

Feed-in Tariff load factor analysis, 2011/12 to 2015/16

Introduction

This article updates the FiT load factor analysis presented in the December 2015 edition of Energy Trends¹. It presents aggregated load factors for installations registered for the Great Britain Feed in Tariff (FiT) scheme, covering years two to six of the FiT scheme (2011/12 to 2015/16). Included in this are annual load factors, disaggregated by technology, as well as PV commissioning cohort, and quarterly PV load factors. The article also presents annual regional analysis of solar PV for all five years and wind for years five and six. The data in the article are also available in spreadsheet format at: www.gov.uk/government/statistics/quarterly-and-annual-load-factors

Key points

- The median load factor for FiT solar PV sites remained at 10.4 per cent in 2015/16, despite a 0.2 hour decrease in average daily sun hours compared to 2014/15.
- Median solar PV load factor in England & Wales was 10.5 per cent in 2015/16, compared to 9.3 per cent in Scotland.
- Scotland saw the highest median wind load factor, 25.6 per cent compared to 24.4 per cent for Wales and 18.2 per cent for England.

Background

Electrical load factor is the ratio of the actual electrical power generated by a site against its maximum potential generation in the period. Load factors vary by technology and conditions. For example, a solar photovoltaic site requires sunlight to generate electricity so its load factor varies according to the time of year, location and weather. Technological advances may improve a technology's load factor if newer models cope better with imperfect conditions.

The Feed-in Tariff (FiT) scheme was launched in April 2010. It is a financial support scheme for eligible low-carbon electricity technologies in Great Britain, 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 to the grid.

Since the start of the scheme, BEIS (formerly 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, the department has obtained meter readings for each registered installation from FiT licensees (energy suppliers) and used this to produce quarterly and annual load factors. This started with FiT year 2 (data from year one is not available as the number of installations running for the full year was very small), and has now been updated to FiT year 6.

¹ The article published in December 2015 can be found at: www.gov.uk/government/statistics/energy-trends-december-2015-special-feature-article-feed-in-tariff-load-factor-analysis

² The full FiT statistics collection is available at: www.gov.uk/government/collections/feed-in-tariff-statistics

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 since 2015: to remove any installations from the analysis where more than one generation meter is attached. This step has only been applied to FiT years 5 and 6 data; previously produced statistics have not been revised.⁴

Table 1 shows how many installations were registered on the Central Feed-in Tariff Register at the start of FiT year 6, and how many installations had meter readings in March 2015 and 2016. Extreme values were excluded (as in previous years' analysis), with just 1.0 per cent of installations (1,549) 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, but this data must be treated with caution as the number of installations remains low.

Table 1: Installations included in FiT year 6 - analysis, by technology

Technology	Commissioned by 1st April 2015	Generation Data Reported*	Valid load factor	% remaining in analysis
Anaerobic digestion	235	36	32	14
Hydro	667	157	144	22
Micro CHP	494	59	59	12
Photovoltaic	622,776	148,279	148,158	24
Wind	6,663	2,136	2,120	32

* Meter reading in March 2015 and March 2016.

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 (FiT years 2 to 6), highlighting the large range present for hydro compared to other technologies.

Table 2: Load factors in FiT year 6 (2015/2016), by technology

Technology	Count	Mean	Weighted mean	Percentile				
				5 th	25 th	50 th (median)	75 th	95 th
Anaerobic digestion	32	75.3	81.5	26.5	65.9	86.8	95.7	97.8
Hydro	144	42.4	44.8	15.7	28.9	39.5	54.9	74.7
MicroCHP	59	12.1	12.1	4.4	8.1	11.2	15.2	24.2
Solar PV	148,158	10.2	10.3	7.4	9.4	10.4	11.2	12.2
Wind	2,120	21.7	28.7	7.6	13.6	20.3	28.8	40.4

The median load factor for Solar PV in 2015/16 was the same as in 2014/15 and 2013/14 (10.4%). This was despite a decrease in the average daily sun hours for the period from 4.5 hours to 4.3 hours⁵ (see Table 3).

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

⁴ Detailed QA of data covering all installations has not been possible due to the large number of installations.

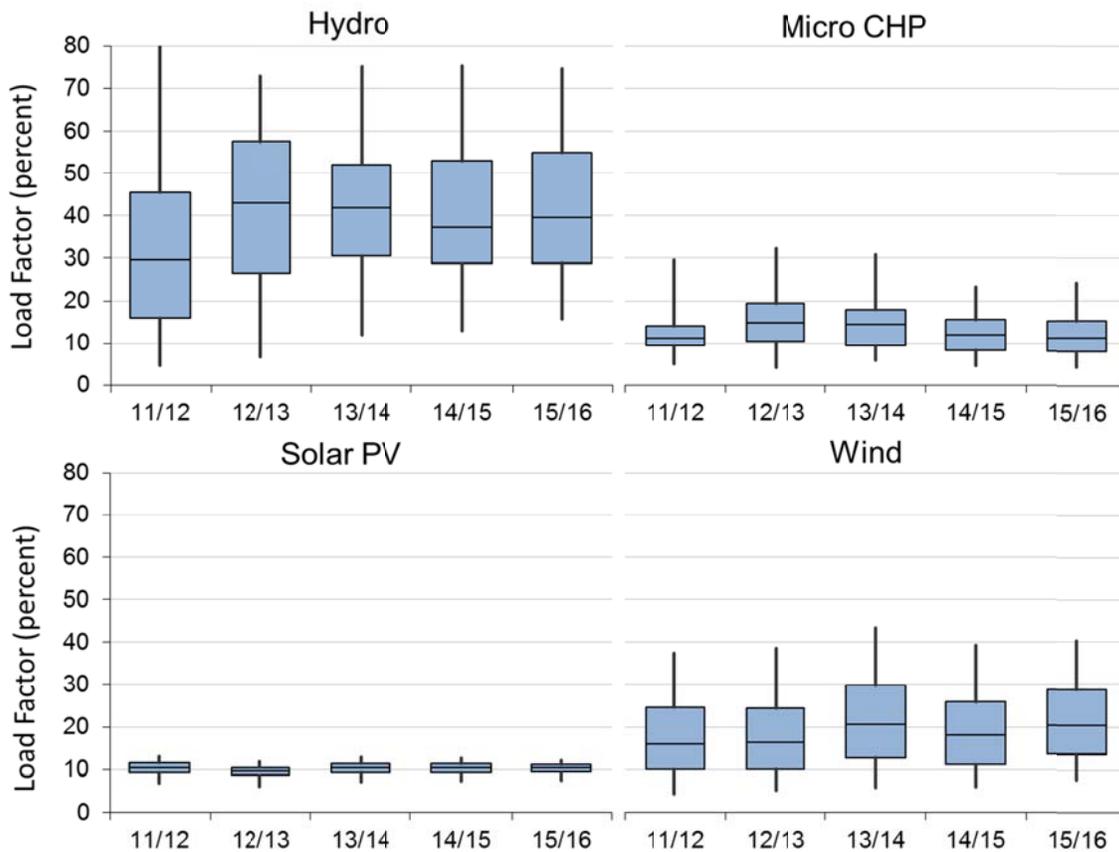
⁵ Average daily sun hours taken from Energy Trends section 7: weather, table 7.3 "Average daily sun hours and deviations from the long term mean (ET 7.3)", available at: www.gov.uk/government/statistics/energy-trends-section-7-weather

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
2015/16	10.4	4.3

Chart 1: Load factor range, by technology and FiT 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 in FiT year 6 is higher than the median, and this difference has increased year on year. This reflects a relative increase in the number of higher capacity wind schemes in the analysis, which have typically performed at higher load factors. The relationship between average daily wind speed⁶ 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.

⁶ 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)", available at: www.gov.uk/government/statistics/energy-trends-section-7-weather.

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	16.3	8.0
2013/14	20.5	9.3
2014/15	18.1	8.6
2015/16	20.3	9.2

Solar PV load factors trends

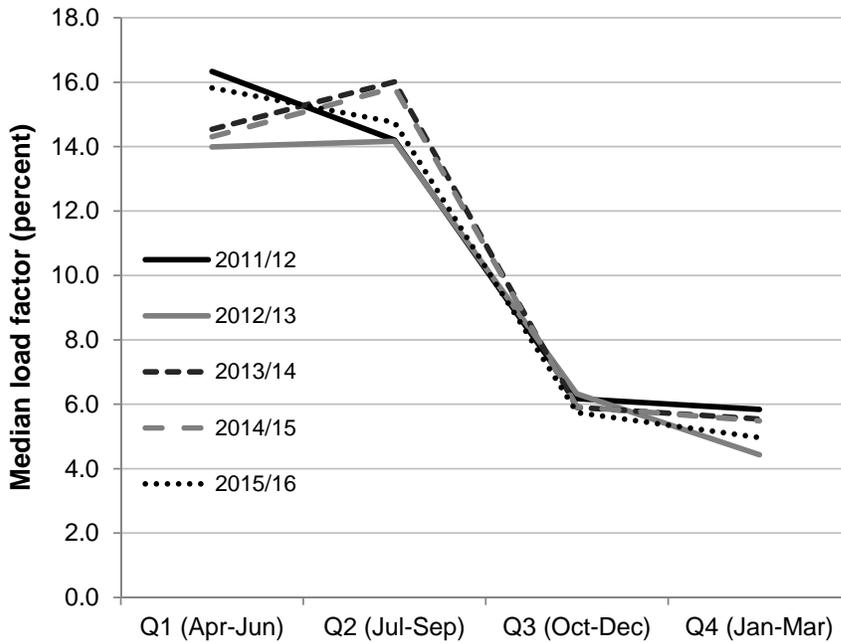
The productivity of solar installations may reduce across time due to degradation of the panels. Also, whilst newly installed schemes can benefit from technological improvements, early solar adopters may have used the most favourable sites, offsetting this. Table 5 gives the data from all the installations in the FiT year 6 analysis, disaggregated by commissioning year. Whilst the number of solar PV installations continues to increase, there is no evidence as yet from this analysis that the load factor of installations decreases over time - the mean load factor does not appear to vary relative to year installed. However, a longer-time series is likely to be needed before firm conclusions can be drawn.

Table 5: Solar PV load factors in FiT Year 6, by year commissioned

Year Commissioned	Count	Mean load factor
2010 and earlier	7,011	10.0
2011	64,475	10.2
2012	46,938	10.2
2013	22,453	10.2
2014	6,836	10.1
2015	445	10.0

Quarterly load factors for Solar PV installations are available in the accompanying spreadsheet and are presented in Chart 2. These show an expected association between load factor and daily hours of sun, 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 3 (2012/13) for solar PV are driven by lower load factors in all quarters - except quarter three (Q3) – which experienced lower than usual sun levels.

Chart 2: Quarterly solar PV load factors, by FiT year



Regional solar PV load factors

Solar PV load factors for each Government Office Region are given (for FiT years 2 to 6) in Table 6. Chart 3 highlights that the lowest load factors are seen in Scotland, while the highest are seen in the South West of England. 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 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: Solar PV load factors for FiTs years 2-6, by region

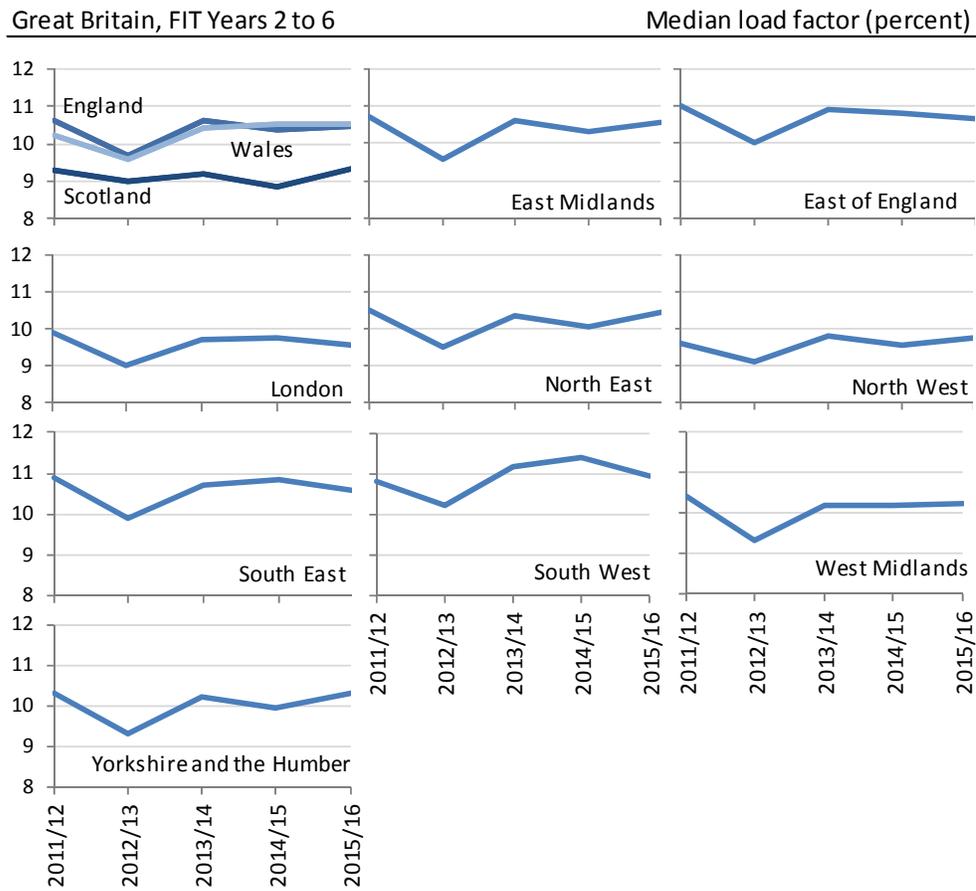


Table 6: Solar PV load factors for FiT years 2-6, by region

Region	FiT Year 2 (2011/12)		FiT Year 3 (2012/13)		FiT Year 4 (2013/14)		FiT Year 5 (2014/15)		FiT Year 6 (2015/16)	
	Count	Median	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	13,489	10.5
East of England	1,465	11.0	10,521	10.0	16,306	10.9	21,247	10.8	16,917	10.6
London	523	9.9	3,283	9.0	4,117	9.7	4,996	9.8	3,813	9.6
North East	224	10.5	3,460	9.5	5,805	10.3	8,023	10.1	6,444	10.4
North West	718	9.6	8,867	9.1	13,024	9.8	17,360	9.5	13,689	9.7
South East	2,764	10.9	17,378	9.9	23,235	10.7	25,994	10.9	18,955	10.6
South West	2,649	10.8	24,445	10.2	31,965	11.2	36,938	11.4	29,331	11.0
West Midlands	974	10.4	7,139	9.3	11,118	10.2	15,312	10.2	12,013	10.2
Yorkshire and the Humber	798	10.3	7,292	9.3	11,299	10.2	18,507	9.9	15,058	10.3
England	10,970	10.6	89,905	9.7	129,805	10.6	167,112	10.4	129,709	10.5
Scotland	508	9.3	7,722	9.0	11,531	9.2	11,363	8.9	6,802	9.3
Wales	645	10.2	9,882	9.6	13,643	10.4	15,100	10.5	11,614	10.5

Regional wind load factors

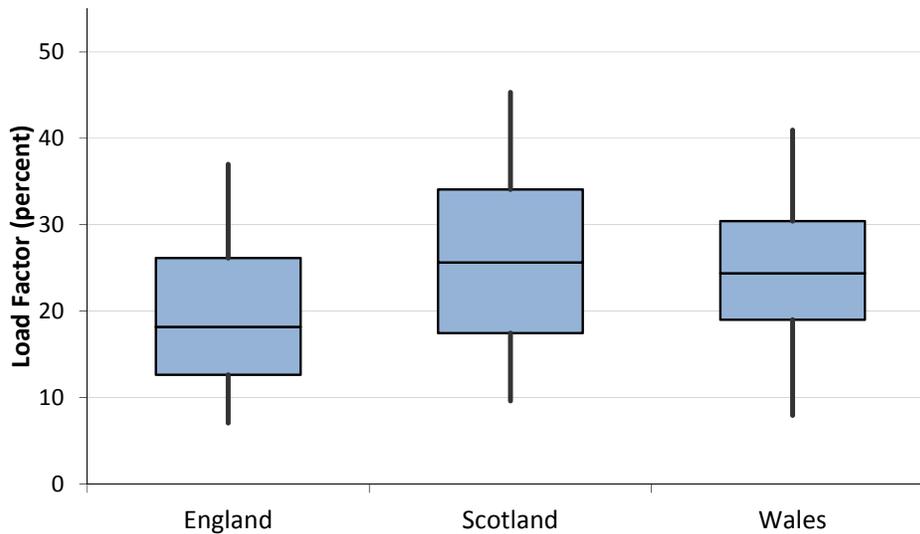
Regional load factors for wind schemes for FiTs years 5 and 6 are presented in Table 7.⁷ Chart 4 summarises this data for England, Scotland and Wales, showing that the highest wind load factors are found in Scotland.

Table 7: Wind load factors for FiT years 5 and 6, by region

Region	FiT Year 5 (2014/15)		FiT Year 6 (2015/16)	
	Count	Median	Count	Median
East Midlands	134	14.4	123	17.5
East of England	453	10.0	405	13.0
London and South East	30	14.8	23	12.1
North East	84	16.5	73	17.5
North West	133	19.0	137	23.6
South West	318	19.6	296	25.7
West Midlands	63	13.6	63	17.1
Yorkshire and the Humber	319	18.9	318	20.8
England	1,534	14.8	1,438	18.2
Scotland	743	24.8	469	25.6
Wales	190	20.0	178	24.4

Chart 4: Wind load factors for FiT year 6, by GB 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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⁷ Data from London and the South East of England has been aggregated as there was only one installation within the London region with a valid load factor.