



**Renewable energy**  
A local progress  
report for England  
2016

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Regen SW passionately believes renewable energy and energy efficiency have a vital role at the heart of a prosperous and sustainable society.

We are an independent not-for-profit working with industry, communities and the public sector to overcome barriers to the development of renewables and energy efficiency, creating local jobs and benefiting local communities.

To find out more about our work and join us visit [www.regensw.co.uk](http://www.regensw.co.uk)

## Renewable energy locator

We plan to make the updated data behind this report available in the autumn to be searched and filtered through Green Alliance's interactive website, the Renewable Energy Locator – [renewablelocator.green-alliance.org.uk](http://renewablelocator.green-alliance.org.uk).

# Foreword

## The rise of renewables

This decade has seen remarkable growth in renewable energy in England; 19 per cent of our power now comes from renewable sources. Renewables are a public policy success story – a combination of public and private investment has led to innovation and technological progress, new industries and rapidly falling costs.

This report examines the renewables revolution in England: what are the key technologies, where have they been deployed, and what is the outlook following the virtual ending of public policy support. To draw these lessons, we have analysed 736,998 renewable energy projects.

It is difficult to exaggerate the scale and speed of the shift in power generation, from around 50 large generation stations to a decentralised system in which three quarters of a million householders, landowners and businesses have become energy generators.

In contrast, the speed of change in heating is much slower – renewable energy provides the equivalent of just 3 per cent of household heating needs in England.

## Anatomy of an energy revolution

The uneven take up of renewables across England demonstrates that a transformation in our energy system is not just about decisions in Whitehall and corporate boardrooms. Renewable energy projects happen in a place and depend on an enabling local environment and the engagement of local communities.

The south west of England has, for example, led the way on householders installing solar panels. Large scale social housing programmes, an engaged population, active community energy groups and trusted local installers have all played a role.

At the other end of the scale the shallow depths in the North Sea have enabled entrepreneurial businesses to develop world leading offshore wind projects. Embracing this technology has brought major new industrial opportunities to the east coast.

## Environmental imperative: industrial opportunity

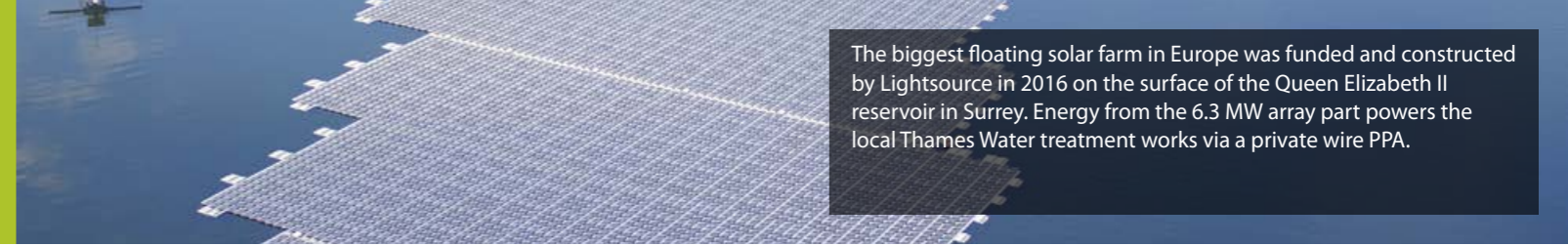
Government policy changes are currently taking the UK out of the fast lane of renewables and the impact can already be seen on the ground. However, the global shift to a smart, decentralised and renewable energy system is now unstoppable. The leading areas of England are showing how this shift can be turned into an opportunity for businesses and local communities.

Regen is committed to using the insights from this report to inform the policy and investment decisions that will underpin the transformation in our energy system.



**Merlin Hyman**  
Regen SW chief executive

# Progress this year



The biggest floating solar farm in Europe was funded and constructed by Lightsource in 2016 on the surface of the Queen Elizabeth II reservoir in Surrey. Energy from the 6.3 MW array part powers the local Thames Water treatment works via a private wire PPA.

Government policy support, together with falling technology and installation costs, has driven a remarkable surge in renewables investment since 2010. However, this started to slow in 2015/16 as cuts in support took effect. In total, 3 GW of renewable electricity and 0.46 GW of renewable heat capacity were installed last year, a third less than the previous year. This came from 123,439 new projects. England meets five per cent of its total energy demand from renewables – still a long way short of the UK's 2020 15 per cent target.

### England's renewable electricity generation delivers:

- 19 per cent of England's total electrical demand
- 14.5 million typical homes electrical demand
- 3 per cent of heat demand for English households

### Growth in 2015/16:

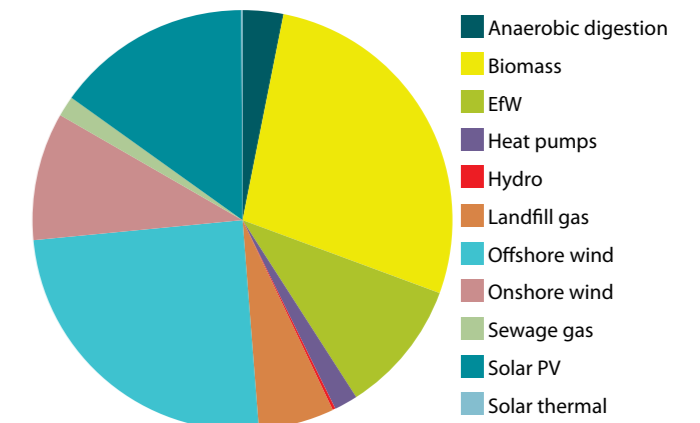
Renewable electricity capacity	3022 MW
Renewable heat capacity	469 MW
Number of new installations	123,446

Technology	Number of projects	Renewable electricity		Renewable heat	
		Capacity (MW)	Estimated generation (GWh)	Capacity (MW)	Estimated generation (GWh)
Anaerobic digestion	314	282.7	1,662	66.8	409
Biomass	17,985	1,882.9	9,134	1,921.7	5,892
Energy from waste	42	820.2	4,585	-	-
Heat pumps	44,478	-	-	495.6	984
Hydropower	342	39.1	120	-	-
Landfill gas	271	622.1	3,175	-	-
Offshore wind	22	4,181.5	13,490	-	-
Onshore wind	3,768	2,343.7	5,374	-	-
Sewage gas	142	196.6	812	8.4	51
Solar PV	647,994	8,710.5	8,197	-	-
Solar thermal	21,640	-	-	85.3	52
<b>England total</b>	<b>736,998</b>	<b>19,079.3</b>	<b>46,549</b>	<b>2577.8</b>	<b>7,388</b>

- Biomass (electricity and large scale heat) and offshore wind are the major contributors to England's renewable generation, providing 28 per cent and 25 per cent of generation respectively.
- Solar PV is the technology with the greatest installed capacity in England at 8.7 GW, over twice that of offshore wind with 4.2 GW.
- 2 GW of solar PV was installed in 2015/16, two-thirds of 2014/15 new capacity.
- Three new offshore wind farms commissioned in 2015/16 - Humber Gateway, Westermost Rough and Kentish Flats extension - adding 478.5 MW of capacity.
- Energy from waste, landfill gas and sewage gas provide a consistent baseload of renewable energy totalling 18 per cent of current renewable production, but are unlikely to see rapid growth due to the constraints of waste resource availability.
- Biomass heat was the technology that saw the greatest drop in its growth rate with 285 MW added, a quarter of the figure in 2014/15.
- The heat pump installation rate has grown slowly year on year, with 7,904 projects installed in 2015/16.
- Onshore wind deployment, although higher than last year, was less than 50 per cent of the peak 2012/13 rate. Crook Hill in Lancashire was the largest project commissioned at 36 MW.

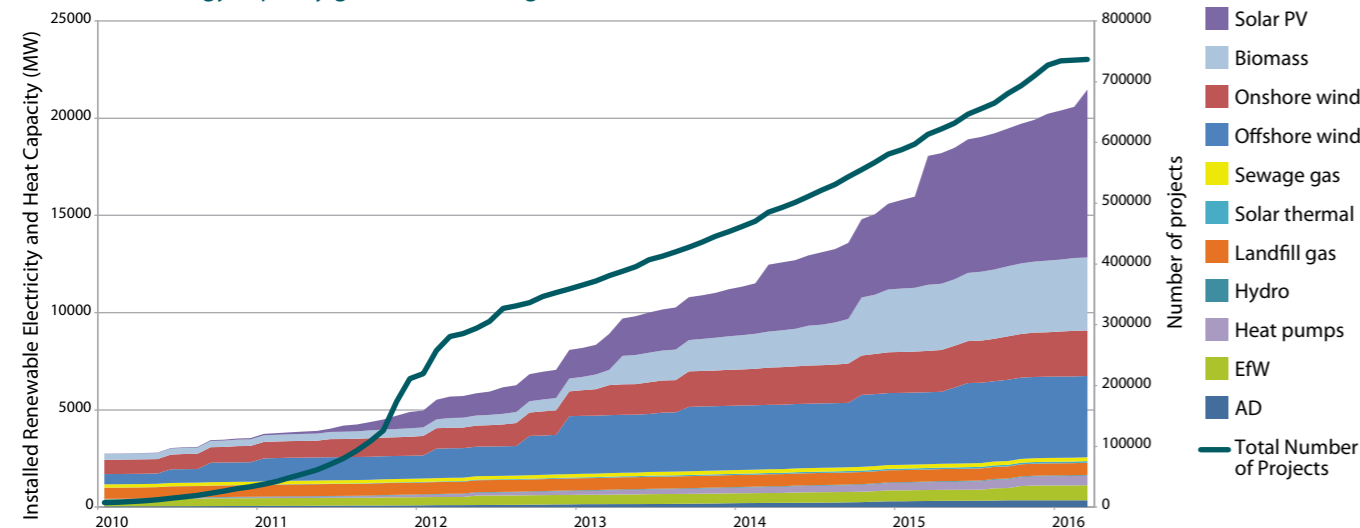
Small scale heat technologies, hydropower and anaerobic digestion are yet to take off at the rates predicted by government to contribute to our 2020 targets, due to technology constraints, customer perceptions and lower than needed subsidies.

Percentage of renewable energy generation (GWh) by technology



This chart shows the resilient energy mix developing in England.

Renewable energy capacity growth across England



### RSPB wind turbine

Ecotricity constructed a 100m wind turbine at the RSPB's Lodge headquarters near Sandy in Bedfordshire, which will generate enough green energy to power over half of the RSPB's electricity use across its 127 UK locations. The site includes pioneering bat mitigation methods never before used in Britain.



# Progress by region



At 26 MW, Wryde Croft Wind Farm near Peterborough generates sufficient renewable electricity to power more than 15,000 UK homes. Developed and constructed by RES, it delivers a £200 annual electricity discount for local properties, plus an annual £52,000 community fund.

The south west has the greatest onshore installed capacity with 3.47 GW, thanks largely to 2.5 GW of solar PV. The south west was also the region that added the greatest onshore capacity this year, with 538.5 MW of new capacity. Three new offshore wind farms were commissioned in the North Sea, adding 478.5 MW of capacity.

## Local authority league tables

Top five local authorities by percentage of electricity consumption met by renewables	Electricity generation (GWh)	Percent (%)
Selby, North Yorkshire	6608.9	1629
East Cambridgeshire	354.8	84
Rosendale, Lancashire	305	81
Torrige, Devon	191.3	65
Allerdale, Cumbria	361.5	64

Top five local authorities by domestic renewable heat	Number of installations	Percentage of households with installation
Eden, Cumbria	597	2.4
Torrige, Devon	606	2
Ryedale, North Yorkshire	431	1.73
Stroud, Gloucestershire	893	1.7
Mid Devon	581	1.7

## Renewable energy generation by region

- Yorkshire and the Humber is the leading region for renewable electricity generation, with the equivalent of 41 per cent of the region's electrical consumption from renewable sources; 27 per cent of this is due to the presence of 1,320 MW of biomass co-firing at Drax power station in Selby.
- The north east, is the second region for onshore electricity generation as a proportion of consumption, thanks to a broad mix of installed capacity and relatively low demand.
- Offshore wind in the North Sea and Irish Sea contributes an estimated 30 per cent of renewable electricity generation in England.

## Top local authority areas

- Selby is the leading local planning authority by percentage of energy consumption met by renewable generation, due to the presence of co-firing at Drax.
- East Cambridgeshire is second, thanks in large part to a biomass electricity plant which produces nearly 70 per cent of the area's renewable electricity.
- Other leading areas on this metric have a large capacity of onshore wind, such as Scout Moor wind farm, the 65 MW wind farm, in Rosendale.
- Domestic scale renewable heat installations are focussed in areas where housing associations have co-ordinated programmes, particularly through the social landlord strand of the Renewable Heat Premium Payment.

Area	Number of projects	Renewable electricity		Renewable heat	
		Capacity (MW)	Estimated generation (GWh)	Capacity (MW)	Estimated generation (GWh)
East midlands	84,391	1,649.5	2,898	317	915
East of England	106,377	2,437.8	4,292	318	854
London	21,744	324.1	1,375	58.3	251
North east	46,091	686.5	1,891	107.6	308
North west	83,661	1,123.1	2,572	368.7	1,239
South east	113,325	2,288.5	4,431	302.9	793
South west	128,080	3,031.7	3,905	511.5	1,673
West midlands	69,253	776.7	1,912	341.6	978
Yorkshire and the Humber	83,195	2,579.7	9,783	411.9	1,389
Offshore wind North Sea	16	3,094.5	9,682	-	-
Offshore wind Irish Sea	6	1087	3,808	-	-
<b>England total</b>	<b>736,139</b>	<b>19,079.1</b>	<b>46,549</b>	<b>2,737.6</b>	<b>8,400</b>

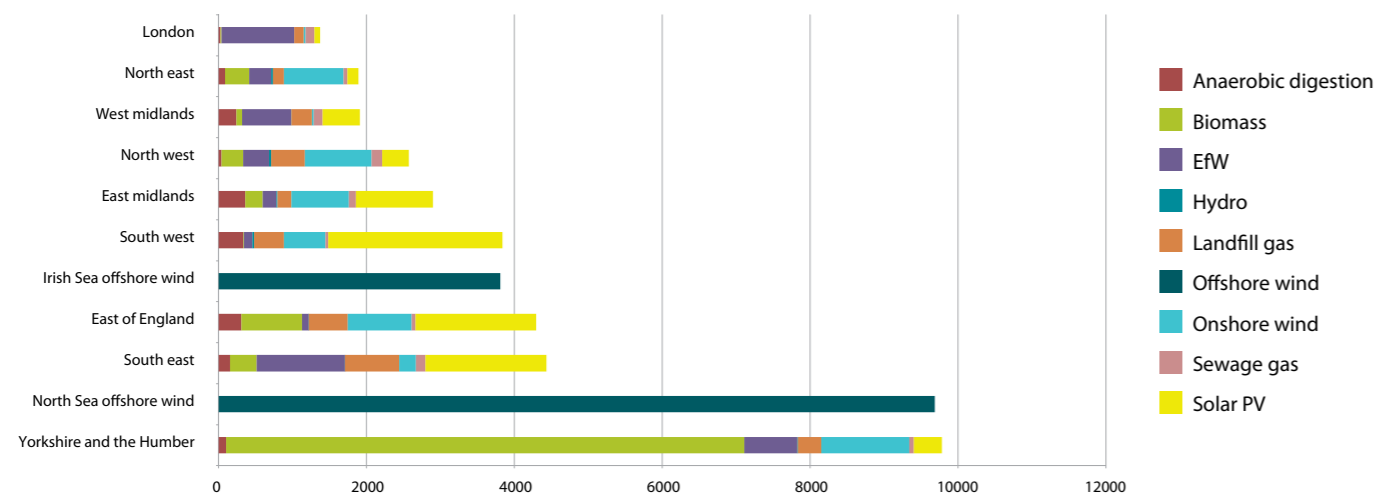
## Top local authority areas in 2015/16

- Halton, Cheshire, was the local authority area that commissioned the highest amount of new capacity, predominantly through 132 MW of electrical and heat capacity at Viridor's Runcorn energy from waste plant.
- Wiltshire and Test Valley were second and third, with large scale solar PV dominating their new capacity.
- Cornwall was the leading local authority by capacity of domestic solar PV installed this year.

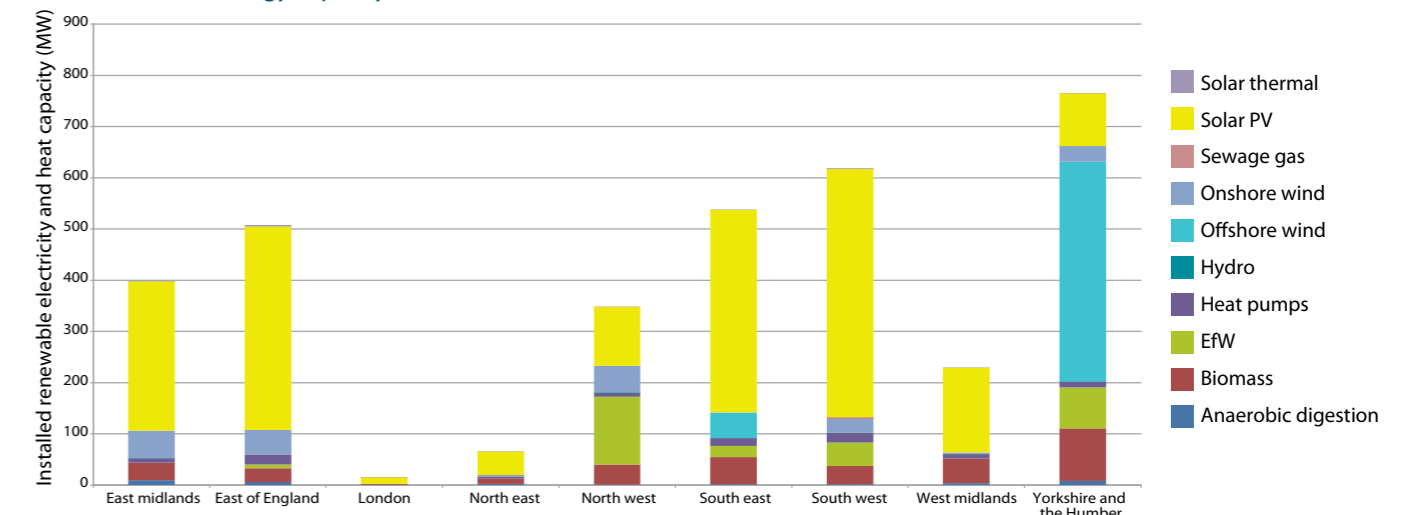
## Local authority league tables

Top five local authorities by new capacity 2015/16	Electricity Capacity (MWe)	Thermal Capacity (MWth)	Total Capacity (MW)
Halton, Cheshire	80.9	52	132.9
Wiltshire	96.5	5.3	101.8
Test Valley, Hampshire	99.6	1.1	100.7
Cornwall	85.6	9	94.6
Wakefield, West Yorkshire	75.7	2.1	77.8

## Geographical spread of electricity generation (GWh)



## New renewable energy capacity 2015/16



# League tables



**Eveley Solar Farm, Hampshire – Utility-scale solar**  
 Energised in March 2016, Eveley (49 MW), near Stockbridge was developed and constructed by PS Renewables and is now owned by Primrose Solar. The solar farm uses a bespoke programme of ecological enhancement, and provides community benefits for two local parish councils.

The following league tables show the leading regions for several measures of onshore renewable energy across England. Yorkshire and the Humber lead on both electricity consumption met by renewables and subsequently the estimated CO<sub>2</sub> savings each year. The south west is top for domestic heat consumption met by renewables, predominantly from biomass heat generation. For the total number of domestic installations the south west also comes top, due to the high amount of solar PV projects in the region. London and the north east remain consistently low across all four measures.

## Percentage of electricity consumption met by onshore renewable electricity generation

Yorkshire and the Humber	41%
North east	16%
East of England	16%
South west	15%
East midlands	13%
South east	11%
North west	8%
West midlands	8%
London	3%

## Percentage of domestic heat consumption met from renewable heat generation

South west	5%
Yorkshire and the Humber	4%
East midlands	3%
West midlands	3%
North west	3%
East of England	2%
North east	2%
South east	1%
London	1%

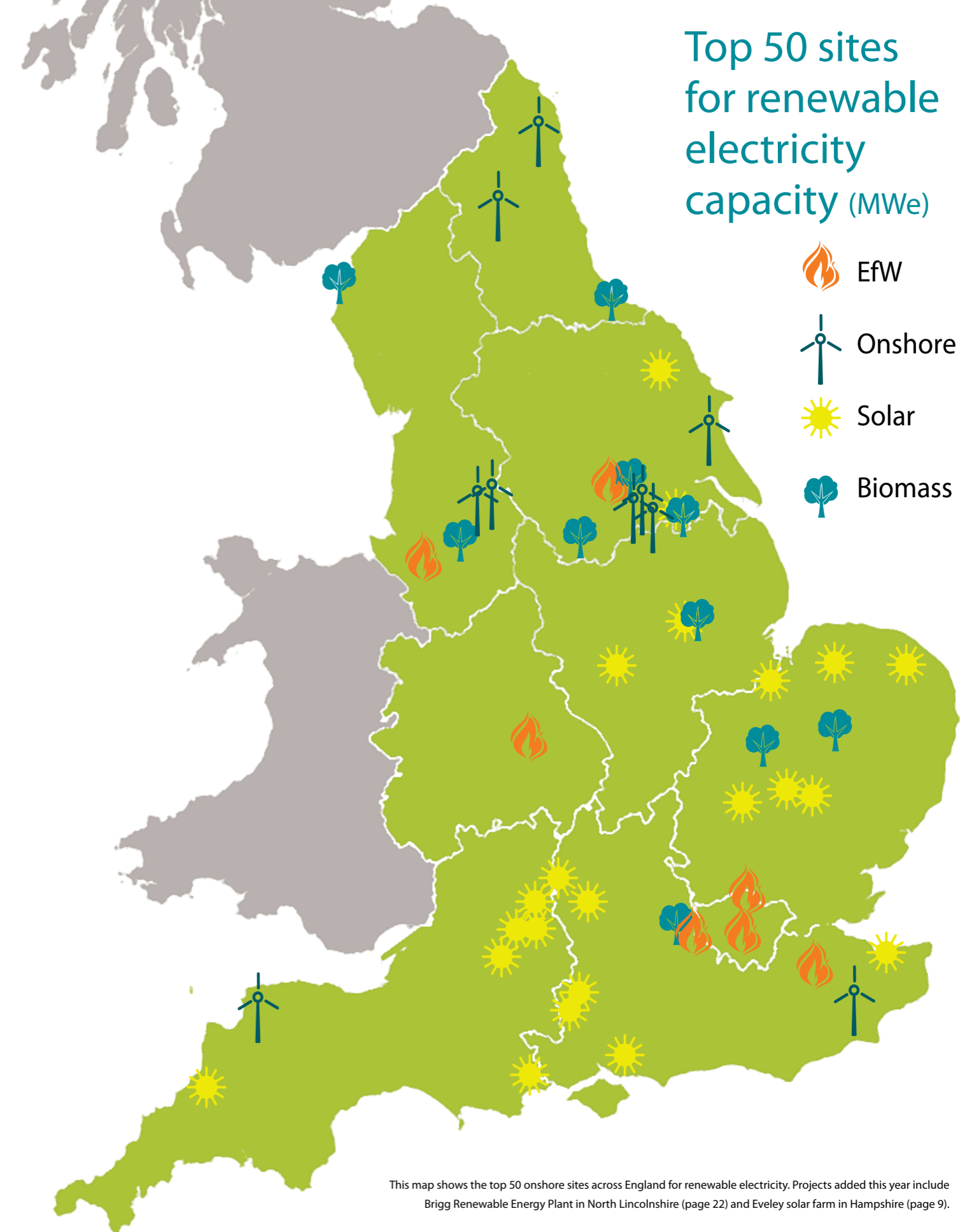
## Estimated CO<sub>2</sub> saved per annum (kilotonnes of CO<sub>2</sub>)





Yorkshire and the Humber	4,680
South east	2,153
East of England	2,102
South west	2,092
East midlands	1,487
North west	1,405
West midlands	1,056
North east	912
London	669
<b>England total</b>	<b>16,556</b>

## Domestic FIT installations to date

South west	104,709
South east	94,753
East of England	89,596
North west	74,442
East midlands	73,451
Yorkshire and the Humber	72,040
West midlands	58,203
North east	40,512
London	19,081
<b>England total</b>	<b>626,787</b>

## Top 50 sites for renewable electricity capacity (MWe)



-  EFW
-  Onshore
-  Solar
-  Biomass

This map shows the top 50 onshore sites across England for renewable electricity. Projects added this year include Brigg Renewable Energy Plant in North Lincolnshire (page 22) and Eveley solar farm in Hampshire (page 9).



# Outlook



Public Power Solutions developed an 8 MW solar farm at Swindon Borough Council's Common Farm. The project was financed by the Council and by people investing directly through the UK's first council solar bond. The bond offer was so successful it closed a month early.

The recent growth in renewable energy deployment across the UK has been driven by government decarbonisation targets and incentives, as well as global market factors such as technology improvement and rapidly falling costs. However, it has not taken hold equally across England. The analysis in this report shows that local factors play a key role including: availability of renewable resources; public sector investment programmes; an enabling local planning environment; and local support.

## Pipeline

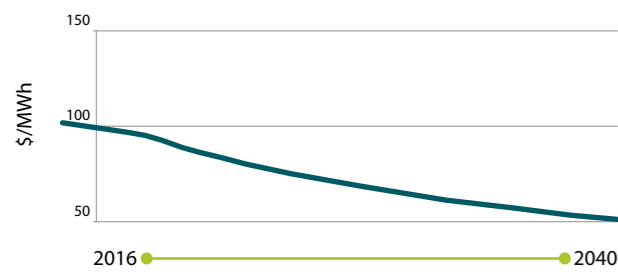
National policy changes in the second half of 2015 are having a dramatic effect. There are still renewable energy projects with planning permission coming through the pipeline, but there are few new large projects in development. Overall, the industry is entering a difficult period of low growth, although this will vary regionally. Offshore wind projects in the southern sector of the North Sea will continue to be built out through the decade providing jobs and economic opportunities in eastern England.

In the south west, good solar resources, an established community energy sector and a strong supply chain are coupled with severe grid constraints, meaning that continued growth is likely to be in smaller solar projects where power can be used onsite.

## Market drivers

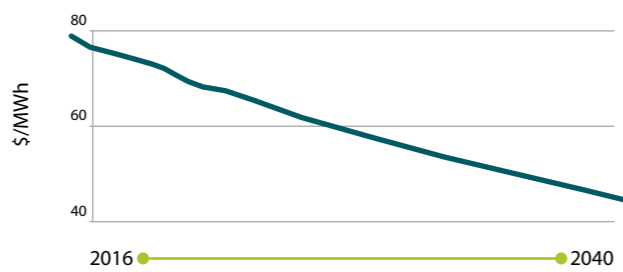
The medium term prospects of renewables are very positive. The sector has moved from the lab to the boardroom and, globally, investment is flowing. A key question is how quickly renewable energy will reach a point of market parity and can be developed without direct subsidy. Costs for renewables are falling rapidly, already wind costs are cheaper than new fossil fuel generation, and the cost of energy in Europe for wind and solar generators is predicted to fall by a further 50 per cent by 2040. The key factor holding back renewables now is the massive subsidies governments continue to pay to prop up fossil fuels.

Solar PV cost forecast to 2040 (\$/MWh)\*



\*Data from Bloomberg New Energy Outlook 2016.

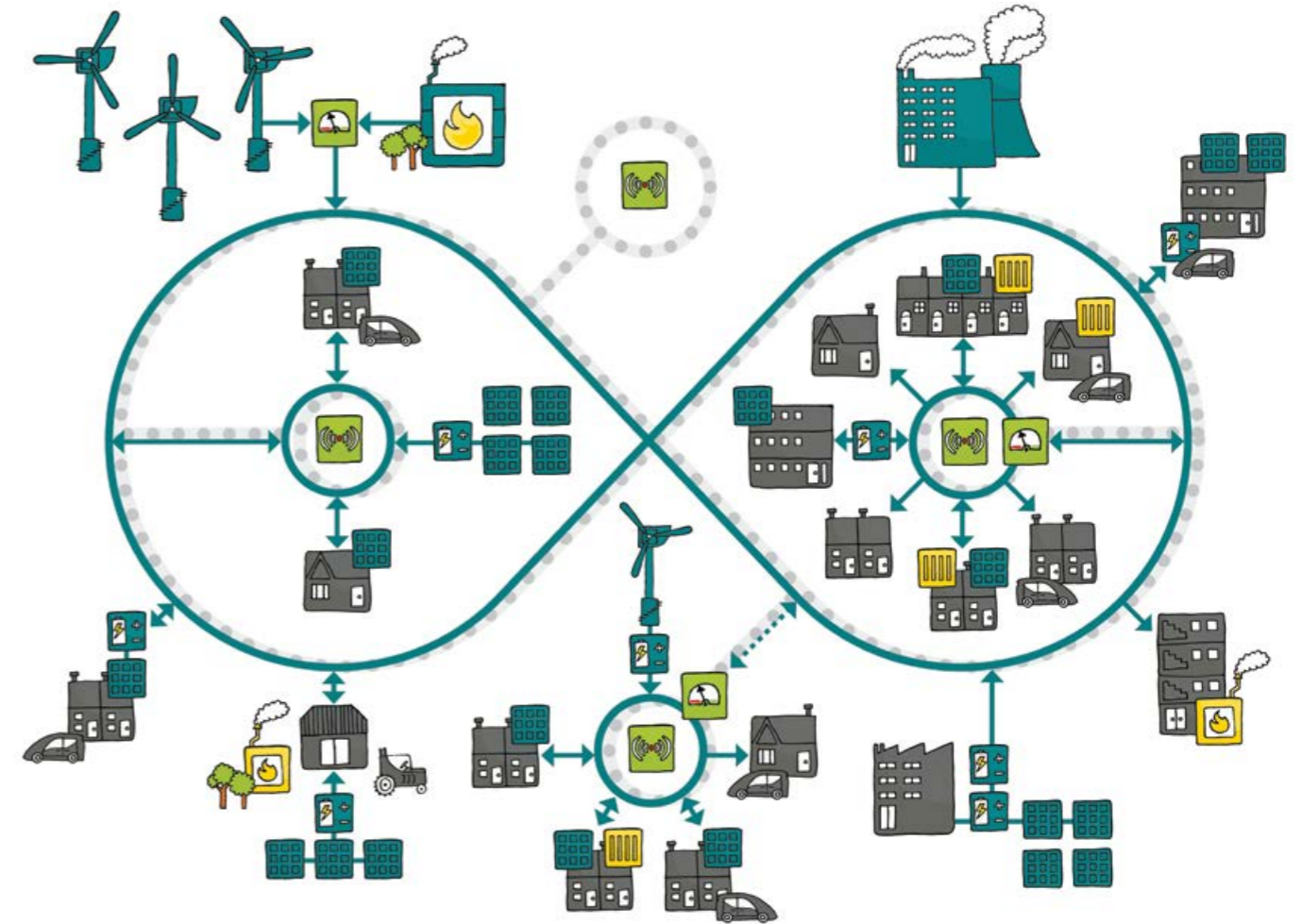
Onshore wind cost forecast to 2040 (\$/MWh)\*



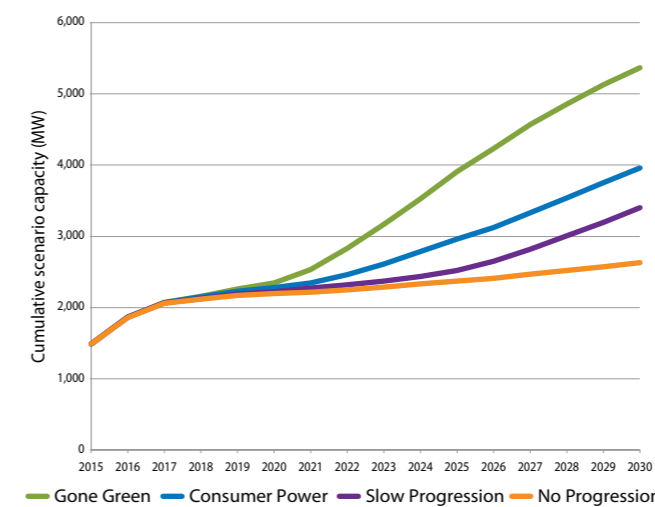
\*Data from Bloomberg New Energy Outlook 2016.

## A smart, decentralised system

A critical shift is towards a smart, decentralised system, with local consumption of renewable energy generation, network and own use storage and integrated smart grids, meters and appliances.



Total distributed generation capacity growth 2015-2030  
WPD south west licence area



## Growth Scenarios

To illustrate how national trends could play out locally, Regen has analysed the potential growth of renewables in the south west of England using the National Grid Future Energy Scenarios.

Our projection shows a slowdown of growth in the period to 2019, as a direct impact of recent policy changes, followed by an uplift in growth under the "Gone Green" and "Consumer Power" scenarios as renewable energy projects again become viable. Indeed, while the impact of policy has undoubtedly been felt in cancelled projects and lost jobs, it is also clear that the market appetite to find new business models using smarter technology solutions is undiminished.

Only under the "No Progression" scenario, which would imply that the UK abandons its commitment to decarbonisation becoming a climate change pariah nation, is growth permanently stagnated.



# South west in focus

18.45 MW Batsworthy Cross wind farm in North Devon is commissioning in 2016. The project will supply electricity to up to 8,900 homes. Each year, £90,000 will be given to local projects during the 25-year lifetime of the wind farm.

Progress in renewables varies across the country. These pages look in more detail at one region, the south west, building on ten years of detailed progress reports by Regen. The south west is at the forefront of renewables in England, with the highest onshore installed capacity of any region.

## South west renewables provide:

- 15 per cent of south west total electrical demand
- 1.2 million typical homes electricity demand
- 5 per cent of south west domestic heat demand

After years of accelerating renewables growth, cuts and uncertainty around the subsidy regime, changes to national planning policy and grid constraints have led to reduced growth rates in the south west in 2015/16.

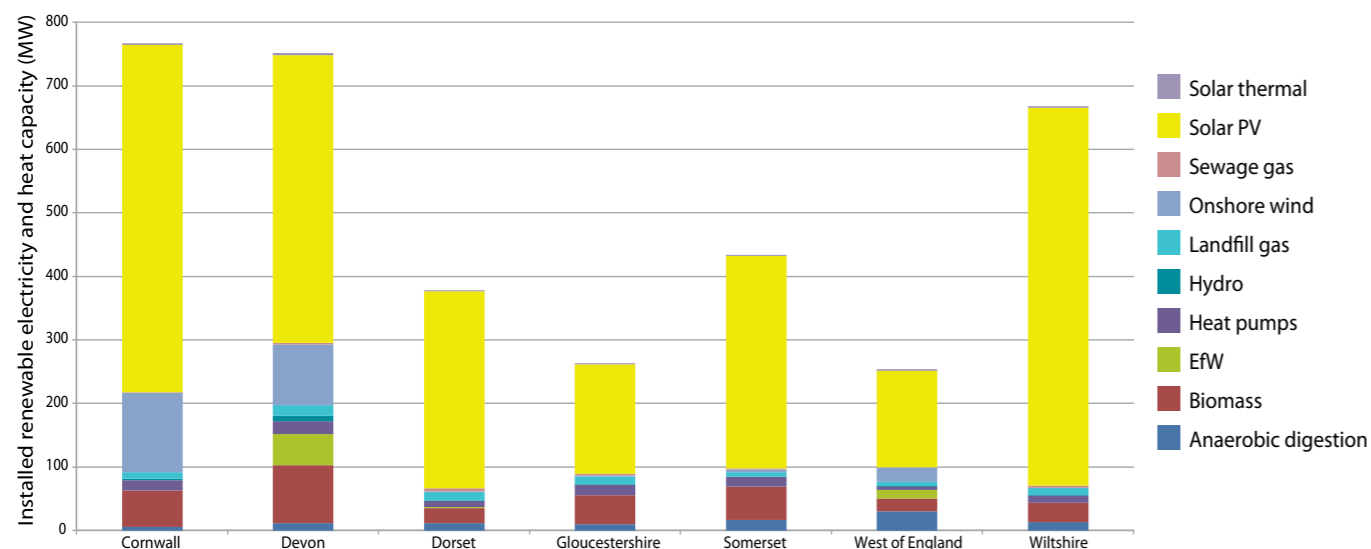
## Growth in renewables:

Renewable electricity capacity	538.5 MW
Renewable heat capacity	80.7 MW
Number of new installations	16,224

## Highlights this year include:

- 90 per cent of new electrical capacity was solar PV, which added 485 MW of new capacity, a 50 per cent slow down on 2014/15.
- Large scale solar deployment was concentrated in Wiltshire and Swindon, with moderate to low levels in the other areas.
- Roof-top solar PV deployment continued at a high rate, with over 13,400 installations.
- Onshore wind deployment was limited, with two Cornish wind farms repowering, no new large scale projects and just 29 new small and medium sized turbines.
- Biomass saw a real slowdown in deployment with new capacity dropping to 35.5 MW, a third of that added the previous year.
- The rate of heat pump deployment continued to grow, with 1,863 new projects spread across the region.
- Anaerobic digestion deployment was muted, with four new sites in the south west.

## Geographical spread of renewable energy capacity in the south west



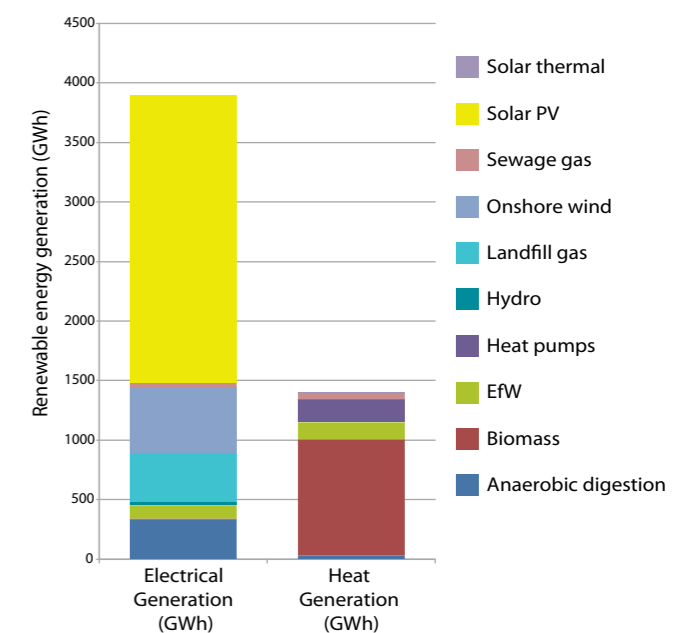
Technology	Number of projects	Renewable electricity		Renewable heat	
		Capacity (MW)	Estimated generation (GWh)	Capacity (MW)	Estimated generation (GWh)
Anaerobic digestion	59	52.4	344	48.8	299
Biomass	3,826	-	-	318.9	978
Energy from waste	4	39.9	113	23.3	143
Heat pumps	10,047	-	-	96.3	192
Hydropower	143	11.8	28	-	-
Landfill gas	34	79.6	400	-	-
Onshore wind	820	255.3	562	-	-
Sewage gas	16	8.8	39	8.4	51
Solar PV	108,675	2,582.4	2,421	-	-
Solar thermal	4,456	-	-	15.9	10
<b>South west total</b>	<b>128,080</b>	<b>3,030.2</b>	<b>3,907</b>	<b>511.6</b>	<b>1,673</b>

## Connecting to the grid

The connection of thousands of local generators has presented huge challenges for the electricity grid. Regen has worked with Western Power Distribution to develop detailed future energy scenarios that can underpin their strategic planning for future investment in the grid.



## South west renewable electricity and heat generation



In the south west, 62 per cent of renewable electricity generation is from solar PV thanks to over 2.5 GW of installed capacity.



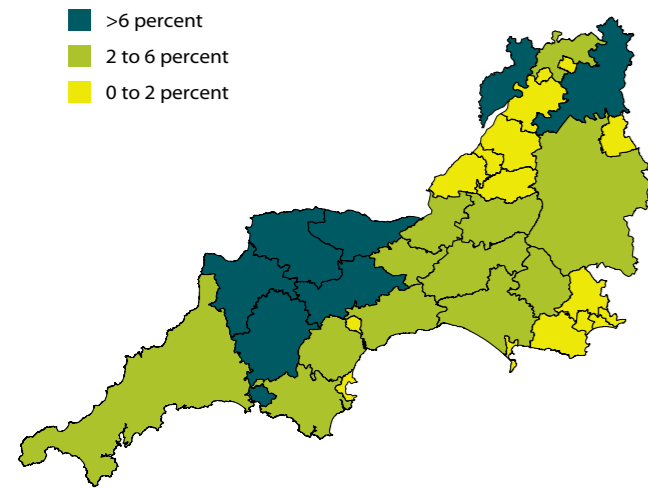
# South west in focus



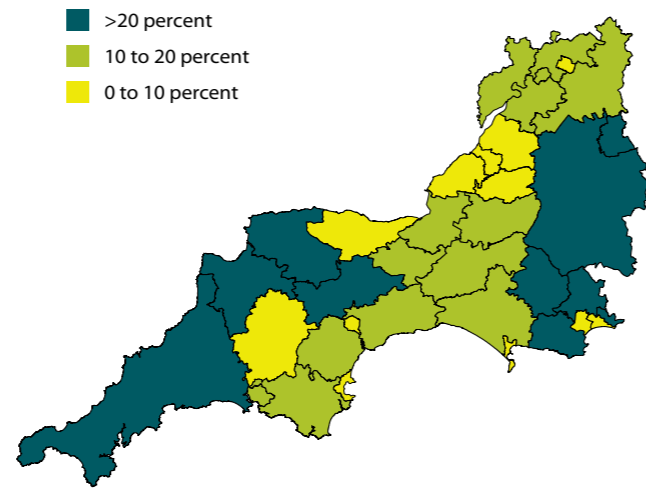
Bristol City Council added a new 1.8 MW solar farm to its existing wind turbine site in Avonmouth. The co-located wind and solar together could generate enough clean energy to power over 4,000 homes and save over 7,000 tonnes of CO<sub>2</sub>.

Cornwall continues to lead on installed capacity in the south west, with a total installed capacity of 768 MW, followed closely by Devon. Due to a different technology mix, Devon generates a slightly higher quantity of renewable energy. Wiltshire remains in third place, but was once again the area to add the greatest amount to its installed capacity, with 171 MW of new projects.

Percentage domestic heat met from renewable heat generation by local authority



Percentage electricity met from renewable electricity generation by local authority



## Community energy case studies

Plymouth Energy Community (PEC) secured short-term finance from Pure Leapfrog to build the 4.1 MW Ernesettle Community Solar Array ahead of March 2016 subsidy cuts. PEC worked with Communities for Renewables CIC, Four Greens Community Trust (FGCT), and Plymouth City Council to turn derelict land into Plymouth's largest solar array, generating enough clean energy to meet the annual needs of 1000 homes and providing long-term funds for local economic development, fuel poverty and climate change projects. To maximise community benefit and keep ownership local, PEC is re-financing the project through a longer-term loan from Plymouth City Council and £1,230,000 in community shares.

South West Water (SWW) is working with Regen on a programme to collaborate with local communities. The aim is to develop renewable energy projects sized to provide power to SWW infrastructure, and keep bills and CO<sub>2</sub> emissions low. As a result, the 100 kW Nanstallon Solar array was financed and developed by Wadebridge Renewable Energy Network (WREN) to provide power to SWW's Bodmin Sewage Treatment Works. A direct wire and 20 year power purchase agreement is in place between WREN and SWW. With ongoing grid capacity constraints in the Wadebridge area, this private wire agreement was a positive way for the community to develop a project with local economic benefit, despite policy and subsidy changes.

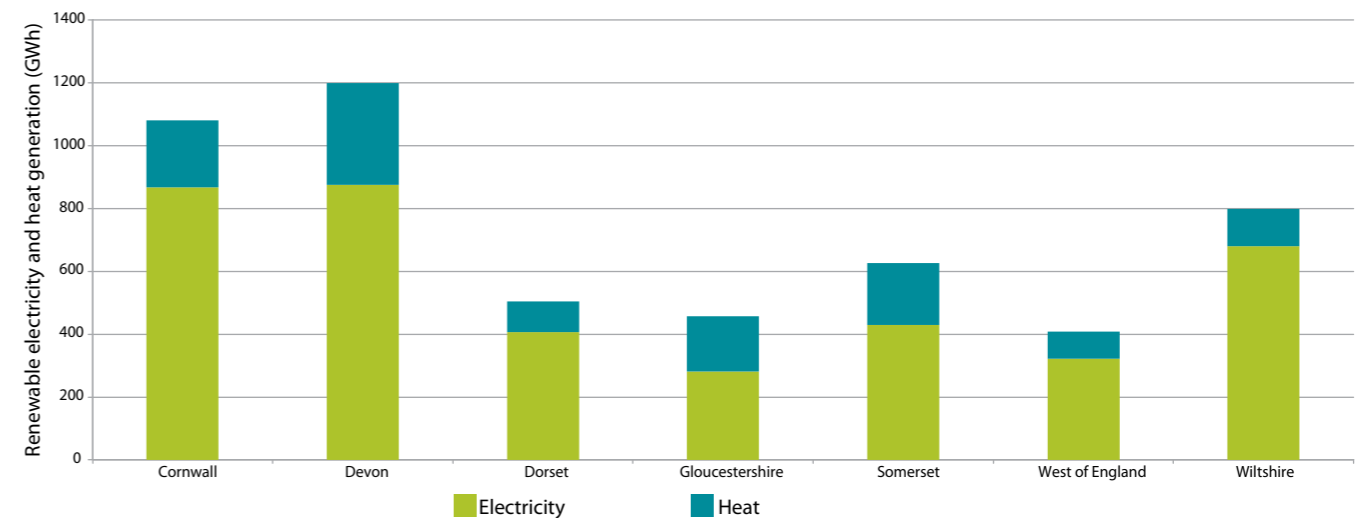


Area	Number of projects	Renewable electricity		Renewable heat	
		Capacity (MW)	Estimated generation (GWh)	Capacity (MW)	Estimated generation (GWh)
Cornwall	19,412	687.7	864	80.7	238
Devon	34,494	608.8	876	143.4	494
Dorset	15,550	334.7	407	43.4	141
Gloucestershire	13,029	195.7	282	67.4	196
Somerset	15,402	357.5	430	76.7	236
West of England	17,153	204.4	323	49.3	208
Wiltshire	12,823	617.4	680	50.6	159
<b>South west total</b>	<b>127,863</b>	<b>3,006.1</b>	<b>3,862</b>	<b>511.5</b>	<b>1,672</b>

## Highlights this year include:

- Wiltshire with Swindon added 171 MW of installed capacity, the highest amount of any county area in the south west, 96 per cent of which was solar.
- Torrige is the local planning authority area that generates the greatest proportion of its electricity consumption from renewables – 65 per cent.
- Torrige with Mid Devon also tops the chart for the equivalent proportion of domestic heat consumption which is produced by renewables – with 15 per cent each.
- Gloucestershire and the West of England generate the least renewable energy, equating to just 9 per cent and 7 per cent respectively of their electricity consumption.
- Dorset has the lowest renewable heat installed capacity, with 43 MW installed, with estimated heat production equating to around 3 per cent of the area's domestic heat demand.
- Over 10 per cent of homes in mid Devon have installed solar PV, the second highest level in the England.
- Devon saw almost double the number of new rooftop PV installations of any other county.
- Stroud in Gloucestershire has the highest rate of heat pump installations in the country with 1.4 per cent of households with a heat pump.
- Wroughton airfield solar farm in Swindon was the largest renewable electricity project to be built in the south west in 2015/16 at 50 MW, followed by 49.6 MW Snarlton Farm in Wiltshire.
- North Yard energy from waste plant in Plymouth was the largest heat project to be built with 23.3 MWth plus 22.5 MWe. Heat is piped to the neighbouring naval base and dockyard.

## Geographical spread of renewable energy generation in the south west





# Advisory Services

Regen SW offers independent, expert advice on all aspects of sustainable energy delivery.



Regen works with a wide range of public and private sector organisations to make the most of their sustainable energy opportunities. We have over 10 years' experience in supporting businesses, local authorities and government, helping them to:

- ▶ understand energy markets, policy and regulation
- ▶ explore onsite opportunities
- ▶ assess the renewables sector
- ▶ develop a sustainable energy strategy
- ▶ engage with local communities
- ▶ provide a clear picture to their internal and external stakeholders.

Contact Tim Crook, head of technical services, if you would like to discuss partnering opportunities or commission us to work with you.



tcrook@regensw.co.uk  
01392 494 399  
07734308598

# Technologies

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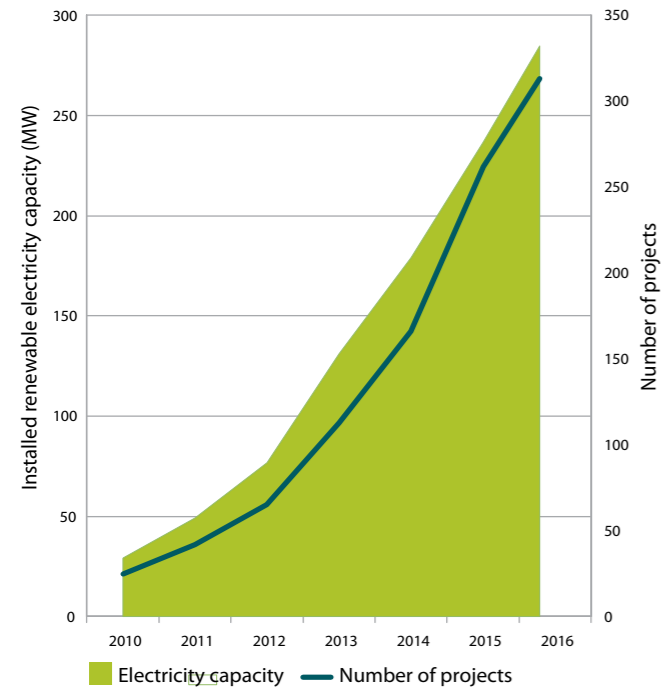
# Anaerobic digestion



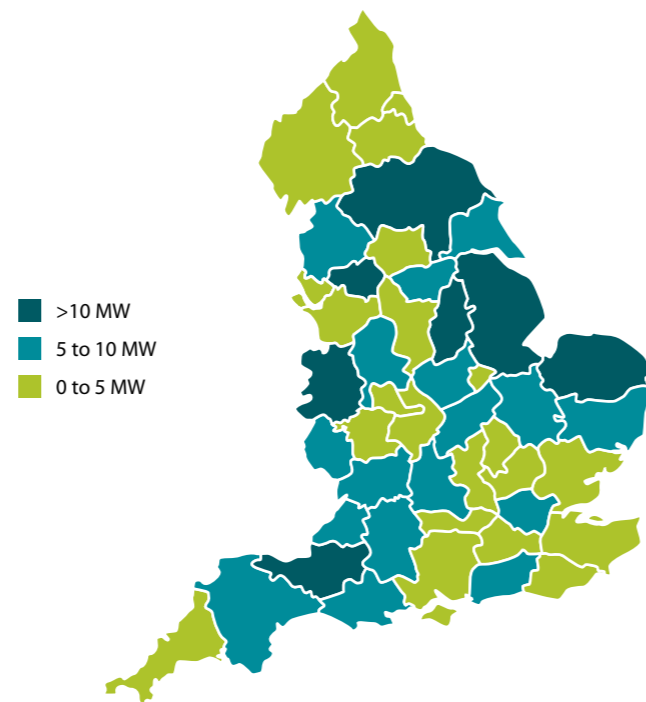
Geneco's Gas to Grid plant in Bristol currently supplies 60GWh per annum of biomethane, derived from food and sewage waste, to the national gas grid, saving over 4,000 tonnes CO<sub>2</sub> each year. The biomethane also fuels the world-famous 'Bio-Bus'.

There are 314 anaerobic digestion (AD) projects in England, with an installed capacity of 285 MWe. 42 new projects were built in 2015/16, adding 35 MWe. A growing number of sites produce useable heat or biomethane for injection to the gas grid.

Trends in growth of anaerobic digestion



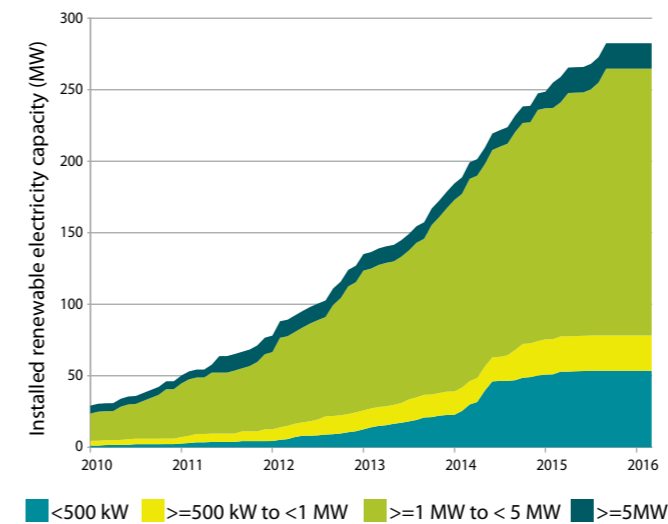
Distribution of anaerobic digestion electricity capacity



## Future

Deployment of AD is expected to remain at a steady rate until September 2016, as pre-accredited sites build out. Recent cuts to support and deployment caps will limit small-scale projects (up to 500 kW). The first round of AD applications for the FIT under the new system reached the quarterly cap of 5.8 MW in 20 minutes. Larger scale plants tend to include income streams from processing food waste, making them less dependent on support and more likely to continue to be developed.

Trends for anaerobic digestion by project scale



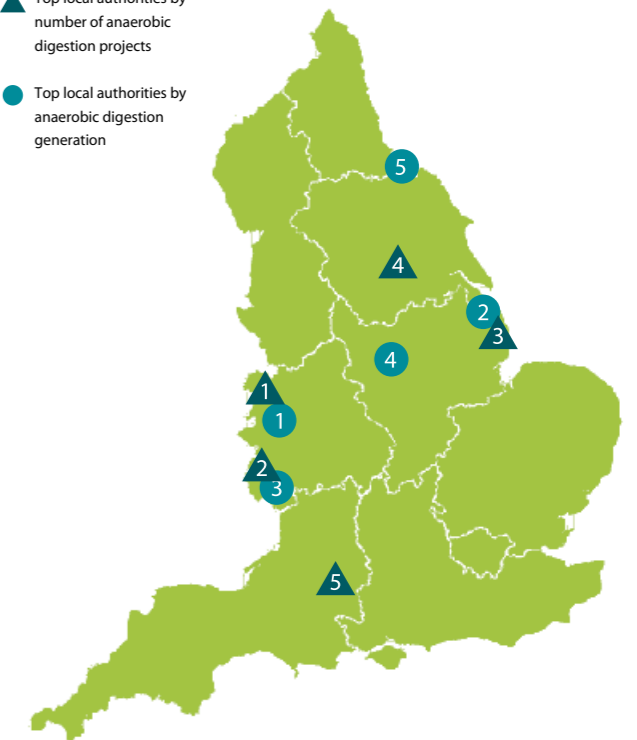
## Local authority league tables

Top local authorities by number of projects	Number of projects
1. Shropshire	18
2. Herefordshire	15
3. East Lindsey, Lincolnshire	11
4. Selby, North Yorkshire	8
5. Wiltshire	6

Top for anaerobic digestion generation	GWh
1. Shropshire	74
2. East Lindsey, Lincolnshire	71
3. Herefordshire	58
4. Gedling, Nottinghamshire	50
5. Middlesbrough, North Yorkshire	47

## Local authority top five: anaerobic digestion

- ▲ Top local authorities by number of anaerobic digestion projects
- Top local authorities by anaerobic digestion generation



## Analysis

2015/16 saw less than half the number of projects than in 2014/15, which was a record year. Cuts and uncertainties in future support levels were the main reasons.

The south west has the greatest number of projects at 59 and the east midlands the highest capacity (57 MWe). The majority of deployment is farm scale. Areas where an AD installer is based tend to have a greater number of projects, demonstrating that

the market is at a relatively early stage with companies focussed on a local rather than national market.

Shropshire is the local authority with the greatest number of projects and greatest installed electrical capacity. Middlesbrough is home to the largest AD plant in England, 6.25 MWe, and the highest amount of AD capacity per km<sup>2</sup> of land area.

## Energy from anaerobic digestion in England

Geographical area	Total (March 2016)		New in 2015/2016	
	Number of projects	Capacity (MWe)	Number of projects	Capacity (MWe)
East midlands	58	57.2	11	9.8
East of England	44	48.3	4	5.7
London	5	5.3	-	-
North east	9	12	2	2.6
North west	31	22.4	3	0.4
South east	27	23.6	5	1.6
South west	59	52.4	4	1.2
West midlands	48	35.7	5	3.7
Yorkshire and the Humber	33	26	8	8.1
<b>Grand total</b>	<b>314</b>	<b>282.7</b>	<b>42</b>	<b>33.1</b>



## Biomethane

Leeming Biogas anaerobic digestion plant is based in Leeming, north Yorkshire. It is one of the largest anaerobic digestion plants in the country to feed gas directly into the national grid. It will consume up to 80,000 tonnes of food waste every year, which will generate enough gas to supply nearly 4,000 homes.

There are 29 AD projects producing biomethane for injection to the grid, with seven of these built in 2015/16. However, cuts to the RHI and the relatively long lead times for AD projects have reduced the pipeline. With the right support, the Renewable Energy Association estimates that another 100 biomethane gas to grid projects could be developed by the end of 2020.



# Biomass heat

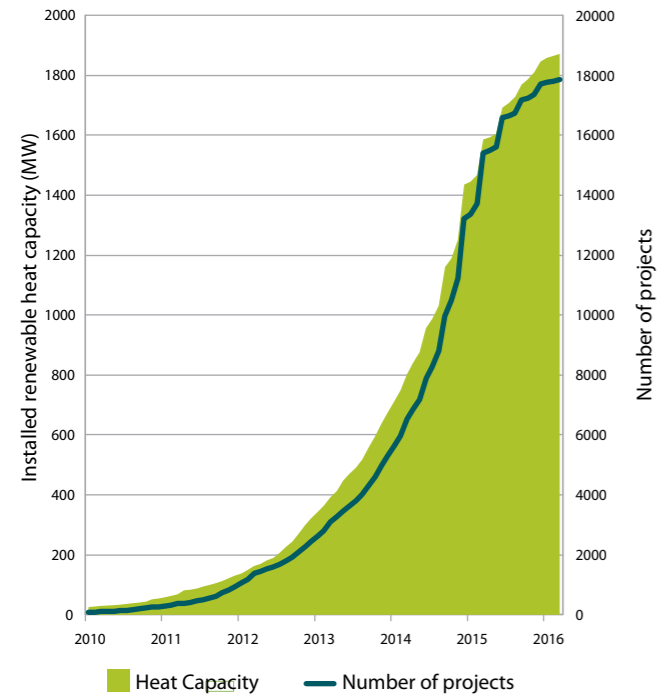


## Aldwick Court Farm

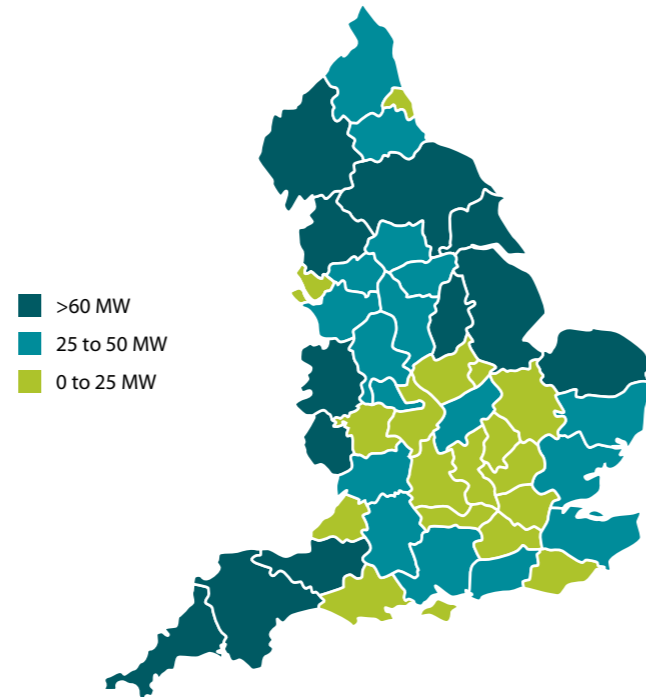
Aldwick Court Farm installed an Eco Angus 130kW log boiler with a 10,000 litre thermal store for all their central heating and hot water requirements. They claim the non-domestic RHI and receive payments yearly totalling £403,900 over the full 20 year period.

There are 17,870 biomass boiler installations across England, an estimated 1,872 MW of renewable heat capacity. Just under 2,500 of these boilers were commissioned in 2015/16, adding 285 MW.

Trends in growth of biomass heat



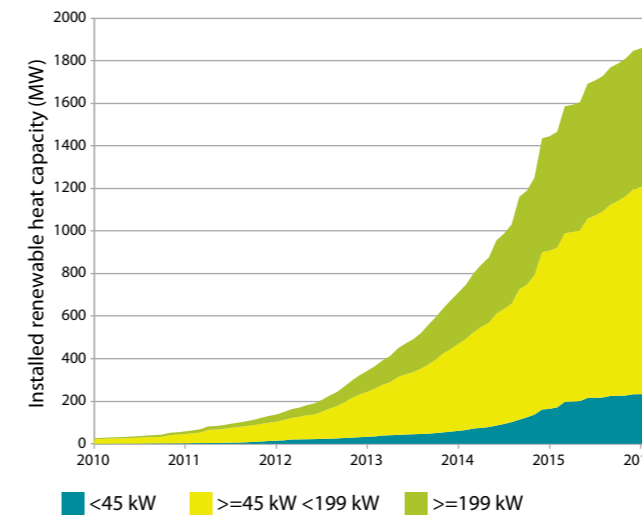
Distribution of biomass heat capacity



## Future

Biomass is viewed in the government's heat strategy as a transition technology towards the electrification of the majority of heat. However, we believe there is a long term role for sustainable biomass heat, particularly for small scale projects that stimulate the local production of sustainable biomass and for larger scale waste biomass fuelled district heat networks. At current RHI tariffs, deployment is likely to remain low, unless the oil price rises.

Trends for biomass heat by project scale



Local authority league tables

Top local authorities by Non Domestic RHI Biomass installations	Number of projects
1. Craven, North Yorkshire	59
2. Eden, Cumbria	57
3. West Lindsey, Lincolnshire	53
4. Ryedale, North Yorkshire	39
5. Richmondshire, North Yorkshire	39

Top local authorities by biomass generation	GWh
1. Herefordshire, West midlands	257
2. East Riding of Yorkshire	247
3. Shropshire, West midlands	241
4. Cornwall	177
5. West Lindsey, Lincolnshire	129

## Analysis

2015/16 saw a slowdown in the deployment of biomass boilers, with the installation rate at a quarter of that for the previous year due to reductions in the RHI. However, deployment in 2015/16 remained above pre-2012/13 rates.

64 per cent of new installations were domestic boilers with capacities of 50 kW or less; the remaining projects were non-domestic, with the largest project 11.6 MW.

Deployment is highest in rural areas off the gas grid. Regen's south west Bioheat project helped the south west have the highest installed capacity of any region, with 3,824 projects creating 319 MW of capacity in total. Herefordshire is the local authority area with the highest installed capacity of biomass heat and Craven in North Yorkshire has the highest proportion of commercial buildings using biomass.

Energy from biomass heat in England

Geographical area	Total (March 2016)		New in 2015/2016	
	Number of projects	Capacity (MWth)	Number of projects	Capacity (MWth)
East midlands	2,274	261.3	273	33.9
East of England	1,842	202.6	231	22.9
London	66	15.8	7	1.9
North east	995	87.2	168	11.1
North west	2,378	244.1	434	39.2
South east	1,558	163.1	218	30
South west	3,823	318.9	447	35.2
West midlands	2,090	282.9	304	48
Yorkshire and the Humber	2,839	295.9	379	63
<b>Grand total</b>	<b>17,865</b>	<b>1,871.6</b>	<b>2,461</b>	<b>285.4</b>



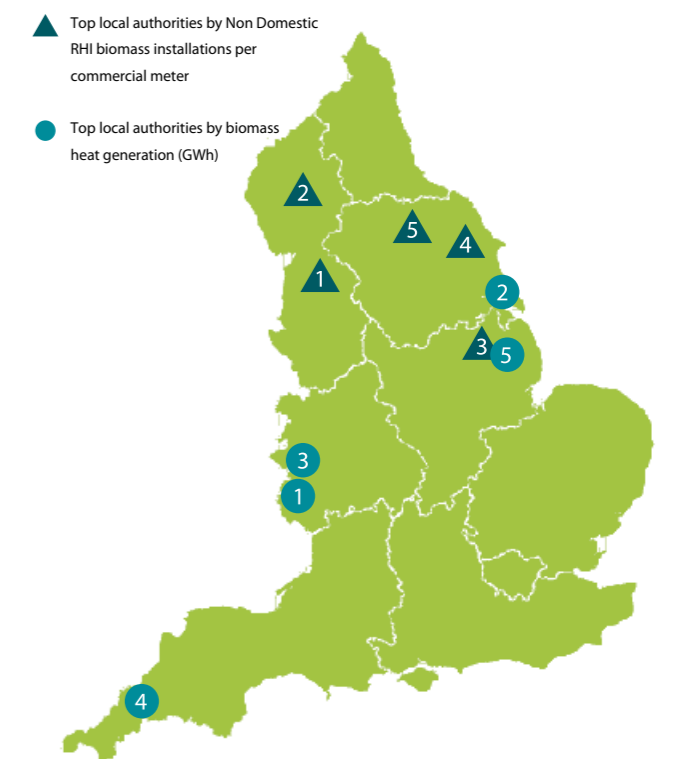
## Forest Fuels consolidates wood fuel supply chain

In its mission to consolidate the biomass wood fuel supply chain, in 2015/16 Forest Fuels joined forces with Midlands Woodfuel and purchased Anglia Biofuels, Lakes Biomass and Liverpool Woodpellets' commercial business.

Forest Fuels' model retains local staff and utilises specialist local managers, backed up by head office support and logistics. This has spread the overheads of increasingly complicated regulation, enabling the industry to stay profitable and sustainable.

Forest Fuels turns over in excess of £9 million per annum and has a clear strategy for further growth, aiming for turnover of £20-30 million within a few years.

Local authority top five: biomass heat



# Biomass electricity



The 40 MW Brigg Renewable Energy Plant in Humberside

# Energy from waste

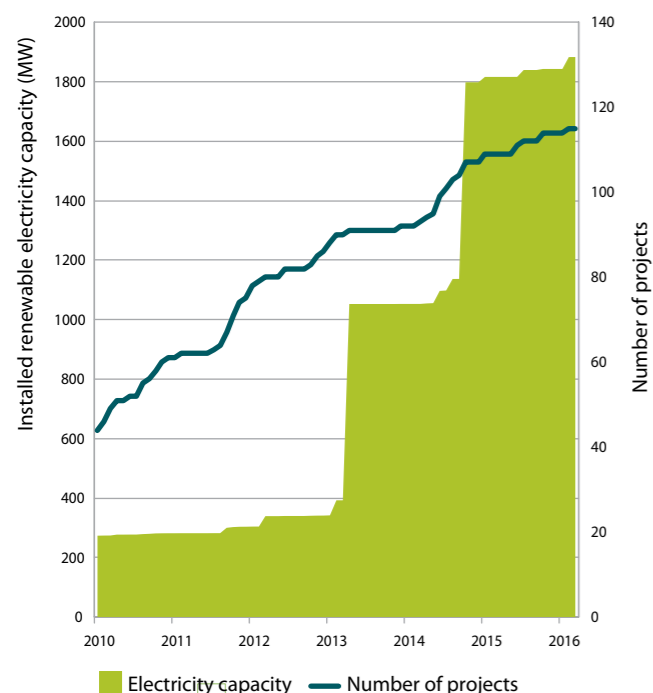


Viridor's Runcorn 80 MWe, 52 MWth energy from waste plant

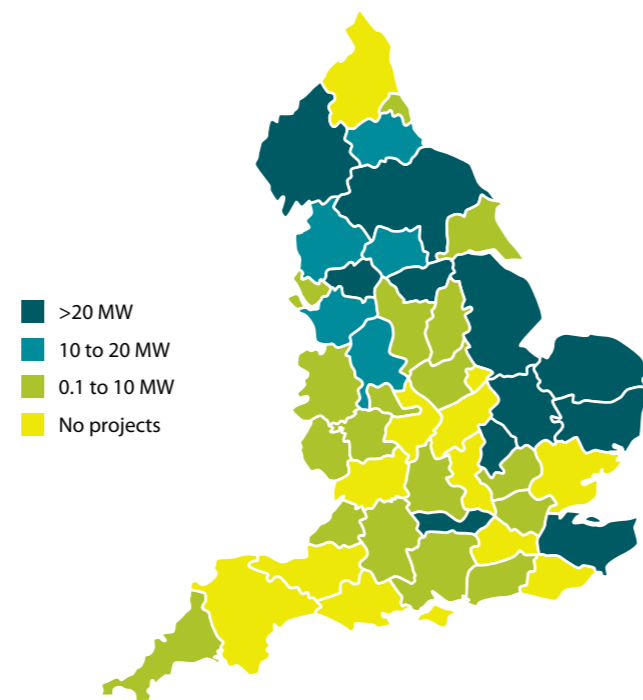
Around 1880 MWe of biomass electricity is installed across England at 115 sites. In 2015/16, six new biomass electricity sites were commissioned, totalling over 65 MWe of capacity.

Six new energy from waste (EfW) plants were commissioned in 2015/16 in England, totalling 211 MW. Energy from waste capacity in England now stands at 810 MW from 42 installations. There are 8 EfW plants under construction, around 190 MW, and a further 600 MW with planning permission.

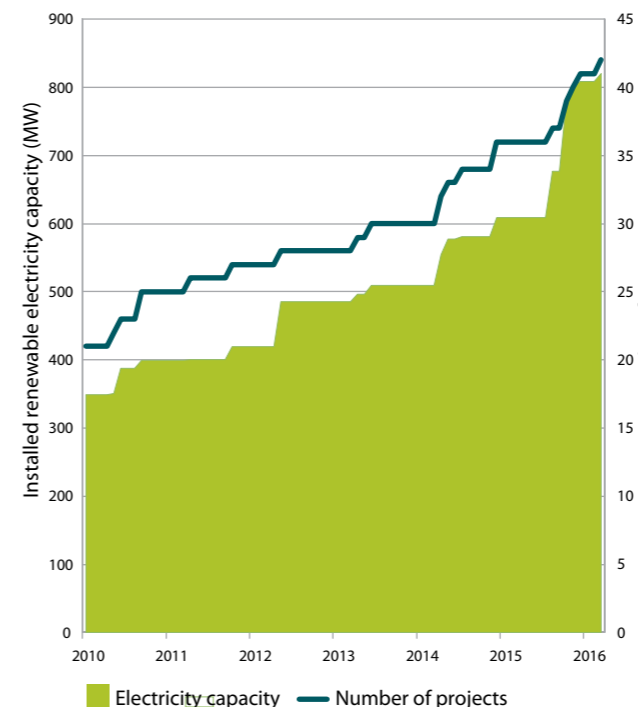
Trends in growth of electricity from biomass



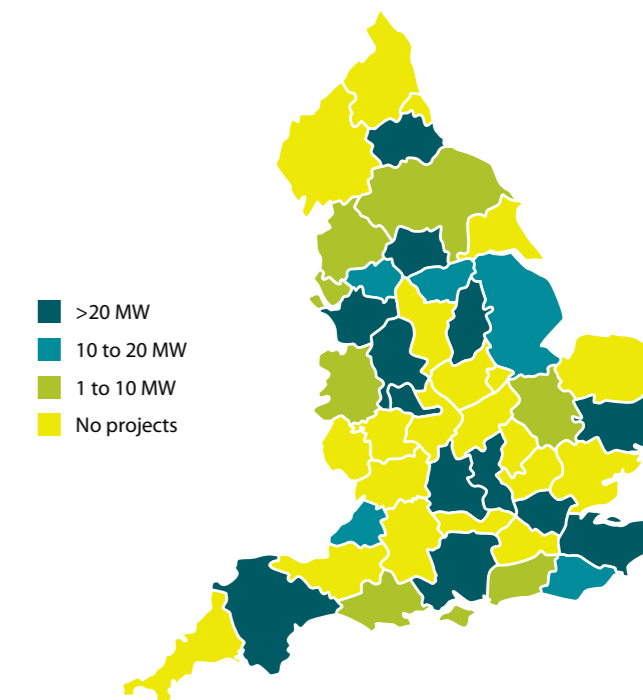
Distribution of biomass electricity capacity



Trends in growth of energy from waste



Distribution of energy from waste electricity capacity



## Analysis

Large scale biomass electricity with the exception of Drax, has not taken off in England, with questions over sustainability, uncertainty over incentives and an illiquid feedstock market. 2015 saw Heliuss Energy abandon two 100 MW biomass electricity projects in Bristol and Southampton. Selby in North Yorkshire has by far the highest installed capacity, due to the presence of co-firing Drax power station, which makes up 70 per cent of England's biomass electricity capacity.

## Future

The closure of the Renewables Obligation from the end of March 2017 means that new biomass electricity only plants will be without an incentive framework. Deployment in the near term will continue only where additional income streams can be generated, for example, where the feedstock is a waste product, where there is onsite electricity use, or where useful heat can be generated.

## Analysis

Incineration of residual waste in EfW plants has grown rapidly as government seeks to divert waste away from landfill. As EfW plants rely on household waste from population centres, the regions with the greatest capacity are the south east with nearly 200 MW, followed by London with 156 MW. Teeside is bucking this trend as it is now an EfW hub with multiple plants importing waste from other areas.

## Future

Industry estimates that EfW could provide 15 per cent of our renewable electricity by 2020. However, a report from Eunomia found that the UK's residual waste treatment capacity will exceed supply in 2017/18, bringing into question the level of demand. New advanced thermal treatment technologies (gasification and pyrolysis) remain in their infancy with only one large scale project in operation. Construction of two 50 MW gasification plants on Teeside halted in November 2015.

Energy from biomass electricity in England

Geographical area	Total (March 2016)		New in 2015/2016	
	Number of projects	Capacity (MWe)	Number of projects	Capacity (MWe)
East midlands	11	52.9	-	-
East of England	11	129	1	3.5
London	5	1.9	-	-
North east	4	52.8	-	-
North west	30	112.6	1	0.1
South east	11	79	1	23
South west	3	1.6	-	-
West midlands	13	14.6	1	0.2
Yorkshire and the Humber	19	1,438.5	1	40
<b>Grand total</b>	<b>107</b>	<b>1,882.7</b>	<b>5</b>	<b>66.7</b>

Energy from waste in England

Geographical area	Total (March 2016)		New in 2015/2016	
	Number of projects	Capacity (MWe)	Number of projects	Capacity (MWe)
East midlands	2	31	-	-
East of England	2	27.3	1	7.3
London	3	156	-	-
North east	3	50.2	-	-
North west	4	94.3	1	80
South east	11	198.4	1	22
South west	4	39.9	1	22.5
West midlands	7	108.6	-	-
Yorkshire and the Humber	6	114.5	2	79.6
<b>Grand total</b>	<b>42</b>	<b>820.2</b>	<b>6</b>	<b>211.4</b>



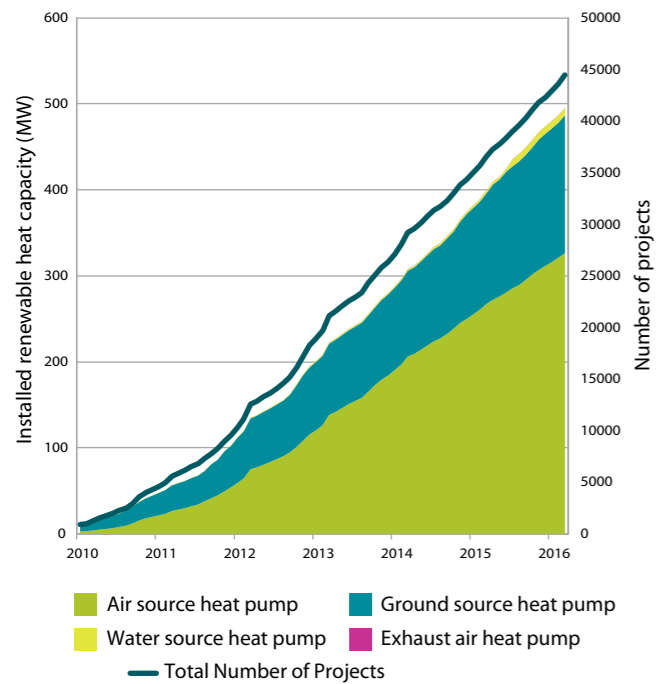
# Heat pumps and geothermal



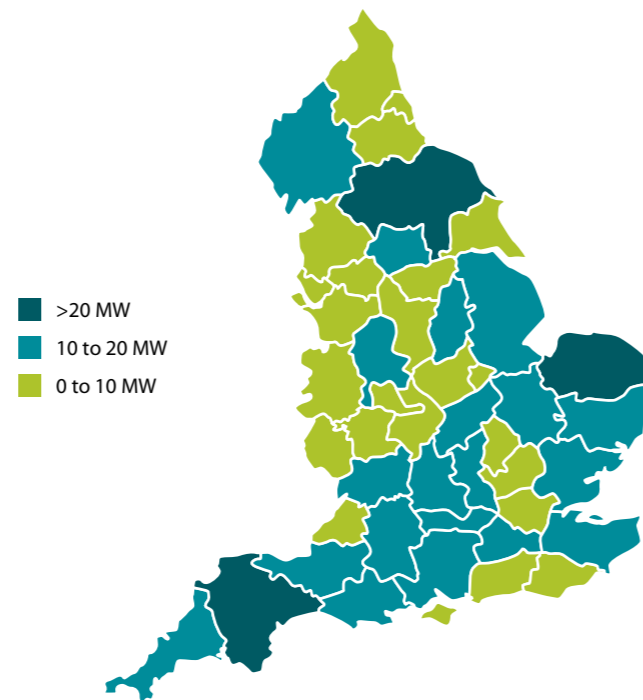
A new build project in the South Hams has recently installed a highly efficient air source heat pump system from OMNIE. Designed by Stopher Design Partnership, the home uses two LWD 70A/SX units which provide domestic hot water and warmth for the underfloor heating.

There are nearly 44,478 heat pumps installed across England, a total of 495.6 MW of installed capacity. In 2015/16, 7,904 heat pumps were installed, totalling 96 MW of additional capacity.

Trends in growth of heat pumps



Distribution of heat pump capacity



## Analysis

Heat pumps have been the major beneficiary of the domestic Renewable Heat Incentive, making up 61 per cent of all projects. As a result, the last five years have seen consistent deployment in the heat pump market with a yearly average of 88 MW installed. 78 per cent of heat pumps are air source, with ground-source heat pumps making up nearly all of the remainder.

The south west, south east and east of England are far ahead in terms of both capacity and numbers of projects. Areas with the highest numbers of projects are off-gas areas with social housing investment programmes. Stroud has the greatest number of heat pumps per household. In 2013, Stroud District Council received a £900,000 grant to install 400 air source heat pumps in its council homes.

## Energy from heat pumps in England

Geographical area	Total (March 2016)		New in 2015/2016	
	Number of projects	Capacity (MWth)	Number of projects	Capacity (MWth)
East midlands	4,509	47.7	833	8.8
East of England	8,574	97.1	1,303	19.9
London	282	8.4	96	0.7
North east	1,567	15.8	289	2.9
North west	2,957	35.7	677	7.9
South east	8,032	97.6	1,219	15.4
South west	10,047	96.3	1,864	18.9
West midlands	3,671	42.1	734	8.9
Yorkshire and the Humber	4,267	49.1	788	11.9
<b>Grand total</b>	<b>43,906</b>	<b>489.8</b>	<b>7,803</b>	<b>95.3</b>

## Future

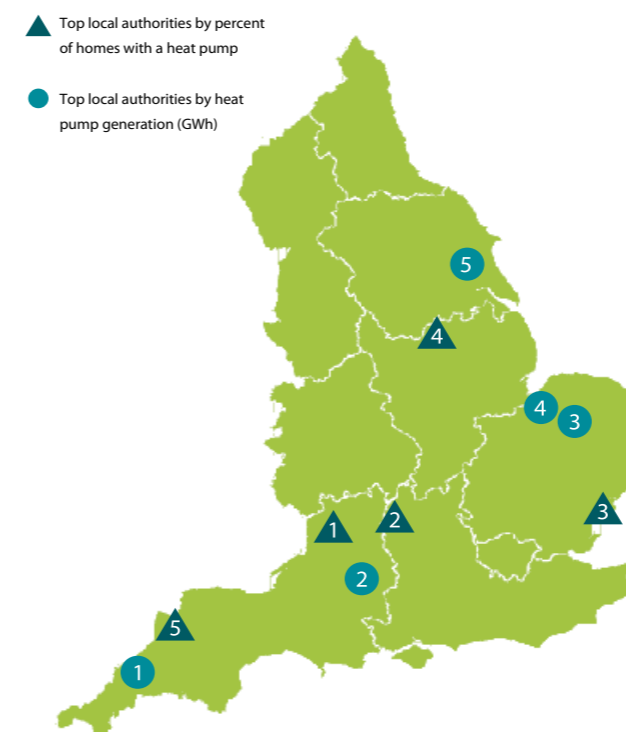
The government heat strategy gives a major role to heat pumps, estimating 700,000 installations by 2020. This would require a huge increase in the installation rate and is highly unlikely to materialise. Future deployment will remain predominately in off-gas areas driven by proactive social landlords alongside a niche homeowner market.

### Local authority league tables

Top local authorities by percentage of homes with a heat pump	Percentage
1. Stroud, Gloucestershire	1.3
2. West Oxfordshire	1.2
3. Tendring, Essex	1.2
4. Bassetlaw, Nottinghamshire	1.1
5. Torrington, Devon	1.1

Top local authorities by heat pump generation	GWh
1. Cornwall	31.8
2. Wiltshire	23.2
3. Breckland, Norfolk	18.4
4. King's Lynn and West Norfolk	18.3
5. East Riding of Yorkshire	17.4

### Local authority top five: heat pumps



## Geothermal

The British Geological Survey identified six areas of the UK as having the potential to exploit deep geothermal energy. Geothermal energy is underdeveloped in the UK; Southampton district energy scheme, commissioned in 1986, is the only operational geothermal plant in England. In Europe, there are over 200 geothermal district energy schemes in operation, with over 34 in Paris alone.

Cornwall and West Devon have the optimum geology for this technology. EGS Energy Ltd has planning permission for a geothermal CHP plant at the Eden Project. This scheme will involve drilling two wells to a depth of 4,500 metres, with a design output of 5 – 7 MWe, dependent on the production flow rate. A deep geothermal scheme is also proposed by Geothermal Engineering Ltd at United Downs near Redruth in Cornwall.

A call through the European funded Growth Programme for Cornwall & the Isles of Scilly has recently been issued, which aims to provide ERDF investment towards the costs of drilling and testing a first deep geothermal well in the region, in order to drive private sector confidence in this technology. If the sites can secure funding, development could potentially start in 2017.

Schemes are also being explored at the Crewe Campus of the Manchester Metropolitan University, in Ardwick in central Manchester and in Stoke on Trent. With the right investment, deep geothermal energy has the potential to become a significant contributor to the UK's energy demand.

The deep geothermal plant at Landau, Germany, is an example of the type of plant proposed at the Eden Project.



# Landfill and sewage gas

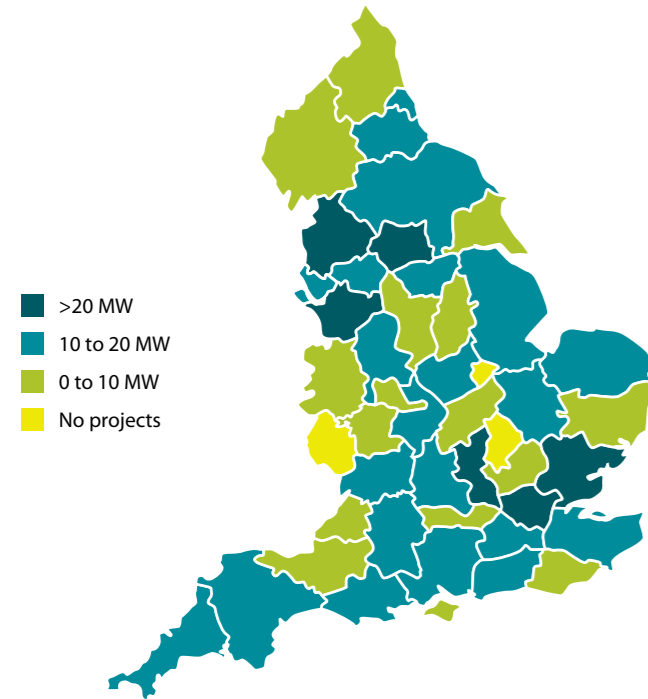


South West Water has a target to source 20 per cent of energy from a mixture of renewables by 2020. To date, SWW own and operate seven sewage sludge AD sites, 25 hydro turbines, 35 solar arrays and a 100 kW wind turbine.

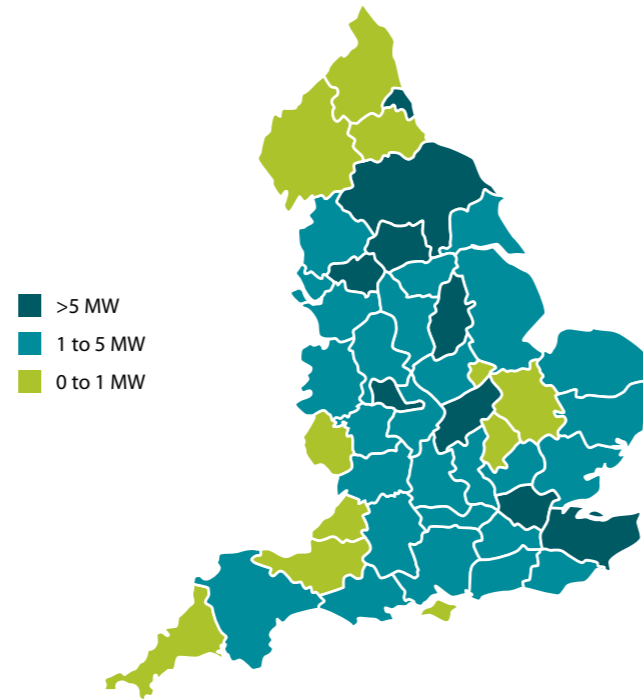
Image courtesy of Lizzy-Jane Frankel

Landfill gas installed capacity is around 622 MW in England, with sewage gas adding a further 202 MW to England's total. Together they provide around two per cent of England's renewable electricity generation.

Distribution of landfill gas electricity capacity



Distribution of sewage gas electricity capacity



## Analysis

Landfill gas is declining as sites de-gas and close with waste being diverted away from landfill to other waste management options. There have been no new projects since 2014.

Investment in sewage gas generation in England has also levelled off, with one new 1.2 MW plant installed in 2015/16 at Trowbridge in Wiltshire.

Landfill gas plants and sewage gas plants are located at existing waste facilities that tend to be within easy reach of population centres.

Energy from landfill gas in England

Geographical area	Total (March 2016)	
	No. of projects	Capacity (MWe)
East midlands	22	38.5
East of England	44	103
London	3	20.4
North east	20	34.4
North west	42	100.2
South east	53	131
South west	34	79.6
West midlands	24	51.2
Yorkshire and the Humber	29	63.9
<b>Grand total</b>	<b>271</b>	<b>622.1</b>

Energy from sewage gas in England

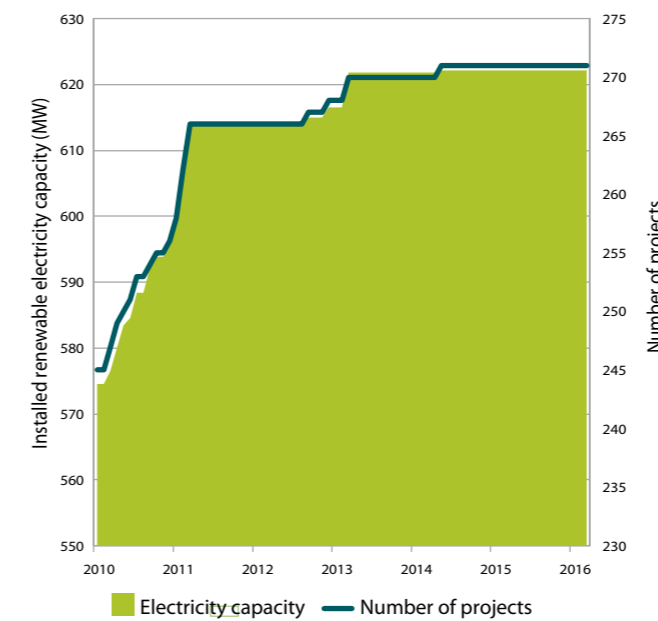
Geographical area	Total (March 2016)	
	No. of projects	Capacity (MWe)
East midlands	14	20.2
East of England	9	13.9
London	8	45.4
North east	5	11.3
North west	23	29.3
South east	29	30.2
South west	16	8.8
West midlands	18	22.2
Yorkshire and the Humber	20	15.2
<b>Grand total</b>	<b>142</b>	<b>196.6</b>

## Future

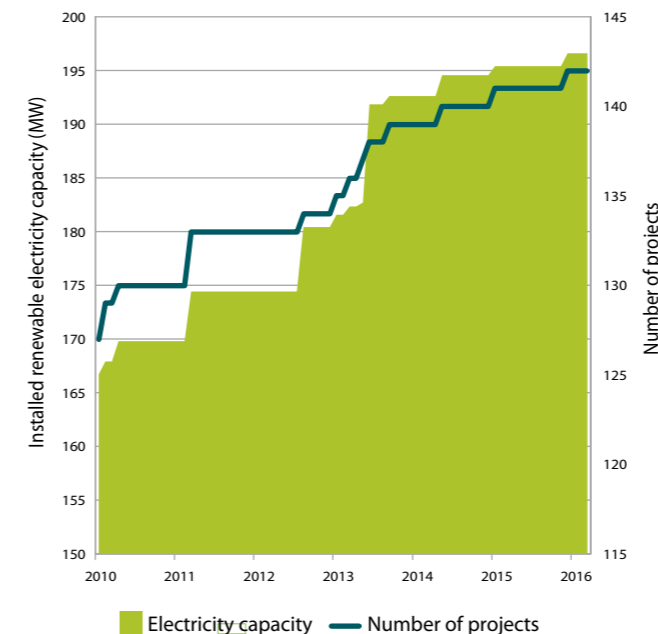
As landfill reduces, gas produced from landfill sites will play a decreasing role in England's energy generation. A significant proportion of landfill gas in the future will come from waste that is already deposited within sites and engines will continue to be moved around and between sites, leading to variations in the year on year production.

An estimated 66 per cent of the UK's sewage was processed in energy generating plants in 2013; sewage gas has the potential to grow further to make use of more of the available resource, given the right economic incentives.

Trends in growth of landfill gas



Trends in growth of sewage gas

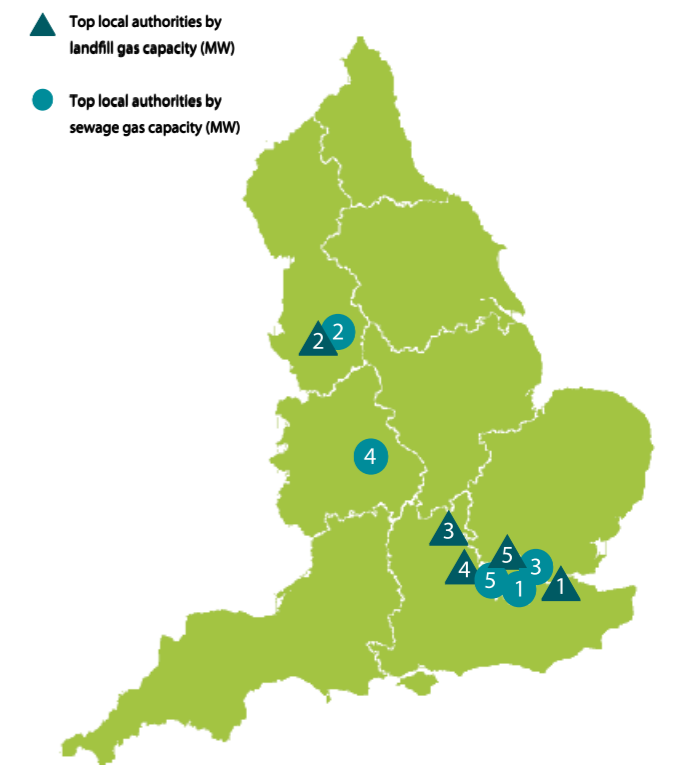


Local authority league tables

Top local authorities by landfill gas capacity	MWe
1. Thurrock, Essex	31.8
2. Warrington, Cheshire	29.2
3. Aylesbury Vale, Bucks	17.4
4. South Bucks	15.3
5. Havering, Greater London	15

Top local authorities by sewage gas capacity	MWe
1. Havering, Greater London	12
2. Trafford, Greater Manchester	11.6
3. Newham, Greater London	11.1
4. Birmingham	10.5
5. Hounslow, Greater London	8.9

Local authority top five: landfill gas and sewage gas





# Offshore wind and marine

## Future growth will likely focus on the southern North Sea

Government has indicated that it may support up to a further 10 GW of offshore wind in the next decade, and has allocated a budget to support 4 GW by 2026, but this is dependent on further energy cost reduction. A number of UK projects have been cancelled or withdrawn including the 970 MW Navitus Bay project, which was refused planning by the Secretary of State.



## Tidal lagoons – Swansea Bay gets consent but awaits government strategy

In July 2015, the 320 MW Swansea Bay Tidal Lagoon project was given planning consent, but it has yet to receive a subsidy commitment and now awaits the outcome of a wider independent review on the future potential of tidal lagoons in the UK energy strategy. The review could herald further lagoons in the Bristol Channel, off North Wales and in Liverpool Bay.



## Tidal stream – consolidation and progress

The acquisition by Atlantis Resource Corporation of Marine Current Turbines is a further sign of consolidation, while Tidal Energy Limited's long awaited 400 kW turbine deployment at Ramsey Sound has given the sector some cheer. New tidal Demonstration Zones off North Devon and Anglesey, alongside the newly consented Perpetuus Tidal Energy Centre (PTEC) have given developers an alternative route to market.



## Wave energy takes some tentative steps

After a twelve month lull, there has been a noticeable increase in wave energy activity in the UK and internationally, with Cornwall's Wave Hub and FaBTest sites to the fore. The recent redeployment of the Seatricity Oceanus 2 device at Wave Hub is expected to be followed by the Wello 1 MW "Penguin" device, with further arrays planned in 2017.



## Offshore wind provides circa 5% of the UK's electricity

- 29 offshore wind farms in the UK, representing 5.1 GW of installed capacity
- 4.5 GW in construction
- Further 5.55 GW granted planning
- Expectation of 8-10 GW installed by 2020



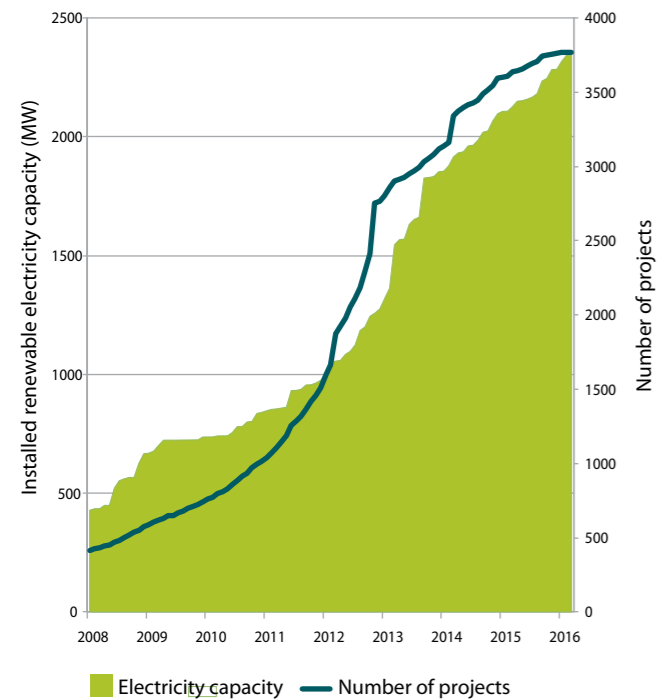
# Onshore wind



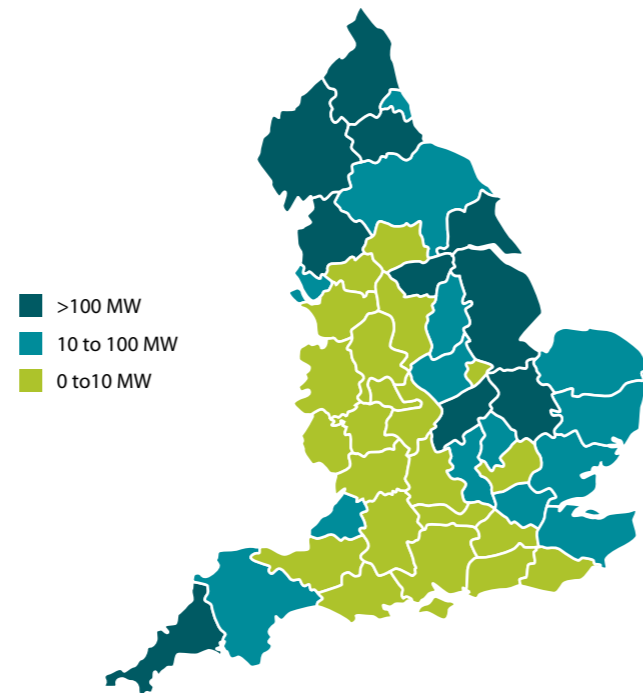
REG Windpower repowered St Breock wind farm in Cornwall in 2015. 11 old turbines were replaced with five 100-metre 2MW machines, more than doubling the capacity of the wind farm, which originally went live in 1994. The repower included the provision of a community benefit fund.

In 2015/16, 132 new projects were commissioned in England, adding over 216 MW of capacity. Onshore wind totals over 2.3 GW with 3,700 projects, ranging from microturbines to the 68 MW Keadby wind farm in Lincolnshire.

Trends in growth of onshore wind



Distribution of onshore wind capacity



## Analysis

Large wind deployment in England reached a peak rate of 451 MW in 2012/13 and has dropped to 183 MW in 2015/16. This drop is due to a worsening planning environment and uncertainty over the future of the subsidy regime.

Yorkshire and the Humber is the leading region with 514 MW – over 125 MW more than the east of England. Rossendale in Lancashire has the highest capacity compared to its size, with

four large wind farms, including Crook Hill and Reaps Moss, both commissioned in 2015.

High levels of deployment are concentrated in areas with good wind resource, open spaces and relatively favourable planning environments. Bristol is a notable exception, with three large scale wind projects in its industrial zone at Avonmouth, one of which is owned by the City Council.

Energy from onshore wind in England

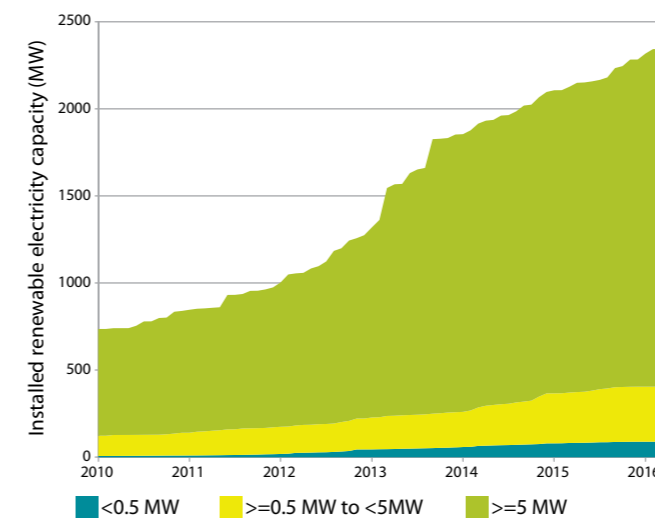
Geographical area	Total (March 2016)		New in 2015/2016	
	Number of projects	Capacity (MWe)	Number of projects	Capacity (MWe)
East midlands	369	340.8	21	53.9
East of England	844	389.1	10	48.2
London	22	11.1	-	-
North east	245	359.9	7	2.9
North west	463	374	21	51.1
South east	93	91	1	0.5
South west	820	255.3	31	26.9
West midlands	168	8.3	8	2.6
Yorkshire and the Humber	743	514.2	33	30.1
<b>Grand total</b>	<b>3,767</b>	<b>2,343.7</b>	<b>132</b>	<b>216.3</b>

## Future

There is a pipeline of 25 onshore wind projects under construction, totalling 414 MW, with a further 276 MW with permission and awaiting construction - although not all will be built due to financial or planning conditions.

The government's attempt to ban onshore wind through the planning system and ending of subsidies will create a hiatus in further deployment. However, onshore wind is now the cheapest form of electricity production - as demonstrated by Good Energy's plan to build the Big Field wind farm site in Cornwall without subsidy. We believe the logic of producing cost-effective power from England's plentiful wind will lead to a renaissance.

Trends for onshore wind by project scale



## Small wind

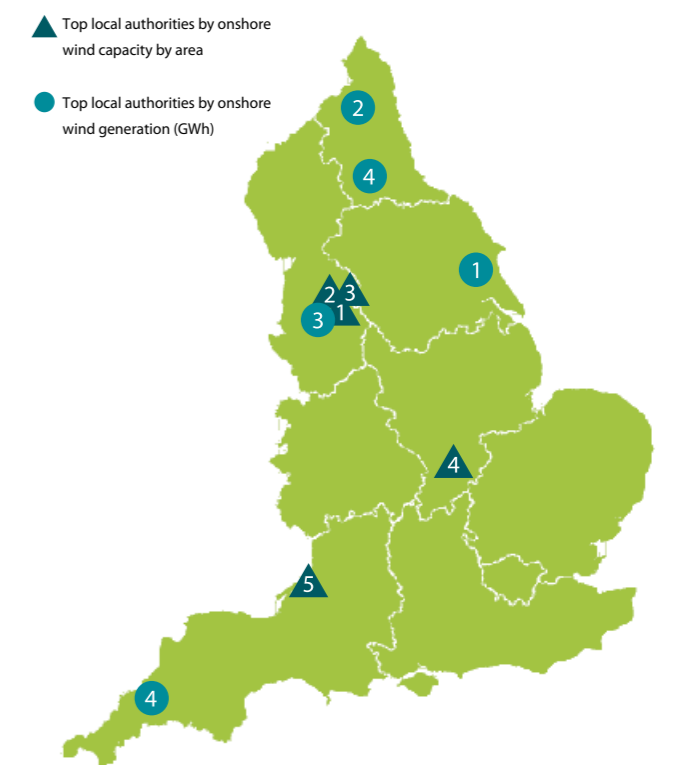
Small wind has been significantly reduced by cuts to the Feed-in Tariff – only 19 sub-50 kW projects were installed in the last year down from a peak of 786 in 2012/13. Without further financial incentives (or increases to power prices), deployment rates are likely to remain very low. Many small scale wind installers have shifted their focus or gone into administration.

Local authority league tables

Top local authorities by onshore wind capacity by area	MW/km <sup>2</sup>
1. Rossendale, Lancashire	0.90
2. Hyndburn, Lancashire	0.33
3. Burnley, Lancashire	0.26
4. Kettering, Northamptonshire	0.21
5. Bristol	0.20

Top local authorities by generation	GWh
1. East Riding of Yorkshire	501
2. Northumberland	437
3. Rossendale, Lancashire	300
4. Cornwall	274
5. County Durham	258

Local authority top five: onshore wind



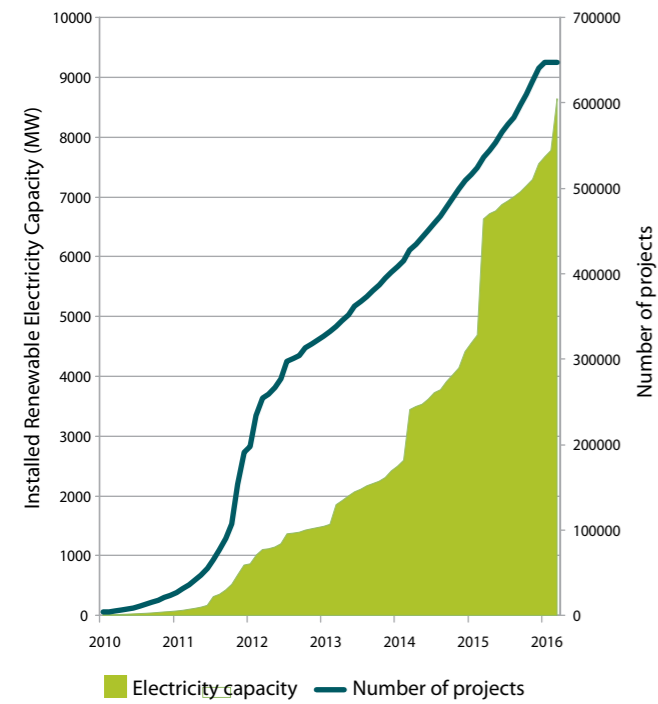


# Solar PV

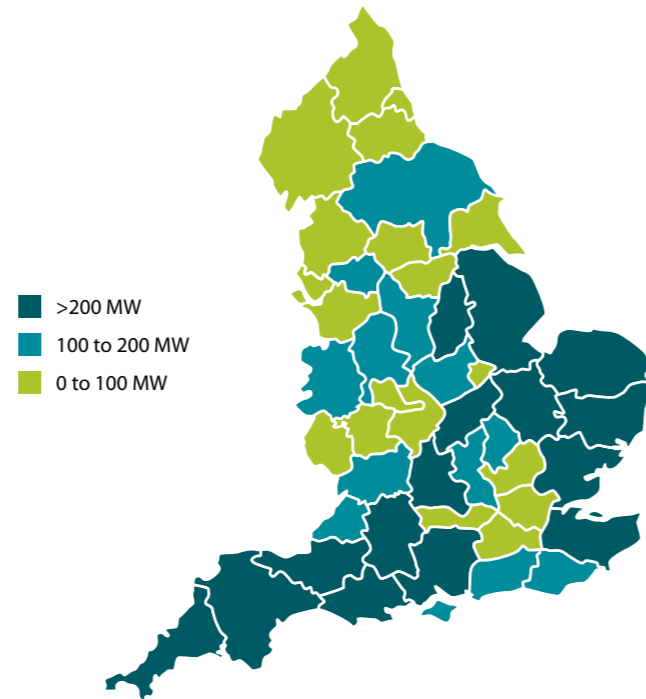


Solar PV is the renewable energy technology with the greatest installed capacity in England, totalling 8.6 GW, from nearly 648,000 installations. Over 2 GW was installed in 2015/16, through 111,289 projects.

Trends in growth of solar PV



Distribution of solar PV capacity



## Analysis

Solar PV deployment remained high with 2 GW of new capacity, although this is less than the 3.1 GW installed in 2014/15. Changing incentives led to a switch of focus from larger projects (over 5 MW) to 1-5 MW projects.

Deployment of large scale solar has closely followed England's solar resource; the south west has over 2.5 GW, with the south east and the east of England following with 1.7 GW each. Christchurch in Dorset has the greatest solar capacity per km<sup>2</sup>,

due mainly to the 51.3 MW Chapel Lane solar farm.

Rooftop installations continued at a steady rate through 2015, until cuts to the FIT in February 2016. Peterborough is the leading area for domestic scale, with PV on over 10 per cent of homes, thanks in large part to social housing provider Cross Key Homes installing solar PV in over 5,000 properties. Excellent installers, social landlord programmes and a strong community sector have put three Devon local authorities in the top five.

## Energy from solar PV in England

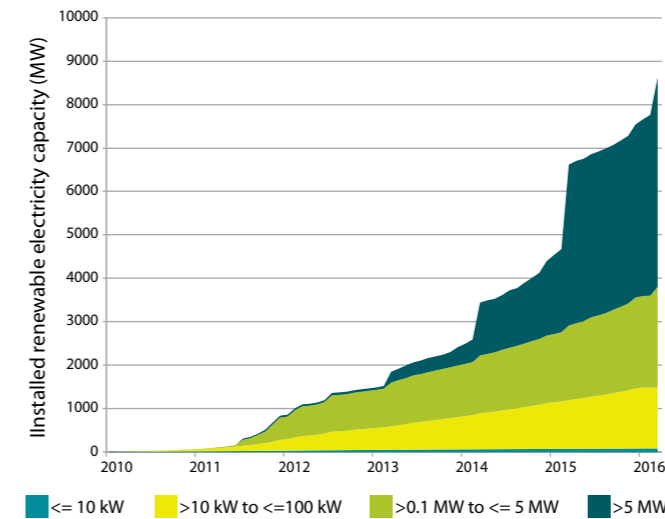
Geographical area	Total (March 2016)		New in 2015/2016	
	Number of projects	Capacity (MWe)	Number of projects	Capacity (MWe)
East midlands	75,677	1,104.6	13,346	291.6
East of England	91,881	1,727.1	17,105	396.5
London	20,227	84	2,796	12.8
North east	42,222	158	9,465	46.2
North west	76,019	381	15,842	115.4
South east	97,964	1,734.2	14,219	395.3
South west	108,675	2,582.4	13,527	485.6
West midlands	61,361	535	11,255	165.6
Yorkshire and the Humber	73,957	404	13,734	103.2
<b>Grand total</b>	<b>647,983</b>	<b>8,710.4</b>	<b>111,289</b>	<b>2,012.1</b>

## Future

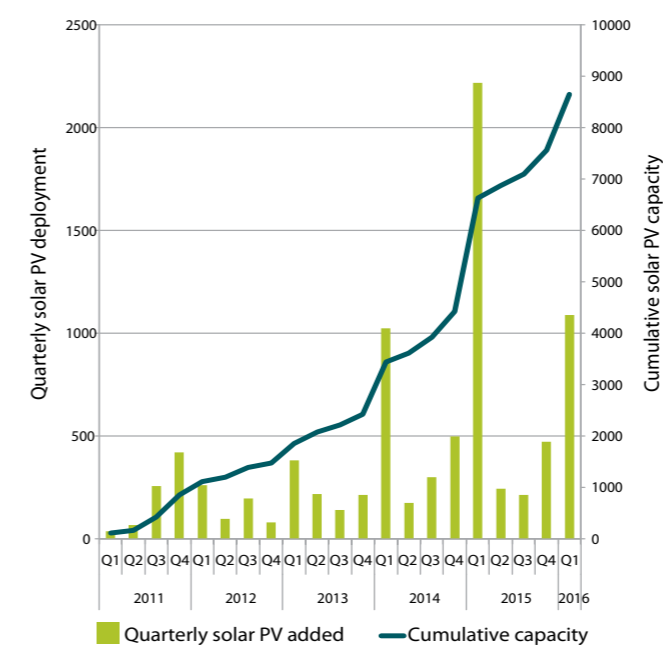
Government ending support for large scale solar has had a dramatic effect. There is a pipeline of projects being built in 2016/17 after which deployment will virtually cease. Despite this short sighted policy, costs continue to fall and, with solar already cheaper than new gas power stations, it is a matter of when, not if, the first subsidy free projects will be built. A number of hybrid energy parks, co-locating solar with wind turbines, are planned across England.

Cuts in support have also led to a dramatic drop in deployment of PV on commercial and domestic roofs. One bright spot is that commercial projects remain viable where the power can be used on the site and we expect this to pick up as structural and ownership issues are overcome.

Trends for solar PV by project scale



Quarterly deployment of solar PV



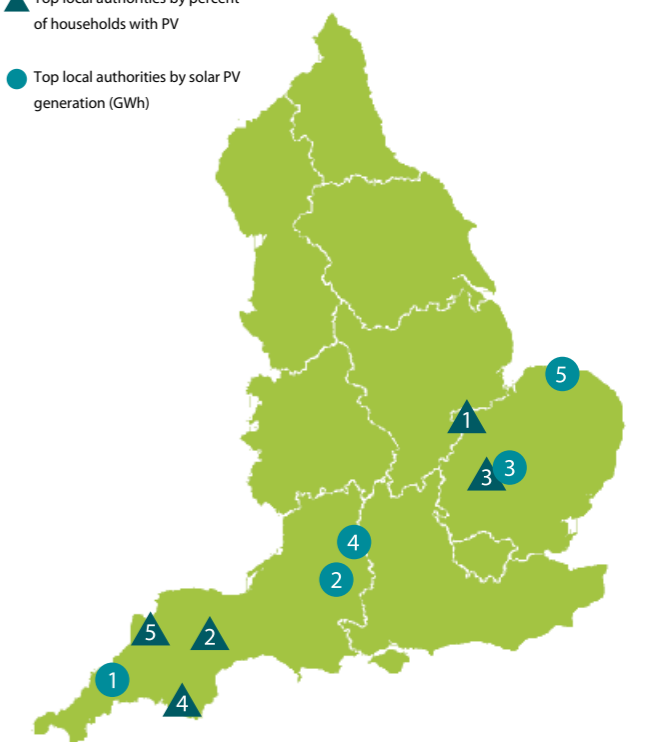
## Local authority league tables

Top local authorities by percentage of households with PV	Percentage
1. Peterborough, Cambridgeshire	10.5
2. Mid Devon	10
3. South Cambridgeshire	8.7
4. South Hams, Devon	7.4
5. Torridge, Devon	7.4

Top local authorities by solar PV generation	GWh
1. Cornwall	516
2. Wiltshire	412
3. South Cambridgeshire	244
4. Swindon, Wiltshire	149
5. North Norfolk	143

## Local authority top five: solar pv

- ▲ Top local authorities by percent of households with PV
- Top local authorities by solar PV generation (GWh)



# Solar thermal



Source CHP solar thermal installation in Harford, East Devon

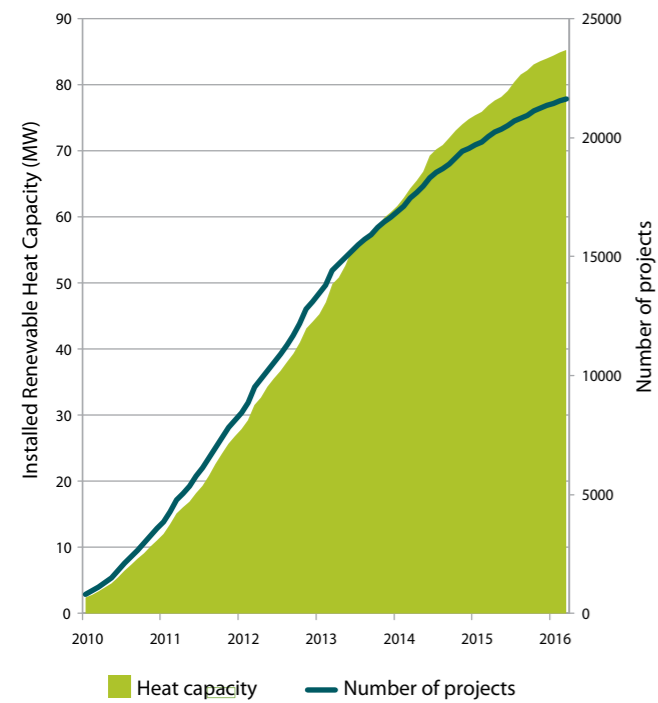
# Hydropower



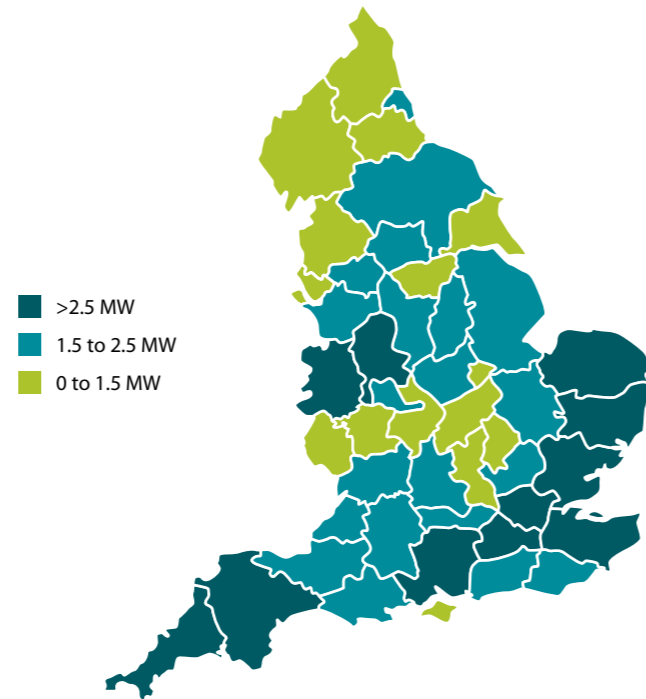
Renewables First 60 kW Archimedes screw turbine, Berkshire

Installed capacity of solar thermal across England now totals 75.6 MW through 19,256 projects. There were 1,422 projects installed in 2015/6, adding 5.5 MW.

Trends in growth of solar thermal

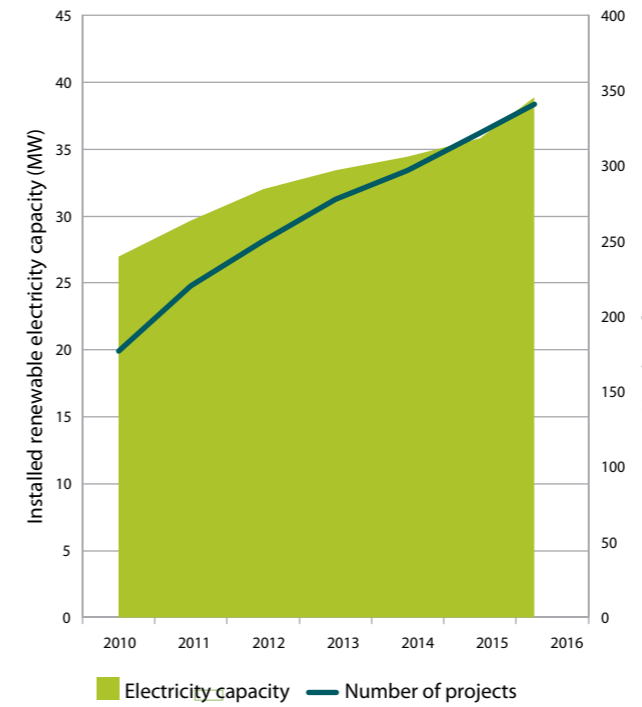


Distribution of solar thermal capacity

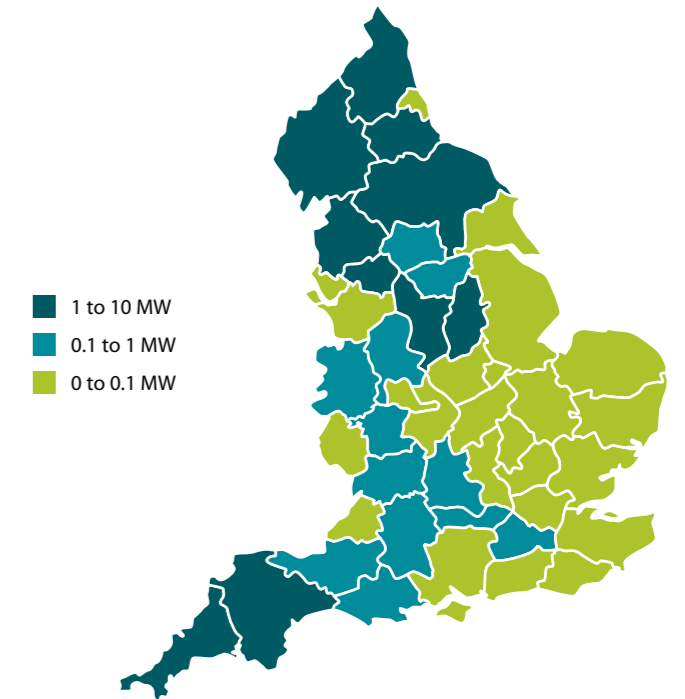


Hydropower in England grew slowly in 2015/16, with 15 projects installed, adding just under 3 MW of capacity. There is now 39 MW of installed capacity of hydropower in England, compared with 1.8 GW across the UK as a whole.

Trends in growth of hydropower



Distribution of hydropower capacity



## Analysis

Solar thermal has grown steadily since 2009, mainly due to the RHI. The installation rate peaked in 2012/13 at 4,363 projects – still nothing like the growth of PV, which solar thermal competes with for roof space and investment.

Around half of all installations are in the south east or south west, demonstrating a strong correlation with solar resource and affluent consumers. Local clusters are driven by social housing.

## Future

The government has proposed ending eligibility of solar thermal to the RHI and cancelled the 2016 Zero Carbon Homes policy. This will lead to deployment, which has never achieved high rates, dropping further. However, solar thermal is a mature technology, with low installation costs and demand is likely to continue in off-gas grid areas; social landlord properties; and new build properties where local planning policy requires low carbon measures.

## Analysis

The introduction of the Feed-in Tariff led to a slight increase in projects from 2010, but the rate dropped again in 2015/16 due to FIT cuts. The south west is the leading region with 12 MW of installed capacity. Development is concentrated on areas with the greatest resource and with local initiatives such as the South Somerset Hydropower Group, which coordinated installations across 9 historic mills.

## Future

There are a number of sites with pre-accreditation for the FIT that will be developed before February 2018. Once those schemes are built, England is likely to see very low deployment rates. With limited scope for cost reductions, industry focus will be on: higher head sites in north Wales and Scotland; sites with onsite usage; and the refurbishment of existing sites.

## Energy from solar thermal in England

Geographical area	Total (March 2016)		New in 2015/2016	
	Number of projects	Capacity (MWth)	Number of projects	Capacity (MWth)
East midlands	1,428	5.4	100	0.3
East of England	3,118	13.2	250	3.1
London	1,123	4.1	85	0.3
North east	1,009	3.6	74	0.2
North west	1,653	5.9	96	0.4
South east	5,522	17.8	382	1.4
South west	4,456	15.9	342	1.2
West midlands	1,831	13.6	124	0.7
Yorkshire and the Humber	1,238	4.6	117	0.5
<b>Grand total</b>	<b>21,378</b>	<b>84</b>	<b>1,570</b>	<b>8.2</b>

## Energy from hydro in England

Geographical area	Total (March 2016)		New in 2015/2016	
	Number of projects	Capacity (MWe)	Number of projects	Capacity (MWe)
East midlands	27	4.3	1	0.006
East of England	8	0.1	-	-
London	-	-	-	-
North east	12	7.9	-	-
North west	61	9.3	4	1.7
South east	25	1.1	-	-
South west	143	11.8	8	1.1
West midlands	22	1.2	1	0.1
Yorkshire and the Humber	44	3.4	1	0.1
<b>Grand total</b>	<b>342</b>	<b>39.1</b>	<b>15</b>	<b>3</b>



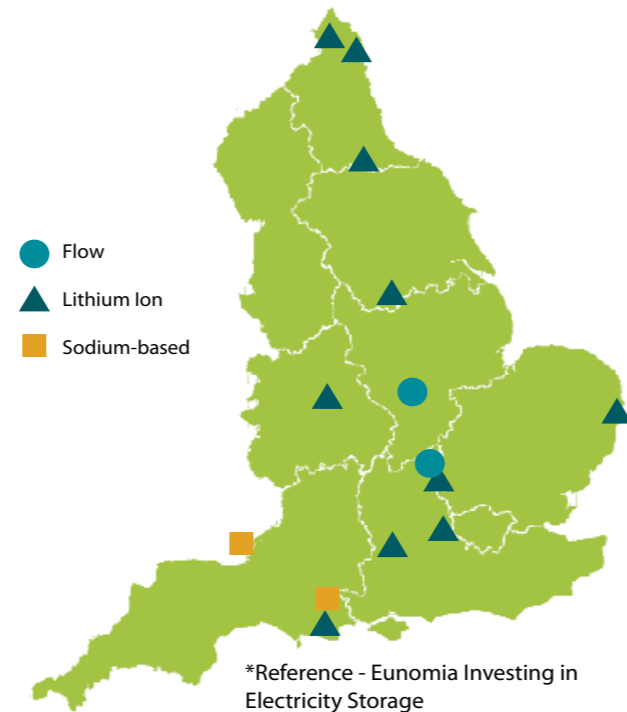
As we move to more distributed and variable power generation there is a need for a smarter and more flexible energy system. The National Infrastructure Commission's Smart Power report estimates that smart power could save consumers up to £8 billion a year by 2030, help the UK meet its 2050 carbon targets, and secure the UK's energy supply. Storage is a key innovation area that will provide greater flexibility and high growth potential if the barriers to the market are tackled.

## Large scale electricity storage

While hydro and pumped storage has been around for some time, the industry focus for new storage projects has been on the potential of battery storage. Underlying factors include the rapid fall of battery costs and growth of variable generation while the demand for flexibility increases. National Grid's 200 MW Enhanced Frequency Response tender at the beginning of 2016 led to 1.8 GW of applications, 88 per cent of which were from battery storage providers. Requests to connect storage to the distribution network are flooding in, with Western Power Distribution and UK Power Networks alone receiving over 11 GW of applications in England and Wales.

Although many of these connection applications will be speculative, they are an indication that the availability of grid capacity will be a key determinate of the location of the first wave of storage projects that aim to provide ancillary services to the network. The wider market for local supply balancing, and for distributed generation and energy user support, is expected to follow.

Battery storage projects in England\*



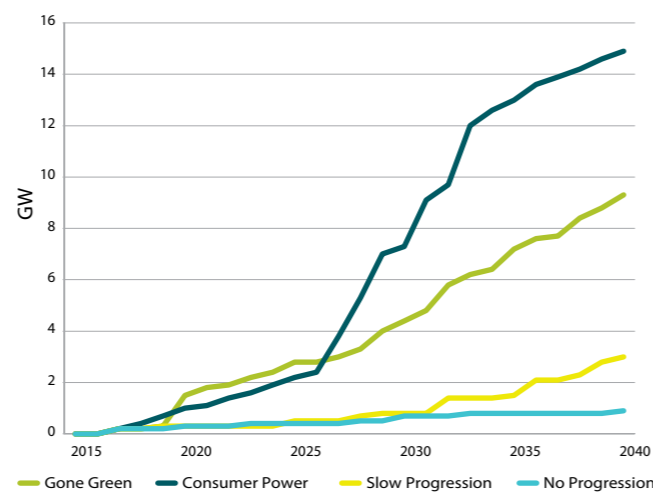
## Future Energy Scenarios

The wide range in storage deployment under National Grid's 2040 Future Energy Scenarios show the level of uncertainty on how storage will develop.

A key challenge for the industry is to create viable (long term) business models that are attractive to investors and ultimately bankable. The good news is that given energy storage's intrinsic value to provide an energy reserve, rapid response and the time/price shift of energy demand or supply there are plenty of value streams to tap into. The difficulty is to combine revenue streams in a way that is compatible within the technical, regulatory and commercial constraints of the current market.

Growth factors in the short term will be the rate of cost reductions, the firmness of combined revenue streams, the clarification of regulation and improvements in how National Grid and DNOs procure services.

National Grid FES 2016: New installed storage capacity excluding pumped storage (Reference - National Grid)



## Domestic electricity storage

It is early days for domestic storage technologies and it is difficult to assess the number of installations as there is currently no mechanism for recording and reporting them. Despite recent Department of Energy and Climate Change and Innovate UK trials, which have installed 350 domestic energy storage units to test the business case for aggregation of domestic energy storage for providing grid services, the UK domestic storage market still lags some way behind Germany and the US.

A number of domestic battery installers and suppliers have recently joined Regen as members and, although payback periods are still long, they are reporting a steady increase in demand from customers installing new PV. We look forward to reporting on their progress in future reports.



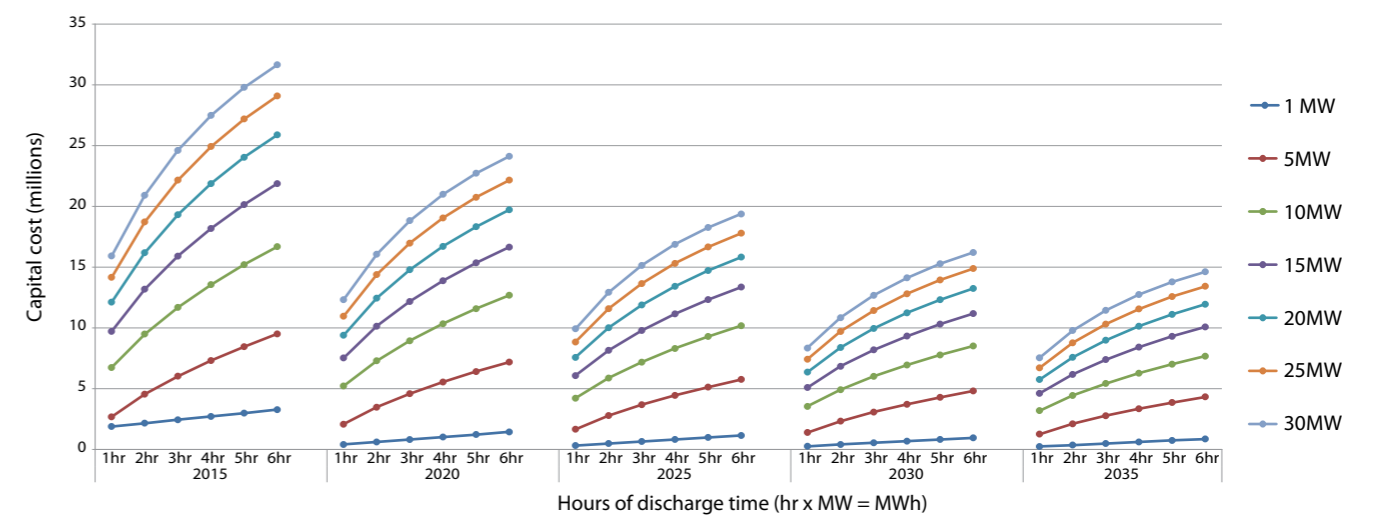
## Projections for energy storage costs

Falling energy storage costs will be a critical factor in the speed and scale of the take up. For a 'white paper' on storage, Regen has examined the costs of different scales of batteries with different performance characteristics in terms of the MWh they can supply.

Our analysis supports the hypothesis that energy storage costs will fall rapidly due to economies of scale, and technology and market development over time; but highlights this drop will be different depending on the service the battery is designed for.

Understanding the details of how costs could fall will be important to understanding which applications battery storage is likely to become viable for first.

Regen SW: Projected cost reduction over time 2015-35 (illustrative Lithium Ion)



## Case study - Powervault

Powervault launched their next generation 'G200' model in May 2016. It is more efficient than their G100 system, uses either Lead Acid or Lithium-ion batteries, provides emergency power during power cuts and stores off-peak, Economy 7 electricity. Sixty Powervault G200s have been installed to date.

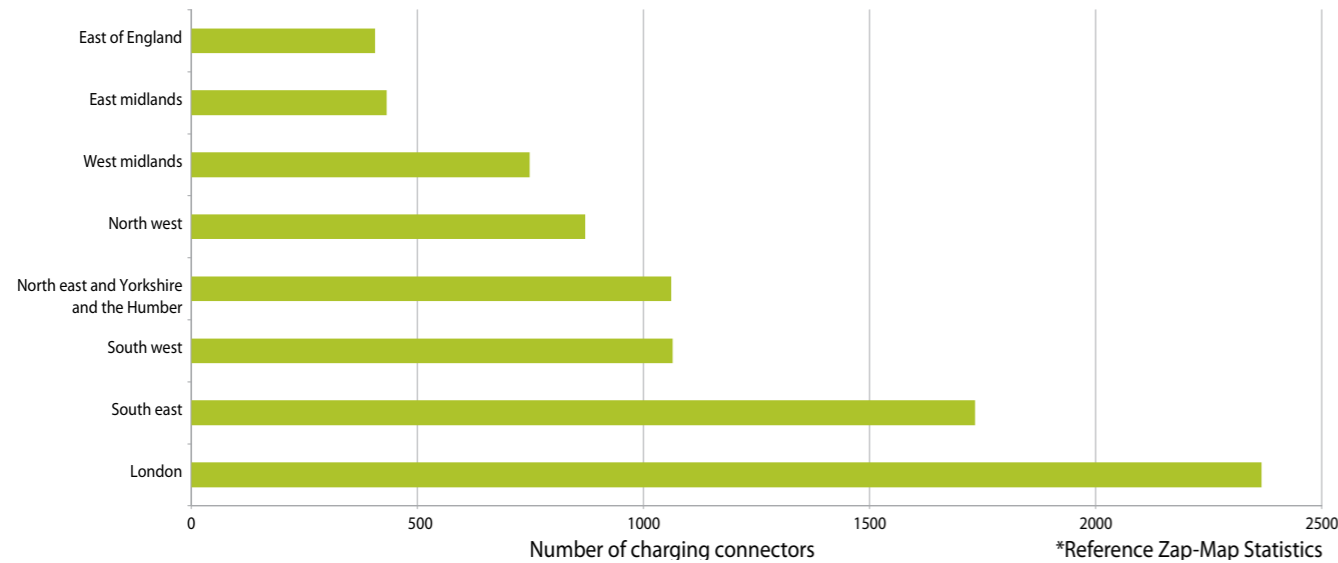
# Transport



Nottingham has the largest electric bus fleet in Europe

Over 52,600 electric vehicles have been purchased in England through the government's plug-in car and van grants scheme, of which 1,824 were plug-in vans. Electric car purchases are increasing rapidly due to a focus from car companies coupled with government grants.

ZAP-MAP: EV charging point connectors across England\*



## Analysis

The south east is the leading region with over 11,800 electric vehicle purchases by April 2016, and nearly 50 per cent of charging connectors located in London and the south east. The highest local concentrations of purchases tend to be in areas with a national leasing firm, such as Lex Autolease in Birmingham. There are over 4,000 public charging point locations across the UK, with their number growing consistently each month.

## Alternative low carbon vehicles

Hydrogen vehicles are also being supported by the government, for example through the £2 million Fuel Cell Electric Vehicle Fleet Support Scheme, announced in May 2016 to support investment in hydrogen-powered fleets. Biomethane is also growing as a fuel – Geneco's gas to grid AD plant at Avonmouth produces biomethane for a bio-bus that operates in Bristol.

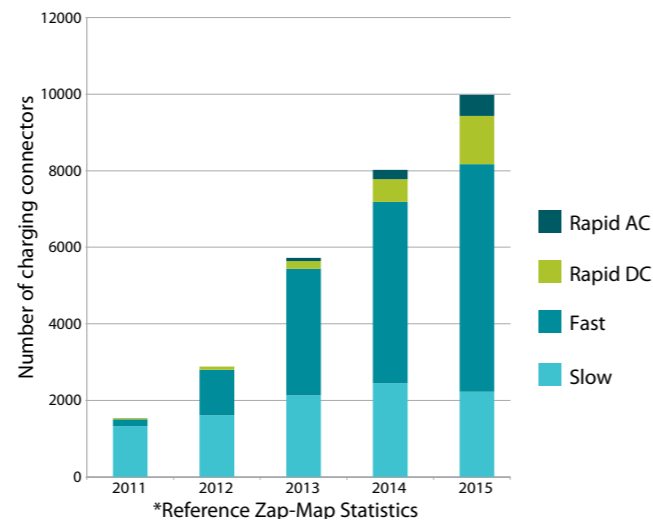
## Future

According to Bloomberg New Energy Finance, electric vehicles will be cheaper to own than conventional cars by 2022, based largely on falling battery prices. National Grid's Future Energy Scenarios 2016 estimates there will be between four and ten million plug-in vehicles on UK roads by 2040. Purchases of electric vehicles are likely to be most concentrated in affluent areas with supporting infrastructure.

Local authority league tables

Top local authorities by number of electric vehicles purchased	Number of electric vehicles
Birmingham	5,449
Peterborough, Cambridgeshire	3,027
Slough, Berkshire	2,234
Swindon, Wiltshire	1,605
West Berkshire	1,416

ZAP-MAP: Charging connectors by type\*



Renewable energy: a local progress report for England 2016



“Regen SW Arts and Energy Programme, led by Chloë Uden, demonstrates what can be done at both a regional and a sectoral level to connect the arts to climate change.

A particular focus has been to find engaging – often fun – ways of encouraging more positive visions of a renewably powered future.”

Dr Joe Smith, Open University

## ICE Arts & Energy 200

Regen has been working with The Institution of Civil Engineers and Land Art Generator Initiative to develop an art competition in time for the Institution's 200<sup>th</sup> Anniversary in 2018 and a permanent art installation forming part of the long-term legacy.

## Power-culture

This blog exploring our energy generation through the arts is delivered by Regen and highlights events, opportunities, great ideas and resources to support artists and renewable energy project developers in finding new ways to engage people in the energy debate.

## Arts and Green Energy Awards

Regen SW are awarding an Arts and Green Energy Awards with a prize of £1000 supported by ICE, to recognise the crucial role that creative practitioners play in challenging and broadening the energy debate.



## Something Wonderful in My Back Yard

Through the development of SWIMBY, a wonderful community musical currently being written by Matt Harvey and Thomas Hewitt Jones, we want to communicate the breadth and ambition of community energy groups – to show that resistance is fertile, a half-full glass can be rose-tinted and, crucially, that if you reach for the stars you might just get to the pub.



# About Regen SW



Regen's communities' programme helps groups start and progress sustainable energy projects

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

We are an independent not-for-profit that uses our expertise to work with industry, communities and the public sector to revolutionise the way we generate, supply and use energy. We are ambitious on the scale of our impact and aim to be the leading national experts in how to enable radical change in the energy system at a local level.

We use three strategies to drive change:



## Experts

We work out what's wrong and how to put it right. We're experts in how sustainable energy works, and what needs to be done to make it work better, in areas such as technical, financial, business model and policy change.

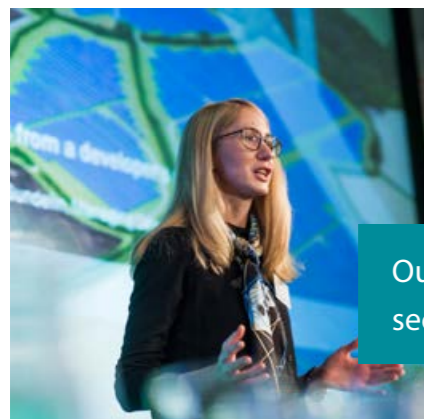
Our work with Western Power Distribution on detailed scenarios for distributed energy growth is underpinning their investment strategy.

## Pioneers

We get leading sustainable energy projects off the ground. Our work with the renewable energy sector, local authorities and communities means we are well placed for creating and driving new initiatives.



We supported over 450 small construction businesses to develop the skills and products to transform the energy efficiency of social housing.



## Conveners

We bring the right people together to come up with ideas and influence others and to make change and achieve things together that they can't do alone.

Our national Women in Renewables programme is supporting our sector to be an exemplar in using the talents of all society.

We help groups through:

- our community energy network of over 200 communities
- regular community energy updates and newsletters
- training and events that help communities network and build partnerships with industry and local authorities
- information, guides and tools
- influencing policy makers in government and beyond
- being a positive voice for renewables in the media
- projects that provide direct support

Support for groups at the early stages is free, we expect community groups at advanced stages to join as members of Regen, and we can also provide you with a quote if you need specific support.

### Community Energy Accelerator

This project funded by the Esmée Fairbairn Foundation is supporting 30 communities nationally to develop renewable energy projects, providing technical and engagement expertise and enabling these groups to form the necessary partnerships with businesses and local authorities.

### Local energy models

This Friends Provident funded project is exploring new models for community energy including heat, storage and local supply. It is convening the leading experts in these fields with our partners, 10:10, Forum for the Future and Community Energy England.

### Devon Community Energy Accelerator

Working with Devon County Council, we gave out over £60,000 of seed funding to 18 groups in Devon last year. With training and tailored support this led these groups to pre-accredit over 4 MW of rooftop PV in Devon and enabled groups to bring in £225,000 of Rural Community Energy Funding.

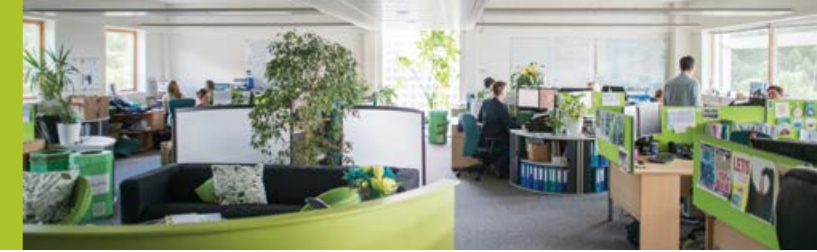


To join the network, contact Jodie on 01392 494 399 or [jgiles@regensw.co.uk](mailto:jgiles@regensw.co.uk)

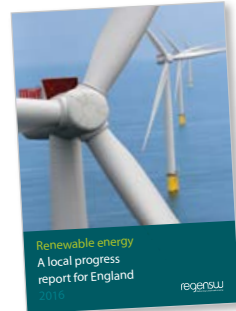
# The making of this report



# Meet the team



Regen began compiling a database of renewable energy projects in the south west in 2003 and has produced a Progress Report for the south west based on the data each year. This is the first year that we have extended the project to cover the whole of England.



Data for the Regen SW 2016 Progress Report was collected for the period 1 April 2015 to 1 April 2016, using a baseline created from national datasets, together with our south west baseline database.

We collected, cleansed, cross referenced and analysed information gathered from local authorities, industry, communities and from scouring the internet to produce

a picture of progress across the country.

Please contact us if you have information about projects that you feel are missing from our dataset so we can improve next year's Progress Report.

We will be working with Green Alliance to use this data to update the Renewable Energy Locator website in the autumn.

The key sources of data used include:

- Ofgem Feed-in Tariff data
- Renewables Obligation register
- Renewable Heat Incentive and Renewable Heat Premium Payment data
- MCS accredited projects
- RESTATS
- Utilities
- Installers and industry organisations

The report was led by our analysts Joel and Amy, please contact them if you have any questions about this report or how to licence the data.



**Joel Venn, senior analyst**  
jvenn@regensw.co.uk



**Amy Brimmicombe, analyst**  
abrimmicombe@regensw.co.uk

Regen SW would like to thank the wide range of organisations and individuals who have contributed to this report. In particular, we would like to thank:

- |                                |                                |                             |                              |
|--------------------------------|--------------------------------|-----------------------------|------------------------------|
| ■ 10:10                        | ■ Good Energy                  | ■ Peel Group                | ■ Southern Water             |
| ■ Abundance Investment         | ■ Green Alliance               | ■ Plymouth Energy Community | ■ Sun and Soil               |
| ■ Anglian Water                | ■ Greenvale                    | ■ Powervault                | ■ SunGift Energy             |
| ■ Belltown Power               | ■ Haymaker Energy              | ■ Primrose Solar            | ■ Tidal Energy Ltd           |
| ■ Bloomberg New Energy Finance | ■ Hive Energy                  | ■ PS Renewables             | ■ Tidal Lagoon Swansea Bay   |
| ■ BNRG Renewables              | ■ Inazin                       | ■ Public Power Solutions    | ■ The Crown Estate           |
| ■ Bristol City Council         | ■ Infinis                      | ■ Push Energy               | ■ TLT LLP                    |
| ■ British Solar Renewables     | ■ James Fisher Marine Services | ■ Rehau                     | ■ Treco                      |
| ■ Cenex                        | ■ James Reddy PR               | ■ Renewables First          | ■ University of Bristol      |
| ■ Cradle Infrastructure        | ■ JFS & Associates             | ■ REG Windpower             | ■ Viridor                    |
| ■ DONG Energy UK               | ■ Johns Associates Ltd         | ■ RES                       | ■ WATTSTOR                   |
| ■ Earthworm                    | ■ Lark Energy                  | ■ RWE Innogy                | ■ Wells Printing             |
| ■ Eco Angus                    | ■ Lightsource                  | ■ SC Innovation             | ■ Wessex Solar Energy        |
| ■ Ecotricity                   | ■ Low Carbon                   | ■ Seatricity                | ■ Wessex Water               |
| ■ EDF Energy Renewables        | ■ Micro Hydropower Association | ■ Severn Trent Water        | ■ Western Power Distribution |
| ■ EGS Energy Limited           | ■ Momentum Graphics            | ■ SFW Communications        | ■ WREN                       |
| ■ Elgin Energy                 | ■ National Grid                | ■ Sillson Communications    | ■ Yorkshire Water            |
| ■ Eunomia                      | ■ Northumbrian Water           | ■ Solar South West          | ■ Your Group                 |
| ■ Gemserv                      | ■ Nottingham City Council      | ■ Solarsense                | ■ ZAP-MAP                    |
| ■ GENeco                       | ■ Ofgem                        | ■ Solstice Renewables       |                              |
|                                | ■ OMNIE                        | ■ South West Water          |                              |

The Regen team is always happy to answer queries from our members and to discuss new partnership opportunities. The first point of contact for our main areas of work are given below, with full details of all our team on our website: [www.regensw.co.uk/about-us/our-team](http://www.regensw.co.uk/about-us/our-team)

To speak to any of the team, call us directly on 01392 494399.



## Membership

**Rachel Hayes**  
rhayes@regensw.co.uk

Contact Rachel, head of membership and events and her team to discuss our events, sponsorship opportunities or joining Regen SW.



## Communities

**Jodie Giles**  
jgiles@regensw.co.uk

Contact Jodie, senior project manager, if you are a community energy group or interested in working with our communities network.



## Offshore energy

**Johnny Gowdy**  
jgowdy@regensw.co.uk

Contact Johnny, director, if you are working in the marine and offshore wind sectors.



## Onshore electricity

**Cheryl Hiles**  
chiles@regensw.co.uk

Contact Cheryl, director, and her team if you are involved in grid access, storage, onshore electricity generation projects or energy efficiency.



## Smart

**Tamar Bourne**  
tbourne@regensw.co.uk

Contact Tamar, senior project manager, if you are interested in smart energy or local supply.



## Public sector

**Hazel Williams**  
hwilliams@regensw.co.uk

Contact Hazel, head analyst, if you are interested in local authority membership or working with the public sector.



## Renewable heat

**Olly Frankland**  
ofrankland@regensw.co.uk

Contact Olly, project manager, if you are working in the renewable heat sector or looking to install renewable heat technologies.



## Arts

**Chloë Uden**  
cuden@regensw.co.uk

Contact Chloë, programme manager, if you are interested in getting involved in our arts and energy programme.





We are an independent not-for-profit that uses our expertise to work with industry, communities and the public sector to revolutionise the way we generate, supply and use energy.

# Join us

[www.regensw.co.uk/membership](http://www.regensw.co.uk/membership)

member

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delivering sustainable energy