Buckinghamshire Local Energy Strategy 2018-2030

Consultation Draft July 2018

Comments and feedback on this consultation draft are welcome to be received by Friday 31 August 2018.

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Executive Summary

This Energy Strategy has been developed in partnership by Buckinghamshire Thames Valley Local Enterprise Partnership (BTVLEP) & Buckinghamshire County Council (BCC). Recognising the important changes in how energy is now generated and consumed, as well as its vital role in unlocking growth, this strategy has been produced to address the challenges and opportunities which are present in Buckinghamshire.

In particular, the level of growth expected in Buckinghamshire, and the County's location in the Cambridge : Milton Keynes : Oxford Growth Corridor, mean the existing demands placed on the energy system are set to increase rapidly. Whilst energy technology is developing quickly and regulations are being updated to keep pace, Buckinghamshire will grow and demand more from the energy system whilst still having a responsibility to reduce carbon emissions.

The evidence presented provides a view of the energy characteristics of Buckinghamshire with the key findings including:

- The local electricity grid is constrained in many locations, making new connections often expensive and lengthy. With three Distribution Network Operators (DNOs) serving Buckinghamshire, cooperation and forward planning, aligned with growth expectations, is required to ensure growth is not constrained.
- A high proportion of properties are not connected to the gas network, with oil and electric providing heating. Low carbon alternatives are needed if carbon emissions are to continue to decline in Buckinghamshire whilst the population grows.
- Opportunities to deploy heat networks are limited due to the absence of high density settlements. However new developments can offer opportunities, particularly when located near existing heat generation or industrial heat demands.
- The electric vehicle charging network in the County is undeveloped and the availability of publically accessible charging points is very limited. Improvements are required to meet the growth in electric vehicles, which will be more acute due to growth within Buckinghamshire and across the Cambridge : Milton Keynes : Oxford Growth Corridor.
- There has been little innovation with the electrification of public transport, with no electric bus routes and only hybrid electric taxis operating. This is in contrast to other towns and cities in the UK where electrification is being trialled or implemented.

Challenges & Opportunities

A range of challenges and opportunities arise from reviewing the evidence presented here:

- The level of housing growth in Buckinghamshire and across the Cambridge : Milton Keynes : Oxford Growth Corridor provides an opportunity to take new approaches. For example, Aylesbury Garden Town could be used as a testbed to show how high energy performance standards can be deployed at scale.
- The constraints on the grid in many areas of the County, combined with growing demands on the grid make Buckinghamshire a suitable location to trial innovation grid management

measures, such as those associated with 'smart grid' approaches. This could help to maximise the opportunities which onsite generation projects already offer, such as Westcott Solar Park.

- The construction of significant national infrastructure will bring additional emissions to the County (e.g. HS2 and East-West Rail construction). However, these may also bring long term legacy benefits, such as improvements to the electricity grid required to construct HS2 which will be available to others once construction completes.
- The Woodlands development provides an opportunity to install a heat network which could also be connected to the neighbouring Arla dairy site, making use of the varied heat demands and potential to utilise waste heat.
- The Energy from Waste (EfW) facility has the potential to provide the anchor heat supply to a heat network in its vicinity, an area without mains gas supply, should further development take place.
- The electric vehicle charging infrastructure of the County needs significant development to cater for a range of charging needs. This includes promotion of off-street at home charging and BCC (as the highways authority) enabling on-street charging infrastructure to be installed. There is a role for local institutions to make charging infrastructure available across our combined estates, for example all Councils, the Healthcare Trusts, Universities and Housing Associations.
- Further renewable electricity generation is required for Buckinghamshire to continue to align itself to national targets. This can include the role of community led initiatives such as Gawcott Solar Farm.
- New business models are emerging as the requirements of the energy system change and local supply become more important. This creates opportunities for innovation and entrepreneurship in energy services and should be supported though business networks such as Buckinghamshire Business First.

Next Steps

The Strategy sets out a range of relevant parties which are well placed to take forward actions which will address the challenges and opportunities identified. These include:

- BTVLEP will work with the Greater South East (GSE) Energy Hub to develop transformation projects which can address the opportunities presented here.
- BTVLEP and BCC will identify suitable funding opportunities and develop bids to help fund energy projects and initiatives identified here. This includes the current Housing Infrastructure Funding (HIF) Forward Funding bid.
- BTVLEP and BCC take an enablement and advocacy roles, to promote and support actions by other organisations which support these outcomes. In particular, promotion of high energy efficiency standards within Aylesbury Garden Town.

Governance & Monitoring

The Energy Strategy will be embedded within the Local Industrial Strategy's Action Plan and will be overseen by its governance and monitoring process.

Introduction

Recognising the changes to the ways in which energy is now generated, distributed and consumed; Buckinghamshire Thames Valley Local Enterprise Partnership (BTVLEP) & Buckinghamshire County Council (BCC) have jointly developed this Energy Strategy.

There are two primary aims of this Strategy:

1. To identify the challenges and opportunities which changing energy systems provide to Buckinghamshire, including where energy interacts with other strategies, policies or initiatives.
2. To set out priority areas for action to address the challenges and benefit from the opportunities.

Since the first Buckinghamshire Energy Strategy was written in 2015, there have been a range of significant changes in UK energy policy and the local and national contexts within which these operate.

- The Feed-in Tariff (FiT) subsidy was reduced in February 2016 by up to 65%, new quarterly deployment caps were introduced along with a faster, more flexible tariff reduction mechanism.
- The Renewables Obligation (RO – subsidy for larger renewable generation schemes) was closed to solar photo voltaic (PV) schemes above 5MW from April 2015 and then those below 5MW from April 2016. The RO closed to all technologies from April 2017.
- Changes to national planning rules in June 2015 required proposed sites for on-shore wind generation to be identified in Local or Neighbourhood Plans in order for planning permission to be granted. This has largely ruled out new on-shore wind in most of the UK.
- In July 2015, both the Zero Carbon Homes Policy and the Green Deal were withdrawn; both policies were aimed at improving domestic energy efficiency.

In the local context, the growth expectations for Buckinghamshire are now much clearer as the Local Plans have moved closer to being adopted. These detail the delivery of approximately 50,000 new homes by 2035 along with supporting infrastructure and employment sites.

The County is also going to see a range of major infrastructure projects being delivered including East West Rail, HS2, the Oxford – Cambridge Expressway and the expansion of Heathrow airport just outside the County but with significant implications for the area. Three Local Enterprise Zones (LEZs) are also being delivered which will bring new employment sites to the county.

This update to the Buckinghamshire Energy Strategy responds to the new circumstance and is being developed collaboratively between Buckinghamshire County Council (BCC) and Buckinghamshire Thames Valley Local Enterprise Partnership (BTVLEP) with input from a wide range of stakeholders.

National Context

Energy, climate and business policy has been rapidly changing over recent years. The government merger between the Business and Energy departments to form the Department for Business, Energy and Industrial Strategy is a signifier of how closely energy and industrial aims are aligned. This is made particularly clear with the publication of the Clean Growth Strategy.

Clean Growth Strategy

The Clean Growth Strategy[1] sets out how the UK will continue to deliver economic growth whilst also achieving reductions in carbon emissions. The UK has successfully delivered increasing economic output whilst reducing carbon emissions for nearly 30 years as shown in Figure 1 below.

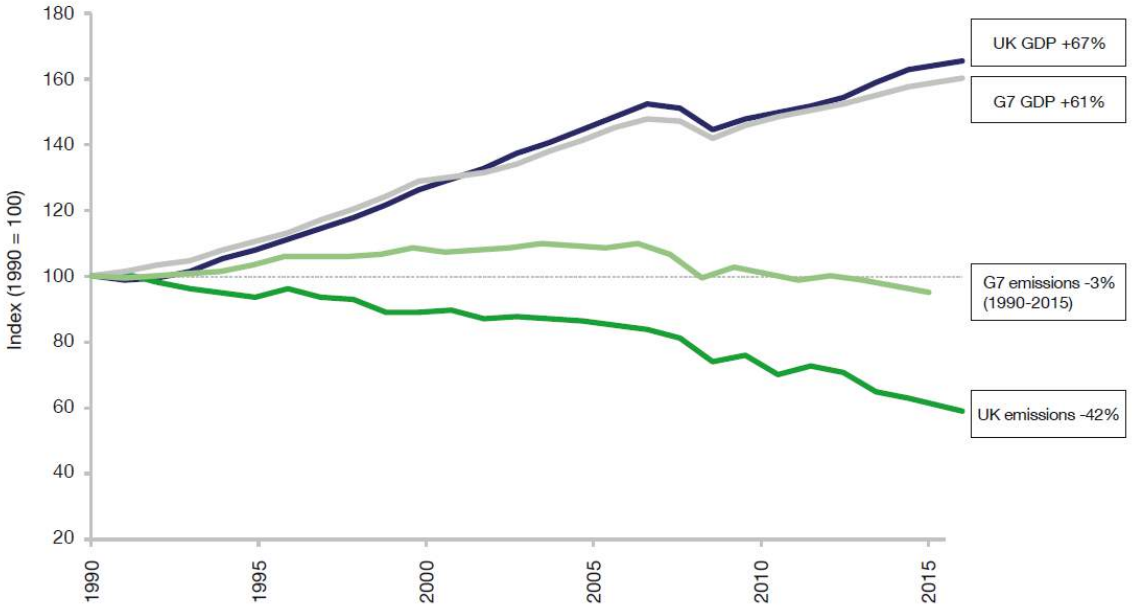

Figure 1: UK and G7 economic growth and emissions reductions[2]

The Clean Growth Strategy sets out a range of national challenges and opportunities with two guiding objectives which are critical in shaping these policies. In the context that the Clean Growth Strategy is the Governments principal approach for meeting it's, legally binding, carbon emissions reductions set out in the Climate Change Act (2008), these guiding objectives are shown below:

1. To meet our domestic *(Climate Change Act)* commitments at the lowest possible net cost to UK taxpayers, consumers and businesses; and
2. To maximise the social and economic benefits for the UK from this transition

[1] Clean Growth Strategy , BEIS 2018 https://www.gov.uk/government/publications/clean-growth-strategy
[2] Extract from Clean Growth Strategy

The Strategy goes on to set out 50 policies and proposal, some of which are new and some which reaffirm existing commitments and approaches. These are grouped into 8 broad areas as set out below with examples of more prominent policies proposed:

Proposal Area	Example Policy
1. Accelerating Clean Growth	Working with the British Standards Institution to develop a set of voluntary green and sustainable finance management standards
2. Improving Business and Industrial Efficiency	Following the outcome of the independent review of Building Regulations and fire safety, and subject to its conclusions, to consult on improving the energy efficiency of new and existing commercial buildings
3. Improving Our Homes	Support around £3.6 billion of investment to upgrade around a million homes through the Energy Company Obligation (ECO), and extend support for home energy efficiency improvements until 2028 at the current level of ECO funding
4. Accelerating the Shift to Low Carbon Transport	End the sale of new conventional petrol and diesel cars and vans by 2040
5. Delivering Clean, Smart, Flexible Power	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
6. Enhancing the Benefits and Value of our Natural Resources	Establish a new network of forests in England including new woodland on farmland, and fund larger-scale woodland and forest creation, in support of our commitment to plant 11 million trees, and increase the amount of UK timber used in construction
7. Leading in the Public Sector	Introduce a voluntary public sector target of a 30 per cent reduction in carbon emissions by 2020-21 for the wider public sector
8. Government Leadership in Driving Clean Growth	Report annually on our performance in delivering GDP growth and reduced emissions through an "Emissions Intensity Ratio"

National Industrial Strategy

The National Industrial Strategy White Paper (November 2017) sets out how the UK will increase its productivity. It is therefore closely aligned with the aims of the Clean Growth Strategy but with a focus on economic growth through greater productivity.

The Strategy sets out 5 foundations of productivity – these are attributes which a successful economy needs one which are to be enhanced by the policies in this Strategy:

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

The White Paper also identifies four "Grand Challenges" which come out of significant developments in technology which are set to transform industries and societies around the world. These challenges will be used to work with industry, academia and society to build on the UK's strengths and create a more productive economy.

The Four Grand Challenges	
Artificial Intelligence & Data Economy	Putting the UK at the forefront of the artificial intelligence and data revolution
Future of Mobility	Being a world leader in shaping the future of mobility
Clean Growth	Maximising the advantages for UK industry from the global shift to clean growth
Ageing Society	Harnessing the power of innovation to help meet the needs of an ageing society

DEFRA 25 Year Environment Plan

The Department for Environment, Food and Rural Affairs' (DEFRA) 25 year Environment Plan sets out how the Government intends to deliver on the ambition of 'leaving the environment in a better state than we found it in'. In part, this Plan is required to fill the regulatory gap which will be created when the UK leaves in the European Union (EU) in March 2019. Much of the UK's environmental legislation has its origins in EU Directives and Regulations and so can be replaced with UK developed regulation over the coming years.

The policies in the 25 Year Environment Plan are grouped into six key areas:

1. Using and managing land sustainably
2. Recovering nature and enhancing the beauty of landscapes
3. Connecting people with the environment to improve health and wellbeing
4. Increasing resource efficiency and reducing pollution and waste
5. Securing clean, productive and biologically diverse seas and oceans
6. Protecting and improving the global environment

BEIS Local Energy Programme

The Department for Business, Energy & Industrial Strategy's (BEIS) Local Energy Programme aims to support the development and delivery of local energy projects. The programme intends to do this by supporting LEPs in the development of local energy strategies which will set out the challenges and opportunities in the area for delivering local energy projects.

A key feature in this approach is the establishment of regional 'Energy Hubs' which will provide support to LEPs and Local Authorities in overcoming the technical and financial barriers in delivering energy projects. This includes the joining up of multiple local energy projects into a larger programme which will have the potential to attract commercial investment.

This jointly developed Strategy between the LEP and the County Council will be used to represent the challenges and opportunities in Buckinghamshire to our regional Energy Hub. The Hub which covers the BTVLEP region, The Greater South East (GSE) Energy Hub, is expected to become fully operational in autumn 2018.

Local Context

Buckinghamshire Local Industrial Strategy

As one of the LEPs across the Cambridge : Milton Keynes : Oxford Growth Corridor, BTVLEP is working with central government and the other LEPs and Combined Authorities across the Corridor, as one of three 'Trailblazer Areas' to develop a Local Industrial Strategy (LIS). The Buckinghamshire LIS will be aggregated with the others to form a Corridor-wide approach. The Buckinghamshire LIS is expected to be written by autumn 2018.

Buckinghamshire Strategic Economic Plan & Growth Strategy

The **Buckinghamshire Strategy Economic Plan** (2016) is a refresh of the original 2014 version. In this, a number of key changes in the local context are described including:

- **Greater clarity on population and housing growth**: several sources highlight the increase in housing and population, with an estimated 14.8% growth in population between 2013 and 2033 and an average of 2,500 additional dwellings per year or an extra 50,000 across the same timeframe.
- **Increased need for local Jobs Growth**: BTVLEP is a highlight porous LEP area, with only 62.3% of residents working in the LEP area and 92,000 people commuting. With the high level of housing and population growth, this indicates that securing local jobs growth should continue to be a priority for Buckinghamshire.

The **Buckinghamshire Growth Strategy produced by BTVLEP in 2017** builds upon this picture. The current housing delivery provided for in the Local Plans of the 4 District Councils currently stands at approximately 46,000 homes for the current plan periods ending 2033/34. However, the Buckinghamshire Growth Strategy's expectations are that in addition to delivering this volume, a further 75,000 homes will be required in the period 2030-2050, an estimate which has subsequently been exceeded by the National Infrastructure Commission targets.

Buckinghamshire European Union Structural Investment Strategy

The Buckinghamshire European Union Structural Investment Strategy sets out how certain EU funding sources will be used to strengthen the local economy in line with a set of priority areas. The Strategy sets out what funds can and cannot be used for, approaches to securing match funding and the outputs which are desired from use of the funds.

It is important to note that the BTVLEP area received the lowest allocation of ESIF and so difficult decisions have had to be made when prioritising areas to allocate funding. This is offset to some degree as Aylesbury Vale District falls within the South East Midlands LEP (SEMLEP) area as well.

The priority areas for support are:

1. Promoting Research and Innovation
2. Enhancing access to and use and quality of ICT
3. Enhancing the competitiveness of SME's
4. Supporting the shift towards a low carbon economy in all sectors
5. Developing Inclusive Labour Markets
6. Supporting Skills for Growth

NIC Report into the Cambridge – Milton Keynes – Oxford Growth Corridor

The National Infrastructure Commission (NIC) was established to advise on the long term and nationally significant infrastructure needs of the UK. The NICs 2017 report (and subsequent other calls for evidence and plans) highlight the national importance of the Cambridge : Milton Keynes : Oxford Growth Corridor for its knowledge economies and the strong potential for future growth.

Buckinghamshire, being located on the Oxford to Milton Keynes arm of the corridor, has an important role to play in the development of the corridor. The 2017 report highlights the importance of housing and infrastructure in delivering the growth along this corridor, of which energy infrastructure is part of.

Buckinghamshire Air Quality Management Group

Air quality is increasingly being recognised as an important factor in overall health and approximately one in twenty deaths in Buckinghamshire are attributed to poor air quality[3]. Whilst public health and transport (the source of many air pollutants) are County responsibilities, monitoring and acting on air quality is a District responsibility.

In May 2018 the County and District Councils jointly held an Air Quality Conference with a range of stakeholders to increase awareness of the local and national picture, to identify good practices across the county and to kick start discussions on exploring ways for more joined up working to maximise the health benefits for residents. The Buckinghamshire Air Quality Management Group (formed of the Councils in the area) will be taking forward a range of actions following the event to help improve air quality in the County.

Current Buckinghamshire Energy Strategy

The current Buckinghamshire Energy Strategy[4] was written by the County Council in collaboration with the 4 District Councils (Aylesbury Vale, Chiltern, South Bucks and Wycombe) and the Local Nature Partnership (Bucks & Milton Keynes Natural Environment Partnership) in 2014 and 2015.

The Strategy had four areas of focus with the broad objectives of:

- **Generation**: Increasing generation which benefits local communities
- **Efficiency**: Improving the energy efficiency of public, commercial, residential and community buildings
- **Community Energy**: Ensuring communities influence and benefit from projects.
- **Business**: Growing the local green economy

In particular the community energy sector and role of communities in energy developments was an important theme running through the strategy. At the time, the number community energy groups was growing and the number of scale of energy projects they were delivered was increasing. In general, the community energy sector was built upon generous renewable energy subsidies which allowed them to derive a significant income from funding and delivering renewable energy schemes.

[3] https://www.buckscc.gov.uk/news/air-quality-conference/

[4] Available from https://www.buckscc.gov.uk/media/4509563/buckinghamshire-energy-strategy-july-15-final.pdf

As a result, when the Feed-in Tariff was significantly reduced in February 2016, many community energy groups found that their funding model had been nearly totally removed. The level of activity of community energy groups has therefore dropped significantly with closures also occurring.

This has left one of the core themes of the previous strategy largely undeliverable in Buckinghamshire and the need for an updated approach necessary.

South East Midlands Energy Strategy

The geographic coverage of South East Midlands Local Enterprise Partnership (SEMLEP) overlaps with BTVLEP's area, with Aylesbury Vale District within both boundaries. The energy challenges and opportunities in this area are therefore covered by two LEPS and two strategies. In order to avoid unnecessary duplication and ensure coordinated solutions are proposed, there has been close collaboration between BTVLEP and SEMLEP in the development of the respective Energy Strategies.

Buckinghamshire Today: Setting the Baseline

In this section we look at the current situation in Buckinghamshire to understand the key characteristics of our energy consumption, carbon emissions and how our industrial make up is reflected in these.

A range of comparisons are made including to National, English and South Eastern regional averages as well as some boarding and comparable local authority areas. Other measures are compared over time to show how characteristics are changing within Buckinghamshire depending on the datasets available.

Buckinghamshire's Economy

Buckinghamshire is a prosperous county with an economy worth around £15.5bn in Gross Value Added (GVA) in 2016/17. Its economy performs above average on a wide range of measures including its economic output at £55,000 per head, 12% above UK average, higher rates of economic activity (84% compared to 78% for the UK) and a high proportion of well-paid directors, senior managers and professionals (57% in relative to 45% for the UK).

There are approximately 281,000 workforce jobs in Buckinghamshire County Council with 68,600 (24%) in Professional & Other Private Services, 65,400 (23%) in Public Services and 50,700 (18%) in Wholesale & Retail. Buckinghamshire has a high proportion of micro-enterprises (those employing fewer than 10 employees) with 91% being in this category, compared to 89% nationally. This is reflected in the relatively high business density in Buckinghamshire with 602 active enterprises for every 10,000 residents compared to 410 in the UK.

Energy Consumption

Non-Domestic Electricity & Gas

Energy consumption statistics are compiled with a simple breakdown between domestic and non-domestic customers. This is due to the way energy suppliers register customers as a result of the different taxes and levies placed on customer types. As a result, a wide range of economic activities are captured in the non-domestic statistics and variations between areas arise partly from the mix of industries present in an area. It should also be noted that these statistics are compiled on a 'per meter' basis and reflect the average consumption at each meter and do not indicate total emissions in an area.

As per Figures 2 and 3, Buckinghamshire has below average non-domestic energy consumption for both electricity and gas, however this is notably more pronounced with gas consumption. The relatively low consumption of Buckinghamshire when compared to both other authorities in the region and the national averages may reflect the higher density of small businesses. This tendency for a larger number of smaller businesses would be expected to keep average consumption statistics lower than a smaller number of large businesses would.

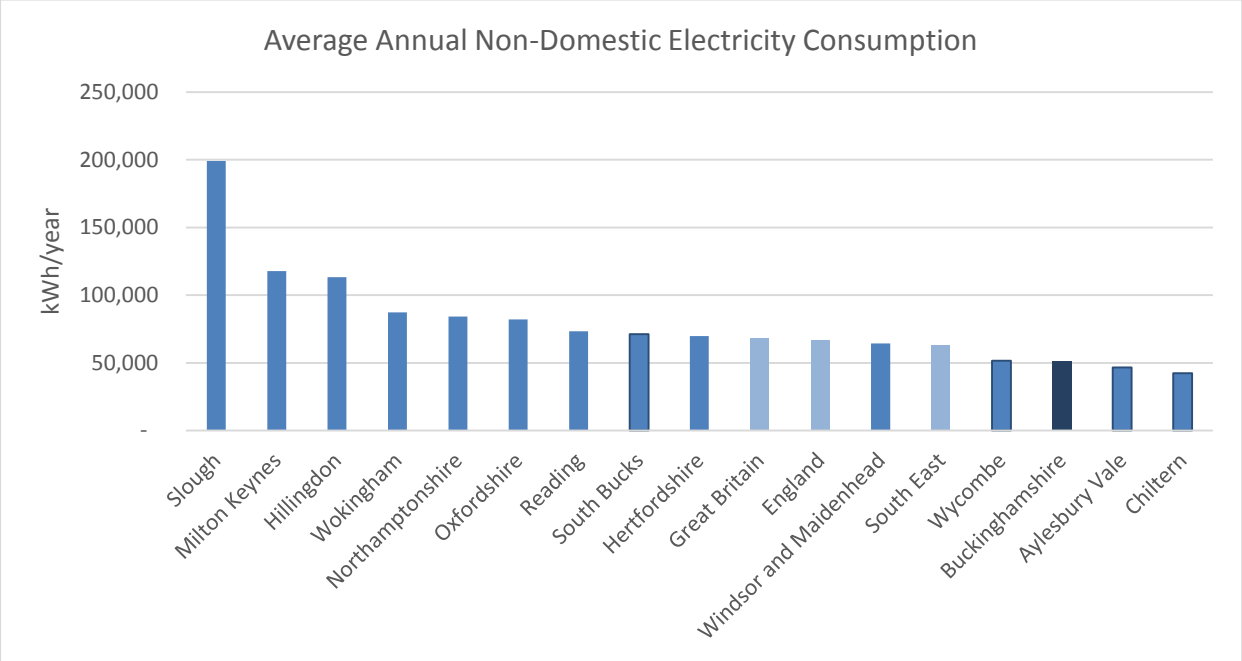

Figure 2: Non-Domestic electricity consumption comparison

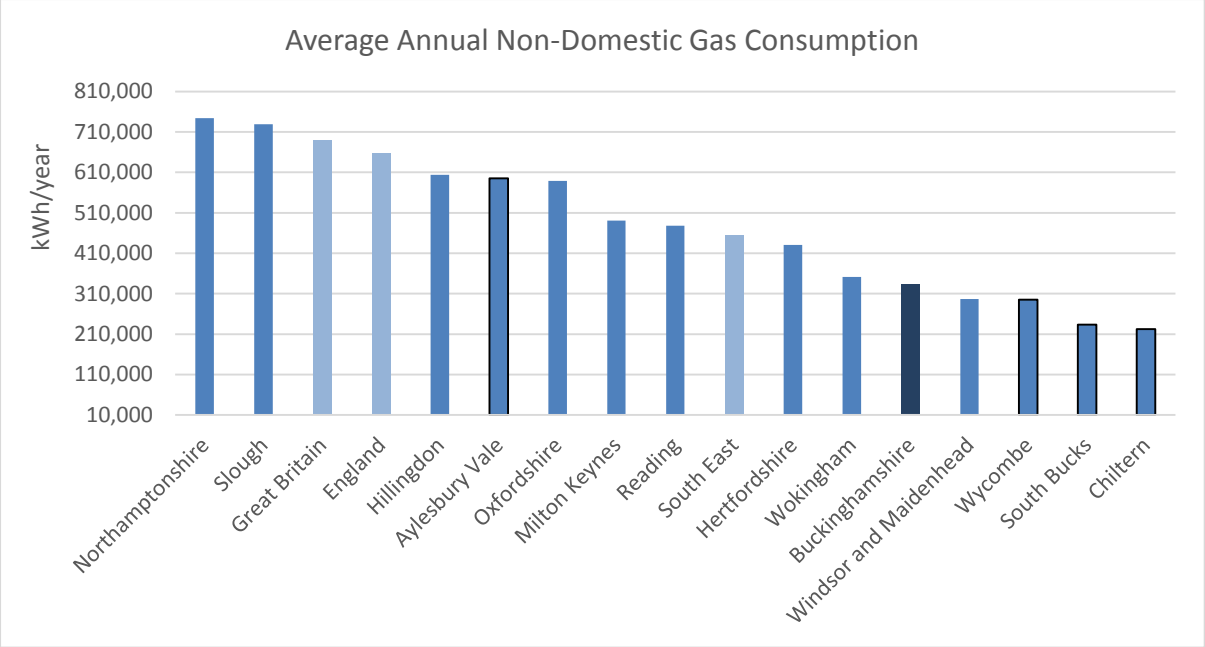

Figure 3: Non-Domestic gas consumption comparison

Domestic Electricity & Gas

Domesestic energy consumption is driven by a several factors of which average energy efficiency is important along with average size (number of bedrooms) and the fuels availkable in an area. Off gas grid areas will likely show much higher electricity consumption as it is being used for heating as well as lighting etc.

In a reversal of the non-domestic trends, Buckinghamshire shows high average domestic energy consumption for both electricity and gas, as shown in figures 4 and 5 below. Whilst all District areas have off gas grid properites (see page 28), South Bucks is relativly well served and still shows high electricity consumption compared to both the rest of Buckinghamshire and other authorities and the regional and national average. Many off gas grid homes will use heating oil for heating purposes and so whilst cuation is required in interpreting the electricity consumption statistics.

Gas consumption statistics are more comparable across regions as, by definition, these only capture homes where gas is available and so do not get affected by differing fuel uses. As with electricity, South Bucks and Chiltern disticts show significantly higher average consumptions – these are the two highest gas consuming areas in England and Wales. This is likely to be partly down to these areas having larger than average homes (3.2 bedrooms per home compared to 2.7 nationally). However such a significant variation from the national average may suggest that lower levels of efficiency are also present.

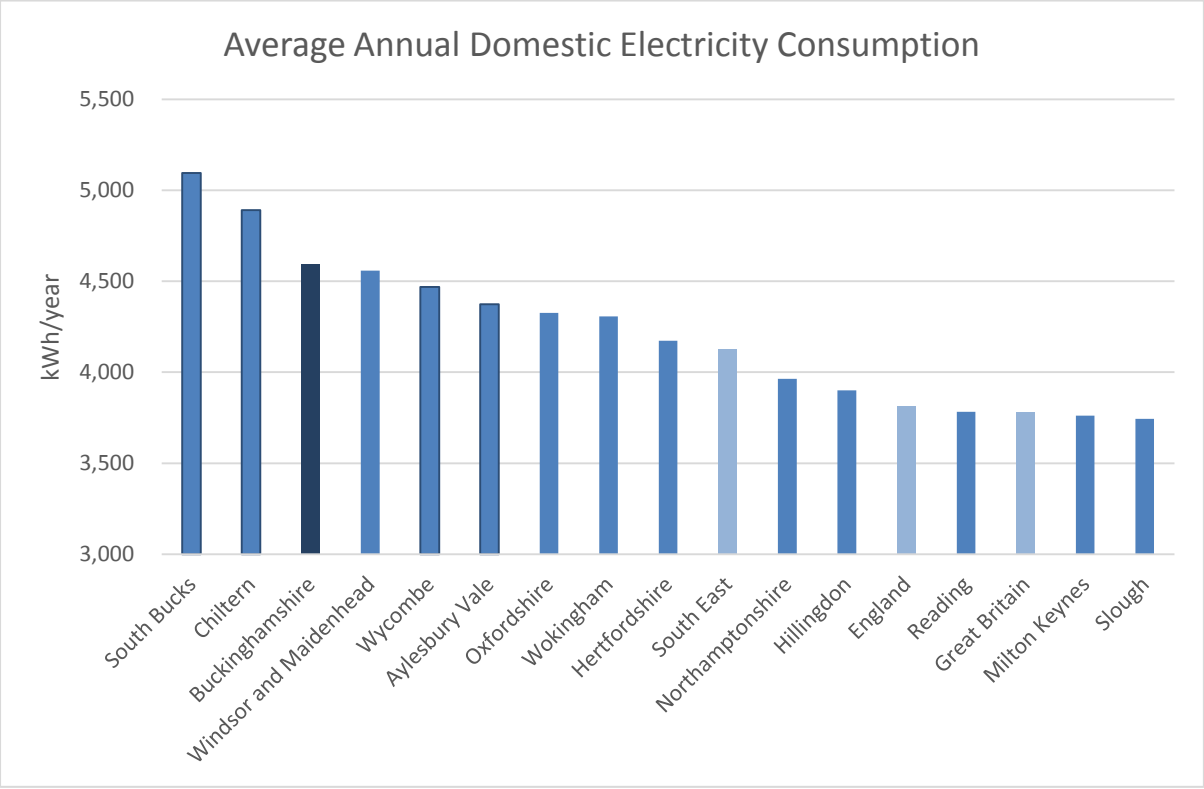

Figure 4: Domestic electricity consumption comparison

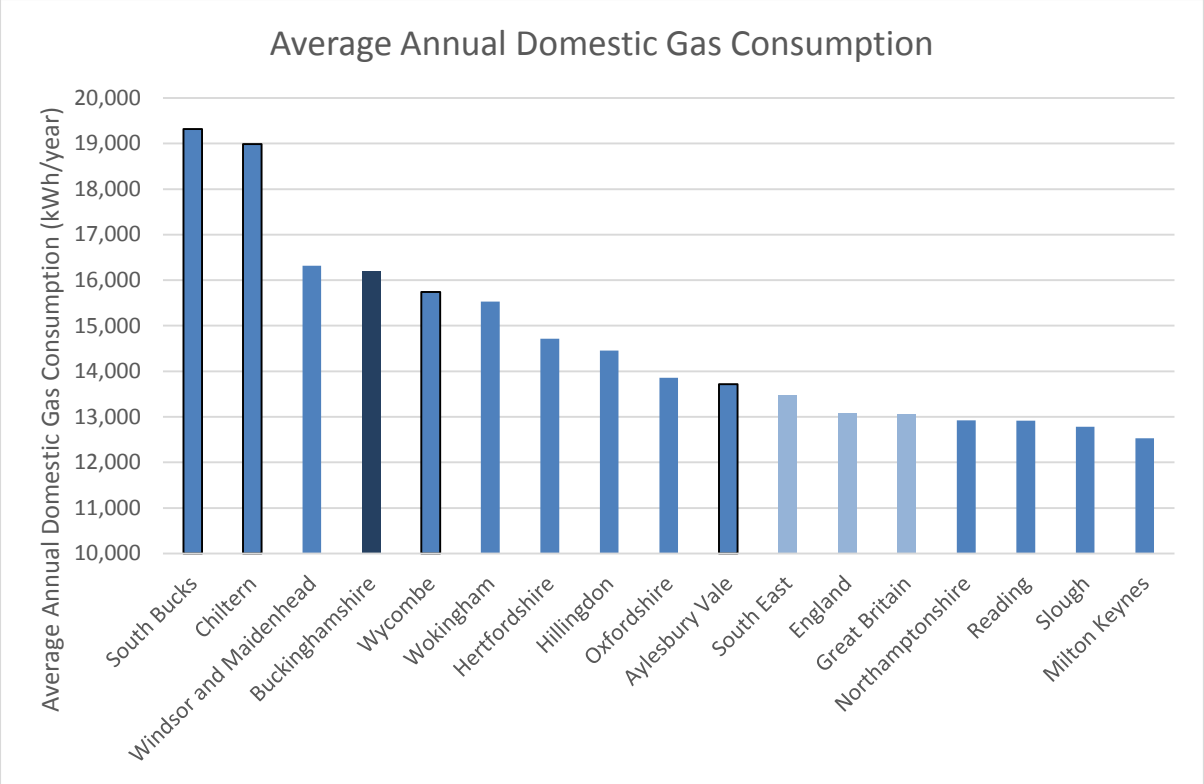

Figure 5: Domestic gas consumption comparison

Carbon Emissions

Total Emissions

Buckinghamshire emitted over 3,100 kilotonnes, or 3.1 million tonnes, of carbon in 2015. This is a notable reduction on the 4 million tonnes emitted in 2005, largely due to reduction in domestic and non-domestic building emissions. Transport emissions are the largest source and despite some reductions over the 10 years shown in Figure 6 have remained relatively stable.

The per capita emissions of Buckinghamshire have also declined over time but remain close to the England and UK average – Buckinghamshire with 6, UK at 5.9 and England at 5.6 tonnes per person per year.

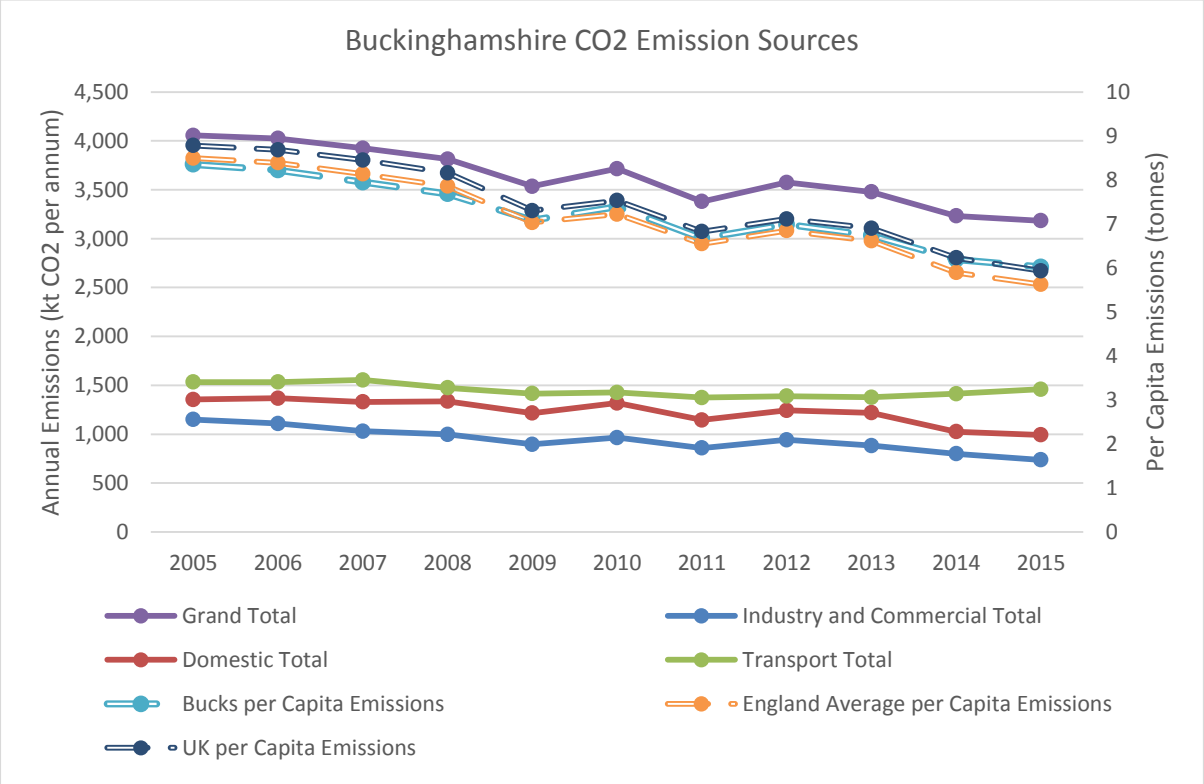

Figure 6 - Carbon Emissions by sector

Industrial & Commercial Emissions

The decline in Industrial and Commercial emissions shown in Figure 6 has driven by the reduction in emissions from electricity consumption as per Figure 7 below. Emissions from electricity have reduced by over a third in the 10 years shown which is likely to be driven by improvements in efficiency or potentially industrial make up (e.g. from a shift away from electricity intensive industries). Despite this significant reduction, commercial and industrial electricity usage remains the most dominant source of carbon emissions in this sector.

LULUCF stands for Land Use, Land Use Change and Forestry and is broadly the emissions which arise from impacts on soils and land from agriculture and other primary industries after taking into account any carbon absorbed in growing crops.

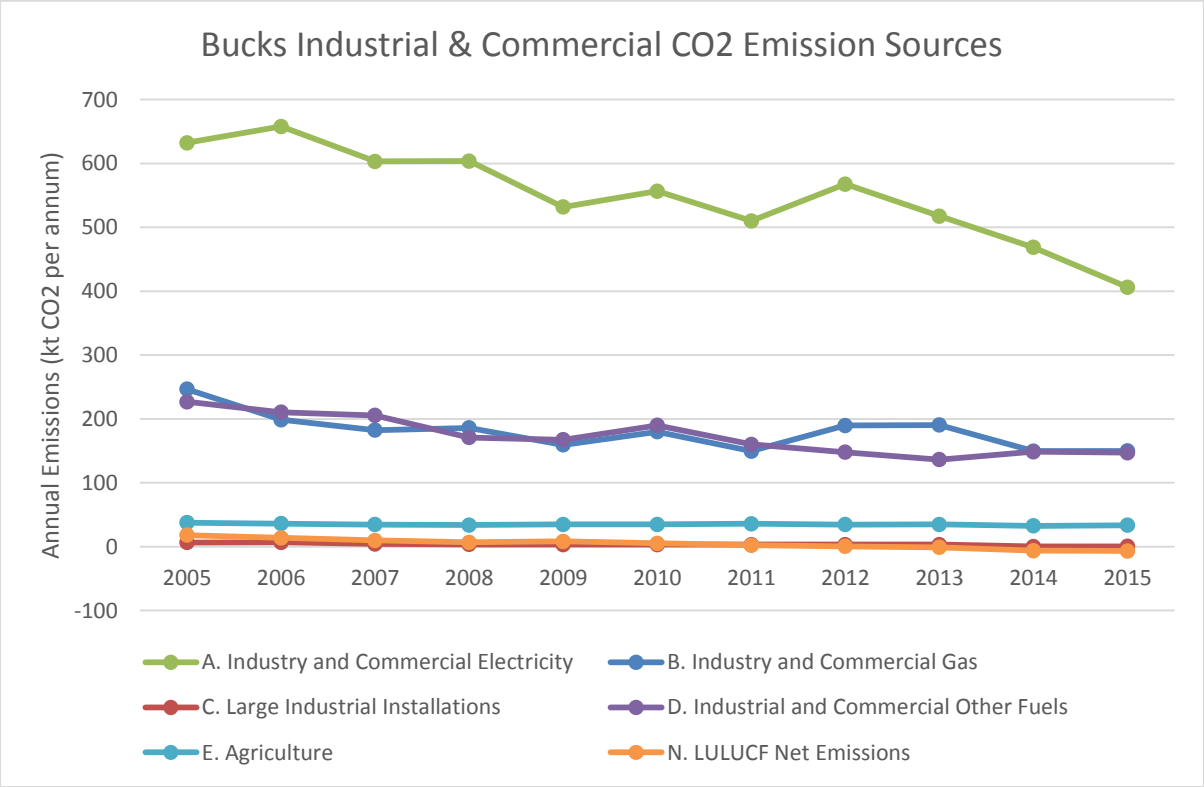

Figure 7 - Industrial and commercial carbon emissions sources

Domestic

Domestic emissions are predominantly from gas consumption which show a general tend downwards overtime albeit with notable year to year variation, as per Figure 8 below. This annual fluctuation is determined by the number of heating degree days in a year (i.e. how cold each winter is) which does vary considerably year to year. The overall trend downwards suggests that improvements in home energy efficiency are being achieved.

Emissions from electricity have broadly declined over time, in particular the final three years of the available data. This may be driven by increasing efficiency of electrical equipment in homes which is sufficient to more than offset the increase in consumption as a result of a growing population.

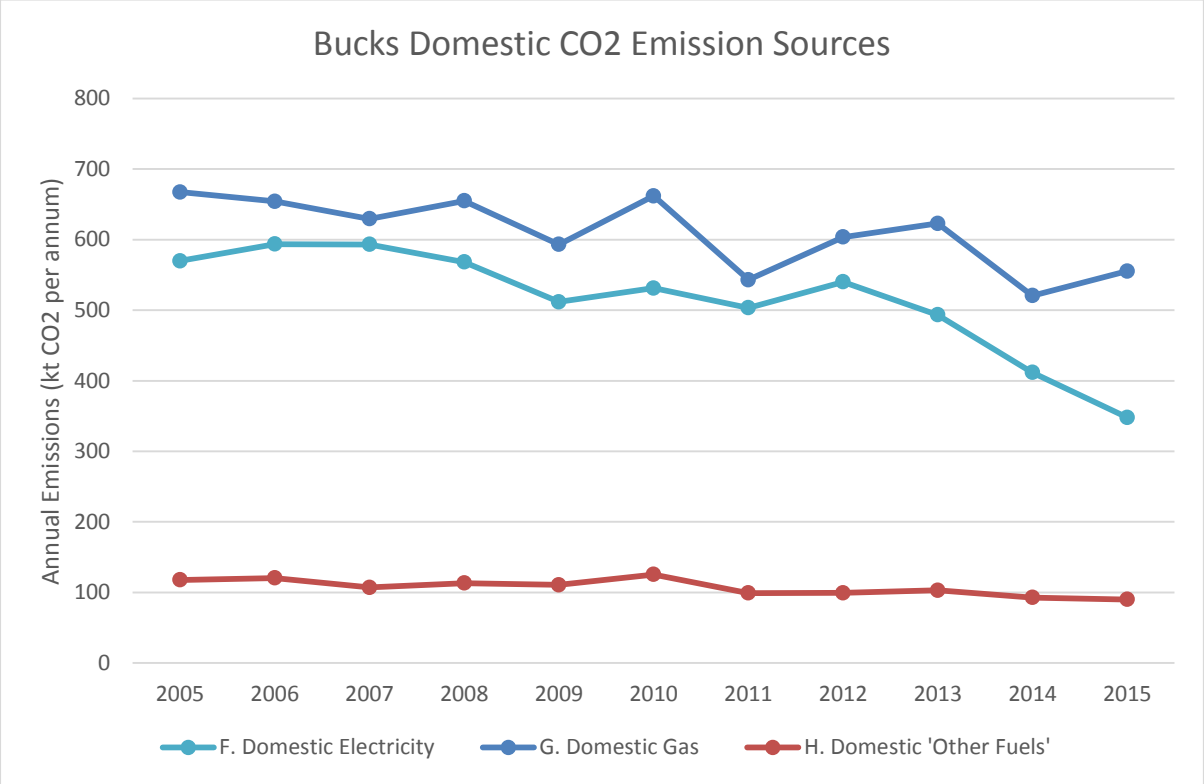

Figure 8 - Domestic Carbon Emissions Sources

Electricity Emissions Factor

As shown in in Figure 9, the amount of carbon emitted from UK electricity has started a notable decline from 2015 onwards but fluctuated within a narrow band before this time. For the years in which electricity emissions declined in Figures 7 and 8, there was no comparable decline in UK electricity emission factors. The decline show is therefore due to another cause and not the decline in grid electricity emission intensity.

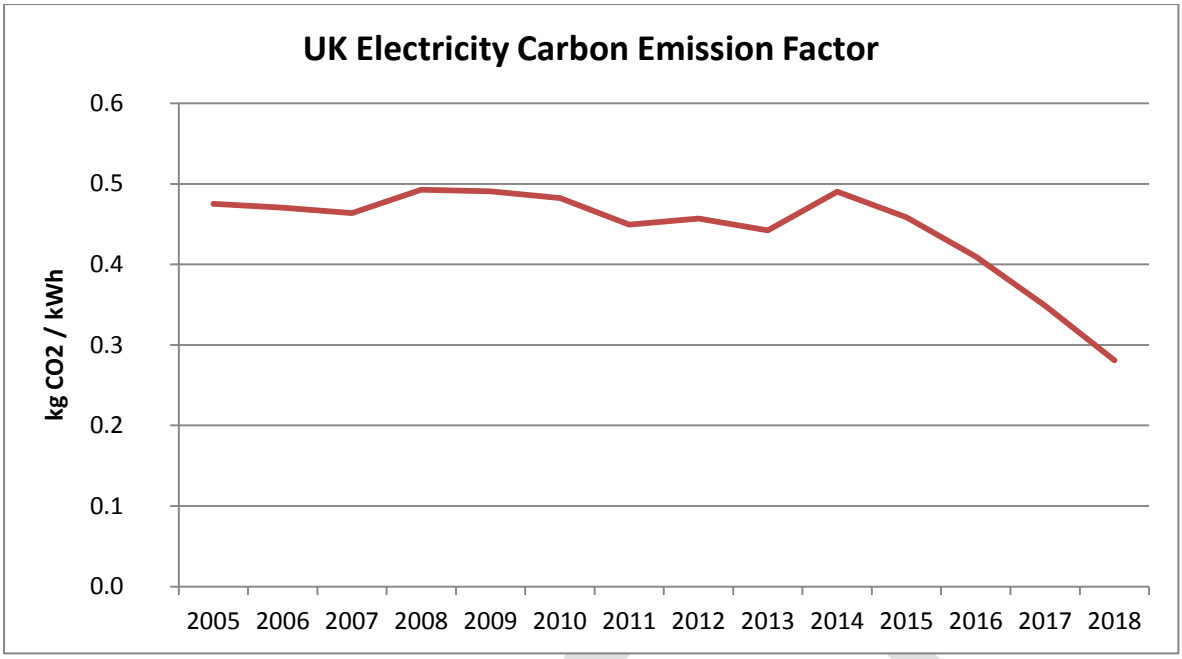

Figure 9: UK Electricity Carbon Emission Factor

Transport

Whereas domestic and non-domestic carbon emissions are compiled using a variety of specifically located meter data, allocating transport emissions to a geographic area requires a greater level of modelling. Transport emissions data relies on traffic flow data from a range of monitoring points, combined with average emission factors for vehicles and modelled average speeds for the type of area being travelled through (e.g. urban or rural). As a result these figures should not be taken to be a record of actual emissions in county but rather an indication of the relationship between different sources of emissions.

Figure 10 below shows that it is the motorways within where the most emissions arise. The breakdown of this data (Figure 11) shows that it is motorway emissions within South Bucks, which captures both the M40 and M25, where over 60% of motorway emissions arise.

There had been a small but relatively consistent trend from 2007 onwards for transport emissions on A and minor roads to decline, however these appears to be reversing from 2013 onwards. Due to the lag time in the data being compiled, it is not possible to see if this trend has continued from 2016 onwards at this time.

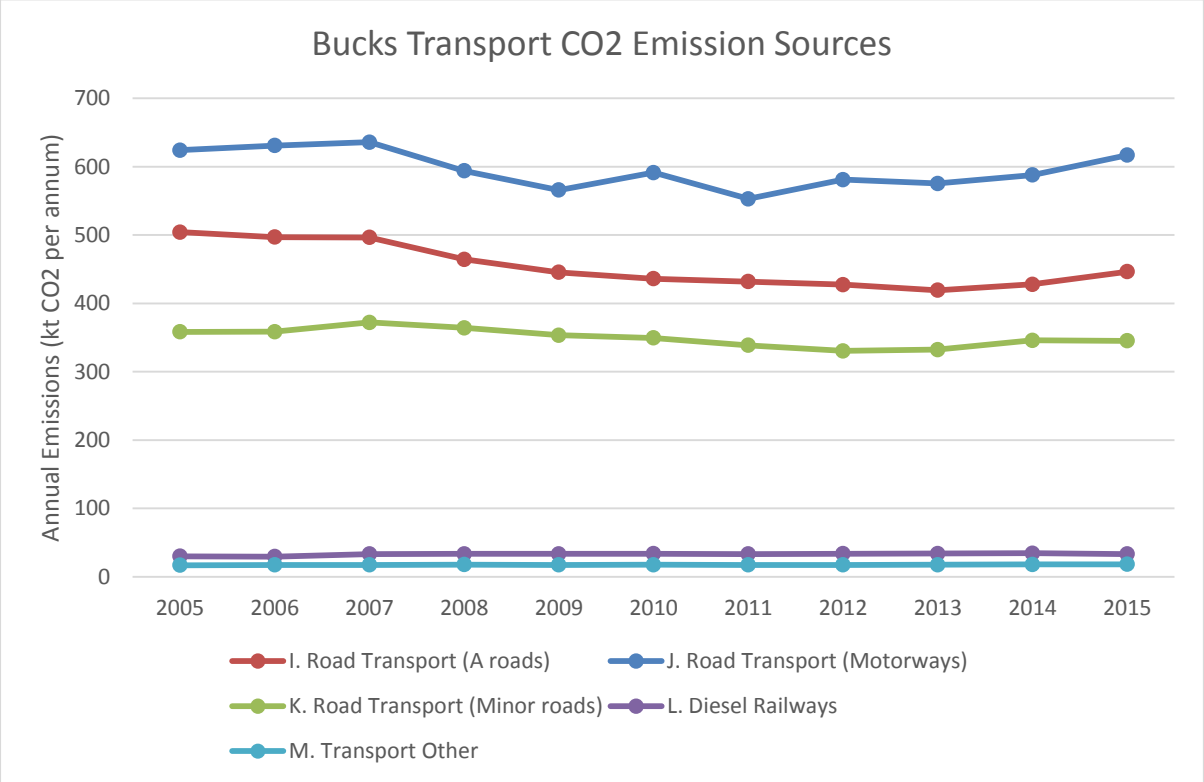

Figure 10 - Transport Carbon Emission Sources

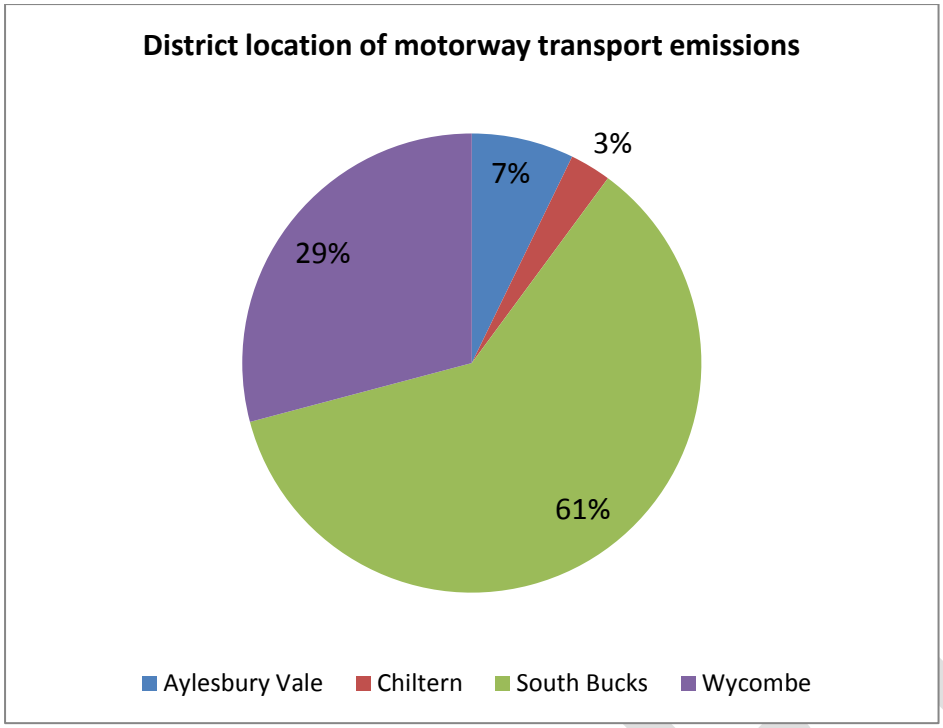

Figure 11 - District location of motorway emissions sources

Renewable Energy Generation

BEIS produce statistics on renewable generation by Local Authority area, using data from a range of renewable energy schemes to compile this – for example Feed-in Tariff (FiT) submissions and Renewable Obligation (RO) certificates amongst others. The most recent complete data set is from 2016. This captures the vast majority of local renewable electricity generation, but is not a perfect measure as anything not registered on such a scheme would be omitted.

The Greatmoor Energy from Waste (EfW) facility is located near Calvert, Buckinghamshire, which the County Council completed commissioning of in 2016. In 2018 the facility received its REGO (Renewable Energy Guarantee of Origin) certification, certifying its electricity generation as renewable. Due to the time lag in statistics its generation was not included in the 2016 data. However due to the significance of its output, we have incorporated its data for completeness.

The data included below is from its first full 12 month operational period which was the 2016/17 financial year. Other data is reported on a calendar year. So whilst there is some misalignment of data, the below figures help to illustrate the scale of the EfW's contribution to local renewable generation as per Figure 12.

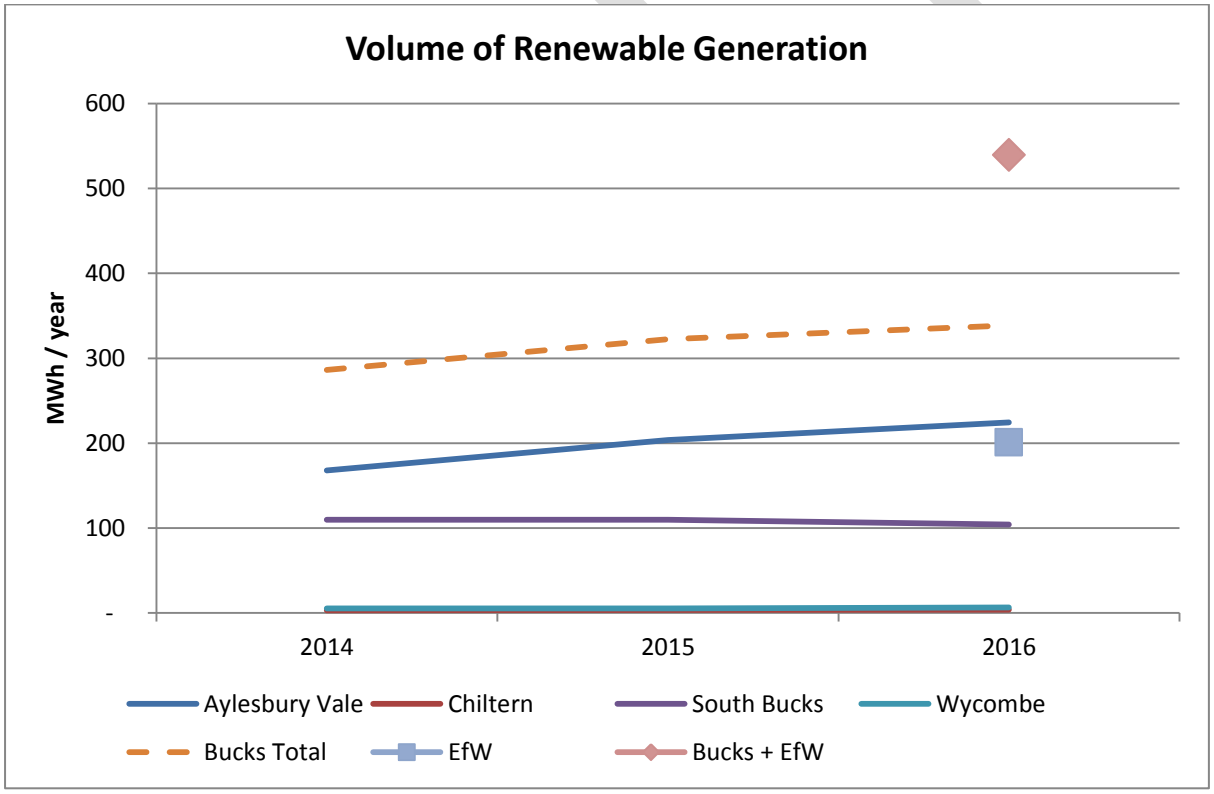

Figure 12 - Volume of Renewable generation over time

The 2009 Renewable Energy Directive set the UK a target of sourcing 30% of its electricity from renewable sources by 2020. The UK is largely on track to achieve this electricity target although there is some annual variation in volumes produced. Using local renewable generation data with information on the volume of electricity consumed within Buckinghamshire, we can see how the local picture reflects the national

Figure 13 shows the most recent 3 years for which data is available and again we have added in the EfW data for completeness (it was not part of original dataset). Without the EfW, around 17% of

Buckinghamshire's electricity demand could be met by local renewables – however the EfW raises this figure to 27%. The other lines shows how this figure would look on a District level basis, with Aylesbury (without the EfW included) and South Bucks producing enough to meet 35% and 30% of local demand respectively. Chiltern and Wycombe Districts have far lower levels of renewable generation.

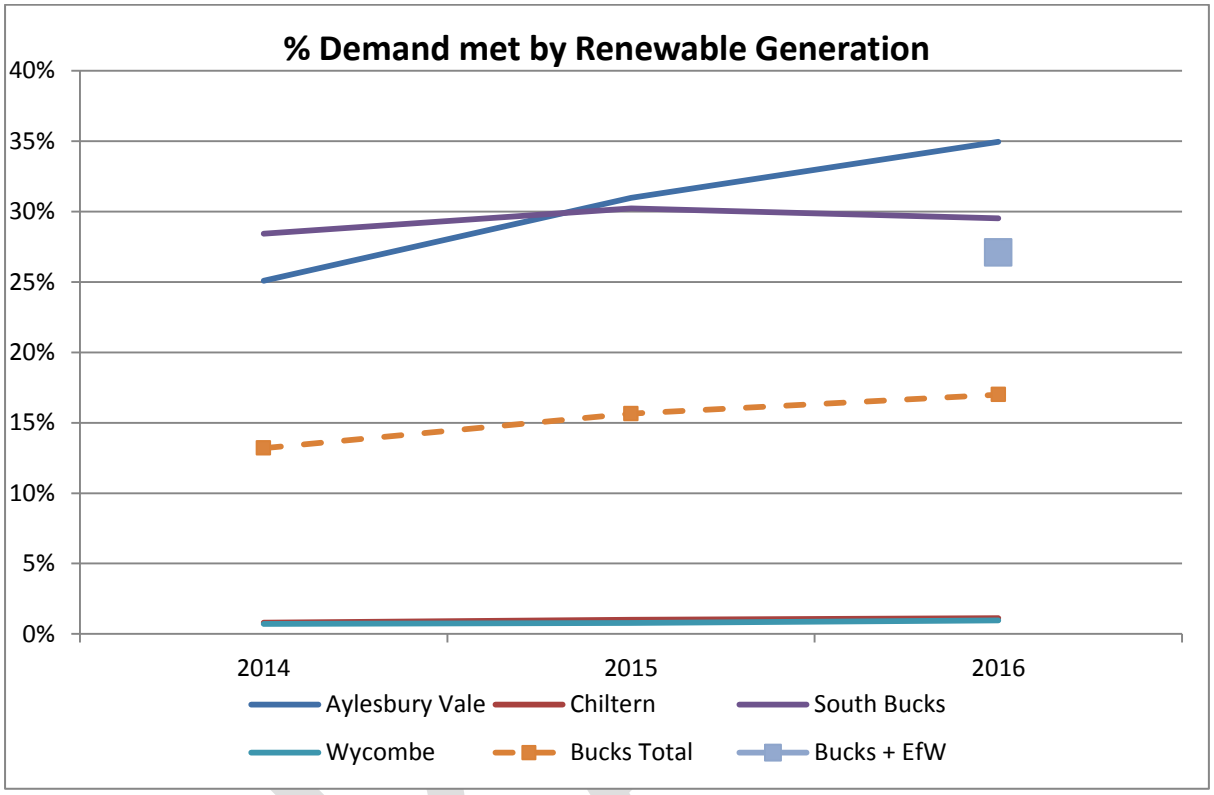

Figure 13 - Local electricity demand met by renewable generation

Figure 14 shows the technology sources which make up the overall renewable energy mix in Buckinghamshire. Landfill gas, produced from the decomposition of material in closed landfills, is the largest source though this would be expected to decline over time as landfill gas production levels fall. Solar Photo-voltaic (PV) now contributes 16% and is expected to increase as the price of solar continues to fall, electricity prices rise and take up increases.

Solar Noise Barriers

The noise pollution created by the M40 motorway, which travels much of the length of Buckinghamshire, has been the focus of a campaign by a local community campaigning group, the M40 Chiltern Environment Group (M40CEG). Whilst addressing noise pollution is their focus, the opportunity to generate renewable electricity by incorporating solar panels in the noise barriers was a key feature in the proposed solution. Whilst increasing the initial cost, this would also provide the opportunity to either power aspects of the motorways infrastructure or sell the power to suppliers via the grid.

Highways England experienced challenges in connecting the installations to the electricity grid in order to export the electricity generated. With only lighting as the electricity demand on these stretches, the solar element of the proposal was removed.

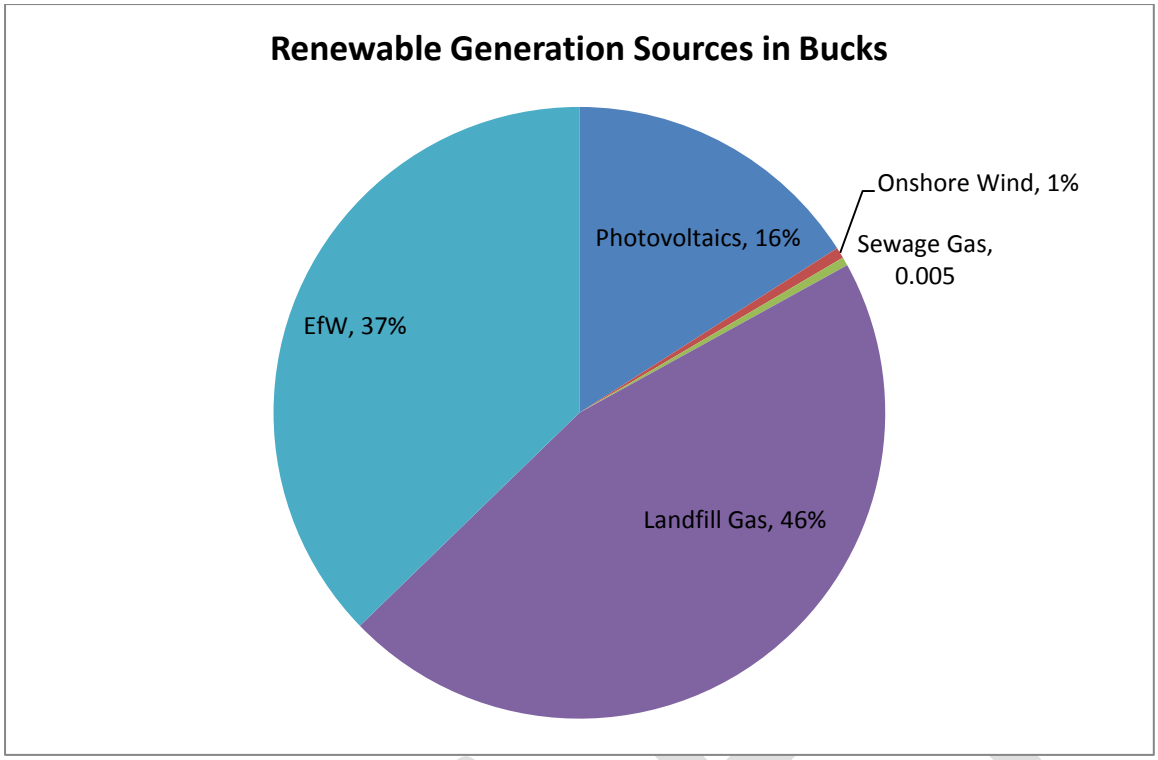

Figure 14 - Sources of Renewable Electricity Generation in Buckinghamshire

Greatmoor Energy from Waste (EfW) Facility

In 2016, the commissioning of the Greatmoor EfW facility was completed. The facility receives 300,000 tonnes of residual waste from across Buckinghamshire and other authorities in the south east of England. With a typical output of 26MW, the facility generates over 200,000 MWh of electricity a year. This is sufficient to power ~ 40,000 homes, or nearly 1 in 5 of the homes in Buckinghamshire.

Energy Efficiency

Energy efficiency ratings for buildings are reported via the A-G ratings shown on Energy Performance Certificates (EPC); A being the most efficient and G the least. The rating of A+ is now available for non-domestic buildings which demonstrate carbon positive performance - that is to say they can show they gone beyond being 'carbon neutral' and lead to a wider carbon emission reduction.

As a standardised approach across the UK, this provides very good comparator data. However as EPCs are valid for 10 years the data incorporates both recent and older survey findings. It is however still the most reliable method of comparing energy efficiency across a range of different building types.

Figure 15 and 16 below show the distributions of EPC ratings for domestic and non-domestic properties in Buckinghamshire and England and Wales. Whilst there are some variations these are relatively small – Buckinghamshire has slightly higher proportion of A to C rated properties that England and Wales but only by 5%. For non-domestic properties the difference in A+ to C ratings between Buckinghamshire and England is only 1%, in favour of England.

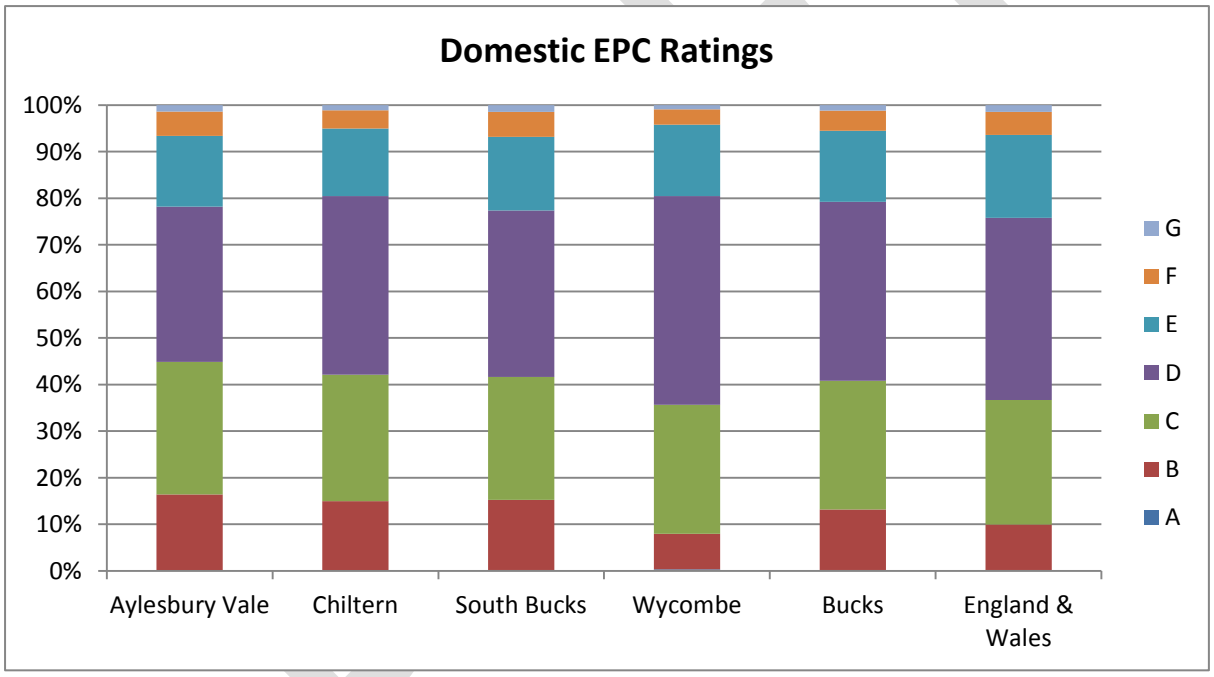

Figure 15 - Domestic Energy Efficiency Ratings

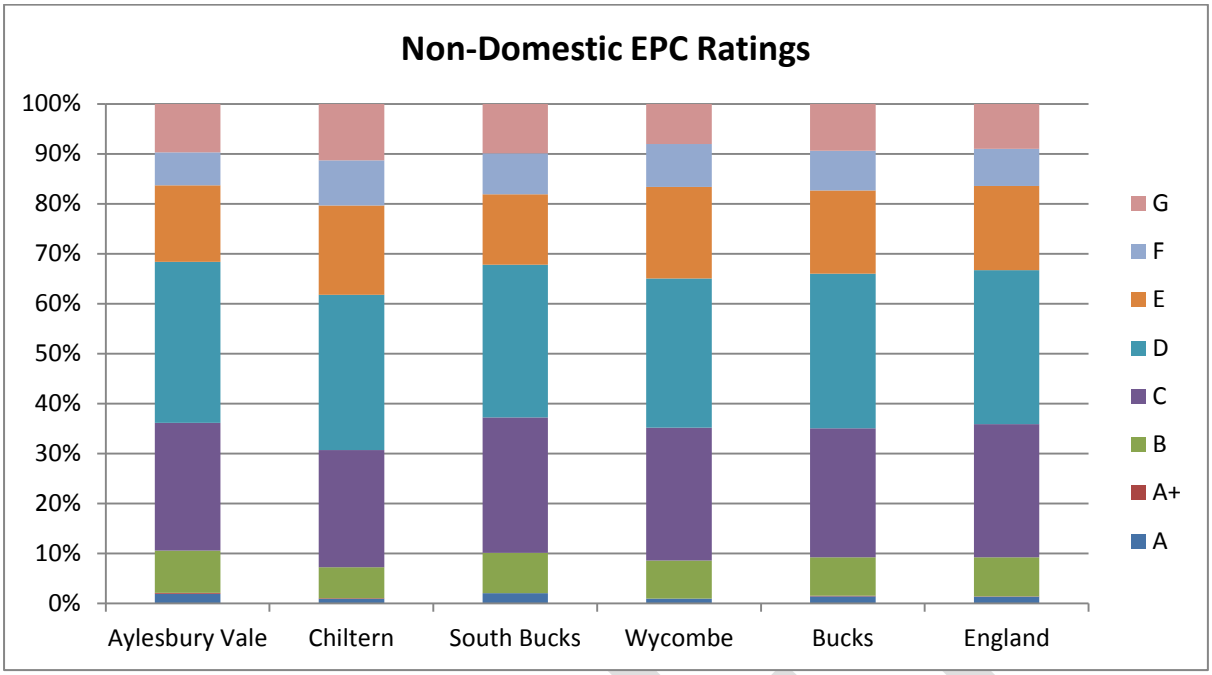

Figure 16 - Non-domestic Energy Efficiency Ratings

Minimum Energy Efficiency Standards (MEES)

The Minimum Energy Efficiency Standard (MEES) regulations, introduced 1 April 2018, place a requirement on landlords to ensure that properties subject to a new lease achieve an EPC rating of E or above. This requirement will be extended to cover existing leases for all domestic properties from 2020 and all non-domestic from 2023.

Certain derogations from this requirement may be available for protected properties such as listed buildings or those in conservation areas where energy efficiency improvements may alter its character or appearance.

Infrastructure

Electricity Grid

In the UK there are two operational parts of the electricity grid:

1. **Transmission Network**: high voltage network which receives electricity from large generators and moves this power across the country; in England this is operated by a single company: National Grid.
2. **Distribution Network:** lower voltage networks which receive electricity from the Transmission Network, and deliver this to individual consumers. An increasing volume of generation is also connected to the Distribution Network, such as solar farms and Energy from Waste facilities.

Buckinghamshire is in the unusual position of being served by three different Distribution Network Operators (DNOs).Figure 6 below shows the regions served by the DNOs in the UK and Ireland with Buckinghamshire served by Wester Power Distribution (WPD – 7), UK Power Networks (UKPN – 8) and Scottish and Southern Electricity Networks (SSE – 9).

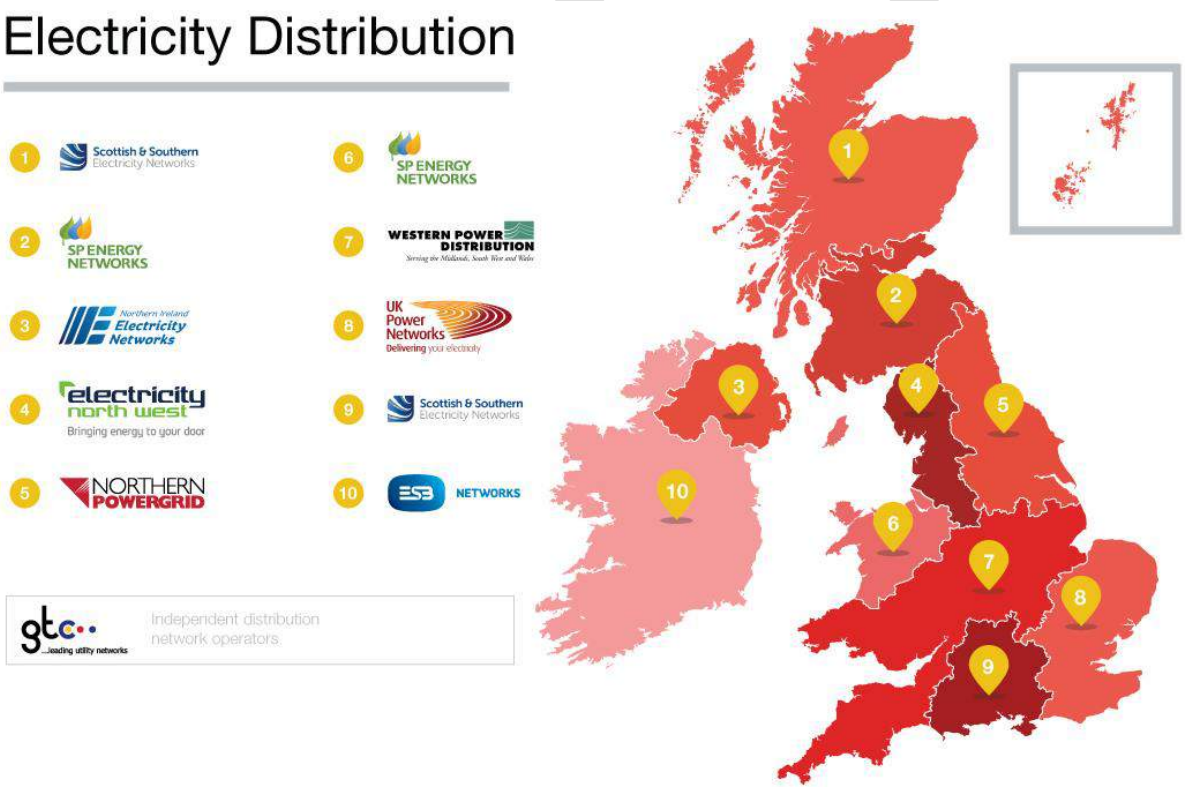

Figure 17: Electricity Distribution Network Operator Map (Energy Networks Association[5])

Further mapping information on the grid operator's regions of supply and level of capacity in available on pages 33 – 37.

[5] Retrieved 29 June 2018 http://www.energynetworks.org/info/faqs/electricity-distribution-map.html

Gas Grid

Whilst the electricity network serves all of Buckinghamshire, there are many areas which are not connected to the gas network as shown by Figure 18 below. In particular, the rural areas between Aylesbury and Buckingham have areas with high proportions of properties off the network. In the south of the County, it is the areas to the west of Marlow with the highest proportion of homes off gas. Overall it is Aylesbury Vale which has the highest proportion and overall number of properties not connected to the gas as detailed in the table.

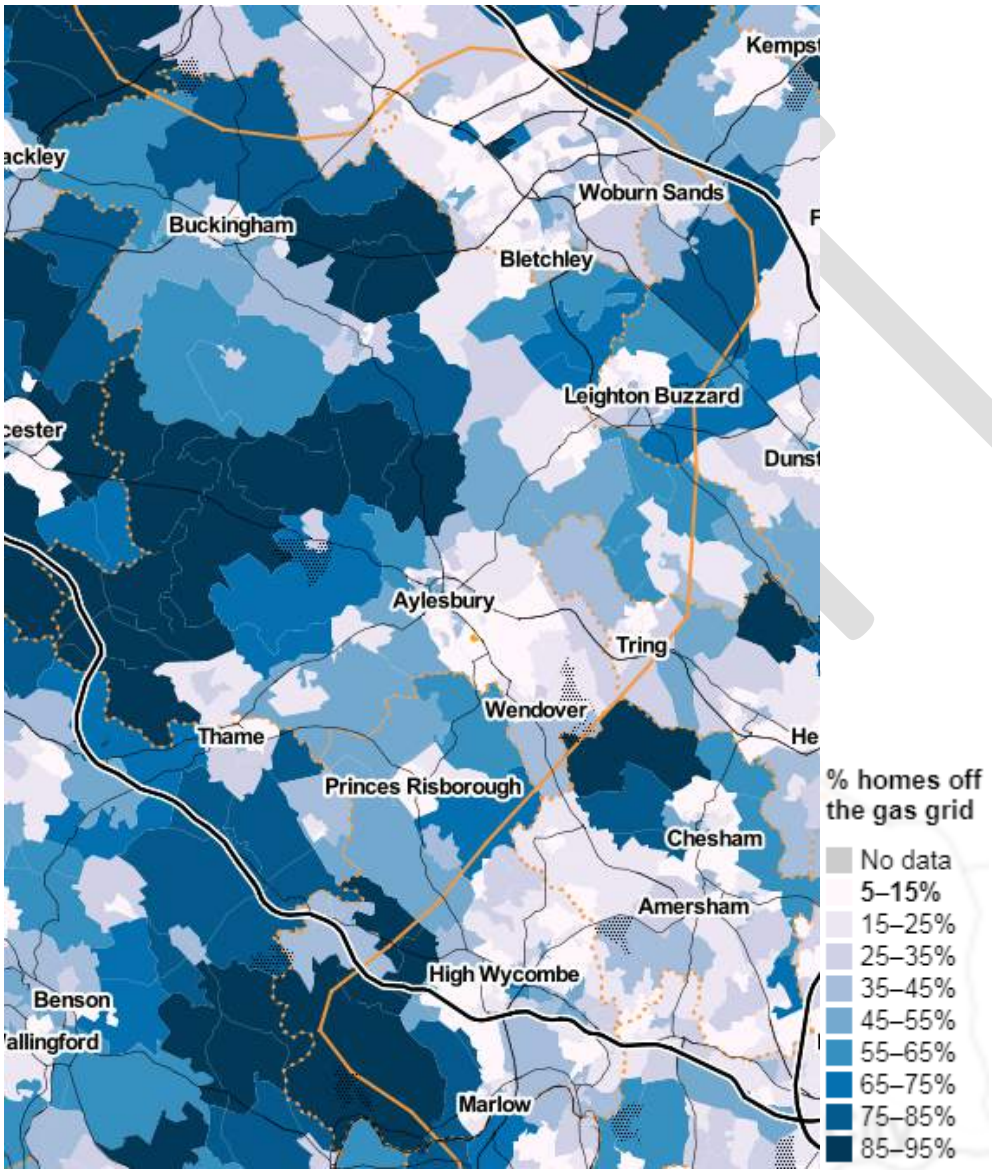

Figure 18: Map showing % of properties no connected to the gas network (https://www.nongasmap.org.uk)

District	Number of Properties	% Off Gas	Number Off Gas	National Ranking (out of 378)
Aylesbury Vale District	82246	37%	30513	98
Wycombe District	73076	29%	21411	157
Chiltern District	40124	25%	9871	215
South Bucks District	29237	24%	7017	225
Bucks Total	224683	31%	68812	N/A

Data retrieved from: https://www.nongasmap.org.uk/

There is also some variation in the main fuel type used in off gas grid homes by District as showing in Figure 19. Aylesbury Vale has a greater proportion using oil (39%) whereas electric heating is the predominant approach in the remaining three Districts, in particular Wycombe where it accounts for 44%. Overall electric heating is the most commonly used in off-gas homes (36%) with oil accounting for 31%.

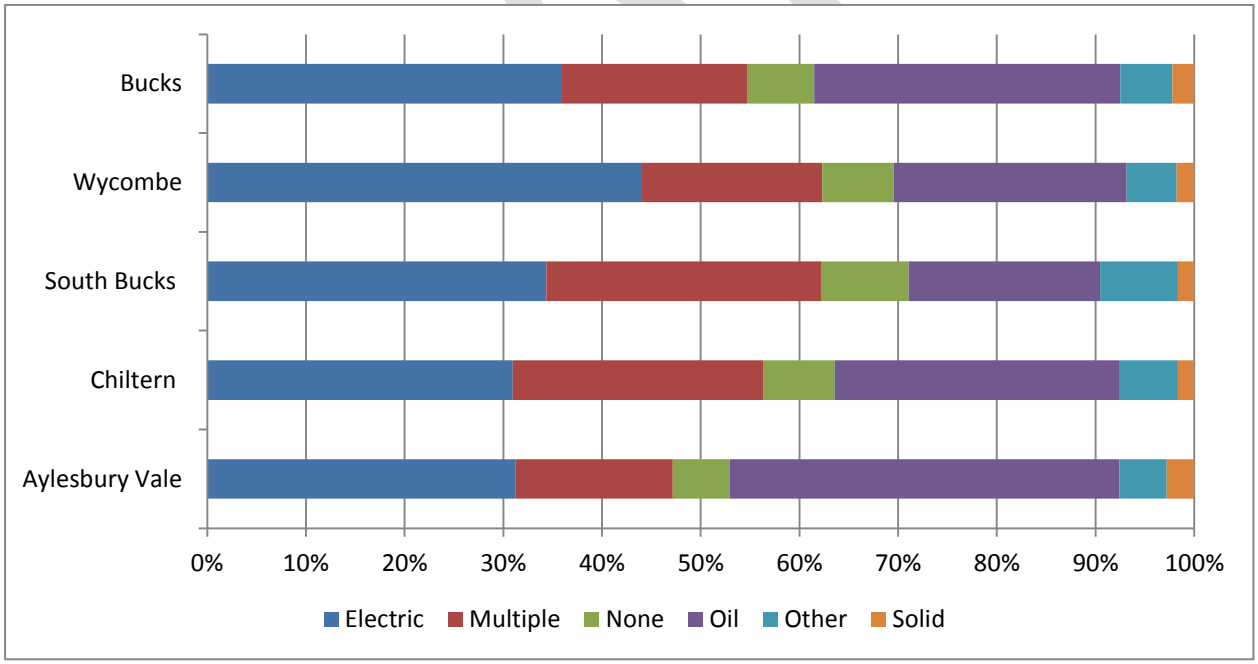

Figure 19: Main heating fuels for off-gas grid homes

Heat Networks

A heat network, also known as district heating, is made up of a network of insulated pipes which deliver hot water from a central point of generation to customers. These networks can vary in size, from a few buildings to large parts of a town or city.

Heat networks can be more efficient than individual building having their own heat generation equipment and so can provide lower cost heating and carbon savings. However the network of insulated pipes is costly to install and maintain and so heat networks are most appropriate where there is a high heat density (i.e. a high level of heat demand in a small geographic area). Heat networks are therefore most commonly found in cities where the concentration of tall buildings is sufficient to provide the required density.

Electric Vehicle Infrastructure

The Government has announced that there will be a ban on the sale of new conventional (i.e. petrol and diesel) cars from 2040, with electric vehicles and different forms of hybrid-electric vehicles taking their places. This will bring with it a range of benefits including improvements to local air quality and reductions in the carbon emissions from transport (assuming the grid continues to decarbonise).

Electric vehicles continue to become more advanced and accepted as reliable forms of transport; however they require new charging infrastructure to be available in order to remove barriers to greater uptake.

There is currently a range of views on the charging habits of the future however there are three emerging location categories in which the charging habits are similar.

- **Home**: For both on and off-street parking where customers will leave the vehicle for long periods of time and overnight, allowing for long charge times which can be accommodated on slow (or trickle) charging equipment.
- **Destination**: such as workplaces, train stations and hotels where customers are likely to spend several hours, providing sufficient time to either top-up the car or fully charge of a fast or rapid charger.
- **Strategic / Route based**: such as motorway service stations and major A roads. These will need to provide fast charging times as customers are still travelling and charging times of hours are not suitable.

Figure 20 shows the location of EV charging points in Buckinghamshire and neighbouring areas as collated by Open Charge. This includes fully publicly accessible points (such as on street charging points), those which are within private but open car parks (such as train stations) and private charges (such as in company car parks). This does not show private home charging points.

As such the availability of charging infrastructure is varied and whilst here are more around key population centres, there are large areas with little or no infrastructure.

Buckinghamshire County Council, as the highways authority, has now installed the first on-street charging points in Marlow with funding secured for a total of 30 across the County. The EV charging market is quickly evolving with new entrants emerging and so this number is expected to grow quickly.

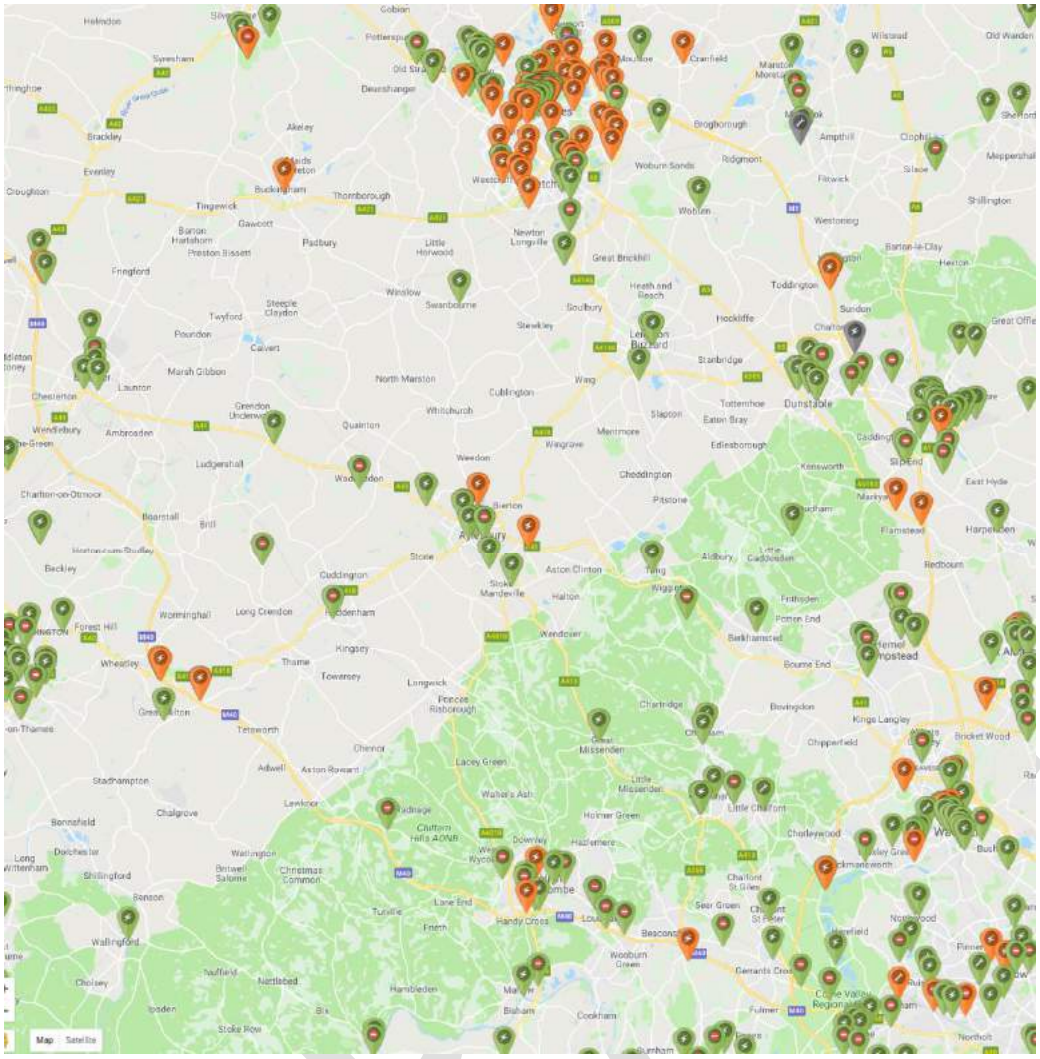

Figure 20 - EV Charging Points in and around Buckinghamshire, data from open charge map: https://map.openchargemap.io /

Electric Bus Routes & Taxis

Buckinghamshire does not currently operate an electric bus routes. Oxford and Milton Keynes are both operating routes and their usage is expected to increase over time as low and potential zero emission zones are introduced in some cities.

There are currently no all-electric taxi services operating in the County although the use of hybrid electric vehicles is common for private hire taxis.

Hydrogen Refuelling

The market for hydrogen fuel cell electric vehicles (FCEV) is much smaller and less developed then the battery or hybrid electric vehicle markets. Proponents of the technology highlight its fast refuelling times and longer ranges than currently offered by battery only electric vehicles which may make these more suitable for certain uses in the future – such as those making longer journeys.

Buckinghamshire does have one of the 15 publicly accessible hydrogen refuelling stations in the UK, located at the motorway service station on the M40 at Beaconsfield.

Wireless Charging Electric Buses in Milton Keynes

Arriva operates an all-electric bus route in Milton Keynes, the first in the UK. In addition to charging overnight, the buses at topped up via wireless inductive charging plates at bus stops and at the start/end of the route. This charging regime allows the buses to have smaller, lighter batteries than would otherwise be required to achieve the 190 miles completed daily. Regularly topping up the batteries also appears to be helping the batteries maintain efficiency and last longer – an important factor in the lifetime operating costs of the bus.

More information at: https://www.milton-keynes.gov.uk/highways-and-transport-hub/bus-and-taxi/bus-projects/electric-bus

Buckinghamshire Forecasts

Buckinghamshire is expecting to grow significantly over the next 25 years. The Local Plans indicate a supply of nearly 50,000 new homes by 2033 – that is on an existing base of just over 200,000 homes today. There will also be a growth in employment sites in order to provide the jobs the larger population will need.

Future carbon emissions are not just influenced by the number of new homes or businesses over a period of time, but by the technologies and energy consuming equipment they use. This is a rapidly evolving picture and increases in the number of energy consuming devices can be offset by improvements in efficiency. For example, the increased use of LED lighting has reduced energy consumption per light fittings due to their greater efficiency. However, the increase in the number of fittings typically used means these savings are smaller than they might otherwise be. Similar relationship can be seen with other equipment such as IT equipment and white goods.

These forecasts are therefore indicative only but help to put the scale of future emissions potential into context.

It is important to note that these forecasts do not take into account the anticipated increase of electric vehicles (EVs). Whilst EVs are a less carbon intensive form of transport compared to conventional petrol or diesel vehicles, their charging habits will influence how electricity consumption and its related emissions are reported. If a significant amount of EV charging takes place at domestic properties, then domestic electricity consumption and emissions will increase, whilst transport fuel consumption and emissions will fall. The electricity to the car will be indistinguishable from that consumed in the home. The same would apply to charging at non-domestic locations and future reporting will need to account for this change.

Future Emissions

Figure 21 shows the previous carbon emissions in Buckinghamshire up to end of 2015 which is the last full year of recorded data – 2016 onwards is projected data. For domestic emissions, we have used forecasts in housing delivery from District Local Plans and applied average emission factors to model the affect which increasing housing could have on emissions.

For Industrial and Commercial emissions, we have used Experian forecasts for the number of workforce jobs in Buckinghamshire and applied emissions factors specific to each sector to derive future emissions. This allows us to account for the industrial make up of Buckinghamshire as different sectors will have different impacts on carbon emissions.

The historic data shows a steady decline in emissions from both domestic and I&C sources which is influenced by both improvements in energy efficiency and an increasing volume of renewable generation on the network. We have therefore applied this trend in annual reduction to the forecasts to account for the continuation of these trends and to improve reliability.

As can be seen in Figure 21, the forecasts show that the scale of growth may be sufficient to stall the previous declines and, particularly with respect domestic emissions, reverse this trend. Importantly, the forecasts predicts that the growth in housing will lead to more emissions that the growth in

industrial and commercial (I&C) emissions. Whilst the growth in I&C emission sources may be sufficient to cancel out continuing improvements in effieincy, the forecasts show the growth in housing may be sufficient to reverse the trend.

This is based on previous trends and so significant advances in domestic energy efficiency, for both the existing housing stock and new homes, could change the assumptions this forecast is made on.

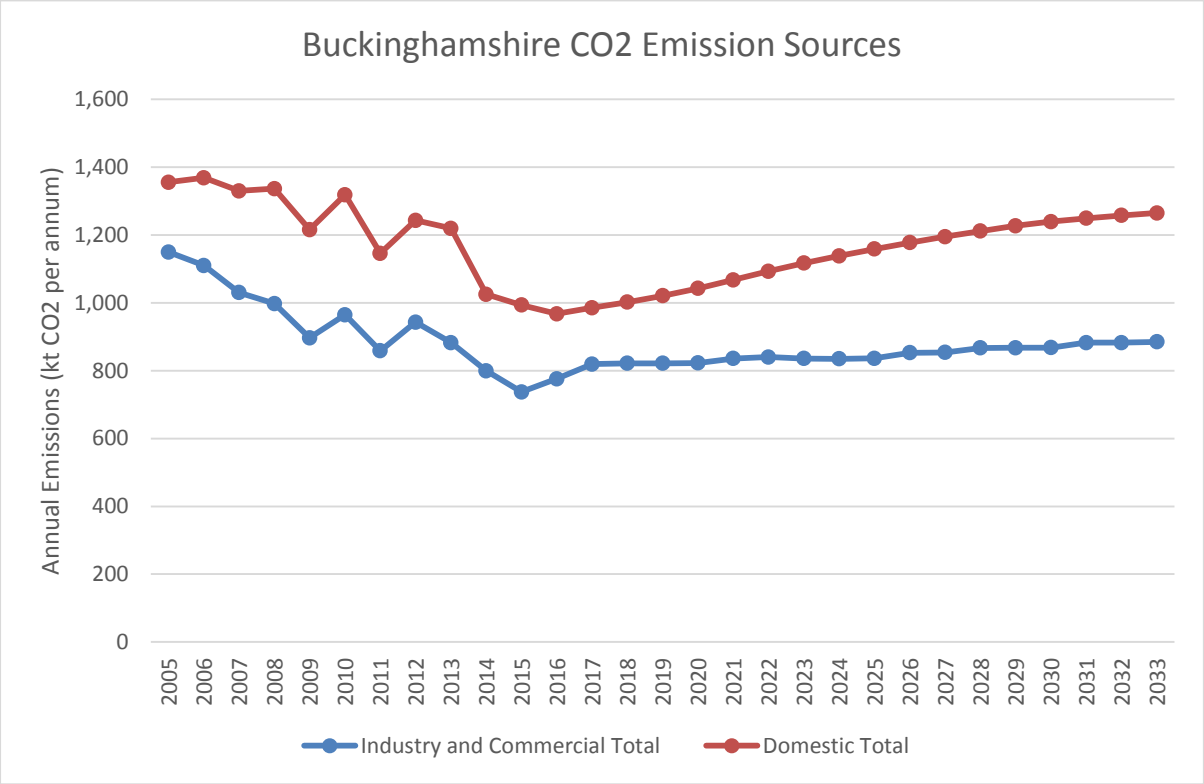

Figure 21: Current and Forecast Carbon Emissions in Buckinghamshire

Emissions from Transport

It has not been possible to forecast transport emissions in the same way. Whilst building emissions are significantly driven by the number of buildings in an area, transport emissions are heavily influenced by population outside the County and driving habits. In particular, as such a large proportion of emissions come from Motorway traffic, emissions in County are influenced by the trading and commuting patterns of those outside the County.

It should also be noted that as the growth in electric vehicles mileage grows, the emissions from transport will increasingly be counted within the meter types they are charged off. For example, charging an electric vehicle at home would appear to make domestic emissions increase when these emissions are attributed to a transport rather than building use.

Electricity Grid Capacity

Buckinghamshire is served by three Distribution Network Operators (DNOs) who are responsible for the maintenance and operation of the local electricity grid. This part of the grid receives high voltage

electricity from the Transmissions Operator (National Grid in England and Wales) and steps this down into increasing lower voltage electricity as it is moved closer to the point of consumption.

Buckinghamshire is positioned across three DNO areas operated by:

- Western Power Distribution (WPD) which covers the northern part of the County around Buckingham
- UK Power Networks (UKPN) which covers the central part of the County around Aylesbury
- Scottish & Southern Electricity Networks (SSEN) which covers the southern part of the County.

Each of these DNOs provides public information on the grid capacity currently available in their operational areas for new connections. This is a dynamic situation and changes principally as a result of new connections being made and new / upgraded infrastructure being installed. There are two forms of capacity which DNOs provide information on:

1. **Generation** – capacity for new electricity generation equipment to be connected to the network in these areas, for example solar farms or gas turbines.
2. **Demand** – capacity for new electricity consuming sites to be connected to the network in these areas, for example homes and businesses.

Information on the grid capacity at the time of writing (June 2018) provided by each of the DNOs is provided over the following pages. Each DNO maps the information across their operational area with a different presentation approach.

Western Power Distribution

The north of the County is served by WPD where there is a lower density of grid infrastructure. This is largely a function of the more rural nature of this area and grid infrastructure typically follows centres of population, as can be seen by the concentration of infrastructure serving Milton Keynes.

The available mapping data from WPD also shows data gaps with these points being shown in grey where at the time of writing WPD did not currently hold available capacity data on these points. Where capacity data is available, the WPD area of Buckinghamshire shows capacity for new generation schemes near Buckingham and Winslow. However at the northern point of the County at Silverstone the grid is constrained for new generation connections. In respect of new demand connections, the WPD area of Buckinghamshire is shown as constrained on all points for which data is available.

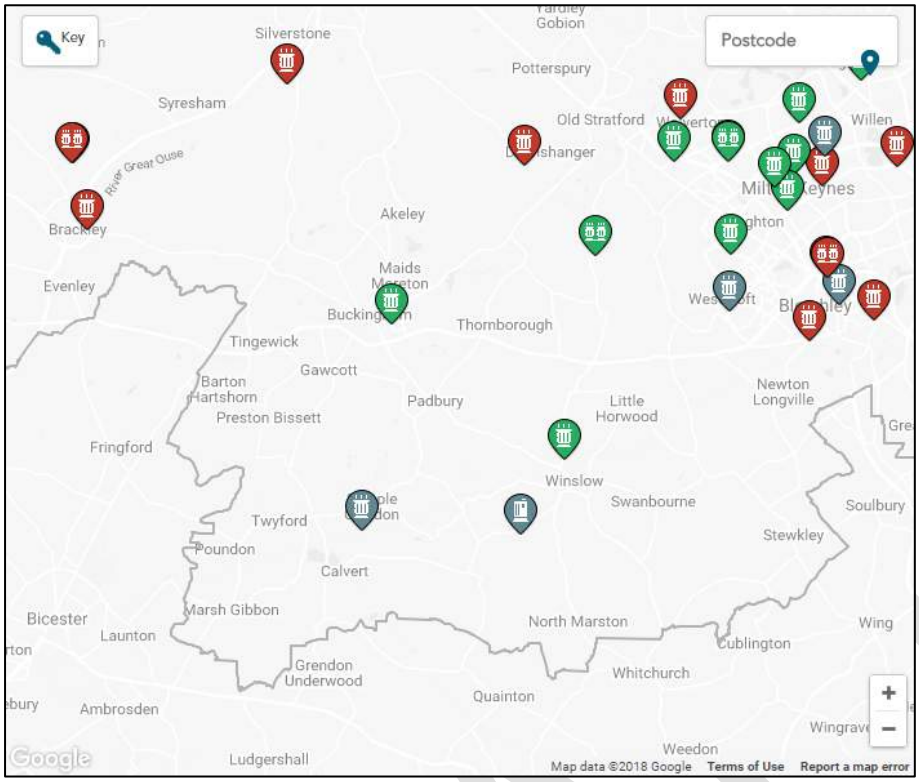

Figure 22 - Generation constraints maps for WPD area[6]

Electricity Connection Charges Regulations – (ECCR): the Second Comer rule

When a new connection is made (generation or demand), some of the grid infrastructure may be upgraded to make this possible. However, the new customer may not need all of the new capacity created from this upgrade – there is a benefit to the system. The ECCR regulations require a second customer connecting to and benefiting from the previous upgrade to pay a proportional share of the cost for the new equipment which they are benefiting from.

The implication is that the first customer can run a financial risk of paying additional fees for equipment they do not require. The potential for a future refund of a proportion of this is not certain, placing greater financial pressure on the first to develop in an area. It could also lead to the second customer delaying their connection to avoid paying this share.

The regulations were updated in 2017 to increase the time limit for second comer contribution from 5 to 10 years.

[6] Downloaded on 15 June 2018 from http://www.westernpower.co.uk/connections/generation/network-capacity-map.aspx

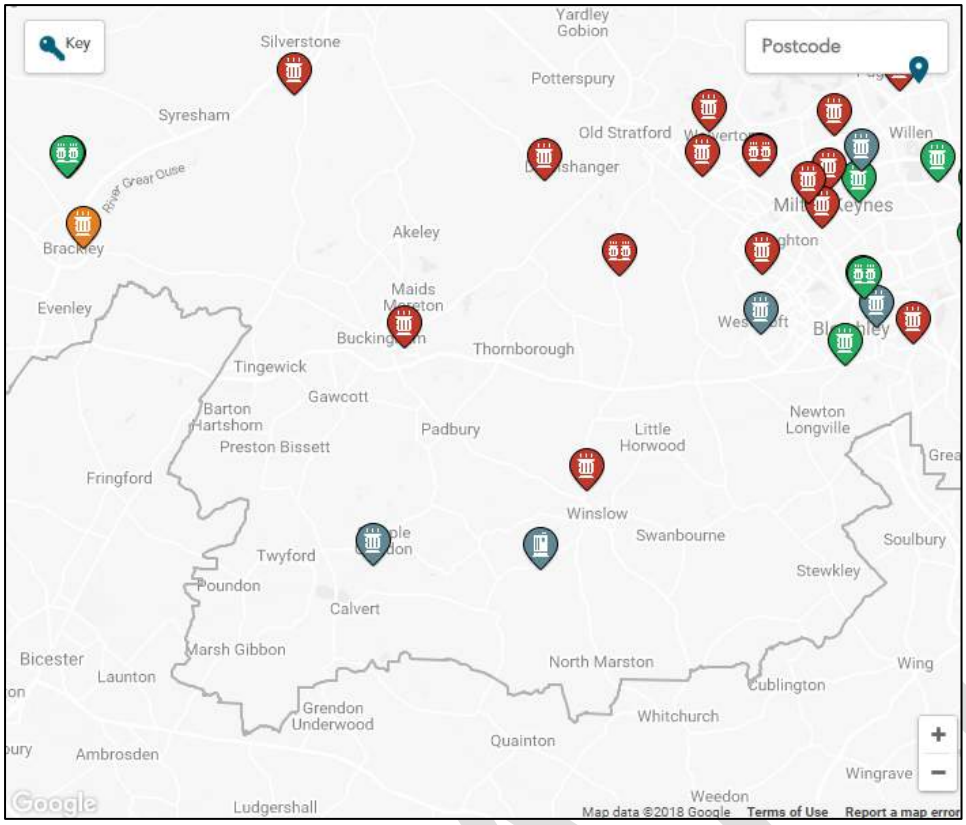

Figure 23 - Demand constraints maps for WPD area[7]

UK Power Networks

UKPN show both generation and demand capacity on a single map. The background colour indicates available capacity in that area for new generation connections. The colour code of the individual substations indicates the voltage and level of constraint for demand connections. The map shows the grid area around Aylesbury is 'highly utilised or reinforcement required' with respect new generation connection. The area around Amersham and Chesham is shown as having 'Capacity available', the central measure above the 'Significant capacity available' which is not present in this area of the grid.

With respect to demand connections, the majority of the substations in the Aylesbury have 'limited demand capacity' with a small number showing 'available demand capacity'. A varied picture is also present in the Amersham and Chesham area of the UKPN grid with Chesham / Great Missenden having 'limited demand capacity' and Amersham having 'available demand capacity'.

[7] Downloaded on 15 June 2018 from: http://www.westernpower.co.uk/connections/generation/network-capacity-map.aspx

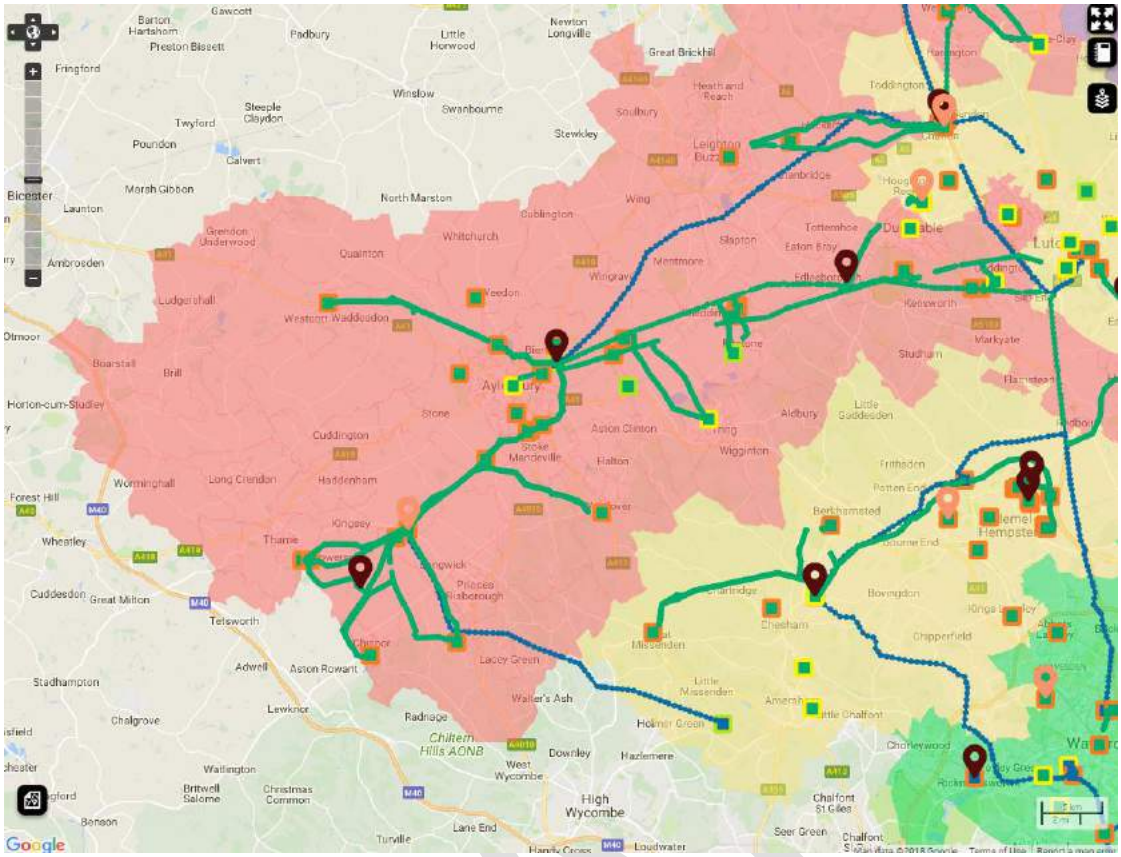

Figure 24 - Generation and Demand constraints map for UKPN area[8]

[8] Downloaded on 15 June 2018 from http://dgmapping.cloudapp.net/site/?q=dgmapping_ext

Scottish & Southern Electricity Networks

The south of the County has areas with and without capacity for new generation connections (Figure 25). The area to the west and south of High Wycombe being those principally without capacity, with the eastern areas unconstrained at this time. With regard new demand connections, SSEN do not provide constraints information via the map but the information may be downloaded separately. The current information shows that none of the grid infrastructure in the SSEN area of Buckinghamshire is constrained for new demand connections.

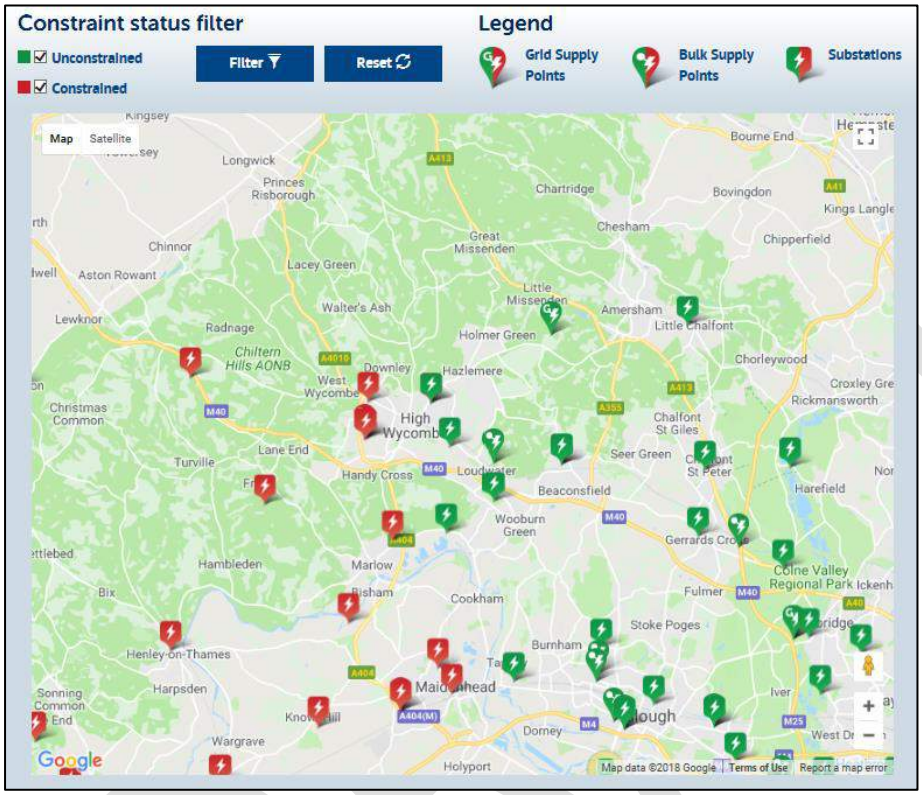

Figure 25 - Generation Constraints map for SSEN area[9]

Growth Implications for the Electricity Grid

The issue of grid constraints, particularly for demand connections, can become critical when larger new developments wish to connect. In such circumstances, connections will still be possible but the lack of existing capacity means that they can be expensive (£10m+) and take several years to complete. This can cause both financial and timing difficulties for delivering new developments and therefore could be a constraint on growth.

Figure 26 shows the areas within Buckinghamshire allocated in Local Plans for new developments. From this is can be seen that large areas around Aylesbury are allocated for housing. High Wycombe, bring constrained by AONB and Green Belt, shows patterns of infill in various locations. Other sites for developments are more dispersed across the County. The following table shows the total number

[9] Retrieved on 15 June 2018 from https://www.ssepd.co.uk/GenerationAvailabilityMap/?mapareaid=1

of dwellings allocated for delivery within the local plans with Aylesbury Vale allocating the most by a significant margin.

Considering this distribution in the context of areas of known grid constraints, it is Aylesbury which stands out as the area where both high levels of growth are expected and where the grid is currently constrained. Whilst not possible to forecast with certainty if or when grid capacity will become a constraining factor on growth, the conditions for this situation to arise are in place.

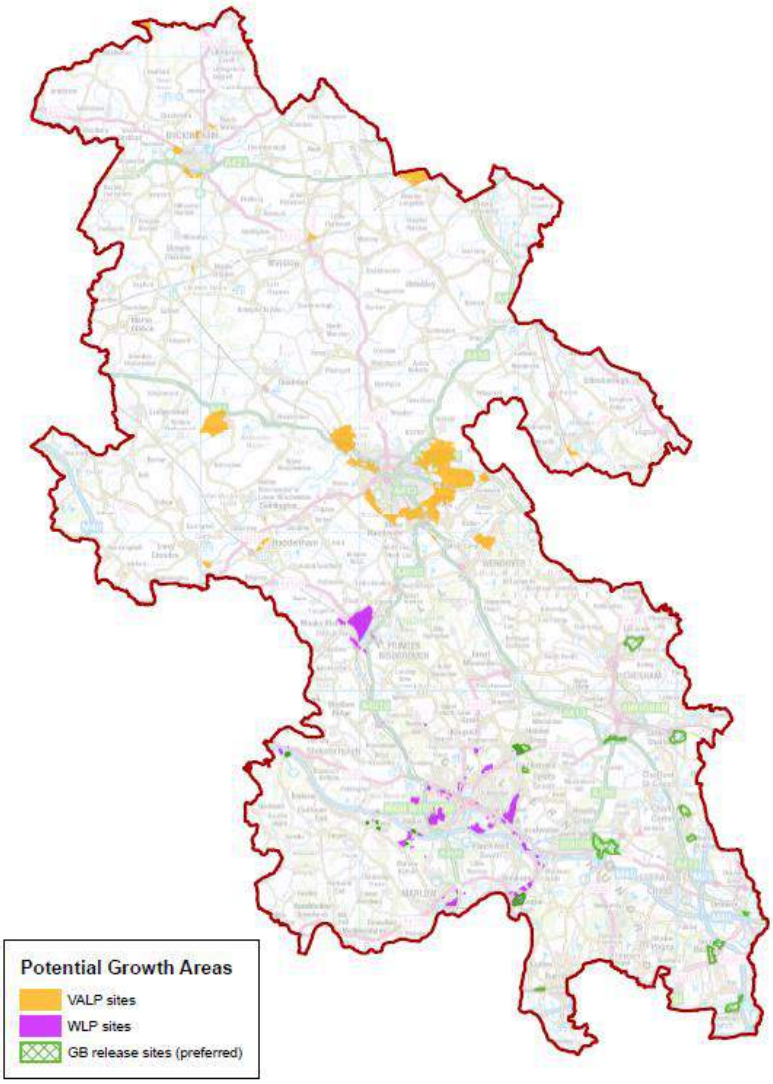

Figure 26 - Locations of development sites in Local Plans

	Housing delivery to 2033
Aylesbury Vale	28879
Wycombe	9862
Chiltern	3600
South Bucks	3600

Housing delivery to 2033 by District

Smart Grids & the Internet of Things (IoT)

Two emerging approaches to managing electricity supply and demand, as well as the grid infrastructure required to deliver this power, are Smart Grids and their interaction with the Internet of Things (IoT).

Smart Grids is an evolving term and can be used to describe a range of approaches to grid management, but at its core describe a flexible and data supported approach to supplying mainly electricity, though gas and heat are also included. This is seen as a necessary step away from the current 'passive' grid, where energy demand and generation are only monitored at a very high level. Due to the new demands being placed on the electricity grid – such as the volume of renewable generation and uptake of electric vehicles – more active management of the network is required. For example, a drop in the wind might mean energy stored in batteries is released or large consumers agree to reduce their demand. Smart grids may also allow existing reserve capacity in the networks to be utilised by closely managing the flows on the network and adjusting demand / generation as necessary. This is similar in concept to using the hard shoulder as an additional lane on smart motorways to release existing but unused capacity.

Looking further down this evolution of energy management, the ability for the IoT to allow power consuming devices to be controlled remotely gives the opportunity for the level of demand on the network to be remotely controlled. This might mean that fridges stop consuming power for when power is limited, or washing machines to run when power is plentiful.

Aspects of this approach exist in various forms, but a smart grid would see these applied far more broadly and to far more activities. For example the evolution of Economy 7 meters (where electric storage heaters charge overnight and receive cheaper electricity) can now evolve with Smart Meter abilities. These provide data on how much electricity is used at what time and so more specific 'time of use' tariffs can be introduced, with expensive electricity at peak times, cheap electricity overnight and potentially even pay consumers to use energy when there is too much being generated.

Conclusions from Baseline Evidence and Forecasts

Emissions

- Carbon emissions in Buckinghamshire have broadly been on a downward trajectory over recent years, considered to be driven by improvements in efficiency rather than the increase in renewable generation reducing electricity related emissions.
- Future emissions projections could reverse this trend and lead to Buckinghamshire's emissions growing. Our forecast indicate that that the growth in domestic emissions is expected to be larger than the growth in non-domestic emissions. Non-domestic emissions may remain flat if the forecast growth is offset by improvements in efficiency.
- Emissions from transport are dominated by those originating on motorways, and these are largely from the M40 and M25 in South Bucks District. The future expansion of Heathrow and of other major national infrastructure and transport projects across Buckinghamshire will strongly influence future emission levels. There are, however, significant opportunities for the national infrastructure projects to also leave a positive energy legacy for Buckinghamshire communities.
- Emissions from other roads have decreased over the last 10 years but are showing a potential upturn in the most recent years.

Electricity

- The amount of renewable generation in Buckinghamshire has been significantly increased with the building of the Energy from Waste facility at Greatmoor. This facility generates over 1/3 of the renewable electricity in the County and has brought Buckinghamshire in line with national renewable electricity targets. The centre also provides a significant heat opportunity in an area currently poorly served by existing infrastructure.
- The next largest volume of renewable electricity comes from landfill gas generation, which will decline over the coming years as gas output from closed landfills decreases over time. More renewable generation will be needed to replace this if Buckinghamshire is to remain aligned with national renewable energy targets. In addition to private individuals nad organisations, there is a role of community led action, such as crowd funding of solar farms as took place at Gawcott Fields Community Solar.
- The electricity grid situation in Buckinghamshire is complicated. There are three DNOs in the area and many areas have constrained grids which may make new developments difficult to connect. Greater collaboration between the DNO's should be facilitated, enabling better strategic investment, identifying future constraints at an earlier stage and providing a framework for wider collaboration across the growth corridor.
- Aylesbury is highlighted as the area expecting both the most significant growth in housing and with a significant proportion of available connection points already constrained. The Aylesbury Garden Town Status should be utilised to ensure the highest energy efficiency standards are applied to all new development and to provide a framework for other new settlements in Buckinghamshire.

- The potential to use 'smart grid' approaches to manage demand could be applied in Buckinghamshire in order to help alleviate grid constraints by allowing greater use of the existing infrastructure. This could allow greater installation of onsite renewable generation, helping to achieve carbon reductions and meet renewable energy targets, such as the solar farm at Westcott Venture Park.

Heat

- Large areas of the County are not served by the gas network with 31% of households not connected.
- Reducing emissions from heating poses a significant challenge in Buckinghamshire.
    - Heat networks are unlikely to be a widely applicable solution as the lack of high density settlements will make finding viable locations challenging. However new developments may offer some opportunities where domestic and non-domestic heat demands are present. This is the case at the Woodlands development which could work together with the nearby Arla dairy facility.
    - Decarbonisation of heating can be achieved by the electrification of heat via a move to heat pumps. This would require the electricity grid to be capable of distributing more electricity which may require additional investment in capacity opr more active management of network usage (i.e. smart grids).
- The existing housing stock could be significantly more energy efficient and improvements to this will be required to help offset increases in emissions from new housing.

Energy Efficiency

- The energy efficiency of buildings in Buckinghamshire is broadly in line with the national trends. However this generally of poor energy efficiency with a minority of buildings achieving a rating of C or better. The Aylesbury Garden Town Status should be used to demonstrate how highly efficient buildings can be delivered at scale across the County.
- To put that in context, it has been suggested in a 2017 report by Frontier Economics[10] that in order to meet the UK's climate change targets, all buildings in the UK would need to achieve an EPC rating of C or above. Currently 60% of domestic and 65% of non-domestic properties fall short of this aspiration.
- As the demands on the energy system change and technology allows for real time and remote management, new business models can emerge to help manage demand and supply. This could include local energy trading of renewable generation through digital platforms and, dynamic pricing tariffs where energy costs are based on current system demands, which provides the potential to pay customers to consume energy when there is a surplus.

Transport

- Buckinghamshire has a growing number of electric vehicle charging points but remains relatively poorly served when compared to nearby areas such as Milton Keynes. The demand for charging points is expected to grow significantly due to both electric vehicle

[10] Affordable Warmth, Clean Growth (2017) http://www.frontier-economics.com/publication/affordable-warmth-clean-growth/

uptake increasing and growth in Buckinghamshire and across the Cambridge : Milton Keynes : Oxford Growth Corridor.

- The County Council, as the highways authority, is progressing the installation of on-street electric vehicle charging points to provide 30 across the County. However the scale of action needs increasingly significantly so that charging infrastructure enables the growth of electric vehicles. This includes provision at a range of location types, such as destinations, major routes and homes – both for on and off street parking.
- Buckinghamshire has yet to implement measures to encourage or trial the use of electric public transport. One of the ambitions of the Bucks Growth Strategy was for the area to be developed as a testbed at scale and this area provides a significant opportunity at the heart of the Cambridge : Milton Keynes : Oxford Growth Corridor. Milton Keynes has electric buses in service and both Cambridge and Oxford have plans to introduce them.
- The impacts of the growth in electric vehicle charging on the electricity grid are not yet clear and will be heavily influenced by charging habits.

DRAFT Challenges and Opportunities

The below content is a starting point for the discussions with key stakeholders.

The actions which come out of this Strategy must be appropriate, deliverable and help meet the challenges and opportunities which Stakeholders agree need addressing.

Themes	Challenges	Opportunities	Potential Actions	Action Owners / Timeframes
Electricity	• The electricity distribution grid is constrained which can make connecting new demand and generation projects expensive and/or lengthy, putting growth at risk. This is most challenging where significant growth and limited capacity are aligned. • Electric vehicles could place additional demands on an already constrained network, potentially exacerbating the existing connecting issues or making electric vehicle charging infrastructure delivery challenging. • A significant proportion of local renewable generation comes from landfill gas which will decline over time; greater deployment of renewable generation is required to ensure the County continues to	• The potential use of 'smart' grids may to help reduce the constraints on the electricity grid, though this approach is still in development. • Use of time specific charging mechanisms to enable EV charging to take place at times of low demand can reduce network demand and enable more rapid infrastructure installation. • Renewable energy generation (in particular solar PV) offers a secure financial return for businesses and homes and is suitable for installation on most buildings. This may help to improve competitiveness by lowering business running costs. • Buckinghamshire's position	• Mapping of current grid capacity with timeframes of future growth in domestic & non-domestic connections in order to identify future pinch points on the network. • Submission of a grid reinforcement programme within the Housing Infrastructure Fund (HIF) Forward Funding bid. • Identify models for financial support for grid connections, helping to overcome issues associated with '2nd comer rule' and cash-flow impacts for developers. • Identify opportunities for 'smart grid' trials to help address a constrained grid by actively managing demand and generation.	• BCC with support from Consultants and input from DNOs and key developers. ○ Q2-4 2018 • BCC to submit HIF bid, using information from DNOs and key developers. ○ Q2 2018 • BTVLEP & BCC engagement with DNOs and Energy Networks Association. ○ 2018-2019 • BCC with DNO support and developers/ end users which would connect to 'smart grids' ○ 2018-2019

	be aligned with national targets.	with 3 DNOs in the County provides an opportunity to resolve network constraints by coordination and planning across multiple grid areas.		• BTVLEP to work with GSE Hub to develop approaches to overcome issues caused by grid constraints, using our position with 3 DNOs to work across multiple grid areas to resolve the constraint. ○ 2018-2020
Heat	• 31% of homes in Buckinghamshire are not connected to the gas grid with electric and oil heating being the most common alternatives. Electric storage heating is expensive for households and oil has high carbon emission intensity, so both run contrary to the clean growth objectives. • Electricity infrastructure may not be sufficient to switch non-gas households to low carbon electric forms of heating (e.g. heat pumps) • Energy efficiency performance in domestic and non-domestic properties is broadly in line with National averages but this represents an overall energy	• Financial support is available from Government to help develop and deploy heat networks in the UK. • Local Plans are expected to be reviewed in the coming years, providing an opportunity to influence energy policies and enhance performance. • New developments provide opportunities to consider heat provision before construction and allows for low carbon solutions to be installed (e.g. heat networks, heat pumps)	• Undertake an Energy Technology Institute (ETI) Carbon Pathway model to identify options and costs of decarbonising off-gas grid homes • Utilise Aylesbury Garden Town initiative to trial / pilot / exemplify how low carbon heating solutions can be installed at scale • Businesses to be supported with identifying and implementing energy efficiency measures.	• BTVLEP with support of local District Councils to commission ETI to undertake Carbon Pathway modelling. Outcomes to inform revisions of local plans. ○ 2018-2019 • Aylesbury Garden Town partnership organisation (BCC, Aylesbury Vale District Council, BTVLEP and South East Midlands LEP) to include high energy efficiency standards within scope of master planning and Supplementary Planning Documents (SPDs) produced. ○ 2018-2019 • Low Carbon Workspaces

	inefficiency building stock.			programme to be continued and future funding opportunities identified to support future delivery. ○ 2018-2019
Transport	• There is relatively little publicly accessible EV charging infrastructure in the County potentially slowing the uptake of EVs in the area. Demand is expected to increase significantly. • Public transport has not started to adopt electric modes. • Most transport emissions in County originate on motorways which are strongly influenced by national and regional traffic movements.	• Air quality initiatives in Bucks provide an additional basis to move to greater electric vehicles use, particularly where air pollution issues are present • Government grants are available for EV charging infrastructure, helping reduce the cost of installing more charging points. • Aylesbury Garden Town provides an opportunity to design electric vehicle infrastructure into plans at an early stage.	• BCC to continue to install EV charging points in residential areas with on-street parking. • Planning authorities to include requirements for developers to install EV charging points in new developments • Local authorities and public bodies to provide publically available EV charging points at central locations in larger towns. • Use of electric bus routes to be investigated • Time of use tariffs could be used to influence EV charging habits away from peak consumption times, preserving grid capacity and managing peak supply demands.	• BCC To continue and expand its charging infrastructure installation programme in the longer term ○ 2018-2030 • BTVLEP to work with GSE Energy Hub to develop and ADEPT Transport Board to develop common standards and policies for on-street charging infrastructure. ○ 2018-2019 • BTVLEP to advocate for public bodies to install, and make available to the public, electric vehicle charging points in their car parks. ○ 2018-2019 • BTVLEP to identify funding opportunities to support electric bus use in Buckinghamshire. ○ 2019-2020

		• DNOs, Energy Suppliers and EV charging manufacturers to develop systems to allow 'out of hours' charging of electric vehicles to take place ○ 2019-2022