Office for National Statistics

Statistical bulletin

UK Environmental Accounts: Low Carbon and Renewable Energy Economy Survey: 2016 final estimates

Final results from the Low Carbon and Renewable Energy Survey on the low carbon and renewable energy economy in the UK, including direct and indirect activity, employees and turnover.

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1 . Main points

- The UK low carbon and renewable energy (LCRE) economy grew by 5.0% to £42.6 billion in 2016, from £40.5 billion in 2015; it continued to account for around 1% of total UK non-financial turnover.
- The number of employees working directly in the LCRE economy in the UK, grew by 3.3% to 208,000 full-time equivalents (FTE) in 2016, from 201,500 in 2015; it continued to account for around 1% of total UK non-financial employees.
- The energy efficient product group accounted for almost half of total LCRE turnover (£20.7 billion) and over two-thirds of LCRE employment (141,500 FTE) in 2016.
- Turnover in the solar sector in the UK fell from £3.1 billion in 2015 to £2.0 billion in 2016; over 85% of UK turnover in the solar sector relates to activity in England.
- In 2016, almost half (45.8%) of the UK's turnover from onshore wind activities was generated in Scotland (£1.5 billion); by contrast, over 80% (£2.4 billion) of the UK's turnover from offshore wind activities was generated in England.
- Exports related to the low emission vehicles sector were £2.2 billion in 2016, representing 60% of all UK LCRE exports.

2 . Things you need to know about this release

The figures in this bulletin are survey-based estimates. Surveys gather information from a sample rather than from the whole population. The sample is designed to allow for this, and to be as accurate as possible given practical limitations such as time and cost constraints, but results from sample surveys are always estimates and not precise figures. This means that they are subject to some uncertainty. This can have an effect on how changes in the estimates should be interpreted. Estimates of the level of uncertainty associated with all figures (coefficients of variation) reported are presented in the datasets to aid interpretation.

In general, changes in the estimates reported in this statistical bulletin between 2015 and 2016 are not usually greater than the level that is explainable by sampling variability. This means that movements in the estimates should be treated as indicative only. All estimates are reported at current prices so no adjustments have been made to account for the effects of inflation.

Activity in the low carbon and renewable energy (LCRE) economy is spread across a wide range of industries. Many sectors are small but growing and for many businesses LCRE activity is secondary rather than primary. For this reason, estimates of the number of businesses are subject to particular volatility and though provided in the datasets, are not directly considered within this statistical bulletin. A review of the methodology used to estimate the number of businesses will be undertaken in 2018.

A more complete picture of how the LCRE economy is changing over time will be possible once longer-term trends are available. More information on how to interpret the survey estimates is available in Section 10: Accuracy of the statistics.

Regional estimates and country-level data are presented throughout this release. These estimates are based on where the activity takes place, rather than where the business is registered. For example, if a business in England owns a wind farm in Scotland then the activity would be allocated to Scotland. This should be taken into consideration when comparing these results to estimates of low carbon activity from other sources, which may be based on where the business is registered.

Estimates of indirect activity in the LCRE economy, which are presented in Section 8, are Experimental Statistics and remain under development.

This release contains revisions to previous figures since they were published in April 2017. This is mainly due to the incorporation of additional data received from businesses who have been sampled in multiple years of the survey. A summary of the effect of revisions can be found in Section 9.

Estimates rely on businesses self-reporting their activity. Where a business is active in the low carbon services sector, if they entirely provide services in relation to another low carbon sector then they may choose to report their estimates there. For example, a business who provides financial services to the onshore wind sector may report their estimates under onshore wind only. Estimates of low carbon financial services may therefore be an underestimate.

3 . How do we measure the low carbon economy?

The low carbon economy is defined as economic activities that deliver goods and services that generate significantly lower emissions of greenhouse gases; predominantly carbon dioxide.

The Low Carbon and Renewable Energy (LCRE) Economy Survey was designed to provide greater detail on the low carbon and renewable energy economy in the UK. The survey was despatched for the third time in 2017, for the reporting year 2016, to a sample of around 14,000 businesses. The survey collects information on turnover, imports, exports, employment[1], and acquisitions and disposals of capital assets, for 17 low carbon sectors. For analysis purposes, these 17 sectors[2] can then be aggregated into six[3] groups; results for these groups can be found in the dataset accompanying this bulletin.

Only the portion of a business's economic activity that directly relates to low carbon activities is included. The survey does not collect information on the supply chain involved in low carbon activities; instead, this is estimated by applying multipliers. Experimental estimates of indirect activity related to the low carbon economy can be found in Section 8.

This bulletin discusses estimates from the UK LCRE economy survey for 2016 and revised figures for 2015. Results are discussed at the UK and UK country level, followed by analysis of the contribution of specific groups and sectors. Revised figures for 2014 are available in the reference tables accompanying this bulletin. Finally, we present experimental estimates of indirect activity from the LCRE economy.

Notes for: How do we measure the low carbon economy?

1. Employment is measured in terms of full-time equivalents (FTE). One FTE employee may be thought of as one person working full time for a year. For example, a person working in a factory who spent 60% of their time working in activities within the low carbon and renewable energy economy (LCRE) solar sector but the rest of their time on other non-LCRE activities within the factory, would be considered as a 0.6 FTE employee in the LCRE solar sector.

2. The low carbon sectors are: offshore wind, onshore wind, solar photovoltaic, hydropower, other renewable energy, bioenergy, alternative fuels, renewable heat, renewable combined heat and power, energy efficient lighting, energy efficient products, energy monitoring, saving or control systems, low carbon financial and advisory services, low emission vehicles and infrastructure, carbon capture and storage, nuclear power, fuel cells and energy storage systems.

3. The low carbon groups are: low carbon electricity, low carbon heat, energy from waste and biomass, energy efficient products, low carbon services, and low emission vehicles (which combines the low emission vehicles and infrastructure with fuel cells and energy storage sectors).

4 . The low carbon and renewable energy economy employed around 208,000 full-time equivalent employees in 2016

In 2016, businesses active in the low carbon and renewable energy (LCRE) economy generated £42.6 billion in turnover and employed an estimated 208,000 full-time equivalent (FTE) employees. This was an increase of 5.0% and 3.3% respectively when compared with 2015. The LCRE economy accounted for around 1% of total UK non-financial turnover and employment in 2016, similar to 2015 (Table 1).

The energy efficient products group, which covers the design, manufacture and installation of energy efficient products, is the largest group within the LCRE economy, accounting for almost half of all LCRE turnover and two-thirds of all employees. This group grew in 2016, generating £20.7 billion in turnover and employing 141,500 FTEs compared with £17.3 billion and 129,000 FTEs in 2015.

The low carbon electricity group, which covers activities related to the production of electricity from nuclear, wind, solar, hydro and other renewable sources such as tidal or geothermal, remained the second-largest group in 2016, despite a slight fall in turnover and employment from 2015. This group generated £11.9 billion in turnover and employed 31,500 FTEs in 2016, compared with £12.5 billion and 34,500 FTEs in 2015. This was driven by decreases in turnover and employment within the solar and nuclear sectors, despite increases in the onshore and offshore wind sectors.

Growth in the UK LCRE economy is reflected by LCRE active businesses acquiring £8.6 billion of capital assets [1] in 2016, an increase of £3.2 billion compared with 2015 and now representing 3.8% of total UK non-financial business economic activity in acquisitions. Of LCRE economy acquisitions in 2016, £7.2 billion were made by businesses active in the low carbon electricity group. The main sectors with acquisitions within this group were offshore and onshore wind, where acquisitions by businesses active in either of these groups grew by £3.1 billion to £5.2 billion in 2016. Acquisitions in these sectors can be high as they include purchases of land for wind farms.

Imports by businesses active in the LCRE economy increased to an estimated £6.0 billion in 2016 compared with £4.3 billion in 2015. Import activity was more evenly spread across the six LCRE groups, with the energy efficient products and low emission vehicles groups being the largest contributors to the total in 2016, accounting for £1.9 billion and £1.5 billion respectively. Exports by businesses active in the LCRE economy were an estimated £3.7 billion in both 2015 and 2016. The low emission vehicles group accounted for almost two-thirds (£2.3 billion) of these exports in 2016.

The relative contribution of the groups and sectors making up the LCRE economy across the UK are considered in more detail in Sections 5 to 7.

Table 1: Low carbon and renewable energy economy, UK, 2015 and 2016

	Low carbon and renewable energy economy		Percentage change	Percentage of total UK non-financial business economy activity	
	2015	2016	2015 to 2016	2015	2016
Turnover (£ thousands)	40,532,000	42,559,000	5.0	1.3	1.3
Employees (FTE)	201,500	208,000	3.3	0.9	0.9
Imports (£ thousands)	4,330,500	6,002,000	38.6	0.8	1.0
Exports (£ thousands)	3,663,500	3,715,500	1.4	0.8	0.8
Acquisitions (£ thousands)	5,409,000	8,638,000	59.7	3.0	3.8
Disposals (£ thousands)	409,000	374,500	-8.4	1.3	0.9

Source: Office for National Statistics, Low Carbon and Renewable Energy Economy Survey

Notes:

1. The difference between the 2015 and 2016 estimates should be interpreted with caution due to the precision of survey-based estimates.

2. Information on the coefficients of variation associated with these estimates can be found in the datasets.

3. The 2015 disposals and 2016 acquisitions estimates should be treated with caution due to a high coefficient of variation. Consequently, estimates of percentage change between 2015 and 2016 for disposals and acquisitions should be treated with caution.

4. Number of full-time equivalent (FTE) employees is rounded to the nearest 500, all other variables are rounded to the nearest £500,000.

5. See Section 11: Quality and methodology for details on how the percentage of total UK non-financial business economy activity has been calculated.

Notes for: The low carbon and renewable energy economy employed around 208,000 full-time equivalent employees in 2016

1. Defined as capital assets that are used repeatedly to facilitate production, or provide services, for more than one year. It includes non-produced assets such as patents, contracts and domain names. Existing buildings and structure for own use, or where the respondent is responsible for maintenance, are also included. Further information on what is included in the capital assets definition can be found in the questionnaire.

5 . How does each UK country contribute to the low carbon and renewable energy economy?

In 2016, England accounted for most of the turnover (78.5%) and employment (79.2%) in the UK low carbon and renewable energy (LCRE) economy[1]. Turnover in the LCRE economy increased in all UK countries in 2016 compared with 2015. England saw the largest absolute increase in turnover (£0.9 billion) over this period. This was due to increases within the energy efficient products group, which offset decreases in the low carbon electricity and energy from waste and biomass groups. Wales saw the largest proportional increase in turnover during this period, driven by increases within the energy efficient products and low carbon electricity groups.

Employment was relatively stable in England and Scotland from 2015 to 2016. Wales and Northern Ireland saw the largest proportional increases in employment over this period at 26.6% and 40.6% respectively (Table 2). In both countries, most of this increase was accounted for by increases in the energy efficient product and low carbon heat groups.

In 2016, Scotland accounted for a larger proportion (20.2%) of the UK LCRE economy in terms of acquisitions in comparison with turnover (13.5%) and employment (11.5%) (Figure 1). The majority of UK acquisitions were in the onshore and offshore wind sectors and Scotland represents a large proportion of the UK onshore wind sector. The majority of the £1.7 billion LCRE acquisitions made in Scotland during 2016 were within the onshore and offshore wind sectors.

The relative contribution of the major sectors in the low carbon electricity and energy efficient products groups to the LCRE economy across different countries in the UK are detailed in Sections 6 and 7.

Table 2: Low carbon and renewable energy economy, UK countries, 2015 and 2016

	2015 Estimate	2016 Estimate	Percentage change 2015 to 2016
Turnover (£ thousands)			
UK	40,532,000	42,559,000	5.0
England	32,519,500	33,423,000	2.8
Scotland	5,349,000	5,761,000	7.7
Wales	1,771,000	2,433,500	37.4
Northern Ireland	892,000	928,000	4.0
Employment (FTE)			
UK	201,500	208,000	3.3
England	164,500	165,000	0.2
Scotland	22,000	24,000	8.1
Wales	10,500	13,000	26.6
Northern Ireland	4,500	6,000	40.6
Imports (£ thousands)			
UK	4,330,500	6,002,000	38.6
England	3,633,500	4,831,500	33.0
Scotland	334,000	675,500	102.3
Wales	279,500	254,000	-9.2
Northern Ireland	83,500	241,000	188.1
Exports (£ thousands)			
UK	3,663,500	3,715,500	1.4
England	3,088,500	3,141,000	1.7
Scotland	225,500	277,500	23.0
Wales	300,000	230,000	-23.4
Northern Ireland	49,000	67,000	36.8
Acquisitions (£ thousands)			
UK	5,409,000	8,638,000	59.7
England	3,572,000	6,140,500	71.9
Scotland	1,296,500	1,748,000	34.8
Wales	432,000	298,000	-31.0
Northern Ireland	109,000	452,000	315.5
Disposals (£ thousands)			
UK	409,000	374,500	-8.4
England	389,000	324,000	-16.7
Scotland	9,000	35,000	282.8
Wales	7,500	13,500	83.6

Northern Ireland	3,500	2,000		-40.0

Source: Office for National Statistics, Low Carbon and Renewable Energy Economy Survey

Notes:

1. Figures may not sum due to rounding. Regional estimates may not sum to UK totals where it was not possible to allocate activity to a region.

2. These estimates are based on the country that a business reports activity is in, rather than where the business is registered. For example, if a company based in England owns a solar farm in Scotland then their activity will be included in the estimates for Scotland.

3. Information on the coefficient of variation associated with these estimates can be found in the datasets.

4. Estimates for imports and exports in Northern Ireland in 2016 should be treated with caution due to their high coefficient of variation. Consequently, estimates of percentage change between 2015 and 2016 should also be treated with caution.

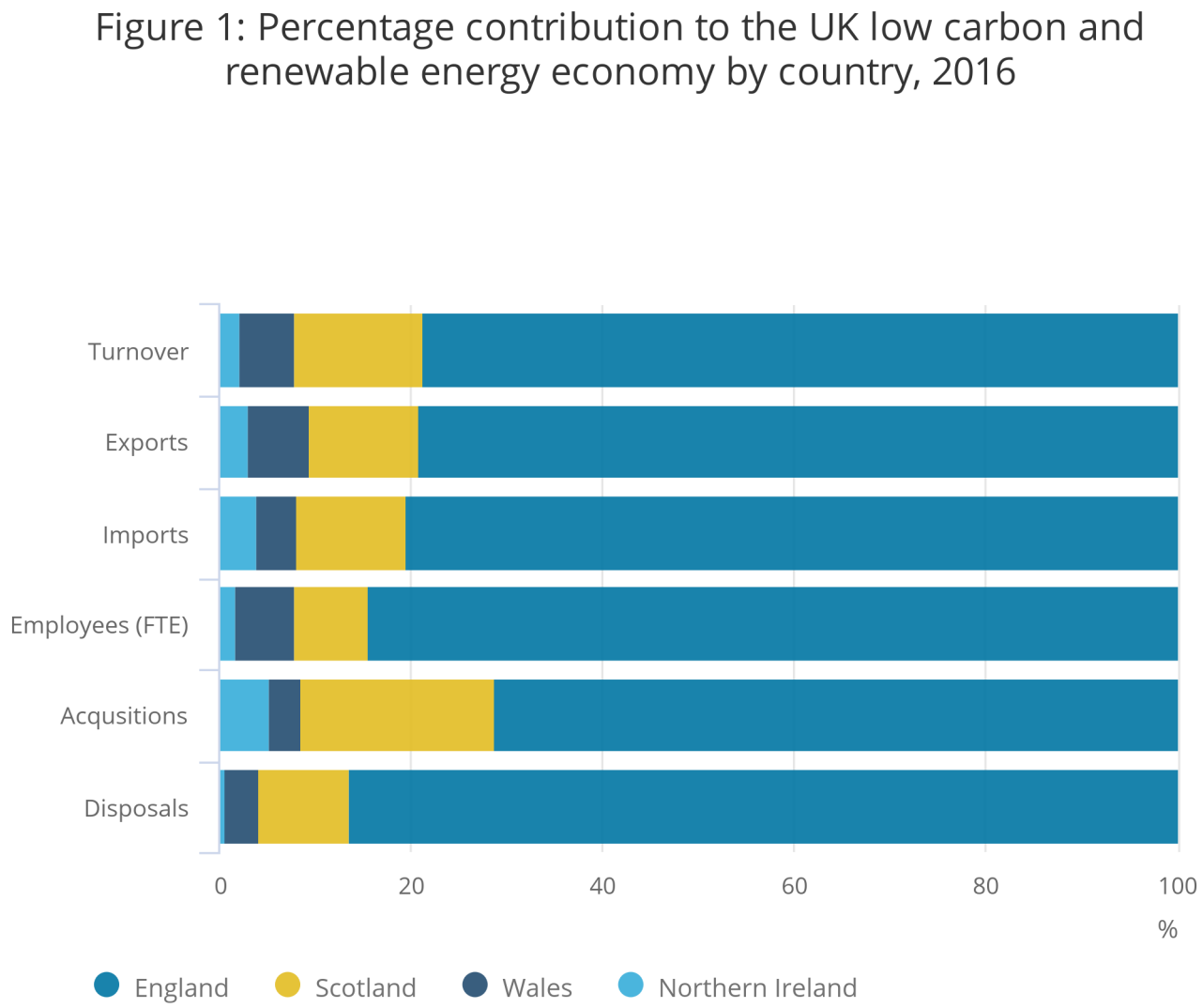
5. Estimates of employment in Wales in 2016 should be treated with caution due to the high coefficient of variation. Consequently, estimates of percentage change between 2015 and 2016 should also be treated with caution.

6. All estimates for acquisitions and disposals in 2016 at a lower geographical level than UK should be treated with caution due to their high coefficient of variation. Consequently, estimates of percentage change between 2015 and 2016 should also be treated with caution.

7. Estimates for number of businesses and disposals and their associated coefficient of variation can be found in the datasets.

8. Number of full-time equivalent (FTE) employees rounded to the nearest 500, all other variables rounded to nearest £500,000.

Figure 1: Percentage contribution to the UK low carbon and renewable energy economy by country, 2016



Source: Office for National Statistics, Low Carbon and Renewable Energy Economy Survey

Notes:

1. Figures may not sum due to rounding.
2. These estimates are based on the country that a business reports activity is in, rather than where the business is registered. For example, if a company based in England owns a solar farm in Scotland then their activity will be included in the estimates for Scotland.
3. Information on the coefficient of variation associated with these estimates can be found in the datasets.
4. Estimates for imports and exports in Northern Ireland should be treated with caution due to their high coefficient of variation.
5. Estimates of employment in Wales should be treated with caution due to the high coefficient of variation.
6. All estimates for acquisitions and disposals in 2016 at a lower geographical level than UK should be treated with caution due to their high coefficient of variation.

Notes for: How does each UK country contribute to the low carbon and renewable energy economy?

1. Regional estimates presented in this release are based on where a business reports the activity takes place, rather than where the business is registered. For example, if a business in England owns a wind farm in Scotland then the activity would be allocated to Scotland.

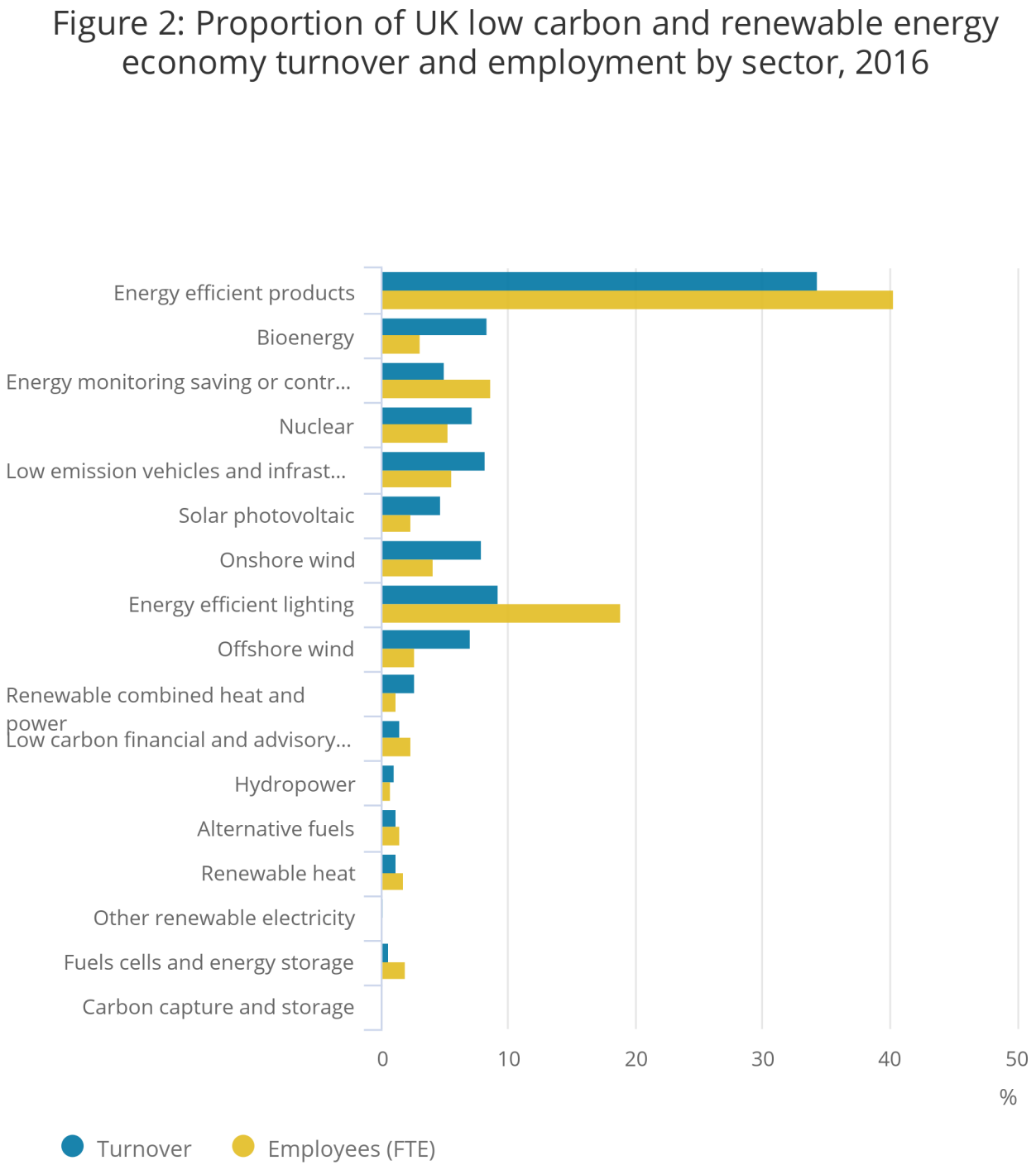
6 . The energy efficient products sector was the biggest employer in the UK low carbon and renewable energy economy in 2016

The energy efficient products group, which covers the design, manufacture and installation of energy efficient products, is the largest group within the low carbon and renewable energy (LCRE) economy (Section 4). This group comprises three sectors: energy efficient products, energy efficient lighting and energy monitoring saving or control systems.

Business activity in the energy efficient products sector [1] resulted in more full-time equivalent (FTE) employment in the UK LCRE economy than any other UK LCRE sector in 2016 (Figure 2).

Turnover for the energy efficient products sector grew to £14.7 billion in 2016 from £13.3 billion in 2015 and represented around one-third of all UK LCRE turnover. The proportion of employees in the UK LCRE economy who were active in the energy efficient products sector was higher, at just over 40%. This is because, compared with other UK LCRE sectors such as solar, activities in the energy efficient products sector are relatively labour intensive.

Figure 2: Proportion of UK low carbon and renewable energy economy turnover and employment by sector, 2016



Source: Office for National Statistics, Low Carbon and Renewable Energy Economy Survey

Notes:

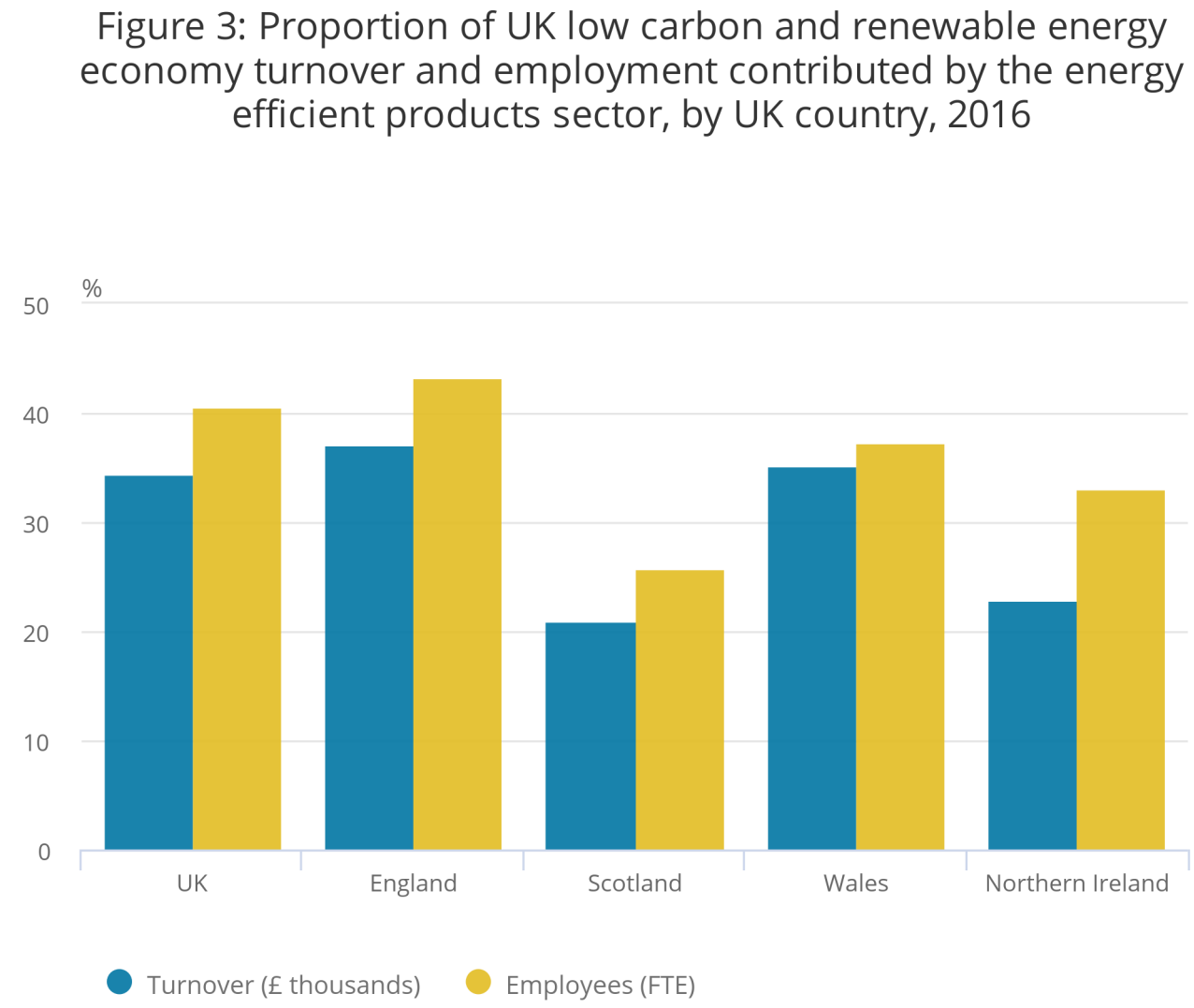
1. Information on the coefficient of variation associated with UK sector estimates of turnover and employment can be found in the datasets. Estimates for some sectors should be treated with caution due to their high coefficient of variation.

Considering the size of the energy efficient products sector in terms of turnover and employment, this sector made a relatively small amount of capital investment in 2016, with capital investment in this sector amounting to 2.7% of the UK LCRE economy's total acquisitions. This might reflect the more established nature of this sector compared with other sectors within the LCRE economy. Acquisitions in this sector are also likely to be less expensive than for other sectors such as wind and solar, which include the acquisition of land.

The energy efficient products sector was the second-largest sector in the UK LCRE economy in terms of imports and exports. The sector accounted for just over one-tenth of all imports and exports in the UK LCRE economy, with exports of around £0.4 billion and imports of around £0.8 billion. The largest proportion of LCRE economy imports and exports occurred in the low emission vehicles sector, which accounted for 24.5% of imports and 60.0% of all UK LCRE economy exports, equivalent to £1.5 billion and £2.2 billion respectively.

The energy efficient products sector was important in all four countries in the UK. In England and Wales, the greatest proportion of each countries' LCRE turnover was generated in the energy efficient products sector, with 37.1% (£12.4 billion) and 35.1% (£0.9 billion) respectively (Figure 3). In Scotland and Northern Ireland, the energy efficient products sector was the second-largest contributor to the countries' LCRE turnover, accounting for 20.9% (£1.2 billion) and 22.8% (£0.2 billion) respectively.

Figure 3: Proportion of UK low carbon and renewable energy economy turnover and employment contributed by the energy efficient products sector, by UK country, 2016



Source: Office for National Statistics, Low Carbon and Renewable Energy Economy Survey

Notes:

1. Information on the coefficient of variation associated with the energy efficient products sector estimates of turnover and employment can be found in the datasets. The estimate of employment in the energy efficient products sector in Northern Ireland should be treated with caution due to its high coefficient of variation.

Table 3: Contribution of the energy efficient products sector to the UK low carbon and renewable energy economy, 2015 and 2016

	2015		2016	
	Estimate	Percentage of UK total	Estimate	Percentage of UK total
Turnover (£ thousands)				
UK	13,275,000		14,660,000	
England	11,238,500	84.7	12,389,000	84.5
Scotland	1,112,500	8.4	1,205,000	8.2
Wales	722,500	5.4	854,500	5.8
Northern Ireland	201,500	1.5	212,000	1.4
Employment (FTE)				
UK	90,500		84,500	
England	77,500	85.4	71,500	84.5
Scotland	6,500	7.3	6,000	7.3
Wales	5,000	5.3	5,000	5.9
Northern Ireland	2,000	2.0	2,000	2.4

Source: Office for National Statistics, Low Carbon and Renewable Energy Economy Survey

Notes:

1. Figures may not sum due to rounding.

2. These estimates are based on the country that a business reports activity is in, rather than where the business is registered. For example, if a company based in England owns a solar farm in Scotland then their activity will be included in the estimates for Scotland.

3. Information on the coefficient of variation associated with these estimates can be found in the datasets. The estimates of employment in the energy efficient products sector in Wales in 2015 and Northern Ireland in 2016 should be treated with caution due to their high coefficient of variation.

4. Number of full-time equivalent (FTE) employees is rounded to the nearest 500, turnover is rounded to nearest £500,000.

Notes for: The energy efficient products sector was the biggest employer in the UK low carbon and renewable energy economy in 2016

1. The energy efficient products sector covers a wide range of low carbon and renewable energy (LCRE) activities. These include the design, production and/or installation of doors and windows, heating and ventilation, insulation, and sustainable buildings and architecture. It does not include energy efficient lighting, which is considered a separate sector.

7 . Growth in the wind sectors offsets a drop in the solar sector in 2016

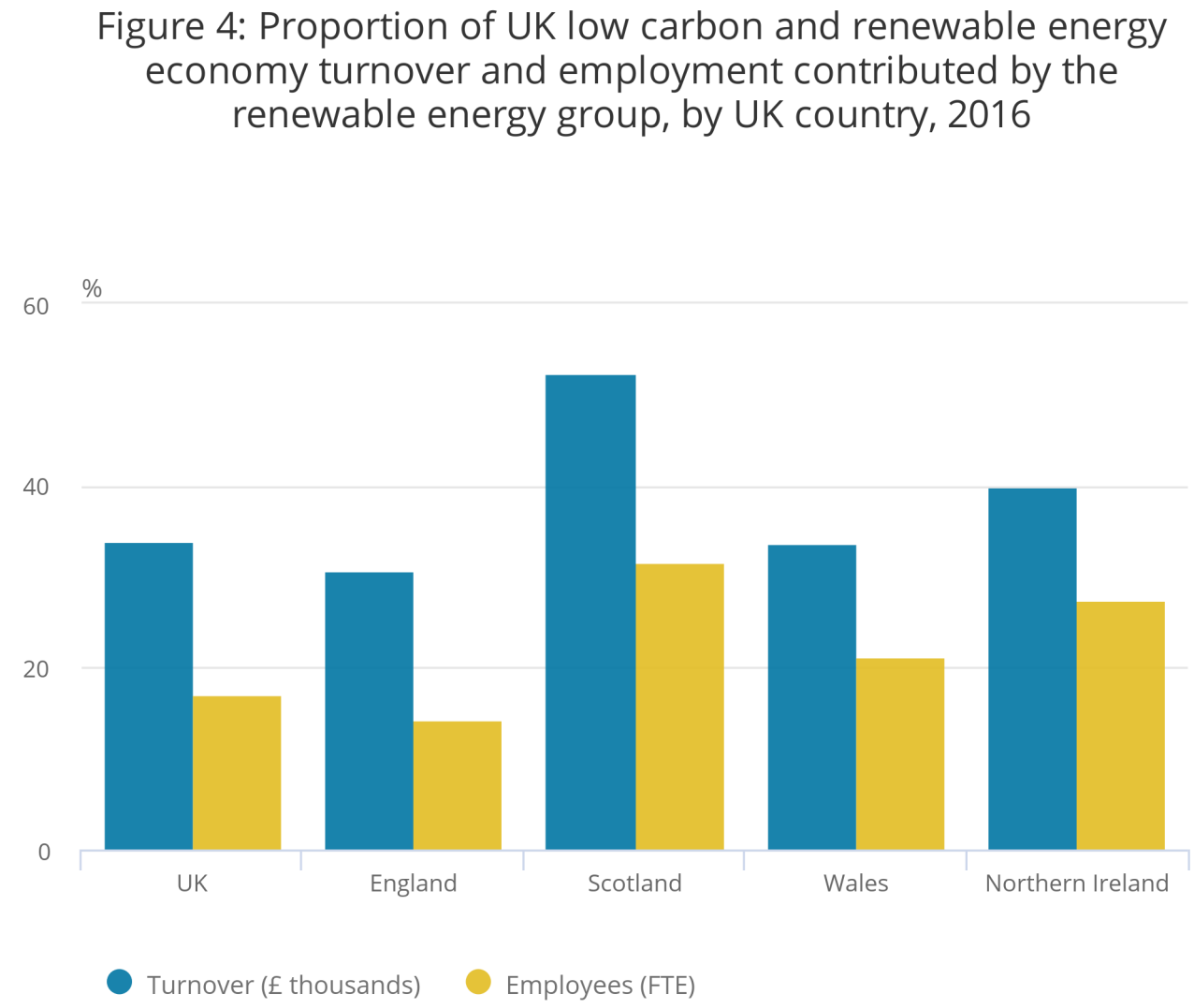
This section looks at the low carbon and renewable energy (LCRE) sectors that can be grouped together to represent renewable energy activities. The sectors classified as renewable energy are:

- offshore wind
- onshore wind
- solar photovoltaic
- hydropower
- other renewable energy
- bioenergy
- alternative fuels
- renewable heat
- renewable combined heat and power

In 2016, the renewable energy group accounted for over one-third of all UK LCRE turnover and around one-fifth of UK LCRE full-time equivalent (FTE) employees.

The renewable energy group was particularly important in Scotland, where it accounted for just over half of all LCRE turnover and one-third of LCRE employment in 2016 (Figure 4). Over half of this turnover and employment in Scotland was from the onshore wind sector.

Figure 4: Proportion of UK low carbon and renewable energy economy turnover and employment contributed by the renewable energy group, by UK country, 2016



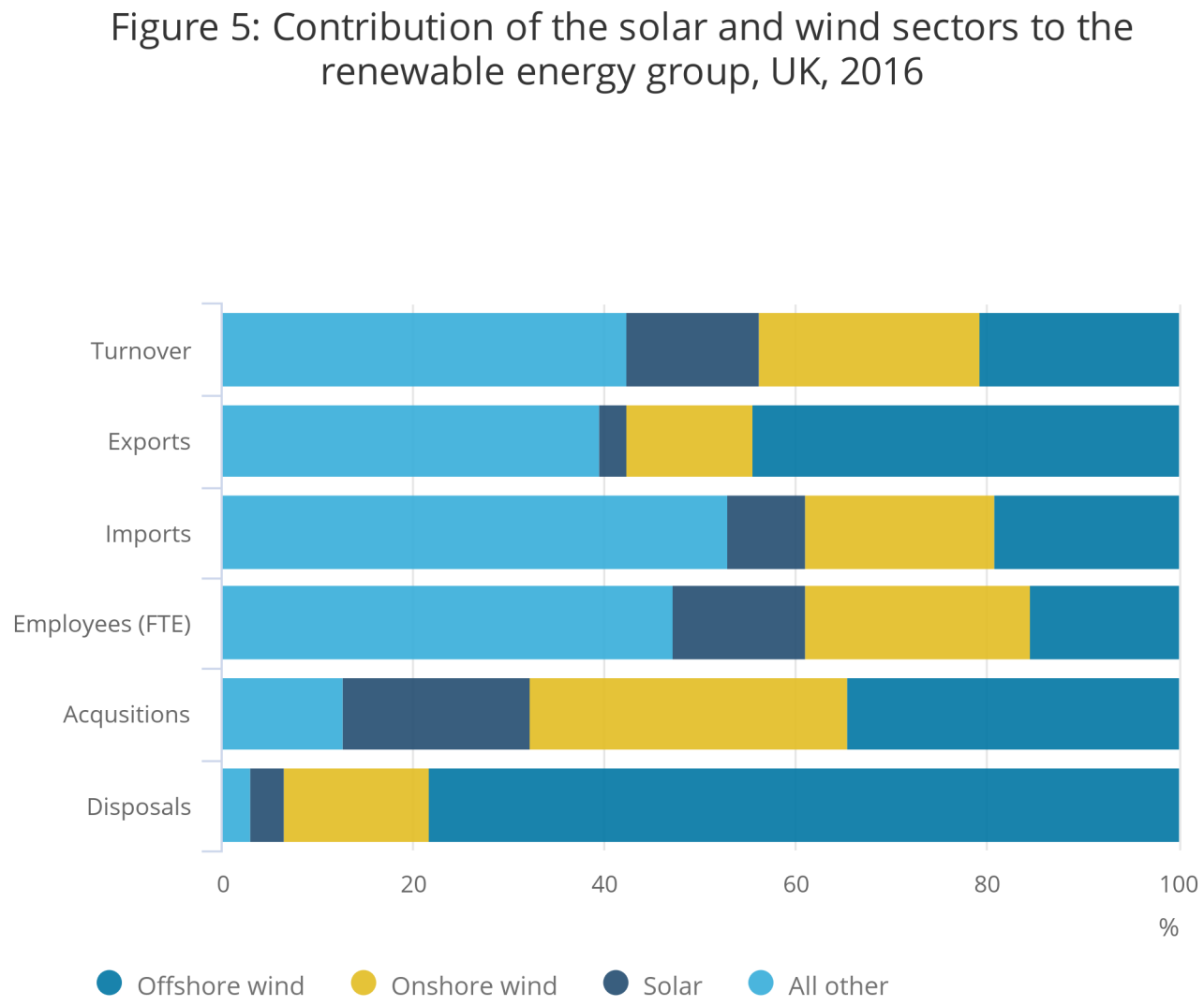
Source: Office for National Statistics, Low Carbon and Renewable Energy Economy Survey

Notes:

1. Information on the coefficient of variation associated with the renewable energy groups' estimates of turnover and employment can be found in the datasets. The estimates of employment and turnover in Wales and employment in Northern Ireland for the renewable energy group should be treated with caution due to their high coefficient of variation.

The wind and solar sectors were the biggest contributors to the renewable energy group (Figure 5). These sectors include businesses that are involved in the production of electricity from solar and wind (both offshore and onshore) and the design, production, and/or installation of infrastructure for these purposes, or operations and maintenance.

Figure 5: Contribution of the solar and wind sectors to the renewable energy group, UK, 2016



Source: Office for National Statistics, Low Carbon and Renewable Energy Economy Survey

Notes:

1. Information on the coefficient of variation associated with renewable energy group and sector estimates can be found in the datasets.

Turnover and employment in both the offshore and onshore wind sectors grew in 2016 compared with 2015, and when combined accounted for £6.4 billion (14.9% of UK LCRE) of turnover and employed 14,000 (6.7% of UK LCRE) FTEs in 2016.

The majority (80.5%) of offshore wind turnover in 2016 was generated in England, with most offshore wind farms being located on the coast of England. In contrast, the largest proportion (45.8%) of onshore wind turnover was generated in Scotland. This aligns with the fact that the majority of large capacity wind farms are in Scotland. Wales and England both saw an increase in estimates of onshore wind turnover in 2016, to £0.3 billion and £1.4 billion respectively. Most of this growth was within the manufacturing and construction industries.

Activity in the solar sector decreased in 2016, with businesses generating £2.0 billion of turnover and employing 5,000 FTEs in 2016, compared with £3.1 billion and 10,500 FTEs in 2015 (Table 4). When looking at the LCRE economy as a whole, solar sector activity represented 4.7% of UK LCRE turnover and 2.3% of UK LCRE employment in 2016, down from 7.7% and 5.3% respectively in 2015.

This fall was due to a decrease of activity in England, where the majority of UK turnover (85.4%) and employment (86.7%) generated from businesses active in the solar sector was located. Turnover from the solar sector in England fell from £2.9 billion in 2015 to £1.7 billion in 2016. The fall in solar sector turnover and employment between 2015 and 2016 was largely within the construction industry, so is likely to relate to the construction and installation of solar panels. Government subsidies relating to solar have been gradually reduced since early 2016.

Table 4: Turnover and employment in the solar, offshore and onshore wind sectors, UK, 2015 and 2016

	2015		2016	
	Estimate	**Percentage of total UK LCRE**	**Estimate**	**Percentage of total UK LCRE**
Turnover (£ thousands)				
Solar	3,124,000	7.7	2,003,000	4.7
Offshore wind	2,388,000	5.9	2,986,000	7.0
Onshore wind	2,967,000	7.3	3,356,000	7.9
Employment				
Solar	10,500	5.3	5,000	2.3
Offshore wind	3,000	1.5	5,500	2.7
Onshore wind	7,500	3.8	8,500	4.0

Source: Office for National Statistics, Low Carbon and Renewable Energy Economy Survey

Notes:

1. Information on the coefficient of variation associated with these estimates can be found in the datasets.

2. Estimates of solar turnover in 2015 and solar employment in 2015 and 2016 should be treated with caution due to their high coefficient of variation. Consequently, the percentage of total UK low carbon and renewable energy economy associated with these estimates should also be treated with caution.

3. Number of full-time equivalent (FTE) employees rounded to the nearest 500, all other variables rounded to nearest £500,000.

The offshore and onshore wind sectors were the largest sectors in the UK LCRE in terms of acquisitions of capital assets in 2016. They accounted for £2.6 billion (30.6% of UK LCRE) and £2.5 billion (29.3% of UK LCRE) of investment respectively. This was likely due to the acquisitions of new wind farms, which may not currently be generating high turnover but have relatively high start-up costs. The solar sector shrank from being the largest sector in the UK LCRE in 2015 in terms of acquisition of capital assets to being the third-largest sector in 2016. There remains investment in solar, with £1.5 billion of acquisitions made in 2016 (17.4% of all UK LCRE acquisitions). Acquisitions may include solar panels and wind turbines themselves but also include the cost of land that has been purchased for the construction of solar and wind farms.

8 . Estimates of indirect low carbon and renewable energy economy activity – Experimental Statistics

This section uses an experimental methodology to estimate indirect turnover and employment generated by the low carbon and renewable energy (LCRE) economy.

The UK Statistics Authority's Code of Practice for Official Statistics defines Experimental Statistics as "new official statistics undergoing evaluation. They are published in order to involve users and stakeholders in their development and as a means to build in quality at an early stage."

The data contained in this section have undergone the same high levels of quality assurance as other official statistics. However, as Experimental Statistics, the methodology used to create them remains under development and may be revised following further evaluation. It is therefore recommended that this is taken into account when using the findings.

Multipliers are used to estimate levels of indirect activity. As with the direct estimates, the difference between the 2015 and 2016 estimates should be interpreted with caution due to the precision of the survey-based estimates. For more information, see Section 10: Accuracy of the statistics.

What is indirect activity?

Most economic transactions increase economic activity by a larger amount than their size – this is because any transaction results in an increase in another economic actor's income or demand for an input, which in turn results in an increase in their spending, or investment. Multipliers are used to estimate the indirect effect an economic activity has on the wider economy, such as additional activity due to demand generated for the products of other firms by the wages paid to employees, or the increase in demand for the inputs used. A multiplier effect is the impact an economic transaction has on the wider economy; the multiplier measures the overall increase in economic activity resulting from the transaction, proportional to its size.

The total activity estimates in this report were calculated by constructing multipliers for each LCRE sector, both for the UK as a whole and for each UK country, based on the sector's composition in terms of Standard Industrial Classification 2007: SIC 2007 and the corresponding multipliers for turnover and employment, which were published in February 2014. Turnover and employment for each region, group and sector were multiplied by the corresponding multipliers to yield an estimate of total activity generated, including both direct and indirect activity. The difference between the direct activity discussed in this bulletin and the calculated total estimate is the indirect activity. Further details of the methodology are provided in Section 11: Quality and methodology.

Estimates of indirect turnover and employment

In the UK in 2016, an estimated £77.4 billion turnover was generated directly and indirectly by businesses active in the low carbon and renewable energy (LCRE) economy (Table 5), compared with £74.1 billion turnover in 2015. Of the total LCRE turnover generated in 2016, £34.8 billion (45.0%) was from indirect activities. LCRE businesses accounted for a total of 391,500 full-time equivalent (FTE) employees in 2016, compared with 377,000 in 2015. Of the total LCRE employment in 2016, 183,500 (46.8%) were from indirect activities (Table 6).

Table 5: Estimates of direct and indirect turnover (£ thousands) in the low carbon and renewable energy economy, UK countries, 2015 and 2016

	2015			2016			% change in Total 2015 to 2016
	Direct	Indirect	Total	Direct	Indirect	Total	
UK	40,532,000	33,615,000	74,147,000	42,559,000	34,830,500	77,390,000	4.4
England	32,519,500	26,536,000	59,055,500	33,423,000	26,893,500	60,316,500	2.1
Scotland	5,349,000	4,982,500	10,331,500	5,761,000	5,239,000	11,000,500	6.5
Wales	1,771,000	1,362,000	3,133,000	2,433,500	1,959,500	4,393,000	40.2
Northern Ireland	892,000	734,000	1,626,500	928,000	722,500	1,650,500	1.5

Source: Office for National Statistics, Low Carbon and Renewable Energy Economy Survey

Notes:

1. Figures may not sum due to rounding. Regional estimates may not sum to UK totals where it was not possible to allocate activity to a region.

2. The methods used to calculate indirect activity are experimental. The methods used to calculate indirect activity are experimental. Consequently, percentage change in total estimates of turnover between 2015 and 2016 should be treated with caution.

3. Turnover rounded to the nearest £500,000.

Table 6: Estimates of direct and indirect employment (full-time equivalent) in the low carbon and renewable energy economy, UK countries, 2015 and 2016

	2015			2016			% change in total 2015 to 2016
	Direct	Indirect	Total	Direct	Indirect	Total	
UK	201,500	176,000	377,000	208,000	183,500	391,500	3.8
England	164,500	138,500	303,000	165,000	140,500	305,500	0.8
Scotland	22,000	22,500	44,500	24,000	25,000	49,000	9.5
Wales	10,500	9,500	20,000	13,000	11,500	25,000	24.3
Northern Ireland	4,500	5,500	9,500	6,000	6,000	12,500	27.2

Source: Office for National Statistics, Low Carbon and Renewable Energy Economy Survey

Notes:

1. Figures may not sum due to rounding. Regional estimates may not sum to UK totals where it was not possible to allocate activity to a region.

2. The methods used to calculate indirect activity are experimental. Consequently, percentage change in total estimates of full-time equivalent (FTE) employment between 2015 and 2016 should be treated with caution.

3. Number of full time equivalent (FTE) employees rounded to the nearest 500.

The pattern of total activity across UK country and low carbon sector is the same as was seen in the direct estimates, which are discussed in the main body of this publication. The reason for this is that the multipliers are calculated by SIC 2007 and within each low carbon sector there is often a wide range of SICs. This means that the effect of applying the multipliers is fairly consistent across sectors and UK country.

9 . Revisions

This release contains revisions to 2014 and 2015 figures since they were published in April 2017. Revisions are not unusual in the first few years of a new survey and result from a variety of factors, including:

- the incorporation of additional data received from businesses who have been sampled in multiple years of the survey
- changes to data as a result of businesses revising their previous submissions
- developments in methodology

Table 7 shows the effect of revisions to 2015 data on estimates of UK turnover, employment, imports, exports, acquisitions and disposals. Revisions have also been made to 2014 data (less than 1% in magnitude at a UK level) and the new estimates can be found in the datasets. Revisions may continue to be made in future rounds of the survey as the methodology develops, for example, following a review of the methodology of estimates of number of businesses.

Table 7: Revisions to low carbon and renewable energy survey estimates, UK, 2015

	Latest estimate	Previously published estimate	Percentage change
Turnover (£ thousands)	40,532,000	43,087,000	-5.9
Employment (FTE)	201,500	234,000	-13.9
Imports (£ thousands)	4,330,500	4,688,000	-7.6
Exports (£ thousands)	3,663,500	4,113,500	-10.9
Acquisitions (£ thousands)	5,409,000	5,658,000	-4.4
Disposals (£ thousands)	409,000	405,000	0.9

Source: Office for National Statistics, Low Carbon and Renewable Energy Economy Survey

Notes:

1. Number of full-time equivalent (FTE) employees is rounded to the nearest 500, all other variables are rounded to the nearest £500,000.

10 . Accuracy of the statistics: estimating and reporting uncertainty

The figures in this bulletin are survey-based estimates. Surveys gather information from a sample rather than from the whole population. The sample is designed to allow for this, and to be as accurate as possible given practical limitations such as time and cost constraints, but results from sample surveys are always estimates and not precise figures. This means that they are subject to some uncertainty. This can have an effect on how changes in the estimates should be interpreted. Estimates of the level of uncertainty associated with all figures (coefficients of variation) reported are presented in the datasets to aid interpretation.

The coefficient of variation (CV) is the ratio of the standard error of an estimate to the estimate itself. For example, an estimate with a CV of 5% will have a standard error that is 5% of the estimate. The smaller the coefficient of variation the greater the accuracy of the estimate. A rough guide to CVs is that a CV of less than 5% is very good, of less than 10% is good, and of less than 20% is acceptable. Estimates with a CV greater or equal to 20% should be used with caution. In general, changes in the estimates reported in this statistical bulletin between 2015 and 2016 are not usually greater than the level that is explainable by sampling variability. This means movements in the estimates should be treated as indicative only.

11 . Quality and methodology

The Low Carbon and Renewable Energy Economy Survey Quality and Methodology Information report contains important information on:

- the strengths and limitations of the data and how it compares with related data
- uses and users of the data
- how the output was created
- the quality of the output including the accuracy of the data

The 2016 Low Carbon and Renewable Energy Economy Survey

The Low Carbon and Renewable Energy (LCRE) Economy Survey was despatched for the third time in 2017, for the reporting year 2016, to a sample of 13,884 businesses. It achieved a response rate of 85.8%, and of those responding, 1,664 businesses were operating in the LCRE sectors captured by the survey. We designed the survey to provide greater detail on the low carbon and renewable energy economy in the UK. Results from the survey can be used to show business activity in six low carbon groups, which can be further subdivided into 17 low carbon sectors (see the QMI report for more information).

Estimates for 2014 are provided in the datasets accompanying the statistical bulletin only. Comparing estimates from 2014 with estimates from later years of the survey is not advised due to changes in the sample methodology that were implemented in 2015. The survey sample size was reduced from around 40,000 in 2014 to around 14,000 in 2015. To enhance the sample for 2015, a number of businesses that were known to have activity in the LCRE economy were selected to be included in the sample. Because these businesses were not selected through random sampling for the 2015 sample, the weight applied to them to estimate for non-response is lower than it was in 2014. This partially explains why the estimates for the LCRE economy are generally lower in 2015 compared with 2014.

Business counts

Activity in the LCRE economy is spread across a wide range of industries. Many sectors are small but growing and for many businesses, LCRE activity is secondary rather than primary. For this reason, estimates of the number of businesses are subject to particular volatility and though provided in the datasets, are not directly considered within this statistical bulletin. A review of the methodology used to estimate the number of businesses will be undertaken in 2018.

The method used to calculate business counts for sectors within the LCRE economy was changed since the publication of 2014 final estimates in May 2016. Previously, businesses were apportioned to each sector that they were active in. For example, if a business was active in three sectors then it counted as one-third of a business in each sector. The benefit of this was that the sum of businesses in each sector added up to the UK total number of businesses. However, this potentially resulted in an underestimate of the number of businesses active within a particular sector. This methodology, used since the release of 2015 estimates in April 2017, means that if a business is active in three sectors, it counts as one business within each sector. This means that when the number of businesses is summed across all the sectors, the total may be more than the UK total number of businesses. This methodology has been applied to the 2014, 2015 and 2016 figures released alongside this bulletin. The method used to calculate the UK total number of businesses within the LCRE economy is unchanged since the survey began.

UK non-financial business economy

Total turnover, acquisitions and disposals in the UK non-financial business economy are derived from the Annual Business Survey, UK non-financial business economy, 2016 provisional results. The Annual Business Survey (ABS) excludes the following agricultural industries:

- 01.1 growing of non-perennial crops
- 01.2 growing of perennial crops
- 01.3 plant production
- 01.4 animal production
- 01.5 mixed farming

These industries were included in the LCRE Economy Survey and are included in the LCRE survey results. This should be considered when making comparisons. At the time of writing, regional ABS results for 2016 were not available. Therefore, 2015 ABS regional data have been used to derive proportions, which have then been applied to the UK 2016 total.

Regional full-time equivalent (FTE) non-financial business economy estimates are derived from the Business Register Employment Survey (BRES) and the Northern Ireland Quarterly Employment Survey (QES). Figures for Great Britain derived from BRES exclude employees in all industries that are excluded from the LCRE survey. However, figures for Northern Ireland derived from the QES do include employees in the industries: 63 information service activities, and 95 repair of computers and personal and household goods. This should be considered when making comparisons.

Total UK non-financial business economy imports and exports are derived from UK Balance of Payments, The Pink Book 2017. To ensure a like-for-like comparison, data by industry are required to remove industries that are not selected for the LCRE Economy Survey. UK imports and exports figures are not available by industry and therefore an exact comparison is not possible. However, figures are available for financial imports and exports. As financial industries are excluded from the LCRE Economy Survey sample, these have been excluded from the calculation, which will improve comparability.

Estimates for 2014 are provided in the datasets accompanying the statistical bulletin only. Estimates from this first year of the survey should be interpreted with caution due to changes in the sample methodology implemented in 2015.