

Article

# Energy efficiency of housing in England and Wales

Analysis of the energy efficiency, estimated carbon dioxide emissions and energy cost of dwellings in England and Wales with an Energy Performance Certificate.

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# 1 . Introduction

This article contains analysis of Energy Performance Certificate (EPC) data for England and Wales available from the Ministry of Housing, Communities and Local Government (MHCLG) [Open Data Communities website](#). We examine EPC data to help provide insight on energy efficiency, carbon dioxide (CO2) emissions and estimated energy cost of new and existing homes, and to show progress towards decarbonising the dwelling stock.

This article also contains an initial assessment of the EPC data coverage, quality and limitations. For more information about this, which is helpful when interpreting this analysis, see the [Methodology section](#).

Our analysis of EPC data is designed to complement MHCLG's [quarterly EPC statistical releases](#).

This report covers EPC data up to 31 March 2019, which is before the coronavirus (COVID-19) pandemic.

## Energy Performance Certificates

An Energy Performance Certificate (EPC) indicates the energy efficiency of a building. It is based on data about a building's energy features (for example, the building materials used and the heating systems and insulation), which are collected by an accredited energy assessor and are entered into a government-approved software to generate the EPC.

An EPC is required when a building is constructed, sold or let, and is valid for 10 years. Domestic EPCs are banded from "A" to "G", where "A" is the most energy efficient in terms of likely fuel costs and CO2 emissions.

[You can use MHCLG's EPC retrieval webtool to see and download the EPC for your home.](#)

[More information on EPCs is available on MHCLG's frequently asked questions page.](#)

## What is the context?

In June 2019, the [UK Government passed a new law](#) that commits the UK to reduce its greenhouse gas emissions to [net zero](#) by 2050. Around that time, both the Committee on Climate Change and the Business, Energy and Industrial Strategy Committee had noted that [any credible strategy to achieve net zero will require widespread deployment of energy efficiency measures across the UK's buildings \(PDF, 2.7MB\)](#).

A year later, the UK Government is setting policies regarding the UK's economic recovery from the coronavirus pandemic, and on the environment. In July 2020, the new [Green Homes Grant](#) scheme was announced, which is intended to support homeowners in England in making their homes more energy efficient, and create new work in the construction industry.

Since 2011, the Welsh Government has invested in its own home energy efficiency programme, designed to support people living on a lower income to improve the energy efficiency of their home.

Emerging green schemes and climate targets, combined with existing media interest in [energy efficiency targets for UK homes](#) and their [impact on the environment](#), make it important to have statistics that help inform the public, and future policies, on the energy efficiency of homes and their decarbonisation.

## Some definitions we use

We define a dwelling as an address containing a unit of accommodation. A dwelling is new if it has just been constructed, or if it is a building that has just undergone a conversion or change of use (for example, office to residential). An existing dwelling is simply one that is not new.

The concept of a dwelling covers multiple types of accommodation. For our statistics, we focus on flats (which include purpose-built flats and maisonettes) and houses (which include detached, semi-detached and terraced houses, bungalows and park homes).

A financial year period goes from 1 April to 31 March.

You can find more definitions in our [Glossary section](#).

## 2 . Main points

- Energy Performance Certificate (EPC) data show new dwellings are more energy efficient than existing dwellings, though the median energy efficiency rating bands for both types of dwellings in England and in Wales have not changed in recent years.
- On average, existing houses in England and in Wales that had an EPC undertaken in financial year ending 2019 were rated within band D; this is lower than the current target of having as many homes as possible in EPC band C by 2035.
- In FYE 2019, EPC data shows that both the median estimated carbon dioxide (CO<sub>2</sub>) emissions and estimated energy cost for an existing house in England and in Wales were more than twice as high as those for a new house.
- On average in England and in Wales, social rented flats and houses with an EPC record are more energy efficient than privately rented flats and houses respectively.
- For England and for Wales, we estimate that almost 8 out of every 10 dwellings with an EPC use mains gas to power central heating.
- London is the only region in England where the majority of new dwellings do not use mains gas directly in central heating; EPC data show 67% of new dwellings in London received heat from a community heating scheme in FYE 2019.
- Heat pumps, a low-carbon heating source, are not widely used for central heating in England and Wales, with 3% of new dwellings in both countries using them for central heating in financial year ending 2019.

## 3 . Energy efficiency of new and existing dwellings

Statistics are presented for England and Wales separately on the energy efficiency of new and existing dwellings, rented dwellings, main fuel type (and method of heating) used in central heating, and the heating of new dwellings.

The analysis in this report does not cover all dwellings in England and Wales because not every dwelling has an Energy Performance Certificate (EPC) (these are required when a dwelling is constructed, sold or let). We can still draw conclusions from our analysis because EPC data appear to be broadly representative of the split between flats and houses present in the overall dwelling stock ([see Table 1](#)). More information is available in the [Coverage of Energy Performance Certificate data section](#).

Analysis of EPC data shows that existing dwellings are less energy efficient than new dwellings. On average, existing houses in England and in Wales that had an EPC undertaken in financial year ending (FYE) 2019 were rated in band D. This was lower than the current target of [having as many homes as possible in EPC band C by 2035 \(PDF, 5.3MB\)](#).

Figure 1 shows the median energy efficiency scores for new and existing flats and houses that had an EPC undertaken in the given financial year.

### **Figure 1: EPC data shows new dwellings are more energy efficient than existing dwellings**

Median energy efficiency scores for new and existing flats and houses, financial year ending 2013 to financial year ending 2019, England and Wales

Notes:

1. A financial year period goes from 1 April to 31 March.
2. The energy efficiency score figures reflect the dwellings that had an EPC in the given financial year.

[Data download](#)

For FYE 2019, the median energy efficiency score for new flats and new houses in England and in Wales was rated within EPC band B. For both countries, EPC data show new flats had a median score of 83 and new houses a score of 84. In contrast, the median energy efficiency score for existing flats (70 in both countries) was rated within EPC band C, and for existing houses within band D. The median energy efficiency score for existing houses in England was 64, while in Wales it was 63.

In addition to giving the energy efficiency of buildings, EPCs also provide information about the impact of buildings on the environment in terms of estimated carbon dioxide (CO<sub>2</sub>) emissions, and estimated energy cost (comprising of lighting, heating and hot water costs).

Apart from being the least energy efficient property type, existing houses are also estimated to produce the most CO<sub>2</sub> emissions and to have the highest estimated energy cost out of all dwelling types. This is important to consider in the overall picture of improving the energy efficiency of homes, because existing houses make up the majority of the dwelling stock in both England and Wales.

Figure 2 shows the median estimated CO<sub>2</sub> emissions for new and existing flats and houses in England and in Wales in the given financial year.

### **Figure 2: In England and in Wales, EPC data shows that the estimated CO<sub>2</sub> emissions for existing houses were more than twice the level of those for new houses**

Median estimated Carbon dioxide (CO<sub>2</sub>) emissions (tonnes/year) for new and existing flats and houses, financial year ending 2013 to financial year ending 2019, England and Wales

Notes:

1. A financial year period goes from 1 April to 31 March.
2. The estimated CO2 emission figures reflect the dwellings that had an EPC in a given financial year.
3. CO2 emission estimates are based on standardised assumptions about dwelling occupancy and energy use.

### [Data download](#)

For FYE 2019, in England and in Wales, the median estimated CO2 emissions for existing houses were equivalent to the emissions of more than two new houses combined. Also, in both countries, the median estimated energy cost per year for an existing house (£885 in England and £907 in Wales) was more than twice as much as that estimated for a new house (£399 in England and £394 in Wales).

These findings also apply to all English regions. Across England, existing dwellings are less energy efficient than new dwellings, with existing houses estimated to produce the most CO2 emissions and to have the highest estimated energy cost.

EPC data can also be useful to look at smaller geographical areas, such as local authorities.

While some of our statistics for local authorities may be based on a relatively small number of EPCs, they are still useful for indicating the local picture for energy efficiency. For example, in any local authority, we would expect the median energy efficiency rating for new dwellings to be above (or at least equal to) that of existing ones, and it is interesting to see when this is not the case.

At the local authority level across England and Wales, EPC data for FYE 2019 shows:

- new flats: Cambridge had the highest median energy efficiency score for new flats, with 89 (EPC band B), and North Lincolnshire the lowest, with 59.5 (band D)
- new houses: Hounslow in London had the highest median energy efficiency score for new houses, with 90 (EPC band B), and both Adur in West Sussex and Kensington and Chelsea the lowest, with 81.5 (band B)
- comparing new and existing flats: 14 local authorities had lower median energy efficiency scores for new flats than for existing ones; Harlow had the biggest energy efficiency score difference between new flats (61, EPC band D) and existing flats (71, band C)

Use our interactive map to explore the energy efficiency of different properties where you live.

### **Figure 3: Energy efficiency of dwellings in your area**

Notes:

1. The data in Figure 3 are for financial year ending 2019.
2. Where no data are available, this is due to there being no EPCs or fewer than five EPCs for that property type in the given year for the selected geography. These are suppressed as fewer than five EPCs is not deemed enough to produce a robust average and is therefore not reported.

### [Data download](#)

## 4 . Energy efficiency of rented dwellings

The energy efficiency of rented dwellings is particularly important because the people who live in rented accommodation depend on their landlord to ensure that their home is of sufficient quality. The [decent homes standard](#) in England and the [Welsh housing quality standards](#) in Wales aim to ensure that landlords keep their properties in good condition for existing and future tenants.

Analysis of Energy Performance Certificate (EPC) data shows that, on average in England and in Wales, social rented flats and houses are more energy efficient than privately rented flats and houses.

Figure 4 shows the median energy efficiency scores of privately rented and social rented dwellings in England and in Wales in the given financial year.

### **Figure 4: The median energy efficiency score for privately rented dwellings had been well above the minimum EPC band E required since April 2020**

Median energy efficiency scores for privately rented and social rented flats and houses, financial year ending 2013 to financial year ending 2019, England and Wales

Notes:

1. A financial year period goes from 1 April to 31 March.
2. The energy efficiency score figures reflect the dwellings that had an EPC in a given financial year so that they could be let.

#### [Data download](#)

The median energy efficiency score, for social rented flats in England that had an EPC undertaken in financial year ending 2019, was within EPC band C (73). Social rented houses and both privately rented flats and houses were within band D.

For FYE 2019 in Wales, the median energy efficiency scores for both social rented flats (74) and houses (70) were rated within EPC band C; privately rented flats (67) and houses (62) were within band D.

An EPC is required when a dwelling is going to be privately let. Since FYE 2013, EPCs undertaken for privately let dwellings in England and in Wales had a median energy efficiency score within EPC rating band D. This is above the [minimum energy efficiency rating of E for private rented properties](#) set by the UK Government as of 1 April 2020.

## 5 . Main fuel type and methods of heating used in central heating

Energy Performance Certificate (EPC) data also gathers information on whether a dwelling has a central heating system, what type of system this is and the fuel it uses.

Figure 5 shows the estimated distribution of dwellings with an EPC by main fuel type (or method of heating) used in central heating in England and its regions, and Wales.

## Figure 5: For England and for Wales, we estimate that nearly eight out of every 10 dwellings with an EPC use mains gas to power central heating

Estimated distribution of dwellings with an EPC by main fuel type (or method of heating) used in central heating, as at financial year ending 2019, England, English regions and Wales

Notes:

1. Other includes B30K, bioethanol, biogas, biomass, dual fuel (mineral and wood), liquid biofuel, solid fuel (e.g., coal), tank or bottled gas (like Liquefied Petroleum Gas) and wood.
2. Totals do not add to 100% because the fuel type or method of heating used in central heating could not be determined for some dwellings.
3. These statistics are estimates because we could not account for dwellings that have been demolished since their last EPC.

### [Data download](#)

While improving the energy efficiency of new and existing homes will be vital to meet the net zero carbon target, so will be reducing the amount of high-carbon fossil fuels burnt to heat homes (such as gas).

Our analysis of EPC data shows that mains gas is the most common fuel type used in central heating in England and its regions, and Wales. As at 31 March 2019, an estimated 79% of dwellings with an EPC in England used mains gas to power central heating (77% in Wales). Regionally, the North East had the highest estimated proportion of dwellings that used mains gas (87%) and the South West the lowest (70%).

After mains gas, electricity was the second most common fuel type used in England to power central heating (11%). In Wales, this was split between oil and electricity (both 8%).

[Community heating schemes and heat pumps are being presented as alternative low-carbon heating sources to mains gas](#), and we estimate that 4.0% and 0.8% of dwellings with an EPC in England used these methods for central heating respectively (1.5% and 0.8% in Wales).

## 6 . Heating new dwellings

The [UK Government's ambition \(PDF, 5.3MB\)](#) for the next 10 years is to phase out the installation of mains gas in new and existing homes, starting with new ones.

In England, under the [Future Homes Standard](#) (to be introduced by 2025), a typical new dwelling should either have a heat pump as its central heating source or receive heat from a community (or district) heating scheme. In Wales, the Welsh Government's [consultation into the Building Regulations for new dwellings \(PDF, 2.1MB\)](#) proposed phasing out the use of high-carbon fossil fuels and moving to low-carbon alternatives from 2025.

In financial year ending (FYE) 2019, most new homes in England and in Wales used mains gas to power central heating. Figure 6 shows the percentages of new dwellings using mains gas to power central heating and the percentage that receive heat from a community heating scheme.

The chart shows this for London, the rest of England, and Wales over time.

## Figure 6: London is the only region in England where the majority of new dwellings do not use mains gas directly in central heating

New dwellings using mains gas to power central heating or receiving heat from a community heating scheme, financial year ending 2013 to financial year ending 2019, London, the rest of England and Wales

Notes:

1. A financial year period goes from 1 April to 31 March.

### [Data download](#)

In recent years, London has consistently had more new dwellings receiving heat from a community heating scheme than using mains gas to power central heating, with this proportion increasing almost every year. Over the same time period, the proportion of new dwellings using mains gas in London has decreased. In FYE 2019, an estimated 24% of new dwellings in London used mains gas to power central heating, compared with 67% receiving heat from a community heating scheme.

In the rest of England, the majority of new dwellings use mains gas to power central heating, although this proportion has slightly decreased in recent years (from 81% in FYE 2013, to 77% in FYE 2019).

In Wales, the majority of new dwellings also use mains gas in central heating, with this proportion having slightly increased from FYE 2013 (78%) to FYE 2019 (82%).

Finally, the proportion of new dwellings using heat pumps for central heating in England and in Wales has decreased in FYE 2019 compared with FYE 2013 (England: from 4% to 3%; Wales: from 6% to 3%).

## 7 . Future developments

We will gather and consider the feedback we receive from users and assess whether to repeat this analysis of Energy Performance Certificate (EPC) data and any other additional research into the energy efficiency of housing. Using this feedback, we will engage with the Ministry of Housing, Communities and Local Government (MHCLG), as well as with the Welsh Government, to explore the feasibility and user demand for producing this type of analysis on a regular basis.

## 8 . Related publications

Our research aims to gain insight into the energy efficiency of different types of dwellings. It is designed to complement the Ministry of Housing, Communities and Local Government's (MHCLG) [quarterly EPC statistical releases](#). These focus primarily on describing the Energy Performance Certificates (EPCs) themselves, presenting timely information for domestic and non-domestic buildings in England and Wales.

MHCLG also publishes weekly EPCs lodgement statistics for domestic properties in England and Wales. You can find a link to these statistics at the bottom of their [live tables page](#).

The Welsh Government also provides analysis on the [energy efficiency of dwellings in Wales](#), based on data from the [Welsh Housing Conditions Survey](#).



While we have only focused on England and Wales in this report, other EPC-related statistics for the remaining UK countries can be found using the following links:

## Scotland

The [Scottish House Condition Survey](#) contains statistics on EPCs, based on an annual survey sample of around 3,000 dwellings. This is the primary source of data at a national level on the energy efficiency of the Scottish housing stock.

There is separate information about EPCs in the [Scottish EPC register](#), which collates actual EPCs undertaken.

## Northern Ireland

The [Northern Ireland Housing Statistics report](#) contains information and statistics relating to domestic energy and energy efficiency of homes in Northern Ireland.

The Northern Ireland EPC register collates actual [domestic](#) and [non-domestic](#) EPCs undertaken.

# 9 . Feedback

We are keen to get feedback on this report and the statistics presented within, including:

- how these statistics might be improved
- quality and potential uses of Energy Performance Certificate (EPC) data
- further research needed to understand the energy efficiency of the dwelling stock

If you have any feedback that you would like to share with us, please email it to [better.info@ons.gov.uk](mailto:better.info@ons.gov.uk).

# 10 . Coverage of Energy Performance Certificate data

The analysis in this report does not cover all dwellings in England and Wales because not every dwelling has an Energy Performance Certificate (EPC) (these are required when a dwelling is constructed, sold or let).

We can still draw conclusions from our analysis. This section shows that EPC data appear to be broadly representative of the split between flats and houses present in the overall dwelling stock in England and in Wales (see Table 1).

As at 31 March 2019, we estimate that more than half of all dwellings in England and in Wales have had at least one EPC. This has been rising steadily in recent years (Figure 7).

## Figure 7: Over half of dwellings in England and in Wales have had an Energy Performance Certificate

Estimated proportion of the dwelling stock that has had at least one Energy Performance Certificate, financial year ending 2009 to financial year ending 2019, England and Wales

Notes:

1. A financial year period goes from 1 April to 31 March.
2. Since Autumn 2008, an EPC is required when a building is constructed, sold or let.
3. These statistics are estimates because we could not account for dwellings that have been demolished since their last EPC.

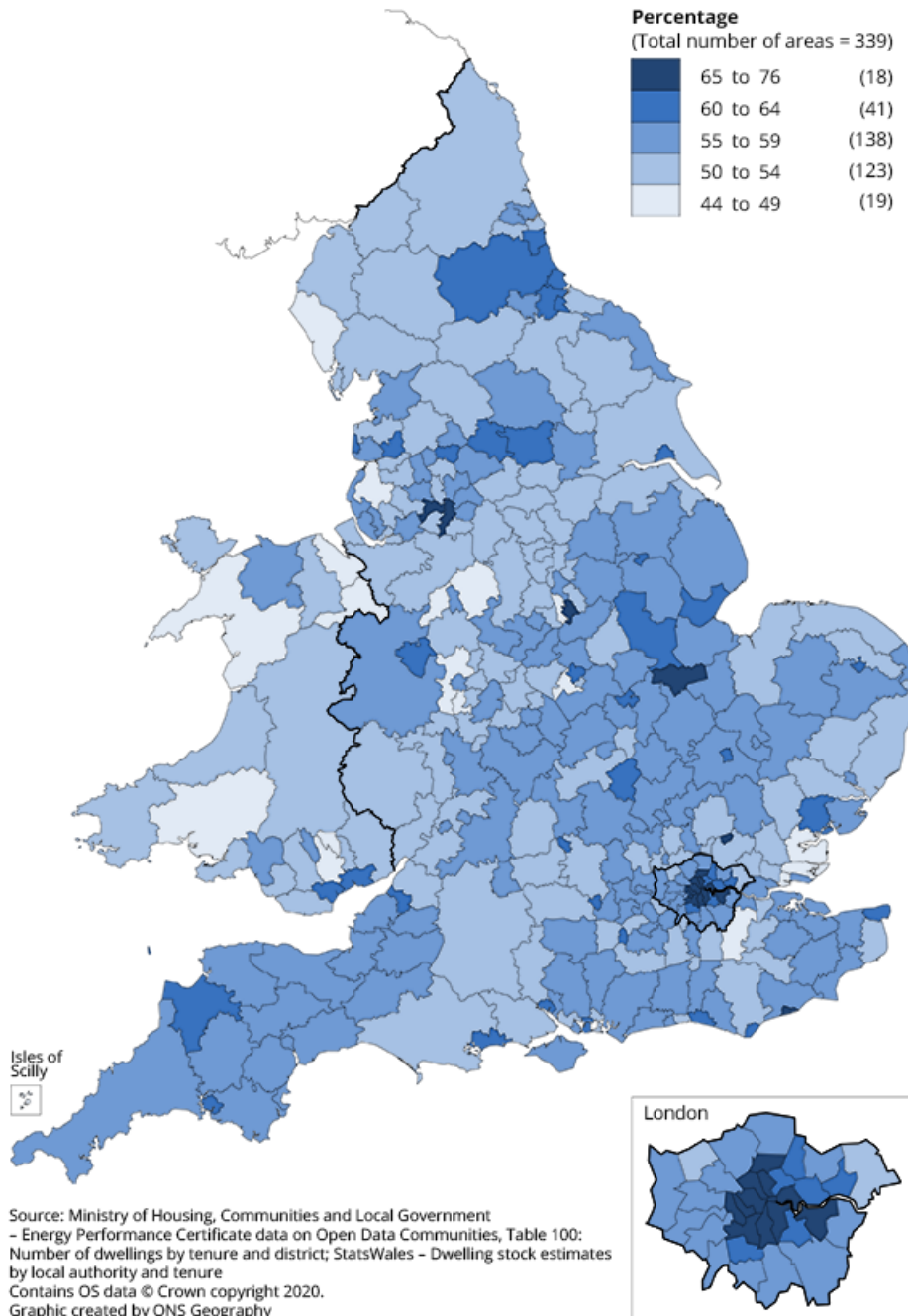
[Data download](#)

Rather than being clustered geographically, EPCs are relatively evenly distributed across local authorities in England and in Wales. Looking at each local authority individually, we see that in nearly all of them, more than half of the dwelling stock had an EPC (Figure 8). Only in 19 out of the 339 local authorities across England and Wales did less than half of the dwelling stock have an EPC, with the Isles of Scilly having the lowest proportion (44%).

**Figure 8: In nearly all local authorities, more than half of the dwelling stock had an Energy Performance Certificate**

Estimated proportion of the dwelling stock that had at least one Energy Performance Certificate, as at financial year ending 2019, local authorities in England and Wales

Local authority districts, England and Wales



Source: Ministry of Housing, Communities and Local Government – Energy Performance Certificate data on Open Data Communities, Table 100: Number of dwellings by tenure and district; StatsWales – Dwelling stock estimates by local authority and tenure

Notes:

1. Dwellings with an EPC is based on data as at 31 March 2019.
2. Number of dwellings is based on data as at 31 March 2019.
3. These statistics are estimates because we could not account for dwellings that have been demolished since their last EPC.

As shown in Figure 8, EPC coverage is highest in some of the most urban areas of England (such as inner London, Nottingham and Manchester). One possible explanation for this may be the [higher proportion of the dwelling stock that is rented](#) in such urban areas, since all rented dwellings need to have a valid EPC.

Using [Valuation Office Agency \(VOA\) data](#), we can check if the property types in EPC data were representative of the mix present in the overall dwelling stock (Table 1). As shown in Table 1, the proportion of EPCs for flats and houses in England and in Wales were broadly representative of the mix of flats and houses present in the overall dwelling stock.

Table 1: Property type mix by data source as at 31 March 2019

Country	Property type	Energy Performance Certificate data	Valuation Office Agency data
England	Flat	30%	23%
England	House	70%	75%
Wales	Flat	19%	14%
Wales	House	81%	85%

Source: Ministry of Housing, Communities and Local Government – Energy Performance Certificate data on Open Data Communities; Valuation Office Agency – Table CTSOP3.0: number of properties by Council Tax band, property type and region, county and local authority

#### Notes

1. For VOA statistics, “House” includes all house categories (terraced, semi-detached and detached) and bungalow. Percentages do not sum to 100% as there are some properties recorded in VOA data that are neither houses nor flats (for example, mobile homes and caravans).

## 11 . Methodology

### Interpreting these statistics

The analysis presented in this report does not cover all dwellings in England and Wales because not every dwelling has an Energy Performance Certificate (EPC) (these are required when a dwelling is constructed, sold or let).

This analysis does not contain statistics on actual energy consumption, which are published by the [Department of Business, Energy and Industrial Strategy](#).

For our statistics the term “flats” includes maisonettes, and the term “houses” includes bungalows and park homes.

EPCs may not necessarily show the latest situation of a dwelling, because the majority of alterations don't require a new EPC to be generated. Works undertaken (such as a boiler installation) would only be reflected in our analysis if an EPC was carried out on the dwelling after the works were complete.

Statistics on EPC coverage and on distribution of dwellings by fuel type (or method of heating) used in central heating are estimates, as it was not possible to discern which dwellings have been demolished since their last EPC was generated.

EPC data on the estimated CO2 emissions and estimated energy cost are based on standardised assumptions about how residents will use the dwelling (such as number of occupants, heating patterns and lighting and hot water usage). This is to make dwellings directly comparable to each other for prospective buyers or tenants, so does not reflect how residents actually use it.

Some dwellings included in our statistics on the energy efficiency of rented dwellings may have changed tenure since the date of their latest EPC. Likewise, dwellings that had an EPC for reasons other than being let may have since entered the private or social rented sector.

## How we used the Energy Performance Certificate data

The analysis described in this report is based on domestic, record-level EPC data downloaded from the Ministry of Housing, Communities and Local Government [Open Data Communities](#) website in July 2019.

There were 18,171,912 EPC records that covered dwellings in England and Wales. Table 2 shows the filtering process we applied to these records in order to create the dataset used for our analysis. After filtering, our dataset consisted of 17,544,671 records (16,639,725 for England and 904,946 for Wales), which is 96.6% of what we originally downloaded.

Table 2: Data parsing process overview

<b>Step</b>	<b>Type of remaining records</b>	<b>Reduction of records as a percentage of the original 18,171,912 records</b>
Step 1	More than 18 million EPC records downloaded from Open Data Communities	Records that failed to join with the National Statistics Postcode Lookup (NSPL) (0.04%)
Step 2	EPC records joined with the NSPL	Superseded and duplicate records filtered out of dataset (3.2%)
Step 3	Filtered EPC data with no superseded or duplicate records	EPC records showing a dwelling as new when it already exists in EPC data (0.17%)
Step 4	No new dwelling records after dwelling already existed in EPC data	"INVALID!" EPC records (less than 0.01%)
Step 5	17,544,671 EPC records remained	

Source: Ministry of Housing, Communities and Local Government – Energy Performance Certificate data on Open Data Communities

A more detailed version of the methodology presented in Table 2 is available upon request at [better.info@ons.gov.uk](mailto:better.info@ons.gov.uk).

## Statistics for new and existing dwellings

In this report, we generated statistics for new dwellings using data from new dwelling EPC records (which include new builds, conversions and change of use). Statistics for existing dwellings were created using data from the latest EPC record available for existing dwellings in a financial year.

The same dwelling can be represented in statistics for multiple financial years. For example, an existing house with EPCs for the financial years ending (FYE) 2013, 2015 and 2019 would be represented in the existing house statistics for those three financial years.

It is possible for the same dwelling to be represented in both new and existing dwelling statistics within a single financial year. For example, a house had an EPC assessment when it was newly constructed in the financial year ending 2016, and later that financial year it had another EPC assessment done as part of a [Renewable Heat Incentive](#) application.

## Statistics for privately rented and social rented dwellings

In this report, we generated statistics for privately rented dwellings using the latest EPC record available for existing dwellings, in a financial year, when they were lodged under the reason “rental (private)”. Statistics for social rented dwellings were generated using the latest EPC record available for existing dwellings, in a financial year, when they were lodged under the reason “rental (social)”.

The same dwelling can be represented in statistics for multiple financial years. For example, the latest EPCs for a flat for FYE 2013, 2015 and 2019 were under the reason “rental (private)”. This flat would be represented in the privately rented flats statistics for those three financial years.

The same dwelling can be represented in both privately rented and social rented statistics across financial years. For example, the latest EPCs for a house for FYE 2013 and 2015 were under the reason “rental (private)”, and for FYE 2018 and 2019 under the reason “rental (social)”. This house would be represented in the privately rented houses statistics for FYE 2013 and 2015, and in the social rented houses statistics for FYE 2018 and 2019.

# 12 . Glossary

## Business, Energy and Industrial Strategy (BEIS) Committee

The [BEIS Committee](#) is a Commons select committee. Its purpose is to scrutinise the policy, spending and administration of the Department of Business, Energy and Industrial Strategy and its public bodies (including Ofgem, the Financial Reporting Council and the Committee on Climate Change).

## Committee on Climate Change

The (UK) [Committee on Climate Change](#) is an independent, statutory body established under the [Climate Change Act 2008](#). Its purpose is to advise the UK Government and Devolved Administrations on emissions targets, and report to Parliament on progress made in reducing greenhouse gas emissions and preparing for climate change.

## Community heating scheme

A community heating scheme is a distribution system of insulated pipes that takes heat from a central source (usually in the form of hot water or steam) and delivers it to a number of different buildings. The way these central sources produce heat can vary (through normal boilers, renewable-fired boilers or utilising waste heat from electricity generation), but they decarbonise more easily compared with other heat sources because new technologies can be added to the distribution system with little disruption to individual buildings.

Community heating schemes are one of the most cost-effective ways of reducing carbon emissions from heating, and their efficiency and carbon-saving potential increase as they grow and connect to each other.

## Decarbonisation

Decarbonisation can be defined as the process of reducing greenhouse gas emissions that result from activities such as producing electricity, heating homes or transport, for example.

## Dwelling

A dwelling is an address containing a unit of accommodation that can comprise one or more household spaces.

## Energy efficiency

Energy efficiency relates to the concept of efficient energy use, which means using less energy to provide heating or lighting, for example. Using less energy, in itself, cuts down on greenhouse gas emissions.

An example of good energy efficiency would be using fluorescent lightbulbs to illuminate a home. Compared with traditional incandescent lightbulbs, fluorescent lightbulbs use less electricity to produce the same amount of light. Another example is home insulation. If a home is well-insulated, it will need less energy to achieve a comfortable temperature compared with a poorly insulated home, making it more energy efficient.

## Greenhouse gases

These are natural and human-produced gases that trap heat emitted from the Earth's surface in the atmosphere, which contributes to the Earth's [greenhouse effect and rise in global temperatures](#). The main six greenhouse gases, as per the [Kyoto protocol](#), are:

- carbon dioxide (CO<sub>2</sub>)
- methane (CH<sub>4</sub>)
- nitrous oxide (N<sub>2</sub>O)
- hydrofluorocarbons (HFCs)
- perfluorocarbons (PFCs)
- sulphur hexafluoride (SF<sub>6</sub>)

## Heat pump

A heat pump is a device that absorbs heat from one environment and transports it into another using electricity. For example, an air-source heat pump extracts heat from the air outside and transfers it into the home. This heat can then be used to warm radiators and underfloor heating systems.

Heat pumps are highly energy efficient because the amount of heat they produce, in relation to the amount of electricity they consume, is greater than other traditional sources of heating. Heat pumps are also low carbon because of their very low overall greenhouse gas emissions.

## Net zero

Net zero is the term used to describe the UK Government's target for at least 100% reduction of greenhouse gas emissions in the UK by 2050. This target can be achieved by a combination of deep reductions in emissions across the UK and emission removal through other methods (for example, by [afforestation](#) or using [carbon capture and storage](#) technologies).