-on-Trent City Council and other key participants in this project, and upskilling the local workforce will be a key opportunity to maximise benefits from this project.

Linking the residential energy and health agendas together represents an opportunity to improve outcomes. There have been existing examples of this in Stoke-on-Trent with the better care scheme and the Beat the Cold Initiative.

It will be crucial for Stoke-on-Trent and Staffordshire to build on the development of local innovation projects and leverage these to provide further benefits. Where trialled solutions prove appropriate these could be rolled out both locally but also nationally and internationally offering substantial potential for growth in the low carbon sector.

The development of new rail connections through HS2 within Staffordshire is a potential opportunity. Phase 2a of the railway will run from the West Midlands to Crewe, passing through parts of Staffordshire and Cheshire. The new railway will be electrically powered, with electricity supplied directly from the National Grid transmission network either from the Rugeley Power Station site or from transmission lines near Newborough, East Staffordshire. This will not necessarily affect grid constraints at the lower distribution network operator level, however as part of this reinforcement work there may be opportunities to develop renewable energy to supply a portion of the increased electricity demands.

The local Distribution Network Operator is developing a market for procuring flexibility in the electricity network[4] in order to allow them to alleviate constraints in the network without resorting to traditional reinforcement. One of the pilot sites is within the Rugeley area, this represents an opportunity for local businesses to secure additional revenue streams in exchange for committing to vary their electricity consumption within pre-determined periods.

Development of car clubs at key sites could be an opportunity in the transport sector to increase the use of electric vehicles or other alternative fuelled vehicles while reducing carbon emissions from transport. These could be sited at public sector or public locations such as hospitals.

In the public sector, available funding such as Salix represents an opportunity to support energy efficiency improvements in the public sector estate and demonstrate best practice in energy management and energy efficiency. The public sector has a leadership role in this respect and can demonstrate the viability of energy efficiency measures.

Renewable energy generation resources within Stoke-on-Trent and Staffordshire are substantial, and the development of wind and solar electricity generation is a major opportunity to reduce local carbon emissions from the electricity sector. Energy from Waste also represents a major opportunity to increase local electricity generation and utilise local waste streams. Existing development in this area at Four Ashes, South Staffordshire, funded through the City Deal, highlights the work already going on in this area.

[4] https://www.flexiblepower.co.uk/Can-I-take-part.aspx

There is an opportunity to develop not-for-profit community energy companies like the Bristol Energy model that can buy in bulk and take a lead on energy efficiency and smart solutions across a geographical area, ensuring these are locally focused for Stoke-on-Trent and Staffordshire in particular.

3.3.4 Threats

If not properly addressed electricity grid constraints could present a barrier to future growth within Stoke-on-Trent and Staffordshire. Issues have been identified that present an existing barrier to growth and a barrier to the deployment of renewable generation in particular. This means it may be challenging to meet the county's climate goals.

A lack of electric vehicle (EV) charging infrastructure could make Stoke-on-Trent and Staffordshire less attractive as a place to live, work and invest. Of particular interest is the provision of charge points in rural areas, as these areas are not currently well served, and may not be met by commercial providers until a critical mass of electric vehicles is reached. Home EV charging may also be limited by constraints on the electricity network, with solutions needed for residents utilising on-street parking.

4. Flagship projects

Stoke-on-Trent and Staffordshire have forged ahead with developing a number of innovative flagship projects to move forward in the energy sector.

4.1 Smart Energy Network Demonstrator

Keele University in Staffordshire has an estate with a mixed business, academic and residential community of over 10,000 people, with over 2.2 million ft^2 of built environment (academic, business, commercial, retail, banking, leisure and residential) and circa 90km of private utilities: heat, gas and electricity networks. There is an ongoing project to enhance this Energy Grid to deliver a Smart Energy Network Demonstrator (SEND). (31)

The SEND, utilising a mixed energy supply and demand environment, will provide a facility for trialling and evaluation of new and evolving energy technologies. This will also provide the opportunity to assess their efficiencies, both individually and combined, in terms of energy reduction, cost, and CO_2 emissions, through real-life data analysis and scenario modelling:

- Energy Supply and Demand Scenario Planning/Modelling - demand response.
- Energy Generation Performance Monitoring.
- Energy Source, Capacity, Storage, Prioritisation and Evaluation.
- Energy Mix Design and Evaluation.

Keele University has provided access to its own technical energy and estates managers, and academic research team and engaged a range of people including estate managers, innovators, manufacturers, installers, planners, developers and energy suppliers to:

- Demonstrate the application of a multi-vector Smart Energy Grid and how it can be used to efficiently manage and distribute energy generated from a range of supply solutions and technologies, thus stimulating the concept of "Local Smart Energy Grids" as a transferable solution which can be implemented in other areas.
- Use the Facility to test and evaluate the performance of new, evolving and developing energy technologies, by connecting them to the network and assessing performance in both general and specific energy demand scenarios.
  - Plug and Play Research and evaluation of new and evolving technologies
  - Pre-implementation design verification
  - Evaluating end user use and behaviours.
- Use the Facility to test, evaluate and adapt energy solutions (individual and/or mixed) against varied demand scenarios to establish the most efficient energy solution in terms of: energy reduction, CO_2 reduction and cost reduction; and then implement the solution in a real-world location/ development.

Keele University are also bringing forward significant proposals for multi-vector renewables which will add significant value to SEND and produce significant carbon savings. These proposals are currently (December 2018) at the procurement and planning application stage.

This is a landmark innovation project that could lead to investment within the sector in Staffordshire and opportunities to build on the project to develop solutions that could be applicable in other areas of the county and internationally.

4.2 Staffordshire Business Environment Network (sben)

Staffordshire Business & Environment Network (sben) was launched in 1992, providing a membership organisation, entitling members to subsidised and free initiatives from within the sben portfolio.

sben is managed by its Organisers Group made up of members of the network and lead by a Chairperson and Management committee and is supported by Staffordshire County. **sben** offers business support through the Low Carbon Business Evolution Programme (LCBEP) which helps businesses across Stoke-on-Trent and Staffordshire reduce their carbon footprint and increase energy efficiency, supported by European funding.

Eligible businesses (SMEs) can receive a free specialist low carbon review around either energy efficiency or Environmental Management System (EMS) Gap Analysis. It also offers a Low Carbon Enterprise Grant of between £2,000 – £20,000 for up to 60% of eligible costs. Grants are available for the installation of energy efficient measures in buildings, processes, products and services which will reduce carbon, as well as for further low carbon specialist advice e.g. environmental management systems, energy management systems, carbon footprinting and renewable energy feasibility. The scheme has engaged with hundreds of businesses saving significant amounts of carbon.

One business was offered a free LCBEP energy review that looked at all aspects of the business; existing EMS, vehicles and transportation, buildings, insulation and glazing, heating, cooling and lighting.

Consultants recommended existing lighting be replaced with more energy efficient LED lighting and controls. This would potentially deliver an annual energy saving of 20,948 kWh, a cost saving of £2,135 and carbon emission savings of 9.8 tCO2e. The business was offered a grant of £8,700 to support the installations and resulted in a project payback of 2.7 years.

4.3 Stoke-on-Trent City Heat Network

The Stoke-on-Trent District Heat Network is the UK's **first** ever low-carbon heat network system on this scale and will help heat thousands of homes and businesses in the city.

The planned heat source is geothermal and will tap into water that is almost 3km underground but has a high temperature to produce up to 45 GWh a year, save 10,000 tonnes of CO_2 a year, and lower energy costs by up to 10 per cent. The geothermal plant will transfer this heat to a closed loop of district network pipes which then provide heating across areas of the city. The city council will be an initial customer,

with a range of other public and private sector customers subsequently due to come on board. It is expected that over 18km of piping will have been laid by 2021 in the city.

£500 Million investment is being leveraged through this project in the next 6-7 years in district heating, smart energy systems, and further energy generation opportunities.

This will lead ultimately to affordable and clean energy for the city, benefiting the local economy in many ways – employment, new housing, increased local skills and greater incoming investment.

4.4 Community solar at Royal Stoke University Hospital

Royal Stoke University Hospital led a community energy investment scheme into solar-generated energy. The scheme raised £335,600 investment from a local share offer, with investment available on a sliding scale from £100 offering a 4.5% return on investment over 20 years. The project aimed to facilitate both energy and community resilience by assisting local and vulnerable patients who are suffering from fuel poverty whilst increasing the sustainability of UHNM's (University Hospitals of North Midlands NHS Trust) estates.

Beat the Cold is a charity based in Stoke-on-Trent set up to combat the health and wellbeing effects of fuel poverty faced by vulnerable households. In partnership with University Hospitals of North Midlands NHS Trust (UHNM), they sought to assist vulnerable patients suffering from conditions which are exacerbated by the cold, following their discharge from hospital, at the same time, reducing cost and the carbon footprint of NHS operations.

'Saving lives with solar' is a community energy project, the first of its kind for the NHS. As part of the scheme, Solar Photovoltaic (PV) panels have been installed and commissioned on hospital roofs. The electricity generated by the panels will receive a guaranteed 20-year 'Feed in Tariff' (FiT) income from the Government, which will accumulate into Southern Staffordshire Community Energy's (SSCE) community fund and then be diverted to 'Beat the Cold'.

The scheme saves over £600,000 in electricity purchase costs over the twenty-year project life and offers the hospital added resilience against grid price increases, while also funding a £300,000 community fund and reducing carbon emissions by nearly 4,000 tonnes over the project lifetime.

4.5 Summary

There are a number of really innovative energy related projects underway in Stoke-on-Trent and Staffordshire. In some areas these can be fragmented, and a joined-up vision of the future energy system within the LEP area is needed to bring these together and set the overall context. There are clearly major opportunities to continue with and build on these existing projects, and these can be complemented by the development of further innovative energy projects in future.

5. Energy roadmap and action plan

Stoke-on-Trent and Staffordshire are at the forefront of efforts to increase renewable energy supply and increase decentralised energy provision. This was demonstrated with the *Powerhouse Central* Stoke-on-Trent and Staffordshire City Deal, agreed in 2014. This provided almost £20 million of capital funding to help deliver the UK's first at-scale low-carbon heat network within Stoke-on-Trent. This investment in energy infrastructure in the city has also created additional opportunities to accelerate local energy infrastructure improvements and use energy innovation and generation to power economic growth, address economic and health inequality and transform the city's labour market in the longer term.

The overall vision for Staffordshire within the Local Enterprise Partnership's Strategic Economic Plan is to achieve **an economy growth of 50% and generate 10,000 jobs in the next 10 years**. Energy has been identified as a priority area here due to the physical, locational and research assets, particularly in the power generation sector. The strong presence of energy generation companies highlights the possibility to expand the sector even further.

5.1 Energy Vision

The changes in the energy system within Stoke-on-Trent and Staffordshire out to 2030 are likely to be significant and are set in the context of a period of rapid national change in the energy sector driven by shifts towards greater use of renewable energy, increased use of electric vehicles and growth in the low carbon sector. The vision statement sets out the situation Stoke-on-Trent and Staffordshire LEP are moving towards and aim to reach by 2030.

2030 Vision Statement

Stoke-on-Trent and Staffordshire is a leader in smart energy and the development of smart cities. The county is a leader in community energy generation and has a secure, distributed energy generation and supply system based on low carbon and renewable participation backed by strong digital infrastructure, delivering reliable and low-cost energy to businesses and communities

A number of goals have been developed in order to achieve the vision as outlined;

Smart	Integrate the UK's first fully integrated smart city network, building on expertise from SEND
Heat	Build on the success of the Stoke-on-Trent city centre heat network and further district heat in Staffordshire
≤10%	Fuel poverty reduced below 10% by 2030
Generate	Increase low carbon and renewable energy generation proportion of Staffordshire energy consumption
57%	Carbon emissions reduced in line with UK targets, a 57% reduction on 1990 levels

Five goals have been put in place for the strategy, to build on areas of strength for Stoke-on-Trent and Staffordshire and set stretching targets for improvement. This strategy builds on the LEP's Strategic Economic Plan ambitions for a low carbon economy with sustainable energy infrastructure. Carbon emissions reduction is an overall goal, with emissions reduction needing to follow the modelled pathway in Section 3 to meet these demanding goals.

To achieve the goals of the strategy, four separate sectors have been considered, which each have their own challenges and opportunities:

- Residential
- Commercial and Industrial
- Transport
- Public sector

5.1.1 Residential

As set out in the evidence base, the residential sector accounts for a significant proportion of energy demand within Stoke-on-Trent and Staffordshire, and there are a number of challenges within the sector that will become more apparent as our national energy system changes. Key priority areas in the residential sector are:

- Energy efficiency
- Addressing fuel poverty
- New build energy consumption
- Increased renewable energy generation

Energy efficiency

Domestic Energy Performance Certificate information was analysed within the evidence base and it is clear that there are many areas with poor energy efficiency. On average only 31.4% of domestic properties have an EPC rating of C or better and 26% of properties rated E or below, indicating particularly poor energy efficiency and high energy costs. The areas with the highest proportion of properties with poor energy efficiency are East Staffordshire and Staffordshire Moorlands, which both have over 30% of properties rated E or below and over 9% of properties rated F or G. These figures indicate that energy efficiency is a priority for the county. Achieving the challenging decarbonisation targets in the national pathway towards the 2032 and 2050 carbon targets requires substantial reductions in carbon emissions from domestic housing stock, and energy efficiency measures will play a crucial role in this.

The Energy Company Obligation (ECO) is the main driver behind energy efficiency improvements, such as cavity wall insulation, solid wall insulation, or new heating system installations. However, it has limits to both the level of funding and the interventions available to individual properties and households. To achieve the ambitions set out there will need to be a review of the support available through ECO, both in terms of measures available and the level of funding provided, otherwise many measures will not be "cost-effective" or "affordable" for many households. In particular, it can be challenging to deliver energy efficiency measures for pre-1919 properties with solid wall construction, as external wall insulation has particularly high capital costs.

The latest phase of ECO enables greater local authority input into energy measures through *flexible eligibility*, where the Council can set criteria to direct assistance towards local private sector homes at risk of fuel poverty, but falling outside of the normal rules of ECO. This offers one route to greater support for local energy efficiency measures outside of standard.

The district councils should work with their local energy advice agency, such as Warmer Homes Stafford or Beat the Cold to identify homes in fuel poverty that can be supported under their flexible eligibility Statement of Intent. There may also be an opportunity to work with a specialist software company to analyse appropriate datasets to identify eligible households that can be targeted for energy efficiency improvement measures.

Fuel Poverty

As highlighted in the evidence base, most local authority areas across Stoke-on-Trent and Staffordshire have average levels of fuel poverty above the national average, with highest average fuel poverty seen in Stoke-on-Trent, representing 14% of households. Some local areas can be substantially higher than these averages, with 41.5% of households within Lower Super Output Area in Stoke-on-Trent in fuel poverty.

It is important to tie in the fuel poverty ambitions of this strategy with existing fuel poverty initiatives, in particular, the Stoke-on-Trent City Council Fuel Poverty Strategy 2016-2020. This sets out the ambitions to combat fuel poverty by focusing on reducing energy consumption through behavioural change and improvements of the building fabric, maximising the household's income, reducing fuel costs and increasing the amount of energy generated from renewable and low carbon sources. Nationally the target is to improve as many fuel poor properties as practicable to EPC C standard.

Linking the residential energy and health agendas together represents a key opportunity to improve outcomes. Fuel poverty can lead to residents living in cold homes, a situation which is linked to poor health outcomes. Bringing households out of fuel poverty therefore has wider benefits, and represents part of the drive to improve health outcomes.

The Royal Stoke Hospital community energy scheme highlighted under the public sector scheme funds a community scheme which supports 'Beat the Cold' in order to assist local and vulnerable patients who are suffering from, and/or their illness is exacerbated by, fuel poverty and living in cold and damp homes. Patients identified as high risk of their condition becoming exacerbated by living in a cold home together with living within a geographical area that has a high prevalence of fuel poverty, are selected and referred into the scheme. Upon discharge, Beat the Cold then contacts the patient to arrange a visit in order to help facilitate a safe temperature and affordable warmth.

There is an opportunity to replicate this type of project more widely to build on the excellent learnings. While the Feed-In Tariff is being phased out by March 2019, there may still be opportunities for similar renewable based schemes including solar generation, with the cost of solar having fallen substantially, or renewable heating schemes, supported by the renewable heat incentive (RHI).

Municipal energy companies such as Bristol Energy and Nottingham's Robin Hood Energy have demonstrated the opportunities for local authority involvement in energy and the potential to offer cheaper tariffs to local customers which could help alleviate fuel poverty. A number of other local authorities have undertaken a 'white label' approach where they launch their own local brand backed by an existing energy company, Robin Hood Energy is proactively entering white label agreements to support councils with this. Stoke-on-Trent council are involved in a community energy offering with an energy supplier offering domestic solar installations and below market rate electricity tariffs aiming to roll out across an initial 10,000 properties. This demonstrates one route to mitigate the impacts of fuel poverty through provision of more affordable energy, and represents an opportunity to expand this further.

The target of reducing fuel poverty below 10% by 2030 represents a challenging aim, however, integrated initiatives supporting energy efficiency measures and targeted interventions represent a clear opportunity to achieve this goal.

New build energy consumption and renewable energy

The planning system is also crucial to ensuring Stoke-on-Trent and Staffordshire's future housing stock is fit for purpose. Based on current local plans 3,370 homes are proposed to be built annually across all local authority areas in Stoke-on-Trent and Staffordshire, which represents an opportunity to embed energy at the centre of these developments.

Energy efficiency of new build housing represents an important area of consideration, as houses built now need to be suitable for Stoke-on-Trent and Staffordshire's long-term energy and carbon reduction ambitions. Building to building regulation standards as they stand potentially leads today's new build properties requiring retrofitted energy efficiency measures by 2050 in order to deliver the carbon emissions reductions from the built environment necessary to comply with the UK's targets. Another key consideration is electric vehicle charging. Within new build properties, electric vehicle charging should be considered as part of planning applications to

ensure new developments meet the future needs of residents within Stoke-on-Trent and Staffordshire.

There is an opportunity in future to take account of the revised National Planning Policy Framework (NPPF) of July 2018 which sets out the flexibility that local authorities have to set local energy efficiency standards. In light of this, it may be appropriate to reassess the energy efficiency provisions within Stoke-on-Trent and Staffordshire planning policy and consider where these may be improved. This could be addressed through the local plan process, strengthening energy efficiency standards. In order for strengthened energy efficiency standards to be put in place, local planning authorities need to be able to justify these, ensuring that this does not impact on development viability. Existing evidence for the viability of sites delivered with energy efficiency standards should be consolidated so that this can be referred to within future revisions to local plans.

Local planning policy is crucial to encouraging the uptake of renewable technologies; there have been existing efforts made in this area, with the Stoke-on-Trent Core Strategy setting a strategic aim to: "*minimise the adverse impacts of climate change in the move towards zero carbon growth through energy efficiency, promoting the use of renewable energy sources and green construction methods in accordance with best practice.*"

There is more that can be done to encourage the use of renewable energy in new developments, in particular related to the new Stoke-on-Trent city heat network, new developments should have an obligation to consider connection to local district heat networks if within a suitable distance.

	Key actions	Timescale	Owner
1.1	Liaise with eco partners on flexible eligibility criteria	2018-2021	Stoke-on-Trent City Council District authorities
1.2	Work with local energy advice agency to identify homes in fuel poverty	2019-2020	Stoke-on-Trent City Council District authorities
1.3	Expand link between the residential energy and health agendas	2018-2020	Stoke-on-Trent City Council Staffordshire County Council
1.4	Scope fuel poverty project building on 'Saving Lives with Solar' scheme utilising alternate funding streams.	2019-2020	Stoke-on-Trent City Council
1.5	Explore opportunities to expand local community energy offering beyond initial scope	2019-2020	Stoke-on-Trent City Council

1.6	Consolidate existing evidence within Staffordshire that can be used to justify improved energy standards for new build properties	2019-2021	City and District authorities
1.7	Review existing new home energy efficiency standards	2018-2019	City and District authorities
1.8	Review planning policy for renewable energy, district heat and electric vehicle charging	2018-2019	City and District authorities

5.1.2 Commercial and industrial

Areas of focus within the commercial and industrial sector include:

- Smart energy sector
- Ceramic sector decarbonisation
- Improved energy efficiency
- Heat networks
- Renewable energy generation

Smart energy sector
Keele University is already forging a path in the smart energy sector by developing the largest UK demonstrator for integrated energy management (Smart Energy Network Demonstrator, SEND). The SEND, utilising a mixed energy supply and demand environment, will provide a facility for trialling and evaluation of new and evolving energy technologies and provide the opportunity to assess their efficiencies, both individually and combined, in terms of energy reduction, cost, and CO_2 emissions, through real-life data analysis and scenario modelling. This is a flagship project, which has been supported under the City Deal and establishes Staffordshire as a leader in the smart energy sector.

This is an important innovation project that could lead to investment within the sector in Staffordshire and opportunities to build on the project to develop solutions that could be applicable in other areas of the county. To fully leverage this work to grow the local low carbon economy, Stoke-on-Trent and Staffordshire aim to develop the UK's first fully integrated smart city network. Smart cities present an opportunity to optimise city functions and drive economic growth while improving the quality of life for its citizens using smart technology and data analysis.

Development of a multi-vector Smart Energy Grid can enable efficient management and distribution of energy generated from a range of supply solutions and technologies to deliver cost-effective solutions to minimise energy consumption and carbon emissions. The development of smarter networks will also facilitate greater connection of local renewable energy generation which can be challenging where there are constraints on the local distribution network.

Smart Energy Network Demonstrator (SEND)

Based on Keele University's privately owned and operated utility networks (power, gas, heat, telecoms, water and waste-water), the University is developing Europe's first 'at scale' multi-energy vector Smart Energy Network Demonstrator – a living laboratory where new low-carbon technologies and interventions can be researched, developed and tested in a real-world environment.

This is a landmark project for Staffordshire, representing the largest such demonstrator in Northern Europe.

The University is working with businesses, graduates and academics to research and develop a wide range of smart energy innovations, from cross-vector technologies and updated approaches to demand side management, through to behavioural interventions, new approaches to low-carbon generation and storage, and revised contexts for regulatory or business models. It will engage with an anticipated 270 businesses.

The Demonstrator will build on Keele University's privately-owned and managed infrastructure, including:

- 600 acre site, it's the UK's largest university campus
- 341 buildings, ranging from academic, student residential, staff flats & houses, and Science & Innovation Park business accommodation for a total of 204,000m² built environment
- Campus energy demand of:
  - 39.2GWh pa – Gas
  - 23.8GWh pa – Electricity
- 10km+ of underground gas network (6 MP/LP meter points)
- 18km+ of electrical network (cable) with 22 sub-stations (11kV/400V)
- 6km district heating (3 networks)

The project aims to demonstrate the application of a multi-vector Smart Energy Grid and how it can be used to efficiently manage and distribute energy generated from a range of supply solutions and technologies, thus stimulating the concept of "Local Smart Energy Grids" as a transferable solution which can be implemented in other areas.

This is a landmark innovation project that could lead to investment within the sector in Staffordshire and opportunities to build on the project to develop solutions that could be applicable in other areas of the county and internationally.

In order to build on this, the public sector should continue to support SEND at all levels and look for opportunities to take the pilot into the wider community. All adjoining development should trigger a flag to see if it can be incorporated into the scheme.

Also within the smart energy sector, Western Power Distribution, the local electricity Distribution Network Operator, is developing a programme called 'Flexible Power. This is a market for procuring flexibility in the electricity network[5] in order to allow them to alleviate constraints in the network without resorting to traditional reinforcement. One of the pilot sites is within the Rugeley area, this represents an opportunity for local businesses to secure additional revenue streams in exchange for committing to vary their electricity consumption within pre-determined periods. The LEP should promote this opportunity to local businesses as a potential revenue stream which would help engage local consumers in the electricity flexibility market, which could help mitigate local network constraints.

Ceramic sector decarbonisation

Stoke-on-Trent and Staffordshire have a strong industrial heritage which continues to this day, one of the key sectors remains the ceramics sector. Decarbonisation of the ceramics sector is challenging and represents a key undertaking for Stoke-on-Trent and Staffordshire. The Ceramic Sector Industrial Decarbonisation and Energy Efficiency Roadmap Action Plan is a key collaboration between government and industry to help the ceramics industry make the low carbon transition while also maintaining its competitiveness. It has been developed through partnership between the British Ceramics Confederation (BCC) and the Department for Business, Energy and Industrial Strategy (BEIS).

The ceramics sector is energy-intensive and consumes around 4.7 TWh of delivered energy per year, with gas accounting for 80 to 82% of the industry's overall energy mix. Total emissions in 2012 were 1.2 million tonnes CO_2, with the Roadmaps pathways showing a maximum technical abatement potential of up to 0.7 million tonnes CO_2 by 2050 without accounting for cost considerations. Most of this was through the electrification of heat and accompanying grid decarbonisation, although energy efficiency including heat recovery and the use of biofuels could also make significant contributions. Energy costs are a major factor for the sector, accounting for as much as one-third of production costs, thereby naturally driving efficiencies and improvements.

This action area ties in with the Strategic Economic Plan priority for decarbonisation of the ceramics sector and the ceramic sector deal between BEIS and the British Ceramic Confederation. This involves the development of a supportive and long-term policy framework, with stronger representation of the sector and enhanced collaboration with relevant governmental instruments. Focus is also drawn on research and innovation of manufacturing and operational technologies used. There is a planned new National Advanced Sintering Centre to be located within Stoke-on-Trent backed by industry and higher education institutions which would lead the way in developing the advanced ceramics technologies of the future which, in turn, will lead to job creation, productivity and innovation improvements and an upskilling of the industry.

The energy steering group should work with the proponents of this centre to ensure energy and resource efficient working are front and centre on the agenda to suit a Stoke-on-Trent and Staffordshire industry fit for the future.

Improved energy efficiency

Commercial energy efficiency is another area where there are improvements that can be made. High energy costs to businesses represent a constraint on local economic

[5] https://www.flexiblepower.co.uk/Can-I-take-part.aspx

growth. Businesses should be encouraged to examine their own processes to understand their energy usage and make efficiency improvements. This is an area where the LEP can play a role to facilitate improvements and spread awareness, building on existing activities.

This is an area of existing strength with organisations such as the Staffordshire Business Environment Network active in engaging with SMEs to support energy efficiency and low carbon investment. This has been supported by European funding and has offered free energy efficiency and environmental management reviews to identify investment opportunities for businesses. This is also supported by partial grant funding of eligible low carbon measures such as fabric energy efficiency measures, process optimisation and renewable energy technology.

This programme is an example of the type of support that is crucial to growing the local economy and low carbon sector; energy efficiency and renewable energy investment can reduce energy costs for businesses and increase competitiveness nationally and internationally.

Staffordshire Business Environment Network (sben)

Staffordshire Business & Environment Network (sben) was launched in 1992, providing a membership organisation, entitling members to subsidised and free initiatives from within the sben portfolio.

sben is managed by its Organisers Group made up of members of the network and lead by a Chairperson and Management committee and is supported by Staffordshire County Council. **sben** offers business support through the Low Carbon Business Evolution Programme (LCBEP) which helps businesses across Stoke-on-Trent and Staffordshire reduce their carbon footprint and increase energy efficiency, supported by European funding.

Eligible businesses (SMEs) can receive a free specialist low carbon review around either energy efficiency or Environmental Management System (EMS) Gap Analysis. It also offers a Low Carbon Enterprise Grant of between £2,000 – £20,000 for up to 60% of eligible costs. Grants are available for the installation of energy efficient measures in buildings, processes, products and services which will reduce carbon, as well as for further low carbon specialist advice e.g. environmental management systems, energy management systems, carbon footprinting and renewable energy feasibility. The scheme has engaged with hundreds of businesses saving significant amounts of carbon.

One business case study was offered a free LCBEP energy review that looked at all aspects of the business; existing EMS, vehicles and transportation, buildings, insulation and glazing, heating, cooling and lighting.

Consultants recommended existing lighting be replaced with more energy efficient LED lighting and controls. This would potentially deliver annual energy savings of 20,948 kWh, a cost saving of £2,135 and carbon emission savings of 9.8 tCO2e. The business was offered a grant of £8,700 to support the installations and resulted in a project payback of 2.7 years.

The LEP should continue to support sben and increase the reach of this network by holding cross network events to encourage greater participation. It should also explore the opportunities to continue delivery of this programme through the Shared Prosperity Fund subsequent to the UK leaving the European Union.

Heat networks

The Stoke-on-Trent District Heat Network will use deep geothermal heat energy to produce up to 45 GWh a year, save 10,000 tonnes of CO_2 a year, and lower energy costs by up to 10 per cent. It's the UK's first ever low-carbon heat network system on this scale and will help heat thousands of homes and businesses in the city.

The District Heat Network will support over 200 jobs directly, with 1,350 jobs protected in the supply chain. This has been funded by £20 million from the government and £31.65 million of local funding. In addition, this will bring in £150 million of private investment for energy projects across the Stoke-on-Trent and Staffordshire Local Enterprise Partnership including projects in Meaford and South Staffordshire.

Heat networks offer an opportunity for local businesses to connect and secure long-term low-cost energy from a reliable low-carbon source. The LEP has a role to play in delivering this message and encouraging connection.

The development of a heat network on this scale demonstrates a level of expertise that is nationally leading and represents an opportunity to build on this success to further increase the levels of district heat within Stoke-on-Trent and Staffordshire. This should be achieved through sharing this expertise with other councils to facilitate access to BEIS funding to support early-stage feasibility studies. Where suitable opportunities are identified Stoke-on-Trent City council will be able to share best practice procurement strategies to guide the development of these.

Substantial investment into energy is being delivered through the Stoke-on-Trent city centre heat network project, including in Solar PV, peaking plant, geothermal, digital infrastructure, Energy from Waste and recovery of industrial waste heat. It is important to ensure that digital integration is considered as part of any investment decision, enabling future links to a smart energy system and the integration of distributed energy assets through digital networks.

Stoke-on-Trent College has been identified as a key provider of the training that will be required over the coming decades to meet the skills needs of such a large infrastructure project and will become the designated Skills Training Academy for the project. The College is already working in collaboration with Stoke-on-Trent City Council and other key participants in this project, such as Nordic Heat, LOGSTOR and the Swedish Energy Agency, who have expertise in delivering geothermal heating systems across Europe. This will be the UK's first District Heat Skills Academy.

The Rugeley power station redevelopment is on a 374-acre plot, and will involve 1,800 new homes and substantial commercial development, and represents an opportunity to embed sustainability at the heat of the development, including district heating. The site is a potential garden village development with plans proposed including local renewable energy generation supplying the site. This should be supported corporately and proactively by the planning officers to ensure holistic benefits from the development.

Renewable energy generation

Increasing the proportion of renewable energy generation in Stoke-on-Trent and Staffordshire is crucial to reducing overall carbon emissions from the area and making Stoke-on-Trent and Staffordshire more self-sufficient in energy generation. Out of energy resources within Stoke-on-Trent and Staffordshire that have been reviewed the greatest opportunity was determined to be in onshore wind development, with up to 6.5 GW of potential generation available, most notably within Stafford, East Staffordshire and Staffordshire Moorlands, with only 3.7 MW of onshore wind generation installed to date. Total renewable electricity generation in Stoke-on-Trent and Staffordshire is 345 GWh, which represents 7.2% of the 4,726 GWh of existing electricity consumption. The other major opportunity is for increased levels of solar generation. 109 GWh of existing renewable energy generation locally comes from solar generation, with over 143 MW of installed solar generation capacity within the county, nearly a third of this within East Staffordshire. There is an opportunity for growth of solar deployment across other local authority areas in line with this that could contribute substantially to Staffordshire's ambitions of increasing local renewable energy supply. The development of the Energy from Waste Plant at Four Ashes in South Staffordshire will also contribute to increased local energy supply.

Delivering onshore wind generation can be particularly challenging within the current national planning climate. There is only one large-scale wind turbine development in Staffordshire – 4 MW in South Staffordshire - however, there have been 65 MW of onshore wind planning applications withdrawn, refused or abandoned, indicating there has been demand for development that hasn't been able to proceed.

This indicates the scale of the challenge to local renewable energy generation, and it is clear that action is needed if Stoke-on-Trent and Staffordshire are to further develop renewable generation in this area. The available resource should be highlighted with local key decision makers including MPs and councillors as well as through the Midlands Energy Hub to push for change to national planning policy. It is important to set the ambition to increase energy generation locally and endeavour to make the most of local resources.

One further action is to scope the renewable energy opportunities in Staffordshire in more detail in order to test the viability of different types of renewable schemes and find a replicable model that can be used to increase local renewable energy generation.

	Key actions	Timescale	Owner
2.1	Utilise outcomes from SEND trial to feed into energy aspects of smart city development	2020-2025	Keele University Stoke-on-Trent City Council
2.2	Ensure future adjoining development to SEND is reviewed for potential incorporation to the project	2018-2023	Keele University Stoke-on-Trent City Council
2.3	Support SEND innovation funding applications where appropriate	2018-2023	Keele University SSLEP

2.4	Promote WPD Flexible Power opportunity to businesses to improve local network flexibility	2018-2019	SSLEP Growth Hub, sben
2.5	Support Ceramic sector with decarbonisation action plan and representation to government	2018-2022	SSLEP
2.6	Work with development of National Advanced Sintering Centre on energy and resource efficiency	2018-2022	Steering group, SSLEP
2.7	Explore opportunities to offer low carbon support to SMEs through the Shared Prosperity Fund once European funding is no longer accessible, building on the success of SEND, the ERDF Low Carbon Business Evolution Programme, and Low Carbon Growth Support Project	2018-2020	Keele University SSLEP
2.8	Liaise with district councils to ensure available heat network support from HNDU and HNIP is utilised	2018-2019	SSLEP
2.9	Share best practice district heat procurement guidelines	2018-2021	Stoke-on-Trent City Council
2.10	Ensure digital integration to enable smart energy systems	2019-2022	SSLEP Stoke-on-Trent City Council
2.11	Ensure renewable energy opportunities are maximised on the Rugeley Power Station site	2019-2020	Cannock Chase District Council, Lichfield District Council
2.12	Highlight under-utilisation of wind resource with local decision makers and politicians	2018-2019	Steering Group
2.13	Support community generation schemes, building on past success and with local partners	2018-2030	SSLEP
2.14	Scope opportunities to test viability of renewables throughout Staffordshire incorporating SEND where appropriate	2019	Keele University Stoke-on-Trent City Council District Councils

5.1.3 Transport

Areas of focus within the transport sector include:

- Sustainable transport use
- Low carbon transport infrastructure
- Improving air quality

Sustainable transport use
Sustainable forms of transport include walking, cycling and public transport. Increasing levels of sustainable transport is important from a number of aspects, including decarbonisation, energy use and improving health outcomes. Local transport plans set out the transport priorities for local authority areas and detail plans for future investment in infrastructure; only local authorities are able to effectively facilitate increases in use of sustainable transport. Stoke-on-Trent and Staffordshire get integrated Transport Block allocations for transport capital works.

Stoke-on-Trent City Council secured funding from the Department for Transport for the Local Sustainable Transport Fund (LSTF) for the period 2012-2015. This programme included a package of sustainable transport interventions aimed at improving the access to major employment sites enhancing the local economy through improved connectivity to jobs from areas of deprivation resulting in better opportunities for employment of local residents. This aimed to help unlock 10,000 jobs and provide an increased pool of labour available to businesses on key employment sites. District authorities within Staffordshire including Tamworth, Stafford and Newcastle have also received LSTF funding to implement sustainable transport measures.

Delivery of active travel infrastructure can play a role in reducing carbon emissions from transport. Undertaking a Strategic Transport Study to look at the feasibility and options for delivering parking and cycle banks around train stations could increase active travel, potentially leveraging funding through the LSTF. This could also investigate the feasibility of re-opening currently defunct rail lines that could improve public transport availability, helping to meet high demand for rail travel and play a role in reducing carbon emissions and increasing sustainability in transport. It will be important to engage West Midlands Connect on these issues so the LEP and County can work closely with them to deliver transport solutions. A further avenue to explore in the study is for low carbon public transport, with electric and hydrogen fuelled buses representing an avenue for investment that can play a role in reducing carbon emissions and improving air quality.

Low carbon transport infrastructure
Within the evidence base the spread of electric vehicle charging points across Stoke-on-Trent and Staffordshire have been mapped to understand the current provision and preparation for future increases in electric vehicle numbers. Fast charging locations can be found at service stations up the M6, with a number of other charge points available in urban centres including Stoke-on-Trent and Stafford. Beyond this, however, EV charge point availability is limited, particularly in rural areas, putting a barrier in place to widespread take-up of electric vehicles as a mobility solution.

There is an opportunity for local authorities to secure 75% funding for the cost of procuring and installing chargepoints through the government's On-Street Residential

Chargepoint Scheme. This could enable local authorities within Stoke-on-Trent and Staffordshire to support EV chargepoint deployment to enable the shift to lower carbon forms of transportation.

A first step will be to undertake a scoping study to understand the best locations to site charge points across the county to meet future needs so support can be utilised to deliver charging points in the right locations. This initial study would produce an evidence base with recommendations on locations for charging points and delivery methods. It will be important for the County Council to work in partnership with district authorities in the delivery of charge points, with outcomes of this study used to support district authority local plan policies.

Improving air quality

Air quality management areas (AQMAs) are in place within Stoke-on-Trent, Newcastle-under-Lyme, East Staffordshire, Cannock Chase, Lichfield, South Staffordshire and Tamworth. This indicates the widespread nature of the air quality problem, and the challenges local authorities face to improve these.

There are clearly opportunities to tie in the meeting of air quality targets with change in the transport system. Many urban areas across the country, including within Stoke-on-Trent and Staffordshire, have high levels of air pollution including pollutants such as nitric oxides and particulates. Electric vehicles have substantially lower air quality impacts than traditional vehicles, particularly diesel, and so the rise in the use of electric vehicles is likely to have a positive effect on these emissions.

Alternative transport models are growing in popularity and may be particularly appropriate for electric vehicles, there may be opportunities for the growth of car clubs in Stoke-on-Trent and Staffordshire, a mobility solution already available in many other parts of the UK. These could be based around public sector sites such as hospitals or local authority buildings offering a mobility solution for local authority vehicle usage to switch towards lower carbon alternatives. Alternatively, standalone car clubs established by a social enterprise in partnership with local authorities may offer an appropriate solution for local consumers.

The shift towards electric vehicles represents an opportunity to improve air quality, however, this is not the only avenue to do so, with local initiatives involving road infrastructure improvements to smooth traffic flow also important. Another important action is the growth of sustainable transport as previously highlighted, with local authority approaches to support walking and cycling and integrated end-to-end transport solutions involving public transport particularly important.

	Key actions	Timescale	Owner
3.1	Further embed plans for increasing sustainable transport in local transport plans	2018-2030	Stoke-on-Trent City Council, Staffordshire County Council
3.2	Commission EV charging scoping study	2018-2019	Staffordshire Council

3.3	Seek UK government match funding for EV chargepoint installation	2018-2020	Stoke-on-Trent City Council, Staffordshire County Council
3.4	Explore opportunities for electric vehicle car clubs	2018-2020	City and District councils
3.5	Undertake Strategic Transport Study considering active travel options and opportunities for expansion of rail	2019	SSLEP, Staffordshire Council

5.1.4 Public sector

Areas to focus on within the public sector include:

- Improved energy and resource efficiency
- Community energy
- Renewable energy generation
- Knowledge and skills
- Planning and development

Energy and resource efficiency
Energy efficiency and resource efficiency are at the heart of public sector engagement with this energy strategy. Staffordshire County Council and Stoke-on-Trent City Council monitor ongoing carbon emissions related to their buildings and activities, with ongoing carbon reduction targets put in place. This drives best practice in emissions reduction associated with council activities and emissions related to subcontracted activities. Reductions in emissions have been achieved over time,

Available funding such as Salix (6.2.4) should be leveraged where possible to support energy efficiency improvements in the public sector estate and demonstrate best practice in energy management and energy efficiency. The public sector has a leadership role in this respect and can demonstrate the viability of energy efficiency measures.

Community energy and renewable energy
There are existing examples of good practice in this sector, for example the Royal Stoke University Hospital community energy scheme (see section 4 for more details).

Engaging community support and investment for this type of renewable energy project demonstrates what can be achieved locally, and the importance of linking public sector and community initiatives to deliver on overlapping priorities. The closure of the feed-in tariff in March 2019 sets a timescale beyond which solar investment may be less attractive, however, beyond this point it should still be possible to deliver profitable schemes with community benefit, but with potentially lower returns. Engaging with communities to deliver similar schemes based on a similar approach offers an opportunity. Council support for renewable energy generation can make a crucial difference to project viability and the likelihood of these schemes going ahead.

District heating can be challenging to deliver within rural areas, however there may be opportunities for district councils to learn from case study schemes that have been delivered outside of Staffordshire. The Association for Decentralised Energy offers a number of case studies on different types of district heating schemes[6], including those in rural areas[7].

Knowledge and skills

Skills development is particularly important, as many of the energy solutions included within this strategy are relatively new, and therefore there may only be a small pool of people who are able to offer maintenance or construction locally. Creating an action plan for skills development in this area will be a good step to building the local knowledge base and translating this into supply chain development. This should cover how partners will work together to develop the skills and courses necessary to help develop a workforce around renewable technologies locally.

Planning and development

Planning policy is a major determinant of carbon emission from new development. Incorporating requirements to project carbon emissions from new development and test draft policy against carbon emissions targets would help ensure a holistic approach to future development, accounting for lifetime energy consumption and carbon emissions.

	Key actions	Timescale	Owner
4.1	Support public sector organisations into energy efficiency action utilising Salix funding	2018-2030	Steering group
4.2	Update Carbon Management Plans and set stretching targets for carbon emissions reduction	2018-2020	Local Authorities
4.3	Continue ongoing reporting of carbon emissions and collate across districts	Annually	Local Authorities
4.4	Share best practice of community engagement across public sector organisations	2018-2021	Stoke-on-Trent City Council
4.5	Review rural district heating case studies to apply learnings locally	2018-19	District Councils
4.6	Develop action plan for local energy skills development	2019	SSLEP
4.7	Test draft policy against carbon reduction objectives	In line with local plan revisions	Stoke-on-Trent City Council District Councils

[6] https://www.theade.co.uk/case-studies/district-heating
[7] https://www.theade.co.uk/assets/docs/case-studies/Llanwddyn_Biomass_Case_Study.pdf

5.2 Governance and implementation

To facilitate delivery of the strategy there are a number of initial and ongoing actions necessary which are set out below.

	Action	Timescale	Owner
5.1	Adopt LEP Energy Strategy	December 2018	LEP Board
5.2	Reflect energy strategy into the development of the Local Industrial Strategy	2020	SSLEP
5.3	Establish ongoing steering group for monitoring of strategy implementation	2019	SSLEP
5.4	Produce dashboard for ongoing strategy monitoring of key indicators	2019	SSLEP
5.5	Monitor progress against targets using dashboard for LEP Board	Ongoing	SSLEP

Delivery of this strategy will be monitored by an ongoing steering group with oversight from Stoke-on-Trent and Staffordshire Local Enterprise Partnership. This governance structure should incorporate the Midlands Energy Hub as well as identified actors within the LEP and the local authorities, supported by a local project support officer from the Energy Hub. Figure 36 below sets out a potential structure for this group.

The steering group should link with the Staffordshire Business Environment Network to liaise with local businesses. To monitor implementation of the strategy, key indicators for the strategy will be incorporated into existing LEP dashboard monitoring to ensure the LEP Board remain updated on progress with the energy strategy.

Each action within the action plan will be assigned an action owner, with oversight of this provided by a steering group convened quarterly to review progress. The steering group needs an agreed terms-of-reference and a regular meeting structure.

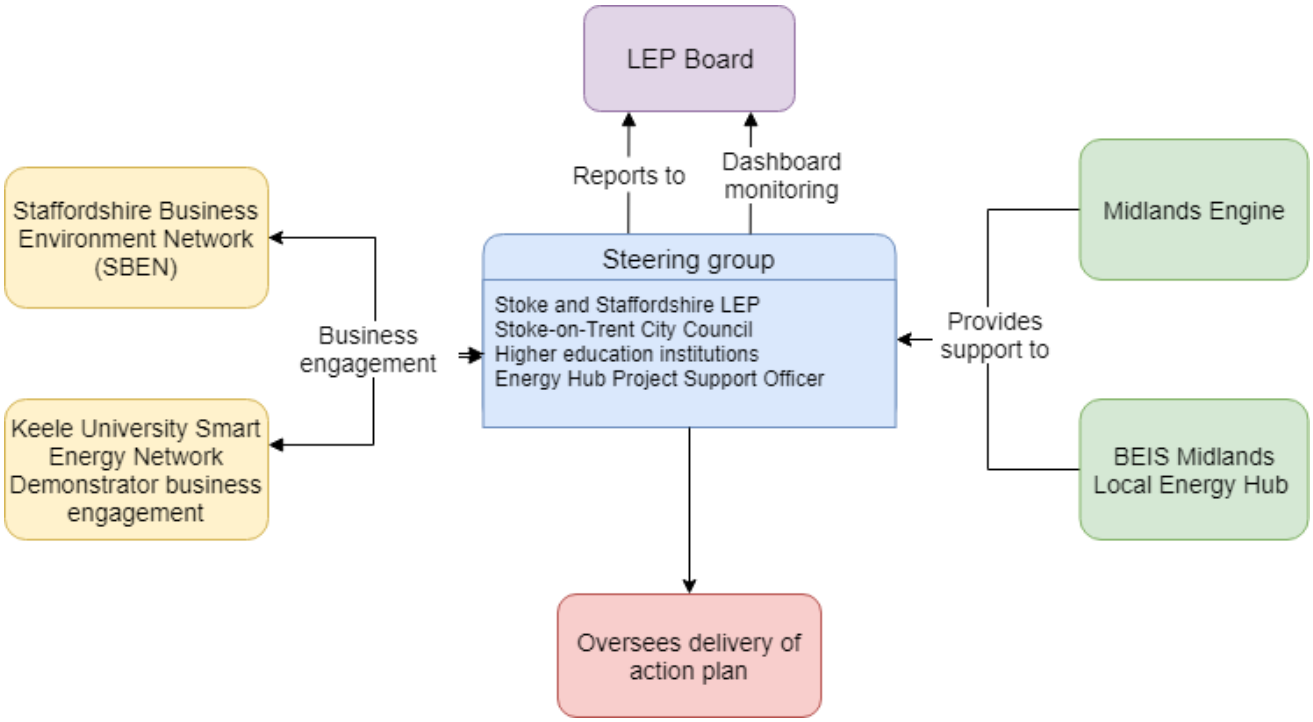

Figure 36: Energy Strategy governance structure

6. Funding and support

6.1 European funding

6.1.1 European Structural and Investment Fund (ESIF)

ESIF includes money from the European Social Fund (ESF), European Regional Development Fund (ERDF)[8] and European Agricultural Fund for Rural Development (EAFRD).

While the decision to leave the European Union will affect this funding in the medium term, in the short-term UK local authorities still have access to this funding and it can be used to support appropriate projects that align with the ESIF strategy. The government has confirmed that it will guarantee EU funding for structural and investment fund projects signed before the UK's departure from the EU, even when these projects continue after the country has left the EU. In practice this still means that funding bids for new projects need to be submitted by September 2018 to ensure funding is accessible, however, there may still be support available after this date depending on the status of any future transition period.

The primary categories of funding that should be targeted are Priority Axis 4: Supporting the Shift Towards a Low Carbon Economy, Priority Axis 1: Promoting Research and Innovation and Priority Axis 6: Preserving and Protecting the Environment and Promoting Resource Efficiency.

Stoke-on-Trent and Staffordshire LEP has developed a set of ambitions for use of ESIF funds which complement and reinforce the objectives within the Strategic Economic Plan. These include areas of low carbon focus, with ambitions of:

- **A leading low carbon economy:** driven by its unique approach to local energy generation and by an SME base which has evolved and embedded low carbon principles, practices and activities
- **A more diverse and resilient economy:** building on established (and acknowledged) strengths in a number of high value-added priority sectors including Advanced Manufacturing, Advanced Materials, Creative Media and Energy Generation.

6.1.2 Other European funding opportunities

There are two other European funds that can help to develop projects in the energy and low carbon space; these are:

Horizon 2020
According to the dedicated website,[9] "Horizon 2020 is the biggest EU Research and Innovation programme ever with nearly €80 billion of funding available over 7 years (2014 to 2020) – in addition to the private investment that this money will attract. It promises more breakthroughs, discoveries and world-firsts by taking great ideas from

[8] https://www.gov.uk/government/publications/draft-european-regional-development-fund-operational-programme-2014-to-2020
[9] https://ec.europa.eu/programmes/horizon2020/en/what-horizon-2020

the lab to the market." Its goal is to ensure European nations can produce world-class science, remove barriers to innovation and make it easier for the public and private sectors to work together in delivering innovation. Within this pot of money is the 'societal challenges' tranche, which includes 'secure, clean and efficient energy,' along with 'smart, green and integrated transport' and 'climate action, environment, resource efficiency and raw materials. All these present opportunities for the LEP to bring together consortia and collaborations to help fund the priority actions outlined in this strategy.

In particular, the 'secure, clean and efficient energy'[10] aspect of Horizon 2020 is structured around seven specific objectives and research areas:

- Reducing energy consumption and carbon footprint
- Low-cost, low-carbon electricity supply
- Alternative fuels and mobile energy sources
- A single, smart European electricity grid
- New knowledge and technologies
- Robust decision making and public engagement
- Market uptake of energy and ICT innovation.

Its three main priorities are energy efficiency, low carbon technologies and smart cities and communities.

Interreg

Interreg Europe[11] offers opportunities for regional and local public authorities across Europe to share ideas and experience on public policy in practice, therefore improving strategies for their citizens and communities. Two of the categories that it provides funding for are listed as 'low carbon economy' and 'environment and resource efficiency.' It also provides what it calls the '3 C's:' cooperation, collaboration and community engagement and helps public authorities to access peer learning, policy advice, CPD and network expansion, again with particular support offered in the low carbon arena.

Funding for Interreg Europe projects is allocated through calls for project proposals; the next is due in 2019.

As with ERDF, both Horizon 2020 and Interreg funds provide an excellent opportunity to develop some exciting projects in this area, however, because it is a European fund the amount of time remaining to apply is limited and there is uncertainty about what support, if any, will replace them post-Brexit.

6.2 UK government and local support

6.2.1 Shared Prosperity Fund

While ERDF funding is still available, it should be utilised where possible to support the delivery of appropriate projects and to support the delivery of this strategy. Beyond this, the UK government has proposed a Shared Prosperity Fund to replace European funding in the aftermath of the UK's exit from the European Union. This fund has the

[10] https://ec.europa.eu/programmes/horizon2020/en/h2020-section/secure-clean-and-efficient-energy
[11] https://www.interregeurope.eu/about-us/what-is-interreg-europe/

aim *"to tackle inequalities between communities by raising productivity, especially in those parts of our country whose economies are furthest behind"*.

At this stage it is unclear what form support under the Shared Prosperity Fund will take, and what the priority support areas will be, however, given it is being put forward as a replacement for regional support currently provided through European funding it may be possible to leverage it in a similar manner to support the delivery of energy-related projects and utilised to support the implementation of this strategy.

6.2.2 Local energy support from the Department for Business, Energy and Industrial Strategy (BEIS)

BEIS has identified that barriers to progression toward a low carbon economy at a local level include 'limited capacity and capability amongst Local Enterprise Partnerships (LEPs) and local authorities' to deliver local energy investment.

The BEIS Local Energy Programme is designed to address the gap in the capacity and capability of LEPs and other local organisations. Part of this involves funding LEP Energy Strategies to understand the opportunities and challenges across each LEP area.

BEIS is also supporting the establishment of a series of local energy hubs across England that, via staff and funding, will:

- Develop and prioritise a pipeline of local energy projects identified through LEP and partner energy strategies and take these projects from concept to business cases that attract investment and are then taken forwards to implementation by other partners.
- Help coordinate local action across several local LEP areas.
- Provide a local good practice link between local LEP activity, other local LEP areas, and national government.

This will take the form of around five hubs established around the country that will provide regional support to LEPs and local authorities for energy. The Midlands Energy Hub is based in Nottingham and works closely with the energy team at Nottingham City Council, where the manager of the hub will be based. The hub will also provide a project support officer who will be locally based to support project delivery in each LEP area.

6.2.3 Innovation funding

Innovate UK

Given the government's focus on innovation within the Industrial Strategy, this is an important area to explore. Access to this funding is likely to primarily be through Innovate UK, which offers partial funding for projects which do the following:

- to test the feasibility of an idea and make sure it will work
- create a new product, process or service, or improve an existing one, through research and development
- work with other businesses or research organisations on collaborative projects

These opportunities will typically be business-led, but could incorporate local authority or LEP involvement to encourage commercialisation of innovative projects that have been taken forwards by private sector partners. Opportunities may initially be considered at the feasibility stage, but this could then lead to opportunities for the implementation of pilot projects and indeed larger scale rollouts.

Network Innovation

There are also opportunities to work with Distribution Network Operators (DNOs) on their innovation projects to ensure that DNO spending on innovation is appropriately targeted at the local area. DNOs have licence to invest in innovation through Ofgem's regulatory framework. This includes an annual Network Innovation Competition (NIC) which DNOs are encouraged to submit bids into, as well as support for new technology or operation through the Network Innovation Allowance (NIA).

Gas Network Operators also have access to their own NIC funding, and can also look to develop innovative local projects. This could include developments such as piloting areas with an increased proportion of green gas (gas produced from sources including anaerobic digestion and landfill).

The LEP could liaise with Western Power Distribution as the local electricity network operator, and with Cadent as the local gas distribution network (GDN) in order to ensure that the LEP's views and local challenges within Stoke-on-Trent and Staffordshire are adequately represented when the operators are considering their bids for this type of funding.

Industrial Strategy Challenge Fund (ISCF)

ISCF[12] provides funding and support to UK businesses and researchers. The fund is part of the government's £4.7 billion increase in research and development over four years. The government has worked with businesses and academics to identify the biggest core industrial challenges where:

- the UK has a world-leading research base and businesses ready to innovate
- there is a large or fast-growing and sustainable global market

One important challenge area for Stoke-on-Trent and Staffordshire is 'prospering from the energy revolution' including up to £41.5m of support for smart energy system projects and ground-breaking, localised energy system demonstrators. Other relevant challenges have also been identified such as 'transforming construction,' 'healthy ageing,' 'next generation services,' and 'the Faraday Battery Challenge'. Further challenges may be added to the list in the near future. The ICSF is managed by a combination of BEIS and Innovate UK.

[12] https://www.gov.uk/government/collections/industrial-strategy-challenge-fund-joint-research-and-innovation

6.2.4 Salix funding

Salix Finance Ltd.[13] provides interest-free government funding to the public sector to improve their energy efficiency, reduce carbon emissions and lower energy bills. Salix is funded by BEIS and was established in 2004 as an independent, publicly funded company, dedicated to providing the public sector with loans for energy efficiency projects. Given its longevity, Salix is one of the most popular, flexible and trusted funding sources in operation and can provide significant energy savings for any local authority, school, college, university or NHS Trust based in Stoke-on-Trent or Staffordshire.

6.2.5 Heat network support

The Heat Network Delivery Unit (HNDU) has been running since 2013 and was set up to address the capacity and capability challenges which local authorities identified as barriers to heat network deployment in the UK.

Government is keen to support the development of heat networks because they can enable a transition to lower carbon heating sources, and can be effectively implemented using a variety of different heat supply technologies. Once the infrastructure is in place, even if carbon-emitting fuel sources such as gas boilers are used to supply the heat initially, it will be possible in future to replace the central plant used to supply the heat with lower carbon options without causing any disruption to the homes or businesses supplied, therefore enabling easier decarbonisation of heat supply.

HNDU provides support to local authorities in England and Wales through the early stages of heat network development:

- Heat mapping
- Energy masterplanning
- Techno-economic feasibility
- Detailed project development
- Early commercialisation

This funding enables local authorities to explore the potential opportunities for heat networks within their towns and cities, and move from there through feasibility to initial commercialisation to a point where a local heat network may become commercially viable. HNDU grant funding can provide up to 67% of the estimated eligible external costs of these early stage development studies (meaning the money paid by the local authority to third parties to deliver the heat network development stages). The local authority will have to secure at least 33% in match funding.

Many of these studies have identified networks where the commercial returns are marginal and are unlikely to be taken forward by the private sector; this has led to capital funding being made available by the government to support these in order to overcome initial economic barriers to investment. This funding is known as the Heat Networks Investment Project (HNIP) and is a £320m capital investment programme providing support for the capital costs of heat networks. So far £24m of support has

[13] https://www.salixfinance.co.uk/loans

been provided to a total of nine local authority projects. The supported heat network projects provide heat to approximately 5,000 domestic customers and 50 non-domestic buildings.

In order to ensure carbon reductions, HNIP funding requires that heat networks must meet one of the following criteria for their heat supply:

- 75% of heat from non-renewable fuelled CHP
- 50% of heat from a non-renewable source
- 50% of heat recovered a waste heat source
- 50% of the heat from any combination of renewable/recovered heat and non-renewable fuelled CHP

This places some limitations on the type of networks that are eligible for support. HNIP will also only contribute a proportion of total eligible capital expenditure and this funding should be used to lever in other sources of funding.

The full HNIP funding scheme is open to applications from January 2019, with a quarterly review of applications and funding award. The application period runs to December 2021 with the scheme closing by March 2022

6.3 Private sector investment

Where opportunities have been identified for businesses to improve their own energy efficiency or reduce energy consumption, there are potential funding routes available for them to implement some of these schemes that are financially viable. These may include energy efficiency improvements, heating system replacement or lighting upgrades through to more ambitious energy projects such as local heat networks.

'Green' finance has started to become more common, with funding offered specifically for energy-related projects that can reduce energy consumption or carbon emissions. These loans often include attractive rates of interest for credit that is used for qualifying projects and is typically appropriate for once a project is ready for implementation, rather than feasibility or early project development.

The Green Investment Group (formerly UK Green Investment Bank) offers finance specifically for energy projects and energy infrastructure, typically funding large-scale multimillion-pound energy projects including development funding, construction phase equity and debt and asset financing. Their main investment sectors are in onshore and offshore wind and investment in waste facilities including anaerobic digestion and energy from waste, however, they also invest in a wider array of energy projects including energy efficiency, transport and energy storage.

There are also funding solutions from more traditional corporate banking known as 'green loans' which offer finance dependent on meeting environmental criteria for the planned use of funds. These can be used to support the delivery of a variety of thematic projects including energy efficiency, renewable energy, green transport, sustainable food, agriculture and forestry, waste management and greenhouse gas emission reduction. This type of finance allows medium-sized firms who do not have available capital to invest in these types of opportunities a bespoke funding route to delivery of their energy objectives. The implementation of new technologies such as

LED lighting present opportunities for businesses to save significant amounts of energy and hence also reduce their costs, with the costs and paybacks of these type of opportunities now well understood.

Large firms have been required to undergo an assessment under the Energy Savings Opportunity Scheme (ESOS) since July 2014 to identify potential energy savings measures that could then be delivered cost-effectively to save both time and money. This type of opportunity identification has led to a number of energy projects being taken forward; the government is currently holding a consultation to better understand the effectiveness of the scheme to date. Firms that have undertaken an ESOS audit will have identified energy efficiency projects that may be easier to take forwards using third-party funding.

6.3.1 Green Finance Taskforce

In March 2018 an independent taskforce established by government reported on measures to accelerate green finance. The Green Finance Taskforce report sets out a series of recommendations on how the government and the private sector can work together to make green finance an integral part of our financial services. These include:

- boosting investment in innovative clean technologies
- driving demand and supply for green lending products
- setting up Clean Growth Regeneration Zones
- improving climate risk management with advanced data
- building a green and resilient infrastructure pipeline
- issuing a sovereign green bond

The response from government to these recommendations should be monitored to identify any resultant changes in access to finance.

6.3.2 Other sources of funding

Other funding sources that may be relevant to the LEP and the energy and low carbon agenda are listed on the government website.[14]

[14] https://www.gov.uk/guidance/innovation-funding-for-low-carbon-technologies-opportunities-for-bidders

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Appendix II Stakeholder engagement register

Two stakeholder workshops were held in order to inform the development of the energy strategy. A summary of organisations invited directly is summarised below. The events were also publicised more widely by the Staffordshire Business Environment Network (sben), the Staffordshire Chamber of Commerce, Staffordshire Business Club and the Growth Hub.

Organisations invited directly		
ATP Industries (Cannock)	JCB (Uttoxeter)	Southern Staffordshire Community Energy
BEIS	Keele University	Stafford Borough Council
British Ceramic Confederation	KMF (Newcastle)	Staffordshire Chambers
Burton Hospitals NHS Foundation Trust	Lichfield District Council	Staffordshire County Council
Cadent	Lucideon (formerly Ceram)	Staffordshire Moorlands District Council
Cannock Chase District Council	Michelin (Stoke-on-Trent)	Staffordshire University
East Staffordshire District Council	Midland Pig Producers	Stoke-on-Trent & Staffordshire LEP
Encraft	National Farmers Union	Stoke-on-Trent City Council
Energy Capital	National Grid	Sustainability West Midlands
Entrust (Staffordshire County Council Energy)	Newcastle-under-Lyme Borough Council	Tamworth Borough Council
GBSLEP	Orsted	The Royal Wolverhampton NHS Trust
Gestamp (South Staffs)	Perkins Engines (Stafford) / CAT	University Hospitals North Midlands
Goodwin Group (Trentham)	sben	Veolia
HyDeploy/SEND (Keele University)	Severn Trent Water	Western Power Distribution
Jaguar Land Rover	South Staffordshire District Council	

Organisations that attended the workshops are listed below.

Organisations attending stakeholder workshops	
BBC Energy Ltd	Severn Trent Water
Beat the Cold	Smart Innovations Grid Ltd
BEIS	Southern Staffordshire Community Energy
Cannock Chase Council	Stafford Borough Council
Capinal Ltd	Staffordshire BIC
Eccleshall Biomass	Staffordshire County Council
Encraft	Staffordshire Growth Hub
Groundwork West Midlands	Stoke-on-Trent & Staffordshire LEP
Keele University	Stoke-on-Trent City Council
Kirby Automation Ltd	Stopford Energy & Environment
Longscape Ltd	Sustainabiltiy West Midlands
Neida Products Engineering Ltd	T G Sargeant & Sons
Newcastle-under-Lyme Borough Council	The Hotspot
REU International	Western Power Distribution
sben	Severn Trent Water

Appendix III Carbon emissions projection methodology

Appendix IV Risk Register