

Oxfordshire Energy Strategy

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Foreword

Recent months have seen a welcome spotlight turned on our need for cleaner economic growth. The publication of the UK Industrial Strategy and its Grand Challenge of Clean Growth, and the subsequent Clean Growth Strategy have provided the impetus for local areas to focus on their role in helping the UK to meet its agreed target of reducing carbon emissions by 80% by 2050, against a 1990 baseline.

The opportunity for people and businesses across the UK is huge. As the Clean Growth Strategy makes clear, the low carbon economy could grow by 11% per year between 2015 and 2030, four times faster than the projected growth of the economy as a whole. Work already undertaken by the University of Oxford and the Low Carbon Hub in 2014 shows that, with the right policies in place, Oxfordshire could add a further £1.35 billion annually to the local economy and create over 11,000 new jobs by 2030, and in doing so, deliver emission reduction targets in line with local and national targets.

The Oxfordshire Energy Strategy is led by the Oxfordshire Local Enterprise Partnership (OxLEP). We have a dynamic economy, strong growth and have been asked by Government to be one of a small number of LEPs to develop a Local Industrial Strategy (LIS) as part of the Wave 1 programme. Our approach to clean growth is an important element of our emerging LIS. We are determined to make the most of our LIS. It will have three principles, each of which is pertinent to the Energy Strategy:

- **Oxfordshire can deliver for the UK;**
- **Oxfordshire is a great place to invest;**
- **Oxfordshire has international potential.**

Our Energy Strategy builds on the innovative work already in train in Oxfordshire. We have a wealth of energy businesses, institutions and organisations, from the Culham Centre for Fusion Energy and the Faraday Institution, to the Hydrogen Hub and the Low Carbon Hub. This means that Oxfordshire, with its ambition to be one of the top three innovation ecosystems¹, can seize the clean growth opportunity for the benefit of our businesses and communities. The successful implementation of our Energy Strategy will not just deliver reduced emissions, but also cleaner air, lower energy bills, an enhanced natural environment, high-value jobs and commercial opportunity.

This Energy Strategy has been prepared in partnership with our local, national and international renowned organisations, including both universities, and from those that deliver innovative energy projects on the ground, including our local authority partners. As a Local Enterprise Partnership, we will continue to lead, facilitate and broker collaborative working arrangements and partnerships to realise the objectives of our Energy Strategy for the benefit of our communities and businesses alike.

¹ <https://www.oxfordshirelep.com/lis>

Executive Summary

Oxfordshire is a globally renowned region with one of the strongest economies in the UK. It has a wealth of science and research facilities and is home to two world class universities. Oxfordshire is a place of real innovation – our Energy Strategy will build on this to put us firmly in place to lead the deployment of an energy system fit for the 21st century.

This strategy has been developed by OxLEP and our partners and is aligned to the Government’s Industrial Strategy and the Clean Growth Strategy. It will feed into our emerging Local Industrial Strategy (LIS), and help inform Oxfordshire’s growth ambitions up to 2031, as outlined in the Oxfordshire Housing and Growth Deal.

Our Energy Strategy will form part of a much wider picture of energy and the transition to a low carbon energy system in England, and create a foundation for project development and participation by industry, our research sector, regulatory bodies, local authorities and our communities.

Our Vision is:

For Oxfordshire to be at the forefront of energy innovation to foster clean growth

Our Objectives are to:

- 1. Secure a smart, modern, clean energy infrastructure – including increased electricity grid capacity - which supports our planned housing, industrial and commercial growth, and changing energy requirements;**
- 2. Lead nationally and internationally to reduce countywide emissions by 50% compared with 2008 levels by 2030 and set a pathway to achieve zero carbon growth by 2050. We will realise the economic benefits of this low carbon transition by supporting:**
 - **ambitious and innovative clean generation projects across the county, both in urban and rural areas, and in growth locations;**
 - **projects that reduce energy demand and increase energy efficiency for domestic, industrial, commercial buildings and transport energy**
- 3. Enhance energy networking and partnership working across Oxfordshire to focus on the low carbon energy challenges and funding opportunities created through the Clean Growth Strategy and the Oxfordshire Industrial Strategy.**

These objectives form the backbone of the strategy and will create a framework for investment priorities.

Our low carbon sector already generates £1.15 billion a year in sales, 7% of our local economic value. According to the influential report 'Oxfordshire's Low Carbon Economy' (2014), the likely economic benefits of an ambitious low carbon investment programme up to 2031 - delivered in tandem with the housing growth committed to through the Housing and Growth Deal - could add £1.35 billion annually to the local economy, create over 11,000 new jobs, *and* deliver emission reductions in line with local and national targets.

Our three objectives will move us forward to meet our agreed targets and the economic prize that this can deliver.

Objective 1: Delivering an energy strategy for clean growth

Oxfordshire is entering a period of rapid planned growth – 100,000 new homes between 2016 and 2031 - alongside a period of innovation and disruptive technological change. It is vital that our energy infrastructure can support this growth, changing energy requirements and the needs of our energy-hungry research and scientific institutions.

We know that the electricity network across the county is already constrained, both for additional load and for new generator connections. To unlock the grid across Oxfordshire, we will develop new working partnerships both with our Distribution Network Operators (DNOs) as they transition to Distribution System Operators (DSOs), and with Ofgem. The key challenge is to get the energy provision for new development better aligned with the planning system in the same way that other infrastructure already is.

The Oxfordshire Growth Board's emerging Joint Statutory Spatial Plan (JSSP) will give consideration as to how local and national agencies and departments could take a more joined up role, recognising the aims of the Housing and Growth Deal, and the need for engagement to enable effective outcomes through both the planning and development process.

Objective 2: Reducing emissions - increasing local generation, reducing energy demand and increasing energy efficiency

Delivering affordable, clean energy locally to meet local demand will drive our transition to a low carbon county, help meet our carbon emission reduction targets and keep up to £1.1 billion within the county's economy every year.

Meeting the scale of demand will mean using multiple sources and technologies. By 2030, at least 56% of our electricity demand and 40% of our heat requirement needs to be met by renewables if we are to achieve our carbon reduction targets. Meeting this scale of demand will mean using multiple sources and technologies delivered at a strategic, community and household scale.

Our local authorities have a key part to play in their role as landowners, local planning authorities, and as potential energy suppliers in their own right.

A renewables-based energy system will require significant demand reduction. Our new developments will need to meet best practice standards - following the example set by the North-West Bicester development - and ensure that all new homes are built to the highest standards of energy efficiency to minimise the increase in energy demand. We recognise this is ambitious, has an impact on viability and affordability but will work towards this as an ambition. These criteria need to be set out in our local plans and mechanisms put in place to ensure they are met during the development. This will require different and innovative approaches.

We will need focussed efforts to reduce energy demand from existing buildings, commerce and transport. For example, the pathway to a low carbon future set out in our greenhouse gas emission projections, assumes that by 2030 4,000 existing homes must be renovated every year to reduce energy requirements to 60 kWh / m² per year. To meet this, or an equivalent ambition, will require a coherent retrofit programme to bring all homes in the county up to a minimum of EPC band C by 2035 in line with the ambitions of the Clean Growth Strategy. This will build on projects already being delivered in Oxfordshire.

Connecting Oxfordshire² shapes our transport policy and sets out Oxfordshire County Council's policy and strategy for developing the transport system in Oxfordshire to 2031. It has been developed with over-arching transport goals, including: to reduce transport emissions and meet our obligations to Government.

Objective 3: A networked Oxfordshire – collaboration and partnership working

The need for a high-level coordinating group to oversee the multiplicity of energy interests and opportunities across the county is a critical outcome of our Energy Strategy. We believe this is necessary to drive the alignment and integration of policies and initiatives that may be required to move towards a zero-carbon growth model. We know good building blocks are already in place which provide the basis for improved communication and dialogue between partners in Oxfordshire around energy and the low carbon agenda. Now is the time to strengthen that dialogue and knit it together under a truly strategic umbrella building on existing work and relationships. A dynamic, high level partnership board, appropriately resourced, will bring together key stakeholders to oversee delivery of the energy strategy. Two streams flow from this...

- An “Innovation” ecosystem—that is the place where research, experimentation and the concepts of the “living lab” can be developed; networks created, experiences shared and ideas hatched and pursued, and;
- A “Delivery” ecosystem—for those who are involved in the implementation of technology, the planning and delivery of Smart Grids and for those who are delivering development sites and business opportunities, and who need to know

² <https://www2.oxfordshire.gov.uk/cms/public-site/connecting-oxfordshire>

how best to interact with the low carbon energy sector and the existing regulatory framework.

Oxfordshire is one of 11 LEPs that make up the Greater South-East Energy Hub (GSEEH)³. There are five such energy hubs being established across England that will be operational later in 2018. The GSEEH team will have access to technical, legal, and financial expertise and will provide practical support and expertise to LEPs and local authorities to help them undertake the initial stages of development for priority projects emerging from energy strategies, up to the point where they are able to source finance.

Delivering the Strategy

This Energy Strategy sets our ambition to become a low carbon county, bringing investment, jobs and clean growth. It establishes a framework for investment priorities and the resulting capital and revenue projects that will be required to meet our challenging targets to reduce our carbon emissions.

A Delivery Plan sits alongside the Strategy and maps out these priorities and the related work streams and projects which will be delivered in partnership with our energy stakeholders and partners across the county over the coming years.

³ <http://energyhub.org.uk/>

1. Introduction and context

New energy systems have, throughout history, spurred economic progress. Oxfordshire is ideally placed to lead the deployment of an energy system fit for the 21st century. Human and financial capital, an established low-carbon economy and a global reputation for new ideas are major local advantages.

Joining the Crowd: Growing a New Economy for Oxfordshire

Oxfordshire is a globally renowned region with one of the strongest economies in the UK. It is one of three net contributors to the national exchequer, generating around £22 billion Gross Value Added (GVA) to the UK economy. Oxfordshire is home to Oxford Brookes University, one of the UK's leading modern universities, and the University of Oxford, the number one ranked university in the world which generates more technology spin-outs than any other UK university, including five Unicorn companies⁴. Indeed, the university has more Unicorns than any other University in Europe. Two of the UK's 13 current UK \$1bn companies are in Oxfordshire, along with over 1,500 high technology firms, many of which are based in Science Vale UK, including world-leading science research facilities at Harwell Campus and at Culham Science Centre.

These science and research facilities include the Culham Centre for Fusion Energy (CCFE), the UK's national laboratory for fusion research owned and operated by the United Kingdom Atomic Energy Authority (UKAEA). Meanwhile, the recently established Faraday Institution on the Harwell Campus is the UK's independent institute for electrochemical energy storage science, research and technology. Other innovative organisations include the pioneering Low Carbon Hub and the Hydrogen Hub.

These innovations build on Oxfordshire's unique history of energy research and generation. For example, research by Oxford University scientists 30 years ago led to the development of lithium-ion batteries, one of the world's most popular rechargeable batteries. The landscape to the south of the county is dominated by Didcot Power station. Built 50 years ago, it was the first large power station to be converted to be able to be fired with natural gas.

Our local authorities are enabling and delivering innovative energy and low carbon projects; for example, the Bicester Eco Town, and energy master-planning for Didcot Garden Town. Also in the pipeline is the country's first Zero Emission Zone in Oxford from 2020, championed by Oxfordshire County Council and Oxford City Council. We are rich in award winning partnerships, delivered through Low Carbon Oxford and OxFutures; and the county council funded Community Action Group programme which supports an extensive network of local groups to reduce waste and carbon emissions across the county.

⁴ Adaptimmune, Circassia, Immunocore, Oxford Nanopore and Sophos.

Oxfordshire is growing. The Oxfordshire Growth Board, through the emerging Joint Statutory Spatial Plan (JSSP), is planning for 100,000 new homes to be built in our county by 2031. 86,500 new jobs are also being created. This growth is being supported by the Oxfordshire Housing and Growth Deal, a £215 million investment by central Government to help put in place some of the necessary infrastructure to unlock development sites.

It is important that we turn a spotlight onto the quality of new development, as well as the quantity. The Oxfordshire's Low Carbon Economy report⁵ rightly points out that *'going beyond the 'quick and cheap' requires a different, more integrated approach'*. New business models will be needed to provide good quality services and goods to increase the market for innovative low energy projects related to new development. This will have a positive impact on the business supply chain, as well as on the type of skills needed to grow the sector, including those for new sustainable construction practices.

1.1 What is the Oxfordshire Energy Strategy about?

The winners will be those who use low-carbon as a spur to growth. Here in Oxfordshire, the prize is increased sales, thousands of new jobs, a robust local economy, a vibrant business ecosystem, and better homes, workplaces and transport.

Joining the Crowd: Growing a New Economy for Oxfordshire

Clean growth is at the heart of the UK Industrial Strategy. Recognising that much of the response needed to deliver this ambition will be met locally, BEIS have asked all Local Enterprise Partnerships in England to prepare energy strategies for their areas. Through our Energy Strategy and the subsequent Delivery Plan we identify:

- The range of energy opportunities and challenges across Oxfordshire, related to our growth ambitions, and how they connect to the UK Industrial Strategy and the Clean Growth Strategy (see Figure 2);
- How we will contribute to and accelerate the local and national trajectory for decarbonisation and clean growth;
- If and where support is needed from central government, and how this might be delivered;
- The pipeline of energy projects which could come forward across the county and the scale of the investment opportunity;
- The capacity and capability of LEPs and their partners to deliver energy projects.

Our Energy Strategy will inform a much wider picture of energy and the transition to a low carbon energy system in England, and to this end we want to build on our own unique strengths and opportunities. Some regions have coastlines, inviting the development of

⁵ University of Oxford Environmental Change Institute and Low Carbon Oxford, 2014. Oxfordshire's Low Carbon Economy. <http://lowcarbonoxford.org/reports/oxfordshires-low-carbon-economy/>

large-scale off-shore wind farms and nuclear power stations; other regions may take advantage of tidal river estuaries for very large-scale renewable energy development, whilst others can benefit from remote mountain and moor locations for on-shore wind farms. Oxfordshire has none of these geographical features to allow the development of very large-scale renewable energy plants. What we do have, however, are three inter-linked offers which put us firmly in place to lead the deployment of an energy system fit for the 21st century:

1. A world class innovation ecosystem;
2. A well-developed appetite for harnessing the power of our communities (including business communities) to make the best of new low carbon technologies;
3. A will to make the most of our planned growth to 2031 and beyond to adopt and implement innovative local energy schemes and new building construction techniques; and planning policies that allow a reduction in carbon emissions.

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Figure 2: The UK industrial Strategy and the Clean Growth Strategy

The UK Industrial Strategy aims to create an economy that boosts productivity and earning power throughout the UK. There are five foundations:

- Ideas – the UK to be 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.

These are underpinned by four Grand Challenges:

- AI and Data Economy – the UK at the forefront of the artificial intelligence and data revolution;
- Future of Mobility – a world leader in the way people, goods and services move;
- Clean Growth – to maximise the advantages for UK industry from the global shift to clean growth;
- Ageing Society – harness the power of innovation to help meet the needs of an ageing society

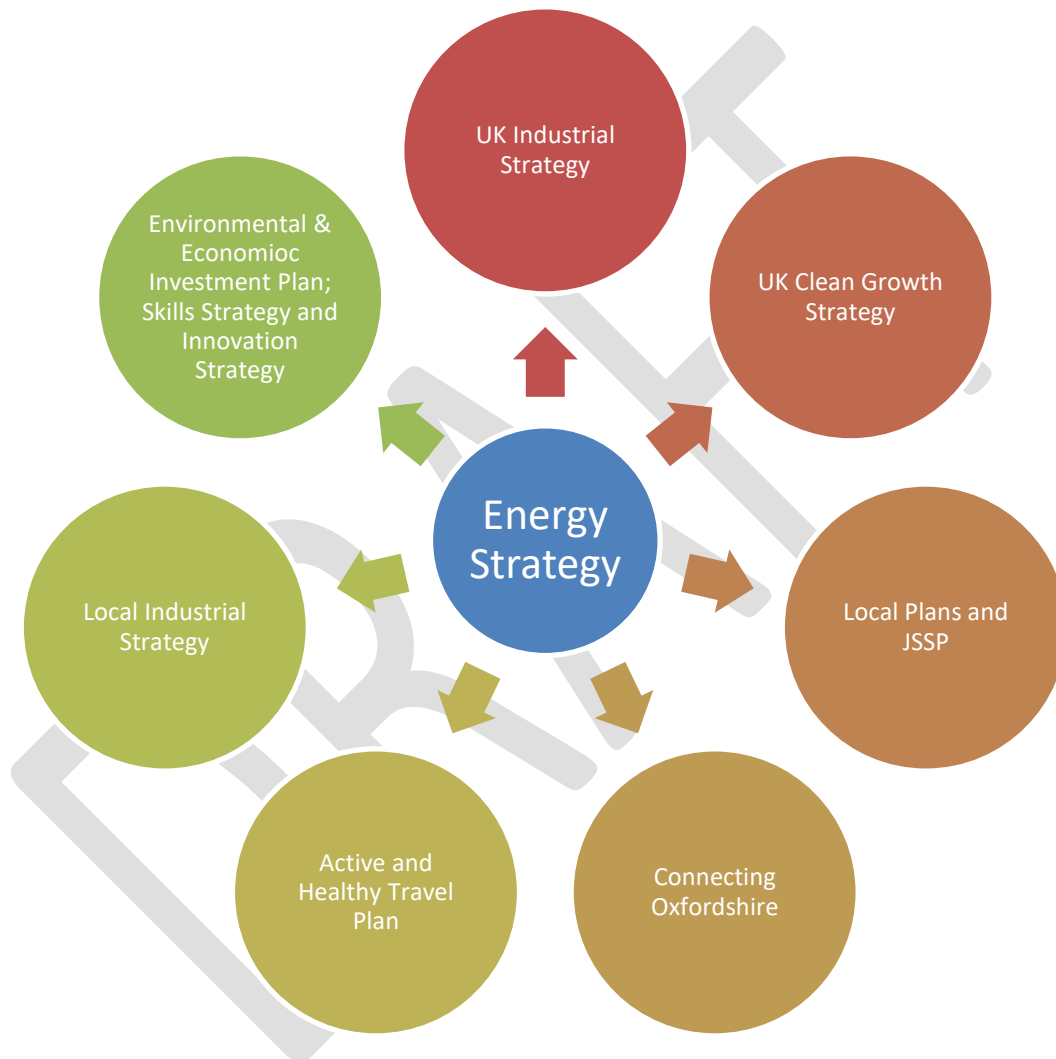
The Clean Growth Strategy sets out proposals that aim to accelerate the pace of clean growth in the UK by delivering increased economic growth and decreased emissions for decarbonising all sectors of the UK economy through the 2020s. The strategy is a key plank of government policy that will help to meet the climate change Act commitment to reduce greenhouse gas emissions by at least 80% by 2050 when compared to 1990 levels. The strategy aims to create the best possible environment for the private sector to innovate and invest in technological breakthroughs. It sets of £2.5 billion on investment to support low carbon innovation from 2015 to 2021, whilst more broadly the National Productivity Investment Fund will provide an additional £4.7 billion, with an extra £2 billion a year by 2021. Many of the policies in the Clean Growth Strategy relate directly to our approach articulated throughout this document:

- Accelerating clean growth;
- Improving business and industry efficiency;
- Improving our homes;
- Accelerating the shift to low carbon transport;
- Delivering clean, smart, flexible power;
- Enhancing the benefits and value of our natural resources.

The strategy is intended to be accessible to everyone with an interest in energy. It will create a foundation for project development and participation by industry, our research sector, regulatory bodies, local authorities and our communities.

The Energy Strategy is linked to many other plans and strategies, both national and local, as shown in Figure 3.

Figure 3: Links to other plans and strategies



1.2 Our Vision and Objectives

Our vision for future energy in Oxfordshire is:

‘For Oxfordshire to be at the forefront of energy innovation to foster clean growth’

Our Objectives are to:

1. **Secure a smart, modern, clean energy infrastructure – including increased electricity grid capacity - which supports our planned housing, industrial and commercial growth, and changing energy requirements;**
2. **Lead nationally and internationally to reduce countywide emissions by 50% compared with 2008 levels by 2030 and set a pathway to achieve zero carbon growth by 2050. We will realise the economic benefits of this low carbon transition by supporting:**
 - **ambitious and innovative clean generation projects across the county, both in urban and rural areas, and in growth locations;**
 - **projects that reduce energy demand and increase energy efficiency for domestic, industrial, commercial buildings and transport;**
3. **Enhance energy networking and partnership working across Oxfordshire to focus on the low carbon energy challenges and funding opportunities created through the Clean Growth Strategy and the Oxfordshire Industrial Strategy.**

These objectives align with the ambition for the Clean Growth Grand Challenge as outlined in the UK Industrial Strategy – *‘we 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’*.

Alignment with the ambitions of the Industrial Strategy and Clean Growth Strategy is demonstrated in Figure 4 below.

Figure 4: Oxfordshire Energy Strategy Objectives aligned to UK Industrial Strategy and Clean Growth Strategy

Oxfordshire Energy Strategy Objectives	Secure a smart, modern, clean energy infrastructure – including increased Grid Capacity	Realise the economic benefits of clean growth		Enhance Partnership working and Collaboration to focus on low carbon energy challenges and funding opportunities
		Champion Clean Generation	Reduce energy demand and increase energy efficiency	
UK Industrial Strategy – Clean Growth priorities	Develop smart systems for cheap and clean energy across power, heating and transport	Enable energy intensive industries to compete in the clean economy	<p>Transform construction techniques to dramatically improve efficiency</p> <p>Put the UK at the forefront of the global move to high efficiency agriculture</p>	Make the UK the global trend-setter for finance that supports clean growth
Clean Growth Strategy	Delivering clean, smart, flexible power	Accelerating clean growth	<p>Improving business and industry efficiency</p> <p>Improving our homes</p> <p>Accelerating the shift to low carbon transport</p>	Enhancing the benefits and value of our natural resources

1.3 The development of this strategy

This Energy Strategy has been developed with significant input of a dedicated Steering Group, and through discussions via two workshops held on 27 February and 18 April 2018. We have also taken the time to interview various stakeholders, including the two Universities, the local authorities, and manufacturers such as BMW. A full list of our Steering Group, workshop participants and interviewees can be found in Annex 1.

1.4 The structure of this Energy Strategy

We are excited to ramp up activity across the county to meet the local and national low carbon targets. Our Energy Strategy sets the framework to help generate new ideas and to stimulate new thinking to help us transition to a low carbon economy. It identifies the key investment priority themes for energy (linked to the objectives) which we consider will help our county grow, and at the same time harness real innovation in low carbon technology that will unlock economic benefits.

Section 2 sets the scene for this strategy, outlining our current energy use and trends, where our energy comes from, renewable energy generation, our low carbon economy and greenhouse gas emissions – current and future. This provides a backdrop to the sections which follow.

Section 3 focusses on delivering an energy infrastructure and centres on the electricity grid and how we aim to work with the Distribution Network Operators (DNOs) to achieve planned growth.

Clean generation and energy efficiency is the subject of section 4 where we explore how we can build on our already successful track record in developing clean, innovative and ambitious energy projects for power, heat and transport across the county; and how we might utilise new development, existing buildings and the transport network to reduce energy demand and become more energy efficient.

Finally, section 6 concentrates on the partnership working and collaboration that will be needed to make this strategy and its accompanying Delivery Plan a success.

At the end of each section we establish a number of key priorities for investment. These priorities will guide our partners and other stakeholders in energy project development which will then be included in the Delivery Plan. The transpiring projects and programmes will then be delivered by our stakeholders, including private investor organisations, the local authorities, the Low Carbon Hub, the Universities, and the Greater South-East Energy Hub, amongst others.

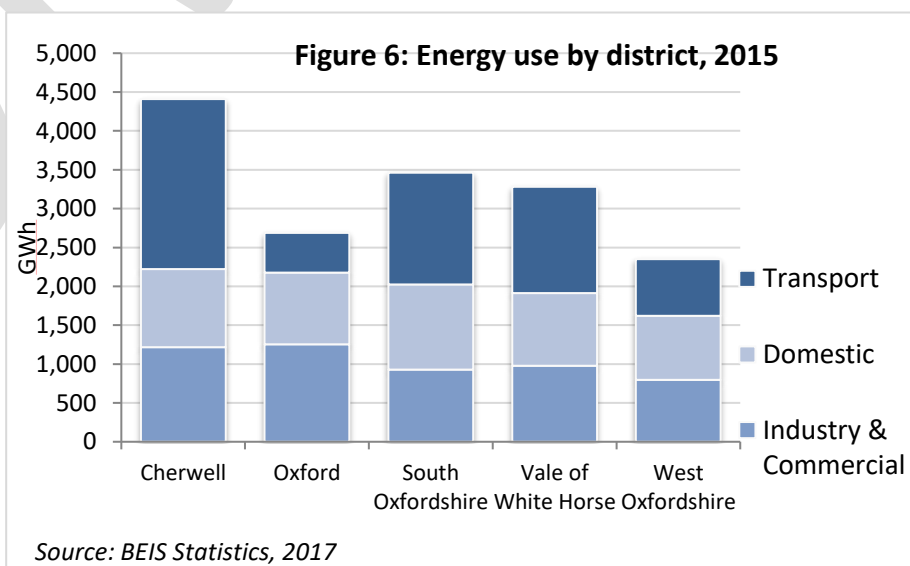
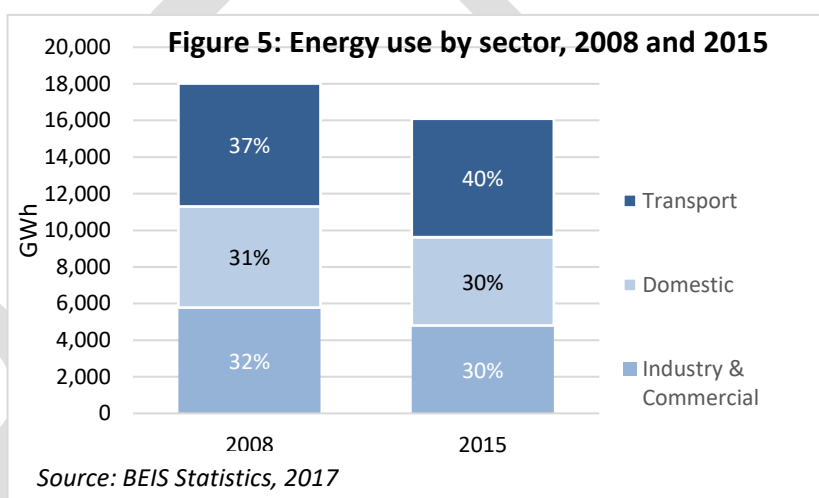
2 This is Oxfordshire

Our Energy Strategy is underpinned by a rich evidence base, ensuring it is relevant to our local needs and can inform local decision making now and for years ahead. Central to this is the influential report, Oxfordshire’s Low Carbon Economy which highlights the huge economic opportunity afforded by investment in a low carbon future. Modelling work commissioned specifically for our Energy Strategy builds on this report to identify the scale and focus of the actions needed to meet local and national emission targets. The key data and assumptions are set out below.

2.1 Energy demand

Oxfordshire is home to 683,200 people⁶. It has a thriving economy, with almost 31,000 businesses contributing £21.9 billion to the national economy⁷. Our homes, businesses and transport used **6,800 GWh** of energy in 2015⁸.

- Figure 5 shows total energy use in the county fell between 2008 and 2015. Energy used for transport has increased proportionately and it remains the highest energy consumer across the county (40% of total energy used) —although not the most significant in Oxford and West Oxfordshire.
- Domestic demand is relatively consistent across the county (30% of total energy use), whereas industry and commerce is predominant in Cherwell and Oxford, but lower in the other districts – see Figure 6.



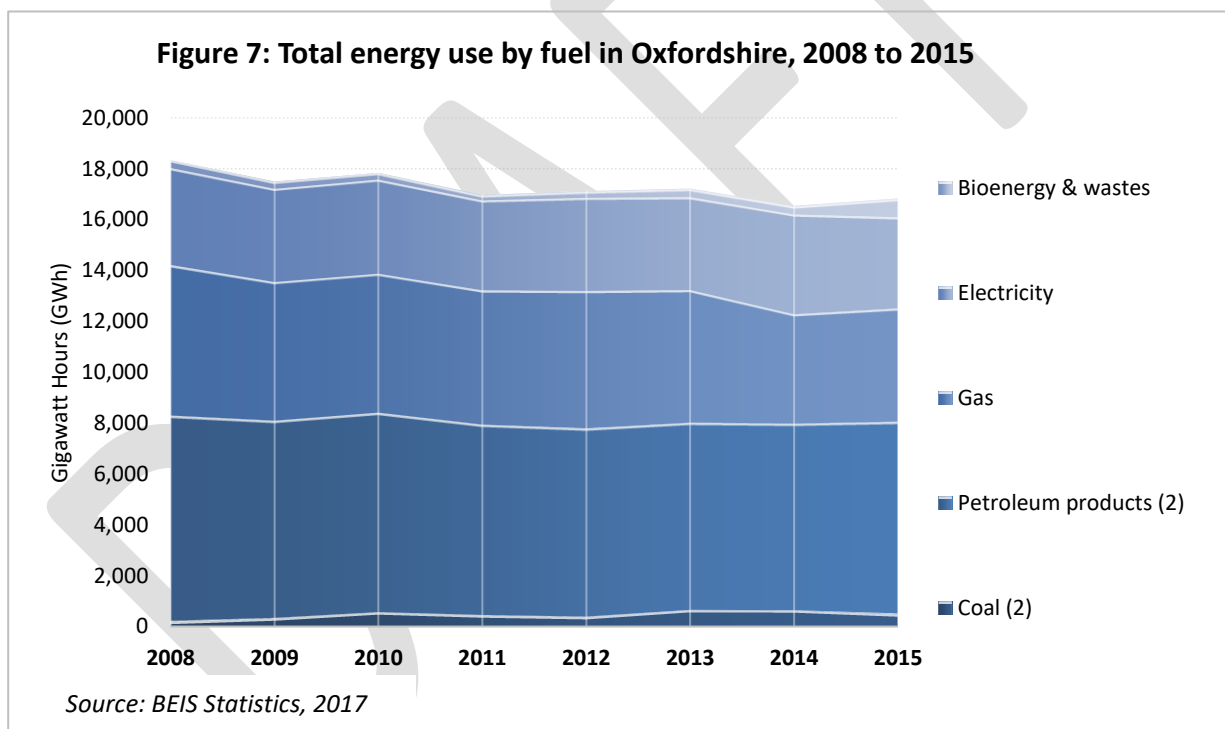
⁶ ONS mid-year estimates, accessed from Oxfordshire Insight, October 2017

⁷ Oxfordshire labour profile, accessed from Nomis, October 2017

⁸ BEIS sub-regional total energy use, 2015, accessed October 2017

The majority of energy used in the county in 2015 was derived from fossil fuels as shown in Figure 7⁹:

- 74% was provided by natural gas, petroleum products and coal, down from 77% in 2008. The contribution of bioenergy and energy from waste has increased proportionately;
- Electricity accounted for a further 21%. Whilst the proportion of energy provided as electricity has remained unchanged since 2008, the proportion of renewables in the national mix has increased significantly;
- In the domestic sector, almost two thirds of total energy used is provided by gas – the majority for heating. The Committee for Climate Change has identified reducing our heat demand and decarbonising remaining demand as a key area of focus in meeting our national emission reduction targets.



⁹ BEIS sub-regional total energy use, 2015, accessed October 2017

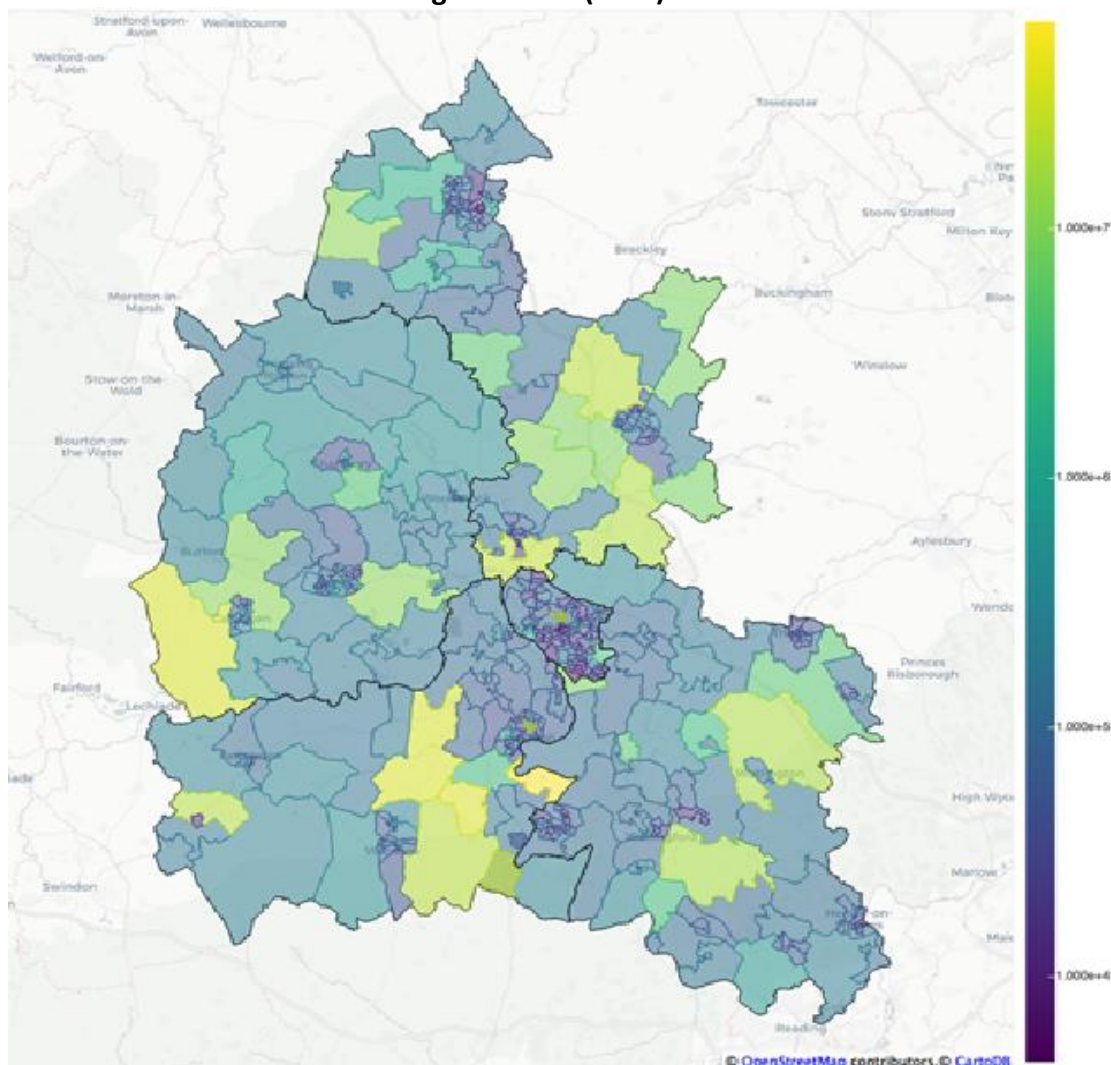
2.2 Low carbon electricity generation

Latest figures show there are 37 operational or consented large scale renewable installations in Oxfordshire:

- An installed capacity of around 370 MWe, (equivalent to around 9% of demand, based on electricity and gas use);
- PV totals 85% of installed capacity (313 MWe, up from 114 MWe just two years earlier); energy from waste totals 8% (the Ardley facility 24MWe), landfill gas provides 4 % (13.4 MWe).¹⁰

Local small-scale renewables increasingly add to the mix. Figure 8 below shows the estimated annual low carbon generation across the county.

Figure 8: Estimated annual low carbon generation (kWh)



Source: Scot Wheeler, University of Oxford, 2018

¹⁰ BEIS regional renewable energy statistics, accessed October 2017. NB, this data and analysis is based on infrastructure with a capacity greater than, or equal to, 1MW, and does not capture smaller -scale renewables

2.3 Low carbon economy

Our low carbon sector already makes a significant contribution to the local economy, generating £1.15 billion a year in sales, 7% of our local economic value (GVA).

‘Oxfordshire’s Low Carbon Economy’¹¹ clearly makes the case for investment in low carbon energy (Figure 9) - whether in energy saving or renewable energy – in tandem with our commitment to growth:

- The financial benefits will be largely retained within the county – unlike the £1 billion we currently spend on energy derived from fossil fuels. The more successful Oxfordshire becomes in developing the supply chains for these technologies, the bigger this effect becomes;
- New jobs can be created and a market place for new skills to deliver new technologies - from the building trade, project management, business management and support, to high-tech research.

Figure 9: Investment, £m/year to 2030	
Transport	49
Housing	50
Renewable Energy	199
TOTAL	298
Additional GVA, £m/year to 2030	
Transport	364
Housing	94
Renewable Energy	889
TOTAL	1347
Additional employment, FTE jobs in 2030	
Transport	4,256
Housing	1,972
Renewable Energy	4,905
TOTAL	11,133
<i>Source: Oxfordshire Low Carbon Economy, 2014</i>	

By choosing the pathway to clean growth, we have at our fingertips the opportunity to add a further £1.35 billion annually to the local economy, create over 11,000 new jobs *and* (as we show in the following section) deliver emission reductions in line with – or even exceeding - local and national targets.

¹¹ University of Oxford Environmental Change Institute and Low Carbon Oxford, 2014. Oxfordshire’s Low Carbon Economy. <http://lowcarbonoxford.org/reports/oxfordshires-low-carbon-economy/>

2.4 Meeting emission reduction targets

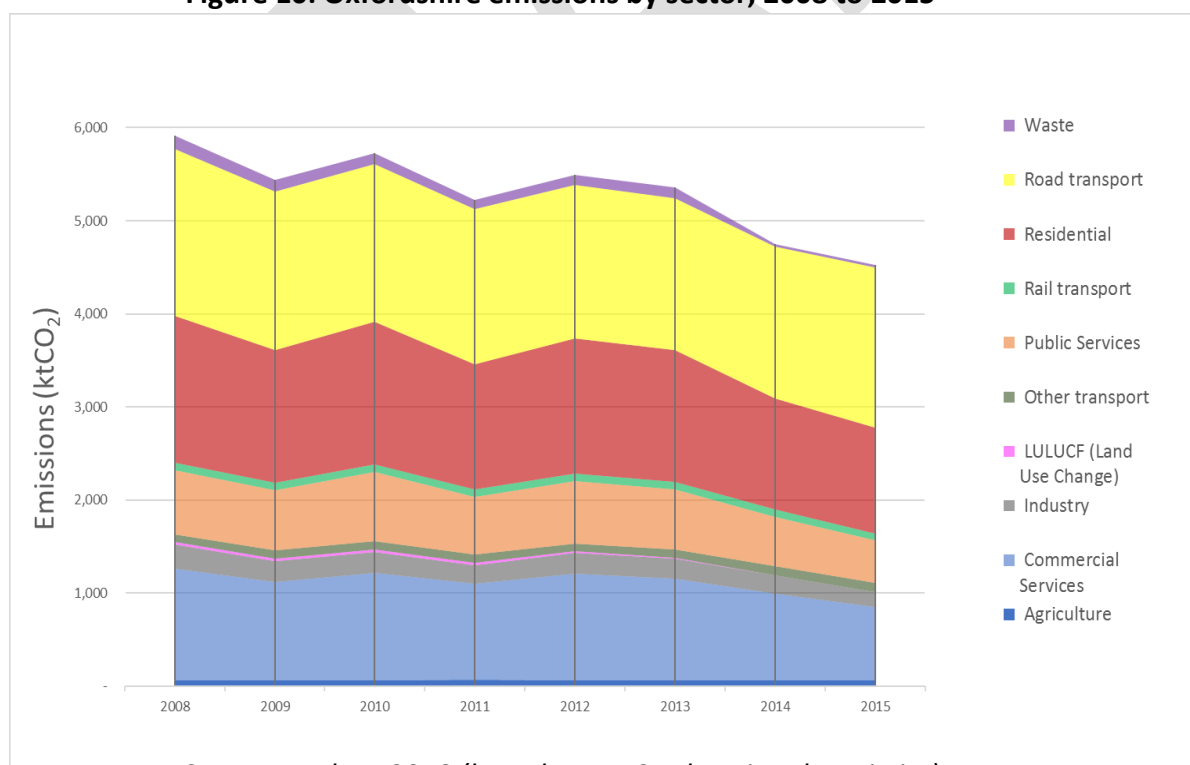
The County's six local authorities and partner organisations across Oxfordshire have agreed that **'Oxfordshire's greenhouse gas emissions are reduced to levels comparable with the best in the UK – a 50% reduction in CO₂, on 2008 levels by 2030'**¹².

This is in line with the national target set in the UK Climate Change Act to reduce emissions by 80% by 2050 against a 1990 baseline.

Where we are now

Countywide energy use highlighted above led to the emission of 4,500 kilotonnes CO₂, equivalent to 6.6 tonnes CO₂ per person – above the national average (5.9 tonnes per person). This is 22% less than emissions in 2008 (the baseline year for our carbon reduction commitment). Much of this is due to reductions in the carbon factor for electricity and, to a lesser extent, decreasing industrial and commercial gas consumption (Figure 10).¹³

Figure 10: Oxfordshire emissions by sector, 2008 to 2015



Source: Aether, 2018 (based on BEIS subnational statistics)

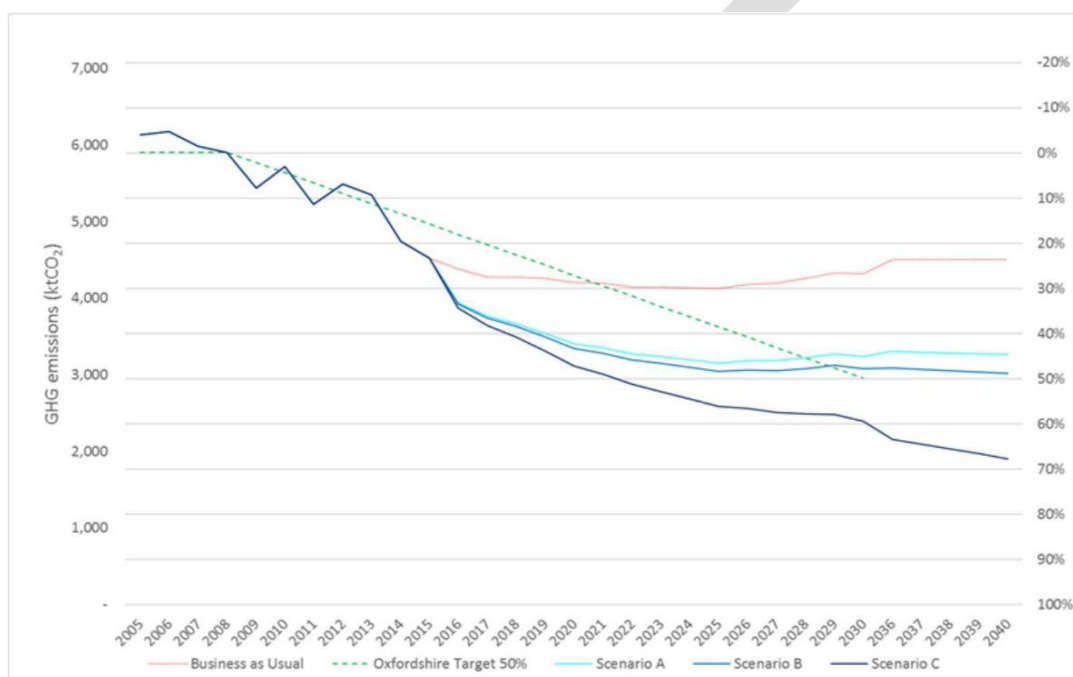
¹² Oxfordshire Partnership, 2008. Oxfordshire 2030: Sustainable Community Strategy

¹³ Aether, Oxfordshire Greenhouse Gas emission projections, 2018 update.

Where we're going

Understanding the scale of the emission reductions needed to meet our 2030 target is critical, and will inform where effort will be most needed and effective. The Oxfordshire Greenhouse Gas Projections, 2018¹⁴ (commissioned to inform our Energy Strategy) model a range of possible outcomes to 2040 (see figure 11), from 'continued business as usual' with and without implementation of national and local policies, to 'Scenario C', one of the three pathways to 2031 set out in the Oxfordshire's Low Carbon Economy report.

Figure 11: Estimated emission projections to 2030 and beyond



Scenario	% reduction to 2030	% Reduction to 2040
Business as usual based on national modelling	27%	24%
With national and local measures	42%	40%
Additional measures - Scenario C	59 %	68%

Source: Aether, 2018. Oxfordshire Greenhouse Gas Projections: 2018 Update

¹⁴ Aether, 2018. Oxfordshire Greenhouse Gas Projections: 2018 Update for Oxfordshire County Council

Critically, 'Scenario C' - which assumes delivery of 100,000 new homes in line with our commitments made through the Housing and Growth Deal - demonstrates that by driving a committed and ambitious low carbon agenda we can deliver the planned increase in housing and employment *and* meet our public commitment to reduce carbon emissions in line with national targets.

To achieve this low carbon transition, the model makes a number of key assumptions:

- Extensive retrofit programme for existing housing (assumes 4,000 homes renovated per year);
- Shift to electric vehicles (at least 25% of fleet, and 50% of new vehicles), with delivery of the necessary infrastructure;
- Reducing overall number of journeys;
- 56% of electricity demand and 40% of heat demand met by renewables.

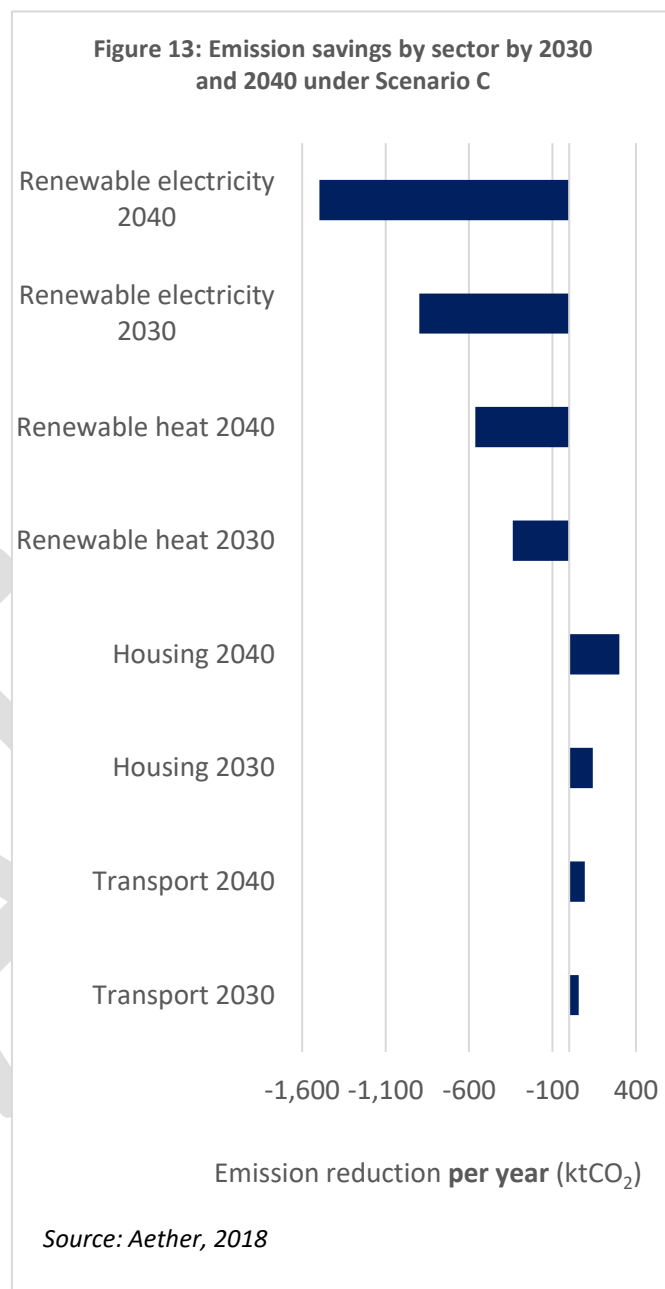
Further details of the assumptions used in the greenhouse gas projections and projected emission reductions by sectors are given in Figure 12¹⁵ and Figure 13.

There will be other combinations of actions that will achieve the same goal, but importantly the figures illustrate the scale of the task ahead and the areas which will require the greatest focus.

This will inform our Energy Strategy and set the Delivery Plan to 2030 and beyond.

¹⁵ Details on the Scenarios are detailed in the Oxfordshire Low Carbon Economy report, and the Greenhouse gas projection report and accompanying infographic is available to download at <https://www2.oxfordshire.gov.uk/cms/content/reducing-emissions-across-oxfordshire>.

Figure 12: Assumptions in the Oxfordshire Greenhouse Gas Projections, Scenario C	
Scenarios to 2030	C
HOUSING	
New Homes	
No. of new homes by 2030	100,000
Energy standard for new homes per unit floor area, kWh/m ² year	30
Renovation of existing homes	
No. of existing homes renovated per year	4,000
Energy standard for renovations per unit floor area, kWh/m ² year	60
TRANSPORT	
Alternative vehicles and fuels	
Average no. new vehicles per year	38,133
Share of EVs in new fleets	25%
Automotive cluster activity	
Automotive production growth in 2030 (compared with 2014)	200%
Proportion of new production that relates to low carbon vehicles	50%
Infrastructure	
No of EV home charging points installed by 2030	30,000
No. of public DC fast and AC slow charging stations	300
Mass rapid transit (km)	50
Cycling infrastructure	200
Influencing travel behaviour	
No. of personalised travel plans for all homes (new and existing)	373,000
RENEWABLE ENERGY	
Renewable heat supply (GWh)	2,183
Renewable heat as a percentage of total heat demand	40%
Renewable electricity supply	2,052
Renewable electricity supply as a percentage of electricity demand	56%



3 Delivering an energy infrastructure for clean growth

Energy Strategy Objective 1

Secure a smart, modern, clean energy infrastructure – including increased electricity grid capacity - which supports our planned housing, industrial and commercial growth, and changing energy requirements

3.1 Unlocking the grid

Oxfordshire is entering a period of rapid planned growth – 100,000 new homes between 2016 and 2031 - alongside a period of innovation and disruptive technological change. It is vital that our energy infrastructure can support this growth and changing energy requirements (estimated to be more than 450 GWh)¹⁶.

In addition, Oxfordshire is home to a unique group of energy hungry ‘big science’ and other research facilities, primarily in Science Vale in the south of the county, including the aforementioned Culham Centre for Fusion Energy. We also – at Harwell – have the Science and Technology Facilities Council (STFC) Rutherford and Appleton Laboratory; Diamond Light Source – the national synchrotron facility; the ISIS Pulsed Neutron Sources; the Central Laser Facility; the UK Space Gateway, including the Satellite Applications Catapult; and the Medical Research Council’s facilities.

Other key scientific employment sites include Milton Park, Grove Technology Park, Begbroke Science Park, the Oxford Science Park, Howbery Park, Leafield Technology Centre and the Bicester Business Park. The University of Oxford and Oxford Brookes University are also key employment sites, as are the hospitals.

Oxfordshire has some outstanding and globally-renowned industrial and manufacturing businesses that use a significant amount of energy, including BMW, Airbus, Siemens, and Prodrive. These will be key to the success of the Local Industrial Strategy in shaping Oxfordshire to be one of the three top global innovation ecosystems, and increasing its contribution to the national economy.

A stable, clean energy supply will be a pre-requisite for continuing investment and growth.

The Oxfordshire Infrastructure Strategy¹⁷ and a subsequent assessment by Scottish and Southern Energy Networks (SSEN), one of the two Distribution Network Operators (DNOs) covering our area, has highlighted that the electricity network across the county is already constrained, both for additional load and for new generator connections (see figures 14

¹⁶ Analysis for the Oxfordshire Energy Strategy

¹⁷ https://www.oxford.gov.uk/info/20238/oxfords_economy/1215/oxfordshire_infrastructure_strategy_oxis

and 15). Similar issues are experienced in the area to the north of the County covered by Western Power Distribution (WPD).

Our priority is to work with SSEN and WPD to ensure that the network is:

- enabled to support planned housing and job growth;
- smart and flexible, balancing local demand and supply and able to connect local clean energy supplies for new and existing developments.

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Figure 14: High Level capacity analysis at SSE primary sub stations taking into account planned Housing and Employment Growth to 2031

An initial capacity analysis at SSE primary substations combined existing load forecasts with the increase in load due to projected housing growth and shows whether the primary substations have sufficient capacity to support growth to 2031.

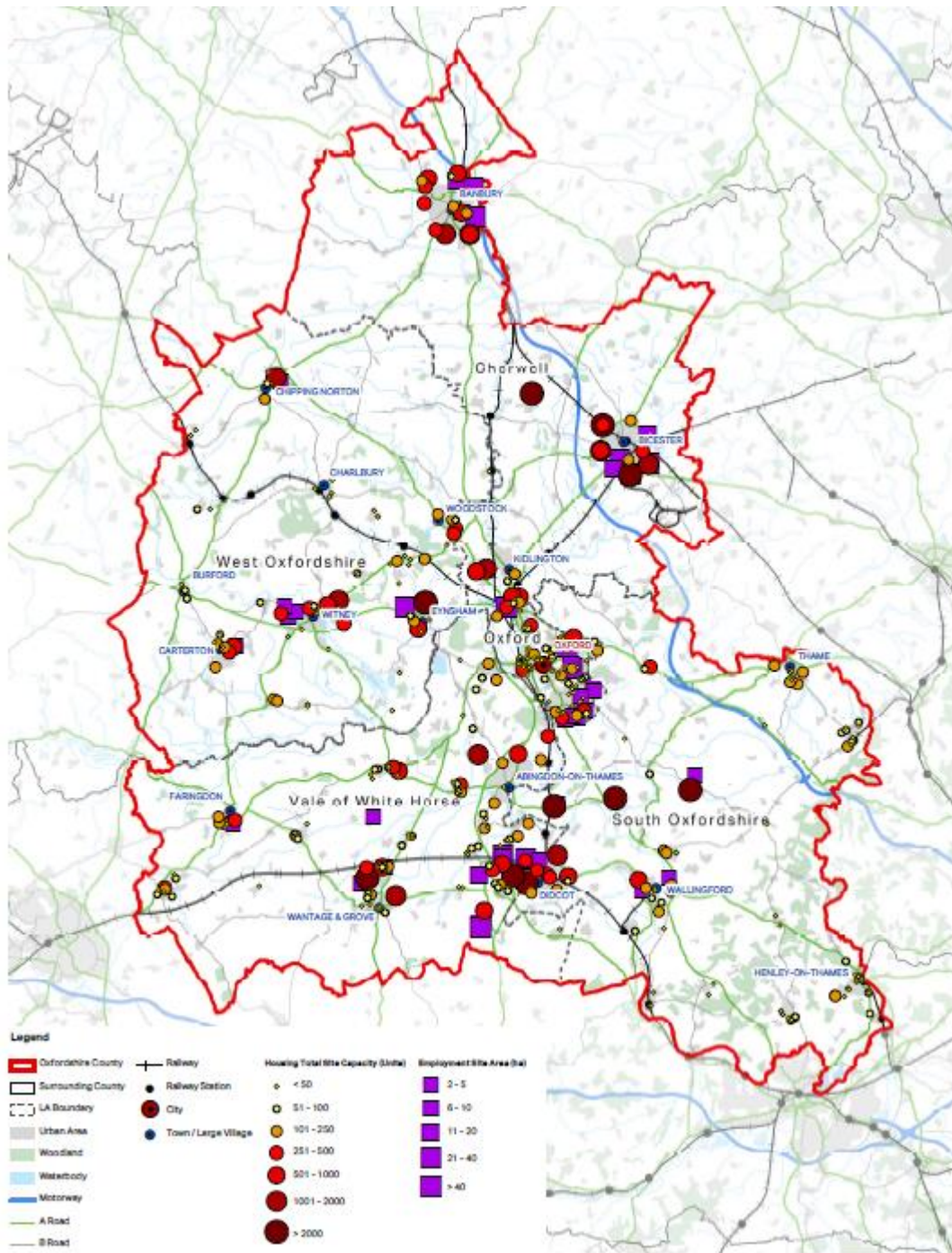
The key electricity and energy infrastructure projects which do not currently have funding are:

- Reinforcement of 132kV circuits between Headington / Yarnton tee and Yarnton substation by 2023;
- A section of the 132kV cable at Osney Bulk Supply Point needs to be updated by 2023;
- CHP and use of heat from Ardley for northwest Bicester Site.

It seems likely that these works will be required to keep the growth agenda on track, and so investment and liaison will be required to ensure their delivery.

We are also aware that to the North of the county, upgrades are required at Bloxham, Epwell and Banbury to allow the planned growth to proceed.

Figure 15. Planned growth and current network capacity



3.2 Supporting housing and economic growth

The six councils in Oxfordshire and OxLEP have agreed the Oxfordshire Housing and Growth Deal with Government. Under the terms of the Deal, the local authorities have committed to producing an Oxfordshire Joint Statutory Spatial Plan (JSSP), to be adopted, subject to examination process, by March 2021. The Oxfordshire JSSP will provide a strategic policy framework for Oxfordshire to 2050 and will give consideration as to how local and national agencies and departments could take a more joined up role in planning for the future of Oxfordshire.

The JSSP will recognise and reinforce the commitment to the Housing and Growth Deal to deliver up to 100,000 homes by 2031 as well as identify the number of new market and affordable homes, the level of economic growth and related infrastructure that is needed across Oxfordshire to 2050. It will then seek to place the required growth in a cohesive and sustainable spatial planning framework that will set the scene for a future round of Local Plans.

The development of the JSSP will provide the opportunity to engage with Distribution Network Operators (DNOs), utility providers and other stakeholders to enable effective outcomes through both the planning and development periods over the coming years. Additionally, Scottish and Southern Electric Networks (SSEN) have been closely involved in the preparation of this strategy.

SSEN are also developing their thinking in a strategic full system planning study commencing in Summer 2018. The purpose of the study is to analyse future growth in Low Carbon Technology aligned with the National Grid Future Energy Scenarios. This will allow SSEN to identify possible networks of risk of overload and proactively plan for the provision of flexibility services or network reinforcement to alleviate them.

Meanwhile, Western Power Distribution (WPD) have already produced a similar study called 'Shaping Subtransmission' for their area¹⁸.

¹⁸ <https://www.westernpower.co.uk/docs/About-us/Our-business/Our-network/Strategic-network-investment/East-Midlands/Shaping-subtransmission-to-2030-East-Midlands-2017.aspx> and <https://www.westernpower.co.uk/About-us/Our-Business/Our-network/Strategic-network-investment/West-Midlands.aspx>

Figure 15: Harwell Campus

Harwell is a strategic scientific and industrial location in the heart of the Science Vale Oxford area, to the southern end of Oxfordshire's Knowledge Spine. Around 280 ha in size it is currently home to over 200 high technology organisations. It directly supports 5,500 jobs and is a location with a growing international reputation as a place where world-leading science, innovation and entrepreneurship happen. In February 2018 it was selected as the location for the new Faraday Institution headquarters. Harwell has plans to add a further 5 million sq ft of commercial floorspace, alongside 1,000 new homes. Harwell has sufficient energy capacity for this planned growth, but no further margin. They are considering possible projects around adding capacity for 'predictable surprises', developing innovative energy architecture for the new homes, and running 'living labs' for pilot energy projects. The Campus, through its Green Club, is also alive with a wide-ranging interest in a sustainable low carbon future, with many people and organisations on the Campus engaged in a range of relevant activity, from encouraging cycling to storing hydrogen.

3.3 Supporting change - demand and disruption

As well as the increasing demand through growth, the grid will need to accommodate non-linear changes in demand created by the switch to electric vehicles, additional demand for commercial activity, space heating / cooling in buildings and other new technology. This could increase electricity demand by around 50% over current levels (dependent on assumptions of electric vehicle charging demand)¹⁹.

3.3.1 At forefront of smart grid technology

To support and enable the fundamental changes to the UK's electricity distribution network, the electricity industry is currently undergoing major change to facilitate the shift to a smart grid (see figure 16). The DNO's are changing into Distribution Systems Operators (DSOs) to allow this change to happen, recognising that one of the biggest changes in the energy system is the flexibility revolution. Distributed generation, electric vehicles, demand-side response and energy storage are transforming the sector and will provide domestic and industrial/commercial customers access to new products, markets and services from a range of providers.

We want to position Oxfordshire at the forefront of the change to Smart Grid technology, and have the opportunity to work with our DNOs as they transition to DSOs and other key stakeholders – including the academic sector and local authorities - to develop new ways of working and explore innovative projects within the county.

Our combination of housing and economic growth ambitions, enthusiastic early adopters and academic and engineering excellence mean that this is a great place to pilot new technologies in a 'living laboratory' (see Figure 17).

Delivering a local smart energy network will make best use of our existing infrastructure and avoid much of the need for expensive network reinforcement to meet increased demand.

¹⁹ Analysis carried out during development of the Energy Strategy

*<https://www.ssepd.co.uk/SmarterElectricity/>

Figure 16: Smart Grids

The shift to a modern, smart grid will enable a real-time, two-way communication between suppliers and consumers, creating more dynamic interaction on energy flow to create a highly interactive, responsive electricity grid that can maintain a demand- supply balance on a fraction of a second basis. This smarter network will balance demand and generation through a combination of power storage, flexible demand increases, peaking plants and shedding loads off the network (i.e. removing unnecessary load during periods of peak demand). This opens the way for the increased use of local renewables and low carbon energy but also the prospect of additional revenue streams to help fund them. Integrating local generation with control mechanisms and storage will reduce reliance on the distribution network for peak supply, in turn potentially reducing the need for early, expensive offsite grid reinforcements.

SSEN has prepared the 'Supporting a Smarter Electricity System'* report. Its transition principles are built around three priorities: Customers; Costs; Collaboration

Figure 17: The Living Laboratory concept

We know that businesses working in related sectors benefit from being located close to one another, following the established model of economic clusters. To develop our low carbon economy, we need a broader focus so that innovations are harnessed to meet low carbon goals. Different partnerships need to relate to each other within a low carbon ecosystem, **based on three types of interdependent collaborations – clusters, networks and living laboratories.**

Name	Type of members	Focal point
Cluster	Businesses	Technology development (how to create/improve a technology)
Network	Clusters, Businesses	Market development (how to increase technology deployment)
Living Laboratory	Clusters, Businesses, Networks, Users, Policy Makers	Outcomes in real life settings (how to enhance a particular town or place)

More information on living laboratories can be found in the Oxfordshire's Low Carbon Economy Report²⁰.

²⁰ <http://www.eci.ox.ac.uk/research/energy/archive-low-carbon-energy-report.html>

3.3.2 Leading the way - Electric Vehicles and supporting infrastructure

We need to harness and use Oxfordshire's strengths in innovative vehicle and transportation technologies to deliver 'future of mobility'.

Transport accounts for 40% of Oxfordshire's energy use. Switching to electric or other ultra-low emission vehicles – private cars, commercial vehicle fleets and public transport - will not only be a key component in achieving carbon reduction targets but also in addressing air quality issues in our towns and in Oxford city.

Our local authorities are already leading the way, putting in place the world's first Zero Emissions Zone in central Oxford from 2020 (Figure 18).

Figure 18: World's first Zero Emissions Zone

In order to tackle harmful air pollution levels across Oxford, Oxford City Council and Oxfordshire County Council announced plans in October 2017 to introduce the world's first Zero Emission Zone in Oxford city centre.

The zone will restrict vehicles in phases, taking into account the best available technology, starting with some vehicle types and a small number of streets in 2020 and, as vehicle technology develops, moves to all vehicle types across the whole city centre in 2035.

Its full implementation would take air pollution levels in Oxford city centre down to near-background levels. For example, in the city centre's most polluted street, George Street, a 74 per cent reduction in toxic nitrogen dioxide (NO₂) levels is expected by 2035.

Source: <https://www.oxfordsmartcity.uk>

https://www.oxford.gov.uk/info/20216/air_quality_management/1227/oxford_zero_emissio

Public transport

Meeting the requirements for the Oxford Zero Emission Zone – and any similar initiatives implemented elsewhere in the county in response to air quality concerns - will push the transition to ultralow emission vehicles in our public transport fleet. For example, Oxford Bus Company have been exploring options for fully electric buses to operate in and around the city. Hydrogen and fuel cell technology may also have a role to play here.

Freight and goods movement

Whilst it seems likely that most freight will continue to move by road (at least in the near future), more can be shifted onto the rail network with provision made for low carbon shipping to and from bulkheads.

There are a number of options to explore. For example, BMW MINI highlighted to us that they are interested in a long-term logistics strategy, especially one that considers mile by mile environmental issues and the role of increasingly autonomous vehicles on the highway. There will be “easy wins” for logistics companies in targeting the “trunk” element of the journey for autonomy, e.g. logistics companies may link autonomous trucks in “road trains”.

“Last mile” logistics would be completed by another means—possibly by electric powered vans and small trucks. For example, BMW MINI suggest the potential for a “break bulk” logistics facility on the edge of Oxford, with “just in time” shuttle deliveries into the plant.

3.3.3 Charging Infrastructure

Supporting an increasing number of Electric Vehicles (EVs) will require appropriate charging infrastructure – both domestic and ‘public’ - in place across the county. Oxford City Council and Oxfordshire County Council’s Go Ultra Low project, funded by the Government’s Office for Low Emission Vehicles (OLEV), is trialling charging solutions in residential streets, over time up to 100 charging points will be rolled out across the city. Oxford City has also received funding for research & development into off street charging solutions, including trialling the world’s first ‘pop up’ charging points.²¹

3.3.4 Managing energy demand

Effective demand management and timing for battery charging using a network of smart, price responsive chargers which are able to charge at points in time when supply is high and demand is low will be key. Oxford City Council is trialling battery technology.

3.3.5 Storage

We need to support the development of storage at all levels including:

- Strategic – “at scale” provision by National Grid, or major DNO / DSO or commercial investments;
- Local – domestic and commercial provision, with potential to share between providers. There are implications for Smart Grids and some opportunity may be created for local private grids. PV and battery technology (see Figure 19) together could provide the opportunity for smaller users to be periodically (or totally) self-sufficient – not “off-grid”, but only using the grid to sell surplus or for supply in extremis;
- Mobile – Vehicle to Grid - using vehicles as mobile battery assets that can be used to help meet peak grid demand and then re-charged off-peak. We need to ensure that new housing stock is positioned to allow rapid uptake of this technology when it matures.

²¹ <https://www.oxfordsmartcity.uk/oxblog/oxford-to-have-worlds-first-pop-up-electric-vehicle-charging-points/>

Figure 19: Faraday Institute

The Faraday Institute, based on the Harwell Campus, is the UK's independent institute for electrochemical energy storage science and technology, supporting research, training, and analysis. It brings together scientists and industry partners on research projects to reduce battery cost, weight, and volume; to improve performance and reliability; and to develop whole-life strategies from mining to recycling to second use.

Its first four fast start projects include 25 industry partners and 20 universities that are passionate about leading Britain's energy future;

- Extending battery life;
- Battery Systems modelling;
- Recycling and reuse;
- Next generation Solid State batteries.

<https://faraday.ac.uk/>

3.4 Lobbying for change

To unlock the grid across Oxfordshire, we will develop new working partnerships both with our Distribution Network Operators (DNOs) as they transition to Distribution System Operator (DSOs) as well as Ofgem. The key challenge is to get the energy provision for new development better aligned with the planning system in the same way that other infrastructure already is.

The objective of the industry regulator (Ofgem) is to minimise investment costs resting on service users, rather than make long term provision for growth. As such this can constrain housing and economic growth due to utility infrastructure not being in place to align with local plan development aspirations.

Our ambitious growth plans that will be set out in the emerging Oxfordshire JSSP –will put us in a strong position to lobby for changes to the regulations and financing surrounding energy infrastructure.

Recognising the importance of utility infrastructure across the wider Oxford – Milton Keynes – Cambridge arc, England’s Economic Heartland (EEH) commissioned a study to identify opportunities and barriers to wider strategic infrastructure delivery governed by the existing regulatory framework.

The finalised report can be found on England Economic Heartland’s website and contains the following key findings:

- In order to realise the economic potential and raise productivity across the Heartland there is a need for wider strategic infrastructure investment to be aligned across all sectors;
- There is a disconnect in the governance of different sectors involved in utility provision, with national and local government, regulators and utilities working to different timme frames from each other and takng account of different factors;
- The main impediment to the advance delivery of strategic infrastructure appears to be the regulatory framework for utilities, particularly the price control mechanisms.

The full report produced by Bircham Dyson Bell can be found on England’s Economic Heartland website²².

²² <http://www.EnglandEconomicHeartland.com/Pages/home.aspx>

Investment Priorities

We would welcome proposals for inclusion in the Delivery Plan that:

- Ensure that the electricity grid in Oxfordshire is developed in a way that accommodates planned phased growth as identified in the existing Local Plans;
- Utilise the opportunities presented by new development and additional grid capacity to enable innovative community-level renewable energy projects to be delivered;
- Enable the development of energy projects that have been constrained by the lack of adequate grid capacity in the past;
- Exploit the Smart Grid approach to enable more sustainable use of energy, including charging points for EVs, demand side responses and energy storage;
- Enhances the Living Laboratory concept for testing new technologies, monitoring results and building partnerships.

4 Increasing local generation and reducing demand

Energy Strategy Objective 2

Lead nationally and internationally to reduce countywide emissions by 50% compared with 2008 levels by 2030 and set a pathway to achieve zero carbon growth by 2050. We will realise the economic benefits of this low carbon transition by supporting:

- ambitious and innovative clean generation projects across the county, both in urban and rural areas, and in growth locations;
- projects that reduce energy demand and increase energy efficiency for domestic, industrial, commercial buildings and transport

4.1 Increasing local generation

Delivering affordable, clean energy locally to meet local demand will drive our transition to a low carbon county, help meet our carbon emission reduction targets and keep up to £1.1 billion within the county's economy every year.

Many of our largest energy-using organisations, manufacturers and institutions have the appetite and are open to new ideas in energy innovation to move to more sustainable energy supplies, and to reduce their carbon footprints. For example, in 2014 BMW installed 11,500 solar panels to help harness renewable energy at the Oxford Mini Plant. It is one of the largest roof mounted solar installations in the UK.

We can build on this willingness and encourage more innovation, and the sharing of best practice between large organisations and SMEs, and between sectors.

4.1.2 Scaling up

By 2030, at least **56% of our electricity demand** – an additional 2,050 GWh – *and 40% of our heat requirement* needs to be met by renewables if we are to achieve our carbon reduction targets²³. Meeting this scale of demand will mean using multiple sources and technologies delivered at a strategic, community and household scale. Unlocking the electricity supply network - already at or close to capacity and limiting connections for local low carbon generation²⁴ will be a priority.

To secure adequate supplies of clean energy within the county we need to:

- identify appropriate locations for new strategic generation capacity;

²³ Aether 2018. Oxfordshire Greenhouse Gas emission projections, 2018 update

²⁴ Oxfordshire Infrastructure Strategy

- support and develop models that deliver local revenue from low carbon generation, for example, the hugely successful model developed by the Low Carbon Hub (see figure 20) to deliver the local benefits of community energy;
- include renewables on new and existing buildings including PV, solar thermal PV, Ground Source Heat Pumps (GSHPs) and Air Source Heat Pumps (ASHPs);
- Work with SGN to decarbonise gas networks;
- Support the development and integration of new and emerging technologies (for example, building on the successful hydrogen fuel cell demonstrator project, DIMES) into our local infrastructure to significantly decarbonise heat and transport systems;
- Build up the expertise of installers and the knowledge for users and to use them effectively.

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Figure 20: The Low Carbon Hub

The Low Carbon Hub is one of Oxfordshire's key energy assets. It calls for the creation of a new energy system that:

- has renewable generation and energy efficiency at its heart, reducing carbon emissions;
- makes the money spent on energy work harder for the benefit of communities and strengthening the local economy;
- supports the creation of more locally-owned community energy projects, putting local power in the hands of local people;
- makes homes, businesses, and community buildings more healthy and comfortable;
- is smart and flexible to make the most of future technological solutions.

The Low Carbon Hub also:

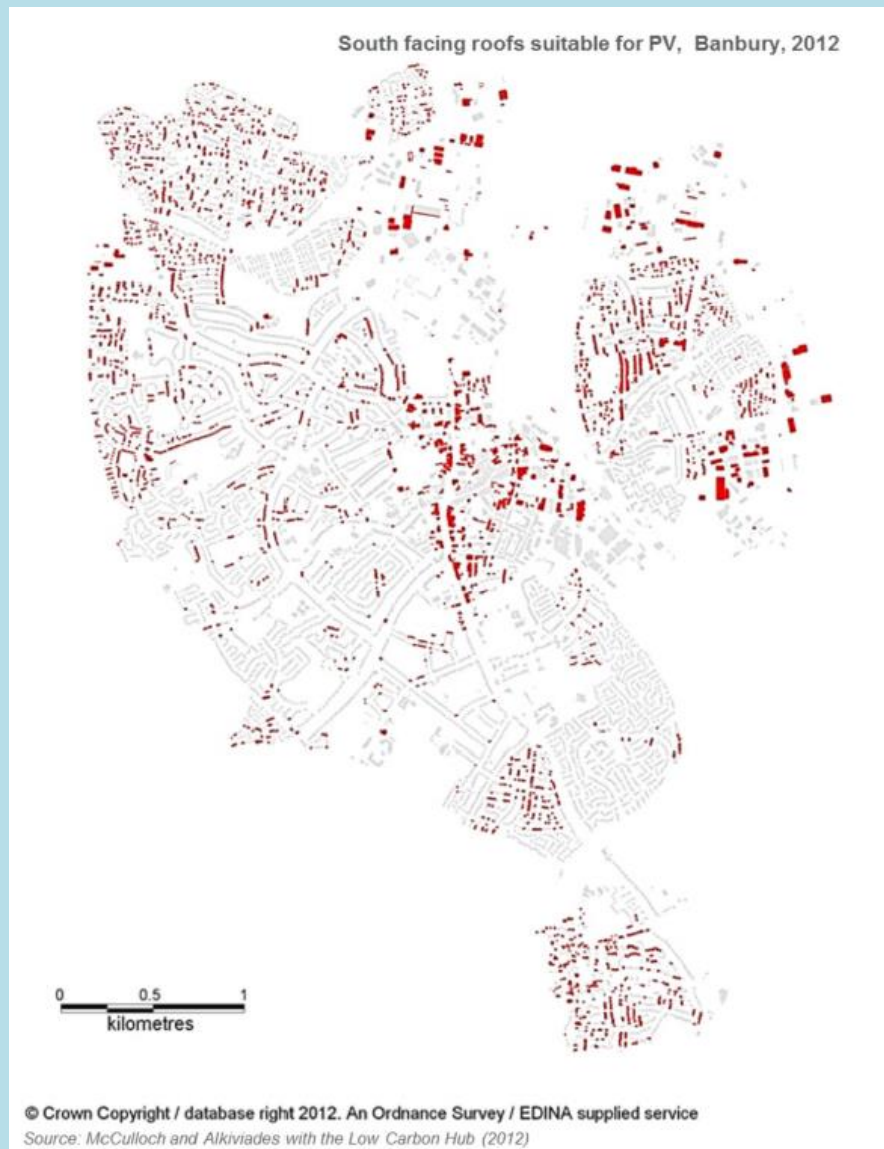
- Develops community-owned renewable energy in Oxfordshire by working in partnership with schools, businesses and community groups, at no cost to our partners;
- Raises money to build these projects through community share offers and re-invests 100% of its own surplus in its mission, and donates all of its surpluses to support further local carbon-cutting initiatives across Oxfordshire;
- Offers practical support to groups who want to set up their own renewables or energy saving projects;
- Runs pathfinding innovation pilots;
- Helps the community energy sector in Oxfordshire expand more rapidly by bringing together people who can break through obstacles like grid constraints or technology gaps.

<https://www.lowcarbonhub.org/>

Figure 21: Scaling up: roof top Solar PV

Research by McCulloch and Alkiviades with the Low Carbon Hub (2012) looked at the scope for incorporating PV as part of Oxfordshire's energy mix. The solar part of the study looked at rooftops PV generation capacity only. The study estimates the number and size of south-facing rooftops which can be considered for PV installations. The PV generation capacity if this was fully employed in Abingdon, Banbury, Bicester and Oxford in Oxfordshire was estimated to assess the total theoretical energy capacity. According to the study, these towns represent 40% of the total county population and so this percentage was extrapolated to calculate the total surface area suitable for PV installation in the county.

In total, the study found that the total annual solar resource striking suitable Oxfordshire rooftops was equivalent to 2,055 GWh/year. This is equivalent to 57% of the total Oxfordshire electrical demand based on 2015 usage of 3,600 GWh.



4.1.3 Technologies

The majority of the low carbon energy needed in Oxfordshire is likely to be met by solar PV – delivered through household and community schemes and a number of larger scale developments (Figure 21).

Other potential technologies include:

- Heat networks & combined heat and power (CHP) schemes;
- Waste streams, anaerobic digestion;
- Hydropower;
- Hydrogen²⁵ (Figure 22);
- Private wire;
- Biomass and biofuels, wood fuel; and
- Small modular reactors.

A list of energy projects already underway in Oxfordshire can be found at Annex 2.

Figure 22 The Hydrogen Hub

The Hydrogen Hub is an industry-led community of stakeholders from across the hydrogen and fuel cell supply chain, local authorities, businesses and current and potential users. It is an organisation which is committed to advancing the deployment of hydrogen and fuel cell technologies in the UK. It achieves this by bringing together key stakeholders from the supply chain, potential end users and local government to focus on projects in a specific location. This process is supported by extensive knowledge in the technical and commercial aspects of hydrogen and fuel cells developed over many years in the industry.

The first Hydrogen Hub, established in 2016 has focussed on Swindon and Wiltshire in the UK with success in developing the local hydrogen refuelling infrastructure and the fleet of fuel cell vehicles now operating in the region.

2018 marked the launch of the second Hydrogen Hub, in Oxfordshire, where there is a strong appetite for clean and sustainable transport and energy generation. This is demonstrated by the plan to introduce the UK's first zero emission zone in the city of Oxford.

Figure 23: Scaling up: decarbonising heat

Heat accounts for 45% of UK energy consumption, with gas supplying around 70% of this use (BEIS and Committee on Climate Change, March 2018).

The Oxfordshire Infrastructure Strategy (OxIS) highlighted that there are no significant constraint issues in relation to gas in Oxfordshire. However, consideration needs to be given to the way that gas could be used in the future, and in particular the part that “green gas” could play in meeting energy demand.

Locally produced biomethane from the breakdown of organic material such as animal slurries and food waste by anaerobic digestion (AD) is already being injected into our gas network in Oxfordshire operated by Scotia Gas Network. The plant at Icknield Farm in Ipsden has been in operation since 2014, supplying *locally produced renewable gas for 3,000 Oxfordshire homes since 2014.*

²⁵ <https://www.hydrogenhub.org/>

4.1.4 Role of local authorities

Significant planned housing and employment growth offers a unique opportunity to make a step change in matching new utility generation and infrastructure with demand. Co-locating renewable and low carbon technologies with new development will increase efficiencies and open up options for “behind the meter” strategies and local microgrids.

Local authorities as land owners

A more active public-sector role in the development process – and in particular, a more proactive and coordinated approach to capturing land value uplift – will be very important if developments are going to be able to deliver the low carbon infrastructure that is needed early in the build process. The finances of development will be critical—especially where infrastructure has to be delivered well in advance of need. Other finance mechanisms will be explored through work associated with England Economic Heartland across the Oxford – Milton Keynes – Cambridge corridor.

Oxfordshire Local Authorities as landowners are keen to facilitate new ways of delivering the low carbon infrastructure. There are examples of landowners being willing to work with local authorities to implement innovative schemes for infrastructure delivery, and for the capture of some land value towards community benefits.

Ownership of the energy assets could then be vested in the local authorities, for the common good, or transferred to the new communities themselves. This may be especially appropriate where “behind the meter” initiatives and local generation can be established.

Local planning policy and the Joint Statutory Spatial Plan

Oxford City Council and the four rural districts are responsible for preparing local plans to guide development in their areas. The five local plans covering Oxfordshire are all at various stages of development. For example, whilst both Cherwell and Vale of the White Horse District Councils have adopted local plans covering the period 2011 to 2031, Oxford City Councils emerging local plan is from 2016 to 2036, and is currently at Preferred Options Stage. It is through building regulations and the local planning process that policies can be adopted to ensure developers of both housing and industrial/commercial sites implement practices that increase energy efficiency and reduce energy demand.

For some years now, Oxford City Council have had a requirement in their Local Plan for 20% of total energy requirements (regulated and unregulated) to be met from on-site renewable or low and zero carbon technologies. This applies to commercial buildings over 2,000 sqm sites of 10 or more homes.

Cherwell District Council is another leader in the field. Theme Three of the Adopted Cherwell Local Plan Part 1 contains policies for ensuring sustainable development including for:

- Mitigating and adapting to climate change;
- Energy Hierarchy and allowable solutions;

- Sustainable construction;
- Decentralised energy systems; and
- Renewable energy.

To promote sustainable construction, Cherwell District Council requires that all new residential development addresses the policies in the Local Plan. At NW Bicester all development is to incorporate sustainable design and construction technology to achieve zero carbon development. Should promoters of development consider that individual proposals would be unviable with these requirements, 'open book' financial analysis of proposed development are expected so that an independent economic viability assessment can be undertaken.

In the case of renewable energy, the council requests a feasibility assessment of the potential for significant on site renewable energy provision on all residential sites for 100 dwellings or more and in off-gas areas for 50 dwellings or more, and on planning applications for commercial development above 1000 m² floorspace.

What the council has achieved at the Bicester Eco Town, and at Graven Hill (see Figure 24), have provided a clear foundation for these policies, and demonstrate how a local authority can strongly influence development that reduce reliance on fossil fuels, and promote energy efficiency. There is a role for the Growth Board and OxLEP in promoting higher standards to

Figure 24: NW Bicester

The Eco Towns Planning Policy Statement sets out standards for Eco Town development. These were incorporated into the adopted Cherwell Local Plan policy Bic 1 and into the NW Bicester Supplementary Planning document. This includes the requirements to achieve zero carbon development, reduced water use, consider daylighting and overheating and climate change adaptation.

The standards required were clearly stated and known prior to land purchase and therefore could be taken into account in the price paid. The Elmsbrook development, the first phase of NW Bicester, is being built out and monitoring is taking place to assess then development against the standards and to ensure learning is used to inform later stages.

Graven Hill

The Graven Hill Design Code identifies requirements for building performance. A design check is carried out by the Development Company to ensure designs for self-build plots meet the requirements.

Some properties have been commissioned to Passivhaus standards by the Company.

<http://nwbicester.co.uk/>

the Government to support wider adoption of such policies so that a policy base is provided across the County.

There is a real opportunity to embed similar policies for sustainable development across Oxfordshire through the Oxfordshire Joint Statutory Spatial Plan and individual Local Plans which are yet to be adopted.

Local authorities as energy suppliers

Local authority led energy supply companies offer the opportunity to deliver affordable energy locally. Profits made through the sale of energy and gas are invested back into the local community, for example, to address fuel poverty (currently affecting one in ten households in Oxfordshire). This route also provides an opportunity to incorporate local low carbon generation. Examples already successfully operating include Robin Hood Energy²⁶ (Nottingham) and Bristol Energy²⁷.

We will support our local authorities to explore options for a public-sector led energy supply company for Oxfordshire.

²⁶ <https://robinhoodenergy.co.uk/>

²⁷ https://www.bristol-energy.co.uk/?gclid=EAlaIqObChMI8Lfw2PvG3AIVgrTtCh0X8Qd2EAAYASAAEgIXIPD_BwE

4.2 Increasing energy efficiency and reducing demand

A renewables-based energy system will require significant demand reduction. Our new developments will need to meet best practice standards, and we will need focussed efforts to reduce energy demand from existing buildings, commerce and transport.

4.2.2 New developments

“Oxfordshire partners are committed to ensuring that new housing and employment development are of high quality design and meet environmental standards in order to create attractive, sustainable places” ... Growth Deal Outline Agreement, 2018

Not only do we need to ensure that energy efficiency is incorporated in our new developments, we need to follow the example set by the North-West Bicester development and ensure that all new homes are built to the highest standards of energy efficiency to minimise the increase in energy demand.

These criteria need to be set out in our local plans and mechanisms put in place to ensure they are met during the development. This may require different and innovative approaches as outlined below. The LEP, via the Local Industrial Strategy, and the local planning authorities and the Growth Board through local plans and the JSSP, will need to explore best practice to ensure Oxfordshire is at the forefront of these future changes and best practice.

Voluntary agreements

The history of the Bicester eco-town shows that voluntary agreements with enlightened landowners and developers can be successful in delivering low-carbon development.

We could usefully take best practice from Bicester, and publicise the approach more widely. The key element to explore would be the way in which the planning and economics of the deal were structured in a way which allowed the delivery of low carbon development – for example the Bicester Ecotown-specific Planning Policy Statement - even after regulations removed the ability of local authorities to impose low carbon standards on developers.

For example, new homes built to Passivhaus standard achieve a 75% reduction in space heating requirements, compared to standard practice for UK new build²⁸. There is evidence that Passivhaus properties are more valuable and are able to sell at a higher price than traditional properties in the area - Savills have suggested a 16% increase in value - other studies say their value is in their ability to sell much more quickly than lower standard housing.

There may be an opportunity to sponsor work which better quantifies the value uplift resulting from higher energy efficiency standards, and then working with the development industry to publicise the opportunity.

²⁸ UK Passivhaus Trust, <http://www.passivhaus.org.uk/>

4.2.3 Improving existing built stock

The pathway to a low carbon future set out in our greenhouse gas emission projections²⁹, assumes that by 2030 4,000 existing homes must be renovated every year to reduce energy requirements to 60 kWh / m² per year³⁰. To meet this, or an equivalent ambition, will require a coherent retrofit programme to bring all homes in the county up to a minimum of EPC band C by 2035 in line with the ambitions of the Clean Growth Strategy. This will build on projects already being delivered:

- The LEMUR project (Local energy mapping for urban refit) led by Oxford Brookes University, BioRegional and Cherwell DC has successfully shown how effective use of data can focus limited resources to deliver local community retrofit projects. The programme is now expanding to the rest of the county under the auspices of the OxFutures ERDF project, matching up the mapping element with local community engagement through the Community Action Group network³¹;
- The ongoing Better Housing, Better Health programme³², addresses the immediate issues affecting those residents living in fuel poverty (around one in ten households countywide);
- Enforcement of the Minimum Energy Efficiency Standards (MEES) from April 2020, will require all eligible private rented residential and non-domestic properties to meet a minimum standard of at least EPC band E;

We are already supporting local businesses to reduce energy demand through our Growth Hub³³. More comprehensive support is also available through the OxFutures project (see Figure 25).

²⁹ Aether 2018, Oxfordshire Greenhouse Gas emissions projections, 2018 update, based on assumptions in the low carbon economy report.

³⁰ The figures set out here are indicative of scale. We may require more or less action depending on delivery of other low carbon measures

³¹ <http://cagoxfordshire.org.uk/>

³² <http://www.bhbh.org.uk/>

³³ <https://www.oxfordshirelep.com/business/growth-hub>

Figure 25: OxFutures

The Low Carbon Hub, in partnership with Cherwell District Council, Oxford City Council, the University of Oxford, Oxford Brookes University and BioRegional, is running a three-year £3.2 million programme to help businesses become more resource efficient.

The project focusses on three interlocking strands:

- Oxfordshire Green Tech – a free county-wide network for businesses that will encourage partnership working, and for businesses to submit joint bids for funding low carbon projects. It also offers free energy audits to businesses;
- Oxfordshire Green Lab – brings Oxfordshire’s world-leading universities and the researchers into collaborations with businesses to develop new thinking around the transition to a smart, clean energy system. This new thinking is then developed into new businesses, products and services;
- Oxfordshire Green Fund - provides grant funding to support the implementation of energy saving measures in businesses following their free energy audit; and to bring new businesses, products and services to market.

<http://oxfutures.org/>

Further funding and incentives will be needed to support the delivery of large scale retrofit. The scale of the investment needed across the county will be significant. For example, Cherwell District Council have identified costs of around £19.5 million to improve homes with a category 1 Housing Health and Safety Rating System hazards such as excess cold or significant damp.

As well as maximising the use of eco-funding (current opportunities are available through ECO flex and the recently announced ECO3³⁴ – for example, the Low Carbon Hub is exploring options to deliver an Oxfordshire RetrofitWorks model) we need to explore options to make use of other models, for example a local energy bond (an option currently being explored by the Low Carbon Hub); home energy efficiency loans (0% interest, revolving fund, based on successful model operating in Scotland).

³⁴ The ECO3 funding has increased ECO flex from 10% to 25% but has also provided opportunities for suppliers to meet 10% of their obligations through innovation.

We also need to develop business supply chains and the skills base to make sure we have the right capacity in place to take advantage of opportunities to improve the efficiency of the existing building stock. These concepts are outside the scope of this Energy Strategy, however, our strategic priorities related to skills and supporting innovation can be found in the Oxfordshire Skills Strategy³⁵, and in the Oxfordshire Innovation Strategy³⁶.

4.2.4 Reducing energy demand from transport

As well as increasing the proportion of ultralow emission vehicles (both private and fleet) we also need to reduce the number of journeys made, and provide for alternative modes of travel. For example, our emissions projection, Scenario C, assumes delivery of additional cycling infrastructure and personalised travel plans³⁷.

Whilst this is relevant to the energy agenda, it is out of the scope of this Energy Strategy as the detailed policies and plans to deliver the reduced need for transport are set out in the local transport plans (currently being updated) including the Active and Healthy Travel Strategy. We will work where possible to support these goals.

Connecting Oxfordshire³⁸ shapes our transport policy and sets out Oxfordshire County Council's policy and strategy for developing the transport system in Oxfordshire to 2031. It has been developed with these over-arching transport goals:

- To support jobs and housing growth and economic vitality;
- To reduce transport emissions and meet our obligations to Government;
- To protect, and where possible enhance Oxfordshire's environment and improve quality of life; and
- To improve public health, air quality, safety and individual wellbeing.

³⁵ <https://www.oxfordshirelep.com/about/our-strategies/skills-strategy>

³⁶ <https://www.oxfordshirelep.com/about/our-strategies/innovation-strategy>

³⁷ Oxfordshire Greenhouse Gas Projections, 2018 and Oxfordshire Low Carbon Economy, 2014

³⁸ <https://www2.oxfordshire.gov.uk/cms/public-site/connecting-oxfordshire>

Investment Priorities

We would welcome proposals for inclusion in the Delivery Plan that:

- Build on the work carried out by the Low Carbon Hub to evaluate the potential for on-building generation and develop a model to enable delivery at scale;
- Identify potential development sites for large-scale PV or other renewable generation;
- Encourage alternative forms of land ownership for new development, such as Community Land Trusts, to capture the uplift in the value of land to enable the development of local energy projects;
- Support Oxfordshire local authorities to explore options for a public-sector energy supply company for the county;
- Enable energy efficient buildings in new developments, both residential and commercial/industrial;
- Deliver innovative sustainable construction practices across the county;
- Increase the skills of the future and present workforce in sustainable construction by enabling access to appropriate training programmes;
- Enable the sharing of best practice in energy efficiency;
- Enable more sustainable and energy efficient transport infrastructure;
- Enable large scale retrofit programmes.

5 Networked Oxfordshire - Collaboration and partnership working

If we want the benefits of a holistic new energy economy, we must be wildly ambitious. All of us - world-renowned researchers, creative thinkers, informed investors, bold business leaders, far-sighted planners, an engaged public – need to see the opportunities for Oxfordshire and take action.

Joining the Crowd: Growing a New Economy for Oxfordshire

Energy Strategy Objective 3

Enhance energy networking and partnership working across Oxfordshire to focus on the low carbon energy challenges and funding opportunities created through the Clean Growth Strategy and the Oxfordshire Industrial Strategy.

The need for a high-level coordinating group to oversee the multiplicity of energy interests and opportunities across the county is a critical outcome of our Energy Strategy.

We believe this is necessary to drive the alignment and integration of policies and initiatives that may be required to move towards a zero-carbon growth model. We know there are already good building blocks in place which provide the basis for further communication and dialogue between partners in Oxfordshire around energy and the low carbon agenda. Now is the time to strengthen that dialogue and knit it together under a truly strategic umbrella building on existing work and relationships. A dynamic, high level partnership board, appropriately resourced, will bring together key stakeholders to coordinate the delivery of the energy strategy.

Two workstreams sit below this....

- An “Innovation” ecosystem—this is the place where research, experimentation and the concepts of the “living lab” can be developed, networks created, experiences shared and ideas hatched and pursued, and;
- A “Delivery” ecosystem—for those who are involved in the implementation of technology, the planning and delivery of Smart Grids and for those who are delivering development sites and business opportunities, and who need to know how best to interact with the low carbon energy sector and the existing regulatory frameworks.

Organisations should not be restricted to one ecosystem or the other, and there are clear areas of overlap— but previous experience suggests that there will need to be these two channels of thought and initiative in practice. Some stakeholders may only want to engage with one Ecosystem or the other, and some who will sit happily—and enthusiastically -

across both. The co-ordinating group will need to be properly funded for the longer term and have legitimacy in putting together bids for funding and projects.

5.1 The Innovation Ecosystem

The innovation “ecosystem” fosters new ideas from building innovative, but focused, coalitions for change. Ideas become projects through sponsors empowered to deliver them – including communities, local authorities, the private sector and investors. Innovation depends on the cross-fertilisation of ideas and this is happening across the county, but we see the Innovation Ecosystem as a means to match ideas with resources, and focus funding bids and sources towards initiatives that align with the strategy.

5.2 The Delivery Ecosystem

The energy delivery “ecosystem” would be the pathway to promote low carbon growth, rather than “business as usual”. It would bring together our existing groups such as Low Carbon Oxford, the Low Carbon Hub, Oxfordshire GreenTech, with developers, communities, DNOs and the regulator to review, manage, create and plan energy infrastructure capacity for growth and so enable large-scale and ambitious investment.

This wider delivery group would seek to access public funding - for example, the Industrial Strategy Challenge fund, including the £170 million earmarked for sustainable construction, the £40 million Smart Local Energy Fund, the National Productivity Fund and others - alongside private sector investment and finance tools to bring forward a step change in energy and low carbon solutions for Oxfordshire. It will also seek energy opportunities aligning to the Oxfordshire Housing and Growth Deal.

A renewables-based system will require considerable energy demand reduction. Continuing community level work will be required to encourage behaviour change, and create a local population willing and able to use new technologies and change their energy use. We know that work with individual households and small businesses is essential to reduce demand – but so far this has always sat outside conventional business models. Oxfordshire needs a way of implementing wider cultural change to lower energy demand.

We believe that a new model of Partnership working as described in this strategy could provide the framework for a range of technical and industry stakeholders to work with the community and business sectors in Oxfordshire to better understand, and then implement, a range of culture change approaches to local energy. A range of innovative techniques could be used to change local attitudes, possibly including nudge-based techniques, incentives advertising, focus groups and so on.

5.3 Working with BEIS and the Greater South-East Energy Hub (GSEEH)

OxLEP is one of 11 LEPs that make up the Greater South-East Energy Hub (GSEEH)³⁹. There are five such energy hubs being established across England that will be operational later in 2018.

The GSEEH has been allocated £1.29 million for its operations, along with a further £220,000 for consultancy purposes. It will also lead on a national Mapping Energy and Utilities Infrastructure for Regional Spatial Planning project. A team of eight FTE's are being recruited, including four Regional Energy Managers, one of which will be operating in the sub-region comprising Oxfordshire, Buckinghamshire, Berkshire LEPs and SEMLEP.

The GSEEH team will have access to technical, legal and financial expertise and will provide practical support and expertise to LEPs and local authorities to help them undertake the initial stages of development for priority projects emerging from energy strategies, up to the point where they are able to source finance.

Priorities for Investment

We would welcome proposals for inclusion in the Delivery plan that:

- Bring together our energy stakeholders into an overarching steering group to foster innovation and implement energy projects and programmes;
- Brings together partners to develop a Living Laboratory concept to test new energy technologies;
- Develop the energy sector business supply chain;
- Develops a high-skills work-force for the renewable energy sectors and for sustainable construction.

³⁹ <http://energyhub.org.uk/>

6. Delivering the Strategy

This Energy Strategy sets our ambition to become a low carbon county, bringing investment, jobs and clean growth. It establishes a framework for investment priorities and the resulting capital and revenue projects that will be required to meet our challenging targets to reduce our carbon emissions.

A Delivery Plan sits alongside the Strategy and maps out these priorities and the related work streams and projects. Figure x sets out how these will be delivered in partnership with our energy stakeholders and partners across the county. It will be a working document, updated regularly to incorporate new projects as they emerge.

6.1 The role of the Oxfordshire Local Enterprise Partnership

This development of this Energy Strategy has been facilitated by OxLEP. The specific actions and projects needed to deliver the strategy will in the main be delivered by our partners, including local authorities, the private sector, Universities and organisations such as the Low Carbon Hub. Our role as a LEP will focus on:

Leadership – we will influence decision-making processes (at central government as well as at local levels) by representing the ‘voice of business’ from Oxfordshire;

Brokerage – we will link partners and projects with each other and help to access funds to deliver the objectives of the Oxfordshire Energy Strategy;

Facilitation – working in partnership with partners and wider stakeholders, including our local authorities, private and academic sectors, to make the most of our economic and housing growth ambitions to create opportunities for local residents and businesses.

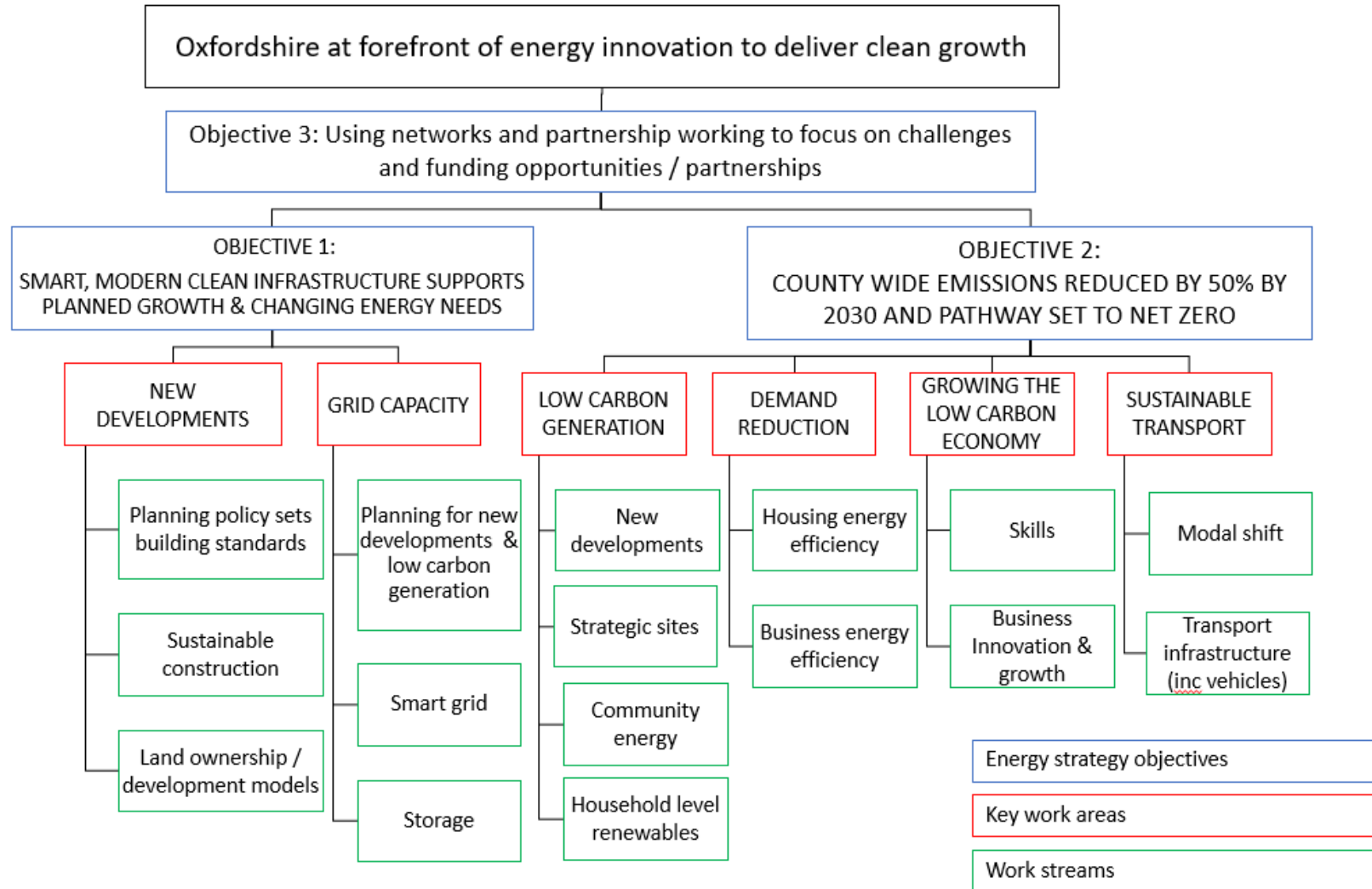
Delivery – we will lead delivery of the Local Industrial Strategy, creating the opportunities for growth of the jobs and skills needed to deliver clean growth, and where there is no natural partner, we will take on the responsibility for delivering key activity

6.2 Monitoring and review

Progress against the energy strategy objectives will be regularly reviewed and monitored against a number of key performance indicators. These will be developed alongside the delivery plan.

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Figure 26 Delivering the Oxfordshire Energy Strategy, themes and workstreams



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Glossary

BEIS	Department for Business, Energy & Industrial Strategy
Clean growth	<p>Clean Growth is one of the Grand Challenges within the BEIS Industrial Strategy. The Grand Challenge is a call to academia, business, industry and the general public to commit to work to maximise opportunities.</p> <p>On 21 May 2018 the Prime Minister announced the first Clean Growth Grand Challenge mission: To at least halve the energy use of new buildings by 2030</p>
CO₂	Carbon dioxide
Disruptors	External factors that are unknown and difficult to predict the full effect of, especially in the context of other unknown or
DNO	Distribution Network Operator
DSO	Distribution System Operator
FTE	Full time Equivalent
GVA	Gross Value Added – the measure of the value of goods and services produced in an area, industry or sector of an economy
GWh	Gigawatt hours
Kt/kilotonnes	1,000 metric tonnes
kWh	Kilowatt hours
MWe	Megawatt electrical – the electric power produced by a generator
Ofgem	Office of Gas & Electricity Markets – the UK energy industry regulator
Passivhaus	A construction standard for buildings defined by the Passivhaus Institute as ‘a building in which thermal comfort can be achieved solely by post-heating or post-cooling the fresh air flow required for good indoor air quality, without the need for additional recirculation of air’
SGN	Southern Gas Networks
SME	Small & Medium sized enterprises

Annex 1: Stakeholders

The development of the Energy Strategy included liaison with stakeholders at Steering Group meetings and at two key workshops held in Oxford.

The Oxfordshire Energy Strategy Steering Group Members

Name	Organisation
Barbara Hammond	Low Carbon Hub
Dawn Pettis	OxLEP
Gavin Killip	ECl, University of Oxford
Heather Saunders	South Oxfordshire and Vale of the White Horse District Councils
Inga Doherty	Oxfordshire County Council
James Higgins	SGN
Louise Croot	West Oxfordshire District Council
Jo Colwell	Oxford City Council
Sarah Gilbert	Oxfordshire County Council
Sam Hampton	OxLEP Business
Steve Atkins	SSE
Paul Robinson	Oxford City Council
Paul Staines	Oxfordshire Growth Board
Sam Thomas	Cherwell District Council
Victoria Fletcher	Oxfordshire County Council

Organisations represented at workshops

Workshop attendees February 2018

- Aether Ltd
- Bicester Healthy New Town
- BioRegional
- Cherwell District Council
- Earth Trust
- Ecuity Consulting
- EDF Energy
- Energeo
- EON
- Harwell Science & Technology Facilities Council
- Hydrogen Hub
- Low Carbon Hub
- Oxford Brookes University
- Oxford Bus Company
- Oxford City Council
- Oxfordshire County Council
- Oxfordshire Growth Board
- Oxfordshire Training Construction Group
- OxLEP
- OxLEP Business
- OxLEP Environment & Sustainability Sub Group
- Pell Frischmann
- Peter Brett Associates
- Road Haulage Association
- RWE Generation UK plc
- SmartKlub
- South Oxfordshire and Vale of White Horse District Councils
- South Oxfordshire District Council
- SSEN
- UKAEA
- University of Oxford
- University of Oxford Environmental Change Institute
- University of Oxford, Energy & Power Group
- West Oxfordshire District Council

Workshop attendees April 2018

- OxLEP
- Aether Ltd
- BioRegional
- Bircham Dyson Bell
- Cherwell District Council
- Earth Trust
- EDF Energy
- Energeo
- Holley Technology UK
- Hydrogen Hub
- Low Carbon Hub
- Oxford Brookes University
- Oxford Bus Company
- Oxford City Council
- Oxfordshire County Council
- Peter Brett Associates
- Ricardo
- Road Haulage Association
- SGN
- SmartKlub
- South Oxfordshire and Vale of White Horse District Council
- South Oxfordshire District Council
- SSEN
- University of Oxford
- University of Oxford, Energy & Power Group
- Vale of White Horse District Council
- West Oxfordshire District Council

Stakeholder interviews

Organisation
Oxfordshire County Council, Innovation Hub
SSEN
University of Oxford, Energy and Power Group
University of Oxford, Industrial Research Partnerships: Energy
Oxford Bus Company
Cambridgeshire County Council, Greater Cambridgeshire LEP
Fuel Cell Systems
Harwell Energy Cluster / STFC
Low Carbon Hub
Oxford City Council
South Oxfordshire and Vale of White Horse District Council
West Oxfordshire District Council
Prodrive
Harwell development strategy
BMW Mini
Oxford Brookes University

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