



Department for  
Business, Energy  
& Industrial Strategy

# BUILDING ENERGY EFFICIENCY SURVEY

## Executive Summary



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## Executive Summary

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# Executive summary

## Introduction

The Building Energy Efficiency Survey (BEES) reports on the non-domestic building stock in England and Wales in 2014–15. Within this overall scope the stock is split into 10 sectors. These are in turn made up of 38 sub-sectors, each of which was analysed separately. The overarching report describes the results from across the 10 sectors, whilst more detail is provided in 10 separate sector-specific reports. The BEES study was designed to meet the following research objectives:

- To update understanding of how energy is used, for a snap-shot in time, across the non-domestic building stock in England and Wales in more detail than is currently available;
- To update understanding of how energy use can be reduced across the non-domestic building stock in more detail than is currently available at present;
- To understand the barriers and facilitators of energy abatement.

## Key findings

- The total stock consumed 161,060 GWh/year of total energy (of which electrical energy consumption comprised 53 per cent and non-electrical consumption 47 per cent). The five largest sectors in terms of energy consumption accounted for 71 per cent of total non-domestic energy consumption: these were offices, retail, industrial, health and hospitality.
- The most common end uses were space heating (66,940 GWh/year), internal lighting (21,260 GWh/year), catering (13,270 GWh/year) and cooled storage (for storage of food and drink) (10,790 GWh/year).
- There was 63,160 GWh/year (or 14,750 ktCO<sub>2</sub>e/year) total energy efficiency abatement potential, representing a 39 per cent reduction from current energy consumption. Over a third of the total abatement potential (22,080 GWh/year) came from measures with a private investment payback of three years or less. The bill savings from measures with a private payback of less than three years was £1.3bn a year.

- The measures with the largest potential savings were carbon & energy management, lighting replacement & control and building services instrumentation & control measures, together representing 55 per cent of the total abatement potential.
- Unsurprisingly the most commonly perceived barriers to energy efficiency were economic ones (e.g. low capital availability, investment costs and interventions not sufficiently profitable). The following were also common: organisational barriers (e.g. complex decision chains, divergent interests); barriers related to competencies (e.g. identifying the inefficiencies, implementing the interventions); and, behavioural barriers (e.g. lack of interest in energy efficiency, inertia).

## Method

The study collected data through a large sample of telephone surveys (3,690) across all ten sectors, tailored to each of the 38 sub-sectors reported here. The telephone survey respondents were randomly selected from National-level datasets for England and Wales. A smaller subset of site surveys (214) across all sub-sectors was conducted to validate the telephone surveys and give insight into barriers and facilitators of energy efficiency.

The telephone survey responses were the primary input into two models: an energy use model, tailored to each sub-sector, calculated each premises' annual energy use, broken down by end use; and an abatement model calculated the energy saving potential.

## Non-domestic stock

The non-domestic stock in England and Wales comprises 1.83 million premises, of which 1.57 million were within the scope of BEES<sup>1</sup> with a gross internal area (GIA) of 784 million m<sup>2</sup>. The total energy consumed by the non-domestic building stock is a function of the specific activities within the premises, their duration and intensity, organisational factors such as size, and energy management maturity, and the size, form, age, fabric and services of the buildings. The stock can be characterised as follows:

- Small premises are far more common in terms of frequency: 92 per cent of premises were smaller than 1,000 m<sup>2</sup>. However, large premises dominated: 68 per cent of the overall floor area was in the largest 10 per cent of buildings.

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<sup>1</sup> Known exclusions were sub-sectors deemed 'de minimis' (53 million m<sup>2</sup>) plus: Agricultural buildings/horticultural glasshouses (24 million m<sup>2</sup>), Bank/ insurance/ building society branches (4 million m<sup>2</sup>), Data centres (1 million m<sup>2</sup>) and Post Office sorting centres (1 million m<sup>2</sup>).

- Large organisations occupied 48 per cent of the total floor area compared with 44 per cent for SMEs.<sup>2</sup>
- Owner occupancy was slightly more common than renting on the whole at 58 per cent of the total floor area but was much higher in the public sector; renting was more common in the office, hospitality and storage sectors.
- Just over half (53 per cent) of the total floor area was found within premises without any energy management resource.
- 65 per cent of the stock was constructed pre-1991 with 24 per cent before 1940.
- Natural gas was used to heat 65 per cent of premises total floor area. There was significant variation in the heating fuel used for hot water across sectors with natural gas dominant in some and electricity in others.

## Energy consumption

- The total stock consumed 161,060 GWh/year of energy, of which electricity was 84,820 GWh/year (53 per cent of total) and non-electrical energy consumption was 76,240 GWh/year (47 per cent of total).
- The five largest sectors in terms of energy consumption were offices (27,620 GWh/year, 17 per cent), retail (17 per cent), industrial (16 per cent), health (11 per cent) and hospitality (11 per cent). Together these accounted for 71 per cent of total non-domestic energy consumption.
- The four largest energy end uses were space heating, internal lighting, catering and cooled storage (for storage of food and drink), which accounted for 70 per cent of total consumption. The three most common end uses of electrical energy were internal lighting (21,260 GWh/year), followed by cooled storage (10,790 GWh/year), and ICT equipment (7,910 GWh/year). The three most common non-electrical energy end uses were space heating (59,300 GWh/year), hot water (6,300 GWh/year) and catering (6,040 GWh/year).
- Electricity use was dominant in four sectors: retail (79 per cent), offices (68 per cent), storage (57 per cent) and hospitality (52 per cent). In the other six sectors, non-electrical energy dominated, especially in these three: emergency services (70 per cent), community, arts & leisure (69 per cent) and education (67 per cent).

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<sup>2</sup> The remaining floor area (9 per cent) is associated with premises where organisation size was not asked and or where respondents did not know their organisation size.

- 67 per cent of energy consumption was used to provide building services (heating, ventilation, cooling, hot water and lighting). The remaining 33 per cent of energy consumption related to sector-specific activity end uses.
- Median total annual energy intensity was highest for premises in hospitality (387kWh/m<sup>2</sup>), followed by emergency services (325 kWh/m<sup>2</sup>) and health (201 kWh/m<sup>2</sup>).
- Owner occupied premises account for over half of total energy consumption (56 per cent, 90,890 GWh/year): 80 per cent of public sector consumption and 49 per cent in the private sector. In the offices, retail and hospitality sectors energy was predominantly consumed in rented premises.
- Large enterprises accounted for 53 per cent of total energy consumption. However, in the community, arts & leisure, industrial and hospitality sectors, a majority of energy consumption is from premises occupied by Small to Medium-sized Enterprises (SMEs).

## Abatement potential

- 89,740 GWh/year (56 per cent of energy was used in premises where respondents indicated that they “actively seek new ways to reduce energy use” (active energy management). 55,090 GWh/year (34 per cent) of energy was used in premises where they “try to reduce energy use where possible, but it’s not a priority” (passive energy management) and the remainder in premises where respondents “have not considered ways to reduce energy use” (no energy management).
- In terms of resources available to manage energy, 80,830 GWh/year (50 per cent) of energy used was in premises that had specialist energy management resources available. 49,900 GWh/year (31 per cent) of energy used was in premises with non-specialist energy management resources while 23,400 GWh/year (15 per cent) was in premises which had no energy management resources.
- Organisations in the public sector and other large organisations were more likely to have active energy management policies and specialist resources to manage energy than those in the private sector.
- There was 63,160 GWh/year (or 14,750 ktCO<sub>2</sub>e/year) total abatement potential. This represents a 39 per cent reduction from current energy consumption. Almost half of this total abatement potential (22,080 GWh/year) came from measures with a private investment payback of three years or less, of which 55 per cent is from non-electrical measures. The bill savings from measures with a private payback of less than three years was £1.3bn a year.

- The measures with the largest potential savings were carbon & energy management, lighting replacement & control and building services instrumentation & control measures, together representing 55 per cent of the total abatement potential.
- This included 29,080 GWh/year of socially cost-effective abatement. This represents the energy savings that could be achieved through measures where the benefits outweigh the costs to society.

## Barriers and facilitators

- The most commonly perceived barriers to energy efficiency were economic ones (low capital availability, investment costs, hidden costs, intervention-related risks, external risks, and interventions not sufficiently profitable).
- The following barriers were also perceived to be common:
  - organisational barriers (complex decision chains, divergent interests, lack of internal control, lack of time, and low status of energy efficiency);
  - barriers related to competencies (identifying the inefficiencies, and opportunities, and implementing the interventions);
  - behavioural barriers (imperfect evaluation criteria, inertia, lack of interest in energy efficiency, lack of sharing the objectives, other priorities and split incentives).
- The most commonly cited enablers – respondents said that they believed would help them implement energy efficiency measures on site - were: improved energy management knowledge; increased availability of funding; and, greater buy in from key internal and external stakeholders.
- For major capital expenditure measures low capital availability was perceived to be the key barrier. Linked to this was also the issue that in many cases measures were not sufficiently profitable to meet internal investment requirements. Beyond financial barriers, respondents commonly cited inertia as being a major behavioural barrier to investment.
- In the hospitality, industrial, retail, education and emergency services sectors, the key barrier to energy efficiency was perceived to be that key internal stakeholders had 'other priorities' or that there were perceptions that energy efficiency conflicted with central organisational priorities. In the community, arts & leisure, hospitality, education and military sectors, complex decision chains - arising either through burdensome

external or internal approval processes – were perceived to be a major barrier to energy efficiency.

