

7. Electricity demand



SUMMARY

‘Demand for electricity will be flat or falling’

Previous DECC projections have shown rising demand for electricity up to 2030 as the electrification of heat and transport accelerates.

Without policy interventions in heat and transport, respondents did not expect electricity demand to increase significantly over the next five to ten years, though beyond 2025 the picture becomes less certain. Most predicted flat or gently falling demand in the short- to medium- term in line with recent trends.

There is greater uncertainty the further out one looks. Some respondents thought the market for electric vehicles could potentially take-off in the second half of the 2020s if technology costs continued to fall or if additional Government support became available. Most saw only limited electrification of heat over this period, with gas remaining the predominant fuel for domestic heating in GB.

7.1 Interview responses

Interviewees were strongly aligned in the view that electricity demand would be flat or falling in the short- to medium-term, although some acknowledged there was more uncertainty beyond 2025. No respondents predicted sharply increasing demand for electricity due to expectations on the slow electrification of heat and transport sectors, moderate economic growth and energy efficiencies.

A few interviewees thought that demand could increase post-2025 should new technologies such as electric vehicles (and potentially electric heat) were to take off. Most, however, saw oil and gas continuing as the major fuel source in these sectors. Many noted electrification of heat and transport was highly dependent on public support mechanisms.

Interviewees also mentioned the importance of an increased focus on energy efficiency over the period and its contribution to electricity demand. Energy efficiency is discussed in more detail in chapter 4.

Interviewees expressed views such as:

“Demand is not likely to rise as quickly as in existing projections.”

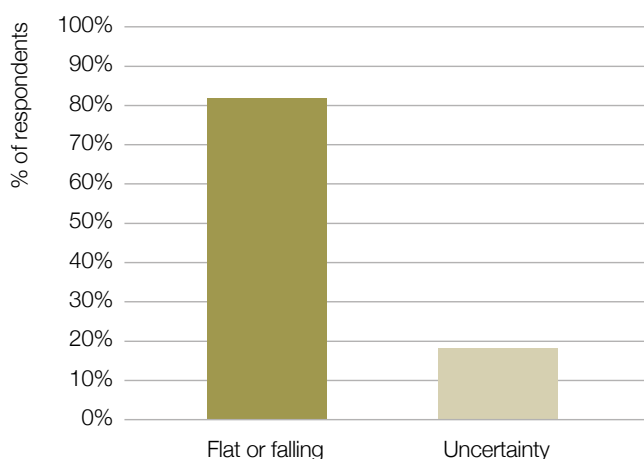
“Transport could have an effect on electricity demand but this is unlikely to happen in the 2020s.”

“Demand is likely to decline given energy efficiencies and consumer interest in savings.”

“At best, demand will be flat.”

“There is unlikely to be an increase in demand due to heat and transport without Government intervention.”

Figure 27: How will electricity demand change in the future?



7.2 Analysis

7.2.1 DECC energy and emissions projections

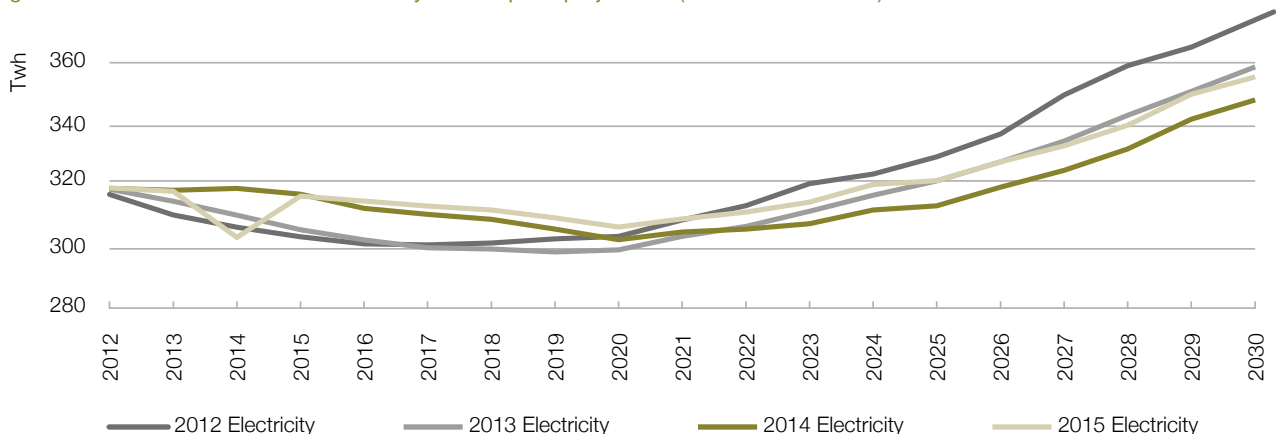
The views expressed by interviewees show the industry takes a different perspective than DECC in its previous energy and emissions projections, which show a fall in demand to 2020 but significant growth from 2020 to 2035. Although the latest DECC projection available when interviews were being conducted was the 2014 publication, DECC has subsequently released its 2015 projections. The comments provided therefore relate in principle to the 2014 projections, but reference and comparison is made to the 2015 projections for completeness.

In its 2014 Updated Energy and Emissions Projections, DECC estimated that total electricity demand would dip from 2014

to 2020 and increase up to the 2030s. In its 2015 projections, DECC forecasts electricity demand to increase from c. 300 TWh in 2014 to c. 350 TWh in 2030, a total increase of around 17% over the period. Figure 28 shows the latest DECC demand forecasts and the evolution of its forecasts. The comparison across different forecasts demonstrates how DECC's forecasts have generally decreased over time.

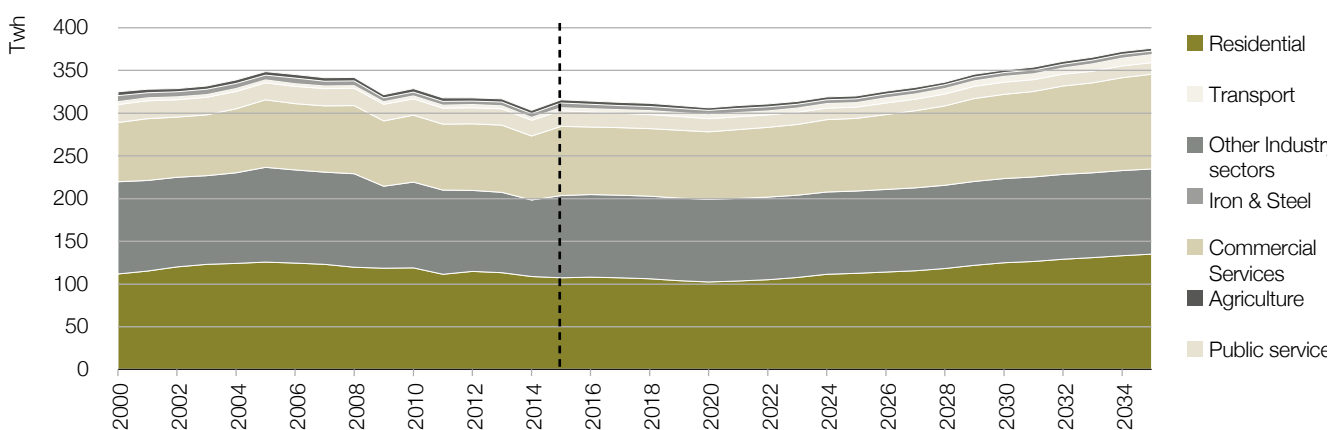
The fall and rise in electricity demand in DECC's projections is largely driven by consumption in the residential and commercial services sectors, in particular residential (see Figure 29). Residential electricity consumption, in DECC's projections, is driven largely by the "declining impact of existing policies",

Figure 28: Evolution of DECC total electricity consumption projections (excl. aviation sector)



Source: Department of Energy and Climate Change, Energy and Emissions Projections, 2012-2015

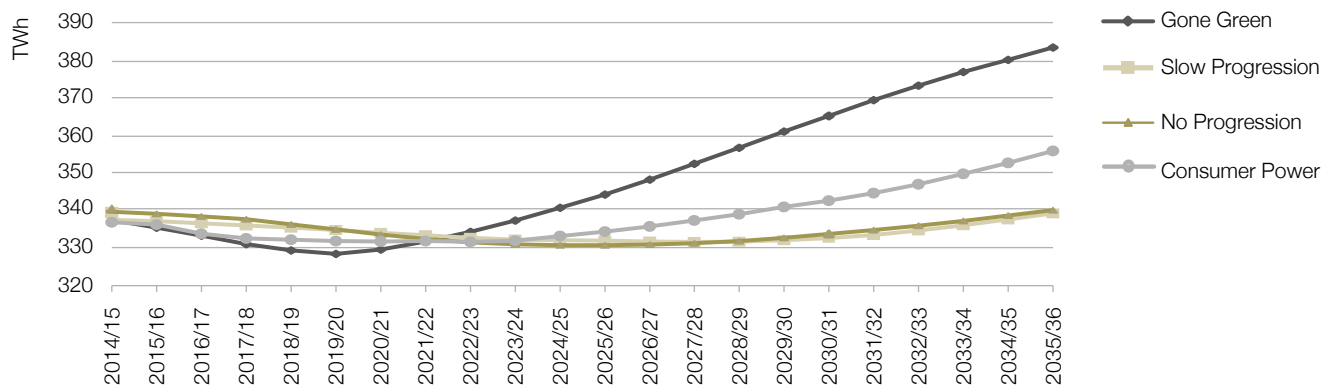
Figure 29: Total and projected electricity demand by sector (2015 projections)



Source: DECC (2015), Updated energy and emissions projections

7. Electricity demand (continued)

Figure 30: National Grid 2015 electricity demand forecast



Source: National Grid (2015), Future Energy Scenarios

primarily because without policy intervention “there is little underlying trend improvement in energy efficiency in this sector”. DECC explains that this is particularly the case for electricity demand where “existing energy efficiency policies drive the medium term fall”. Post 2020, it is expected that “rising prosperity and population growth, starts to outweigh the savings delivered by existing energy efficiency policies” as the marginal benefit of energy efficiency decreases.

7.2.2 Other industry forecasts

National Grid’s latest Future Energy Scenarios (FES) forecast shows a lower demand projection than in DECC’s 2015 Updated Energy and Emissions Projections.

The 2015 FES shows a CAGR of 0.02% for the ‘Slow Progression’ and ‘No Progression’ scenarios from 2014/15 to 2035/36. The highest growth scenario, Gone Green, shows a CAGR of only 0.62%, compared with DECC’s previous reference case that showed 0.82% CAGR over this period. The Gone Green scenario includes a significantly higher degree of electrification throughout the GB economy, which contributes to the higher demand growth forecast.

National Grid’s latest FES forecast reflects recent trends of falling or flattening views of future electricity demand. In previous forecasts, National Grid had more bullish demand forecasts as a result of changing economic growth and technological assumptions.

Many developed countries are forecast to experience low or modest electricity demand growth. In the United States, the Energy Information Administration, in its Annual Energy Outlook (2015), forecasts electricity demand to increase from c. 11,500 TWh in 2014 to c. 13,000 TWh in 2035, a relatively low CAGR of c. 0.5% (see Figure 31).

7.2.3 Transport sector decarbonisation

One of the key factors behind electricity demand over the 2020-2030 period is the up-take of electric vehicles (EVs). To date, deployment of EVs in GB has been highly dependent on the availability of support packages and interviewees were generally sceptical of whether EVs would be deployed on a large-scale unless significant Government action was taken. Interviewees noted two main technological constraints for the uptake of EV as the lack of supporting infrastructure such as charging points as well as the cost of EV batteries relative to fuel prices.

Ultra-low emissions vehicles have had slow up-take in GB over the last decade but have picked up with the introduction of grant subsidy. An average of only 234 vehicles were registered per month over the period 2010-2013 (see Figure 32). Since 2014, however, up-take has increased significantly since the introduction of grant funding, and over Q4 2014 and Q1 2015 ultra-low emissions vehicles made up c. 1% of new vehicle registrations for the first time.

⁵⁸ https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/307019/ulev-2015-2020.pdf

⁵⁹ Institute of Energy, Uncertainties in decarbonising heat in the UK; July 2015

⁶⁰ The Telegraph, Homes with electric heating face paying £360 a year in green levies; December 2014

⁶¹ Energy Technology Institute, The ETI is seeking expressions of interest to understand how electric heating can play a role in decarbonisation of heat in UK homes; June 2015

In April 2014, the coalition government announced the £5,000 grant incentive for ultra-low emissions vehicles would remain in place⁵⁸. This has had a significant impact on up-take in 2014 and 2015. In the recent Autumn Statement, the current government announced they would be extending the support for electric vehicles to £600 million over the next five years. It is uncertain if the entire package will be allocated by that date and if the Government is committed to the package beyond five years.

As well as the introduction of subsidies leading to increased sales, there is evidence to suggest removal of subsidies has a significant impact. Figure 33 below shows the impact of the removal of subsidies in the Netherlands and the resulting fall in sales.

Norway is considered the most advanced market with respect to EV infrastructure, consumer appetite and cost of technology, and has the largest market share of electric vehicles at 18% in 2014 (DfT), up from just 2% in 2011. Since 1990, the Norwegian government has implemented a range of policies to stimulate demand and improve the infrastructure, such as: removal of import taxes; reduced annual registration tax; income tax deductions; toll road exemptions; free public parking; 0% VAT; bus lane access; and building superfast charges all over the country. Norway also has 8,803 public EV charge points, despite the small size of the overall car market.

7.2.4 Low-carbon heat

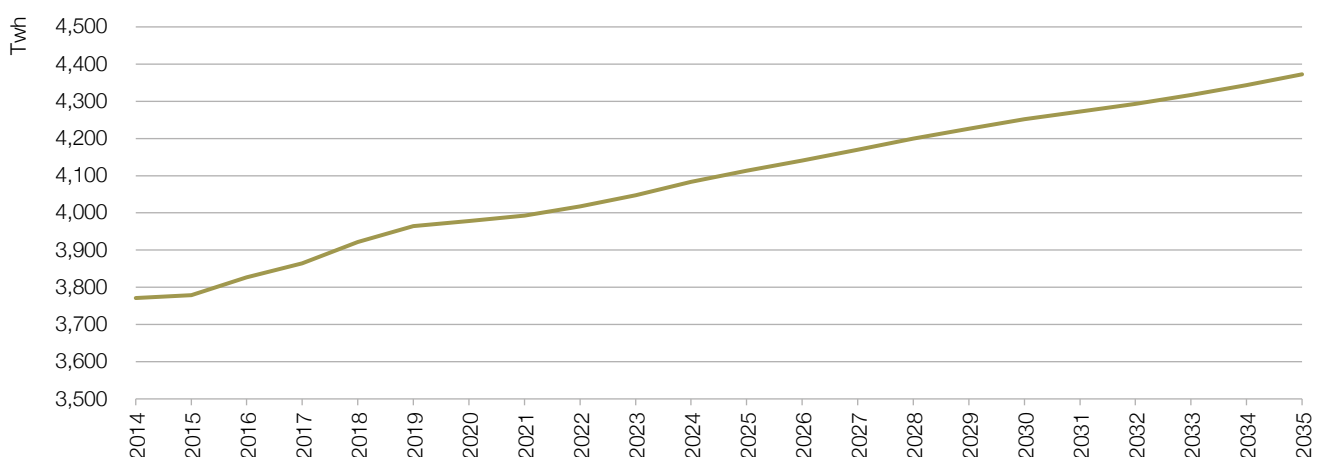
Similar to electric vehicles, several interviewees were sceptical over the likely uptake of electric and renewable heat over the period due to cost considerations, performance and general consumer engagement.

In the UK, 46% of energy is consumed to provide heat sources, of which 81% of total demand for heat is provided by gas networks⁵⁹. Currently, the majority of domestic heating is provided by gas-fired boilers with only 7% of UK homes using electric heating⁶⁰.

The main technologies used in production of electric heating include electric boilers for central heating systems, warm air systems, panel heaters and heat storage systems. However, in the UK, heat pumps are still relatively new compared to other European markets. Under current conditions, in terms of cost and performance, electric heating systems are considered to be an unattractive alternative to gas heating systems for domestic purposes⁶¹. For cost-effectiveness, electric heating should also only take place in energy efficient homes (chapter 4).

The peak demand for heat is about five times higher than the peak demand for electricity. Switching heating sources to electric heating will significantly impact the electricity generation and distribution network⁶². If all the heat pumps would be sourced through electricity, the peak demand for electricity would increase by 24-46 GW compared to current level of around 65 GW, therefore requiring additional capacity and upgrades to network infrastructure. There are alternative technological options in development, such as decarbonisation of gas networks, which

Figure 31: EIA projected total US electricity generation

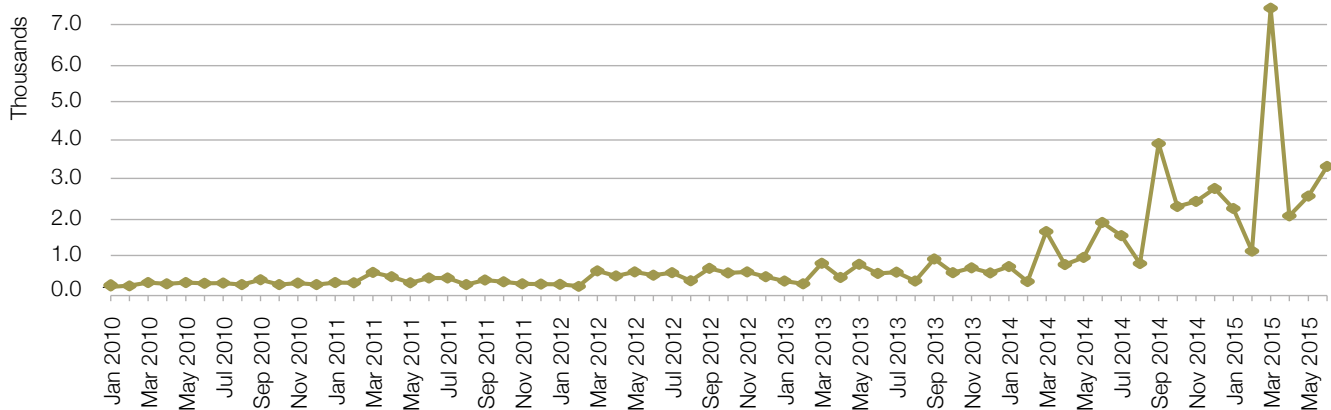


Source: US Energy Information Administration, (2015), Annual Energy Outlook 2015

⁶² Carbon Connect, Pathways for Heat: Low Carbon Heat for Buildings; November 2014

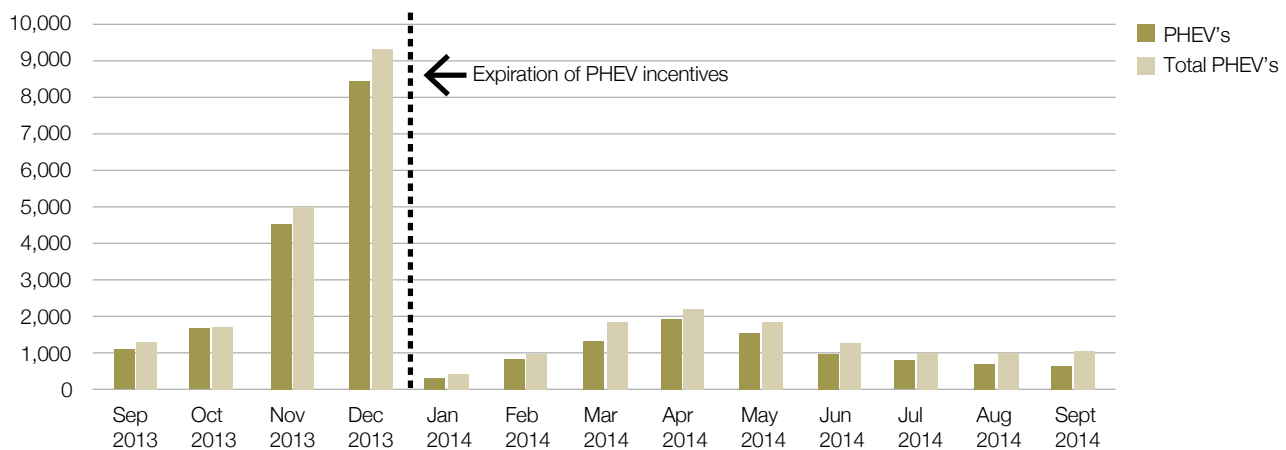
7. Electricity demand (continued)

Figure 32: Newly-registered ultra-low emissions vehicles in GB (monthly)



Source: DfT (2015), <https://www.gov.uk/government/publications/number-of-newly-registered-ultra-low-emissions-vehicles>

Figure 33: EV sales in the Netherlands



Source: Office for Low Emission Vehicles (2015), Uptake of Ultra Low Emission Vehicles in the UK, from Vergis et al (2014)

are not discussed in this report but which deserve consideration going forwards.

Although there are no policy to directly incentivise electric heating, the Government has implemented the Renewable Heat Incentive (RHI) to encourage renewable heating. This promotes technologies such as air/ground-source heat pumps, biomass-based boilers, and solar thermal panels for existing homes. Figure 34 shows the number of applications under the scheme and the cumulative installed capacity.

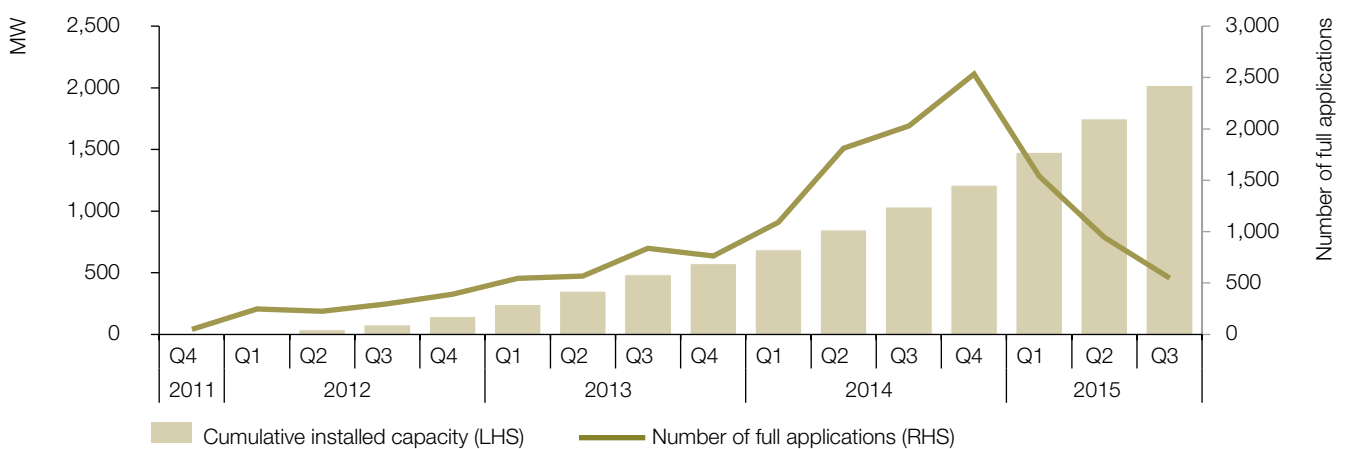
While uptake of these technologies have been growing, total installed capacity is still negligible relative to the entire industry. Interview respondents mentioned that uncertainty regarding the potential expiration of RHI post-2020 had resulted in a reduction in the pipeline. The Government has subsequently announcement continued support of £1.15 billion by 2020/21.

The electric and renewable heating technologies currently exist in the market, but with cost considerations and low consumer interest and in the absence of policy incentives, the demand

for electric heat is unlikely to cause a spike in demand. This is against the backdrop of considerable uncertainty on the optimal policy framework for low carbon heat, hence resulting

in continued unpredictable demand over the long-term. Any policy implications should be considered in view of the whole system approach as described in chapter 2.

Figure 34: Non-domestic RHI - number of applications vs. cumulative installed capacity



Source: UK Government RHI deployment data; December 2015

Table 6: Renewable Heat Incentive Applications 2011-2015

Tariff Band	Capacity of full applications (MW)	Full Applications (Number)
Small Solid Biomass Boiler (< 200 kW)	1,388.6	11,556
Medium Solid Biomass Boiler (200-1000 kW)	484.2	818
Large Solid Biomass Boiler (> 1000 kW)	180.0	33
Small Solar Thermal (< 200 kW)	4.0	260
Small Water or Ground Source Heat Pumps (< 100 kW)	9.1	324
Large Water or Ground Source Heat Pumps (>100 kW)	41.4	71
Biomethane5	0.0	29
Biogas	24.6	42
Air Source Heat Pumps	2.0	46
CHP	1.3	2
Deep Geothermal	0.0	0
TOTAL	2,135.2	13,181

Source: UK Government RHI deployment data; May 2015