Low Carbon and Renewable Energy Economy (LCREE) Survey QMI

Quality and methodology information for the Low Carbon and Renewable Energy Economy (LCREE) Survey, detailing methods used, data it provides, and strengths and limitations.

Contact:
Environmental Economy Survey team
environment.accounts@ons.gov.uk

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1 . Output information

- Designation: official statistics
- Survey name: Low Carbon and Renewable Energy Economy (LCREE) Survey
- Data collection: sample 25,000 businesses
- Frequency: annual
- How compiled: sample-based survey
- Geographic coverage: UK
- Related publications: Low carbon and renewable energy economy, UK
- Last revised: 26 August 2026

2 . About this Quality and Methodology Information report

This quality and methodology report contains information on the quality characteristics of the data (including the European Statistical System five dimensions of quality (PDF, 3.0MB) as well as the methods used to create them.

The information in this report will help you to:

- understand the strengths and limitations of the data
- learn about the existing uses and users of the data
- understand the methods used to create the data
- help you to decide suitable uses for the data
- reduce the risk of misusing data

3 . Important points

- The Low Carbon and Renewable Energy Economy (LCREE) Survey is the primary source of official information on LCREE activity in the UK.
- Businesses are considered to be active in the LCREE if they provide information on economic performance within 17 predefined LCREE sectors (.doc, 25.4KB).
- Estimates are available at the UK and country level for turnover, number of businesses, imports, exports, employees (in full-time equivalents) and capital investment.
- Estimates of the accuracy associated with the dataset is provided for total estimates of the LCREE as well as at various levels of granularity; increasing the granularity to, for example, country or LCREE sector, can present further accuracy challenges, which can limit the use of the data.
- The survey only collects data on direct LCREE activity and not indirect activity (that is, the additional activity in the economy generated because of demand for the products of LCREE-active firms, the wages they pay to employees, or the increase in demand for the inputs used by businesses directly active in the LCREE).
- We have also reviewed and updated our Low Carbon and Renewable Energy Economy (LCREE) Survey: indirect estimates methodology.
- LCREE activity does not have to be the main activity of a business for it to be counted as active in the LCREE.

4 . Quality summary

Overview

The Low Carbon and Renewable Energy Economy (LCREE) Survey was designed to provide estimates of the LCREE in the UK, following demand for official statistics on this topic. The survey was conducted for the first time in 2015, for the reporting year 2014.

The LCREE Survey results can be used to provide estimates of activity in 17 LCREE sectors as outlined in the LCREE sector and codes and descriptions (.doc, 25.4KB). Estimates of turnover, employment, number of businesses, imports, exports and capital assets are available at the UK and country level.

The LCREE Survey currently samples approximately 25,000 UK businesses using the Inter-Departmental Business Register (IDBR) as the sampling frame. The design is a stratified single-stage simple random sample with the target population being stratified by industry, employment size and UK country. Sample selection occurs independently within each stratum.

Sample respondents are weighted to represent the number of non-sampled businesses within the same stratum. As many nil returns are received, estimates are calculated using a two-stage process in combination with one-sided Winsorisation (an averaging method that limits extreme values), to improve the quality of results. Standard errors are calculated assuming that the estimator of the population total is a product of independent random variables. This calculation considers both the variability in the estimate of the proportion of non-zero LCREE activity and the variability of the estimate of the population total assuming all non-zero response.

Results with associated measures of their accuracy are published approximately 14 months after the reference period. The data published are estimates for the calendar year, January to December.

Examples of uses and users

The Department for Energy Security and Net Zero (DESNZ) uses estimates from the LCREE Survey as an informative framework for the development of cross-cutting and sector-level policies across the clean growth and climate change areas.

LCREE data are published in theScottish Energy Statistics Hubandused to track Scotland's renewable and low carbon ambitions, as set out in Scotland's Energy Strategy.

LCREE Survey estimates are published in the biennialEnergy in Northern Irelandcompendium; the data are used in briefings to policy colleagues regarding the size of the low carbon economy in Northern Ireland and will be used in any review of the Northern Ireland Strategic Energy Framework.

Several other government departments regularly use LCREE data for general briefing to ministers and to inform responses to Parliamentary Questions that are received regarding the size of the low carbon economy.

Estimates from the LCREE Survey may be used to contribute to international monitoring and regulation. For example, they are used to help fulfil regulatory required statistics such as our estimates of theEnvironmental Goods and Services Sectorproduced under theUN System of Environmental Economic Accounting (UN SEEA)framework. They are also used to contribute to Sustainable Development Goal (SDG) indicators such as Indicator 7.b.1: Investment in Energy Efficiency as a proportion of Gross Domestic Product (GDP).

Estimates from the LCREE Survey are used in combination with national accounts information to help provide an indication of the indirect economic impacts of activity in the LCREE. See the "Indirect activity in the LCREE" subsection in Section 7: Other information.

The Office for National Statistics (ONS) leads work aimed at defining and measuring green jobs in the UK. We published our most recent estimate of green jobs in our Estimates of green jobs, UK: July 2025 bulletin. Results from the LCREE survey are an important contributor to these statistics, which is helping to guide future LCREE development goals.

Estimates from the LCREE Survey are currently used by international organisations, UK and devolved governments, and the wider research community. They can be used to help assess and develop policies in areas such as green job creation, investment in the LCREE or the trade of LCREE products.

Strengths and limitations

The main strengths of the LCREE Survey include:

- a high response rate - before 2019, the LCREE response rate was consistently above 80% at the publication of results; the response rate fell below 70% for 2019 to 2021 data, since 2022 it has increased and the response rate for 2024 is 74.9%, which is higher than most business surveys
- the LCREE questionnaire collects activity by sector, which allows users to gain a thorough insight into the type of activities operating in the LCREE within the UK

The main limitations of the LCREE Survey include:

- the final and only estimates are published over 12 months after the period to which the data relate, because of the size and complexity of the survey
- the accuracy of survey-based estimates for smaller LCREE sectors and country-level disaggregations, which is highlighted by 95% confidence intervals and coefficients of variation (CV) published with the LCREE estimates, can be variable, which limits the use of some of the data; sample optimisation as the survey continues each year should improve the ability to target LCREE businesses, and accuracy of estimates for smaller sectors

Recent improvements

LCREE government user group meetings are held quarterly to give an opportunity for any changes or developments to the LCREE Survey to be discussed directly with the survey's main users to ensure the survey continues to meet policy requirements. The survey's main users include:

- Department for Energy Security and Net Zero
- Welsh Government
- Northern Ireland Department for the Economy
- Scottish Government
- Climate Change Committee

From the 2018 reporting period onwards, following user request, associated 95% confidence intervals of all survey-based estimates will be provided to aid user interpretation of the accuracy of LCREE estimates.

5 . Quality characteristics of the data

This report provides a range of information that describes the quality of the output and details any points that should be noted when using the output.

We have developed guidelines for defining quality; these are based upon the five European Statistical System (ESS) quality dimensions. This report addresses these quality dimensions and other important quality characteristics, which are:

- relevance
- timeliness and punctuality
- coherence and comparability
- accuracy and reliability
- accessibility and clarity

More information is provided about these quality dimensions in the following sections.

Relevance

Relevance is the degree to which the statistical product meets user needs for both coverage and content.

The Low Carbon and Renewable Energy Economy (LCREE) Survey has been developed in consultation with stakeholders from government departments, who are the primary users of the data, following demand for LCREE official statistics.

A stakeholder group was set up that includes representatives from the Department for Energy Security and Net Zero (DESNZ), Welsh Government, Scottish Government and Northern Ireland Department for the Economy. Workshops were organised during the start-up phase of the survey to ensure the questionnaire and sample selection met requirements. This included developing a list of 17 LCREE sectors for which statistics on activity were required as outlined in our LCREE Survey Guidance.

Stakeholders are consulted before any questionnaire changes are made.

The LCREE Survey is the primary source of official information on LCREE activity and has been designed to meet the needs of users. For example, devolved administrations required regional information, at the UK country level, on LCREE activity. Many businesses may have their reporting office in a different location to where the LCREE activity takes place. The LCREE Survey asks respondents to apportion their LCREE activity between UK regions to overcome this problem and produce robust regional statistics.

Timeliness and punctuality

Timeliness refers to the lapse of time between publication and the period to which the data refer. Punctuality refers to the time lag between the actual and planned dates of publication.

For LCREE, a statistical bulletin is published annually approximately 14 months after the period to which the data refer and includes all headline estimates of UK and country-level turnover, employment, number of businesses, imports, exports, acquisitions and disposals and, in addition, group, sector and industry breakdowns of these estimates.

All publications are pre-announced on the Office for National Statistics (ONS) release calendar at least four weeks in advance. If there are any changes to the pre-announced release schedule, public attention will be drawn to the change and the reasons for the change will be explained fully at the same time, as set out in the Code of Practice for Statistics.

The time lag between despatch and collection of the LCREE questionnaire and publication of the subsequent estimates reflects the size and complexity of this survey. Detailed breakdowns between LCREE sectors and geography require detailed responses from a large number of businesses.

Coherence and comparability

Coherence is the degree to which data that are derived from different sources or methods, but refer to the same topic, are similar. Comparability is the degree to which data can be compared over time and domain, for example, geographic level.

Limited comparator data are available. Information is available on some individual LCREE sectors. However, differences in scope limit comparability. Some examples follow.

The Department for Energy Security and Net Zero (DESNZ) publish statistics on all renewable energy sources in the UK in the Digest of United Kingdom Energy Statistics (DUKES): Chapter 6, Renewable Sources. These statistics cover the production of electricity and renewable electricity capacity. Statistics produced from the LCREE Survey cover all economic sector activity, including design, installation and maintenance in addition to the production of electricity.

Data on activity in the UK low carbon economy between 2010 and 2013 are available from the Low Carbon Report . The differences in definitions and methodology mean that the results are not directly comparable with the LCREE Survey. One significant difference is that this report used a combination of a small survey and existing data. Another important difference is that the study included the supply chain; hence the headline figures quoted by the report are far higher.

The LCREE Survey was conducted for the first time in 2015 collecting data for the calendar year 2014. This was the first survey of this kind following demand for official LCREE statistics. Continuity between the now eight years of the survey has been ensured with minimal changes made to the questionnaire. Any changes made have provided further information to respondents to minimise the risk of error, following feedback from respondents. Year-on-year comparisons are now available up to and including estimates from the calendar year 2014.

The method used to calculate business counts for sectors within the LCREE 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.

Our new 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 now been applied to all years and the method used to calculate the UK total number of businesses within the LCREE is unchanged since the survey began.

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 LCREE 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 LCREE are generally lower in 2015 compared with 2014.

Comparing estimates from 2014 with estimates from later years of the survey is not advised because of changes in the sample methodology that were implemented in 2015.

Accessibility and clarity

Accessibility is the ease with which users are able to access the data, also reflecting the format in which the data are available and the availability of supporting information. Clarity refers to the quality and sufficiency of the release details, illustrations and accompanying advice.

The Low Carbon and Renewable Energy Economy (LCREE) microdata are made available via the Secure Research Service (SRS). This provides the opportunity for approved researchers to access to this detailed information in a controlled environment.

Our recommended format for accessible content is a combination of HTML web pages for narrative, charts, and graphs, with data being provided in usable formats such as CSV and Excel. Our website also offers users the option to download the narrative in PDF format. In some instances, other software may be used, or may be available on request. Available formats for content published online but not produced by us, or referenced on our website but stored elsewhere, may vary. For further information please refer to the contact details at the beginning of this report.

Why you can trust our data

The Office for National Statistics (ONS) is the UK’s largest producer of statistics and is its national statistics institute. The Data Policies and Data Principles details how the data are collected, secured and used in the publication of statistics. We treat the data we hold with respect, keeping them secure and confidential, and we use statistical methods that are professional, ethical and transparent.

6 . Methods used to produce the data

How we collect the data, main data sources and accuracy

Coverage

When the Low Carbon and Renewable Energy Economy (LCREE) Survey was first designed, instead of sending questionnaires to all industry sectors in the economy, a target population of industries likely to have LCREE activity was developed based on four sources. Evidence from the Annual Business Survey, guidance from Eurostat, the target population of similar surveys administered by other national statistical institutes (NSIs) and the Office for National Statistics (ONS) expert judgement. UK government stakeholders were consulted and the proposed target population of 72 two-digit Standard Industrial Classifications (SICs) was agreed upon.

Table 1 shows the industries (divisions) initially excluded from the LCREE sample.

Table 1: 16 industries initially excluded from sample selection

Description	Division
Information service industries	63
Financial and insurance activities	64, 65, 66
Public administration and defence; compulsory social security	84
Human health and social care activities	86, 87, 88
Arts, entertainment and recreation	90, 91, 92, 93
Repair of computers and personal and household goods	95
Activities of households as employers; undifferentiated goods - and services - producing activities of households for own use	97, 98
Activities of extraterritorial organisations and bodies	99

Source: Office for National Statistics - Standard Industrial Classification (SIC) of Economic Activities system, 2007

Following a review of the data collected in the first two years of the survey, 27 industry divisions (see Table 2) were identified as not within the target population of interest and were excluded from the sample frame for the 2016 reporting period onwards. Revisions were made to previously published 2014 and 2015 estimates to account for this change.

Table 2: 27 divisions excluded from 2016 reporting period and future selections

Description	Division
Fishing	03
Extraction of oil/gas	06
Mining support services	09
Manufacture of food	10
Manufacture of beverages	11
Manufacture of textiles	13
Manufacture of clothes	14
Manufacture of leather	15
Manufacture of wood products	16
Printing/reproduction of media	18
Manufacture of coke/refined products	19
Manufacture of pharmaceuticals	21
Manufacture of furniture	31
Repair/installations of machinery	33
Retail	47
Water transport	50
Air transport	51
Accommodation	55
Food and beverage services	56
Publishing	58
Motion picture/tv etc	59
Programming/broadcasting	60
Telecommunications	61
Advertising	73
Veterinary	75
Travel agents/tours etc	79
Security	80

Source: Office for National Statistics - Standard Industrial Classification (SIC) of Economic Activities system, 2007

Concepts and definitions

Concepts and definitions describe the legislation governing the output, and a description of the classifications used in the output.

Sectors

The LCREE Survey asks respondents to report their activity in 17 LCREE sectors as reported later in this section. These sectors were developed in consultation with LCREE experts from various government departments, who are also data users.

Groups

Experts were further consulted regarding aggregating these sectors into groups of similar activity. These six groups are reported later in this section.

Standard Industrial Classification

Estimates are presented at an industry level using the Standard Industrial Classification: SIC 2007. This is the UK standard industrial classification of economic activities.

Output objectives

The LCREE Survey was designed to provide greater detail on the low carbon and renewable energy economy in the UK.

Data collection

The survey questionnaire was designed using our standard four-stage process:

- specialist review
- feasibility testing
- cognitive testing
- final reporting

See our survey guide for respondents for more detail.

Data collection takes place online, with a very small number of businesses being sent a paper version. Respondents are asked if the business operates in any of the 17 LCREE sectors listed in this section.

Respondents are then asked to report the turnover, imports, exports, employment, and capital assets for any of the LCREE sectors they have operated in during the reference period. Where businesses are active in multiple LCREE sectors, respondents are asked to report the information separately for each sector.

LCREE sectors and descriptions of activity

Offshore wind, onshore wind, solar, and hydropower

The production of electricity and the design, production, and installation of infrastructure for this purpose, including operations and maintenance.

Other renewable electricity

The production of electricity from wave and/or tidal and/or geothermal renewable sources and the design, production, and installation of infrastructure for this purpose, including operations and maintenance.

Bioenergy

The production of energy (electricity and heat) and the design, production, and installation of infrastructure for this purpose, including operations and maintenance.

Bioenergy is liquid biofuels, solid biomass and biogas, for example, bio methane, vegetable oil, peanut oil and energy crops. This sector includes gasification and anaerobic digestion.

Alternative fuels

The production of fuels for low carbon and renewable energy use, which is not classified as bioenergy. Including hydrogen. Excluding compressed natural gas and liquefied petroleum gas.

Renewable heat

The design, production, and installation of infrastructure for generating heat directly through solar, thermal, geothermal or other means. Including operations and maintenance. Including ground source and air source heat pumps. Excluding generating electricity, which is then used to generate heat. Excluding heat from biomass, which is classified under bioenergy.

Renewable combined heat and power

The design, production and installation of infrastructure for generating heat directly through solar, thermal, geothermal or other means where the renewable sources both generate direct heat and electricity. Including operations and maintenance. Excluding heat and power from biomass, which is classified under bioenergy.

Energy efficient lighting

The design, manufacture and installation of energy efficient bulbs, tubes, fittings and so on, designed to use less energy to produce the same or greater amount of light.

Energy efficient products

The design, manufacture and installation of energy efficient products. Examples include:

- energy efficient doors and windows
- heating and ventilation, such as condensing boilers, ventilation and heating recovery
- insulation such as loft, external wall, roof insulation, reducing energy consumption for heat or air conditioning by minimising “leakage” of heat
- energy efficient building materials or technologies
- sustainable buildings and architecture
- materials with greater insulation properties or durability properties or those requiring significantly less carbon emission in their manufacture or recycling waste materials in their manufacture

Excludes “smart” goods such as TVs and freezers.

Energy monitoring, saving or control systems

The design, manufacture and installation of systems that reduce energy consumption through effective heat or energy management. Include equipment and related systems for doing this.

Examples include:

- smart heating controls
- condensation control
- control system components
- energy management systems
- energy management software

Low carbon consultancy, advisory and offsetting services

Expert advice and education on reducing carbon consumption, engaging in low carbon industrial activities, carbon credits and funding systems for low carbon activities and services.

Includes environmental and/or energy consultants.

Low emission vehicles and infrastructure

Design and manufacture of vehicles with specific technology to significantly reduce or remove emissions. Includes hybrid vehicles, electric vehicles, fuel cell vehicles or other technologies. Include installation of infrastructure to support these vehicles.

Excludes small efficiency improvements such as lighter bodywork or aerodynamics. Fuel-efficient, conventional vehicles are also excluded.

Carbon capture and storage

Capturing waste CO2 at point of emission and depositing it where it will not enter the atmosphere. Activity of doing this and the design, manufacture and installation of infrastructure for this purpose.

Nuclear power

The production of electricity from nuclear power and the design, production and installation of infrastructure for this purpose. Including operations and maintenance. Decommissioning and waste processing activities are excluded.

Fuel cells and energy storage systems

The design, manufacture and installation of energy storage systems, flywheel energy storage, fuel cells, batteries and any other form of energy storage system.

These 17 LCREE sectors are also aggregated into groups for results publication. Estimates at sector level that are considered disclosive are suppressed (see section on “Disclosure control” for more details).

LCREE groups and description of activity

Low carbon electricity:

- offshore wind
- onshore wind
- solar
- hydropower
- other renewable electricity
- nuclear power
- carbon capture and storage

Low carbon heat:

- renewable heat
- renewable combined heat and power

Energy from waste and biomass:

- bioenergy
- alternative fuels

Energy efficient products:

- energy efficient products
- energy efficient lighting
- energy monitoring, saving or control systems

Low carbon services:

- low carbon consultancy, advisory and offsetting services

Low emission vehicles and infrastructure

- low emission vehicles and infrastructure
- fuel cells and energy storage systems

Sample design

The LCREE Survey samples approximately 25,000 UK businesses using the Inter-Departmental Business Register (IDBR) as the sampling frame. Sample selection is carried out using a stratified single-stage simple random sample with a target population stratified by different cells. Groups of businesses (called cells) are defined by three criteria:

- employment size-band
- industry (Standard Industrial Classification: SIC 2007)
- UK country of business registration (as per the IDBR)

There are around 900 of these cells in LCREE design. Sample selection occurs independently for each cell.

All businesses with 250 or more employees are selected, together with a random sample of businesses from each of the other strata, defined by two-digit SIC 2007 industry, country, and employment size-band. Businesses that are randomly sampled are generally expected to remain in the sample for two years. The sample is supplemented with a small number of businesses that are known to be highly active in one or more of the LCREE sectors, but do not have large enough employment to be selected as part of the census strata. These businesses are allocated to a reference list and will remain on the list each year as their returns are “unique”, and therefore need to be added to their own cell.

The total sample is allocated between strata to try and minimise the variance of the estimates of total LCREE turnover at the UK, country and LCREE group-level as far as is possible.

The sample will be re-optimised to improve the efficiency of sample estimation as more data from the survey become available.

How we process the data

Editing and validation

All responses are put through validation checks and any issues are investigated and queried with the respondent to obtain explanations for data anomalies. Sources such as the Inter-Departmental Business Register (IDBR) and business websites are also used to investigate data.

Various quality assurance exercises, such as validating nil returns, are also carried out. As a large number of nil returns are received (roughly 80% of the returns), a range of methods are employed to identify businesses for which activity is expected. These include:

- cross-checks against lists of businesses known to be transacting in the low carbon industries
- searches for specific key words within the name such as “solar”, “wind” and “energy”
- sector specific checks – for example, businesses in SIC 43.2 “Electrical, plumbing and other construction installation activities”
- within the construction industries businesses are contacted to establish if they carry out installation activities for energy efficient products

Imputation

Imputation techniques are used to estimate the value of the missing data caused by non-response.

Non-response can lead to a reduction in the precision of estimates and undermine the data's utility for users. For the LCREE Survey there are two types of imputation processes:

- item non-response imputation, which refers to incomplete responses
- unit non-response imputation, which refers to businesses that did not respond to the survey

Item non-response

Imputation methods for item non-response are based fundamentally on other survey variables that serve to predict the values or distribution of plausible values of the target variable(s) being imputed (the imputation classifications). Typically, the imputation classifications will consist of other variables from the survey that have two fundamental properties. They should:

- account for any non-response bias identified in the data
- be good predictors of the target variable(s)

Poorly specified classifications will lead to error or bias in survey estimates.

Businesses that have provided valid responses are divided into imputation classes and the median value for the class is calculated. Item non-response replaces missing items with the median of the values returned by the other responders in the imputation class. All incomplete responses are treated for item non-response. It is important that the imputation class has enough responders to enable the imputation calculations to give a fair result. Otherwise, one very large or small response could have a large impact on the quality of the imputed values. An imputation class has to hold at least 10 responders providing complete response. Where this is not the case the next priority order imputation class would be applied.

Imputation classification order:

1. SIC 2007 section and LCREE Sector

2. SIC 2007 section and LCREE Group

3. Collapsed SIC 2007 section (industries A, D, F, G and M separated out and all other sections combined) and LCREE Group

4. LCREE Group only

Unit non-response

When the survey was initially set up, it was not possible to impute for unit non-response as there were no previous data and so all missing whole returns were dealt with by using the mean of the responders (mean imputation). Now previous survey data are available, unit non-response imputation for larger businesses (250 or more employees) and reference list businesses imputes the non-responders in that group with their previous data, upscaled with a growth factor. This growth factor is calculated from responders in both the current and previous years, as the ratio of their current total divided by their previous total (ratio of means imputation).

This method is applied to all variables except disposals. For disposals there is very little year-on-year correlation so applying a growth factor is not sensible. Non-response for this variable is accounted for by using mean imputation.

The rest of the sample non-responders, that is, businesses with fewer than 250 employees or not on the reference list, are accounted for by using mean imputation.

Weighting and estimation

Sample respondents are weighted to represent a number of non-sampled businesses within the same stratum. As many nil returns are received, estimates are calculated using a two-stage process, to improve the quality of results.

First, the proportion of businesses reporting any LCREE activity within a stratum is estimated.

Second, a weighted aggregate of LCREE activity is calculated from those businesses reporting activity. This is achieved by removing those businesses that report no LCREE activity and adjusting the weights of the remaining businesses to ensure they represent the non-sampled businesses appropriately. The resulting weighted responses are then aggregated.

The final stage of the process is to multiply the estimate of the proportion by the weighted aggregate to estimate the population total in each stratum.

All businesses in the census strata (250 or more employees), and those from the reference list, should have a weight of one as they represent themselves. However, not all of businesses respond, and if they have never responded to the LCREE Survey, the weights for the rest of the census strata are adjusted to compensate for this. If a business has previously responded to the LCREE Survey, but has not responded to the latest questionnaire, they are dealt with instead by imputation.

In the first year of the survey (reporting period 2014), no reference list existed as LCREE activity was unknown. A reference list was introduced for the 2015 survey period. Businesses that had identified LCREE activity in 2014 were then added to the reference list in 2015, this will have resulted in a reduction in their weighting.

Business counts are estimated as the weighted aggregate of the proportion of activity reported in each sector and region for each business. These count estimates are consistent across groups, regions and the whole economy.

Businesses with extreme or atypical main variable returns are automatically detected and treated using a method known as one-sided Winsorisation. The detection threshold is set to minimise the mean squared error, with those businesses identified as outliers having their values reduced towards the threshold so they do not represent as many unsampled businesses as their initial weight would imply. The parameters used to set the detection threshold are reviewed on a regular basis. It is the treated values that are used in the estimator.

In addition, some returns have values that are atypical when compared with similar businesses, and also have a large impact on estimated totals, are treated as outliers with post-stratification. They are removed from their original cells and assigned to unique new ones, reducing their weights to one, so that they do not have a large distorting effect on the estimates. The weights of other businesses in the original cell as the outlier are then recalculated.

Standard errors are calculated assuming that the estimator of the population total is a product of independent random variables and considers both the variability in the estimate of the proportion of non-zero LCREE activity, and the variability of the estimate of the population total assuming all non-zero response.

Confidentiality

The Code of Practice for Statistics guarantees confidentiality to those who provide private information to produce Official Statistics. Principle T6.4 of the Code states: “Personal information should be kept safe and secure, applying relevant security standards and keeping pace with changing circumstances such as advances in technology.”

Furthermore, our surveys are conducted on behalf of the UK Statistics Authority and all outputs are subject to Section 39 of the Statistics and Registration Service Act (2007) (PDF, 225KB).

Business surveys operating within the UK are governed under the Statistics of Trade Act (1947). This states that tables should not be published that would disclose any information relating to an individual business unless there is expressed consent in writing from that business.

Our confidentiality pledge assures confidentiality given to respondents:

“All the information you provide is kept strictly confidential. It is illegal for us to reveal your data or identify your business to unauthorised persons."

Statistical disclosure

Statistical disclosure control methodology is applied to LCREE data. This is to make sure that information attributable to an individual or individual organisation, is not identifiable in any published outputs.

The Statistical Disclosure Control Policy sets out the standards for safeguarding the information provided in confidence to us. “Disclosure control” refers to the methods that reduce the risk that confidential information is published in any official statistics. These methods are applied if ethical, practical, or legal considerations require the data to be protected. Disclosure control involves modifying data so that the risk of identifying individuals is reduced, but at the same time attempts to find a balance between improving confidentiality protection and maintaining an acceptable level of quality in the published data.

How we quality assure and validate the data

Accuracy

The degree of closeness between an estimate and the true value.

The LCREE data 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 influence how changes in the estimates should be interpreted. Estimates of the level of uncertainty associated with all figures (coefficients of variation) are presented in the datasets to aid interpretation.

In general, changes in the estimates reported between each year 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.

As in all surveys, the estimates in the LCREE Survey are subject to various sources of error. The total error in a survey estimate is the difference between the estimate derived from the data collected and the true (unknown) value for the population. The total error consists of two main elements: the sampling error and the non-sampling error. The LCREE Survey was designed to minimise both these errors.

Sampling error

This occurs because estimates are based on a sample rather than a census of the population. The results obtained for any single sample may, by chance, vary from the true values of the population but the variation would be expected to be zero on average over a number of repeats of the survey. Sampling error is minimised by using a stratified random sample.

Sampling error is continually monitored with CV calculated for each output measure. The CV is the standard error of a variable divided by the survey estimate and it is used to compare the relative precision across surveys or variables. The closer the CV is to zero, the more accurate the estimate in percentage terms. A rough guide to CVs is:

- 5% is very good
- 10% is good
- 20% is acceptable
- over 20% should be used with caution.

Confidence intervals of 95%, the range within which the true population would fall for 95% of the times the survey was repeated, will be provided from the publication of 2018 data onwards following user feedback. This is another standard way of expressing the statistical accuracy of a survey-based estimate. If an estimate has a high error level and CV, the corresponding confidence interval will be very wide.

Non-sampling error

There is potential for non-sampling error which cannot be easily quantified. These can be caused by coverage issues, measurement and non-response. A number of steps are taken to minimise non-sampling error and are listed in this section.

Validation checks

Returned information is run through a series of validation checks to identify any errors. Data that fail the validation checks are queried with respondents to confirm or correct the original data.

Responses are further quality-assured using a number of resources. For example, key word searches are undertaken on company names. Information from trade membership organisations is also used.

Response accuracy

Following despatch of the questionnaire, up to two reminders are sent to businesses that have not responded. Response-chasing exercises are also carried out, targeting large businesses in important industries that are likely to be operating in the LCREE sectors.

Before 2019, the LCREE response rate had consistently been above 80%. For 2019, 2020 and 2021 data, the response rate fell below 70%. This is likely to be because of the coronavirus (COVID-19) pandemic (2019 was affected because the data were collected in 2020). In 2022, the response rate exceeded 70% and has remained above that level since. Estimates produced for years with lower response rates may be subject to more uncertainty than usual.

In addition, LCREE has a rolling programme of questionnaire reviews where stakeholders are consulted on any changes that may be implemented to improve and clarify the survey questions and supporting notes, and hence help respondents complete the survey more accurately.

LCREE calendar year results

LCREE estimates are published for calendar years. However, to reduce the burden on respondents, some businesses use the option to return data for their business year-end. This covers any 12-month period up to and including the end of the financial year that follows the end of the calendar year. It is possible that, particularly if the economy is undergoing a period of rapid change such as during an economic downturn, the different reporting periods could introduce some bias.

Regional apportionment

Estimates are calculated on regional LCREE activity at the country level. For businesses with multiple sites, using the country recorded on our business register was likely to result in assigning the LCREE activities to the country where the reporting head office was located. A question was therefore tested and added to ask respondents to proportion their LCREE activity between UK countries to enable accurate regional estimates to be produced.

Industry classification in the Inter-Departmental Business Register

Industry re-classification of a business can occur because of a relatively small change to the nature of its operation, and this can have a significant effect on LCREE estimates by industry. In addition, the correction of misclassification of businesses can lead to bias, particularly where there is systematic movement from one industry to another. This is because, where classification updates are identified via survey returns, it is only units in the survey sample that are updated.

Where a survey does not cover the whole business population, such as the LCREE, re-classification can lead to units moving out of the sample but never into it. In the LCREE this effect is likely to be small, and is corrected for by adjusting the weights of the businesses that remain in the sample.

How we review and maintain data processes

Revisions

Revisions are not unusual, especially 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 that have been sampled in multiple years of the survey
- changes to data as a result of businesses revising their previous submissions
- developments in methodology

Revisions are a standard practice when producing official statistics and over time, as more information becomes available, estimates can be revised to improve the quality and accuracy, which will provide a better picture of that being measured.

If revisions arising through improvements to methodology or changes to data are found to be insignificant, they will be introduced in the next planned final estimates bulletin. Revisions to previous estimates are only typically collated for the last two reporting periods.

Assessment of user needs and perceptions

The processes for finding out about uses and users, and their views on the statistical products.

Workshops with a wide variety of users were organised during the start-up phase of the survey to ensure the questionnaire and sample selection met user requirements. Following despatch, monthly highlight reports are provided to the stakeholder group to update on progress. Regular additional workshops with main users are also organised at important points in the survey cycle to update stakeholders further and discuss any developments in detail.

7 . Other information

More information on the Low Carbon and Renewable Energy Economy (LCREE) Survey and other topics related to the UK Environmental Accounts are available:

- Low carbon and renewable energy economy, UK: statistical bulletin
- Low Carbon and Renewable Energy Economy Survey: information for businesses taking part in the survey
- Low carbon and renewable energy economy estimates: dataset
- UK Environmental Accounts: webpage

Indirect activity in the LCREE

Indirect and total activity estimates provide an indication of the effect that direct economic activity in the LCREE, as captured by the LCREE Survey, has on the wider economy. This includes additional activity because of demand generated for the products of other firms by the wages paid to employees, or the increase in demand for the inputs used. These estimates are classed as official statistics in development.

The methodology used to produce indirect estimates has been reviewed and updated. The new method uses the UK input-output analytical tables in its calculations. This data source includes industry-by-industry and further analysis tables derived from the annual Input-output supply and use tables (SUTs).

The latest 2023 input-output analytical tables are now available; therefore we have revised indirect estimates for 2022 and 2023 alongside the publication of provisional estimates for 2024.

Research and development estimates

We released research and development (R&D) estimates for the first time in our Low carbon and renewable energy economy survey, research and development estimates, UK: 2020 to 2024 bulletin, published on 26 August 2026.

The estimates are based on questions introduced to the LCREE Survey in response to user demand, from the 2020 reporting period onwards. These focused on providing more information about investment in innovation within the low carbon and renewable energy economy.

The Survey collects information on both in-house and purchased research and development expenditure. In-house R&D refers to research and development undertaken by businesses using their own employees and resources. Purchased R&D refers to research and development completed by external organisations, such as contractors or consultants. Both measures include capital and non-capital expenditure.

These measures are presented separately, rather than as a total, because they capture different aspects of research and development investment. This provides transparency on both R&D activity and its funding flows, as combining them may increase the risk of double counting. Double counting can happen when the same R&D activity is reported by both the organisation carrying out the work and the organisation funding it, potentially overstating overall levels of R&D activity.

Presenting the measures separately is also consistent with established international research and development statistical guidance, and the treatment of R&D expenditure in Business Enterprise Research and Development (BERD) statistics.

Quality and revisions

Research and development estimates are subject to the LCREE Survey revisions policy, as described in Section 6: Methods used to produce the data, under the subsection "How we review and maintain data processes". Estimates for 2020, 2021 and 2022 are final. Estimates for 2023 and 2024 are provisional and will be revised when R&D estimates are incorporated into the main LCREE dataset for the 2025 reporting period.

Research and development estimates are labelled as official statistics in development, reflecting the continued development of validation and quality assurance processes for these newly collected variables. The methodology used to produce the estimates is consistent with other variables collected through the LCREE Survey and follows the same principles for sampling, weighting, imputation and revisions. Further details are available in Section 6: Methods used to produce the data.

Users should interpret these estimates with caution. Research and development expenditure can be volatile, and estimates are subject to uncertainty, especially where activity is concentrated among a small number of businesses.

Changes over time may also reflect genuine changes in business activity, project-based R&D cycles, changes in sample composition, the entry or exit of large contributors, revisions, or differences in reporting practices.

Comparability

LCREE R&D estimates are not directly comparable with other UK or international measures of R&D, including Business Enterprise Research and Development (BERD) statistics. The LCREE Survey measures research and development by relating specifically to low carbon and renewable energy activities within the scope of the LCREE framework.

In contrast, BERD measures business research and development activity across the whole economy. As a result, LCREE R&D estimates should be viewed as complementary to other research and development statistics, rather than directly comparable with them.

Definition of research and development

Research and development covers both basic and applied research involving creative and systematic work undertaken to increase knowledge or develop new applications of existing knowledge. These relate to the 17 LCREE sectors described in Section 6: Methods used to produce the data, under the subsection "LCREE sectors and description of activity".

To qualify as research and development, activities must be:

- novel
- creative
- uncertain
- systematic
- transferable or reproducible

Survey development

Our Environmental economy business surveys development plan, UK: August 2026 article, published on 26 August 2026, sets out future development plans for the LCREE Survey. It also provides an overview of planned improvements to statistics collected through environmental business surveys, including an indicative timeline for their implementation.

8 . Cite this methodology

Office for National Statistics (ONS), released 25 February 2026, ONS website, methodology, Low Carbon and Renewable Energy Economy (LCREE) Survey quality and methodology information (QMI)