

**Distribution Future
Energy Scenarios:
Regional Review**

South West licence area



Foreword by WPD

The electricity distribution network across the four Western Power Distribution (WPD) licence areas has changed dramatically in the last ten years.

Primarily designed to operate as a passive network, WPD has connected 10GW of distributed energy resources and transitioned to operating a more active distribution system. In addition, annual electricity demand has decreased during this time as we start to use more energy efficient devices in everyday life.

The next decade will see even more far-reaching changes. That is why we have worked with Regen to help us understand what these changes might mean for our distribution network and the investment that may be needed to meet customers' changing needs.

This report summarises the 2020 Distribution Future Energy Scenarios (DFES) study for the South West licence area. During the next 30 years, we are predicting to see a large increase in distributed generation connected to the network, a large proportion being supplied from renewable sources.

The network will also see electricity storage technologies and high levels of new low-carbon technologies, such as electric vehicles and heat pumps, increasing household demand for electricity.

The scenario framework used in this study is heavily influenced by the UK government targets to reach Net Zero greenhouse gas emissions by 2050, our projections out to 2050 provide a granular breakdown of the customers connected to the distribution network in a Net Zero compliant future.

The DFES projections are used to assess the distribution network and identify areas of strategic network investment, which can be delivered through conventional reinforcement or a range of smart and flexible solutions. By performing this study, WPD is able to demonstrate that we will be able to continue to meet the needs of our customers as we transition to a low carbon future.

This regional review is part of a wider suite of DFES documents, which along with an interactive map of the data can be found on our [website](#).



Ben Godfrey
Network Strategy Manager



The DFES process



The Distribution Future Energy Scenarios outline the range of credible pathways to 2050 for the change in connections to the distribution network.

Using a scenario framework consistent with other distribution network operators and National Grid ESO (known as the Future Energy Scenarios or FES), these local stakeholder informed projections are created on an annual cycle and encompass changes in demand, storage and distributed generation, including electrified transport and heat.

The four scenarios include three compliant with UK's target to reduce carbon emissions by 100%, **achieving 'net zero' by 2050**. A fourth, non-compliant scenario is also modelled.

The factors used to project deployment at a local level are the result of consultation with developers, local authorities and community energy groups, as well as analysis of existing trends, spatial data and technological innovation.



South West story to date



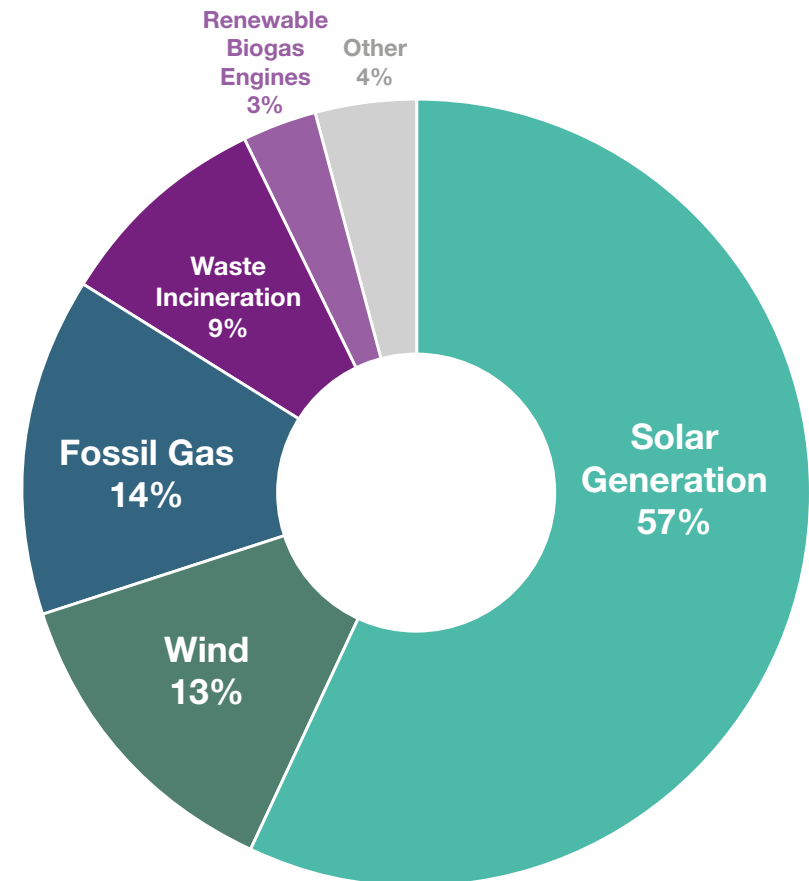
As of April 2020, there is 2.7GW of distributed generation in the South West licence area, 2.1GW of this is low carbon or renewable generation.

The South West accounts for around 5% of the total renewable energy capacity in GB, enough to power around a million homes.

Distributed electricity generation in the area has increased significantly in recent years, with over 50% of capacity having only connected since 2014. However, others such as hydropower sites on Dartmoor have been connected for over 100 years. The South West licence area has some of the best solar irradiance in the UK and saw very high deployment of solar PV from 2012. Over half of all distribution connected generation in the South West licence area is solar PV.

Electricity demand has changed more slowly. Only 1% of South West homes currently have a heat pump and 0.6% of cars are electric. However, widespread change is expected with as new policies are brought forward to encourage electrification of heat and transport.

Total distributed energy generation in the South West licence area



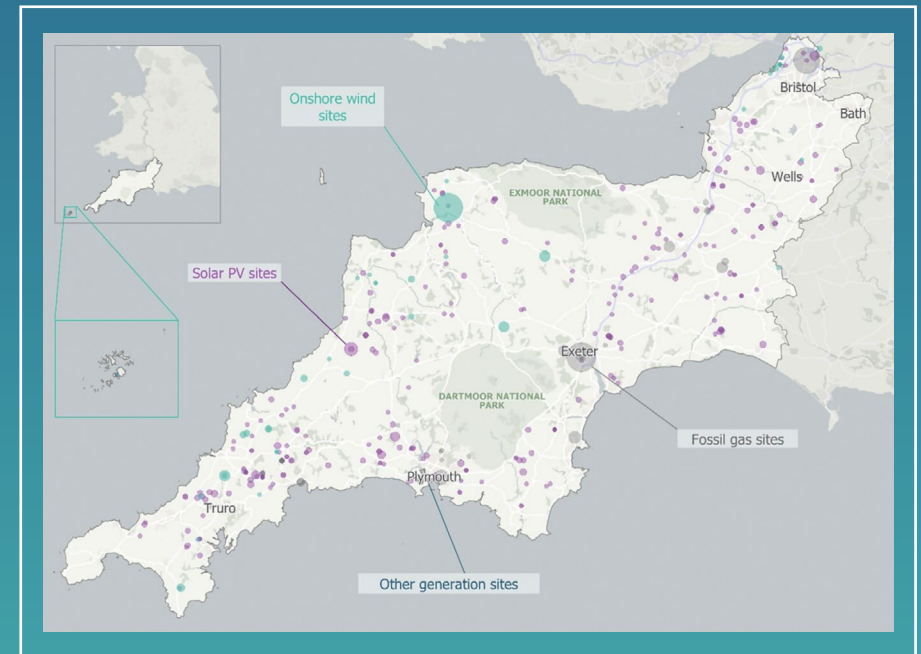
Distributed energy generation in the South West licence area

Ground mounted solar PV is distributed across the licence area with concentrations visible in Cornwall and on the corridor between Exeter and Bristol – following proximity to the distribution network.

The largest distribution connected generation site is Fullabrook wind farm in North Devon, at a total capacity of 66MW.

There are two fossil gas power plants over 50MW in the licence area, near Exeter and Filton, South Gloucestershire.

Other smaller fossil gas sites tend to be located near urban areas as well, for example at Plymouth and Torbay.



Near term pipeline summary



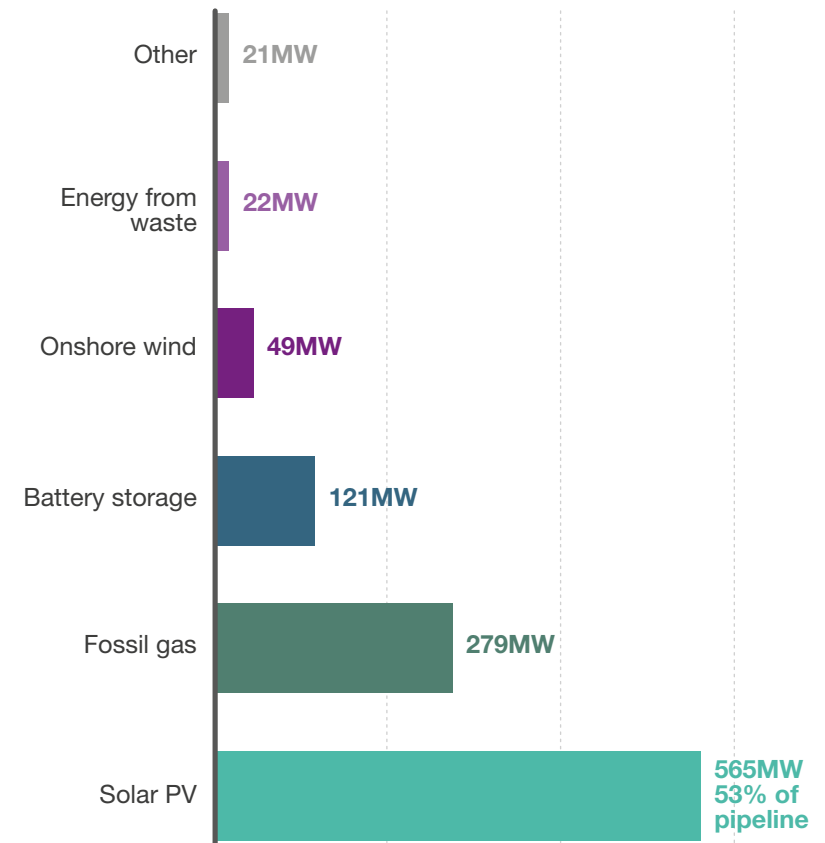
There are over 150 projects poised to connect to the South West distribution network in the near future, totalling 1GW of additional generating capacity.

Over half of the current pipeline capacity is made up from solar sites, a total of 565MW. There are five c.50 MW solar sites in the pipeline, Around half of the solar pipeline accepted a network connection before January 2019, and half have accepted since. Although deployment has slowed in recent years, the DFES analysis shows that there is still interest to develop new solar capacity in the area.

Energy storage is projected to play a larger role in the energy system as the country decarbonises, there are 14 battery sites with accepted connection offers which could connect in the near term. With a capacity of 121MW, the energy storage pipeline is over twice the current installed capacity.

There is a total of 50MW of wind sites in the pipeline from 6 sites, most of which are located in Cornwall. There is also 279MW of fossil gas capacity, the technology with the second largest pipeline capacity after solar.

Sites with an accepted connection offer in the South West licence area



Stakeholder engagement



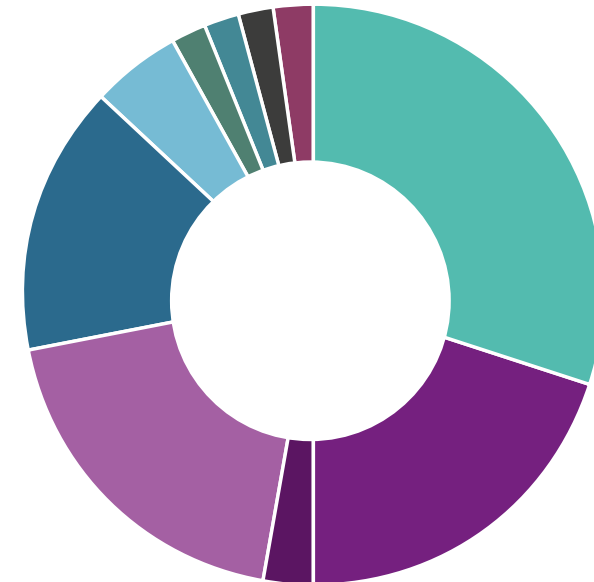
Stakeholder insight is critical to the shaping of the DFES projections and ensuring they are accurate and relevant.

Four consultation events were held in May 2020 with 266 attendees across the four licence areas. Each local authority in the WPD areas were also contacted as part of the analysis of planned new developments.

In the South West consultation webinar, 66% of respondents were already aware of the WPD DFES process, and 77% felt well engaged by WPD.

Local policies identified by stakeholders are included as positive weightings within the DFES projections, as an example, the heat network deployment work in Bristol and the South Gloucestershire Climate Emergency Action Plan. Proposed clean air zones, for example in Bath, increases the use and uptake of electric vehicles in city centres in the net zero scenarios.

South West webinar



- 30% Energy industry
- 20% Local Government
- 19% Community energy groups
- 15% Other consultancy
- 5% Academia
- 2% UK Networks
- 2% Consumer
- 2% Legal
- 2% Other industry
- 3% National Government

Summary of results in 2035

DFES scenario	Description of scenario	Baseline Renewable energy capacity	2035 Renewable energy capacity	Baseline Battery electric vehicles (000s)	2035 Battery electric vehicles (000s)
Steady Progression Not net zero compliant	Not compliant with the net zero emissions target.	2.1GW Including: 1.5GW of solar 0.3GW of wind	2.7GW	6.7 Equivalent to: 0.6% of total vehicles	579 Equivalent to: 27% of total vehicles
	Low levels of decarbonisation and societal change.				948 Equivalent to: 43% of total vehicles
System Transformation Net zero compliant	High level of decarbonisation with lower societal change. Larger, more centralised solutions are developed. This scenario has the highest levels of hydrogen deployment.		4.9GW		1,457 Equivalent to: 69% of total vehicles
Consumer Transformation Net zero compliant	High levels of decarbonisation and societal change. Consumers adopt new technologies rapidly, and more decentralised solutions are developed. This scenario has significant electrification of domestic heat.		4.9GW		1,650 Equivalent to: 77% of total vehicles

Summary of results in 2035

DFES scenario	Description of scenario	Baseline Energy storage capacity	2035 Energy storage capacity	Baseline Heat pumps	2035 Heat pumps			
Steady Progression Not net zero compliant	Not compliant with the net zero emissions target.	48MW Around 9% of the GB total installed battery storage capacity.	200MW	14,520 Heat pumps Equivalent to: 1% of total homes. < 10 hybrids	23,525 Heat pumps c.1.5% of homes, and 0.7% with hybrids			
	Low levels of decarbonisation and societal change.							
System Transformation Net zero compliant	High level of decarbonisation with lower societal change. Larger, more centralised solutions are developed. This scenario has the highest levels of hydrogen deployment.				162MW	343MW	14,520 Heat pumps Equivalent to: 1% of total homes. < 10 hybrids	89,175 Heat pumps c.5.7% of homes, plus 2.0% with hybrids
	High levels of decarbonisation and societal change. Consumers adopt new technologies rapidly, and more decentralised solutions are developed. This scenario has significant electrification of domestic heat.							590MW
Consumer Transformation Net zero compliant	High levels of decarbonisation and societal change. Consumers adopt new technologies rapidly, and more decentralised solutions are developed. This scenario has significant electrification of domestic heat.							
Leading the Way Net zero compliant	Very high levels of decarbonisation and societal change. Consumers adopt new technologies rapidly, and a mix of solutions is developed. This scenario aims for the “fastest credible” decarbonisation pathway.							


Working with local authorities

New homes, industry, and commercial properties can have a significant impact on local electricity demand. These homes and commercial properties are also likely to be more energy efficient, heated by new technologies or be designed to facilitate low carbon transport.

Over 4,500 individual data records were brought together to model the impact of new developments on the WPD network in the future. Local authorities were also asked about plans which may affect uptake of low-carbon technologies in their areas, for example support for electric chargers or renewable generation.


Where and when these buildings and new technologies are expected to connect is projected using the scenario frameworks and based on data from local authority plans along with historic data on the number of new homes per year.

High and low scenarios were produced to model the variable building rates of these developments over the scenario period. Between 45,000 and 70,000 homes are projected be built over the next 5 years. The four largest domestic developments in the licence area are in the South Somerset and Taunton Deane areas.



Cornwall Planning for Cornwall's future
Local Plan
Strategic Policies 2010 - 2030
Community Network Area Sections

www.cornwall.gov.uk



Joint Local Plan Review for
West Dorset, Weymouth and Portland

INITIAL ISSUES AND OPTIONS CONSULTATION
February 2017



Renewable energy



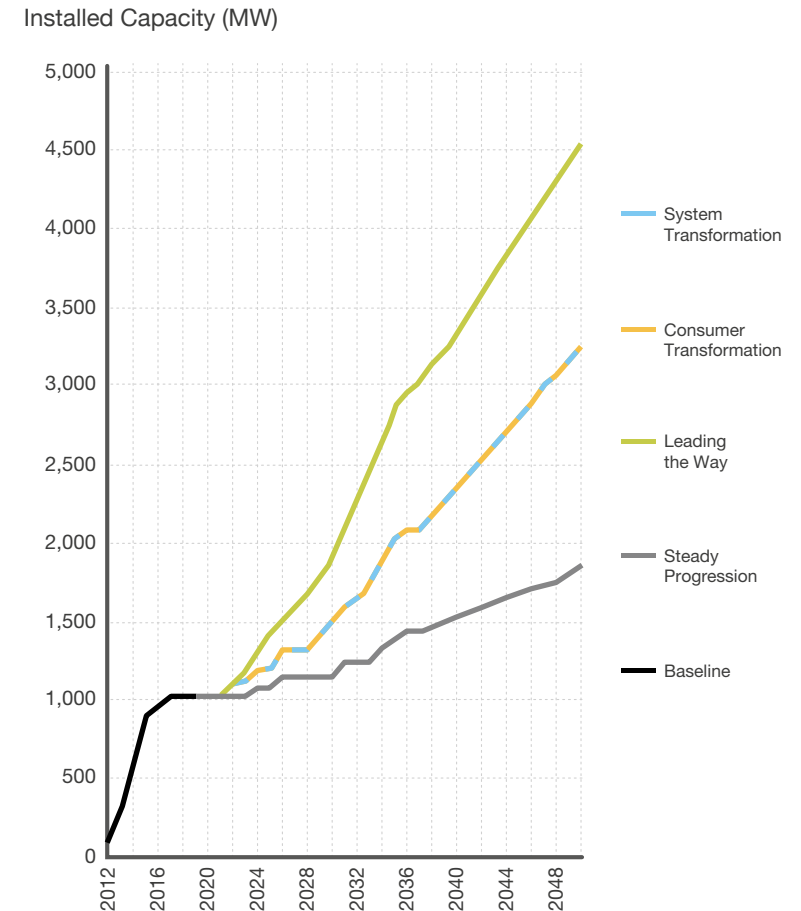
There is currently c.1.5GW of solar power generation in the South West licence area, around 1GW made up from ground mounted solar arrays, and 0.5GW from rooftop solar installations.

There was a high level of deployment from 2012 onwards, earlier than other parts of the UK due to the relatively high solar irradiance in the South West.

The cost of solar **reduced by 82%** over the last decade however, deployment in the South West has slowed significantly in recent years, market uncertainties after the reduction in government subsidies mean that fewer sites have been completed. Though just one site, at 9MW, has been energised since January 2019, there is still scope for high levels of deployment in the long term with the highest DFES scenario projecting over 5GW of additional capacity by 2050, including rooftop installations.

Onshore wind sites make up around 10% of total distribution network connected generation capacity in the South West licence area. Onshore wind deployment has stalled in recent years due to difficulties in achieving planning. There is still scope for increased deployment of onshore wind however, and the DFES projects an increase to 2050 of between 150 and 1,460MW.

Scenarios for ground mounted solar power in the South West licence area



Fossil Gas



Another of the key distributed energy generation technologies in the licence area is fossil gas fired power stations.

The energy output of the fossil gas power plants significantly decreases in all net zero complaint scenarios, though the installed capacity may remain stable in the near term.

There is a total of 427MW of fossil gas generation connected in the South West licence area. This is made up mostly from gas reciprocating engines and large OCGT sites. There are two large OCGT sites, in Exeter and Bristol, with a total of 123MW total capacity. There are no CCGT sites identified with a network connection agreement for the WPD South West licence area.

The DFES analysis shows the potential for near term increase in all scenarios based on the successful planning and Capacity Market applications of sites in the pipeline. However, the operational hours of large plant are limited by emissions regulation, and a significant reduction in energy output and capacity is projected for the net zero scenarios.

Energy storage



Energy storage is expected to be critical for balancing a high renewables electricity system.

National Grid ESO announced in 2019 that it will be able to operate a **zero carbon electricity system by 2025** and will need new technologies like storage to provide network services to support this. The four scenarios include a variety of assumptions regarding these network service providers, a key uncertainty is the development of energy storage.

The South West licence area has a total of 48MW of battery storage, made up from 11 sites which have all connected since 2016. DFES analysis suggests that there are 14 pipeline sites, a total of 121MW which could connect in the near term. Other potential areas of growth that are modelled include smaller installations in homes and sites in non-domestic properties with high energy usage.

Due to the scenario specific assumptions around the deployment of other providers of network services, there is a wide envelope of deployment between the scenarios. Overall battery storage capacity in 2050 in the South West licence area ranges from c.0.3GW in System Transformation to 1.3GW in Leading the Way.

Low carbon heat



A key area of change in the energy system is the decarbonisation of heat.

The four DFES scenarios model a variety of decarbonisation pathways, all showing a large increase in domestic heat pump deployment in the medium and long term.

The South West licence area currently has 460,000 homes electrically heated and c.7,500 domestic heat pumps, all of which are non-hybrids. Around 1% of homes use a heat pump, a slightly higher baseline than the national average of 0.6%.

There is a dramatic shift to low carbon heating in all net zero compliant scenarios, 73% of homes are primarily heated by a heat pump by 2050. In the near term, deployment is supported by national policies such as the Renewable Heat Incentive and the Green Homes Grant.

National policy is also expected to target off-gas homes over the next decade (Clean Growth Strategy 2017), the higher than average proportion of off-gas homes in the South West licence area compared to the UK average leads to higher near-term deployment of heat pumps in these areas.

By 2050

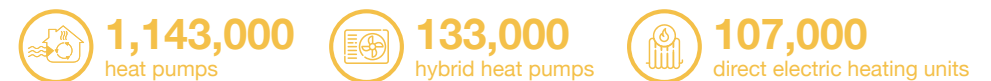
Steady Progression



System Transformation Net Zero Target compliant



Consumer Transformation Net Zero Target compliant



Leading the way Net Zero Target compliant



Low carbon transport



The UK government ban on new petrol and diesel vehicles from 2040 drives a significant increase in uptake of electric vehicles over the next 10 years. However, to be net zero compliant, DFES scenarios assume that this ban is brought forward to the early 2030s, in line with assumptions in National Grid ESO FES.

There are more than 6,500 battery electric cars (excluding hybrids) registered in the South West licence area, just over 0.5% of the total. This is slightly below the average level nationwide but is projected to increase rapidly over the next decade. The projections use local factors that influence take up in the near term, including:



The availability of off-street parking, and the level of car and second-car ownership



Initiatives to increase the number of electric vehicle chargers or potential clean air zones such as in Bath.

For electricity networks the key factor is how and when these electric vehicles are charged. The deployment of chargers is also projected in the DFES by charger size and type such as domestic chargers, car parks or refuelling stations

By 2050, all road transport is projected to be decarbonised, the majority being electric vehicles. By 2035:

Steady Progression



579,000
battery electric vehicles



295,000
domestic charge points

System Transformation Net Zero Target compliant



948,000
battery electric vehicles



446,000
domestic charge points

Consumer Transformation Net Zero Target compliant



1,457,000
battery electric vehicles



760,000
domestic charge points

Leading the way Net Zero Target compliant



1,650,000
battery electric vehicles



831,000
domestic charge points

Next steps

The WPD DFES 2020 suite of output documents is now available online:

The DFES is an annual process conducted by WPD and Regen, the WPD DFES 2021 process will begin in February 2021.

WPD Distribution Managers are in contact with local authorities to discuss the results. The stakeholder engagement process for DFES 2021 runs from February to July 2021.

If you have any questions in relation WPD's Network Strategy work, please contact WPD on the details below:

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