



Buckinghamshire Local Energy Strategy

2018-2030

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1.0 Executive Summary

Introduction

This Energy Strategy has been developed by Buckinghamshire Thames Valley Local Enterprise Partnership (BTVLEP) & the Buckinghamshire Energy & Resource Management Group, working and consulting with a range of national, regional and local partners.

Recognising the important changes in how energy is now generated and consumed, as well as its vital role energy plays in unlocking growth, this strategy has been produced to address the challenges and opportunities which are present in the area and improve the economic, environmental and social performance of Buckinghamshire.

In particular, the level of growth expected in Buckinghamshire and the County's location at the heart of the Oxford - Cambridge Arc means the demands placed on the existing energy model are set to increase significantly, with Buckinghamshire likely needing to think creatively to ensure energy doesn't become a blockage to growth.

Whilst energy technology is developing rapidly, and the regulations are being updated to keep pace, demand for energy in Buckinghamshire will grow over the next economic cycle. In order to ensure we protect the environment and continue to deliver positive health outcomes, we need to ensure this energy demand stimulates the growth in clean, low-carbon energy.

The Challenges with the current UK Energy Model

There are a number of well publicised problems associated with the UK's current energy model. These can be summarised as being;

- We are too reliant on fossil fuels;
- The current model impacts negatively on the environment and people's health;
- Overly high energy costs can serve to suppress productivity; and
- Our energy security is coming under increasing scrutiny.

Supporting the take up of clean energy systems possesses the potential to enhance regional productivity, help to protect the climate/environment and deliver improved health outcomes.

Challenges and Opportunities linked to the Buckinghamshire energy model

The research presented in the Evidence Base section of this strategy provides a view of the energy characteristics, challenges and opportunities of Buckinghamshire. The key findings of this analysis demonstrate that:

Grid Capacity

- The local electricity grid is constrained in many locations, making new connections often expensive and lengthy. With three Distribution Network Operators (DNOs) serving Buckinghamshire, public-private sector cooperation and forward planning, which is aligned with growth expectations – together with encouragement of local energy generation and storage systems - is required to ensure growth is not constrained;
- 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 innovations in local clean energy generation, storage and grid management measures, such as those associated with 'smart grids' and 'micro grids'. This could help to maximise the opportunities which onsite generation projects already offer, such as Westcott Solar Park;

Heat Model

- A high proportion of properties in Buckinghamshire 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 have historically been fairly limited due to the lack of high density settlements. However new developments offer potential opportunities, particularly when located near existing heat generation or industrial heat demands;
- 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 in the area;

Low Carbon Transport

- There are significant industrial capabilities in Low Carbon Vehicle (LCV) technologies in the area which could act as a strong catalyst for developing Vehicle to Grid (V2G) solutions. The electric vehicle charging network in the County is undeveloped and the availability of publicly accessible charging points is currently somewhat limited. There is one Hydrogen refuelling station in Beaconsfield. Further improvements in LCV refuelling infrastructure are required to meet the growth in low carbon vehicles, which will be more acute due to growth within Buckinghamshire and across the Oxford-Cambridge Arc;
- Historically, there has been limited innovation in low carbon transport in the public sector in Buckinghamshire, 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 trailed or implemented. Future growth provides a real opportunity to address this issue.
- The low carbon vehicle charging infrastructure of the County needs significant development to cater for a range of charging needs. This includes the promotion of on-street, off-street and home electric charge points and the potential for additional hydrogen refuelling infrastructure. 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;

New Developments

- The level of housing growth in Buckinghamshire and across the Oxford-Cambridge Arc 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 and integrated LCV refuelling infrastructure can be deployed at scale;
- 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, but which may also be available to others once construction is completed) and the introduction of emerging low carbon traction technologies such as battery and hydrogen power;

Innovative Generation and Storage

- 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 through business networks such as Buckinghamshire Business First.

Only by addressing the challenges and exploiting the opportunities set out above will we be able to successfully achieve our goal of delivering clean growth in Buckinghamshire.

Vision

Our Vision is that ***“By 2030, Buckinghamshire will have a Emissions Intensity Ratio (EIR) of 100 tonnes/£million to meet national and local clean growth ambitions”.***

Objectives

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

As previously highlighted, the UK’s Clean Energy Strategy sets out the need for the UK to tackle a number of issues which have hitherto eluded the UKs energy generation sector, namely the need to decarbonise the transport, business and industrial sectors; the need to reduce the emissions created by heating our homes and businesses, in such a way which stimulates innovation and investment to reduce our energy bills; the need to improve our productivity; the need to improve air quality; and the need to create more high-value jobs and export opportunities.

However, there are a significant number of challenges linked to the delivery of these ambitious goals. In order for our vision to be realised, Buckinghamshire will need to place significant emphasis on;

- Improving the **energy efficiency of new and existing commercial buildings;**
- **Maximising the potential of future housing growth** to deliver clean growth;
- **Establishing a Living Laboratory to invest in energy innovation** to stimulate new business models;
- Promoting the **development of innovative, local, integrated, clean energy systems;**
- Facilitating the **development of Heat Networks;**
- Accelerating the rollout of **Low Carbon Vehicle (LCV) Charging Infrastructure;**
- **Improving Grid Capacity;**
- Encouraging the **development of Community Energy Solutions;**
- Ensuring **the skills system is equipped** to take advantage of, and support, clean growth; and
- Promoting **‘circularity’, to ensure we maximise the value of our indigenous resources;**

As discussed previously, many of these goals are interlinked, largely because clean energy solutions can have an extremely positive economic, societal and environmental impact, by creating good quality

jobs and boosting earning power; overcoming fuel poverty; improving air pollution; and improving health outcomes.

Strategy

Our Strategy for delivering improvements in the above areas is focussed on BTVLEP partners;

- **Governance:** Strengthening the local Energy Management governance arrangements, to build a stronger public-private-academic and community partnership to collaborate on the delivery of the above goals;
- **Project Development:** Working with the BEIS, the Greater South East (GSE) Energy Hub¹ and national/regional/local partners to develop transformational projects and programmes which can address the clean growth opportunities presented in this Strategy;
- **Identifying Investment:** Identifying suitable funding opportunities capable of funding energy projects and initiatives identified within this Strategy;
- **Securing Investment:** Establishing effective systems for securing investment funds in pursuit of the above goals;
- **Partnership Based Delivery:** Adopting delivery, enablement and advocacy roles, to promote and support actions by partners, and other organisations, which support these outcomes.

Collectively focussing on these goals will support the implementation of this strategy by enabling the partnership to tackle some of the key challenges that stand in the way of delivering clean growth and move projects forward which exploit the clean growth opportunities identified in this Strategy.

Resources

In addition to encouraging partners to pool their existing resources to strengthen and improve our capability to deliver, we will also utilise what existing resources that are currently and likely to be available to us (i.e. ERDF, UK Shared Prosperity Funding etc) to underpin the delivery of this strategy.

Recognising that our local capacity to facilitate local energy innovation has been eroded in recent years through increased budgetary pressures and changing government policy, we will continue to make the case for additional government investment into this area, to create a robust and consistent level of resource to manage the implementation of this Strategy.

Lastly, recognising that much of the government funding being invested in clean energy solutions is innovation funding, we will seek to establish more effective mechanisms for securing funding from these sources to invest in local clean energy initiatives.

Targets

In order to track the UK's performance against the UK Clean Growth Strategy, the Government has developed an Emissions Intensity Ratio (EIR) to measure the UK's clean growth performance, which they will publish each year to track progress.

To reach our 2032 targets we will need to drive the emissions intensity of the economy down by an average of five per cent per year to 2032, an acceleration in the four per cent annual fall since 1990².

The Emissions Intensity Ratio (EIR) measures the amount of greenhouse gases (tonnes of carbon dioxide equivalent) produced for each unit of Gross Domestic Product (GDP) created. Currently the

¹ See <http://46.32.240.41/energyhub.org.uk/>

²

EIR is 270 tonnes/£ million and it was 720 tonnes/£ million in 1990. By 2032, the government expects the EIR will need to be nearly as low as 100 tonnes/£million to meet their ambitions.

In order to measure Buckinghamshire's progress against the nation EIR goals, we will seek to develop a local variant of the same measure.

Governance & Monitoring

We will seek to embed this Energy Strategy into partner organisations, to ensure it is fully adopted within Buckinghamshire, particularly across the key organisations that will support its delivery. The delivery of the strategy will be overseen by a governance and monitoring process which will be overseen by the Buckinghamshire Energy and Resource Management Group.

2.0 Introduction

Recognising the changes to the ways in which energy is now generated, distributed and consumed; Buckinghamshire Thames Valley Local Enterprise Partnership (BTVLEP) & the Buckinghamshire Energy and Resource Management Group have jointly developed this Energy Strategy, through consultation with a range of partners.

In developing this Local Energy Strategy, we have sought to develop an approach which is tailored towards the needs of Buckinghamshire, by:

1. Identifying the challenges and opportunities which changing energy systems provide to Buckinghamshire, including where energy interacts with other strategies, policies or initiatives.
2. Setting 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. For example;

- 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 potentially detail the delivery of approximately 50,000 new homes by 2035 along with supporting infrastructure and employment sites.

Buckinghamshire 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 Thames Valley Local Enterprise Partnership (BTVLEP), Buckinghamshire Energy Management & Resource Group, with input from a wide range of stakeholders.

3.0 Vision

This Strategy sets out a comprehensive set of policies and actions that aim to accelerate the pace of “clean growth” in Buckinghamshire, by delivering increased economic growth and reducing harmful emissions.

Our Vision is that;

“By 2030, Buckinghamshire will have a Emissions Intensity Ratio (EIR) of 100 tonnes/£million to meet national and local clean growth ambitions”.

4.0 Objectives

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

As previously highlighted, the UK’s Clean Energy Strategy sets out the need for the UK to tackle a number of issues which have hitherto eluded the UKs energy generation sector, namely the need to decarbonise the transport, business and industrial sectors; the need to reduce the emissions created by heating our homes and businesses, in such a way which stimulates innovation and investment to reduce our energy bills; the need to improve our productivity; the need to improve air quality; and the need to create more high-value jobs and export opportunities.

Key Challenges in delivering Clean Growth

However, there are a significant number of challenges linked to the delivery of these ambitious goals;

- **Decarbonising the grid**

It is universally acknowledged that the need to ‘drive a significant acceleration in the pace of decarbonisation’ to achieve our fourth and fifth generation carbon targets requires us to intensify our efforts on decarbonising transport and heat systems. Whilst more than half our power in the UK comes from low-carbon sources; our grid is the fourth cleanest in Europe; and renewables now generate 29% of our electricity, as recently as 2016 they supplied just 6% of our heat and 4.5% of our transport requirements.

- **Promoting the development of innovative, local, integrated, clean energy systems**

In order to deliver on the national energy goals, greater integration is also needed across energy systems - not only to export low-cost, low-carbon electricity into other energy services like heat and transport that have so far proved harder to decarbonise, but also to help balance electricity grids as they absorb an ever-higher proportion of intermittent renewable generation – for instance through smart heat pumps and EV charging.

Tighter integration of energy systems into wider systems – such as municipal waste, and waste heat recovery – is also vital to increase resource efficiency and reduce emissions and cost. Since renewable and waste energy resources are inherently local, this integration will also need to

happen at the local rather than national level. As resources and infrastructure differ between regions, it follows that the innovation required to exploit them will also differ.

- **Enhancing regional productivity, creating good jobs and boosting earning power**

The energy generation sector itself could contribute to productivity improvement, both through the delivery of more low-cost energy solutions, but also through improved innovation in the sector. The need to drive improvements in regional productivity is driven by the need to;

- Maintain the economic prosperity of the UK and the BTVLEP Region;
- Enhance the competitiveness of the regions businesses, to ensure they can compete effectively in increasingly global markets;
- Ensure everyone can participate fully in the economy; and
- Maintain the quality of public services

The UK Clean Growth Strategy estimates that the low-carbon economy in Britain could grow at 11% a year to 2030, four times faster than the rest of the economy, and deliver as much as £170 billion in exports. BIES data suggests the UK LCEGS Sales was £128.1bn in 2011/12. This compares with Sales in 2010/11 of £122.2bn, indicating an annual increase of approximately £5.9bn, or 4.8%. Annual growth in the previous year was £5.4bn or 4.7%. This figure is consistent with recent data from the ONS, which confirms the UK low carbon and renewable energy economy grew 5% in 2016, outpacing the 1.8% growth in the wider economy.

As far as global sales are concerned, The UK Department for Business, Energy, Innovation and Skills (BEIS) estimated the total sales for Low Carbon Environmental Goods and Services (LCEGS) in 2011/12 was £3.4 trillion³, with the largest sub sectors being; Alternative Fuels (16%), Building Technologies (13%), and Wind (12%). Rankings of the Top 50 countries indicated that the US accounts for 19.2% of the global total, followed by China (13%), Japan (6%), India (6%) and Germany (4%). The UK is ranked sixth with a market share of 3.7%.

According to BEIS, the UK is ranked sixth in 18 of the 24 sub sectors. UK LCEGS Sales in 2011/12 were £128.1bn. In each of the 18 cases where the UK is sixth it is ranked behind the US, China, Japan, India and Germany. The six sub sectors where the UK is not sixth are: Carbon Finance (2nd), Alternative Energy Sources (9th- down from 8th in previous year); Environmental Consulting (7th- down from 6th); Renewable Energy Consulting (8th- down from 6th); Photovoltaic (7th) and Wave and Tidal (5th). Geothermal increased from 7th in 2010/11 to 6th in 2011/12.

BIES data on the **global** LCEGS sector suggests that it grew by 3.8% between 2010/11 and 2011/12. This growth was not evenly spread across the world. Growth was highest in Africa (6.5%), although this is high growth from a low base. Growth across Europe was 3.9%, which was ahead of the Americas and Asia. The annual increase from 2010/11 of 3.8% compared with increases in previous years of 3.7% and 1.75%. However, this rate of growth is some distance behind what we need to achieve, if we are to achieve targets set in relevant international agreements. For example, renewable heat needs to grow 32% between 2014 and 2025, to be consistent with limiting global warming to 2°C.

³ Low Carbon Environmental Goods and Services (LCEGS) Report for 2011/12, JULY 2013, Department for Business Innovation and Skills

As far as the comparative advantage of the Buckinghamshire is concerned, research by BEIS has shown that the Low Carbon Environmental Goods and Services Sector in Buckinghamshire generated £940m of sales in 2011/12, from 405 companies, employing some 7,391 people⁴.

An analysis of the capabilities of Buckinghamshire Thames Valley, and the surrounding LEP areas, indicates particular strengths in alternative powertrain, alternative fuels, sustainable construction and geothermal technologies.

- **Helping to protect the climate/environment**

Clean Energy solutions can have a far more positive societal and environmental impact, by overcoming fuel poverty, improving air pollution and health outcomes.

The core objectives of this Strategy

In order for our vision to be realised, and for the above challenges to be successfully addressed, Buckinghamshire will need to place to significant emphasis on;

- **Improving the energy efficiency of new and existing commercial buildings**

In Buckinghamshire:

- Overall emissions are almost equally split between Industrial and Commercial (27.1%), Domestic (32.9%) and Road Transport (40%);
- Total industrial and commercial emissions are estimated to be 1,154.7 thousand tonnes (kt) of CO₂, over 51.2% (597.7 kt) of which is attributable to the use of electricity; 26.1% (301.7 ktCO₂) is attributable to the use of gas; 9% (104.3 ktCO₂) is attributable to the use of oil; with the remaining nine sources together contributing less than 15% to the total.

As a consequence of these issues, businesses, social enterprises and communities in Buckinghamshire are particularly exposed to high energy costs. Because of the scale of the current stock, in comparison to the scale of new developments and , the major challenge relates to retrofitting existing commercial property, rather than new developments.

Increasing the energy efficiency of commercial buildings and stimulating the take up of renewable energy could play a major part in helping businesses reduce their energy costs and help the United Kingdom achieve its greenhouse gas emission targets.

However, the market is characterised by a number of structural issues which serve to reinforce market failures and which make achieving this goal a real challenge. On the supply side, the structure of the market can act as a barrier in accelerating the take up of low carbon technologies. The supply chain is generally characterised by a high degree of fragmentation. This can tend to cause many businesses problems, particularly when trying to implement strategic solutions, as it can increase the time, effort and information needed. Similarly, there is some evidence to suggest restrictions in grid capacity and the cost of grid connections is driving up the cost of localised energy solutions.

On the demand side, the complex nature of the landlord/tenant relationship means the business sector is more complex than residential sector. Because many small businesses are in rented accommodation, the landlord is often a key influencer in deciding whether or not to implement

⁴ Low Carbon Environmental Goods and Services (LCEGS) Report for 2011/12, Department for Business Innovation and Skills, July 2013

any new energy initiatives. Because of this, solutions often benefit from the landlord and the tenant agreeing what to implement and how to apportion the savings.

Many small and medium enterprises struggle to access the information they need to develop the investment case. Accessing the data and information needed to build an investment case (about current costs and the costs of any potential future solution) can be a particular barrier to the take up of initiatives. The costs of undertaking energy assessments can be difficult for businesses to justify when the returns are uncertain; whilst others struggle to understand what potential returns might come from implementing a range of scenarios. Similarly, very few small businesses/social enterprises possess the necessary in-house expertise, or the time needed to research and implement the necessary solutions.

To deliver the maximum financial benefit to the business owner, solutions often require collaborative action between the landlord and the end occupiers to work together. However, whilst 'mutual' solutions are likely to offer the lowest energy prices for businesses (because they are owners in the facility) the complexity and high upfront costs of implementing 'mutual' solutions can serve to act as a disincentive to businesses. Lastly, the breadth of skills and the complexity of the funding mix needed to get a successful project away, can act as a barrier. Solutions often require a complex funding mix, which necessitates a mix of skills to access all the available funding and experience suggests few organisations possess the necessary mix of commercial, bid writing and community share ownership skills.

In response to these market failures, BTVLEP and partners aspire to;

- Use future funding opportunities (like UK Shared Prosperity Funding) to continue to support projects which encourage and incentivise businesses (landlords and tenants) to invest in energy efficiency/renewable energy measures.
- Mainstream the provision of information and business support for firms looking to implement energy efficiency improvements;
- Explore the potential of 'whole estate' solutions, which may be owner or occupier-led or lean on co-operative solutions.

Case Study: Low Carbon Workspaces

Low Carbon Workspaces offers small and medium-sized businesses in Buckinghamshire, Hertfordshire and the Black Country*; grants of between £1,000 and £5,000 to cover up to a third of the cost of making energy improvements.

The programme is funded by the European Regional Development Fund (ERDF) and managed by Ngage Solutions, a not-for-profit company, that specialises in the design and delivery of grant schemes and business support programmes. We work closely with Growth Hubs, Local Enterprise Partnerships, local authorities, business organisations and other grant schemes in each area.

For more information, see <https://www.lowcarbonworkspaces.co.uk/>

- **Maximising the potential of future housing growth to deliver clean growth**

One of the ways in which Buckinghamshire can support the growth of the clean energy grand challenge is by embedding the principles of clean growth at the heart of all future developments. With such significant growth forecast across the area, developing ambitious energy goals for future development will have significant knock on benefits.

Whilst some challenges still exist with delivering on this goal, it's likely that the combination of strengthened regulations, support for modern methods of construction and increased consumer demand for improved environmental performance will drive some improvements in this regard.

For example, government plans to review Part L Building Regulations and adopt a target to half the energy use in all new buildings by 2030 will provide impetus to the market to drive adoption of new energy and construction technologies.

That said, there is also a significant recognition that there needs to be greater connectivity between national initiatives, regional structures and local capacity. In order to knit together the various clean growth initiatives and ensure robust local implementation, Buckinghamshire needs more investment to support it to secure community buy in, drive local behaviour change, support relevant skills development etc.

In response to this issue, BTVLEP and partners aspire to;

- Embed clean growth principles in all future developments, including the Garden Town programme, to ensure compliance with strengthened Part L regulations;
- Develop local energy generation/storage capabilities, where appropriate and viable;
- Improve energy efficiency of residential premises and reduce the energy demand for improved environmental performance; and
- Make the case for local resource to improve the integration of various national initiatives on the ground, build the capacity of local communities/supply chains and support the drive for clean growth.

- **Establishing a 'Living Lab' to invest in energy innovation to stimulate new business models**

Given the above picture, there is a need to develop a range of new business models for delivering our energy futures and support the transition to a new energy generation model, by facilitating and accelerating the development of innovative local, integrated, clean energy systems, which are capable of decarbonising the grid, protecting the environment and enhancing regional productivity, thereby creating good jobs and boosting earning power.

Stimulating local and democratically accountable clean energy innovation possesses the potential to reduce emissions and cost for the area; stimulate regional markets and supply chains that provide a platform for exports and growth; de-risk future investment; and inform new policies, standards and regulatory frameworks that could be applied in other regions and even nationwide.

One way to systematise the process for stimulating energy innovation is to establish Buckinghamshire as a 'Living Laboratory' – with a discrete focus on stimulating energy innovation – to stimulate early markets, buy and try-out innovative energy products and services.

A living lab is a user-centred, open-innovation ecosystem, that integrates current research and innovation processes within a public-private-people partnership, bringing together different approaches to solve real-life problems.

Adopting this approach requires the anchor institutions in the locality to come together to adopt an innovative (risk-averse) approach to public procurement and service commissioning, to test and trail new ideas. Adopting a challenge-driven approach to energy research and innovation will enable Buckinghamshire to draw on a range of additional funding to stimulate the adoption and diffusion of innovative technologies and processes, which may also possess the potential to stimulate the low carbon jobs of the future.

Only by enhancing our ability to collaborate more effectively on developing joint clean energy R&D projects and supporting businesses to commercialise new energy technologies & systems and developing a unique source of competitive advantage will we be able to develop solutions to overcome local energy challenges; demonstrate new & emerging technologies; develop a skills pipeline matched to the emerging commercial energy opportunities; and stimulate investment into energy infrastructure/markets.

Delivering this goal requires much closer collaboration across the public, private, academic and voluntary sectors than has historically been the case if the current market failures in local energy generation can be successfully addressed.

In response to this issue, BTVLEP and partners aspire to;

- Work with the Natural Environment Partnership to review the membership of the Energy & Resource Management Group to strengthen its role as a public-private-academic-voluntary sector project development group, that is equipped to explore the potential of stimulating greater energy innovation in the area;
 - Establish a Clean Energy 'Living Laboratory', to stimulate the growth of energy innovation within the county and provide a 'test-bed' for energy companies to develop new, integrated, local, clean energy solutions.
 - Explore the potential of working with the Regional Energy Hub to resource this group appropriately to ensure that it can stimulate the development of a range of energy innovation projects.
- **Promoting the development of innovative, local, integrated, clean energy systems**

A key part of the Energy Living Laboratory in Buckinghamshire will focus on trying to develop innovative integrated local, clean energy solutions for the new and growing settlements and communities likely to emerge in Buckinghamshire over the next few years, including the new Garden Town.

This is likely to necessitate the involvement of a range of private sector partners across the waste, energy and transportation sectors, research capacity and a group of 'patient' public sector 'anchor institutions' that are capable of facilitating and developing the partnerships needed to develop new solutions.

Using open innovation principles, these public sector partners would seek to stimulate the establishment of new value chains and business models, using public procurement or pre-

collaborative procurement tools to bring together innovators and companies in different sectors to provide integrated solutions.

In addition to adopting traditional 'Smart City' approaches to commissioning new energy innovations (to stimulate Smart Grid and Internet of Things solutions) some of the best 'Living Laboratories' also prioritise the development of 'Citizen Science' initiatives. These initiatives involve residents in helping to deliver social innovation programmes, linked to the energy challenge (for example, by supporting the development of local energy co-op's). Adopting this kind of bottom up social innovation aspect in a 'Living Laboratory' can be useful in helping to raise residents awareness of a particular challenge area and therefore also support more 'top down' innovation projects.

In addition to tackling the core challenges set out previously, one of the secondary benefits of adopting a 'Living Laboratory' approach to energy challenge is that locations that do so are generally more attractive to global firms looking to finance or test their innovations in the locality, as they look to capitalise on the presence of more advanced, open-minded consumers.

In response to this issue, BTVLEP and partners aspire to;

- Strengthen Buckinghamshire's capabilities to develop energy innovation projects and resource their delivery (by securing investment to enable them to be brought forward);
- Strengthen relationships with relevant HE institutions and businesses that are active in the clean energy sector;
- Embed an open innovation approach into local infrastructure planning and development structures – including the Garden Town arrangements - to enable the commissioning of innovative technological solutions and future-proof infrastructure investments.

- **Facilitating the development of Heat Networks**

One of the key opportunities that exists to decarbonise the energy network in Buckinghamshire as its population grows, is to support the development of Heat Networks.

A heat network – sometimes called district heating – is a distribution system of insulated pipes that takes heat from a central source and delivers it to a number of domestic or non-domestic buildings. The heat source might be a facility that provides a dedicated supply to the heat network, such as a combined heat and power plant; or heat recovered from industry and urban infrastructure, canals and rivers, or energy from waste plants.

Heat networks form an important part of our plan to reduce carbon and cut heating bills for the residents of Buckinghamshire. They are one of the most cost-effective ways of reducing carbon emissions from heating, and their efficiency and carbon-saving potential increases as they grow and connect to each other. They provide a unique opportunity to exploit larger scale – and often lower cost – renewable and recovered heat sources that otherwise cannot be used. It is estimated that around 18% of UK heat will need to come from heat networks by 2050 if the UK is to meet its carbon targets cost effectively.

In Buckinghamshire, particular opportunities currently being explored include Aylesbury Woodlands and utilising the waste heat from the Greatmoor Energy from Waste (EFW) plant. Other opportunities may emerge as Buckinghamshire's population grows.

In response to this issue, BTVLEP and partners aspire to;

- Continue to identify potential opportunities for establishing Heat Networks in the area;
- Secure investment to undertake feasibility studies to develop viable business cases and secure investment to bring forward viable heat networks in Buckinghamshire.

- **Accelerating the rollout of Low Carbon Vehicle (LCV) Charging 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. In the public transport sector, it is reasonably common to find buses powered by biogas and electricity and a number of projects are trialling the use of hydrogen trains.

These changes will bring with them a range of benefits including improvements to local air quality and reductions in the carbon emissions from transport.

Whilst Low Carbon Vehicles (LCV) continue to become more advanced and accepted as a reliable form of transport, they require new refuelling 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, although future requirements are likely to comprise a mix of home (new build and retro-fit); on and off street; destination; and strategic / route based requirements.

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

In response to this issue, BTVLEP and partners aspire to;

- Continue to invest in the expansion of EV Charging infrastructure, across Buckinghamshire;
- Explore the potential for establishing Hydrogen Refuelling Hubs, at relevant points across the county.

- **Improving 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.

Considering the current known distribution infrastructure and areas of known grid constraint, 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 already in place.

In response to this issue, BTVLEP and partners aspire to;

- Understand more about current grid capacity and constraints, to identify opportunities for flexible solutions;
- Overcome the current constraints on grid capacity by working with developers and the DNOs to explore how best to overcome the current capacity constraints.

- **Encouraging the development of Community Energy Solutions**

One of the significant opportunities that exists to lock the benefits of growth into localities is the establishment of community energy co-operatives.

Operating along similar lines to community broadband projects, these kind of community co-operatives work around the principle of encouraging community investment in key infrastructure, with local residents benefitting from the shareholder returns once the capital asset has been paid down.

Enthusiasing residents to the potential opportunity to own local energy infrastructure has significant secondary benefits – in terms of promoting share ownership, local value into the local community and promoting positive environmental behaviours.

In response to this issue, BTVLEP and partners aspire to;

- Explore the potential to establish a strong low carbon hub, to try and support and encourage residents to establish community energy co-operatives and/or promote community based clean energy solutions.

- **Ensuring the skills system is equipped to take advantage of, and support, clean growth**

If the UK is to embed clean energy approaches in future developments, and encourage retrofitting of clean energy solutions, there is a need to ensure people have the knowledge and skills to be able to specify, install, champion and manage the resultant technology solutions.

A raft of regulatory changes are likely to require improved skills in the specifier and installer communities. Encouraging communities to develop co-operative energy solutions will require community capacity building. Helping businesses and landlords to address energy efficiency measures will require an investment in workforce development. Encouraging the establishment of strong local energy leadership will require investment in skills and knowledge.

In response to these issues, BTVLEP and partners aspire to;

- Support the education, skills and training sector to adapt their provision to ensure it is fit for purpose and supports the goals of this Strategy;
- Inspire more young people to work in the clean energy sector;
- Encourage and incentivise businesses, residents, installers, suppliers and local leaders to develop the skills necessary to be able to specify, install, champion and manage clean energy solutions.

- **Promoting 'circularity', to ensure we maximise the value of our indigenous resources**

The two major potential advantages of implementing clean growth principles is the idea that such policies offer positive economic and environmental benefits. However, going forward, significant benefits are also likely to accrue for Buckinghamshire from maximising the value that the locality extracts from its indigenous resources, and minimising the negative environmental and carbon impacts associated with their extraction, use and disposal.

Such 'circular' business models are growing in popularity, both in business but also in public policy, because they also offer the potential to deliver increased returns/profitability and best value, but also because they limit environmental damage.

For example, government has an ambition to work towards zero avoidable waste by 2050. Waste is a recognised feedstock in energy generation. One of the valuable by products of the energy from waste process is heat, which offers significant potential to decarbonise the grid.

By thinking of the energy system as a 'whole system', designing out waste and pollution, keeping products and materials in use (at their highest utility and value) and regenerating natural systems, Buckinghamshire will be able to re-design the way the economy works, build long-term resilience, generate business and economic opportunities, and provide environmental and societal benefits.

In response to these issues, BTVLEP and partners aspire to;

- Promote strong collaboration across the waste, energy and transport value chains to develop innovative solutions for decarbonizing heating, cooling, power and transport;
- Promote energy efficiency and waste reduction in the energy sector;
- Promote renewable energy as the natural 'go to' technology in future developments;

5.0 Strategy

Having considered the primary areas of focus for Buckinghamshire's Renewable Energy Strategy, we will now go on to look at how BTVLEP and partners will realise improvements in the areas identified.

In order to consider how best to deploy the existing resources we have available to us and maximise future investment into this area, its worth analysing what key processes underpin the successful delivery of energy improvements in a particular locality.

Past evidence suggests the following are important;

- **Partnership:** A strong, place based, public – private – academic - community energy partnership is one of the fundamental building blocks of delivering strong improvements in a localities clean energy systems;
- **Project Design and Development:** A strong ability to design and develop innovative clean energy projects (from early idea, through to proof of concept and prototype) is key to delivering successful clean energy projects;
- **Investment Attraction:** The ability to identify and attract resources to finance suitable energy investments is another key competence of localities that are good at securing energy projects;
- **Project Delivery:** Once the funding has been secured, successful project delivery is vital to securing the trust of future funders.

In light of the above, our Strategy for delivering improvements in the above areas is focussed on BTVLEP partners;

- **Governance:** Strengthening the local Energy Management governance arrangements, to build a stronger public-private-academic and community partnership to collaborate on the delivery of the above goals;
- **Project Development:** Working with the BEIS, the Greater South East (GSE) Energy Hub⁵ and national/regional/local partners to develop transformational projects and programmes which can address the clean growth opportunities presented in this Strategy;
- **Identifying Investment:** Identifying suitable funding opportunities capable of funding energy projects and initiatives identified within this Strategy;
- **Securing Investment:** Establishing effective systems for securing investment funds in pursuit of the above goals;
- **Partnership Based Delivery:** Adopting delivery, enablement and advocacy roles, to promote and support actions by partners, and other organisations, which support these outcomes.

Collectively focussing on these goals will support the implementation of this strategy by enabling the partnership to tackle some of the key challenges that stand in the way of delivering clean growth and move projects forward which exploit the clean growth opportunities identified in this Strategy.

6.0 Resources

In this section of the Strategy, we examine where the funding is likely to come from to implement this strategy and the potential quantum of funding needed.

The Current Investment Climate for Clean Energy

The International Energy Agency (IEA)⁶ estimates that \$13.5 trillion of public and private investment in the global energy sector alone will be required between 2015 and 2030 if the signatories to the Paris Agreement are to meet their national targets.

Analysts at Bloomberg New Energy Finance estimate that **global** government spending on clean energy R&D was worth \$5.5 billion in 2016 and corporate spending was worth \$3.5 billion.⁷ Similarly, the IEA's estimates of investment in the broader category of RD&D show that governments invested \$19 billion in 2015, companies \$6 billion, and venture capital funds \$2 billion⁸.

The energy industry as a whole invests far less in R&D than other sectors. For example, in 2017 the world's 25 largest corporate R&D investors – a list dominated by internet, automotive and pharmaceutical companies – spent \$222 billion on R&D alone.

This data emphasises the importance of government investment in energy innovation.

Locally available funding to support the delivery of this strategy

The mainstream resources that Buckinghamshire has available to it, to deliver this strategy have generally been coming under increasing pressure in recent years. This is particularly true of revenue funding, which has been hit particularly hard.

One of the major areas where Buckinghamshire has received some funding to invest in Low Carbon initiatives in the past is through European Programmes. For example, circa £4,000,000 of ERDF funding has been made available to invest in a range of business support programmes, to encourage the adoption of Low Carbon Transport and Workplace Energy Efficiency Programmes. In addition, ESF offers the potential to address some of the skills issues identified in this strategy.

⁵ See <http://46.32.240.41/energyhub.org.uk/>

⁶ International Energy Agency (2015) [Climate pledges for COP21 slow energy sector emissions growth dramatically](#)

⁷ [Global Trends in Renewable Energy Investment 2017](#), UNEP, BNEF

⁸ [Tracking Clean Energy Innovation Progress 2017](#), IEA,

However, following our departure from the European Union, this is likely to be replaced with UK Shared Prosperity Funding although it is unclear whether or not Buckinghamshire will continue to benefit from this, or whether it will continue to focus on low carbon initiatives. We believe the case for continuing to invest in this area is compelling.

Buckinghamshire has also benefitted from a range of other funding to support Low Carbon initiatives in the recent past (i.e. OLEV Plugged in Places Funding, Affordable Warmth Networks etc.) but this has tended to come to the area via periodic, open competitive competitions, rather than ring fenced funding.

UK Government investment in Clean Energy

At Autumn Statement 2015, the government committed to double the UK's **energy innovation spend**, such that by 2021 it will have doubled to over £400 million per year. This builds on previous initiatives under the Coalition government. This funding will support investments in innovations across the energy sector. The UK government's energy innovation investment portfolio includes;

- Innovative renewables;
- Innovative smart energy system technologies;
- Nuclear innovation;
- Innovative low carbon industry;
- Innovative built environment;
- Green finance; and
- Energy Entrepreneurs Fund.

In the **UK Clean Growth Strategy**, the government significantly increased its investment in low carbon innovation. The strategy indicates that between 2015 and 2021 the government expects to invest (subject to value for money projects being put forwards) over £2.5 billion in research, development and demonstration of low carbon energy, transport, agriculture, and waste. This includes:

- Up to £505 million from the BEIS Energy Innovation Programme, which aims to accelerate the commercialisation of innovative clean energy technologies and processes;
- Up to £1.2 billion from the combination of UK Research Councils investments and Innovate UK – now being brought into one organisation with the creation of UK Research and Innovation. These investments include funding for the Energy Systems Catapult and the Offshore Renewable Energy Catapult.
- Up to £246 million for the Faraday Challenge, which will ensure the UK builds on its strengths and leads the world in the design, development and manufacture of electric batteries.
- Up to £620 million from a range of Departments, including BEIS, DfT, DfID, and Defra.

In addition to this Government funding, Ofgem is making available to GB gas and electricity network companies up to £720 million of regulated expenditure for them to support smarter, more flexible, efficient, and resilient gas and electricity networks.

BEIS Energy Innovation Programme

The BEIS Energy Innovation Programme aims to accelerate the commercialisation of innovative clean energy technologies and processes into the 2020s and 2030s. The Programme, with a budget of £505 million from 2015-2021 consists of six themes, to invest:

- Around £70 million in smart systems;
- Around £90 million in the built environment (energy efficiency & heating);

- Around £100 million in industrial decarbonisation and carbon capture, use, and storage (CCUS);
- Around £180 million in nuclear innovation;
- Around £15 million in renewables innovation; and
- Around £50 million in support for energy entrepreneurs and green financing.

Conclusions

The major ringfenced funding that localities have traditionally been in receipt of to support the transition to a low carbon economy is in transition, with little or no guarantee that it will continue to be invested in this area.

Going forward, the major public sector investment into clean energy will be through innovation and R&D programmes like the Industrial Strategy Challenge Fund, Strength in Places etc. These types of programme operate around open competitions and promote deep collaboration across the public, private, academic sectors, with the primary goal of strengthening the industrial capability of business, to strengthen the economy and create jobs of the future.

Given this funding is likely to be the major funding that is flowing into supporting clean energy projects going forward, Buckinghamshire will need to strengthen, adapt and evolve its systems and processes for securing this kind of funding going forward, if it wants to develop clean energy projects.

7.0 Targets

In order to track the UK's performance against the UK Clean Growth Strategy, the Government has developed an Emissions Intensity Ratio (EIR) to measure the UK's clean growth performance, which they will publish each year to track progress.

To reach our 2032 targets we will need to drive the emissions intensity of the economy down by an average of five per cent per year to 2032, an acceleration in the four per cent annual fall since 1990⁹.

The Emissions Intensity Ratio (EIR) measures the amount of greenhouse gases (tonnes of carbon dioxide equivalent) produced for each unit of Gross Domestic Product (GDP) created. Currently the EIR is 270 tonnes/£ million and it was 720 tonnes/£ million in 1990. By 2032, the government expects the EIR will need to be nearly as low as 100 tonnes/£million to meet their ambitions.

In order to measure Buckinghamshire's progress against the nation EIR goals, we will seek to develop a local variant of the same measure.

8.0 Governance & Monitoring

In order to better understand how government investment flows into localities, it's worth analysing the emerging governance framework being used to deploy government investment.

The National Energy Innovation Board

Nationally, the Energy Innovation Board has been formed to replace and build on the work of the Low Carbon Innovation Co-ordination Group (LCICG), to provide an even greater opportunity to collaborate at a strategic level.

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This new Board is Chaired by Dr Patrick Vallance, the Government Chief Scientific Advisor, and attended by senior civil servants across BEIS, Innovate UK, Research Councils, DCLG, Defra, DfID, DfT, Ofgem, and with HMT as observers.

The Regional Energy Hubs

The Greater South East Energy Hub is a newly forming organisation funded by the Department for Business, Energy and Industrial Strategy. Cambridgeshire and Peterborough Combined Authority, are the accountable body for the Greater South East Energy Hub responsible for the effective operation and financial accountability of the Hub and therefore the employer for these roles.

The Hub comprises 11 Local Enterprise Partnerships (LEPs), see below, across the Greater South East of England and represents their interests in facilitating the development of a pipeline of innovation energy projects and energy infrastructure schemes. These 11 LEPs manage the Hub and decide how best to deploy human and financial resources.

The Buckinghamshire & Milton Keynes Energy & Resource Management Group

The Buckinghamshire & Milton Keynes Energy and Resource Management (ERM) Group aims to promote the use of natural resources, including energy resources, in a way which protects the natural environment whilst using it to support growth. An important aspect of the group's work has been the development of the Buckinghamshire Energy Strategy.

Historically, this group has focussed on promoting the benefits which developing energy resources can bring, rather than focusing on building a specified capacity.

Going forward, Buckinghamshire may need to review the resource base and membership of this group, or establish other mechanisms, if it wants to more fully exploit the opportunities that are emerging through programmes like the Industrial Strategy Challenge Fund, Strength in Places etc.

9.0 Conclusions

This Strategy sets out a programme of work which will enable Buckinghamshire to support the delivery of the UK Clean Growth Strategy and the National Industrial Strategy.

It's been built around a strong local evidence base, to prioritise and focus action on the areas that will help Buckinghamshire to decarbonise and exploit new energy opportunities for future growth.

In developing the priorities that we have, we have deliberately sought to focus investment into the unique activities that are best delivered by localities, through actions like community capacity building, community enablement, local promotion, embedded implementation etc.

In delivering this strategy, we will work with – and need the continued support of – the Regional Energy Hub and the Government. Indeed, the scale of activity that Buckinghamshire is able to deliver is likely to be dependent on the support received from these partners and the ability of the Buckinghamshire to get behind this strategy as a shared platform for clean growth.

Appendices

Appendix 1: The Evidence Base

Appendix 1: The Evidence Base

In this section of the Strategy, we set out what we know about the Buckinghamshire energy economy and what particular challenges and opportunities arise from this.

The 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.

The UK Clean Energy Strategy

The UK's Clean Energy Strategy sets out the need for the UK to tackle a number of issues which have hitherto eluded the UK's energy generation sector, namely the need to decarbonise the transport, business and industrial sectors and reduce the emissions created by heating our homes and businesses, in such a way which stimulates innovation and investment to reduce our energy bills, improve our productivity, improve air quality, and create more jobs and more export opportunities.

The UK's Clean Growth Strategy¹⁰ recognises that delivering clean growth will *“increase our productivity, create good jobs, boost earning power for people right across the country, and help protect the climate and environment upon which we and future generations depend”*.

The Clean Growth Strategy also 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.

The UK's Clean Growth Strategy continues; *“Capturing part of the global opportunity while continuing to drive down carbon emissions from our own activities could provide a real national economic boost. The UK low carbon economy could grow by an estimated 11 per cent per year between 2015 and 2030 – four times faster than the rest of the economy – and could deliver between £60 billion and £170 billion of export sales of goods and services by 2030.*

This means that clean growth can play a central part in our Industrial Strategy – building on our strengths to drive economic growth and boost earning power across the country. Action to deliver clean growth can also have wider benefits. For example, the co-benefit of cutting transport emissions is cleaner air, which has an important effect on public health, the economy, and the environment.

¹⁰ UK Clean Growth Strategy (2017) - <https://www.gov.uk/government/publications/clean-growth-strategy>

But hitting our carbon budgets and expanding the low carbon economy will not be easy. We have achieved significant results in the power and waste sectors and now need to replicate this success across the economy, particularly in the transport, business and industrial sectors.

We also need to reduce the emissions created by heating our homes and businesses, which account for almost a third of UK emissions. If done in the right way, cutting emissions in these areas can benefit us all through reduced energy bills, which will help improve the UK's productivity, and improved air quality, while the innovation and investment required to drive these emissions down can create more jobs and more export opportunities".

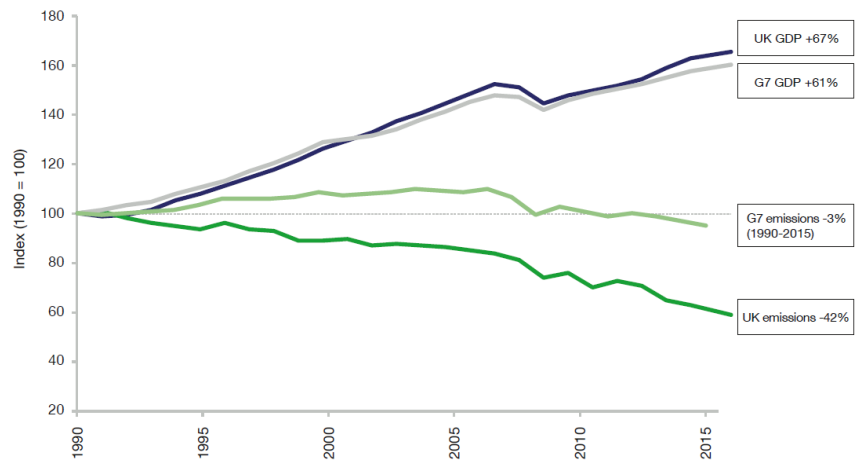


Figure 1: UK and G7 economic growth and emissions reductions¹

The Clean Growth Strategy sets out a range of national challenges and opportunities with two guiding objectives which are critical in shaping these policies, namely the need to;

1. Meet our domestic (Climate Change Act¹¹) 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

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 |

¹¹ The Climate Change Act (2008) sets out the Governments principal approach for meeting it's, legally binding, carbon emissions reductions.

| | |
|--|---|
| 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 Paper¹² 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 |

The **Industrial Strategy**¹³ goes on to identify that the Clean Growth Grand Challenge “*will maximise the advantages for UK industry from the global shift to clean growth – through leading the world in the development, manufacture and use of low carbon technologies, systems and services that cost less than high carbon alternatives. The move to cleaner economic growth – through low carbon technologies and the efficient use of resources – is one of the greatest industrial opportunities of our time. By one estimate, the UK’s clean economy could grow at four times the rate of GDP. Whole new industries will be created, and existing industries transformed as we move towards a low carbon, more resource-efficient economy.*”

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

¹² The UK’s Industrial Strategy (2017) – see <https://www.gov.uk/government/topical-events/the-uks-industrial-strategy>

¹³ The UK’s Industrial Strategy (2017) – see <https://www.gov.uk/government/topical-events/the-uks-industrial-strategy>

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.

Mission Innovation

The UK has indicated that it will also continue to play a leading role in international research efforts to reduce the costs of low carbon energy, working with other countries to strengthen collaboration and transparency in clean energy research, development, and demonstration. To demonstrate this commitment, at the COP21 climate change conference in Paris, the UK joined **Mission Innovation**. Mission Innovation is an international initiative which aims to accelerate clean energy investment and innovation in order to provide reliable and affordable energy for all.

However, there are a significant number of challenges linked to the delivery of the ambitious goals set out in these various strategies/agreements. In particular, there is a desperate need to develop a range of new business models for delivering our energy futures. In order for this vision to be realised, future energy solutions need to place more emphasis on;

- Decarbonising the grid;
- Promoting the development of innovative, local, integrated, clean energy systems;
- Enhancing regional productivity, creating good jobs and boosting earning power; and
- Helping to protect the climate/environment.

The Buckinghamshire Context

A range of other strategies and evidence also supports the work for the priorities of the Buckinghamshire Energy Strategy.

Buckinghamshire Local Industrial Strategy

As one of the LEPs across the Oxford - Milton Keynes - Cambridge 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 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 quality¹⁴. 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 Strategy¹⁵ 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.

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.

¹⁴ <https://www.buckscc.gov.uk/news/air-quality-conference/>

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

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

Looking at some of the energy consumption patterns in Buckinghamshire;

- **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

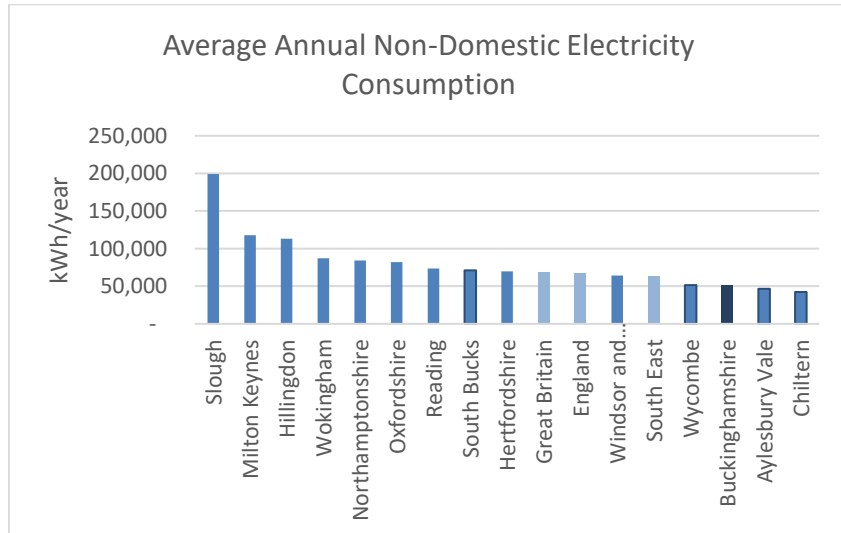


Figure 2: Non-Domestic electricity consumption comparison

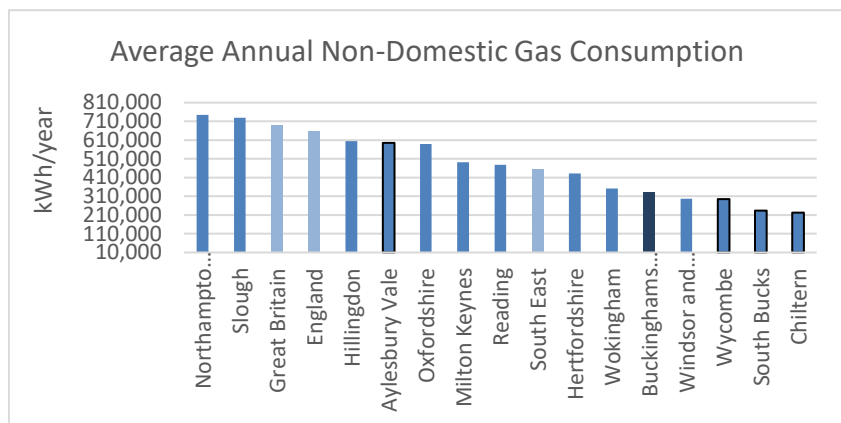


Figure 3: Non-Domestic gas consumption comparison

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.

- **Domestic Electricity & Gas.**

Domestic 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 available 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 properties (see page 28), South Bucks is relatively 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 caution 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 districts 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

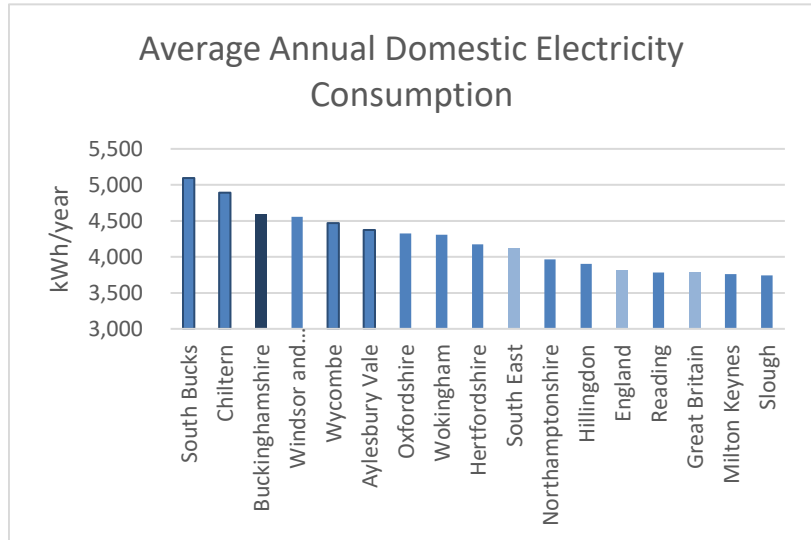


Figure 4: Domestic electricity consumption comparison

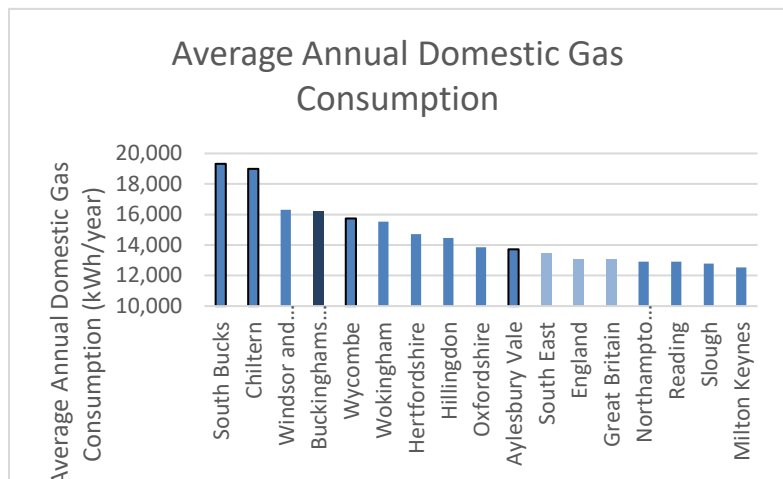


Figure 5: Domestic gas consumption comparison

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.

Carbon Emissions

Looking at some of the Carbon Emission patterns in Buckinghamshire;

- **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.

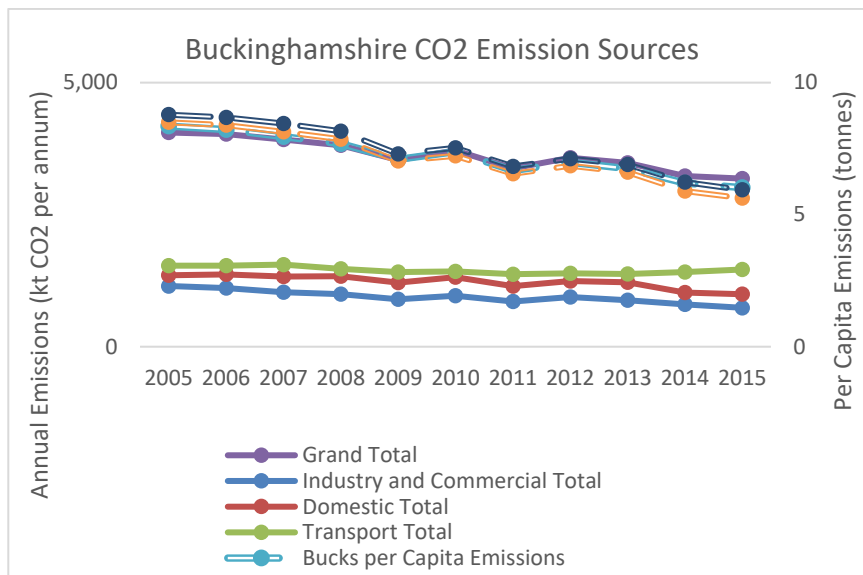


Figure 6 - Carbon Emissions by sector

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.

- **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.

- **Domestic**

Domestic emissions are predominantly from gas consumption which show a general trend 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.

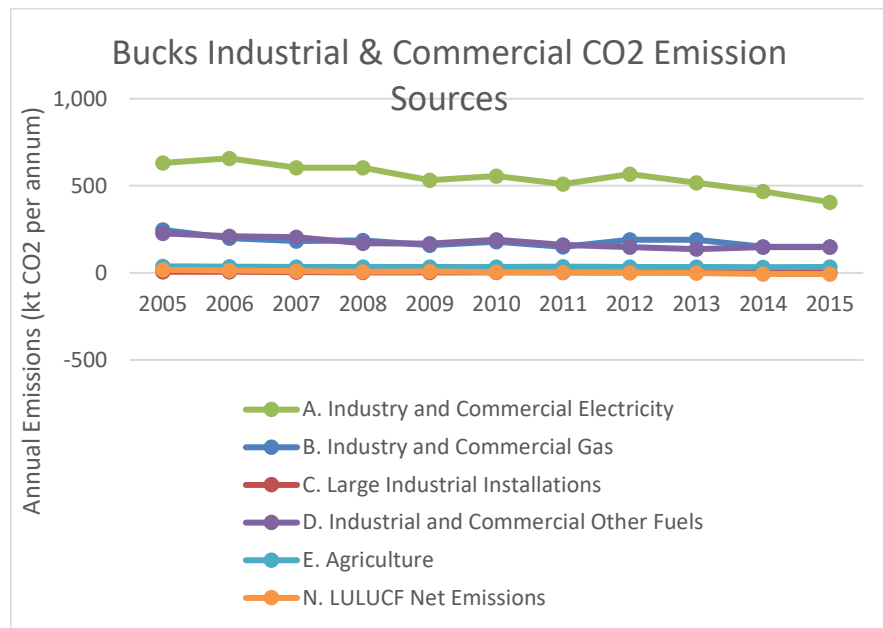


Figure 7 - Industrial and commercial carbon emissions sources

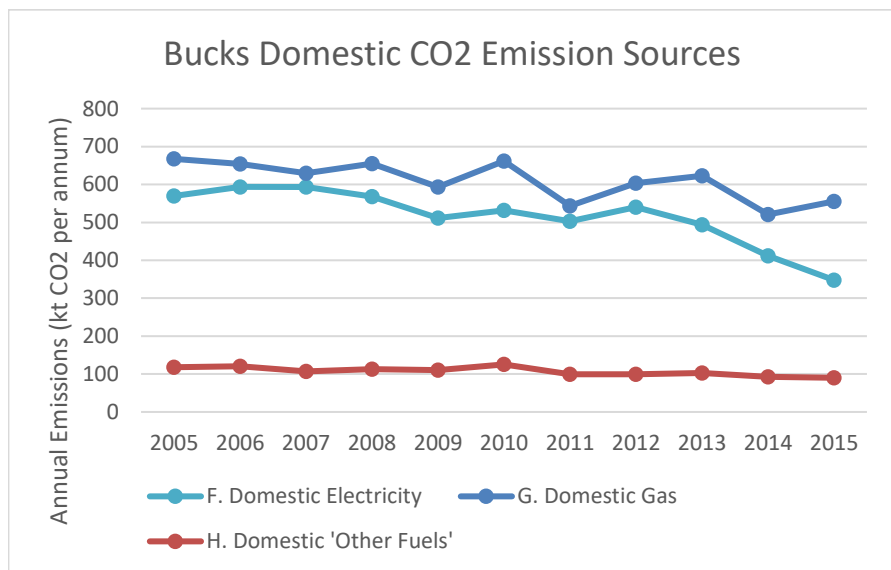


Figure 8 - Domestic Carbon Emissions Sources

- 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.

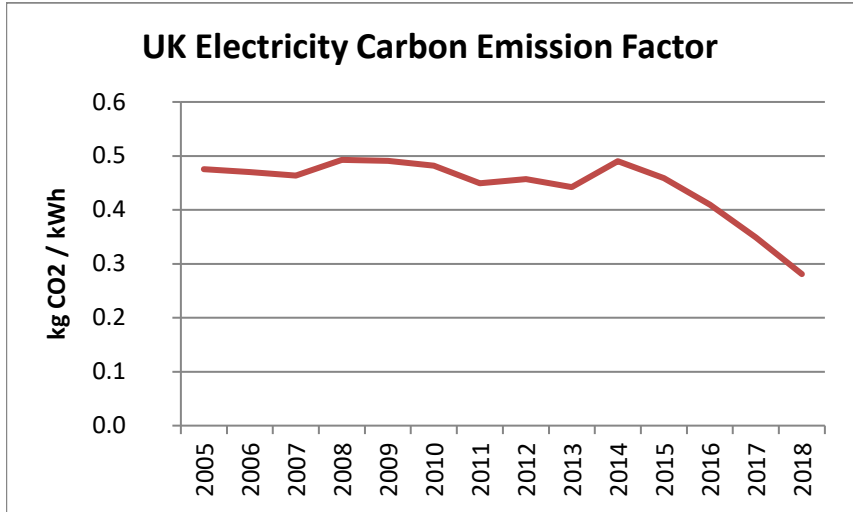


Figure 9: UK Electricity Carbon Emission Factor

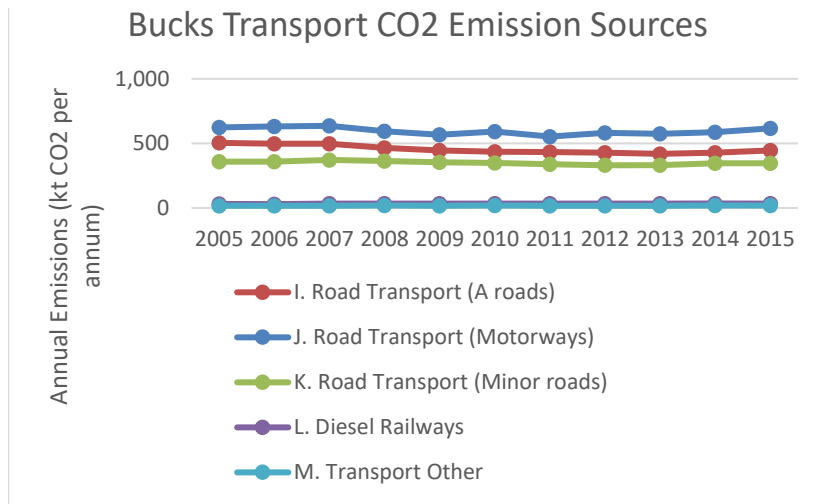


Figure 10 - Transport Carbon Emission Sources

- 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

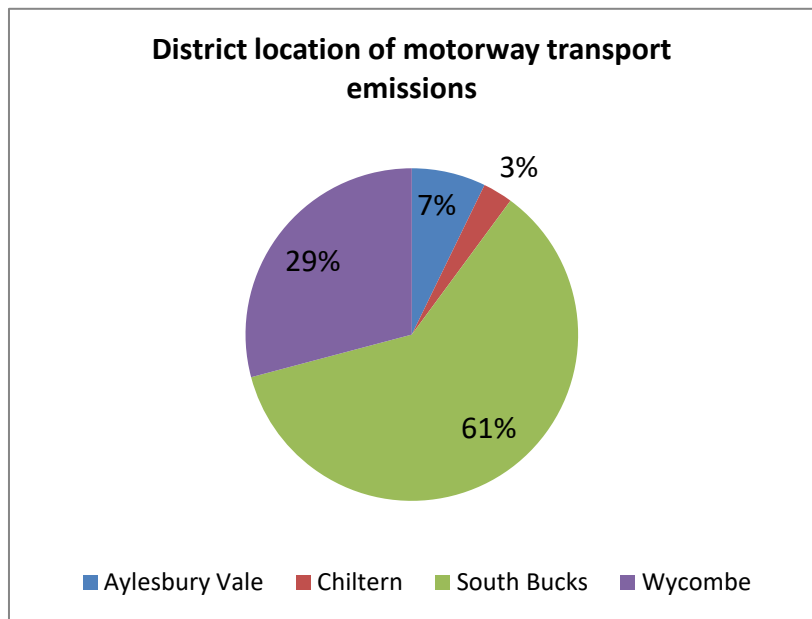


Figure 11 - District location of motorway emissions sources

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.

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

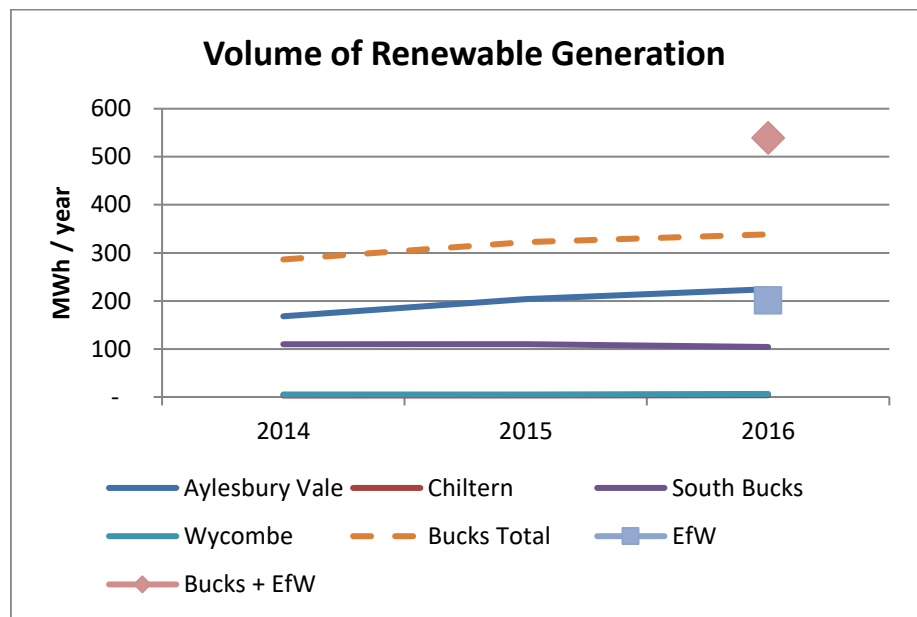


Figure 12 - Volume of Renewable generation over time

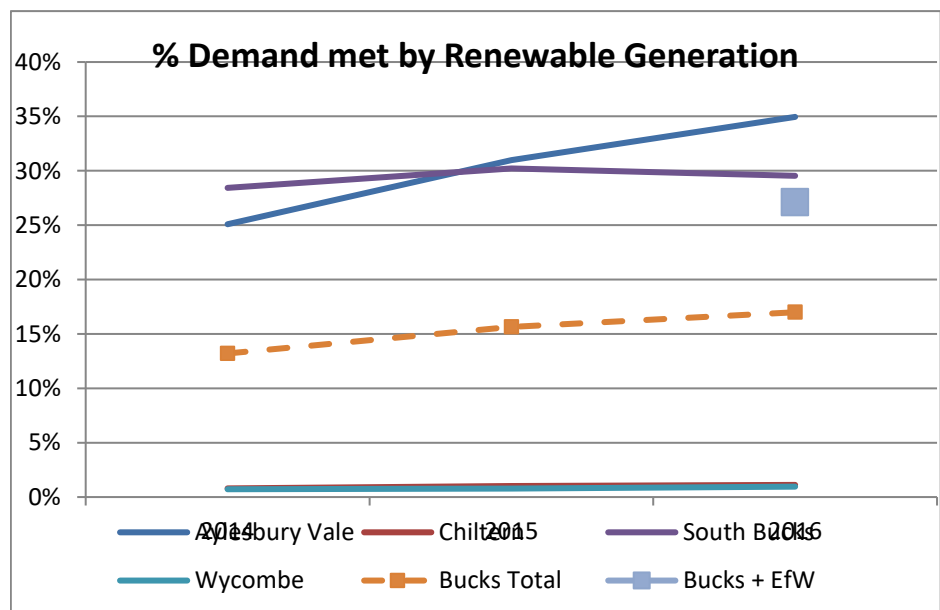


Figure 13 - Local electricity demand met by renewable generation

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.

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 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.

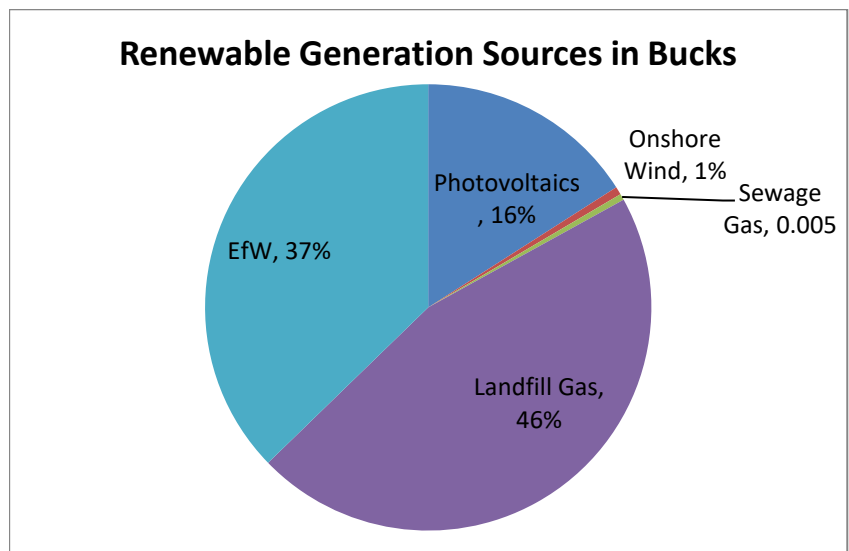


Figure 14 - Sources of Renewable Electricity Generation in Buckinghamshire

Case Study: 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

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-

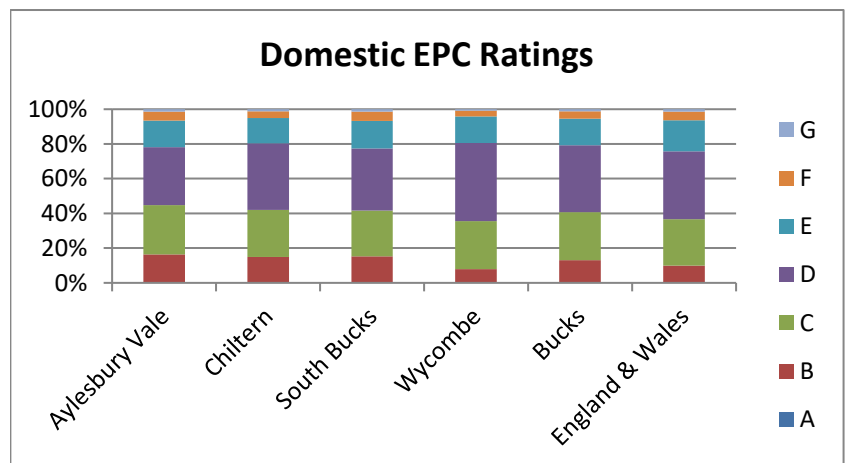


Figure 15 - Domestic Energy Efficiency Ratings

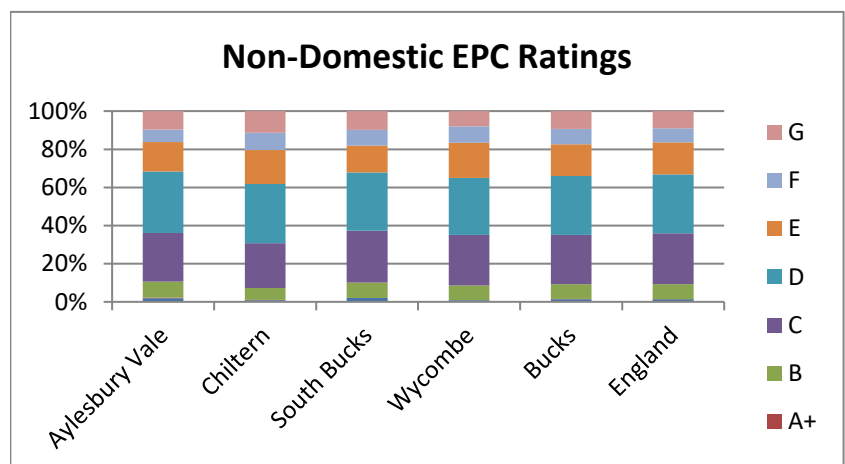


Figure 16 - Non-domestic Energy Efficiency Ratings

domestic properties the difference in A+ to C ratings between Buckinghamshire and England is only 1%, in favour of England.

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

Looking at some of the existing Infrastructure in Buckinghamshire;

- **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

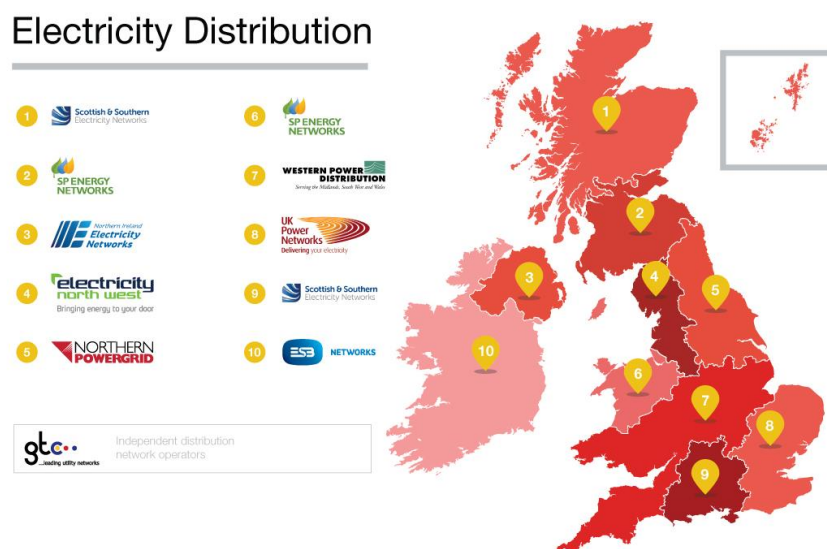


Figure 17: Electricity Distribution Network Operator Map (Energy Networks Association¹)

and Ireland with Buckinghamshire served by Wester Power Distribution (WPD – 7), UK Power Networks (UKPN – 8) and Scottish and Southern Electricity Networks (SSE – 9).

Further mapping information on the grid operator’s regions of supply and level of capacity is available later on in this strategy.

- **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.

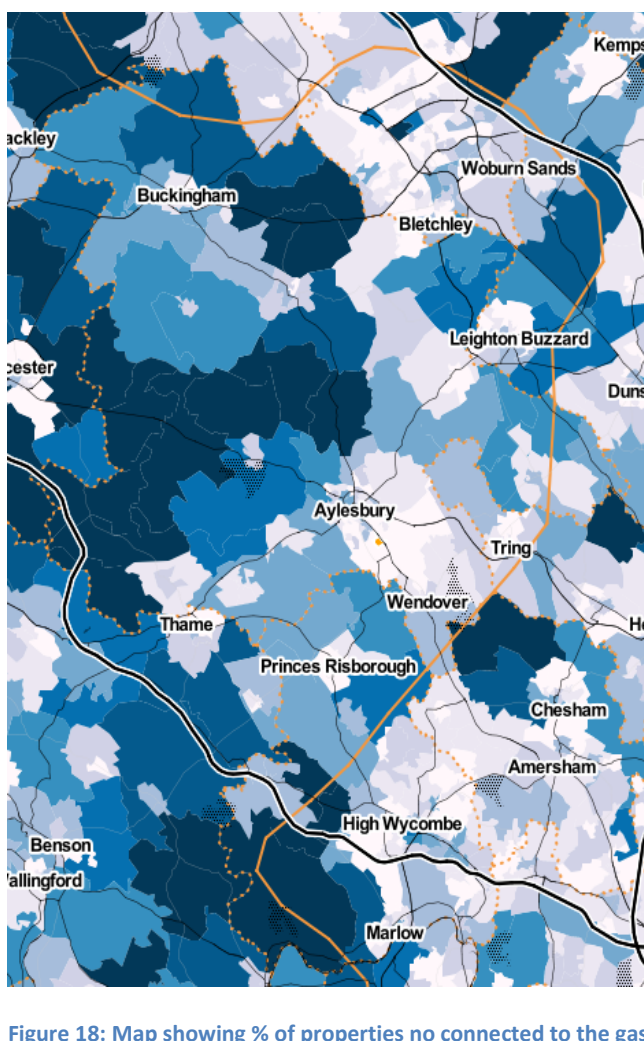


Figure 18: Map showing % of properties not connected to the gas network (<https://www.nongasmap.org.uk/>)

| 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

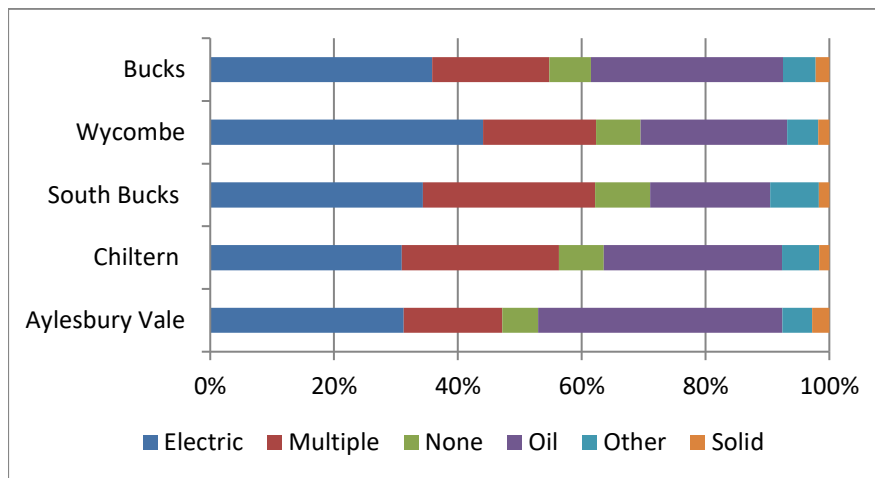


Figure 19: Main heating fuels for off-gas grid homes

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%.

- **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 there 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.

- **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.

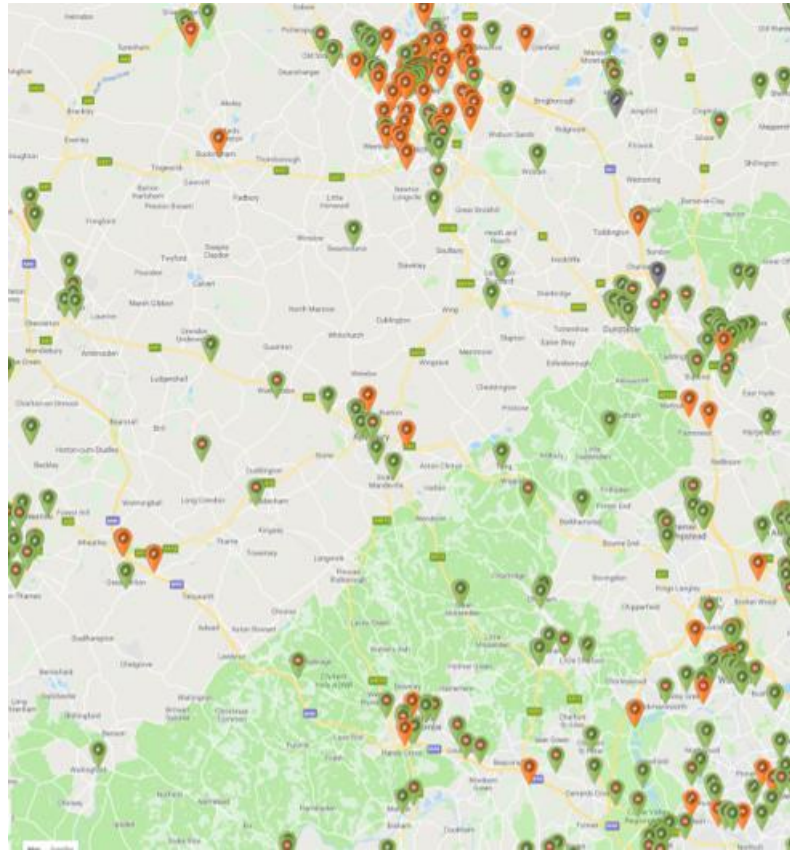


Figure 20 - EV Charging Points in and around Buckinghamshire, data from open charge map: <https://map.openchargemap.io/>

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 than 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.

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

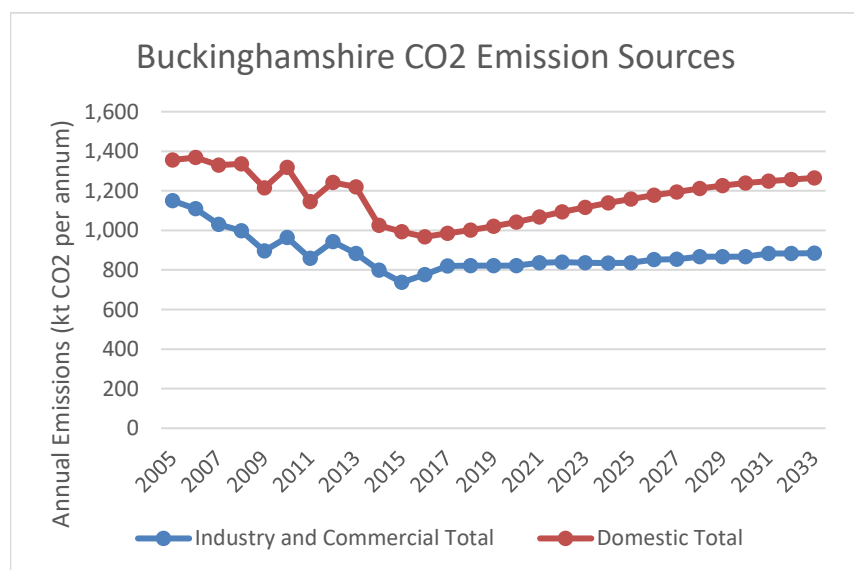


Figure 21: Current and Forecast Carbon Emissions in Buckinghamshire

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 than 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 efficiency, 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.

- **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

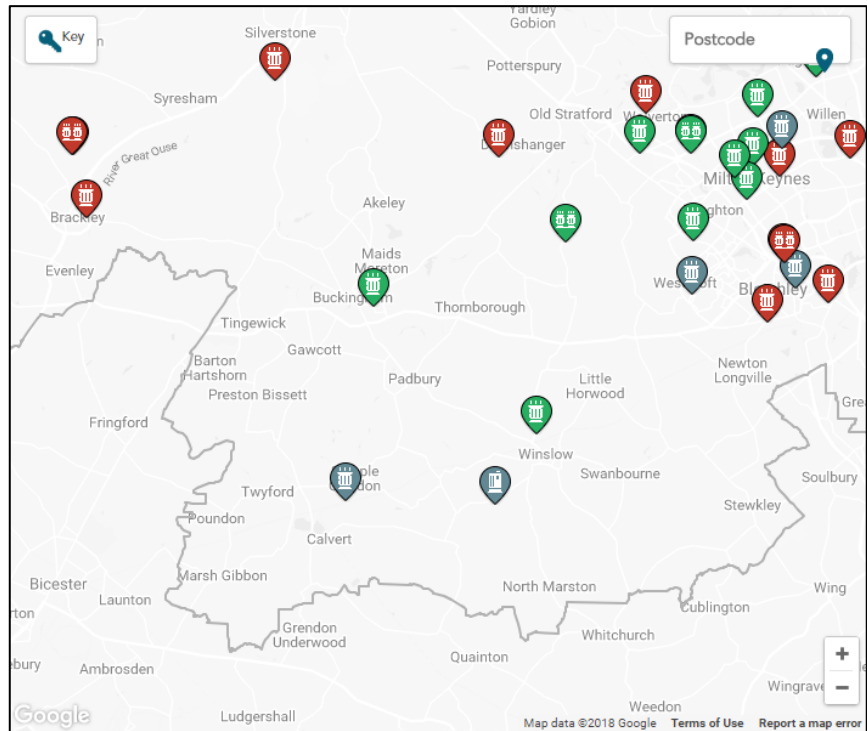


Figure 22 - Generation constraints maps for WPD area (Downloaded on 15 June 2018 from <http://www.westernpower.co.uk/connections/generation/network-capacity-map.aspx>)

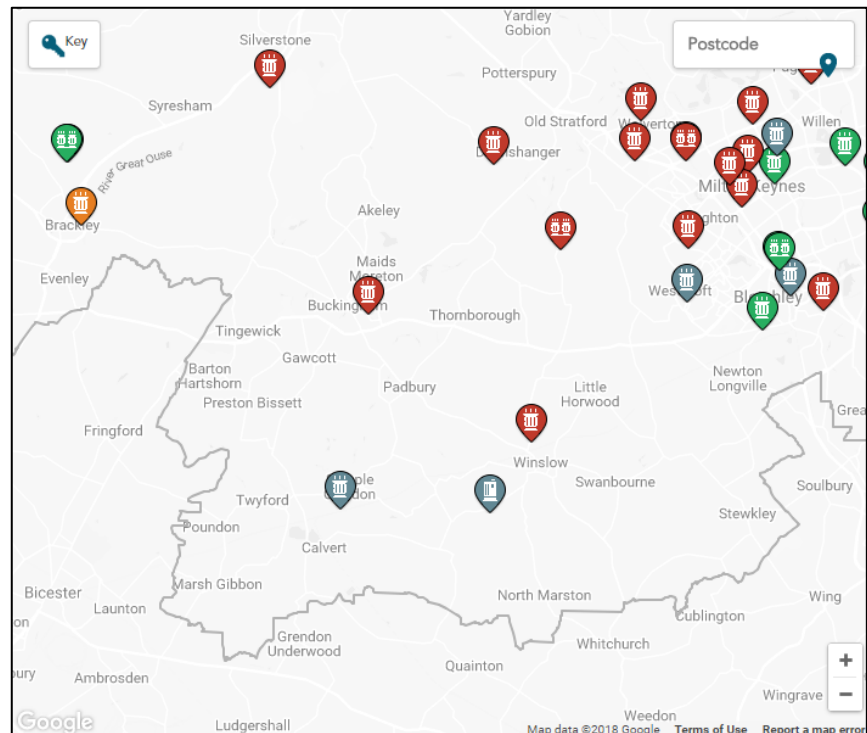


Figure 23 - Demand constraints maps for WPD area (Downloaded on 15 June 2018 from: <http://www.westernpower.co.uk/connections/generation/network-capacity-map.aspx>)

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.

- **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

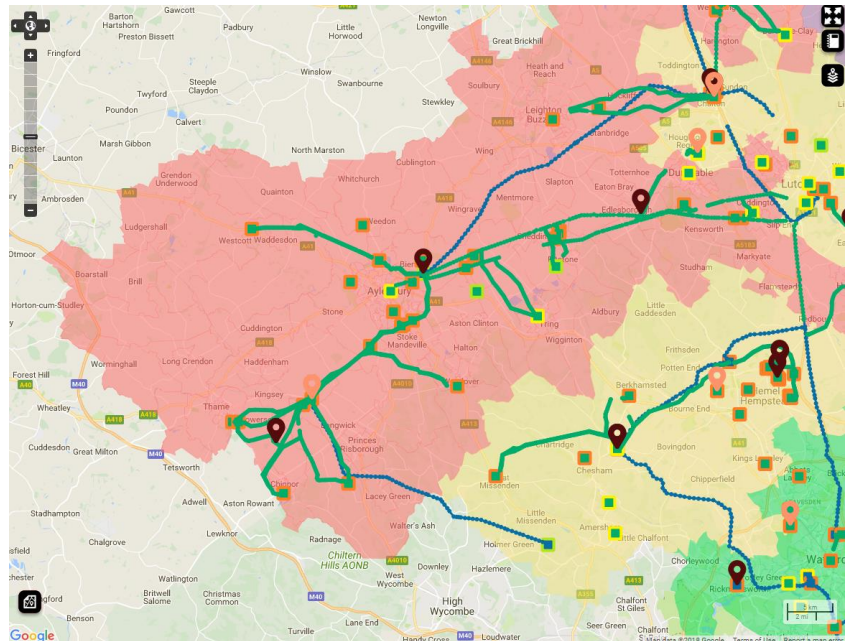


Figure 24 - Generation and Demand constraints map for UKPN area (Downloaded on 15 June 2018 from http://dgmapping.cloudapp.net/site/?q=dgmapping_ext)

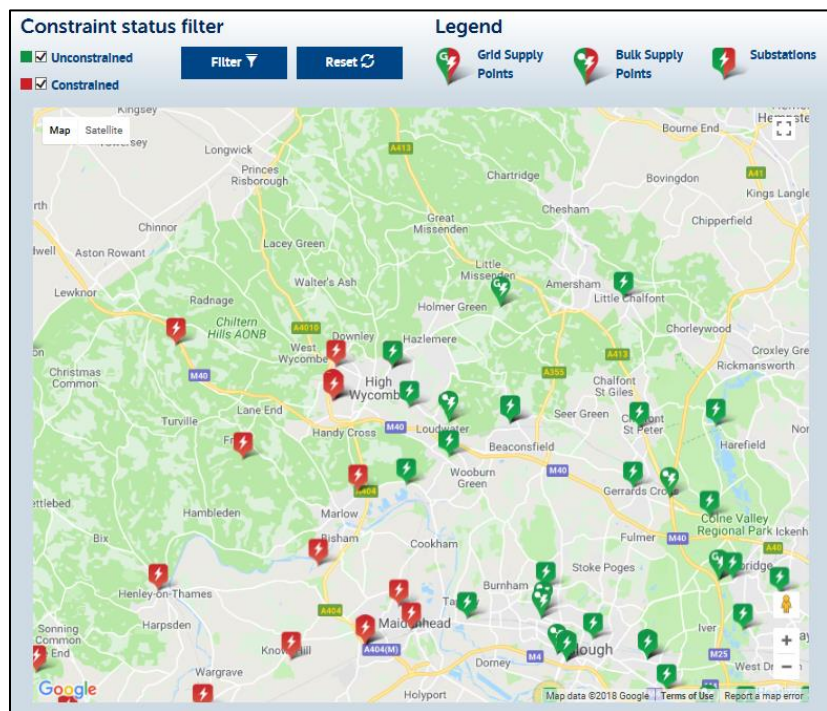


Figure 25 - Generation Constraints map for SSEN area (Retrieved on 15 June 2018 from <https://www.ssepd.co.uk/GenerationAvailabilityMap/?mapareaid=1>)

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’.

- **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.

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 it can be seen that large areas around Aylesbury are allocated for housing. High Wycombe, being 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 of dwellings allocated for delivery within the local plans with Aylesbury Vale allocating the most by a significant margin.

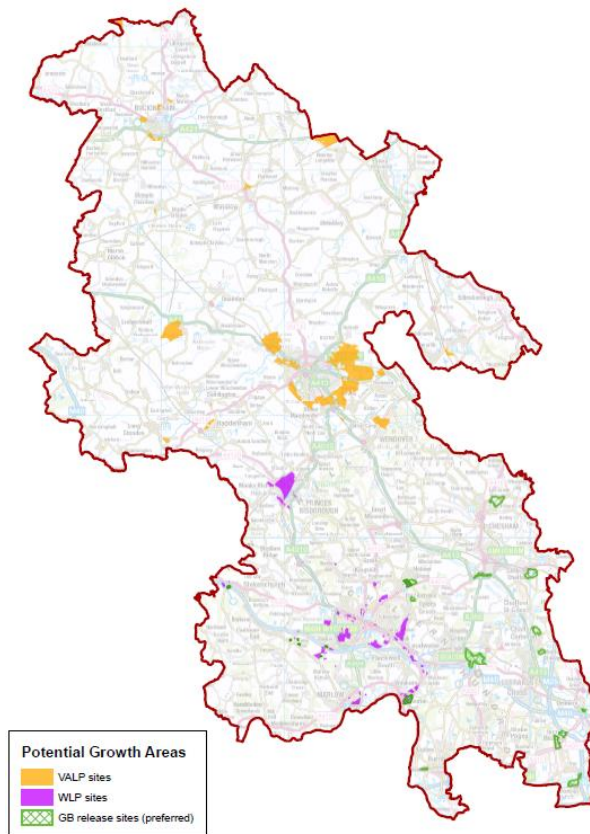


Figure 26 - Locations of development sites in Local Plans

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

Housing delivery to 2033 by District

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.

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 and 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 or 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 Economics¹⁶ 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 uptake increasing and growth in Buckinghamshire and across the Oxford-Cambridge corridor.

¹⁶ Affordable Warmth, Clean Growth (2017) <http://www.frontier-economics.com/publication/affordable-warmth-clean-growth/>

- 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 increasing 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 Oxford to Cambridge 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.

Appendix 2: DRAFT Challenges and Opportunities

The below content was 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 | <ul style="list-style-type: none"> 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 | <ul style="list-style-type: none"> 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. | <ul style="list-style-type: none"> 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 | <ul style="list-style-type: none"> BCC with support from Consultants and input from DNOs and key developers. <ul style="list-style-type: none"> Q2-4 2018 BCC to submit HIF bid, using information from DNOs and key developers. <ul style="list-style-type: none"> Q2 2018 BTVLEP & BCC engagement with DNOs and Energy Networks Association. <ul style="list-style-type: none"> 2018-2019 BCC with DNO support and developers/ end users which would connect to 'smart grids' <ul style="list-style-type: none"> 2018-2019 |

| | | | | |
|-------------|--|---|---|---|
| | <p>ensure the County continues to be aligned with national targets.</p> | <ul style="list-style-type: none"> • Buckinghamshire’s position with 3 DNOs in the County provides an opportunity to resolve network constraints by coordination and planning across multiple grid areas. | <p>actively managing demand and generation.</p> | <ul style="list-style-type: none"> • 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. <ul style="list-style-type: none"> ○ 2018-2020 |
| <p>Heat</p> | <ul style="list-style-type: none"> • 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 | <ul style="list-style-type: none"> • 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) | <ul style="list-style-type: none"> • 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. | <ul style="list-style-type: none"> • BTVLEP with support of local District Councils to commission ETI to undertake Carbon Pathway modelling. Outcomes to inform revisions of local plans. <ul style="list-style-type: none"> ○ 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. <ul style="list-style-type: none"> ○ 2018-2019 |

| | | |
|-------------------------|--|---|
| | <p>represents an overall energy inefficiency building stock.</p> | <ul style="list-style-type: none"> • Low Carbon Workspaces programme to be continued and future funding opportunities identified to support future delivery. <ul style="list-style-type: none"> ○ 2018-2019 |
| <p>Transport</p> | <ul style="list-style-type: none"> • 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. | <ul style="list-style-type: none"> • 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 publicly 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 <ul style="list-style-type: none"> ○ 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. <ul style="list-style-type: none"> ○ 2018-2019 • BTVLEP to advocate for public bodies to install, and make available to the public, electric vehicle charging points in their car parks. <ul style="list-style-type: none"> ○ 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