

Feed-in Tariff load factor analysis

Introduction

This article updates the FIT load factor analysis presented in the December 2014 edition of Energy Trends¹ with data for FIT year five (financial year 2014/15). We also present regional analysis of solar PV for the four years that data has been published (FIT years two to five) and for wind for year five. All the data in this article is also available in excel format at the following link, including quarterly load factors for solar PV:

www.gov.uk/government/statistics/quarterly-and-annual-load-factors

Background

The Feed-in Tariff (FIT) scheme was launched in April 2010. It is a financial support scheme for eligible low-carbon electricity technologies, aimed at small-scale installations. The following technologies are supported:

- Solar photovoltaic (PV; Up to 5 MW capacity)
- Anaerobic digestion (AD; Up to 5 MW capacity)
- Hydro (Up to 5 MW capacity)
- Wind (Up to 5 MW capacity)
- Micro combined heat and power (MicroCHP; Up to 2 kW capacity)

Installers receive support through generation and export tariffs, paid directly from electricity suppliers. The generation tariff is based on the number of kilowatt hours (kWh) generated whereas the export tariff is based on electricity that is generated on site, not used and exported back to the grid.

Since the start of the scheme, DECC has provided regular updates on the number and capacity of installations installed under the scheme, currently publishing monthly updates on deployment levels with quarterly reports on geographical distribution, amongst other outputs². From 2013, DECC obtained meter readings for each registered installation from Energy Suppliers and used this to produce quarterly and annual load factors for FIT years two to four (data from year one is not available as the number of installations running for the full year was very small).

Methodology

The methodology used for the load factor analysis has been described in detail in an Energy Trends article from September 2014³. One additional quality assurance (QA) step has been added for 2015, to remove any installations from the analysis where more than one generation meter is attached. This step has only been applied to FIT year five data; previously produced statistics have not been revised. Please note that full QA on data from all installations has not been possible.

Table 1 shows how many installations were registered on the Central Feed-in Tariff Register at the start of FIT year five and how many installations had meter readings in March 2014 and 2015. Extreme values were excluded as in previous year's analysis, with just 0.9% of installations (1,739) removed. The column 'Valid load factor' in Table 1 indicates how many installations were included in the final analysis for each technology for the annual generation data. Anaerobic Digestion data has been included in the main results for the first time, but this data must be treated with caution as the number of installations remains low.

¹ The article published in December 2014 can be found at: www.gov.uk/government/statistics/energy-trends-december-2014-special-feature-article-feed-in-tariff-load-factor-analysis

² The full FIT statistics collection can be found at: www.gov.uk/government/collections/feed-in-tariff-statistics

³ The article published in September 2014 can be found at: www.gov.uk/government/statistics/energy-trends-september-2014-special-feature-article-analysis-of-feed-in-tariff-generation-data

Table 1: Installations included in analysis by Technology – FIT Year 5

Technology	Commissioned by 1st April 2014	Generation Data Reported*	Valid load factor	% remaining in analysis
Anaerobic digestion	214	26	24	11
Hydro	632	186	175	28
Micro CHP	505	83	83	16
Photovoltaic	615,550	195,413	193,708	31
Wind	6,609	2,545	2,524	38

* Meter reading in March 2014 and March 2015.

Results

Table 2 gives the weighted mean and median load factors as well as associated percentiles for each technology. Chart 1 presents this data across all available years (FITs years two to five), highlighting the large range present for Hydro compared to other technologies.

Table 2: FIT Year 4 (2014/2015) load factors by technology

Technology	Count	Mean	Weighted mean	Percentile				
				5 th	25 th	50 th (median)	75 th	95 th
Anaerobic Digestion	24	71.9	73.0	29.1	67.0	78.5	84.9	98.2
Hydro	175	41.0	39.7	12.9	28.8	37.2	52.9	75.3
MicroCHP	83	12.5	12.5	4.6	8.4	12.0	15.5	23.3
Solar PV	193,708	10.2	10.2	7.3	9.3	10.4	11.3	12.7
Wind	2,524	19.5	25.3	5.9	11.2	18.1	25.9	39.3

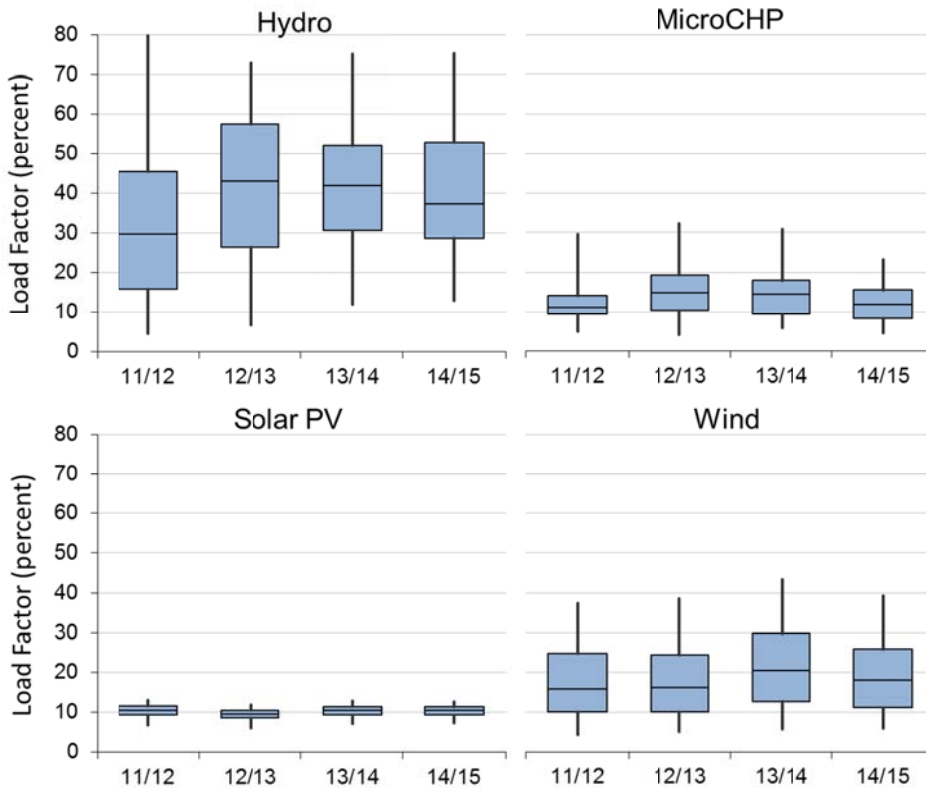
The median load factor for Solar PV in 2014/15 is the same as in 2013/14 (10.4%). This is expected, as the average daily sun hours are the same for both periods (4.5 hrs)⁴, see Table 3.

Table 3: Solar PV load factors and average sun index

Year	Median load factor	Average daily sun hours
2011/12	10.5	4.5
2012/13	9.6	3.7
2013/14	10.4	4.5
2014/15	10.4	4.5

⁴ Average daily sun hours taken from Energy Trends section 7: weather, table 7.3 "Average daily sun hours and deviations from the long term mean (ET 7.3)" www.gov.uk/government/statistics/energy-trends-section-7-weather. Note that data for 2015 is provisional and subject to revision.

Chart 1: Load factor range by technology and year. Lines indicate range from 5th to 95th percentile. Boxes indicate range from lower to upper quartile (25th to 75th percentile) with median indicated.



As in previous years, the weighted mean load factor for Wind installations is higher than the mean, and this difference has increased year on year. This reflects a relative increase in the number of larger wind schemes in the analysis. The relationship between average daily wind speed⁵ and load factor for wind installations is less clear than between sun hours and solar load factors (see Table 4). The data for wind installations is based on a smaller number of installations than the Solar PV analysis and therefore it is not clear yet whether the annual variation seen is an artefact of the samples used for each year.

Table 4: Wind load factors and average wind speed

Year	Median load factor	Average wind speed (knots)
2011/12	15.9	9.2
2012/13	19.3	8.1
2013/14	20.5	9.3
2014/15	18.1	8.6

⁵ Average wind speed taken from Energy Trends section 7: weather, table 7.2 " Average wind speed and deviations from the long term mean (ET 7.2)" www.gov.uk/government/statistics/energy-trends-section-7-weather. Note that data for 2015 is provisional and subject to revision.

Solar PV Load Factors

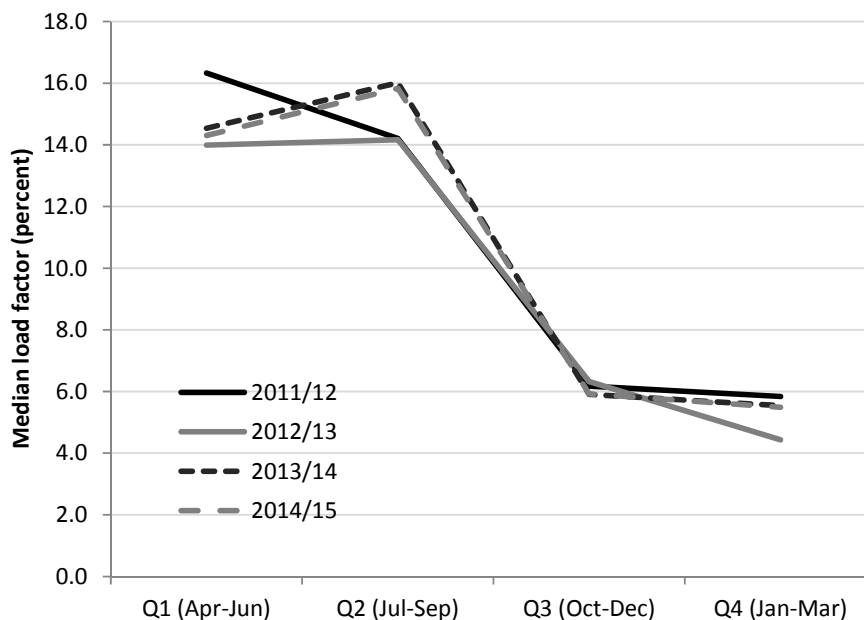
The number of Solar PV installations continues to steadily increase but there is no evidence from our analysis here that the load factor of installations decreases over time. When schemes are installed, their productivity may vary across time since the solar panels may degrade, losing efficiency. Newly installed schemes can benefit from technological improvements, but there is also a potential concern that early solar adopters used the most favourable sites, making newer sites less efficient. Table 5 gives the data from all the installations in the FIT year five analysis, broken down by calendar year commissioned. The mean load factor for Solar PV installations does not appear to vary relative to year installed.

Table 5: Solar PV Load Factors in FIT Year 5 by year commissioned

Year Commissioned	Count	Load Factor
2010 and earlier	10,003	10.1
2011	4,960	10.3
2012	61,629	10.2
2013	29,909	10.1
2014	7,206	10.1

Quarterly load factors for Solar PV installations are available in the accompanying excel workbook and are presented graphically in Chart 2. These show an expected association between load factor and daily hours of sunshine, where the quarters mainly covering Autumn and Winter have the lowest load factors. This chart also highlights that the lower annual load factors seen in FIT year three (2012/13) for Solar PV are driven by lower load factors in all quarters except quarter three (Q3).

Chart 2: Quarterly PV load factors by FIT year



Regional Solar PV Load Factors

Solar PV Factors for each Government Office Region have been published for FIT years two to four and are updated with data from year five in Table 4. Chart 3 highlights that the lowest load factors are seen in Scotland, while the highest are seen in the South West. Load factors in year three (2012/13) are lower than in other years, which are explained by the average daily sun hours also dropping for that year (see Table 3). London again has a lower load factor than the South East which may be due to pollution or particles settling on the panels or because panels are shaded by tall buildings nearby.

Chart 3: Regional Solar PV load factors for FITs years 2-5

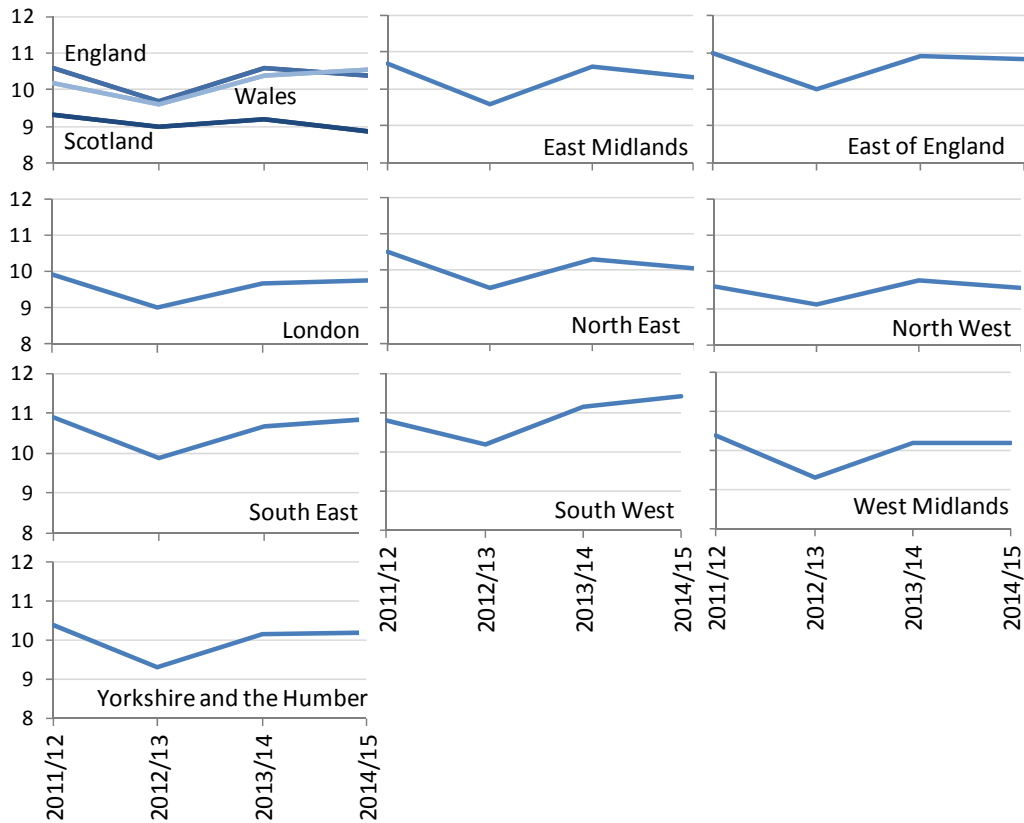


Table 4: Regional Solar PV load factors for FITs years 2-5

Region	FIT Year 2 (2011/12)		FIT Year 3 (2012/13)		FIT Year 4 (2013/14)		FIT Year 2 (2014/15)	
	Count	Median	Count	Median	Count	Median	Count	Median
East Midlands	855	10.7	7,520	9.6	12,936	10.6	18,735	10.3
East of England	1,465	11.0	10,521	10.0	16,306	10.9	21,247	10.8
London	523	9.9	3,283	9.0	4,117	9.7	4,996	9.8
North East	224	10.5	3,460	9.5	5,805	10.3	8,023	10.1
North West	718	9.6	8,867	9.1	13,024	9.8	17,360	9.5
South East	2,764	10.9	17,378	9.9	23,235	10.7	25,994	10.9
South West	2,649	10.8	24,445	10.2	31,965	11.2	36,938	11.4
West Midlands	974	10.4	7,139	9.3	11,118	10.2	15,312	10.2
Yorkshire and the Humber	798	10.3	7,292	9.3	11,299	10.2	18,507	9.9
England	10,970	10.6	89,905	9.7	129,805	10.6	167,112	10.4
Scotland	508	9.3	7,722	9.0	11,531	9.2	11,363	8.9
Wales	645	10.2	9,882	9.6	13,643	10.4	15,100	10.5

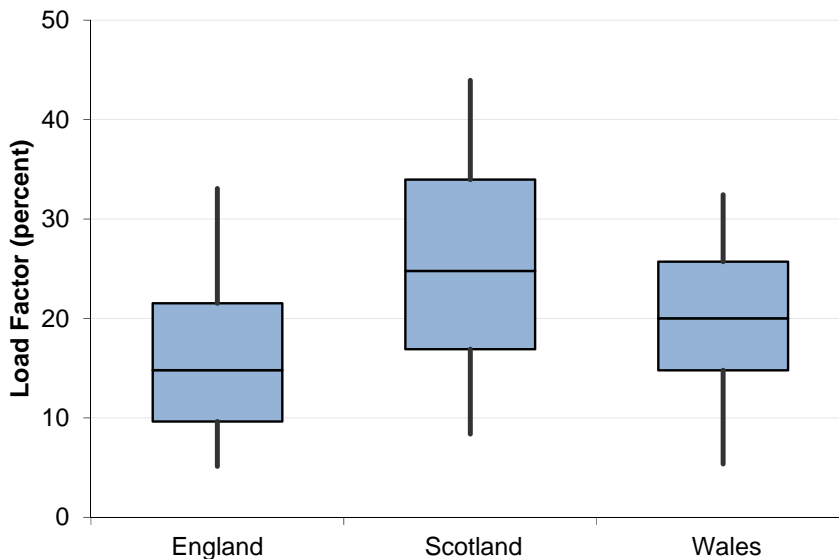
Regional Wind Load Factors

This year we have also produced regional load factors for Wind schemes and these are presented in Table 5. Data from London and the South East has been aggregated as there was only installation within the London region with a valid load factor. Chart 4 summarises this data for England, Scotland and Wales, showing that the highest Wind load factors are found in Scotland.

Table 5: Regional Wind load factors for FITs year 5

Region	Count	Median
East Midlands	134	14.4
East of England	453	10.0
London and South East	30	14.8
North East	84	16.5
North West	133	19.0
South West	318	19.6
West Midlands	63	13.6
Yorkshire and the Humber	319	18.9
England	1,534	14.8
Scotland	743	24.8
Wales	190	20.0

Chart 4: Wind regional load factors for FITs year 5 by country. Lines indicate range from 5th to 95th percentile. Boxes indicate range from lower to upper quartile (25th to 75th percentile) with median indicated.



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