

**REPORT SUMMARY SHEET  
WEST OF ENGLAND ENERGY STRATEGY**

**Purpose**

To present the proposed basis of the West of England Energy Strategy for approval.

**Summary**

This report sets out the proposed basis of the West of England Energy Strategy. The purpose of the Energy Strategy is:

*A diverse, resilient and affordable energy system that enables economic growth and reduces greenhouse emissions.*

Key objectives include:

- Upgrade energy infrastructure to underpin clean and inclusive growth.
- Drive energy efficiency measures to keep costs down for businesses and local people (increasing productivity).
- Increase the local production of clean energy that is sustainable and resilient.
- Invest in science, research and innovation, including energy storage and grid technologies.

Success will mean cleaner air, lower energy bills, lower emissions and greater economic security.

**Recommendation**

**That approval be given to the proposed basis of the West of England Energy Strategy**

**Contact officer:** Helen Edelstyn

**Position:** Senior Policy Manager

**Email:** Helen.Edelstyn@westofengland.gov.uk

**REPORT TO: JOINT COMMITTEE**

**DATE: 1 FEBRUARY 2019**

**REPORT TITLE: WEST OF ENGLAND ENERGY STRATEGY**

**DIRECTOR: JESSICA LEE, HEAD OF POLICY AND STRATEGY**

**AUTHOR: HELEN EDELSTYN, SENIOR POLICY MANAGER**

### **Purpose of Report**

- 1 To present the proposed basis of the West of England Energy Strategy for approval.

### **Recommendation**

- That approval be given to the proposed basis of a West of England Energy Strategy.

### **Background / Issues for Consideration**

- 2.1. In Spring/Summer 2017, the Government (Department for Business, Energy & Industrial Strategy) awarded all LEPs £50,000 to develop Energy Strategies. The funding forms part of the Government's commitment to a diverse, resilient, affordable and clean energy system that reduces greenhouse emissions, as set out within the national Clean Growth Strategy. The West of England Joint Committee has overall accountability for the funding, as it is LEP funding.

- 2.2 The purpose of the West of England Energy Strategy is:

*A diverse, resilient and affordable energy system that enable economic growth and reduces greenhouse emissions.*

Key objectives include:

- Upgrade energy infrastructure to underpin clean and inclusive growth.
- Drive energy efficiency measures to keep costs down for businesses and local people (increasing productivity).
- Increase the local production of clean energy that is sustainable and resilient.
- Invest in science, research and innovation, including energy storage and grid technologies.

Success will mean cleaner air, lower energy bills, lower emissions and greater economic security.

- 2.3 The Strategy is aligned to the national Climate Change Act [2008] timeframe and covers the period to 2050.

- 2.4 The proposed basis of the West of England Energy Strategy is attached as appendix 1 to this report and is in PowerPoint form.
- 2.5 Engagement with constituent authorities and key stakeholders has helped to shape the development of this piece of work. This has included a workshop with stakeholders to test the evidence base as well as a series of meetings with Directors and Officers from the four constituent authorities.
- 2.6 Once the proposed basis of a West of England Energy Strategy has been agreed, more detailed work will begin on action planning. This work will be co-ordinated by WECA officers, alongside constituent councils and other key stakeholders. Ongoing oversight and governance will be provided by existing WECA and LEP governance structures (WECA Directors; Chief Executives; Infrastructure Advisory Board; Overview & Scrutiny Committee; Joint Committee).

## Consultation

- WECA Chief Executive and Chief Executives / relevant Directors / Sustainability Officers across constituent councils.
- LEP Board
- Infrastructure Advisory Board
- WECA Overview and Scrutiny Committee (any comments from the 23 January meeting of the Overview and Scrutiny Committee will be reported at the Joint Committee meeting).
- Workshop with sustainability / low carbon sector

## Public Sector Equality Duties

- 4.1 The public sector equality duty created under the Equality Act 2010 means that public authorities must have due regard to the need to:
- Eliminate unlawful discrimination, harassment and victimization and other conduct prohibited by the Act.
  - Advance equality of opportunity between people who share a protected characteristic and those who do not.
  - Foster good relations between people who share a protected characteristic and those who do not.
- 4.2 The Act explains that having due regard for advancing equality involves:
- Removing or minimizing disadvantages suffered by people due to their protected characteristics.
  - Taking steps to meet the needs of people from protected groups where these are different from the needs of other people.
  - Encouraging people from protected groups to participate in public life or in other activities where their participation is disproportionately low.
- 4.3 The general equality duty therefore requires organisations to consider how they could positively contribute to the advancement of equality and good relations. It requires equality considerations to be reflected in the design of policies and the delivery of services, including policies, and for these issues to be kept under review.
- 4.4 Implementation of the strategy will support inclusive growth

## **Finance Implications, including economic impact assessment where appropriate**

- 5 The objectives and actions set out within the Energy Strategy are in line with existing councils' corporate planning and budgeting commitments.

Officers will work with Government and other external partners to explore additional funding routes such as The South West Energy Hub. Any additional funding identified will require consideration / agreement through the agreed decision-making process.

Advice given by: Malcolm Coe, Director of Investment and Corporate Services

## **Legal Implications**

- 6 There are no specific legal implications arising as a result of this report.

Advice given by: Shahzia Daya, Director of Legal

## **Appendices:**

Appendix 1 – Basis for the West of England Energy Strategy (PowerPoint attached)

## **Background papers:**

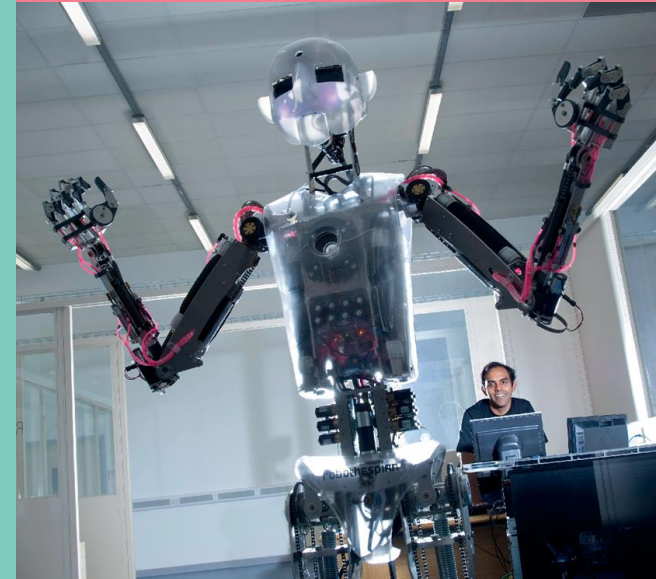
- West of England Evidence – regen 'transforming energy'
- Towards a sustainable energy future for the West of England - CSE

## **West of England Combined Authority Contact:**

Any person seeking background information relating to this item should seek the assistance of the contact officer for the meeting who is Ian Hird / Tim Milgate on 0117 332 1486; or by writing to West of England Combined Authority, 3 Rivergate, Temple Way, Bristol BS1 6ER; email:

[democratic.services@westofengland-ca.gov.uk](mailto:democratic.services@westofengland-ca.gov.uk)

# ENERGY STRATEGY



- Policy context
- Purpose of an Energy Strategy
- What we know about our energy system
- Direction of travel
- Next steps

# POLICY CONTEXT

- The Climate Change Act [2008] commits the UK to reducing greenhouse gas emissions by at least 80% by 2050 [when compared to 1990 levels]
- National Industrial Strategy 2017
- National Clean Growth Strategy 2017
- UN Intergovernmental Panel on Climate Change [IPCC] report to limit the impacts of climate change to 1.5 degrees Celsius

## Locally

- Clean growth is at the heart of our operating framework and emerging Local Industrial Strategy

# GOVERNMENT REQUIREMENT

- Government requirement that all LEPs develop local Energy Strategies [granted £50k]

Local Energy Strategies should:

- Provide local leadership and influence ...
  - towards an integrated, smart, resilient and secure energy system
  - towards greater affordability (to alleviate fuel poverty and increase business productivity)
  - to reduce greenhouse gas emissions (meeting legally binding national targets)



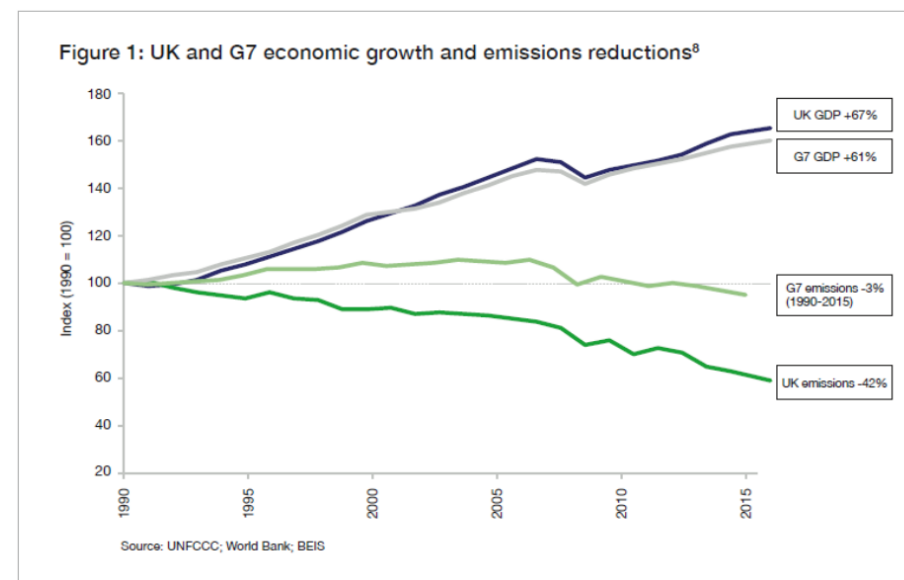
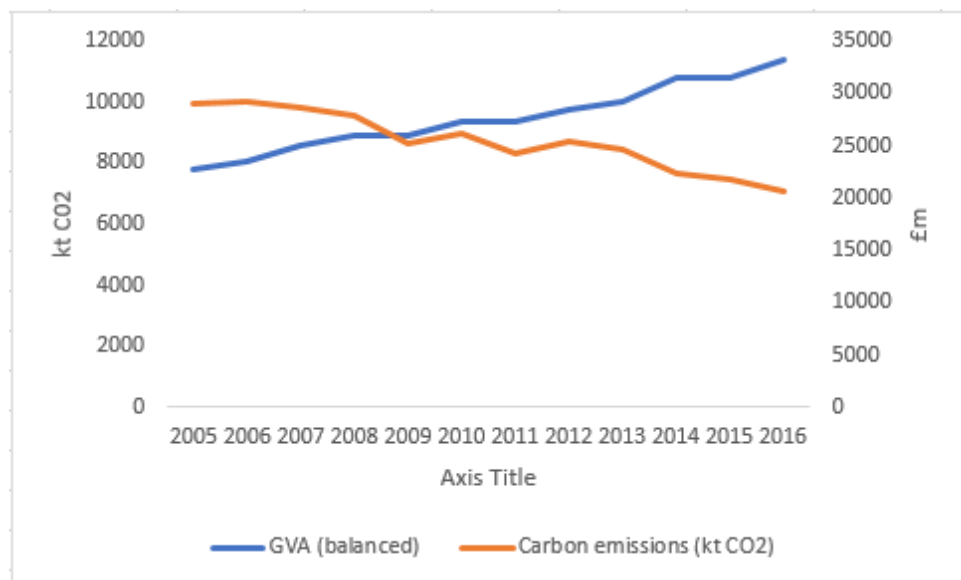
# PURPOSE OF WOE ENERGY STRATEGY

*A diverse, resilient, and affordable energy system that enables economic growth whilst reducing greenhouse gas emissions in line with national targets*

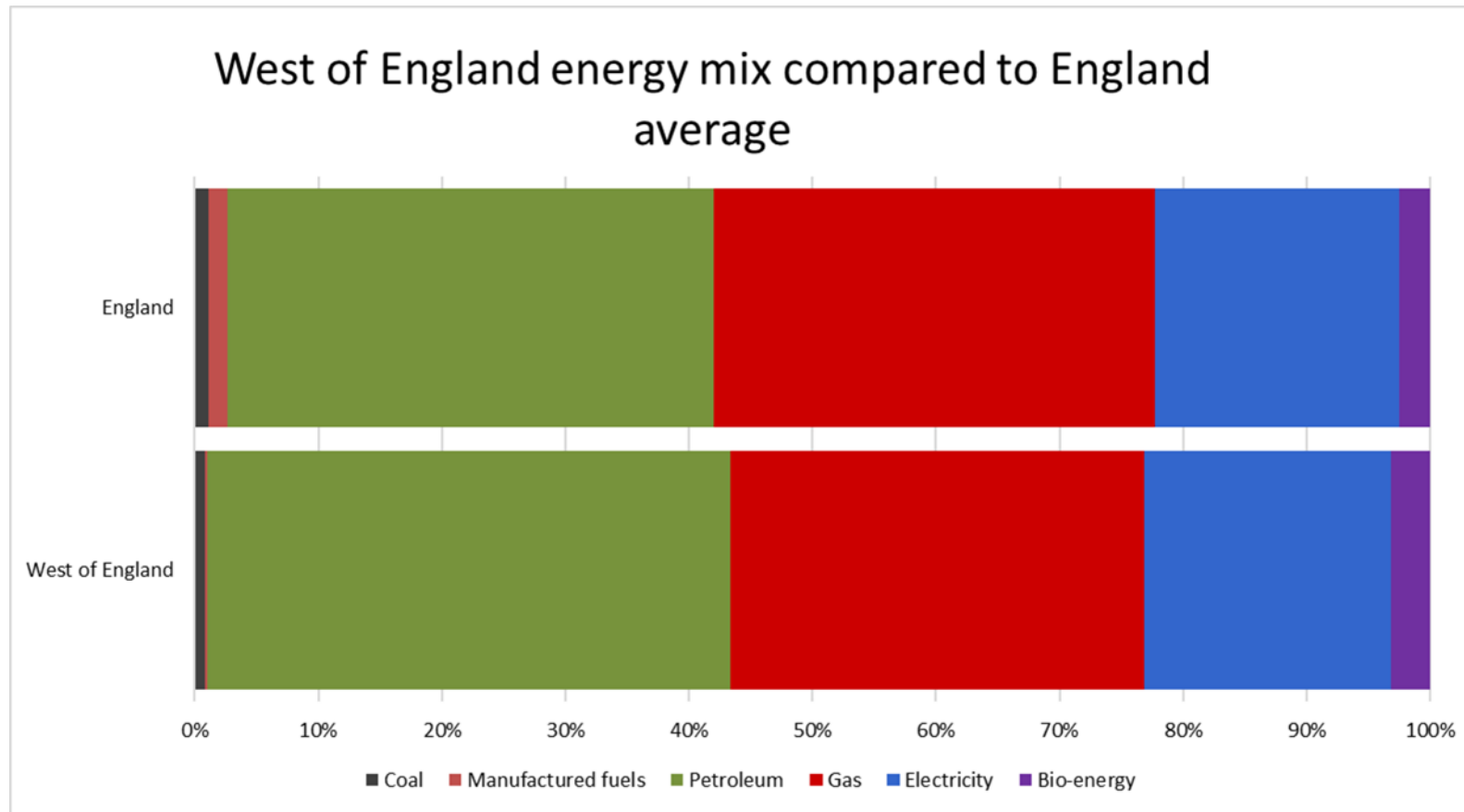
- Upgrade energy infrastructure to underpin clean and inclusive economic growth as set out in local industrial strategy
- Drive energy efficiency measures to keep costs down for businesses and local people
- Increase the local production of clean energy that is sustainable and resilient
- Invest in science, research and innovation, including energy storage and grid technologies

Success will mean cleaner air, lower energy bills, lower emissions and greater economic security

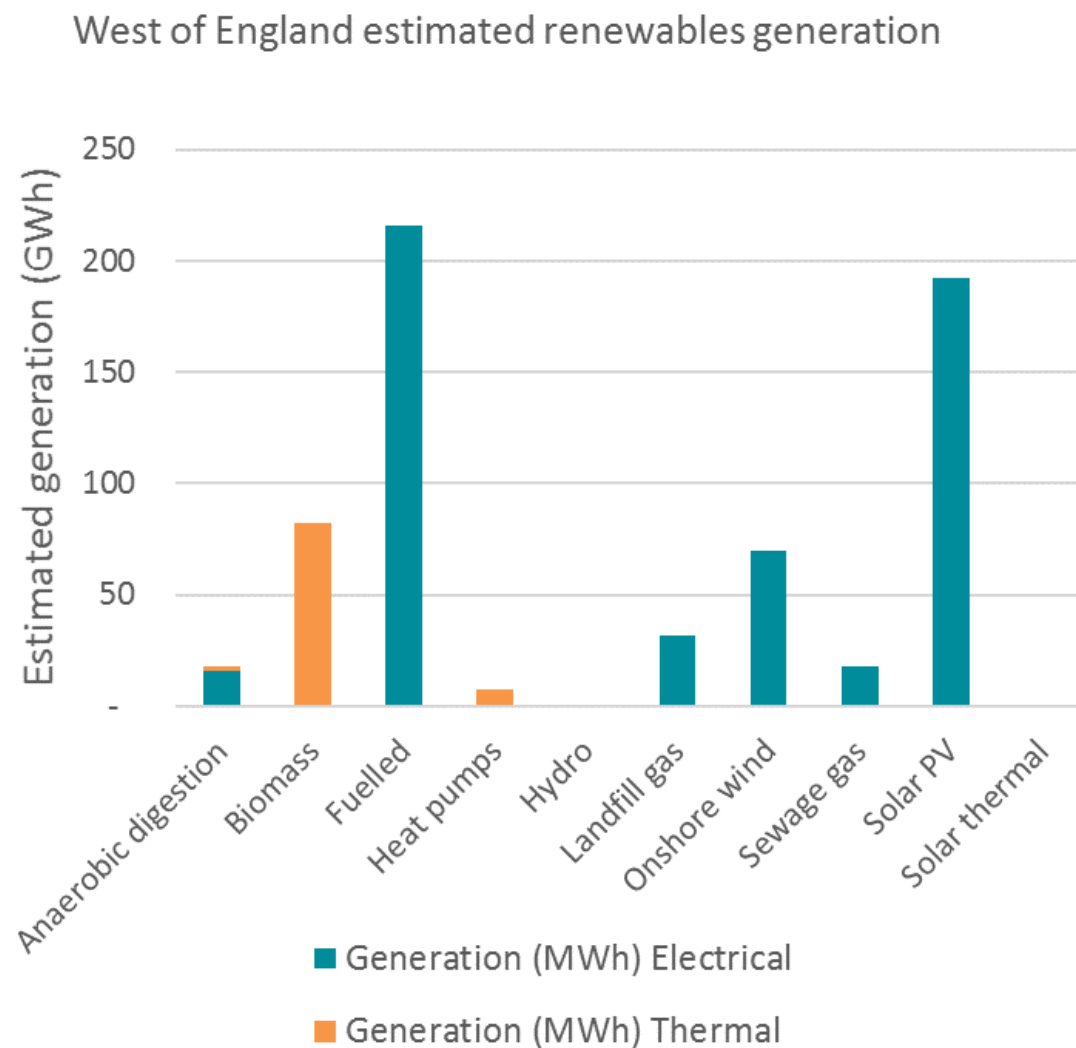
# OUR ECONOMY IS GROWING, WHILE OUR EMISSIONS ARE GOING DOWN



# OUR ENERGY MIX

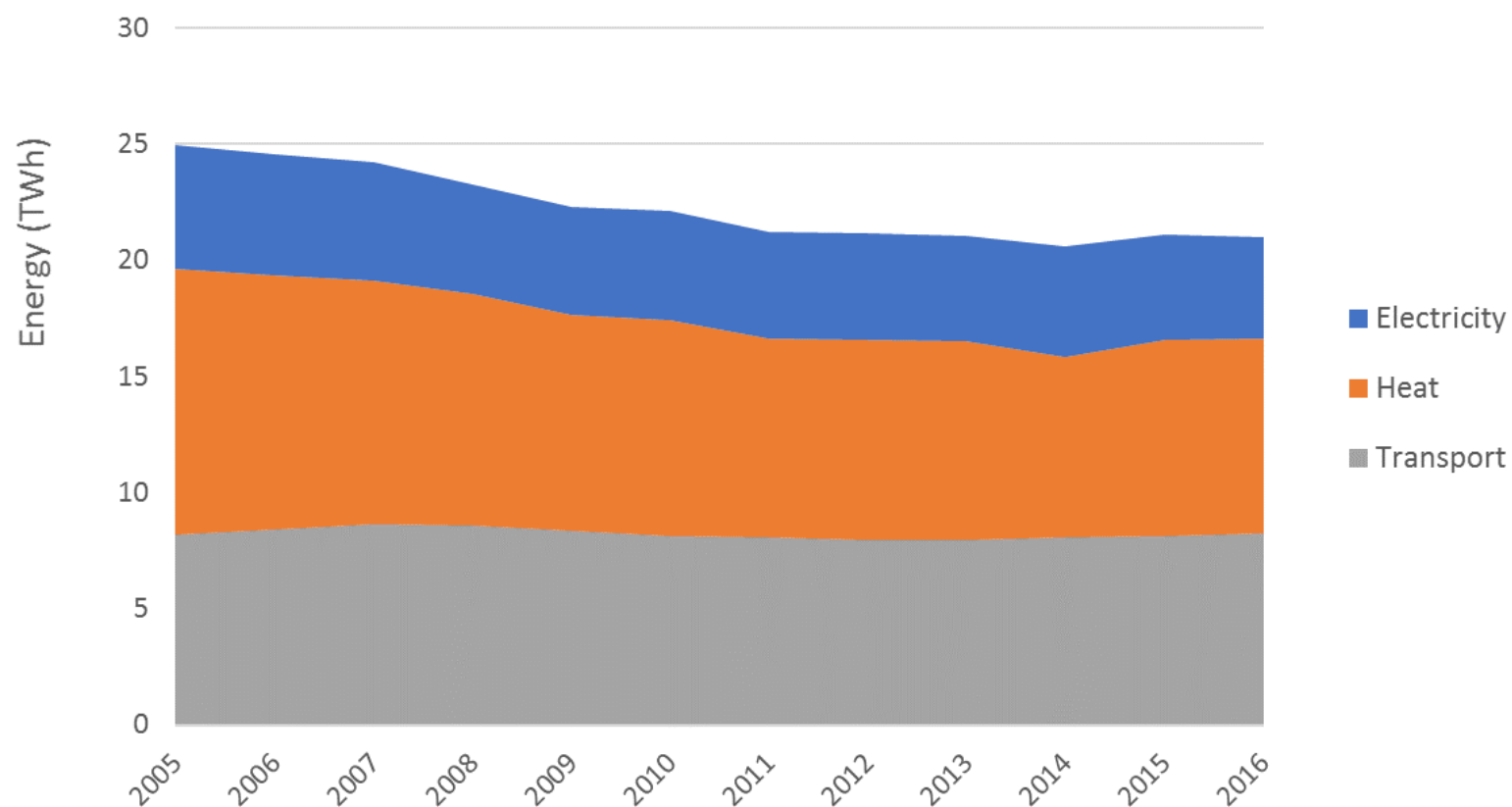


# RENEWABLES IN WEST OF ENGLAND



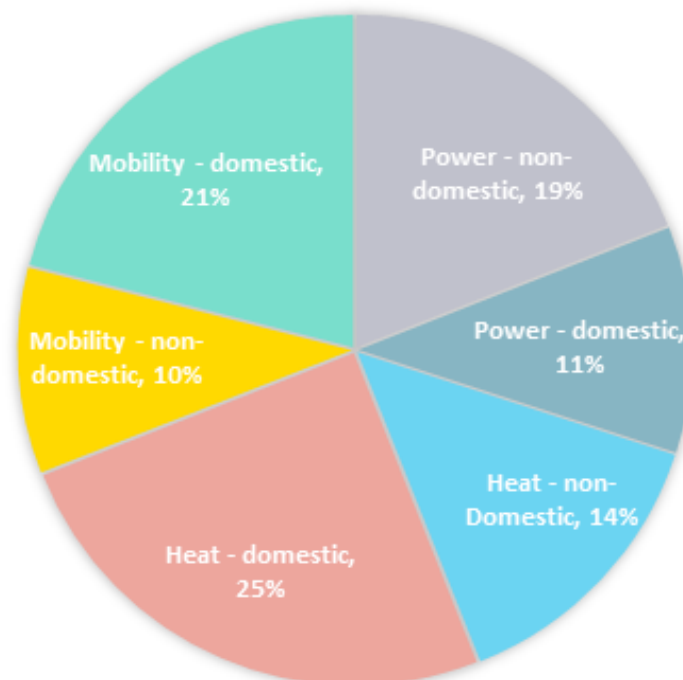
# HOW WE USE OUR ENERGY

West of England energy consumption  
over time by use

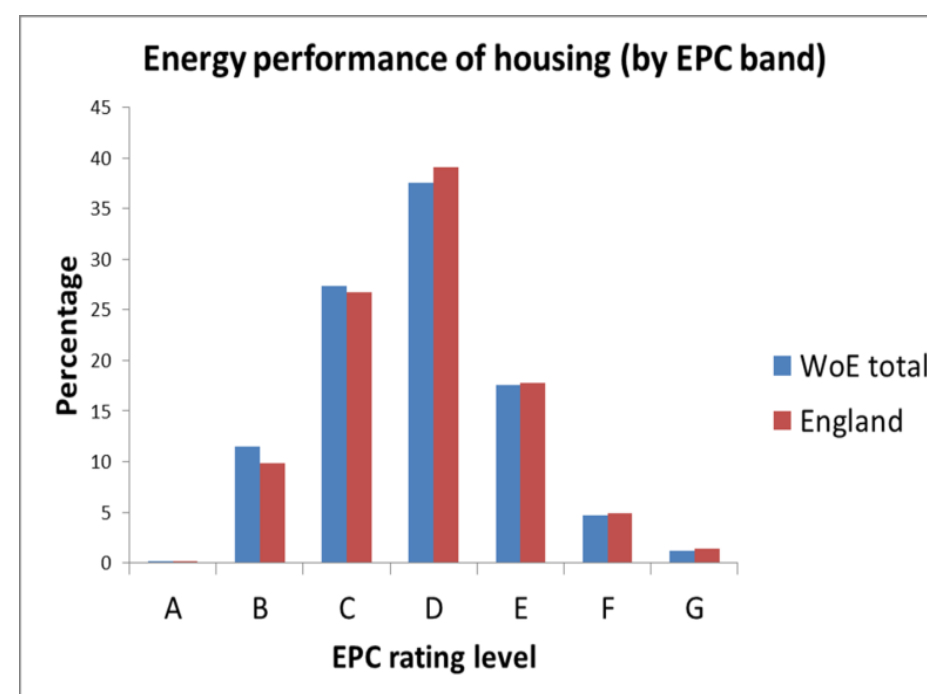
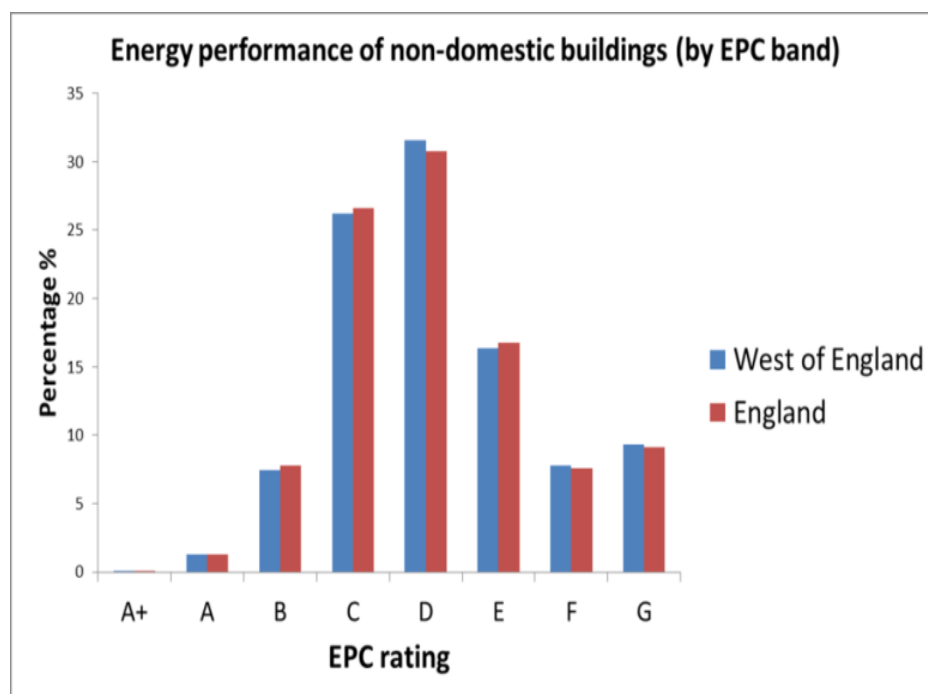


# CARBON EMISSIONS

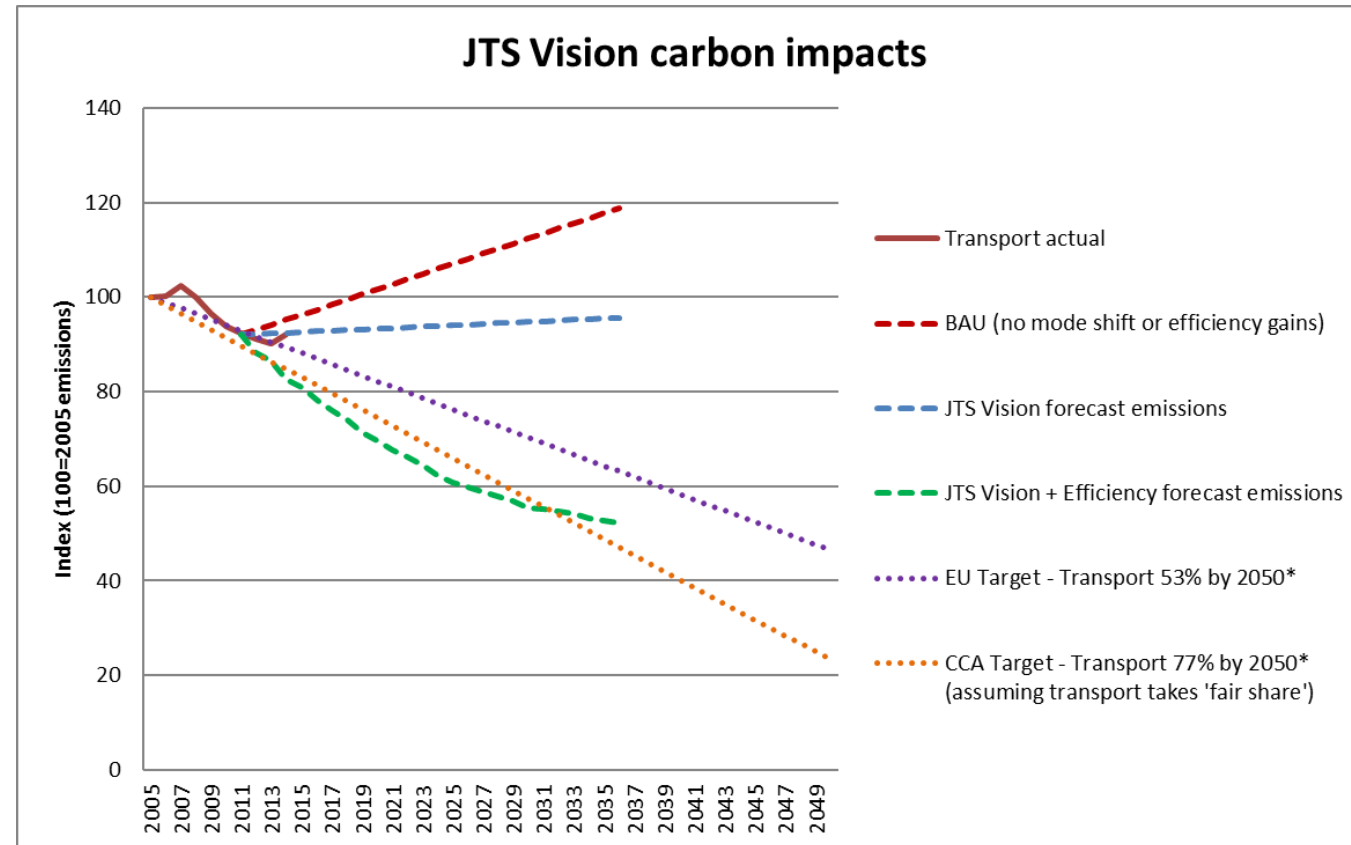
**WOE ENERGY RELATED CARBON EMISSIONS BY  
APPLICATION AND SECTOR**



# OUR BUILDINGS COULD BE MORE ENERGY EFFICIENT



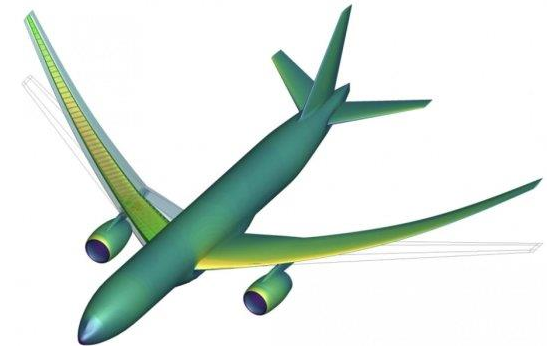
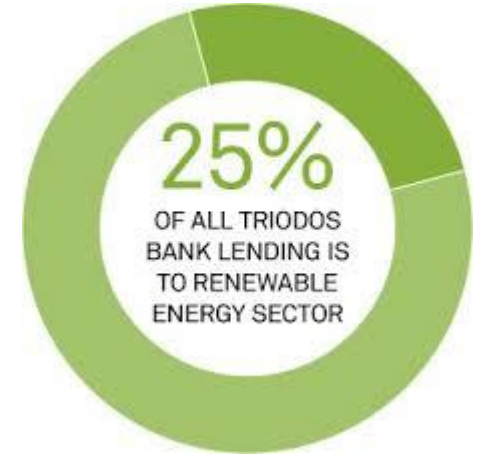
# CARBON EMISSIONS IMPACT OF THE JOINT LOCAL TRANSPORT PLAN





# LEADER IN CLEAN GROWTH INNOVATION

- Low Carbon sector in WoE employs over 19,000 people, generating £2.4 billion, more than any other English region
- Global leader in green finance - Triodos Bank
- Low Carbon high value design - Leonardo helicopter blades, Airbus wings of the future, NCC light weight materials
- University spin outs - Robial 'pee power'
- R&D - UoB battery storage and nuclear, UoBath smart tech and IAAPS
- High tech cluster - creates the platform for smart energy tech



# DIRECTION OF TRAVEL

# CLEAN GROWTH STRATEGY



Improving Business and Industry Efficiency and Supporting Clean Growth



Improving our Homes



Accelerating the Shift to Low Carbon Transport



Delivering Clean, Smart, Flexible Power



Enhancing the Leading in the Public Sector

Theme	National Goal	Evidence base	Objectives
Improving Business and Industry Efficiency	<p>Enable businesses and industry to improve energy efficiency by at least 20 per cent by 2030.</p> <p>Halve the energy usage of new buildings by 2030</p>	<p>Energy use from Industry and Commercial sector has reduced 27% 2005-2016</p> <p>65% of non-domestic buildings perform below Government's 2030 energy efficiency target.</p>	<p>Reduce energy use in commercial and industrial buildings across the region by at least 20% by 2030 from a 2015 baseline.</p>
		<p>40% of regions energy consumption is for heating</p> <p>Parts of the West of England has areas producing significant quantities of waste heat</p>	<p>Recycle waste heat produced in industrial processes to provide benefits to local businesses and populations</p>

Theme	National Goal	Evidence Base	Objectives
Improving Our Homes	<p>As many homes as possible are improved by EPC Band C by 2035</p> <p>Halve the energy usage of new buildings by 2030</p>	60% of homes in West of England perform below Government's 2035 energy efficiency targets	All homes to meet the governments 2035 energy efficiency target where practical, cost-effective and affordable.
		1 in 9 homes (52,000) in fuel poverty	Improve energy efficiency in all households identified as fuel poor by 2030
		150k homes off gas network	Increase the number of homes and businesses taking up renewable heat opportunities
		<p>105,500 new homes by 2036, will increase energy demand across the region</p> <p>40k new homes granted planning permission will add 7% to current housing-related carbon emissions in the region</p>	Minimise energy demand and maximise the use of renewable energy, where viable meeting all demands for heat and power without increasing carbon emissions [JSP policy 5, point 6]

Theme	National Goal	Evidence Base	Objectives
Accelerating the Shift to Low Carbon Transport	30% reduction in emissions in transport by 2032	Transport is the largest energy consumer in the West of England, consumption from transport has not reduced since 2005.	Reduce energy consumption in transport
		<p>The delivery of the new homes being planned in the West of England to 2036 could result in a 22% increase from 2014 transport emissions</p> <p>Governments aspiration is that all new vehicles will be EVs by 2040</p>	Create the enabling conditions to increase new ULEV vehicles registrations
		The region occupies a key location on strategic road network and has increasing interactions with major conurbations e.g. Cardiff City region and Greater London.	Enable increased use of Ultra Low Emissions Vehicles (ULEV) for users of strategic road network

Theme	National Goal	Evidence Base	Objectives
Delivering clean, smart and flexible power	85% of electricity supply from clean sources by 2032	12% of electricity in the West of England is generated from 'within-region' renewables.	25% of electricity generated in the region supplied by local renewable generation by 2032
		Smart energy is an emerging opportunity and potential area of strength for the West Of England	The West of England to develop it's position as a leader in smart energy

Theme	National Goal	Evidence Base	Objectives
Leading in the Public Sector	Carbon emissions to be reduced by 80% by 2050	The public sector has demonstrated good progress in reducing energy use.	<p>UA's have different carbon emissions reductions targets measured from different baselines</p> <ul style="list-style-type: none"> <li>• BANES reduce carbon emissions 80% by 2050 on a 1990 baseline</li> <li>• Bristol reduce carbon emissions by 60% by 2035 on a 2005 baseline</li> <li>• North Somerset reduce carbon emissions by 50% by 2035 on a 2014 baseline</li> <li>• South Gloucestershire reduce by 50% by 2025 on a 1990 baseline</li> </ul> <p>The aggregated carbon emissions of the West of England UA's reduced by 50% by 2035 (on 2014 levels)</p>
		The region boasts continued investment and world leading examples of bringing innovation, research, renewable energy products and processes to the market	Take ambitious action to catalyse low carbon market in the regions
		The region has proactive community and business sectors which have demonstrated leadership in energy efficiency, and renewables	Actively engage stakeholders to deliver actions and sustain a common strategic purpose and mutual benefit from collaborative action.



# DIRECTION OF TRAVEL ON ACTIONS

- Detailed action planning against the objectives

Potential actions to be considered:

- Support to encourage SMEs to take up energy efficiency measures [Low Carbon Fund]
- Better use of existing regulation, such as Minimum Energy Efficiency Standards [MEES]
- Heat Networks [recycling waste industrial heat]
- Support for the low carbon retrofit market [skills development]
- JSP commitment reflected in Local Plans [Minimise energy demand and maximise the use of renewable energy, where viable meeting all demands for heat and power without increasing carbon emissions [JSP policy 5, point 6]
- Support communities to include sustainable energy in their Neighbourhood Plans

To deliver this we will need to active lobby Government for funding

# NEXT STEPS

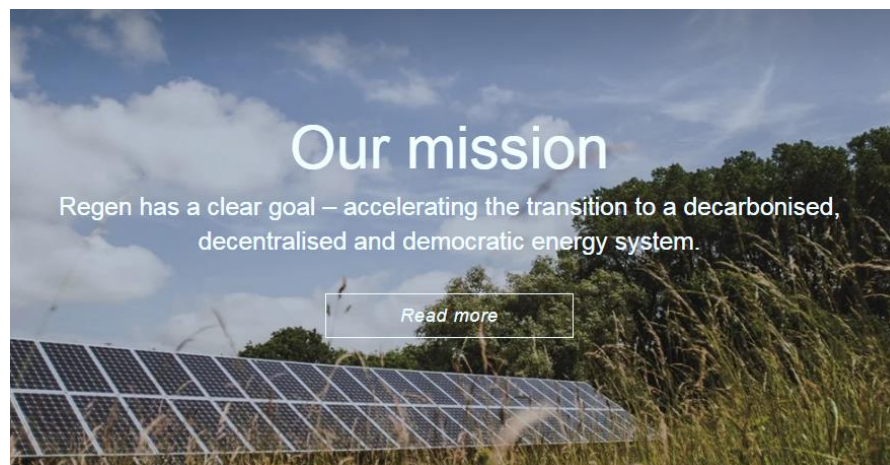
## Governance process

- 18<sup>th</sup> January LEP Board
  - 23<sup>rd</sup> January WECA Scrutiny
  - 25th January Infrastructure Advisory Board
  - 1<sup>st</sup> February Joint Committee
- 
- Ongoing governance oversight via existing LEP / WECA structures



# West of England Strategy Evidence

*October 2018*



Regen passionately believes that sustainable energy has a vital role at the heart of a successful economy and its thriving local communities.

We offer independent expert advice on all aspects of sustainable energy delivery. We use our technical, financial and policy knowledge to support a range of public and private sector organisations to make the most of their clean energy opportunities.

Regen was commissioned by the West of England Combined Authority to provide evidence in the form of data and high level analysis of the WoE energy system as it stands now, and could develop by 2032.

- [Notes on the National Grid Future Energy Scenarios](#)
- [Key elements of the electricity supply network](#)
- [Key elements of the gas supply network](#)
- [Map of off-gas grid LSOA areas](#)
- [Map of fuel poverty LSOA areas](#)
- [Heat networks in the WoE area](#)
- [Heat networks in GB](#)
- [Projected growth of DHN connections, according to National Grid FES 2018](#)
- [Built environment routes to decarbonisation](#)
- [Status of key WoE Electricity assets \(capacity and constraints\)](#)
- [WoE energy consumption facts](#)
- [WoE energy consumption compared to GB](#)
- [Electricity consumption by WoE LA](#)
- [Energy Consumption by fuel \(comparison with England\)](#)
- [Energy consumption by fuel \(south west comparison\)](#)
- [Historic energy consumption by fuel type](#)
- [Historic energy consumption by use](#)
- [Historic energy consumption by sector](#)
- [WoE renewable energy projects](#)
- [Installed capacity of renewable technologies in WoE LAs](#)
- How renewable generation in WoE compared to the rest of the UK
  - [Electricity](#)
  - [Heat](#)
- [WoE renewable energy generation facts](#)
- [Estimated percentage of electricity and energy met from renewable sources](#)
- [Seabank – transmission connected generation](#)
- Scenario analysis for energy supply in the WoE area (four scenarios based on the National grid FES 2018) out to 2032
  - [Electricity](#)
  - [Gas](#)
  - [Transport fuel](#)
- [Energy technology investment – levelized cost of energy](#)
- [Energy technology investment – levelized cost of energy \(historical trends\)](#)

Reference to the West of England refers to the local authorities of Bath and North East Somerset, Bristol, North Somerset and South Gloucestershire.

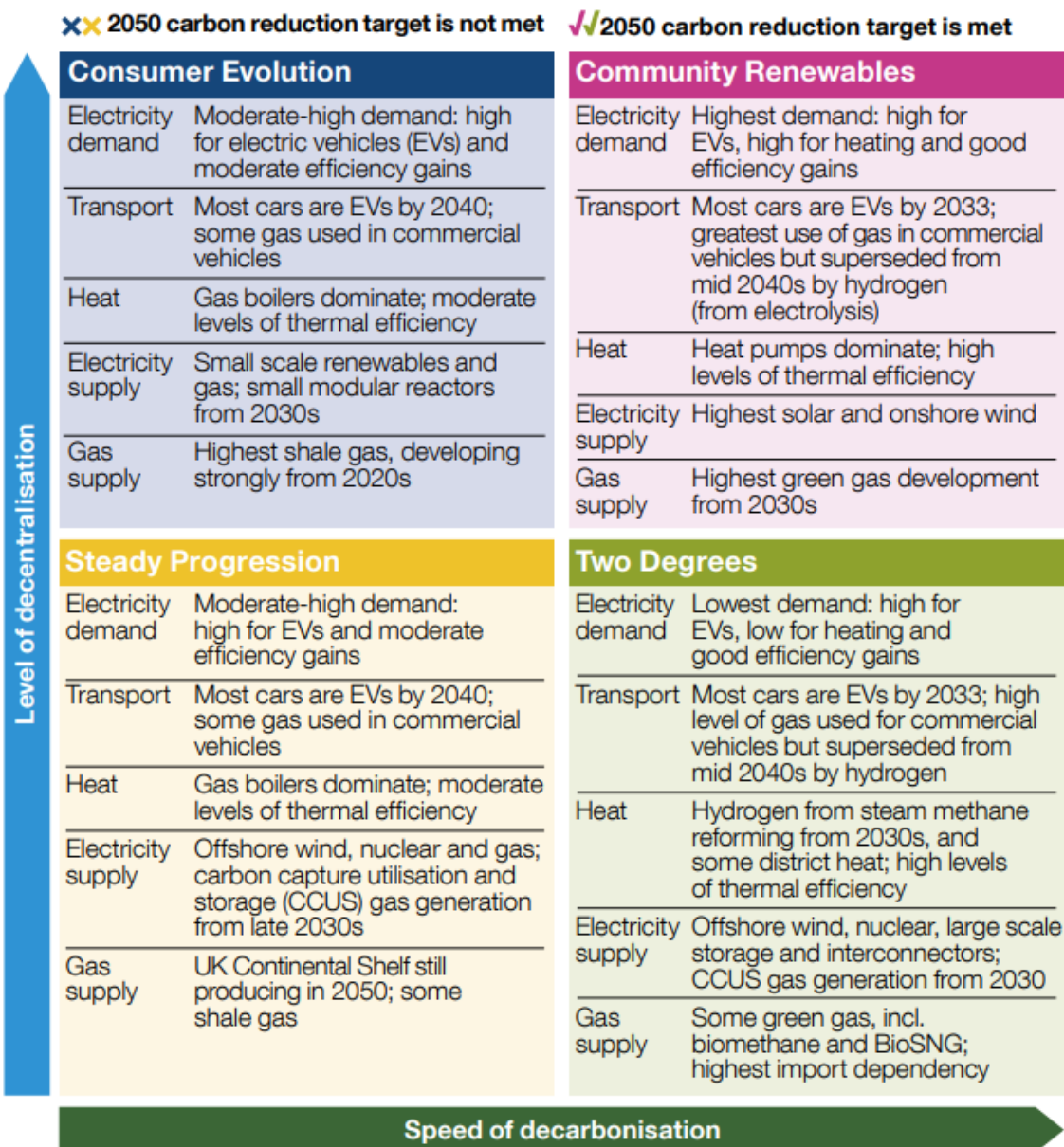
# Notes on the National Grid Future Energy Scenarios 2018

Every year, the National Grid produce a forecast of how energy will be generated and consumed in Great Britain.

This done by considering four scenarios;

Consumer evolution (CE)  
Steady Progression (SP)  
Community Renewables (CR)  
Two Degrees (TD)

In considering how the energy landscape may change over the next 25 years in the WoE area, we have used the approach set out in the NG FES.





# Key elements of the electricity supply network

nationalgrid

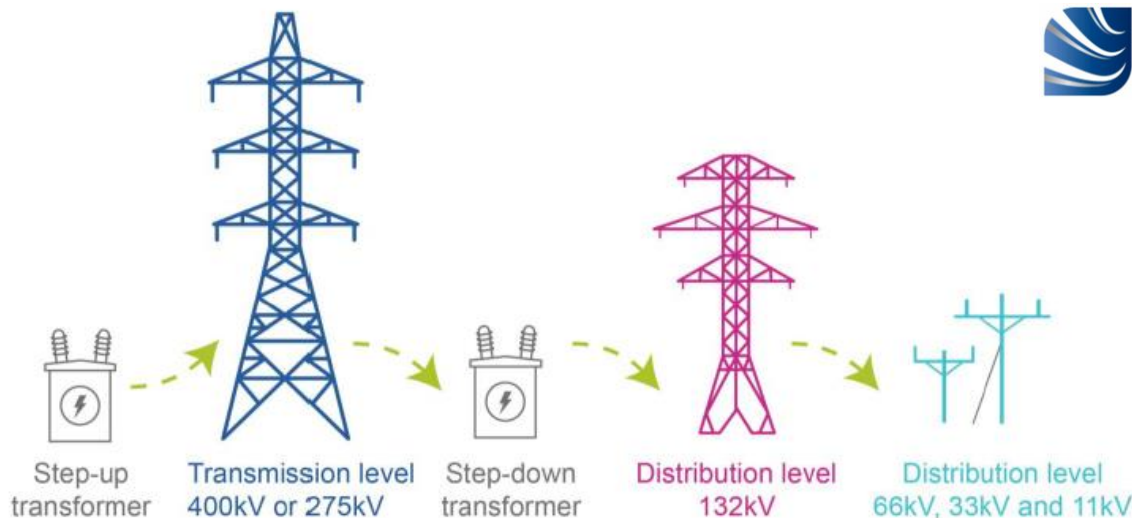
National Grid balance the system every second of every day, using a range of markets

## Electricity network

**WESTERN POWER DISTRIBUTION**  
*Serving the Midlands, South West and Wales*

**Scottish & Southern**  
Electricity Networks

Distribution Network Operators (DNOs) own and operate the cables that connect the transmission system to smaller generators and consumers. WoE has three DNO licence areas, WPD South West, WPD West midlands, SSE South.



Capacity market  
STOR  
FFR  
EFR

Source: Regen

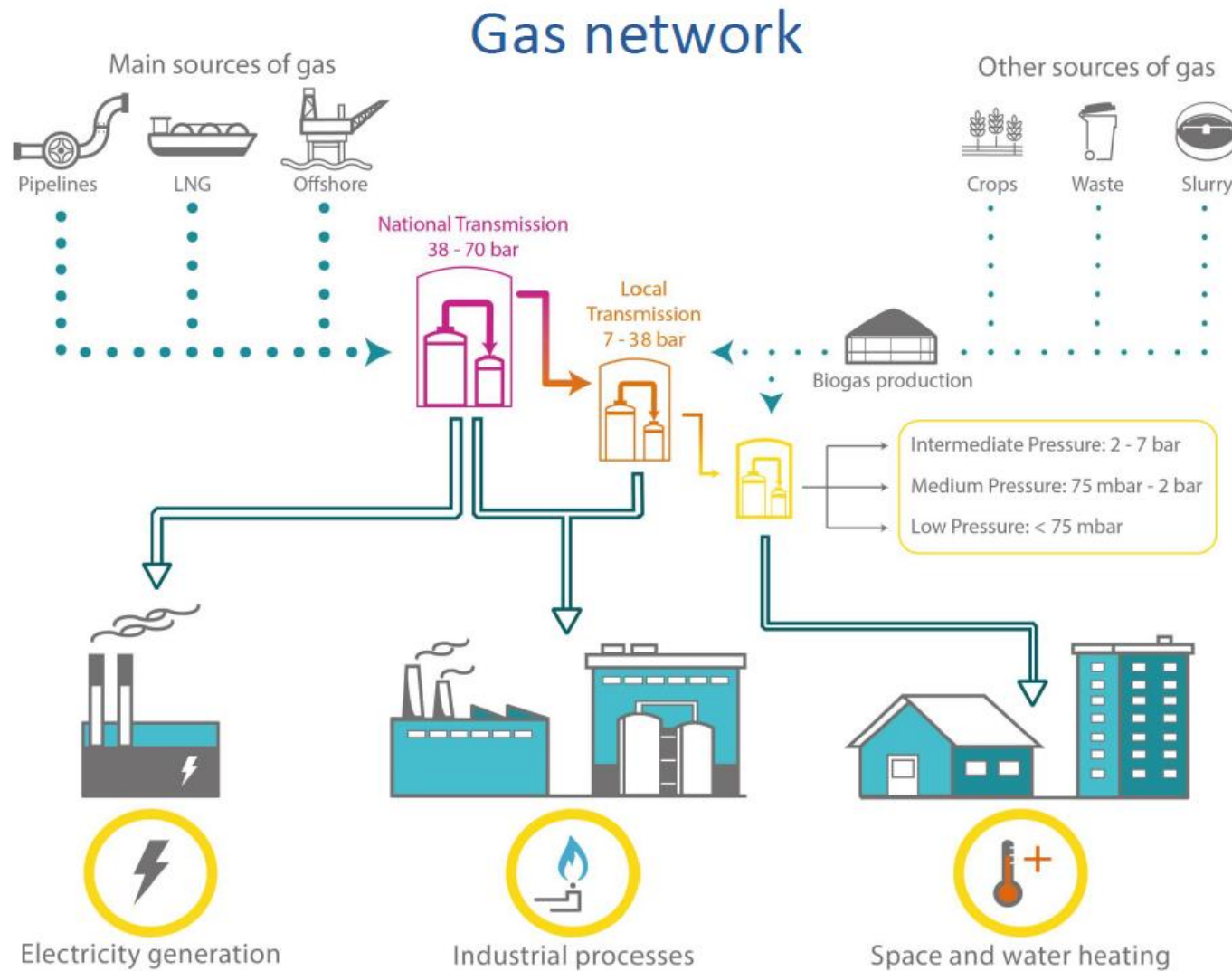


Energy Suppliers purchase enough power to meet the needs of their customers. Suppliers do not own or operate any network assets. WoE suppliers are:

Source Regen

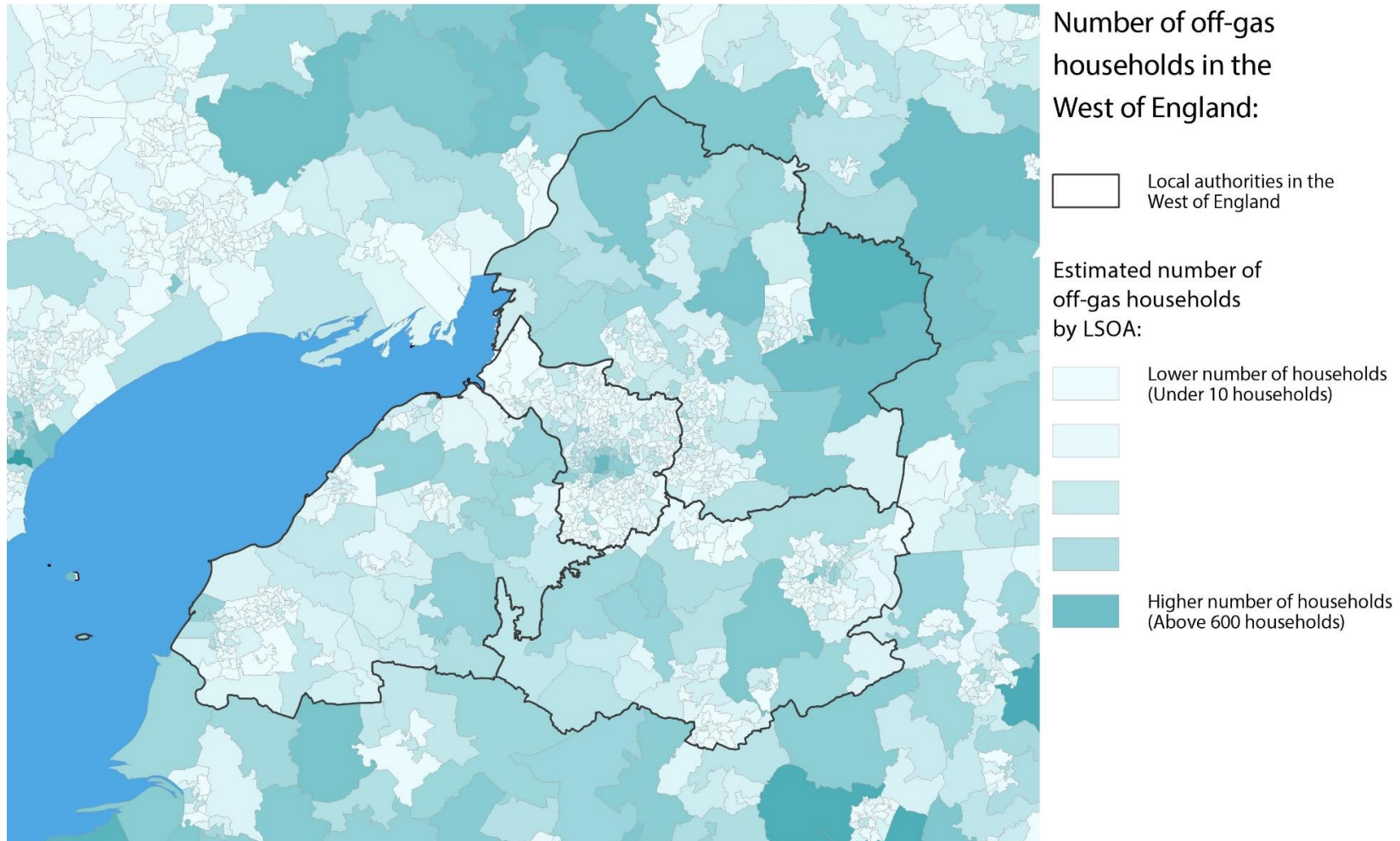
**BRISTOL**  
energy **pwc** energy

# Key elements of the gas supply network





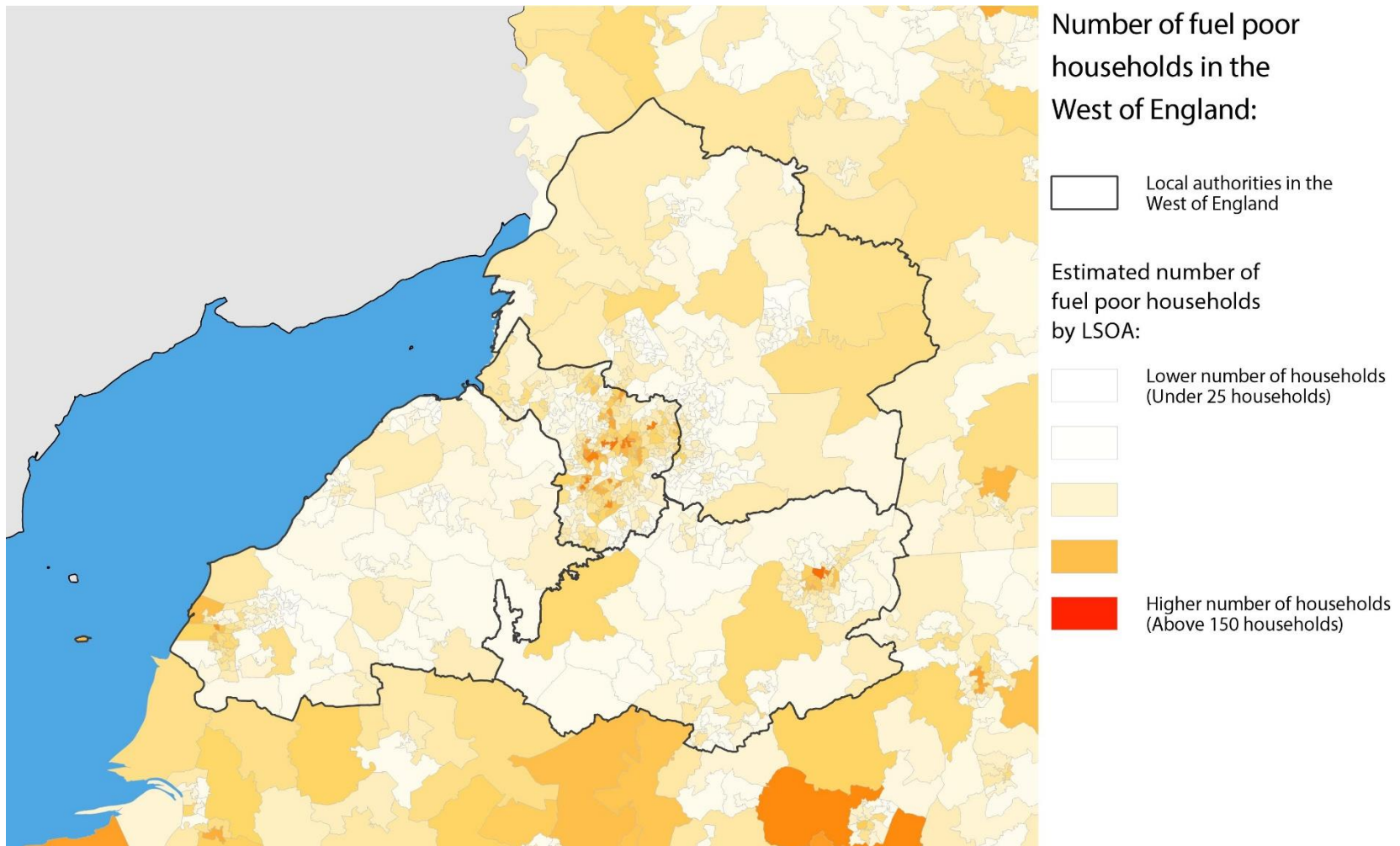
# Proportion of WoE connected to the gas network



Source: [Regen and Fuel poverty sub-regional statistics 2016](#)

Lower Super Output Areas (LSOA) are geographic areas that have consistent population sizes, typically between 1000 and 1500 people. WoE has rural areas, particularly in the North that have a high proportion of households off the gas grid. Conversely, Bristol is extremely well served by the gas grid.

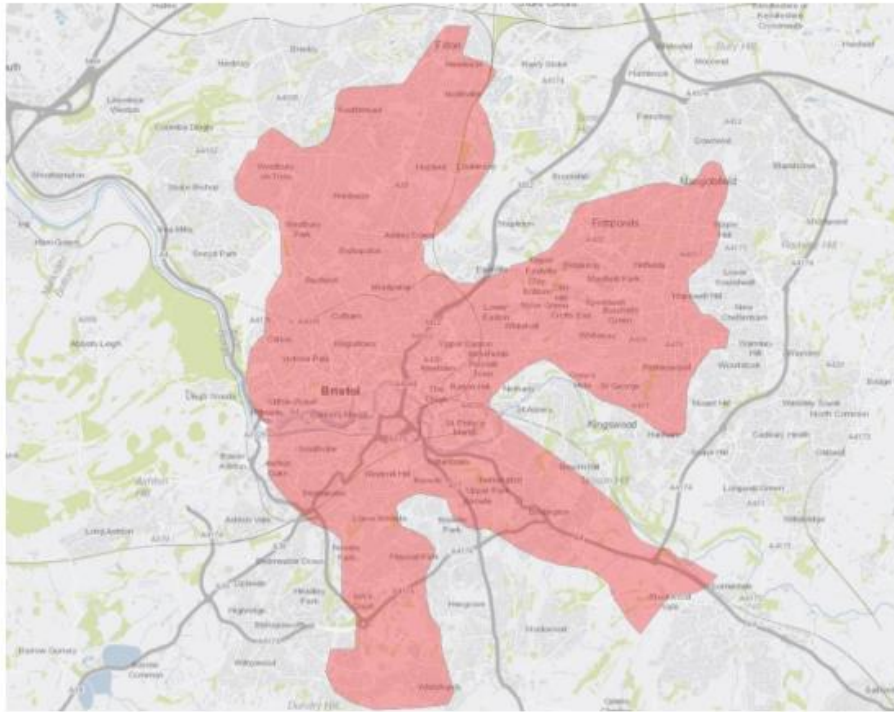
# Number of fuel poor households



Source: [Regen and Fuel poverty sub-regional statistics 2016](#)

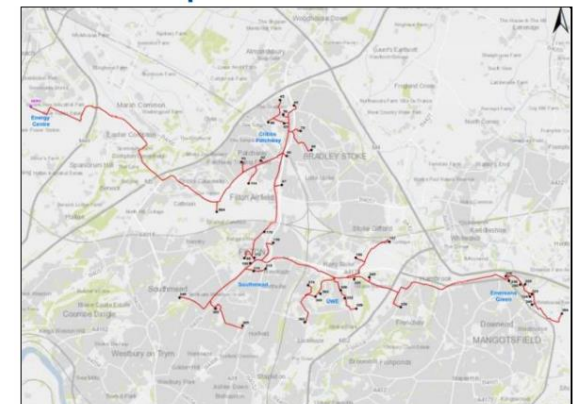
The definition of fuel poverty as used here, is if 10% of net household income is (or would be) spent on heating a home to normal standards of comfort. WoE does have areas where high numbers of people are classed as being fuel poor. This can often be in areas that do not have access to the cheapest form of heating fuel – grid connected gas.

# Heat networks



Bristol is utilising heat networks as a major component of the commitment to be Carbon Neutral by 2050. Phase 1 was expected to cost around £5m.

Other parts of the WoE area are exploring heat networks as a way to improve energy security and utilise waste heat, playing a role in a joined up approach to DHN opportunities. South Gloucestershire Council have submitted a masterplan option to the HNDU for a £34m project meeting demand from Cibbs Patchway, Airbus, GKN Aerospace and others from the SITA Severnside EfW site.





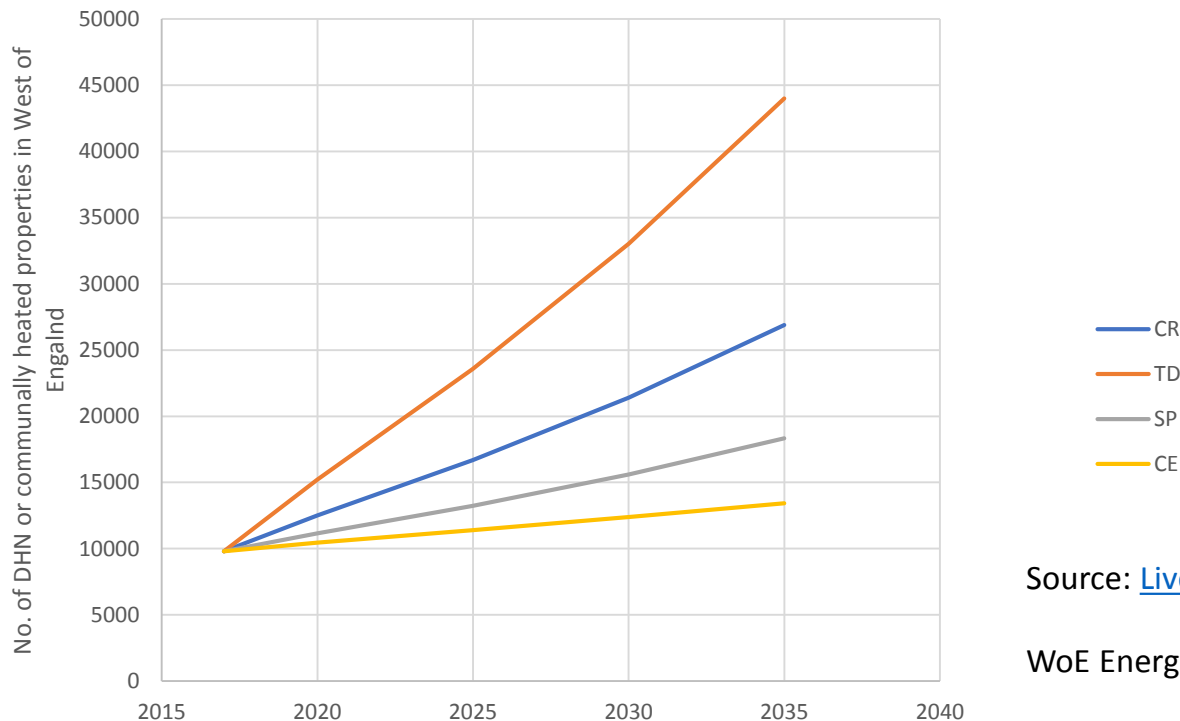


Work undertaken by Buro Happold Engineering in 2016 shows the spread of DHN capacity across GB.

The WoE area clearly shows a strong cluster of medium scale DHNs relative to the rest of the country. Currently, around 2% of the UK's buildings' heat demand is met via heat networks.

Source: [Buro Happold, 2016](#)

# Heat networks – future connections



Source: [Live tables on dwelling stock, MHCLG 2018](#)

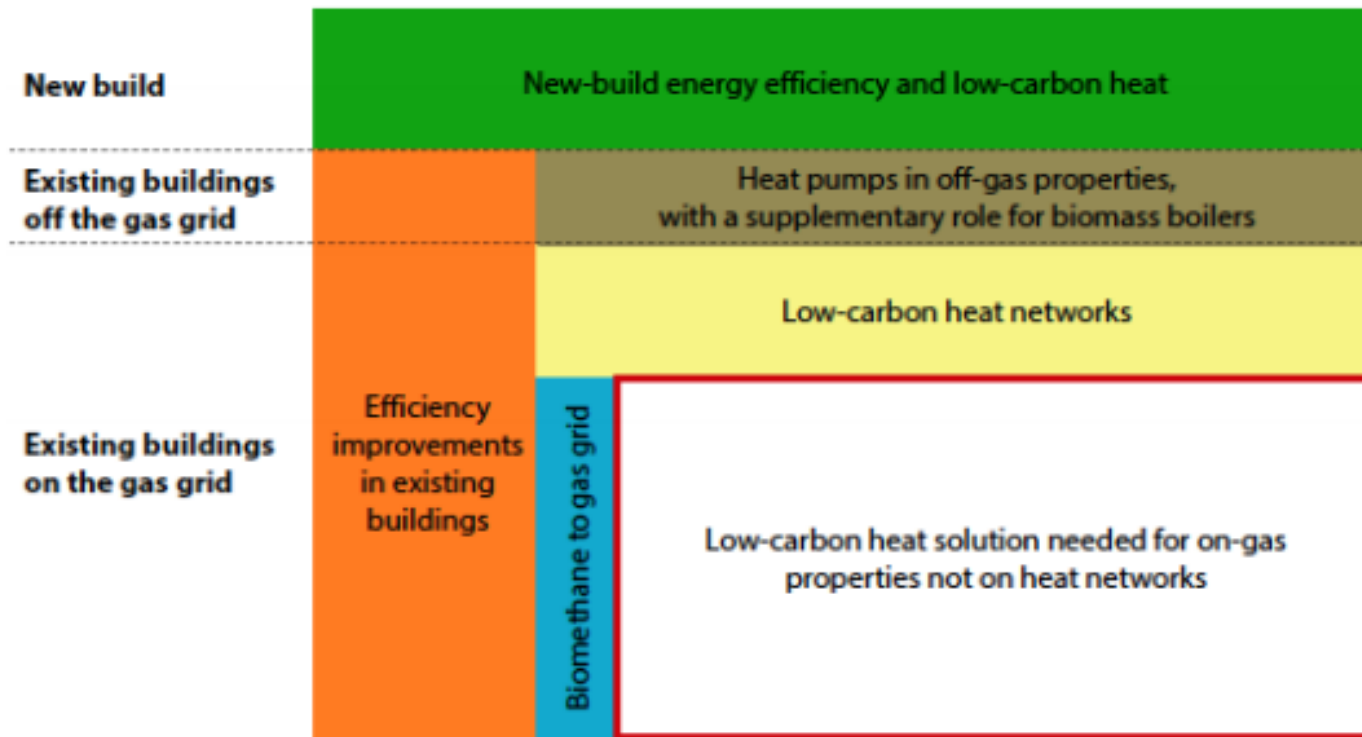
WoE Energy Strategy Evidence .xlsx, ANALYSIS | Housing

The WoE has approximately 490,000 homes. Nationally, around 2% of homes are heating via district heat networks or communal heating systems. This would suggest around 9,800 homes in the WoE area are heated this way.

The National Grid Future Energy Scenarios 2018 offers predictions on the growth of heat network connections using four scenarios. These have been used to illustrate the potential growth of connections to heat networks in the WoE LEP area out to 2035.

The most ambitious scenario (Two Degrees) shows that just under 10% of properties in the WoE area could be connected by 2035.

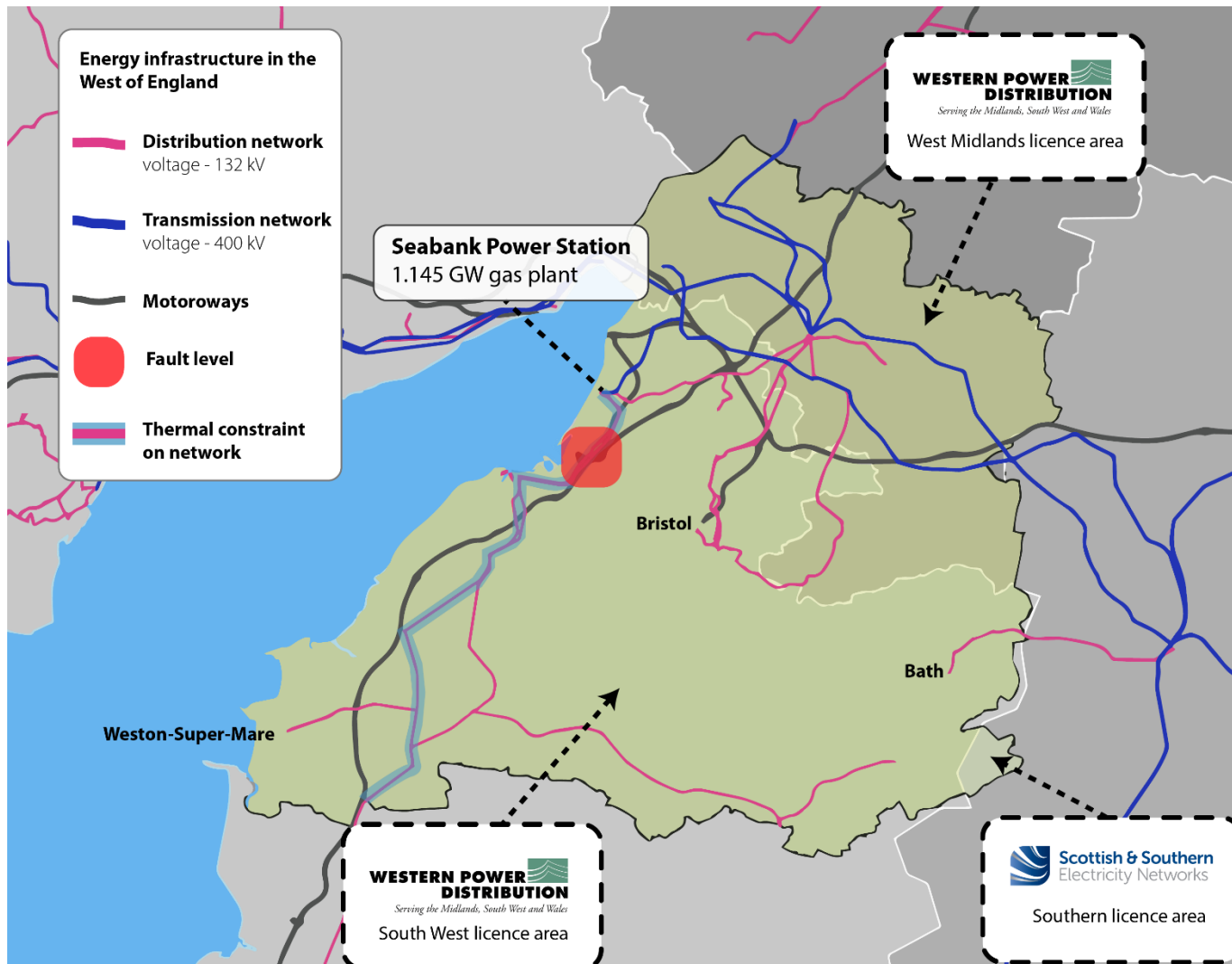
# Buildings and decarbonisation



Source: [Analysis of alternative UK heat decarbonisation pathways Imperial College, IPCC 2018](#)

Work undertaken by Imperial College London on behalf of the Committee for Climate change illustrates how meeting the UK's legally binding carbon targets still requires solutions for on-gas properties that are not on heat networks.

# Status of key WoE Electricity assets



The West of England LEP area straddles two Western Power Distribution licence areas, and a small part of the Scottish and Southern licence area.

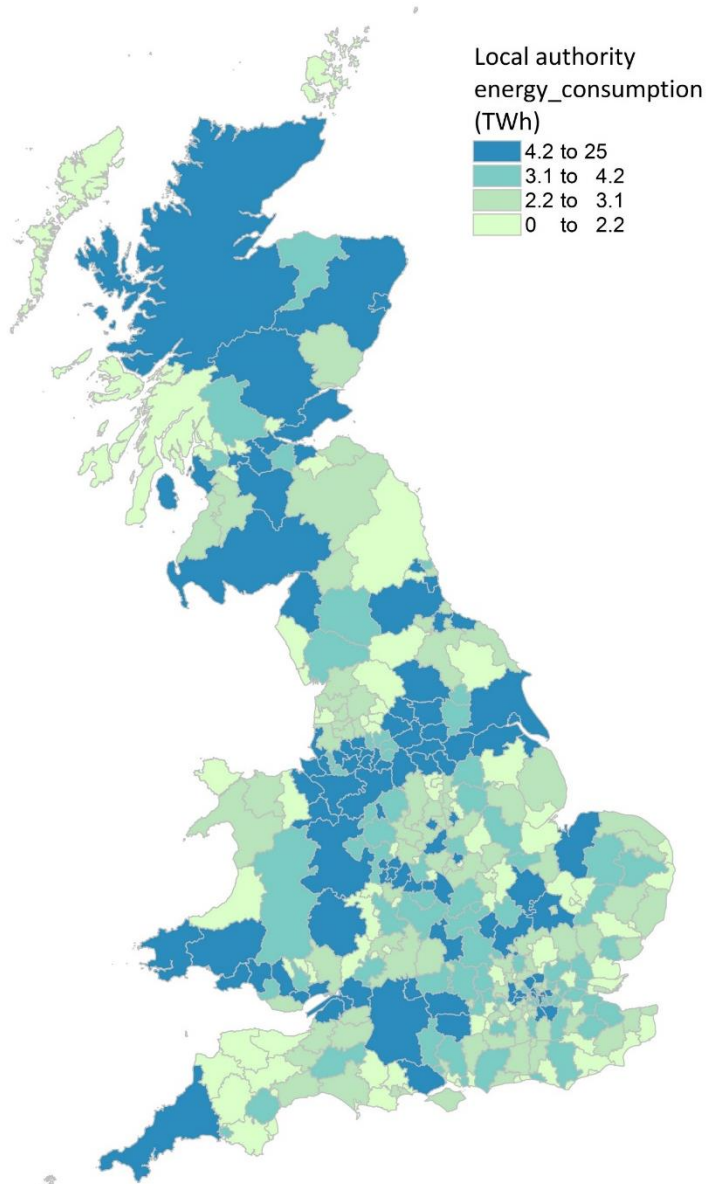
The area is well served by the distribution network, but a significant section of the 132kV network is at its thermal limit, preventing further generation connections

The LEP area hosts one major generation asset, Seabank Power Station: a 1.1GW Combined cycle gas plant. All the electricity generated is sold under contract to SSE.

## West of England energy consumption facts (2005 to 2016)

- The West of England consumed 21.6 TWh of energy in 2016.
- Energy use has decreased by nearly 14 percent since 2005.
- Electricity consumption is the smallest energy use at 4.3 TWh, followed by transport (8.2 TWh) and heat (8.4 TWh).
- Industrial and commercial energy use has decreased by over 27 percent since 2005. Transport sector energy use has not decreased since 2005, albeit with minor fluctuations.
- Gas consumption has decreased by 26 percent since 2005.
- Coal represents less than 1 percent of all energy consumption, and has increased since 2005.
- Electricity consumption has decreased by 18 percent since 2005.



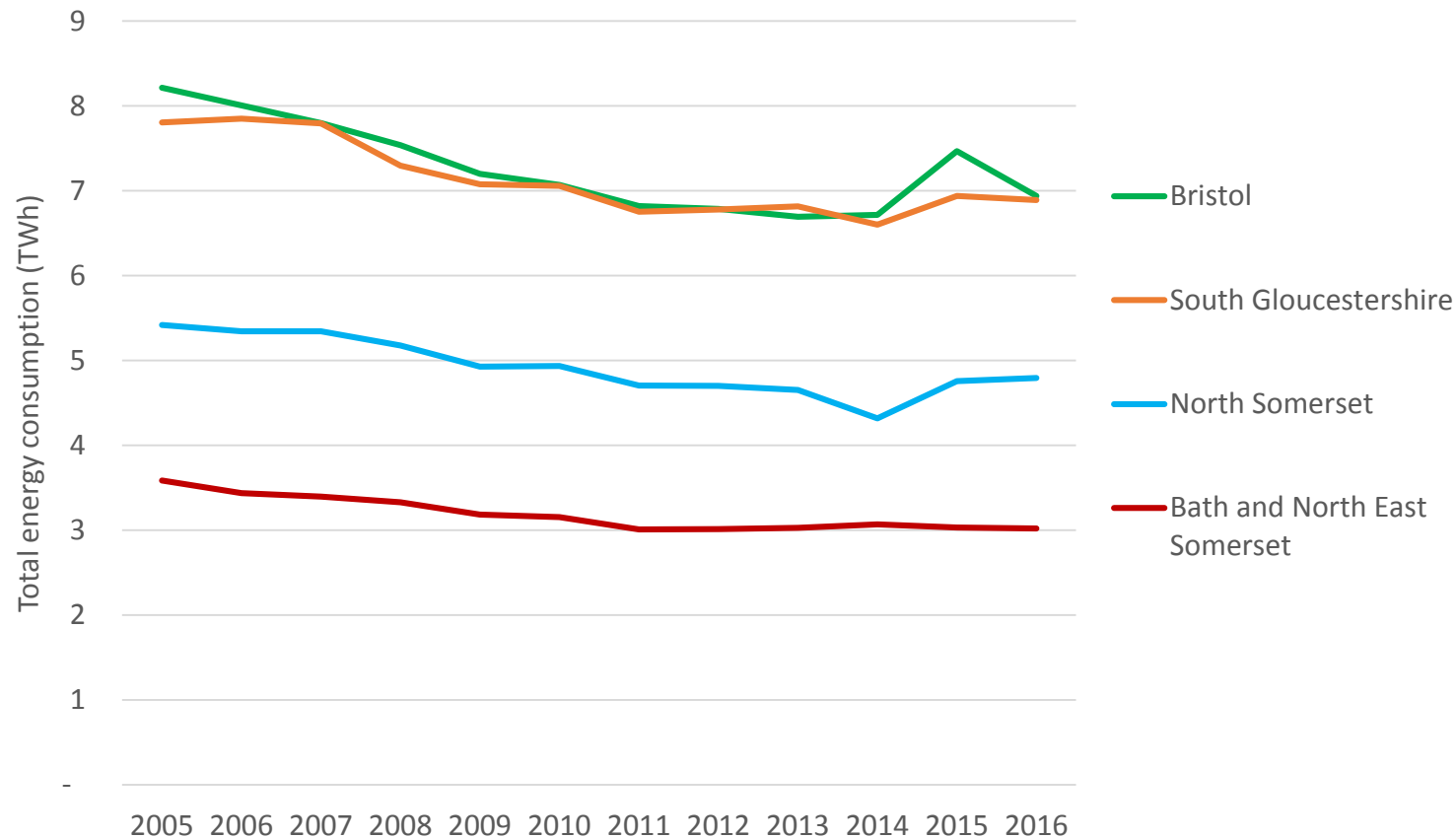


## GB and West of England energy consumption facts 2016

- West of England energy consumption
  - South Glos = 6.9 TWh
  - Bristol = 6.9 TWh
  - North Somerset = 4.8 TWh
  - Bath = 3.0 TWh
- South west local authority average energy consumption = 3 TWh
- GB local authority average energy consumption = 3.6 TWh
- GB total energy consumption = 1,416 TWh

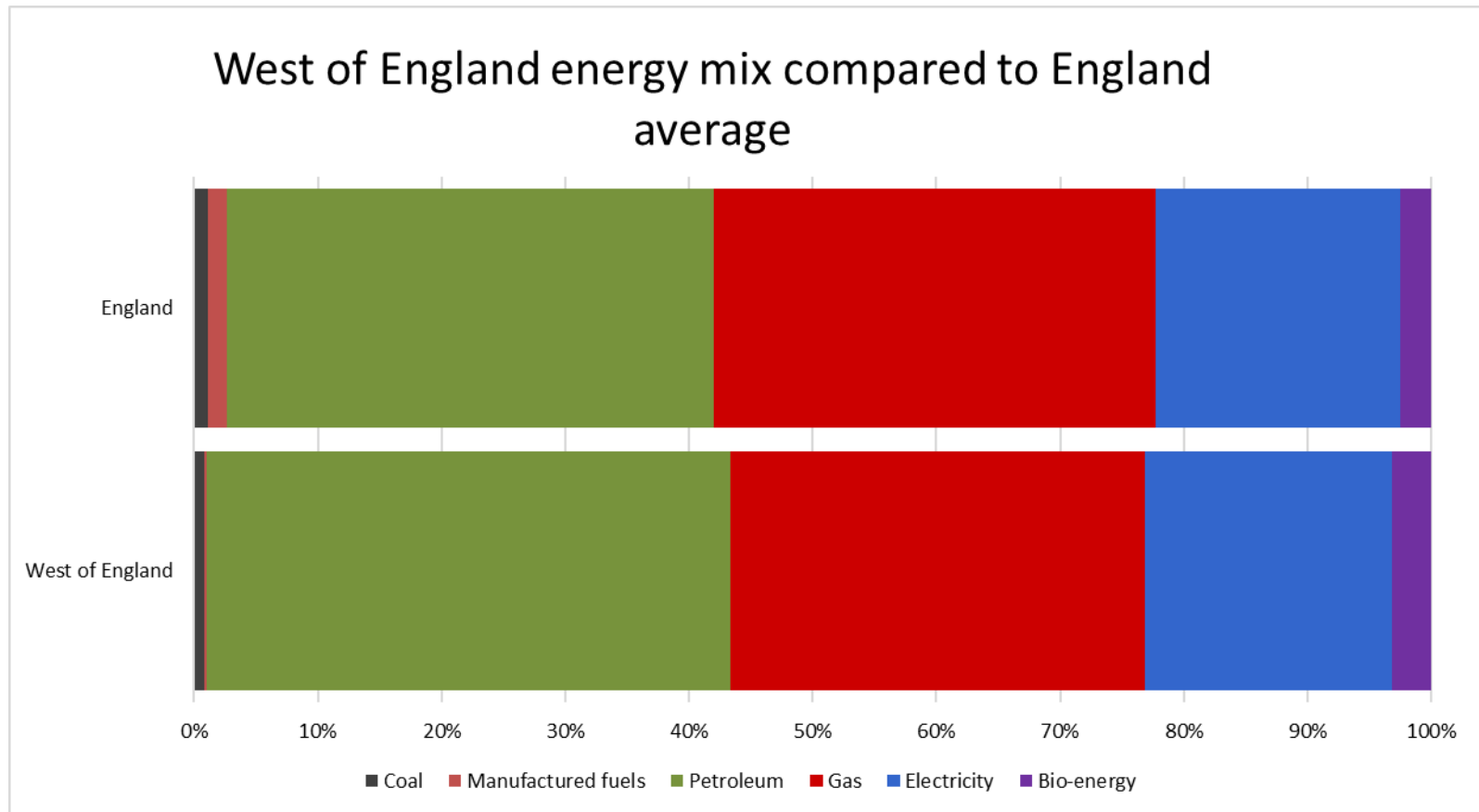
# Electricity consumption by LA

## West of England local authority energy consumption



Source: BEIS, Total sub-national final energy consumption 2016  
WoE Energy Strategy Evidence .xlsx, ANALYSIS | Energy data

# Energy consumption by fuel

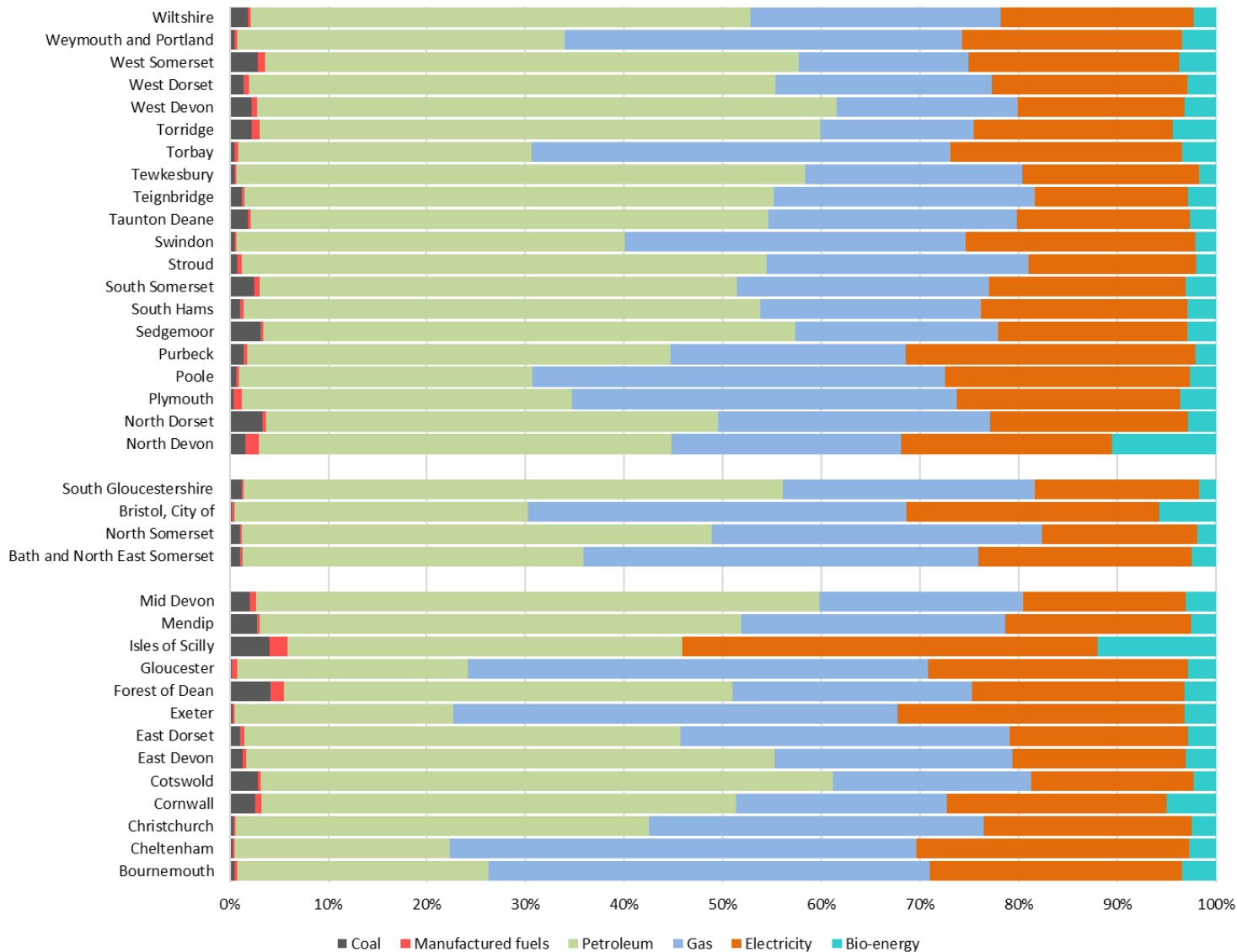


Source: BEIS, Total sub-national final energy consumption 2016  
WoE Energy Strategy Evidence .xlsx, ANALYSIS | Energy mix

# Energy consumption by fuel (south west comparison)

## Total energy consumption mix for local authorities in the South West

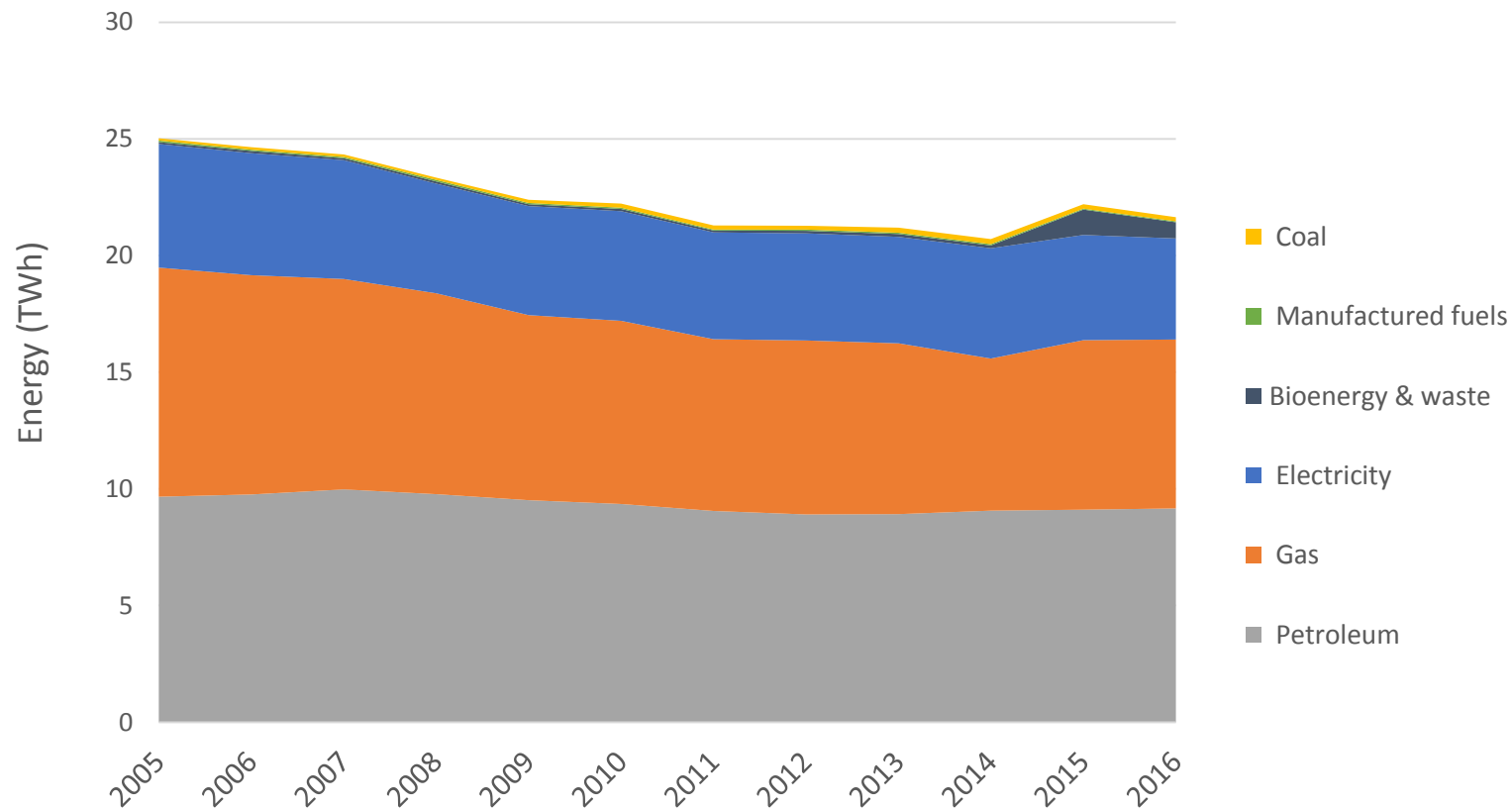
BEIS 2016 data



Source: BEIS, Total sub-national final energy consumption 2016  
WoE Energy Strategy Evidence .xlsx, ANALYSIS | Energy mix

# Energy consumption by fuel

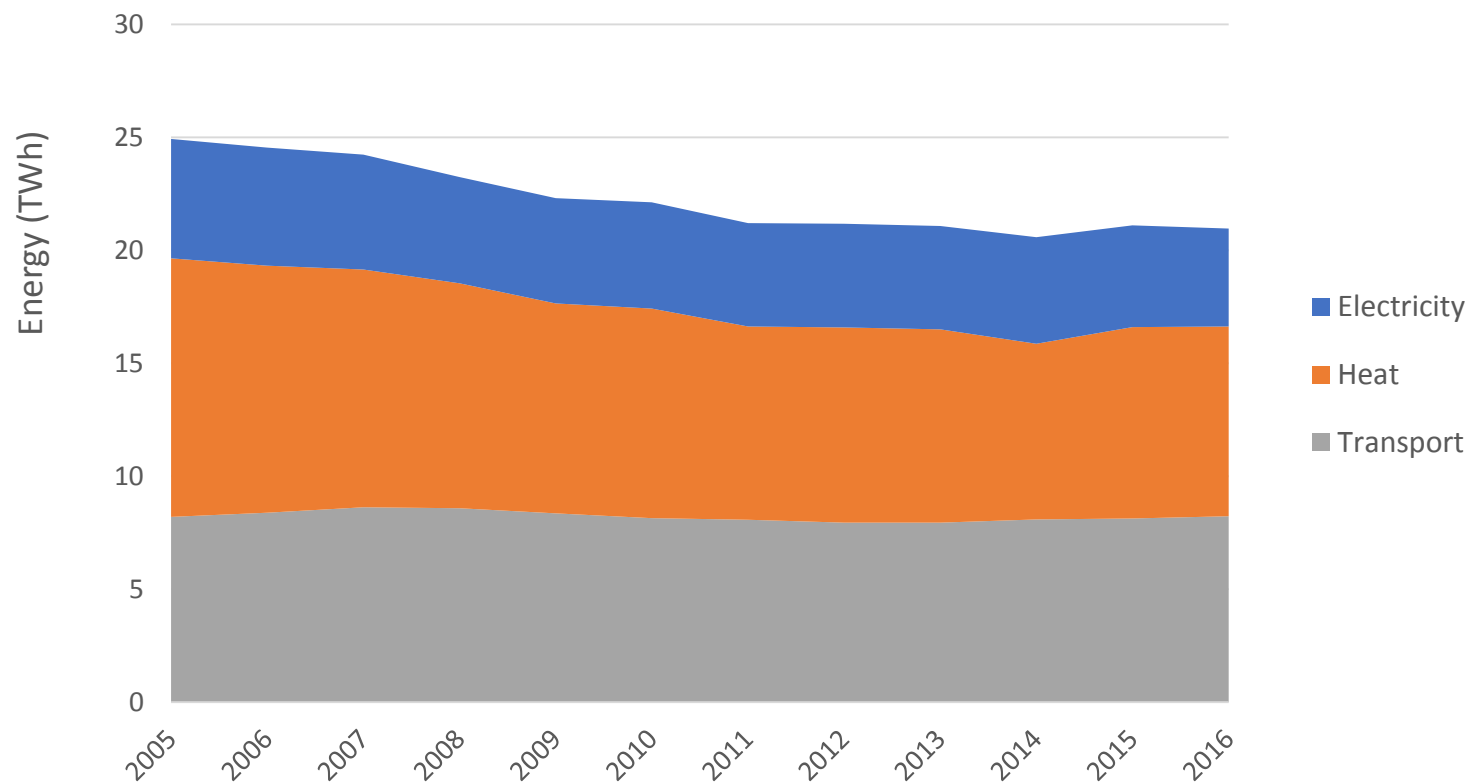
## West of England energy consumption over time by fuel



Source: BEIS, Total sub-national final energy consumption 2016  
WoE Energy Strategy Evidence .xlsx, ANALYSIS | Energy use

# Energy consumption by use

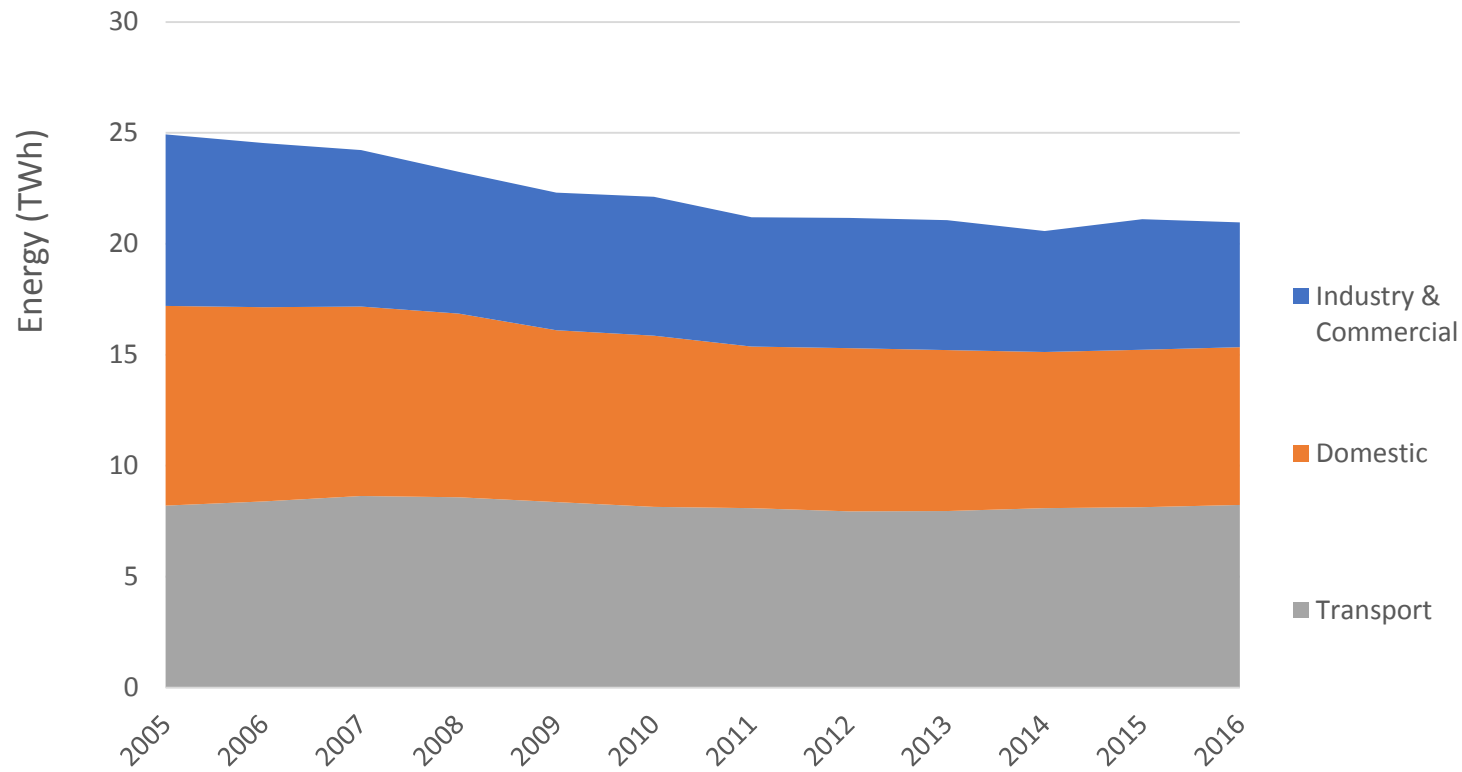
## West of England energy consumption over time by use



Source: BEIS, Total sub-national final energy consumption 2016  
WoE Energy Strategy Evidence .xlsx, ANALYSIS | Energy use

# Energy consumption by sector

## West of England energy consumption over time by sector

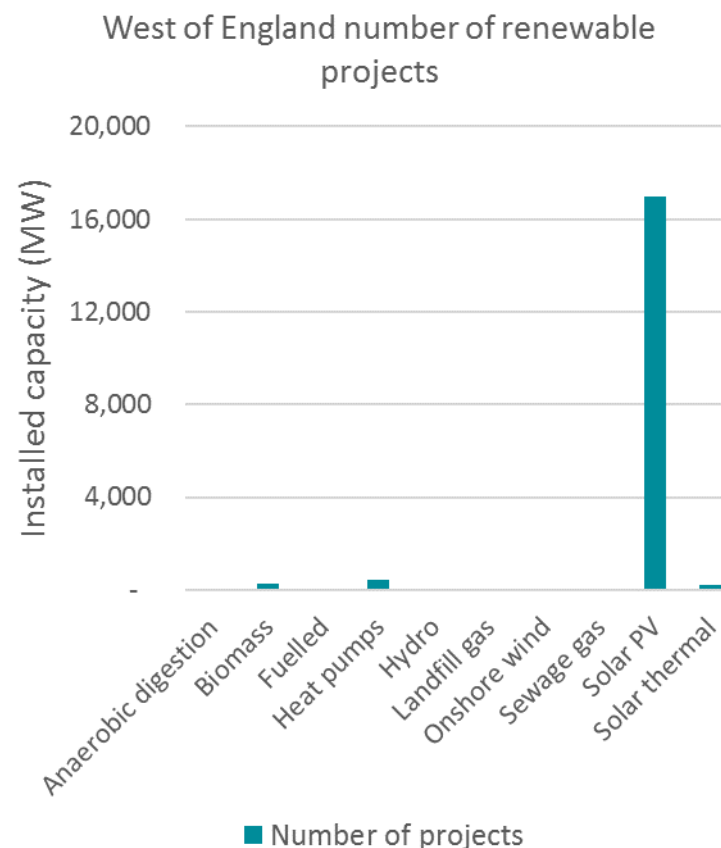


Source: BEIS, Total sub-national final energy consumption 2016  
WoE Energy Strategy Evidence .xlsx, ANALYSIS | Energy use

# WoE renewables – project types

FiT, RHI and RO number of projects in the West of England

Technology	Number of projects
Anaerobic digestion	6
Biomass	259
Fuelled	14
Heat pumps	440
Hydro	8
Landfill gas	5
Onshore wind	25
Sewage gas	1
Solar PV	16,966
Solar thermal	229
<b>Total</b>	<b>17,953</b>

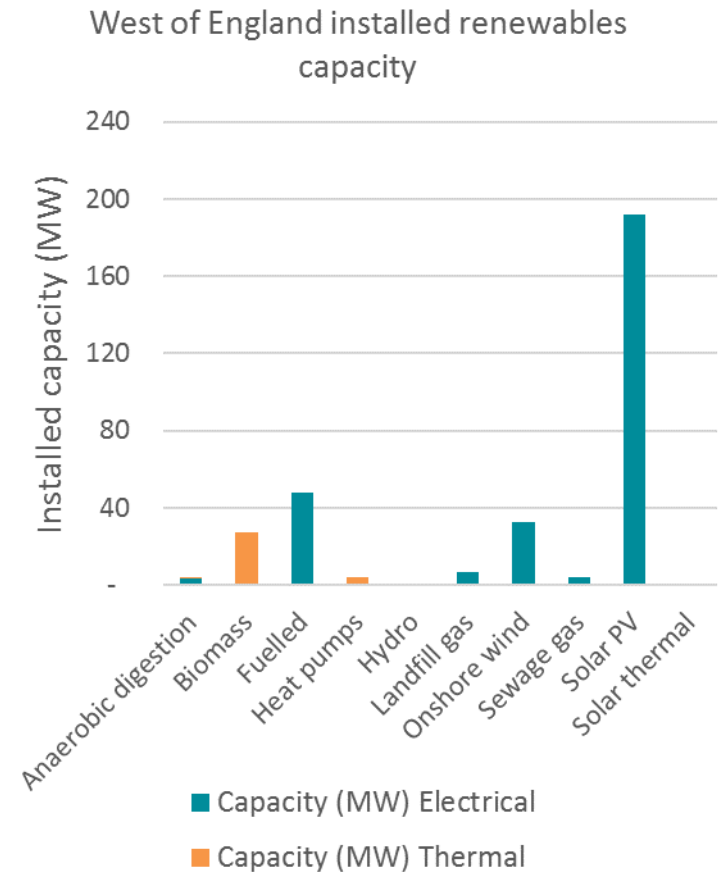


Source: National Grid Scenarios 2018 and RHI, REPD, FiT data for 2018, compiled by Regen.  
WoE Energy Strategy Evidence .xlsx, ANALYSIS | Renewables



## FiT, RHI and RO installed capacity in the West of England

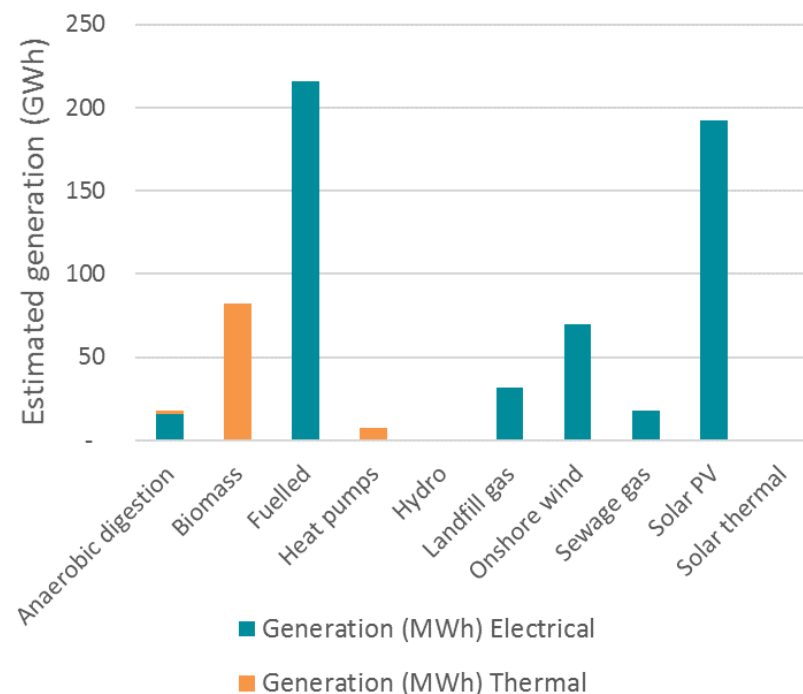
Technology	Capacity (MW)	
	Electrical	Thermal
Anaerobic digestion	4	0
Biomass	-	27
Fuelled	48	-
Heat pumps	-	4
Hydro	0	-
Landfill gas	7	-
Onshore wind	33	-
Sewage gas	4	-
Solar PV	192	-
Solar thermal	-	0
<b>Total</b>	<b>287</b>	<b>32</b>



## FiT, RHI and RO estimated generation in the West of England

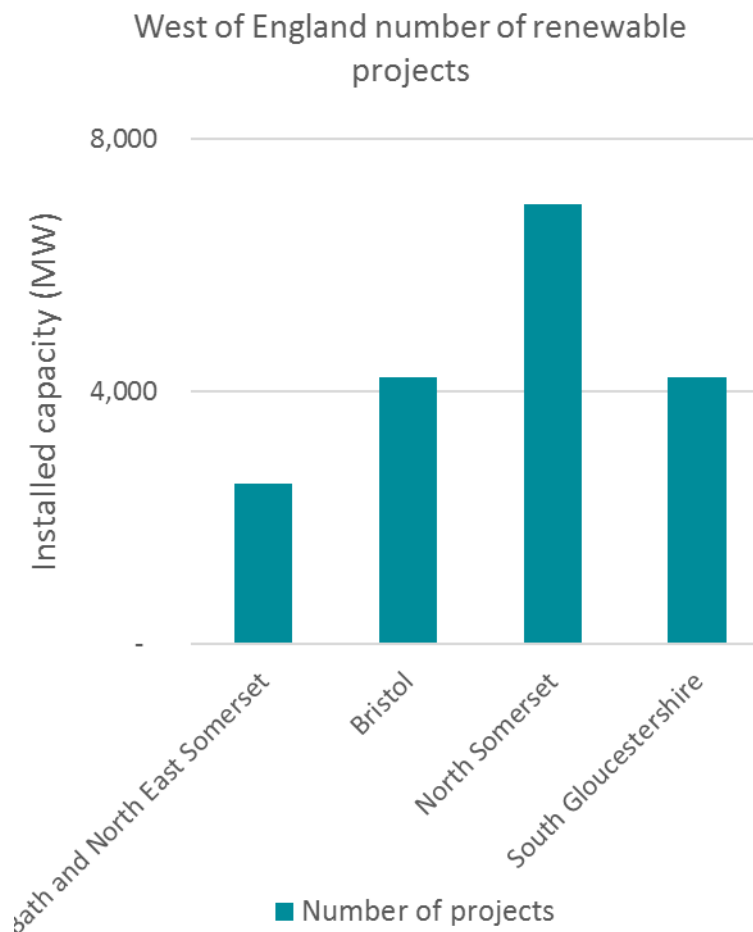
Technology	Generation (MWh)	
	Electrical	Thermal
Anaerobic digestion	15,984	1,748
Biomass	-	82,618
Fuelled	216,013	-
Heat pumps	-	7,773
Hydro	378	-
Landfill gas	32,005	-
Onshore wind	69,874	-
Sewage gas	17,700	-
Solar PV	192,584	-
Solar thermal	-	304
<b>Total</b>	<b>544,537</b>	<b>92,444</b>

West of England estimated renewables generation



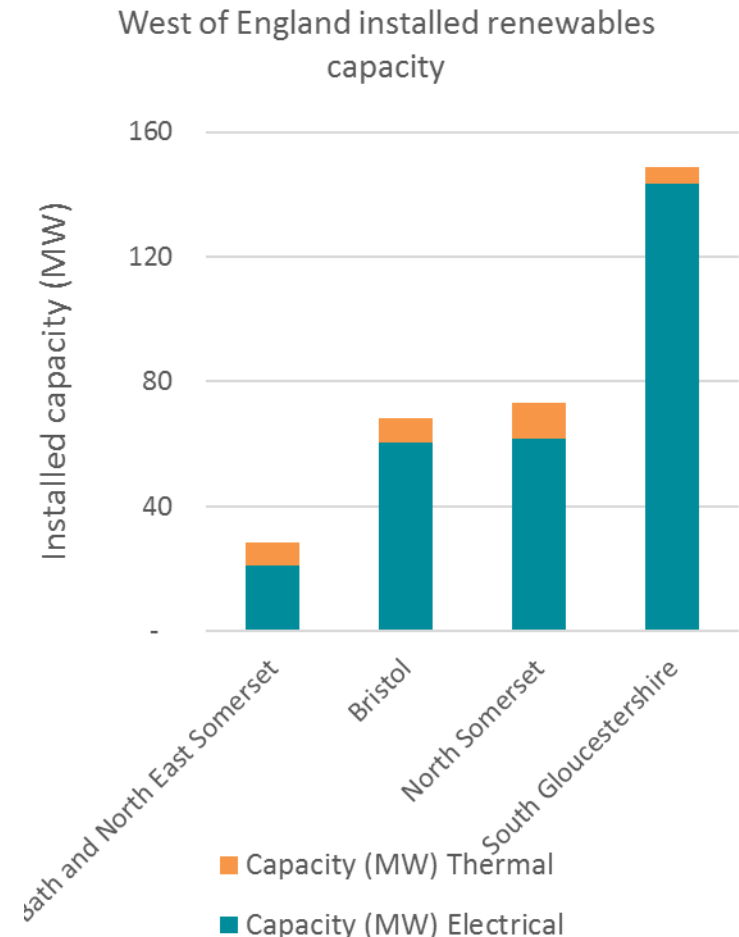
## FiT, RHI and RO number of projects in the West of England

Technology	Number of projects
Bath and North East Somerset	2,535
Bristol	4,217
North Somerset	6,970
South Gloucestershire	4,229
<b>Total</b>	<b>17,951</b>



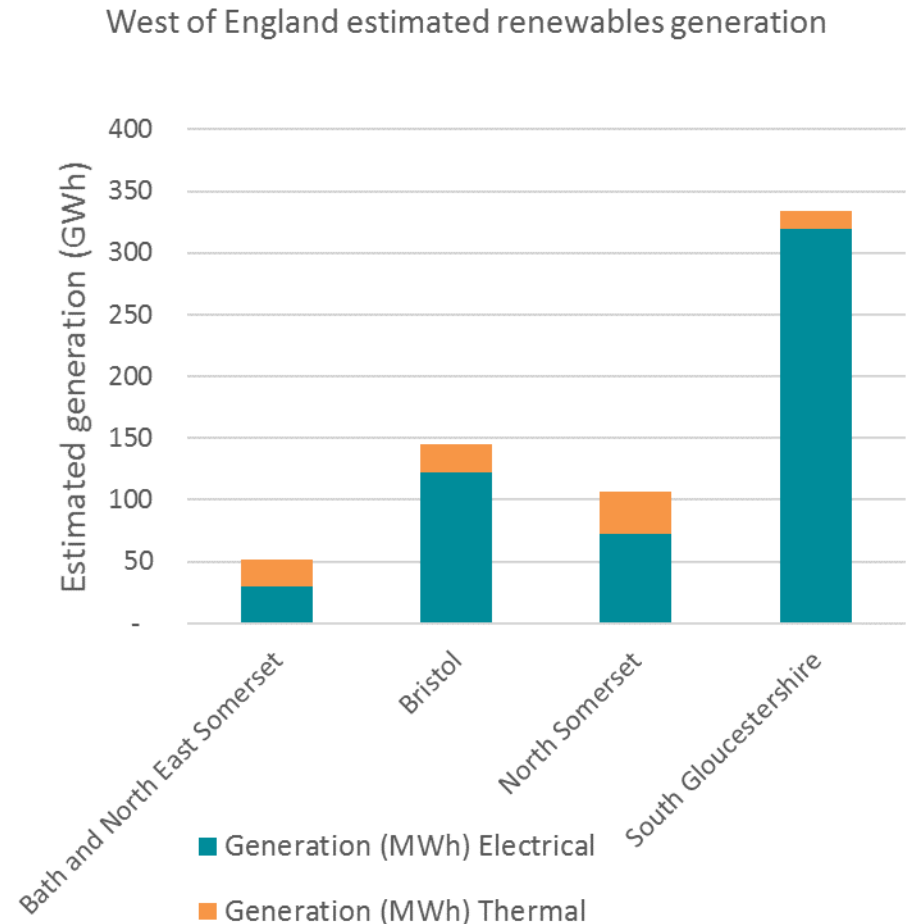
## FiT, RHI and RO installed capacity in the West of England

Technology	Capacity (MW)	
	Electrical	Thermal
Bath and North East Somerset	21	7
Bristol	61	8
North Somerset	62	11
South Gloucestershire	144	5
<b>Total</b>	<b>287</b>	<b>32</b>

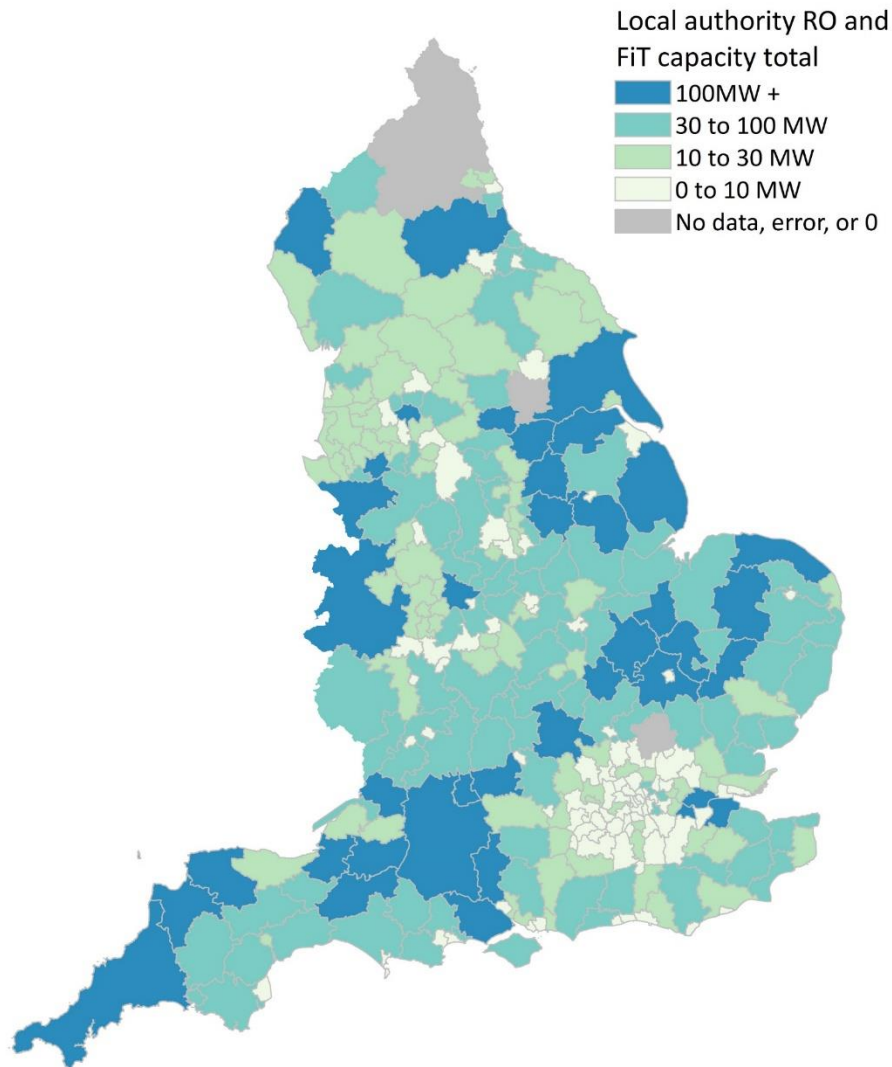


## FiT, RHI and RO estimated generation in the West of England

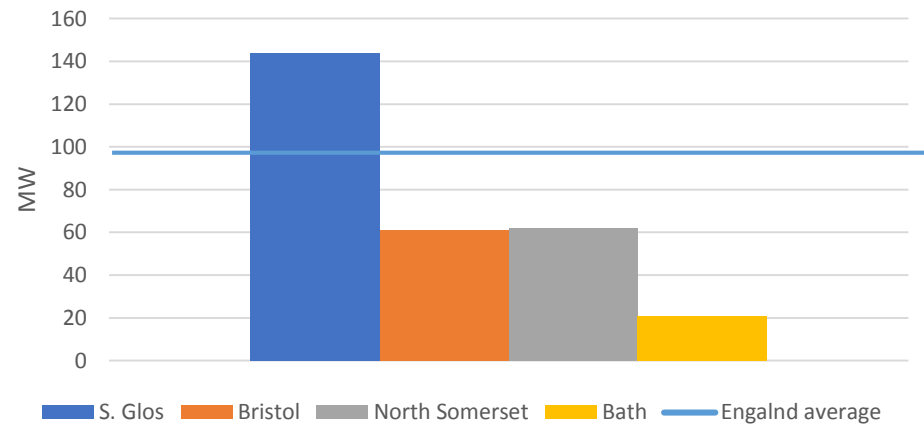
Technology	Generation (MWh)	
	Electrical	Thermal
Bath and North East Somerset	29,887	21,408
Bristol	122,101	22,624
North Somerset	72,623	33,872
South Gloucestershire	319,926	14,540
<b>Total</b>	<b>544,537</b>	<b>92,444</b>



# How WoE compares – renewable electricity



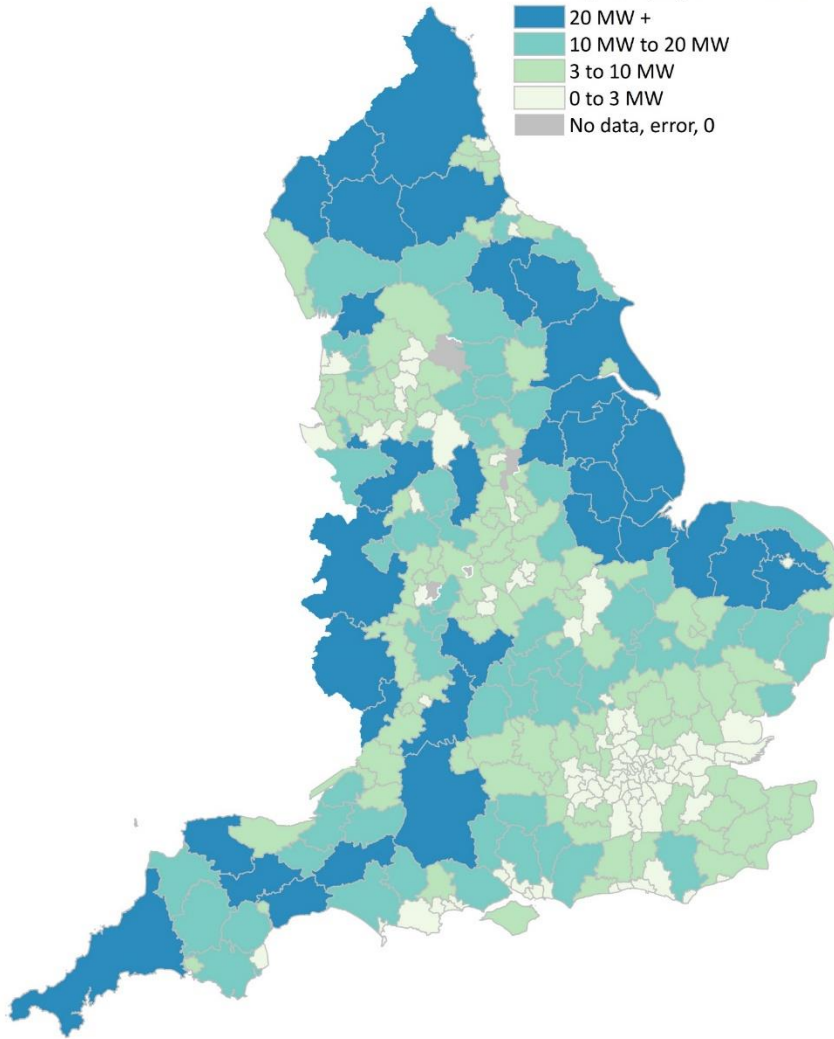
Feed in Tarriff and Renewables Obligation capacity



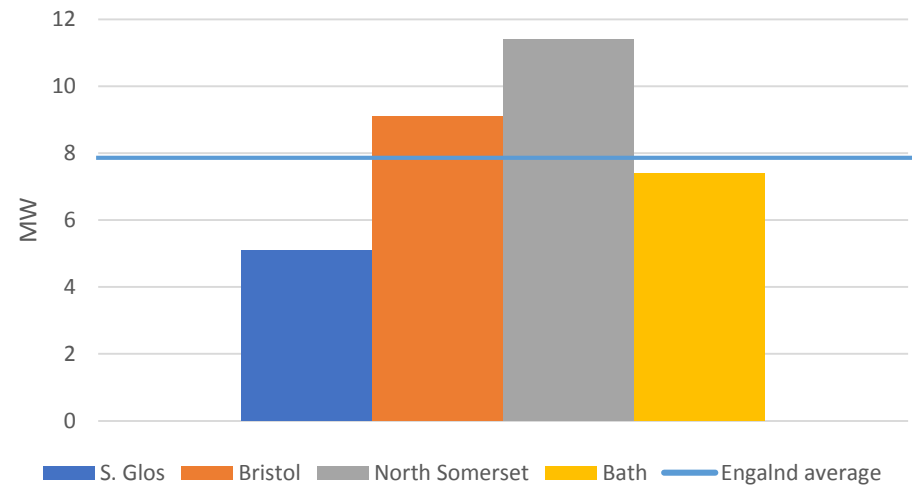
Source: National Grid Scenarios 2018 and RHI, REPD, FiT data for 2018, compiled by Regen.

# How WoE compares – renewable heat

RHI capacity by local authority



Renewable Heat Incentive capacity



Source: National Grid Scenarios 2018 and RHI, REPD, FiT data for 2018, compiled by Regen.

## England and West of England electricity generation facts

- West of England RHI capacity
  - South Glos = 320 GWh
  - Bristol = 112 GWh
  - North Somerset = 72 GWh
  - Bath = 30 GWh
- England average renewable electricity generation = 160 GWh
- South West average renewable electricity generation = 126 GWh



## **Key energy variables**

### **West of England renewable energy generation**

611 GWh

### **West of England renewable electricity generation**

519 GWh

### **West of England energy consumption**

21,647 GWh

### **West of England electricity consumption**

4,331 GWh

Estimated percentage of electricity and heat consumption in West of England from renewable heat and electricity generation

4.8%

Estimated percentage of electricity consumption in West of England from renewable electricity generation

12%

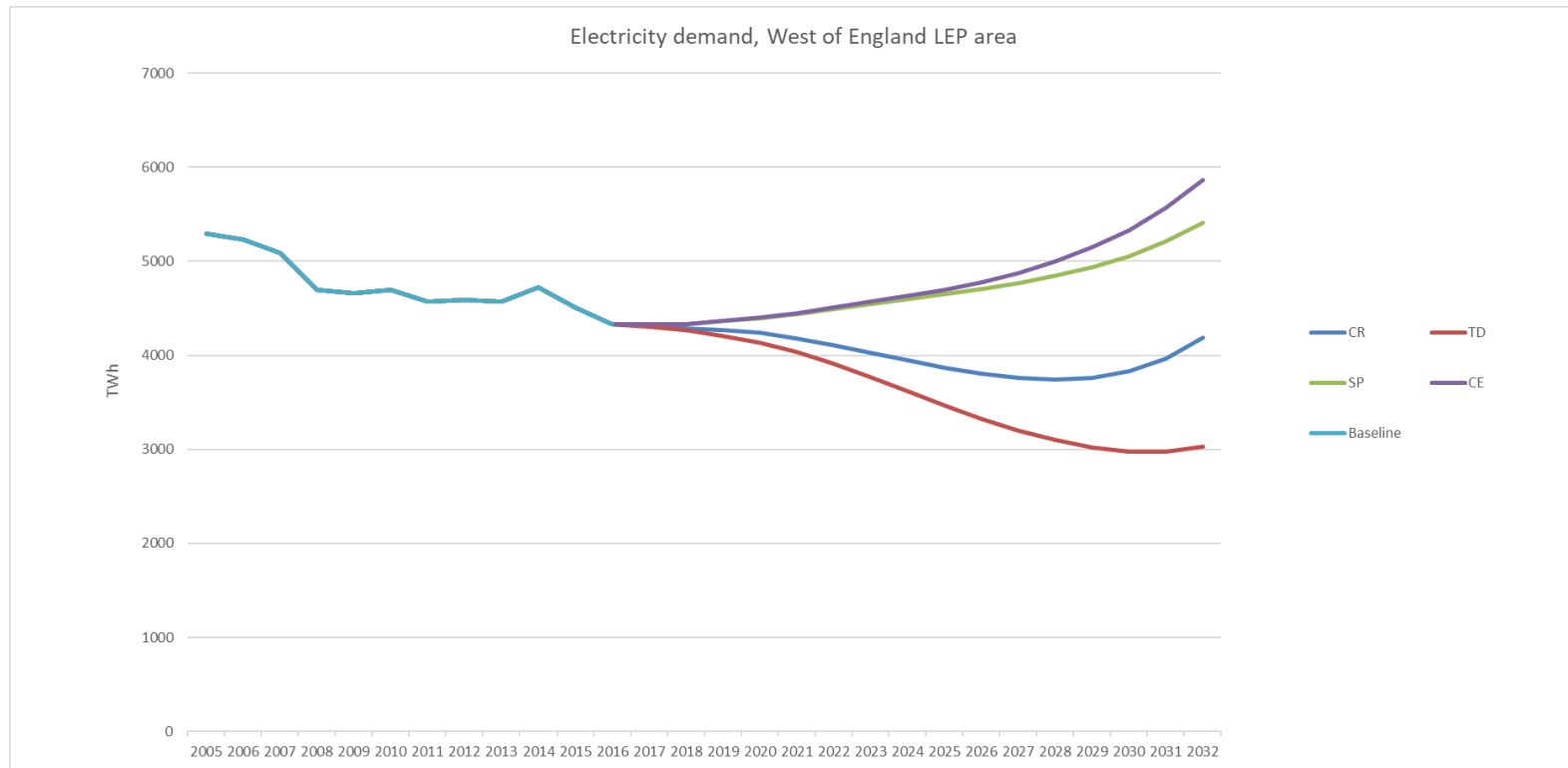
The West of England hosts the 1.23 GW CCGT Seabank Power Station, in Bristol. Seabank was commissioned in 2000 and consists of three main generators, connected to National Grid's transmission network.



Photo credit: Picasa 2.7

The only suitable publicly available sources of data for fossil fuels are DUKES' power station data and ADE case studies. Small back up and on-site fossil fuel electricity generators, which may be located on farms or industrial and commercial properties, are, therefore, underestimated. While these small generators would increase the number of projects within this category, their impact on the total capacity and generation trends would be minimal.

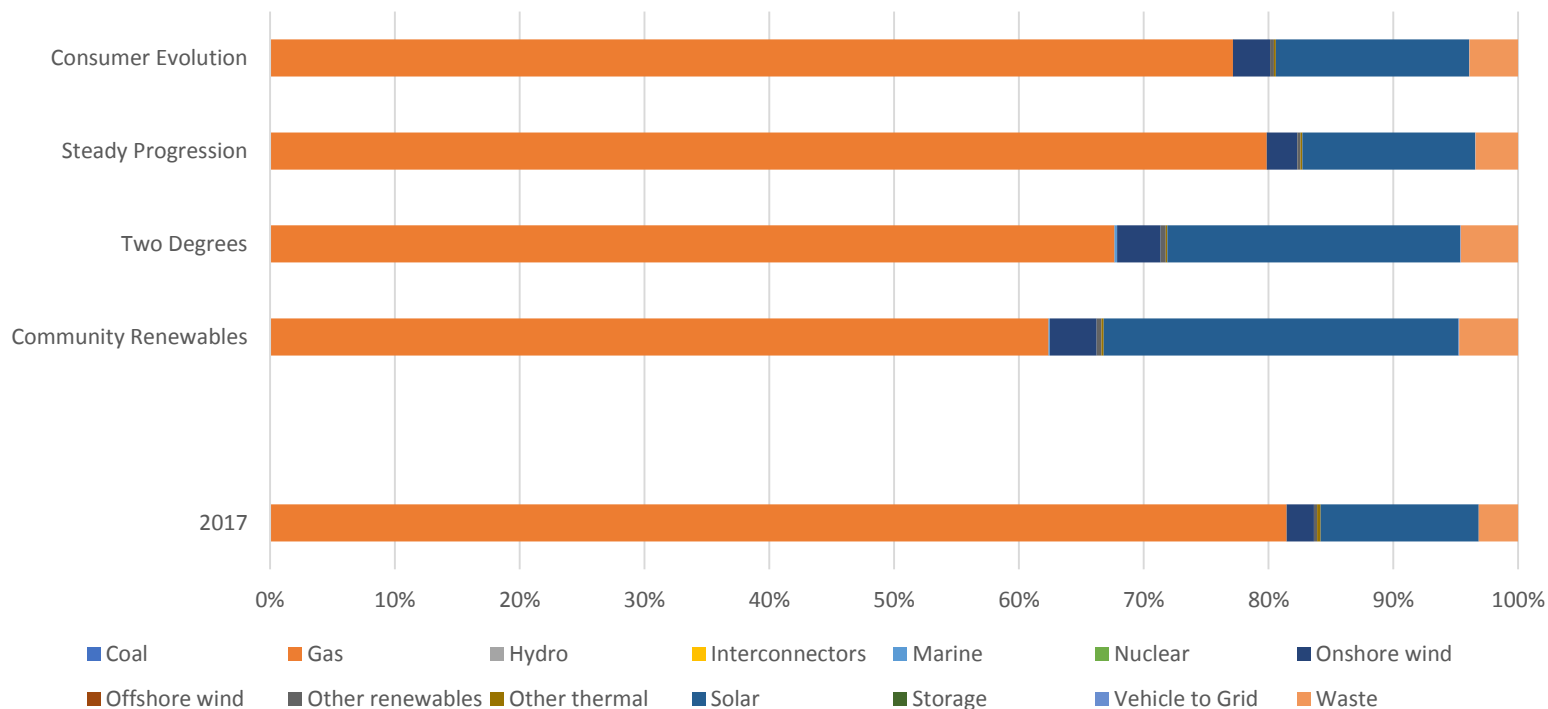
Under two of the National Grid FES scenarios (Consumer Evolution and Steady Progression), electricity demand in the WoE LEP area is forecasted to be between 5000 and 6000 TWh annually by 2032. This compares to the 2017 electricity demand of 4300 TWh. The other two scenarios, Community Renewables and Two Degrees (the two scenarios that hit the UK's 2050 carbon reduction targets) see reduced electricity demand in the WoE area at 4191 TWh and 3031 TWh respectively.



Source: National Grid Scenarios 2018, UK Government DUKES 2017 compiled by Regen  
WoE Energy Strategy Evidence .xlsx, ANALYSIS | Scenarios Dem

# Scenario Analysis – Electricity mix

Future Energy mix scenarios - 2032



Source: National Grid Scenarios 2018 and RHI, REPD, FiT data for 2017, compiled by Regen  
WoE Energy Strategy Evidence .xlsx, ANALYSIS | Scenarios Gen. Data table on next slide

Using the growth trends published by the National Grid in their FES 2018, it is possible to map those trends on to the current energy mix for the West of England, as it has been assessed in 2017.

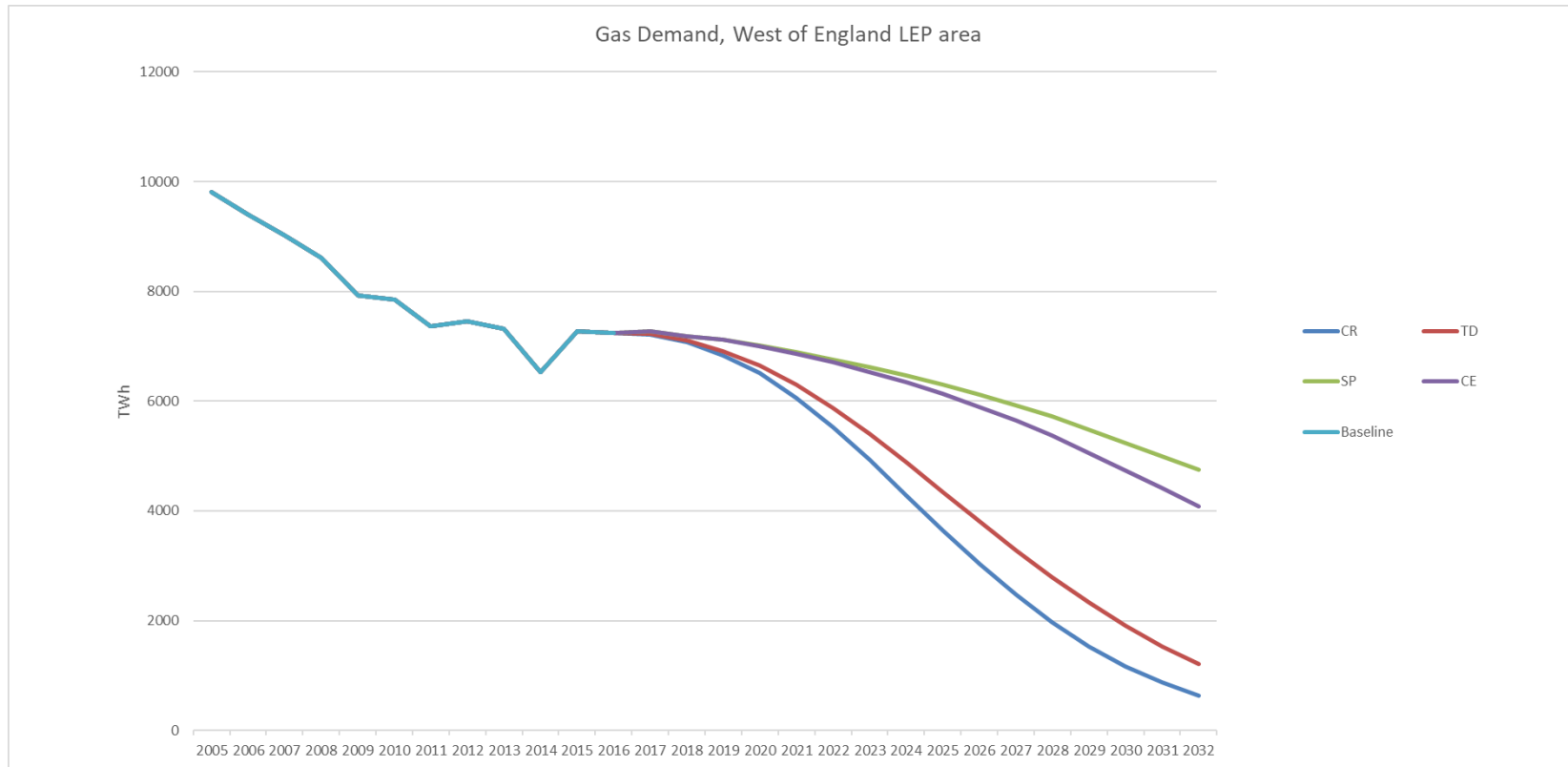
This shows that based on *current* installed capacities, electricity generated by gas continues to dominate (due to the Seabank plant) , although it sees a reduction capacity in all scenarios, with wind and solar picking up market share). Note that no geographic area in the UK is self sufficient in balancing its supply and demand for electricity or heat.

# Scenario Analysis – Electricity mix

Installed Electrical generation capacity (MW) WoE LEP					
Year	2017	2030			
Fuel Type		Community Renewables	Two Degrees	Steady Progression	Consumer Evolution
Biomass	0	0.0000	0.0000	0.0000	0.0000
Coal	0	0.0000	0.0000	0.0000	0.0000
Gas	1234.1	1120.9447	1085.5837	1463.9467	1527.5966
Hydro	0.16	0.1956	0.1778	0.1778	0.1778
Interconnectors	0	0.0000	0.0000	0.0000	0.0000
Marine	0.000001	1.9000	3.3000	0.1000	0.0000
Nuclear	0	0.0000	0.0000	0.0000	0.0000
Onshore wind	33	67.1478	55.9565	44.4783	58.5391
Offshore wind	0	0.0000	0.0000	0.0000	0.0000
Other renewables	4	7.1111	6.4444	4.6667	6.0000
Other thermal	4	2.9333	2.1333	2.9333	3.4667
Solar	192	510.9677	376.2581	253.9355	306.5806
Storage	0.000001	0.0000	0.0000	0.0000	0.0000
Vehicle to Grid	0.000001	1.1000	1.0000	0.2000	0.2000
Waste	48	84.9231	73.8462	62.7692	77.5385

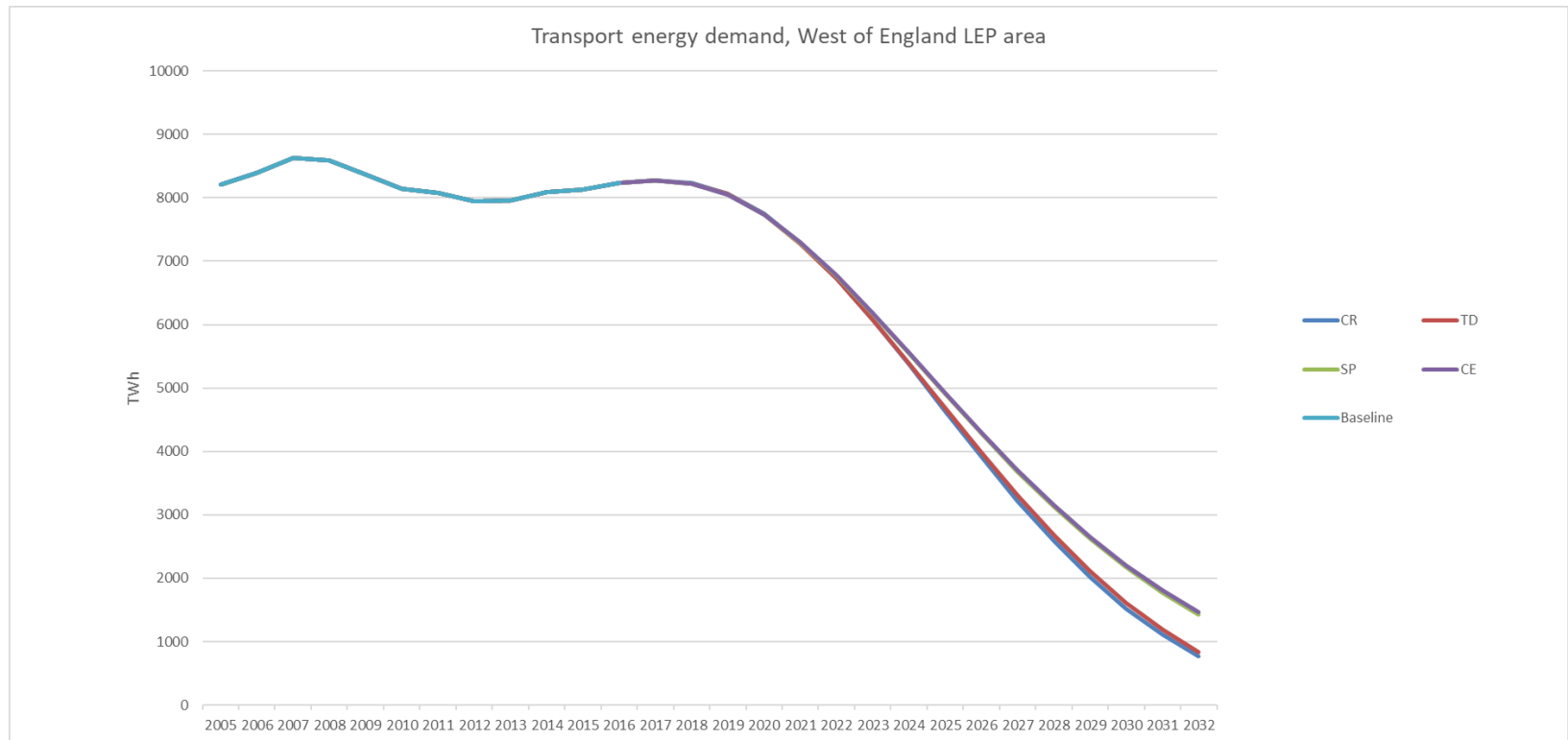
Source: National Grid Scenarios 2018, UK Government DUKES 2017 compiled by Regen  
WoE Energy Strategy Evidence .xlsx, ANALYSIS | Scenarios Dem. Data table on next slide

# Scenario Analysis – Gas demand



Source: National Grid Scenarios 2018, UK Government DUKES 2017 compiled by Regen  
WoE Energy Strategy Evidence .xlsx, ANALYSIS | Scenarios Dem

In all of the National Grid FES scenarios, it is predicted that gas demand in the region will reduce. This is partly due to declining demand for large scale gas driven electricity generation plant and partly due to an increase in 'green' gas supplying the system. In addition, it is widely expected that heat pumps and better thermal efficiency in housing will reduce gas volume used for heating.



Source: National Grid Scenarios 2018, UK Government DUKES 2017 compiled by Regen  
WoE Energy Strategy Evidence .xlsx, ANALYSIS | Scenarios Dem

In all of the National Grid FES scenarios, it is predicted that transport energy demand (excluding electricity) will drastically fall by 2032, and this is likely to be no different in the West of England LEP area. This is due to a forecasted rapid switching to hybrid and electric vehicles in the commercial and industrial sector as well as fleet vehicles switching wholesale away from fossil fuels.



# Investment in Energy – Levelised cost of energy

## Unsubsidized Levelized Cost of Energy Comparison

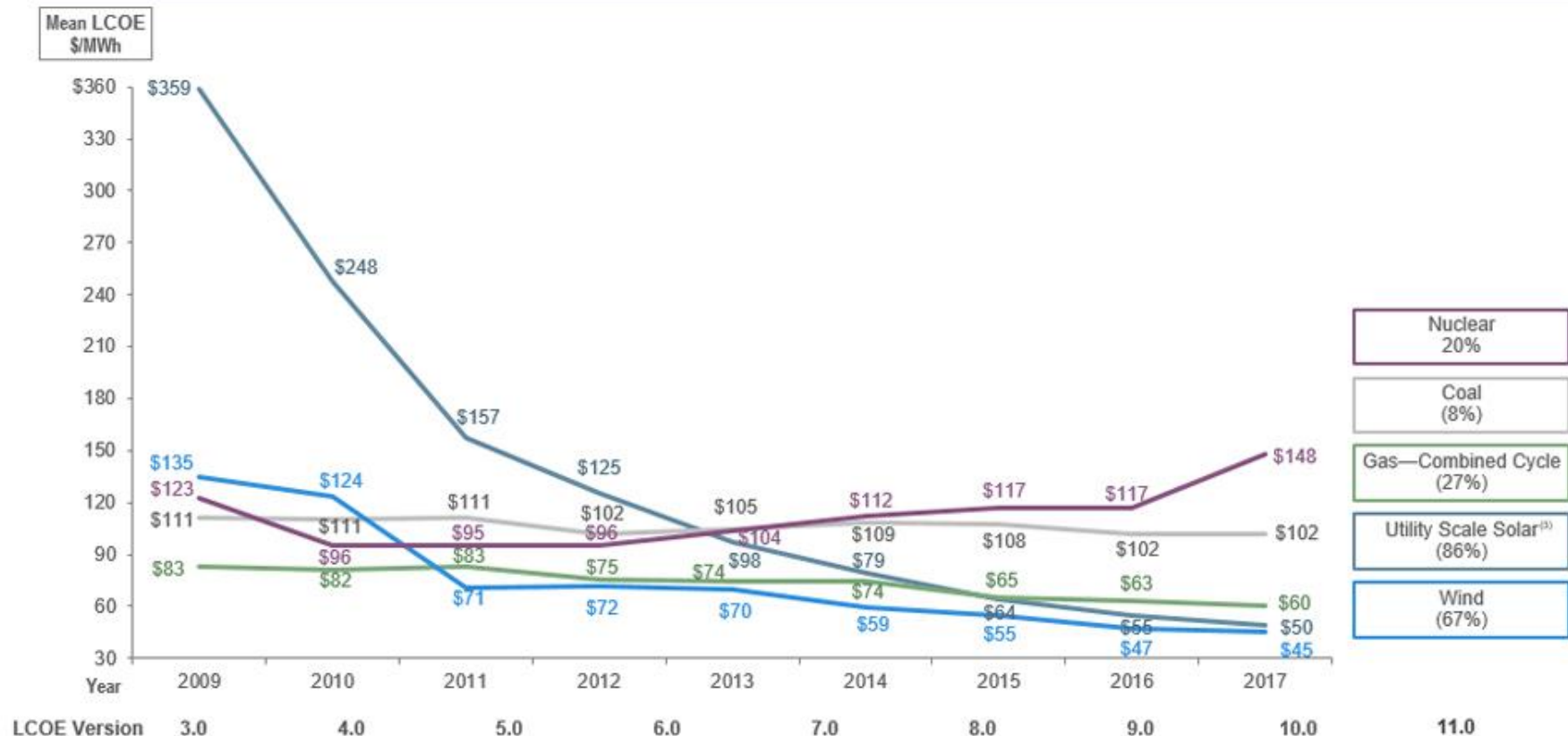


‡ Denotes distributed generation technology.

# Investment in Energy – Levelised cost of energy (historic trends)

## Summary Findings of Lazard's 2017 Levelized Cost of Energy Analysis<sup>(1)</sup>

### Selected Historical Mean LCOE Values<sup>(2)</sup>



Source: Lazard estimates.

Note: Reflects average of unsubsidized high and low LCOE range for given version of LCOE study.

(1) Primarily relates to North American alternative energy landscape, but reflects broader/global cost declines.

(2) Reflects total decrease in mean LCOE since the later of Lazard's LCOE—Version 3.0 or the first year Lazard has tracked the relevant technology.

(3) Reflects mean of fixed-tilt (high end) and single-axis tracking (low end) crystalline PV installations.



Background paper

# Towards a sustainable energy future for the West of England

Report and recommendations  
of the West of England energy study

## Final report [DRAFT]

May 2018

Lead Author: Simon Roberts OBE



# Contents

Executive summary .....	5
1. Introduction: study background and report structure .....	9
2. Our approach: acting within a national context, walking right round the issues, and taking the first next steps .....	11
a. Regional action in a national context of system transformation .....	11
b. Walking right round the issues to build a more complete picture of what's needed for success .....	14
c. Roadmaps and 'first next steps' (in a dynamic, complex field) .....	16
3. The current state of play on energy and carbon emissions in the West of England: the data .....	17
4. Setting strategic energy ambitions, guiding principles, and success criteria for the West of England .....	24
a. Strategic ambitions .....	24
b. Guiding principles .....	28
c. Success criteria .....	29
5. The current state of play on transforming energy in the West of England: a SWOT analysis .....	30
5.1. Key issues emerging from the SWOT analysis .....	31
6. What happens on energy in the West of England without purposeful action? .....	42
7. The first next steps: key building blocks for purposeful effort and early progress .....	44
7.1. Requiring more local renewables and zero carbon, smart-enabled new development: stronger planning policies and enhanced execution .....	44
7.2. Delivering solar PV at scale (on roofs and low-grade land with local supply, smart management and community investment) .....	45
7.3. Taking the lead on smart energy: establishing a cluster for smart energy .....	46
7.4. Accelerating the low carbon housing retrofit market, starting with willing home-owners .....	47
7.5. Tackling fuel poverty at its roots: making homes warm and healthy and leaving no one behind in the smart energy transition .....	48
7.6. Boosting energy management capacity in the public sector (setting an example for the commercial sector) .....	49
7.7. Enabling energy demand reduction in the commercial sector: .....	49
7.8. Providing leadership and co-ordination on the growth of EVs (and getting smart in the process) .....	50

7.9. Getting to grips with the decarbonisation of heat: building understanding, exploring options, developing a plan .....	51
7.10. Establishing meaningful public consent and regional leadership for this energy transition .....	52
7.11. The over-arching commitment: align all policies and programmes with the region's carbon commitments and sustainable energy ambitions .....	53
7.12. Identifying the locus for action: who leads at what scale? .....	54
8. Recommendations for early action .....	58
8.1. Recommendations for taking the first next steps .....	58
8.2. Additional recommendations for further specific actions for early progress .....	60
9. The road map to a sustainable energy future for the West of England: from 2018 to 2025 .....	62
10. The potential benefits of regional action .....	65
10.1. Economic benefits .....	65
10.2. Social benefits .....	67
10.3. Skills and training issues .....	68
Appendix – SWOT analysis in detail .....	69
Bibliography .....	78

## DISCLAIMER

This is the report of a study commissioned by the West of England Local Enterprise Partnership to inform the development of an energy strategy for the West of England region. The report is based on analysis and stakeholder engagement undertaken between mid December 2017 – March 2018. The views expressed here are those of the authors and should not be taken to represent the views or policies of the West of England Combined Authority or the West of England Local Enterprise Partnership or any of the local authorities involved (Bath and North East Somerset Council, Bristol City Council, North Somerset Council, South Gloucestershire Council).

## Executive summary

The West of England, like every other part of the country, needs to contribute to achieving the UK's legally binding carbon emissions reduction target while sustaining reliable energy supplies and ensuring energy costs remain (or, for some, become) affordable. Our energy system needs to change.

Putting the West of England on the path to this very low carbon, affordable and resilient energy future will ensure the region is aligned with what the Government and the Committee on Climate Change consider to be the best course for the country's economic development.

But it will only be through purposeful effort across the West of England that the region will ensure that: (a) this path is secured, and; (b) the economic and social benefits of such a clean growth future are captured by and for the region's businesses and people, rather than largely exported to businesses elsewhere.

- **The prize on offer: a significant efficiency gain, at least £2.1 billion GVA by 2030 and a world-leading smart energy cluster**

This study suggests that, by securing this path, the region has the potential to realise reductions in energy expenditure by its households, businesses and organisations of some £440 million a year by 2030 (at current prices). This efficiency gain represents 30% of the £1.5 billion a year the region is spending on electricity gas, petrol, diesel and other fuels, the value of which is currently mainly 'exported' from the region.

There are already tangible investment opportunities for the region in meeting targets for additional renewable energy generating capacity (£1.2 billion by 2030) and for upgrading the energy performance of buildings (e.g. £3 billion for low carbon housing retrofit by 2030). Invested through regionally-based businesses and supply chains could capture an estimated £2.1-2.6 billion of this as GVA (Gross Value Added) for the region by 2030.

Where this required investment can be sourced from communities of investors (both individual and institutional) based in the region, the long-term returns created by the investment would also be retained in the region, increasing the investment's local economic multiplier effect.

The West of England is uniquely placed as a region in the UK to realise the enormous national and global market opportunities represented by the smart energy revolution which is starting to transform energy systems across the world. The region has strong capabilities in: data analytics and digital skills (academic and commercial); high speed data infrastructure; energy control systems design and manufacture; energy management (particularly in the public sector); smart energy technical, commercial, legal and policy knowledge (academic, commercial and community); an engaged and innovative electricity distribution company (Western Power Distribution). But this combination of skills and capabilities in the region will need organising – or 'clustering' – to ensure these otherwise potentially disparate interests focus on the smart energy market opportunities.

Putting the region on this path will also generate health and social benefits, helping to reduce the ill-health and premature deaths associated with: (a) under-insulated cold homes (as they are improved), and; (b) air pollution caused by road traffic (as electric vehicles – EVs – cut the use of petrol and diesel).

- **What needs to change – and how**

The changes required in the West of England's energy system over the next 20 years are already well understood. They are, by and large, the changes required nationally and across every other part of the UK, as documented in various official national strategies and plans:

- i. a complete shift to very low or zero carbon electricity generation, mostly renewable and much of it decentralised;
- ii. smarter and more flexible management of demand, including storage, to enable higher penetration of variable renewable generation and to optimise electricity system operation;
- iii. huge reductions in energy demand by improving significantly the energy performance of our buildings (across all sectors and all tenures) and the equipment and processes within them;
- iv. decarbonisation of heat (for buildings, hot water and industrial processes);
- v. a dramatic rise in use of electric vehicles and other steps to cut the carbon emissions of road transport (as electricity is decarbonised);
- vi. ensuring new build developments achieve their full low carbon potential and contribute effectively to a smarter energy system.

These changes will need to be made right across the region's economy and will involve action by all of its economic sectors.

This study, commissioned to underpin a regional energy strategy, involved an extensive evidence review and a programme of stakeholder engagement to: (a) understand the current state of play in the region in relation to each of these changes, and; (b) inform a SWOT analysis (Strengths, Weaknesses, Opportunities, Threats). This approach helps to ensure that recommended actions – the proposed 'first next steps' for the strategy – start from where the region is now, acknowledging the limitations of current practice and constraints on progress as well as the region's existing and potential strengths. This should enable the region to move quickly from strategy to action.

- **The current state of play**

- The region's households, businesses and organisations spend £1.5 billion a year on electricity, gas, coal, oil, petrol and diesel. At least 85% of the energy used is fossil fuelled.
- Carbon emission reductions (-32% since 2005) have been largely in line with the national picture, with electricity (-17%) and gas consumption (-30%) both reducing significantly.
- Fuel poverty affects 52,000 households – or 1 in 9 households – in the region, almost all of whom live in buildings with Energy Performance Certificate – EPC – ratings of below C.
- Renewable energy accounted for 25% of all UK electricity (2016 data) but only 8% of electricity in the West of England was generated from 'within-region' renewables. 1 in 30 homes now have solar PV.
- 60% of the region's housing is below an EPC C and 80% of homes have gas central heating, 14% are not connected to the gas network.
- 65% of the region's non-domestic buildings are below and EPC C.
- Take up of EVs is doubling every 15 months, with the Go Ultra Low West project aiming to double the number of EV charging points in the region to 400.



- The 40,000 new homes already given planning permission in the region will be built to current building regulations (rather than zero carbon standards), adding 7% to the region's housing-related carbon emissions as a result.

## • Strategic energy ambitions for the West of England

From the evidence review and stakeholder engagement, a set of strategic ambitions are proposed to set a long-term direction and provide a sense of the nature and scale of changes required in the region.

---

### **Committing to reducing carbon emissions** (in line with the region's local authority commitments)

1. The West of England's carbon emissions reduced by 50% by 2035 (on 2014 levels) and by 87% by 2050 (on 2005 levels) (or, approximately, 90% on 1990 levels).

---

### **Increasing renewable electricity generation**

- 2a. Carbon emissions per unit of electricity below 100g by 2030 with at least 25% of electricity consumed in the region generated from renewable energy sited within the region.
- 2b. An extra 1 TWh a year of renewable electricity from projects sited within the region by 2030 from 2016 levels (to generate a total of c. 1.35 TWh). This represents a tripling of current renewable capacity in the region; as an example, this would require 1 in 10 homes to have solar PV, 500MW of additional non-domestic PV and 40 large wind turbines.

---

### **Improving building energy performance** (and tackling fuel poverty in the process)

3. Every existing building to at least an (accurate) EPC rating of C by 2030.

---

### **Decarbonising heat**

4. By 2021 there is a clear regional plan to decarbonise the remaining – and much reduced – heat demand in the region by 2040.

---

### **Shifting to Electric Vehicles (EVs)**

5. Half of all vehicles are EVs by 2028 (with smart charging to minimise network costs and maximise the value of renewable electricity generation).

---

### **Securing zero carbon new development**

6. All new developments to be net carbon negative and smart-energy-enabled from 2020 onwards.

---

### **Capturing the economic benefits of smart energy**

7. Secure a leading position in smart energy in national and global markets by 2021.
- 

To guide the prioritisation of options and programme design choices, five principles are proposed:

- No one left behind: opportunities for all to participate in the benefits of change.
- Bring the people with you: establish public consent for change.
- Maximise opportunities for local enterprise, innovation and locally-sourced investment.
- Addresses the region's weaknesses as well as capitalising on its strengths.
- Lead from the region: don't wait for all the national policy and regulatory details to be finalised before taking action.

- **10 key building blocks and one over-arching commitment**

The analysis identifies 10 key building blocks and one over-arching commitment that together provide the foundations for a strategic approach to achieving these ambitions.

1. Developing planning policies which require more local renewables and zero carbon, smart-enabled new development
2. Delivering solar PV at scale on roofs and low grade land across the region with local supply, smart management and community investment
3. Establishing a smart energy cluster to become the UK's leading region for smart energy
4. Accelerating the low carbon housing retrofit market, starting with willing home-owners
5. Tackling fuel poverty at its roots by making homes warm and healthy and leaving no one behind in the smart energy transition
6. Boosting energy management capacity in the public sector
7. Enabling energy demand reduction in the commercial sector
8. Providing leadership and co-ordination on the growth of EVs with an EV Growth Co-ordination Group
9. Creating a West of England Heat Decarbonisation Task Force to develop a plan by 2021
10. Establishing public engagement and consent and regional leadership for the energy transition

**The overarching commitment:** Ensuring all West of England and local authority policies, programmes and funding decisions are aligned with the region's carbon emission reduction commitments and strategic energy ambitions.

- **The potential cost: £10 million (revenue) + £5 million (revolving) over 3 years**

The indicative three year funding requirement for establishing these key building blocks is estimated at £10 million (revenue) together with a £5 million revolving fund for project development risk capital loans.

- **22 recommendations and a road map**

A set of **22 recommendations for early action** to establish these key building blocks and to guide the region's representation to national government are outlined in Section 8 of this report. These, and associated follow-on actions between 2019 and 2025 have then been developed into a road map, provided in Section 9, to show how progress can be sustained.

- **From study to strategy: identifying the locus for action**

The study's recommendations represent a set of activities which the study team has concluded are necessary to achieve the region's ambitions and long term commitments. Translating these into the region's energy strategy will require decisions to be made about who should lead these activities, who else needs to participate in them and how that situation will be realised (and by whom with what or whose resources). To help with these decisions, Section 7.12 of the study provides a series of questions to consider regarding this 'locus for action' and associated aspects of decision-making and governance.

# 1. Introduction: study background and report structure

The Centre for Sustainable Energy (CSE) was commissioned by the West of England Local Enterprise Partnership (LEP) in December 2017 to undertake an energy study for the LEP and West of England Combined Authority (WECA) to underpin a new energy strategy for the West of England region.<sup>1</sup> The study and the development of the strategy are sponsored by the Department for Business, Energy and Industrial Strategy (BEIS).

The study's purpose is to provide the evidence and insight to describe what the West of England region needs to do to play its role successfully in securing the (very) low carbon, affordable and resilient energy future to which the UK is committed. It will enable the WECA and LEP to establish a clearly prioritised strategy and action plan setting out the key steps to realise the required changes locally and maximise and capture the regional economic, social and environmental advantages of doing so. This is the report and recommendations of that study.

The study scope focused on reviewing existing evidence rather than undertaking new analysis to define the technical or economic potential for action or the nature of targets which are suitable for adoption by the region. The study therefore involved an extensive literature review of the many previous regional and local studies and analyses, the latest available regional data and statistics, national and international analyses of the market opportunities in key energy sectors, and relevant existing and emerging local, regional and national strategies and plans.

In addition, a programme of stakeholder engagement has been undertaken to explore the perspectives of a wide range of relevant stakeholders on the current conditions and opportunities for, and routes to, change. The programme also sought to capture evidence of the interests, motivations and capabilities of different stakeholders in contributing to these changes. This stakeholder engagement has involved one-to-one meetings, group discussions and a half-day workshop held in mid-February 2018, attended by more than 70 stakeholders.

The study scope included an exploration of the current and anticipated future energy use associated with transport use in the West of England, but with a relatively narrow focus on the future adoption and integration of electric vehicles (EVs). This is because, unlike current transport activities, the growth of EVs (and particularly when and where their batteries are charged) will have a significant and potentially highly disruptive impact on the electricity system and its infrastructure. It is therefore a key issue for a regional energy strategy. However, beyond this particular focus on EVs, the study has not sought to address the details of transport strategy and planning (for example modal shift or optimisation of freight logistics).

The study has adopted a deliberate focus on defining a near term programme of action to take place in the region, detailing the actions required, who might be involved, how this might best be orchestrated, resourced and implemented, and the nature of the economic and wider benefits which could result from success. The aim was to inform a regional energy strategy which reflected an

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1 The 'West of England' is used here to describe the area covered by the four unitary authorities, Bath and North East Somerset, Bristol City, North Somerset and South Gloucestershire Councils. The [West of England Local Enterprise Partnership](#) also serves this area. The [West of England Combined Authority](#) (WECA) and its Mayor (Tim Bowles) covers three of the unitary authority areas, with North Somerset Council having opted out of these arrangements.

understanding of both (a) the current conditions in the West of England and how they needed to change and (b) the steps that could be taken promptly to start creating that change.

Each of the region's four unitary authorities (Bath and North East Somerset Council, Bristol City Council, North Somerset Council and South Gloucestershire Council) has been involved in the study through a Steering Group convened by (and including) WECA to oversee the study and guide the development of the strategy. Each council has adopted a target for greenhouse gas emission reductions at least as challenging as the UK's legally binding target of 80% reduction by 2050, providing a clear goal for the West of England's combined efforts. The shared intention is that, as far as possible, the strategies and plans of the local authorities and the regional bodies are aligned and mutually reinforcing. Emerging findings were also presented to the LEP Board, the Infrastructure Advisory Board and the WECA Overview and Scrutiny Committee.

This report outlines our findings and recommendations from these activities and is structured as follows:

**Section 2** covers the approach we have taken to the study to understand as fully as possible the current state of play in the region (and within relevant national policy, programmes and markets) and to identify the opportunities and challenges to deliver the required changes and capture associated benefits for the people and businesses of the region.

**Section 3** explores the current state of play on energy and carbon emissions in the West of England, based on available data and evidence. **Section 4** lays out the strategic ambitions for a sustainable energy future for the West of England which meets the region's goal of a very low carbon, resilient and affordable energy system. It also provides a clear indication of the scale and nature of the effort required to meet these ambitions and proposes guiding principles and success criteria for the strategy.

**Section 5** describes the current state of play in the region, including the conclusions of a detailed SWOT (Strengths, Weaknesses, Opportunities, Threats) analysis, across the range of areas where action will be needed. The detail of the SWOT analysis is provided in the **Appendix**.

Sections 3, 4 and 5 each rely on both the extensive literature review (see **Bibliography**) and evidence gathered from the programme of stakeholder engagement, particularly the set of structured exercises undertaken at the stakeholder workshop.

**Section 6** describes a counterfactual suggested by the evidence: what will happen in the West of England if there is no purposeful effort to deliver systematic and co-ordinated regional and local level activity (i.e. if a strategy is weak or lacks follow through).

**Section 7** identifies the key initial building blocks for purposeful action – the 'first next steps' – which emerge from the evidence reviewed for the study. The section ends with guidance (**Section 7.12**) on making decisions about who leads such action and whether it is best organised locally or regionally, key issues to resolve for the strategy.

**Section 8** outlines specific recommendations for actions to deliver these 'first next steps' and which address other strategic issues emerging from the evidence review and stakeholder engagement.

**Section 9** provides a road map for these first next steps and recommendations, showing how they help deliver the West of England's energy ambitions from now until 2025.

**Section 10** describes the potential benefits to be gained by the region from taking these first next steps and thus putting the region on a path to delivering on the proposed strategic ambitions.

## 2. Our approach: acting within a national context, walking right round the issues, and taking the first next steps

There are three elements to the approach taken to this study which are fundamental to the analysis and recommendations which are reported here. These are:

- To consider regional action in the context of an existing, nationally established trajectory for energy system change.
- To ‘walk right round’ the issues so that the full range of factors which will influence success (or otherwise) and associated evidence of their status in the region are taken into account.
- To develop a road map for regional action with a particular focus on identifying ‘the first next steps’.

These elements are each outlined in more detail below.

### a. Regional action in a national context of system transformation

The backdrop to this study is the fact that, like every other part of the UK, the West of England’s energy system needs to change rapidly. This is needed to ensure the region makes its full contribution to the UK’s national, legally binding carbon emission reduction targets (80% by 2050) while sustaining reliable energy supplies and ensuring energy costs remain (or, for some, become) affordable for households, businesses and other organisations.

The changes required in the West of England’s energy system over the next 20 years are already well understood. They are, by and large, the changes required of the energy system nationally and across every other part of the UK, as documented in various official national strategies and plans.<sup>2</sup> They include:

- i. a complete shift to very low or zero carbon electricity generation, mostly renewable and much of it decentralised;
- ii. smarter and more flexible management of demand, including storage, to enable higher penetration of variable renewable generation and to optimise electricity system operation;
- iii. huge reductions in energy demand by improving significantly the energy performance of our buildings (across all sectors and all tenures) and the equipment and processes within them;
- iv. decarbonisation of heat (for buildings, hot water and industrial processes);
- v. a dramatic rise in use of electric vehicles and other steps to cut the carbon emissions of road transport (as electricity is decarbonised);

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<sup>2</sup> Such as the [Clean Growth Strategy](#) (October 2017), which sets out the government’s plans to meet the fifth carbon budget and capture the associated economic benefits, and [Upgrading our energy system: smart systems and flexibility plan](#) (July 2017), which sets out the plans of the government and Ofgem to enable a smart, flexible energy system.

- vi. ensuring new build developments achieve their full low carbon potential and contribute effectively to a smarter energy system.

This study does not assess whether these are the transformations required in this region. These changes represent the nationally stated direction of change, established over many years of detailed analysis and consideration. They will be broadly the same anywhere in the UK, driven by the same current and emerging policies, regulatory frameworks, market developments and funding and innovation regimes and markets.

The study is about how to deliver these changes in the West of England.

This needs to be viewed through two lenses:

- i. what is required of this region within a national delivery context to contribute as fully as we can to national success, and;
- ii. what are the specific local circumstances which influence the detail of what we should do in the region to ensure it gains as fully as possible in the process.

Firstly, the study – and the subsequent strategy – needs to reflect what is required of all regions in the context of current and emerging national policies, regulations, institutional structures, market conditions and drivers and existing market players.

That said, as detailed by the Committee on Climate Change in its January 2018 report,<sup>3</sup> not all these changes can be considered inevitable without further and stronger national initiatives and market developments and, in many cases, purposeful local and regional action. Yet these national strategies and action plans often do not provide any description of what that purposeful action at local or regional level might be or how it might vary by region or locality. Hence the value of a regional energy study and strategy.

This study needs to acknowledge and work within this national context, including its shortcomings. But it also needs to fill in the gaps and describe what the West of England actually needs to do to deliver these changes, irrespective of any lack of this detail in national strategies and plans. In addition, reflecting on the assessment of the Committee on Climate Change, the study should identify areas where further national action (from policy change to funding provision), in addition to that already in place or planned, is either necessary or would be hugely beneficial in enabling the region to deliver.

However, in doing so, it needs to define what the region should be doing in the absence of fully formed national policy, regulatory and/or funding regimes. This is important since national action often follows or is emboldened by examples set or leadership demonstrated in specific places or by particular organisations; it is not a purely a top-down process but one subject to influence by local and regional initiative-taking.

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3 The Committee on Climate Change's [independent assessment of the Clean Growth Strategy](#) was published at the end of January 2018.

Secondly, the study needs to reflect specific local and regional circumstances which shape the particular actions needed;

- a. to enable the region to address particular technical challenges or capability weaknesses (which might lead to the region being 'left behind' in national efforts) and:
- b. to make the most of its particular strengths and opportunities so local citizens and businesses gain the economic and wider benefits of taking a lead and 'getting ahead' in associated national and potentially international markets.

To meet these needs requires an understanding of three different aspects of the required energy system changes as they relate to the West of England region:

1. **The nature of these changes in the West of England region:** In the context of the changes which need to happen 'everywhere' (as outlined above), what are the specific circumstances and anticipated future developments in the West of England region (in terms of, for example, its built forms, renewable resources, energy and transport infrastructure, energy supply and demand, socio-demographics, patterns of economic activity etc.) which shape the precise nature of these changes in the region (and thus how they resemble or differ from changes occurring elsewhere)? And are there other relevant regional and/or local priorities (such as tackling inequalities or, more specifically, reducing fuel poverty) which need to be factored in to how the region approaches these changes?
2. **How well the West of England region is set up to deliver these changes:** What are the current capabilities, skills, supply chains, organisational capacity, institutional arrangements and commitments across the region – their strengths and weaknesses – upon which a regional programme to secure these changes would be built? The answers will determine the nature and scale of the key interventions required to ensure the West of England delivers these changes successfully, both to build on its strengths and, crucially, to address its weaknesses.
3. **The economic growth opportunities for West of England from the changes:** Which aspects of the changes is the West of England already (or is able to become) particularly good at delivering, providing the opportunity to get ahead and capture the economic benefits of serving markets beyond the region (as well as within it)? And which are the changes which potentially involve significant economic activity within the region which can be captured by West of England businesses and organisations? This is both in terms of demonstrating how the changes happen but also in developing and perfecting skills, capabilities, technologies, services, business models, and/or public engagement techniques in the design and delivery of these changes, both for the region but also in wider markets (in UK and overseas).

These are explored more in Sections 3, 4 and 5 below. By way of contrast, Section 6 outlines a counterfactual in which the region takes no purposeful action to stimulate or co-ordinate or resource activity and continues 'business as usual'. This exercise in counterfactual thinking helps to reveal the risks associated with such an approach. Aside from failing to meet the region's carbon reduction commitments (undermining legally binding national targets), these include the likely loss of economic opportunity which may result from standing back, particularly if other regions are being more purposeful.



## **b. Walking right round the issues to build a more complete picture of what's needed for success**

There is a tendency for discussions about energy futures to be dominated both by futuristic visions which ignore the limits of current practice (i.e. ignore the inevitable starting point for any strategy) and by principally technical and/or economic perspectives. They typically overlook a range of other factors which will strongly influence and, in some cases, ultimately determine whether the actions outlined in the strategy can actually be taken and are likely to succeed.

It is therefore important that the study takes more than a technological or economic perspective of the region's strengths and weaknesses and the challenges and opportunities involved.

For example, the transformation of the energy system described here represents a huge transformation not just in how we produce, distribute and use energy, but also what we invest in and how we do business and live our lives. It requires a different pattern of capabilities and supply chains, many of which are relatively rare, still emerging, or focused on serving other interests (which may currently be more rewarding). And it requires a level of public involvement in, and consent for, change which, to date, has often not featured in nationally driven programmes.

To avoid missing these sorts of issues, the study has sought to 'walk right round' the issues and consider the technical, commercial, policy and regulatory, and socio-cultural dimensions involved. This should result in a more complete understanding of what is involved in delivering change and the conditions required for success. This, in turn, enables a more thorough consideration of the possible range of actions required to create those conditions.

To give an example, to drive energy demand reduction and more flexible energy use patterns in buildings within a smarter energy system, the following conditions need to apply:

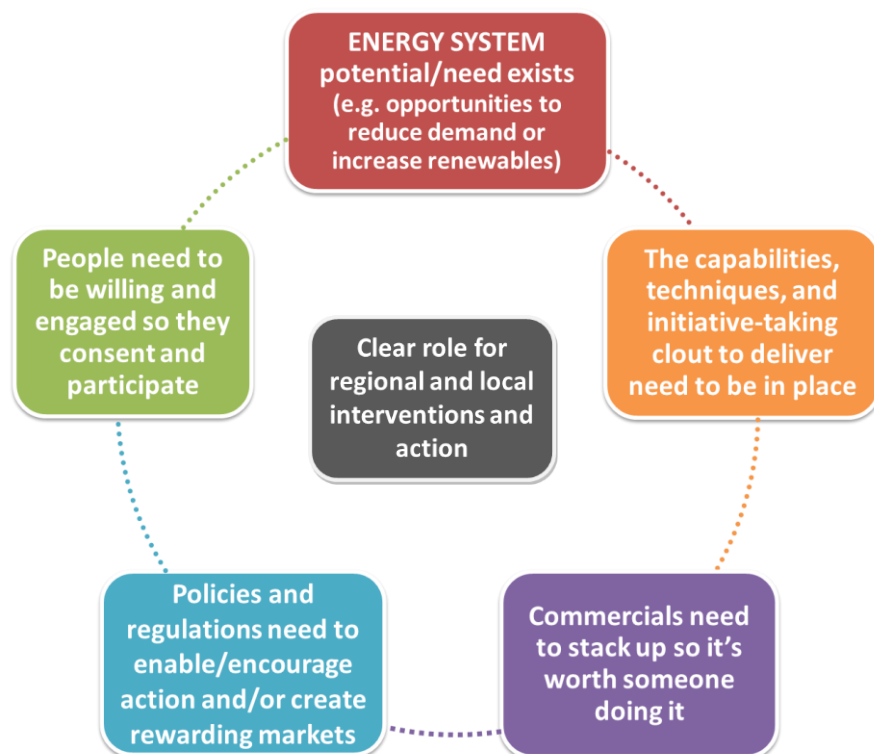
- **The energy system needs and has the potential for action:** There needs to be potential for energy demand reduction and demand flexibility and a system need which it meets.
- **We need to have – or be able to develop – the capabilities to deliver:** Unless people can develop the capabilities, the techniques and the tools to capture and analyse data, and someone has the initiative-taking clout to organise these and secure funding to get started, they are unlikely to be in a position to establish a value-creating enterprise.
- **The commercials need to be right:** In spite of the significant potential for demand reduction and demand flexibility, nothing can happen if the commercial arrangements don't stack up enough to fund interventions to secure change. For example, unless there is sufficient financial value in stimulating households and building occupiers to reduce consumption and change their energy use patterns, it is unlikely such activity will emerge as organised services in the market.
- **The policies, regulations and market rules need to reward action:** The commercials being right will depend, at least in part, on how policy-makers and regulators set the relevant market and trading rules and whether these enable those providing demand reduction or peak shifting services to capture a decent share of the value they are creating for the energy system (e.g. by providing balancing services, reducing investment in new generating capacity, avoiding network reinforcement etc).



- **The public need to be willing and engaged to participate:** unless the public and building owners and occupiers can be engaged constructively with their smart energy data – and with offers of assistance to use it well or with interventions to put it into action to manage demand – the market won't really exist and hardly any of the technical potential or economic value will be realised. And if specific efforts are not made to ensure more vulnerable households have an opportunity to participate in the benefits of these services, the wider public may resist and seek to undermine politically what they see as unfair market developments.

A brief analysis of the current state of activity in this field would suggest that none of these conditions is being met fully at the moment – but that probably all of them need to be met to make rapid progress. It would also suggest that the West of England has some promising capabilities in this field of smart energy and that national policies and programmes are seeking to address some (but not all) of these conditions. The question this raises for this study is what actions could be taken regionally and locally to take full advantage of the emerging national initiatives and to help to create all of these conditions more rapidly within the West of England to enable the region to 'get ahead' and realise its potential.

This 'walking round the issue' approach can be represented diagrammatically as below:



By reflecting on each of these dimensions (energy system need, capabilities, commercials, policies, socio-cultural) for each of the six 'required changes' outlined above, the study can establish a clearer picture of (a) the current state of play in relation to each change and (b) the full range of factors influencing the opportunities and challenges involved in achieving change. This will ensure the

strategy is embedded by the fullest possible understanding of the current state of play, the starting point for any successful strategy.

### **c. Roadmaps and ‘first next steps’ (in a dynamic, complex field)**

The transformation of the UK’s energy system is a rapidly developing, dynamic field with huge complexities across all of these dimensions. To these complexities we need to add a consideration of the specific role of regional and local action in the West of England, given the national nature of much of policy-making, regulation design and market development.

This complexity and dynamism requires an approach which is inquisitive but open to the uncertainties involved. It assumes the need for a collaborative, flexible approach that can assimilate change and new developments and respond to emerging opportunities, acting across all of the dimensions described above.

Above all, it suggests an approach which is less about nailing down ‘answers’ and thus presenting a false sense of certainty about what needs doing over the next five years and the impact it will have. It is more about understanding the challenges and opportunities, keeping options open (or developing them in the first place) and establishing a sense of how what is done now might shape and influence what can be achieved next.

This requires an understanding of the temporal dimension of addressing the challenges and realising the opportunities: the ‘when’ as well as the ‘what’ and ‘how’ of the shift from the limits of current practice to the realisation of the West of England’s sustainable energy objectives and ambitions.

As indicated, this is not just about the dynamic and complex nature of the field and therefore how it may change over time (resulting perhaps in a need for different solutions to those currently envisaged). It is also about an approach which starts from the ‘current state of play’ and acknowledges the limitations of current practice, the identified constraints on progress, the conditions required for success and the range of uncertainties in play, having ‘walked right round’ the issues.

It should reflect an understanding of the many steps needed to achieve the required changes and the likely sequence in which they will need to be taken. Specifically, it should be able to answer the question: what are the steps to take first which prepare us for taking the steps after next?

These ‘first next steps’ are the key actions which kick start progress by specifically focusing on initiatives which address the current state of play and start immediately to change it for the better. That way, they create the conditions in the region which enable the ‘steps after next’ to be taken more easily and more quickly across the region.

By taking this road-mapping and ‘first next steps’ approach and by considering the full range of conditions required for success, the study will enable the region and its stakeholders to set clear priorities in its strategy and move quickly from strategy to action.

### 3. The current state of play on energy and carbon emissions in the West of England: the data

Based on the latest available data (as at February 2018), this section outlines the current state of play relating to energy consumption, carbon emissions and the associated economic aspects in the West of England. This describes the context which the strategy needs to address and underpins the rationale for the strategic sustainable energy ambitions for the region proposed in **Section 4**.

#### a. Energy consumption and expenditure in the West of England: > £1.5 billion a year

In 2015 the West of England's households, businesses and public organisations spent nearly £800 million on electricity and gas:<sup>4</sup>

		Annual Consumption (GWh)	Meters	Expenditure (£)
Domestic	Standard Electricity	1,518	434,000	243,000,000
	Economy 7 Electricity	306	54,000	36,000,000
	Gas	4,930	414,000	190,000,000
Non-Domestic	Electricity	2,507	44,000	263,000,000
	Gas	2,339	4,000	56,000,000
<b>TOTAL</b>		<b>11,600</b>	<b>950,000</b>	<b>788,000,000</b>

The West of England's households also spend an additional £500 million a year on petrol and diesel for their cars,<sup>5</sup> and c. £15 million on coal and oil, creating a **West of England household total annual energy bill (gas, electricity, coal, oil and petrol/diesel) of roughly £1 billion**.

The total business and public sector electricity and gas bill was nearly £320 million in 2015, with a further £30 million spent on coal and oil. Data for expenditure by these sectors on petrol and diesel (i.e. transport energy) is not available at regional level but is likely to be in the region of £220 - 230 million (given the split of domestic to non-domestic transport energy use).

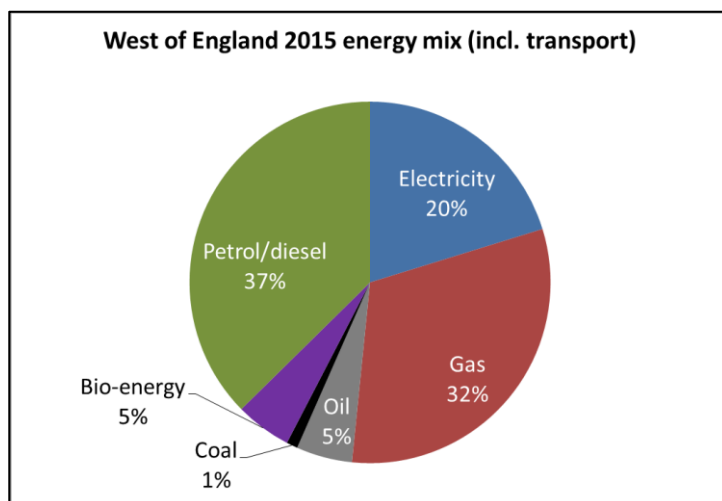
The West of England is therefore spending **in excess of £1.5 billion a year** on gas, electricity, coal, oil, petrol and diesel.

Electricity demand is predominantly non-domestic (58%) (i.e. business and public sector), while gas demand (principally for heat) is dominated by domestic use (73%). Transport energy (petrol and diesel use) is dominated by domestic (i.e. private) use (68%).

<sup>4</sup> Source: CSE calculation based on BEIS regional and local energy consumption statistics and BEIS Digest of UK Energy Statistics average energy price data

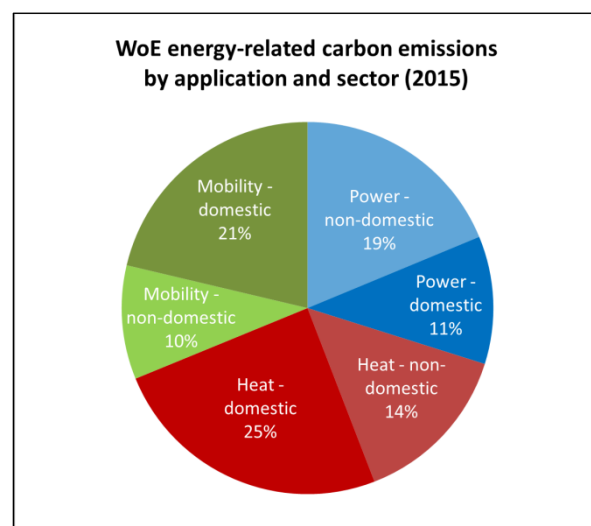
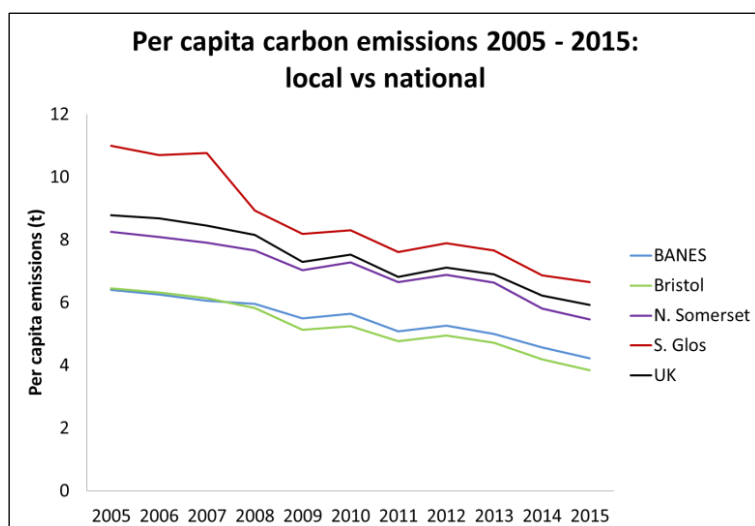
<sup>5</sup> Source: CSE calculation based on ONS Family Expenditure Survey data

## b. The West of England's energy mix: still at least 85% fuelled by fossil fuels



According to BEIS statistics, in 2015, the West of England's energy consumption (including for transport) was met by different sources in the proportions shown in the pie-chart. Some 85% of energy used in the West of England was from fossil fuelled sources (taking account of the national proportion of electricity generation which was non-fossil-fuelled – i.e. renewables or nuclear in 2015).

## c. Carbon emissions: steady reductions (broadly in line with the national picture)



Carbon emissions per capita have been declining steadily in the region and broadly in line with the national decline in emissions.<sup>6</sup> This has been achieved largely through: the decarbonisation of electricity generation (mainly due to the significant increase in the proportion generated from

<sup>6</sup> These figures are derived from BEIS published data on [local and regional carbon emissions](#). In this case we have used the data subset which excludes large industrial plants (i.e. those included by the EU Emissions Trading Scheme) and motorway transport. This is designed to reflect those emissions over which local authorities and regions may be expected to exert some direct influence. South Gloucestershire Council has historically included the emission reductions from the closure of a large local industrial plant within its calculations.

renewable sources – see below); reduced industrial activity, and: energy efficiency gains in appliances, buildings and boilers, and vehicles (the latter significantly offset by increased mileage in the more efficient vehicles). Absolute reductions in emissions are less significant than this graph would indicate, due to population growth. The similarity in the shapes of the lines on the graph suggests that the reductions in the region are likely to be due to similar factors as those influencing emissions across the UK.

Between 2005 and 2015, the West of England's carbon emissions reduced by 32% (compared with a UK-wide reduction of 27%). The additional reduction in the West of England can be attributed to the closure of an industrial plant in Severnside between 2005 and 2008 (which had been responsible for 6% of the region's emissions in 2005).

The pie-chart of emissions by application and sector above shows that 70% of West of England carbon emissions are associated with applications (heat and mobility) which are currently almost entirely fuelled by fossil fuels. To meet UK 2050 carbon emission targets (particularly taking account of projected aviation emissions) will require both heat and transport/mobility to be almost completely decarbonised within the next 30 years.

Emission reductions have not been achieved evenly across sectors. Between 2005 and 2015, emissions associated with power (electricity) use in the West of England reduced by 45% (from reductions in electricity demand and the growth of renewables nationally), emissions associated with heat by 31% (from increased building and heating system efficiency and very modest displacement of gas and oil with renewable fuels), and road transport emissions by just 6%.

#### **d. Fuel poverty: sustained deprivation with impacts on health and wellbeing**

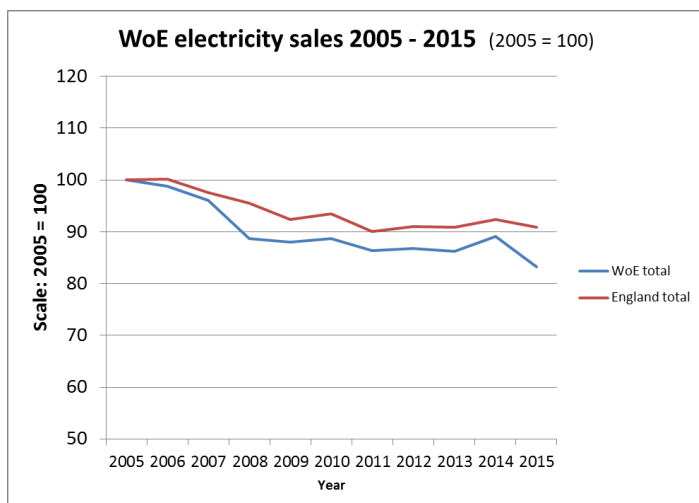
1 in 9 of the region's households – more than 52,000 households - are in fuel poverty according to the official 'Low Income, High Costs' definition for England; they will be struggling to keep their home affordably and healthily warm in winter. This is a similar proportion to England as a whole. The incidence of fuel poverty is not evenly distributed between the local authorities; roughly 1 in 8 of households in both Bath and North East Somerset and Bristol are in fuel poverty, whereas fewer than 1 in 11 are fuel poor in either North Somerset or South Gloucestershire. This difference can be largely explained by differences between the local authorities in the numbers of households on low incomes and the average age (and thus energy performance) of dwellings.

The National Institute of Care and Health Excellence (NICE) published guidance in 2015 which demonstrated a link between a wide range of health conditions (from childhood asthma to COPD) and living in a cold home.<sup>7</sup> The guidance calls upon the health sector and other agencies to work together to reduce the risk that someone would have to live in a cold home, particularly through improvements to the energy performance of the home, in order to improve their health and thus reduce demand on the health service.

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7 See <https://www.nice.org.uk/guidance/ng6>

### e. Electricity generation and consumption: declining use and the growth of renewables



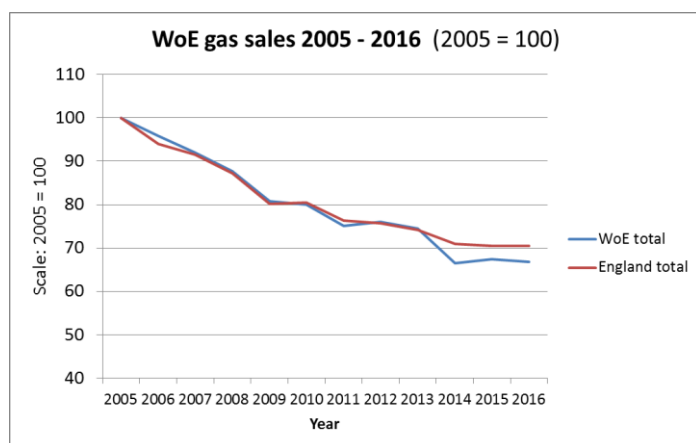
Electricity consumption in the West of England has declined steadily over the last decade,<sup>8</sup> due to increased efficiency of electricity-using appliances (driven by EU minimum efficiency standards and technology breakthroughs such as good quality LED lighting), reduced industrial activity and improved efficiency of electrically heated buildings.

In 2016 (the last full year for which data has been published), 25% of the

UK's electricity production was from renewable energy sources. However, in 2016 only 8% of the West of England's electricity consumption was met by renewable energy capacity installed in the region. Of this within-region production, half was generated by PV, about a quarter each from wind & bio-energy/waste – 307MW of installed capacity in total.<sup>9</sup>

By the end of September 2017, 1 in 30 homes in the West of England had installed solar PV (average installed capacity of 3.24 kWp per home).

### f. Gas consumption (and heating): declining demand for heat



Gas consumption in the West of England has dropped by more than 30% since 2005.<sup>10</sup> This is largely as a result of improvements to heating system efficiency and to the insulation of dwellings (particularly of lofts and cavity walls). Less than 1% of the gas supplied is currently from 'green gas' (with local sources such as sewage gas and anaerobic digestion plants typically used to generate electricity rather than be injected into the gas network).

80% of homes in the West of England have gas central heating and this remains the cheapest source of heating for homes and hot water. 14% of the region's homes are not connected to the gas network.<sup>11</sup>

<sup>8</sup> Source: BEIS [sub-national electricity and gas consumption statistics](#)

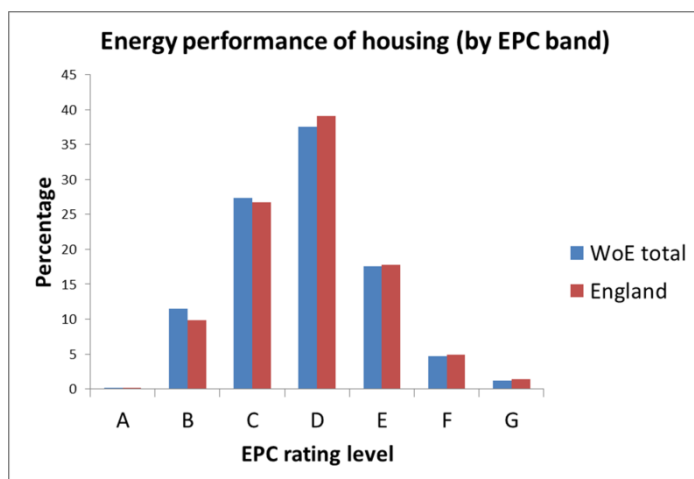
<sup>9</sup> Source: BEIS [regional renewable energy statistics](#)

<sup>10</sup> Source: Source: BEIS [sub-national electricity and gas consumption statistics](#)

<sup>11</sup> Source: CSE analysis of Xoserve [off-gas postcodes data](#)

The recent rapid decarbonisation of electricity generation means that electricity is on the verge of becoming the lowest carbon heating option (in terms of carbon emissions per unit of useful heat). A future shift from gas to electric heating (such as heat pumps) is therefore potentially a significant component of decarbonising heat supplies. However, typical peak gas demand on the coldest day of an average winter is some 5 times higher than the peak demand which the electricity system is currently designed to meet.<sup>12</sup> A rapid and significant shift to electric heating (such as heat pumps) could not therefore be accommodated without: (a) significant efforts to reduce such peaks through better insulated buildings, improved heat storage and smarter controls, and; (b) significant new and additional investment in the electricity network infrastructure and renewable generating capacity.

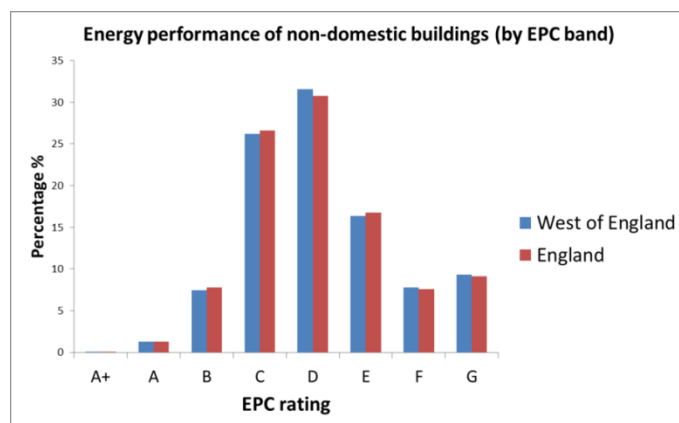
### g. Building energy performance - homes



Based on Energy Performance Certificates (EPCs),<sup>13</sup> the West of England's housing stock has a similar energy performance profile to that of England as a whole, with a slightly higher average rating. This is largely due to a housing stock that is on average slightly younger than the English average (and therefore built to higher energy standards and/or with cavity walls which have since been insulated).

60% of the West of England's housing has an EPC less than a C, a level which the Government says in the Clean Growth Strategy that all homes should achieve by 2035. It is also the standard which the Government's Fuel Poverty Strategy for England seeks to achieve by 2030, in its goal that no fuel poor household should be living in a home less than a C by that date.

### h. Building energy performance – non-domestic buildings



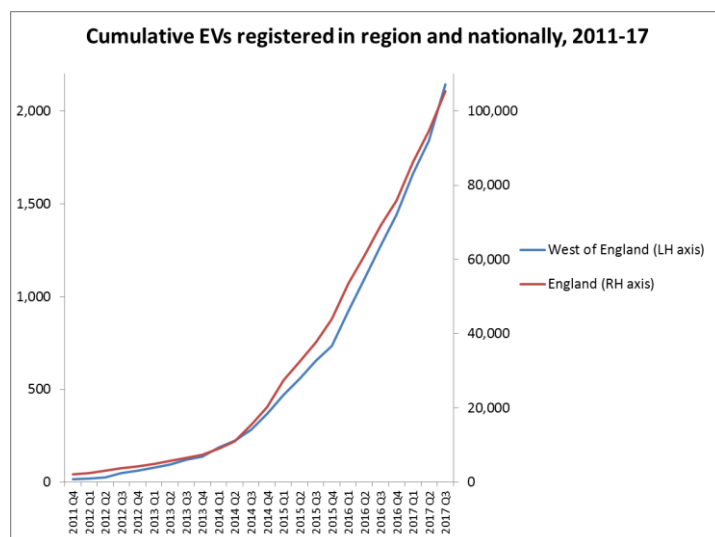
As with the region's housing, the West of England's non-domestic buildings' EPCs indicate a broadly similar profile to that of England as a whole, though with a slightly lower average performance. 65% of the non-domestic building stock is below an EPC of C.

12 Source: DECC (2013) [The future of heating: meeting the challenge](#) (see graph on page 103, provided by Imperial College)

13 While EPCs are not entirely reliable and have not been undertaken for every home, the key point here is that the proportions of EPCs in each band for the West of England is roughly the same as for England as a whole. So, assuming the patterns of EPC inaccuracies and sampling are similar across England, the comparison remains informative.



## i. Electric vehicles



The take up of electric vehicles (EVs) has accelerated rapidly in the last few years, with numbers now doubling roughly every 15 months both nationally and within the region. The graph here shows that growth rates regionally and nationally are very similar. At end q3 2017, approximately 0.3% (1 in 300) of all cars the region were EVs or plug-in hybrids;<sup>14</sup> these now account for about 1 in 50 of all new car registrations. The comparable 'new cars' figure in 2013 was nearer 1 in 900.

A standard EV charging point (7kW) has twice the peak demand of a typical home. For the electricity network to integrate significant numbers of EVs without huge additional costs, it matters where the charging points are on the network and what time of day they are used. The [Go Ultra Low West project](#), co-ordinated by the West of England's local authorities, is currently looking to double the number of charging points in the region to 400 within 3 years.

## j. New build: a challenge to carbon emission reduction commitments

The West of England is expected to build 105,500 new homes by 2036. Analysis for the West of England's local authorities shows that the c.40,000 new homes already given planning approval (to current building energy standards) will add c.7% to the region's current housing-related carbon emissions. Given the region's carbon emission reduction commitments, this increases the need to cut carbon emissions harder from existing housing or in other sectors (such as generating more renewables). However, the carbon emission reductions required from existing housing or 'other sectors' are already challenging to achieve, providing little room for 'harder' cuts. This highlights the need to ensure all future new build developments are zero carbon so that this problem is not further exacerbated.

## k. The West of England's low carbon [energy] economy

The West of England Strategic Economic Plan 2015-30 ranks the low carbon sector 1<sup>st</sup> in volume growth sectors in terms of GVA and GVA per FTE, above high tech and professional and legal services. It is identified as a priority sector for the region's economic development and, as at 2015, was employing at least 5,900 people and generating £333m of GVA.<sup>15</sup> This reflects the region's relative strengths within a national context in low carbon skills. In its latest release, the Office for

<sup>14</sup> Derived from Table VEH0131 of [ONS Vehicle Licensing Statistics 2017](#)

<sup>15</sup> See <http://westofengandlep.co.uk/about-us/strategicplan>



National Statistics (ONS) reports that the sector grew nationally by 5% in 2016, nearly three times the rate of growth of the economy as a whole.<sup>16</sup>

However, only a proportion of these companies and/or employees are involved in the energy aspects of a low carbon economy: the sector as currently defined also includes those involved in waste management and recycling and other environmental management services.

It has not been possible for this study to drill down into the distinctions to identify the proportion of the sector involved in energy. However, these 'sub-sectors' included in this 'Low Carbon Sector' (energy, waste management, etc) each have very different policy and business drivers; 'preventing carbon emissions' is often not a major driver, even if it is an outcome common to all.

Moreover, from the energy system transformation perspective being considered here, the 'Low Carbon Sector' approach will not capture all relevant existing and potential capabilities and economic activity in the construction, engineering, transport, and digital and technology sectors which are relevant to delivering a very low carbon, resilient and affordable energy system. Indeed, meeting the challenge of delivering a sustainable energy future ultimately requires all of the region's economic activity to contribute to – and operate within – carbon emission targets and the needs of a resilient and affordable energy system. 'Low carbon' activity will therefore need to occur right across the region's economic sectors, not just the sector currently categorised as 'low carbon'.

For example, if a building contractor installs solid wall insulation as part of a more extensive home refurbishment, that business and its activities are likely to be classified as 'construction' rather than 'low carbon'. Similarly, a software company developing, as one of its activities, algorithms which can be used to actuate building energy management systems to curb demand at times of peak electricity system load would be more likely captured within the 'digital' rather than 'low carbon' sector. Furthermore, at what point in its current development to become an electricity Distribution System Operator (DSO) stimulating smart demand flexibility would Western Power Distribution be considered part of the 'Low Carbon Sector'?

For these regions, the SWOT analysis undertaken for this study considers the region's existing and potential capabilities across all sectors (not just the low carbon sector as currently defined) and across all of the relevant areas for action. The results of this SWOT analysis are summarised in Section 5 below.

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16 <https://www.ons.gov.uk/economy/environmentalaccounts/bulletins/finalesimates/2016> (Released 31.01.18)

## 4. Setting strategic energy ambitions, guiding principles, and success criteria for the West of England

The focus of this study is to identify near term actions for the region which start to create the conditions in which the long-term objectives of a very low carbon, affordable and resilient energy system can be successfully achieved for the benefit of the region's businesses and citizens.

Nevertheless, it is appropriate for the strategy to consider the much longer-term ambitions for carbon emission reductions and other quantitative and measurable aspects of the intended energy system transformation and the economic opportunities these represent. The targets suggested by this study are proposed below, together with a clear indication of the scale and nature of the effort required to meet them.

Such targets are typically silent on the principles which will be applied in making choices about the region's strategic priorities and, particularly, how the region goes about achieving them. A set of proposed guiding principles is therefore outlined below, drawing on discussions with stakeholders and the study Steering Group.

In addition, it is valuable to consider how it will be possible to tell if the strategy is proving successful at a relatively early stage. This is partly because the targets will be achieved over time in relatively modest incremental steps and the data which enables achievement to be tracked<sup>17</sup> is often only available after a time lag of some 18-24 months. It would be useful to establish an earlier sense of the strategy's impact than that would allow. And it is partly because the achievement of the targets is dependent – to varying degrees – on national policies, regulations, market rules and funding programmes; any shortfall in achievement may not therefore be due to strategic failure in the region. A set of qualitative success criteria is therefore proposed to enable an early assessment of how well the strategy is providing the drive to affect change in the region.

### a. Strategic ambitions

It is useful to establish some longer-term ambitions for the region's energy strategy as these can helpfully provide a clearer sense of the nature and scale of change and activity required in the West of England. Those emerging from the evidence review for this study are outlined below.

However, as pointed out by the Committee on Climate Change in its recent assessment of the Government's Clean Growth Strategy,<sup>18</sup> setting out these ambitions only ultimately has value if specific policies and actions are put in place to realise them at national, regional and local level. Moreover, as explained in Section 2c above, the ultimate success of the West of England's energy strategy will not be determined by the rigour of these longer-term ambitions; it will be determined by the actions the region takes in the near future – the first next steps of the strategy and action plan – and the extent to which these are effective in creating the conditions in which further action is easier and more effective.

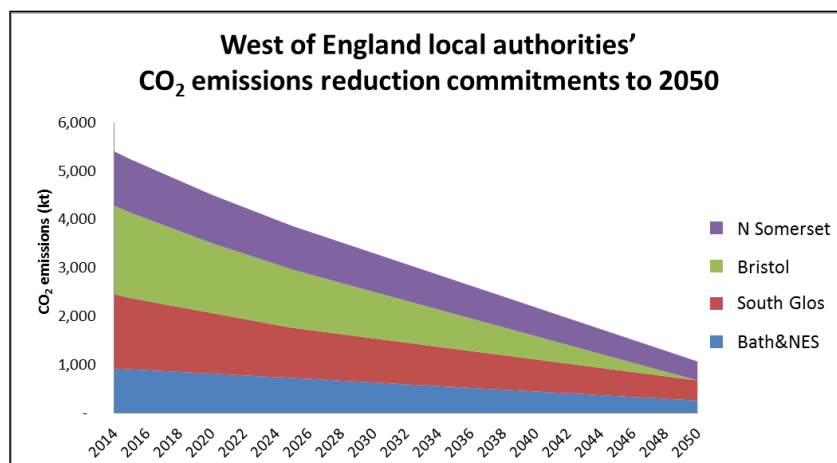
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<sup>17</sup> E.g. regional energy consumption and carbon emission data and sufficiently granular economic and employment data

<sup>18</sup> See Footnote 3

- **Carbon emissions**

**1. The West of England's carbon emissions reduced by 50% by 2035 (on 2014 levels) and by 87% by 2050 (on 2005 levels) (or, approximately, 90% on 1990 levels)**



This carbon emission reductions target for 2030 is the regional target proposed in the Joint Spatial Plan. The 2050 target results from combining the current commitments of each of the unitary authorities for 2050: Bristol 'zero carbon', Bath & NE Somerset, North Somerset and South Gloucestershire each in line with the UK's legally binding target for an 80% reduction.

- **Decarbonising electricity**

**2a. Carbon emissions per unit of electricity below 100g by 2030 with at least 25% of electricity consumed in the region generated from renewable energy sited within the region**

The electricity generation carbon intensity target of less than 100gCO<sub>2</sub>/kWh is as set out nationally in the 5<sup>th</sup> carbon budget (as described in the Clean Growth Strategy of 2017). Much of the reduction in carbon intensity will be due to the growth in offshore wind and increased renewable energy generation in Scotland; the West of England can, in part, rely on those developments elsewhere to help decarbonise electricity supplies. But more will need to be done within the region, both to reflect the potential here (particularly solar PV and onshore wind) and to make a reasonable contribution to achieving the national target. The 'within region' generation target of 25% represents a tripling of current 'within region' renewable generation (in 2016 it stood at 8% of regional electricity consumption). Assuming electricity demand increases by 25% from current levels (because of increased use for EVs and electric heating, partly offset by greater efficiency), this 25% target would set a goal of generating:

**2b. An extra 1 TWh a year of renewable electricity from projects sited within the region by 2030 from 2016 levels (to generate a total of c. 1.35 TWh)**

To provide a sense of the scale of what might at first appear to be a relatively modest goal (25% by 2030), this could be achieved by tripling the region's 2016<sup>19</sup> onshore wind capacity to 112 MW (an extra 40 additional large turbines) and tripling the region's 2016 solar capacity (PV installations expanding from 1 in 30 homes to 1 in 10 homes, plus an additional 500MW from non-domestic installations).

19 Latest available regional data from BEIS at <https://www.gov.uk/government/statistics/regional-renewable-statistics>

- **Reducing energy demand in buildings**

**3. Every existing building to at least an (accurate) EPC rating of C by 2030**

This target will require retrofit activities in the 60% of West of England's housing stock and 65% of non-domestic buildings which are currently below a C rating. This should be subject to appropriate consideration of the character and construction fabric of buildings of recognised heritage value and also reflect the need to avoid overheating as the risk of summer heatwaves increases. At current energy prices and household income levels, there are very few households in England in C rated homes which are officially fuel poor (under the 'Low Income High Costs' definition). Achieving this target would therefore also help to ensure that fuel poverty in the region was effectively addressed.

Given the timescales and the current state of the housing stock (as from the regional EPC data), this target requires c. 1 in 20 homes (21,000 homes) being improved to a C each year.

This rate of activity is higher than the current rate of retrofit/refurbishment which requires a planning application (estimated from available data at c. 3.75 homes per hundred – or 1 in 17 per year – across the region), though not all current refurbishment activity would require a planning application. The rate of refurbishment is therefore probably not the issue; it is the fact that the refurbishment currently being undertaken is not focused on improvements which lower carbon emissions and improve the energy performance of the building. With an estimated £0.5 billion a year being spent on home repair and refurbishment in the West of England,<sup>20</sup> we estimate that it would require half of this expenditure to be re-directed towards low carbon home retrofit to meet the target. Efforts will need to be made to secure investment from private landlords for homes in the private rented sector; the Government has indicated that it intends to ratchet up the Minimum Energy Efficiency Standards for private rented sector housing to level C by 2030.

The required rate of energy performance improvement in non-domestic buildings would be 1 in 18 buildings each year.

For both domestic and non-domestic buildings the refurbishment should take account of the need to maintain adequate ventilation (to avoid mould growth and poor indoor air quality) and to avoid overheating as the risk of summer heatwaves increases.

- **Decarbonising heat**

**4. By 2021 there is a clear regional plan to decarbonise the remaining – and much reduced – heat demand in the region by 2040**

Building on work currently being undertaken by some of the West of England local authorities and taking account of developments and findings nationally (including in other regions), the plan should examine the opportunities to: (a) reduce demand for heat in new and existing buildings (reflecting on the relative costs of reducing demand vs supplying zero carbon heat); (b) optimise the roll-out of heat networks and deliver zero carbon heat supplies through them using waste heat and/or renewable heat; (c) overcome barriers to increased take up of renewable heat technologies and/or

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<sup>20</sup> CSE calculation based on ONS Family Expenditure Survey Data

fuels including air-, water- and ground- source heat pumps, biomass and bio-wastes; (d) generate and use green gas locally, either directly or via the gas network; (e) inject hydrogen into the gas network to displace fossil fuel gas (including the extent to which the hydrogen production is – or could be – zero carbon).

- **The shift to electric vehicles**

**5. Half of all vehicles are EVs by 2028** (with smart charging to minimise network costs and maximise the value of renewable electricity generation)

On current rates of take up of EVs (doubling roughly every 15 months), we could expect every other **new** vehicle registered in the West of England will be an EV by 2025. What this means for the overall vehicle fleet will depend on scrappage rates and how EV market growth sustains (which will itself depend on the availability of a smart charging network). It will also depend on the success of wider efforts to reduce the need to use (and therefore own) a car or to constrain their use to reduce dangerous air pollution in the region. At current vehicle numbers, this rate of take-up could mean that half of all vehicles in the region were EVs by 2028. We estimate this would increase local electricity demand by 15 - 20% (cf 2015).<sup>21</sup>

- **New developments**

**6. All new developments to be net carbon negative and smart-energy-enabled from 2020 onwards**

As outlined in Section 3j above, meeting the region's carbon emission reduction targets while maintaining energy affordability requires that the anticipated growth in new homes and other developments across the region do not add to carbon emissions but rather help to reduce them. Planning policies currently being developed by the region's local authorities are looking to ensure that each new-build development viably achieves a net reduction in emissions through high energy performance standards and on-site or off-site new renewable energy generation that exceeds the development's forecast energy use. Such 'net carbon negative' (or 'renewable energy positive') development can lower the costs of home ownership when running costs are taken into account.

- **Sector leadership and economic value**

**7. Secure a leading position in smart energy in national and global markets by 2021**

As detailed in Section 5 below, the West of England has the potential to establish a world-leading smart energy enterprise sector which effectively combines and commercialises the region's skills, knowledge and capabilities in: data communications, data capture and curation, and data analytics; energy control systems and energy management; smarter network management; energy system charging and trading regimes; policy and regulatory insights; financing, legal and business model development; community engagement and understanding of the needs of more vulnerable energy consumers. These skills, knowledge and capabilities are distributed across the region's commercial, academic, public and charitable sectors.

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<sup>21</sup> The renewable energy target for 25% 'within region' generation allows for 25% growth in electricity demand, principally to accommodate the take up of EVs.

## **b. Guiding principles**

To guide the prioritisation of options and the design choices associated with delivery mechanisms, the following five principles are proposed:

### **i. No one left behind: ensure there are opportunities for all to participate in the benefits of this energy future, with the costs of change shared fairly**

Aside from the general principle of social justice, it is widely considered that long-term public support for energy system change is dependent on the public believing the changes are being done in ways which are fair. That means that efforts need to be made to ensure everyone has an opportunity to participate in the benefits of change and there needs to be consideration of who is paying the costs of change. This is likely to require: (a) specific effort to support more vulnerable households in accessing retrofit schemes (through grants and advisory support), engaging with smart energy services and other cost-saving opportunities, as well as; (b) representation to national policy-makers and regulators about how policy and investment costs are charged on fuel bills or funded through taxation.

### **ii. Bring the people with you: ensure steps are taken to establish meaningful public consent for the changes being sought**

Unless the public understand and support (or at least don't oppose) the changes being sought in how we generate, distribute and use energy, the changes will prove more difficult to secure and the political space for action and funding will tighten. In the past, approaches to energy system change have typically been rather technocratic and top down, treating people as consumers with more or less interest in participating in markets (and more or less 'buying power' to do so), rather than citizens with values, views, and votes who influence one another. Applying this principle will ensure the need to build meaningful public consent for the changes being planned is a consistent component of the region's strategic approach.

### **iii. Consider the potential for local investment in, and accountability of, local energy infrastructure and maximise opportunities for local enterprise and innovation**

The success of the region's community energy enterprises (such as Bath and West Community Energy and Bristol Energy Co-op) demonstrates the potential for raising principally local capital for energy infrastructure investment in the region. Such locally sourced investment thus locks into the region more of the returns on offer from new energy infrastructure. It also provides new mechanisms for keeping the ownership and management of local energy infrastructure to account. Bristol City Council's establishment of a wholly-owned energy supply company (Bristol Energy) reflects a similar intent in relation to the provision of energy supply services.

### **iv. Address the region's weaknesses as well as seeking to capitalise on its strengths**

It may be tempting to focus strategic effort on making the most of the region's existing or potential strengths in relation to sustainable energy (such as smart energy), but that would be missing the point that the successful achievement of a very low carbon, affordable and resilient energy future requires action across all fronts at local and regional level (in every region). Having such a narrow focus would leave key weaknesses unaddressed and, for example, risk missing out on developing a

building retrofit market which can support large numbers of skilled and semi-skilled building industry jobs which are essential to meeting the region's goal of tackling economic and social inequalities.

**v. Lead from the region: don't wait for national policies or market rules and regulations to be finalised before taking action**

The Committee on Climate Change has highlighted a number of shortfalls in national policies, regulations and market rules in terms of whether they are sufficiently clear to guarantee long-term success in terms of carbon emission reductions. The situation is similar in relation to the development of markets for smart energy services and mechanisms for maintaining the resilience of the energy system. Nevertheless, that should not prevent the region taking preparatory steps, building capacity, capabilities and experience so that it is able to participate fully in the highly dynamic policy and market conditions which are emerging. Moreover, evidence of regional success and/or preparedness can often be the catalyst for stronger resolve and clarity in national policy, so leadership in the regions may be a necessary approach nationally as well as regionally.

**c. Success criteria**

While progress against the objectives above can be tracked as data becomes available, the partial dependency for success on national policies, regulations, market rules and funding programmes means that it will be difficult to draw definitive conclusions about the relative effectiveness of regional action. It would therefore be useful to establish some more qualitative success criteria which can be used from an early stage to assess how well the strategy is providing the drive to affect change in the region. The following criteria are proposed:

- i. the need to maintain energy system resilience, achieve energy affordability and cut carbon emissions significantly become routine considerations and drivers in the development of all policies, programmes and funding decisions across the West of England (for WECA, the LEP and the councils);
- ii. the region's specialist technical understanding, knowledge, capabilities and delivery capacity, and the policy know-how relating to sustainable energy recognise their common interests and shared purpose and start to organise around the region's strategy to:
  - improve efficiency and effectiveness;
  - identify gaps (and how to fill them);
  - enhance learning and delivery capability;
  - stimulate new collaborations;
  - secure funding for innovation/sector development; and
  - sustain progress across all appropriate fronts,
 and capturing the benefits of doing so for the region;
- iii. across the public, business and community sectors there are leading organisations actively 'joining in', implementing change in their own investment priorities and business practices in line with the energy strategy and endorsing its intent through their actions;
- iv. the specific needs of the West of England and the acknowledgment of the region as a legitimate player are taken into account within the development of national energy policies, regulations and rule setting for new markets for energy services.
- v. Businesses, universities and other organisations in the region are, between them, securing more than the region's 'fair share' of UK research/innovation funds for low carbon and smart energy.



## 5. The current state of play on transforming energy in the West of England: a SWOT analysis

Alongside the data reviewed in Section 3 above, it is important to understand how well – or badly – the West of England is currently set up to take action across the six areas of action needed to achieve the energy system transformation. As described in Section 2a, these are:

- i. a complete shift to very low or zero carbon electricity generation, mostly renewable and much of it decentralised;
- ii. smarter and more flexible management of demand, including storage, to enable higher penetration of variable renewable generation and to optimise electricity system operation;
- iii. huge reductions in energy demand by improving significantly the energy performance of our buildings (across all sectors and all tenures) and the equipment and processes within them;
- iv. decarbonisation of heat (for buildings, hot water and industrial processes);
- v. a dramatic rise in use of electric vehicles and other steps to cut the carbon emissions of road transport (as electricity is decarbonised);
- vi. ensuring new build developments achieve their full low carbon potential and contribute effectively to a smarter energy system.

To understand this ‘readiness to act’ we have undertaken a SWOT (Strengths, Weaknesses, Opportunities, Threats) analysis for each of these areas of action. These have been considered in relation to each of the 5 dimensions we are considering as part of ‘walking right round the issue’ to provide the fullest possible picture of the ‘state of play’ from which the regional energy strategy will need to start.

The SWOT analyses are based on an extensive assessment of a wide range of reports and documents describing different aspects of these areas of action, both nationally and, particularly, within the region (see [Bibliography](#)). This included documentation relating to the range of strategic policies adopted and practical activities being undertaken or commissioned by the different local authorities in the region together with their own assessments of their current performance in relation to aspects of sustainable energy.<sup>22</sup>

The SWOT analysis was also greatly assisted by the contributions of the 70 stakeholders at the stakeholder workshop for this study. The workshop was specifically designed to capture stakeholder perspectives of the region’s strengths, weaknesses, opportunities and threats in relation to each area of action.

The detailed SWOT analysis is reproduced in the tables in the [Appendix](#). Section 5.1 below summarises the key findings.

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22 These assessments used the CSE [Local Sustainable Energy Assessment Matrix](#)



## 5.1. Key issues emerging from the SWOT analysis

From the detailed SWOT analysis (see [Appendix](#)), we have drawn out below what we consider to be the key issues for (a) each area for action (zero carbon electricity etc) and (b) each ‘walking round the issue’ contextual dimension (such as ‘capabilities to deliver’). The latter exercise helps to identify issues which are common across several different areas for action and thus the potential value of cross-cutting interventions (to better engage the public, for example). There is obviously a degree of repetition between the descriptions here of these two different perspectives as they derive from the same core analysis.

### a. Key issues by area for action

- **Zero carbon electricity generation (i)**<sup>23</sup>

The combination of significant technology cost reductions (particularly solar PV and battery storage), improved understanding of how to manage the electricity network more smartly (to accommodate more renewables), and the West of England’s strong capabilities across different sectors (private, public and community) provides a solid foundation for developing new approaches and business models for project development and deployment. There is good potential for further development of solar PV and onshore wind in the region. Against this should be set the limited political appetite for onshore wind in those areas in the region where it is feasible (in spite of public support) and the fact that some of the new ‘post-subsidy’ business models have yet to be proven, with associated market rules yet to be finalised and/or potential revenue flows uncertain.

With the revision of local plans underway across the 4 local authorities and the potential to stimulate extensive community engagement through low carbon neighbourhood planning and associated activity, there are opportunities to develop and make explicit public appetite and local support for policies demanding higher levels of renewable energy, including on-shore wind and solar PV.

The successful deployment (to date) of floating off-shore wind turbines off the east coast of Scotland suggests an opportunity to revisit the potential for offshore wind in the Bristol Channel and further out into the Atlantic (and to understand what the West of England region could gain economically from such developments). While there is interest in the region in the potential of tidal and marine energy, many stakeholders are doubtful about its commercial viability, particularly given the cost advantages now enjoyed by other renewable energy technologies.

- **A smarter energy system (ii)**

The GB electricity system needs to become much smarter in order to integrate higher levels of renewables and EVs and to curb demand growth and control network costs. This is a situation common to most electricity systems around the world, creating a global smart energy market estimated by the UK government (in 2013) to be worth \$220 billion by 2020.<sup>24</sup> National policy and

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<sup>23</sup> The roman numeral in brackets refers to one of the six ‘areas for action’ as listed at the beginning of this Section.

<sup>24</sup> The Smart City Market: Opportunities for the UK – research paper by Arup for BIS, October 2013, [www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/249423/bis-13-1217-smart-city-market-opportunities-uk.pdf](http://www.gov.uk/government/uploads/system/uploads/attachment_data/file/249423/bis-13-1217-smart-city-market-opportunities-uk.pdf)

regulatory efforts are aligning to support the transition to a smarter energy system and innovation funding is becoming available. As a result of these rapid policy and regulatory developments, Western Power Distribution (WPD) – the electricity distribution network operator (DNO) serving the West of England (with its HQ in Bristol) – is expecting to invest c.£125 million over the next 5 years across its four licence areas on developing its smart energy capabilities and associated innovations.

The West of England's combination of data analysis and digital knowledge and capabilities (academic – Bristol, and commercial), high speed data infrastructure, energy control systems design and manufacture, energy management (particularly public sector), smart energy technical, commercial and policy knowledge (academic – Bath, commercial and community), an engaged and innovative DNO in WPD, and previous trailblazer initiatives like the Bristol Smart Energy City Collaboration,<sup>25</sup> give the region a potential head start on the rest of the UK in becoming the leading region for smart energy enterprise.

There is a risk that a failure to act quickly and to establish a clear locus for regional action will leave the West of England in the wake of other regions in establishing a leading sector for smart energy (notably, in terms of stated ambition, London and Greater Manchester). The emerging smart energy market, which is still at relatively early stages with many remaining uncertainties, will not, by itself, pull the West of England into a leadership position, in spite of the region's many strengths in this field.

- **Reduced energy demand in existing housing (iii)**

While the Clean Growth Strategy sets a clear ambition for all existing housing to reach EPC C by 2035 (which would represent a retrofit market of some £3 billion in the West of England), the government has largely withdrawn from actively supporting the home-owner low carbon retrofit market and made it clear that it will not be providing grants to home-owners for such work for the foreseeable future.

The widely acknowledged failure of the Green Deal<sup>26</sup> and the end of a range of associated grant programmes (some of which were delivered by the region's local authorities e.g. Warm Up Bristol and Energy@Home) has left the supply chain overtly wary of joining in with 'official schemes'. Meanwhile, the heating and building trades required for the next phase of low carbon home improvements (particularly solid wall insulation) are already busy and earning well, so lack the impetus to drive the existing market in housing refurbishment and retrofit towards low carbon solutions.

However, there is evidence<sup>27</sup> that the region has both the home-owner interest (encouraged through Green Open Homes initiatives in the past such as Bristol Green Doors, Bath Green Homes, and Thornbury Energy-Smart Homes Trail) and the supply chain potential to kick-start a 'grant-free' low carbon retrofit market amongst home-owners. But this will need to be orchestrated and given technical and skills development support to emerge with sufficient quality and to scale enough to

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25 The [Bristol Smart Energy City Collaboration](#) is a partnership initiative started in 2015 convened by CSE with WPD, Bristol City Council, University of Bristol (Computer Science, Engineering and Estates Management departments), Demand Logic, Secure Group, Arup, KPMG, DNV-GL, Knowle West Media Centre and CEPRO. The initiative was cited in the Bristol's recognition as leading the Huawei UK Smart Cities Index for 2017).

26 See, for example, National Audit Office [statement on its investigation into Green Deal and ECO](#) from 2016.

27 See, for example, evidence to BEIS 'Building a market for energy efficiency' call for evidence at <https://www.cse.org.uk/news/view/2223>.

become ‘normal’ practice (for both home-owners and building trades). This has the potential to become self-sustaining as the wider market (both householders and the supply chain) takes up the techniques and technologies normalised by these ‘early adopters’ (particularly if this is reinforced by clear signals from government about future expectations for improved energy performance of existing homes).

The need to address fuel poverty and reduce the health and social impacts (and costs) of cold homes will be difficult; the Government’s Committee on Fuel Poverty highlights the inadequate levels of funding on offer from either central government or obligations on energy suppliers.<sup>28</sup> The four local authorities all have long-standing commitments to action to tackle fuel poverty and continue to support energy advice provision and to have grant schemes in place, drawing mainly on ECO funding from energy suppliers but also some public health and Clinical Commissioning Group funding (in South Gloucestershire). In the face of budgetary pressures, the local authorities may need to co-ordinate or pool efforts more in future to: (a) increase market clout (e.g. with securing ECO); (b) build the case for greater investment (e.g. from central government or from the health sector for illness prevention), and; (c) realise the potential of the Private Rented Sector Minimum Energy Efficiency Standards (PRS MEES). These PRS standards present an opportunity to secure investment from private landlords in improving the worst housing in the region, though caveats and exemptions in the regulations (currently under review) may limit the immediate impact.

- **Reducing energy demand in public sector buildings (iii)**

The West of England’s public sector has strong skills and commitments to energy management in its buildings (particularly Bristol City Council and the other local authorities, the hospitals, and all four universities). The funding opportunities presented by SALIX and some of the new emerging demand side response and flexibility markets are being utilised. However, there is only limited sharing of best practice and pursuit of the innovation funds available is ad hoc. While extensive smart energy data is now being captured and curated by the public sector’s energy management teams, these are not subject to the full range of potentially valuable data analytics and there are constraints in the resource available to assess new smart energy technologies and service offerings emerging in the market.

The sector tends to focus on short-term payback opportunities in existing buildings, with their institution’s capital resources often focused on longer-term investments in new build rather than refurbishment.

This strong public sector energy management practice offers an ideal platform for testing smart energy techniques and services and creating exemplars as models for better practice in the commercial sector.

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28 See Committee on Fuel Poverty’s 2017 annual report which identifies a £14.4 billion funding gap for England at [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/652701/CFP\\_report\\_formatted\\_-\\_final.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/652701/CFP_report_formatted_-_final.pdf)

- **Reducing energy demand in commercial buildings (iii)**

The commercial buildings sector is a well-recognised challenge in terms of improving its energy performance because: (a) any demand-reducing benefits of investment by the building owners (landlords) are enjoyed by the tenants ('split incentives'); (b) the ownership of the region's commercial building stock is opaque (so promoting opportunities is difficult), and; (c) current energy demand patterns of commercial buildings and the potential for improvement are not well understood (so the potential for financial benefits from making improvements is poorly defined).

This creates opportunities for third party financed 'energy services' offerings, though take up of such services has generally been patchy in the past. The development of smart energy markets may create new value for improved demand management and peak reduction (typically via an aggregator service), though participation will often still be dependent on landlords or their building managers who may have little direct incentive to become involved (because it is the tenants who benefit).

- **Decarbonisation of heat (iv)**

Decarbonising heat is a known but highly complex challenge on the path to meeting long-term national carbon reduction commitments. The initial priority for action is to reduce demand for heat by improving the energy performance of buildings, particularly homes, and to largely remove the need for space heating in new developments. The region's local authorities (particularly Bristol) have been driving a programme to establish heat networks for areas with high density of heat demand, with the specific intent of installing infrastructure which enables heat supply decarbonisation.

Bristol is also developing its own Zero Carbon Heat Strategy which is expected to be reflected in its new local plan. However, the extent of decarbonisation beyond these initial priorities will depend on the heat sources/fuels which emerge as technically feasible, economically attractive and socially acceptable. Greener gas, biomass, electricity (given its rapid decarbonisation and the potential of heat pumps), and hydrogen are all potentially in the running, though at different stages of development and each with their own technological challenges.<sup>29</sup> While heat decarbonisation is a complex problem that will not be fully resolved for several years, there is a need to start now developing a plan for the region that can be optimised as new evidence and practice emerges from within the region and more widely (e.g. from the Leeds H21 hydrogen experiment).

- **Growth of EVs (v)**

The increasingly rapid take up of EVs (see Section 3i) is pushing the national policy focus from creating demand for EVs to developing and managing the orderly growth of charging infrastructure, the introduction of smart charging services (including, potentially, from local suppliers) and the optimisation of its impact on the local electricity network and wider system. The region has a local authority-led EV project (Go Ultra Low West) and the UK's leading DNO on EVs (WPD). However,

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<sup>29</sup> For example, hydrogen's low carbon status depends on how it is produced (which, in some proposals, is from fossil fuel gas with the assumption that carbon capture and storage is both available and cost-effective to prevent the associated carbon emissions). Its use as an alternative to gas to be distributed via the existing gas network depends on the ability of the gas network to transport hydrogen safely and of gas-burning boilers to be adjusted to burn hydrogen and avoid associated corrosion risks. The Leeds H21 hydrogen project is in the early stages of exploring these issues.

there is not yet sufficient appreciation amongst those promoting EVs of the electricity network challenges (and opportunities) presented by EVs, and WPD has not particularly focused on the West of England in its innovation work on this topic. Greater involvement of WPD in the development of EVs in the region is essential to avoid a chaotic and/or expensive rollout (in terms of network reinforcement requirements).

The region enjoys significant EV-relevant R&D capabilities at its universities (e.g. the IAAPS and FLOURISH research programmes) and consultancy and research skills (e.g. at the University of the West of England and in the local offices of national consultancy companies) on public attitudes and transport planning.

The West of England's Joint Transport Study<sup>30</sup> contains no proposals to encourage the take up of EVs (though it recognises their benefits for air quality and reduced carbon emissions). It also makes no mention of EV charging or the challenges this represents for the region's electricity infrastructure without effective co-ordination and smart charging approaches. This exposes the work needed to create a more integrated approach in the region between the transport and energy sectors as this radical shift in the types of vehicles in use takes off.

- **New build development being zero carbon and smart (vi)**

The region's local authorities share a commitment to securing high quality, zero carbon, smart enabled new developments and are actively pursuing the evidence base to support such policies in both the Joint Spatial Plan and the forthcoming revisions of their own local plans. Local neighbourhood planning processes could, with the right support and stimuli, also promote these low carbon objectives, reinforcing the requirements being established for the new local plans from the 'grass-roots' upwards.

National planning policies and guidance have in the last few years made some approaches more difficult (e.g. it is no longer permitted for local plans to require higher energy efficiency standards than building regulations). There is no requirement for low carbon issues to be addressed in neighbourhood plans. Large developers routinely contest local planning requirements for on-site renewable generation on grounds of viability. This stretches the capacity (and capabilities) of local authorities to challenge developers' viability assessments and 'hold the line' to secure the policy requirements in practice.

Much of the new housing already permitted in the region (amounting to c.40% of the total requirement until 2036) will be meeting current building regulation standards rather than zero carbon targets. This threatens the achievement of the region's carbon emission reduction commitments unless further reductions can be found from other sectors with already challenging requirements to meet.

There is considerable technical and design expertise in the region for very low energy buildings (including modular and 'eco' designs) and sustainable approaches to new build developments.

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30 Published end October 2017. See <https://www.jointplanningwofe.org.uk/consult/ti/JTSTransportVision>

## **b. Key issues by contextual dimension**

- **Energy system need and the potential for action (within the West of England)**

The six areas for action identified are all relevant to the West of England. However, current rates of activity across all areas for action are significantly below what is required to meet carbon emission reduction targets, particularly in relation to improving the energy performance of the region's buildings and, following the reduction in subsidies, deploying renewable energy.

For the latter, the region's renewable resources are constrained by its urban character but there remain considerable opportunities for further development of solar PV and of on-shore wind, particularly with the developments in smarter network management, storage and local energy markets. Achieving significant decarbonisation of the electricity used by the region will rely not only on capturing a decent proportion of the available within-region resource but also on the development of renewable energy in other parts of the UK, particularly offshore wind and in Scotland.

Realising the opportunities to increase the take up of renewable electricity generation and EVs and to achieve demand reduction in buildings in the region are heavily dependent on successful development and application of smart energy services. These will be based on improved energy data capture and analytics and better control technologies, at the level of both individual buildings and across the energy network. The adoption of smart charging systems for EVs is vital to avoid risks to the resilience of the electricity system and to keep associated network reinforcement and operational costs to a minimum.

Decarbonisation of heat is essential to meet long-term carbon emission targets. However, with more than 80% of current heat fuelled by fossil fuels and more than half of boiler replacements happening 'in distress' (i.e. at point of breakdown on a rushed basis with no change entertained and little meaningful 'decision-making'), the challenge of changing to lower or zero carbon fuels and heating systems is significant. Reducing demand for heat is widely acknowledged as the first priority and does not need to wait for a better understanding of the technical and commercial viability of different heat decarbonisation options.

Unless new build developments achieve zero carbon emissions – or better (by being 'energy positive') – the planned growth in housing in the region of 105,000 units by 2036 will increase carbon emissions from the housing stock (as outlined in Section 3j). Analysis suggests that the 40,000 new homes already granted planning permission at current energy performance standards will add 7% to current housing-related carbon emissions in the region. Continuing with this approach would result in larger carbon emission reductions being required from other areas for action. This may not be possible, given all of them are already expected to be making very significant – and challenging – contributions to the overall commitments to cut total carbon emissions from the region's energy and transport use.

The potential for offshore energy – and particularly wind power – in the Bristol Channel and Atlantic may be worth exploring again after the emerging success of floating technology for offshore wind off the North Sea coast of Scotland.

- **Capabilities to deliver**

The West of England has strong capabilities across technical, commercial, legal, financial, regulatory, policy and public engagement dimensions of achieving a very low carbon, affordable and resilient energy system. The business, academic, public, and community and voluntary sectors are all active, though efforts are not always joined up to make the most efficient use of resources and a clear locus for action is often lacking (particularly for newer areas, such as smart energy).

Particular existing or potential areas of strength in the West of England include: smart energy (including the associated digital skills and academic expertise in power systems engineering and economics at University of Bath and big data analytics at University of Bristol); low carbon local and neighbourhood planning; EV take-up, network integration and smart charging (and some associated engineering R&D); public sector energy management; heat networks; technical and engineering consultancy across most domains; fuel poverty alleviation; community energy approaches; low carbon finance and legal structures.

Many of these capabilities have been in place for several decades across the region, with Bristol in particular building a reputation as a centre for excellence in sustainable energy. The City Council has similarly been active on energy for many years, often in partnership with other organisation and businesses. Over the last six years or so the council has developed a more strategic approach and an extensive programme of activity run from within the council (including the development of a licensed energy supply company, Bristol Energy, owned by the Council, and a support programme for community energy activities in the city), with it taking a leading role on energy amongst the national Core Cities group.

Bath & North East Somerset (particularly through its Energy@Home programme), South Gloucestershire (through Warm and Well) and North Somerset Councils have all played important roles in recent years supporting energy efficiency advice services and insulation and heating grant programmes. Bath & North East Somerset has also established a strong partnership with Bath and West Community Energy, one of the UK's leading community energy co-ops, and explored the challenges of retrofitting heritage buildings to meet modern carbon emission standards without compromising heritage characteristics.

The region's electricity distribution network operator, Western Power Distribution (which also serves the whole of the South West, South Wales and the West and East Midlands), is one of the leading DNOs for innovation, support for vulnerable customers and community engagement. However to date, their engagement with (and by) the region has been somewhat ad hoc (albeit valuable), usually focused on specific projects rather than at a strategic level. The gas distribution network operation Wales and West Utilities is actively involved in exploring options for decarbonising heat, though clearly has a strong interest in approaches which will require the continuing use of the existing gas network.

Potential supply chains for the low carbon retrofit markets, particularly for home-owners, are typically busy and making a decent living doing 'normal' rather than low carbon refurbishment and retrofit; they are wary of official schemes, given recent history of grant schemes, and doubtful of the extent to which a market for low carbon retrofit will grow and sustain. However, the region has some exemplary initiatives and businesses in low carbon housing and building retrofit. Examples



include the [Green Register of Construction Professionals](#), [Greenheart](#), [Urbane ECO](#), and [White Design](#).

The smart energy market will require a new combinations of skills, capabilities and knowledge from across sectors and disciplines in which the West of England is very strongly represented – though these are not current organised to focus on or deliver smart energy solutions. Moreover, the smart energy market, while potentially very significant at both national and global level, remains ‘in development’ as policies and regulations to set market rules are finalised and, for domestic consumers, smart meters rolled out. There is therefore not yet clarity as to how exactly the rewards for innovation and action will be earned in future. As a result, there is insufficient market pull to stimulate the ‘spontaneous’ creation of the new business relationships and innovation test beds vital to realising the opportunities.

The region has two of the country’s most successful community energy enterprises (Bristol Energy Co-op and Bath and West Community Energy). Together with locally-based businesses like Thrive Renewables and Mongoose, they are working to enable wider ownership of renewable energy generating assets, both in the region and more widely.

The region’s high quality public sector energy management capabilities (for example, in the councils, all of the universities and the hospitals) may be able to provide a test-bed for the development of innovative smart demand management services; these could then be offered to the commercial buildings sector, through such initiatives as Business West and Bristol Green Capital Partnership.

Many of the region’s law firms have strong renewable energy and energy teams, serving national markets as much as local ones. The presence of Triodos Bank’s UK headquarters in Bristol creates an opportunity to tap into financing and investment structuring expertise.

- **Commercials/funding rewarding the right initiatives**

There are currently significant challenges in establishing strong business cases for many of the interventions required to achieve the carbon emission reduction targets. This is not a specific regional problem, but arises particularly because:

- previous national grant and/or subsidy schemes have been cut significantly or all together (reducing potential returns on investment and leaving supply chains weakened, but also, more positively, allowing markets to start afresh without grant- or subsidy-induced price distortions);
- relevant new market rules (for example for local energy trading) are still in development, creating risk and uncertainty for potentially viable new business models, and;
- technology cost reductions emerging globally are only just filtering through to markets previously buoyed by subsidies.

All of these changes will create new opportunities for those businesses and organisations which can find viable approaches within the largely subsidy-free markets which are emerging. Those regions which can help and support local enterprises to understand these markets and develop these



approaches will gain the most, enabling them to capture economic value within their regions and potentially to sell products and services to those regions which are less well prepared.

In spite of these currently weak markets, there is considerable innovation funding available (from BEIS, Innovate UK and WPD) to stimulate new approaches, particularly in relation to the introduction of smarter demand management and response services. The Government has made a £2.5 billion funding commitment to support low carbon innovation (2015-21). That said, such funding tends towards technology development rather than service integration or sector development initiatives. WPD has committed to spend £125 million over the next 5 years across its four licence areas to underpin its transition from a DNO to a Distribution System Operation (DSO).

The SALIX fund offers the public sector low cost finance for relatively quick pay-back measures and BEIS is still making funding available for the development of heat networks and the Renewable Heat Incentive (RHI) subsidies for renewable heat continue (though with some uncertainty currently about their availability for new projects after 2019).

With current annual expenditure on electricity and gas in the region of nearly £800 million, organisations and households making investments and purchasing services which reduce energy demand will also have the benefit of reducing energy costs. And if those investments and purchases (e.g. in building retrofit or smart demand management services) are made through businesses based in the region, the value of the investment is also retained in the region.

As an example, the investment required to bring all homes in the region up to an EPC C where practicable is estimated at c. £3 billion. While some of that will be for equipment and building materials manufactured outside of the region, the potential GVA for the region's building and heating engineering business to secure from this improvement is estimated to be in the order of £1.5 - 2 billion over the next 12 years.

Achieving energy demand reductions in commercial buildings remains very challenging, given the split incentives between the building owner/landlord who would invest in building improvements and the tenant who would gain from them in terms of reduced bills.

Funding for tackling the causes of fuel poverty by improving home energy performance – typically available from energy supplier energy saving obligations set by the government (the Energy Company Obligation or ECO) – is not, according to the Government's Committee on Fuel Poverty,<sup>31</sup> adequate to meet national targets for eliminating fuel poverty. That said, the new Private Rented Sector Minimum Energy Efficiency Standards (PRS MEES) regulations may enable more investment to be secured from private landlords (see below). In addition, the region may not be maximising the take up of the ECO which is available nationally and there may be benefits from a more co-ordinated approach across the local authorities and health bodies and with other agencies and contractors operating in the region. Social housing landlords have tended to invest well in the energy performance of their housing, leveraging other funding such as ECO where available (ensuring that

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31 See Committee on Fuel Poverty's 2017 annual report which identifies a £14.4 billion funding gap for England at [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/652701/CFP\\_report\\_formatted\\_-\\_final.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/652701/CFP_report_formatted_-_final.pdf)

the social rented sector has the most energy efficient homes). The recent decision by Curo to refurbish rather than demolish homes in Foxhill creates an opportunity for exemplary low carbon refurbishment.

- **Policies, regulations and market rules**

National, regional and local policies all share the intent of cutting carbon emissions at least in line with legally binding targets set out in the Climate Change Act 2008. However, as the Committee on Climate Change has indicated at national level and this study reveals at regional and local level, the policies, regulations, market rules and funding programmes currently in place or publically declared as in preparation are not yet adequate to realise that intent.

Policies and regulations to enable a smarter energy system are coming forward but the markets in which actions can create (and capture) value are still evolving.

The policies currently proposed in the region's Joint Spatial Plan and the revisions being made by local authorities to their local plans demonstrate an understanding of what is required of new development and the policy tools available to seek to deliver it. However, the limited political appetite in some parts of the region for onshore wind may limit opportunities for further developments within the region of this lowest cost zero carbon electricity source, leading to higher electricity costs than necessary.

The PRS MEES coming into force in April 2018 potentially provides an opportunity to drive greater landlord investment in both the worst housing (where the incidence of fuel poverty is very high) and the worst non-domestic buildings. However, the combination of limited enforcement resources and various exemptions available to landlords (until at least 2019) create some challenges to realising this opportunity without additional funding.

- **Public engagement in and consent for change**

Nationally and locally, there has been a lack of purposeful public engagement to develop an understanding of the changes required for a low carbon energy system and establish meaningful public consent for these changes. At national level there has been, until very recently, little systematic policy or programme effort to consider the local and regional dimensions of a low carbon future.

This lack of explicit, positive public endorsement has left national and local politicians wary of whether they have the political space to accelerate action and take tougher approaches to address barriers to change or stand up to vocal minority opposition. Activities such as neighbourhood planning, consultation processes for new local plans, and other deliberative public engagement techniques at community level all provide opportunities to develop better public understanding of what a low carbon future might mean for their locality. The evidence suggests that, done well, these activities build understanding, an active interest in realising – and benefiting from – the required changes, and greater enthusiasm for renewable energy technologies such as wind and solar.

The smart meter rollout to every household in Great Britain offers an ideal opportunity to engage the public in the potential opportunities and benefits of a smarter energy system. However, by being energy supplier-led, the rollout is not being delivered in a way which will realise this opportunity,

with a lack of local engagement or messaging and no co-ordination of support for more vulnerable households. Efforts (including for Bristol and more recently by London) to co-ordinate energy suppliers efforts to create a more area-based approach and communications strategy have not yet borne fruit.

The take up of EVs is starting to become normal (most people now know someone who owns an EV) and 1 in 30 homes in the region (effectively 'one in every street') now has a PV system on its roof. These growth rates signal new norms emerging which will start to alter the purchasing and investment choices of 'the less interested' who will tend to follow the example of what's becoming normal as set by pioneers and early adopters.

Ongoing community energy activity across the region contributes to these processes of normalisation of change. This social process was embraced by the green open homes activities around the region over the last few years (led by Bristol Green Doors) which sought to normalise low carbon retrofit and inspire households to upgrade their own homes. However, the limited supply chain for low carbon housing retrofit (already busy on normal refurbishment activity) means that enthused householders can find it difficult to obtain quotes and initiate work. The occasional availability of grants and schemes like the Green Deal in recent years within local authority-managed programmes has stimulated take up. However, markets have not sustained following their subsequent expiry and the withdrawal of government support and involvement may have led some to conclude (incorrectly) that the measures are no longer 'of value'.

There has been little effort to date to use the good examples of smart energy management and carbon emission reduction in the public sector to stimulate more activity in the commercial sector (or to engage public sector workers in wider carbon reduction activities). Initiatives like Go Green (Low Carbon South West) and the Bristol Green Capital Partnership could provide opportunities to showcase these examples and draw more businesses into taking steps in their own buildings and business practices (acknowledging the landlord/tenant split incentive challenge). The take up of solar PV, EVs and smarter energy demand management services within businesses could also be boosted using these channels to promote opportunities and create new partnerships between service suppliers and buyers.

## 6. What happens on energy in the West of England without purposeful action?

It is instructive to consider the counterfactual to the approach and actions proposed here: what is likely to happen in the West of England if there is no purposeful effort in the region to stimulate and resource new regional and local activity to deliver on the region's energy objectives?

There will of course still be activity in the region, from initiatives taken by existing and new players based in the region in response to commercial and/or funding opportunities they have identified or which emerge from national action over time. However, it is highly unlikely that this level of activity would be sufficient to deliver the region's emission reduction commitments or strategic ambitions or to capture for the region the full benefits of doing so.

Moreover, given the funding constraints faced by local authorities (which have previously been a source of initiative and a route to government funding), it should not be assumed that even current levels of activity can be sustained in the absence of a more strategic, coherent and collaborative approach across the region.

There are a number of risks associated with taking little or no purposeful action in the region:

- **Economic value of delivery is 'exported' as businesses from elsewhere win market share:** The West of England loses much of the economic value of delivery within the region, because delivery activity is mainly done by businesses based elsewhere in the UK (who have responded more promptly to policy and market signals, potentially as a result of successful backing by their region). As a result the economic value and associated jobs are largely exported and the region fails to benefit to the extent possible.
- **Missing out on growth sectors (and falling behind other regions):** The region misses out on establishing globally significant, economically valuable market-leading sectors such as smart energy because other regions steal a march on the West of England by organising themselves better to realise their own potential sooner (even if their potential started out as less than the West of England).
- **Failure to deliver on energy objectives undermines wider regional and local priorities:** The West of England and its local authorities fail to deliver their strategic objectives on energy and thus fail to cut carbon emissions in line with national carbon targets and end up with a less resilient, less smart energy system with higher costs (leading to greater inequality, higher fuel poverty, higher costs for local businesses, and fewer EVs on the road to help address poor air quality). Because national policies are acknowledged (by the Committee on Climate Change) as being insufficient on their own without more concerted local and regional action, 'business as usual' in the region will prove inadequate.
- **The West of England's interests and needs don't feature:** What happens on energy in the region fails to reflect the interests and needs of its people, communities and businesses, with little attention to structures of asset ownership (such as community-backed ownership) or enabling the participation of more vulnerable households. This reduces public and business engagement

with energy system transformation, raises costs and increases the risk of energy-related vulnerability as services prove ill-suited to local conditions.

- **Lack of co-ordination leads to reduced electricity system resilience and higher costs (which fall more heavily on those least able to bear them):** Without a managed and integrated approach to EV take up and particularly the development of the EV charging infrastructure and charging management across the region, the electricity network will be much less resilient and/or require significant (and costly) upgrades which could have been avoided. These higher costs will feed through into higher electricity bills, hitting hardest those least able to afford them (who are also unlikely to be EV owners). There would also be resilience and cost impacts if the region is slow to take up smarter demand response services, potentially reducing the capacity of renewable energy which the region's infrastructure could cost-effectively sustain.
- **Cherry picking leaves vulnerable households behind and undermines public support for change:** Left to their own devices, businesses and other organisations would quite reasonably cherry-pick the best opportunities where the greatest financial rewards can be found. This makes commercial sense for the individual businesses involved. However, it will increase all of the risks outlined above and make it far more likely that vulnerable households will be left behind, unable to participate in the benefits of, for example, smarter energy services while still paying the costs of system changes through their energy bills. This will exacerbate existing inequalities. It will also undermine wider public support – and thus political appetite – for changes to the energy system which, left unchecked, appear to result in unfair outcomes.
- **The risk of too narrow a focus from the region for its efforts:** There is also a risk that the region focuses its efforts only on those areas where there appears to be economic advantage to be gained, particularly from selling into markets beyond the region. Having such a narrow focus would leave key weaknesses unaddressed and, for example, risk missing out on developing a building retrofit market which can support large numbers of skilled and semi-skilled building industry jobs which are essential to meeting the region's shared goal of tackling economic and social inequalities.

The negative impacts of the risks described above are not inevitable. But they do represent a perfectly possible set of outcomes if the region does not take purposeful action to move beyond 'business as usual'.

Avoiding these impacts – and achieving instead their positive opposites – is achievable (and one of the purposes of the regional energy strategy) But it is only achievable with concerted, co-ordinated, purposeful effort which draws on the best of the public, commercial, and voluntary and community sectors and initiates new and additional activity, designed to meet the West of England's energy ambitions and the wider priorities which they can serve. These are explored in Sections 7 and 8 below.

## 7. The first next steps: key building blocks for purposeful effort and early progress

From the analysis undertaken for this study and consideration of the outputs of road mapping exercises undertaken at the stakeholder workshop, a number of key building blocks emerge that provide the foundations for a strategic approach to realising the West of England's sustainable energy ambitions outlined in Section 4.

These represent the 'first next steps' for the region. As described in Section 2 above, these are the key actions which kick start progress by specifically focusing on initiatives which address the current state of play and start immediately to change it for the better. That way, they create the conditions in the region which enable the 'steps after next' to be taken more easily and more quickly across the region.

Ten key building blocks for purposeful effort and one over-arching commitment have emerged from the analysis for this study and the associated stakeholder engagement. While putting these in place will not over time be sufficient to realise in full the ambitions outlined in Section 4 above, they represent the core initial elements of a successful programme that should form the heart of the West of England's energy strategy.

The study team has also provided (at the end of the description of each key building block) an indicative funding requirement for the next 3 years to initiate and support the establishment of each these building blocks. This totals £10 million of revenue funding over 3 years, principally for staff resources and a £5 million revolving loan fund for development risk capital for renewable energy project development (modelled on the Bristol Community Energy Loan Fund).

To assist the shift from study to strategy, Section 7.12 provides some guidance on how to consider the decisions which need to be made about who leads these activities in the region and at what scale they might best be organised.

The next section, Section 8, then sets out a more detailed set of recommended actions which need to take place in the region to establish these building blocks. It also provides some additional recommendations on exploring some other opportunities for the region (such as off-shore energy), and addressing some of the challenges to regional progress and success presented by current gaps in national policy and/or shortfalls in funding. These and associated follow-on actions between 2019 and 2025 have then been developed into a road map, provided in Section 9.

### 7.1. Requiring more local renewables and zero carbon, smart-enabled new development: stronger planning policies and enhanced execution

As outlined in Section 3j above, achieving the region's long-term carbon emission reduction commitment needs planning policies which: (a) enable additional renewable energy generation to be developed in the region, and; (b) ensure all new developments contribute to reducing carbon emissions rather increasing them and are resilient to climate change (addressing, for example, the risks of overheating).

New developments will also need to be ‘smart enabled’ with energy data capture and EV charging points so that those living and working in them can play a full role in the smarter, lower carbon energy and transport system from the time they move in without the need for subsequent retrofit. Such buildings offer occupants extremely low energy bills.

To create conditions in which additional renewable energy generation can be developed within the region to meet the strategic ambition to generate the additional 1TWh a year by 2030, the new regional and local plans need to identify suitable locations for on-shore wind (as required by national planning policy for local wind power development to be permitted). These should not be constrained too readily where technical solutions may be available to mitigate potential barriers (e.g. civil aviation radar concerns around an airport). The plans also need to have policies which support solar PV retrofit on existing roofs (domestic and non-domestic) and brownfield and low-grade land. (See also 7.10 below for details on how public consent for these policies may be enhanced).

The work currently being done by local planning authorities on the Joint Spatial Plan and in revising their own local plans is seeking to establish policies to achieve these outcomes. However, with only limited backing from national planning guidance and policies, any local or regional policies to secure zero carbon smart new developments always run the risk of being challenged by developers on the basis of commercial and/or technical viability and affordability. Resisting such challenges requires: (a) an evidence base which demonstrates the basis for viability and affordability, and; (b) an ability to sustain a strong position in the face of considerable developer resources. The former is currently being actively pursued to underpin strong new policies. The latter could potentially benefit from additional expert resources shared between the planning authorities to support core development control staff in marshalling the evidence and holding the line in negotiations with developers.

**3 year funding requirement: c. £1 million** (£0.33m per year) to provide additional expert planning resources to support policy development and, particularly, assist with their routine implementation across all new developments in the region.

## 7.2. Delivering solar PV at scale (on roofs and low-grade land with local supply, smart management and community investment)

While the Feed-in-Tariff subsidies for solar PV have been severely cut back, causing a hiatus in development and installation activity, there are several reasons why solar PV remains a significant opportunity for the region to develop its within-region renewable energy capacity. Reductions in technology costs for both PV and storage are cutting the installation costs. There is a growing understanding of how storage can integrate with solar PV to increase revenues (and thus project viability). And the emergence of working models of local energy markets and peer-to-peer electricity trading increase the opportunities to secure higher value for the electricity generated (by selling it to host and neighbouring consumers). The potential for (near) subsidy-free solar PV in the region is realisable within the next year or two.

However, given these new, tighter commercial realities, success is likely to depend on establishing a relatively large portfolio of projects and to having an anchor set of buildings for installations (provided, for example, by public sector organisations). This approach would keep down unit



development costs and spread capital raising costs across more projects, avoiding them rendering individual projects unviable or reducing the potential for rewarding community investment.

The growth in solar PV within the region suggested by the target in Section 4 could require in investment in the region of £1 billion (depending on future technology cost reductions), potentially to be invested through regionally-based developers and installation contractors. If this was financed by community investment raised principally from the region (and perhaps combined with public sector pension fund investment), the projects' long-term returns would be retained within the region.

Developing a significant portfolio to be made available for community investment is likely to require some risk capital pump-priming (as Bristol City Council has done with the [Bristol Community Energy Loan Fund](#)). It will also require some co-ordinating resource to bring together the community energy co-operatives, technical development expertise, local authorities and others (who have buildings with potentially suitable roofs).

**3 year funding requirement: c. £5 million for a revolving fund** for development risk capital loans to support the development of this portfolio of projects – refunded with interest as projects are financed (in line with the approach adopted by the Bristol Community Energy Fund).

### 7.3. Taking the lead on smart energy: establishing a cluster for smart energy

Realising the significant regional, national and international economic opportunities and wider benefits of the smart transformation of our energy system will require brand new combinations of capabilities and skills from the low carbon, digital and high tech sectors, orchestrated to develop and deploy innovative solutions. The West of England is strong in all of these sectors, potentially uniquely so amongst the UK's regions, offering the opportunity to become the leading smart energy region of the UK and to gain a significant share of the fast growing and extensive national and global smart energy markets.

But these capabilities and skills are not currently organising themselves with smart energy in mind and the evidence suggests that the 'market pull' of smart energy is not yet sufficiently strong to create such organisation spontaneously in the region.

Action is therefore needed in the region to provide sufficient organising impulse to address this. It needs to draw together businesses, entrepreneurs, academics and other active parties across all of these disciplines and sectors to develop the technologies and services needed to enable genuinely smart energy systems. This need has been recognised for some time; stimulating an 'enterprise cluster on smart energy' was a key recommendation of the multi-partner, cross-sector Bristol Smart Energy City Collaboration in its first year report at the end of 2015.

Such a smart energy cluster would create a sector-led growth platform for the participating businesses to grow market share in national and global smart energy markets by: (a) creating processes to stimulate collaboration and cross-disciplinary learning; (b) curating an active 'laboratory for change' (amongst public sector buildings, households, new build developments and commercial premises) to test, learn and improve smart energy applications, technologies and services in development, and; (c) supporting applications for national funding for the new innovations and



business models which emerge. The cluster could draw on the strong academic capabilities in power systems engineering and regulatory economics at University of Bath and big data analytics and data capture and handling at the University of Bristol.

It could also work with WPD to develop a smart network innovation fast-track process as they develop into a Distribution System Operator. And it could link the commercial smart energy interests with region's community-focused design and public engagement specialists such as Knowle West Media Centre.

A smart energy enterprise cluster in the region would provide an innovation boost to smart energy activities in the West of England, enhancing local smart energy delivery capabilities, and improving the ability of the region's more energy-intensive businesses and its public sector bodies to realise (and capture for the region) the benefits of being smarter in their energy management.

**3 year funding requirement: c. £2 million** to provide the staff resources and support for businesses to convene and run a smart energy enterprise cluster.

#### 7.4. Accelerating the low carbon housing retrofit market, starting with willing home-owners

Most of the housing in the West of England will need to be subject to a low carbon retrofit in order to meet long-term carbon emission targets and keep energy bills affordable. But they can't all be retrofitted at once and there is currently (and for the foreseeable future) a lack of central government funding to support the sorts of short-term grant-funded programmes which have occurred recently in the region. In addition, the potential supply chain is currently busy undertaking 'normal' (i.e. not low carbon) retrofit work which does not include low carbon features (such as solid wall insulation). The market for low carbon retrofit is not currently working at the scale and rate required and needs a kick-start to address its failings and scale up.

In the absence of a significant grant funding programme, this suggests a phased approach which acknowledges that all households will need to be reached in time but which starts with those home-owners who are most likely to act now and who, if matched with the willing and competent businesses already in the supply chain, have easy access to the financial resources to do so.

Such an approach will harness the concept of a technology adoption curve, in which early adopters set new norms for the wider population and thus stimulate wider take-up ('adoption') of the product or service. In this case, the home-owners will start to make low carbon housing retrofit a more normal activity (particularly if aided in initial years by local showcasing initiatives such as green open homes). And the building and heating businesses who deliver the low carbon retrofit will have a similar influence and start to create a new norm for the building trades, creating demand for apprentices and skills training focused on low carbon retrofit techniques (such as solid wall insulation).

Getting the market going like this will require some resources to orchestrate the demand (through, for example, more 'green open homes' activities across the region) and to draw the supply chain away from their current normal retrofit work towards low carbon retrofit (by revealing the emerging

demand). By working with local initiatives like Green Register and with quality assurance expertise developed by some of the local authorities within their recent grant programmes, both the supply chain businesses and home-owners can be supported to make technically robust decisions about overall solution design and specifications, pricing quotes and dealing with unanticipated problems.

BEIS has recently announced that it will soon be holding a competition to fund a small number of local pilots of different models of how to do this low carbon market and supply chain acceleration.

It should be noted that the jobs associated with this sort of low carbon retrofit work are ones which typically suit less academically qualified sections of the population but which tend to pay at or above median wage levels. The growth potential in this sector can therefore help to tackle inequalities in the region by providing reasonably paid jobs and opportunities for skills training and apprenticeships with modest educational attainment requirements.

**3 year funding requirement: c. £1.5 million** for staff resources to run a low carbon home owner retrofit market development and supply chain acceleration programme (note potential for BEIS funding), including resources for training bursaries.

## 7.5. Tackling fuel poverty at its roots: making homes warm and healthy and leaving no one behind in the smart energy transition

In line with targets to reduce carbon emissions, the Government also has targets to eliminate fuel poverty in England which similarly require action at regional and local level. The West of England has a good track record of action to tackle fuel poverty but the current limits to available funding for improving insulation and heating systems for fuel poor households has combined with reductions in household incomes and rises in fuel costs to constrain progress in recent years.

Building on existing partnerships in the different local authorities (including the new one in Bristol backed by Bristol Energy, CSE and WPD with Bristol City Council), there are opportunities to reduce current duplication between activities and develop a more co-ordinated approach across the region to:

- establish a common referral and programme delivery system;
- to secure more ECO funding through a shared approach to energy suppliers and a co-ordinated approach to ECOflex with a credible delivery system in place and to combine with other any available funding to maximise impact;
- develop a common case to health service commissioning bodies and Health and Wellbeing Boards in the region to apply the NICE guidance and contribute to action to prevent the health impacts of cold homes (by, for example, sharing Joint Strategic Needs Assessments);
- share resources and experience in using the PRS MEES regulations to secure greater investment by private landlords in improving the least energy efficient housing;
- set up a locally-based service to support more vulnerable households make the most of their smart meters (to help energy suppliers meet their obligations);
- work with Bristol Energy and other energy suppliers to get fuel poor households on to more suitable tariffs (particularly as smart time of use tariffs become available);

- link with efforts by WPD and WWU and their delivery partners to support vulnerable households improve their energy resilience through their Priority Services Register programmes.

In establishing the above approach, it could also prove valuable to develop a regional strategy to tackle fuel poverty and understand in more detail the financial, wellbeing and health system costs and impacts associated with cold homes, high fuel charges and fuel debt across the region.

**3 year funding requirement: c. £1.5 million** for staff resources to develop the shared programme described above and secure funding from energy suppliers, health sector and others to fund building improvements and additional advice and support in the region.

## 7.6. Boosting energy management capacity in the public sector (setting an example for the commercial sector)

The existing good practice in public sector energy management would benefit from additional resources to improve data analytics, share best practice and assessments of new technologies and demand side market services, develop business cases for investment and innovation funding bids, and secure faster throughput of SALIX applications and associated procurement and contractor management.

While there may be a valid joint business case across public sector bodies for such an additional expert resource, it is unlikely that such a case would stack up for an individual organisation. This suggests value in a regionalised approach, creating an expert 'Energy Management Support Team' to support the practitioners across the different organisations.

This would have the triple benefits of:

- delivering additional and more rapid cost savings and carbon emission reductions savings across the public sector;
- providing a key point of liaison with the Smart Energy Enterprise Cluster, providing a data-rich test bed for the innovative approaches its businesses would be developing;
- setting an example for the commercial sector in the region, with proven techniques, evidenced business cases and demonstrable financial benefits (though making this example influential would require specific additional effort to capture the sector's attention and involvement, potentially through the region's existing business oriented networks).

**3 year funding requirement: c. £1 million** for the additional resources to establish and staff the shared expert Energy Management Support Team.

## 7.7. Enabling energy demand reduction in the commercial sector:

As in the public sector, there are pockets of good energy management practice in the commercial sector, particularly amongst the larger industrial companies based in the region with significant energy costs. Linking this expertise with the proposed additional analytical resources in the public sector and the smart energy cluster (outlined in 7.3 and 7.6 above) would reduce costs associated

with new technology and service assessment, business case development and making innovation funding bids.

However, as described in Section 5, the commercial sector is notoriously difficult to stimulate into taking energy saving or renewable energy generation opportunities. This is often to do with split incentives (businesses not owning the buildings they occupy). While there is nowhere where this problem has been successfully overcome, the following steps should be taken to improve understanding and create greater future potential for action:

- commission a study into the energy use of commercial buildings across the region, to understand patterns of energy demand and opportunities for improvement (particularly within new demand side response markets) and to detail the ownership and management responsibilities of these buildings (so that the owners and building managers as much as the tenants can be targeted);
- explore the potential and, if appropriate, develop the business case for a West of England Energy Efficiency Fund for investment in commercial building energy demand reduction initiatives based on delivery by local retrofit supply chains and smart energy businesses (reviewing progress with the London Energy Efficiency Fund)
- establish a consistent basis across the region for local authorities' Trading Standards teams to enforce the Private Rented Sector Minimum Energy Efficiency Standards for commercial buildings and seek additional funding (from BEIS) for resources to enforce the regulations.

**Initial year funding requirement: c. £0.25 million** to commission the study, explore the business case and co-ordinate region-wide assessment of enforcement opportunities with PRS MEES. Subsequent funding dependent on results of the study and business case assessment.

## 7.8. Providing leadership and co-ordination on the growth of EVs (and getting smart in the process)

The rapid growth in EVs anticipated over the next decade requires a co-ordinated approach across the region to ensure the timely development of the EV charging network. It also requires the prompt introduction of smart charging regimes to minimise the potentially costly demands on the local electricity distribution network and avoid localised risks to the resilience of that network through excessive EV charging at peak times. Getting this right quickly will also ensure the associated air quality (and thus health) benefits of shifting to EVs will be secured early while removing potential obstacles to accelerating growth of EV ownership in the region.

Building on the charging point delivery experience being gained by local authorities from the current Go Ultra Low West project, the region needs to develop a co-ordinated approach and ensure that this aspect of the changing transport system is reflected fully in the region's future transport plans. The region will need to work more closely with local and national EV businesses, with businesses based in the region with large vehicle fleets, and, in particular, with WPD. The region's DNO has both a detailed understanding of the status of the local network (and therefore where charging points can currently be easily and cost-effectively accommodated) and growing knowledge of EV user

behaviour, derived from its extensive past and current innovation projects in this field. The potential local economic benefits of linking new EV charging points with the 'solar PV at scale' programme (described in 7.2 above) should be explored.

In addition, the region needs to engage systematically with the local university expertise in vehicle engineering and transport behaviour studies, particularly at UWE, to link the innovative R&D and knowledge there into the region's emerging approach to enabling EV to replace petrol and diesel vehicles.

This suggests the need for an **EV Growth Co-ordination Group**, building out of the expertise being gained in the Go Ultra Low West project and providing an explicit point of leadership for the region.

There should also be attention to how the additional electricity network costs caused by EVs are recovered from consumers to ensure that new network charging arrangements are fair. This may require representations by the region to WPD and at national level to BEIS and Ofgem. In keeping with the 'no one left behind' principle proposed in this study, the cost recovery regime needs to be different to current arrangements (in which all domestic consumers pay the same 'per unit consumed' cost for distribution and grid services, irrespective of the scale and timing of their demand on network). It would be unfair if consumers who are not in need of the EV charging network (and not likely to be in future, particularly low income non-car owning households) were effectively subsidising through their electricity bills the network investment which serves only better-off EV-owning households and businesses.

**3 year funding requirement: c. £0.75 million** for the staff resources to convene and lead the EV Growth Co-ordination Group and undertake further analysis and research as required.

## 7.9. Getting to grips with the decarbonisation of heat: building understanding, exploring options, developing a plan

The West of England needs to start organising its understanding and thinking about how the heat required in future will be decarbonised, effectively by phasing out direct use of fossil fuels. This will require the various interests and expertise – from local authorities developing heat networks to the electricity (WPD) and gas (WWU) networks – to be brought together into a **West of England Heat Decarbonisation Task Force**.

Alongside the existing work to develop heat networks, Bristol City Council's emerging zero carbon heat strategy, and the new planning policies being developed by the local authorities which will cut heat demand in new developments, this Task Force would establish and then deliver a shared programme of work to explore the issues and apply whole system thinking to the challenge.

The Task Force should identify and examine the regional dimensions of the opportunities to: (a) reduce demand for heat in new and existing buildings (reflecting on the relative costs of reducing demand vs supplying zero carbon heat); (b) optimise the roll-out of heat networks and deliver zero carbon heat supplies through them using waste heat and/or renewable heat; (c) overcome barriers to increased take up of renewable heat technologies and/or fuels including air-, water- and ground-

source heat pumps, biomass and bio-wastes; (d) generate and use green gas locally, either directly or via the gas network; (e) inject hydrogen into the gas network to displace fossil fuel gas (including the extent to which the hydrogen production is – or could be – zero carbon), learning from current experimental initiatives like the H21 zone in Leeds.

The Task Force should also draw up an inventory of heating systems in the region and their likely replacement cycles to identify when and where opportunities for upgrades will occur.

The region should engage with national policy dialogue and associated programmes on decarbonisation of heat to take advantage of wider experience and potential funding opportunities.

In line with the strategic ambition set out in Section 4, the West of England Heat Decarbonisation Task Force should complete the development of the plan by 2021.

**3 year funding requirement: c. £1 million** for the staff resources to convene and lead the West of England Heat Decarbonisation Task Force and undertake further analysis and research as required.

## 7.10. Establishing meaningful public consent and regional leadership for this energy transition

Securing public engagement with, and consent to, the energy system changes required in the region will require a systematic approach to involving the public in discussions about: (a) the nature of these changes, and; (b) what they will mean for the place where they live and work and how they live their lives and do their jobs.

This ‘consent’ makes easier all the other necessary initiatives requiring the public’s involvement or agreement – from accepting the installation of a smart meter or investing in low carbon retrofit in their own homes to supporting new programmes and policies in the region to establish more renewable energy generation in their landscapes or embracing EVs and the associated charging infrastructure in their streets. It also translates into what national and local politicians might consider to be the ‘political space’ in which they can promote policies and programmes to drive change.

There are opportunities and techniques available to achieve this involvement which draw out what appears to be the public’s largely latent interest and support for a more sustainable energy future:

- neighbourhood planning offers the potential (though not a requirement) for local people to consider how their place needs to develop to play its part in a low carbon future;
- the consultation process associated with the development of new local plans could adopt much more involving public engagement techniques and include a specific focus on the energy aspects of their proposals;

- there are neighbourhood/parish scale deliberative engagement techniques which are shown (in part through a pilot in Congresbury) to develop shared understanding and a growing sense of interest and agency associated with developing low carbon energy initiatives.<sup>32</sup>

Through CSE (which has a funded national programme to support low carbon neighbourhood planning) and the extensive range of community activities on energy in the region, the West of England has the expertise and channels to organise a coherent and scalable programme of such public engagement. This could emerge as an approach which sets the benchmark for other regions in England, all of which face similar challenges with public engagement and consent for change.

Leadership is also needed to encourage the public, business and public sectors to engage with – and act upon – the opportunities and challenges inherent in delivering the sustainable energy ambitions described in this study. The Local Enterprise Partnership Board, the Combined Authority Mayor, the Mayor of Bristol and the leaders of Bath & North East Somerset, North Somerset and South Gloucestershire Councils as well as organisations like Business West and the Bristol Green Capital Partnership can all play a positive role in shaping wider public and business opinion in support of these ambitions.

**3 year funding requirement: c. £1 million** to support public engagement through neighbourhood planning, local plan consultations and other targeted activities, and to encourage and support leadership on sustainable energy across the region.

### 7.11. The over-arching commitment: align all policies and programmes with the region's carbon commitments and sustainable energy ambitions

While the programme outlined here can set the foundations for the region to meet its long-term objectives of a very low carbon, affordable and resilient energy system, this will only be realised in practice if all other policies and programmes developed within the region are consistent with these objectives.

The regional and local authorities will therefore need to review their wider activities through the lens of these carbon emission commitments and the other strategic sustainable energy ambitions outlined here. This process should identify those which, if emphasised, could enable greater and more rapid progress to be made. And it should prioritise identifying and addressing any activities, policies and programmes which may be unintentionally creating barriers to achieving these ambitions or which are in tension with them because, unless they are re-shaped, their impact would be to stimulate higher energy use and/or higher emissions.

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<sup>32</sup> See, for example, the [Future Energy Landscapes project](#) developed by CSE and Campaign for the Protection of Rural England (CPRE)



## 7.12. Identifying the locus for action: who leads at what scale?

*This study proposes a set of activities which are considered necessary to achieve the region's ambitions and long term commitments. Following discussions with the study's Steering Group, the study team has not addressed the questions of who should lead those activities, who else needs to participate in them, and how that situation will be realised (and by whom with what or whose resources). Associated with these questions is the one of scale: whether the actions are best organised at regional or local or community-level (or some orchestrated combination of all of these). These are questions for the strategy, informed by this study.*

*Instead, the study team has provided below a series questions regarding this 'locus for action' and associated aspects of decision-making and governance. Considering these should assist with the allocation within the strategy of the agreed actions to different actors and the associated funding commitments.*

Identifying the actions which need to be taken in the region is the essential first step towards putting a strategic programme in place. Delivering that programme will additionally require the identification of the 'locus for action' for each of the required activities – to designate within the strategy where the initiative is expected to come from to take the action forward in the manner intended.

This could be one of the existing 'official' public bodies at regional (e.g. WECA or the LEP) or local level (one or more of the local authorities) or some newly available resource (such as the SW regional energy hub). Such initiative-taking could assume the form of a team of staff developing and managing the activity directly or a public procurement or commissioning exercise to secure the activity from another party, or some combination of the two.

Or it could be done through the active encouragement or stimulation of other organisations or businesses in the region to take the lead by, for example, actively endorsing their work, adding support to their applications for funding, and/or helping them build the partnerships they require to succeed.

In this regard, it is important that the purposeful effort required for the region to achieve its ambitions is established in a way which:

- a. works with, rather than crowds out, existing initiative-taking that is in the interests of the region and aligned with the strategy emerging from this study (harnessing it for the benefit of the region);
- b. acknowledges that the regional or local authorities are not the only potential sources of that effort (much of the progress made in the region to date has been the result of leadership and initiative-taking from organisations and businesses other than these authorities), and;
- c. recognises the need to establish and sustain, as part of the effort, a shared sense amongst current and potential actors and other stakeholders of a common strategic purpose and mutual benefit from collaborative action.



To assist with the consideration of where the initiative-taking might best be located (the ‘locus for action’) and at what scale it should act, the approach to decision-making and governance, and other issues relevant to the shaping of new practice across the region, we have outlined below some questions to ask of each action:

- **Scale based on the nature of the action required**

*How similar is the action needed across the region?*

Very similar actions across the region would suggest a regionally co-ordinated approach to ensure consistency and efficiency. Where there are significant differences in the action required for different locations, it may be more appropriate to distribute initiative-taking or ensure that local perspectives have a strong role in shaping the design and communication of actions locally. See the smart meter rollout example under ‘political and social allegiance’ below.

- **Scale based on the current organising or operating scale**

*At what scale do the necessary supply chains or sectors or markets tend to organise and/or operate?*

It is important to understand the nature of the supply chains, sectors or markets where influence and change is sought. For example, the low carbon housing retrofit supply chain (and the housing retrofit market more generally) operates across the West of England (in terms of its travel to work area). However, demand creation activities (to stimulate home-owners interested in retrofit to take action by requesting quotes from the supply chain) is likely to need a more localised feeling (Bristol Green Doors, Bath Green Doors, Sustainable Thornbury etc).

- **Scale based on whose priorities and/or practices we’re trying to change**

*How important is the ‘clout’ of the region’s selected initiative-taker to the organisations which the region needs to have engaged to deliver strategic success?*

If the region needs to be engaging with a large organisation or a nationally-focused business to succeed in delivering its strategic priorities, it is likely to be more successful with a single approach from the region (representing the region), as this simplifies the relationships they need to manage and adds clout (though scale) to the region’s case. Relevant parties in this respect would include: the main energy suppliers because they have the most ECO funding and deliver the smart meter rollout; WPD as the region’s DNO and WWU as its gas distribution network; national government energy policy makers.

- **Scale based on political and/or social allegiance**

*At what scale do political and social allegiances (“I represent Bristol not West of England”, “I’m from Yate, not Bristol”), matter in terms of: (a) what actions are actually taken; (b) who is seen to lead, and; (c) how the activity is communicated and ‘packaged’?*

It could be that, in answer to the first question above, everywhere in the West of England needs to do exactly the same thing (e.g. smart meter rollout is happening throughout the region – eventually). But, because people’s allegiances are more to their local place rather than the region, it would be better for communications and public engagement to reflect a sense of place to establish the local

dimension of the opportunity on offer (“Smart meters are coming to Radstock – here’s how we can all benefit”). Energy suppliers are unlikely to engage with just one community or one local authority to develop a more co-ordinated roll-out plan, but they might engage with somebody or organisation acting on behalf of (and with the support of) the whole region.

- **Locus based on capabilities required**

*What sort of skills, capabilities, initiative taking clout and relationships with others required to act do we need to initiate the required activities within the region? Where or with whom do these sit in the region? How can they be stimulated/commissioned/funded to lead the required activities?*

The chosen locus for action needs to be in a position to lead the action required. That requires consideration of the dimensions of the action outlined in the questions above. It may be that the organisation that is the right choice to be the locus for action needs to be given the authority to do so by the relevant authorities at local or regional level. Or it may be (as tested by the next question) that that organisation will be taking the initiative anyway (because they have the capabilities and are responding to the same drivers outlined in this study but acting on their own initiative). Again, official acknowledgement and support for this may be appropriate and doing so would accelerate progress to the advantage of the region.

- **Locus based on current or potential signs of initiative-taking**

*Where does initiative taking currently lie, if anywhere? Does that have the right capabilities? Is it acting broadly in the interests of the region (e.g. in line with the principles)? Could it scale up if a regional approach is suggested?*

As mentioned in the previous question, there may already be initiative taking in the region which is relevant to making progress with the actions required here. The questions here would help to decide whether this should be further encouraged, or redirected, or a different approach adopted where other organisations are put forward to be the locus for action.

- **Locus based on existing or potential decision-making or funding powers**

*Where do relevant decision-making and funding powers currently lie?*

The location of existing decision-making and funding powers is an important consideration in deciding how best to organise to deliver actions quickly. It might ultimately be desirable to change existing institutional arrangements to establish a set up more purpose-built for delivery of the region’s energy strategy. However, it is likely to be a more productive use of available resources and the decision-making time and attention from relevant authorities to focus on securing early progress on the key actions – the first next steps – which will drive future success (none of which are about changing existing institutional arrangements).

In considering all of these questions in the context of the evidence reviewed for this study and the ten key building blocks for purposeful effort, the study team offers the following observations:

- Regional scale actions may well not need a regional body or a new regionally-based resource within such a body to deliver if capabilities already exist more locally and have the potential to scale and act on behalf of the region.
- The region's local authorities are likely to need to work together more on sustainable energy and accept that, for some actions (such as public sector energy management) one authority or another might 'step up' to lead or provide services across the region for or to all authorities. Such arrangements are likely to be more agreeable where such 'stepping up' is done under the region's (rather than the specific local authority's) banner and with clear governance and accountability arrangements in place.
- Much of the expertise and initiative-taking clout sits outside the key public authorities in the region (WECA, the Local Enterprise Partnership or the local authorities). To address this, some thought needs to be given to how to encourage and 'give permission' (and, where appropriate, funding) to such initiative-takers to act for the region (and on what basis of accountability). It should be noted that, without such clarity, the initiative-takers might not wait for permission, an outcome which would leave mechanisms for accountability unclear and increase the risk of dislocating wider regional efforts and collaboration.

## 8. Recommendations for early action

Drawing on the various elements of the project and the ‘first next steps’ outline in Section 7, we have outlined below a series of recommendations from this study to be included in the resulting regional energy strategy. In combination, we believe these constitute a coherent and relatively ambitious programme of work for the initial stages of putting the West of England on a path to achieving the very low carbon, affordable and resilient energy system that will underpin its future economic, social and environmental success. These are the actions which need to take place in the region.

As described in Section 7.12 above, a key task in the development of the strategy will be to consider who is given responsibility for taking each action forward. The questions outlined in Section 7.12 will assist in these decisions and help to ensure they reflect both the existing initiative-taking capabilities within the region and the nature and scale of the actions required.

### 8.1. Recommendations for taking the first next steps

- i. Ensure planning policies associated with new developments in the Joint Spatial Plan and the forthcoming revisions to local plans are robust in their requirements on new developments to be zero carbon, resilient to climate change, and enabled for smart energy and EVs (see 7.1).
- ii. Ensure these new regional and local plans also identify suitable (and not unduly constrained) locations for new on-shore wind development and provide for solar PV on suitable domestic and non-domestic roofs and brownfield and low-grade land (see 7.1).
- iii. Resource additional expertise (see 7.1) shared between the planning authorities to support core development control staff in marshalling the evidence and holding the line in negotiations with developers to ensure the new policies are realised in practice.
- iv. Convene a solar PV development group including interested and capable parties from across the region with the specific purpose of developing a large portfolio of solar PV projects taking advantage of new opportunities in storage, local energy markets and peer-to-peer trading (see 7.2).
- v. Provide a revolving fund for renewable project development risk capital, following the approach adopted by the Bristol Community Energy Loan Fund (see 7.2).
- vi. Support the establishment of a smart energy enterprise cluster (see 7.3) to enable the region to establish a leading sector that can take advantage of national and global markets in smart energy.
- vii. Make clear to national Government the region’s intent to take a lead in smart energy, contributing to its Clean Growth Strategy and Industrial Strategy (see 7.3).
- viii. Enable and encourage the development of a low carbon home-owners retrofit market accelerator programme (see 7.4 above), building on existing capabilities and expertise in the region, to orchestrate the development of new demand from already interested home-owners while supporting the supply chain to find and meet that demand.

- ix. Convene the principal actors on tackling fuel poverty across the region to establish opportunities to co-ordinate efforts to secure more funding, apply the NICE guidance consistently, share resource to use PRS MEES regulations effectively, co-ordinate approaches to securing ECO funding (using ECOflex to improve targeting and tackle worst PRS housing), set up smart meter support services for vulnerable households and get the fuel poor on better tariffs (see 7.5)
- x. Establish an Energy Management Support Team for public sector energy managers to provide additional resource to enhance their current practice and create exemplars to stimulate more action on energy saving and carbon emissions reduction in the commercial sector (see 7.6)
- xi. Commission a study into the energy use of commercial buildings across the region, to understand patterns of energy demand and opportunities for improvement (particularly within new demand side response markets) and to detail the ownership and management responsibilities of these buildings (so that the owners and building managers can be targeted) (see 7.7).
- xii. Explore the potential and business case for a West of England Energy Efficiency Fund for investment in commercial building energy demand reduction initiatives based on delivery by local retrofit supply chains and smart energy businesses (reviewing progress with the London Energy Efficiency Fund) (see 7.7)
- xiii. Building on the expertise gained in the Go Ultra Low West project, draw in WPD, relevant local academic and innovative R&D expertise and other EV interests to establish the EV Growth Co-ordination Group. This would be tasked with making the most of the opportunity provided by EVs while ensuring smart approaches to charging were applied to keep costs under control and the electricity network resilient (see 7.8).
- xiv. Establish a West of England Heat Decarbonisation Task Force to review evidence and undertake analysis, aiming to produce by 2021 a credible plan to decarbonise the region's remaining demand for heat by 2040 (see 7.9).
- xv. Promote the consideration of low carbon energy in all neighbourhood planning activities across the region so that people examine how the place they live in – and how they live there – might need to change to secure a sustainable energy future (see 7.10).
- xvi. Ensure consultation processes used to consider new local plans adopt much more involving public engagement techniques and include a specific focus on the energy aspects of the proposals (see 7.10).
- xvii. Encourage the wider application of deliberative public engagement techniques to increase public understanding of, and consent for, the low carbon energy transition required in the region (see 7.10)
- xviii. Review all existing and proposed policies and programmes at local and regional level to ensure they contribute to, rather than undermine, the objectives to achieve a very low carbon, affordable and resilient energy system for the benefit of the region (see 7.11).

## 8.2. Additional recommendations for further specific actions for early progress

The following recommendations have emerged from the study and stakeholder engagement and are largely concerned with actions which will: (a) enable the region to understand better how in future to achieve successful outcomes and the benefits of doing so, or: (b) raise with national government issues which risk undermining regional efforts to secure progress.

- xix. Develop a combined West of England approach to the domestic smart meter roll-out (having reviewed London's current experience) to negotiate a more co-ordinated programme from energy suppliers, with better public engagement which reflects local interests, improved support for more vulnerable households and integration with offers of new smart energy services from local businesses (e.g. from the smart energy cluster).
- xx. Explore the potential opportunities for the West of England economy (including its engineering businesses and port) of stimulating off-shore wind development activity in the Bristol Channel and into the Atlantic, reflecting the apparent success of recent developments in floating offshore wind technologies (the Statoil Hywind project off the coast of Aberdeen).
- xxi. Develop some exemplary low carbon retrofits of buildings of high heritage value to demonstrate the effectiveness and appropriateness of selected materials and techniques and to capture the experience within the building conservation supply chain in the region.
- xxii. Make representations to national government specifically on:
  - planning powers strong enough to guarantee zero carbon smart-enabled new developments;
  - the region's intent to lead nationally in the development of the smart energy sector, identifying and seeking regulatory derogations identified as enabling greater smart energy innovation in the region;
  - the inadequacy of funding available for fuel poverty alleviation and the general lack of progress by the health sector in putting the NICE guidance into practice;
  - removing exemptions for landlords to avoid the Private Rented Sector Minimum Energy Efficiency Standards in both the domestic and commercial sectors and providing resources to ensure they are as effective as intended in the region;
  - encouraging energy suppliers to co-ordinate with local and regional bodies to secure a more effective, locally oriented smart meter roll-out;
  - the need for powers to require smart charging regimes for EV charging points and regional strategic control over their location and access;
  - new electricity network charging methods to ensure they are fair for non-EV users and non-participants;

- funding for the regional Heat Decarbonisation Task Force and the need for regional perspectives to be effectively represented in the development of national policies.

## 9. The road map to a sustainable energy future for the West of England: from 2018 to 2025

Drawing on the analysis outlined in this report and the outputs of the stakeholder workshop, a high level road map can be developed for a programme of activity to realise the ambitions and objectives established for carbon emission reductions and sustainable energy in the West of England.

The road map shows how these ‘first next steps’ and associated recommendations for early action (outlined in Section 8) could be sustained with purposeful effort from 2018 through to 2025.

The road map rather crudely divides the steps – or activities – into ‘Doing’, ‘Preparing’ and ‘Exploring’.

- **Doing:** activities which can be done now with more or less immediate impact.
- **Preparing:** steps which need taking now so that the West of England is ready to ‘do more’ in a year to two years’ time.
- **Exploring:** initiatives to take now to improve prospects for future activity by helping to create conditions which make impact more possible in the future.

While the steps are allocated to one of four years over time – 2018, 2019, 2021, 2025 – this is not intended to indicate precise timing, but instead provide some indication of the likely sequencing.

Each step is also annotated with one, some or all of the numbers i-vi. These numbers relate to the areas for action which have framed the approach of this study (reproduced below). Those with a red asterisk represent the ‘first next steps’ described in Section 7 to create the key building blocks.

### Areas for Action

To achieve its carbon emission reduction commitments and sustainable energy ambitions, the West of England, in common with everywhere else in the UK, needs to achieve...

- a complete shift to very low or zero carbon electricity generation, mostly renewable and much of it decentralised;
- smarter and more flexible management of demand, including storage, to enable higher penetration of variable renewable generation and to optimise electricity system operation;
- huge reductions in energy demand by improving significantly the energy performance of our buildings (across all sectors and all tenures) and the equipment and processes within them;
- decarbonisation of heat (for buildings, hot water and industrial processes);
- a dramatic rise in use of electric vehicles and other steps to cut the carbon emissions of road transport (as electricity is decarbonised);
- ensuring new build developments achieve their full low carbon potential and contribute effectively to a smarter energy system.

These should all be achieved in ways which take account of the opportunity to capture the economic benefits for the West of England’s businesses and citizens.



	2018
<b>DOING</b>  Things to do now for impact now	<ul style="list-style-type: none"> <li>*Convene a solar PV development group with the specific purpose of developing a large portfolio of solar PV projects (i)</li> <li>*Support the establishment of a smart energy enterprise cluster to enable the region to establish a leading sector (ii + i, iii, v)</li> <li>*Make clear to national Government the region's intent to take a lead in smart (ii)</li> <li>*Enable and encourage the development of a low carbon home-owners retrofit market accelerator programme (iii + iv)</li> <li>*Convene the principal actors on tackling fuel poverty across the region to establish basis for regional programme (iii + iv)</li> <li>*Establish an Energy Management Support Team for public sector energy managers (iii + ii, iv)</li> <li>*Encourage the wider application of deliberative public engagement techniques to increase public understanding of, and consent for, the low carbon energy transition (All)</li> </ul>
<b>PREPARING</b>  Things to do now for impact in 1-2 years	<ul style="list-style-type: none"> <li>*Ensure Joint Spatial Plan and the forthcoming revisions to local plans require new developments to be zero carbon and enabled for smart energy and EVs (vi + i, ii, iv, v)</li> <li>*Ensure the new regional and local plans identify suitable locations for new on-shore wind development and provide for solar PV (i)</li> <li>*Provide revolving fund for project development risk capital loans (i)</li> <li>*Establish the EV Growth Co-ordination Group, building on the Go Ultra Low West project, draw in WPD, relevant local academic and innovative R&amp;D expertise and other EV interests to (v)</li> <li>*Promote consideration of low carbon energy in all neighbourhood planning activities (All)</li> <li>*Ensure consultation processes used to consider energy aspects of new local plans adopt involving public engagement techniques (All)</li> </ul> <p>Develop a combined West of England approach to the domestic smart meter roll-out (review recent experience of the GLA). (ii + iii, iv)</p> <p>Develop some exemplary low carbon retrofits of buildings of high heritage value. (iii)</p>
<b>EXPLORING</b>  Things to do which create the conditions which make impact more possible in future	<ul style="list-style-type: none"> <li>*Establish a West of England Heat Decarbonisation Task Force to produce by 2021 a credible plan to decarbonise the region's remaining demand for heat by 2040 (iv)</li> <li>*Review all existing and proposed policies and programmes at local and regional level to ensure they are aligned with, rather than undermine, a very low carbon, affordable and resilient energy system (All)</li> <li>*Engage with WPD to explore potential for a WoE-specific smart network innovation programme (iii)</li> <li>*Commission a study into the energy use of commercial buildings across the region (iii + ii, iv)</li> <li>*Explore the potential and business case for a WoE Energy Efficiency Fund for commercial building energy demand reduction (reviewing London's experience) (iii)</li> </ul> <p>Assess the potential opportunities for the West of England economy of stimulating off-shore wind development activity into the Atlantic (i)</p> <p>Make representations to national government specifically on:</p> <ul style="list-style-type: none"> <li>• planning powers strong enough to guarantee zero carbon smart-enabled new developments;</li> <li>• the region's intent to lead nationally in the development of the smart energy sector;</li> <li>• the inadequacy of funding available for fuel poverty alleviation and lack of progress by the health sector in putting the NICE guidance into practice;</li> <li>• removing exemptions for landlords under PRS MEES;</li> <li>• encouraging energy suppliers to co-ordinate on more effective, locally oriented smart meter roll-out;</li> <li>• the need for powers to require smart charging regimes for EV charging points;</li> <li>• new electricity network charging methods to ensure they are fair;</li> <li>• funding for the regional Heat Decarbonisation Task Force.</li> </ul>

2019	2021	2025
<p>*Resource expert additional resource shared between the planning authorities to support core development control staff. (vi + i, ii, iv, v)</p> <p>Secure innovation funding through smart energy enterprise Cluster for new collaborations (ii)</p> <p>Finalise initial portfolio of solar PV projects for fundraise</p> <p>Enforce PRS MEES in domestic and commercial sectors</p> <p>Secure regional ECO deal and health sector input to provide funding for fuel poverty programme</p> <p>Double low carbon home owner retrofit market activity</p> <p>Start delivering heritage building retrofit exemplars</p> <p>Drive development of regional smart EV charging infrastructure (with WPD and others)</p> <p>Negotiate with energy suppliers on co-ordinated regional approach to smart meter rollout</p>	<p>Enforce new zero carbon and smart policies in Regional and Local Plans with support of 'crack team'</p> <p>Initiate fundraise for second portfolio of solar PV projects</p> <p>Promote WoE smart energy enterprise credentials internationally</p> <p>Realise WPD network innovation programme and build into RIIO-ED2 plans</p> <p>Engage vulnerable households with new smart energy market/tariff opportunities</p> <p>Use new EV roll-out co-ordination powers to orchestrate EV charging infrastructure growth</p> <p>Launch commercial building demand reduction fund</p> <p>Launch smart energy research facility</p> <p>Publish plan to decarbonise regional heat by 2040</p> <p>Promote 'open for wind power' opportunities in local plans</p>	<p>West of England is Europe's leading region for smart energy enterprise and practice</p> <p>Low carbon building retrofit is the 'norm' in domestic and non-domestic sectors</p> <p>All new developments meeting zero carbon and smart energy standards</p> <p>EV take up managed smartly to minimise cost and resilience risks to local distribution network</p> <p>Heat decarbonisation plan being put into action</p> <p>Fuel poverty eradicated from homes below EPC D</p> <p>1 in 15 roofs in region have solar PV</p> <p>New subsidy-free on-shore wind development realised, thanks to supportive regional, local and neighbourhood plans</p>
<p>Finalise new Local Plans with appropriate evidence and decent public engagement to secure endorsement</p> <p>Alter all regional and local policies which are found to undermine WoE sustainable energy objectives (All)</p> <p>Establish new policy-making &amp; programme design guidance so all reflect WoE sustainable energy objectives</p> <p>Develop business case for programme to support demand reduction in commercial buildings</p> <p>Develop with WPD a WoE network innovation programme</p> <p>Promote exemplary low carbon neighbourhood plans and encourage and support community follow-through on opportunities identified</p> <p>Develop regional heat decarbonisation plan (Task Force)</p> <p>Follow up on off-shore energy economic value study</p>		
<p>Explore through Energy Management Hub the opportunities for collective regional approach to new demand flexibility markets</p> <p>Continue to make representations to Government on relevant energy matters</p> <p>Develop business/funding case for academic-led smart energy research facility combining Uni of Bath power systems knowhow and Uni of Bristol's data analytics</p>		

## 10. The potential benefits of regional action

Putting the West of England on a path to a very low carbon, affordable and resilient energy future aligns the region with what the Government considers to be the best course for the country's economic development. It also has additional benefits from improved health as a result of homes being easier to keep warm in winter and reduced air pollution by displacing diesel and petrol vehicles with EVs.

This Section outlines the potential economic and social benefits for the region that could be captured by following the study recommendations and putting the region on this path. It also provides an initial view of the potential implications for skills and training needs in the region.

### 10.1. Economic benefits

The Government's Clean Growth Strategy and the Committee on Climate Change have both identified this path as representing a 'huge' economic opportunity for the UK. The Government forecasts that, with the right policies and backing across society, the low carbon economy could grow by 11% per year between 2015 and 2030, four times faster than the projected growth of the economy as a whole. And it could deliver between £60 billion and £170 billion of export sales of goods and services for UK businesses by 2030.<sup>33</sup>

This study and its recommendations for early action are aligned with the goals and intentions of the Clean Growth Strategy (and with the clean growth strand of the Government's Industrial Strategy). The analysis and recommendations here reflect the perspective of the Committee on Climate Change on the strengths and weaknesses of the Clean Growth Strategy and associated national policies. In particular, they reflect the Committee's recognition of the need for additional actions at regional and local level to ensure national commitments and delivery aspirations are met.

Through the SWOT analysis, based on an extensive evidence review and a programme of stakeholder engagement, the study team has developed a picture of what those additional actions need to be for the West of England region. These build on the region's strengths while also addressing its weaknesses, with a view to maximising opportunities to achieve the region's share of the economic benefits anticipated by the Government.

Deriving region-specific economic figures from these national forecasts is not feasible for this study from the available evidence. However, it is possible to establish a picture of the potential economic benefits using a more 'bottom up' approach, focusing on those strategic aims (as described in Section 4) which have, at this early stage, reasonably specific and quantifiable investment requirements.

At a very simple level, with current annual expenditure on electricity and gas in the region of nearly £800 million,<sup>34</sup> organisations and households making investments and purchasing services which

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33 The original source for these forecasts is Ricardo Energy & Environment for the Committee on Climate Change (2016) *UK business opportunities of moving to a low carbon economy*. Available at <https://www.theccc.org.uk/publication/uk-energy-prices-and-bills-2017-report-supporting-research/>

34 As a rough estimate, taking account of the components of an energy bill (e.g. distribution, supply, wholesale etc) and how those aspects are reflected in the region's economy, *more than two thirds* of this energy bill expenditure can currently be considered 'exported' from the region's economy.

reduce energy demand will also have the benefit of reducing their energy costs (releasing money for other expenditure). And if those investments and purchases (e.g. in building retrofit or smart demand management services) are made through businesses based in the region, the value of the investment is also retained in the region as GVA.

- **Decarbonising electricity while retaining the investment returns: £1.2 billion by 2030**

The strategic ambition to generate within the region an extra 1TWh a year of renewable electricity by 2030 will require an additional investment of more than £1.2 billion. If the installations are undertaken by regionally based businesses (employing local residents), taking advantage of the readily available local engineering consultancy, financing and legal expertise in support, about half of this investment would directly stimulate the local economy through local employment (representing some £600 million of GVA).

The low cost solar PV and wind-powered electricity generated to meet this target could, if appropriate peer-to-peer supply arrangements are put in place, save more than £20 million a year on energy bills at current electricity prices for the host households, businesses and public sector organisations.

If the required investment is sourced from communities of both individual and institutional investors based in the region (as encouraged by the guiding principles outlined in Section 4), the long-term value created by the investment (typically an annual return of 6 – 7%) would also be retained within the region, increasing the investment's local economic multiplier effect.

- **Reducing energy demand in homes by meeting EPC C: £3 billion investment by 2030**

The investment required to bring all homes in the region up to an EPC band C is estimated (by the study team using the BEIS National Household Model) at £3 billion. While some of this will be for equipment and building materials manufactured outside of the region, the potential GVA for the region's building and heating engineering business to secure from this improvement is estimated to be in the order of £1.5 – 2 billion over the next 12 years. The resulting improvements in home energy performance is likely to reduce heat demand by at least 25%, suggesting a saving on energy bills for the region's households of at least £50 million a year at current prices.

- **Improving energy productivity in businesses: anticipated 20% gain (£70 million a year saving)**

The Government anticipates gains of 20% by 2030 in business energy productivity from adopting such a low carbon economic path and its associated policies and programmes. In the West of England this would represent a cost saving to the region's businesses of some £70 million a year on current energy bills.

- **Shifting to EVs: £300 million a year saving on fuel by 2028**

The economic benefits of the proposed significant shift to EVs in the region are likely to be most obvious in terms of the potential to reduce the region's £800 million a year expenditure on petrol and diesel. The fuel cost per mile of running an EV is up to five times cheaper than for a petrol or diesel car, suggesting a potential saving of perhaps £300 million a year for the region's drivers by 2028 from achieving the EV take up ambition described here. However, depending on how EV

charging regimes develop, this value may end up being captured in the prices charged by EV charge point operators or EV vehicle lease companies, rather than by EV drivers in the region.

Vehicle maintenance costs will also be reduced (because EVs have far fewer moving parts to go wrong than a combustion engine powered vehicle), though this is likely to have a negative impact in one particular sector of the local economy as expenditure in local garages and with local car mechanics is cut.

- **Becoming the UK's leading region for smart energy**

As outlined above, the global market for smart energy has been estimated by the Government to be worth \$220 billion by 2020. In the UK alone, the electricity sector is half way through a £600 million investment in network innovation. The roll-out of smart meters to every home is creating a new market for smart energy services which could be worth £10 billion a year by the early 2020s. The region's DNO, WPD, is investing some £125 million over the next five years across its four licence areas to underpin its transition from DNO to a more active, smart Distribution System Operator.

The 'smart energy sector' is not currently sufficiently formed as to be measurable at a regional level such that a growth target could be meaningfully established. As discussed in Section 5, the sector has yet to emerge in an organised fashion from the digital, technology and energy sectors which need to combine to provide the required capabilities and skills to participate effectively in these markets and capture a proportion of the GVA on offer. The smart energy enterprise development cluster recommended here for the region represents the first step in creating an organised sector featuring businesses with the potential to grow to secure significant market share nationally and globally.

## 10.2. Social benefits

Improving the energy performance of the region's housing stock, particularly where targeted at households at risk of fuel poverty, will make it far easier for the occupants to stay affordably and healthily warm in winter. This would avoid a significant proportion of the £40 million a year cost the region's health service caused by ill-health caused by cold homes, as assessed by National Energy Action.<sup>35</sup> NICE has confirmed that upgrading the energy performance of homes occupied by people with health conditions exacerbated by a cold home (from cardio-vascular and pulmonary conditions to childhood asthma) secures improvements to the physical and mental health and wellbeing of the occupants.

Rapidly increasing the take up of EVs will help to reduce the air pollution which is causing premature deaths (an estimated 297 in 2013 in Bristol alone) and ill-health; most of the air pollution is produced by road traffic. The precise positive impact of a growth in EVs on air pollution and thereby health in the region will depend on: (a) what other steps are taken to curb road traffic in built-up areas over the next 5 years, and also; (b) the scrappage rates are achieved for the older diesel and petrol cars which EVs may be displacing.

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35 See <http://www.nea.org.uk/media/news/260216-01/>

It should be noted that growing the low carbon building retrofit market would support large numbers of skilled and semi-skilled building sector jobs which are suited to those without higher education qualifications. Such jobs are essential to meeting the region's shared goal of tackling economic and social inequalities.

### 10.3. Skills and training issues

While future skills and training needs were not a key focus of the study, there are some brief initial observations that can be made about how the recommendations and future path outlined here will change the patterns of demand for different skills and therefore for associated training through further and higher education and apprenticeship schemes.

Achieving high energy performance, near-zero carbon standards in both new build and existing buildings requires skills in building design, low carbon construction techniques (such as Passivhaus) and building and energy control systems. While initiatives like the Bristol-based Green Register provide post-qualification 'in work' training on these issues, the region's providers of training for architects, planners, building professionals and construction workers will need to ensure that their courses are embedding such understanding and techniques in as core components in future.

There will be demand for power systems electricians who can install EV charging points and battery storage and for electrical engineers to design integrated renewable generation, storage and peer-to-peer supply systems. The reinvigoration of the solar PV and wind power project development and installation markets anticipated here will lead to a high demand for project developer and installer skills, and the associated financing, legal and engineering design capabilities.

Realising the potential of smart energy will require high quality digital skills (in data capture, handling and analysis, pattern recognition, visualisation, system control algorithms etc), high tech (in building energy management systems and control elements, such as automated switches and valves), and energy (in power systems engineering, smart meter installation, new business models for energy trading and demand flexibility services etc), as well as entrepreneurial and business development skills and the associated financial and legal knowledge as regulatory regimes and markets develop. There is likely to be an issue attracting people who have these skills to become involved in smart energy opportunities rather than other sectors such as finance or computer game development. The proposed smart energy cluster approach outlined here is designed to create the critical mass and sense of shared purpose required to achieve this.

Depending on old car scrappage rates, a rapid take up of EVs will have a significant impact on demand for car mechanic skills. EVs typically have about 1% of the moving parts of a car with an internal combustion engine, creating far fewer mechanical problems. The region's FE colleges should consider this likely reduction in long term demand for car maintenance skills.

## Appendix – SWOT analysis in detail

The findings of the SWOT analysis (Strengths Weaknesses Opportunities Threats) undertaken for this study are summarised in Section 5. The tables below provide more detail of the SWOT analysis (which drew on the evidence review and contributions from stakeholders) for each of the six areas of action:

- i. a complete shift to very low or zero carbon electricity generation, mostly renewable and much of it decentralised;
- ii. smarter and more flexible management of demand, including storage, to enable higher penetration of variable renewable generation and to optimise electricity system operation;
- iii. huge reductions in energy demand by improving significantly the energy performance of our buildings (across all sectors and all tenures) and the equipment and processes within them;
- iv. decarbonisation of heat (for buildings, hot water and industrial processes);
- v. a dramatic rise in use of electric vehicles and other steps to cut the carbon emissions of road transport (as electricity is decarbonised);
- vi. ensuring new build developments achieve their full low carbon potential and contribute effectively to a smarter energy system.

The SWOT analysis is captured in one page for each area, with the exception of iii which was divided into domestic, public and commercial buildings.



Area for action	Energy system need and potential for action (within West of England)	Capabilities to deliver (within West of England)	Commercials/funding rewarding the right initiatives	Policies, regulations and market rules in place	Public engagement and consent for change
<b>i. Zero carbon electricity generation</b>  (strong links to Smarter Energy System)	<b>Strengths</b> <ul style="list-style-type: none"> <li>• Good solar and wind resource</li> <li>• Offshore wind and tidal resources (exploitable?)</li> </ul> <b>Weaknesses</b> <ul style="list-style-type: none"> <li>• Near-term grid constraints (but actively engaged DNO)</li> <li>• Offshore opportunities likely to require floating tech (from elsewhere)</li> <li>• Tendency to chase tidal (but no obvious market)</li> </ul> <b>Opportunities</b> <ul style="list-style-type: none"> <li>• Smart ops, DSR, storage to reduce grid limits</li> <li>• Floating tech for offshore wind</li> </ul> <b>Threats</b> <ul style="list-style-type: none"> <li>• East of England and Scotland already in the game (off-shore wind)</li> <li>• Atlantic offshore wind opportunities may be too far away for Bristol to benefit (port etc)</li> </ul>	<b>Strengths</b> <ul style="list-style-type: none"> <li>• Development &amp; engineering consultancy skills, finance and legal experience</li> <li>• Local authority and community energy activity (plus Mongoose and Thrive Renewables)</li> <li>• Actively engaged DNO</li> <li>• Zero West project group exploring how to scale up projects</li> <li>• Innovation work on PV in universities</li> </ul> <b>Weaknesses</b> <ul style="list-style-type: none"> <li>• Limited political appetite for on-shore wind (in spite of resource and overall public support)</li> <li>• Loss of installer capacity after FIT reductions</li> <li>• No manufacturing so limits to GVA</li> </ul> <b>Opportunities</b> <ul style="list-style-type: none"> <li>• Bristol Energy as supply partner for local projects</li> </ul> <b>Threats</b> <ul style="list-style-type: none"> <li>• Existing expertise drifting away after subsidy cuts and planning changes</li> </ul>	<b>Strengths</b> <ul style="list-style-type: none"> <li>• Significant technology cost reductions</li> <li>• Innovation funding available for new ways to integrate renewables and improve materials and efficiencies</li> </ul> <b>Weaknesses</b> <ul style="list-style-type: none"> <li>• Loss of subsidy support for solar &amp; on-shore wind before competitive</li> <li>• New business models yet to be proven</li> </ul> <b>Opportunities</b> <ul style="list-style-type: none"> <li>• New business models for solar – on-roof, self-supply, P2P trading, integrated storage</li> <li>• Innovation funding opportunities on Peer2Peer trading and local energy markets</li> </ul> <b>Threats</b> <ul style="list-style-type: none"> <li>• Lack of clarity on FITs &amp; future market and charging rules</li> <li>• Smart meters and ½ hrly settlement too slow to sustain momentum</li> </ul>	<b>Strengths</b> <ul style="list-style-type: none"> <li>• Quality of local plan policies</li> <li>• Academic expertise (Bath Uni) in design of relevant market and charging regime</li> </ul> <b>Weaknesses</b> <ul style="list-style-type: none"> <li>• Limited political appetite for on-shore wind (in spite of resource and overall public support)</li> <li>• Loss of subsidy support for solar &amp; on-shore wind before competitive</li> </ul> <b>Opportunities</b> <ul style="list-style-type: none"> <li>• Markets starting to shift in right direction</li> <li>• DNO to DSO transition</li> <li>• Revision of local plans (to strengthen further)</li> </ul> <b>Threats</b> <ul style="list-style-type: none"> <li>• Improved markets and charging regimes not inevitable as incumbents seek to protect interests</li> </ul>	<b>Strengths</b> <ul style="list-style-type: none"> <li>• 1 in 30 homes have PV so becoming 'normal'</li> <li>• Community energy activity and strong public support</li> <li>• CSE low carbon neighbourhood planning support programme</li> </ul> <b>Weaknesses</b> <ul style="list-style-type: none"> <li>• Limited political appetite for on-shore wind (in spite of resource and overall public support)</li> <li>• Lack of engagement of more disadvantaged communities</li> </ul> <b>Opportunities</b> <ul style="list-style-type: none"> <li>• Neighbourhood planning and other public engagement activities (to open up discussions about energy)</li> <li>• Revision of local plans as opportunity for wider engagement on energy</li> </ul> <b>Threats</b> <ul style="list-style-type: none"> <li>• We forget to engage the public systematically and consistently and political 'space to act'</li> </ul>



Area for action	Energy system need and potential for action (within West of England)	Capabilities to deliver (within West of England)	Commercials/funding rewarding the right initiatives	Policies, regulations and market rules in place	Public engagement and consent for change
<b>ii. A smarter energy system</b>  (strong links to all other areas for action)	<b>Strengths</b> <ul style="list-style-type: none"> <li>• Future penetration of renewables and EVs dependent on smarter solutions (to keep system cost-efficient)</li> <li>• Strong policy lead from BEIS and Ofgem</li> </ul> <b>Weaknesses</b> <ul style="list-style-type: none"> <li>• Smart markets not quite ready and tech integration &amp; business models still in infancy (so pilots for now)</li> <li>• No local/regional dimension in national thinking</li> <li>• Smart energy data availability limited</li> </ul> <b>Opportunities</b> <ul style="list-style-type: none"> <li>• Significant national and global markets up for grabs (\$220billion by 2020 – see footnote 24)</li> <li>• Funding to improve understanding and experiment (WPD, Innovate UK, BEIS etc)</li> </ul> <b>Threats</b> <ul style="list-style-type: none"> <li>• Cyber security breaches</li> <li>• Data availability issues not resolved</li> </ul>	<b>Strengths</b> <ul style="list-style-type: none"> <li>• Strong smart energy &amp; digital skills (joined up?), plus Uni expertise (Bath &amp; Bristol), engaged DNO, incubator support &amp; open/big data infrastructure, plus projects like REPLICATE</li> <li>• Bristol Smart Energy City Collaboration (plus CSE role on BEIS/Ofgem Smart Systems Forum)</li> <li>• Community energy activity and interest</li> </ul> <b>Weaknesses</b> <ul style="list-style-type: none"> <li>• Locus for action is unclear – who leads?</li> <li>• Smart tech integration and business models still in infancy –need work</li> </ul> <b>Opportunities</b> <ul style="list-style-type: none"> <li>• WPD's shift to DSO</li> <li>• Rich data sets in public sector as test bed</li> <li>• Enterprise cluster approach (link to digital)</li> </ul> <b>Threats</b> <ul style="list-style-type: none"> <li>• Sophisticated knowledge &amp; capabilities required: does WoE have enough?</li> <li>• Other regions get ahead</li> </ul>	<b>Strengths</b> <ul style="list-style-type: none"> <li>• BEIS, Innovate UK, Ofgem, WPD innovation funding available</li> <li>• Demand reduction already creates value (though need to capture in existing markets for now)</li> </ul> <b>Weaknesses</b> <ul style="list-style-type: none"> <li>• Smart markets not quite ready (e.g. ToU tariffs) so all about pilots for now</li> </ul> <b>Opportunities</b> <ul style="list-style-type: none"> <li>• Innovation funding (if can organise right partnerships in region)</li> <li>• Future energy system value all about 'smart' services based on data analytics</li> <li>• Significant national and global markets up for grabs</li> </ul> <b>Threats</b> <ul style="list-style-type: none"> <li>• Lack of co-ordination limits new collaborations needed to secure funds</li> </ul>	<b>Strengths</b> <ul style="list-style-type: none"> <li>• Strong policy lead from BEIS/Ofgem: new market rules in development</li> <li>• DNO to DSO transition</li> <li>• Smart meter roll-out underway</li> </ul> <b>Weaknesses</b> <ul style="list-style-type: none"> <li>• Smart markets not quite ready (e.g. ToU tariffs)</li> <li>• No local/regional dimension in national thinking</li> <li>• Smart meter rollout lacking drive</li> </ul> <b>Opportunities</b> <ul style="list-style-type: none"> <li>• Potential for a region to be 'accelerated' market test bed</li> <li>• Local energy markets experiments</li> </ul> <b>Threats</b> <ul style="list-style-type: none"> <li>• Policy continues to overlook regional interests/needs</li> <li>• New charging regimes are shown to be unfair so lose support</li> <li>• Smart meter rollout slows further due to lack of supplier leadership</li> </ul>	<b>Strengths</b> <ul style="list-style-type: none"> <li>• Bristol Smart Energy City Collaboration analysis (plus CSE role on BEIS Smart Systems Forum)</li> <li>• Community energy activity and interest with LA support (Bristol &amp; Bath)</li> <li>• Strong capabilities to support vulnerable households</li> </ul> <b>Weaknesses</b> <ul style="list-style-type: none"> <li>• No local/regional dimension in national thinking</li> <li>• Smart meter rollout <u>not</u> organised to reflect local/regional interests</li> </ul> <b>Opportunities</b> <ul style="list-style-type: none"> <li>• Smart meter roll-out as public engagement opportunity</li> </ul> <b>Threats</b> <ul style="list-style-type: none"> <li>• Smart meter rollout by-passes local engagement</li> <li>• Vulnerable get to lose out – so undermine public (and political) support</li> <li>• Cyber security and privacy concerns</li> </ul>

Area for action	Energy system need and potential for action (within West of England)	Capabilities to deliver (within West of England)	Commercials/funding rewarding the right initiatives	Policies, regulations and market rules in place	Public engagement and consent for change
<b>iii. Reduced demand in (existing) housing</b>  (links particularly to Decarbonisation of Heat and Smarter Energy Systems)	<p><b>Strengths</b></p> <ul style="list-style-type: none"> <li>• Cutting housing energy demand is lowest cost route to decarbonisation of heat</li> <li>• 60% of WoE housing lower than EPC C – so plenty to do (&gt;£3bn)</li> <li>• Significant additional benefits from action (espec. fuel poverty &amp; health/social benefits)</li> </ul> <p><b>Weaknesses</b></p> <ul style="list-style-type: none"> <li>• Improvements now involve more complex building work (cf loft and cavity insulation)</li> <li>• Sector is already busy (and earning well) doing standard retrofit work</li> <li>• Heritage buildings create some limitations</li> </ul> <p><b>Opportunities</b></p> <ul style="list-style-type: none"> <li>• BEIS low carbon market/supply chain accelerator competition</li> <li>• Heritage home exemplar</li> </ul> <p><b>Threats</b></p> <ul style="list-style-type: none"> <li>• We fail to reframe challenge as the future of retrofit (rather than ‘grants for insulation’)</li> </ul>	<p><b>Strengths</b></p> <ul style="list-style-type: none"> <li>• LAs all interested (some v active in recent past); now mainly focused on ECO schemes cf owner-occupier market</li> <li>• Some good local companies (but few)</li> <li>• Green Open Homes and Green Register</li> <li>• Activities and expertise on tackling fuel poverty</li> <li>• RSLs active and engaged</li> </ul> <p><b>Weaknesses</b></p> <ul style="list-style-type: none"> <li>• LA resources at risk</li> <li>• Sector not organised for low carbon retrofit</li> <li>• Skills &amp; quality challenge plus sector already busy (and earning well) doing standard retrofit work</li> <li>• Supply chain and skills providers bitten by past schemes not living up to promises</li> </ul> <p><b>Opportunities</b></p> <ul style="list-style-type: none"> <li>• BEIS low carbon market accelerator competition</li> </ul> <p><b>Threats</b></p> <ul style="list-style-type: none"> <li>• Supply chains too busy to bother &amp; can’t see demand</li> </ul>	<p><b>Strengths</b></p> <ul style="list-style-type: none"> <li>• Potential amongst ‘green’ home owners to kick start market (but needs supply chain)</li> <li>• ECO and ECO-flex funding (but limited)</li> </ul> <p><b>Weaknesses</b></p> <ul style="list-style-type: none"> <li>• Sector already busy (and earning well) doing standard retrofit work</li> <li>• Funding for improving fuel poor homes insufficient; relies on energy suppliers/ECO</li> <li>• Health sector slow to see ‘invest to save’ potential</li> <li>• Grant availability in past has distorted markets</li> </ul> <p><b>Opportunities</b></p> <ul style="list-style-type: none"> <li>• BEIS low carbon market accelerator competition</li> <li>• There are now no grants; market can start afresh</li> <li>• To refocus current home-owner retrofit spend onto low carbon retrofit</li> <li>• Curo Foxhill exemplar?</li> </ul> <p><b>Threats</b></p> <ul style="list-style-type: none"> <li>• Supply chains too busy to bother – and can’t see demand</li> </ul>	<p><b>Strengths</b></p> <ul style="list-style-type: none"> <li>• Clear intent from Government</li> <li>• Private Rented Sector Minimum Energy Efficiency Std (MEES) (though weak for now)</li> <li>• ECO and ECO-flex funding (but limited)</li> <li>• BEIS starting to look at owner-occupier market post Green Deal</li> <li>• NICE guidance on cold homes and Bristol JSNA chapter on fuel poverty</li> </ul> <p><b>Weaknesses</b></p> <ul style="list-style-type: none"> <li>• No financial incentives or regulatory push or long-term plan from BEIS</li> <li>• Funding for fuel poor households insufficient and relies on energy suppliers/ECO</li> </ul> <p><b>Opportunities</b></p> <ul style="list-style-type: none"> <li>• BEIS low carbon market accelerator competition</li> <li>• PRS MEES standards</li> <li>• There are now no grants so market starts afresh</li> </ul> <p><b>Threats</b></p> <ul style="list-style-type: none"> <li>• Lack of policy signals leaves markets cold</li> </ul>	<p><b>Strengths</b></p> <ul style="list-style-type: none"> <li>• Green Open Homes experience (revealing the possible)</li> <li>• Some evidence of decent potential market without grants to kick start supply chain and set new norms</li> </ul> <p><b>Weaknesses</b></p> <ul style="list-style-type: none"> <li>• Past scheme quality issues undermine trust in customer &amp; supply chain</li> <li>• Limited supply chain means the ‘keen’ can’t get quotes for work or commission promptly</li> </ul> <p><b>Opportunities</b></p> <ul style="list-style-type: none"> <li>• BEIS low carbon market accelerator competition</li> <li>• There are now no grants so market can start afresh</li> </ul> <p><b>Threats</b></p> <ul style="list-style-type: none"> <li>• Expectation that there will be grants again in future stops market development</li> <li>• Heritage building concerns over-ride sensible approaches</li> </ul>

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<b>iii. Reduced demand in public sector buildings</b>  (Links to Smarter Energy System)	<b>Strengths</b> <ul style="list-style-type: none"> <li>Public sector buildings can set example and stimulate supply chains (which could then serve commercial buildings market)</li> <li>Practice easily influenced through funding and governance relationships</li> </ul> <b>Weaknesses</b> <ul style="list-style-type: none"> <li>Some of the easy wins already gained so business case weaker</li> <li>Potential for carbon reduction higher elsewhere</li> </ul> <b>Opportunities</b> <ul style="list-style-type: none"> <li>Existing practice creates platform to scale up activity and set exemplary targets</li> <li>Use public sector practice &amp; exemplars as a model for commercial sector (and to help build supply chain)</li> </ul> <b>Threats</b> <ul style="list-style-type: none"> <li>Focus on new build distracts from sorting out existing estate</li> </ul>	<b>Strengths</b> <ul style="list-style-type: none"> <li>Good activity and commitment in public sector (Unis, LAs – particularly Bristol, NHS) (but resource constrained)</li> <li>‘Smart’ skills in region (see above)</li> </ul> <b>Weaknesses</b> <ul style="list-style-type: none"> <li>Limited data analytics being applied to available (and rich) data</li> <li>Learning and co-ordination between institutions?</li> </ul> <b>Opportunities</b> <ul style="list-style-type: none"> <li>Existing practices create platform to scale up activity and set challenging (and example setting) targets (with more sharing of resources)</li> <li>Shared data analytics capability (see ‘smart’ above)</li> </ul> <b>Threats</b> <ul style="list-style-type: none"> <li>Focus on new build distracts from sorting out existing estate</li> </ul>	<b>Strengths</b> <ul style="list-style-type: none"> <li>SALIX fund</li> <li>Demand reduction reduces costs and has good ‘invest to save’ business case</li> </ul> <b>Weaknesses</b> <ul style="list-style-type: none"> <li>Tendency to focus on short paybacks - deeper refurb not funded at present</li> <li>Markets to extract value from demand side response complex</li> </ul> <b>Opportunities</b> <ul style="list-style-type: none"> <li>Innovation funding from BEIS and DSR and flexibility markets</li> <li>Potential for third party financing ‘invest to save’ models to build on SALIX?</li> </ul> <b>Threats</b> <ul style="list-style-type: none"> <li>Funding restrictions lead to low priority for energy saving work</li> </ul>	<b>Strengths</b> <ul style="list-style-type: none"> <li>SALIX funding</li> <li>HCFE pressures on Unis to take action and cost pressures everywhere else (NHS, LAs etc)</li> <li>Innovation funding from BEIS and DSR and flexibility markets</li> </ul> <b>Weaknesses</b> <ul style="list-style-type: none"> <li>SALIX funding mainly for short-term paybacks</li> <li>Markets for full value of demand side response still evolving</li> </ul> <b>Opportunities</b> <ul style="list-style-type: none"> <li>Innovation funding from BEIS and DSR and flexibility markets</li> </ul> <b>Threats</b> <ul style="list-style-type: none"> <li>Funding restrictions lead to low priority for energy saving work</li> </ul>	<b>Strengths</b> <ul style="list-style-type: none"> <li>Good activity and commitment in public sector (Unis, LAs, NHS) (but resource constrained)</li> </ul> <b>Weaknesses</b> <ul style="list-style-type: none"> <li>Limited engagement with users to reveal successes and encourage further behavioural action</li> </ul> <b>Opportunities</b> <ul style="list-style-type: none"> <li>Promote what’s already been done to encourage others to act in their own sphere of influence</li> <li>Deeper involvement of staff with behavioural change programmes</li> <li>Use public sector practice and exemplars as a model for commercial sector (and to help build supply chain)</li> </ul> <b>Threats</b> <ul style="list-style-type: none"> <li>Without promotion, lack of explicit and obvious action by public sector sends ‘don’t bother’ message to others</li> </ul>

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<b>iii. Reduced demand in commercial buildings</b>  (Links to Smarter Energy System)	<b>Strengths</b> <ul style="list-style-type: none"> <li>• 65% of non-domestic buildings in WoE currently below EPC C</li> <li>• Significant potential for improvement with some easy wins – like lighting &amp; improved heating/cooling controls</li> </ul> <b>Weaknesses</b> <ul style="list-style-type: none"> <li>• Landlord/tenant split incentives – we need to get to building owners to invest but tenants get benefits</li> <li>• Do we know who owns what buildings and how energy is used in them? What's the potential?</li> </ul> <b>Opportunities</b> <ul style="list-style-type: none"> <li>• Smarter system market opening up creates potential additional value from taking action (but probably via third party aggregator)</li> </ul> <b>Threats</b> <ul style="list-style-type: none"> <li>• Seen as 'too difficult' (it is difficult!) so no one tries</li> </ul>	<b>Strengths</b> <ul style="list-style-type: none"> <li>• Good public sector examples</li> <li>• Potential interest and capabilities to set up financing mechanism</li> <li>• Existing initiatives like Go Green &amp; opportunities to engage via Business West and Bristol Green Capital Partnership</li> </ul> <b>Weaknesses</b> <ul style="list-style-type: none"> <li>• Landlord/tenant split incentives: if building owners invest, tenants get benefits</li> <li>• Do we know who owns what buildings and how energy is used in them? What's the potential? Who might take a lead?</li> </ul> <b>Opportunities</b> <ul style="list-style-type: none"> <li>• Potential link in with Smart Energy Enterprise Cluster (and examples from public sector)</li> <li>• Bristol Green Capital Partnership</li> </ul> <b>Threats</b> <ul style="list-style-type: none"> <li>• Seen as 'too difficult' (it is difficult!) so no one tries</li> </ul>	<b>Strengths</b> <ul style="list-style-type: none"> <li>• Some easy wins – like lighting and improved controls</li> </ul> <b>Weaknesses</b> <ul style="list-style-type: none"> <li>• Landlord/tenant split incentives: if building owners invest, tenants get benefits</li> <li>• Energy costs still not a huge component of most WoE businesses so tenants not paying attention or putting pressure on landlords</li> </ul> <b>Opportunities</b> <ul style="list-style-type: none"> <li>• Smarter system market opening up creates potential additional value from taking action (but probably via third party aggregator)</li> <li>• Set up third party financing and delivery – SALIX for commercial sector?</li> </ul> <b>Threats</b> <ul style="list-style-type: none"> <li>• Indifference from building owners (due to tenant getting benefits)</li> </ul>	<b>Strengths</b> <ul style="list-style-type: none"> <li>• Minimum Energy Efficiency Standards coming in for commercial buildings too</li> <li>• ESOS framework should encourage action (but hasn't)</li> </ul> <b>Weaknesses</b> <ul style="list-style-type: none"> <li>• No policy mechanisms to get beyond landlord/tenant split</li> <li>• Lack of third party financing mechanism</li> <li>• Lack of obvious enforcement system/process for MEEs</li> </ul> <b>Opportunities</b> <ul style="list-style-type: none"> <li>• Smarter system markets opening up creates potential additional value from taking action</li> </ul> <b>Threats</b> <ul style="list-style-type: none"> <li>• Seen as 'too difficult' (it is difficult!) so no one tries</li> </ul>	<b>Strengths</b> <ul style="list-style-type: none"> <li>• Good public sector examples</li> <li>• Existing initiatives like Go Green and good opportunities to engage via Business West and Bristol Green Capital Partnership</li> </ul> <b>Weaknesses</b> <ul style="list-style-type: none"> <li>• No pressure on building owners to change (and building owners often anonymous and not local)</li> </ul> <b>Opportunities</b> <ul style="list-style-type: none"> <li>• Highlight good and poor examples in public campaign</li> <li>• Unions and other employee groups as potential allies in campaign?</li> <li>• Equivalent of divestment campaign for property owning funds?</li> </ul> <b>Threats</b> <ul style="list-style-type: none"> <li>• Seen as 'too difficult' (it is difficult!) so no one tries</li> </ul>

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<b>iv. Decarbonisation of heat</b>  (Links to reduced demand for energy in buildings)	<b>Strengths</b> <ul style="list-style-type: none"> <li>Known challenge (85% of heat is fossil fuels) &amp; time to resolve (but need to plan)</li> </ul> <b>Weaknesses</b> <ul style="list-style-type: none"> <li>V complicated long term issues with no 'easy' solutions &amp; lack of clear policy direction but can't be left to the market</li> <li>'Distress' replacements for boilers typical (so gas replaces gas in a hurry): when do we switch 'fuel' &amp; heating system?</li> </ul> <b>Opportunities</b> <ul style="list-style-type: none"> <li>Decarbonisation of electricity making it a 'low carbon option'</li> <li>New-build demonstrators</li> </ul> <b>Threats</b> <ul style="list-style-type: none"> <li>Ignore reducing demand for heat as 'heat supply' assets easier to finance</li> <li>End up with gas-fired district heating for longer than we should – or have stranded assets</li> <li>Reinforcing electricity network for electric heating drive up costs</li> </ul>	<b>Strengths</b> <ul style="list-style-type: none"> <li>Engagement in issue already by WWU (gas) and WPD (electricity) networks and potential for H<sub>2</sub> &amp; green gas</li> <li>District heating activities in Bristol, SGlos, BANES</li> <li>Green gas experience (Geneco and others) and some renewable heat experience and skills</li> <li>Good engineering consultancy know-how &amp; CSE THERMOS project</li> </ul> <b>Weaknesses</b> <ul style="list-style-type: none"> <li>No clear locus for action at regional level</li> <li>Supply chain weaknesses for some technologies</li> </ul> <b>Opportunities</b> <ul style="list-style-type: none"> <li>Work with WWU and WPD to map SW process</li> <li>Bristol Zero Carbon Heat Strategy</li> </ul> <b>Threats</b> <ul style="list-style-type: none"> <li>Focus too much on meeting need for near-term revenues rather than long-term decarbonisation needs</li> </ul>	<b>Strengths</b> <ul style="list-style-type: none"> <li>BEIS HNDU funding</li> <li>Renewable Heat Incentive (RHI) subsidies</li> <li>New build should only need heat for hot water</li> </ul> <b>Weaknesses</b> <ul style="list-style-type: none"> <li>District heating commercials weak, particularly for retrofit</li> <li>Electric heating affordability depends on dwelling energy standard</li> </ul> <b>Opportunities</b> <ul style="list-style-type: none"> <li>Innovation and system funding potentially available (Energy Systems Catapult?)</li> <li>Off-gas homes exemplar (WWU/WPD funding?)</li> </ul> <b>Threats</b> <ul style="list-style-type: none"> <li>Failure to optimise heat demand reduction in new build to provide a case for district heating</li> <li>End up with gas-fired district heating for longer than we should – or have stranded assets</li> <li>Existence of gas network distorts thinking on best approaches</li> </ul>	<b>Strengths</b> <ul style="list-style-type: none"> <li>The issue is on political agenda (but 'tomorrow's problem')</li> <li>New local plans looking to set very high standards to cut heat demand and support low carbon heating</li> </ul> <b>Weaknesses</b> <ul style="list-style-type: none"> <li>Very complicated long term issues with no 'easy' solutions and lack of clear policy direction but can't be left to the market</li> <li>RHI future uncertain</li> <li>Electricity bills carry policy costs so distort electric-gas fuel choice</li> </ul> <b>Opportunities</b> <ul style="list-style-type: none"> <li>New build demonstrators</li> </ul> <b>Threats</b> <ul style="list-style-type: none"> <li>Existence of gas network distorts thinking on best approaches</li> <li>Impact on network of electric heating options not considered, so distorted thinking on best approaches</li> </ul>	<b>Strengths</b> <ul style="list-style-type: none"> <li>Some engagement (e.g. CSE, community groups, LAs) on reducing heat demand (insulation etc)</li> </ul> <b>Weaknesses</b> <ul style="list-style-type: none"> <li>Lack of public engagement to date (even though most of heat is domestic and gas)</li> <li>Very complicated long term issues with no 'easy' solutions and lack of clear policy direction</li> <li>Distress replacements for boilers are typical (so gas replaces gas) so when does option arise to switch 'fuel' and heating system?</li> <li>Electric heating affordability depends on dwelling energy standard</li> </ul> <b>Opportunities</b> <ul style="list-style-type: none"> <li>New build demonstrators</li> </ul> <b>Threats</b> <ul style="list-style-type: none"> <li>Complexity of issue precludes useful public engagement: choices aren't yet clear, so what's the question?</li> </ul>

Area for action	Energy system need and potential for action (within West of England)	Capabilities to deliver (within West of England)	Commercials/funding rewarding the right initiatives	Policies, regulations and market rules in place	Public engagement and consent for change
<b>v. Growth of EVs</b>	<p><b>Strengths</b></p> <ul style="list-style-type: none"> <li>• Take up of EVs growing fast with strong national commitment (policies still lacking some detail)</li> </ul> <p><b>Weaknesses</b></p> <ul style="list-style-type: none"> <li>• No standardisation of charging points or clear co-ordination of rollout</li> <li>• Electricity network will struggle if not co-ordinated and charging isn't 'smart' – can't be left to market</li> <li>• EV rollout needs active orchestration but is anyone in charge?</li> </ul> <p><b>Opportunities</b></p> <ul style="list-style-type: none"> <li>• Innovation funding (vehicle to grid, new technologies etc)</li> <li>• Significant wider benefits (air quality, smarter system) if got right</li> </ul> <p><b>Threats</b></p> <ul style="list-style-type: none"> <li>• EVs become 'the answer' to transport issues (like air quality) ahead of active travel options</li> </ul>	<p><b>Strengths</b></p> <ul style="list-style-type: none"> <li>• Local Go Ultra Low West project: funding &amp; study</li> <li>• Leading DNO for EVs (WPD Electric Nation)</li> <li>• Significant EV-relevant R&amp;D at local universities (e.g. IAAPS, FLOURISH) plus some local business activity (e.g. Zap Map)</li> <li>• Consultancy &amp; UWE skills on public attitudes &amp; transport planning</li> </ul> <p><b>Weaknesses</b></p> <ul style="list-style-type: none"> <li>• Joint Transport Study inadequate on EVs</li> <li>• EV rollout needs active orchestration but is anyone in charge?</li> <li>• Network issues only just starting to feature</li> </ul> <p><b>Opportunities</b></p> <ul style="list-style-type: none"> <li>• Innovation funding</li> <li>• Local energy supplier charging deals?</li> </ul> <p><b>Threats</b></p> <ul style="list-style-type: none"> <li>• Lack of adequate LA resource to deliver Go Ultra Low West project</li> <li>• Failure to coordinate with WPD could create avoidable network costs</li> </ul>	<p><b>Strengths</b></p> <ul style="list-style-type: none"> <li>• Take up of EVs growing fast (now doubling every 15 months) so market pull very strong</li> <li>• Local Go Ultra Low West project: funding &amp; study</li> </ul> <p><b>Weaknesses</b></p> <ul style="list-style-type: none"> <li>• Electricity network will struggle – and create unnecessary costs - if not co-ordinated and charging isn't 'smart' – can't be left to market</li> <li>• EV rollout needs active orchestration but is anyone in charge?</li> </ul> <p><b>Opportunities</b></p> <ul style="list-style-type: none"> <li>• Innovation funding (vehicle to grid, new technologies etc)</li> <li>• Smart charging options</li> </ul> <p><b>Threats</b></p> <ul style="list-style-type: none"> <li>• Take up of EVs rushes ahead before smart charging and collective approaches are sorted</li> <li>• Failure to coordinate adequately with WPD could create avoidable network costs</li> </ul>	<p><b>Strengths</b></p> <ul style="list-style-type: none"> <li>• Co-ordination between BEIS &amp; DfT now in place</li> <li>• Local Go Ultra Low West project: funding &amp; study</li> <li>• New requirement for smart charging drafted</li> </ul> <p><b>Weaknesses</b></p> <ul style="list-style-type: none"> <li>• Joint Transport Study inadequate on EVs</li> <li>• National policy and market frameworks playing catch up - No standardisation of charging points or clear co-ordination of rollout</li> <li>• Electricity network will struggle if not co-ordinated and charging isn't 'smart' – can't be left to market</li> <li>• EV rollout needs active orchestration but is anyone in charge?</li> </ul> <p><b>Opportunities</b></p> <ul style="list-style-type: none"> <li>• Innovation funding (vehicle to grid, new technologies etc)</li> </ul> <p><b>Threats</b></p> <ul style="list-style-type: none"> <li>• EVs left to the market so 'chaotic' and more costly than need be</li> </ul>	<p><b>Strengths</b></p> <ul style="list-style-type: none"> <li>• Take up of EVs growing fast (now doubling every 15 months)</li> <li>• Local Go Ultra Low West project has EV driver engagement element</li> <li>• WPD Electric Nation producing wealth of information on EV user behaviours and attitudes</li> </ul> <p><b>Weaknesses</b></p> <ul style="list-style-type: none"> <li>• EVs presented as individual choice but have shared implications which need addressing</li> <li>• EV rollout needs active orchestration but is anyone in charge?</li> </ul> <p><b>Opportunities</b></p> <ul style="list-style-type: none"> <li>• Getting EV owners to understand impact on network, opportunity to support renewables and thus charge smartly</li> </ul> <p><b>Threats</b></p> <ul style="list-style-type: none"> <li>• EV rollout left to the market so 'chaotic'</li> <li>• EVs become 'the answer' to transport issues (like air quality) ahead of active travel options</li> </ul>



Area for action	Energy system need and potential for action (within West of England)	Capabilities to deliver (within West of England)	Commercials/funding rewarding the right initiatives	Policies, regulations and market rules in place	Public engagement and consent for change
<b>vi. New build development zero carbon and smart</b>	<p><b>Strengths</b></p> <ul style="list-style-type: none"> <li>Carbon emission reduction targets require that new build developments are virtually zero carbon (and enabled for smart energy system)</li> </ul> <p><b>Weaknesses</b></p> <ul style="list-style-type: none"> <li>Lack of ability to shape energy performance directly in policy (only via Merton rule)</li> <li>Developers fight standards (on viability/cost) and built lower quality</li> </ul> <p><b>Opportunities</b></p> <ul style="list-style-type: none"> <li>Set 'energy positive' policies for new build developments in revised local plans (and JSP)</li> <li>Doing interesting things on council-owned land</li> </ul> <p><b>Threats</b></p> <ul style="list-style-type: none"> <li>Developers turning away from WoE if costs too high (or threatening to, worrying politicians)</li> </ul>	<p><b>Strengths</b></p> <ul style="list-style-type: none"> <li>Local planning policies (and chance to update them) and political will</li> <li>Joint working on policy across LAs and WECA</li> <li>Local expertise in v low energy buildings and associated low carbon planning etc</li> <li>Local interest in community land trusts, self-build, modular build</li> </ul> <p><b>Weaknesses</b></p> <ul style="list-style-type: none"> <li>Lack of ability to shape energy performance directly in policy (only via Merton rule)</li> <li>Lack of 'allowable solutions' delivery structure</li> <li>LA capabilities to negotiate with developers is stretched</li> </ul> <p><b>Opportunities</b></p> <ul style="list-style-type: none"> <li>Doing interesting things on council-owned land</li> </ul> <p><b>Threats</b></p> <ul style="list-style-type: none"> <li>Policy intentions challenged on viability grounds by developers</li> </ul>	<p><b>Strengths</b></p> <ul style="list-style-type: none"> <li>?</li> </ul> <p><b>Weaknesses</b></p> <ul style="list-style-type: none"> <li>Developers fight standards and conditions (on viability/cost) and built lower quality</li> </ul> <p><b>Opportunities</b></p> <ul style="list-style-type: none"> <li>Potential for new business models (third party finance) to address viability challenges from developers</li> </ul> <p><b>Threats</b></p> <ul style="list-style-type: none"> <li>Developers turning away from WoE if costs too high (or threatening to, worrying politicians)</li> </ul>	<p><b>Strengths</b></p> <ul style="list-style-type: none"> <li>Local planning policies (and chance to update )</li> <li>Joint working on policy across LAs and WECA</li> </ul> <p><b>Weaknesses</b></p> <ul style="list-style-type: none"> <li>Lack of ability to shape energy performance directly in planning (only via Merton rule)</li> <li>Drive for new housing volumes (from HCLG) taking precedent</li> </ul> <p><b>Opportunities</b></p> <ul style="list-style-type: none"> <li>Set 'energy positive' policies for new build developments in revised local plans (and JSP)</li> <li>Build new viability evidence base to challenge developers and create expert negotiating resource</li> </ul> <p><b>Threats</b></p> <ul style="list-style-type: none"> <li>Drive for housing volumes (and HCLG diktats) leaves local policy intentions useless</li> <li>Developers turning away from WoE if costs too high (or threatening to, worrying politicians)</li> </ul>	<p><b>Strengths</b></p> <ul style="list-style-type: none"> <li>Public not happy with poor quality development</li> <li>Neighbourhood planning framework and CSE low carbon neighbourhood planning support programme</li> <li>Local interest in community land trusts, self-build, green homes</li> </ul> <p><b>Weaknesses</b></p> <ul style="list-style-type: none"> <li>Lack of planning authorities to get policies followed – so public don't trust planning system to deliver what they want</li> </ul> <p><b>Opportunities</b></p> <ul style="list-style-type: none"> <li>Neighbourhood planning with 'low carbon' development dimension</li> <li>Doing interesting things on council-owned land</li> </ul> <p><b>Threats</b></p> <ul style="list-style-type: none"> <li>Lack of action to shift development to high quality, low carbon undermines public faith in planning system</li> </ul>

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This bibliography lists the documents and datasets examined as part of the evidence review for this study. In addition, the study team had access to spreadsheets completed by each local authority listing their relevant current and recent activities, a completed 'Local Sustainable Energy Assessment Matrix' for three of the local authorities, and the results of a national LEP and core city (Bristol) benchmarking exercise (undertaken by Sustainability West Midlands).

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