Feed-in Tariff load factor analysis

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Key headlines

This article updates the load factors – an indication of efficiency of electricity generation – for Feed-in Tariff installations. Feed-in Tariff load factors vary mainly due to weather conditions and do not shift substantially between years. Key findings are:

- **Median load factors were up for solar PV** from 10.3% to 10.4% as average sunlight hours increased.
- **Median wind load factors remained unchanged** at 19.1% but mean wind load factors went down from 29.7 per cent to 26.0 per cent. The load factors and average wind speeds were similar to 2018/19 levels.
- **South West England had the highest median load factor for solar PV,** at 11.3%. Scotland had the lowest median load factor (9.4 per cent), with London the second lowest (9.8 per cent).
- **Scotland had the highest median load factor for wind** at 24.7 per cent followed by South West (22.8 per cent) and Wales (22.5 per cent). Different trends were seen across the various region of England.

Introduction

This article updates the Feed-in Tariff (FIT) load factor analysis presented in the December 2021 edition of Energy Trends with data for FIT year eleven (financial year 2020/21). We also present regional analysis of solar PV for the ten years that data has been published (FIT years two to eleven) and wind for years five to eleven. All the data in this article, including quarterly load factors for solar PV, is available in Excel format at the following link (opens in a new window)[1].

Background

Load factors are a measure of the efficiency of electricity generation. A load factor is defined as the ratio of how much electricity was generated over a certain time period as a proportion of the total generating capacity.

The Feed-in Tariff 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. The FIT scheme closed to new entrants at the end of March 2019.

[1] The article published in December 2020 can be found at the following link (opens in a new window)

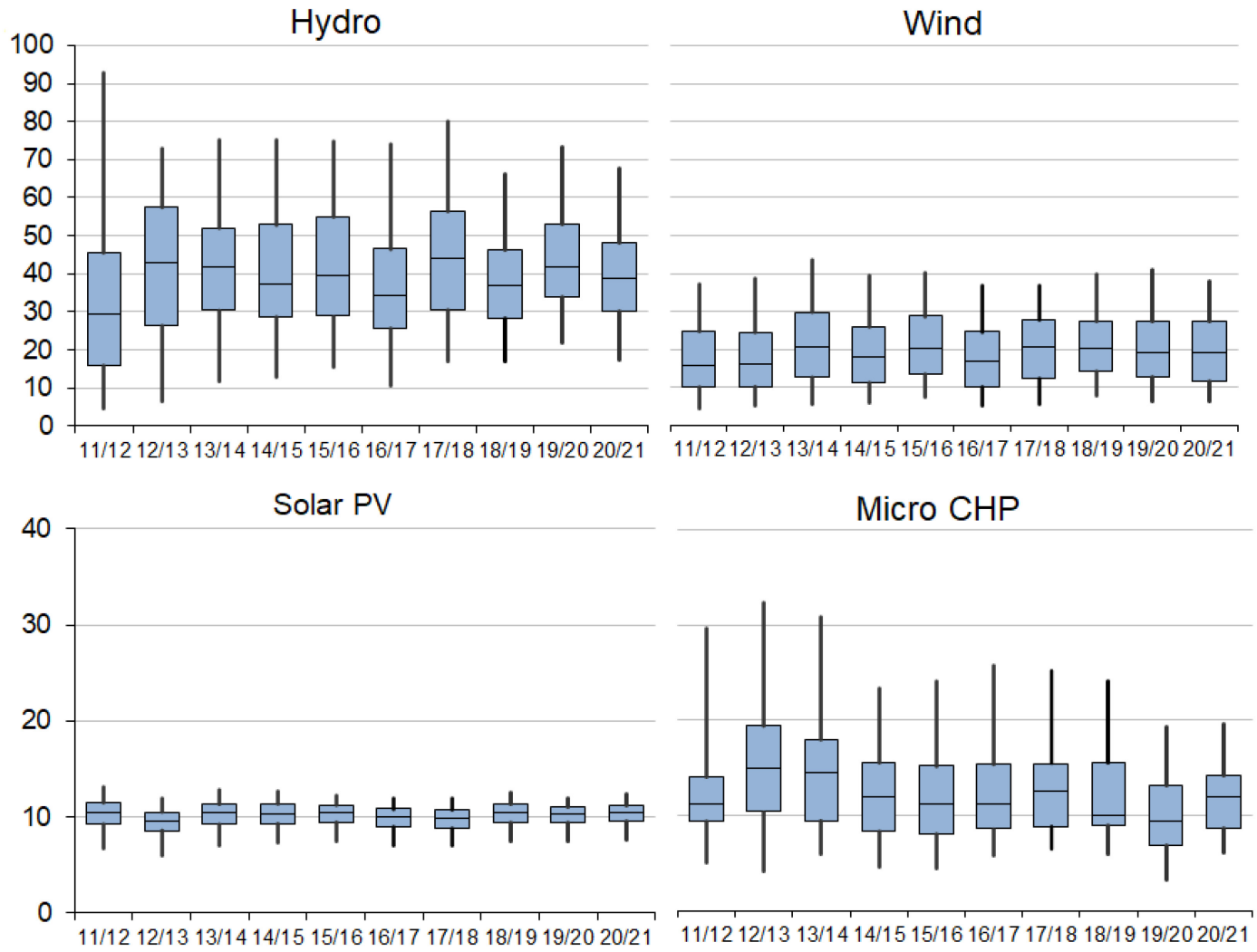
Results

Table 1 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 eleven), highlighting the large range present for Hydro compared to other technologies, whilst solar installations have the smallest range of load factors.

Table 1: FIT Year 11 (2020/2021) load factors by technology

Technology	Count	Weighted mean	Percentile				
			5th	25th	50th (median)	75th	95th
Anaerobic digestion	155	61.4	25.0	61.8	85.3	94.6	98.2
Hydro	245	35.8	17.3	30.2	38.7	48.2	67.3
Micro CHP	14	12.1	6.1	8.7	11.9	14.2	19.6
Photovoltaic	177,826	10.3	7.7	9.5	10.4	11.2	12.4
Wind	1,876	26.0	6.4	11.6	19.1	27.5	37.8

Chart 1: FiT Load factors by technology and FiT year.



The median load factor for solar PV in 2020/21 was higher than 2019/20 by 0.1 percentage points, which can be explained by the longer average daily sun hours reported for 2020/21. The median load factor is in a similar range to the load factor reported in the years 2013/14 and 2014/15, when average daily sunlight hours were also similar. See Table 2:

Table 2: 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
2016/17	10.1	4.2
2017/18	9.8	4.1
2018/19	10.5	4.9
2019/20	10.3	4.4
2020/21	10.4	4.5

As can be seen from Table 3 (below), there is a relationship between wind speed and wind load factors, but it is weaker than the relationship between solar PV and sun hours. In addition, load factors for wind vary much more than those for solar PV: Chart 1 (above) shows that there is a much wider spread between the lower and upper quartiles for wind, but these ranges overlap from year to year. This may be because the wind farms that are on FITs are on average much smaller than wind farms owned by the major power producers and they may not be located in the most advantageous positions for wind generation. Furthermore, wind speeds are measured at ground level which may vary from the wind speed at the level of the wind turbine. The average wind speed quoted here is for the whole of the UK, however, wind speed varies by location.

Table 3: Wind load factors and average wind speed

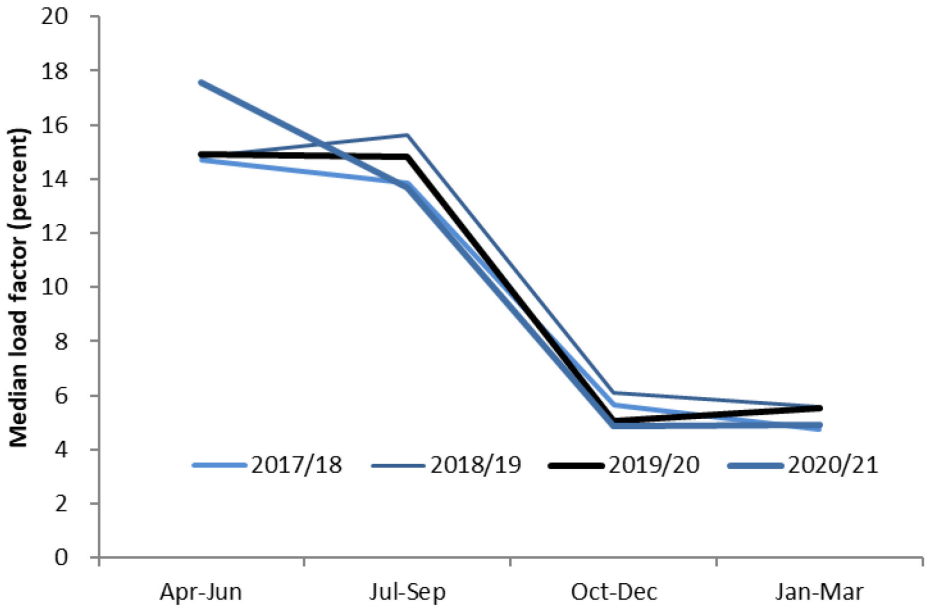
Year	Median load factor	Weighted mean load factor	Average wind speed (knots)
2011/12	15.9	18.3	9.2
2012/13	16.3	22.3	8.0
2013/14	20.5	27.2	9.3
2014/15	18.1	25.3	8.6
2015/16	20.3	28.7	9.2
2016/17	17.0	24.6	8.2
2017/18	20.5	28.4	8.8
2018/19	20.4	26.0	8.5
2019/20	19.1	29.7	8.8
2020/21	19.1	26.0	8.5

Quarterly Solar PV load factors

Quarterly load factors for solar PV installations are available in the accompanying Excel workbook and the last four years 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.

Load factors were exceptionally high during the spring quarter (Apr-Jun), mirroring the unusually long average daily hours of sun in that period, and reached a median value of 17.6%, the highest recorded since the start of the series.

Chart 2: Quarterly Solar PV load factors by FIT year



Regional Solar PV load factors

Solar PV load factors for each region have been updated with data from FIT year eleven and are available in the Excel workbook along with load factors for FIT years two to ten.

Chart 3: annual Solar PV load factor, by region and FiT Year

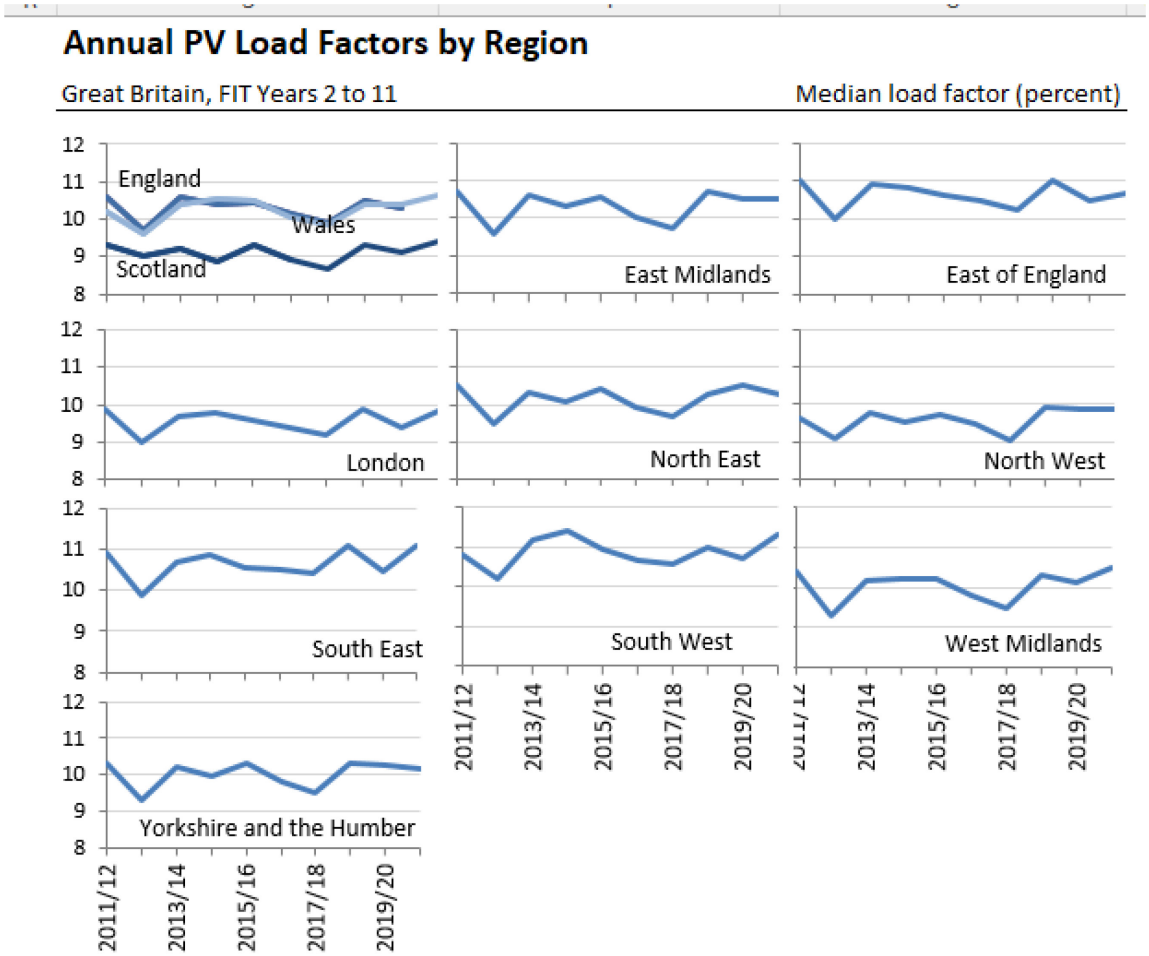
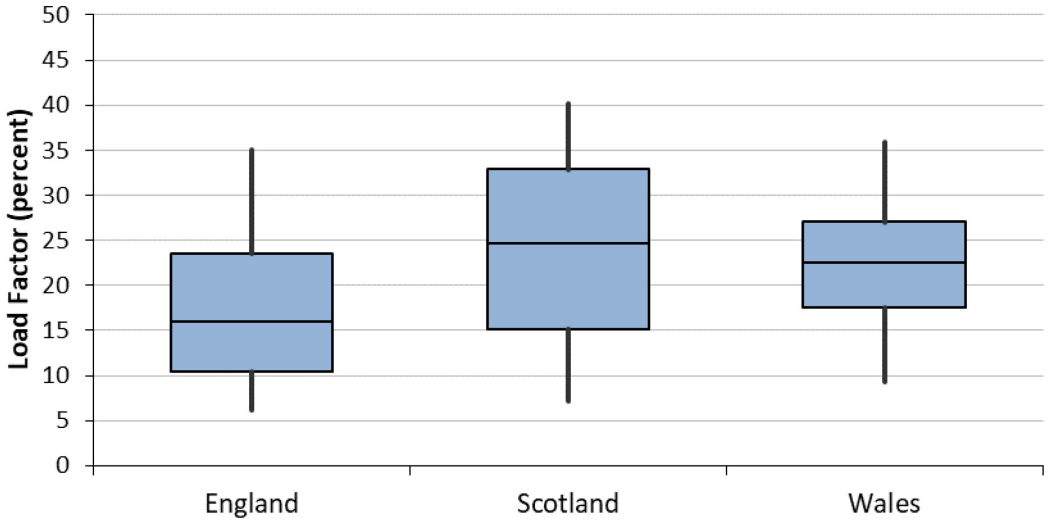


Chart 3 shows that once again Scotland records the lowest load factors, while the highest are seen in the South West. In year eleven (2020/21), the median load factor increased in every region except North East England and 'Yorkshire and the Humber', with the highest absolute increase seen in both South East and South West England (both up by 0.6 percentage points). This reflects average sunlight hours growing on FIT year ten but there are regional variations. Although the median load factor increased by 0.5 percentage points this year, London had a lower load factor than the South East and the lowest outside of Scotland. This may be due to pollution, particles settling on the panels or because panels are shaded by tall buildings nearby. London typically has one of the lowest regional load factors.

Regional Wind load factors

Regional load factors for wind schemes for FIT years five to eleven are also available in the accompanying Excel workbook. Data from London and the South East are aggregated as there were a low number of installations with a valid load factor within these regions. In the latest year, the highest wind load factors are found in Scotland, followed by South West England then Wales. Load factors have generally decreased in Scotland, Wales and the South of England compared to last year, however, the Midlands and the North of England saw an increase. Chart 4 summarises these data for England, Scotland and Wales.

Chart 4: Wind regional load factors for FITs year 11 by country



Lines indicate range from 5th to 95th percentile. Boxes indicate range from lower to upper quartile (25th to 75th percentile) with the line indicating the median.

Annex: Methodology and coverage

Introduction

From 2013, BEIS obtained meter readings for registered installations from Energy Suppliers and used this to produce quarterly and annual load factors for FIT years two to eleven (data from year one is not available as the number of installations running for the full year was very small).

The methodology used for the load factor analysis was described in detail in an Energy Trends article from September 2014[2]. 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 year five to ten data; statistics for previous years have not been revised. Whilst all efforts have been made to quality assure the data in this publication, the results are based on a sample.

Data cleansing

Table A shows how many installations were registered on the Central Feed-in Tariff Register at the start of FIT year eleven and how many installations had meter readings in both March 2020 and 2021. To be included in the analysis, each installation needed a meter reading between February 28 and April 15 2020 and a corresponding reading between February 28 and April 15 2021. Furthermore, to cover the whole financial year and to avoid bias, readings that were less than 330 days or more than 400 days apart were also excluded. For the quarterly analysis, starting and closing meter readings for each quarter were determined using similar date ranges.

Coverage

Of the 869,617 schemes registered for FiTs at the start of the financial year[3], 21 per cent were found to have sufficient meter readings for the annual analysis. Extreme load factor values were further excluded (as in previous years' analysis), accounting for around 4,200 (0.5%) of installations. The column 'Valid load factor' in Table A indicates how many installations were included in the final analysis for each technology for the annual generation data. Micro CHP data is included in the main results, but this data must be treated with caution as the number of installations covered in the analysis remains very low.

Table A: Installations included in analysis by technology – FIT Year 11

Technology	Commissioned by 31st March 2019	Generation Data Reported*	Valid load factor	% remaining in analysis
Anaerobic digestion	425	165	155	36%
Hydro	1,177	260	245	21%
Micro CHP	525	21	14	3%
Solar PV	859,938	181,867	177,826	21%
Wind	7,552	1,981	1,876	25%
All Technologies	**869,617**	**184,294**	**180,116**	**21%**

* Meter readings at start and end of FiT year.

[2] The article published in September 2014 can be found at the following link (opens in a new window)
[3] Subject to further revision.

This publication is available from: https://www.gov.uk/government/collections/energy-trends

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