

The Non-Domestic National Energy Efficiency Data-Framework 2023 (England and Wales)

24 August 2023

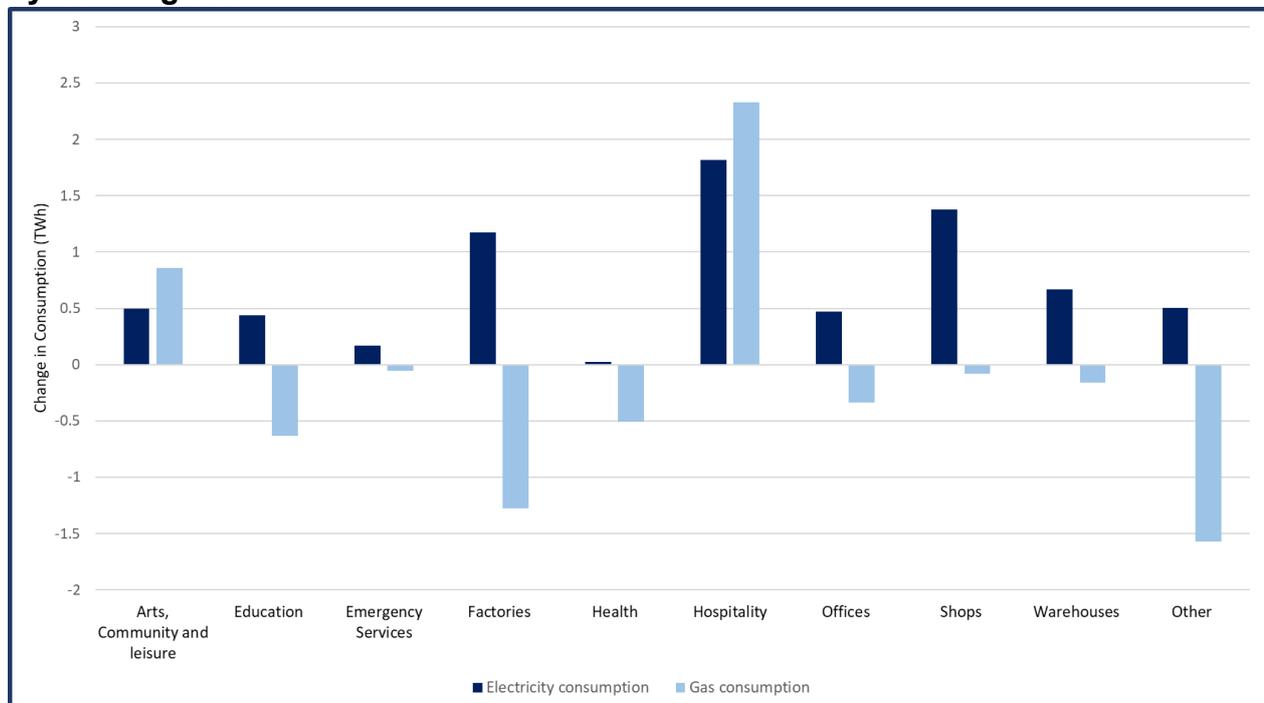
Official Statistics

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).

Key Messages:

- Total electricity consumption increased by 6% in 2021 compared to 2020, although this is still an overall decrease of 4% from 2019. The significant increase in Hospitality (28%) and Arts, Community and Leisure (17%) reflects the bounce back from the COVID-19 pandemic following the notable falls in consumption seen in 2020.
- Total gas consumption decreased slightly in 2021 compared to 2020 (less than 1% decrease). Although the consumption for most sectors fell in 2021, there were notable increases in the Hospitality and the Arts, Communities and Leisure sectors, which grew by 24% and 16% respectively.

Figure 1: The change in electricity and gas consumption in 2021 compared to 2020 by building use



- Both non-domestic building energy consumption and energy intensity – the average kilowatt hour consumed per meter square of floor area – varies by building use. However, the distribution across the two is different:
 - The building uses with the highest median electricity and gas intensities are Hospitality, Shops and Health.
 - Whereas for both electricity and gas, the highest consuming building use (excluding Other) is Factories (31% and 35%). For electricity, this is followed by Offices (14%) and Shops (13%) For gas, this is followed by Education (9%), Hospitality (8%) and Offices (8%)
- A small proportion of the highest consumers (7% for electricity, 5% for gas) are responsible for the majority (80%) of consumption.
 - Similarly, for both electricity and gas, the combined consumption generally increases as building size band increases. Buildings over 1,000m² are responsible for 62% of electricity consumption and 70% of gas consumption, despite both making up around 7% of non-domestic buildings (excluding buildings missing floor area information).
- The composition of the building stock varies with building age. Shops account for the largest share of older buildings (pre-1970), with Offices the most typical of late 20th / earlier 21st century constructions. Warehouses have gradually become more prevalent and account for one-quarter of non-domestic buildings constructed since 2020.

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 2023. Information on energy consumption covers 2012 to 2021, and comprises electricity and gas consumed via the public distribution system (onsite generated electricity consumption is not included).

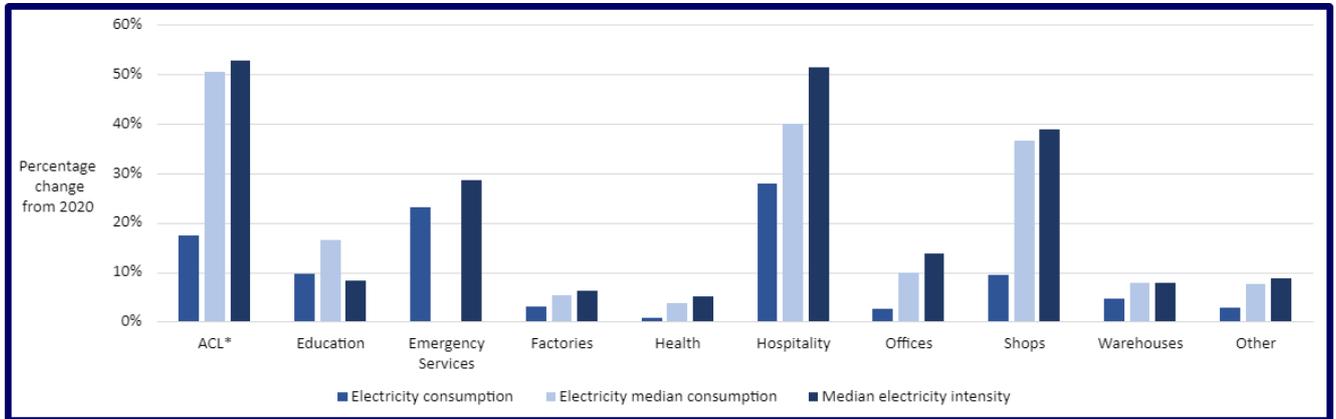
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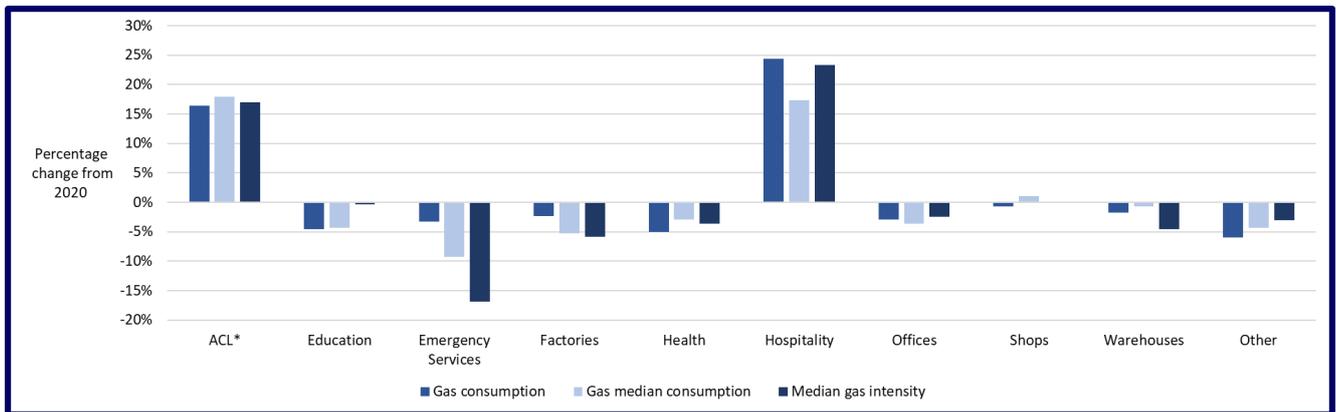
Email: energyefficiency.stats@energy.security.gov.uk Statistical enquiries: 0300 068 5042

Figure 2: Summary graphics of the key ND-NEED 2023 results¹.

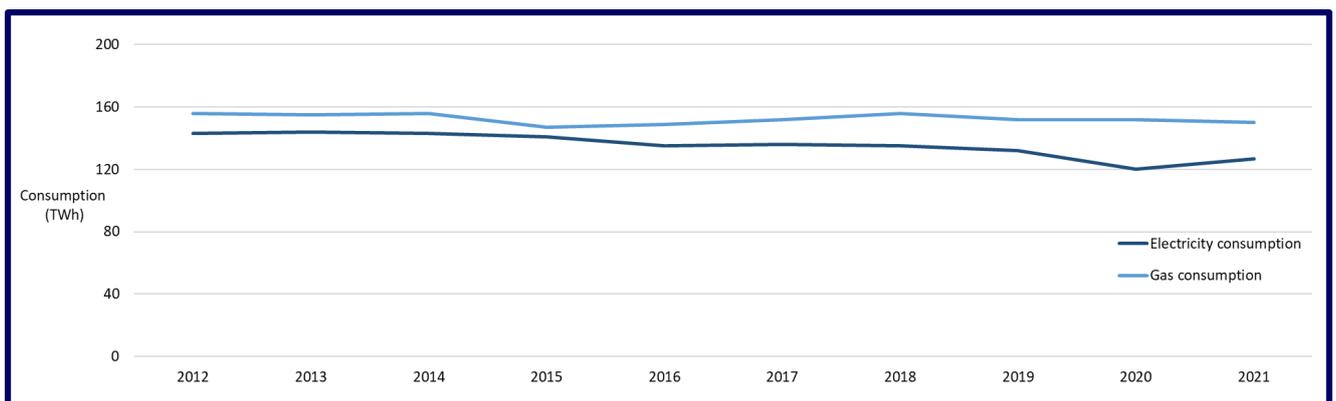
2020 versus 2021 Electricity consumption and intensity



2020 versus 2021 Gas consumption and intensity

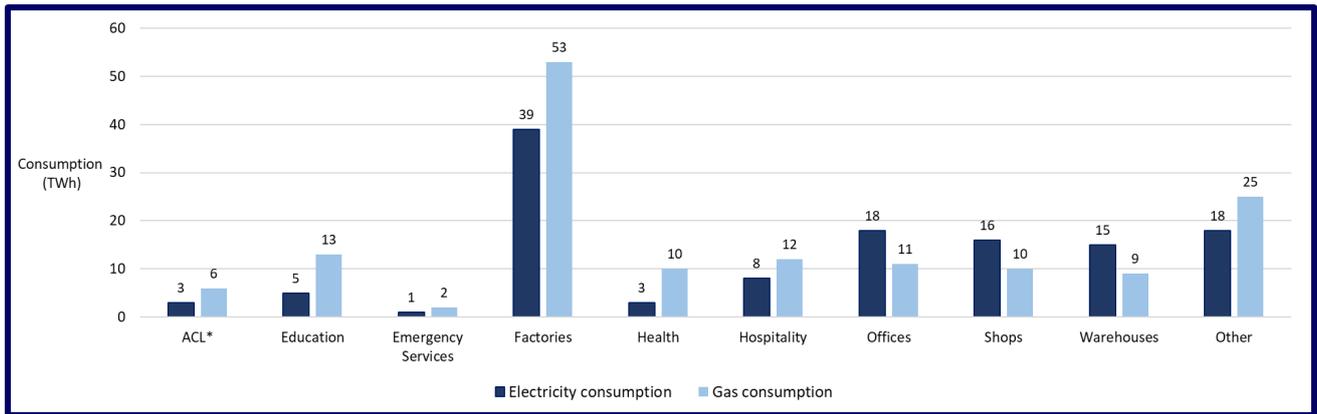


Electricity and gas consumption over time

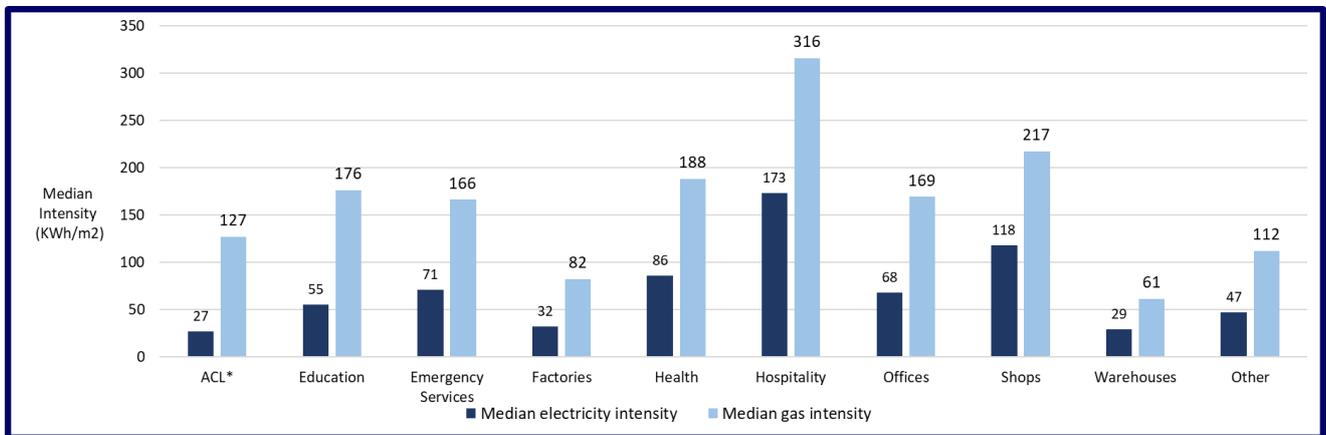


¹ Small values, close to zero, may not be visible.

Electricity and gas consumption by building use



Electricity and gas median intensity by building use



*Arts, Community and Leisure

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1. Introduction

The Non-Domestic National Energy Efficiency Data-Framework 2023 (ND-NEED 2023) provides an insight into the electricity and gas consumption/intensity of non-domestic buildings in England and Wales in 2021 (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' size². Whilst ND-NEED 2022 used the position of the 2017 NDR/SMV as at the end of March 2022, this updates the picture to the middle of March 2023³.

The NDR/SMV dataset received from VOA comprises 2,144,000 hereditaments across England and Wales⁴. However, in ND-NEED, the NDR/SMV data are aggregated to the building level (Unique Property Reference Number (UPRN)). The data are used, following further processing, to provide information about the number, floor area and age of buildings in the ND-NEED non-domestic building stock. Each building is also assigned to one of the 10 sectors used in ND-NEED, based on the building use provided in the NDR/SMV data. This dataset covers all the 1,763,000 buildings⁵ in the ND-NEED non-domestic building population.

The non-domestic building stock is then matched to information on electricity and gas consumption (2012-2021) at meter point level, held by the Department for Energy Security and Net Zero (DESNZ). This gives a large sample of 903,000 non-domestic buildings with electricity consumption data (for at least one of these years) and 390,000 non-domestic buildings with gas consumption data. This sample is then matched to business data⁶ to provide information on the size, measured by the number of employees, 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) so the consumption data can be disaggregated by these characteristics. The resulting

² The Department for Energy Security and Net Zero (DESNZ) 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.

³ VOA [presents statistics on non-domestic properties](#) (numbers and floor space) on a hereditament basis.

⁴ This figure will differ slightly from the updated 2023 VOA figure based on time of download. ND-NEED 2023 updates the picture up to mid-March whereas the VOA updates as at March 31 2023.

⁵ This excludes all non-buildings, as well as the 130,000 hereditaments that do not have UPRNs.

⁶ Business data, such as employment figures, are obtained from the [Interdepartmental Business Register \(IDBR\)](#).

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 accompanying [Methodology note](#). The next update to ND-NEED is currently planned for the summer of 2024.

Uses of ND-NEED

ND-NEED is used within and beyond government as a central part of the evidence base to provide insights on the energy consumption trends of non-domestic buildings across a range of building and business characteristics. Within DESNZ, this data is used to inform the development of energy security and decarbonisation policies, in addition to the monitoring and evaluation of current DESNZ policies. Beyond government, ND-NEED is used by various stakeholders including academics and industry to review trends and support further analysis related to energy efficiency and buildings decarbonisation.

This publication covers non-domestic buildings and consumption only. Domestic energy consumption is analysed the [Domestic NEED framework](#). Further examples of the questions that can and cannot be answered using ND-NEED 2023 are set out below.

What questions can be answered by ND-NEED 2023?

- How does non-domestic electricity/gas consumption/intensity vary by building use, building size and occupying business size?
- How has electricity/gas meter consumption/intensity of non-domestic buildings changed over time (2012-2021)?
- 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?

What questions cannot be answered by ND-NEED 2023?

- 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), the [Building Energy Efficiency Survey](#) (BEES) and the (DUKES), while the [subnational electricity and gas consumption statistics](#) provide information on meter point consumption for all four UK countries (see a comparison of relevant figures from other publications [here](#)).

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 1,763,000, non-domestic buildings in England and Wales at the end of March 2023. This is an increase of 0.5% on the end-March 2022 figure of 1,755,000. However, this increase does not account for the 17,000 existing buildings that now have a UPRN attached to them. Meaning that there has been a net reduction in the overall building numbers. Further information on this, and other, revisions can be found in the accompanying [Methodology note](#).

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 Wales⁷.
- Caravan Parks, Advertising Premises⁸, Car Parks, Beach Huts, Quarries, and Telecoms⁹. 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 7%.

Non-domestic buildings by building use

According to the definition of a building in ND-NEED, within a single building there may be several building uses. Where this is the case, the building use is assigned to that of the component premises ("hereditament") that has the largest floor area.

The number of ND-NEED non-domestic buildings in England and Wales, end of March 2023



1,763,000

Non-domestic
buildings

⁷ 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.

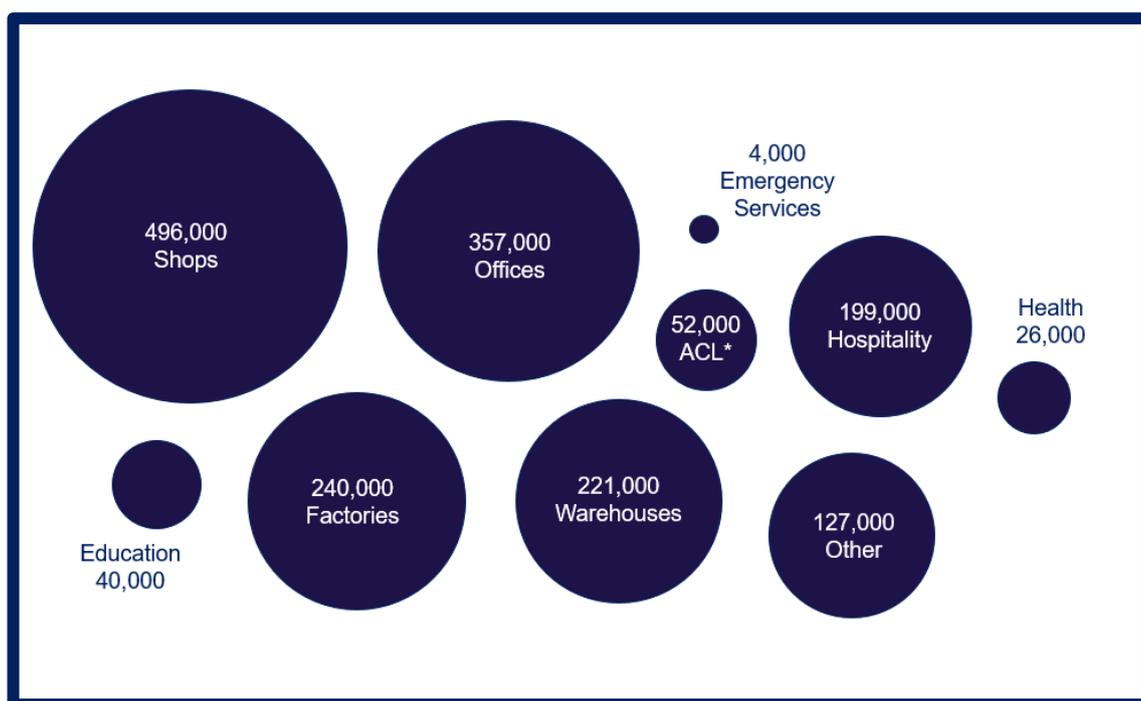
⁸ Places uses for advertisement e.g. roundabout adverts, bus shelter adverts, advertising banners.

⁹ Places used for communication e.g. communication stations, public telephones, telephone exchanges.

This will have a distorting effect on the building stock figures as uses that often occur as the smaller use (by floor area) in mixed used buildings will be underestimated. However, as only 2% of buildings in the ND-NEED building stock contain multiple hereditaments, the impact of this distortion on the building stock figures presented in ND-NEED is likely to be negligible.

The breakdown of non-domestic buildings in England and Wales by building use can be seen in Figure 3.

Figure 3: The number of ND-NEED non-domestic buildings in England and Wales by building use (as at end of March 2023)



*ACL is an abbreviation for Arts, Community and Leisure

Shops are the largest building use category with 496,000 buildings (28% of non-domestic buildings in England and Wales). The next largest category is Offices with 357,000 buildings (20% of all non-domestic buildings in England and Wales), then Factories with 240,000 (14% of non-domestic buildings in England and Wales)¹⁰

Floor area of non-domestic buildings by building use

The combined floor area of all non-domestic buildings in ND-NEED for which floor area information is available is 617,696,000 m² (see Table 1)¹¹. Of the 1,763,000 buildings in ND-NEED, 329,000 (19%) do not have floor area information. Because of this, all floor area

¹⁰ Further information on the composition of the building use types can be found in the accompanying [Methodology note](#) (Annex C).

¹¹ This figure will differ from [VOA's non-domestic floor area statistics](#) due to methodology differences, including differences in the building types where floor areas are removed – see Methodology Annex D

information presented here should be treated with caution as it will be an underestimate. The three reasons that buildings may be missing floor area information are:

1. Some non-domestic buildings do not have floor area information available in the SMV data.
2. If a hereditament in a non-domestic building has a floor area of less than 15m² in the SMV it is treated as having no floor area information in ND-NEED.
3. If non-domestic buildings fall into a building use category where floor area data does not inform the VOA rating, then it is treated as having no floor area data in ND-NEED. This means that there are some distortions in the floor area by building use figures, as some building uses will have more floor area information excluded than others. However, this distortion is likely to be small because the excluded building use categories are very diverse and include buildings in all building use categories.

Table 1: The total floor area of ND-NEED non-domestic buildings in England and Wales by building use (as at end of March 2023).

Building use type	Total floor area (m ²)	Proportion of total floor area
Arts, Community and Leisure	15,303,000	2%
Education	3,852,000	1%
Emergency Services	150,000	0%
Factories	150,037,000	24%
Health	2,341,000	0%
Hospitality	13,281,000	2%
Offices	73,289,000	12%
Shops	98,923,000	16%
Warehouses	214,055,000	35%
Other	46,465,000	8%
Total	617,696,000	100%

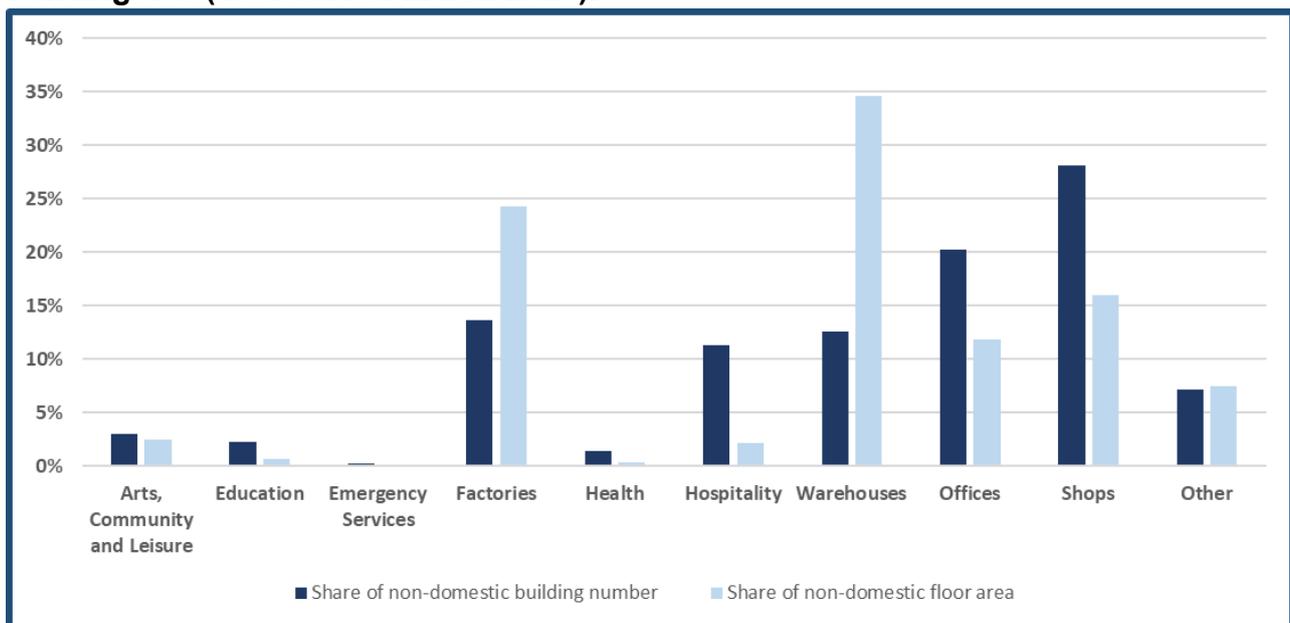
From Table 1, we can see that Warehouses are the building use which occupies the largest floor area, with over a third of non-domestic floor area. This is followed by Factories, occupying a quarter of non-domestic floor area, and Shops occupying 16%.

We can also compare the number of buildings in a building use category and the floor area that the building use category occupies. From Figure 4, we can see that for several sectors there are substantial differences in the share of building use between the two measures.

Both Warehouses and Factories occupy a greater proportion of non-domestic floor area than their share of the total number of non-domestic buildings. This is because these building uses typically occupy large sites. For all other building use sectors, the proportion of the total number of non-domestic buildings that they occupy is larger than their share of the non-domestic floor area (except for Other where the share is marginally greater). This is most prominent for Shops, Hospitality and Offices.

Note, the proportions presented are only based on the non-domestic buildings where floor area information is available. They therefore implicitly assume that the building size distribution of the buildings that are missing building size information is the same as that of those with this information (see Table 13 in the accompanying Methodology note).

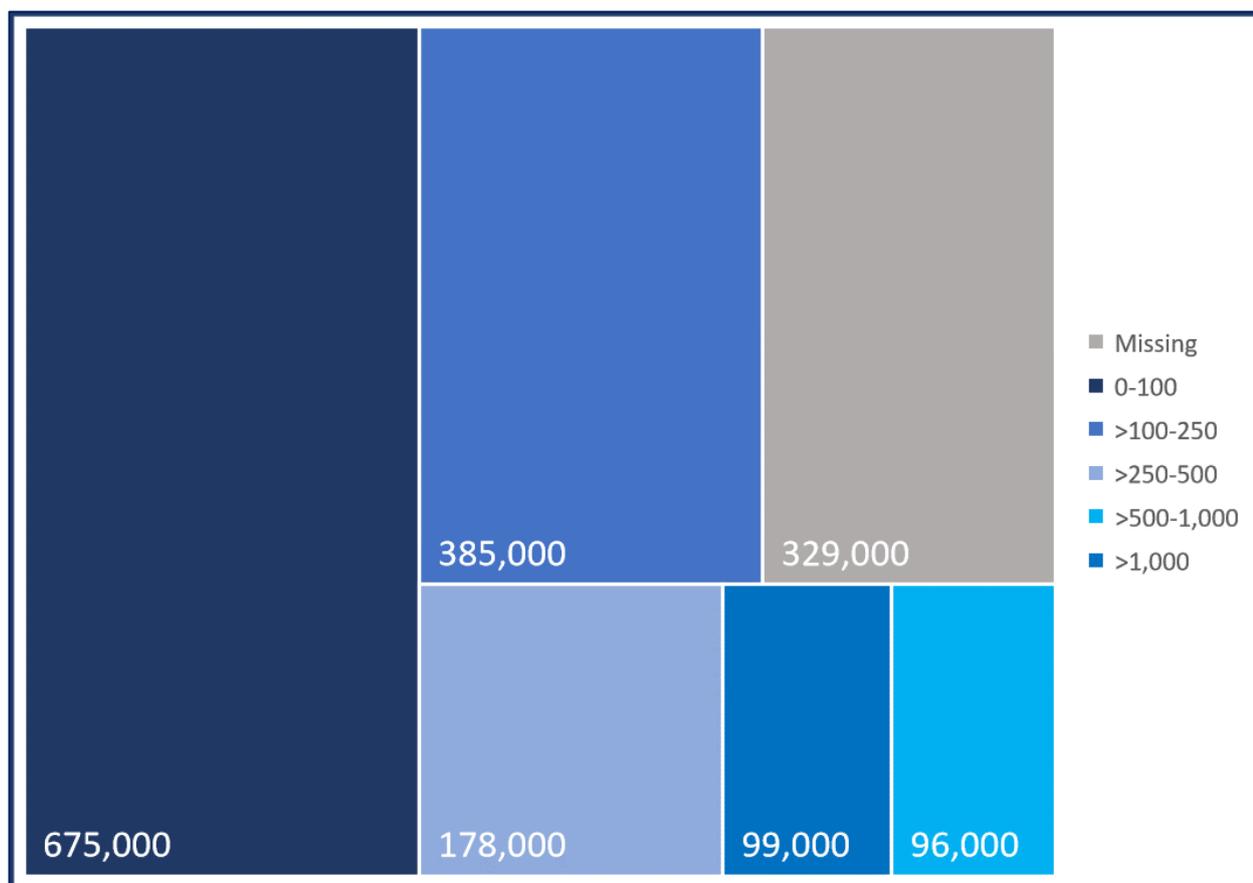
Figure 4: The share of ND-NEED non-domestic building number and floor area by building use (as at end of March 2023).



Number of non-domestic buildings by building size

The breakdown of the number of non-domestic buildings in England and Wales by building size can be seen in Figure 5.

Figure 5: The number of ND-NEED non-domestic buildings in England and Wales by building size (as at end of March 2023).



The general trend is that as building size increases, the number of non-domestic buildings decreases. This is true even though the building size categories used in ND-NEED are wider for larger business sizes.

Almost 74% of non-domestic buildings in England and Wales (for which floor area information is available) have a floor area of less than 250m², and more than 93% have a floor area of less than 1,000m².

Note, because 329,000 (19%) of non-domestic buildings in ND-NEED are missing building size information, the number of buildings in each size category is likely to be an underestimate as some buildings in the missing category will fall into them as well.

Floor area of non-domestic buildings by building size

The total floor area of non-domestic buildings in each floor area band is given in Table 2. This shows that larger buildings occupy a greater proportion of non-domestic floor area than smaller buildings. This is despite there being fewer larger buildings in the non-domestic building stock.

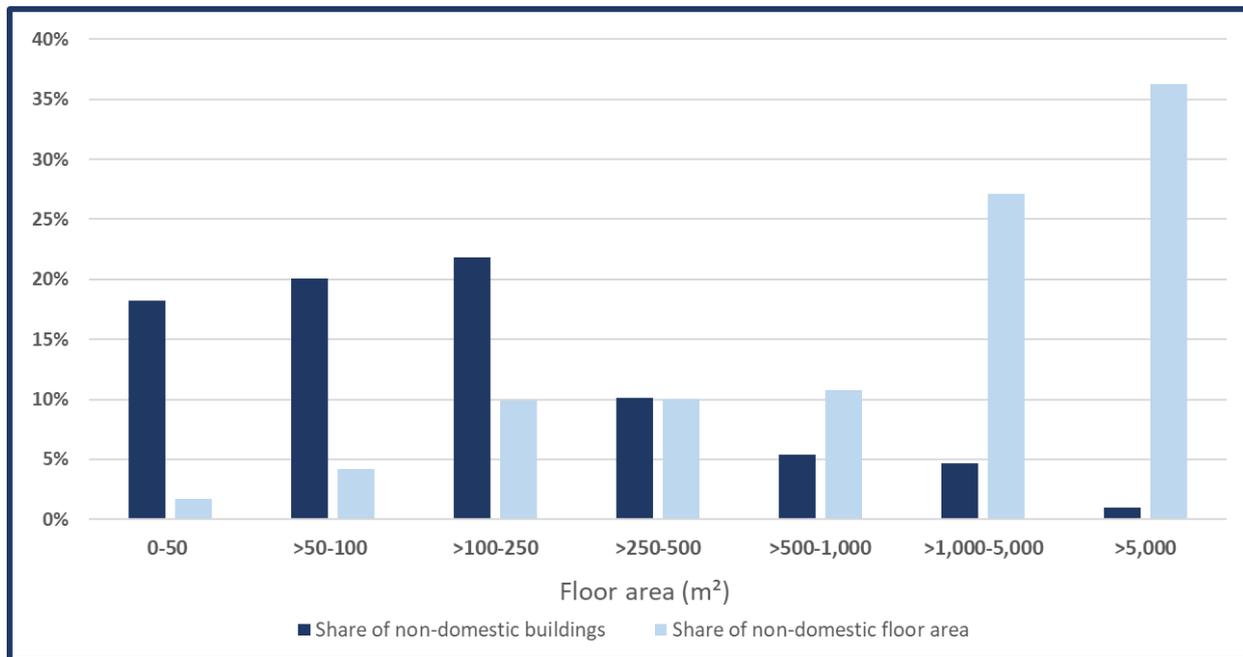
Note, the proportions presented are only based on the non-domestic buildings where floor area information is available. They therefore implicitly assume that the building size distribution of the buildings that are missing building size information is the same as that of those with this information.

Table 2: The total floor area of ND-NEED non-domestic buildings in England and Wales by building size (as at end of March 2023).

Building size	Total floor area (m²)	Proportion of total floor area
0 - 50m ²	10,404,000	2%
>50 - 100m ²	25,758,000	4%
>100 - 250m ²	61,033,000	10%
>250 - 500m ²	62,273,000	10%
>500 – 1000m ²	66,674,000	11%
>1000m ² – 5000m ²	167,358,000	27%
>5000 m ²	224,195,000	36%
Total	617,696,000	100%

Figure 6 shows the divergent trends in the share of buildings and total floor area by building size. Although the greatest share of buildings have floor area between 100-250 m², this then reduces as floor area increases. The opposite is true of floor area trends, where the share of floor area increases alongside the floor area band.

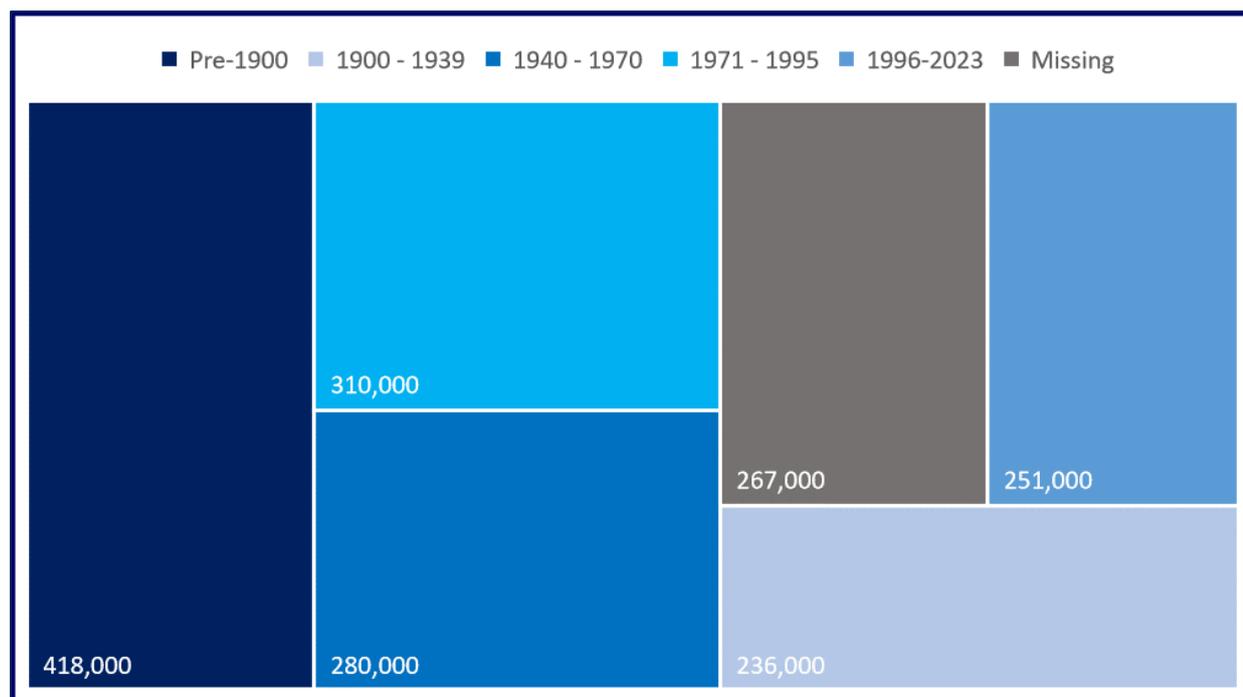
Figure 6: The share of ND-NEED non-domestic building number and floor area by building size (as at end of March 2023).



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 completed.

Figure 7: Breakdown of the ND-NEED non-domestic building stock in England and Wales by year of construction.



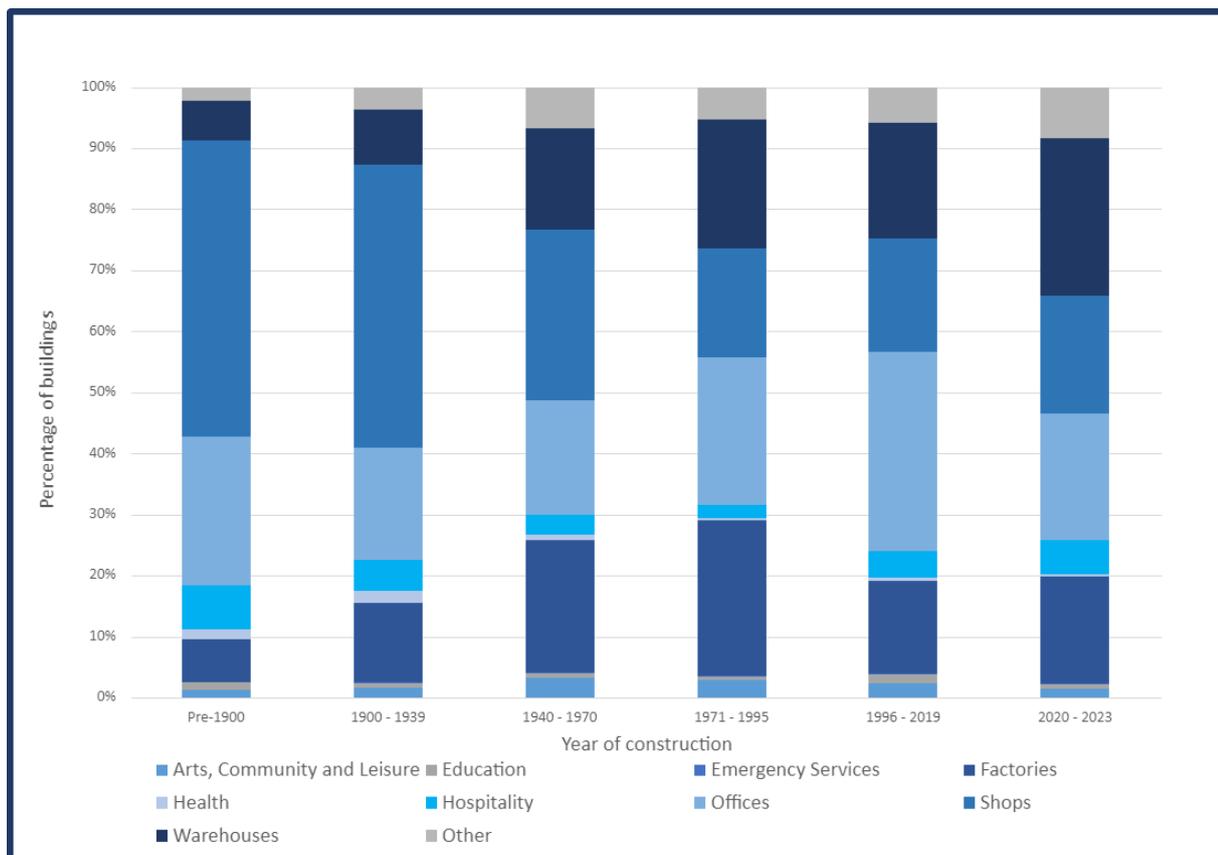
Note, since the building stock data are as at end of March 2023, data for 2023 (and possibly 2022, due to lags) is not complete. This means that the number of buildings constructed will be underestimated.

From Figure 7 we can see that 20% of non-domestic buildings in the ND-NEED non-domestic building stock (with year of construction information available) were built before 1900, and over half (59%) were built before 1970. As building practices and standards, particularly around energy efficiency, have changed over time this has implications for the measures that will be needed to decarbonise the non-domestic building stock.

Non-domestic buildings by year of construction and building use

Breaking down the year of construction by building use shows us what types of buildings sit in these categories. Figure 8 shows that Shops make up the greatest share of buildings that were constructed before 1970 but have had a lower share of new buildings since then. Similarly, the share of Factories and Warehouses grew up to 1995 before decreasing slightly, although the share of Warehouses has rebounded in recent years (2020-2023). Offices on the other hand have remained relatively consistent.

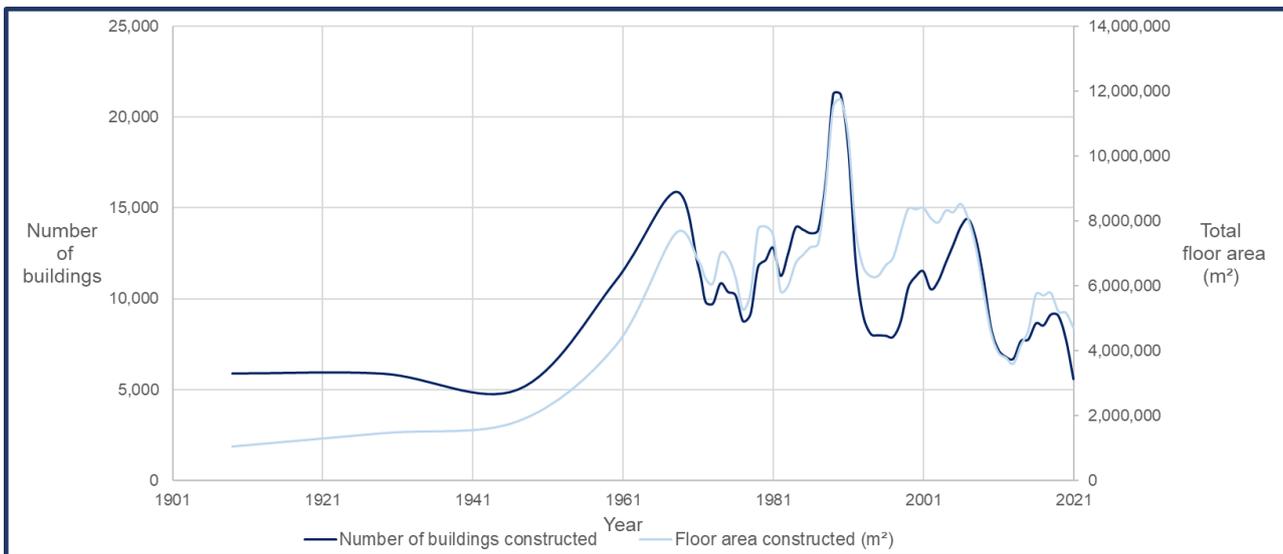
Figure 8: Breakdown of the ND-NEED non-domestic building stock in England and Wales, by year of construction and building use.



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 9).

Figure 9: Number of buildings in the ND-NEED non-domestic building stock constructed between 1900 and 2020 in England and Wales, by number and floor area.



Note, Figure 9 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 2021 (inclusive), the data is presented as a 3-year rolling average. As, for 2022 and 2023 year of construction data are incomplete, these years have been omitted. This does not include the 267,000 buildings missing year of construction data, or 418,000 buildings built pre-1900.

Figure 9 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 2023) 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 2021, but that were removed from the stock before 2021 (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 2023) is impacted by economic and other events, with a substantial fall in construction seen around the 1990 and 2008 recessions and during the the COVID-19 pandemic in 2020 and 2021 (there was an 14% decrease in the number of non-domestic buildings built in comparison to 2019, and a 28% decrease in 2021). 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 2023) between 2010 and 2021 inclusive was 8,000 buildings per year, representing 0.5% of the building stock in ND-NEED with year of construction data. The construction rate in 2010 to 2021 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 9 also provides information on the rate of floor area construction in buildings in the non-domestic building stock (as at end of March 2023). 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 2023) has increased over time. For example, around 11,000 buildings were built in each of 1958, 1971 and 2002, with the average floor area increasing from 400m² to 700m² and then to 800 m².¹²

We can also analyse the change in the building stock by looking at the number of newly constructed buildings, compared with those that have left the ND-NEED stock, either through demolition, (temporary or permanent) closure or repurpose (including conversion to domestic use). This shows that there were 53,000 additional buildings at March 2023 compared to March 2022. The analysis also shows that there were 46,000 buildings which were removed from the stock in the same period, which gives a net additions figure of 8,000. However, the 53,000 increase does not account for the 17,000 fewer buildings that do not have a UPRN allocated to them (further details on revisions to the building stock are included in the accompanying [Methodology note](#)). Meaning that there has been a net reduction in the overall building numbers of around 9,000, with only hospitality showing a net increase in building numbers (at around 3,000 buildings).

Non-domestic buildings by business size

Business size information is obtained by matching the Interdepartmental Business Register (IDBR) business characteristics data to the 1,763,000 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 10.

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.

¹² 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.

Figure 10: Breakdown of the ND-NEED non-domestic building stock in England and Wales by business size.



Figure 10 shows that most non-domestic buildings (for which business size data are available) are occupied by SMEs (<250 employees), with micro businesses (<10 employees) being the most common business size. However, around 70% of the buildings in the non-domestic building stock are missing business size information.

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

1. The UPRN of the corresponding building is missing from the IDBR dataset, either because the building itself is missing; or
2. The building is in the IDBR dataset, but we are unable to match it to its corresponding UPRN. This means the business size cannot be matched to the building.

Given the high number of buildings missing business size information, the number of buildings occupied by a business of a particular size, across all categories is likely to be underestimated. 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 **127 TWh of electricity** and **150 TWh of gas** in 2021 (the most recent year for which data are available).

Note, electricity consumption data is recorded per calendar year, whereas gas consumption data covers mid-May to mid-May.

These consumption figures are based on the 2021 sample (864,000 buildings for electricity consumption and 357,000 for gas consumption) 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 of the population (over 1.8 million buildings). More information about the sampling and weighting process in ND-NEED can be found in the accompanying [Methodology note](#).

Note, these figures are not directly comparable to the yearly consumption figures published in ND-NEED 2022 due to methodological revisions. For more information on these revisions please see the accompanying [Methodology note](#). For comparable figures for 2020 consumption, please see the consumption time series in Table 8 of the accompanying data tables.

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)¹³ 89% of non-domestic building electricity consumption was from the grid in 2021.

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) 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.

Non-domestic energy consumption by building use

Electricity consumption

Figure 11: The electricity consumption of ND-NEED non-domestic buildings in England and Wales by building use, 2021.

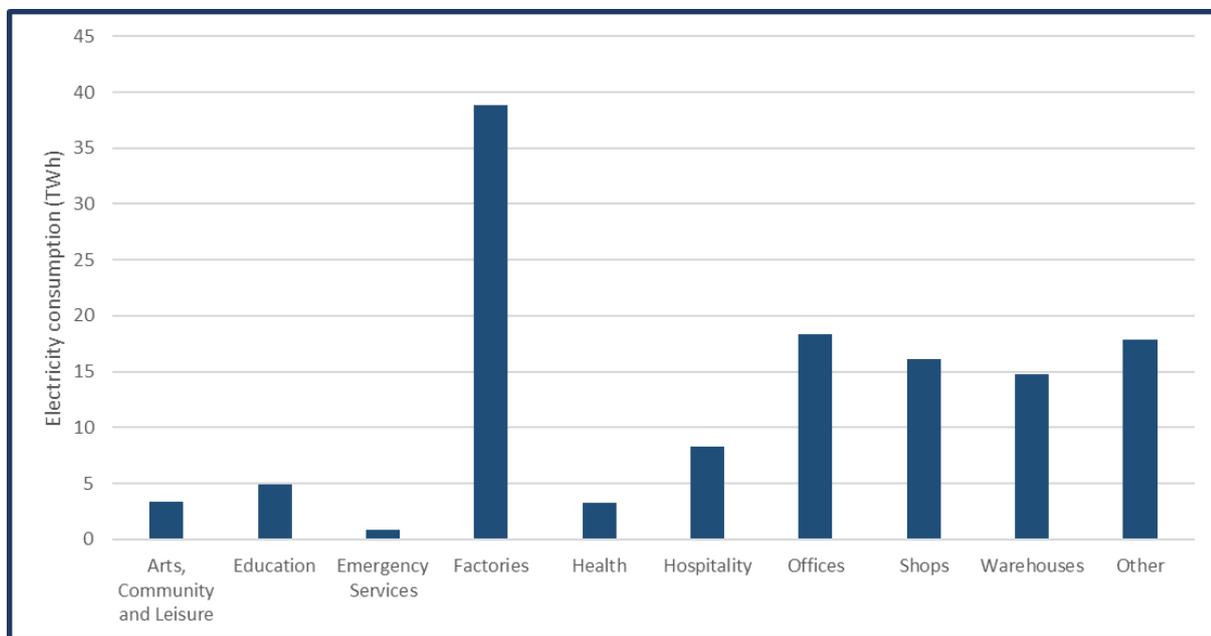


Figure 11 shows non-domestic building electricity consumption by building use. It shows that Factories are the building use that consumes the most electricity (39 TWh in 2021).

¹³ [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.

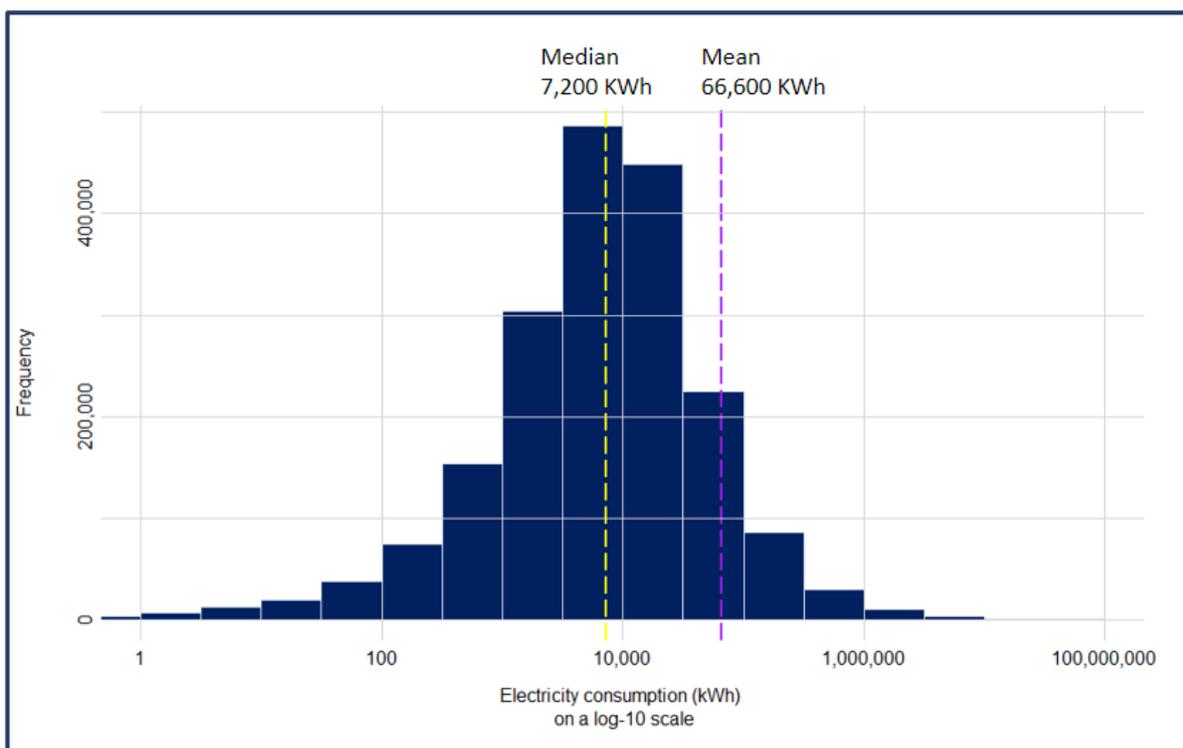
This more than twice the consumption of the next highest consuming building use, Offices (18 TWh).

This is despite there being more Shops (354,000) and Offices (84,000) combined than there are Factories (97,000) 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 2023 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 2023 sample that is weighted to be representative of the non-domestic building population (for more information see the accompanying [Methodology note](#)). For example, we can look at the frequency of different electricity consumption values.

Figure 12: Frequency of different electricity consumption values for all non-domestic buildings, 2021.



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 2021 values within the corresponding consumption band.

Figure 12 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 12 shows that a plurality of buildings consume between 3,160 kWh ($10^{3.5}$ kWh) and

10,000 kWh (10⁴ 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)¹⁴ 2021. This is 23% of buildings in the ND-NEED sample.

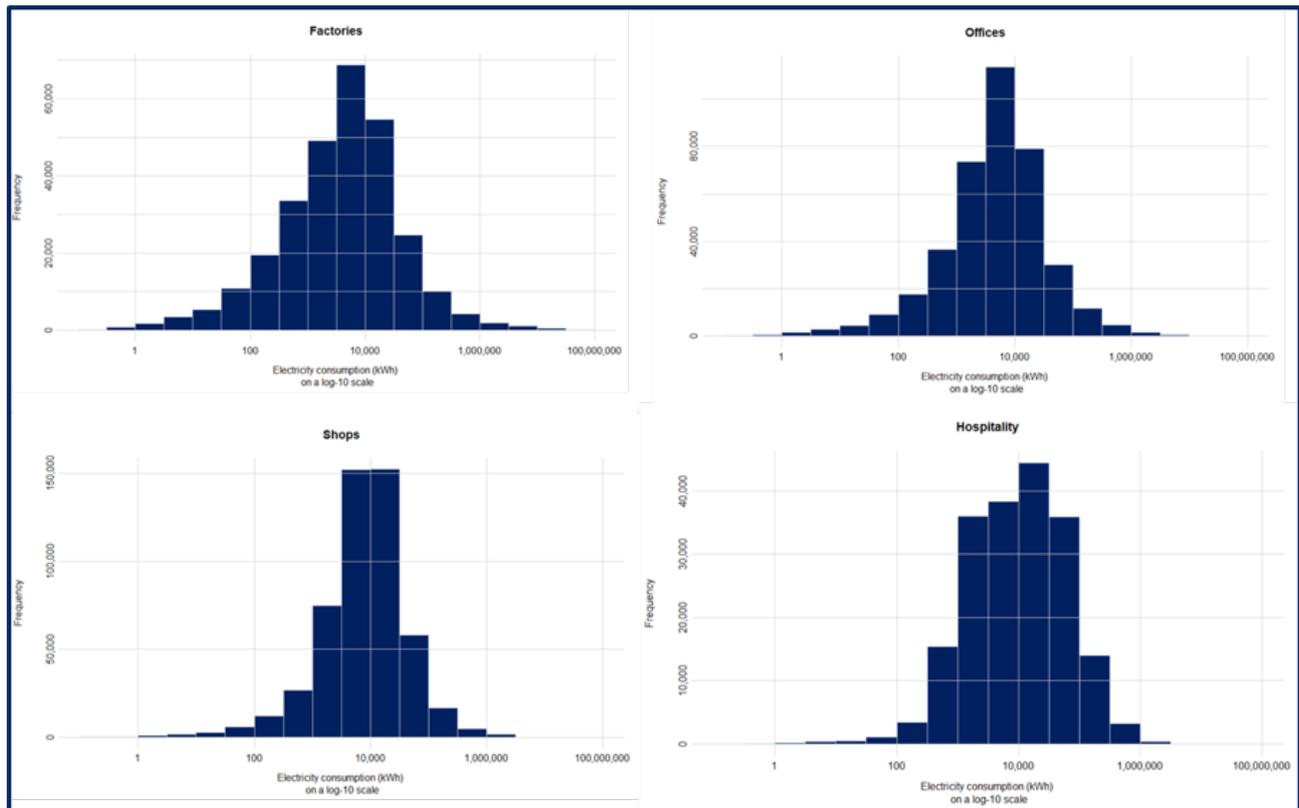
Note, that the distribution in Figure 12 is on a log-10 scale. This is because the underlying data is very positively skewed with a long tail of high-consuming sites. This positive skew can also be seen in the data when you look at the comparison between the weighted median electricity consumption and the weighted mean electricity consumption. The weighted median electricity consumption of non-domestic buildings is 7,200 kWh, compared to a weighted mean electricity consumption of 66,600 kWh.

We can also present the data in Figure 12 split by building use. Figure 13 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.

There are however some differences between building uses. Factories, Offices and Shops have a longer tail compared to Hospitality, showing that there are proportionally more very high and very low consuming Factories, Offices and Shops. 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.

¹⁴ [Subnational electricity and gas consumption summary report 2021.](#)

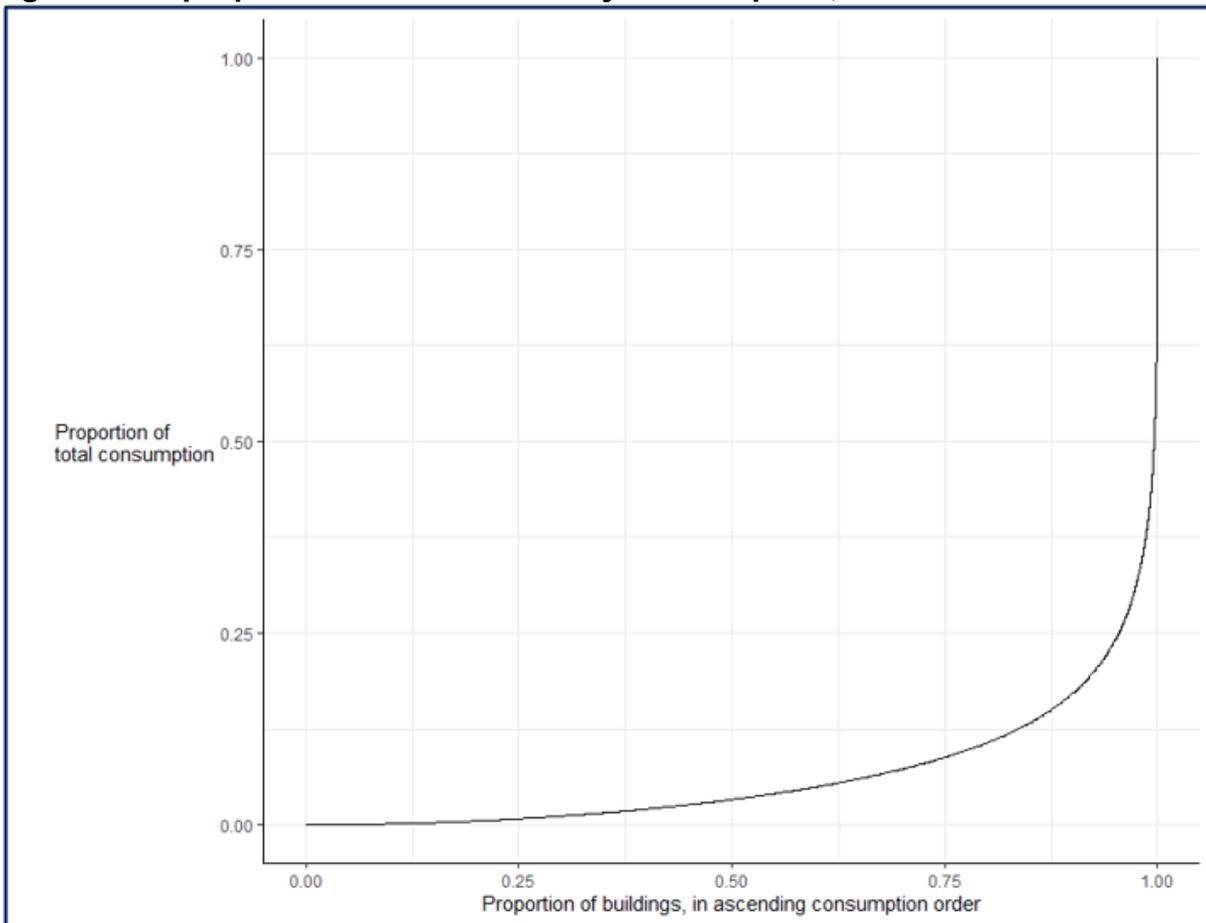
Figure 13: Frequency of different electricity consumption values, by building use, 2021.



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 2021 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 14: The proportion of the building stock (in ascending consumption order) against the proportion of total electricity consumption, 2021.



Note: This cumulative distribution plot has the proportion of buildings in the ND-NEED sample with 2021 electricity consumption on the x-axis (ordered by unweighted electricity consumption). The y-axis shows the proportion of weighted 2021 electricity consumption that these buildings are consuming.

From Figure 14 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 7% highest consuming buildings). This shows that the small number of high consuming sites identified in Figure 14 have a substantial impact on total electricity consumption. This is also demonstrated in Table 3a, which shows that the lowest 10% of electricity consumption (accounting for 13 TWh) is consumed by 78% of buildings in the 2021 sample.

Table 3a: Cumulative electricity consumption and number of buildings by consumption percentile, 2021

Consumption Percentile	Cumulative Consumption (TWh)	Number of buildings in the sample (Cumulative)	Percentage of building sample (%)
10%	13	677,000	78.3%
20%	25	800,000	92.5%
30%	38	840,000	97.1%
40%	51	855,000	98.9%
50%	63	861,000	99.6%
60%	76	863,000	99.8%
70%	89	864,000	99.9%
80%	101	864,000	100.0%
90%	114	864,000	100.0%
100%	127	864,000	100.0%

Table 3b presents the data in Figure 14 from the opposite angle. By looking at cumulative consumption by the building percentiles, it shows that 90% of the buildings, in ascending consumption order, account for only 22 TWh (17%) of the total 127 TWh electricity consumption.

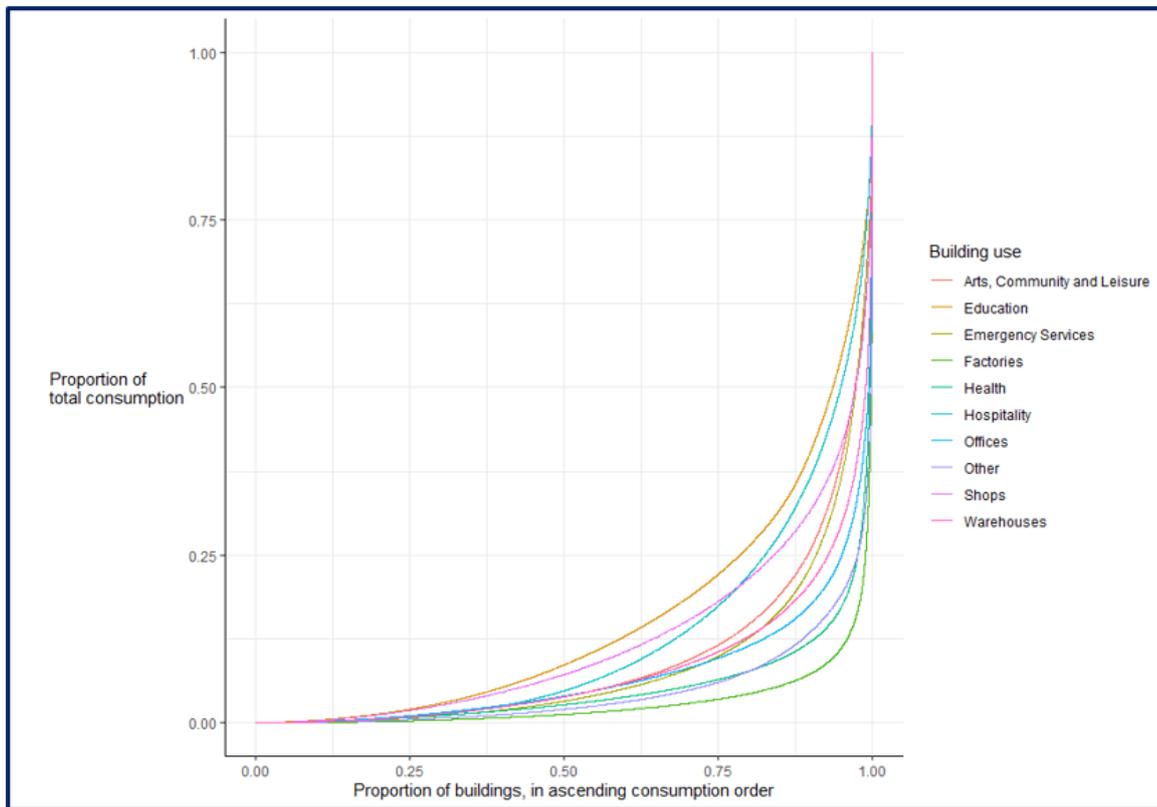
Table 3b: Cumulative number of buildings and electricity consumption by building percentile, 2021

Building Percentile	Cumulative Number of buildings	Cumulative Consumption (TWh)	Percentage of Consumption (%)
10%	86,000	0.2	0.1%
20%	173,000	0.6	0.5%
30%	259,000	1	1.2%
40%	346,000	3	2.1%
50%	432,000	4	3.3%
60%	519,000	6	5.0%
70%	605,000	9	7.3%
80%	692,000	14	10.7%
90%	778,000	22	17.1%
100%	864,000	127	100.0%

We can also split this analysis by building use (Figure 15). From Figure 15 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.

Figure 15: The proportion of the building stock (in ascending consumption order) against the proportion of total electricity consumption, by building use, 2021.



Note: This cumulative distribution plot has the proportion of buildings in the ND-NEED sample with 2021 electricity consumption on the x-axis (ordered by unweighted electricity consumption). The y-axis shows the proportion of weighted 2021 electricity consumption that these buildings are consuming.

Gas consumption

Figure 16: The gas consumption of ND-NEED non-domestic buildings in England and Wales by building use, 2021.

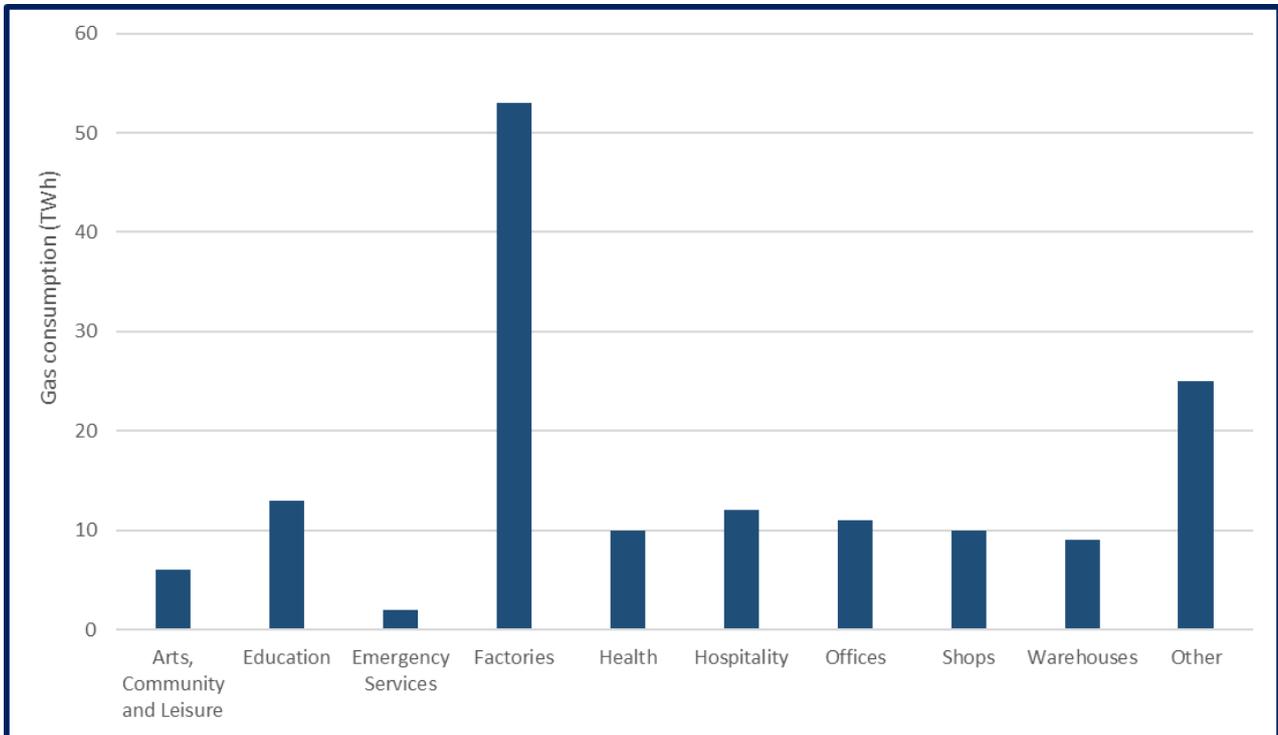


Figure 16 shows that the pattern for gas consumption by building use is similar to that of electricity consumption. Factories have the highest gas consumption, at 53 TWh in 2021. This is over four times higher than the gas consumption of any other building use (excluding the 'Other' category). This is even though 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 24% of non-domestic building floor area (of the buildings with floor area information available).
- From Energy Consumption in the UK (ECUK)¹⁵ we can see that industrial processes (high and low temperature processes, drying/separation, motors, compressed air) are responsible for over three-quarters (78%) of gas use in industry, and so a large part of gas consumption in Factories is likely to be driven by these processes.

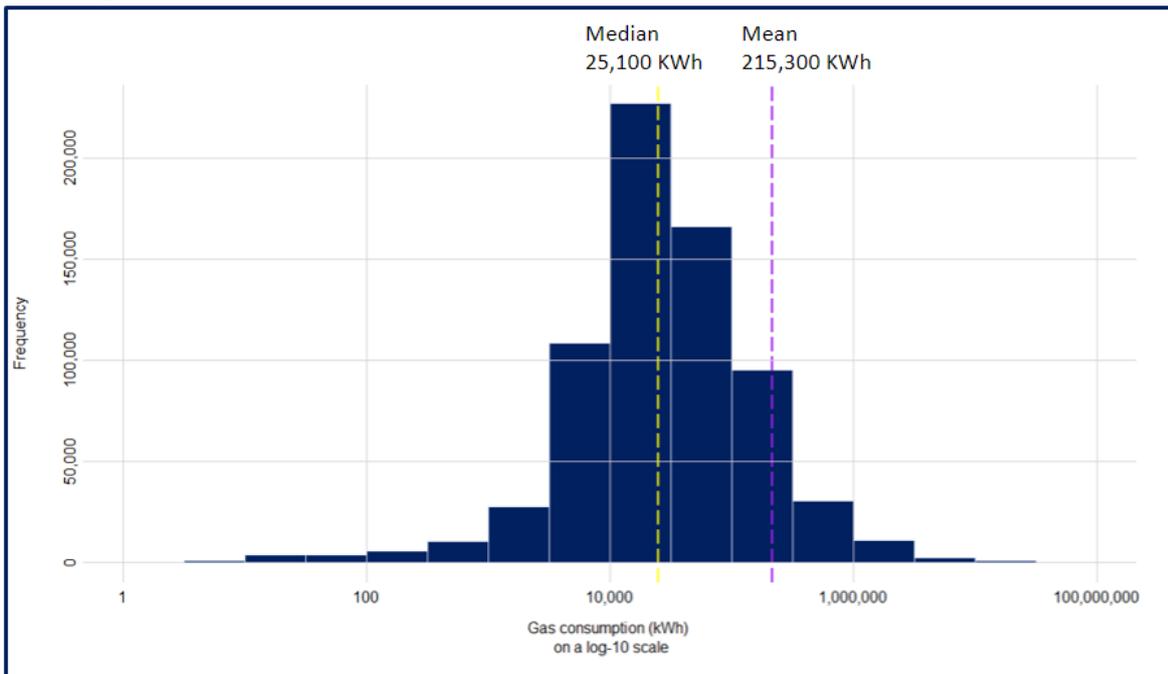
Most other building types consumed around 10 TWh of gas in 2021. The exceptions to this are Arts, Community and Leisure, where the buildings consumed 6 TWh of gas, and Emergency Services where the buildings consumed 2 TWh of gas.

¹⁵ [ECUK, End-use data tables, Table U2.](#)

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 17: Frequency of different gas consumption values for all non-domestic buildings, 2021.



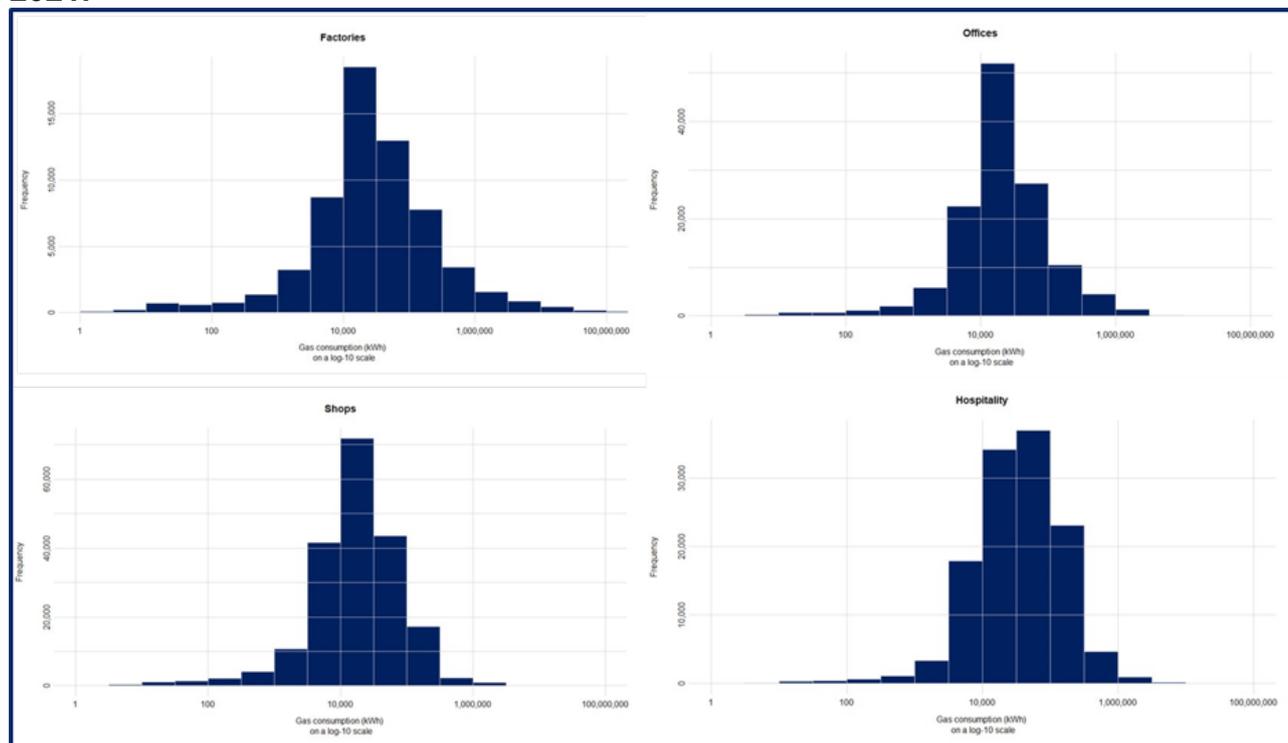
Note: This histogram has weighted gas consumption on the x-axis (ascending order), shown on a log scale (log10). The y-axis shows a frequency count, that is the number of buildings that have gas consumption values within the corresponding consumption band.

Figure 17 plots gas consumption against the frequency of buildings whose consumption falls within that band. The tallest 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 17 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 17 is presented on a log10 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 25,100 kWh, compared to a weighted mean gas consumption of 215,300 kWh.

We can also present the data in Figure 17 split by building use. Figure 18 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.

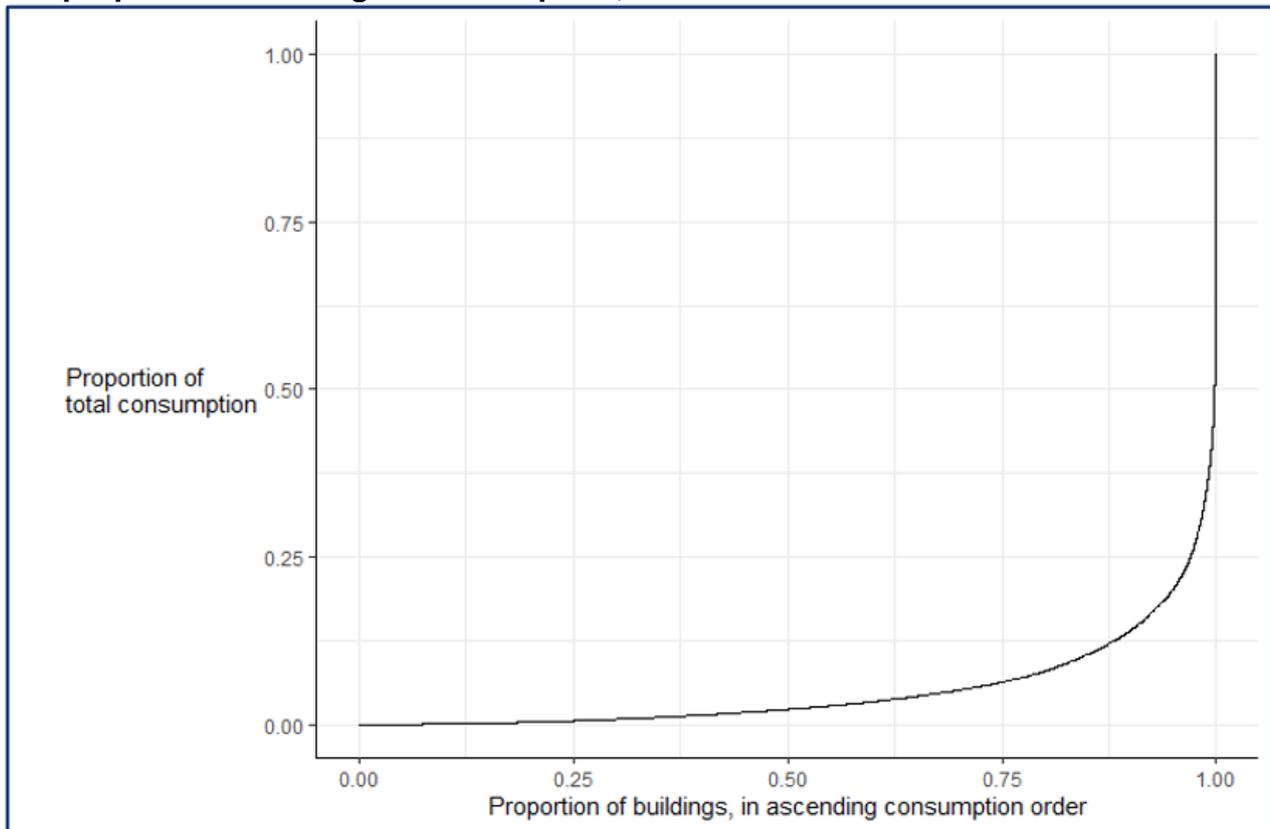
Figure 18: Frequency of different gas consumption values, split by building use, 2021.



Note: This histogram has unweighted gas 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 2021 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 19: Proportion of the building stock (in ascending consumption order) against the proportion of total gas consumption, 2021.



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 2021 gas consumption that these buildings are consuming.

From Figure 19 we can see that the 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 13 above have a substantial impact on total gas consumption. This is the same pattern that is seen for electricity consumption, although is slightly more emphasised for gas. Table 4a shows that 84% of the buildings in the 2021 sample are responsible for consuming the lowest 10% of gas consumption (accounting for 15 TWh).

Table 4a: Cumulative gas consumption and number of buildings by consumption percentile, 2021

Consumption Percentile	Cumulative Consumption (TWh)	Number of buildings in the sample (Cumulative)	Percentage of building sample (%)
10%	15	300,000	84.2%
20%	30	338,000	94.9%
30%	45	350,000	98.1%
40%	60	354,000	99.4%
50%	75	356,000	99.8%
60%	90	357,000	99.9%
70%	105	357,000	100.0%
80%	120	357,000	100.0%
90%	135	357,000	100.0%
100%	150	357,000	100.0%

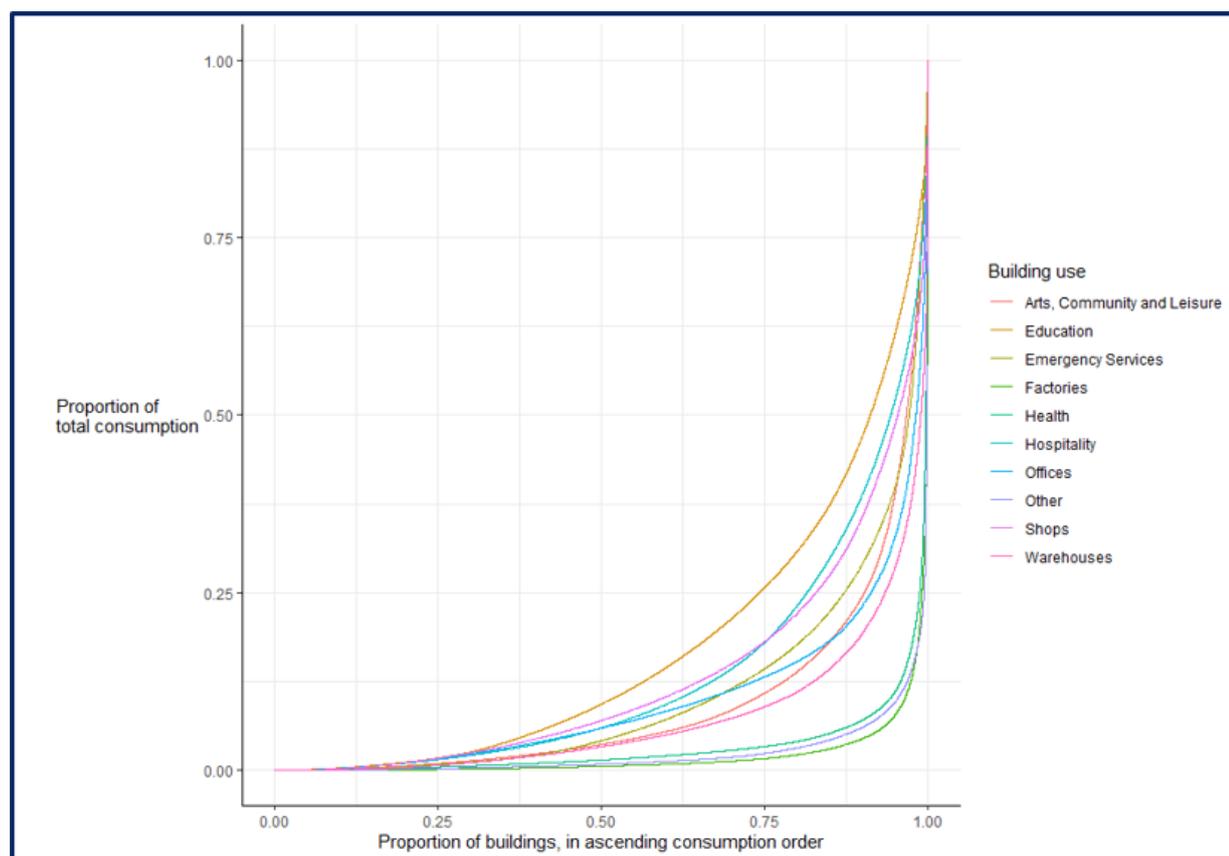
Table 4b presents the data in Figure 19 from the opposite angle. By looking at cumulative consumption by the building percentiles, it shows that 90% of the buildings, in ascending consumption order, account for only 12 TWh (14%) of the total 150 TWh gas consumption.

Table 4b: Cumulative number of buildings and gas consumption by building percentile, 2021

Building Percentile	Cumulative Number of buildings	Cumulative Consumption (TWh)	Percentage of Consumption (%)
10%	36,000	0.1	0.1%
20%	71,000	0.5	0.3%
30%	107,000	1	0.8%
40%	143,000	2	1.4%
50%	178,000	3	2.2%
60%	214,000	5	3.4%
70%	250,000	8	5.1%
80%	285,000	12	8.0%
90%	321,000	21	14.0%
100%	357,000	150	100.0%

We can also split this analysis by building use. From Figure 20, 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 32% highest consuming buildings.

Figure 20: Proportion of the building stock (in ascending consumption order) against the proportion of total gas consumption, by building use, 2021.



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 2021 gas consumption that these buildings are consuming.

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.

Note, there are multiple definitions or denominators that could be used to calculate intensity including using economic metrics such as Gross Domestic Product (GDP) or Gross Value Added (GVA). In ND-NEED, the floor area of a building is used as the denominator to calculate intensity as it is the most applicable metric for analysing the energy efficiency 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 21: The median electricity intensity of ND-NEED non-domestic buildings in England and Wales by building use, 2021

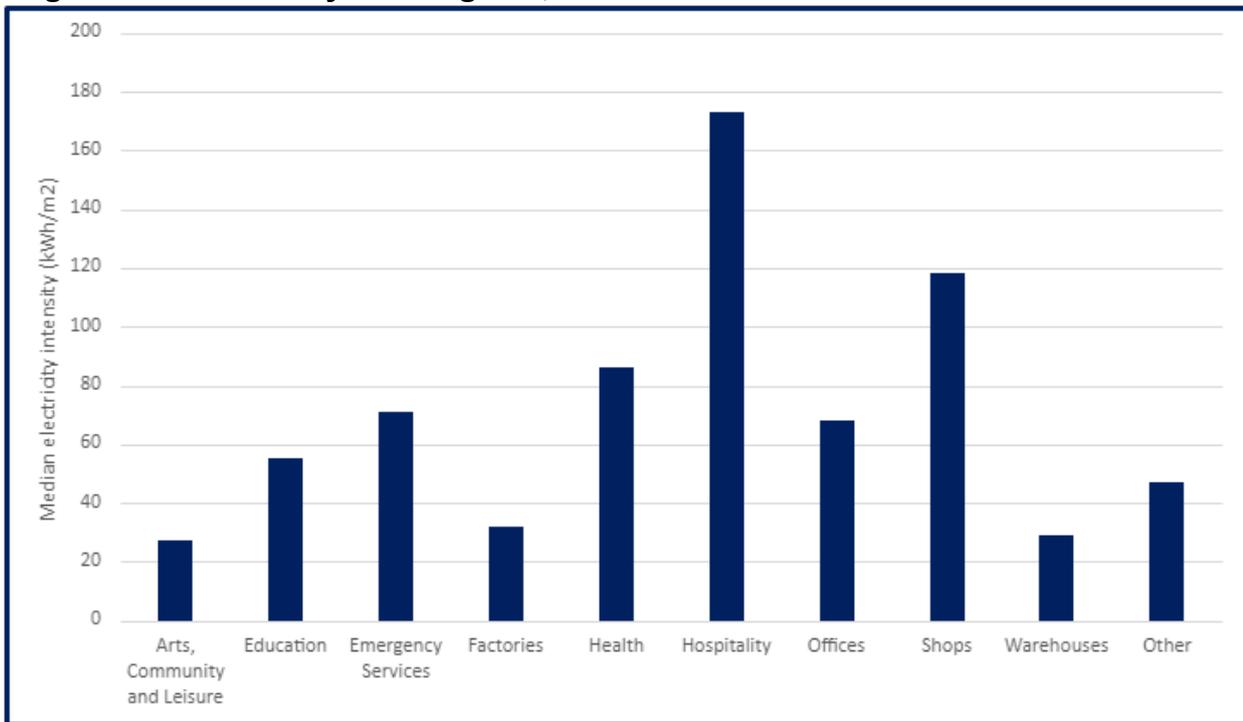


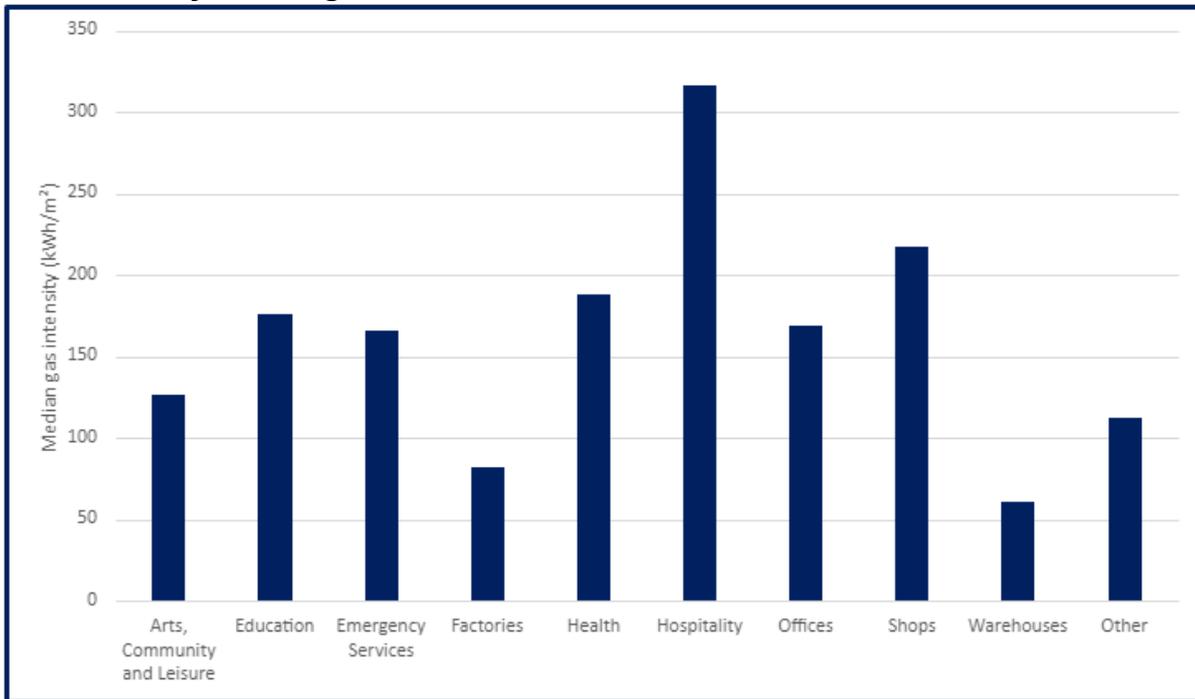
Figure 21 shows that median electricity intensity by building use has a very different pattern to total electricity consumption. Hospitality is the building use with the highest median electricity intensity (173 kWh/m²), despite having relatively low total electricity consumption (8 TWh). This high electricity 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 demands¹⁶.

By contrast, Factories have a relatively low median electricity intensity (32 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.

¹⁶ [ECUK, End-use data tables, Table U5.](#)

Gas intensity

Figure 22: The median gas intensity of ND-NEED non-domestic buildings in England and Wales by building use, 2021



As for electricity, Figure 22 shows that Hospitality is the building use category with the highest median gas intensity (316 kWh/m²), consuming over 40% more gas per square meter than any other building type. 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 (ECUK¹⁷ and BEES¹⁸).

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 59% of non-domestic building floor area, despite only accounting for 27% of non-domestic buildings (see Table 1 and Figure 3 in [Non-domestic buildings by building use](#)).

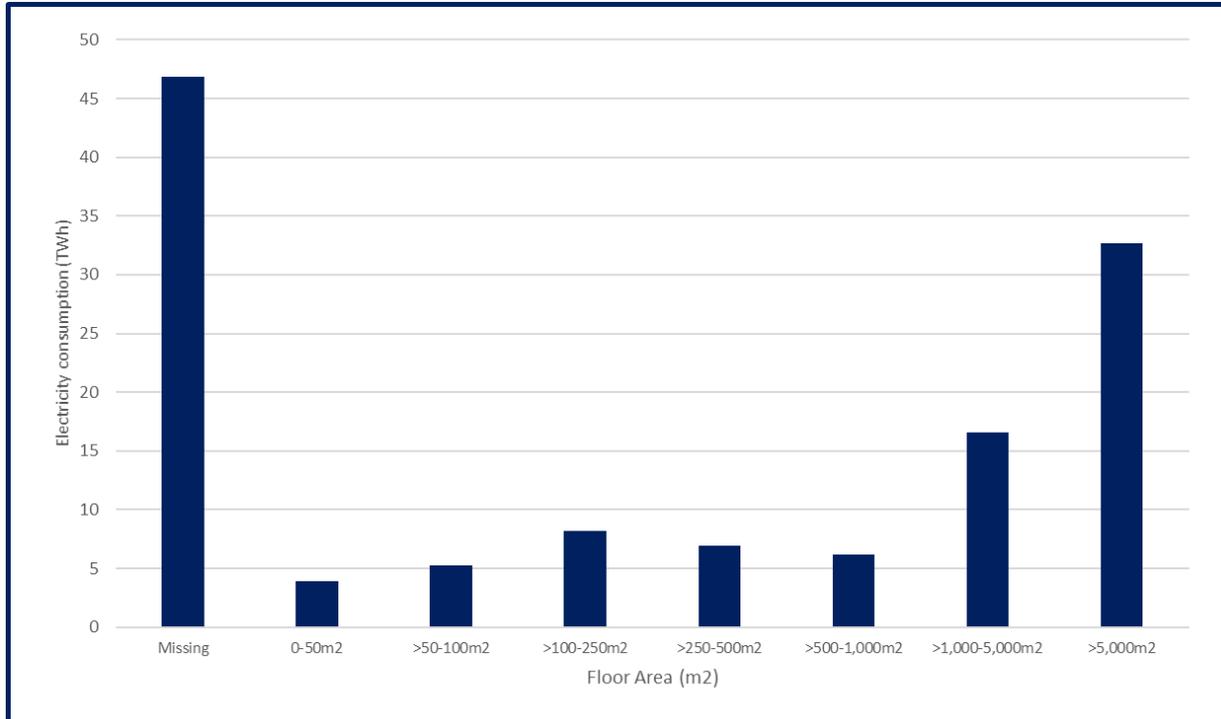
¹⁷ [ECUK, End-use data tables, Table U5.](#)

¹⁸ [BEES, Overarching tables, Figure 3.13.](#)

Non-domestic energy consumption by building size

Electricity consumption

Figure 23: The electricity consumption of ND-NEED non-domestic buildings in England and Wales by building size, 2021.

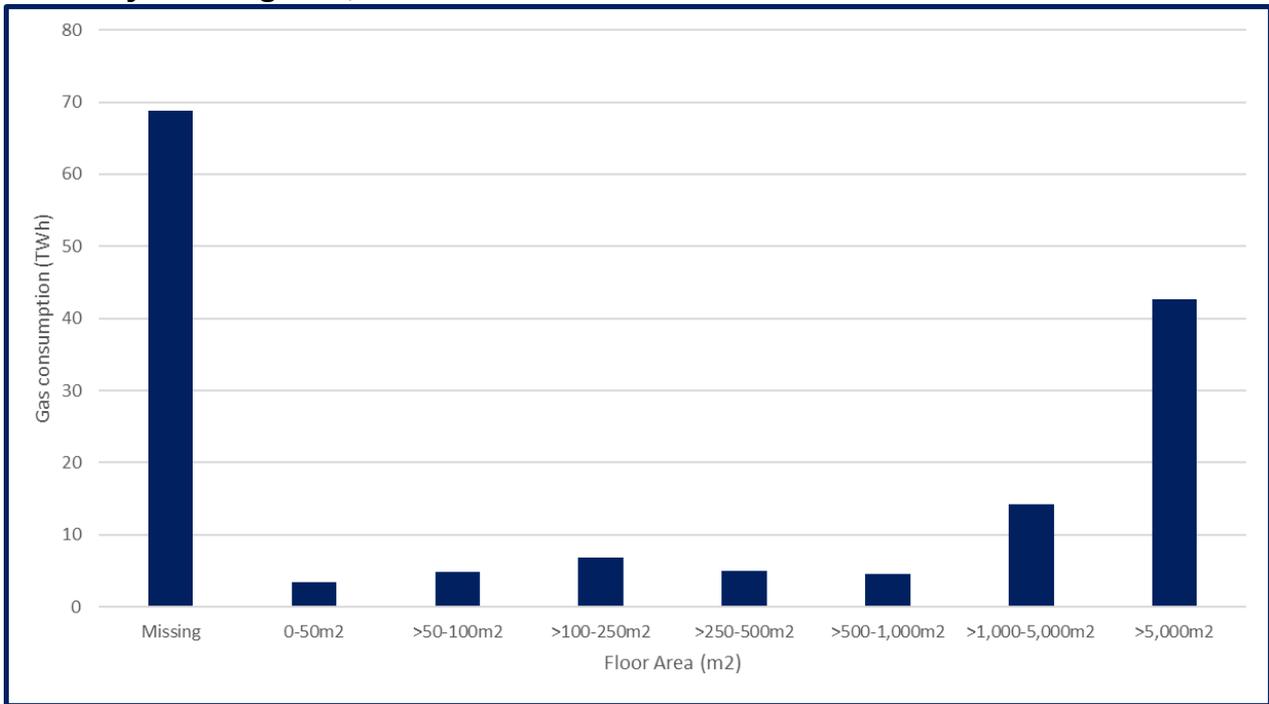


As shown by Figure 23, there is a clear trend that, as building size increases, the share of total electricity consumption increases; this is particularly true for buildings that are over 1,000m². This trend is not driven by the number of buildings as there are more buildings in the smaller floor area 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 – 18% of non-domestic buildings in the ND-NEED sample with electricity consumption in 2021 are missing floor area information. These buildings are responsible for 47 TWh (37%) 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 24: The gas consumption of ND-NEED non-domestic buildings in England and Wales by building size, 2021.



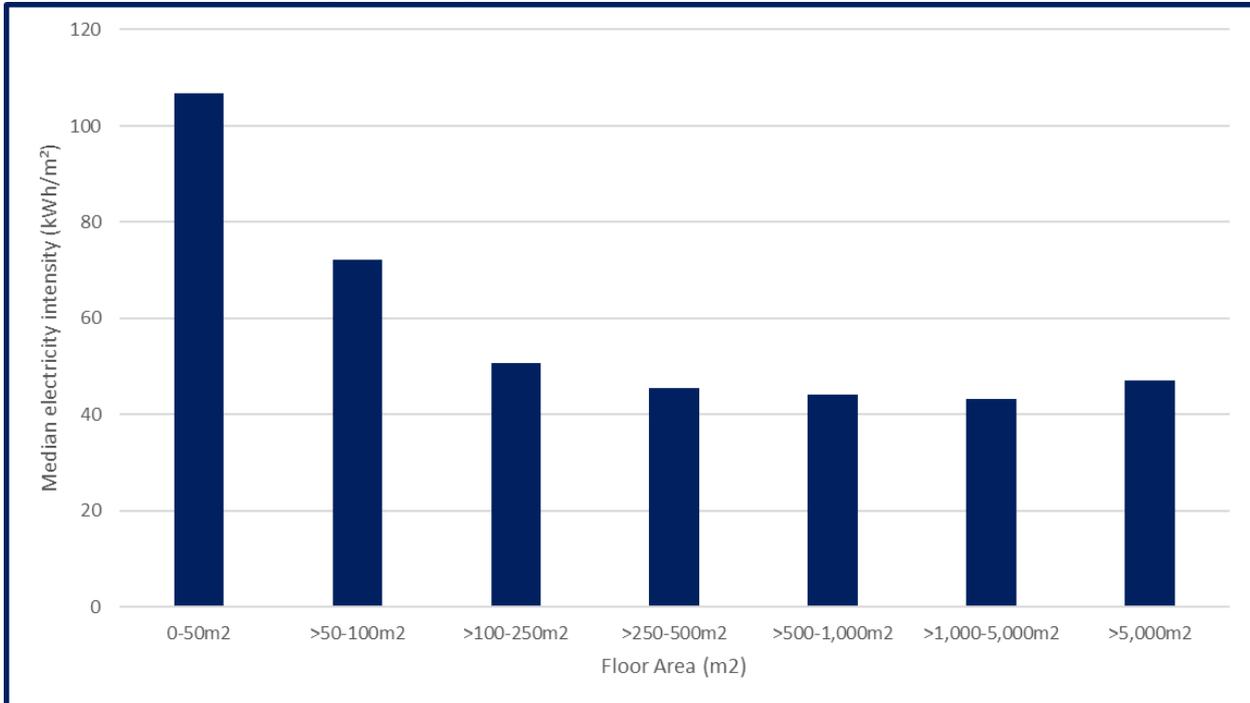
As with electricity consumption, Figure 24 shows that gas consumption tends to increase as building size increases. Again, this trend is at least in part driven by the larger total floor area of the buildings in the larger floor area bands.

It is again important to note the substantial size of the 'Building size missing' category which makes up 69 TWh (46%) of consumption, more than any other building size category. This consumption comes from the 24% of buildings in the ND-NEED gas consumption sample that are missing building size information. The size of the missing category means 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

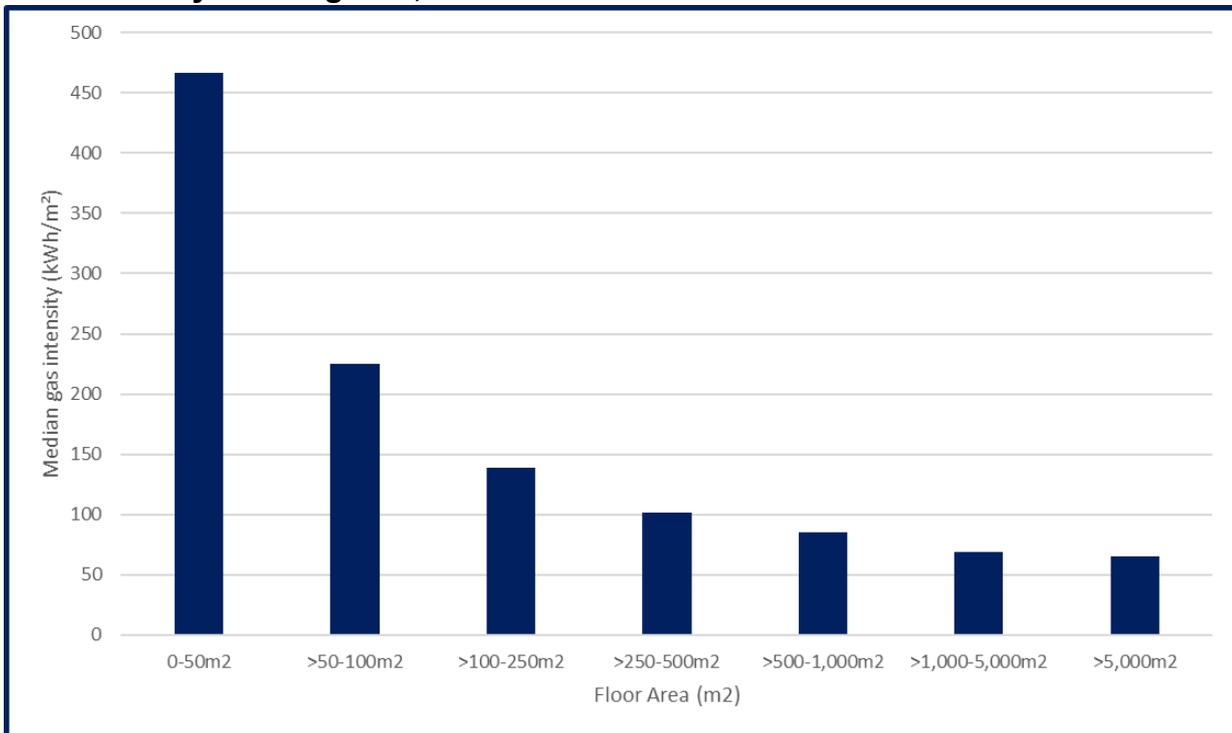
Figure 25: The median electricity intensity of ND-NEED non-domestic buildings in England and Wales by building size, 2021.



Median electricity intensity (Figure 25) shows the opposite trend to total electricity consumption, with smaller buildings generally using more electricity per square metre than larger buildings.

Gas intensity

Figure 26: The median gas intensity of ND-NEED non-domestic buildings in England and Wales by building size, 2021.



Like electricity, median gas intensity shows the opposite trend to gas consumption with smaller buildings using more gas per square metre (Figure 26). This trend is more pronounced 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 fewer 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 is because of the lower coverage of business size information in the building stock (only 30% 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 floor area.

Electricity consumption

Figure 27: The electricity consumption of ND-NEED non-domestic buildings in England and Wales by business size, 2021.

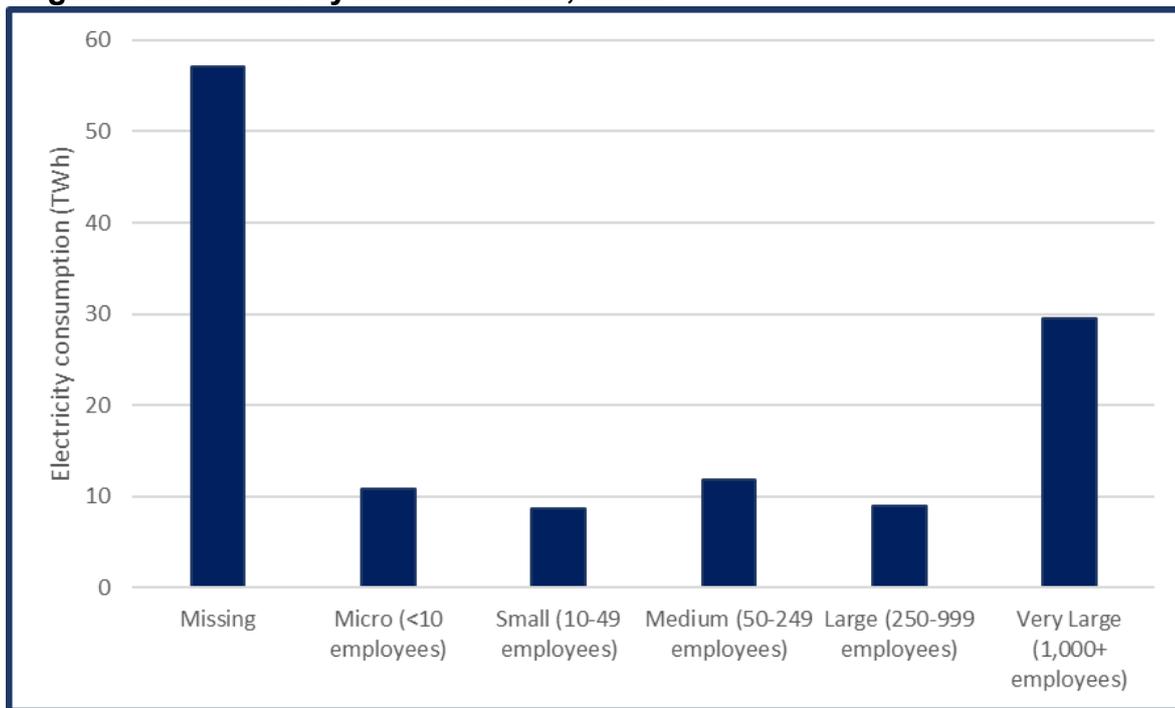


Figure 27 shows the contribution of buildings occupied by businesses of different sizes to non-domestic building electricity consumption. Buildings occupied by Very Large businesses consume the most electricity (30 TWh), followed by buildings occupied by Medium sized businesses (12 TWh), with buildings occupied by Micro, Small and Large businesses consuming the least electricity (around 9 to 11 TWh). This is a different pattern to that seen in the number of buildings in the non-domestic building stock (see [Figure 10](#), where Microbusinesses represent 58% of the stock (with available business size information), and Very Large 15%).

Note, 57 TWh of electricity consumption is missing business size information. This corresponds to the 491,000 buildings of the 864,000 in the ND-NEED electricity consumption sample for 2021, where information on the occupying business size is not available.

In ND-NEED the business size information comes from the IDBR 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 IDBR dataset may not contain business size information for a building.
- The IDBR 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 28: The gas consumption of ND-NEED non-domestic buildings in England and Wales by business size, 2021.

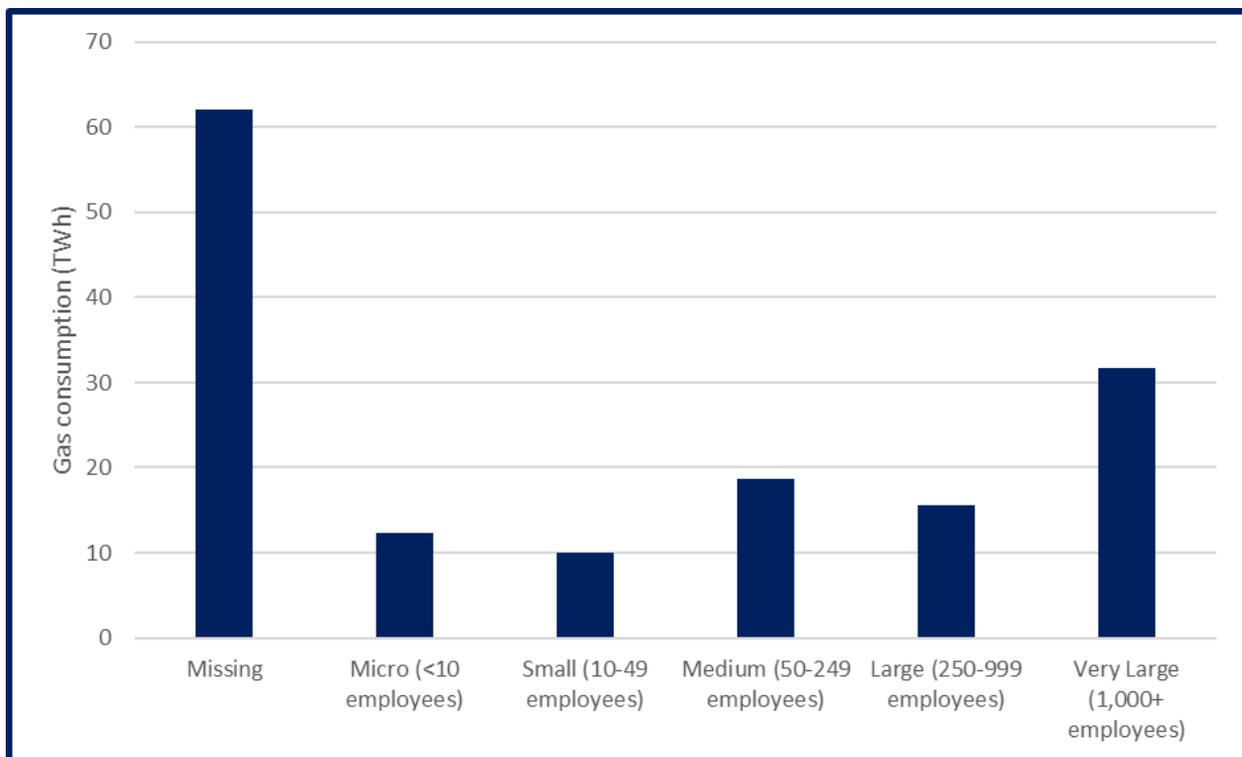


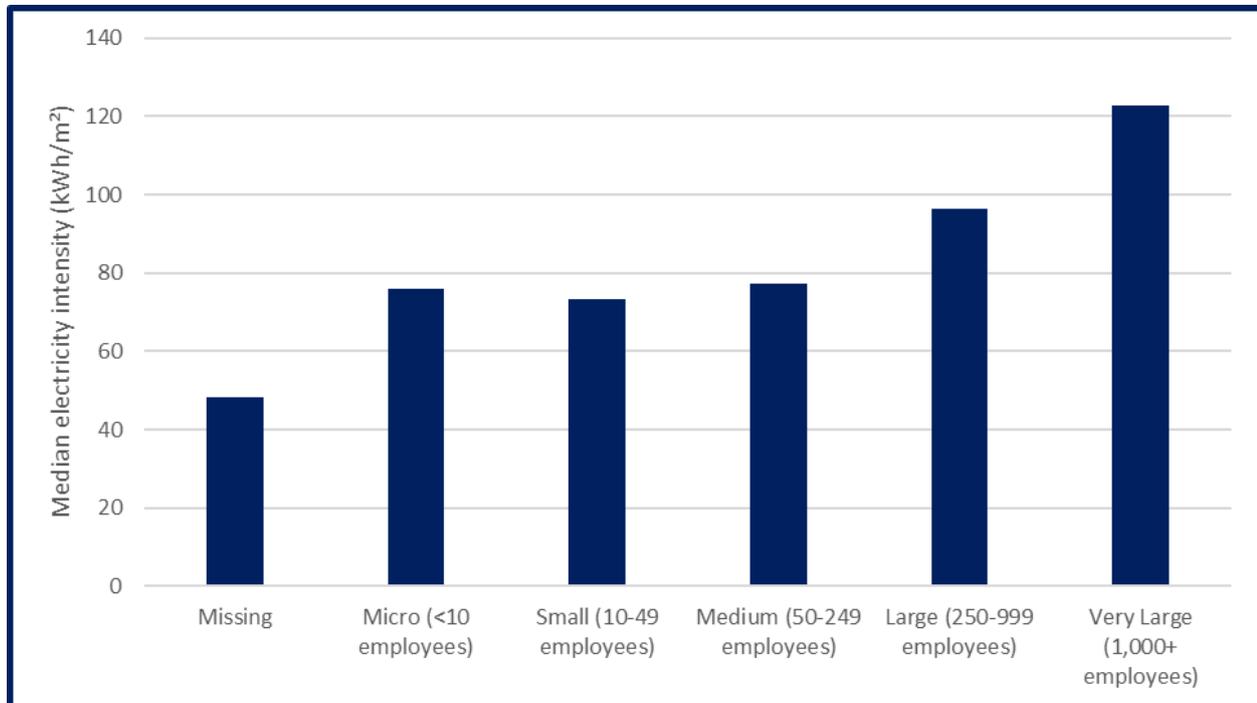
Figure 28 shows that gas consumption by business size follows a similar pattern to electricity consumption. Buildings occupied by Very Large sized businesses consume most gas (32 TWh), followed by Medium-sized businesses (19 TWh), Large (16 TWh) and Micro and Small businesses (12 and 10 TWh, respectively).

It is again important to note the substantial consumption of 62 TWh from the 'Business size missing' category. This is because 186,000 of the 357,000 buildings in the ND-NEED gas consumption sample for 2021 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 29: The median electricity intensity of ND-NEED non-domestic buildings in England and Wales by business size, 2021.



From Figure 29 we can see that electricity intensity increases with the size of the business. It is greatest among Very Large businesses (123 kWh/m²), with small businesses having the lowest intensity (73 kWh/m²).

As with the electricity consumption figures it is important to note the substantial size of the business size missing category – 52% 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 30: The median gas intensity of ND-NEED non-domestic buildings in England and Wales by business size, 2021.

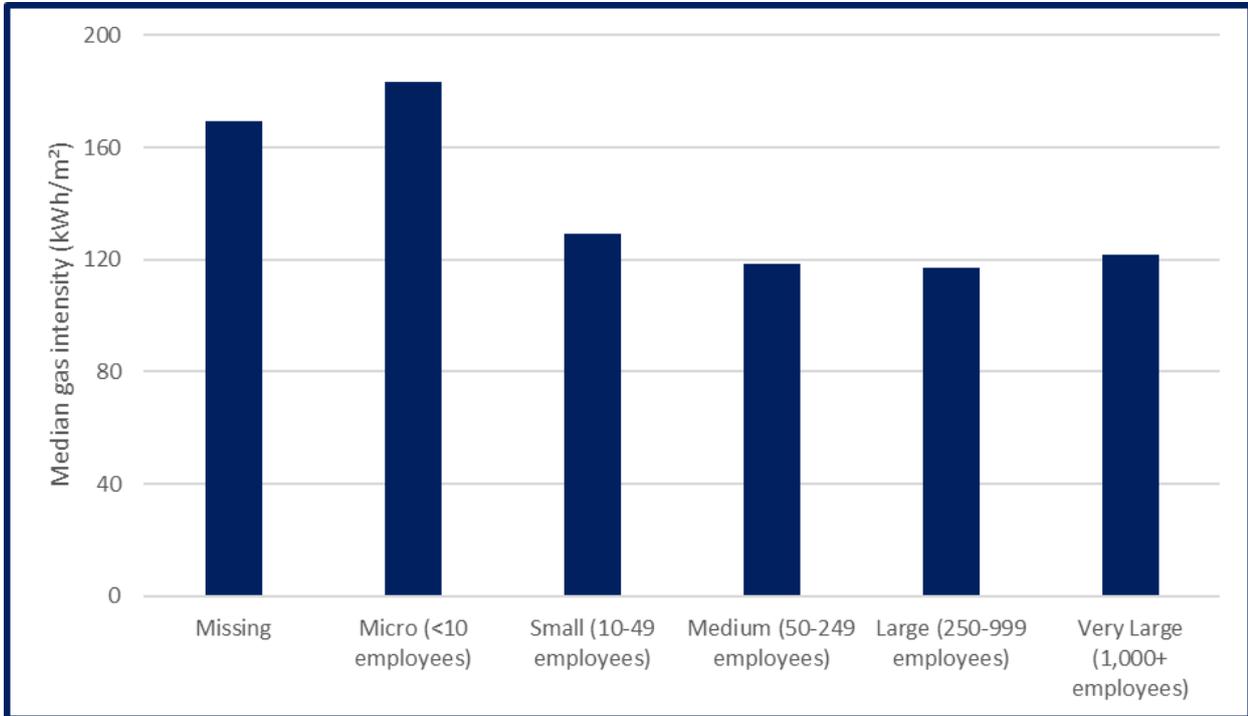


Figure 30 shows that gas intensity by business size is considerably greatest among Micro businesses (183 kWh/m²). Unlike electricity intensity, gas intensity generally decreases with the size of the business.

Again, it is important to note the substantial size of the business size missing category – almost half (45%) 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 (2012 – 2021)?

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 addition to overall consumption, another way to investigate how non-domestic building energy use has changed over time is to look at median consumption and median

intensity. Median consumption will be less affected by consumption from a few high consuming buildings than the overall consumption time series.

Note, the floor area information in ND-NEED is only available for a single point in time (end of March 2023). 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.

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

1. Electricity and gas consumption over time (2012 – 2021)
2. Median electricity and gas consumption over time (2012 – 2021)
3. Median electricity and gas intensity over time (2012 – 2021)

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.

Electricity consumption

Figure 31: Electricity consumption in ND-NEED non-domestic buildings in England and Wales (2012-2021).

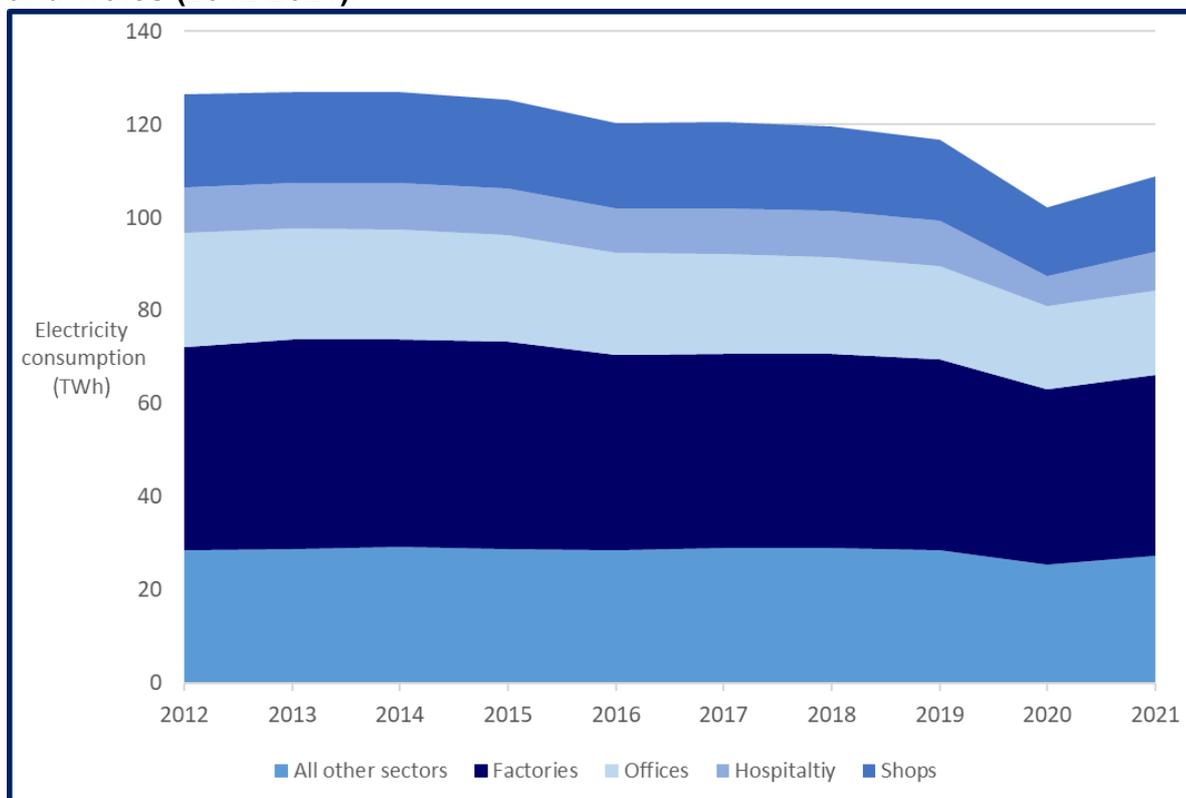


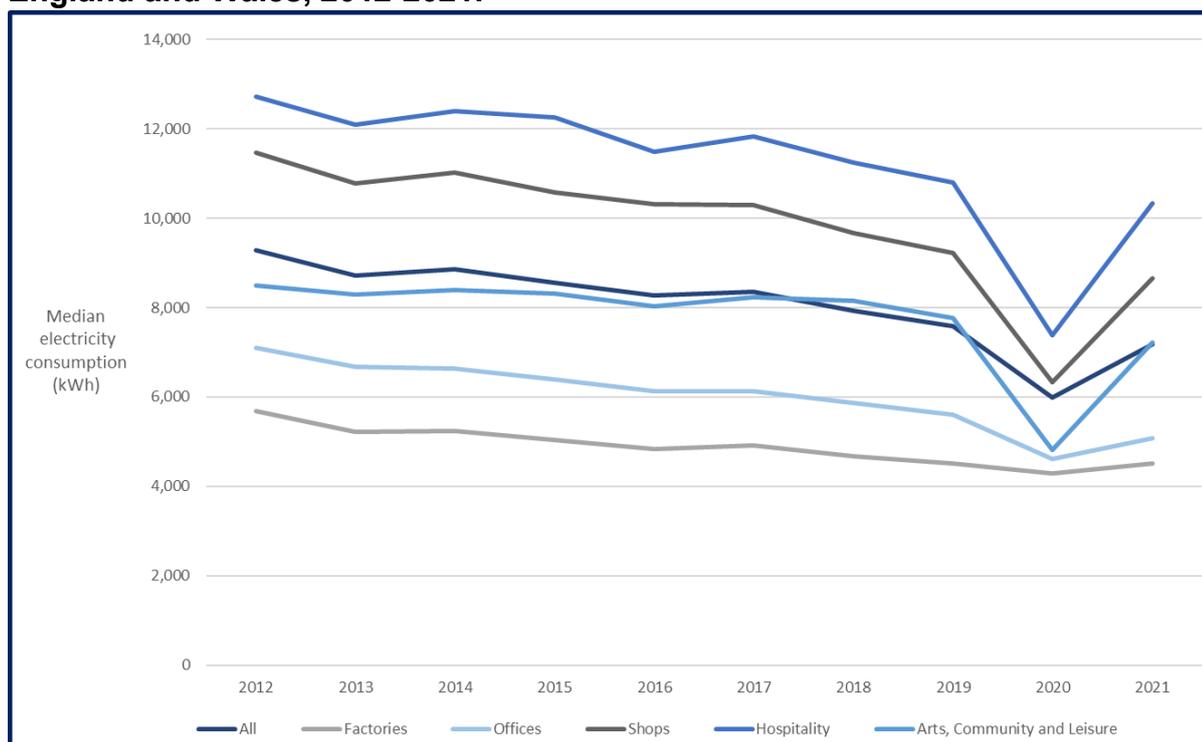
Figure 31 shows that, according to ND-NEED, there has been an overall downward trend in the electricity consumption of non-domestic buildings in England and Wales between 2012 and 2021. There was a noticeable reduction (10% decrease on 2019) in 2020 consumption due to the covid-19 pandemic and consequent trading restrictions. Figure 31 also shows some evidence of the covid bounce back, where consumption has increased again in 2021 (6% more than in 2020), although not to the same pre-pandemic level as in 2019. This is broadly consistent with the trend seen in other publications such as the [Subnational electricity consumption statistics](#) and DUKES¹⁹.

Unlike other publications, ND-NEED can also split this time series by building use. All building uses show a similar pattern to overall consumption, with consumption decreasing slightly between 2012 and 2019. This is before dropping further during the pandemic in 2020 across all sectors besides the “Other” sector (which increased by 12%, largely due to increased use by electricity hereditaments, for example, power station premises - further information in Annex C of the Methodology note). Consumption has risen across all sectors in 2021 including the “Other” sector. Hospitality (28%) and Arts, Community and Leisure (17%) have seen large increases, which reflects a return to similar levels to 2019 after falling 33% and 29% respectively in 2020.

Looking at the small rise (3%) in Office electricity consumption at a more granular level, this is being driven mainly by computer data centres rather than typical offices. Despite making up less than 1% of Office buildings that consume electricity in 2021, computer centres are influential because they make up 25% of the electricity consumption from Offices.

¹⁹ [Dukes, Table 5.2, Sectors: Industry, Commercial, Public administration.](#)

Figure 32: Median electricity consumption in ND-NEED non-domestic buildings in England and Wales, 2012-2021.



Similar to overall consumption, Figure 32 shows how the trend in the median electricity consumption has been impacted by the COVID-19 restrictions.

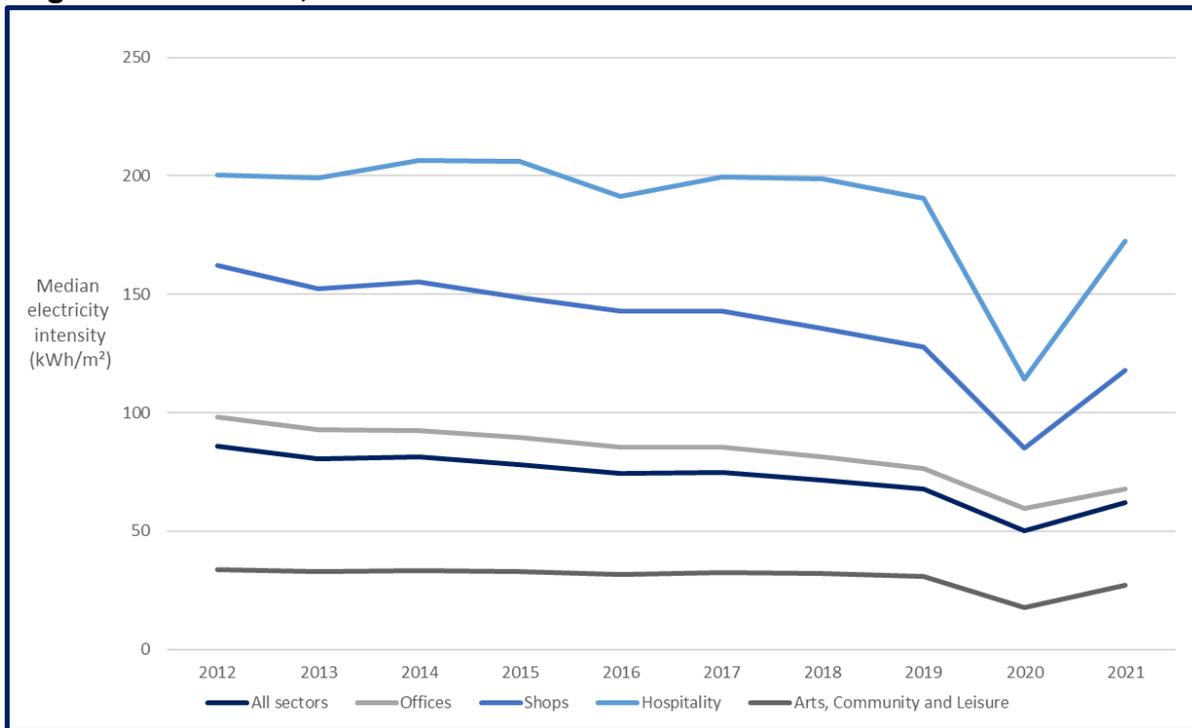
Before the pandemic, median electricity consumption in non-domestic buildings steadily declined between 2012 and 2019, by 18% overall. Then a similar overall decrease of 21% is seen in one year between 2019 and 2020, before increasing again by 20% in 2021. Median consumption therefore shows a greater bounce back from 2020 level, perhaps due to the lesser influence from few higher consumption buildings.

In addition to the Arts, Community and Leisure and Hospitality which showed the biggest increase in 2021 compared to 2020 for overall consumption, Shops also showed notable increases in median consumption (37%).

The overall median electricity consumption in non-domestic buildings in ND-NEED in 2021 (7,200 kWh) is broadly in line with what is seen in the [Subnational electricity data](#) (6,600 kWh a year). This increase in median consumption is also observed in the Subnational electricity consumption data.

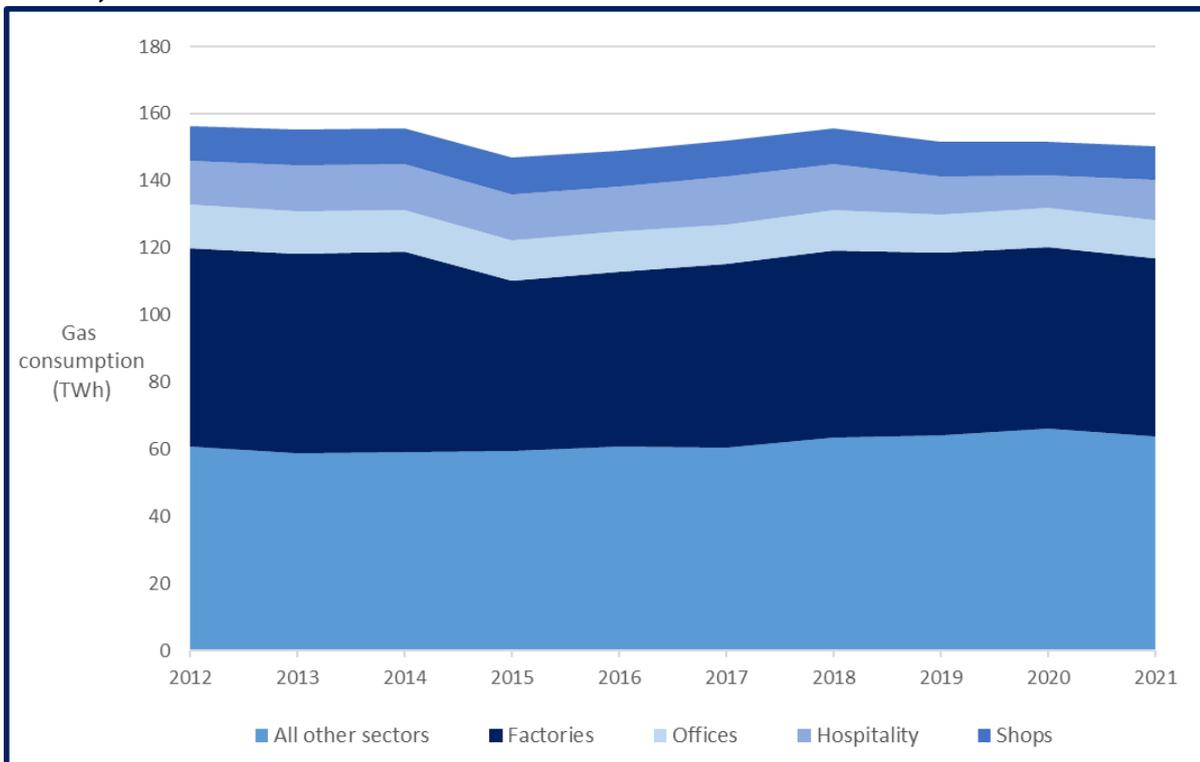
Figure 33 shows that electricity intensity has gradually fallen between 2012 and 2019, decreasing by 21% in this period. Similar to the pattern seen in the overall electricity consumption, intensity fell in 2019 before increasing again in 2021. There was an increase seen consistently across sectors, with Arts, Community and Leisure, Hospitality, and Shops showing the greatest increases (53%, 51% and 39% respectively).

Figure 33: Median electricity intensity in ND-NEED non-domestic buildings in England and Wales, 2012-2021.



Gas consumption²⁰

Figure 34: Gas consumption in ND-NEED non-domestic buildings in England and Wales, 2012-2021.



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 34 shows that, according to ND-NEED, gas consumption in non-domestic buildings decreased slowly between 2012 and 2021, varying between 156 TWh and 150 TWh, respectively (a 4% fall). The impact of the pandemic on gas consumption is not as evident as for electricity, where overall gas consumption fell by just 1% in 2021 compared to 2020. This is likely due to the reporting period for gas being mid-May to mid-May, rather than the calendar year for electricity. Therefore, gas data for 2019 includes records in the first four months of 2020, which will be impacted by the first lockdown period.

There is, however, more variation within certain sectors. Consumption in Hospitality and the Arts, Communities and Leisure sector grew by 24% and 16% respectively in 2021, which is similar to the rise seen for electricity for these sectors. As sectors particularly affected by the pandemic restrictions, this follows a fall of 16% and 12% in 2020. Offices saw a 3%

²⁰ ND-NEED gas consumption years are not calendar years but run from mid-May to mid-May. For example, data from 2021 is data from mid-May 2021 – mid-May 2022. A full historical breakdown of the time periods used can be found in the [Subnational consumption summary report](#) on page 16. For more information see the [methodology note of the Subnational gas consumption statistics](#) which provide the gas consumption figures in ND-NEED.

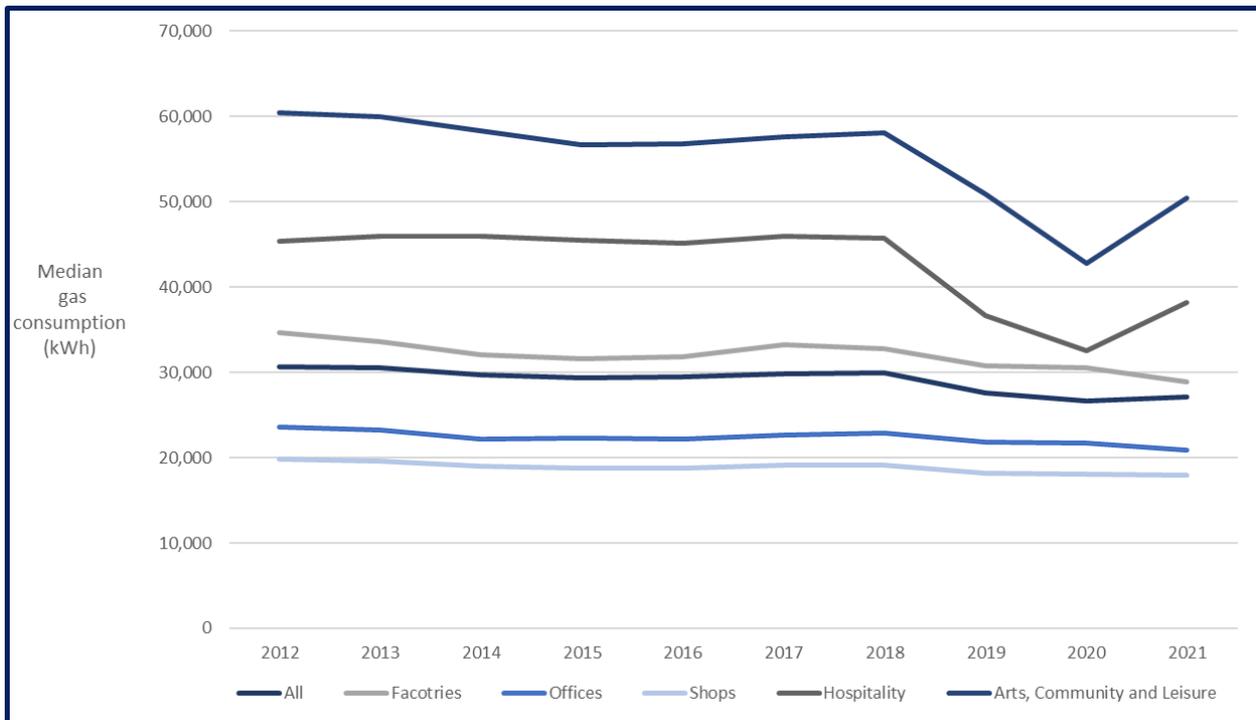
decrease in 2021 compared to 2020, as did Factories and Shops, decreasing by 2% and 1% respectively.

The overall trend is consistent with the Sub-national consumption statistics, which also showed a 1% fall in 2021.

Median gas consumption (Figure 35) shows a similar trend to electricity consumption with evidence of a slight decrease in median gas consumption in 2019 and 2020 (8% and 4%, respectively) before increasing again by 2% in 2021. This trend is also seen in the [Subnational gas consumption data](#). The main drivers of this trend are the Arts, Community and Leisure and Hospitality sectors, experiencing an increase of 18% and 17% respectively in 2021. In comparison to the rest of building uses (excluding the “Other” category), whose median gas consumption fell between 2020 and 2021. Therefore, the trends are not as consistent across all sectors for gas as for electricity.

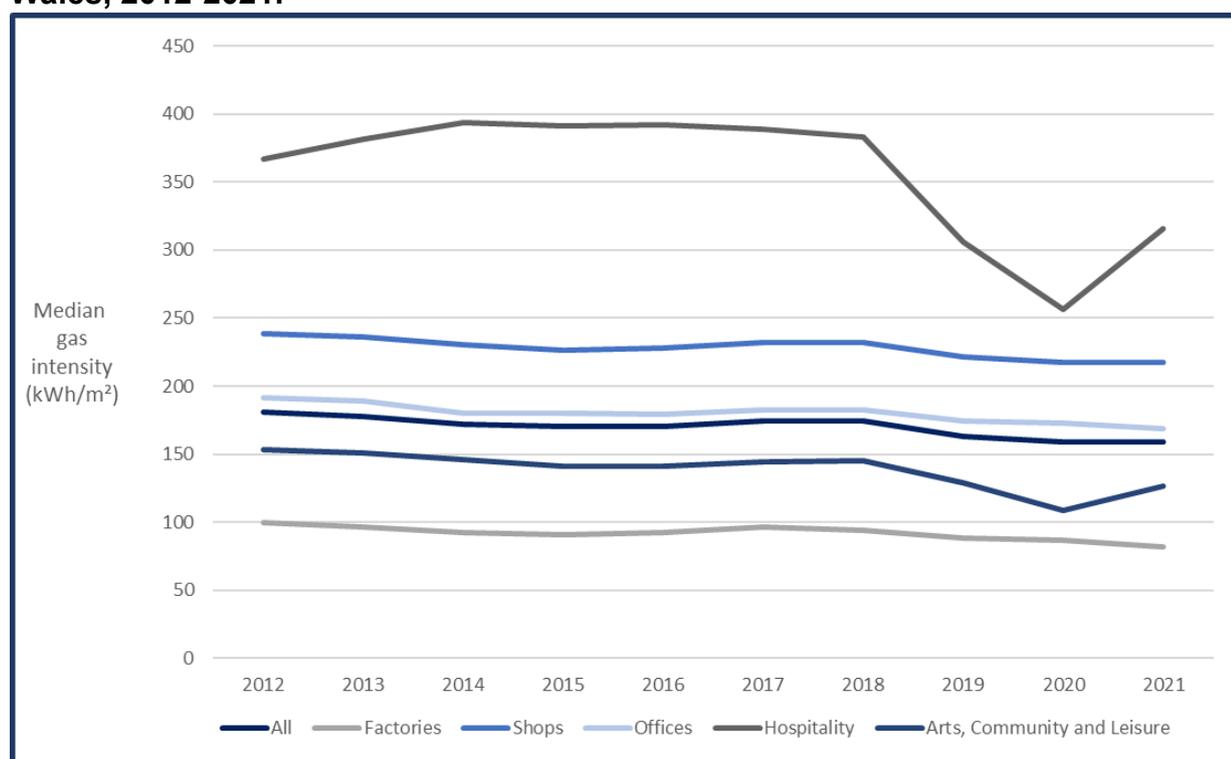
Note, the median gas consumption in non-domestic buildings in ND-NEED (around 27,000 kWh) is much lower than is seen in the Subnational gas consumption data (around 147,000 kWh). This is because the Subnational data uses a consumption threshold of 73,200 kWh to identify non-domestic buildings which means some low consuming non-domestic buildings are not included and are instead classified as domestic. Consumption from these buildings is captured in ND-NEED which leads to the lower median consumption values.

Figure 35: Median gas consumption in ND-NEED non-domestic buildings in England and Wales, 2012-2021.



Gas intensity (Figure 36) shows a similar pattern as electricity intensity, showing a gradual decrease over time, falling by 12% across the 2012 to 2020 period, though no change in 2021. Despite this, again, the variance is high across sectors; with Hospitality and Arts, Community and Leisure experiencing the largest upturns (23% and 17% respectively) compared to decreases or no change across all other sectors. Emergency services showed the most prominent decrease in median gas intensity in 2021, falling by 17%.

Figure 36: Median gas intensity in ND-NEED non-domestic buildings in England and Wales, 2012-2021.



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), 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 51% which means we know that we are missing some 'domestic-like' meters from the ND-NEED population. Understanding how many non-domestic buildings have '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 electricity consumption publication](#) to identify non-domestic meters and so to estimate non-domestic building consumption. Understanding how many non-domestic buildings have 'domestic-like' meters, therefore, informs how much non-domestic consumption is being recorded as domestic consumption in these publications.

Of the 864,000 non-domestic buildings that have been matched to their corresponding electricity meter in the ND-NEED sample in 2021, 108,000 (13%) have 'domestic-like' meters (meters in profile classes 1 or 2). These may have previously been a 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, 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'.

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.

DESNZ 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 51% 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 gas consumption publication](#) 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 meter – 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 357,000 non-domestic buildings that have been matched to their corresponding gas meter(s) in 2021. Of these 357,000 buildings, 280,000 buildings consumed ≤ 73.2 MWh of gas in 2021. That is 78% 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.

This shows that 'low-consuming' gas meters are also 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.

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 MWh.

If 17 MWh a year is used as the cut-off for non-domestic consumption, then 147,000 buildings (41% of buildings in the ND-NEED gas sample) have 'domestic-like' gas consumption in 2021 (< 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 108,000 buildings (30% of buildings in the ND-NEED gas sample) have 'domestic-like' gas

consumption in 2021 (<12 MWh). These buildings are responsible for 1 TWh of consumption.

Overlap between buildings with ‘domestic-like’ electricity meters and ‘domestic-like’ gas meters

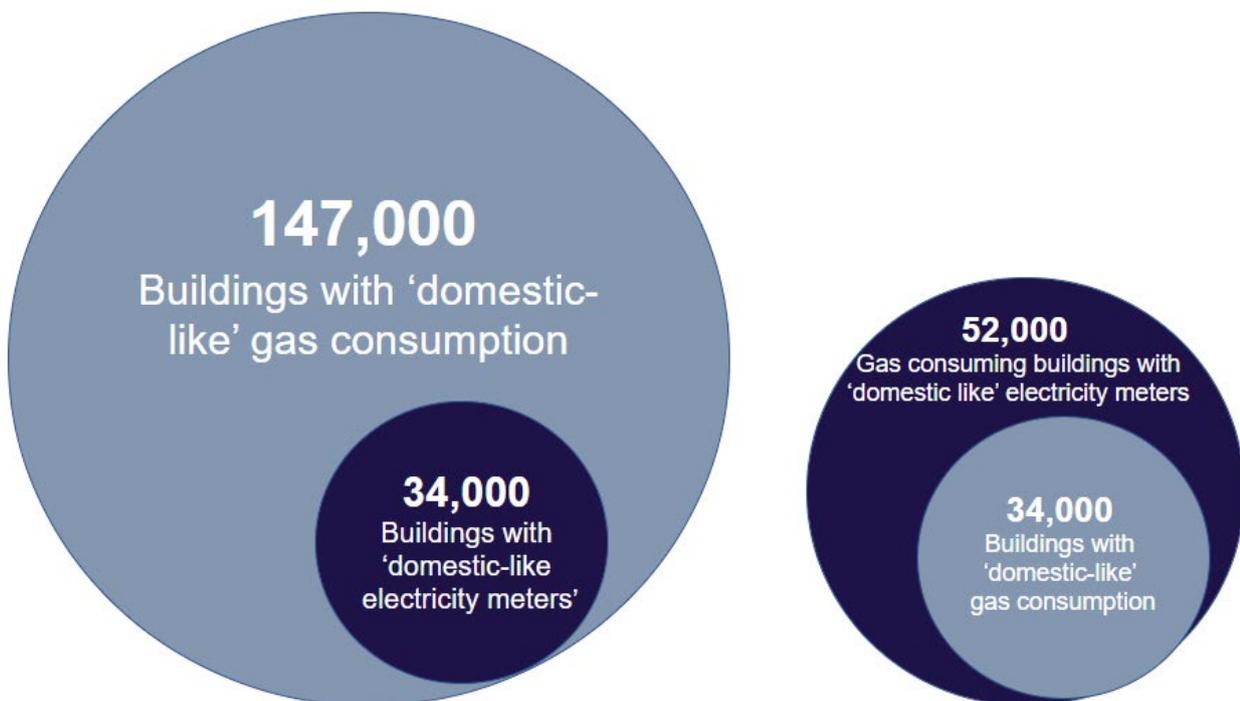
Another area we can investigate with the ND-NEED data is the extent to which the buildings with ‘domestic-like’ electricity and gas meters overlap. For this analysis a gas meter will be considered ‘domestic-like’ if it consumed less than [Ofgem’s ‘high domestic consumption’ level](#) of 17 MWh in 2021.

There are 108,000 non-domestic buildings with ‘domestic-like’ electricity meters and 147,000 non-domestic buildings with ‘domestic-like’ gas consumption in the ND-NEED sample.

As Figure 37 shows of the 147,000 non-domestic buildings with ‘domestic-like’ gas consumption, 34,000 also have ‘domestic-like’ electricity meters. That means that 24% of the buildings with ‘domestic-like’ gas consumption also have ‘domestic-like’ electricity meters.

Of the 108,000 non-domestic buildings with ‘domestic-like’ electricity meters, 52,000 also consumed gas in 2021. As Figure 37 shows, of these 52,000 buildings, 34,000 have ‘domestic-like’ gas consumption. That means that 66% of the gas consuming buildings with ‘domestic-like’ electricity meters also have ‘domestic-like’ gas consumption.

Figure 37: Overlap between buildings with ‘domestic-like’ electricity meters and ‘domestic-like’ gas consumption meters.



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 37 and 38 compare the total electricity and gas consumption figures for non-domestic buildings from three different sources (ND-NEED, BEES²¹ and ECUK²²).

In general, all three publications have similar electricity consumption figures by building use. The figures in ECUK are mostly 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 42 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 figure for Factories is much higher than the BEES consumption figure for the reason stated above.

²¹ [BEES, Overarching report tables, Figure 3.1](#)

²² [ECUK, End uses data tables, Table U5](#)

Figure 38: Non-domestic building electricity consumption from this version of ND-NEED for 2016, BEES for 2014-15²³, and ECUK for 2016²⁴

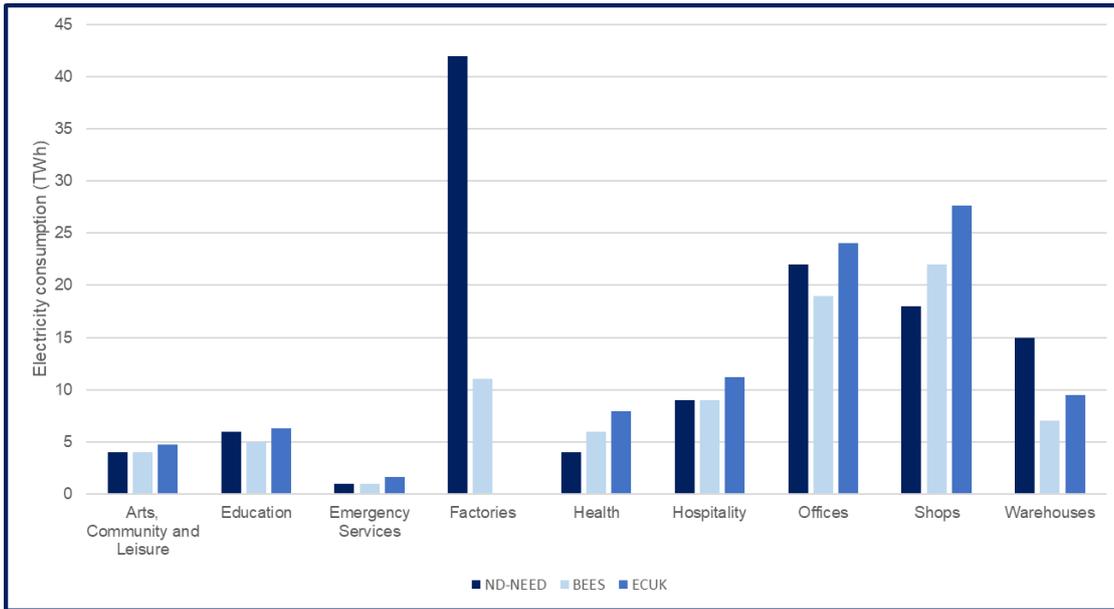
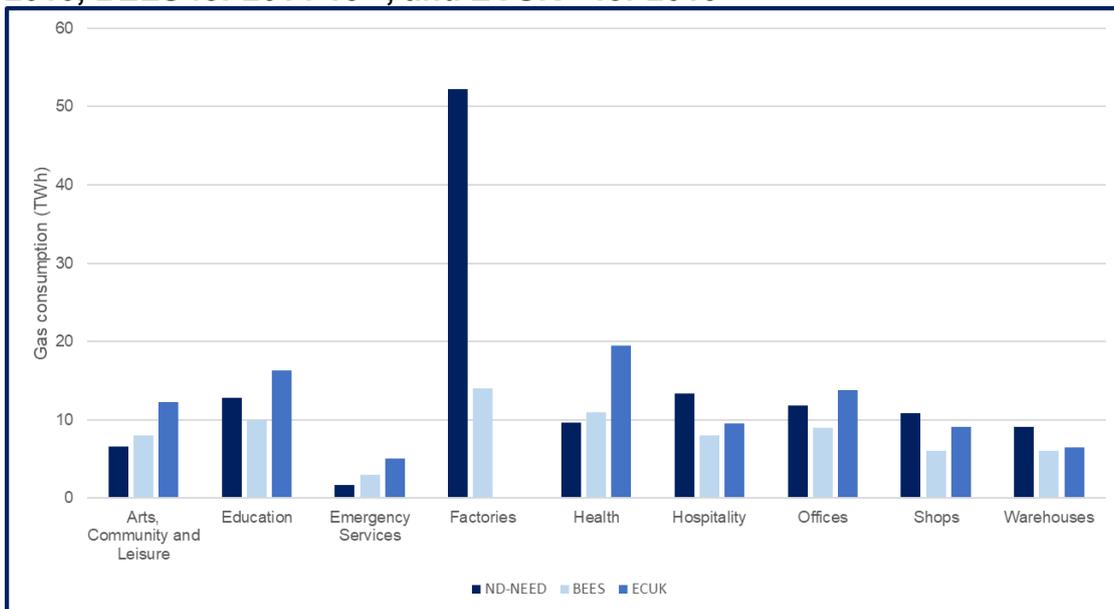


Figure 39: Non-domestic building gas consumption from this version of ND-NEED for 2016, BEES for 2014-15²⁵, and ECUK²⁶ for 2016



²³ [BEES, Overarching report tables, Figure 3.1](#). BEES does not have figures for gas so non-electric consumption is used.

²⁴ [ECUK, End uses data tables, Table U5](#).

²⁵ [BEES, Overarching report tables, Figure 3.1](#). BEES does not have figures for gas so non-electric consumption is used.

²⁶ [ECUK, End uses data tables, Table U5](#).

Consumption over time

The total electricity/gas consumption from non-domestic buildings over time is also available from other publications. Figures 40 and 41 compare the normalised change in non-domestic electricity and gas consumption over time from three different sources (ND-NEED, DUKES and Subnational).

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 three data sources show that non-domestic building electricity/gas consumption has remained broadly stable between 2012 and 2019, with some evidence of a gradual decrease for electricity consumption in that period. However, 2020, according to all three datasets, saw a significant decrease in electricity consumption, before increasing again in 2021. The trend across the three sources is not as consistent for gas, likely due to the different reporting periods (ND-NEED and subnational figures are mid-May to mid-May) where some of the pandemic reductions are not exclusively seen in the 2020 subnational figure.

Figure 40: Non-domestic building normalised electricity consumption 2021 from ND-NEED, Subnational²⁷ and DUKES²⁸.

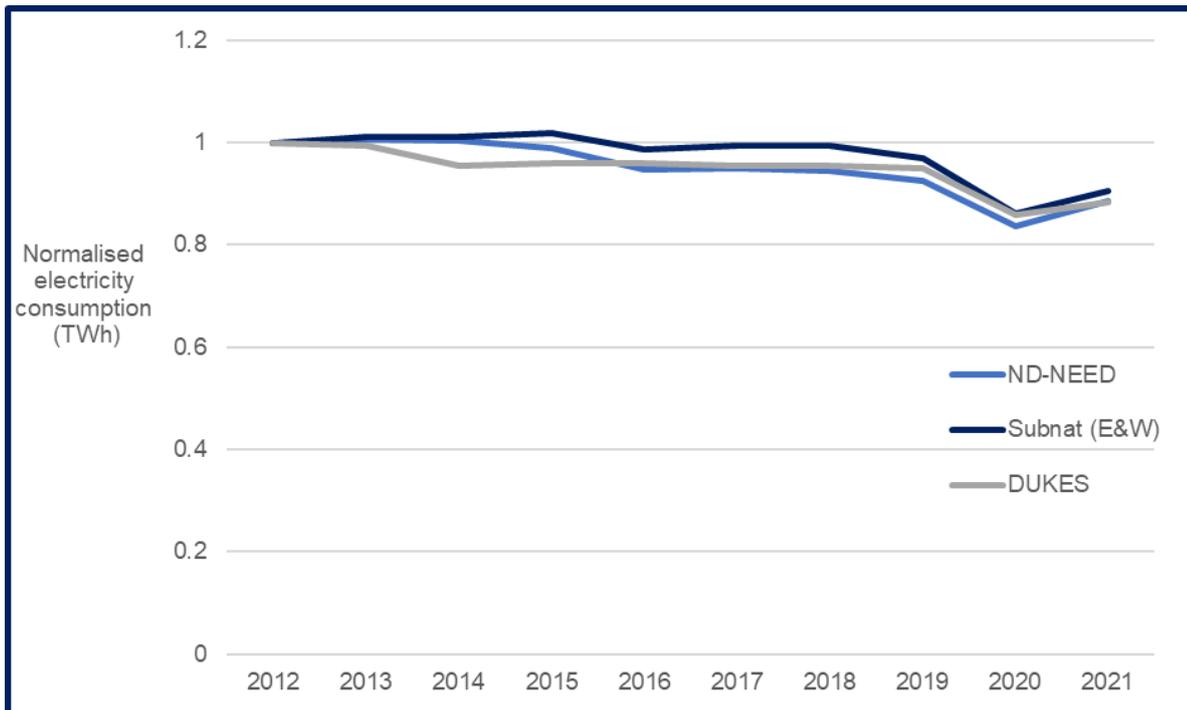
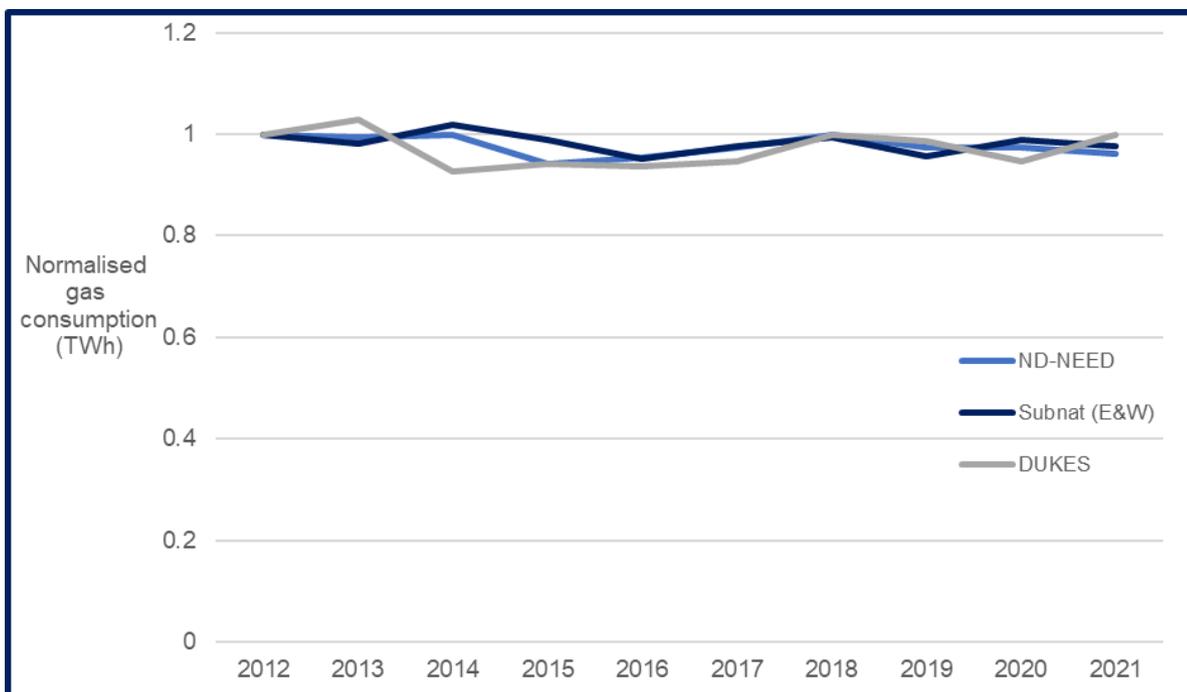


Figure 41: Non-domestic building normalised gas consumption 2021 from ND-NEED, Subnational²⁹ and DUKES³⁰.



²⁷ [Subnational electricity consumption data.](#)

²⁸ [DUKES electricity consumption.](#) Industry, commercial and public administration used as a proxy for nondomestic buildings. Electricity from the public distribution system.

²⁹ [Subnational gas consumption data.](#)

³⁰ [DUKES gas consumption.](#) Industry, commercial, public administration and misc. used as a proxy for non-domestic buildings. Total natural gas.

Main limitations of ND-NEED

The ND-NEED methodology is detailed in the accompanying [Methodology note](#). However, it should be noted that there are several aspects of ND-NEED's methodology which currently limit the insights that it can provide. Work is continually being undertaken to try to address these.

Address matching

- Incorrect matches between the non-domestic buildings data and the energy consumption data (see [Methodology](#) Annex A).
 - 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 51% match rate between the non-domestic buildings data and the energy consumption data (see [Methodology](#) Annex A).
 - Only 51% of non-domestic buildings in the ND-NEED building stock are matched to electricity consumption data
 - Only 20% are matched to gas consumption data (including non-buildings) – however, this is expected to be lower than for electricity since not all buildings use gas
- The address matching algorithm uses addresses from January 2022. 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.

Weighting

- 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 several issues with this:
 - 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 value. This adds to the uncertainty surrounding all ND-NEED consumption estimates.

Consumption: 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 2023, 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 2023 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 2021. 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 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.
 - 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

- 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 occupying the building.
- Additionally, similar to mixed building use, there are often multiple businesses occupying – or registered to – a building, or even a premises. The method takes the business with the best match rating to represent that building, which may not best represent the building as a whole.

Scope

- The definition of a non-domestic building in ND-NEED is an area to review, particularly with regards to excluded buildings, such as prisons; and included buildings, such as those within the “Other” category – particularly electricity hereditaments (which include some generating stations that may consume electricity for non-building purposes).

Accompanying tables

The following tables are available on the [department's statistics website](#):

- 1 Number and total floor area of ND-NEED non-domestic buildings by building use, end of March 2023. *(updated)*.
- 2 Number and total floor area of ND-NEED non-domestic buildings by floor area bands, end of March 2023. *(updated)*.
- 3 Number of ND-NEED non-domestic buildings by year of construction, end of March 2023. *(updated)*. Number of ND-NEED non-domestic buildings by building use and year of construction, end of March 2023 (New for ND-NEED 2023).
- 4 Number of ND-NEED non-domestic buildings by business size, end of March 2023. *(updated)*.
- 5 ND-NEED non-domestic building number and floor area by building use and building size, end of March 2023. *(updated)*.
- 6 ND-NEED non-domestic building number and floor area by building use and business size, end of March 2023. *(updated)*.
- 7 ND-NEED non-domestic building number and floor area by building size and business size, end of March 2023. *(updated)*.
- 8 ND-NEED non-domestic building electricity and gas consumption by building use, 2012-2021. *(updated)*.
- 9 ND-NEED non-domestic building median electricity and gas intensity by building use, 2012 - 2021. *(updated)*.
- 10 ND-NEED non-domestic building electricity and gas consumption by building size, 2021. *(updated)*.
- 11 ND-NEED non-domestic building median electricity and gas intensity by building size, 2021. *(updated)*.
- 12 ND-NEED non-domestic building electricity and gas consumption by business size, 2021 *(updated)*.
- 13 ND-NEED non-domestic building median electricity and gas intensity by business size, 2021. *(updated)*.
- 14 ND-NEED non-domestic building median electricity and gas consumption by building use, 2012 - 2021. *(updated)*.
- 15 Electric meter profile classes of buildings in the ND-NEED sample, 2021. *(updated)*.
- 16 Gas meter consumption of buildings in the ND-NEED sample, 2021. *(updated)*.
- 17 ND-NEED non-domestic building electricity and gas consumption by building use and building size, 2018-2021. *(updated)*.
- 18 ND-NEED non-domestic building electricity and gas consumption by building use and business size, 2018-2021. *(updated)*.
- 19 ND-NEED non-domestic building electricity and gas consumption by business size and building size, 2019-2021. *(updated)*.
- 20 Added and removed buildings, March 2022 – March 2023 *(updated)*.

Revisions policy

The [DESNZ 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@energysecurity.gov.uk.

The DESNZ 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](#).

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