

The Non-Domestic National Energy Efficiency Data-Framework 2021 (England and Wales)

24th June 2021

Official Statistics

This report summarises analysis of the non-domestic building stock and non-domestic building energy consumption in England and Wales using the latest version of the Non-Domestic National Energy Efficiency Data-Framework (ND-NEED).

What you need to know about these statistics

The statistics in ND-NEED cover all non-domestic buildings in England and Wales, under the ND-NEED definition. Information on the non-domestic building stock reflects the position at the end of March 2020. Information on energy consumption covers 2012-2019, and comprises electricity and gas consumed via the public distribution system (onsite generated electricity consumption is not included).

The key results are:

- Non-domestic building energy consumption varies by building use.
 - For electricity, the three highest consuming building uses excluding Other are Factories (30%), Offices (15%) and Shops (13%). For gas, the three highest consuming building uses excluding Other are Factories (37%), Education (8%) and Offices (7%).
- Non-domestic building energy intensity also varies by building use, but with a different pattern to energy consumption.
 - The building uses with the highest median electricity intensities are Hospitality (187 kWh/m²), Shops (125 kWh/m²) and Health (88 kWh/m²). The building uses with the highest median gas intensities are Hospitality (284 kWh/m²), Shops (204 kWh/m²) and Emergency Services (189 kWh/m²).
- Non-domestic building energy consumption varies by building size. For both electricity and gas consumption increases as building size increases.
 - Buildings >1,000m² are responsible for 61% of electricity consumption and 72% of gas consumption (excluding buildings missing floor area information).
- Non-domestic building total electricity and gas consumption remained broadly stable between 2012 – 2019. This pattern is seen across building uses.

Further detail including a breakdown of the non-domestic building stock by building age and occupying business size, and a breakdown of electricity consumption/intensity and gas consumption/intensity by building use, building size and occupying business size can be found in the [results](#) section of the report.

Responsible statistician: Maya Fooks
Email: energy.stats@beis.gov.uk

Media enquiries: 0207 215 1000
Statistical enquiries: 0300 068 655

Figure 1: Summary graphic of the key ND-NEED 2021 results.



*ACL – Arts, Community and Leisure

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1. Introduction

The Non-Domestic National Energy Efficiency Data-Framework 2021 (ND-NEED 2021) provides an insight into the electricity and gas consumption/intensity of non-domestic buildings in England and Wales in 2019 (split by sector, building size and occupying business size) and how this has changed over time. It also provides new information on the non-domestic building stock, with a breakdown of non-domestic buildings by year of construction and occupying business size. Further information on the number of buildings in the non-domestic building stock and non-domestic floor area first published in ND-NEED 2020 is also available.

ND-NEED is based on the Valuation Office Agency (VOA)'s list of all non-domestic premises ("hereditaments") in England and Wales (the non-domestic ratings list (NDR)) and the VOA's summary valuation data (SMV) which contains information on the premises' size. Like ND-NEED 2020, ND-NEED 2021 uses the position of the 2017 NDR/SMV as at the end of March 2020. BEIS have been given access to this data via a legal gateway (specified in an information sharing agreement), and securely receives this data directly from the VOA.

In ND-NEED, the NDR/SMV data are aggregated to the building level (UPRN) and used, following further processing, to provide information about the number, use, floor area and age of buildings in the ND-NEED non-domestic building stock. As the NDR and SMV cover all non-domestic buildings in England and Wales, these datasets cover all the 1,656,000 buildings in the ND-NEED non-domestic building population.

As ND-NEED 2021 uses the same building stock data as ND-NEED 2020, information on the number and floor area of the building stock (split by building use and building size) that was published in ND-NEED 2020 are not updated in ND-NEED 2021. New analysis on the building stock is presented, further disaggregating by year of construction and occupying business size.

The non-domestic building stock is then matched to information on electricity and gas consumption (2012-19) at meter point level, held by BEIS. This gives a large sample of 847,000 non-domestic buildings with electricity consumption data and 373,000 non-domestic buildings with gas consumption data. This sample is then matched to business characteristics data (from Experian) to provide information on the size of the business occupying a building.

The matched dataset can then be used to analyse the electricity/gas consumption/intensity of non-domestic buildings from a large sample size. The sample contains information on building use, building size and occupying business size (for those successfully matched to the business characteristics dataset), so the consumption data can be disaggregated by these characteristics. The resulting consumption data for the sample are then weighted to be representative of the population level.

More information about producing the ND-NEED sample and the weighting process can be found in the [methodology](#). The key limitations of the ND-NEED methodology, and a discussion of the impact of these limitations on the ND-NEED results, can be found in the [limitations](#) section.

The next update to ND-NEED is currently planned for the summer of 2022.

What questions can be answered by ND-NEED 2021?

- How many non-domestic buildings are there in England and Wales and how do they breakdown by building use and building size?
- What is the floor area of non-domestic buildings in England and Wales and how does this breakdown by building use and building size?
- How does the non-domestic building stock breakdown by year of construction, and occupying business size?
- How does non-domestic electricity/gas consumption/intensity change by building use, building size and occupying business size?
- How has electricity/gas meter consumption/intensity of non-domestic buildings changed over time (2012-2019)?

What questions cannot be answered by ND-NEED 2021?

- What is the electricity/gas consumption/intensity of non-domestic buildings in Scotland and Northern Ireland?
- What are non-domestic buildings using their energy for (e.g. is energy used for heating/lighting/industrial processes etc.)?
- How much of other fuels (e.g. biomass/LPG/oil) do non-domestic buildings consume?
- How much energy generated onsite is consumed by non-domestic buildings?
- How does non-domestic building energy use differ between rented/owner-occupied buildings?

Further information related to these questions can be found in Energy Consumption in the UK (ECUK)¹, the Building Energy Efficiency Survey (BEES)² and the Digest of UK Energy Statistics³.

¹ ECUK - <https://www.gov.uk/government/statistics/energy-consumption-in-the-uk>

² BEES - <https://www.gov.uk/government/publications/building-energy-efficiency-survey-bees>

³ DUKES - <https://www.gov.uk/government/collections/digest-of-uk-energy-statistics-dukes>

2. Results

England and Wales non-domestic building stock

In ND-NEED a building is defined as a property that has a unique property reference number (UPRN). In general, each building has a distinct UPRN, so the information presented in ND-NEED can be considered to be at the building level.

There are however a few exceptions to this. Where a single physical structure contains multiple properties with UPRNs e.g. a shopping centre containing multiple shops each with distinct UPRNs, then this is considered to be multiple buildings in ND-NEED. Where multiple physical structures have a single UPRN e.g. a university campus or a hospital, then this is considered to be a single building in ND-NEED.

Under the ND-NEED definition, there were 1,656,000 non-domestic buildings in England and Wales at the end of March 2020.

There are some building types that are not covered by the ND-NEED figures. These are:

- Agricultural Buildings, Places of Worship and Prisons as these are not included in the VOA's list of non-domestic properties (the NDR) that ND-NEED is based on. It is estimated these building types make up 4% of non-domestic buildings in England and Wales⁴.
- Caravan Parks, Advertising Premises⁵, Car Parks, Beach Huts, Quarries, and Telecoms⁶. These are included in the NDR but are not considered to be buildings in ND-NEED and so are excluded. The exclusion of these 'non-buildings' from ND-NEED reduces the number of buildings in the stock by 8%.

Figure 2: The number of ND-NEED non-domestic buildings in England and Wales.



Number of non-domestic buildings by year of construction

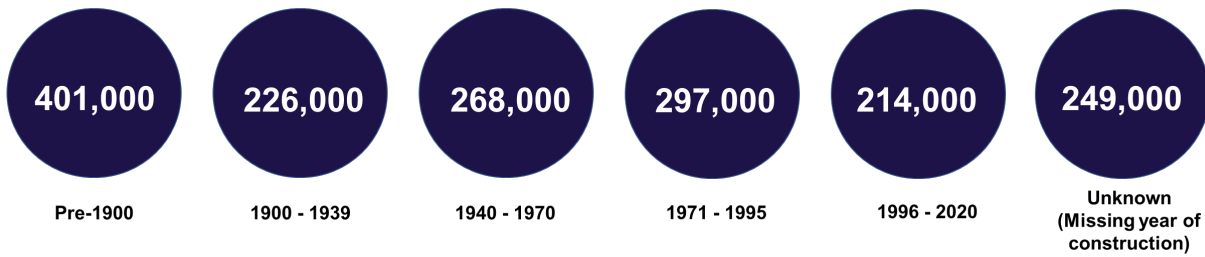
The ND-NEED non-domestic building stock can be split by year of construction. This is carried out by using the building age variable in the VOA's NDR list, which provides information on when each building was built.

⁴ Figures based on the UCL Carb model, UCL's non-domestic energy use model which provides estimates of total number of buildings for different building types.

⁵ Places used for advertisement e.g. roundabout adverts, bus shelter adverts, advertising banners.

⁶ Places used for communication e.g. communication stations, public telephones, telephone exchanges.

Figure 3: Breakdown of the ND-NEED non-domestic building stock in England and Wales by year of construction.



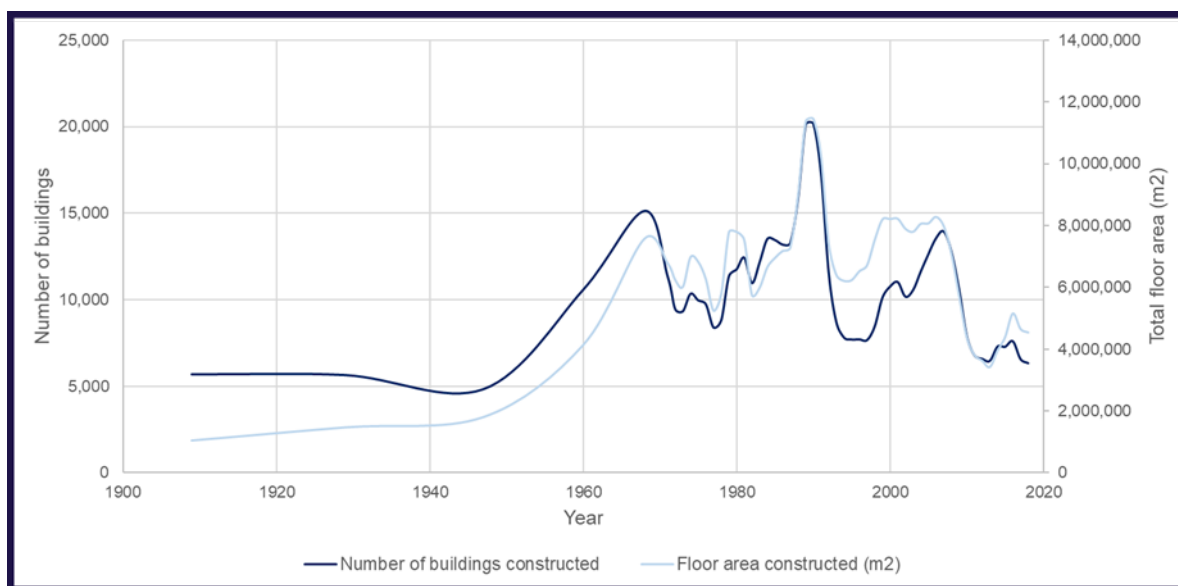
Note, since the building stock data are as at end of March 2020, data for 2020 (and, due to lags, possibly 2019) is not complete. This means that the number of buildings constructed in 1996 – 2020 will be an underestimate.

From Figure 3 we can see that more than a quarter of non-domestic buildings in the ND-NEED non-domestic building stock (with year of construction information available) were built before 1900, and almost two thirds were built before 1970. As building practices and standards, particular around energy efficiency, have changed over time this has implications for the measures that will be needed to decarbonise the non-domestic building stock.

Rate of non-domestic building construction

By looking at the year buildings in the ND-NEED building stock were constructed we can also gain insight into how the rate of non-domestic building construction has changed over time (see Figure 4).

Figure 4: Number of buildings in the ND-NEED non-domestic building stock constructed between 1900 and 2018, by number and floor area.



Note, Figure 4 uses a smoothed line graph. For buildings built between 1900 and 1970 (inclusive) where data is only available as bands covering a period of several years, the data is averaged over that time period and plotted for the middle year. For years between 1971 and 2018 (inclusive), the data is presented as a 3-year rolling average. As 2019 and 2020 year of construction data are incomplete these years have been omitted. This does not include the 249,000 buildings missing year of construction data, or 401,000 buildings built pre-1900.

Figure 4 shows that there is a general trend that the rate of construction of the buildings in the non-domestic building stock (as at end of March 2020) increased steeply between 1940 and 1970 and has remained at a new higher level since then, though there is substantial year to year variation.

This could reflect an increase in the total rate of non-domestic building construction in this time period, but it is important to note that this data does not capture buildings that were built between 1900 and 2018, but that were removed from the stock before 2020 (e.g. buildings that were demolished, buildings that were repurposed for domestic use etc.) which is likely to disproportionately affect older buildings.

There is also evidence that the rate of construction of buildings in the non-domestic building stock (as at end of March 2020) is impacted by economic events, with a substantial fall in construction seen around the 1990 and 2008 recessions. This trend is seen across all ND-NEED building uses.

The average rate of construction of buildings in the non-domestic building stock (as at end of March 2020) between 2010 and 2018 inclusive was 7,000 buildings per year, representing 0.5% of the building stock in ND-NEED with year of construction data. The construction rate in 2010 – 2018 is lower than in previous years, with evidence of a reduction in the rate of non-domestic building construction in 2008, potentially due to the 2008 financial crash.

Figure 4 also provides information on the rate of floor area construction in buildings in the non-domestic building stock (as at end of March 2020). By comparing this to the rate of non-domestic building construction this can provide an insight into changes in the average size of new non-domestic buildings.

This provides some evidence that the average size of non-domestic buildings in the non-domestic building stock (as at end of March 2020) has increased over time. For example, around 10,000 buildings were built in each of 1958, 1971 and 2002, with the average floor area increasing from 400m² to 700m² and then 800 m². This trend is not driven by missing floor area data in ND-NEED since the proportion of buildings missing this is relatively constant across building ages, with slightly more floor area data missing from newer buildings.

Number of non-domestic buildings by business size

Business size information is obtained by matching Experian business characteristics data to the 1,656,000 ND-NEED non-domestic buildings in the building stock. This gives the breakdown of the non-domestic building stock by business size that can be seen in Figure 5.

Note, the number of employees refers to the number of employees employed by the business as a whole, not just the employees that work in the building. This means that small branches of larger businesses e.g. a corner shop that is part of a national chain, will be in the larger categories.

Figure 5: Breakdown of the ND-NEED non-domestic building stock in England and Wales by business size.



Figure 5 shows that the majority of non-domestic buildings (for which business size data are available) are occupied by SMEs (<250 employees), with micro businesses (1 – 9 employees) being the most common business size.

However, almost 70% of the buildings in the non-domestic building stock are missing business size information which limits the conclusions that can be drawn from this data.

There are two reasons why buildings cannot be matched to business size information:

1. The UPRN of the corresponding building is missing from the Experian dataset, either because the building itself is missing, or because the building is in the Experian dataset but we are unable to match it to its corresponding UPRN. This means the business size cannot be matched to the building. This represents 90% of the buildings that are missing building size information).
2. The UPRN of the corresponding building is in the Experian dataset but the business size information for this building is missing. This represents 10% of the buildings that are missing building size information).

Note, the proportion of buildings that are missing business size information is generally consistent between building uses and building sizes.

Given the high number of buildings missing business size information, the number of buildings occupied by a business of a particular size is likely to be a substantial underestimate as buildings that are missing business size information will also fall into this category. It is also possible that the true pattern of distribution of businesses in the non-domestic building stock is different from what is presented here. This means these estimates should be used with caution as they are associated with substantial uncertainty.

England and Wales non-domestic building energy consumption/intensity

According to ND-NEED, in total non-domestic buildings in England and Wales used **129 TWh of electricity** and **147 TWh of gas** in 2019 (the most recent year for which data are available).

These consumption figures are based on a sample of the ND-NEED building stock that was successfully matched to electricity and gas meter-point data (gas consumption figures are temperature corrected). This sample is then weighted to be representative at the population level. More information about the sampling and weighting process in ND-NEED can be found in the [methodology](#).

Note, these figures are not directly comparable to the 2018 consumption figures published in ND-NEED 2020 due to methodological revisions. For more information on these revisions please see [Annex B](#). For comparable figures for 2018 consumption please see the ND-NEED 2021 consumption time series in Table 5.

Because the consumption figures are based on meter-point data, any energy consumed that is not via the electricity or gas grid e.g. energy generated onsite from renewables, is not included. According to the Digest of UK Energy Statistics (DUKES)⁷ 89% of non-domestic building electricity consumption was from the grid in 2019.

The fact that ND-NEED is based on meter-point data also means that the consumption figures cover all grid energy consumed by a non-domestic building, regardless of end-use e.g. heating, lighting, industrial processes etc. This is different from some other publications such as the Building Energy Efficiency Survey (BEES)⁸ which only covers energy consumed by the building itself e.g. heating, lighting, but not energy consumed by activities within the building e.g. industrial processes.

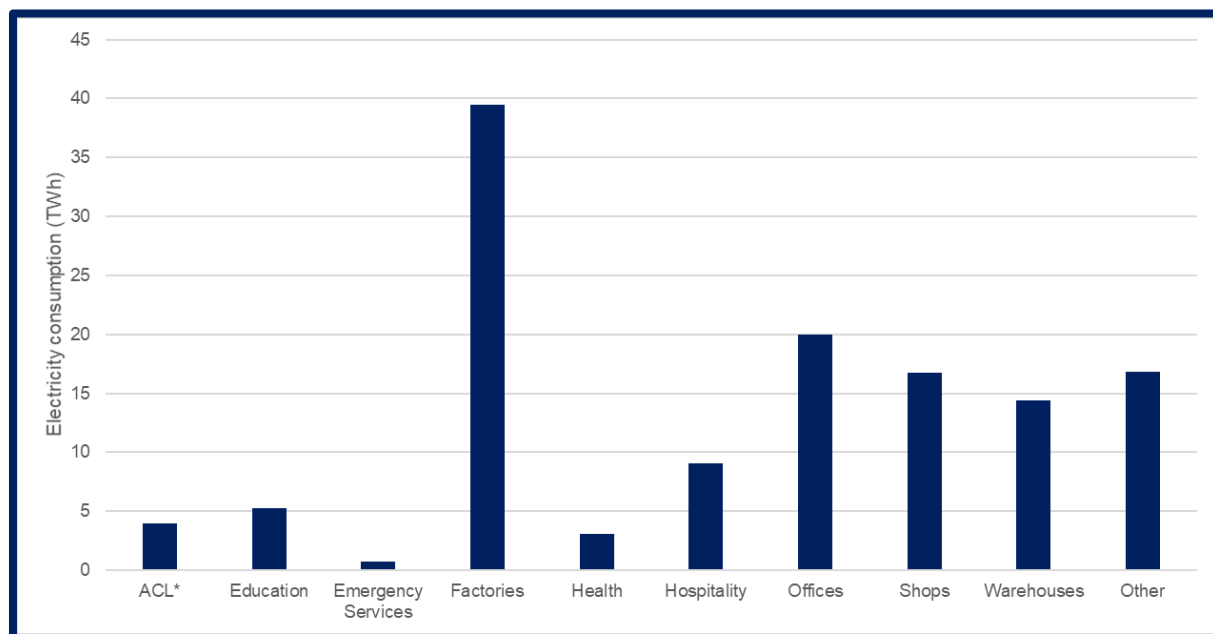
⁷ DUKES, Table 5.2, Sectors: Industry, Commercial, Public administration used as a proxy for non-domestic buildings. Public Distribution System as a share of Total Consumption - <https://www.gov.uk/government/statistics/electricity-chapter-5-digest-of-united-kingdom-energy-statistics-dukes>

⁸ BEES - <https://www.gov.uk/government/publications/building-energy-efficiency-survey-bees>

Non-domestic energy consumption by building use

Electricity consumption

Figure 6: The electricity consumption of ND-NEED non-domestic buildings in England and Wales by building use, 2019.



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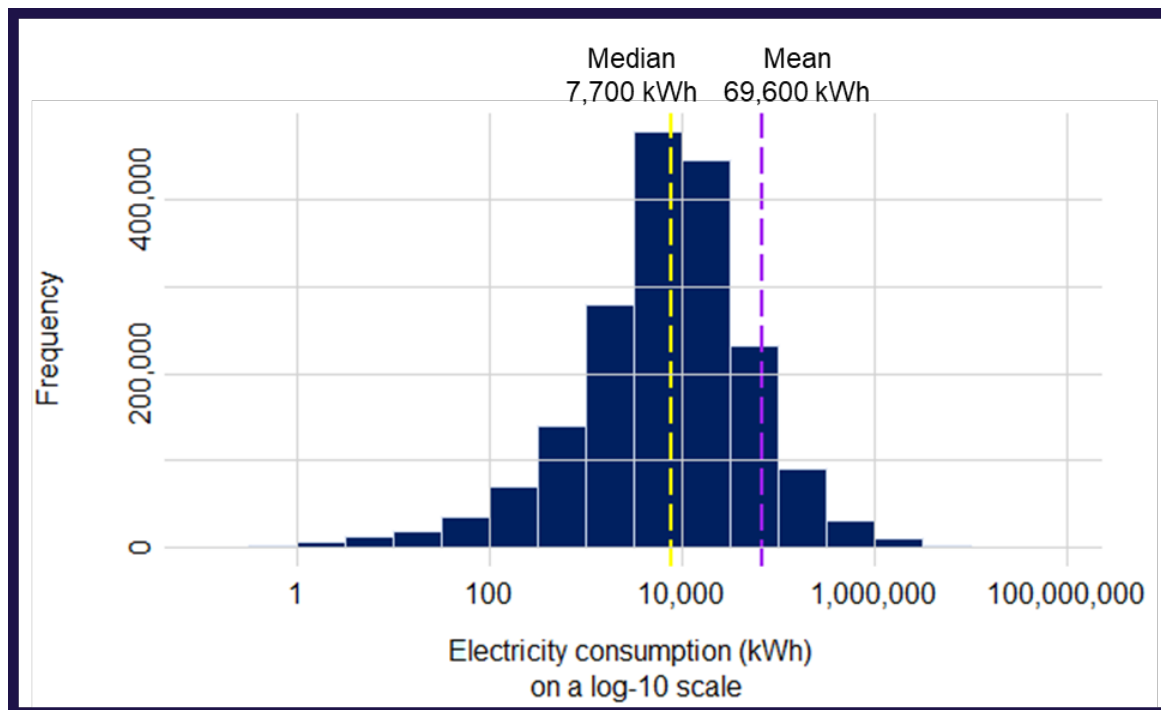
Figure 6 shows non-domestic building electricity consumption by building use. It shows that Factories are the building use that consumes the most electricity (39 TWh in 2019). This is twice the consumption of the next highest consuming building use, Offices (20 TWh).

This is despite there being more Shops (476,000) and Offices (335,000) than there are Factories (227,000) in England and Wales. This suggests that Factories are carrying out processes that have high electricity demands (such as industrial processes whose energy consumption is captured in ND-NEED).

Distributional analysis: Electricity consumption

ND-NEED 2021 can also provide further information about how electricity consumption is distributed within the non-domestic building stock. This analysis is based on the ND-NEED 2021 sample that is weighted to be representative of the non-domestic building population (for more information see the [methodology](#)). For example, we can look at the frequency of different electricity consumption values.

Figure 7: Frequency of different electricity consumption values for all non-domestic buildings, 2019.



Note: This histogram has unweighted electricity consumption on the x-axis (ascending order), shown on a base-10 log scale. The y-axis shows a frequency count, that is the weighted number of buildings that have electricity consumption 2019 values within the corresponding consumption band.

Figure 7 plots electricity consumption against the frequency of buildings whose consumption falls within that band. The highest bar on the chart represents consumption between 3,160 kWh ($10^{3.5}$ kWh) and 10,000 kWh (10^4 kWh) per year. This means that Figure 8 shows that a plurality of buildings consume between 3,160 kWh ($10^{3.5}$ kWh) and 10,000 kWh (10^4 kWh) per year, and fewer buildings have consumption at either the lower or higher extremes.

There are also a substantial number of buildings whose consumption is lower than average domestic consumption (3,500 kWh)⁹ in 2019. This is 24% of buildings in the ND-NEED sample.

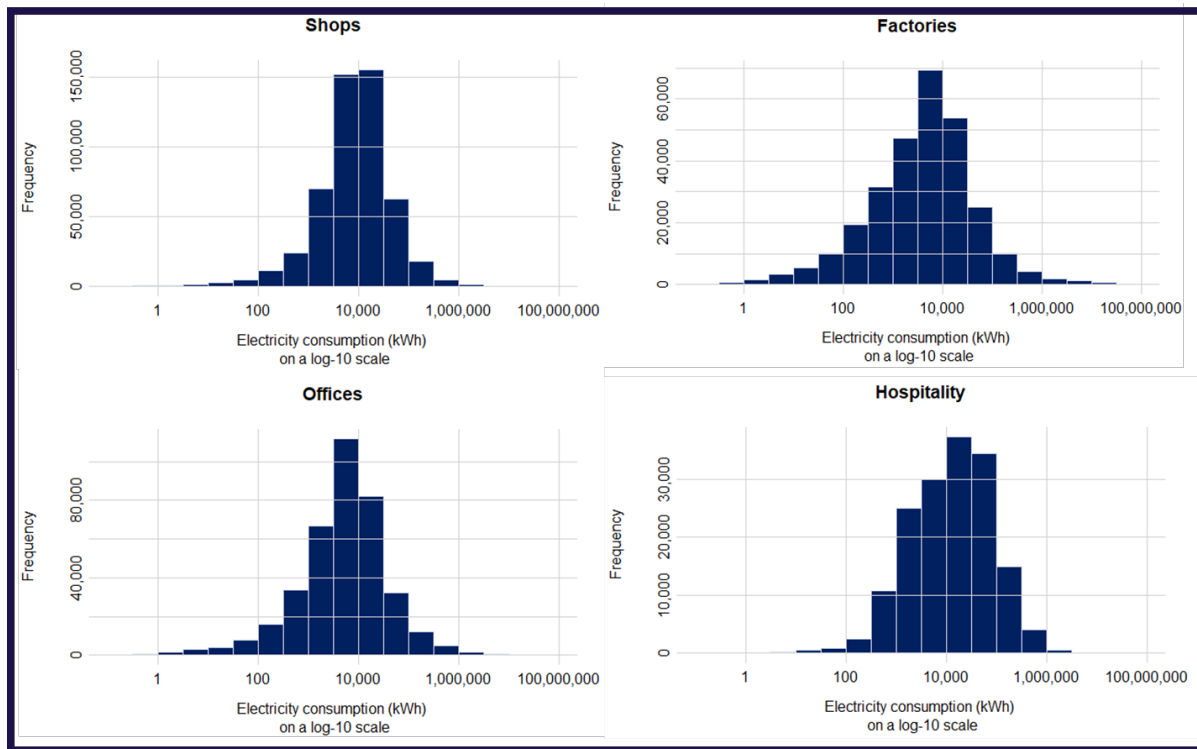
Note, that the distribution in Figure 7 is on a log-10 scale. This is because the underlying data is very positively skewed with a long tail of high-consuming sites. This positive skew can also be seen in the data when you look at the comparison between the weighted median electricity consumption and the weighted mean electricity consumption. The weighted median electricity consumption of non-domestic buildings is 7,700 kWh, compared to a weighted mean electricity consumption of 69,600 kWh.

We can also present the data in Figure 7 split by building use. Figure 8 shows that the distribution of electricity consumption remains broadly similar between sectors, with a peak of buildings with similar electricity consumption values, and fewer buildings with both lower and higher electricity consumption.

⁹ Subnational electricity and gas consumption summary report 2019-
<https://www.gov.uk/government/statistics/sub-national-electricity-and-gas-consumption-summary-report-2019>

There are however some differences between building uses. Factories and Offices have a longer tail compared to Shops and Hospitality, showing that there are proportionally more very high and very low consuming Factories and Offices. The smaller tails and more uniform distribution of the hospitality sector distribution suggest that hospitality buildings have more homogenous electricity consumption than the other sectors.

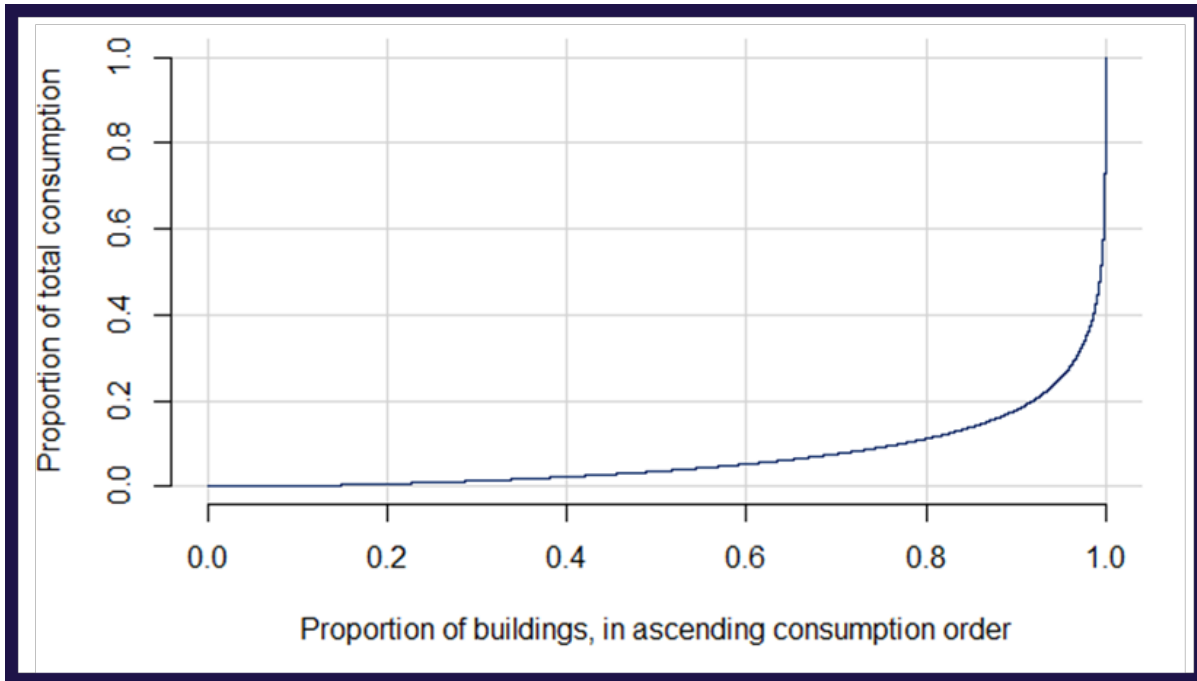
Figure 8: Frequency of different electricity consumption values, by building use, 2019.



Note: This histogram has unweighted electricity consumption on the x-axis (ascending order), shown on a base-10 log scale. The y-axis shows a frequency count, that is the weighted number of buildings that have electricity consumption 2019 values within the corresponding consumption band.

Another way we can look at the distribution of electricity consumption in ND-NEED is looking at the proportion of total electricity consumption that comes from a given proportion of the building stock. This will help us to understand the impact of the small number of high consuming sites (identified above) on total electricity consumption.

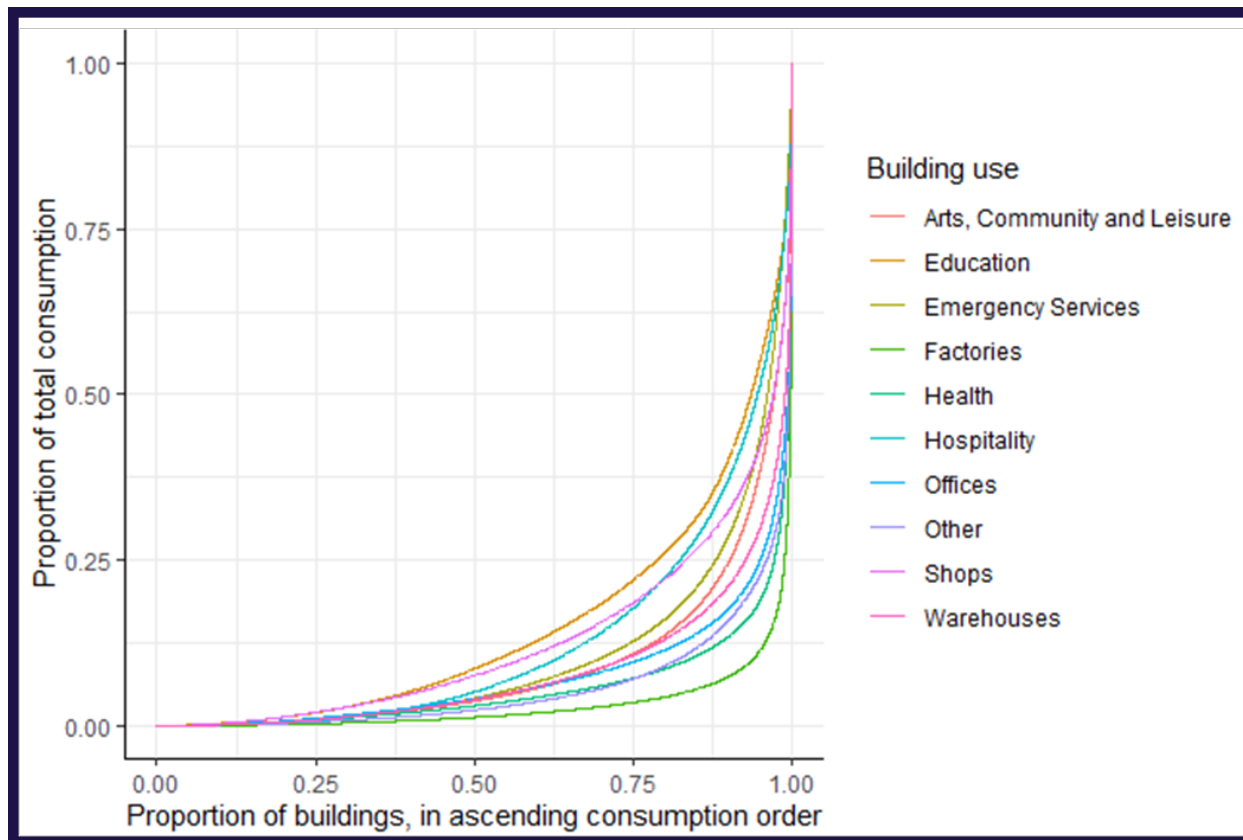
Figure 9: The proportion of the building stock (in ascending consumption order) against the proportion of total electricity consumption, 2019.



Note: This cumulative distribution plot has the proportion of buildings in the ND-NEED sample with 2019 electricity consumption on the x-axis (ordered by unweighted electricity consumption). The y-axis shows the proportion of weighted 2019 electricity consumption that these buildings are consuming.

From Figure 9 we can see that the majority of non-domestic building electricity consumption comes from a minority of non-domestic buildings (80% of consumption comes from the 8% highest consuming buildings). This shows that the small number of high consuming sites identified in Figure 7 have a substantial impact on total electricity consumption.

Figure 10: The proportion of the building stock (in ascending consumption order) against the proportion of total electricity consumption, by building use, 2019.



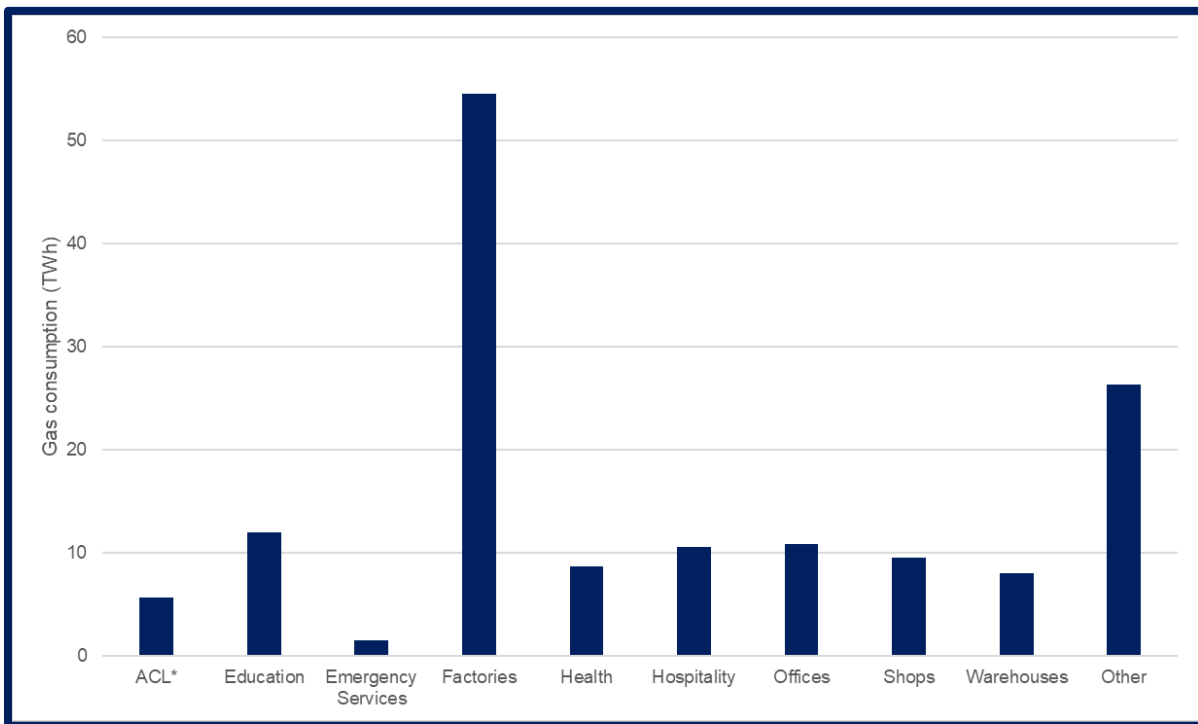
Note: This cumulative distribution plot has the proportion of buildings in the ND-NEED sample with 2019 electricity consumption on the x-axis (ordered by unweighted electricity consumption). The y-axis shows the proportion of weighted 2019 electricity consumption that these buildings are consuming.

We can also split this analysis by building use (Figure 10). From Figure 10 we can see that the overall pattern of a minority of high-consuming buildings being responsible for a majority of electricity consumption is seen across all building uses.

For Factories, 80% of electricity consumption comes from the highest consuming 2% of buildings. For Education, 80% of consumption comes from the highest consuming 28% of buildings.

Gas consumption

Figure 11: The gas consumption of ND-NEED non-domestic buildings in England and Wales by building use, 2019.



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Figure 11 shows that the pattern for gas consumption by building use is similar to that of electricity consumption. Factories have the highest gas consumption, at 54 TWh in 2019. This is over four times higher than the gas consumption of any other building use (excluding the 'Other' category). This is despite the fact that Factories are not the largest building use category in terms of building numbers.

As with electricity consumption, the high gas consumption of Factories is in part driven by their large size and in part by the high gas consuming processes they carry out:

- Factories account for 14% of non-domestic buildings, but 25% of non-domestic building floor area (of the buildings with floor area information available).
- From Energy Consumption in the UK (ECUK)¹⁰ we can see that industrial processes (high and low temperature processes, drying/separation, motors, compressed air) are responsible for around three-quarters of gas use in industry, and so a large part of gas consumption in Factories is likely to be driven by these processes.

Most other building types consumed around 10 TWh of gas in 2019. The exceptions to this are Arts, Community and Leisure where the buildings consumed 6 TWh of gas, and Emergency Services where the buildings consumed 2 TWh of gas.

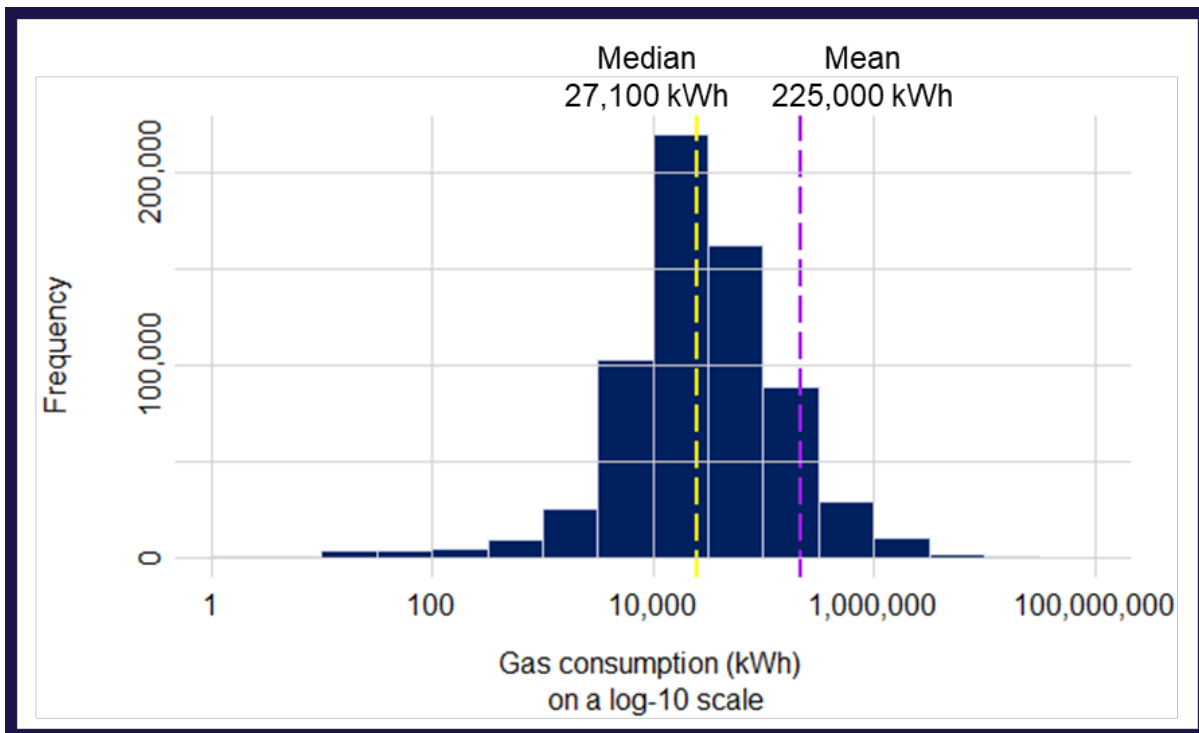
¹⁰ ECUK, End-use data tables, Table U2 - <https://www.gov.uk/government/statistics/energy-consumption-in-the-uk>

Distributional analysis: Gas consumption

As we did for electricity consumption, we can also apply the distributional analysis to gas consumption from non-domestic buildings.

Firstly, we can look at the frequency of different levels of gas consumption to understand the most common gas consumption level from non-domestic buildings.

Figure 12: Frequency of different gas consumption values for all non-domestic buildings, 2019.



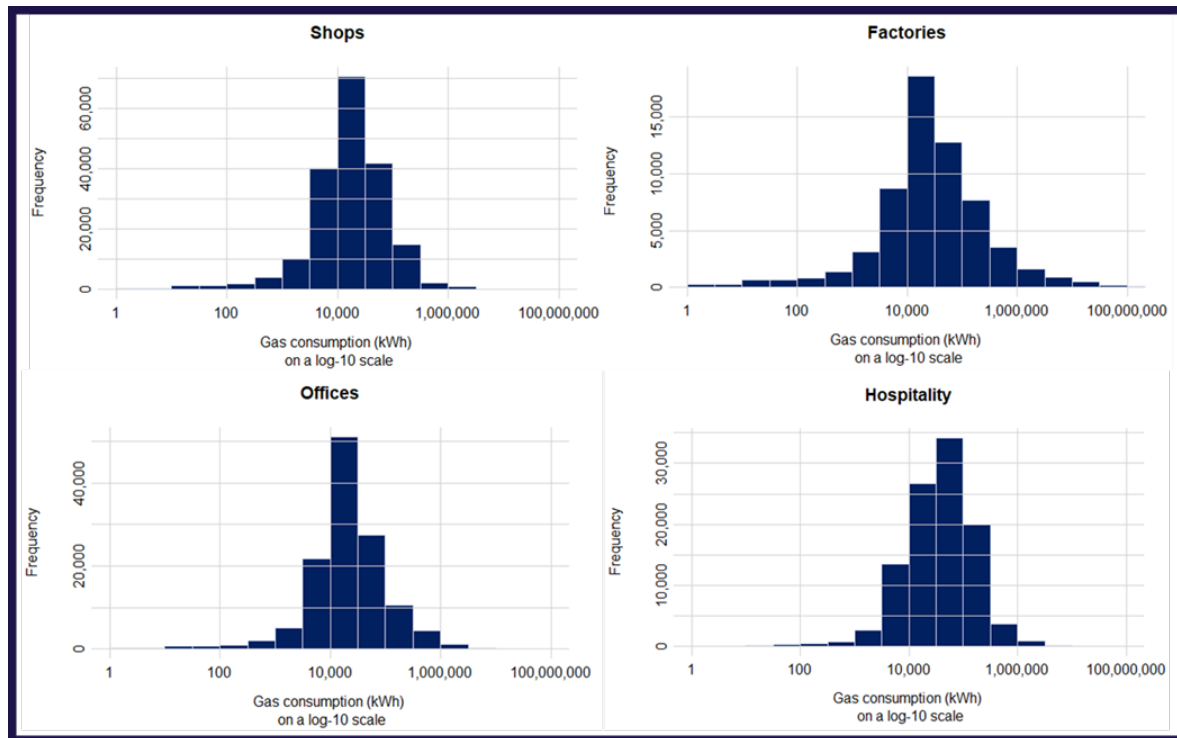
Note: This histogram has weighted gas consumption on the x-axis (ascending order), shown on a log scale (\log_{10}). Placeholder values of <1 kWh have been excluded. The y-axis shows a frequency count, that is the number of buildings that have gas consumption values within the corresponding consumption band.

Figure 12 plots gas consumption against the frequency of buildings whose consumption falls within that band. The highest bar on the chart represents consumption between 10,000 kWh (10^4 kWh) and 31,600 kWh ($10^{4.5}$ kWh) per year. This means that Figure 12 shows that a plurality of buildings consume between 10,000 kWh (10^4 kWh) and 31,600 kWh ($10^{4.5}$ kWh) per year, and fewer buildings have consumption at either the lower or higher extremes.

Note, Figure 12 is presented on a \log_{10} scale because the underlying data is very positively skewed with a long tail of high-consuming sites. This positive skew can also be seen in the data when you look at the comparison between the weighted median gas consumption and the weighted mean gas consumption. The weighted median gas consumption of non-domestic buildings is 27,100 kWh, compared to a weighted mean gas consumption of 225,000 kWh.

We can also present the data in Figure 12 split by building use. Figure 13 shows Shops, Factories and Offices all have a modal consumption of 10,000 kWh to 31,600 kWh (10^4 kWh to $10^{4.5}$ kWh). Hospitality has a higher modal class at 31,600 kWh to 100,000 kWh ($10^{4.5}$ kWh to 10^5 kWh), which is consistent with Hospitality having a higher median gas consumption than Shops, Factories or Offices (Table 11).

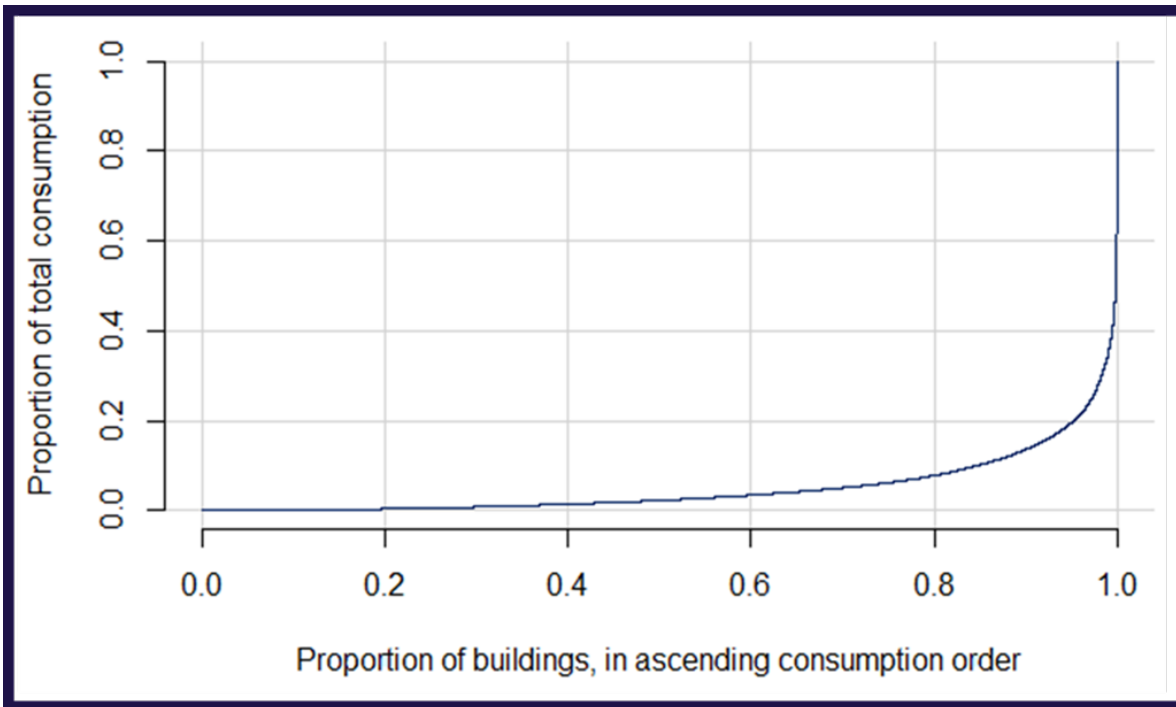
Figure 13: Frequency of different gas consumption values, split by building use, 2019.



Note: This histogram has unweighted gas consumption on the x-axis (ascending order), shown on a base-10 log scale. Placeholder values of <1 kWh have been excluded. The y-axis shows a frequency count, that is the weighted number of buildings that have electricity consumption 2019 values within the corresponding consumption band.

To further understand the distribution of gas consumption within the non-domestic building stock we can also look at the proportion of non-domestic building consumption that comes from the highest consuming buildings. This will help us to understand how the few extremely high consuming sites (identified above) impact total gas consumption.

Figure 14: Proportion of the building stock (in ascending consumption order) against the proportion of total gas consumption, 2019.

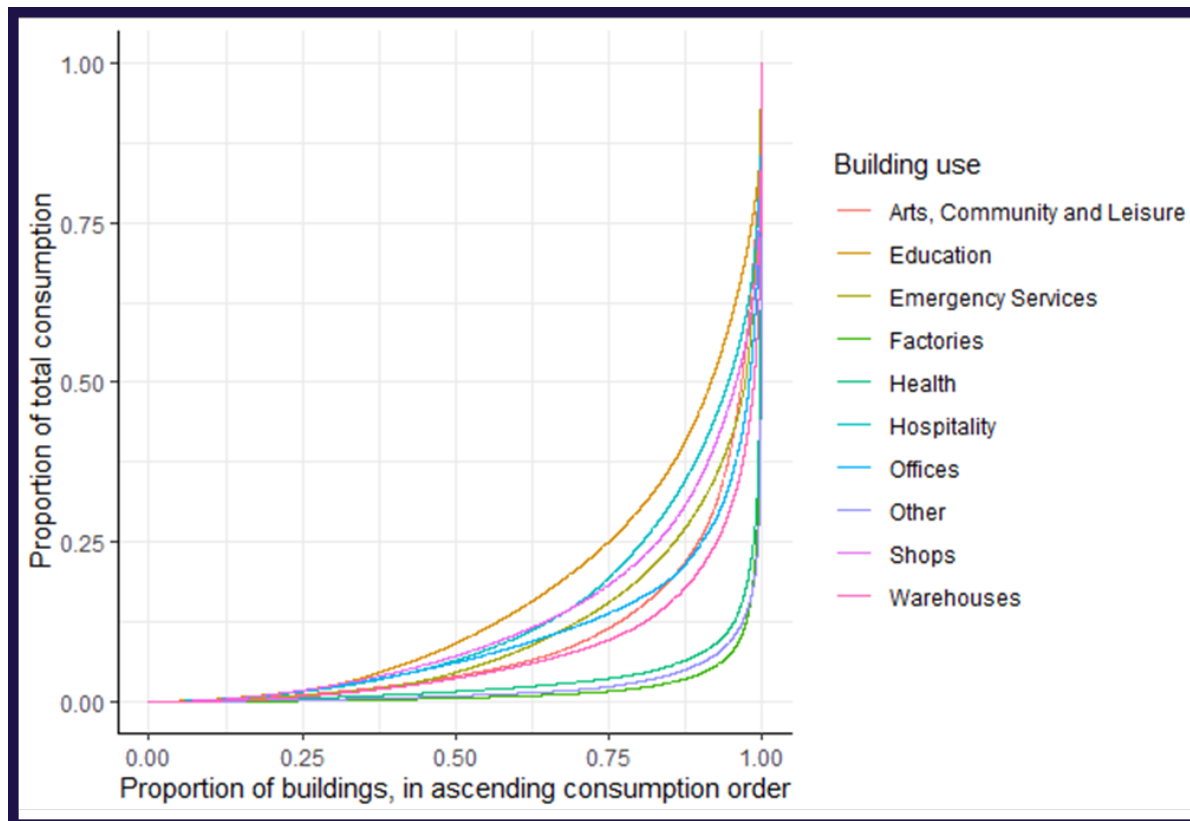


Note: This cumulative distribution plot has the proportion of buildings in the ND-NEED sample on the x-axis (ordered by unweighted gas consumption). The y-axis shows the proportion of weighted 2019 gas consumption that these buildings are consuming. Placeholder values of <1 kWh have been excluded.

From Figure 14 we can see that majority of non-domestic building gas consumption comes from a minority of non-domestic buildings (80% of consumption comes from the 5% highest consuming buildings). This shows that the small number of high consuming sites identified in Figure 12 above have a substantial impact on total gas consumption. This is the same pattern that is seen for electricity consumption.

We can also split this analysis by building use (Figure 15). From Figure 15 we can see that this pattern is seen across all building uses. As for electricity this pattern is most convex for Factories, with 80% of consumption coming from the 1% highest consuming buildings, and least extreme in the Education sector, with 80% of consumption coming from the 31% highest consuming buildings.

Figure 15: Proportion of the building stock (in ascending consumption order) against the proportion of total gas consumption, by building use, 2019.



Note: This cumulative distribution plot has the proportion of buildings in the ND-NEED sample on the x-axis (ordered by unweighted gas consumption). The y-axis shows the proportion of weighted 2019 gas consumption that these buildings are consuming. Placeholder values of <1 kWh have been excluded.

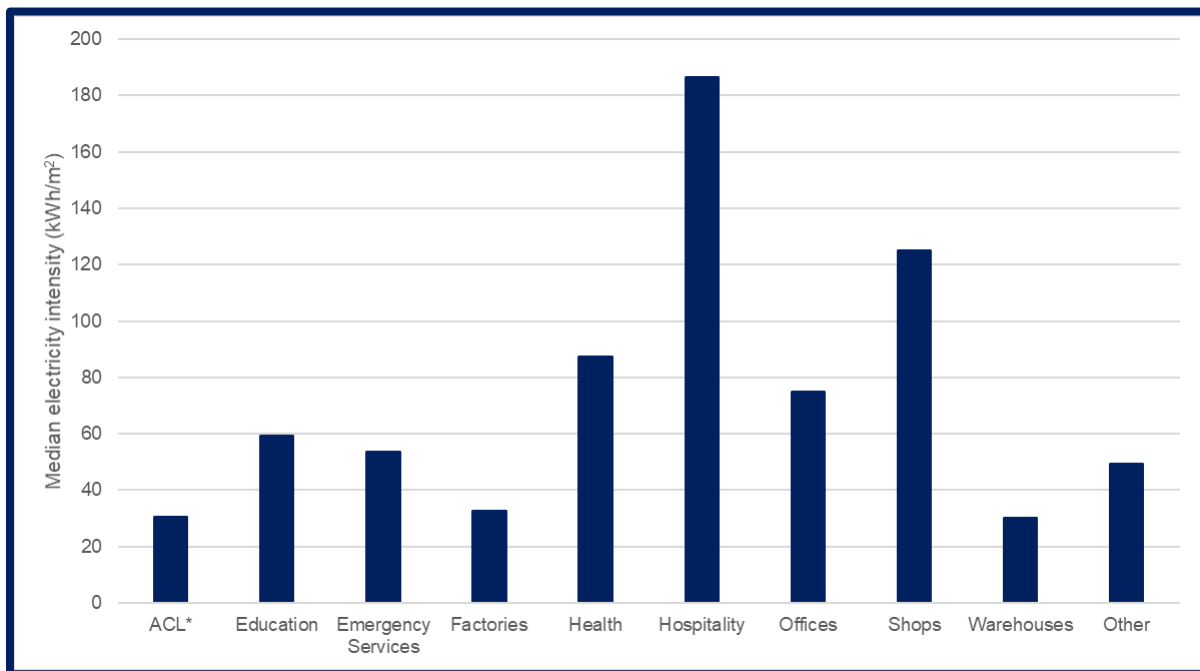
Non-domestic energy intensity by building use

The level of energy consumption in a building use category is in part driven by the number and size of buildings of that type. To control for this, energy intensity can be used. Energy intensity is the average amount of energy used in a square metre of a building. Differences in energy intensity between sectors are therefore not affected by differences in the number or size of buildings.

The electricity intensity figures presented in ND-NEED are the median electricity intensity, weighted by the energy weight. Buildings which are missing floor area information are excluded (see [Non-domestic energy consumption by building size](#)).

Electricity intensity

Figure 16: The median electricity intensity of ND-NEED non-domestic buildings in England and Wales by building use, 2019.



*ACL – Arts Community and Leisure

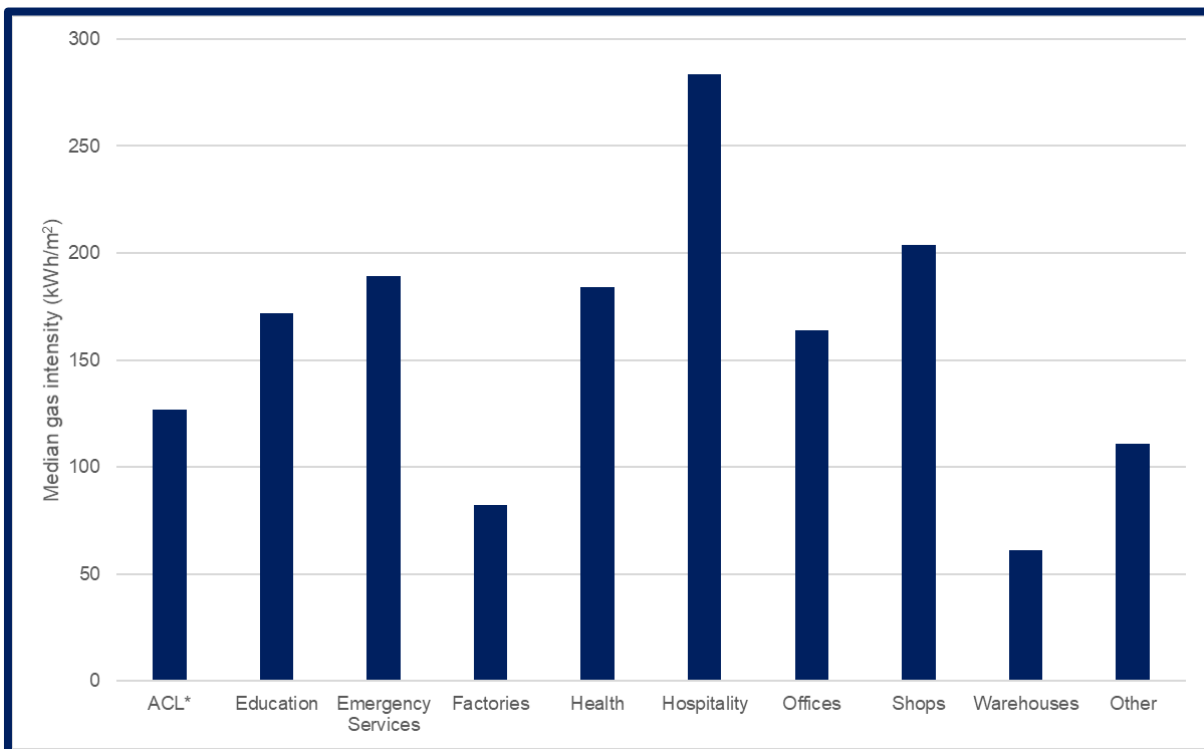
Figure 16 shows that median electricity intensity by building use has a very different pattern to total electricity consumption. Hospitality is the building use with the highest median electricity intensity (187 kWh/m²), despite having relatively low total electricity consumption (9 TWh). This high electricity intensity is likely driven by the fact that hospitality buildings generally operate in small building premises and often perform activities such as catering which have high electricity demands¹¹.

By contrast, Factories have a relatively low median electricity intensity (33 kWh/m²) but high total electricity consumption (39 TWh). The low electricity intensity of Factories suggests that their high electricity demands driven by the industrial processes they carry out, are counterbalanced by the large size of these sites.

¹¹ ECUK, End-use data tables, Table U5 - <https://www.gov.uk/government/statistics/energy-consumption-in-the-uk>

Gas intensity

Figure 17: The median gas intensity of ND-NEED non-domestic buildings in England and Wales by building use, 2019.



As for electricity, Hospitality is the building use category with the highest median gas intensity (284 kWh/m²), consuming almost 40% more gas per square meter than any other building type. As for electricity, this is at least partly due to the high gas demands of the catering activities that often occur in hospitality buildings. This can be seen in other publications that split energy consumption by end-use (ECUK¹² and BEES¹³).

The lowest gas intensities are seen in Factories and Warehouses with 82 kWh/m² and 61 kWh/m² respectively. A key driver of the low gas intensities of Factories and Warehouses is likely to be their large building size. Together, Factories and Warehouses occupy 58% of non-domestic building floor area, despite only accounting for 26% of non-domestic buildings.

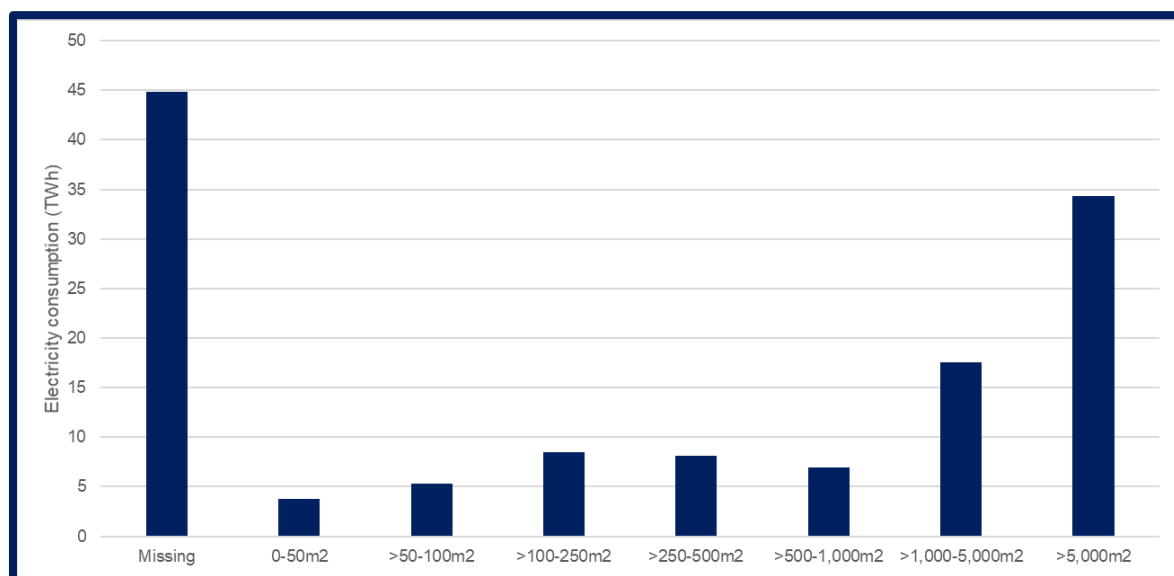
¹² ECUK, End-use data tables, Table U5 - <https://www.gov.uk/government/statistics/energy-consumption-in-the-uk>

¹³ BEES, Overarching tables, Figure 3.13 - <https://www.gov.uk/government/publications/building-energy-efficiency-survey-bees>

Non-domestic energy consumption by building size

Electricity consumption

Figure 18: The electricity consumption of ND-NEED non-domestic buildings in England and Wales by building size, 2019.



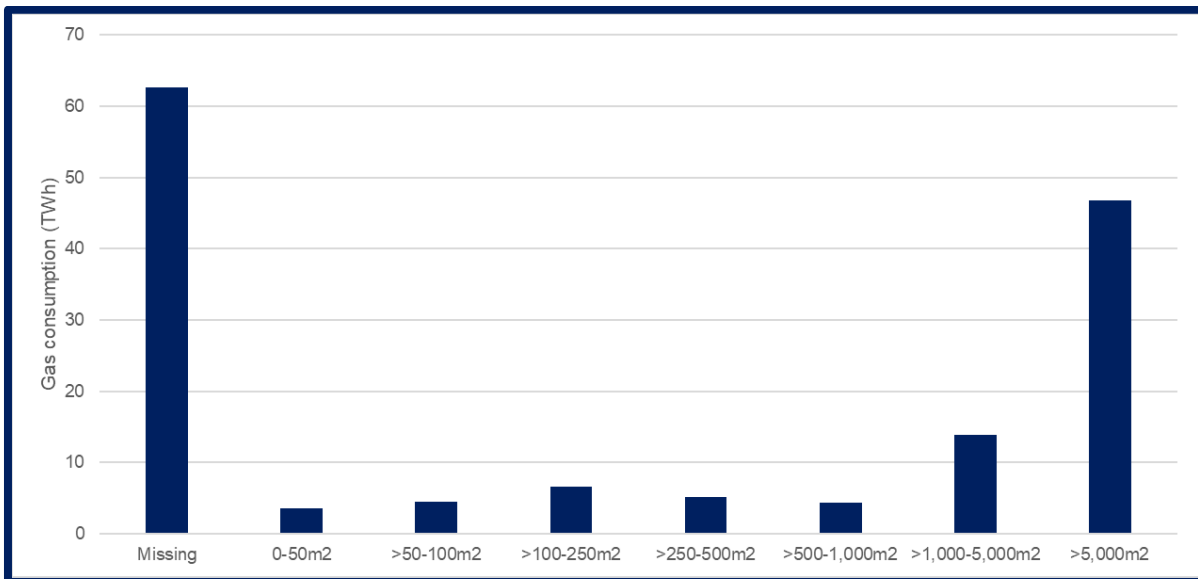
There is a clear trend that as building size increases the share of total electricity consumption increases. This is particularly true for buildings that are over 1,000m².

This trend is not driven by the number of buildings as there are more buildings in the smaller floor area categories than there are in the larger ones. Instead, this trend is at least partly driven by the floor area of buildings in these categories. The total floor area has a similar pattern to the electricity consumption figures with a greater floor area in the larger floor area bands.

Note, there is a proportion of non-domestic buildings in ND-NEED that are missing building size information – 16% of non-domestic buildings in the ND-NEED sample with electricity consumption in 2019 are missing floor area information. These buildings are responsible for 45 TWh (35%) of electricity consumption. This means figures on the electricity consumption of a particular building size should be used with caution as they are likely to be an underestimate. It also means that there is some uncertainty associated with the building size trend presented above.

Gas consumption

Figure 19: The gas consumption of ND-NEED non-domestic buildings in England and Wales by building size, 2019.



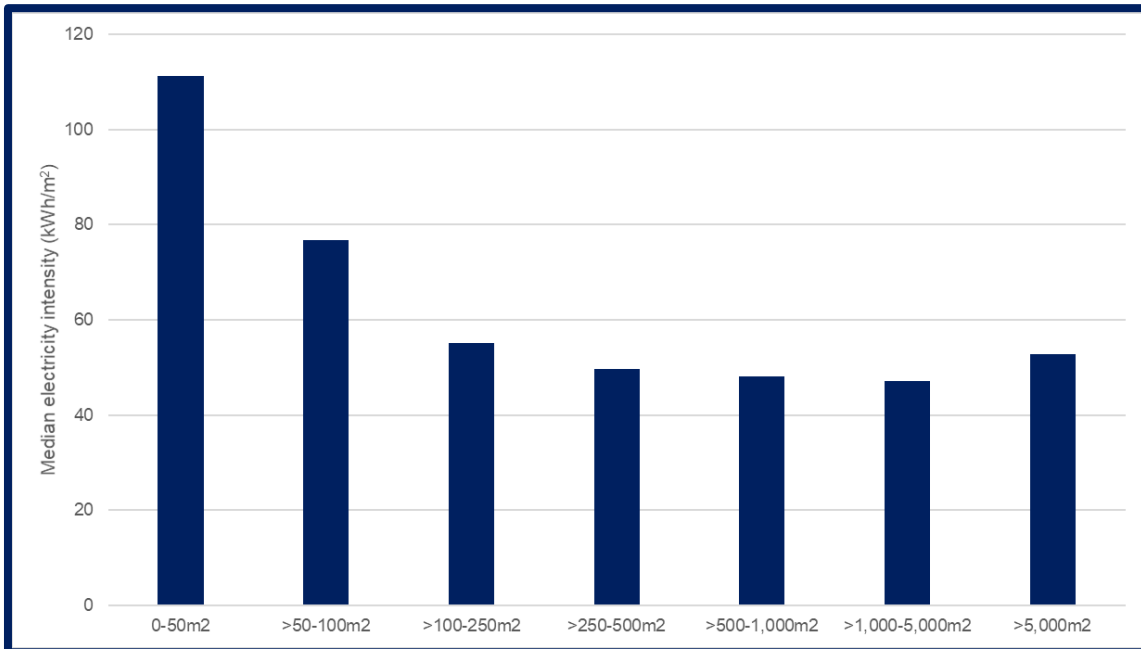
As with electricity consumption, gas consumption tends to increase as building size increases. Again, this trend is at least in part driven by the larger total floor area of the buildings in the larger floor area bands.

It is again important to note the substantial size of the 'Building size missing' category which makes up 63 TWh (42%) of consumption, more than any other building size category. This consumption comes from the 20% of buildings in the ND-NEED gas consumption sample that are missing building size information. The size of the missing category means that that the consumption figures for each building size category are likely to be underestimates and so should be used with caution. It also means there is some uncertainty associated with the results above.

Non-domestic energy intensity by building size

Electricity intensity

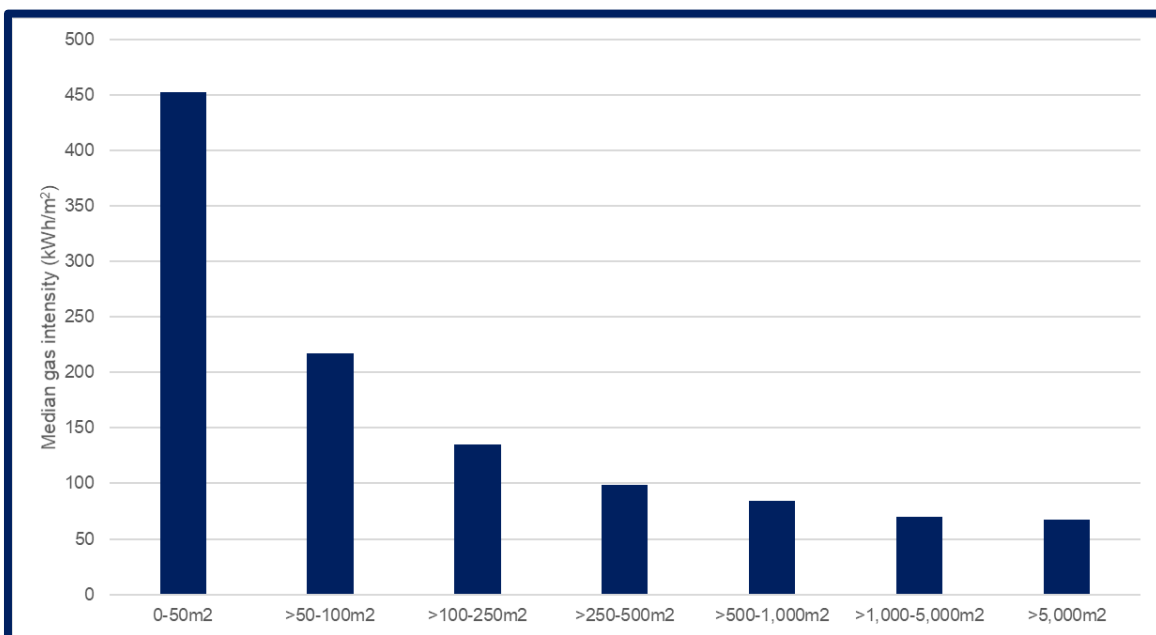
Figure 20: The median electricity intensity of ND-NEED non-domestic buildings in England and Wales by building size, 2019.



Median electricity intensity shows the opposite trend to total electricity consumption with smaller buildings generally using more electricity per square metre than larger buildings.

Gas intensity

Figure 21: The median gas intensity of ND-NEED non-domestic buildings in England and Wales by building size, 2019.



Like electricity, median gas intensity shows the opposite trend to gas consumption with smaller buildings using more gas per square metre. This trend is stronger for gas intensity than it is for electricity intensity.

Non-domestic energy consumption by business size

Non-domestic building energy consumption can also be broken down by business size. In ND-NEED business size refers to the number of employees of the business occupying the building.

As is the case for the building stock, in the energy consumption business size categories the number of employees refers to the number of employees employed by the business as a whole, not just the employees that work in the building. This means that small branches of larger businesses e.g. a corner shop that is part of a national chain, will be in the larger categories.

A Micro business has less than 10 employees, a Small business has 10 - 49 employees, a Medium business has 50 - 249 employees, a Large business has 250 - 999 employees and a Very Large business has 1,000 employees or more.

Note, the weighting used to scale up consumption from the ND-NEED sample to the population does not account for potential differences between the size of businesses in the sample and the size of businesses in the population. This means there is more uncertainty around whether the energy consumption figures by business size are representative of the population, than for the consumption figures by building use or by floor area.

Electricity consumption

Figure 22: The electricity consumption of ND-NEED non-domestic buildings in England and Wales by business size, 2019.

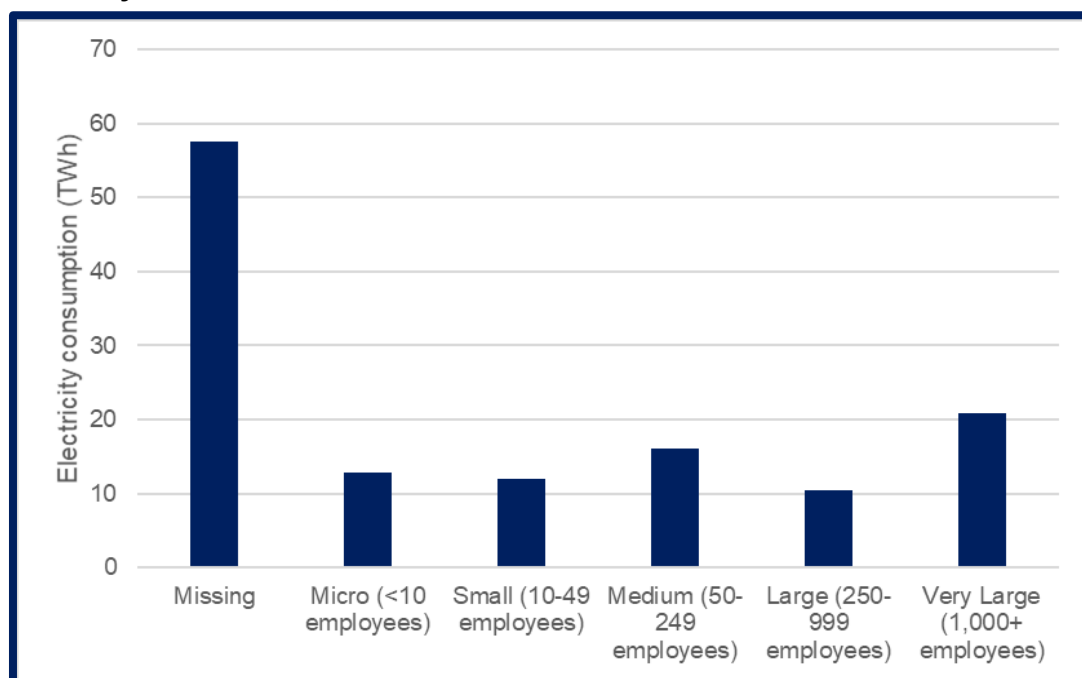


Figure 22 shows the contribution of buildings occupied by businesses of different sizes to non-domestic building electricity consumption.

Buildings occupied by Very Large businesses consume the most electricity (21 TWh), followed by buildings occupied by Medium sized businesses (16 TWh), with buildings occupied by Micro, Small and Large businesses consuming the least electricity (around 12 TWh each).

This is a different pattern than is seen in the number of buildings in the non-domestic building stock ([see above](#)), where the largest category is Micro businesses (300,000 buildings), followed by Small businesses (99,000 buildings), Very Large businesses (70,000 buildings), Medium businesses (35,000 buildings) and Large businesses (21,000 businesses).

Note, 58 TWh of electricity consumption is missing business size information. This is the electricity consumption of the 422,000 buildings of the 814,000 in the ND-NEED electricity consumption sample with 2019 electricity consumption, where information on the occupying business size is not available.

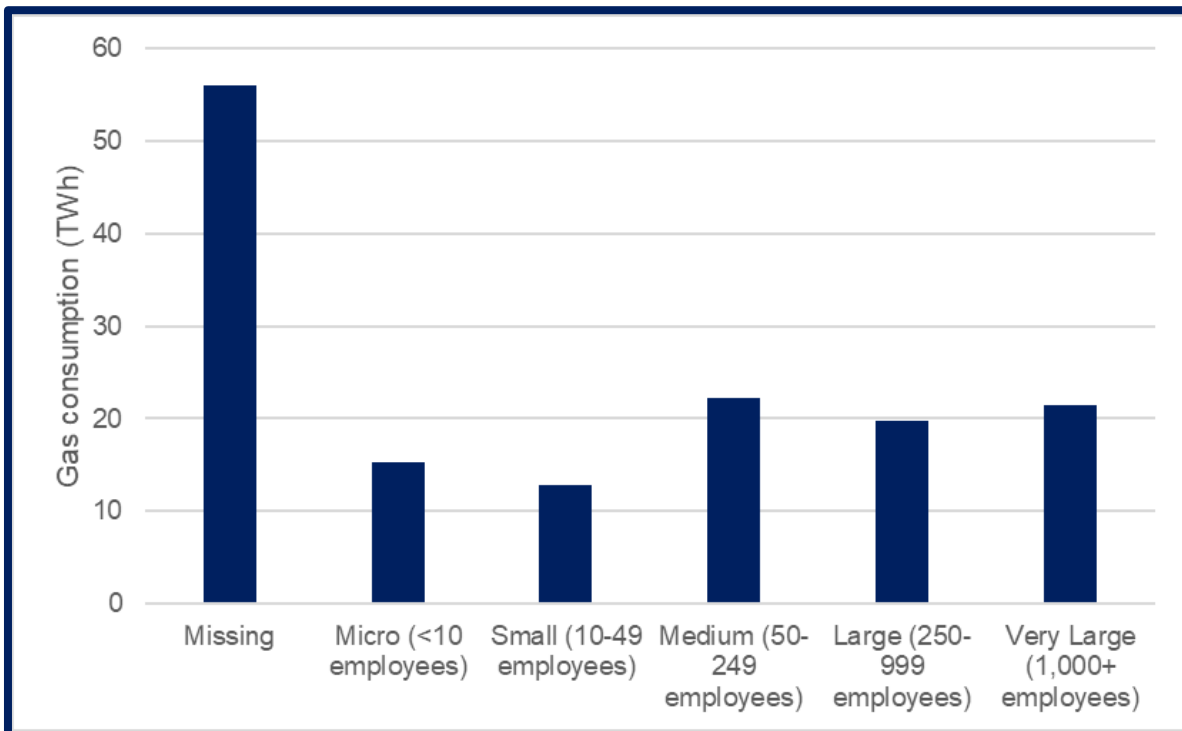
In ND-NEED the business size information comes from the Experian business characteristics dataset which is matched onto the non-domestic buildings and energy consumption data. There are two reasons why business size information may not be available:

- The Experian dataset may not contain business size information for a building.
- The Experian dataset may contain business size information, but this cannot be successfully matched to the corresponding building.

Because of the substantial size of the 'Business size missing' consumption category, the consumption figures for other categories e.g. Micro, Small etc. should be used with caution as they are likely to be underestimates (as some of the consumption in the 'Business size missing' category should be in those categories). It also means that there is substantial uncertainty around the pattern of results.

Gas consumption

Figure 23: The gas consumption of ND-NEED non-domestic buildings in England and Wales by business size, 2019.



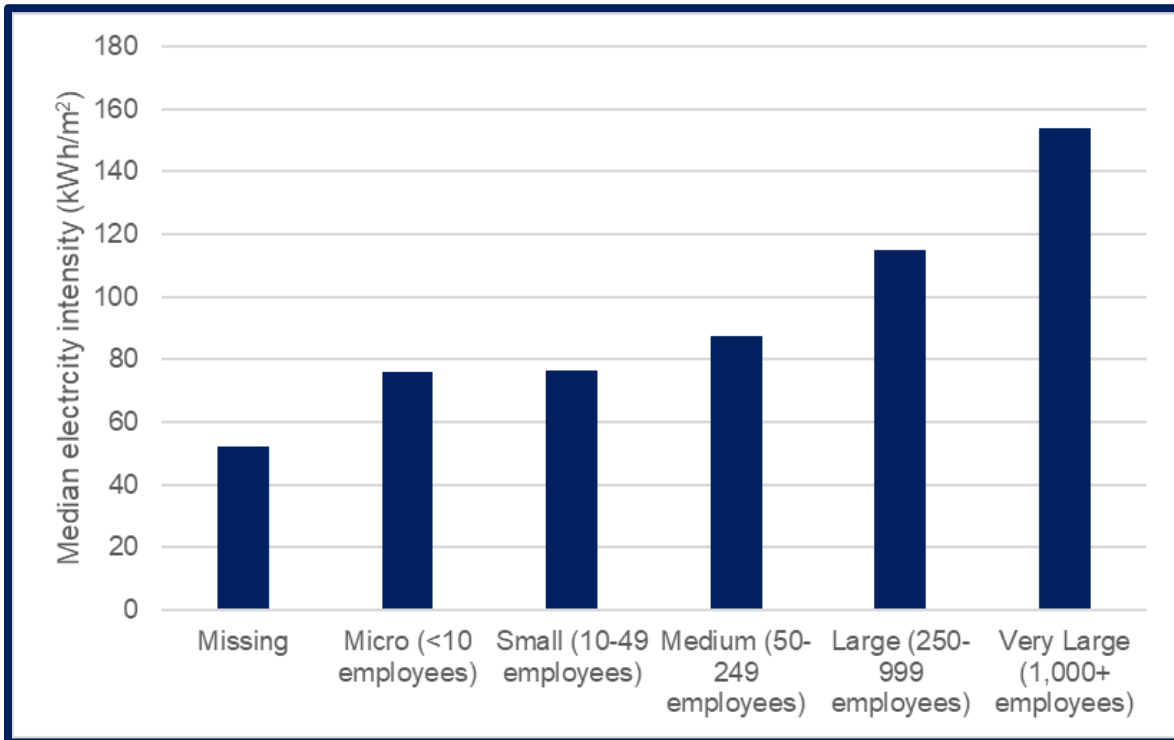
Gas consumption by business size shows a different pattern to electricity consumption. Buildings occupied by businesses with more than 50 employees (Medium, Large and Very large businesses) tend to consume more gas, than buildings occupied by businesses with fewer than 50 employees (Small and Micro businesses).

It is again important to note the substantial consumption of 56 TWh from the 'Business size missing' category. This is because 167,000 of the 358,000 buildings in the ND-NEED gas consumption sample are missing business size information. Because of this, the consumption figures for each business size category are likely to be underestimates (as some consumption from buildings that are missing business size information is likely to fall into each category), and there is substantial uncertainty around the pattern of results seen.

Non-domestic energy intensity by business size

Electricity intensity

Figure 24: The median electricity intensity of ND-NEED non-domestic buildings in England and Wales by business size, 2019.

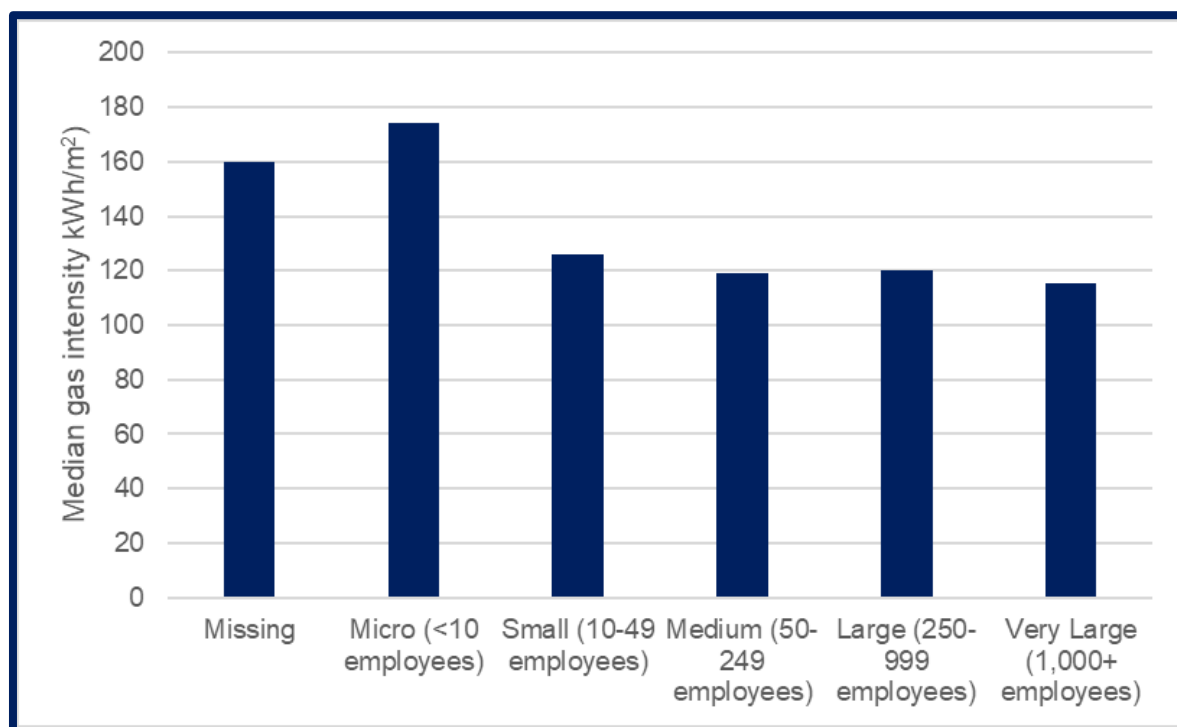


From Figure 24 we can see that electricity intensity tends to increase as the size of the business occupying the building increases.

As with the electricity consumption figures it is important to note the substantial size of the business size missing category – almost half of buildings in the ND-NEED sample that have floor area information are missing business size information. This makes it difficult to draw any firm conclusions from the results as they are associated with a high degree of uncertainty.

Gas intensity

Figure 25: The median gas intensity of ND-NEED non-domestic buildings in England and Wales by business size, 2019.



Gas intensity by business size shows a different trend to electricity intensity. The gas intensity of a building is more stable across all business sizes, decreasing slightly as the size of the business occupying the building increases.

Again, it is important to note the substantial size of the business size missing category – over two-fifths of buildings in the ND-NEED sample that have both gas consumption and floor area information are missing business size information. This makes it difficult to draw any firm conclusions from the results.

How has energy consumption/intensity in non-domestic buildings changed over time?

ND-NEED can also provide information on the electricity and gas consumption/intensity over time, which can be disaggregated by building use.

Note the electricity consumption year is a calendar year (Jan – Dec), the gas consumption year runs from mid-May to mid-May.

In this update we have presented several energy consumption/intensity time series:

1. Total electricity and gas consumption over time (2012 – 2019)
2. Median electricity and gas consumption over time (2012 – 2019)
3. Median electricity and gas intensity over time (2012 – 2019)

Note, because the ND-NEED statistics are created by scaling up the results from a sample of buildings to the population level (rather than from the whole population directly) there is some degree of uncertainty surrounding all ND-NEED estimates. Because of this uncertainty small changes in the ND-NEED consumption figures over time could just be noise rather than showing a true change.

How has total energy consumption in non-domestic buildings changed over time (2012 – 2019)?

Note, due to revisions in the methodology the ND-NEED 2021 total energy consumption figures for 2016 – 2018 differ slightly from the figures presented in ND-NEED 2020. For more information on the reasons for these revisions please see the [methodology](#).

Electricity consumption

Figure 26: Total electricity consumption in ND-NEED non-domestic buildings in England and Wales (2012-19).

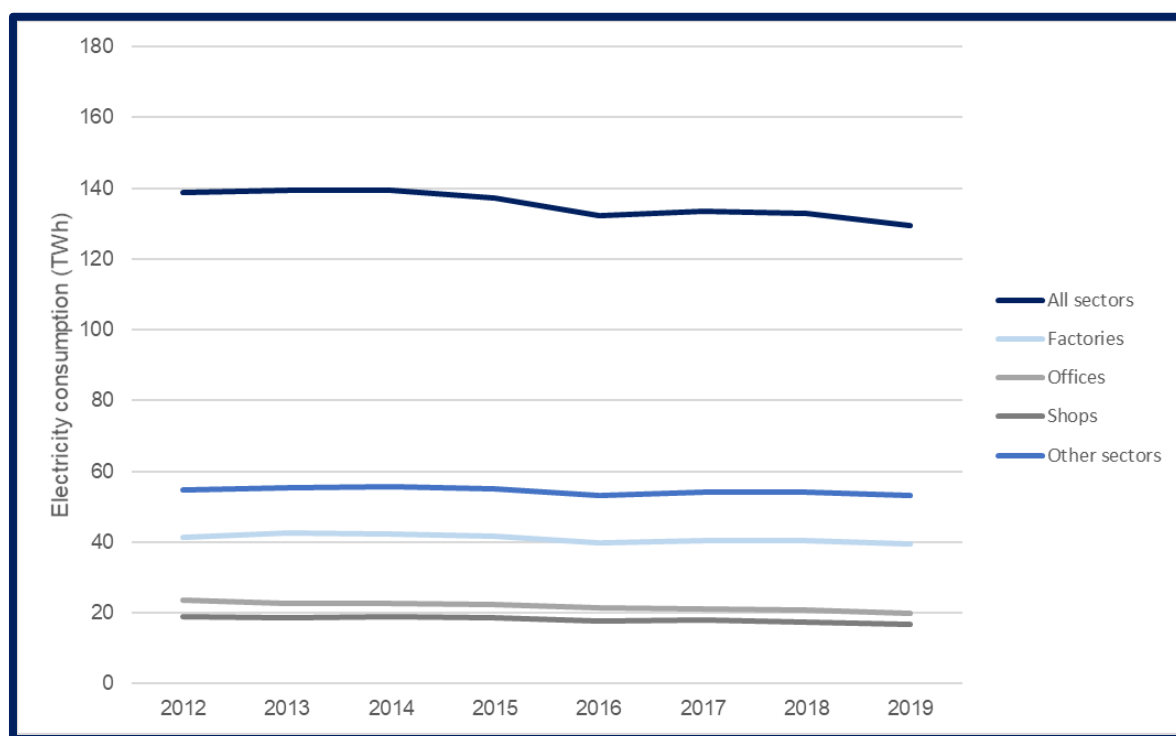


Figure 26 shows that, according to ND-NEED, the electricity consumption of non-domestic buildings in England and Wales remained relatively constant between 2012 and 2019 with some evidence of a slight decrease. This is broadly consistent with the trend seen in other publications such as the Subnational electricity consumption statistics¹⁴ and DUKES¹⁵.

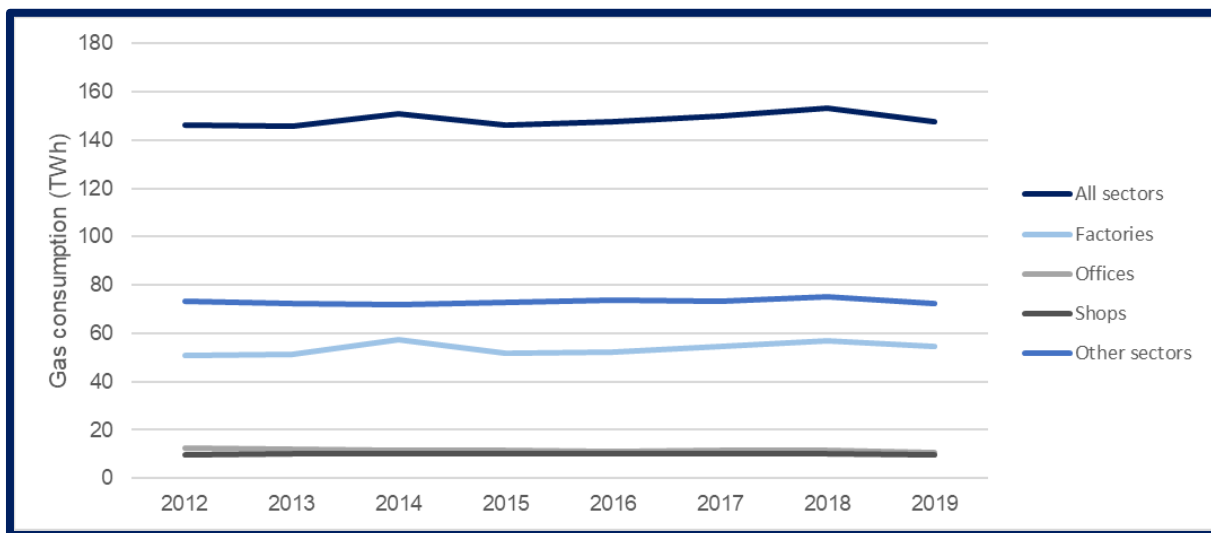
¹⁴ Subnational electricity consumption figures - <https://www.gov.uk/government/statistical-data-sets/regional-and-local-authority-electricity-consumption-statistics>

¹⁵ Dukes, Table 5.2, Sectors: Industry, Commercial, Public administration - <https://www.gov.uk/government/statistics/electricity-chapter-5-digest-of-united-kingdom-energy-statistics-dukes>

Unlike other publications, in ND-NEED this time series can also be split by building use. This shows that all building uses show a similar pattern to total consumption, with consumption remaining broadly stable between 2012 and 2019 (see Table 5 in the accompanying data tables).

Gas consumption¹⁶

Figure 27: Total gas consumption in ND-NEED non-domestic buildings in England and Wales, 2012-19.



Note, the gas consumption figures in ND-NEED are temperature adjusted so any temperature differences between years will not influence the ND-NEED gas consumption trend.

Figure 27 shows that, according to ND-NEED, gas consumption in non-domestic building remained broadly stable between 2012 and 2019, varying between 146 TWh and 153 TWh. This is consistent with the trend seen in the Subnational gas consumption statistics¹⁷ and DUKES¹⁸. As is the case for electricity, this trend is seen across building uses.

How has median energy consumption in non-domestic buildings changed over time (2012 – 2019)?

Another way to investigate how non-domestic building energy use has changed over time is to look at median consumption. This will be less affected by consumption from a few high consuming buildings than the total consumption time series.

¹⁶ ND-NEED gas consumption years are not calendar years but run from mid-May to mid-May. For example, data from 2019 is data from mid-May 2019 – mid-May 2020. For more information see the methodology of the Subnational gas consumption statistics which provide the gas consumption figures in ND-NEED - <https://www.gov.uk/government/publications/regional-energy-data-guidance-note> p.12

¹⁷ Sub-national gas consumption statistics - <https://www.gov.uk/government/collections/sub-national-gas-consumption-data>

¹⁸ DUKES, Table 4.2, Sectors: industrial, commercial, public admin and misc –

<https://www.gov.uk/government/statistics/natural-gas-chapter-4-digest-of-united-kingdom-energy-statistics-dukes>

Electricity consumption

Figure 28: Median electricity consumption in ND-NEED non-domestic buildings in England and Wales, 2012-19.

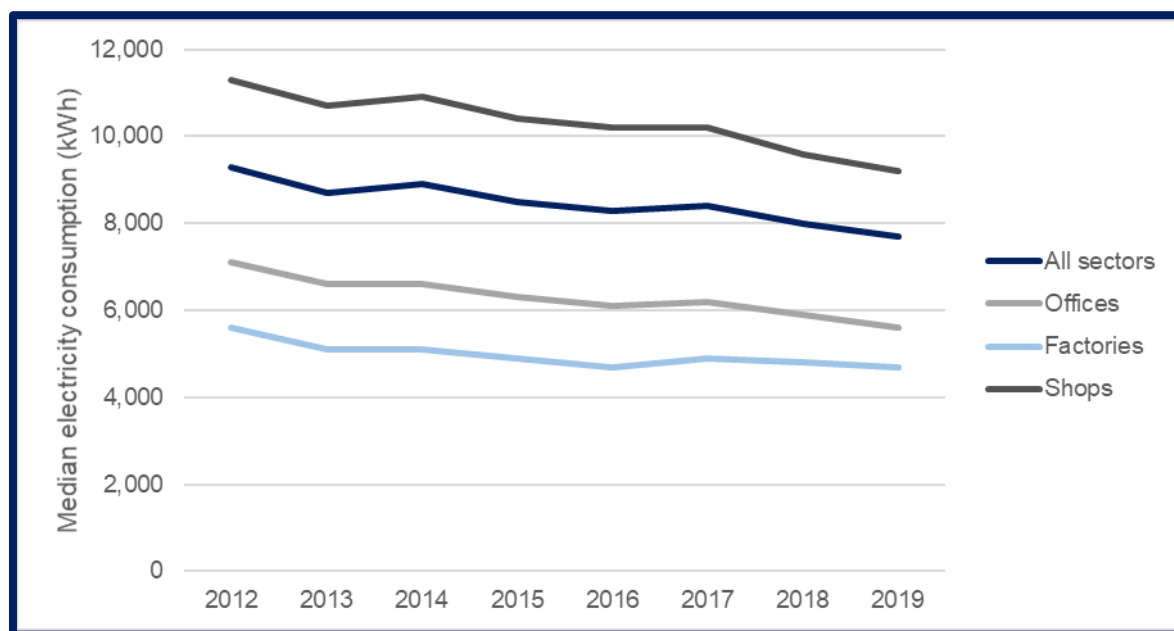


Figure 28 shows that median electricity consumption in non-domestic buildings has decreased by 17% between 2012 and 2019. This decreasing trend is the same as that seen in the Subnational electricity consumption data¹⁹. This trend is also seen across the building uses (Offices -21%, Factories -16%, Shops -19%).

The overall median electricity consumption in non-domestic buildings in ND-NEED in 2019 is in line with what is seen in the Subnational electricity data at around 8,000 kWh a year.

Gas consumption²⁰

Gas consumption shows a similar trend to electricity consumption with evidence of a slight decrease in median gas consumption between 2012 – 2019. This trend is also seen in the Subnational gas consumption data²¹. This slight decrease is seen across all building uses.

There is evidence of a larger decrease in median gas consumption between 2018 and 2019. As the gas year in ND-NEED runs from mid-May to mid-May the 2019 data covers mid-May 2019 to mid-May 2020 and so includes the first two months of the Covid-19 lockdown. Many non-domestic buildings closed during this period with only essential services allowed to open and people told to work from home where possible. This will have decreased non-domestic consumption across a range of building uses and may explain the decrease in consumption seen.

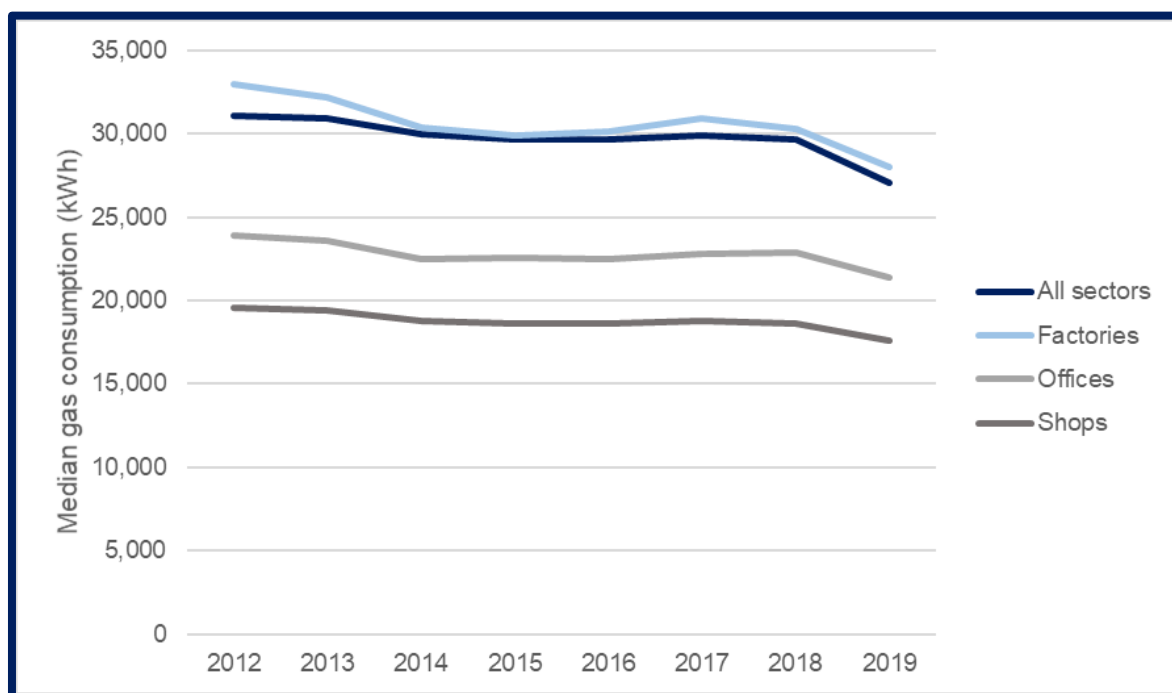
¹⁹ Subnational electricity consumption data - <https://www.gov.uk/government/statistical-data-sets/regional-and-local-authority-electricity-consumption-statistics>

²⁰ ND-NEED gas consumption years are not calendar years but run from mid-May to mid-May. For example data from 2019 is data from mid-May 2019 – mid-May 2020. For more information see the methodology of the Subnational gas consumption statistics which provide the gas consumption figures in ND-NEED - <https://www.gov.uk/government/publications/regional-energy-data-guidance-note> p.12

²¹ Subnational gas consumption data 2019 - <https://www.gov.uk/government/statistical-data-sets/gas-sales-and-numbers-of-customers-by-region-and-local-authority>

Note, the median gas consumption in non-domestic buildings in ND-NEED (around 30,000 kWh) is much lower than is seen in the Subnational gas consumption data (around 150,000 kWh). This is because the Subnational data uses a consumption threshold of 73,200 kWh to identify non-domestic buildings which means some low consuming non-domestic buildings are not included. Consumption from these buildings is captured in ND-NEED which leads to the lower median consumption values.

Figure 29: Median gas consumption in ND-NEED non-domestic buildings in England and Wales, 2012-19.



How has median energy intensity in non-domestic buildings changed over time (2012 – 2019)?

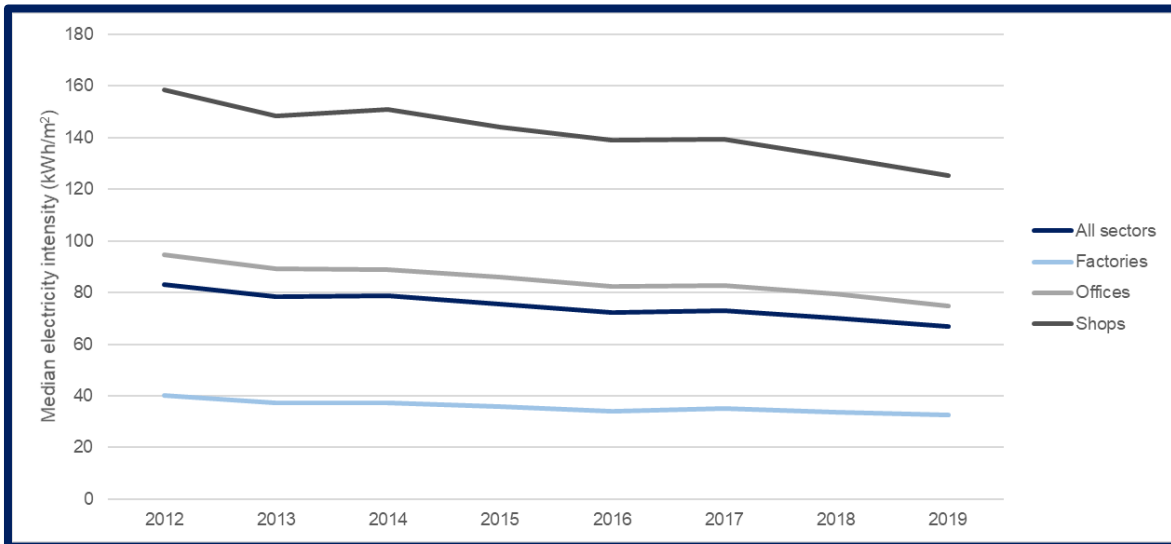
ND-NEED can also be used to track changes in median energy intensity over time.

Note, the floor area information in ND-NEED is only available for a single point in time (end of March 2020). This means that any changes in the energy intensity time series are being driven by changes in consumption alone, as the impact of any changes in floor area will not be captured.

Electricity intensity

Electricity intensity has fallen gradually between 2012 and 2019, decreasing by 20% in the time period. This trend is seen across all building uses.

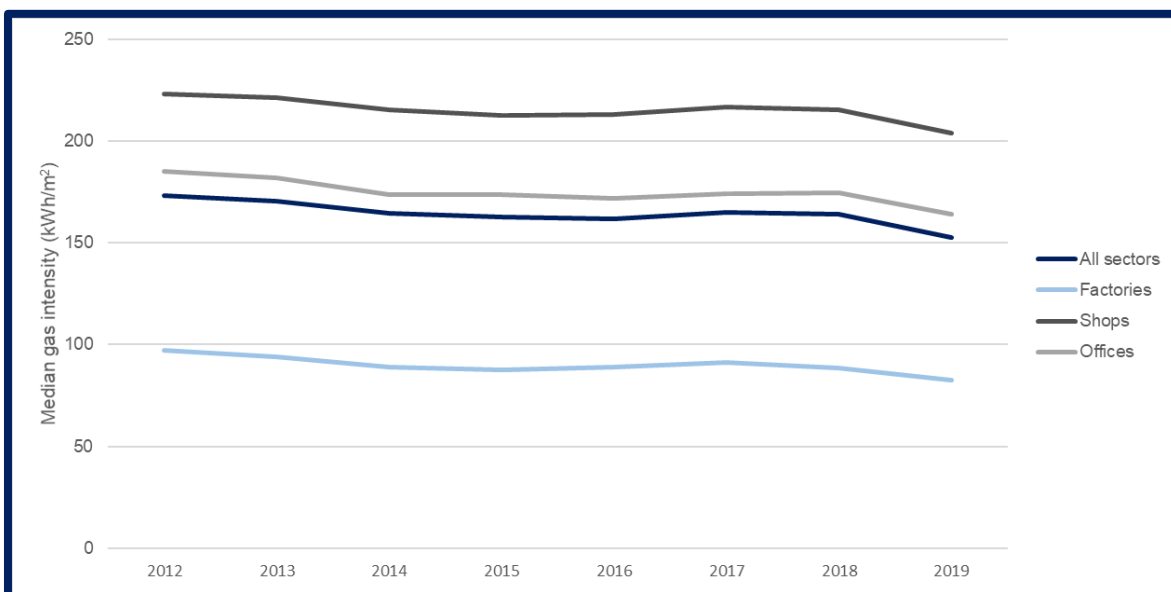
Figure 30: Median electricity intensity in ND-NEED non-domestic buildings in England and Wales, 2012-19.



Gas intensity²²

Gas intensity shows the same pattern as electricity intensity showing a gradual decrease over time, falling by 12% across the time period. Again, this trend is seen for all building uses.

Figure 31: Median gas intensity in ND-NEED non-domestic buildings in England and Wales, 2012-19.



²² ND-NEED gas consumption years are not calendar years but run from mid-May to mid-May. For example, data from 2019 is data from mid-May 2019 – mid-May 2020. For more information see the methodology of the Subnational gas consumption statistics which provide the gas consumption figures in ND-NEED - <https://www.gov.uk/government/publications/regional-energy-data-guidance-note> p.12

Investigating consumption from buildings with low-consuming non-domestic meters

ND-NEED can also provide information on the number of non-domestic buildings that have 'domestic-like' or low consuming electricity or gas meters. This can provide an indication of the proportion of non-domestic buildings that share similar consumption characteristics as domestic buildings, and how much they contribute to overall non-domestic consumption.

Electricity consumption

There are two key reasons why it is important to understand the number of non-domestic buildings that have 'domestic-like' electricity meters:

1. In ND-NEED the non-domestic electricity meter population is defined as all meters that are in 'non-domestic' profile classes (0, 3 – 8)²³, and any meters in a 'domestic-like' profile class (1,2) that can be matched to a non-domestic building address via an address-matching algorithm. The ND-NEED address matching algorithm is estimated to have a match rate of around 50% which means we know that we are missing some 'domestic-like' meters from the ND-NEED population. Understanding how many non-domestic buildings have these 'domestic-like' meters will help us to understand how many of these meters and what level of electricity consumption is currently being missed in ND-NEED.
2. The profile class of an electricity meter is used by other electricity consumption publications such as the Subnational publication²⁴ to identify non-domestic meters and so to estimate non-domestic building consumption. Understanding how many non-domestic buildings have these 'domestic-like' meters therefore informs how much non-domestic consumption is being recorded as domestic consumption in these publications.

In the ND-NEED sample (a sample of 847,000 non-domestic buildings that have been matched to their corresponding electricity meter) 96% of buildings have information about the profile class of their electricity meter(s).

Of these buildings, 89,000 (11%) have 'domestic-like' meters (meters in profile classes 1 or 2). These may have previously been domestic property which have now been converted to non-domestic usage.

These buildings with 'domestic-like' meters are responsible for 1 TWh of electricity consumption, less than 1% of electricity consumption from buildings with profile class information.

This shows that while these 'domestic-like' meters are relatively common in the non-domestic building stock, they make very little contribution to overall electricity consumption. This means that although the ND-NEED meter population is likely missing a substantial number of these 'domestic-like' electricity meters, this has little impact on the overall electricity consumption reported. This will also be the case for other electricity consumption publications that use profile class to define meters as 'domestic' or 'non-domestic'.

²³ <https://www.elexon.co.uk/knowledgebase/profile-classes/>

²⁴ <https://www.gov.uk/government/collections/sub-national-electricity-consumption-data>

Gas consumption

As gas meters do not have profile classes or similar which could indicate whether a meter is located in a domestic or a non-domestic building the metered consumption level is used instead.

BEIS uses the gas industry standard “Annual Quantity” (AQ) cut-off point of 73.2 MWh to determine whether a gas meter is classified as domestic or non-domestic. Meters that consume ≤ 73.2 MWh are classified as domestic and meters that consume >73.2 MWh are classified as non-domestic.

In ND-NEED this classification is refined by also matched low-consuming sites to non-domestic buildings.

For gas consumption there are three key reasons why it is important to understand the number of gas meters that are low-consuming/‘domestic-like’:

1. In ND-NEED the non-domestic gas meter population is defined as all meters that consume >73.2 MWh and any meters that consume ≤ 73.2 MWh that can be matched to a non-domestic building address via an address-matching algorithm. The ND-NEED address matching algorithm is estimated to have a match rate of around 50% which means we know that we are missing some ‘low-consuming’ meters from the ND-NEED population. Understanding how many non-domestic buildings have these ‘low-consuming’ meters will help us to understand how many of these meters and what level of gas consumption is currently being missed in ND-NEED.
2. The consumption level of a gas meter is used by other gas consumption publications such as the Subnational publication²⁵ to identify non-domestic meters and so to estimate non-domestic building consumption. Understanding how many non-domestic buildings have these ‘low-consuming’ meters therefore informs how much non-domestic consumption is being recorded as domestic consumption in these publications.
3. Not all non-domestic buildings will have a gas meters - they may be in an area where no gas connection is available, or they may be in an area where a gas connection is available but choose not to be connected. Understanding how many buildings with gas meters are currently being missed in ND-NEED will help us to estimate the number of non-domestic buildings with no gas connection. This is important as there are differences in decarbonisation policy for buildings that use gas and those that do not.

In the ND-NEED sample there are 337,000 non-domestic buildings that have been matched to their corresponding gas meter(s), where consumption is >1 kWh in 2019 (values of 1 kWh or less are placeholder values).

Of these 337,000 buildings, 266,000 buildings consumed ≤ 73.2 MWh of gas in 2019. That is 79% of all buildings with gas consumption information. These buildings are responsible for 11 TWh of gas consumption, which is around 7% of gas consumption from the whole non-domestic building stock.

²⁵ <https://www.gov.uk/government/collections/sub-national-gas-consumption-data>

This shows that 'low-consuming' gas meters are common in the non-domestic building stock and have a non-negligible impact on the total gas consumption level. This means that the ND-NEED meter population is potentially missing a substantial number of gas meters and is slightly underestimating the total gas consumption from non-domestic buildings. This will be even more true for other publications which just use the 73.2 MWh cut-off to identify non-domestic consumption as they don't use address matching to identify any lower consuming sites.

It also means that the ND-NEED data cannot currently be effectively used to estimate the number of non-domestic buildings which do not have a gas connection (either because they are in an area where no gas connection is available, or they are in an area where a gas connection is available but choose not to be connected). This is because we know that lots of buildings with low consuming gas meters are currently missing from the ND-NEED data.

Note, typical domestic gas consumption is much lower than 73.2 MWh. Ofgem estimates that the medium domestic gas consumption is 12 MWh and high domestic gas consumption is 17 MWh²⁶.

If 17 MWh a year is used as the cut-off for non-domestic consumption, then 137,000 buildings (40% of buildings in the ND-NEED gas sample) have 'domestic-like' gas consumption in 2019 (<17 MWh). These buildings are responsible for 2 TWh of consumption.

If 12 MWh a year is used as the cut-off for non-domestic consumption, then 100,000 buildings (30% of buildings in the ND-NEED gas sample) have 'domestic-like' gas consumption in 2019 (<12 MWh). These buildings are responsible for 1 TWh of consumption.

Overlap between buildings with 'domestic-like' electricity meters and 'domestic-like' gas meters

Another area we can investigate with the ND-NEED data is the extent to which the buildings with 'domestic-like' electricity and gas meters overlap.

For this analysis a gas meter will be considered 'domestic-like' if it consumed less than Ofgem's 'high domestic consumption' level²⁷ of 17 MWh in 2019.

There are 89,000 non-domestic buildings with 'domestic-like' electricity meters and 137,000 non-domestic buildings with 'domestic-like' gas consumption in the ND-NEED sample.

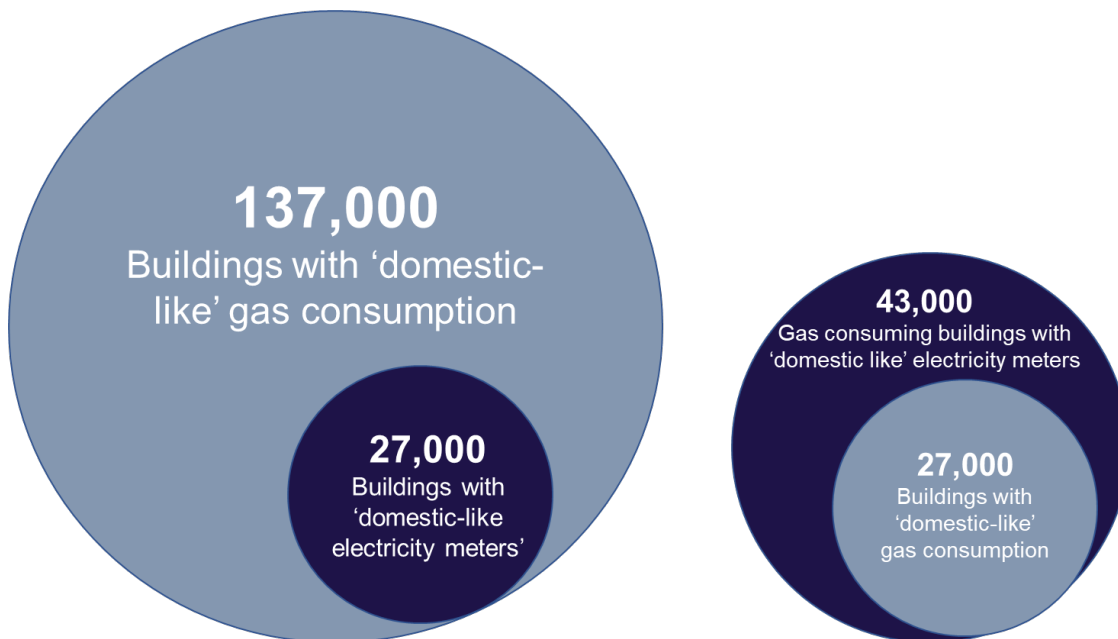
Of the 137,000 non-domestic buildings with 'domestic-like' gas consumption 27,000 also have 'domestic-like' electricity meters. That means that 20% of the buildings with 'domestic-like' gas consumption also have 'domestic-like' electricity meters.

Of the 89,000 non-domestic buildings with 'domestic-like' electricity meters 43,000 have gas consumption >1 kWh in 2019. Of these 43,000 buildings, 27,000 have 'domestic-like' gas consumption. That means that 62% of the gas consuming buildings with 'domestic-like' electricity meters also have 'domestic-like' gas consumption.

²⁶ <https://www.ofgem.gov.uk/gas/retail-market/monitoring-data-and-statistics/typical-domestic-consumption-values>

²⁷ <https://www.gov.uk/government/collections/sub-national-gas-consumption-data>

Figure 32: Overlap between buildings with 'domestic-like' electricity meters and 'domestic-like' gas consumption meters.



3. Methodology

ND-NEED building stock

To calculate the building stock figures in ND-NEED, the 2017 version of the VOA's non-domestic ratings list (NDR) and the VOA's summary valuation data (SMV), as at the end of March 2020, are used.

This data is collected by the VOA as part of their business rate calculations. Almost all properties that are not used for domestic purposes are valued for business rates and so are included in the NDR.

There are however a few non-domestic building uses that are exempt from business rates. These are not included in the NDR and so are also not covered by ND-NEED. Non-domestic buildings that are exempt from building rates include agricultural buildings, prisons, military buildings and places of worship.

The NDR and SMV contain information on the number of non-domestic hereditaments in England and Wales, the size of these and their use. A hereditament can be a building, but there can also be multiple hereditaments within a single building.

Each hereditament in the NDR/SMV has a unique address reference number (UARN). Each hereditament also has a unique property reference number (UPRN), which is a unique building reference. Two hereditaments in the same building will have different UARN's but the same UPRN.

Converting NDR/SMV hereditaments to ND-NEED building stock dataset

Before analysis of the NDR/SMV data can be carried out, any hereditaments which do not have a UPRN or that have a null rateable value are removed. This takes the number of hereditaments in the dataset from 2,111,000 to 1,915,000.

The 1,915,000 remaining hereditaments must then be aggregated to the building (UPRN) level, which results in 1,798,000 unique UPRNs.

Table 1: Single versus multiple hereditaments in ND-NEED non-domestic buildings in England and Wales (end of March 2020).

Number of hereditaments in a building	Number of buildings (UPRNs)
Buildings (UPRN) containing a single hereditament (UARN)	1,751,000
Buildings (UPRN) containing multiple hereditaments (UARN)	47,000

To determine the floor area of buildings containing multiple hereditaments, the floor area of the hereditaments within it are summed. If a hereditament has a floor area of less than 15m² this is not included in the building floor area as this floor area data is thought to be unreliable for the purposes of ND-NEED as it results in some extremely high energy intensity values.

The NDR/SMV also contain hereditament floor area information for some building uses for which this floor area information is thought to be unreliable for the purposes of ND-NEED as the floor area does not inform the business rating. The floor area for these building uses is therefore removed. A list of the building uses which have their floor area information removed can be found in [Annex E](#).

If a building contains hereditaments with multiple building uses, the building use of the hereditament with the largest floor area is taken to be that for the building.

Once the NDR/SMV data has been aggregated to the building level there is some further processing before the building use analysis is carried out.

The NDR/SMV contain some building uses which are not considered to be non-domestic buildings for the purposes of ND-NEED. These 'non-buildings' are removed before the building stock figures are calculated. The building types that are removed are: Caravan Parks, Advertising Rights and Premises, Car Parks, Beach Huts, Quarries and Telecoms. The removal of the 'non-buildings' takes the number of buildings from 1,798,000 to 1,656,000.

The data can then be used to provide information on the building number, use and size of the ND-NEED non-domestic building stock in England and Wales.

Figure 33: The key steps from the NDR/SMV data from the VOA to the ND-NEED building stock population.



Matching the ND-NEED building stock and Experian data

The 1,656,000 buildings in the non-domestic stock (excluding non-buildings) are then matched to the Experian business characteristics dataset (which BEIS has attached UPRNs to) using UPRNs. This dataset contains information about the number of employees of the business occupying the building.

Just under 40% of business in the ND-NEED sample successfully match to the Experian data. However, there are some buildings which match to the Experian data, but the Experian data does not have information on their occupying business size. This means that only 32% of ND-NEED non-domestic buildings have information about their occupying business size.

Note, the Experian business characteristics dataset is a bespoke dataset that BEIS receives from Experian.

Energy consumption

To calculate the non-domestic energy consumption figures in ND-NEED, the list of non-domestic buildings in England and Wales with building use, building size and occupying business size information is matched with energy consumption data (at the meter-point level) held by BEIS. This creates a sample of non-domestic buildings with energy consumption and building/business characteristic information. This sample is then weighted to scale the results up to the population level.

The gas consumption meter data is temperature corrected so ND-NEED gas consumption figures are all temperature corrected.

Note, all 1,798,000 buildings are matched to the energy consumption data (including non-buildings).

The reason non-buildings are not removed before matching is that some of the energy consumption in the consumption data is thought to come from non-buildings. Therefore, if the non-buildings were removed before matching, the energy consumption for non-domestic buildings (excluding non-buildings) would be artificially high as it would be scaled up to population figures that include non-building consumption.

To prevent this the non-buildings are matched to the energy consumption data and included when the weights are calculated to scale the sample up to the population. After the weights have been calculated the non-buildings are removed.

Matching the ND-NEED building stock and energy consumption data

The 1,798,000 buildings in the ND-NEED building stock and the energy consumption data do not share a common unique identifier. Therefore, to match the datasets together address matching is used.

Address matching is when two addresses from different datasets are deemed to correspond to the same property. Address matching of non-domestic buildings can be difficult as non-domestic addresses are often complex. For example, a non-domestic building may occupy a range of building numbers or list the company name in the address. More information about the address-matching process in ND-NEED can be found in [Annex C](#).

Using address matching almost 50% of buildings in the ND-NEED stock (858,000 buildings) were successfully matched to electricity meter data. Of these 858,000 buildings, 375,000 were also successfully matched to gas consumption meter data. This reduced sample size is because not all non-domestic buildings have a gas connection.

Weighting

As not all non-domestic buildings can be matched to energy use data, weights are used to scale up the ND-NEED sample to population. Weighting is used to ensure the results from ND-NEED are as representative of the non-domestic building population as possible.

As there is not a dataset that contains all non-domestic buildings and all non-domestic building electricity/gas consumption, this weighting takes place in two stages (the building weight and the energy weight).

For the weighted sample figures to be representative of the population, the weighting must account for the key characteristics that could influence energy consumption. Both building use and floor area are used to inform the weighting, so the ND-NEED consumption figures should be representative for these characteristics. However, where floor area information is missing the weighting is less effective as buildings missing floor area in the sample will be weighted up to buildings missing floor area in the population, even though the actual floor sizes of buildings in these groups might differ. For this reason, there is more uncertainty around the ND-NEED consumption figures by floor area than by building use (where there is no missing information).

Note, the weighting used to scale up consumption from the ND-NEED sample to the population does not account for potential differences between the size of businesses in the sample and the size of businesses in the population. This is because of the poor coverage of business size information in the building stock (only 32% of non-domestic buildings have business size information).

This means there is more uncertainty around whether the energy consumption figures by business size are representative of the population, than for the consumption figures by building use or by building size.

Building weighting

The building weights scale up the number of buildings in the ND-NEED sample to the number of buildings in the ND-NEED building population.

To account for biases in the ND-NEED sample the building weights are constructed based on building use and building size. A single building weight is calculated for each building in the ND-NEED sample.

The building population and sample are stratified into 35 building uses and 17 floor area bands to form a matrix. A few of the building types have too few counts in either the population or the sample to be stratified into an area band (a count of below 5 was used as the minimum cut-off). In these cases, two or more area bands were merged (in both the population and the sample).

For each cell in the matrix, the population count is divided by the sample count. For example, if there were 1,000 cinemas with a floor area of >500 – 1,000m² in the population, and 500 cinemas with a floor area of >500 – 1,000m² in the sample these buildings would be assigned a building weight of 2.

Energy weighting

The next stage of the weighting process is to calculate the energy weights. The energy weights scale up the energy meters in the ND-NEED sample to match the number of energy meters in the non-domestic meter population. The weights for electricity meters and gas meters are calculated separately.

The non-domestic meter population contains some building uses that are not covered by ND-NEED. These are agricultural buildings, place of worship and prisons. The meters associated with these building uses are therefore excluded from non-domestic meter population before the energy weights are calculated.

To do this, a profile for each of the excluded building types is created from the meter data. Each of these building types is then grossed up to an estimated population from the UCL Carb model²⁸. The resulting population of these building types was then removed from the total population of all consumption meters.

²⁸The UCL Carb model is UCL's non-domestic energy use model which provides estimates of total number of buildings for different building types.

Electricity weight

The population for the electricity weight is all the non-domestic electricity meters in the Sub-national consumption statistics (profile classes of 0 and 3 – 8)²⁹, and any other electricity meters that match to a building in the ND-NEED building stock dataset. The sample is the number of electricity meters in the ND-NEED sample.

To account for biases in the ND-NEED sample the electricity weights are constructed based on their average electricity consumption in 2017 - 2019 and meter profile class. The population and sample of meters is stratified into 17 consumption bands and into seven profile classes to form a matrix. A few of the cells in the matrix have too few counts in either the population or the sample to be stratified into a consumption band (a count of below 5 was used as the minimum cut-off). In these cases, two or more consumption bands were merged (in both the population and the sample).

For each cell in the matrix, the ratio of population count to sample count is calculated. Any meters in the sample with a profile class of 1 or 2 are given a weighting of one, as they will also appear in the population.

If a building has multiple meters the total consumption for the building is divided by the number of meters and assigned the resulting consumption band.

For each combination of consumption band/profile, a single electricity weight is calculated, as the population to sample ratio, averaged over the last three years (2017-2019). This is then applied to all years of electricity consumption, for each building in the sample, in the corresponding band.

Gas weight

The population for the gas weight is all the non-domestic gas meters in the Sub-national consumption statistics³⁰ (meters that consume more than 73,200 kWh a year), and any other gas meters that match to a building in the ND-NEED building stock dataset. The sample for the gas weight is the gas meters in the ND-NEED sample.

To account for biases in the ND-NEED sample the gas weights are constructed based on their average gas consumption in 2017 - 2019. The population and sample of meters are stratified into 17 consumption bands. For each cell in the matrix, the ratio of population count to sample count is calculated.

A few of the cells in the matrix have too few counts in either the population or the sample to be stratified into a consumption band (a count of below 5 was used as the minimum cut-off). In these cases, two or more consumption bands were merged (in both the population and the sample).

Any gas meters with a consumption of less than 73,200 kWh a year are given a gas weight of one as all meters in the population will also be in the sample.

²⁹ Profile classes 1 and 2 indicate a domestic property. Profile classes 0 and 3 – 8 indicate a non-domestic property.

³⁰ Sub-national gas consumption statistics - <https://www.gov.uk/government/collections/sub-national-gas-consumption-data>

If a building has multiple meters the total consumption for the building is divided by the number of meters and assigned the resulting consumption band.

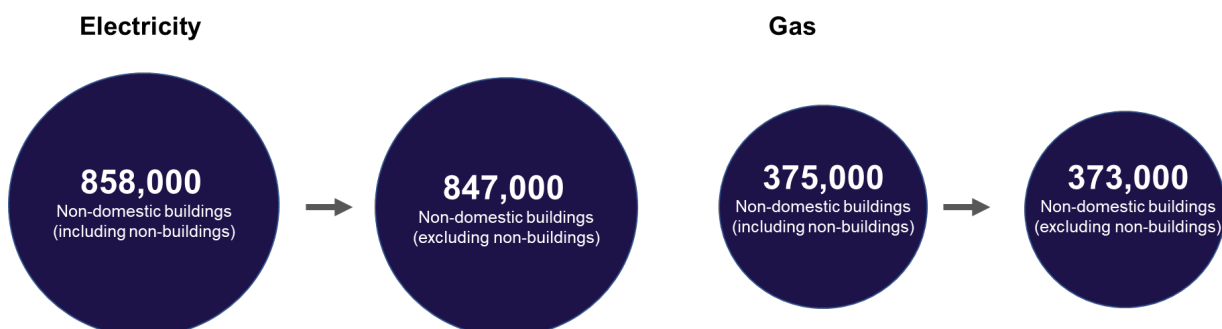
For each consumption band, a single gas weight is calculated, as the population to sample ratio, averaged over the last three years (2017-2019). This is then applied to all years of gas consumption, for each building in the sample, in the corresponding band.

Removing non-buildings

Once the electricity and gas weights have been calculated the buildings that were originally included in the ND-NEED electricity/gas consumption sample, but that are not considered to be non-domestic buildings in ND-NEED ('non-buildings'), are removed. The buildings that are removed are: Caravan Parks, Advertising Right and Premises, Car Parks, Beach Huts, Quarries and Telecoms.

The removal of these 'non-buildings' reduces the size of the ND-NEED electricity consumption sample from 858,000 buildings to 847,000 buildings, and the size of the gas consumption sample from 375,000 buildings to 373,000 buildings.

Figure 34: The removal of non-buildings from the ND-NEED electricity and gas consumption samples.



The removal of non-buildings from the sample also removes the energy consumption associated with these non-buildings from the ND-NEED consumption figures (18 TWh for electricity and 16 TWh for gas in 2019).

The removal of non-buildings from the ND-NEED sample is one of the reasons that the ND-NEED energy consumption figures for non-domestic buildings are generally lower than comparable figures from other sources such as the Subnational consumption statistics.

Comparing the results in ND-NEED to comparable figures from other publications

Consumption by building use

The electricity/gas consumption of non-domestic buildings broken down by building use is available in other publications as well as in ND-NEED.

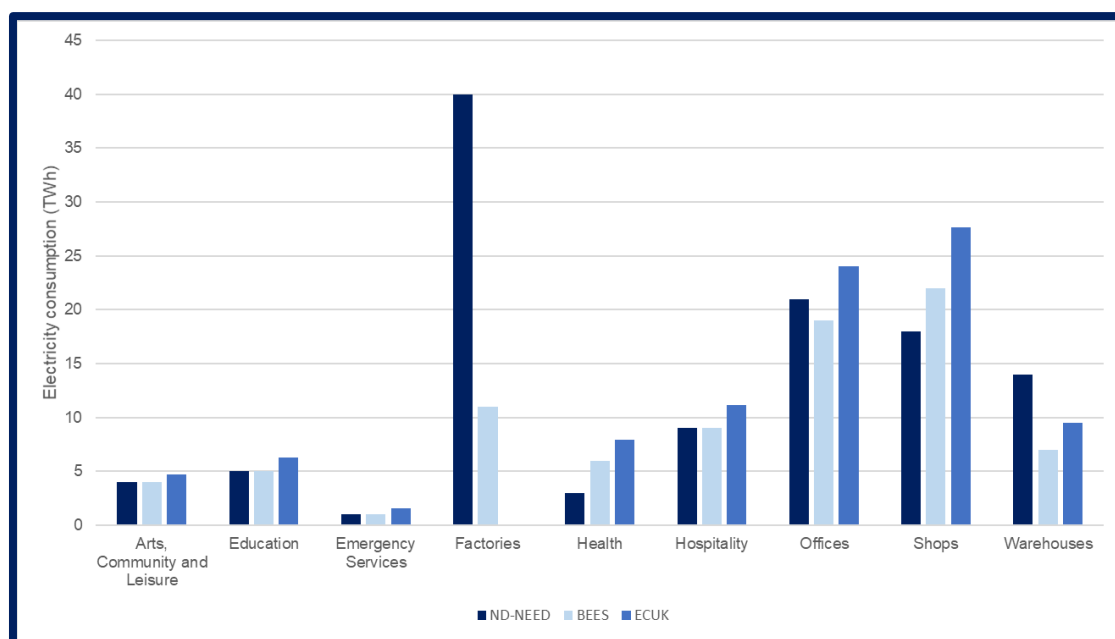
Figures 35 and 36 compare the total electricity and gas consumption figures for non-domestic buildings from three different sources (ND-NEED, BEES³¹ and ECUK³²).

In general, all three publications have similar electricity consumption figures by building use. The figures in ECUK are generally higher than the figures in ND-NEED and BEES. This is consistent with the fact that ECUK covers the whole of the UK, whereas the ND-NEED and BEES just cover England and Wales. Methodological differences also account for some of this difference.

The notable exception to this is Factories where consumption in BEES is much lower than in ND-NEED (11 TWh in BEES compared to 40 TWh in ND-NEED). Factory consumption figures are not available for ECUK. This difference can be explained by a difference in the BEES and ND-NEED methodologies. The BEES consumption figure refers to all electricity consumed by the building whereas the ND-NEED figures, as they are based on meter point data, refer to all energy consumed by the building and any activity inside the building. In the case of Factories, this means that industrial processes are not included in the BEES consumption figures, but they are included in ND-NEED.

The gas consumption figures show a similar pattern to the electricity consumption figures. For all sectors except Factories the consumption figures are relatively consistent across all three publications. The ND-NEED consumption figures for Factories is much higher than the BEES consumption figure for the reason stated above.

Figure 35: Non-domestic building electricity consumption from this version of ND-NEED for 2016, BEES for 2014-15³³, and ECUK for 2016³⁴



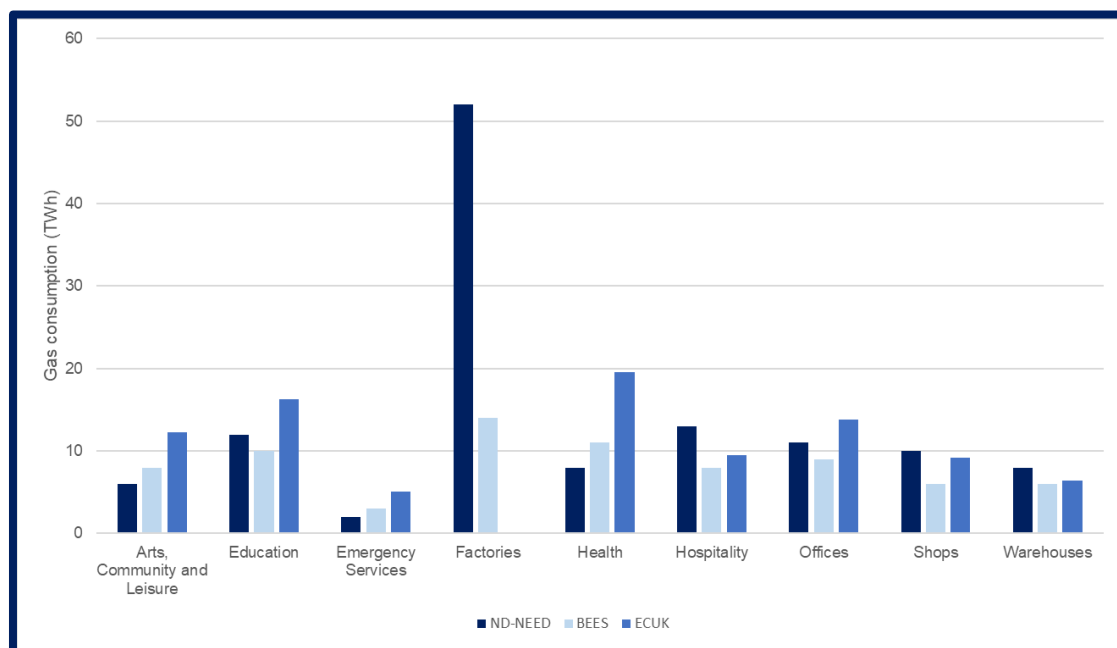
³¹ BEES, Overarching report tables, Figure 3.1 - <https://www.gov.uk/government/publications/building-energy-efficiency-survey-bees>

³² ECUK, End uses data tables, Table U5 - <https://www.gov.uk/government/statistics/energy-consumption-in-the-uk>

³³ BEES, Overarching report tables, Figure 3.1. BEES does not have figures for gas so non-electric consumption is used

³⁴ ECUK, End uses data tables, Table U5 - <https://www.gov.uk/government/statistics/energy-consumption-in-the-uk>

Figure 36: Non-domestic building gas consumption from this version of ND-NEED for 2016, BEES for 2014-15³⁵, and ECUK³⁶ for 2016



Consumption over time

The total electricity/gas consumption from non-domestic buildings over time is also available from other publications.

Figures 37 and 38 compare the normalised change in non-domestic electricity and gas consumption over time from three different sources (ND-NEED, DUKES and Subnational³⁷).

The total non-domestic building consumption from these sources varies due to methodological and definitional differences. Because of this normalised electricity/gas consumption is presented so the trends over time can be easily compared.

Note for gas consumption both the subnational and ND-NEED gas year runs from mid-May – mid-May, while the DUKES gas year is the calendar year Jan – Dec. This may cause differences in the trends seen in these publications.

All 3 data sources show that non-domestic building electricity/gas consumption has remained broadly stable between 2012 – 2019, with some evidence of a decrease for electricity consumption.

³⁵ BEES, Overarching report tables, Figure 3.1. BEES does not have figures for gas so non-electric consumption is used

³⁶ ECUK, End uses data tables, Table U5 - <https://www.gov.uk/government/statistics/energy-consumption-in-the-uk>

Figure 37: Non-domestic building normalised electricity consumption 2019 from ND-NEED, Subnational³⁸ and DUKES³⁹.

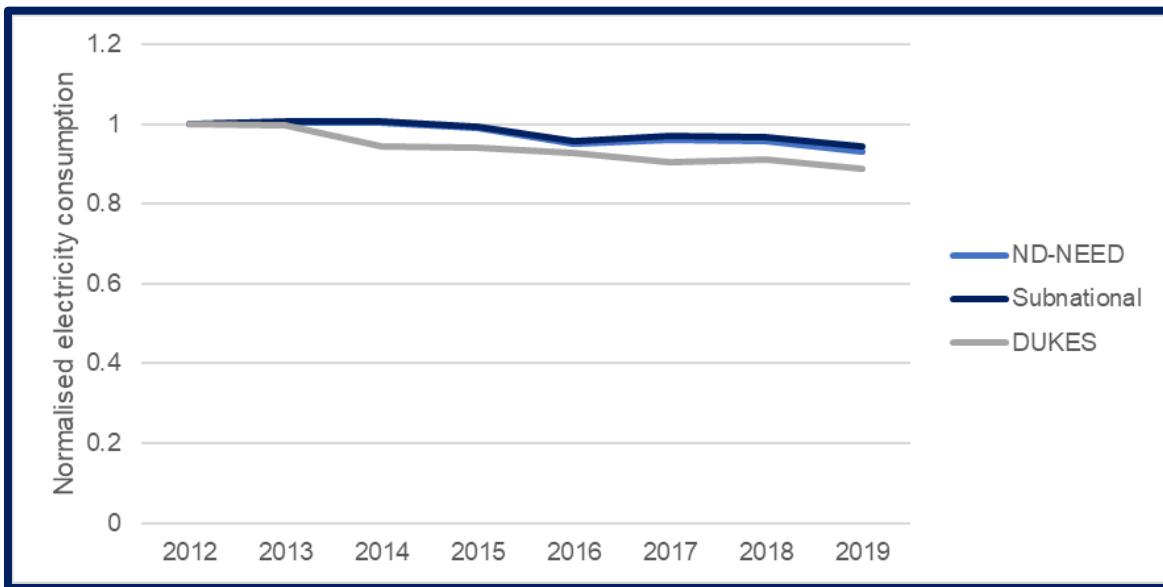
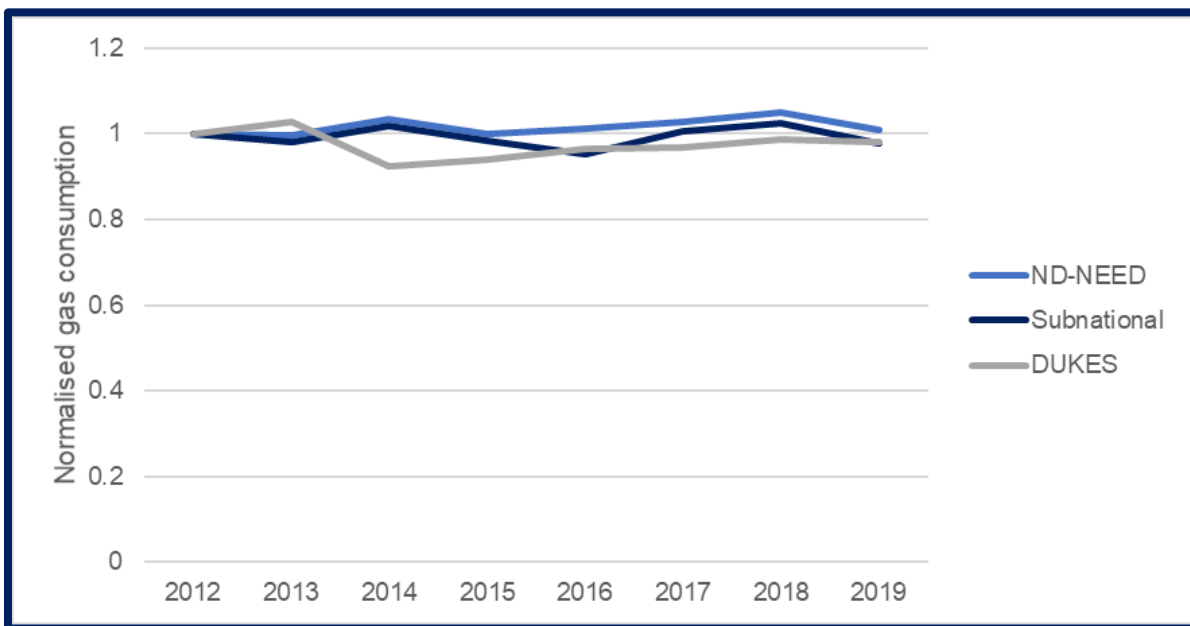


Figure 38: Non-domestic building normalised electricity consumption 2019 from ND-NEED, Subnational⁴⁰ and DUKES⁴¹.



³⁸ Subnational electricity consumption data 2019 - <https://www.gov.uk/government/collections/sub-national-electricity-consumption-data>

³⁹ DUKES electricity consumption- <https://www.gov.uk/government/statistics/electricity-chapter-5-digest-of-united-kingdom-energy-statistics-dukes>. Industry, commercial and public administration used as a proxy for non-domestic buildings. Electricity from the public distribution system.

⁴⁰ Subnational gas consumption data 2019 - <https://www.gov.uk/government/collections/sub-national-gas-consumption-data>.

⁴¹ DUKES gas consumption - <https://www.gov.uk/government/statistics/natural-gas-chapter-4-digest-of-united-kingdom-energy-statistics-dukes>. Industry, commercial, public administration and misc used as a proxy for non-domestic buildings. Total natural gas.

Current limitations of ND-NEED

There are several aspects of ND-NEED's methodology which currently limit the insights that's ND-NEED can provide. Before the next publication of ND-NEED, work will be undertaken to see if any of these limitations can be addressed.

The key limitations of ND-NEED are:

Address matching

- Incorrect matches between the non-domestic buildings data and the energy consumption data (see [Annex C](#)).
 - Due to difficulties with the address matching process used to match the energy consumption data to AddressBase, some matches will not be correct. It is estimated that around 5% of address matches are incorrect.
 - If an energy meter data has been matched with the wrong address in AddressBase it will then match to the wrong address in the ND-NEED building stock. The consumption of that building will therefore be assigned to the wrong building and business characteristics information, and weighted accordingly, causing distortions in the data.
- Around 50% match rate between the non-domestic buildings data and the energy consumption data (see [Annex C](#)).
 - Only 48% of non-domestic buildings in the ND-NEED building stock are matched to electricity consumption data and only 21% are matched to gas consumption data (including non-buildings).

Weighting (see [weighting](#) section of the methodology)

- Because we cannot match all non-domestic buildings data with their energy consumption data, weighting is needed to ensure the ND-NEED consumption figures are representative of the population.
 - There are however several limitations of the ND-NEED weighting process. Firstly, there is currently no information in ND-NEED about business size at the population level. Business size is therefore not accounted for in the weighting process. Secondly, although floor area is a factor in the weighting process, the relatively high rates of missing floor area information in ND-NEED reduces the efficacy of the floor area weighting.
- Applying energy weights to energy intensity figures.
 - Energy intensity is influenced by both the energy consumption and the floor area of a building, whereas the energy weight currently applied to energy intensity figures is just influenced by a building's energy consumption. This means that differences in floor area between the buildings in the sample and the population are not accounted for.

- Manual elements of the weighting process
 - The current ND-NEED weighting processes requires subjective decisions to be made about when to merge adjacent cells when there are a low number of buildings/meters in a particular cell and which cell to merge these 'low value' cells with. This means that two people running the weighing process would calculate slightly different weights, and as a consequence slightly different consumption values. This adds to the uncertainty surrounding all ND-NEED consumption estimates.

Time series

- There are several reasons why consumption in the earlier years in the time series maybe being underestimated in ND-NEED:
 - The building stock figures used in ND-NEED, based on position of the 2017 NDR at March 2020, do not include sites that have closed (or no longer attract business rates, for example, if converted to domestic use). Because of this, any buildings that do not exist in March 2020 will not be included in the ND-NEED stock and so cannot be matched to energy consumption data.
 - The energy consumption data used in this version of ND-NEED only includes meters which are active in 2019. Because of this, any energy consumption from meters that have now been deenergised e.g. because the building has been destroyed, is not captured.
 - The address matching algorithm uses addresses from Jan 2019 Addressbase and Sep 2020 Addressbase. This means that any old addresses that no longer exist in Addressbase (because the building no longer exists or because the buildings address has changed e.g. if a new business is occupying the building) will not be matched.
- The weighting process
 - The weighting process in ND-NEED is currently unable to account sufficiently for the underestimation of consumption in earlier years. This makes it difficult to create a robust time series from the ND-NEED. Energy consumption in earlier years is likely to be underestimated, as energy consumed by buildings/meters that no longer exist would not be captured.
 - The manual element of the weighting process (see above) introduces uncertainty into the consumption figures which can also have a small impact on the time series trend presented. This means that it is not possible to determine whether small changes in the time series trend are real changes in consumption or caused by noise in the data.

Missing data

- Many buildings in ND-NEED are missing information on business/building size (see [Annex E](#)).
 - The main consequences of the high level of missing data in ND-NEED is that the consumption value associated with a particular business or building size will likely be an underestimate, as some consumption from buildings that are missing business/building size information will likely fall into that category.

Mixed building use

- Assigning building use to buildings containing multiple hereditaments of different building uses.
 - The data received from the VOA (NDR/SMV) is at the hereditament level and must be aggregated to the building level for use in ND-NEED. Where a building contains multiple hereditaments of different building uses the building use of the hereditament with the largest floor area is assigned to the building. However, it is possible that the building use of the hereditament with the largest floor area does not best represent the building use of the building as a whole. Improving the building use classification for building uses with multiple hereditaments would improve the accuracy of ND-NEED's energy consumption and energy intensity figures by building use.

Business size

- The business size information in ND-NEED is the size of the business that occupies the building, not the number of employees that work in the building. Because of this a small branch of a national store will be a large business in ND-NEED, even if there are only a few employees in the building.

Accompanying tables

The following tables are available on the department's statistics website:

<https://www.gov.uk/government/collections/non-domestic-national-energy-efficiency-data-framework-nd-need>

- 1 Number and total floor area of ND-NEED non-domestic buildings by building use, end of March 2020. *(Not updated from ND-NEED 2020).*
- 2 Number and total floor area of ND-NEED non-domestic buildings by floor area bands, end of March 2020. *(Not updated from ND-NEED 2020).*
- 3 Number of ND-NEED non-domestic buildings by year of construction, end of March 2020. *(New for ND-NEED 2021).*
- 4 Number of ND-NEED non-domestic buildings by business size, end of March 2020. *(New for ND-NEED 2021).*
- 5 ND-NEED non-domestic building number and floor area by building use and building size, end of March 2020. *(Not updated from ND-NEED 2020).*
- 6 ND-NEED non-domestic building number and floor area by building use and business size, end of March 2020. *(New for ND-NEED 2021).*
- 7 ND-NEED non-domestic building number and floor area by building size and business size, end of March 2020. *(New for ND-NEED 2021).*
- 8 ND-NEED non-domestic building electricity and gas consumption by building use, 2016-2019. *(2016 - 2018 updated from ND-NEED 2020, 2012 - 2015 and 2019 new for ND-NEED 2021).*
- 9 ND-NEED non-domestic building median electricity and gas intensity by building use, 2016 - 2019. *(2016 - 2018 updated from ND-NEED 2020, 2012 - 2015 and 2019 new for ND-NEED 2021).*
- 10 ND-NEED non-domestic building electricity and gas consumption by building size, 2019. *(2019 new for ND-NEED 2021).*
- 11 ND-NEED non-domestic building median electricity and gas intensity by building size, 2019. *(2019 new for ND-NEED 2021).*
- 12 ND-NEED non-domestic building electricity and gas consumption by business size, 2019. *(2019 new for ND-NEED 2021).*
- 13 ND-NEED non-domestic building median electricity and gas intensity by business size, 2019. *(2019 new for ND-NEED 2021).*
- 14 ND-NEED non-domestic building median electricity and gas consumption by building use, 2012 - 2019. *(2019 new for ND-NEED 2021).*
- 15 Electric meter profile classes of buildings in the ND-NEED sample, 2019. *(New for ND-NEED 2021).*
- 16 Gas meter consumption of buildings in the ND-NEED sample, 2019. *(New for ND-NEED 2021).*
- 17 ND-NEED non-domestic building electricity and gas consumption by building use and building size, 2018-2019. *(Updated for ND-NEED 2021).*
- 18 ND-NEED non-domestic building electricity and gas consumption by building use and business size, 2018-2019. *(Updated for ND-NEED 2021).*

Related statistics

Non-domestic National Energy Efficiency Data-Framework 2020

Previous release of the ND-NEED statistics, November 2020

Non-domestic National Energy Efficiency Data-Framework: energy statistics 2006-2012

Previous release of the ND-NEED statistics, March 2015.

The non-domestic National Energy Efficiency Data-Framework (ND-NEED)

Overview of the concept of ND-NEED, known issues, plans for improvement, preliminary results and the proposed weighting methodology, May 2014.

National Energy Efficiency Data-Framework (NEED)

Summary statistics of domestic energy consumption 2005-2018, June 2020.

Subnational electricity consumption data

Local authority level electricity consumption statistics (2003 – 2019).

Subnational gas consumption data

Local authority level gas consumption statistics (2004 – 2019).

Energy consumption in the UK (ECUK)

Information for overall energy consumption in the UK with details of the transport, domestic, industry and services sectors.

Digest of UK energy statistics (DUKES)

Detailed and comprehensive picture on the production and consumption of individual fuels and energy as a whole.

Revisions policy

The [BEIS statistical revisions policy](#) sets out the revisions policy for these statistics, which has been developed in accordance with the UK Statistics Authority [Code of Practice for Statistics](#).

User engagement

Users are encouraged to provide comments and feedback on how these statistics are used and how well they meet user needs. Comments on any issues relating to this statistical release are welcomed and should be sent to: energy.stats@beis.gov.uk.

The BEIS statement on [statistical public engagement and data standards](#) sets out the department's commitments on public engagement and data standards as outlined by the [Code of Practice for Statistics](#).

Contact

- Responsible statistician: Maya Fooks
- Email: energy.stats@beis.gov.uk
- Media enquiries: 0207 215 1000
- Statistical enquiries: 0300 068 655

4. Annex A: Changes since the 2020 publication

ND-NEED was last published in November 2020. Since 2020 there have been several changes to the methodology.

The key changes are listed below:

- Improvements to address matching ([see Annex C](#))
- Updated meter data

A further change between the 2020 and 2021 versions of ND-NEED are the charts and data tables that have been published.

The 2021 version of ND-NEED includes new information about the business size and year of construction of the non-domestic building stock. This was not presented in the 2020 version of ND-NEED.

The 2021 version of ND-NEED also contains a slightly different combination of charts and data tables for the energy consumption data. The charts and data tables included in the 2021 version of ND-NEED contain more detailed information about the distribution of energy consumption within sections of the building stock.

5. Annex B: Understanding ND-NEED 2021 revisions

The consumption figures published in ND-NEED 2021 show some revisions from comparable figures that were published in ND-NEED 2020. Some examples of these revisions can be seen in Tables 2 and 3 below.

Table 2: ND-NEED electricity consumption 2016 – 2018, from ND-NEED 2020 and ND-NDEED 2021.

	Electricity consumption 2016 (TWh)	Electricity consumption 2017 (TWh)	Electricity consumption 2018 (TWh)
ND-NEED 2020	137	139	140
ND-NEED 2021	132	133	133
Size of revision	-5	-6	-7

Table 3: ND-NEED gas consumption 2016 – 2018, from ND-NEED 2020 and ND-NDEED 2021.

	Gas consumption 2016	Gas consumption 2017	Gas consumption 2018
ND-NEED 2020	147	148	153
ND-NEED 2021	148	150	153
Size of revision	+1	+2	No change

There are several differences between ND-NEED 2020 and ND-NEED 2021 that have contributed to these revisions.

- The new 2021 address match algorithm will match a slightly different set of buildings to their corresponding meters than were matched using the 2020 address matching algorithm.
- The historic address-matching list (see [Annex C](#)) increases the number of buildings with consumption data in the ND-NEED sample.
- The ND-NEED weighting process contains a manual element where subjective decisions need to be made. This means that if the weights were recreated using the exact same data there could be differences in the final consumption values.

- The ND-NEED weighting process calculates weights based on consumption in the latest three years and applies these weights to all years in the time series. In ND-NEED 2020 the weights were therefore calculated from 2016 – 2018 consumption data, but in ND-NEED 2021 they are calculated from 2017 – 2019 consumption data.
- The meter level data which ND-NEED is based is revised each year so we would expect subsequent revision in the ND-NEED data.

These reasons highlight the uncertainty that surrounds the ND-NEED consumption figures. Because of this, small revisions to the ND-NEED consumption data or small changes in ND-NEED consumption over time should be interpreted with caution as they may be a result of the methodological issues described above, rather than reflecting a true trend in the data.

6. Annex C: Address matching

The ND-NEED sample is created by matching the ND-NEED building stock with corresponding meters from BEIS's energy meter data. However, the non-domestic building stock and BEIS's energy meter data do not share a unique identifier and so cannot be directly matched.

Instead, the energy meter data is first matched to the AddressBase dataset. This is an Ordnance Survey dataset that contains the addresses of all buildings in Great Britain as well as their Unique Property Reference Number (UPRN). As both the energy meter data and the AddressBase dataset contain the buildings address, address matching is used to match these datasets together.

In ND-NEED 2021 there were two parts to the address matching process:

1. An algorithm was used to carry out the address-matching. This was the broadly the same algorithm that was used for the address-matching in ND-NEED 2020, with some small changes to improve match quality. Where buildings in the energy meter dataset successfully match to AddressBase, the UPRN for the building can be identified. As the non-domestic building stock contains UPRN information, the UPRN can then be used to match the energy meter and building stock datasets.
2. Where meters could not be match to an address using the address matching algorithm described above, a list of Meters-UPRN from a different address matching algorithm was used. The address matching algorithm was developed for BEIS by GB consultants and used as part of the address matching process in 2015. This was not used in ND-NEED 2020.

The addition of this historic address matching algorithm improves the match rate between the buildings stock and the energy meter data from 43% to 49%.

7. Annex D: Building use categories

The building use categories that are used in this version of ND-NEED have been chosen to align as far as possible with the categories used in the Energy Consumption in the UK (ECUK)⁴² and Business Energy Efficiency Statistics (BEES)⁴³.

In the March 2015 publication of ND-NEED, six building use categories were used: Factories, Offices, Restaurants, Shops, Warehouses and Other.

In this publication 10 building use categories are used: Arts, Community and Leisure; Education; Emergency Services; Factories; Health; Hospitality; Offices; Shops; Warehouses and Other. Details of the buildings uses that are included in these 10 categories can be found in Table 4 below.

Table 4: The building uses included in the 10 building use categories in ND-NEED.

Building use	Buildings included
Arts, Community and Leisure	Cinemas, Community centres, Libraries/Museums, Sports centres, Sports grounds
Education	Nurseries, State schools, Private schools, Universities
Emergency Services	Ambulance/Fire stations, Police stations
Factories	Factories
Health	Healthcare
Hospitality	Restaurants, Hostels, Hotels, Holiday homes/Guesthouses, Pubs
Offices	Offices
Shops	Shops
Warehouses	Warehouses
Other	Bus stations/moorings, Cemeteries, Docks, Electricity hereditaments, Garages, Markets, Military premises ⁴⁴ , Sewage treatments

⁴² ECUK, End uses data tables, Table U5 - <https://www.gov.uk/government/statistics/energy-consumption-in-the-uk>

⁴³ BEES, Overarching report tables, <https://www.gov.uk/government/publications/building-energy-efficiency-survey-bees>

⁴⁴ Note – some military premises are not included in the NDR and so are not covered in ND-NEED.

8. Annex E: Removing inaccurate floor area data

The NDR/SMV received from the VOA contains information on floor area. This floor area information is at hereditament level. For some hereditaments, this floor area information is missing in the VOA's data. As ND-NEED presents information at the building level, when there are multiple hereditaments in a single building the floor area of the constituent hereditaments are added together.

Before hereditament floor areas are aggregated to the building level all hereditaments with a floor area of <15m² have their floor area value removed. This is because, for the purposes of ND-NEED, these floor area values are thought to be inaccurate.

The floor area of building uses for which floor area is not used to inform VOA's building rating are also removed.

This occurs for the building uses:

Abattoirs and Slaughterhouses,	Chalet Parks,	District Heating Undertakings and Networks,
Agricultural Showgrounds,	Chemical Works,	Docks and Harbours,
Air Ports,	Cinemas,	Domestic Fuel Installations,
Air Strips,	Civic and Public Buildings,	Effluent Minewater Treatment Plants and Premises,
Aluminium Smelting Works,	Civic Amenity Sites,	Electricity Undertakings,
Amusement Parks,	Civil Airports,	Field Study Activity and Adventure Centres,
Aquaria,	Coaching Inns,	Fire Stations,
Archives,	Coastguard Stations,	Fish Farms,
Arenas,	Courts,	Flour Mills,
Army Hereditaments,	Coking and Carbonising Plants,	Football Stadia,
Artificial Fibre Works,	Colleges of Further Educations,	Formula Assessed Miscellaneous,
Asphalt Plants,	Communication Stations,	Game Farms,
Beet Sugar Factories,	Concert Halls,	Gas Processing Plants,
Bingo Halls,	Concrete Batching Plants,	Go Kart Rinks,
Bird Sanctuaries,	Concrete Block Works,	Golf Driving Ranges,
Bowling Centres,	Concrete Product Works,	Grain Silos,
Brickworks,	Conference and Exhibition Centres,	Greyhound Racetracks,
Bulk Cement Storage Depots,	Conference Centres in Country Houses,	Hatcheries/Poultry Farms,
Bus Garages,	Country House Hotels,	Health Farms,
Bus Stations,	Courts,	Heliports,
Caravan Parks,	Crematoria,	Hereditaments used for Primary Treatment/Processing of Minerals,
Caravan Sites and Pitches,	Cricket Centres,	
Cattle Breeding Centres,	Cricket Grounds,	
Cement Tiles Works,	Crown Miscellaneous,	
Cement Works,		
Cemeteries,		

Heritage Railways,
 Holiday Centres,
 Horse Racecourses,
 Hospitals and Clinics NHS,
 Hospitals and Clinics Private,
 Hotels (3 star and under),
 Operated,
 Ice Rinks,
 Information/Visitor Centres,
 Iron and/or Steel Works,
 Lakes with Water Sport
 Facilities,
 Land used for Car Boot
 Sales,
 Landfill Gas Generator Sites,
 Land used for Waste
 Composting,
 Leisure Miscellaneous,
 Libraries,
 Lifeboat Stations,
 Liquid Bulk Storage,
 Livestock Markets,
 Local Authority Schools,
 Lodges,
 Marinas,
 Markets,
 Mineral Depots and
 Premises,
 Minerals Miscellaneous,
 Mineral Producing
 Hereditament – Blockstone,
 Mineral Producing
 Hereditament – Brine,
 Mineral Producing
 Hereditament – Chalk,
 Mineral Producing
 Hereditament – China Clay,
 Mineral Producing
 Hereditament – Clay,
 Mineral Producing
 Hereditament – Coal,
 Mineral Producing
 Hereditament – Fluorspar,
 Mineral Producing
 Hereditament – Gas,
 Mineral Producing
 Hereditament – Hardrock,

Miniature Railways,
 Model Villages,
 Mineral Producing
 Hereditament – Inert,
 Mineral Producing
 Hereditament – Oil,
 Mineral Producing
 Hereditament – Other
 Mineral Categories,
 Mineral Producing
 Hereditament – Putrescible,
 Mineral Producing
 Hereditament – Sand,
 Gravel, and, Slates,
 Mortuaries,
 Motor Racetracks,
 Motor Vehicle Works,
 Motorway and Major Road
 Service Areas,
 Museums and Art Galleries
 (Contractors),
 Museums and Art Galleries
 (Non-Contractors),
 Nuclear Establishments,
 Nursing Homes,
 Observatories,
 Oil Refineries,
 Oxbridge Colleges,
 Peat Fields,
 Petrol Filling Stations,
 Pipelines,
 Pitch and Putting Greens
 Pleasure Piers,
 Point to Point and Eventing
 Courses,
 Police Stations,
 Police Training Colleges,
 Power Generators,
 Prison Service
 Hereditaments,
 Property used for Secondary
 Aggregate Processing,
 Provender Mills,
 Public Conveniences,
 Public Halls,
 Public Houses/Pub
 Restaurants,

Public Houses/Pub
 Pumping Mines
 Railways and Tramways,
 Religious Retreats/Study
 Centres (Residential),
 Restaurants (inc. Lodge),
 Roller Skating Rinks,
 Rugby League Grounds,
 Sea Dredged Aggregate
 Processing Plants and
 Depots,
 Sewage Works,
 Ship Building Yards,
 Ship Repair Yards,
 Ski Centres,
 Showhouses,
 Speedway Racetracks,
 Spoil Heap Workings,
 Sporting Rights,
 Sports and Leisure Centres
 (Wet and Dry),
 Sports and Leisure Centres
 Within/Part of Specialist
 Property,
 Sports Stadia,
 Stately Homes and Historic
 Houses,
 Statutory Docks and
 Harbours (Formula),
 Statutory Docks and
 Harbours (Non-Formula
 Prescribed),
 Statutory Docks and
 Harbours (Other),
 Surgeries Clinics Health
 Centres (Contractors
 Valuation),
 Swimming Pools (Local
 Authority),
 Swimming Pools (Private),
 Telecommunications Cable
 Networks,
 Telecommunications
 Switching Centres,
 Telescope Sites,
 Tennis Centres,
 Theatres,
 Theme Parks,
 Timeshare Complexes,
 Tolls,

Totalisators on Horse
Racecourses,
Tourist Attractions/Dark
Rides,
Training Centres
(Residential),
University – Ancillary Land or
Buildings,
Universities (excluding
Oxbridge),

War Game Courses/Misc.
Agriculture Use,
Universities (excluding
Oxbridge),
University Occupation Within
Hospitals,

Waste Incinerator Plants,
Waste Transfer Stations,
Water Undertakings (Non-
Statutory),
Windmills,
Zoos and Safari Parks.



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