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Marches LEP Energy Strategy

Energy Strategy for the Marches Local Enterprise Partnership

Prepared for
Marches LEP

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The Marches Local Enterprise Partnership
Herefordshire - Shropshire - Telford & Wrekin

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Executive summary

The Marches Local Enterprise Partnership (LEP) has recognised that energy provision can impose a barrier to economic growth. The way that energy is generated and consumed in the UK is changing and it is important to understand this when setting out a strategy for future energy use in the Marches. The current energy infrastructure is already at capacity in many areas and this presents both a threat to future business and housing development but also an opportunity to invest in innovation that can overcome these challenges while providing a unique selling point for those in the energy supply chain to invest in the area.

The Marches is an area with ambitious growth plans; it is set to create 40,000 new jobs and 70,000 new homes over the twenty years to 2031. Energy is a vital component in the realisation of these plans in terms of the availability and reliability of supply to be able to support this growth trajectory. Within the energy sector, there are also opportunities to expand high-value supply chains supporting technological innovation.

This energy strategy has been commissioned by Marches Local Enterprise Partnership (LEP) with support from the Department of Business and Industrial Strategy (BEIS). Its objectives are to:

- Identify barriers to growth from current energy infrastructure.
- Highlight opportunities for the Marches to deliver its growth potential through innovative and low carbon related business opportunities.
- Develop an achievable action plan required to mitigate risks and capture the opportunities for the Marches that come with change in the national energy system.

Assessing the local energy system

The strategy has been built on a review of the existing evidence base of data and documentation on all aspects of the local energy system. This included national datasets of energy consumption across the region by sector, fuel type and location. This data was benchmarked against national averages to be able to identify regional differences and examined to understand the strengths and weaknesses of the Marches' use of energy today, and the aspects of energy usage in the region that may be a threat or present an opportunity for growth.

Local datasets were also incorporated, the key to this exercise was understanding what had already been achieved. This was particularly important in areas such as energy efficiency and supply, strengthening opportunities in the low carbon supply chain and understanding what was still proving to be a barrier to development. Additionally, analysis of electricity grid constraints across the Marches was undertaken, as it had already been identified as an area of weakness for delivering some of the key strategic development required.

Key findings included;

- There is significant potential for renewable generation including biomass, solar, wind and anaerobic digestion.
- A significantly constrained electrical grid both in terms of generation and supply leading to difficulties in connecting both new development and energy generation assets.
- The Marches is already a national leader in the deployment of anaerobic digestion plants.

- The rural nature of the area results in:
  - Comparatively high transport emissions as vehicles have to travel further to their destinations.
  - Significant areas off the gas grid leading to the relatively widespread use of high carbon and high-cost fuels.
  - Above national and West Midlands average levels of fuel poverty.

Looking to the future

The local Marches energy system (generation, supply, and infrastructure) is completely interconnected with the national system. The national energy system is undergoing a period of significant and in some cases disruptive change, such as the rise in the contribution of local renewable generation to our energy mix and changes in energy use in transport through the increased use of electric vehicles. This presents both opportunities and threats to local Marches businesses.

A number of future energy scenarios have been developed by National Grid, these consider the uptake of electric vehicles, heat pumps and other technological innovation. This strategy presents two of these scenarios, the first entitled S*teady State* shows business-as-usual with only slow uptake of these technologies and the other, *Two Degrees*, shows an accelerated path to decarbonisation with large subsequent impacts on local electricity distribution networks and changes in the way energy is produced and consumed.

2030 Vision Statement

The Marches area has an energy generation and supply system which is flexible and reliable, delivering energy that is low carbon and low cost to businesses and communities, can accommodate planned growth and can support well developed low carbon supply chains.

Forming the vision

The evidence base and the national context for transformational change in the national energy sector was considered alongside in-depth analysis of strengths, weaknesses, opportunities and threats relating to the Marches energy system. This work and consultation with stakeholders has informed the development of a vision for energy in the Marches. In order to achieve this strategy, a number of key priorities were developed:

Key priority 1: Smart control and mitigation of grid constraints

Key priority 2: Innovation in agricultural technologies

Key priority 3: Sufficient reliable energy supply

Key priority 4: Development of the supply chain in key areas of the low carbon economy

Key priority 5: Local renewable energy supply

Key priority 6: Addressing high levels of fuel poverty

In order to understand some of the detail of what this might look like, and to monitor progress towards the vision, a number of primarily quantifiable aspirations were developed:

Pilot	Developing a pilot grid constraints mitigation project as a national demonstrator
50%	Renewable electricity meeting 50% of local demand
1000	1000 new jobs in the Low Carbon and Renewable Energy Sector
≤10%	Fuel poverty reduced below 10%
Leader	Continue to be a national leader in deployment of anaerobic digestion
Centre	Create a centre for UK agriculture innovation and low carbon transition
57%	Carbon emissions excluding agriculture reduced in line with UK targets, a 57% reduction on 1990 levels

Delivering the vision

The vision is an aspirational target for 2030 and achieving this will require a number of work streams by a range of stakeholders. This strategy aims to articulate the primary tasks by work stream and assign action owners in order to make it clear who needs to do what by when in order to drive towards the same outcomes. Some of the key actions to be undertaken are set out below.

Action	Timescale	Owner
Adopt 2030 Energy Vision aspirations	March 2018	Marches LEP Board
Liaise more closely with the local electricity network operators (DNOs) to understand constraints and planned work	2018	Marches LEP and partners
Development of Energy Innovation Zone to undertake pilot smart grid project	2019	Marches LEP
Facilitating establishment of Centre for Agri-Tech Innovation in the Marches	2022	Marches LEP
Work with energy companies to influence local use of ECO funds for energy efficiency	2019	Marches LEP

How the vision falls within the LEPs strategic priorities

The LEP has already developed a number of strategic priorities; the strategy delivers against a number of these and this is mapped in the following graphic.

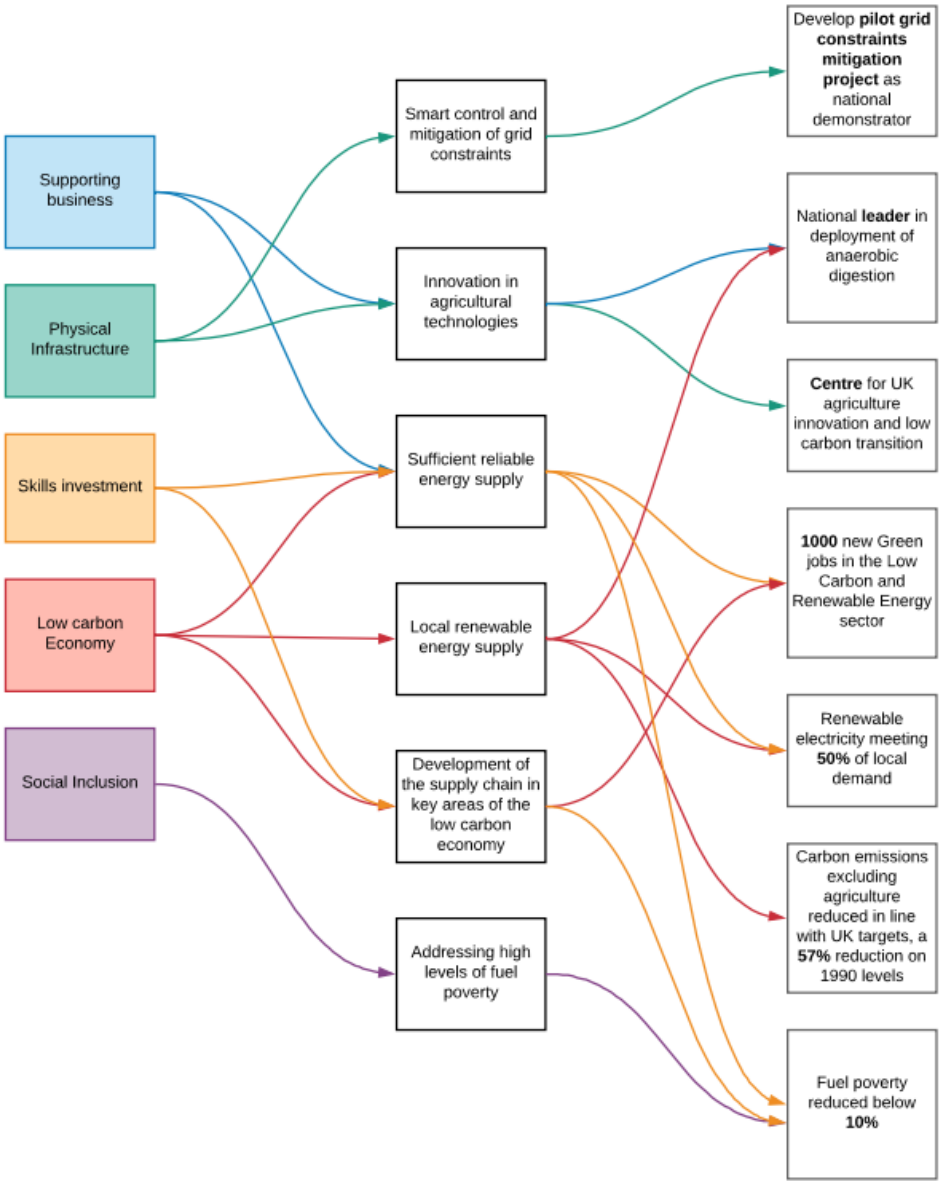

Figure 1 - Mapping LEP strategic priorities against deliverable actions.

1. Introduction

Encraft have been commissioned to produce an Energy Strategy for the Marches, supported by Sustainability West Midlands (SWM).

The Marches LEP area includes Herefordshire, Shropshire and Telford and Wrekin Councils. The area is home to 29,800 businesses and contributes over £12.3 billion to the national economy. The Marches Local Enterprise Partnership (LEP) has recognised that future energy provision, both the supply and demand is a key part of unlocking future growth potential. The current energy infrastructure is already at capacity in many areas and this presents both a threat to future business and housing development but also an opportunity to invest in innovation that can overcome these challenges providing a unique selling point for those in the energy supply chain to invest in the area.

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

1.1 Marches growth plans

Marches LEP has ambitious plans for growth across the region both in terms of the local economy and housing to support this. The LEP's vision for the Marches is of a strong, diverse and enterprising business base, operating in an exceptional and connected environment, where the transfer of technology and skills foster innovation, investment and economic growth.

In order to deliver this vision, the LEP has produced a detailed Strategic Economic Plan (submitted in March 2014) and secured funding from central government for local Growth Deals (July 2014, January 2015 and March 2017). The Strategic Economic Plan is being updated, this Energy Strategy will feed into the new SEP which will be published later in 2018.

1.1.1 Strategic Economic Plan

The Strategic Economic Plan (SEP) for the Marches LEP focuses on achieving strong growth in both good quality skilled jobs and associated housing. It identifies specific localities for targeted future development and details the required improvements to transport and broadband infrastructure. In terms of targets, it summarises the combined targets of the local authority Local Plans for the areas of housing and employment.

- In Herefordshire, the adopted Core Strategy (2016), part of the Local Plan, is set to provide a minimum of 16,500 new homes and 148 ha of employment land between 2011 and 2031.

- Shropshire's Core Strategy sets a target for the county to deliver 27,500 new homes and to develop 290 ha of land for employment uses between 2006 and 2026.
- Telford and Wrekin Council has updated its Local Plan, which is currently undergoing public consultation. The Plan sets a target for 26,500 new dwellings to be delivered up to 2031 and also identifies that 76 ha of employment land will be required between 2011 and 2031.

Each local authority area has also developed an economic vision document, setting out plans for economic growth:

- Invest Herefordshire, Herefordshire's Economic Vision sets out the ambition to directly assist in the creation of 1,000 new businesses by 2031 and create 10,000 new jobs by 2031.
- Shropshire's Economic Growth Strategy is aiming to create 3,700 jobs by 2021 and 1,300 new homes per annum.
- Telford and Wrekin's Economic Development Strategy sets out aims to increase the number of new business start-ups and maximise the availability of high quality readily available brownfield development for housing and employment.

The SEP identifies that the combined target of 514 hectares of employment land corresponds to a target of 41,000 new jobs to 2031. The July 2016 SEP Evidence Refresh identified that 12,300 new jobs have been created to 2014, accounting for 30% of this target.

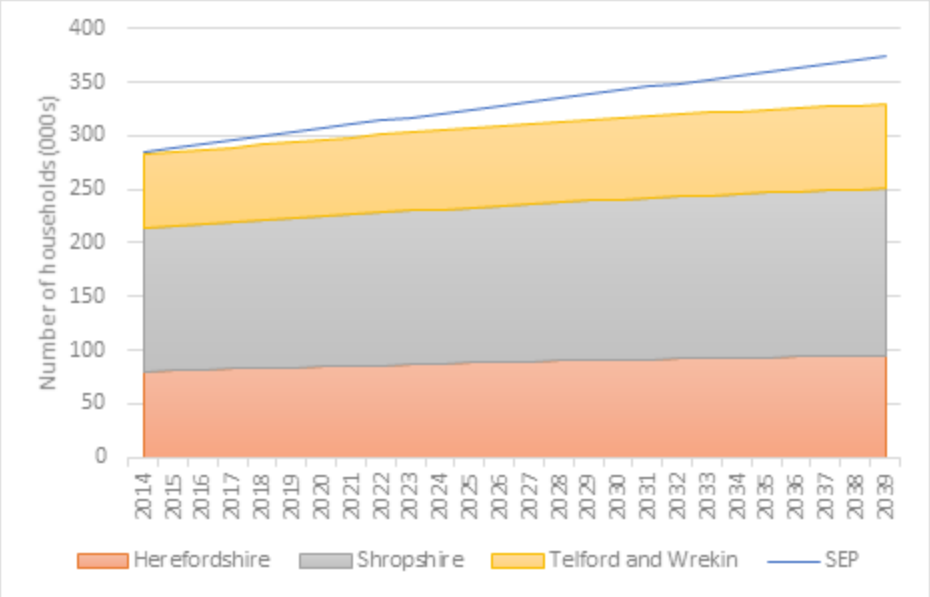

Figure 2: Ministry of Housing, Communities and Local Government (MHCLG) household projections to 2039

Figure 2 shows the Ministry of Housing, Communities and Local Government (MHCLG) household projections out to 2039 for the Marches as stacked bars with the figures for new homes projected by the LEP's SEP shown by the overlaying blue line. The SEP commits to a combined housing growth target that is the sum of that from the three local authority's local plans. It can be seen that MHCLG project a lower level of

household growth than the LEP's SEP. The LEP's growth targets will, therefore, impose greater demands for energy on the region's infrastructure.

The SEP Refresh identifies that currently the LEP trajectory would lead to a shortfall of around 6,000 homes against the 70,500 target. However, this is still an increase on the projected level of household growth from the MHCLG figures.

1.1.2 Marches Growth Deal

The first Marches Growth Deal saw the Marches LEP secure support from the Government's Local Growth Fund of £75.3m which is already helping to deliver infrastructure and skills projects across Herefordshire, Shropshire and Telford and Wrekin Council areas. The second Growth Deal supported the roll-out of superfast broadband across the area; Growth Deal Three announced in 2017, supports innovation, enterprise and skills development and brings the total amount of Growth Deal funding secured by the LEP to over £100m.

Some of the Growth Deal projects already completed or well underway include:

- Telford Eastern Gateway project which involved junction and infrastructure improvements to maximise the opportunities linked to the Jaguar Land Rover site 12 miles east of Telford, opening up the 31-hectare T54 site next to J4 of the M54, and delivering 3,400 jobs and 1,400 homes.
- The Shrewsbury Integrated Transport Package was designed to improve the road network capacity by improving junctions, sustainable transport and traffic management measures, public realm enhancements, and to deliver 1,100 jobs and 1,100 homes.
- The Fastershire project is Herefordshire's broadband project which aims to reach near to 100% of the residual need for superfast connectivity in Herefordshire, overcoming market failure in hard to reach areas.
- The Marches Centre for Manufacturing and Technology which is a regional training centre in Bridgnorth designed to provide learners with opportunities to apply new skills in a real-life manufacturing situation.

More recent Growth Deal projects started or planned to start include:

- The Newport Innovation and Enterprise Package (Telford) will create serviced employment land with direct links to the Harper Adams Centre for Innovation. The project seeks to deliver 1,300 new homes, 10 acres of employment land and create 400 new jobs.
- The Centre for Cyber Security will be developed in the Hereford Enterprise Zone and aims to develop an eco-system offering specialist innovation workspace, research facilities and training space to local businesses and agencies. The Centre will lead to the creation of 15 new jobs, 5 new small and medium-sized enterprises (SMEs) and 1,500m^2 of employment space.

The ambition is that by investing in a range of infrastructure, skills, innovation and enterprise projects, this will unlock some of the constraints on local economic growth. This strategy aims to ensure that the Marches area has the appropriate energy supplies available for this growth whilst addressing the aim of moving to a lower carbon economy. This should also enable local businesses and communities to benefit

from the economic opportunities associated with clean growth, whether this is new opportunities for products or services, a return on investment in energy projects, or just savings on bills

1.2 National policy background

In recent years the government has been revising and updating its policies relating to the UK energy system. There has been renewed focus on the 2050 climate change targets with the signing of the Paris agreement, and an increased impetus looking at how these targets could be met.

1.2.1 Industrial Strategy

The government's Industrial Strategy Green Paper of January 2017 (1) set out ten pillars to drive UK growth, including a particular focus on science, research and innovation. The Marches LEP responded to the consultation (2) released alongside this document, setting out how the LEP could work with other partners to set strategic plans that make a reality of all pillars of the Industrial Strategy.

The Green Paper also set out a number of ways in which investment in energy infrastructure and support for the low carbon economy would play an important role in delivering the country's growth ambitions.

This was followed up by the Industrial Strategy White Paper (3) in November 2017 which set out five foundations of productivity to transform the economy; ideas, people, infrastructure, business environment and places. This also set 'Grand Challenges' to put the UK at the forefront of the industries of the future in areas of:

- Clean Growth
- Artificial Intelligence and Data Economy
- Future of Mobility
- Aging Society

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

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

> Healthy ageing

1.2.2 Clean Growth Strategy

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

There are a number of commitments made as part of this strategy, (4) in several key areas, including:

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

A few of the key commitments for the Marches region are highlighted below.

Improving homes

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

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

Across the national housing stock, the sector with the highest proportion of F and G SAP[1] ratings is the private rental sector (PRS). Conversely, councils and housing associations have been very proactive in upgrading their worst performing stock, typically with internal targets to achieve a SAP C rating across their portfolio within the near future. Owner-occupied properties are typically less likely to have undergone retrofit, but there has been more progress made here than in the private rental sector, where landlords have little to no incentive to improve the energy efficiency of their stock in a market where housing demand often exceeds supply. The minimum energy efficiency standards for the PRS have been signposted for some time and will make it illegal to rent out F and G rated properties, although whether this can be effectively enforced remains to be seen.

[1] SAP – Standard Assessment Procedure – the national calculation methodology for energy performance in domestic buildings

Plans to phase out the installation of high carbon fossil fuel heating in homes off the gas grid are particularly important for the Marches, given the rural nature of much of the area. The focus is initially on new homes, which are easier to tackle, but there will also be policies put in place to encourage retrofit of low carbon heating systems to existing properties that are currently using oil, Liquid Petroleum Gas (bottled gas) or solid fuels.

To meet the Government's 2050 climate targets, a contributing part of this will be the continuation of the Renewable Heat Incentive (RHI) to encourage take-up of technologies such as heat pumps, biomass boilers and biomethane. Beyond this Government are considering a range of policy options and will involve consumers and industry in developing new policy.

Government are also consulting on ways to improve energy efficiency in owner-occupied housing stock amongst householders who are able to pay for retrofit. This consultation was the *Call for Evidence on Building a Market for Energy Efficiency,* which closed in January 2018. This may lead to future policy interventions designed to stimulate the retrofit market in this sector.

Low carbon transport

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

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

The major impacts of this are twofold, firstly the growth of EV numbers will need to be accompanied by a growth in charging points and associated infrastructure to ensure travel remains unimpeded. As EVs are produced that can travel longer distances without recharging, the importance of rapid chargers increases. These are chargers such as the Tesla Supercharger that require over 50kW of power and can charge a battery to 80% in 30 minutes. The distribution of these chargers will potentially be limited by the pre-existing grid constraints in the Marches which could prevent the drawing of such significant amounts of power in certain areas, potentially requiring innovative solutions such as chargers co-located with generation and storage to make this viable.

Secondly, industry in the Marches that is part of vehicle manufacturing supply chains could find that this has a significant effect if there is a decline in demand for traditional internal combustion engine (ICE) models. Almost all major car manufacturers have either already produced an electric vehicle or are working on their first model, which shows the direction of travel of the industry. While much of this was already underway, the Government announcement has provided added impetus to manufacturers to manoeuvre themselves ahead of the competition. This represents both a problem and a potential opportunity, as new technology requires new supply chains to be put in place to deliver this. Suppliers could be well placed to use their

existing relationships with manufacturers to diversify and fill newly emerging supply chain gaps.

Business and Industry

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

These policy areas are focused on helping businesses cut energy consumption, and through this cut energy costs, making them more competitive. Businesses in the Marches which are off the gas network may have particularly high energy costs relative to businesses in other parts of the country, so this could prove beneficial.

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

Other than energy efficiency Government are particularly interested in phasing out high carbon forms of heating, such as oil which has higher usage across the Marches than in many other places, particularly urban areas. This will initially be targeted using the RHI but a successor policy to this is likely to be put in place, potentially including stronger carbon pricing.

Smart, flexible power

- Around £900 million of public funds between 2015 and 2021 in research and innovation invested in the power sector.
- An update on approaches to small-scale low carbon generation beyond 2019 will be shared later this year; including investment in solar without government support.
- Funding worth up to £557 million for renewable energy auctions, with the next one planned for spring 2019.

Smart flexible power is related to the opportunities around making the electricity network ‘smarter’, i.e. adding more monitoring to understand the energy flows on the system at any given time to maximise the use of locally generated electricity and optimise energy consumption against existing infrastructure capacities.

Grid constraints within the Marches, as discussed in the following sections, mean that there are particular opportunities for smart grids and flexible power provision to alleviate some of these constraints. Particular issues arise due to the rural nature of

the Marches and the long distances that cables have to cover between users which make ensuring power quality more challenging for the network operator, particularly where intermittent generation such as solar PV is connected.

The two Distribution Network Operators (DNOs) that own and operate the electricity infrastructure within the Marches are responsible for the network, these are Western Power Distribution (WPD) and Scottish Power Energy Networks (SPEN). They are currently transitioning from DNO to Distribution System Operator (DSO) which will involve more active local management of network load, generation and constraints.

The Government's investment in innovation includes £265 million in the area of smart systems aiming to reduce the cost of electricity storage, advance innovative demand response technologies and develop new ways of balancing the grid. These are technology areas that could prove particularly beneficial to the Marches due to the existing network constraints that exist in some places that can make it difficult to connect new load or generation. Indeed it may be possible to identify sites within the Marches that could operate as pilot sites for feasibility studies investigating these opportunities.

The Feed-In Tariff (FIT) is due to be phased out in 2019, so the update promised in the Clean Growth Strategy is welcome as it will provide clarity on the likely development of small-scale renewable generation beyond this. The FIT pays renewable energy generators a guaranteed subsidy per unit of electricity they generate. Renewable energy auctions – through the Contracts for Difference (CfD) mechanism - will c-ontinue. These are focused on large-scale renewables which are less common in the Marches region. These auctions allow renewable generators to bid to supply power at a particular contract price per unit generated. If the market price of electricity is below this contracted price the Government tops up this price with a subsidy to ensure the generator is viable, however, if the market price of electricity is above the contracted price then the generator pays the Government the extra revenue it receives from this.

Public Sector Leadership

- A commitment to introduce a voluntary public sector target of 30% reduction in carbon emissions from the public sector estate by 2020-21 against a 2009/10 baseline.
- Provide £255 million of funding for energy efficiency improvements in England and help public bodies to access sources of funding.

This is something that should be monitored closely, as while the initial proposed target is only voluntary there is likely to be a consultation on plans to introduce a mandatory target by 2025. This will require local authorities to review their Carbon Management Plans and take steps to reduce carbon emissions in line with the targets put in place. Funding for energy efficiency improvements will enable these targets to be met, Salix funding has been leveraged successfully for these objectives nationally, supporting over 16,000 projects to date.

Local leadership

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

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

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

2. Evidence base review

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

2.1 Renewable energy potential

The table below sets out the maximum possible energy generation resource from different technologies that could be reached in the future. Different technologies have different generation characteristic, and so technologies with the same peak power output may not generate the same amount of energy due to the intermittency of some renewable generation technologies.

Table 1: Total renewables potential of each local authority area in MW by technology across the Marches (5) (6)

		Herefordshire	Telford and Wrekin	Shropshire	Total (MW)
Onshore wind	Large scale	7,786	799	8,908	**17,493**
	Small scale	237	52	358	**647**
Hydro		15	2	12	**29**
Solar	Photovoltaics	67	39	116	**222**
	Water heating	53	31	90	**174**
Heat pumps	Ground source heat pumps	98	62	170	**330**
	Air source heat pumps	392	249	681	**1,322**
Biomass	Managed woodland – elec.	6	0.2	9	**15.2**
	Managed woodland - heat	7	0.2	11	**18.2**
	Energy crops – elec.	42	4	70	**116**
	Energy crops - heat	18	2	31	**51**
	Waste wood – elec.	1	1	2	**4**
	Waste wood - heat	1	1	1	**3**
	Agricultural arisings (straw)	9	2	12	**23**
	Animal waste (wet organic waste)	26	2	54	**82**
	Animal waste (poultry litter)	12	1	4	**17**
	Municipal solid waste	7	7	13	**27**
	Commercial & industrial waste	4	5	6	**15**
	Landfill gas	0	0.8	2	**2.8**
	Sewage gas	0	0.5	1	**1.5**
	Co-firing of biomass	0	0	0	**0**
Total	Electricity (MW)	8,212	915.5	9,567	**18,694.5**
	Heat (MW)	569	345.2	984	**1,898.2**
Overall	Total (MW)	8,781	1,260.7	10,551	**20,592.7**
	% of West Midlands total	16%	2%	20%	**38%**

The 2010 Herefordshire renewable energy study (5) provides an assessment of the maximum potential resource of a number of different renewable energy options across the local authority area. This is also covered in a 2011 study looking at renewable energy capacity for the West Midlands (6), which summarises total renewables potential from different types of technologies across the different local authority areas.

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

The methodology takes into account a number of factors to estimate the total generation potential including availability of natural resource, physical constraints and planning constraints. For example, calculation of sites suitable for large-scale wind generation assessed areas with wind speeds above 6m/s at 45m above ground level, and then removed from these areas any sites that may not be suitable such as urban areas, areas of outstanding natural beauty (AONB), areas with heritage designations and areas subject to aviation or military constraints.

The methodology used did not account for the deployment of solar farms, and considers solar installations on properties only, so there may be scope for further ground mounted PV which has not been captured in Table 1.

From Table 1 it can be seen that Herefordshire and Shropshire have significant wind and biomass resource, particularly from energy crops and animal waste, as well some hydro and PV resource. The smaller land area of Telford and Wrekin leads to correspondingly lower potential generation from most of these technologies, with a contribution to the total West Midlands potential of only 2%. The maximum potential calculated here may not be achievable or desirable in practice, some example calculations of required area for the maximum potential are set out below.

The total potential large-scale wind resource in the Marches of 17.5 GW is only marginally below the UK's current installed wind capacity of 18.4 GW. Scout Moor wind farm in Lancashire is the largest in England with a capacity of 65 MW, occupying 545 hectares, if the Marches wind resource was fully exploited at a similar density wind farms would cover over 145,000 hectares, close to 25% of the total land area of the Marches. This is clearly substantial, however if even a small amount of this potential was exploited it could make a significant contribution to local electricity demand.

Assessment of the potential for energy crops includes the assumption that all abandoned land and pasture will be planted with energy crops, subject to existing constraints on land use. Generating 116 MW of electrical power from energy crops would require around 50,000 hectares to be covered with energy crops, around 12% of the land area of the Marches.

There may also be opportunities for the development of fracking within the Marches, with the British Geological Survey having identified a potential shale gas resource under Shropshire. This may be exploited in future if shale gas exploration in Lancashire proves successful, however is not likely to be developed in the short or medium term.

2.2 Renewable energy deployment

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

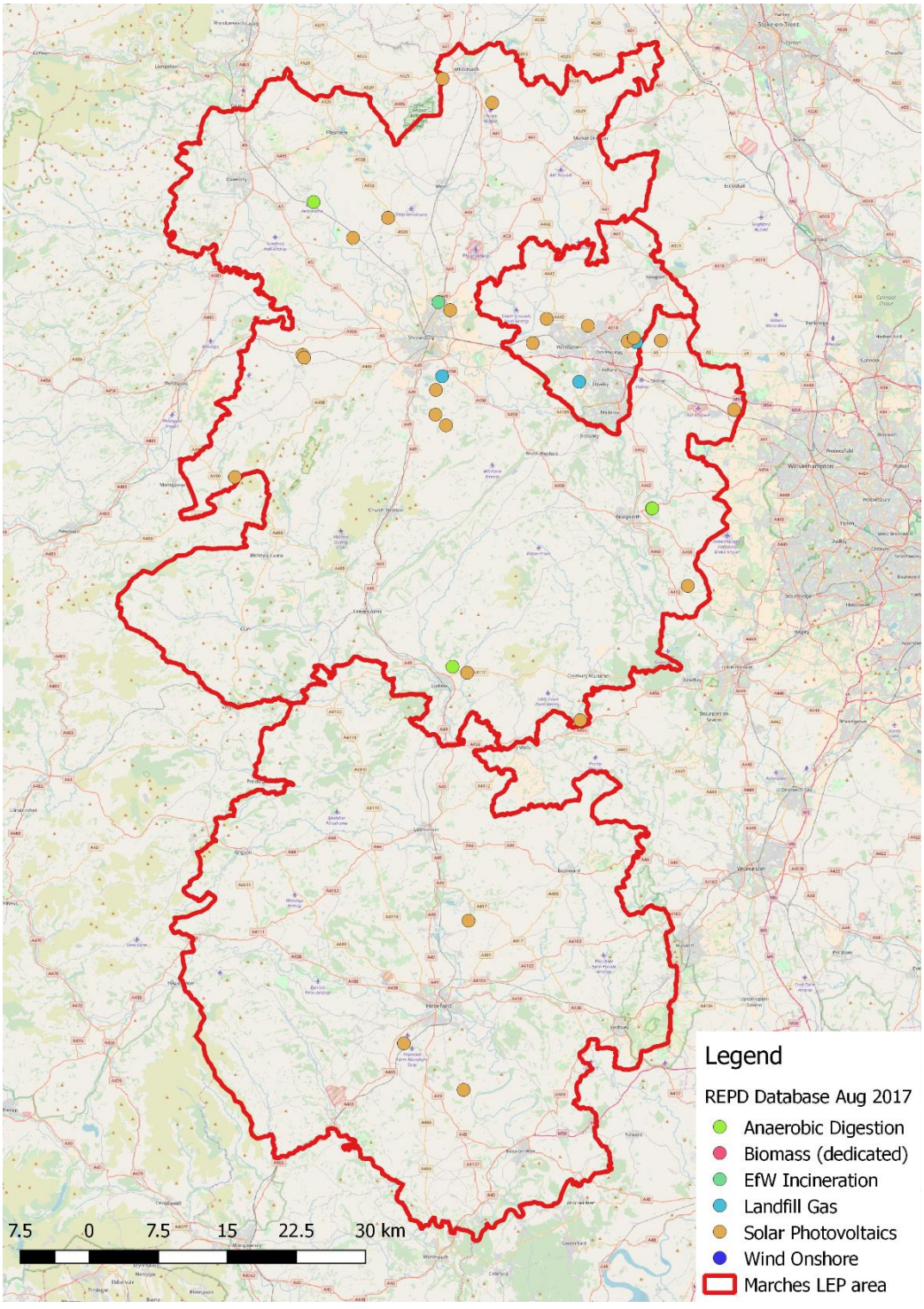

Figure 3: Marches large-scale renewable deployment – operational sites (7)

From Figure 3 it can be seen that the only large-scale renewable developments within Herefordshire are solar farms, a resource which was not quantified within the 2010 study, which focused on rooftop solar as the most likely solar resource to be exploited. The red lines in Figure 3 show the local authority boundaries of the Marches.

There has been wider deployment of large-scale renewable schemes within Shropshire and Telford and Wrekin, primarily Solar PV farms, installation of which has been driven by the Government's FIT, but also opportunities for landfill gas and anaerobic digestion (AD) have been taken forward. There has been no large-scale onshore wind development, despite the large potential identified resource (6) as shown in Table 1.

Energy from Waste (EfW) is a technology which has not seen major uptake within the Marches directly, however, Herefordshire Council has jointly procured a 15.5 MW EfW plant with Worcestershire County Council, processing 200,000 tonnes of residual waste annually from both local authorities. This facility opened in 2017 and is located over the border in Worcestershire, at Hartlebury Trading Estate near Kidderminster; more information can be found in the Worcestershire LEP Energy Strategy.

There are some further projects in Shropshire that are either under construction or have secured planning permission and are awaiting construction that are summarised in Table 2 below. The bulk of large-scale renewable technology development has been from solar PV farms in Shropshire, making up 157 MW of the total 230 MW planned or operational developments.

Table 2: Summary of large scale technology installations by planning status and local authority area (Renewable Energy Planning Database August 2017) (7)

	Herefordshire	Shropshire	Telford and Wrekin	Total (MWe)
Operational	11	171.7	32.5	**215**
Anaerobic Digestion		5.5		5.5
Energy from Waste		8		8
Landfill Gas		1.2	4.2	5.4
Solar PV	11	157	28.3	196.3
Under construction		6.7		**6.7**
Anaerobic Digestion		1		1
Solar PV		5.7		5.7
Awaiting Construction		7.5		**7.5**
Anaerobic Digestion		1		1
Solar PV		6.5		6.5

Beyond large-scale projects greater than 1 MW, there has been significant AD development within Shropshire and Herefordshire, indeed Shropshire and Herefordshire are the leading local authority areas in England for the number of AD projects installed. There are over 11 MW of installed AD generation in Herefordshire and 8.2 MW in Shropshire, the majority of these are on-farm electricity generation projects. There are local companies in these areas installing smaller scale farm level projects.

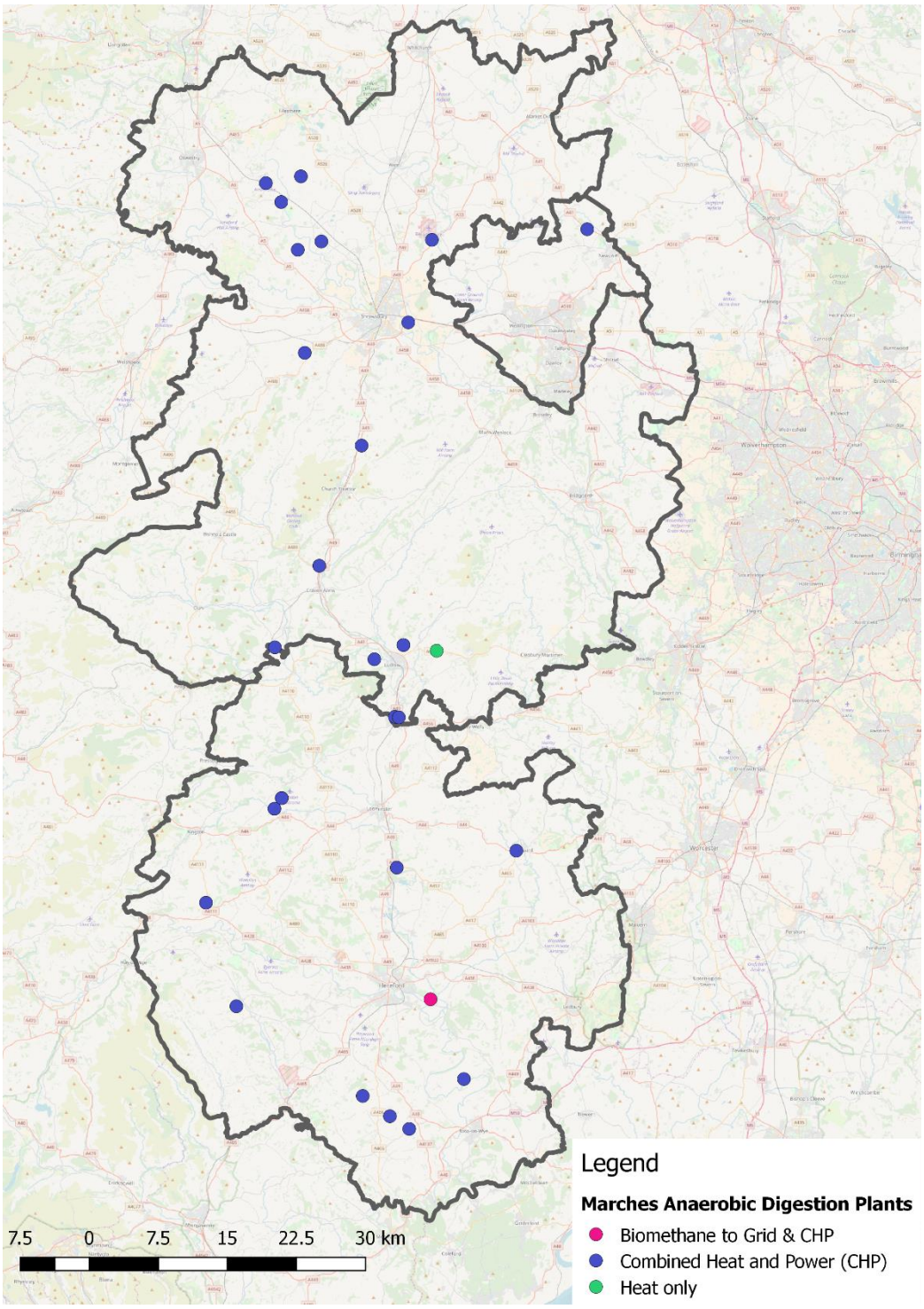

Figure 4: Marches anaerobic digestion plants (all scales) (8)

2.3 Energy use in the Marches

The graphs below summarise overall energy use across the Marches.

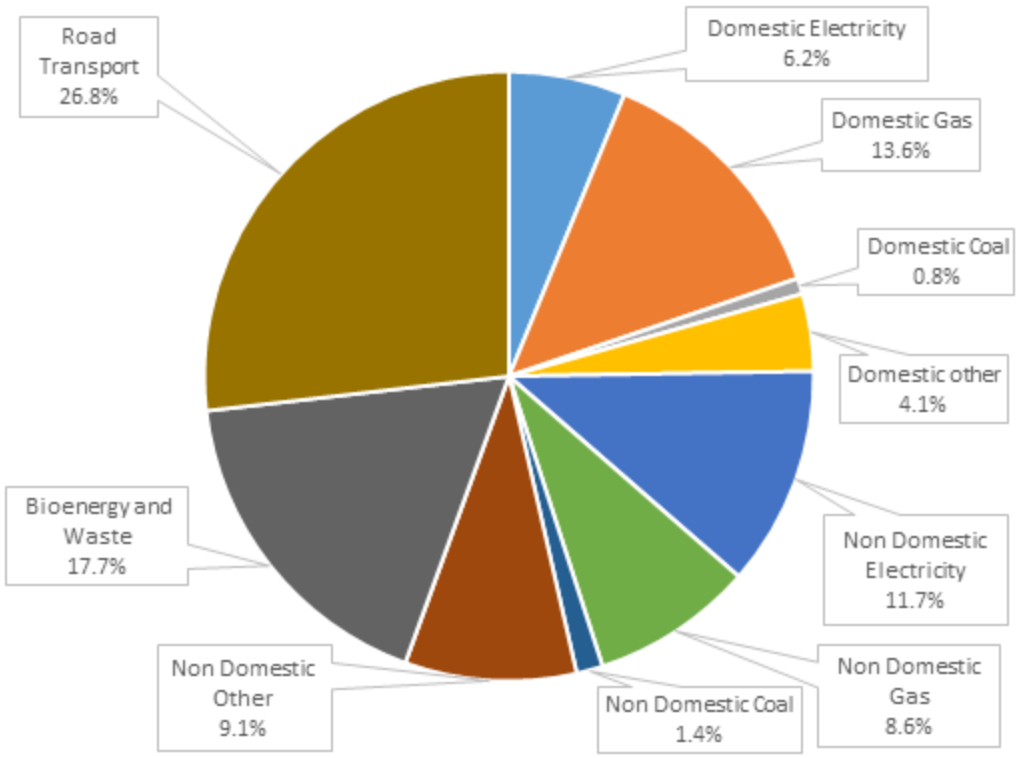

Figure 5: Energy use by fuel and sector in the Marches (9) (10) (11) (12)

Figure 5 shows the split of overall energy use by sector and fuel type in the Marches. This breaks down the consumption by domestic/non-domestic use and final fuel consumed i.e. electricity, gas, coal, bioenergy and road transport fuels.

From this it can be seen that road transport makes up over a quarter of energy consumed in the Marches, this is unsurprising given the rural nature of much of the area. Also significant is the use of bioenergy and waste, primarily within Herefordshire and Shropshire; again due to the rural nature of these local authority areas this is to be expected and demonstrates the potential contribution of biofuels in this context.

Energy use from coal is particularly high; domestic coal use makes up 0.8% of energy consumption in the Marches, double the 0.4% of energy use in Great Britain as a whole. Similarly the use of other fuels such as oil domestically is substantially higher in the Marches, making up 4.1% of total energy use compared to 1.2% nationally.

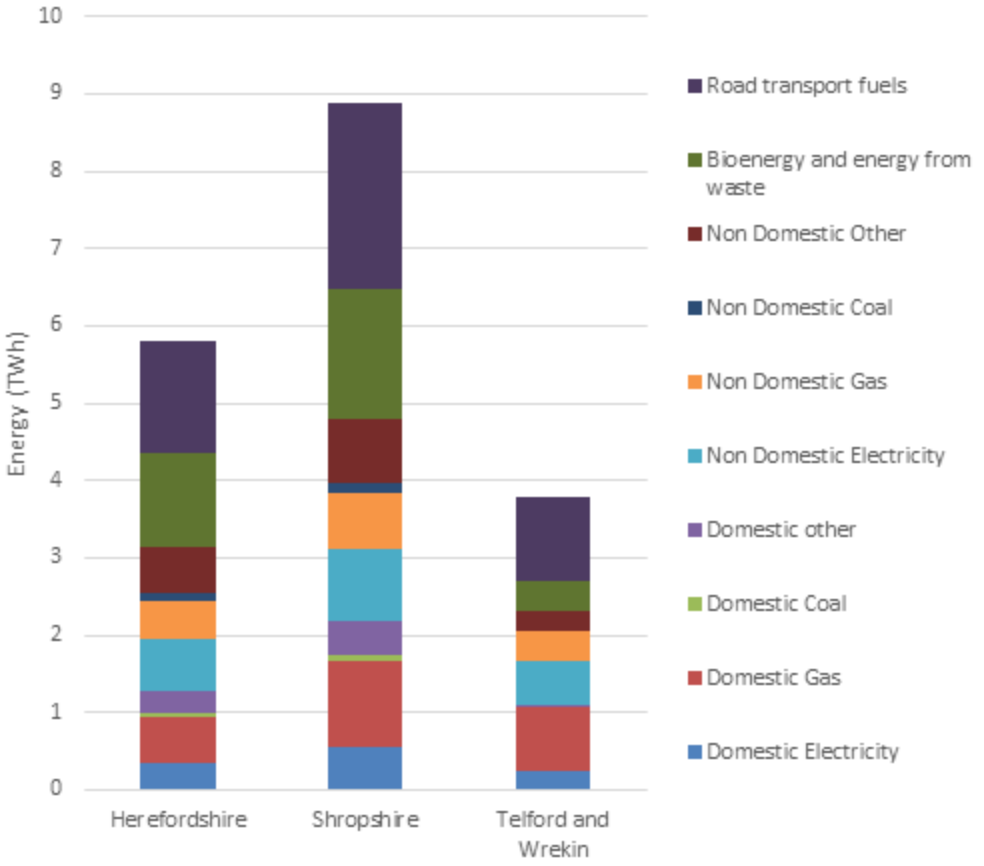

Figure 6: Energy consumption by fuel and by sector per local authority (9) (10) (11) (12)

From ***Figure 6*** it can be seen that road transport is the single largest energy use in each of the local authority areas. This is unsurprising given the rural nature of much of the Marches and the relatively long distances between population centres. The use of bioenergy and waste is significant within Herefordshire and Shropshire, and less common within Telford and Wrekin.

Domestic energy usage is significant but is smaller than non-domestic energy usage and road transport energy use. Domestic and non-domestic use of coal is small, however still identifiable, and represents over 400 GWh of energy usage within the Marches, primarily in Herefordshire and Shropshire.

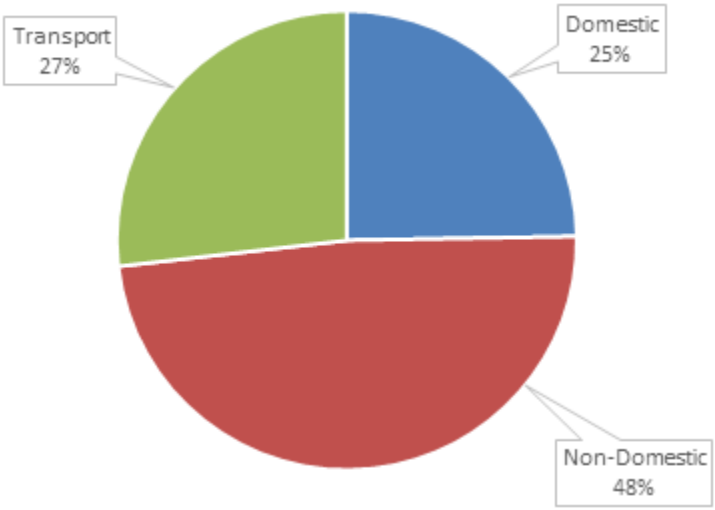

Figure 7: Energy use by sector (9) (10) (11) (12)

An increased proportion of non-domestic energy consumption versus domestic and transport energy consumption could represent a differing ratio of industry to population to the national norm. It could also point to a higher density of businesses that are large energy users.

Figure 8 shows the percentage of off-gas properties within each Lower Super Output Area (LSOA). Off-gas properties are those that are not connected to the gas network. LSOAs represent divisions of England for census purposes based on population, and so represent smaller geographical zones within urban areas than within rural areas. By comparing the number of domestic gas meters within each LSOA with the number of households from the previous census, the proportion of households that are connected to the gas network and are therefore capable of using gas for domestic heating purposes can be estimated.

It can be seen that within the major population centres of Hereford, Shrewsbury and Telford typically less than 20% of households are not connected to the gas network, however, this increases significantly within rural areas. There are 55 LSOAs which have no local connection to the gas network at all, as shown by the darkest blue areas in ***Figure 8***. This represents 13% of the total of 417 LSOAs in the Marches. Moreover, there are a significant number of areas with few domestic gas connections, likely to be because the gas network serves only a small proportion of the LSOA.

This lack of access to the gas network has major impacts on the heating fuels used, correlating with increased use of other more carbon-emitting fossil fuels such as oil or coal within rural homes. Changing the heating fuels in these homes is one of the Government's key priorities for decarbonisation of heat within the UK as set out in the Clean Growth Strategy (4) and discussed in Section 1.2.2. The cost of heating in off-gas areas is typically higher than for properties connected to the gas network, this offers an opportunity for switching to renewable alternatives such as biomass boilers or heat pumps as they offer better financial savings compared to oil or coal.

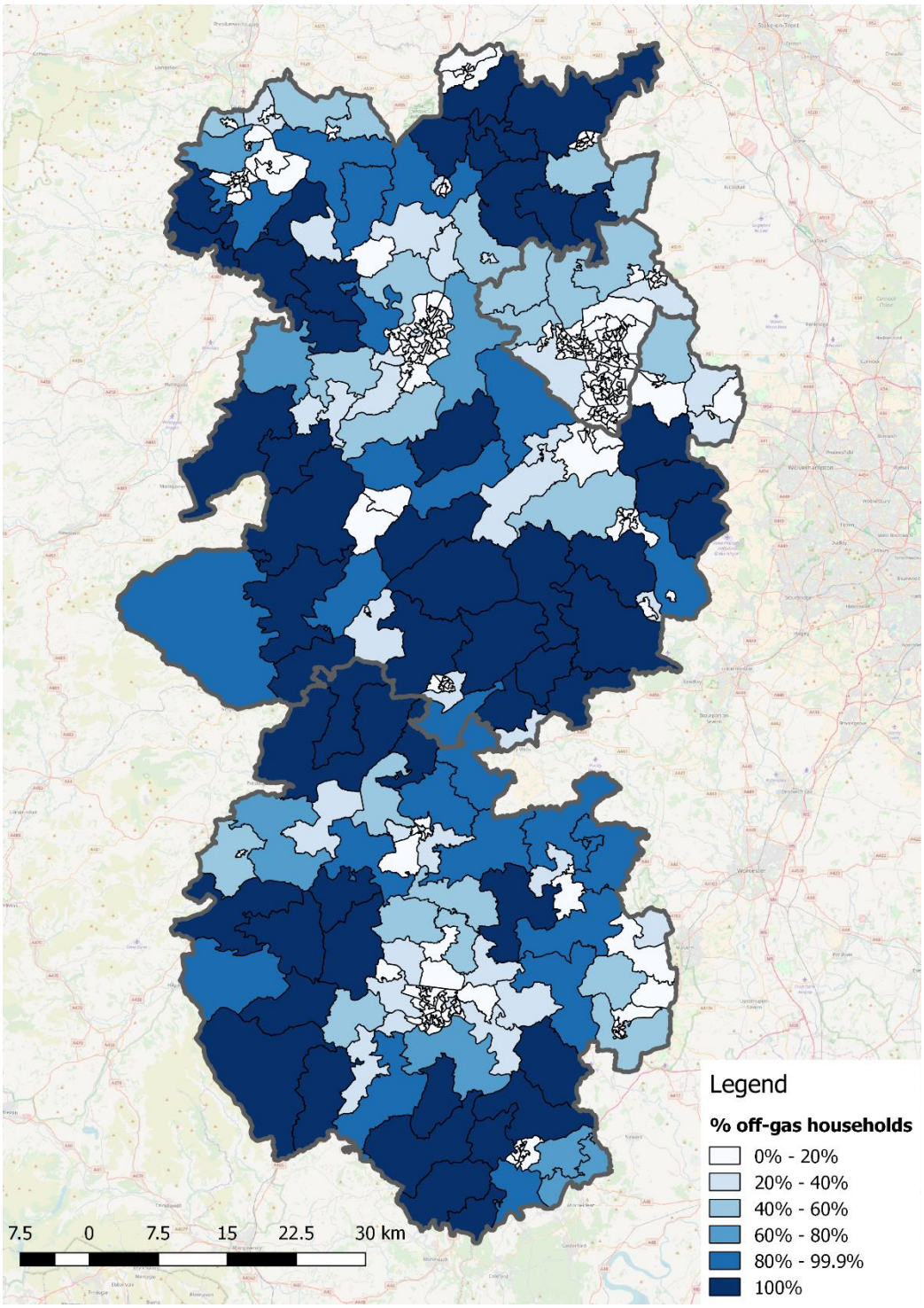

Figure 8: Percentage of off-gas properties by Lower Super Output Area (LSOA) (13)

2.4 Fuel Poverty

Fuel poverty is the condition of being unable to afford to keep one's home adequately heated. Fuel poverty in England is measured using the Low Income High Costs (LIHC) indicator. Under the LIHC indicator, a household is considered to be fuel poor if they have required fuel costs that are above average (the national median level) and were they to spend that amount, they would be left with a residual income below the official poverty line.

Use of high carbon fuels is often linked to fuel poverty, in rural areas where access to the gas network is lower there can be higher levels of fuel poverty as higher carbon fuels such as oil and coal can also lead to higher heating costs due to their cost.

All three local authority areas have fuel poverty levels above the national average, while Herefordshire and Shropshire also have fuel poverty levels above the West Midlands average. These high levels of fuel poverty can only be addressed through improved energy efficiency, access to lower cost energy and/or through economic growth where that growth leads to more employment opportunities with higher wages.

Improving energy efficiency is a key method of tackling fuel poverty, however some homes are harder to improve than others. Cavity wall insulation and loft insulation has been put in place across a large proportion of suitable properties to improve energy efficiency, however these simple measures are not suitable in all places. Properties where energy efficiency improvement is more difficult are classed as 'hard to treat', this category includes older dwellings built with solid walls, dwellings off the gas network and high-rise flats.

Table 3: Marches fuel poverty levels (14)

Geographical area	Number of households	Fuel poor households	Fuel Poverty
Herefordshire	79,804	13,287	16.6%
Shropshire	131,948	21,139	16.0%
Telford and Wrekin	67,827	7,903	11.7%
The Marches	279,579	42,329	15.1%
West Midlands	2,336,127	315,987	13.5%
England	22,656,853	2,502,217	11.0%

2.5 Heat demand

The heat demand of each local authority area has also been explored using the DECC (now Department for Business, Energy and Industrial Strategy (BEIS)) National Heat Map (15). This is a tool that has built up heat demand using a bottom-up approach assessing heat demand by building type and size and is used on an aggregate level to assess expected heat demands.

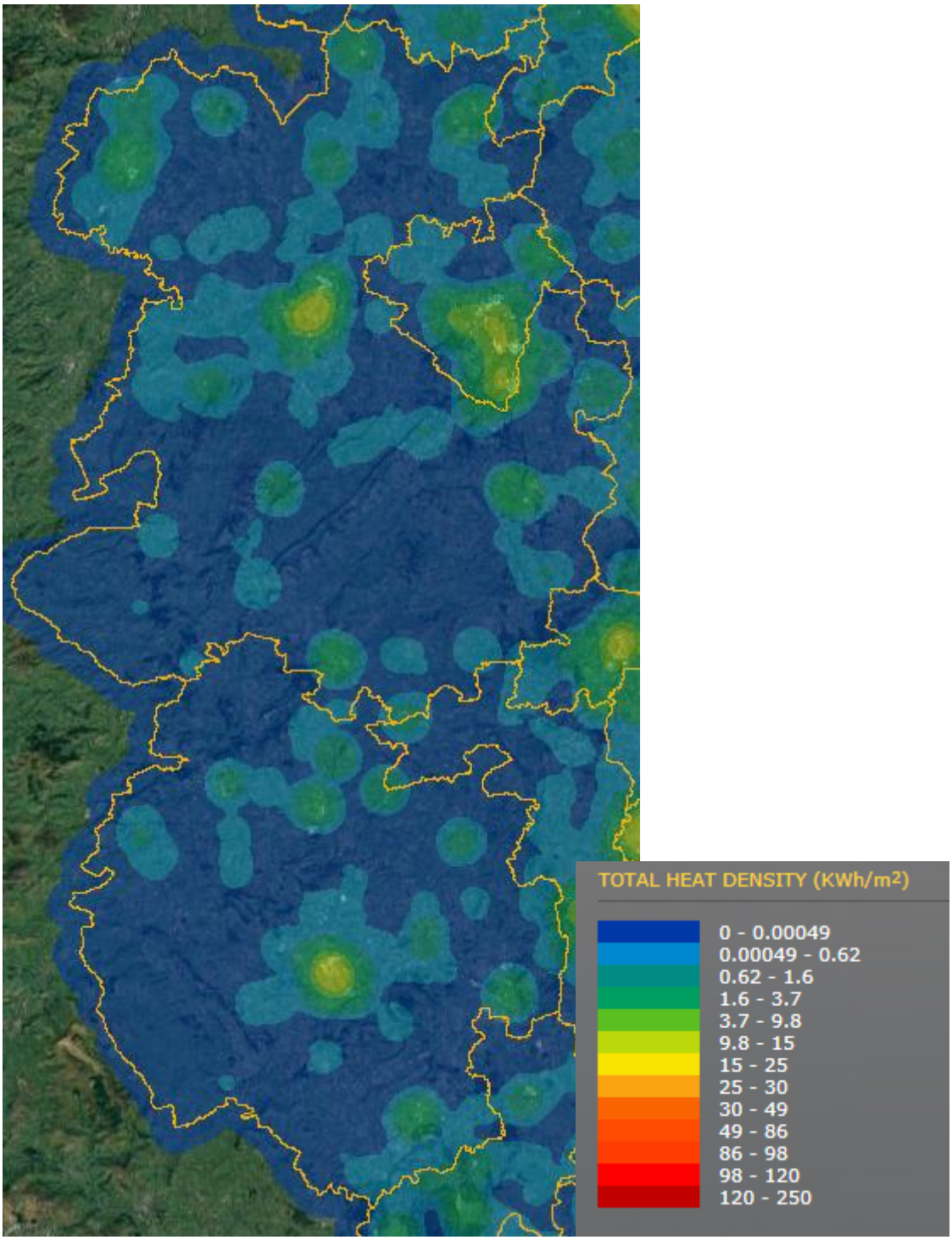

Figure 9: BEIS National Heat Map for the Marches (15)

Figure 9 shows the national heat map with clear hotspots over the major urban areas in the Marches, in particular Hereford, Shrewsbury and Telford.

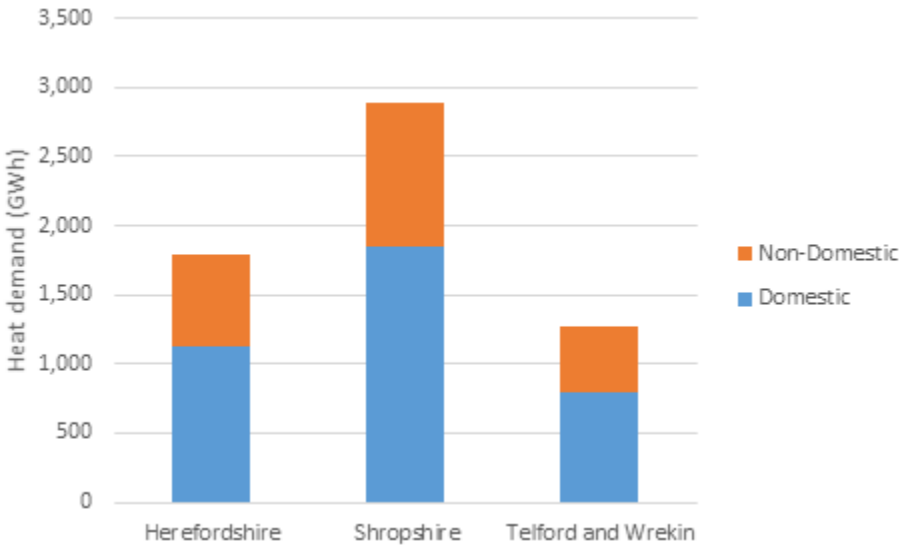

Figure 10: Heat demand by sector and local authority area (15)

Figure 10 shows that the majority of heat demand in each local authority area is for domestic premises, with the bulk of the rest made up of non-domestic demand with a small amount for transport. The domestic demand is easily understood and is made up of heat to people's homes, supplied by a range of different fuel sources, as explored in section 2.3.

The non-domestic heat demand is broken down further in ***Figure 11***. From this, it can be seen that the proportion of heat demand for industrial buildings is around 50% across all three of the local authority areas, with other significant contributions to total heat demand from Retail, Hotels, Health, Education and Offices. Heat for transport purposes includes heat demands from bus and train stations, car parks, freight terminals and warehousing for land transport activities.

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

There have been heat mapping and masterplanning studies carried out focused on four locations within the Marches, Hereford, Whitchurch, Shrewsbury and Telford, the Hereford study identified a network that may be commercially viable to invest in and a further feasibility study has been undertaken to investigate this further using funding from the BEIS Heat Network Development Unit.

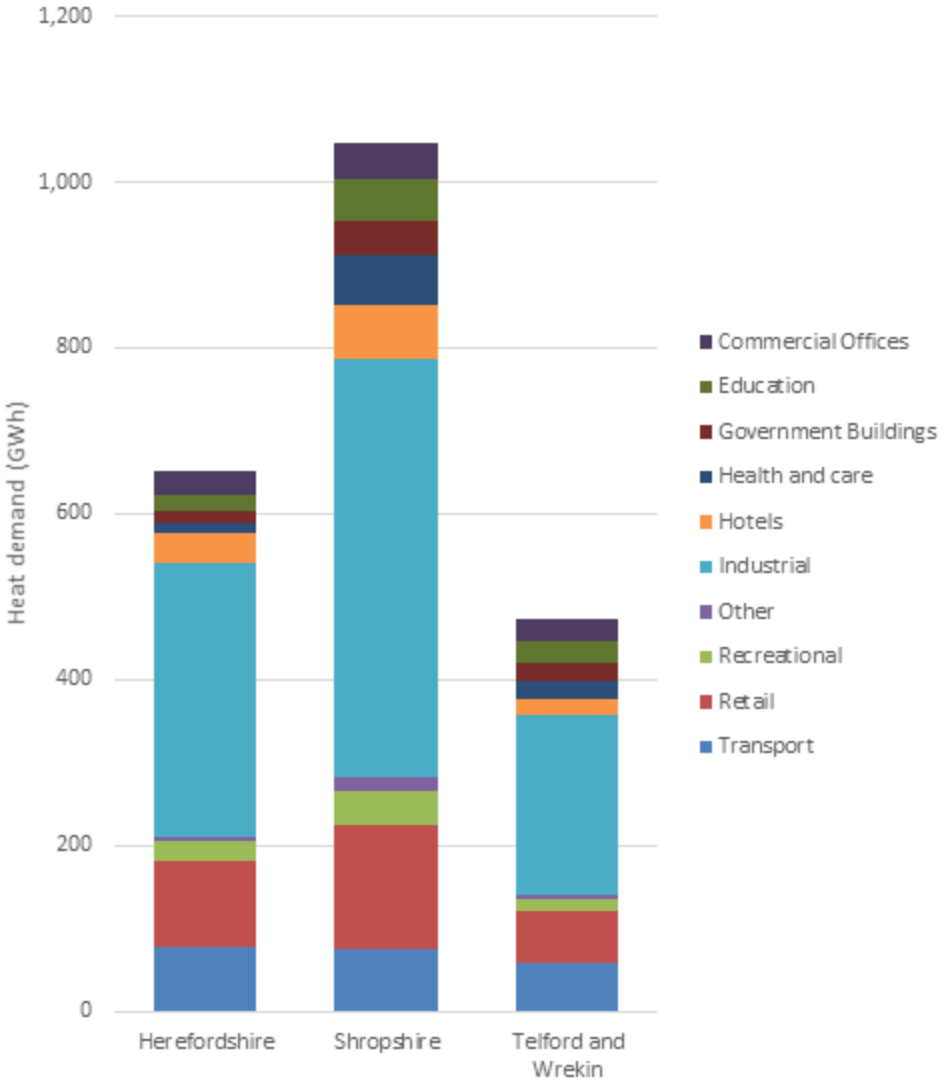

Figure 11: Non-domestic heat demand by industry and local authority area (15)

2.6 Carbon emissions

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

The following data comes from the National Statistics publication *'UK local authority and regional carbon dioxide emissions 2005-2015'*. (16)

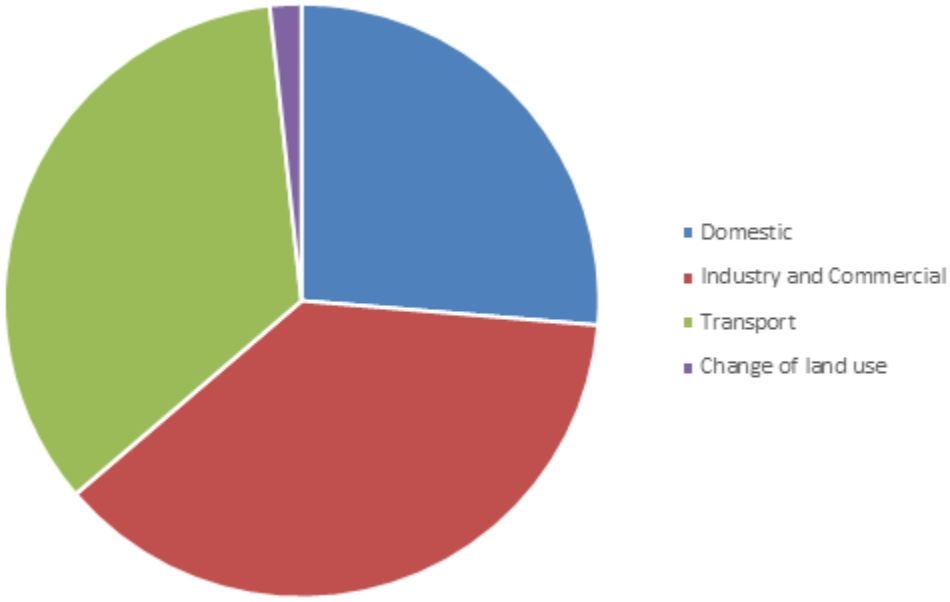

Figure 12: Marches proportion of carbon emissions by sector, 2015 (16)

Carbon emissions by sector are roughly evenly split, with the largest sector being industry and commercial emissions. Change of land use is a category that encompasses change of the sector utilisation of land including removal of forests. This is a small proportion of overall carbon emissions, but it is useful to monitor particularly its impact within rural areas where there is significant potential for development on greenfield sites.

Transport emissions have grown relative to the proportion of total energy use set out in ***Figure 5***. This indicates that transport is a relatively high source of carbon emissions utilising primarily fossil fuels.

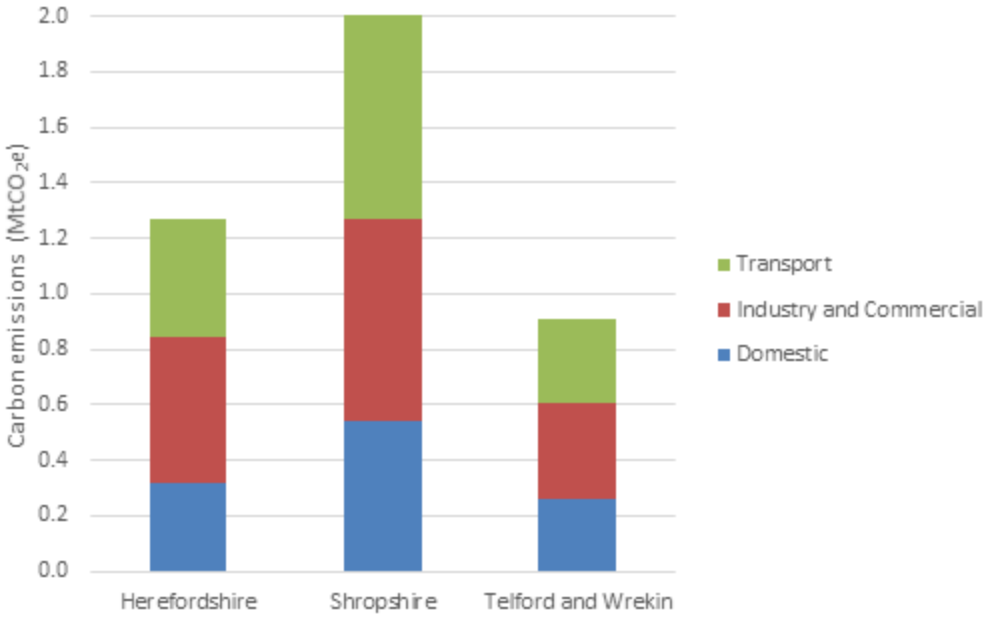

Figure 13: Total carbon emissions breakdown by sector and local authority area, 2015 (16)

Figure 13 shows the sectoral breakdown of carbon emissions between domestic, non-domestic and transport emissions. From this it can be seen that Shropshire is the largest single contributor to carbon emissions in all three categories, with industrial demand making up a similar proportion of total carbon emissions in all three cases.

Converting total carbon emissions figures for each local authority area to a normalised figure of tonnes emitted per person allows us to compare these figures on a more even footing, as well as comparison to national benchmarks, see ***Figure 14***.

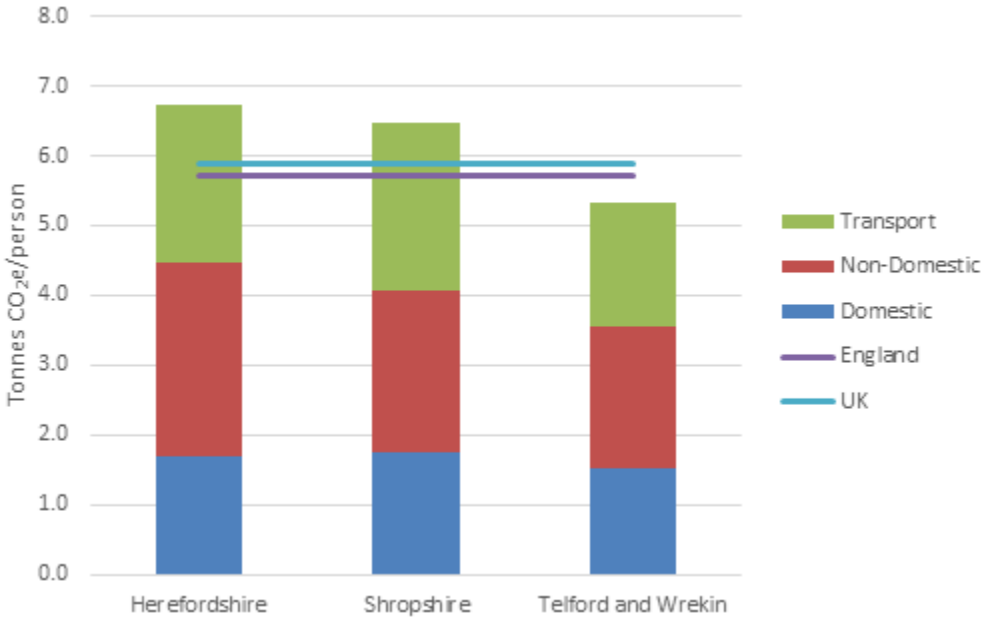

Figure 14: Carbon emissions per capita by category and local authority area compared to national benchmarks (16)

Figure 14 shows that while Herefordshire and Shropshire have emissions above national averages, emissions for Telford and Wrekin are below. Carbon emissions on a domestic basis are similar, with marginally lower emissions from Telford and Wrekin, likely to be caused by the greater proliferation of domestic gas-based heating.

Herefordshire has the highest per capita carbon emissions on a non-domestic basis, this could indicate that industries within Herefordshire have particularly high carbon emissions, or there are more of them than typical per head of population.

Shropshire and Herefordshire both have relatively high carbon emissions from transport, this can be put down to the rural nature of these counties and the increased mileage required to travel between market towns and urban areas.

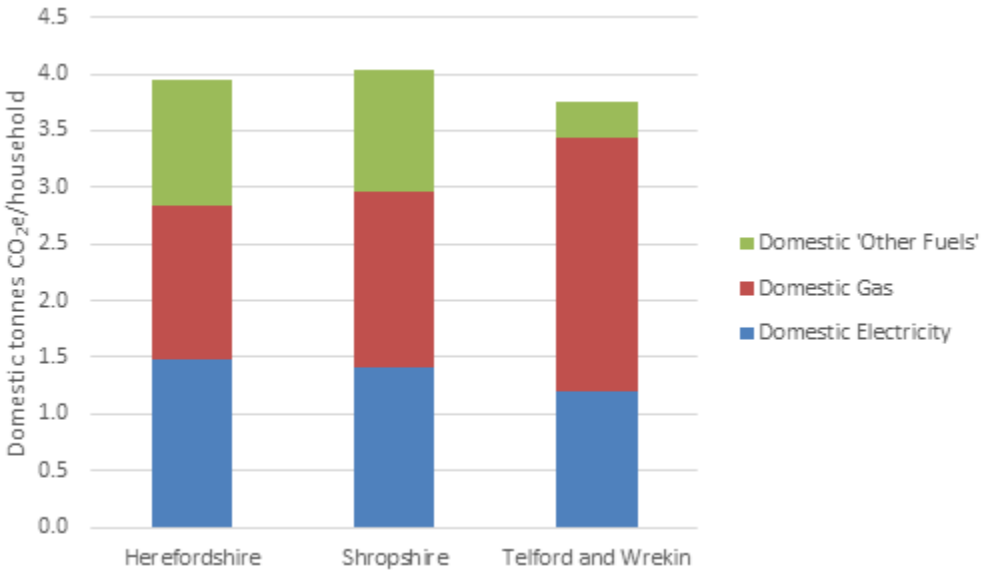

Figure 15: Domestic carbon emissions by household (16)

Figure 15 shows domestic carbon emissions split by fuel consumed on a per household basis. A per-household basis is most appropriate for comparison here as it is the number of households not the number of people that is more important in determining energy consumption.

Domestic electricity consumption is lowest within Telford and Wrekin, while gas consumption is particularly high here compared to the other local authority areas, due to the increased proportion of households connected to the gas network, as shown in ***Figure 8***. Herefordshire and Shropshire show lower emissions per capita from domestic gas usage, but significantly higher carbon emissions from 'other fuels'. This category includes oil and solid fuels such as coal which have significant carbon emissions and so will have a proportionately higher contribution to carbon emissions than to energy consumption alone.

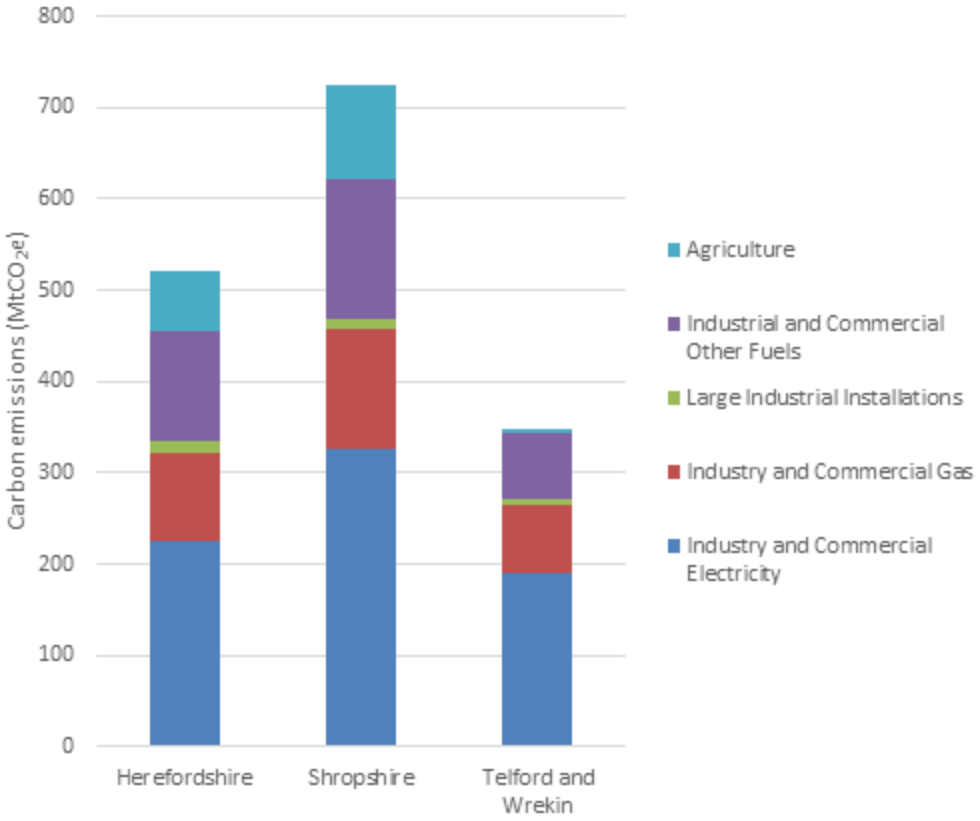

Figure 16: Non-domestic carbon emissions broken down by sector and local authority area (16)

Figure 16 shows non-domestic carbon emissions broken down by sector. From this it can be seen that the largest contributor to carbon emissions within each local authority area is industrial and commercial electricity use. The graph separates agriculture out specifically from industrial and commercial carbon emissions, and it can be clearly seen that agriculture contributes significantly to Herefordshire and Shropshire's carbon emissions, but relatively little to emissions in Telford. Given the agricultural land within each local authority area this is to be expected, but it does highlight that for Herefordshire and Shropshire to decarbonise they will need to tackle carbon emissions from agriculture.

There is also a significant contribution to carbon emissions from industrial and commercial use of 'other fuels'; this is likely to be due to businesses unable to connect to the gas network that have high energy demands and require other energy sources. Large industrial installations contribute a relatively small amount to the total emissions figures.

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

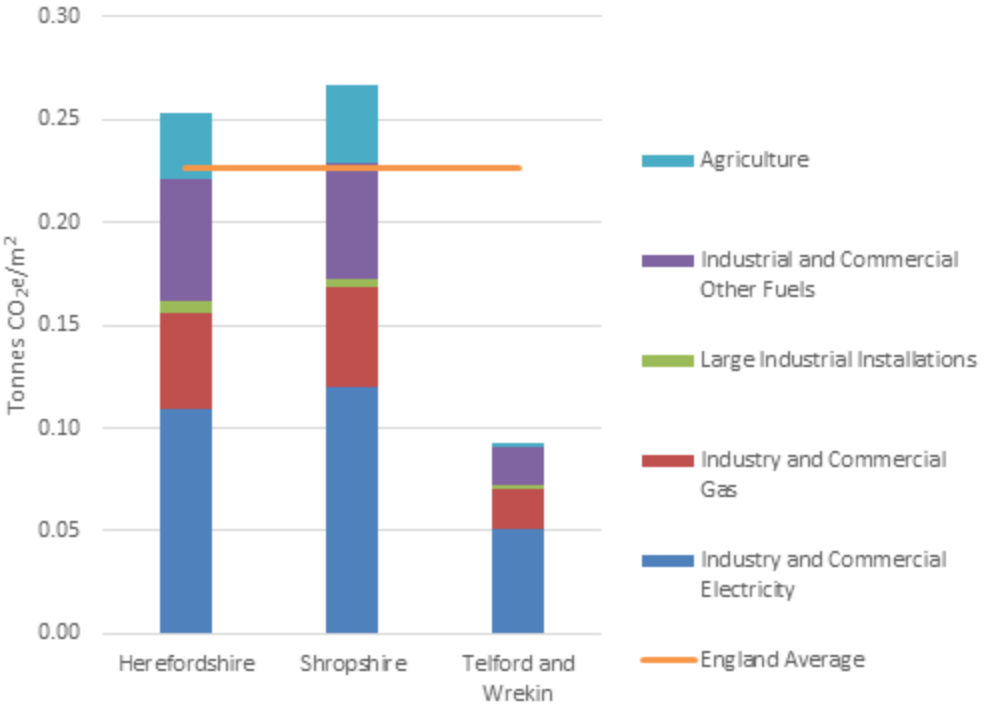

Figure 17: Non-domestic carbon emissions per metre squared of commercial floor area by sector and local authority area (17)

Figure 17 shows the same data as ***Figure 16*** but presented on a normalised basis for ease of comparison. Total emissions have been divided by total commercial floor area from Valuation Office Agency (VOA) statistics to produce a carbon emissions figure per metre squared of commercial floor area. This normalised figure can then be compared to the national average, shown by the orange line.

From this it can be seen that Telford's industrial carbon emissions are significantly lower than the national average on this basis, due to its relatively low emissions and also the high density of commercial development around Telford. Herefordshire and Shropshire have total emissions figures above the national average, with a significant contribution to the total from electricity use carbon emissions. These are likely to fall over time, as discussed above, however, as the fall will be the same nationally this will not necessarily help reduce emissions below the national average.

Again, the significance of the contribution to total emissions from agriculture can be seen here, with both Herefordshire and Shropshire likely to be under the national average in terms of emissions without the contribution of agricultural emissions.

Improvements in business energy efficiency are important and offer economic advantages in terms of productivity. Reducing the carbon intensity of grid supplied power also helps contribute to reduce business carbon emissions. An alternative is also to generate heat and power locally to the commercial sites or for them to invest in their own facilities, which offers further economic benefits. The Clean Growth Strategy sets out the Government's intentions to develop a pathway for reducing business carbon emissions.

2.7 Grid capacity review

The Long Term Development Statements from Western Power Distribution (18), which is the Distribution Network Operator (DNO) responsible for the majority of the Marches, and from SP Energy Networks (SPEN) (19), which is the DNO responsible for parts of North Shropshire, have been reviewed. The 33kV and 132kV substations within each region have been colour coded according to how feasible it is to connect additional generation to them. The grey lines in ***Figure 18*** show the local authority boundaries of the Marches.

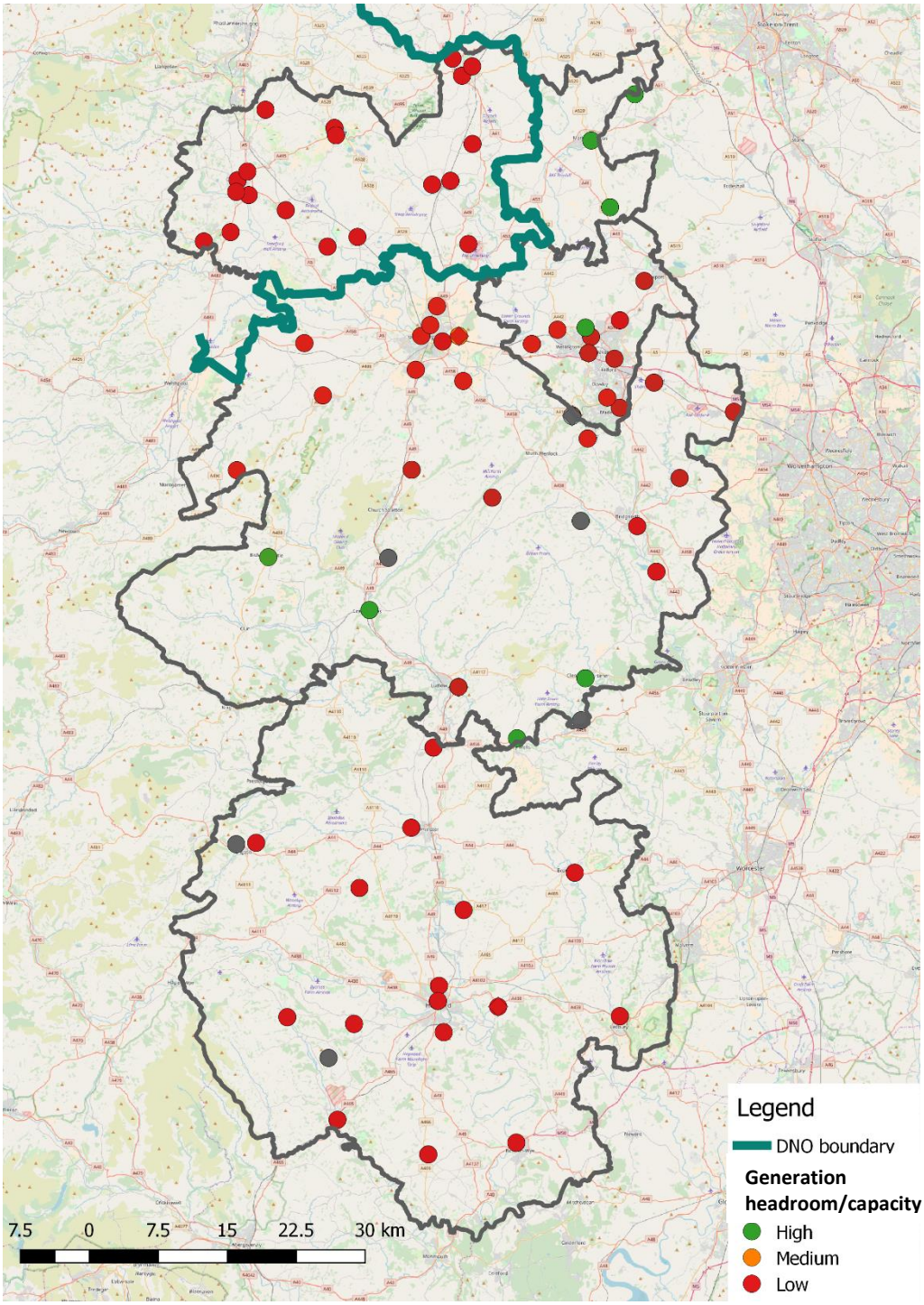

Figure 18: Marches substation grid capacity review – generation headroom (18) (19)

It is clear from ***Figure 18*** that the majority of substations within the Marches have generation constraints associated with them. This means that large electricity generators, for example wind or solar farms, may be unable to secure a connection to the network without paying for significant reinforcement costs. This impacts on the potential future investment opportunities in the renewables sector across the Marches. Very small scale generation, below 4kW such as a domestic solar installation, does not need to apply to the DNO to connect, only to notify them. If small-scale installations continue to proliferate this could further decrease the ability of large-scale generation to access an affordable connection.

The prevalence of red dots across ***Figure 18*** shows that investment in generation within the Marches is already curtailed due to lack of available grid capacity. This can be seen both within the DNO area of Western Power which covers the majority of the Marches, and the DNO area of SP Energy Networks within North Shropshire.

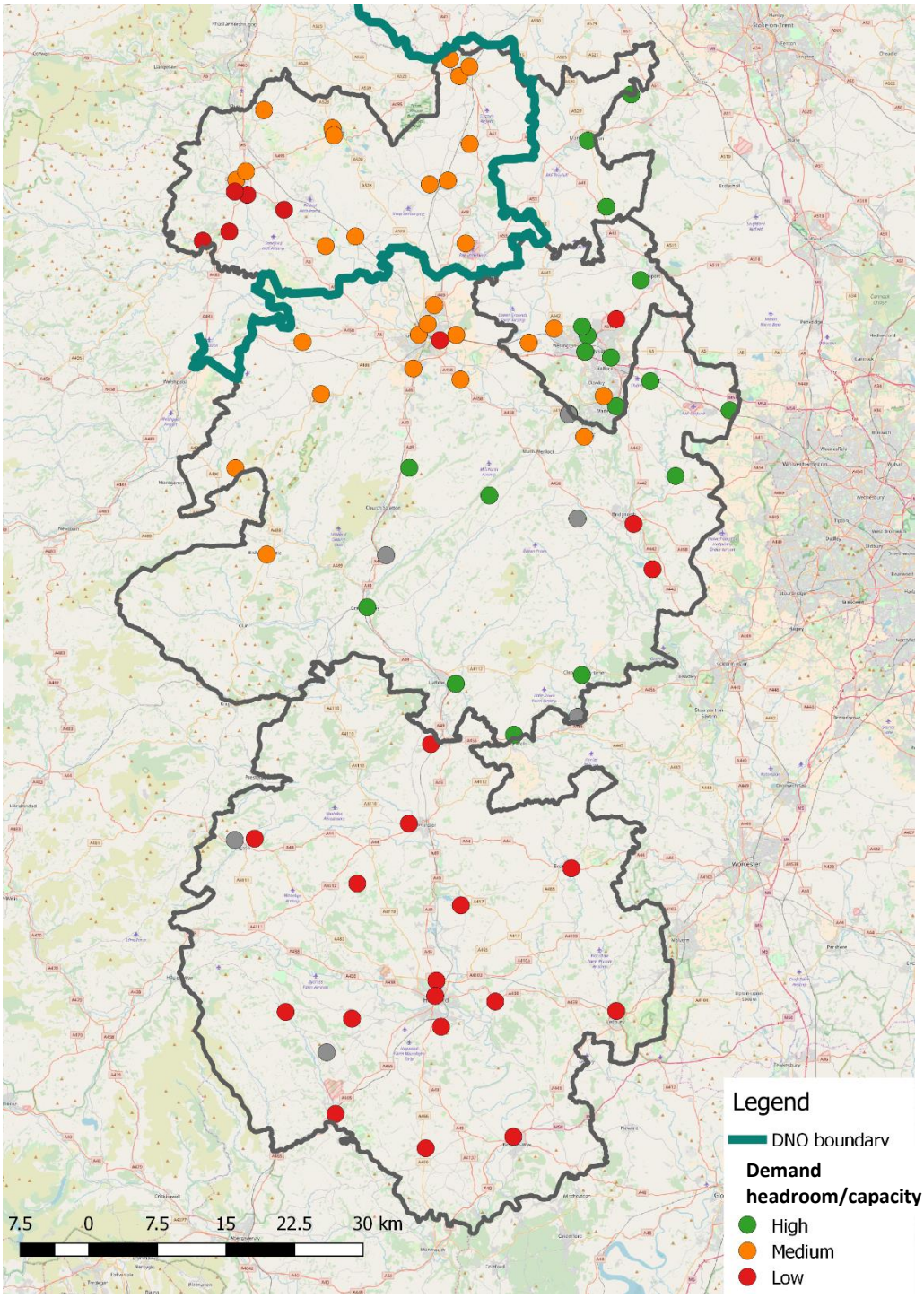

Figure 19: Marches substation grid capacity - demand headroom (18) (19)

Figure 19 shows headroom by substation for additional demand, with red representing substations that have little available capacity for new developments to be connected. The grey lines show the local authority boundaries of the Marches.

The substations are less constrained when considering adding additional demand rather than generation, however, particularly in Herefordshire, there is still a major issue that can be seen that will constrain the growth plans for Herefordshire.

It can also be seen that there are significant constraints within North Shropshire, covered by SP Energy Networks, particularly around Oswestry, which will hamper growth plans for the area by making it more difficult for new development to connect to the electricity network, however at the time of writing SP Energy Networks are consulting on reinforcing supplies in this area[2]. Moreover, constraints on new electricity demand connections around some of the Marches' largest urban hubs including Shrewsbury and Hereford are liable to cause future problems for economic growth plans across the region.

2.8 Smart grids and flexibility

One potential route to circumvent network capacity restrictions as seen in the Marches is the utilisation of smart grid technology and smart energy management. The inclusion of storage with smart controls within some of these opportunity areas may free up additional capacity. The addition of flexibility and storage can present an opportunity for generators to circumvent expensive grid reinforcement options that would be involved in their site.

Co-locating new generation and new demand and potentially integrating smart approaches to balancing supply and demand including storage is one avenue that could get around the capacity constraints.

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

Western Power Distribution is now rolling out alternative connections across its four licence areas which enable customers willing to have their capacity temporarily reduced to connect ahead of the required reinforcement.

The level of curtailment experienced by the connection can be fixed or dynamic, depending on the type of alternative connection offered. The conditions which will require curtailment to be applied will be detailed in the connection offer and historical data can be provided in order for the customer to estimate the likely level of curtailment, but the actual curtailment level will depend on load, generation and system availability in that area, and is outside of the DNO's control.

Customers may choose to accept an alternative connection as either an interim connection, pending completion of works required for a standard unconstrained connection, or as an enduring connection which would not attract the apportioned costs of any reinforcement in that area.

2.9 Electric vehicle charging

One important area to explore is the availability of electric vehicle charge points, as a lack of availability is likely to put consumers off electric vehicle ownership. The geographical spread of chargers is important, as is the power of the charger. The larger the power output of the chargers the faster cars will charge, and the shorter the

[2] www.spenergynetworks.co.uk/north_shropshire

waiting time for customers. The power of the chargers that it is possible to install is however limited by the locally available grid capacity.

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

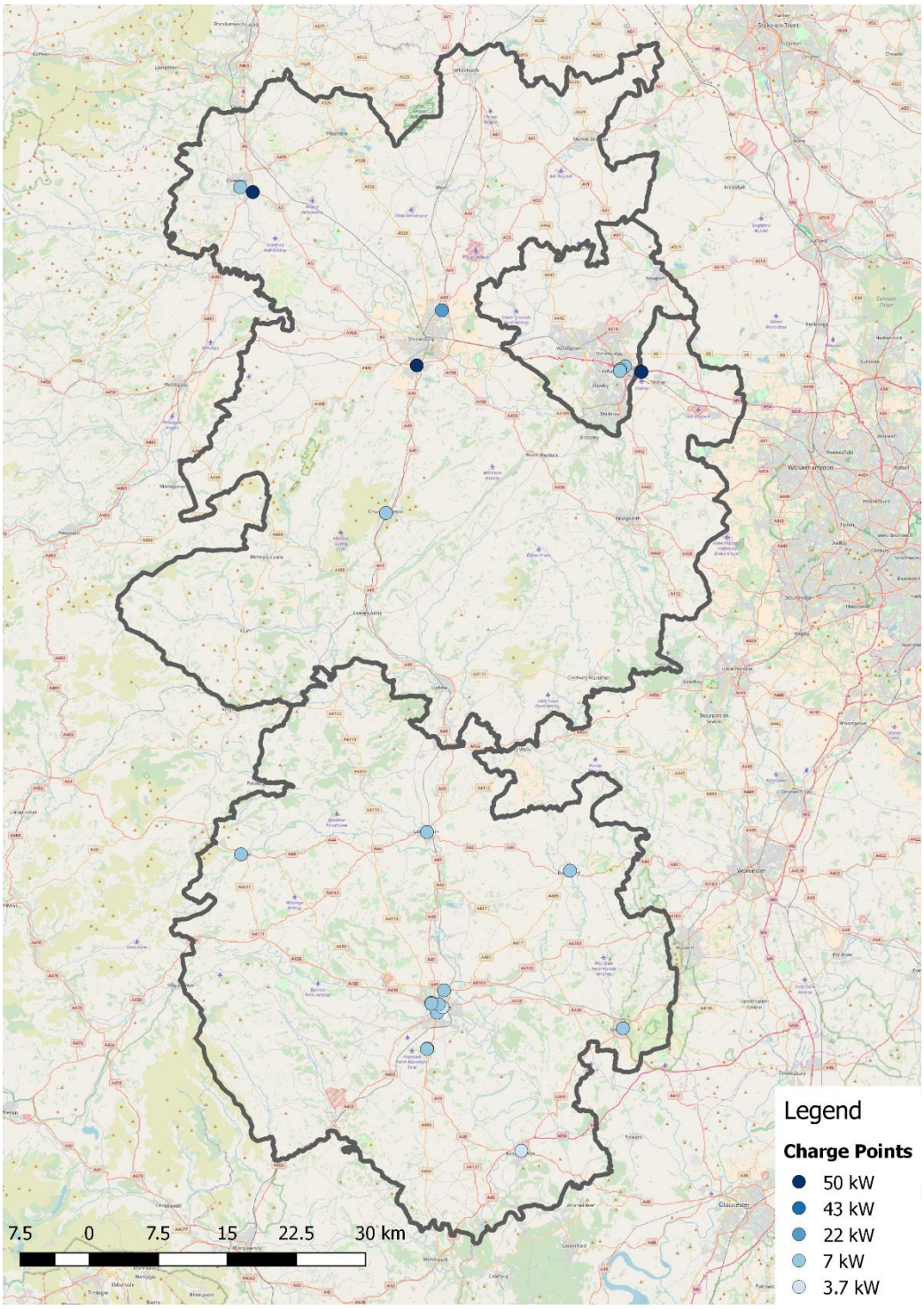

Figure 20: Electric vehicle charge point locations (20)

From ***Figure 20*** it can be seen that Herefordshire has the widest geographical distribution of charge points, with chargers situated in a number of different market towns, with more within Hereford itself, however, the maximum rating of any of these is 7 kW. On some of the arterial routes within Shropshire and Telford and Wrekin there are 50kW fast chargers. These are all provided by Ecotricity and are sited at service stations adjacent to the M54 near Telford, and at two locations along the A5, one outside Shrewsbury and the other outside Oswestry.

At each of the locations on the map there are up to three chargers per site, although not all of them will necessarily be the same capacity as the maximum one denoted by the colour of the dot on the map, for example at some of the Ecotricity sites two of the three charging points are 50kW while a third is 43kW.

Most of the other charging points marked within Shropshire are provided by car dealerships and as such are restricted to customers of a particular car manufacturer. There are three Nissan charging locations and one on a Toyota forecourt.

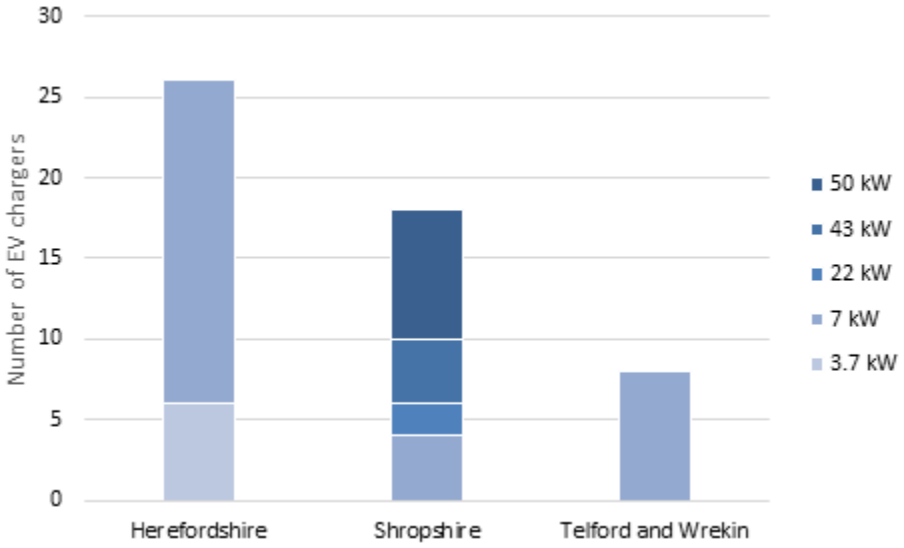

Figure 21: Electric vehicle charge point availability by local authority area (20)

Figure 21 shows the breakdown of charging point numbers by local authority area, this refers to total available charging points, not charging locations, the number of charging points is greater than the number of locations as many locations have more than one available charger.

From ***Figure 20*** and ***Figure 21*** it can be seen that current charging provision for electric vehicles is limited, with a particular lack of fast charging provision across much of the Marches minimising the attractiveness of electric vehicles to consumers within the Marches. This is a problem which the electric vehicle industry is currently grappling with in that consumer uptake of EVs will be slower while charging point infrastructure is inadequate, however, private charge point providers have no incentive to invest in charging point provision without the customers there to use them. This situation is slowly changing, particularly with the use of central Government or European grant funding to deliver additional charging points.

Herefordshire Council is looking to secure funding for installation of charging posts along the A49 within the county, which will help improve charging point provision. Until the time where charging point provision improves, electric vehicle owners will have to carefully plan their vehicle use to ensure they can charge their vehicles overnight at home.

3. Future energy scenarios

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

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

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

Figure 22: National Grid Future Energy Scenarios 2017

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

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

3.1 Energy system pathways for change

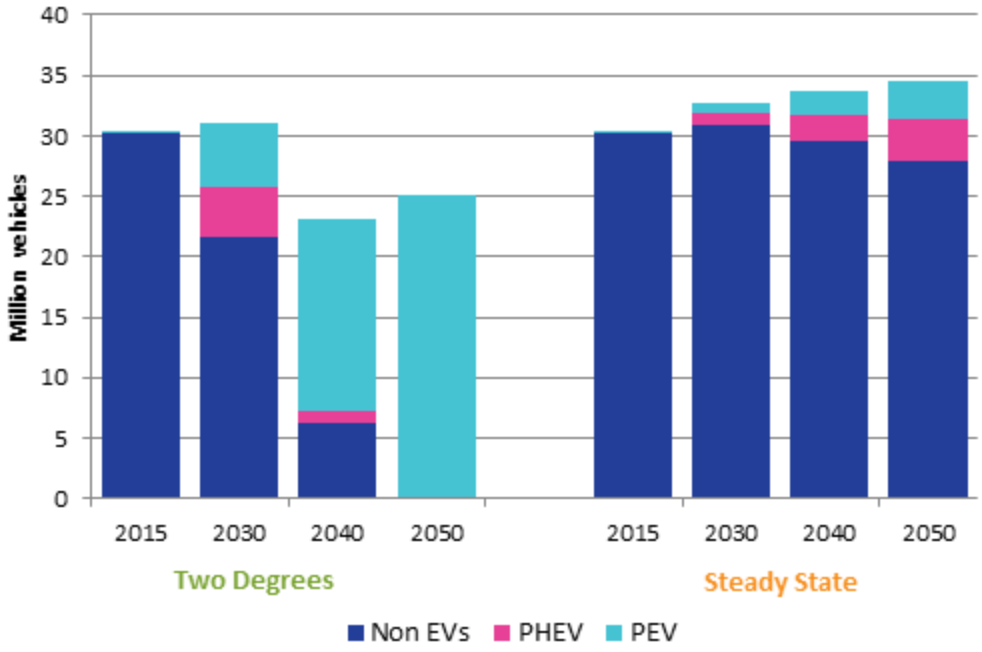

Figure 23: National numbers of electric vehicles on the roads in each scenario out to 2050

In Figure 23 the differing trajectories of electric vehicle (EV) deployment can be seen – within the Two Degrees scenario it can be seen that by 2050 all vehicles on the roads are electric, while within the steady state scenario 80% of vehicles are petrol or diesel powered. The government's recent commitment in policy to eliminating combustion engine car sales by 2040 has provided a boost to the low carbon vehicle sector. Almost all major car manufacturers have either already produced an electric vehicle or are currently developing one. The modelling separates out Plug-in Electric Vehicles (PEVs), which are purely electric, from Plug-in Hybrid Electric Vehicles (PHEVs) which typically have an electric motor with a battery which can be recharged by an onboard internal combustion engine as well as by being plugged into mains electricity.

Within the Two Degrees scenario, the milestone of two million EVs on the roads is met by 2021, whereas in the Steady State scenario this milestone is not reached until 2031.

The direction of travel, however, is clear: electric vehicle sales will continue to increase over time as the industry adapts to this new standard. The current FES were developed in 2017, as discussed in the previous section, prior to the government EV policy announcement referenced above. This has changed the baseline, so the Steady State forecast set out in Figure 23 is already likely too pessimistic in terms of electric vehicle growth and without any further policy change, we would expect the numbers of electric vehicles in 2050 to be significantly greater than the projected 20%.

In 2017 there were around 38 million licensed vehicles on the road, of which 131,000 were EVs, however low carbon vehicles (of which these are primarily electric vehicles) make up an increasing proportion of new car registrations, more than doubling from around 1% in the third quarter of 2015 to 2.1% in the third quarter of 2017. As things stand two million EVs on the road by 2021 is clearly still a very high figure, with the proportion of electric vehicle sales needing to continue to grow exponentially to over 30% of new vehicle sales to reach this figure, with new vehicle registrations typically between 2.5 and 3.2m annually. The Steady State figure would require only 6% of new vehicle registrations to be electric by 2031.

The level of electric vehicle take-up will naturally have a major knock-on effect on the local infrastructure requirements in terms of availability of charging points to support these and the associated electricity grid infrastructure. Electric vehicles could also require increases in additional electricity generation if they are charged at times of current peak electricity demand (winter weekday evenings, 4-7pm). Smart charging that time shifts home electric vehicle charging would help mitigate this.

A ‘smart’ charging system could respond to signals from the grid to manage the charging of connected electric vehicles to reduce strain on the network. For example, when a vehicle is expected to be plugged in all night, charging could be shifted from 4-7pm to take place later when there are fewer constraints on the network. This could reduce consumer electricity bills when combined with time of use tariffs.

In the Marches, it has already been shown to be challenging to install rapid charging for electric vehicles without significant grid reinforcement. This challenge is set to deepen even at low levels of take up.

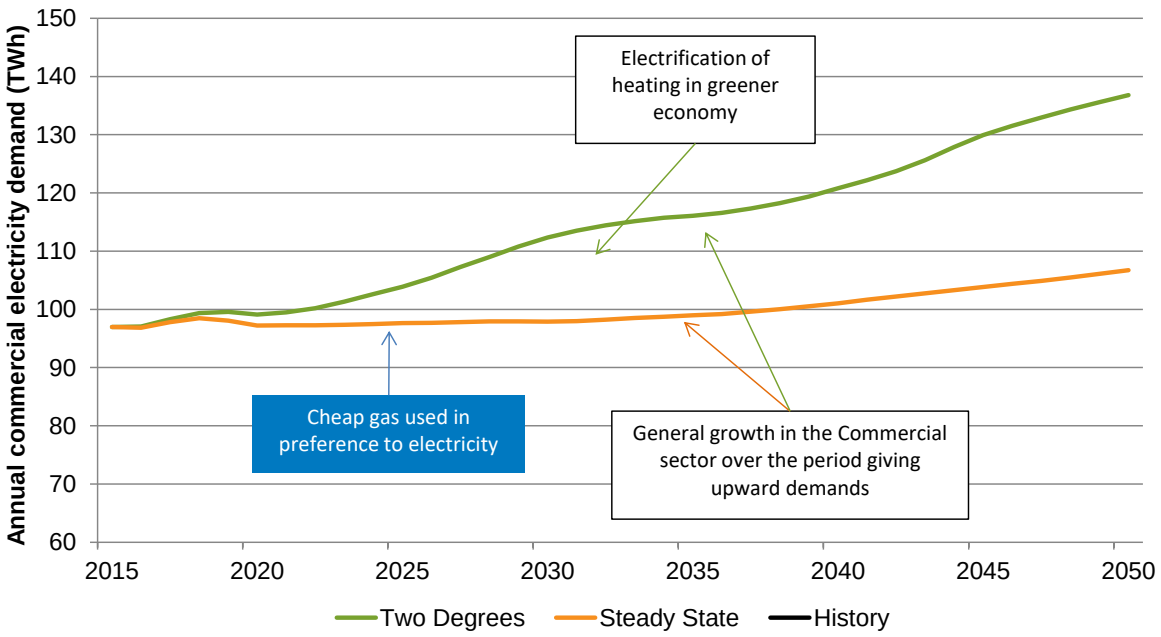

Figure 24: Projected development of commercial electricity demand in Terawatt Hours

Commercial electricity demand has seen a downward trajectory over the last five years, primarily as a result of improved energy efficiency within business, however, there is a range of potential outcomes for how this could develop in future. The growth in commercial electricity demand is driven primarily by electrification of heating within the sector.

Another key area to consider is the deployment of low carbon heating technologies. Within the Two Degrees scenario, significant deployment of these technologies is seen, as shown in Figure 25. The primary technologies seen to be developed in the Two Degrees scenario are air source heat pumps, ground source heat pumps and hybrid heat pump gas boilers. These technologies all include electrification of heat provision, which may prove challenging in some rural areas unable to accept significantly greater new demands from homes and businesses.

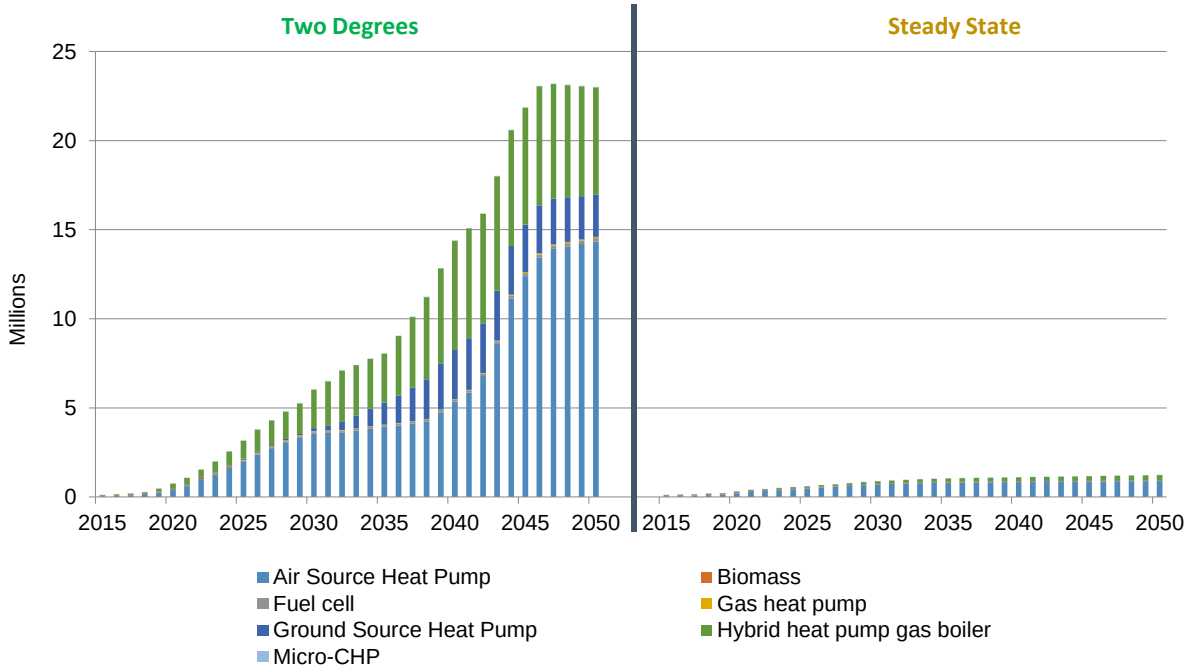

Figure 25: Deployment of low carbon heating technologies to 2050

3.2 Carbon emissions targets

The UK as a whole has committed to legally binding targets of a reduction in carbon emissions of 80% by 2050 compared to the 1990 baseline. Figure 26 shows the current state of play in meeting these targets for the Marches, assuming that the Marches meet the same proportional reduction. This demonstrates the significant progress that has been made to date, and also the distance that remains to go to meet these targets over the next 30 years.

Much of the change to date has come from the increase in renewable generation within our electricity generation mix, combined with the reduced use of coal as a source of electricity generation. There are significant challenges to come, not only in how to continue with the decarbonisation of power generation but also in the decarbonisation of other sectors of energy use, in particular heat and transport.

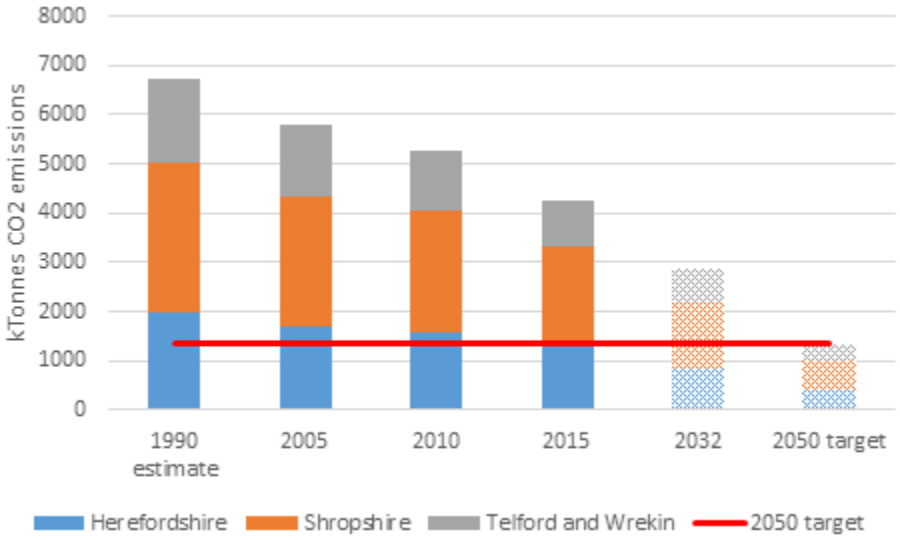

Figure 26: Marches carbon emissions targets to 2050 compared to the 1990 baseline and current emissions

All local authorities within the UK are likely to struggle to meet national carbon targets under current trajectories. The Steady State scenario would lead to significant undershoot of the 2050 carbon target, i.e. much higher carbon emissions than required, while the Two Degrees scenario would just meet the target. For local authorities to achieve targets some areas are covered primarily by national policy, for example decarbonisation of the power generation sector, however local authorities and LEPs still have an important role to play in influencing, facilitating and in some cases delivering the investment needed to implement the projects which will decarbonise the power sector.

Local authorities and LEPs have a role to play in areas such as decarbonisation of heat, improvements in energy efficiency across all sectors, improvements to the grid, decarbonisation of transport. Local authorities and LEPs have more direct involvement in areas such as domestic and business carbon emissions and reducing emissions from the public sector estate, however their actions can touch on all areas of the Clean Growth Strategy. The challenge of this can be seen through some of the previous graphs, particularly Figure 25 showing the potential growth in low carbon heating options.

4. SWOT analysis of energy in the Marches

The integration of the policy review with the development of the evidence base has revealed a number of location-specific factors relating to the Marches, which have been categorised into strengths, weaknesses, opportunities and threats (SWOT). These have been considered in the context of the scenarios discussed in the previous section, focussing primarily on the Steady State and Two Degrees scenarios.

The Steady State scenario is included as a baseline to understand how the opportunities and threats in the Marches may differ in a world without significant action on climate change as compared to the climate conscious world of Two Degrees.

This SWOT analysis has been developed using feedback from a stakeholder workshop held in Telford in December 2017 for businesses, DNOs and other relevant stakeholders, along with wider stakeholder consultation undertaken by Encraft and SWM including feedback from Marches Sustainable Housing partnership and the Marches Energy Agency. A full description of the stakeholder feedback is included in Appendix III.

4.1 Strengths

Steady State	Two Degrees
• Heat maps are available to indicate opportunities • Current industry diversifying to new technology • Significant renewable potential in rural areas • More comfortable and fits with a 'wait and see' approach • More time to demonstrate technology and reduce costs • Inertia in the economy resisting change and protecting existing sectors • Existing subsidy available to support area of renewable strength	• Expertise in renewables including solar and wind • A national leader in energy generation using anaerobic digestion • Rural area, therefore significant renewable potential • Support through policy, fiscal incentives and business networks • Diversification of existing businesses • Resources including land and wood fuel • Battery industry within Telford • Investment interest in storage • Innovation potential in domestic storage and agriculture supported by academia: Harper Adams University

The Marches has significant renewable energy resources as highlighted in the evidence base review, and as the UK further develops its renewable generation capacity the

Marches could play a major role. The significant potential identified within the evidence base review made up nearly 40% of the total capacity within the West Midlands. Primary strengths within these are opportunities for large-scale onshore wind development, solar PV generation, heat pumps, including air source and ground source, and use of biomass and waste for energy generation through AD, and biomass for heating. There are barriers to taking advantage of the wind resource, primarily due to difficulties in securing planning permission.

AD is a key strength area, given the number of installations across Herefordshire and Shropshire primarily driven by private installations by farm owners. Some of these are fed using food waste, while others source feedstocks from dedicated energy crops.

The Marches has a relatively strong local AD supply chain, an abundance of potential AD sites and a plentiful organic waste resource for the development of both on farm and larger scale AD, as well as the potential for growing energy crops. There are increasingly variable and diverse feedstocks for AD and it is suitable for a variety of different uses at different scales: processing food waste and manure; producing biomethane for injection into the gas grid and use as a transport fuel; producing onsite electricity and heat; and generating electricity for export. AD can offer benefits to many different stakeholders, including farmers, industry, communities and local authorities.

In addition, AD export generation can be controlled, with gas stored ready for generating electricity through a combined heat and power (CHP) unit when required. If incentivised to do so, AD has the ability to provide balancing services to the local electricity network, for example, generating at times of peak demand. Similarly, flexible connection offers, where the generator provides guarantees that they will not export to the network at certain times, are more likely to be viable for AD in comparison with other renewable energy technologies, and hence can enable them to secure cheaper grid connections.

As part of the Government's Clean Growth Strategy focus on innovation, the government has committed to invest £99 million in innovative technology and research for agri-tech, land use, greenhouse gas removal technologies, and waste and resource efficiency. The Marches has existing strengths in agriculture and food and drink, and is well placed to build on this, particularly given the potential role of Harper Adams as a higher education institution with an agricultural focus.

The Marches has a strong foundation of low carbon businesses, particularly around Shrewsbury, where 21% of consultancy businesses are within the low carbon sector (21). It also has strong networks of 'green' support for businesses including the Business Environment Network, BESST (Business Environmental Support Scheme for Telford), the Meres and Mosses Business Environment Network covering Shropshire, Herefordshire Business Futures Forum and Herefordshire New Leaf.

4.2 Weaknesses

Steady State	Two Degrees
• Grid constraints, both for demand and supply • Planning Policy (e.g. Building Regulations) requirements not rigorous for energy efficiency • Lack of awareness and intelligence of issues • Economic consequences of climate change • Some innovative businesses but not widespread • Connections for large-scale generation projects • High levels of fuel poverty	• South Shropshire & Herefordshire rural areas grid constraints • Lack of knowledge and awareness of impacts of technology changes on infrastructure • Regulatory environment constrains the approaches that can be taken to energy supply of new development • Regulations constrain local authorities ability to influence energy efficiency or renewables take-up in new development • Lack of preparation for the impacts widespread electric vehicle use will have on the grid • Grid constraints can hamper the connection of energy storage to the network • 'SMART' homes are not supported • DNOs are constrained in the forward-looking actions they can take, i.e. difficult to invest ahead of need • Needs of electric vehicles are different in rural areas • Local government influence on new developments - lobbying by LEP to BEIS is difficult • Application of planning guidance – other case studies • Demand and supply connection • Planning Policy (e.g. Building Regulations) • Local transport policy not prepared for rise in electric vehicle use or automation

The electricity network may not be suitable for currently planned developments in places, and therefore requires upgrading or managed solutions to these issues to be implemented. It also limits the potential addition of generation locally including renewables such as solar and wind. While network operators will invest in upgrades to the network, this may not align with the timescales desired by local businesses looking to grow and increase their energy consumption.

Many homes and businesses are using expensive forms of energy; this is an issue that constrains the development of private sector businesses and removes money from the

local economy as significant amounts are spent on energy and not retained in local supply chains. Households in rural areas that use expensive forms of energy such as oil or coal to heat their homes are more likely to be in fuel poverty, this can be a significant burden and constraint on economic growth.

Fuel poverty is higher than national and regional averages within the Marches, indicating there are a significant number of domestic customers for whom energy costs represent a burden, and a weakness for the local area. This is exacerbated by the rural area's lack of access to the gas network. Within the Two Degrees Scenario, significant numbers of these properties are likely to be shifted to different forms of heating, such as heat pumps which could be cheaper to run and therefore help bring more dwellings out of fuel poverty. Within the Steady State scenario there is likely to be less take-up of low carbon heating options and less opportunity to offer residents cost savings.

There are a number of issues with current regulation and suitability for a changing energy system, particularly in a Two Degrees scenario with rapid change to the energy system and growth in low carbon technologies. Current regulatory structures, particularly in the electricity market, could pose a barrier to the development of new commercial models to support innovative energy technology such as direct domestic sale of locally generated electricity.

4.3 Opportunities

Steady State	Two Degrees
• Biomass – forestry and animal by-products • Wind • Solar • Local generation and consumption e.g. co-location of renewables such as solar and business parks • Demonstrators and case studies • Community ownership • Inclusion of new businesses models • Innovation funding • Electrical efficiency • Lobby regulator for capacity	• Biomass – forestry and animal by-products • Wind • Solar • Battery storage opportunities associated with solar • Rural community board • Customer empowerment to generate and sell electricity to the grid • Energy efficiency improvements • Local generation and consumption e.g. co-location of renewables such as solar on business parks • Demonstrators and case studies • Community ownership • Can start with public sector to 'normalise' • Business opportunity associated with selling energy • Use of local energy • Modernisation of grid • Radical change in policy • Industrial Strategy Challenge Fund for innovation • Investment in storage and demand side response • District heating and associated funding • DNO investment at substation level • Sponsored schemes for DNO to support local authorities working with developers • DNO active network management (ANM) schemes

The projected growth of electric vehicle numbers will have a significant impact on the automotive manufacturing industry. Within Telford in particular there are a number of businesses within the automotive supply chain. They could potentially benefit from the growth of the electric vehicle industry as new supply chains are developed and production is scaled up. By building on existing relationships with car manufacturers there are opportunities for growth in Marches businesses in the automotive sector.

The development of flagship commercial sites such as the Hereford Enterprise Zone, T54 (Telford) and Oswestry Innovation Park offers opportunities to develop innovative solutions to infrastructure constraints such as smart networks to manage demand. This would allow the Marches to develop exemplar sites which build capacity in the local energy supply chain.

Smart networks are networks in which energy flows are monitored and can be actively managed to stay within the limitations of the local infrastructure. Improving the availability or reliability of energy within key development sites for the Marches will encourage business expansion and new business creation by removing one of the barriers to growth, particularly for energy-intensive businesses. Western Power Distribution has committed to introducing Active Network Management (ANM) in Herefordshire in 2020 which will help manage constraints in the area and potentially allow more generators to connect more cheaply if they accept connections that may be limited at certain times of network stress.

Renewable resources are abundant and, in an energy-conscious world with greater support available, then the potential for community energy schemes is high. Local smart grid development could include energy storage and local generation to retain energy spend within local communities. These could be in collaboration with the local DNO who may be able to procure services from local energy storage. Local biomass resources could be developed further to support the growth of biomass in the Marches and ensure a local low carbon supply chain is in place.

4.4 Threats

Steady State	Two Degrees
• Rural areas left behind e.g. EV provision • Slow uptake from local government • EV coming quicker than infrastructure can support • Limitations related to AONB and other area designations • Local resistance to large-scale wind and solar projects, particularly wind • Existing domestic energy efficiency funding, i.e. ECO, is not well designed to support hard to treat properties • Wood fuel may be the cheapest option in some current places, however high use of this comes with air quality issues and supply chain problems without further investment	• High cost of technology adoption at present • Rural areas with limited broadband and impact on smart meters and smart home technology • Limitations related to AONB and other area designations • Local resistance (anti wind and solar) • Demand on grid and charging network for electric vehicles • Business continuity • Investing in new areas with limited infrastructure e.g. the grid and road • National changes to policy and funding • Connections for large-scale renewables • EVs coming quicker than infrastructure can cope with • DNOs are regulated by Ofgem in terms of levels of investment • Responsibility for plug-in points • Air Source Heat Pumps not an effective solution in uninsulated properties

If not properly addressed electricity grid constraints could present a barrier to future growth within the Marches. Issues have been identified particularly around Oswestry that present an existing barrier to growth, although there are reinforcement plans in place to mitigate some of these.

Lack of electric vehicle (EV) charging infrastructure could make the Marches less attractive as a place to live, work and invest as the appeal of EVs grows. If the pace of change in the automotive sector is rapid, and there is sharp take-up of electric vehicles with the technology seen as very attractive for consumers then any barriers in place to those acquisitions, such as the lack of sufficient local charging infrastructure could present a threat to the ongoing growth of the Marches economy.

The Two Degrees scenario including large numbers of air source heat pumps (ASHPs) could see the Marches left behind if energy efficiency improvements are not made to domestic properties because ASHPs struggle to meet peak heat demands in poorly insulated properties. Hybrid heat pumps are not appropriate for much of the Marches as they require a connection to the gas network so this would not be appropriate for rural areas without this access.

5. Energy vision for the Marches

2030 Vision Statement

The Marches area has an energy generation and supply system which is flexible and reliable, delivering energy that is low carbon and low cost to businesses and communities, can accommodate planned growth and can support well developed low carbon supply chains.

5.1 The Marches in 2030

Pilot	Developing a pilot grid constraints mitigation project as a national demonstrator
50%	Locally generated renewable electricity meeting 50% of local demand
1000	1000 new jobs in the Low Carbon and Environmental Goods and Services sector
≤10%	Fuel poverty reduced below 10%
Leader	National leader in deployment of anaerobic digestion
Centre	Centre for UK agriculture innovation and low carbon transition
57%	Carbon emissions excluding agriculture reduced in line with UK targets, a 57% reduction on 1990 levels

5.2 Strategic priorities

As part of the work done to build the evidence base and analyse the strengths and weaknesses of the Marches energy system, some strong themes have emerged. The Marches has some ambitious growth plans, including increases in the delivery of housing and new employment. To support this growth it is clear that a robust energy system that can meet the needs of customers at the lowest cost is needed, and there are some existing barriers to growth with the current energy system. There will also be opportunities for inward investment in the low carbon sector where focus on low carbon development leads to further economic growth.

The Marches LEP's Strategic Economic Plan sets out the intention to:

"Drive the transition to a high value, low carbon economy, maximising the opportunity in new technologies, reducing environmental costs to business and recognising our environment as an economic asset."

This goal is a successful low carbon economy, uninhibited by energy system constraints and able to grow and flourish at the forefront of energy innovation. There are some key areas on which the Marches must address to achieve this. Appendix II sets out a number of best practice case studies from other LEPs who have been able to decarbonise while maintaining or increasing levels of economic growth.

The energy priorities defined for the Marches energy system build on the Strategic Priorities within the Marches LEP Strategic Economic Plan. These priorities will also feed in to the development of the 2018 refresh of the Strategic Economic Plan and the development of a Local Industrial Strategy.

Table 4: Marches LEP Strategic Priorities from the Strategic Economic Plan

Supporting business	We will create an exceptional business support environment for aspiring growth businesses through access to finance and incentives to innovate. We will promote the Marches as a business investment location
Physical Infrastructure	We will provide a compelling business investment offer with a progressive planning framework and infrastructure fit for tomorrow's business needs.
Skills Investment	We will support employers to develop themselves and their workforce and to provide employment opportunities for young people.
Low Carbon Economy	We will drive the transition to a high value, low carbon economy, maximising the opportunity in new technologies, reducing environmental costs to business and recognising our environment as an economic asset.
Social Inclusion	We will support socially excluded and marginalised groups by removing barriers to their participation in activities that will improve their economic well-being.

Within this context, key priorities for the Marches are:

- Smart control and mitigation of grid constraints
- Innovation in agricultural technologies
- Vehicle supply chain opportunities
- Local renewable energy supply
- Development of the supply chain in key areas of the low carbon economy
- Addressing high levels of fuel poverty

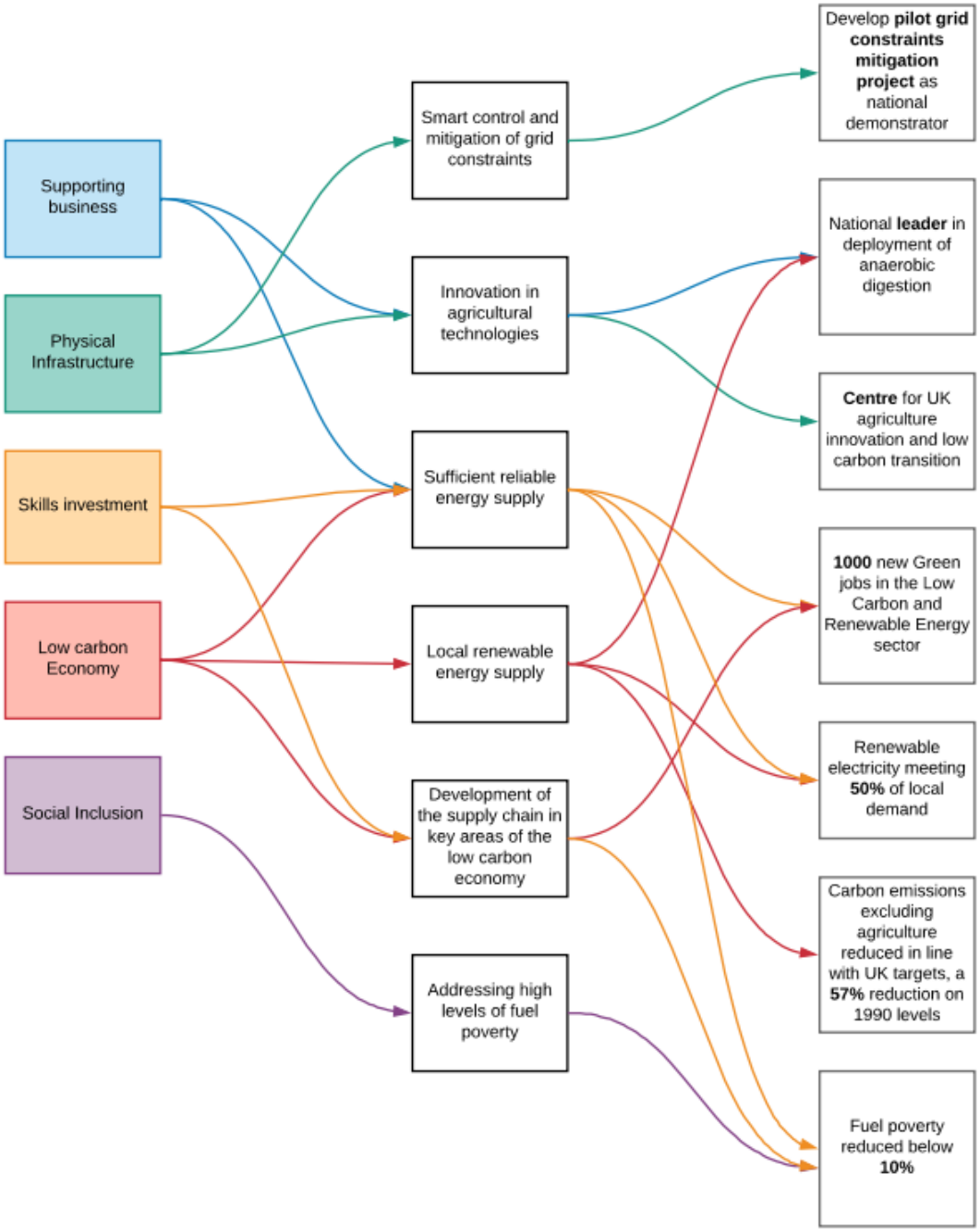

Figure 27: Relation of LEP Strategic Priorities to energy strategy key priorities and aspirations

Figure 27 shows the relation of the energy strategy key priorities to the 2030 aspirations and the LEP's strategic priorities from their Strategic Economic Plan.

Key Priority 1: Smart control and mitigation of grid constraints

As previously identified, the electricity grid constraints that currently exist may place a constraint on economic growth. The local constraints identified within the evidence base work indicate that a clear mitigation strategy needs to be put in place to ensure that this doesn't impact on economic growth.

This fits within the physical infrastructure LEP priority, as energy infrastructure is crucial to facilitating business growth, and business investment will grow further in areas with access to secure energy supplies. The LEP needs to work with the local DNOs (Western Power and SP Energy Networks) to understand exactly what the local constraints are and what the easiest next steps are that could facilitate growth to ensure key opportunities aren't missed.

Beyond this, one potential avenue to deliver change within the energy system in the Marches is through the establishment of Energy Innovation Zones (EIZs). This is a concept currently being explored by the West Midlands Regional Energy Policy Commission[3] that is aiming to secure national political support and visibility for the establishment of EIZs in selected parts of the West Midlands. The Commission is due to report by the end of March 2018.

The concept of EIZs has been developed in order to create commercial markets for new approaches to local energy systems. The aim is to attract substantial private investment to deliver lower cost energy for local communities, often by exploiting technology in new ways, creating new markets and allowing experimentation and demonstration of new technologies in a commercial context. This should provide a route to investing in pilot projects including smart solutions to grid capacity issues that could unlock economic growth opportunities.

Establishment of an EIZ within the Marches that will enable potential solutions to grid constraint issues within the Marches to be explored could be a useful pilot exercise. This could be sited in North Shropshire around Oswestry as while the local DNO has existing reinforcement plans, these will not be fully in place until 2021 and a deregulated zone that could trial new commercial models and generation technologies to meet demand from business growth could bring significant benefit.

If Energy Innovation Zones do not prove to be a useful mechanism to bring forwards a grid constraints mitigation project then there may be other avenues to pursue. A pilot project may be able to be brought forwards through available innovation funding under the existing regulatory regime.

Key Priority 2: Innovation in agricultural technologies

The LEP's priority is to encourage innovation in the local agricultural industry, and facilitate growth in the sector through increased use of technology and innovation.

The Government proposes within the Clean Growth Strategy to '*work with industry to produce a UK Bioeconomy Strategy that will bring together biological industries, academia and innovators, linking up farmers and land managers with high tech industries.'*

This is linked to the investment of £90 million in innovative technology and research for agri-tech, land use, greenhouse gas removal technologies, and waste and resource efficiency. The Marches existing strengths in this area will enable it to compete for this investment and utilise it to ensure that the Marches agricultural sector is well prepared for future changing patterns in energy use. This priority ties in with the LEP's strategic priority to support business and grow the low carbon economy.

[3] https://www.energycapital.org.uk/news/sir-david-king-chairs-new-west-midlands-regional-energy-policy-commission/

Government has been developing Centres for Agricultural Innovation, a new collaborative model between the agri-tech sector and government, which could be suitable for the Marches. The centres are to help the UK:

- turn agricultural innovation into commercial opportunities for UK businesses
- encourage inward investment
- improve farming practice

The Industrial Strategy Challenge Fund is to deliver funding to make it easier for food and agri-business to embrace technology and innovation that will be critical to meeting the increasing food demands of a growing population, fuel rural growth and create high-skilled jobs.

Progress against this goal could include trials of electrification opportunities within agriculture to exploit the development in this technology area which would also enable decarbonisation of agricultural industries to be more easily achieved. Improved energy efficiency within agriculture will help improve business energy productivity within the Marches. This could be achieved through enhanced digital monitoring and precision targeting of activities responsible for energy use.

The flagship innovation projects could include farms which generate their own power from renewable resources, store it locally for when it is needed, and use it to power their vehicles. It could also potentially be used to set up local public electric vehicle charge points to provide a revenue stream. Anaerobic digestion is a generation technology that is well suited to agricultural sites, as shown by its takeup within the Marches to date, this could contribute to farm electrical self-sufficiency.

Key priority 3: Sufficient reliable energy supply

The LEP's priority here is for new and existing businesses to have a reliable energy supply to enable business continuity and sufficient energy supply to allow for growth of local companies on existing sites or new sites within the Marches. Secure and reliable energy supplies are crucial to the growth of new and existing businesses within the Marches. Without access to sufficient energy existing businesses may not be able to expand while new businesses may not choose the Marches as a key growth area.

There are two main strands to this; access to connection to the local gas and electricity networks, and access to low cost energy. Without access to competitively priced energy, businesses will be unable to compete and grow within the Marches. Grid constraints in some areas present a barrier to new business connections as connection costs can be very high if capacity is not available.

Across large rural areas of the Marches there is a lack of access to the gas network, which can prove challenging for businesses and increase energy costs, however within the major urban areas it is possible to connect to the gas network. The electricity network has a number of constraints as detailed in the evidence base which in places can impose a constraint on local growth.

The growth of the electric vehicle market will change consumer demand for electricity, and increase the desire for electric vehicle charge points. The local authorities need to have a coherent transport plan in place to respond to this likely change in mobility.

There will be increasing demand for electric vehicle charge points at locations such as shopping and leisure destinations as well as pressure for local businesses to offer workplace charging.

This priority ties in with the LEP's Strategic Priorities to support businesses and drive the transition towards a low carbon economy.

Key priority 4: Development of the supply chain in key areas of the low carbon economy

The LEP's priority here is to maximise the benefit to the Marches from the growth of the national low carbon economy. The Marches' strength in anaerobic digestion puts them in a strong position to build up the local supply chain for the deployment of this technology.

A growth in local renewable energy would also help to drive the growth in local supply chains in particular. The LEP's priorities for supporting business and investment in skills are important here; unlocking business growth in the low carbon sector will help achieve the LEP's growth goals. A commitment to growth in 'green' jobs in the low carbon and renewable energy sector (LCRE) would show leadership in this area.

The projected growth of electric vehicle numbers will have a significant impact on the automotive manufacturing industry. Within Telford in particular there are a number of businesses within the automotive supply chain. They could potentially benefit from the growth of the electric vehicle industry as new supply chains are developed and production is scaled up. By building on existing relationships with car manufacturers there are opportunities for growth in Marches businesses in the automotive sector.

The Government is investing significant amounts of money into the electric vehicle industry and associated infrastructure, and the Marches should be at the forefront of this investment. This is within the context of the LEP's strategic priority to support business and invest in skills to support employers to develop themselves and their workforce.

Key priority 5: Local renewable energy supply

The LEP's priority here is to increase local renewable energy supply, with a focus on technologies that have the greatest local potential where the Marches has existing strengths.

The Marches is well placed to expand current renewables deployment, subsidy free large-scale solar is becoming an attractive prospect. Despite the planned demise of the Feed-In Tariff, large-scale solar development is potentially viable, particularly through the use of power purchase agreements between solar farms and large energy users. The LEP Strategic Priority of a transition towards a low carbon economy and maximising the opportunities from new technologies provides a solid foundation to build from. The environment as an economic asset is an approach that should be encouraged, with natural energy resources available to be tapped into to drive economic growth.

There may be opportunities for the LEP or local authorities to sign up to power purchase agreements with renewable generators local to the public sector estate to secure low carbon power below the cost of supply from the grid while offering the generators a secure revenue stream.

Anaerobic digestion is also a key technology for the Marches, with many farmers having invested in this technology to provide them with secure local energy supply and reduce carbon emissions. The existing strength in this area ensures that there is an opportunity to grow the sector and maximise the benefits from the existing take-up of this technology.

Key priority 6: Addressing high levels of fuel poverty

The LEP's priority here is to make steps towards eliminating fuel poverty. Within the Marches fuel poverty is higher than the average for the West Midlands and the national average, indicating many residents have particularly high heating costs. Use of high carbon fuels is often linked to fuel poverty, in rural areas where access to the gas network in lower there can be higher levels of fuel poverty as higher carbon fuels such as oil and coal can also lead to higher heating costs due to their cost.

Fuel poverty has a number of causes, and a number of potential solutions. High levels of fuel poverty can be addressed through improved energy efficiency, access to lower cost energy or economic growth. The LEP and local authorities can help coordinate local action on improving energy efficiency, while the LEP has a focus on improving local economic growth.

Addressing fuel poverty supports the LEP priority of social inclusion to remove barriers to household participation in activities supporting their economic wellbeing. The smart meter rollout may help with this as it will empower fuel poor residents to take further action to reduce unnecessary consumption.

5.3 Aspirations

As part of this strategy a number of aspirations have been set out in section 5.1 in order to set goals to work towards in 2030. These are linked to the key priority areas and the strategic priorities in the LEP's strategic economic plan.

Grid constraints mitigation
The issues with grid constraints in the Marches explored in the evidence base indicate that there is a real opportunity to address this issue and lead in this area. The action plan sets out steps to take towards putting a pilot grid constraints mitigation project in place and if followed through should lead to a demonstration project from which wider learning on how to address these issues can be gathered.

Anaerobic digestion
The Marches is already a national leader in deployment of anaerobic digestion and steps should be taken to ensure that this position can be maintained by exploiting the available resources of the area that can produce electricity and biogas locally. The total of 30 plants within the Marches still provides further scope for expansion to more agricultural locations.

Agricultural innovation
The Marches LEP aims to establish a centre for UK agriculture innovation and low carbon transition within the Marches. Given the strength of the Marches economy in this area and the commitment that government have made within the Industrial Strategy Challenge Fund to support innovation in agriculture this is a realistic goal for the Marches to build on existing experience within sites such as Harper Adams University.

Low carbon jobs

The low carbon sector is a key part of the future makeup of the Marches economy. The definitions of the sector and how data is collected nationally have changed over time. Up to 2015 government collected data on the low carbon environmental goods and services (LCEGS) sector, since 2015 this dataset has been revised to encompass a smaller more focused area of the UK economy known as the low carbon and renewable energy (LCRE) economy.

In 2011/12, the most recent year for which data on a local authority basis is available the Marches, the LCEGS sector in the Marches was made up of 453 companies employing 8,279 people with sales of £1,097m (22). This made up 0.88% of UK LCEGS employment. The 2016 national figures for the LCRE sector (23) indicate the UK had 208,000 full time equivalent employees in this area. Assuming the Marches share of the LCRE economy is consistent with earlier LEP level data, this indicates that in 2016 the LCRE sector employed 1836 people in the Marches.

The 2030 aspiration of an additional 1000 jobs in the low carbon sector therefore aims for over a 50% increase in employment within the sector.

Renewable electricity

The Marches is committed to increasing uptake of low carbon electricity. The interconnected nature of the national electricity network will see Marches electricity consumption met by generated electricity from across the country, and so a national increase in electricity from renewable sources will contribute towards this target, however the Marches needs to ensure that it is contributing in line with its potential resources. Marches electricity demand was 3,296 GWh in 2015, with 414 GWh of local renewable electricity generation meeting 12.5% of this.

BEIS energy and emissions projections 2017 forecast national renewable electricity generation making up over 50% of total electricity generation by 2030. The Marches is aiming to contribute to this in kind with renewable electricity to meet 50% of local demand.

Carbon emissions reduction

The Marches LEP aim to reduce carbon emissions excluding agriculture in line with UK targets under the fifth carbon budget, a 57% reduction on 1990 levels by 2032. Up to 2015 total carbon emissions reductions have been reduced by 36.5% on 1990 levels. This aim sets out the LEP's commitment to the low carbon agenda and desire to ensure that the Marches meets its share of the UK's obligations under the 2008 Climate Change Act that commits the UK to delivering 80% reduction in 1990 carbon emissions by 2050. This target will be achieved through concerted action on the other priority areas.

Fuel poverty reduction

Fuel poverty is currently above 15% for the Marches as a whole, compared to 13.5% for the West Midlands and 11% for England. The aspiration for this area is to reduce fuel poverty to below 10% by 2030. This is below the current national average and will prove challenging, with energy efficiency improvements and an increasing uptake of low carbon heating technologies in off gas areas proving crucial to reducing energy bills for residents. Targeted use of government ECO funding to address households in deepest fuel poverty will enable progress to be made towards this target.

6. How to deliver this vision

In this section the potential next steps for delivery of this energy vision are explored, including the actions necessary to monitor this process.

6.1 Action plan

6.1.1 Implementation of strategy

	Action	Timescale	Owner
0.1	Establishment of LEP Energy Steering Group to take forwards the actions in this strategy	March 2018	Marches LEP
0.2	Establish project pipeline database	March 2018	Marches LEP
0.3	Adopt 2030 Energy Vision targets	March 2018	Marches LEP Board
0.4	Engage with neighbouring LEPs to identify opportunities for cross LEP working	December 2018	Marches LEP
0.6	Funding review of project database	Quarterly	Energy Strategy Steering Group
0.7	Disseminate government policy updates to LEPs	Annually	BEIS Local Energy Hub
0.8	Assess impact of changes to government policy	Annually	Steering group
0.9	Review areas identified in GAP analysis to update	2019	Steering group

To develop this strategy there needs to be oversight of actions and accountability. To facilitate this the energy strategy steering group that has been in place throughout the development of this strategy should continue.

A list of potential energy projects has been initiated as part of the development of the Energy Strategy and should be routinely monitored and updated. The list should include an assessment of the reason an individual project has not yet been taken forwards, and what it would take to deliver them.

The steering group should aim to secure LEP board sign off for the planned carbon reduction targets for the Marches. These should be achieved in line with planned economic growth as energy consumption and economic growth are decoupled. Herefordshire Council has already committed to meeting national carbon reduction targets. The Fifth Carbon Budget, passed by parliament in 2016, commits to a 57%

reduction in carbon emissions on 1990 levels by 2032, these could be committed to by the LEP as a whole. The LEP also needs to adopt the 2030 goals as part of its vision.

To identify opportunities for cross-LEP working on energy it is important for the LEP to engage with its neighbours, namely Worcestershire LEP, Stoke & Staffordshire LEP, and the three LEP's forming the West Midlands Combined Authority (Black Country, Birmingham and Solihull, and Coventry and Warwickshire LEPs). All of these LEPs are currently working on their own energy strategies with support from BEIS. By working together there may be opportunities for joint projects, joint bids for funding, and for economies of scale.

A regular review of available funding opportunities should be carried out, using the Energy Strategy review as a starting point. Funding should be reviewed regularly alongside the project database to identify what has changed in the funding landscape and what this means for the Marches. The project database is only an effective tool if it is kept updated. Some funding opportunities can be very short term so it is important to be prepared with projects that are ready to go.

Utilising the resource available within the BEIS Midlands energy hub to keep up to date with developments in national policy led by BEIS and the work done using the Clean Growth Strategy. Appendix V sets out some key areas to watch for new policy announcements.

The partners should also review areas identified in the GAP analysis for the Evidence Base in areas including review of electric vehicle deployment, and housing and commercial energy efficiency reviews to understand the local context better so as to better target action measures.

6.1.2 Key Priority 1: Smart control and mitigation of grid constraints

	Action	Timescale	Owner
1.1	Liaise more closely with the local DNOs to understand constraints and planned work	2018	Marches LEP and partners
1.2	Agree constraint mitigation strategy with DNOs	2018	Marches LEP and partners
1.3	Liaise with other rural LEP areas to share knowledge on approaches to tackling grid constraints	2018	Steering group
1.4	Explore potential of utilising Energy Innovation Zone to facilitate pilot smart grid project	2018	Marches LEP
1.5	Development of pilot project to trial a solution to grid constraints using smart controls	2019	Marches LEP and partners

One important action for the future is for the steering group to liaise with the local DNOs to better understand constraints on the grid for connection of new generation and demand to the network. As the DNOs transition to DSOs and implement greater levels of monitoring of load flows on a local level they will be able to understand the

local issues and potential solutions in greater detail. The steering group should ensure that work is fully understood.

This should lead on to ensuring that a constraint mitigation strategy is agreed with the local DNOs, so the LEP can understand whether this will come from investment in the local network or through technological solutions. For example, Western Power Distribution has committed to introducing Active Network Management (ANM) in Herefordshire in 2020 which will help manage constraints in the area and potentially allow more generators to connect more cheaply if they accept connections that may be limited at certain times of network stress.

The Steering Group could benefit from communicating with other LEP areas that have large rural areas and have experienced significant grid constraints to understand what actions they have taken and share best practice on the development of smart grids. LEP areas that may be beneficial to talk to include Cornwall & Isles of Scilly LEP, Hertfordshire and New Anglia LEPs, and Greater Lincolnshire LEP.

The results of the West Midlands Energy Policy Commission reports at the end of March 2018 into the viability of the Energy Innovation Zone (EIZ) concept. The outputs from this should be monitored in order to understand whether an EIZ may be suitable for the Marches and if it could be helpful for developing a grid constraints mitigation project.

Development of pilot project to trial a solution to grid constraints using smart controls would enable the Marches to be at the forefront of smart grid technology development. There are a number of avenues and sources of funding that can be explored to take forwards a pilot project. The Industrial Strategy Challenge Fund challenge *Prospering from the Energy Revolution*, if funding is confirmed, could provide another avenue to leverage funding to explore smart grid opportunities. The Energy Innovation Zone concept may be helpful for the development of this type of pilot project, however if it is not a pilot could be taken forwards within the existing regulatory framework.

6.1.3 Key Priority 2: Innovation in agricultural technologies

	Action	Timescale	Owner
2.1	Liaison with the agricultural sector to better understand their energy needs and opportunities to deliver and benefit from clean growth	2018	Marches LEP
2.2	Facilitating establishment of Centre for Agri-Tech Innovation	2022	Marches LEP

Before businesses in the agricultural sector can develop or invest in innovation it is important their current most important issues are understood, as well as how they foresee their energy needs changing.

The LEP could facilitate the development of a centre for agri-tech innovation. The Clean Growth Strategy commits to putting these in place, and so the LEP has a key role

to play in lobbying government for locating this type of facility in the Marches. This could build on the agricultural expertise that exists within Harper Adams University.

The Industrial Strategy Challenge Fund may provide an avenue for taking forwards innovation opportunities in agriculture. As part of £90m committed to *Transforming Food Production* the ISCF will fund demonstrator projects that show how innovative agri-tech ideas can be applied in real-world settings. The

6.1.4 Key priority 3: Reliable energy supply

	Action	Timescale	Owner
3.1	Lobby DNOs for investment in the Marches	2019	Marches LEP
3.2	Review Local Transport Plans	When up for review	Local Authorities
3.3	Coordinate joined up approach to local transport planning between local authorities	2018	Marches LEP
3.4	Support government funding schemes supporting electric vehicle charge point provision	2020	Local Authorities

The LEP should build on action 1.1 of liaising more closely with DNOs to understand constraints and planned work and use this information to lobby DNOs for investment in the local area where there are areas that have not had recent investment. DNOs are obliged by regulation to ensure reliability across the network. The Marches LEP should also be prepared to work with DNOs to reliably adopt any of the innovation projects they are looking to take forwards.

It is recommended that the local transport plans be reviewed and consideration given to an update to set out what the local authorities' approach to low carbon vehicles and infrastructure provision is. Telford and Wrekin Council has identified that they may have a role to play in helping to facilitate the provision of electric vehicle charging points within the period covered by the local transport plan (LTP) and will introduce charging points where necessary (24), however the other local authorities have not. Within Herefordshire 58% of people drive to work by car or van (25), this demonstrates the significance of changes in vehicle fuel to the economy of the county, and a similar approach may help facilitate the transition to electric vehicles. When the local transport plans for each of the local authorities come up for renewal they should consider the likely change in the provision of transport. The LEP could encourage and coordinate a joined up approach across local authority areas to transport planning; a holistic approach here will ensure that energy for transport can be reliably supplied.

There are a range of government funding schemes available to support electric vehicle chargepoint infrastructure. The LEP may have a key role in promoting schemes such as the Workplace Charging Scheme (WCS), which is a voucher-based scheme that provides support towards the up-front costs of the purchase and installation of electric vehicle charge-points, for eligible businesses, charities and public sector organisations.

This is one way to ensuring reliable transport energy provision in future as vehicle use shifts away from traditional high carbon options.

6.1.5 Key Priority 4: Development of the supply chain in key areas of the low carbon economy

	Action	Timescale	Owner
4.1	Spread awareness of electric vehicle opportunities for businesses in the vehicle supply chain	2019	Marches LEP
4.2	Support for businesses looking to expand to the low carbon sector	2020	Marches LEP

The Government is investing significant amounts of money into the electric vehicle industry and associated infrastructure, and the Marches should be the focus of some of this investment. The LEP should ensure that Marches businesses within the vehicle supply chain are aware of the opportunities from vehicle manufacturers developing electric vehicles. This could be through existing business support networks.

Through the LEP business boards and existing business support networks the LEP could also try to facilitate the uptake of low carbon technologies by engaging low carbon developers to present their offerings to local businesses. These could include anaerobic digestion or solar developers for example.

The Marches LEP could work more closely with existing networks such as the Local Nature Partnership, the Business Environment Network including Business Environmental Support Scheme for Telford (BESST) and Herefordshire's Business Futures Network to support businesses looking to expand to the low carbon sector. This could be through supporting business networking events that emphasise the opportunities within the low carbon sector. This could be in areas such as the low carbon vehicle supply chain or the growth in existing engineering expertise to develop innovative products for smart grids. This could be achieved via the LEP Business Boards and existing business support networks and the Marches Growth Hub.

6.1.6 Key Priority 5: Local renewable energy supply

	Action	Timescale	Owner
5.1	Promote uptake of low carbon technologies through LEP business boards and existing business support networks	Quarterly	Marches LEP
5.2	Widen awareness of funding and support schemes for anaerobic digestion in the agricultural sector	2018	Marches LEP
5.3	Review barriers to local large scale renewables deployment in the Marches	2018	Steering group

Anaerobic digestion is a key technology for the Marches, with many farmers having invested in this technology to provide them with secure local energy supply and reduce carbon emissions. There is still room for growth in this technology area, and the LEP should ensure that local businesses, particularly in the agricultural sector are aware of the opportunities and funding available.

There are a number of funding streams available specifically to support anaerobic digestion, as detailed in section 6.2.4. These opportunities should be disseminated using appropriate business networks to ensure that relevant businesses, particularly in the agricultural sector can take advantage of funding opportunities.

The LEP can show the benefits of renewable options to the business sector demonstrated by existing renewables in the area that show tangible benefits to the local economy. The LEP can also signpost funding opportunities to support further development of renewable schemes, disseminating best practice through interconnected networks such as Sustainability West Midlands or low carbon working groups.

There are a number of barriers to exploitation of the renewables resource within the Marches, including planning constraints, local objections and difficulty in securing grid connections. Clarification of these barriers could be achieved through discussions with local authority planning officers and existing large scale developers of renewable generation that have been installed such as solar and anaerobic digestion.

6.1.7 Key Priority 6: Addressing high levels of fuel poverty

	Action	Timescale	Owner
6.1	Work with energy companies to influence local use of ECO funds	2019	Local authorities
6.2	Planning framework changes	When up for review	Herefordshire Council, Shropshire Council, Telford and Wrekin Council

Improving energy efficiency of existing housing stock is crucial to reducing fuel poverty, and currently one of the best ways of addressing this is using existing government energy efficiency funding schemes such as ECO. This is a mechanism by which large energy companies must invest in energy efficiency for low income customers. This is carried out by a limited number of companies, typically only the ‘big six’ energy suppliers. The local authorities could engage with these companies to understand the measures they intend to focus on installing and where and try to direct their effort towards that may be most appropriate for the Marches within each local authority area.

The planning guidelines set out in local plans for each of the local authorities should be reviewed when necessary and low carbon requirements increased for example this could include presumption of connection to a heat network for heat supply where one is in place or the adoption of a ‘Merton Rule’ type planning condition that sets out requirements for inclusion of a minimum level of renewable generation.

6.2 Funding and support

6.2.1 European Structural and Investment Fund (ESIF)

ESIF includes money from the European Social Fund (ESF), European Regional Development Fund (ERDF)[4] and European Agricultural Fund for Rural Development (EAFRD). The Marches LEP ESIF Strategy 2014-2020 includes a strategic activity of *'supporting the shift towards a low carbon economy;'* ESIF funds could therefore be leveraged to support potential projects.

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

The Marches ERDF Priority Axis 4[5] allocation sets out areas which are most appropriate for funding applications:

- Promoting the production and distribution of energy derived from renewable resources (4a)
- Promoting energy efficiency and renewable energy use in enterprises (4b)
- Supporting energy efficiency, smart energy management and renewable energy use in public infrastructure, including in public buildings, and in the housing sector (4c)
- Promoting low-carbon strategies for all types of territories, in particular for urban areas, including the promotion of sustainable multimodal urban mobility and mitigation-relevant adaptation measures (4e)
- Promoting research and innovation in, and adoption of, low carbon technologies (4f)

There are also two other ERDF Priority Axes that can be utilised to implement projects that can contribute to the energy and low carbon agenda. These are Priority Axis 1: Promoting Research and Innovation and Priority Axis 6: Preserving and Protecting the Environment and Promoting Resource Efficiency. The former can be used to demonstrate innovation in low carbon energy technologies (for example aspects of the European Bioenergy Research Institute (EBRI)[6] at Aston University was funded by ERDF Priority Axis 1), and the latter could weave energy into the resource efficiency aspect of a specific project.

It is important to ensure that opportunities to utilise available funding to achieve the Marches' energy ambitions are not missed, particularly where such funding is time limited. It is also important to note that should money have been spent against one of

[4] https://www.gov.uk/government/publications/draft-european-regional-development-fund-operational-programme-2014-to-2020
[5] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/651543/ESIF-GN-2-009_ERDF_Priority_Axis_4_Guidance_v4_new.pdf
[6] http://www.aston.ac.uk/eas/research/groups/ebri/

the three priority axes, projects could still be implemented by using another axis as outlined above. However, as with all ERDF bids, organisations that apply for funding and are successful must have the capacity and expertise around ERDF reporting, as proving the success and outputs of projects can require significant amounts of administration. Recipients must also be able to secure appropriate match funding.

Table 5: Remaining ERDF funding for the Marches in Priority Axes 1, 4 and 6, January 2018

Priority Axis	Transition ERDF budget remaining	Transition % committed	More developed ERDF budget remaining	More developed % committed
P1	£1,880,358	74%	£181,712	91.7%
P4	£2,953,601	66%	-£160,376	107.7%
P6	£487,999	63%	£51,810	91.0%
Total	**£5,321,958**	**69%**	**£73,146**	**98%**

Regions are divided into three categories, more developed, transition and less developed with different sums of money allocated to each category. Money within the 'Transition ERDF' funds must be spent in areas classified as transition areas. More developed areas have GDP per capita over 90% of the EU average, while transition areas have GDP per capita between 75 and 90% of the EU average and less developed areas have GDP per capita below 75% of the EU average. The budget for the more developed areas is typically nearly all committed, however there are more funds available to be spent in 'transition' areas.

Shropshire and Telford and Wrekin are within the 'Shropshire and Staffordshire' classification region, classed as a transition area, while Herefordshire is within 'Herefordshire, Worcestershire and Warwickshire' region, classed as a more developed area.

6.2.2 Other European funding opportunities

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

Horizon 2020

According to the dedicated website,[7] "Horizon 2020 is the biggest EU Research and Innovation programme ever with nearly €80 billion of funding available over 7 years (2014 to 2020) – in addition to the private investment that this money will attract. It promises more breakthroughs, discoveries and world-firsts by taking great ideas from the lab to the market." Its goal is to ensure European nations can produce world-class science, remove barriers to innovation and make it easier for the public and private sectors to work together in delivering innovation. Within this pot of money is the 'societal challenges' tranche, which includes 'secure, clean and efficient energy,' along with 'smart, green and integrated transport' and 'climate action, environment,

[7] https://ec.europa.eu/programmes/horizon2020/en/what-horizon-2020

resource efficiency and raw materials. All these funding streams present opportunities for the partners to form a consortium or collaborate to access money to fund the priority actions outlined in this strategy. Businesses, charities and academic organisations are able to collaborate to access this funding through regular funding calls.

In particular, the 'secure, clean and efficient energy'[8] aspect of Horizon 2020 is structured around seven specific objectives and research areas:

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

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

Interreg

Interreg Europe[9] offers opportunities for regional and local public authorities across Europe to share ideas and experience on public policy in practice, therefore improving strategies for their citizens and communities. Two of the categories that it provides funding for are listed as 'low carbon economy' and 'environment and resource efficiency.' It also provides what it calls the '3 C's:' co-operation, collaboration and community engagement and helps public authorities to access peer learning, policy advice, CPD and network expansion, again with particular support offered in the low carbon arena.

Funding for Interreg Europe projects is allocated through calls for project proposals; the next is due in approximately May 2018.

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

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

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

The BEIS Local Energy Programme is designed to address the gap in the capacity and capability of LEPs and other local organisations. Part of this involves funding LEP

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

energy strategies, such as this one, to understand the opportunities and challenges across each LEP area.

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

1 Identify and prioritise local energy projects for support, using LEP energy strategies as a starting point

2 Undertake initial stages of development for priority projects and programmes

3 Take a collaborative and coordinated approach across multiple LEPs

4 Provide regional leadership and liaison with BEIS on local energy matters

This will take the form of around five hubs established around the country that will provide the above support on a regional basis to LEPs and local authorities. The Marches LEP and its local authorities will be part of the Midlands local energy hub.

As part of its role in providing a link between local areas and government, the Hub will be able to provide information and updates to local areas on the funding opportunities that are available to support their projects. Projects identified in this strategy will feed into the Midlands Local Energy Hub's action plan.

BEIS has also created a group within the web-based Huddle portal that effectively acts as an information sharing platform for LEPs and their local authority partners to discuss progress on the energy and low carbon agenda. This includes a specific forum being set up around ERDF Priority Axis 4.

6.2.4 Support for anaerobic digestion

There are support schemes in place to support the development of anaerobic digestion, offering grants and loans to enable projects to be brought forward. Anaerobic digestion is also eligible for the feed-in tariff for electricity generation or the renewable heat incentive for heat generation.

On Farm Anaerobic Digestion Loan Fund
The On Farm AD loan fund is a £3 million initiative designed to support farm-scale AD capacity in England. The fund has been available to farms planning to build an AD plant with a capacity of up to 250 kWe and which have access to slurries or manures to use as feedstock. The fund is split into two parts. Farmers have been able to apply for a business plant grant of up to £10,000 to investigate the environmental and economic potential of building an AD plant on the farm. The second part is a capital loan up to £400,000, or a maximum of 50% of the project cost. This scheme is currently closed while under review, however may reopen in future, announcements from the Waste and Resources Action Programme (WRAP) should be monitored for change[10].

Feed-in Tariff and Renewable Heat Incentive
The Feed-In Tariff scheme pays generators a subsidy per unit of renewable electricity they generate, including electricity generated from anaerobic digestion, and so can provide ongoing support for an AD facility, while the RHI can be used to provide support if the AD plant is primarily generating heat or biomethane.

[10] http://www.wrap.org.uk/content/farm-ad-fund

6.2.5 Innovation funding

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

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

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

Some of the areas that are current priorities for funding that would be appropriate for the Marches include:

- Infrastructure systems
  - Energy systems and supply
  - Transport systems
  - Smart and resilient infrastructure
- Health and life sciences
  - Improving agriculture productivity
  - Developing centres for agricultural innovation
  - Enhanced food quality
- Manufacturing and materials
  - Digital technologies for manufacturing and materials

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

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

The LEP could liaise with SP Energy Networks and Western Power Distribution as the local electricity network operators, and with Cadent as the local gas distribution

network (GDN) in order to ensure that the LEP's views and local challenges within the Marches are adequately represented when the operators are considering their bids for this type of funding. The DNOs were represented at the stakeholder workshop undertaken to contribute to the direction of this strategy.

Industrial Strategy Challenge Fund (ISCF)
ISCF[11] provides funding and support to UK businesses and researchers. The fund is part of the government's £4.7 billion increase in research and development over four years. Government has worked with businesses and academics to identify the biggest core industrial challenges where:

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

At present, the most relevant challenges identified are 'prospering from the energy revolution' and 'transforming food production' but other relevant challenges have also been identified such as 'transforming construction,' 'next generation services,' 'the Faraday Battery Challenge' and 'manufacturing and materials of the future.' Further challenges may be added to the list in the near future.

The ICSF is managed by a combination of BEIS and Innovate UK. Developments to come in 2018, according to a recent government blog,[12] include the recruitment of Directors for each of the nine challenges and the launch of the next round of competition.

6.2.6 Salix funding

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

6.2.7 Heat network support

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

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

[11] https://www.gov.uk/government/collections/industrial-strategy-challenge-fund-joint-research-and-innovation
[12] https://innovateuk.blog.gov.uk/2017/11/30/industrial-strategy-challenge-fund-more-challenges-more-opportunities/
[13] https://www.salixfinance.co.uk/loans

the homes or businesses supplied, therefore enabling easier decarbonisation of heat supply.

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

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

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

There have been four mapping and masterplanning studies undertaken across the Marches, one in Herefordshire, two in Shropshire and one in Telford and Wrekin. Herefordshire Council secured further funding for a feasibility study into a network in Hereford city centre.

Many of these studies have identified networks where the commercial returns are marginal, and are unlikely to be taken forward by the private sector; this has led to capital funding being made available by government to support these in order to overcome initial economic barriers to investment. This funding is known as the Heat Networks Investment Project (HNIP), and is a £320m capital investment programme providing support for the capital costs of heat networks. So far £24m of support has been provided to a total of nine local authority projects. The supported heat network projects provide heat to approximately 5,000 domestic customers and 50 non-domestic buildings.

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

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

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

6.2.8 Innovative Low Carbon Working Group (ILCWG)

The ILCWG[14] is run by Sustainability West Midlands in partnership with the Innovation Alliance for the West Midlands. It provides the opportunity for cross-sector organisations to come together to catalyse collaborative opportunities to help develop low carbon, innovative projects and share good practice. The Group convenes quarterly and membership of the Group also brings access to once to twice weekly email updates on relevant funding sources, events and collaboration opportunities around energy innovation and low carbon. This will include one-off funding sources, above and beyond those listed in this section that may be relevant to energy that the LEP or its partners could apply for. By joining the ILCWG, the LEP will become part of this wider Alliance of partners and have better access to local activities and, therefore, partnership opportunities.

6.2.9 Private sector investment

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

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

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

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

[14] http://www.sustainabilitywestmidlands.org.uk/networks/innovative-low-carbon-working-group/

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

6.2.10 Other sources of funding

Other funding sources that may be relevant to the LEP and the energy and low carbon agenda are listed on the government website.[15] Local authorities and other organisations may also be able to borrow money or use their own assets and reserves to invest in energy projects, particularly where those projects deliver a good return on investment

6.3 Project database

As part of this project an initial project database was developed collating potential projects that could be brought forward. See Appendix VI for this project database spreadsheet.

6.4 Governance

A clear governance strategy needs to be in place to support the delivery of the Energy Strategy. This governance structure should incorporate the Midlands BEIS Local Energy Hub as well as identified actors within the LEP, the three local authorities and local networks and stakeholder organisations. Figure 28 below sets out a potential structure. Each action within the action plan will be assigned an owner, with oversight of this provided by the Steering Group at their quarterly meetings, to review progress and funding availability.

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

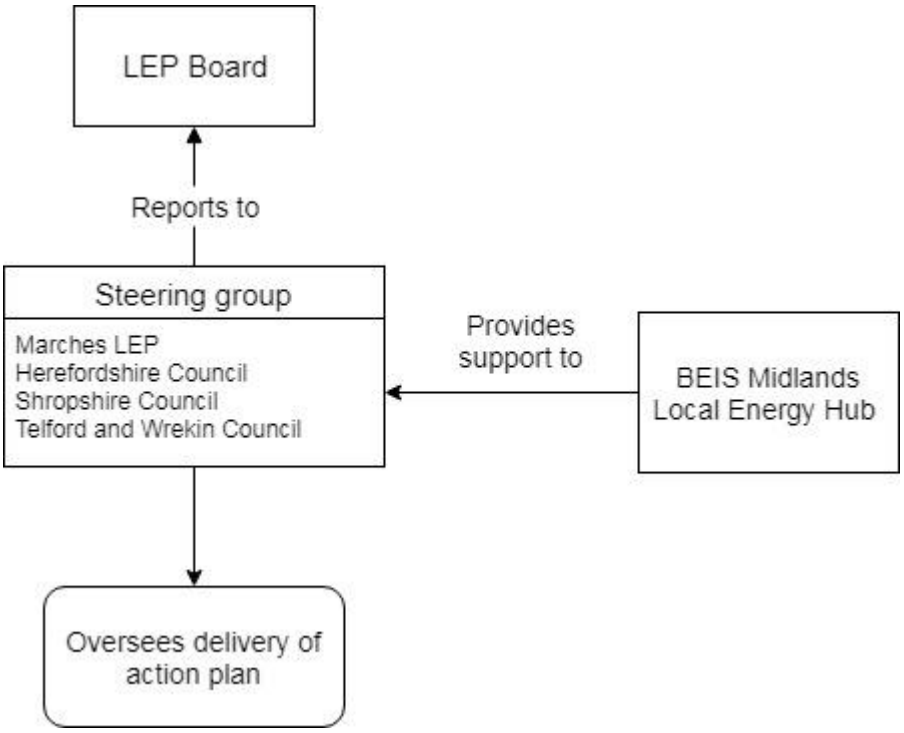

Figure 28: Governance structure

The steering group should be made up of members of each local authority and the LEP, and also liaise closely with the BEIS local energy hub for the Midlands. The BEIS local energy hub will also be able to provide support for follow up work that results from this strategy, for example additional resource in project development for energy related initiatives within the Marches.

The LEP Board will be asked to endorse the creation of a Steering Group. It is recommended that the Steering Group should have an agreed Terms of Reference to include membership and chairing of the group, an identified Chair, and the Group's role and remit. It is suggested that the Group be tasked with progressing actions and accessing funding streams in order the meet the overall aims of the strategy. A summary of the action plan and project pipeline will be available on the LEP website in due course, so that stakeholders are able to see progress and future plans.

The LEP Board, which is led by the private sector and includes the leaders of all three local authorities will consider this strategy and if it is agreeable, the strategy will then need to be approved by the Marches Enterprise Joint Committee.

Appendix I Glossary

General

Term	Acronym	Definition
Air Source Heat Pump	ASHP	ASHPs extract heat from outside air and transfer this heat to inside air.
Anaerobic Digestion	AD	The process by which organic matter such as animal or food waste is broken down to produce biogas for electricity and bio-fertiliser.
Area of Outstanding Natural Beauty	AONB	An area of countryside in the UK which has been designated for conservation due to its significant landscape value.
Climate Change Act (2008)		Act of parliament that established a legally binding UK target of reducing the UK's greenhouse gas emissions by at least 80% (from the 1990 baseline) by 2050.
Combined Heat and Power	CHP	A generator that generates electricity and useful thermal energy in a single, integrated system
Demand Side Response	DSR	A scheme where customers are incentivized financially to lower or shift their electricity use at peak times
Department for Business, Energy and Industrial Strategy	BEIS	BEIS is responsible for business, industrial strategy, and science and innovation with energy and climate change policy, merging the functions of the former departments of Business Innovation and Skills and Energy and Climate Change
Department of Energy and Climate Change	DECC	Precursor department to BEIS, responsible for energy statistics
Distribution Network Operator	DNO	Companies licensed to distribute electricity in Great Britain by Ofgem. There are six DNOs in Britain, each one a regulated monopoly covering a different region of the country.
Distribution Systems Operator	DSO	A DNO that more actively manages supply and demand within their area, what DNOs are transitioning towards
Electric Vehicle	EV	Vehicle powered by an electric engine
Electricity distribution system		Electricity cables and assets facilitating the movement of electricity on more localised networks at voltages from 230 V to 132 kV
Electricity transmission system		Electricity cables and assets facilitating the movement of electricity at high voltages, typically 400 kV
Energy Company Obligation	ECO	Government energy efficiency scheme in Great Britain to help reduce carbon emissions and tackle fuel poverty in which larger energy suppliers fund the installation of energy efficiency measures in British households.
Energy infrastructure		Gas and electricity networks
Energy Performance Certificate	EPC	EPCs present the energy efficiency of dwellings on a scale of A to G. It is compulsory for all buildings that have been newly built, sold or rented out to have an EPC.

Feed-In Tariff	FIT	Government subsidy scheme for renewable electricity generation that pays generators a small amount for every unit of electricity generated
Fossil fuel		A fuel such as coal or gas, formed in the geological past from plant or animal remains.
Future Energy Scenarios	FES	A set of scenarios developed by National Grid
Greenhouse gas		A gas that contributes to the greenhouse effect and climate change
Ground Source Heat Pump	GSHP	GSHPs extract heat from the ground and transfer this heat to inside air.
Heat Pump	HP	Heat pumps are devices to move heat from a cold space to a warmer one.
Local Enterprise Partnership	LEP	Local business-led partnerships between local authorities and businesses that undertake activities to drive economic growth
Liquefied Petroleum Gas	LPG	Bottled gas that can be used for domestic heating
Lower Super Output Area	LSOA	Small unit of geographic area within England and Wales used for reporting national statistics
Marches energy system		The local energy supply, demand and infrastructure within the Marches
Ministry of Housing, Communities and Local Government	MHCLG	Government department responsible for housing and supporting local government
National Grid		The UK's electricity system operator operating the transmission system that ensures that electricity supply and demand are balanced in real-time.
Office of Gas and Electricity Markets	Ofgem	Government regulator who protect the interests of existing and future electricity and gas consumers.
Plug-in Electric Vehicle	PEV	Electric vehicle that draws electricity from a battery with a and is capable of being charged from an external source
Plug-in Hybrid Electric Vehicle	PHEV	A hybrid electric vehicle that can be recharged by plugging it in to an external source of electric power as well by its on-board engine and generator.
Renewable Heat Incentive	RHI	Government incentive scheme to encourage uptake of low carbon heating technologies that pays households or businesses for each unit of renewable heat they generate
Scottish Power Energy Networks	SPEN	The DNO that covers an area around Merseyside including parts of North Wales, Lancashire, Cheshire and Northern Shropshire.
Solar photovoltaics	PV	Panels which turn the sun's energy into electricity
Steady State	SS	Scenario from the National Grid Future Energy Scenarios in which there are only incremental changes in policy and the way energy is generated and consumed.
Two Degrees	TD	Scenario from the National Grid Future Energy Scenarios in which there is significant change in energy consumption and supply with decarbonisation that will meet the UK's climate change targets.
Western Power Distribution	WPD	The DNO for the East and West Midlands, South Wales and the South West including the majority of the Marches

Units of measurement

Term	Acronym	Definition
Kilowatt	kW	Standard unit of power, approximately what is used by a hairdryer
Megawatt	MW	Equivalent to 1000 kilowatts
Gigawatt	GW	Equivalent to 1000 megawatts, the power output of a large power station
Terawatt	TW	Equivalent to 1000 gigawatts
Kilowatt hour	kWh	Unit of energy consumed by a device that uses one kilowatt used for one hour
Megawatt hour	MWh	Equivalent to 1000 kilowatt hours
Gigawatt hour	GWh	Equivalent to 1000 megawatt hours
Terawatt hour	TWh	Equivalent to 1000 gigawatt hours
Carbon dioxide	CO_2	Greenhouse gas, produced by burning fossil fuels
Carbon dioxide equivalent	CO_2e	Standard unit for measuring carbon footprints. Expresses the impact of each different greenhouse gas in terms of the amount of CO_2 that would create the same amount of warming.

Appendix II Best practice case studies

LEPs prioritising low carbon economic growth

Introduction

Examples of LEPs making progress on both economic growth and reducing carbon emissions are included in this document to provide good practice case studies for the Marches LEP to review.

The first three case studies overleaf are taken directly from the newly published *Fit for the Future II* report,[16] compiled by Sustainability West Midlands (SWM) and supported by BEIS, which demonstrates good practice taking place in LEPs on energy, low carbon and climate change management across the country. The three examples are particularly strong at demonstrating low carbon and economic benefits simultaneously. The examples thereafter also arise from the research undertaken to inform *Fit for the Future II* albeit they are not presented as case studies in the report and this information is taken from the deeper research and evidence based compiled by SWM in August 2017. All examples focus primarily on low carbon energy (rather than transport or other interventions).

One of the main ways that the Marches LEP can enhance economic growth whilst reducing carbon is to strengthen its low carbon economy. The initial starting point to help achieve this is to determine the growth potential from low carbon industries in the Marches LEP area by undertaking a Low Carbon and Environmental Goods and Services review, which many LEPs have carried out. This will provide an evidence base outlining the best way that the Marches LEP can exploit the low carbon sector and strengthen its economy, whilst at the same time continuing to reduce emissions. LEPs that have undertaken good Low Carbon Environmental Goods and Services (LCEGS) studies include:

- Liverpool City Region[17]
- Cumbria[18]
- Coast to Capital[19]
- D2N2[20]
- Greater Manchester[21]

The three primary case studies taken from *Fit for the Future II* commence on the next page.

For each LEP figures for GVA and CO2 emissions have been benchmarked. Changes between 2011 (when LEPs formed) and 2015 (latest available data):
GVA in the Marches increased by 10.4% and CO2 fell by 12.2%

[16] http://www.sustainabilitywestmidlands.org.uk/resources/fit-for-the-future-ii-2/
[17] http://bit.ly/2FWVyMP
[18] http://bit.ly/2mVWybS
[19] http://www.coast2capital.org.uk/storage/downloads/low_carbon_sector_report-1475583426.pdf
[20] http://www.d2n2lep.org/write/D2N2_Low_Carbon_Action_Plan.pdf
[21] http://www.neweconomymanchester.com/media/1758/06-lcegs-deep-dive-report-final.pdf

MANCHESTER'S LOW CARBON VISION

Greater Manchester LEP

The Greater Manchester LEP, in partnership with the Greater Manchester Combined Authority, has demonstrated leadership in low carbon integration, demonstration and implementation for several years and continues to do so despite continuous changes to policy and drivers. This can be demonstrated by:

Ambitious carbon targets

- 48% reduction in carbon by 2020 from 1990 levels.
- 80% reduction by 2050 and/or two tonnes per head per capita by 2050 from 1990 levels.

Implementation Plan

- The Whole Place Implementation Plan for Greater Manchester sets out what the area will do under five headline goals: reducing carbon emissions; growing the low carbon economy; rapidly adapting to a changing climate; embedding low carbon behaviours and achieving air quality thresholds.

Partnership working and integration

- The Low Carbon Hub and its Board brings together leading figures in the space, including from local authorities, higher education, large private sector and energy distributors.
- The Hub manages several other sustainability related Boards including one on energy, one focusing on buildings and one around carbon literacy.

Green growth

- The Greater Manchester Growth Hub contains the Green Growth team which *"is here to help you increase your profitability by reducing your environmental impact and taking advantage of the growing market for low carbon and environmental goods and services."*

Smart energy

- The Greater Manchester Smart Energy project sees 600 homes fitted with air source heat pumps which are then connected to a smart grid system which can manage the energy produced in people's homes and help reduce demand on the National Grid.

Low Carbon Project Delivery Unit (PDU)

- The Low Carbon PDU has four additional main work streams: heat networks, LED street lighting conversion, non-domestic energy efficiency and the District Energy Procurement Agency.

Links: Implementation Plan | Low Carbon Hub | Green Growth | Smart energy | LC PDU

Changes between 2011 (when LEPs formed) and 2015 (latest available data):
GVA in Manchester increased by 13.9% and CO_2 fell by 15.9%

HEATING LEEDS CITY REGION

Leeds City Region LEP

One of Leeds City Region LEP's four key pillars is clean energy and environmental resilience and beneath this one of its key priorities is energy generation. This recognition of the economic importance of the energy and low carbon sector is reflected in its commitment to developing heat networks across the LEP area.

The LEP's heat network journey began in 2013 when it started investigating options for heat network implementation across the city region. This would provide a secure source of local low carbon heat as well as create the opportunity to develop the region as a hub for heat network skills and expertise as part the LEPs economic growth agenda.

Ten of the projects have the potential to save over 55,000 tonnes of carbon every year, generate nearly 400 GWh of heat and 165 GWh of electricity.

A mapping exercise initially took place, which identified hundreds of potential sites for district heating schemes in ninety different clusters. This included supply from a variety of sources, including a combined heat and power generator and an energy from waste facility. These were then prioritised and so far, fifteen individual schemes have been or are being implemented.

Partnership working was key and along with engaging with local authorities, housing associations, energy distributors and large heat users, the LEP also obtained funding from the government Heat Networks Delivery Unit's initiative and the Carbon Trust, who undertook a benefits analysis study to quantify the benefits and challenges of implementing district heating schemes in the region. The LEP has a team working on the low carbon agenda, allowing it significant resource to put towards these type of projects.

Locations where heat network schemes are currently being implemented or investigated include Aire Valley, Barnsley, Bradford City Centre Civic Quarter, Castleford, Halifax Town Centre, Huddersfield Town Centre, Knottingley, Leeds City Centre, Wakefield City Centre, Wakefield City Fields and York.

The whole low carbon and energy agenda is driven by the LEP's Green Economy Panel, consisting of large and small public and private sector bodies. It appears, therefore, that the LEP's low carbon agenda is fully embedded into its way of working, not least emphasised by their achievements with heat networks.

Links: Carbon Trust's case study | Green Economy Panel

Changes between 2011 (when LEPs formed) and 2015 (latest available data):
GVA in Leeds increased by 13.7% and CO_2 fell by 13.3%

DEMONSTRATING RENEWABLE TECHNOLOGIES

Humber LEP

There is no doubt that the Humber is one of the best places to go to access facilities, training and support in the renewable energy sector, particularly offshore wind. The flagship development in the region is the Humber Enterprise Zone, the largest Enterprise Zone in the whole country at over 3,000 acres. Not only that, but the Zone contains two leading low carbon centres:

- **Able Marine Energy Park** (AMEP): this is a fully consented project that will be a bespoke port facility for the renewable energy sector. It is designed specifically for the marine renewables sector providing a multi-user facility for the manufacture, storage, assembly and deployment of next generation offshore wind turbines and their associated supply chains.

- **Green Port Hull**: its vision is to establish Hull and the East Riding of Yorkshire as a world class centre for renewable energy and contains a range of incentives including land with quayside access, being located with a designated Centre for Offshore Renewable Engineering (CORE) and utilisation of the Local Growth Fund (LGF) to provide skills and employment, business support and research and development to ensure that local people and businesses gain maximum benefit from the renewable energy sector.

Local Growth Funding, administered through the LEP, has also helped to supplement the renewable energy strengths of the Enterprise Zone by establishing three further centres that help to strengthen business and industry capability in renewables and offshore technologies. These are:

Nearly £5m has been provided through Local Growth Funding to help develop the ERGO Centre, CATCH Energy Offshore and the Environmental Logistics Learning Hub.

ERGO Centre at Bridgehead Business Park: This Centre has the potential to support 3,000 jobs in its lifetime by creating managed workspaces targeting businesses and professional services that support the development of environmental technologies sector.

Environmental Logistics Learning Hub: this will be a centre of excellence for the delivery of education and training for the ports, logistics and energy sectors. It will provide state of the art simulators for training lifting and support vessel operatives working in the offshore energy sector.

- **CATCH Energy Offshore:** this is an investment programme in specialist training facilities and infrastructure for the offshore wind industry. These will include indoor and outdoor training environments to deliver marine survival and a wide range of health and safety-related training.

There is no doubting that Humber offers a multifarious range of opportunities for businesses, specialists and academics to help develop their skills and supply chains in the renewable energy sector; the biggest challenge will be choosing which of the sites to visit first!

Links: ABLE | Green Port Hull | ERGO | Environmental Logistics Learning Hub | CATCH Energy

Changes between 2011 (when LEPs formed) and 2015 (latest available data):
GVA in Hull increased by 9.9% and CO_2 fell by 14.5%

Other examples

Other examples where LEPs are demonstrating economic growth whilst implementing projects that are reducing carbon are included below. Note that these are not solely projects that will strengthen the low carbon economy directly (although many will), but rather they are activities that the LEPs are implementing that their main intention is to reduce emissions, whilst not compromising economic growth (and in many cases, enhancing it).

Cornwall and Isles of Scilly LEP
£90m with leveraged match for low carbon projects using EU funds is being implemented. Several projects, supported by the LEP, have been commissioned, including:

- Green Drive Cornwall: Ambitions for a compressed natural gas/bio-methane refuelling station, additional 65 electric vehicle charging points and low emission buses and a Drive EV project funded by OLEV.
- A Cornwall energy company is being considered.
- Hydrogen refuelling station and injection systems are being considered.
- The Jubilee Pool Geothermal Heat project will act as a high profile demonstrator of how geothermal can be used directly to provide renewable heat.
- A Smart Islands programme is intended to sustainably and affordably tackle some of the Isles of Scilly's main infrastructure and utilities issues.

Changes between 2011 (when LEPs formed) and 2015 (latest available data):
GVA in Cornwall increased by 15.6% and CO_2 fell by 11.3%

Liverpool City Region LEP
Projects to reduce carbon emissions include:

- Master-planning potential systems and investment locations to create area-based systems of Combined Heat and Power District Heat Networks.
- Taken from the Strategic Economic Plan: "*One of the more substantive interventions for energy infrastructure development is our ambition to construct a tidal power scheme in the Mersey to harness one of the highest tidal ranges in Europe. This could provide countless opportunities for environmental and lifestyle improvements as well as a boost to the visitor economy*."
- There is also research being undertaken to determine the possibility of developing and utilising the hydrogen gas grid.

Changes between 2011 (when LEPs formed) and 2015 (latest available data):
GVA in Liverpool increased by an average of 8.5% and CO_2 fell by 17.3%

New Anglia LEP
Relevant successful projects cited as a result of the LEP's Green Economy Pathfinder include the following:

- Big Community Switch, a collective energy switch scheme to help householders save money on their energy bills.
- Centre of Excellence in promoting the government's 'Green Deal' energy saving scheme and other projects worth more than £1 million.
- Installation of renewable heating systems in homes.
- £3.4m contract awarded by Government to develop and build a revolutionary modular energy storage system at the Lotus Engineering's headquarters at Hethel.
- Broadland District Council successfully secured European funding to pilot a carbon reduction scheme to help hard to treat property owners.

Changes between 2011 (when LEPs formed) and 2015 (latest available data):
GVA in Norfolk and Suffolk increased by an average of 15.0% and CO_2 fell by 10.0%

Oxfordshire

Projects that have been implemented where the LEP has had strong involvement include the following:

- The Smart Oxford Strategy has made a strong link with one of its key areas, primarily making homes and businesses more sustainable in terms of resource consumption.
- A heat network has been implemented in Headington which serves two very large hospitals so that they can share heat from one to another.
- There is also a second waste heat scheme initiating from Sainsbury's and will service a social housing estate; an implementation study is currently underway.
- There is also a new development in the eco-town of Bicester, where a new development of 800 low carbon houses has been built and this has been connected to a heat network.

Changes between 2011 (when LEPs formed) and 2015 (latest available data):
GVA in Oxfordshire increased by an average of 21.7% and CO_2 fell by 12.2%

Summary

The examples above show that it is possible for LEPs to embrace the low carbon agenda and reduce emissions via implementation of projects that also enhance energy security and clean energy, whilst not having a detrimental effect on the economy. In fact, the majority of these projects are likely to have boosted the economy of the region, making it a more attractive, resilient and cleaner place to live and invest. Moreover, as mentioned at the start of this document, there are several examples where LEPs can specifically invest in projects that boost the low carbon economy, a sector in itself, that can attract investment, develop skills, improve productivity and strengthen markets and supply chains. This approach, which several LEPs have taken, represents the best of both worlds, as any such projects will automatically benefit the economy but will do it in a sustainable, carbon neutral way.

Appendix III Telford stakeholder workshop SWOT analysis

Two Degrees – Strengths of the Marches

- Expertise in renewables including solar, biomass and wind
- Rural area therefore significant renewable potential
- Support through policy, fiscal incentives and business networks
- Diversification of existing businesses
- Resources including land and wood fuel
- Battery industry within Telford
- Investment interest in storage
- Innovation potential in domestic storage and agriculture supported by academia: Harper Adams

Two Degrees – Weaknesses in the Marches

- South Shropshire & Hereford rural areas lack infrastructure
- Lack of knowledge and awareness
- Regulatory environment constrains network operators
- Planning and building regulations constraints on energy efficiency requirements for new developments
- Electricity network may not meet the future needs of EVs
- Storage has a limited capacity along with grid constraints
- 'SMART' homes are not supported
- Ability of DNOs to change e.g. Developers paying, no negotiation
- Needs of electric vehicles are different in rural areas
- Local government influence on new developments- lobbying by LEP to BEIS
- Application of planning guidance – other case studies
- Demand and supply connection
- Planning Policy (e.g. Building Regulations)

Two Degrees – Opportunities in the Marches

- Biomass – forestry and animal bi-products

- Wind
- Solar
- Battery storage opportunities associated with solar
- Rural community board
- Selling back energy to the grid
- Energy efficiency
- Local generation and consumption e.g. co-location of renewables such as solar on business parks
- Demonstrators and case studies
- Community ownership
- Start with public sector to 'normalise'
- Business opportunity associated with selling energy
- Use of local energy
- Modernisation of grid
- Radical change in policy
- Funding
- Investment in storage DSR
- District heating and associated funding
- DNO investment at substation level
- Sponsored schemes for DNO to support local authorities working with developers

Two Degrees – Threats to the Marches

- Cost! To who?
- Rural areas with limited broadband and impact on smart meters
- Limitations related to AONB and other area designations
- Local resistance to wind and solar
- Demand on grid and charging network for electric vehicles
- Business continuity
- Investing in new areas with limited infrastructure e.g. the grid and road
- National changes to policy and funding
- Connections for large scale renewables
- EVs coming quicker than infrastructure can cope with
- DNOs are regulated by Ofgem in terms of levels of investment
- Responsibility for plug-in points

Steady State – Strengths of the Marches

- Heat maps available to indicate opportunities
- Current industry diversifying to new technology
- Significant renewable potential in rural areas
- More comfortable and fits with a 'wait and see' approach
- More time to demonstrate technology and reduce costs
- Inertia in the economy

Steady State – Weaknesses in the Marches

- Grid constraints – demand and supply
- Planning Policy (e.g. Building Regulations)
- Lack of awareness and intelligence
- Economic consequences of climate change
- Some innovative businesses but not widespread
- Connections for large scale projects

Steady State – Opportunities in the Marches

- Biomass – forestry and animal bi-products
- Wind
- Solar
- Local generation and consumption e.g. co-location of renewables such as solar and business parks
- Demonstrators and case studies
- Community ownership
- Inclusion of new businesses models
- Innovation funding
- Electrical efficiency
- Lobby regulator for capacity

Steady State – Threats to the Marches

- Rural areas left behind e.g. EV
- Slow uptake from local government e.g. PV
- EV coming quicker than infrastructure
- Limitations related to AONB and other area designations
- Local resistance to renewables (anti wind and solar)

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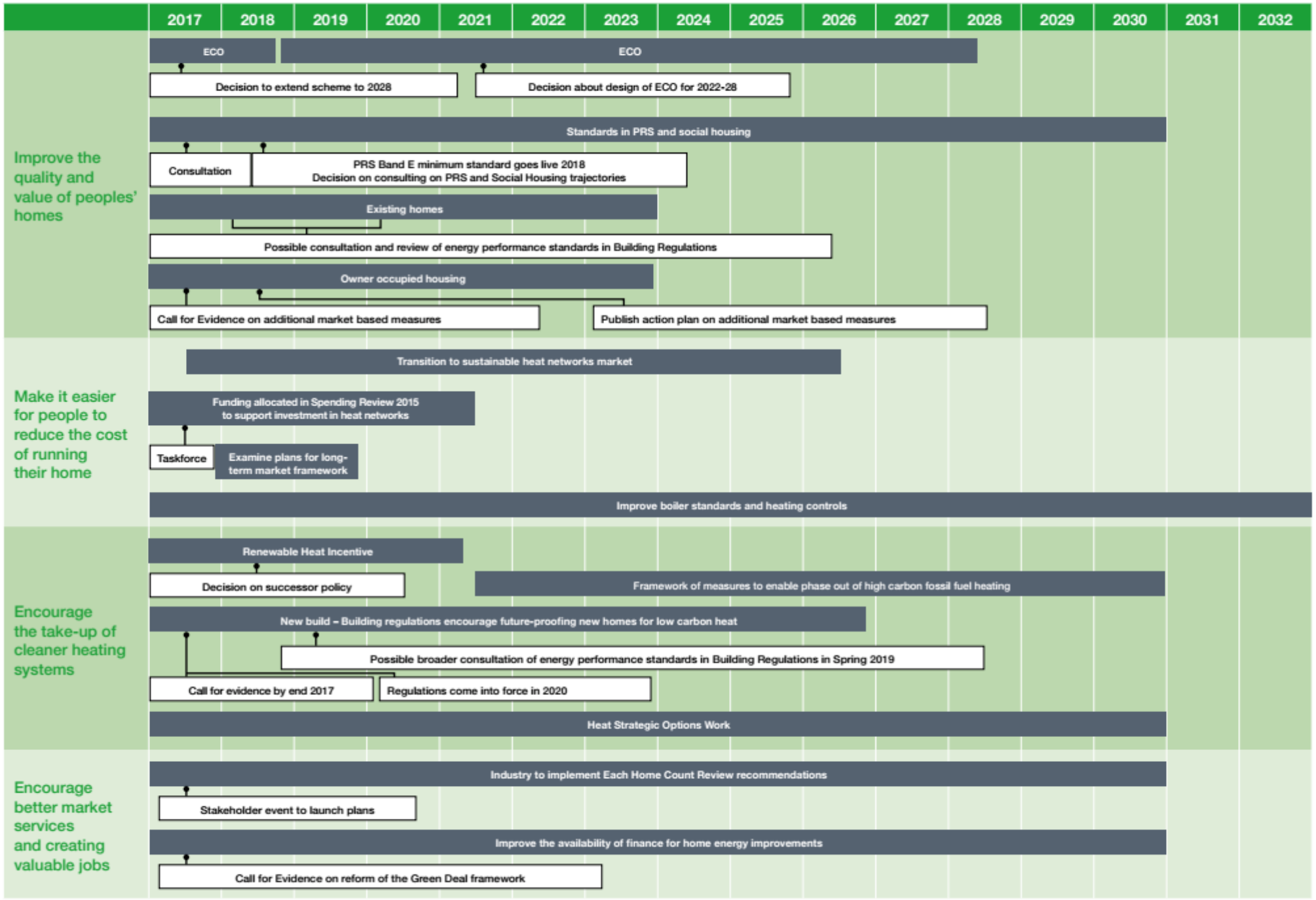
Appendix V Clean Growth Strategy Transition Plans

The following four pages set out government policy plans to 2032, and include a number of areas in which new policies or successor policies to current support has not yet been set out, in particular in relation to:

- Business energy efficiency (consultation on support 2018)
- Changes to minimum standards
- Low carbon heat technology support - successor policy to the Renewable Heat Incentive to be decided 2018
- Development of industrial energy efficiency scheme 2018
- Development of policy framework to support decarbonisation of heavy industry 2018-2021
- Decision on future design of ECO (domestic energy efficiency funds) 2021
- Review of energy performance standards in Building Regulations 2019
- Low carbon freight detailed plans set out 2021 building on innovation trials
- Low carbon electricity generation no further support before 2025, existing Feed-In Tariff scheme closes 2019

Homes


2017
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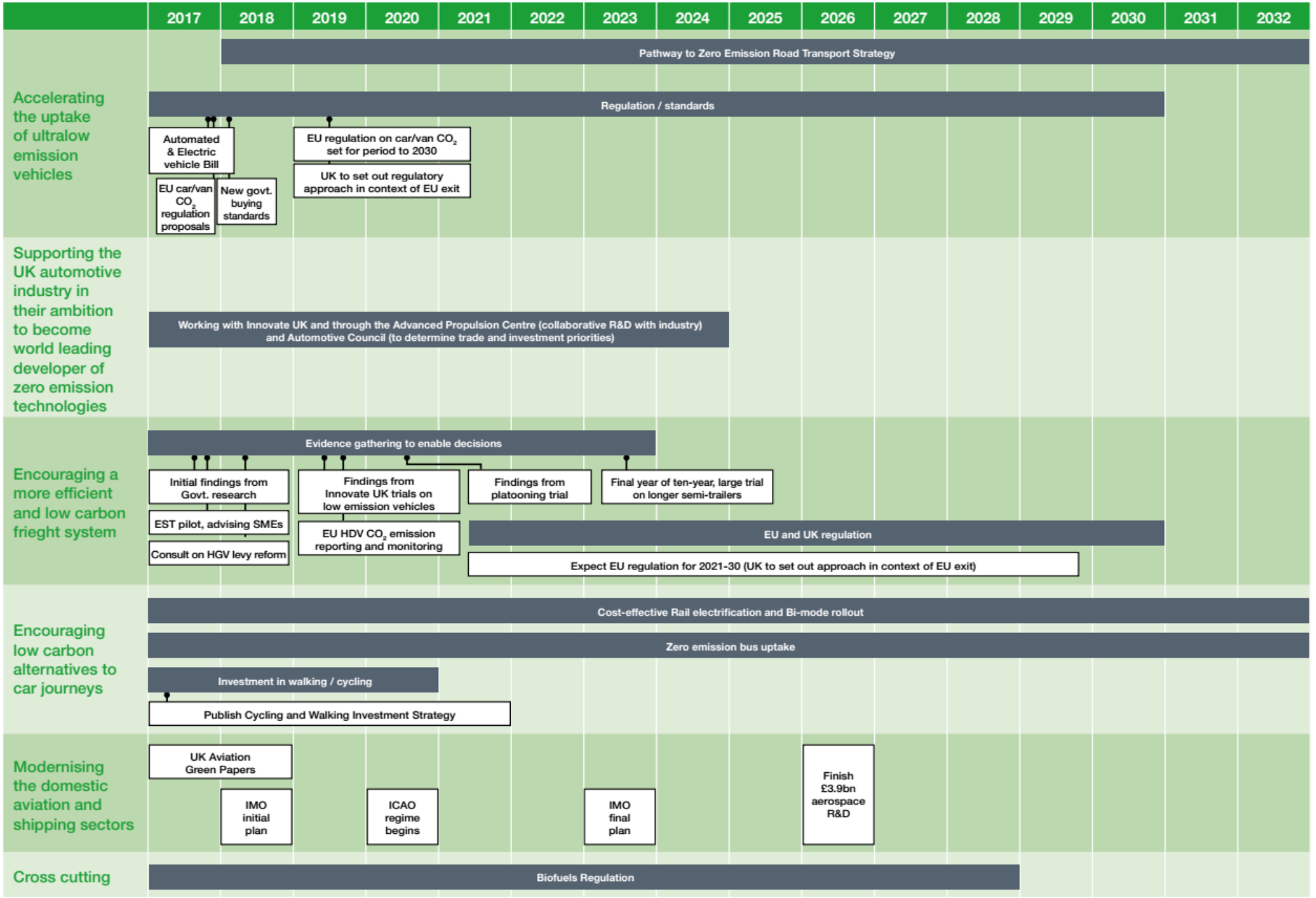
Improve the quality and value of peoples' homes
ECO
ECO
Decision to extend scheme to 2028
Decision about design of ECO for 2022-28
Standards in PRS and social housing
Consultation
PRS Band E minimum standard goes live 2018
Decision on consulting on PRS and Social Housing trajectories
Existing homes
Possible consultation and review of energy performance standards in Building Regulations
Owner occupied housing
Call for Evidence on additional market based measures
Publish action plan on additional market based measures
Make it easier for people to reduce the cost of running their home
Transition to sustainable heat networks market
Funding allocated in Spending Review 2015 to support investment in heat networks
Taskforce
Examine plans for long-term market framework
Improve boiler standards and heating controls
Encourage the take-up of cleaner heating systems
Renewable Heat Incentive
Decision on successor policy
Framework of measures to enable phase out of high carbon fossil fuel heating
New build – Building regulations encourage future-proofing new homes for low carbon heat
Possible broader consultation of energy performance standards in Building Regulations in Spring 2019
Call for evidence by end 2017
Regulations come into force in 2020
Heat Strategic Options Work
Encourage better market services and creating valuable jobs
Industry to implement Each Home Count Review recommendations
Stakeholder event to launch plans
Improve the availability of finance for home energy improvements
Call for Evidence on reform of the Green Deal framework

Transport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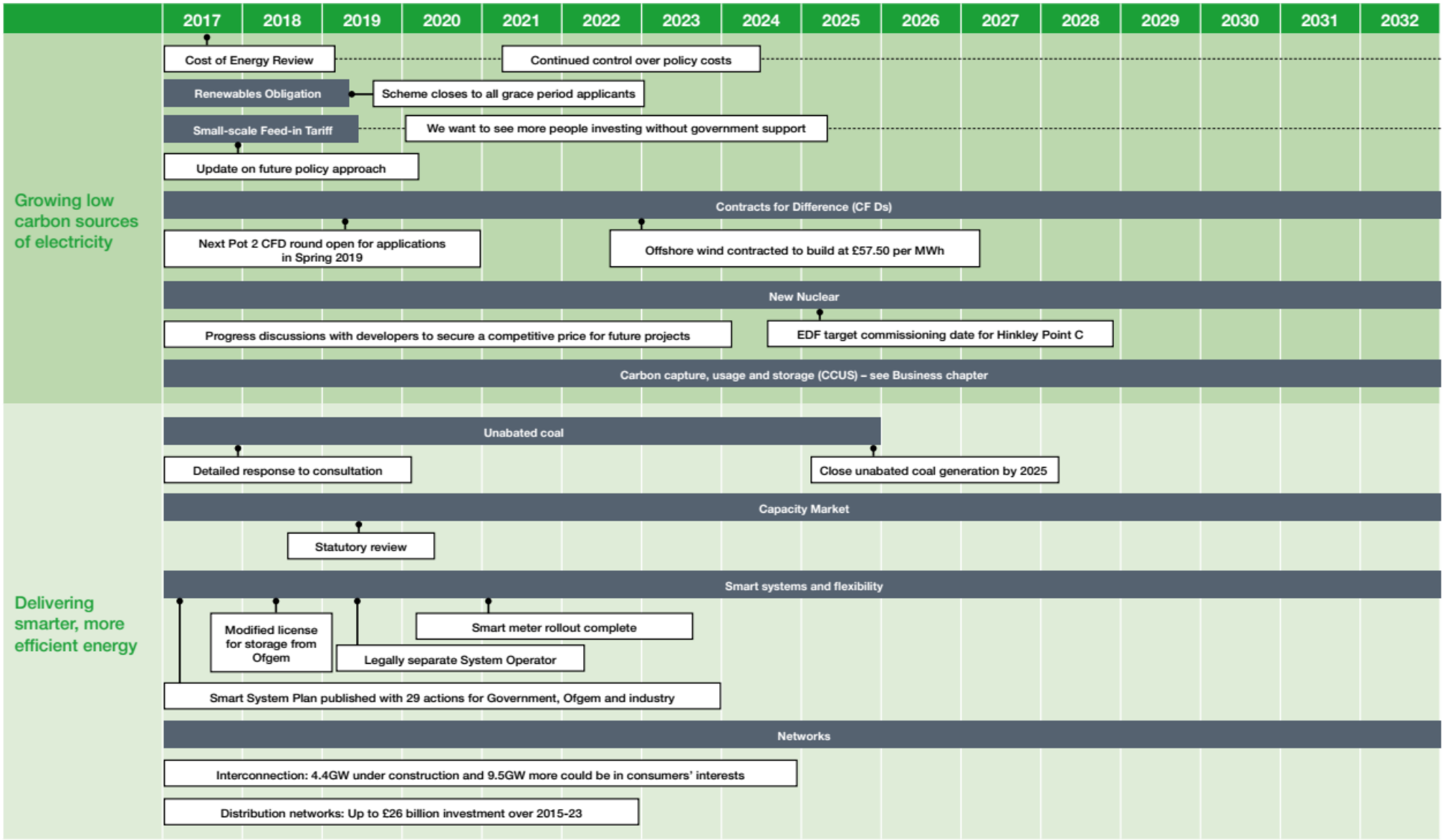
Accelerating the uptake of ultralow emission vehicles
Pathway to Zero Emission Road Transport Strategy
Regulation / standards
Automated & Electric vehicle Bill
EU car/van CO2 regulation proposals
New govt. buying standards
EU regulation on car/van CO2 set for period to 2030
UK to set out regulatory approach in context of EU exit
Supporting the UK automotive industry in their ambition to become world leading developer of zero emission technologies
Working with Innovate UK and through the Advanced Propulsion Centre (collaborative R&D with industry) and Automotive Council (to determine trade and investment priorities)
Encouraging a more efficient and low carbon frieght system
Evidence gathering to enable decisions
Initial findings from Govt. research
EST pilot, advising SMEs
Consult on HGV levy reform
Findings from Innovate UK trials on low emission vehicles
EU HDV CO2 emission reporting and monitoring
Findings from platooning trial
Final year of ten-year, large trial on longer semi-trailers
EU and UK regulation
Expect EU regulation for 2021-30 (UK to set out approach in context of EU exit)
Encouraging low carbon alternatives to car journeys
Cost-effective Rail electrification and Bi-mode rollout
Zero emission bus uptake
Investment in walking / cycling
Publish Cycling and Walking Investment Strategy
Modernising the domestic aviation and shipping sectors
UK Aviation Green Papers
IMO initial plan
ICAO regime begins
IMO final plan
Finish £3.9bn aerospace R&D
Cross cutting
Biofuels Regulation

Power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Growing low carbon sources of electricity
Cost of Energy Review
Continued control over policy costs
Renewables Obligation
Scheme closes to all grace period applicants
Small-scale Feed-in Tariff
We want to see more people investing without government support
Update on future policy approach
Contracts for Difference (CF Ds)
Next Pot 2 CFD round open for applications in Spring 2019
Offshore wind contracted to build at £57.50 per MWh
New Nuclear
Progress discussions with developers to secure a competitive price for future projects
EDF target commissioning date for Hinkley Point C
Carbon capture, usage and storage (CCUS) – see Business chapter
Delivering smarter, more efficient energy
Unabated coal
Detailed response to consultation
Close unabated coal generation by 2025
Capacity Market
Statutory review
Smart systems and flexibility
Modified license for storage from Ofgem
Smart meter rollout complete
Legally separate System Operator
Smart System Plan published with 29 actions for Government, Ofgem and industry
Networks
Interconnection: 4.4GW under construction and 9.5GW more could be in consumers' interests
Distribution networks: Up to £26 billion investment over 2015-23

Business and Industry