



Department for
Business, Energy
& Industrial Strategy

Social research with non-domestic consumers in buildings in off gas grid areas of England and Wales

A study for the Department of Business, Energy and Industrial Strategy (BEIS)

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Glossary of terms

Non-domestic consumers (NDCs): Any employee who is responsible for decisions relating to energy and heating in any organisation (e.g., business, school) whose building is not used as a home.

Off gas grid buildings: Buildings in areas of England and Wales which are not connected to a mains gas supply and therefore rely on alternative heating systems.

Low carbon heating system: Heating system which uses less carbon than traditional fossil fuel heating systems (e.g., heat pumps and biomass boilers)

High carbon heating system: Heating systems which burn fossil fuels (e.g., oil or coal boiler systems)

Heat pump, ground source (GSHP), air source (ASHP) or water source heat pump (WSHP): A low carbon heating system that uses electricity to heat a building.

Solar thermal: A low carbon heating system that harnesses energy through solar panels and transfers it to thermal energy to heat a building.

Biomass: A low carbon heating system that burns biomass pellets to power a boiler to heat a building.

Heat Network: Also known as District Heating, a heating system that takes heat from a central source and delivers to a building through insulated pipes.

Combined Heat and Power System: A heating system that uses a combination of thermal energy and electricity to heat a building

Liquified petroleum gas (LPG) Boiler: A heating system that uses liquified petroleum gas as its fuel source.

Oil boiler: A heating system that uses oil as its fuel source.

Executive summary

Introduction

The greenhouse gas emissions associated with heating domestic and non-domestic buildings (excluding industry) were responsible for 20% of the UK's emissions in 2019.¹ The Government's Clean Growth Strategy² and Ten Point Plan for a Green Industrial Revolution³ stress the importance of cutting emissions from heating to meet the UK's legally binding climate change commitments, but also identifies this area as an opportunity to improve air quality, create jobs and support economic growth.

A key government policy is to “phase out the installation of high carbon forms of fossil fuel heating in new and existing buildings off the gas grid during the 2020s, starting with new build properties”. There are approximately 1.65 million non-domestic buildings in England and Wales⁴. Of these approximately 280,000 are in areas not connected to the gas grid⁵, and many of these use either oil, liquified petroleum gas (LPG), or coal powered heating systems to heat their buildings. The phasing out of fossil fuel installations in non-domestic buildings will therefore require a significant increase in the deployment of low carbon heating solutions, particularly heat pumps. BEIS wishes to develop the evidence-base around the impacts and challenges of heat decarbonisation for non-domestic consumers (NDCs) off the gas grid. This research examines the impact of decarbonising heating in off gas grid NDCs' buildings, and their attitudes towards heat decarbonisation, particularly how changes can best be supported by government policy and incentives.

This research was conducted in tandem with a similar, complementary project examining the [impact of policy on off the gas grid installers](#).

Research aims and objectives

This research investigates the impact of the future transition away from high carbon fossil fuel heating systems, on NDCs who are not connected to the gas grid in England and Wales. It

¹ Department for Business, Energy & Industrial Strategy (2021), Final UK greenhouse gas emissions national statistics 1990-2019, emissions categories included: 'Commercial and miscellaneous combustion and electricity', 'Public' and 'Residential' <https://www.gov.uk/government/statistics/final-uk-greenhouse-gas-emissions-national-statistics-1990-to-2019>

² HM Government (2018), Clean Growth Strategy https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/700496/clean-growth-strategy-correction-april-2018.pdf

³ HM Government (2020), Ten Point Plan for a Green Industrial Revolution <https://www.gov.uk/government/publications/the-ten-point-plan-for-a-green-industrial-revolution>

⁴ Department for Business, Energy & Industrial Strategy (2020), Non-Domestic National Energy Efficiency Data-Framework 2020: geographical annex data tables <https://www.gov.uk/government/statistics/non-domestic-national-energy-efficiency-data-framework-nd-need-2020>

⁵ Department for Business, Energy & Industrial Strategy (2020), Non-Domestic National Energy Efficiency Data-Framework 2020: geographical annex data tables <https://www.gov.uk/government/statistics/non-domestic-national-energy-efficiency-data-framework-nd-need-2020>

also explores how government policy could enable future changes. The specific research questions were:

- How are non-domestic consumers, who are not connected to the gas grid going to be affected by moving away from conventional heating to modern low carbon heating solutions?
- What are the attitudes of non-domestic consumers about these changes?
- What options for support mechanisms can assist with the uptake of low carbon heating systems in off gas grid buildings?
- How would stakeholders respond to the ending of installing fossil fuel heating systems in new build non-domestic properties from 2025?

Methodology

The study comprised three phases:

- A literature review.
- A quantitative telephone survey with 300 non-domestic consumers conducted between January 2020 and March 2020.
- In-depth qualitative telephone interviews with 20 non-domestic consumers conducted between August 2020 and October 2020⁶.

Non-domestic buildings are defined as buildings which are not used as homes. Therefore, these buildings are diverse in size and structure and include commercial and public premises. For this research, non-domestic consumers were defined as employees who are responsible for decisions relating to energy and heating in any organisation whose building is not used as a home and is not connected to the gas grid.

Respondents were recruited by targeting NDCs registered in postcode areas which are not connected to the gas grid. Impact acquired from Xoserve⁷, a full list of postcodes in Great Britain, where there is no record of a gas connection by either large or small gas transporter. This list was then reduced to only cover England and Wales and sent to the sample provider Experian⁸, who were able to provide contact numbers for over 6,000 NDCs who had a building listed in any of these postcodes.

All respondents were screened against the following eligibility criteria:

⁶ The quantitative phase was conducted before Covid-19 lockdown measures were implemented on 23rd March 2020. Therefore, it is possible NDCs' views changed between the survey and interviews.

⁷ <https://www.xoserve.com/media/2687/off-gas-postcodes-v2.xlsx>

⁸ <https://www.experian.co.uk/business-express/marketing-data-lists/>

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- Having responsibility for decisions relating to their organisation's energy usage and heating at the address.
 - Having sufficient knowledge about their organisation's energy usage and heating at the address to be able to answer questions about this.
 - Their organisation's premises did not have access to the gas grid.
 - Their organisation's premises are separate premises to their, or someone else's home address, i.e., the building is not used for domestic purposes.

The qualitative interviews were conducted amongst a subgroup of the quantitative survey respondents who agreed to participate in further research.

Results

A summary of the key findings from the research is outlined below. Data from the surveys and interviews with NDCs are discussed together and are structured around key themes which emerged from analysis.

Non-domestic consumers and their current heating systems

Heating systems installed currently

Half (48%) of the NDCs surveyed used a form of electric heating on their premises whilst 30% had an oil boiler and 12% had an LPG boiler. The NDCs interviewed suggested they do not pay much attention to their heating systems as long as they perform well and do not require frequent maintenance. They appreciated the need to keep their staff warm, especially in the colder months, and as long as their heating system was able to do that, they were generally happy. The NDCs interviewed suggested they would typically install a new system for one of three reasons, and cost would often be the deciding factor in determining which system to go for. The three reasons were as follows:

- Building a new premises or extending current premises.
- Necessity (for example when their current boiler breaks down and needs replacing).
- Desire to decarbonise the organisation.

Satisfaction with current system

The key attributes NDCs sought in a system were cost-effectiveness, good performance and low maintenance requirements. Only 5% of NDCs surveyed had a heat pump installed, but for those that did, the majority (79%) were satisfied with it, which was higher than for those with an oil boiler (67%) but lower than for those with an LPG boiler (86%). Those that had heat pumps installed felt they delivered on the key attributes. Those for whom being 'low carbon' was a key driver in their decision-making for which system to install, tended to have the best experiences with their low carbon system. They were most likely to have conducted extensive research into

the most suitable systems, exploring financing options and identifying suitable installers, prior to going ahead with the installation.

NDCs' awareness and attitudes towards low carbon heating

Awareness of low carbon heating technology

Data from both the quantitative survey and qualitative interviews showed that NDCs had a reasonable level of awareness of low carbon heating technologies. 61% of NDCs surveyed suggested they knew a little or a lot about low carbon heating systems (21% reported knowing a lot). A further 34% said they were aware of them but did not really know what they are. These results suggest awareness is higher amongst NDCs surveyed than domestic customers, as the results of the BEIS Public Attitudes Tracker: Wave 32⁹ showed 33% of domestic customers had some knowledge of renewable heating systems.

The majority of the NDCs interviewed had heard of solar thermal heating, heat pumps and biomass boilers. In this instance, however, few NDCs had any practical knowledge of how they worked or whether they would be suitable for their premises unless they had already installed low carbon heating.

Likelihood of installing a low carbon heating technology if current heating system fails

NDCs surveyed were divided on how likely they would be to install a low carbon heating system in the future. 33% stated they would be likely to consider installing a low carbon heating technology if their current system failed, whilst 45% suggested they were unlikely to do so.

The most cited reason (71%) for considering the installation of a low carbon heating system was to help the environment. Cost continued to be an important factor for many NDCs decision making, with 57% of those considering installing a low carbon system indicating saving money on their energy bills was one reason for this.

The most common reasons for NDC's stating they were not considering the installation of a low carbon heating system were cost, with 55% suggesting low carbon systems were too costly, followed by the NDC not having enough information or not knowing enough about low carbon heating (15%). A number of NDCs interviewed felt that their buildings' low energy efficiency (for example, poor insulation and single glazed windows) meant that a low carbon heating system would be unsuitable for their building.

Lack of understanding of low carbon heating was addressed specifically in the qualitative interviews and there are potential misconceptions that need to be addressed. Some NDCs who were aware of heat pumps were only aware of ground source heat pumps, and they immediately assumed they would not have the space for one. Others questioned the real impact on their energy bills once a heat pump was installed, as some assumed they would

⁹ BEIS Public Attitudes Tracker: Wave 32 (2020) <https://www.gov.uk/government/statistics/beis-public-attitudes-tracker-wave-32>

increase whereas others suggested they would expect them to decrease. They were also unclear why heat pumps driven by electricity were lower carbon than the latest, highly efficient electric heaters.

The final concern among the NDCs interviewed was around performance and effectiveness. Some NDCs were concerned that installers might overpromise on the reliability and performance of new technologies to win the business. Solutions suggested by NDCs included having access to case studies and testimonials from other NDCs and reviews being published of different brands of heat pumps by trusted experts. An industry backed upgrade scheme would also provide reassurance to NDCs that they could easily upgrade if technology advanced quickly after they purchased a heat pump.

Phasing out fossil fuel heating systems in non-domestic buildings

Awareness of government plans to phase out fossil fuel heating in buildings off the gas grid

The NDCs surveyed were fairly evenly divided in terms of awareness of the Government's commitment to phase out fossil fuel heating in off gas grid buildings, with 53% either fully or generally aware and 47% unaware. NDCs were then asked what impact they thought this legislation would have on their business: 63% expected it would have no impact, 22% thought it would have a negative impact and 11% thought the legislation would have a positive impact.

Opinions on the effectiveness of different government measures to encourage a switch to low carbon heating systems

When asked to consider what measures the Government could introduce to encourage NDCs like their own to change to low carbon heating systems, the most popular was action which would result in lower energy bills following installation. 87% of NDC's surveyed suggested this would be either very or fairly effective. Measures to increase the installation or running costs of fossil fuel heating systems were generally considered less effective, although 76% thought an outright ban of such systems by 2030 would be effective.

All NDCs interviewed supported the Government's ambition to reduce carbon emissions, although awareness of steps already taken was low. There were suggestions that the Government needs to be measured in its strategy and not expect too much from businesses straight away. Explaining the Government's commitment to phasing out fossil fuel systems off the gas grid caused concern for some NDCs, as Covid-19 has affected their finances. They would expect and appreciate support from the Government in helping them phase out fossil fuel heating in their buildings, rather than solely legislative measures requiring them to make changes.

Increasing awareness of low carbon heating systems

This research identified NDCs' lack of awareness of low carbon heating systems as a key barrier to uptake. NDCs interviewed generally felt that a two-pronged approach would be the most effective way of raising awareness of low carbon heating. First, a large-scale, national communication campaign targeting the general population using a variety of media channels,

including TV, radio and social media to create an impact and get key messages across. Second, localised and personalised communications to explain the detail of the plans and recommend suitable technologies for different types of organisations.

Some NDCs interviewed would prefer that commercial advice does not come directly from the Government, while others were wary of local trade bodies and tradespeople being impartial. Consistency of messaging, timescales, and support available is important across all communications. Specific channels for such messages included:

- TV and radio advertising.
- Brochures/leaflets clearly explaining the pros and cons of different heating technologies.
- Letters sent to businesses and landlords explaining why it is necessary for them to take action and setting out the support available.
- A website with information and the functionality to provide personalised recommendations based on the size, location, premises type and environmental attitudes of the business.

Increasing awareness of government ambitions for low carbon heating

The national media was again seen as having a key role to play in raising awareness of the commitment to phase out fossil fuel heating in off gas grid buildings, and a few were already aware of the plans from this communication channel. NDCs also felt that the media could help with presenting the commitment as a positive ambition. There were suggestions that the regulator, Ofgem should be involved, as it was felt this would give the plans additional credibility.

Tradespeople were highlighted as potentially playing an important role in encouraging organisations to take action. Whilst some were wary of an increase in companies trying to sell their products and services once a government announcement is made, most interviewed said they would trust the advice of a tradesperson they knew.

Time needed to make the change

The planned timetable for phasing out high carbon heating in off gas grid areas during the 2020s (i.e. in the next nine years) was seen as realistic by most that were interviewed, as long as exceptions are made, or certain buildings and areas are given extra support. These exceptions included older buildings that may be listed or require prohibitively costly work to change the type of heating systems.

NDCs interviewed suggested that they would like at least five years' notice of the phase out, with regular reinforcement and reminders during that time. A common concern raised in the interviews was that if they were to invest in a new high carbon heating system in the next few years, they may be required to change it soon afterwards. Therefore, interviewees highlighted the importance of having sufficient notice of what future regulations will be, to inform what heating systems they next invest in.

Some medium and large NDCs interviewed had a planned schedule for upgrading or replacing their heating system and were putting money aside for this in advance. Other NDCs suggested they would only invest in a new heating system when it was no longer cost-effective to maintain their current system (for example if the cost of a one-off or ongoing repair was higher than the cost of replacement). These NDCs suggested they would need to source additional funding (either from internal budgets or external sources) at the time a replacement system was needed.

Support mechanisms to overcome financial barriers

NDCs surveyed believed a range of measures would be effective to increase the uptake of low carbon heating systems, including lower energy bills for those with low carbon heating systems, a boiler scrappage scheme and loans to help make low carbon technology affordable. Evidence from the interviews with NDCs supported this: the majority wanted a financial incentive to move to low carbon heating; they expressed a strong preference for a grant, free installation offer, subsidised electricity tariff, scrappage scheme, or tax break, but would accept a loan if there was no other option.

If loans were to be used as an incentive, the NDCs interviewed stated they would expect a low interest rate over a 5-10 year repayment period. The overall cost of the loan would be considered when making an investment decision. It is important to these NDCs that the repayment period and the return on investment (ROI) period does not exceed the likely lifespan of the equipment. Most of the NDCs interviewed were unaware of the life expectancy of a heat pump, with the majority feeling it would last around ten years, whilst the CCC suggest that the average life expectancy of a heat pump would be 18 years¹⁰.

¹⁰A report for the Committee on Climate Change, Currie & Brown (2019) - The costs and benefits of tighter standards for new buildings <https://www.theccc.org.uk/wp-content/uploads/2019/07/The-costs-and-benefits-of-tighter-standards-for-new-buildings-Currie-Brown-and-AECOM.pdf>

Introduction and background

This research provides new, robust evidence about the impacts of a transition to low carbon heating technologies on non-domestic customers off the gas grid.

This research project was conducted amongst two sets of respondents, heating installers and non-domestic consumers. This document focusses solely on the findings from non-domestic consumers. A separate report has been published [summarising the findings from heating installers](#).

Background

The UK has committed to reaching net zero carbon emissions by 2050. In order to reach these decarbonisation goals, a transition towards low carbon energy and heat are required.

The greenhouse gas emissions associated with heating domestic and non-domestic buildings (excluding industry) were responsible for 20% of the UK's emissions in 2019¹¹. The Government's Clean Growth Strategy¹² and Ten Point Plan for a Green Industrial Revolution¹³ stress the importance of cutting emissions from heating to meet the UK's legally binding climate change commitments, but also identifies this area as an opportunity to improve air quality, create jobs and support economic growth.

A key government policy is to phase out the installation of high carbon forms of fossil fuel heating in new and existing buildings off the gas grid during the 2020s. This will require a significant increase in the deployment of low-carbon heating solutions, particularly heat pumps, in non-domestic buildings off the gas grid. To support this, BEIS wishes to develop the evidence-base around the impacts and challenges of heat decarbonisation for non-domestic consumers (NDCs) off the gas grid. This research examines the impact of decarbonising heating in NDCs' buildings, and their attitudes towards heat decarbonisation, particularly how changes can best be supported by government policy and incentives.

¹¹ Department for Business, Energy & Industrial Strategy (2021), Final UK greenhouse gas emissions national statistics 1990-2019, emissions categories included: 'Commercial and miscellaneous combustion and electricity', 'Public' and 'Residential' <https://www.gov.uk/government/statistics/final-uk-greenhouse-gas-emissions-national-statistics-1990-to-2019>

¹² HM Government (2018), Clean Growth Strategy https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/700496/clean-growth-strategy-correction-april-2018.pdf

¹³ HM Government (2020), Ten Point Plan for a Green Industrial Revolution <https://www.gov.uk/government/publications/the-ten-point-plan-for-a-green-industrial-revolution>

Low carbon heating options

Fossil fuel heating accounts for the majority of energy used for heating systems in the UK. There are approximately 1.65 million non-domestic buildings in England and Wales¹⁴. Of these approximately 280,000 are in areas not connected to the gas grid¹⁵, and many of these use either oil, liquified petroleum gas (LPG), or coal powered heating systems to heat their buildings.

The main types of low-carbon heating and hot water solutions available for off gas grid buildings are:

- Heat pumps, ground source (GSHP), air source (ASHP), or water source (WSHP): GSHPs require land adjacent to the building to lay the ground array, which can make them an appropriate solution in less-dense rural areas. ASHPs can often be more suitable for customers as they tend to be cheaper and require less disruption at installation, therefore are more commonly used in the UK¹⁶. WSHP move heat from a source of water, such as a river or stream, meaning they are likely to play a fairly niche role. Heat pumps can be either hydronic i.e., they transfer heat via hot water in radiators or underfloor heating, or air output i.e., they transfer heat via warm air in air ducts. Air output heat pumps are often favoured in non-domestic properties where hot water demand is low as they can also provide cooling. Heat pumps are relatively expensive to install in comparison to gas central heating or high carbon alternatives.
- Solar thermal: the characteristics of off gas grid building stock and availability of space near buildings in off gas grid areas may make this solution more practical than in denser areas. However, in most cases, won't be able to provide the entire hot water supply.
- Bioenergy boilers: These can be fuelled by solid biomass, bioliquids/bioLPG or biopropane. An advantage of these is that they do not rely on an electricity supply and can be retrofitted into an existing high temperature heating system with minimal disruption.
- Other electrical systems: Electric panel heaters, storage heaters, or infrared heaters can be an effective solution in some situations, but are generally less efficient than other electrical heating systems, like ASHPs and GSHPs.

Many of these solutions involve heating being used differently from typical customer usage today, at different levels and for different periods of time. They deliver the greatest benefit to customers when the heat demand of buildings is also minimised through improved thermal efficiency. Some of these systems will work most efficiently when used with underfloor heating or high efficiency radiators which are more easily installed in new-builds than being retrofitted

¹⁴ Department for Business, Energy & Industrial Strategy (2020), - Non-domestic National Energy Efficiency Data-Framework <https://www.gov.uk/government/collections/non-domestic-national-energy-efficiency-data-framework-nd-need>

¹⁵ Department for Business, Energy & Industrial Strategy (2020), Non-Domestic National Energy Efficiency Data-Framework 2020: geographical annex data tables <https://www.gov.uk/government/statistics/non-domestic-national-energy-efficiency-data-framework-nd-need-2020>

¹⁶ Statista (2020), Annual amount of heat pumps in operation in the United Kingdom (UK) from 2013 to 2019, <https://www.statista.com/statistics/740491/heat-pumps-in-operation-uk/>

to existing stock. In addition, buildings off the gas grid are extremely diverse in their construction method and materials, age and location. No single type of heating and hot water system will suit all of them, so it is essential that a range of low carbon solutions be made available for retrofitting or installation at new premises, to ensure that each can benefit from an appropriate solution. Some solutions will be more appropriate in particular regions, depending on the dominant building stock in that area, and therefore a regional approach to installation may be considered beneficial.

The transition from existing, high carbon heating methods to any of these solutions may present a number of barriers. These include:

- High up-front costs in purchasing and installing low carbon heating compared with higher carbon systems, although research¹⁷ suggests overall costs are likely to reduce in time.
- For new buildings, the developer bears the installation cost of the system whilst the tenant or purchaser bears the ongoing running cost. Developers are therefore financially motivated to install cheaper systems.
- Both heating engineers and customers are more familiar with existing methods, how to install and operate them, and the costs and availability of the fuels involved.
- The method of installing most alternative heat systems can require a different skill set¹⁸ from those used for traditional systems. Heating companies and individual engineers may be sceptical about the benefits of investing in these skills for a small market. Compounding this issue, the heating engineering market as a whole is facing a skills shortage, as the average age of Gas Safe registered professionals is now around 55¹⁹, meaning that much of the workforce may be retiring within the next 10 years.

¹⁷ Department of Energy & Climate Change (2016), Potential Cost Reductions for Air Source Heat Pumps, https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/498962/150113_Delta-ee_Final_ASHP_report_DECC.pdf

¹⁸ The Heat Pump Association (2020), Building the Installer Base for Net Zero Heating, https://www.heatpumps.org.uk/wp-content/uploads/2020/06/Building-the-Installer-Base-for-Net-Zero-Heating_02.06.pdf

¹⁹ GasSafe Register (2016), The UK gas industry considers its past, present and future, <https://www.gassaferegister.co.uk/media/2490/decade-review.pdf>

Research aims and objectives

Non-domestic consumers (NDCs) (i.e., businesses and other organisations) who are not connected to the gas grid are likely to be affected by a future transition that phases out the use of high carbon fossil fuels for heating buildings off the gas grid.

This research aims to develop the evidence base of how NDCs located off the gas grid will be affected by the future transition to low carbon heating systems in their buildings. This research also seeks to understand what policies and support measures can assist NDCs with this transition. There is some existing research that has been conducted with NDCs about the change to low carbon technologies, but to-date, this is fairly limited. Wave 29 of the Public Attitudes Tracker²⁰ showed varying levels of awareness for renewable heat technologies and low levels of awareness of whether they would be beneficial to consumers. In addition, the Renewable Heat Incentive Evaluation²¹ provided further detail into motivations for the transitioning to renewable heating systems, but a knowledge gap remains regarding the impact it will have on the off gas grid sector, and in particular how it will impact consumers and installers.

Four research questions focussing on the impacts of the future heat transition on NDCs were developed to address key evidence gaps and to inform understanding of measures that may be required to support NDCs with the future transition;

- How are non-domestic consumers, who are not connected to the gas grid going to be affected by moving away from conventional heating to modern low carbon heating solutions?
- What are the attitudes of non-domestic consumers about these changes?
- What options for support mechanisms to assist with the uptake of low carbon heating systems in off gas grid buildings are appropriate?
- How would stakeholders respond to the ending of installing fossil fuel heating systems in new build non-domestic properties from 2025?

²⁰ BEIS Public Attitudes Tracker, Wave 29, 2019, https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/800429/BEIS_Public_Attitudes_Tracker_-_Wave_29_-_key_findings.pdf

²¹ Renewable Heat Incentive evaluation, 2020, <https://www.gov.uk/government/collections/renewable-heat-incentive-evaluation#non-domestic-rhi-evaluation-reports>

Methodology

The research was conducted by Impact Research Ltd and comprised of three phases.

Phase 1: Literature review

The project began with a literature review, undertaken in October 2019. This reviewed a combination of government issued literature, academic reports, and commercially produced materials covering the following topics:

- Low carbon heating solutions.
- Support mechanisms available to encourage uptake of low carbon heating systems.
- Energy consumption and heating systems outside the UK.
- Certification and qualifications for new-build commercial properties.
- Refining definitions for the target sample.
- Barriers to convert to low carbon heating (for customers and installers).
- Example initiatives of low carbon heating.

This review covered published work already conducted by BEIS, along with a variety of other sources. These materials were found using Google searches of the above terms and through searches on the 'Research and Statistics' section of the BEIS website²².

There were six government research projects referenced, along with thirteen external sources. The findings from the literature review informed the design and content of the primary research conducted in Phases 2 and 3.

Details of the literature review can be found in [Annex A](#).

Phase 2: Quantitative measurement

The first phase of the primary research was a quantitative telephone survey conducted with 300 non-domestic consumers in off gas grid areas of England and Wales.

For this research NDCs were defined as employees who were responsible for decisions relating to energy and heating in any organisation whose building is not used as a home and is not connected to the gas grid.

²² <https://www.gov.uk/search/research-and-statistics?organisations%5B%5D=department-for-business-energy-and-industrial-strategy&parent=department-for-business-energy-and-industrial-strategy>

Respondents were recruited by targeting NDCs registered in postcode areas which are not connected to the gas grid. Impact acquired from Xoserve²³ a full list of postcodes in Great Britain where there is no record of a gas connection by either large or small gas transporter. This list was then reduced to only cover England and Wales and sent to the sample provider Experian²⁴, who were able to provide contact numbers for over 6000 NDCs who had a building listed in any of these postcode areas. The sample file also contained contact name, job title, trading name at location, full address, an approximation of company size and industry sector. The contact number for each NDC was dialled at least once²⁵, and if the phone was answered, the respondent was screened against the following eligibility criteria:

- Having responsibility for decisions relating to their organisation's energy usage and heating at the address.
- Having sufficient knowledge about their organisation's energy usage and heating at the address to be able to answer questions about this.
- Their organisation's premises did not have access to the gas grid.
- Their organisation's premises are separate premises to their, or someone else's home address, i.e., the building is not used for domestic purposes.

Hard quotas were not set, but numbers of completed interviews were monitored throughout the fieldwork to ensure there was some representation of different organisation sizes, types and locations. If there was under representation of a certain firmographic (e.g., company size or location), NDCs in those categories were targeted above those in others.

The full details of the contact approach and a breakdown of the final sample are given in [Annex B](#) and [Annex C](#).

The survey was conducted by telephone between January 2020 and March 2020. Surveys were completed before the national lockdown measures in response to the COVID-19 pandemic were implemented on 23rd March 2020.

The questionnaires covered the following topics.

- Awareness and support for decarbonisation of heating for off gas grid buildings.
- Decision drivers when meeting heating needs.
- Identification of barriers and support needed.

Each survey took approximately 15 minutes to complete. The questionnaire is included in [Annex D](#).

²³ https://www.xoserve.com/media/2687/off_gas-postcodes-v2.xlsx

²⁴ <https://www.experian.co.uk/business-express/marketing-data-lists/>

²⁵ Respondents were contacted a maximum of ten times without a contact outcome, before the sample was considered exhausted, in line with Market Research Society guidance

Phase 3: Qualitative understanding

In this phase in-depth qualitative telephone interviews were conducted with 20 NDCs.

Participants were drawn from respondents from Phase 2 who had consented to be re-contacted and invited to take part in Phase 3. The majority of those interviewed were employees in senior positions in their organisations, such as owners, directors or general managers. A purposive sampling approach was adopted, recruiting NDCs based on certain characteristics, which were identified as being most likely to provide relevant data to answer the research questions and inform policy. Minimum target quotas were set for each characteristic of interest and are shown below, alongside the actual numbers interviewed:

NDC characteristic		Minimum target number of interviewees per characteristic	Actual number of interviewees per characteristic
Tenure	Building owner	6	14
	Building renter	6	6
Heating system	Have installed heat pump in their building	6	4 ²⁶
	Have installed a high carbon system in their building	6	6
Business size	Small	5	5
	Medium	5	9
	Large	5	6
Location	Spread across England and Wales		20
Sectors ²⁷	Spread of different sectors		20

²⁶ Due to the low number of survey respondents who had installed a heat pump and indicated they were willing to participate in the qualitative study, it was not possible to recruit 6 participants in this category.

²⁷ Schools, hospitals and some hospitality venues were excluded due to the COVID-19 pandemic

A full breakdown of the sample for Phase 3 is given in [Annex E](#).

The qualitative interviews were conducted by telephone between August and October 2020.

Once contacted, respondents were screened to ensure they still met the Phase 2 criteria and a time was arranged to complete the interview.

The topic guides covered the following areas:

- Current heating systems installed and experiences of using them
- Awareness of and attitudes towards low carbon heating systems
- Awareness of and attitudes towards government plans to phase out fossil fuel heating systems
- Barriers to uptake of low carbon heating systems
- Support measures that could help increase uptake
- Financing a new heating system

The full topic guide is shown in [Annex F](#).

The interviews lasted approximately 40 minutes and respondents were given an incentive of £30 for participating.

All interviews were recorded, with respondent consent and once completed, they were transcribed. Thematic analysis was conducted to identify key themes recurring in multiple interviews.

Limitations

Key limitations to this research relate to the sampling approach that was adopted for the survey; it was not feasible to undertake 'gold-standard' random probability sampling and the sample was limited to 300 participants. Steps were taken to ensure the sample was as robust as possible, which included setting target quotas which were monitored throughout the fieldwork period and randomly drawing numbers to dial from the sample list.

Non-response bias is likely, for example due to certain industries being more able to have the time and be willing to take part in a survey; over 50% of the sample was made up of 'offices and workshops', which is not a representative spread of NDCs across the UK.

The sample size was not sufficient to determine differences across sub-groups, such as sector type, company size, regions, tenure and heating type. Key differences in results for any of these types of NDC have been pulled out and highlighted, but these have been limited to where differences are vast.

In addition, the quantitative phase was conducted before Covid-19 lockdown measures were implemented on 23rd March 2020, whilst the qualitative interviews were conducted after the

first Covid-19 lockdown measures. Therefore, it is possible NDCs' views changed between the two periods of fieldwork.

Results

Non-domestic consumers and their current heating systems

NDCs across England and Wales participated in this research, with representation across different industry sectors, building types and sizes achieved. Please note, when organisation size is mentioned at any point in this report, it refers to building size, rather than number of employees.

Table 1 and Figure 1 show the breakdown of industry sectors that were surveyed and the heating system each NDC had installed.

Table 1: Industry sectors of NDCs surveyed

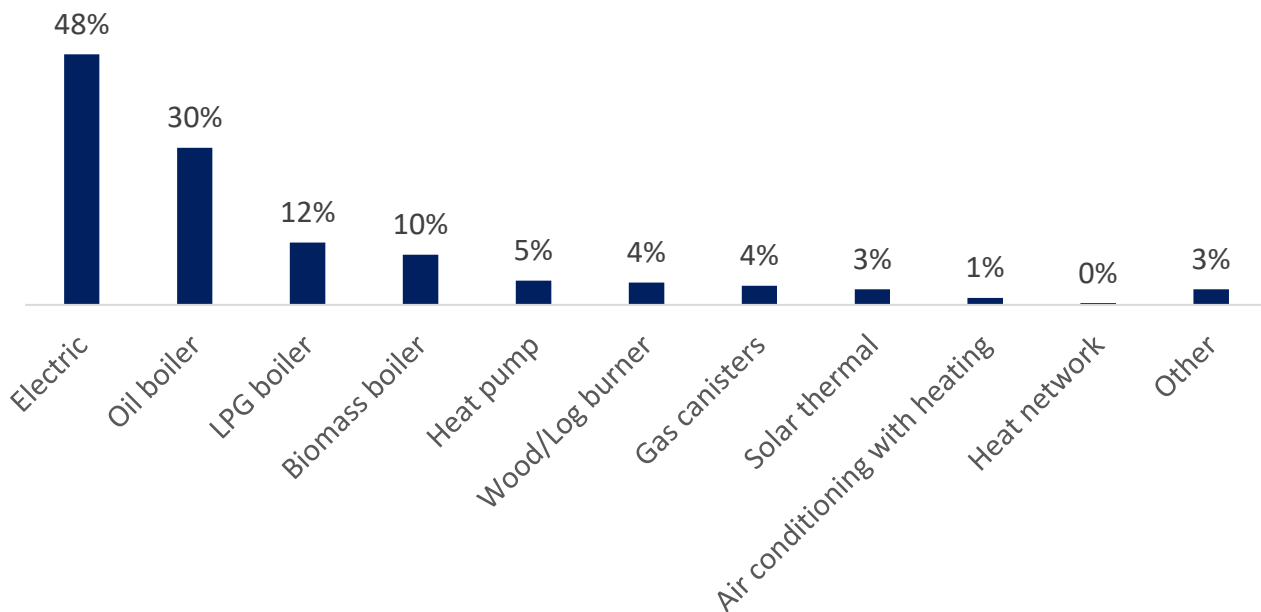
Base: All non-domestic consumers (300)

Industry type	Percentage ²⁸
Offices and workshops	54%
Industrial / Manufacturing	15%
Agricultural	15%
Storage and distribution	9%
Retail and financial	8%
Hotel	6%
Restaurant, café or takeaway	6%
Education	4%
Public assembly	3%
Healthcare	3%

²⁸ Respondents were able to select multiple responses

Figure 1: Heating systems currently installed in NDCs' buildings²⁹

Base: All non-domestic consumers (300)



Almost half (48%) of the NDCs surveyed had some form of electric heating installed on their premises, with these heating systems including storage heaters and electric radiators. The next most common heating system were oil boilers, with 30% of NDCs having one, followed by LPG (12%) and biomass boilers (10%). Only 5% of NDCs already had a heat pump installed. A fifth of NDCs (19%) had multiple heating systems installed, with the most frequent combination being oil and electric, followed by LPG and electric.

How satisfied are consumers with their current heating systems? What drives decisions around heating systems?

Heating systems were generally a low engagement topic. The NDCs interviewed suggested they do not pay much attention to them as long as they perform well and do not require frequent maintenance. Even where heating systems do not perform efficiently, improvement or replacement tended to be far down the list of priorities for NDCs. NDCs, with older buildings, and certain industries (particularly those that include warehouse or manufacturing space) were accustomed to having poor levels of heating and put it down to being “part of the job”.

“Our warehouses have fans to blow warm air in, but it’s like lighting a candle in Wembley Stadium” (Large non-domestic consumer, high carbon heating, building owner)

Many NDCs interviewed in the qualitative phase appreciated the need for their staff to be warm in colder weather, but they were often unsure how best to achieve this. The interplay of heating, insulation, building materials, double glazing and ventilation was not very well

²⁹ Respondents were able to select multiple responses. ‘Electric’ was largely a combination of electric heating, storage heaters and electric radiators. ‘Other’ included halogen heating, diesel heater and straw boilers.

understood. This makes it difficult for NDCs to decide which are the most cost-effective investments for increasing employee warmth.

NDCs interviewed looked to replace or upgrade their heating systems for one of three reasons:

- Building a new premise or extending current premises. It was suggested that heating systems are typically low priority for cashflow, therefore it is easier to pay for a new system as part of a larger building project.
- Out of necessity, for example when their heating system breaks down.
- Desire to decarbonise the organisation. Some NDCs suggested decarbonisation was important to them and they had an energy strategy in place to help reduce their carbon emissions.

Those with oil boilers interviewed suggested they appreciated the environmental need to move away from oil, but were unlikely to while running costs are low.

“A couple of years ago there was this absolutely silly spike in the cost of oil for oil boilers, that made us look at it again a bit then. But then the cost of the oil subsided... I buy oil probably about every nine to ten months or so and I think the last lot of oil cost us about, I don't know, twenty-odd pence a litre, and previous to that it was about fifty-odd pence a litre” (Medium sized non-domestic consumer, high carbon heating, building owner)

“There is no gas so it would have been propane gas which is very expensive, or electricity which again would have been expensive, so we chose to go with the oil boiler” (Medium sized non-domestic consumer, high carbon heating, building owner)

These examples suggest that future increases in the price of oil may help nudge more NDCs towards low carbon alternatives if they are cheaper to run than high carbon systems.

What are the characteristics and experiences of non-domestic customers who already have low carbon systems?

Of the NDCs surveyed in the quantitative phase, only 5% had a heat pump installed and a further 3% had installed a solar thermal system. Heat pumps were installed in NDC's buildings across a range of sectors and organisation sizes. The majority of NDCs with heat pumps (71%) were based in Southern regions. The majority (78%) of NDC's with heat pumps stated they were either very or fairly satisfied with their system, this is higher than for those with an oil boiler (67%) but lower than for those with an LPG boiler (86%). Only one NDC stated they were dissatisfied with their heat pump. Note that due to the low number of NDCs with heat pumps in this sample (14), it is not possible to draw generalisable conclusions about the characteristics and experiences associated with heat pump ownership among all NDCs.

The findings from the qualitative interviews supported the quantitative evidence, as those NDCs with low carbon systems were generally satisfied, although this did depend on the age of the system and how involved the NDC were in choosing and installing the system. The key

things NDCs were looking for in a system tended to be cost-effectiveness, performance and maintenance required. One NDC that had recently installed a heat pump themselves explained they were satisfied with both the installation and the system.

“No, we weren’t actually [disrupted by the installation], no. I mean, it’s a quite a simple process really. Yeah, and it’s quite a neat unit, it doesn’t take up a lot of room, and yeah, and it has been effective” (Medium sized non-domestic consumer, heat pump owner, building owner)

A second NDC suggested they were happy with the performance of their heat pump, but suggested that the costs of running it were slightly higher than they’d been told.

“It performs really well. We’ve no complaints about it at all. It’s not as cheap to operate as advertised, but it is very low maintenance, or has been so far, and it keeps the building really nice and warm, except in extreme weather” (Medium sized non-domestic consumer, heat pump owner, building owner)

Those for whom being ‘low carbon’ was a key driver in their decision-making for which system to install, tended to have the best experiences with their low carbon system. They were most likely to have conducted extensive research into the most suitable systems, exploring financing options and identifying suitable installers, prior to going ahead with the installation.

The least satisfied NDCs were those with legacy systems that just happen to be low carbon, rather than being low carbon by design. This includes those with air conditioning units and electric storage heaters, which were often installed as an alternative to central heating and where cost was the key driver.

NDCs interviewed with newer heat pumps and biomass boilers (in the last five years), tended to report higher levels of satisfaction with their systems than those with older low carbon systems. Most NDCs that were interviewed felt they received value for money (often helped by whichever government incentive was available at the time of installation) and now have a heating system that performs well and requires little maintenance.

A minority of NDCs interviewed installed low carbon heating systems without doing rigorous research into the most suitable system. Whilst no problems were reported with the quality or efficiency of the systems, these NDCs were less satisfied with the cost. One NDC installed a large biomass system but did not shop around. They find the monthly cost expensive although they are pleased with the performance.

“We were approached by a local company who took advantage of a government scheme. They paid for the installation as long as we continue to buy the pellets from them... During the winter months we pay £1,500 per month for the pellets which is more than we used to pay for our electric radiators.” (Large non-domestic consumer, biomass heating, building owner)

Another NDC interviewed installed a heat pump as part of a new build, but did not realise the pump could only heat water in the radiators to 50 degrees Celsius, which meant additional

underfloor heating had to be installed in order to reach the required building temperature. These misunderstandings demonstrate the importance of installers having the expertise required to correctly advise their customers and consumers having access to simple and impartial advice.

There were also NDCs that appreciate the value of ensuring their premises are maintained. This was often because of a desire to “do the right” thing or to promote their businesses green credentials. Others were also keen to maintain their premises if they had the cashflow available, though this did create a barrier for some given the difficult economic situation caused by Covid-19

“As far as the office is concerned it is the most efficient gas boiler we could get. Insulated absolutely as well as we can. Weather-stripped as well as we can. We’ve used the insulation materials are all themselves renewable.” (Medium sized non-domestic consumer, high carbon heating, building owner)

NDCs’ awareness and attitudes towards low carbon heating

Understanding the options

Data from both the quantitative survey and qualitative interviews showed that NDCs had a reasonable level of awareness of low carbon heating technologies. 60% of NDCs surveyed suggested they knew at least a little about low carbon heating systems, with 21% knowing a lot. A further 34% said they were aware of them but did not really know what they are. The remaining 6% had never heard of low carbon heating systems. These results suggest awareness is higher amongst NDCs than domestic customers, as the results of the BEIS Public Attitudes Tracker: Wave 32³⁰ showed only 33% of domestic customers either know a little or a lot about renewable heating systems.

These findings were echoed in the qualitative phase as most of the NDCs interviews had heard of solar thermal heating, heat pumps and biomass boilers. However, those interviewed who did not have a low carbon heating system in their building, had limited practical knowledge of how they worked or whether they would be suitable for their premises.

“I’m not all that knowledgeable about heat pumps to be honest with you. I’ve heard of them but I don’t have much detailed, just little knowledge of them” (Medium sized non-domestic consumer, high carbon heating, building owner)

“We didn’t look into that at all [suitability of a HP]. We looked at it for the lodge and I don’t know whether it would be, I have no idea. It potentially could be for the coach house though. I’ve no idea what the cost would be for the hall.

³⁰ BEIS Public Attitudes Tracker: Wave 32 (2020) <https://www.gov.uk/government/statistics/beis-public-attitudes-tracker-wave-32>

Presumably, you would need more than one, would you? I don't know" (Large non-domestic consumer, high carbon heating, building renter)

The best-informed NDCs interviewed tended to be those that suggested they had a strong environmental ethos in their organisation (for example those who reported having policies in place to reduce their organisations' environmental impacts).

"Yes, it's an important thing for us because we have the opportunity to make a huge difference. It's not like, you know when somebody decided to take their glasses to a recycling bin sort of putting it in the bin, we are the equivalent of ten thousand households doing that" (Large non-domestic consumer, high carbon heating, building owner)

Even if they had not yet acted to reduce their carbon emissions significantly, these NDCs were keen to do more. That said, most had not progressed beyond 'low-hanging fruit' such as improving their recycling or reducing single use plastics.

Other NDCs were motivated more by financial gain and less by environmental benefits. They assessed the low carbon options on a more practical level; they would need more support to understand timescales during which they might see a return on their investment and likely monthly energy savings in order to consider low carbon heating.

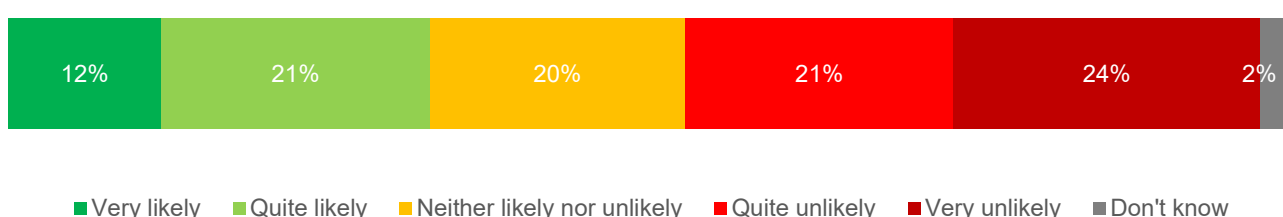
"If it becomes financially advantageous to do something like that then yes that's when I would do it." (Medium size non-domestic consumer, high carbon heating, building owner)

Likelihood of installing a low carbon heating technology if current heating system fails.

NDCs were asked in the quantitative survey how likely they would be to choose a low carbon heating system such as a heat pump or biomass boiler if their system were to stop working and needed to be replaced. Nearly half (45%) of NDCs reported they would be quite or very unlikely to change to a low carbon heating system, compared with only one third (33%) who were quite or very likely; one fifth (20%) were undecided.

Figure 2: Likelihood to replace current heating system with low carbon alternative if it broke down and could not be replaced

Base: All NDCs who do not currently have low carbon heating system installed (221)



Over half (53%) of NDCs who defined their building as small, reported being unlikely to change to low carbon heating technology, compared with 41% of those who defined their building as medium-sized and 38% of those who defined their building as large. More detailed results to this question are shown in Table 2. This suggests a potential relationship between building size and likelihood to adopt low carbon heating systems.

Table 2: Likelihood to consider installing a low carbon heating technology if current heating system failed

Base: NDCs who do not currently have low carbon installed (221)

Likelihood to consider installing a low carbon heating technology if current heating system failed	Very/quite likely	Neither likely nor unlikely	Quite/very unlikely	Don't know
Small building	31%	14%	53%	2%
Medium building	33%	25%	41%	1%
Large building	38%	22%	38%	3%

Reasons for considering replacing heating system with low carbon heating alternative

The 33% of NDCs who reported being very likely or quite likely to replace their heating system with a low carbon heating technology were asked why this was the case. The main two reasons given were 'to help the environment' (71%) and 'to help save money on energy bills' (57%). The full list of responses is shown in Table 3. This again backs up the findings from the qualitative interviews that there are NDCs that are committed to helping the environment, but financial aspects also remain very important. These findings were largely consistent across company/sector type and company size.

Table 3: Reasons for replacing heating system with low carbon heating technology

Base: NDCs likely to install low carbon heating (82)

Reason	Proportion ³¹
To help the environment	71%
To help save money on energy bills	57%
To improve green credentials	9%
It is easier to use/operate	5%
It is already installed at another building/site	1%
To help meet the low carbon targets for my place of work	1%
The new system is more convenient for my place of work	1%
Other	8%

Reasons for not considering replacing heating system with low carbon heating alternative

The 45% of NDCs who reported being unlikely to replace their heating system with a low carbon alternative, and the 20% who were non-committal (neither likely nor unlikely) were then asked why this was the case. The main reason given was that it would be too costly (55%) although one in seven (15%) claimed not to have enough information/know enough about low carbon heating systems to make this change. The full range of responses is shown in Table 4.

This supports evidence from the qualitative interviews that financial aspects are very top of mind for some NDCs, so they would be less likely to choose to install a low carbon heating system if it cost more than a higher carbon counterpart.

³¹ Respondents were able to select multiple responses

Table 4: Reasons for not replacing heating system with low carbon heating technology

Base: NDCs not likely to install low carbon heating system (86)

Reason	Proportion ³²
Too costly	55%
Don't have enough information/know enough about low carbon heating	15%
Don't own the building/landlord will not give permission	10%
Not necessary to update the heating system at the moment	10%
Low carbon heating technology is not suitable for the building	6%
Technologies do not fulfil heating requirements of our site	5%
No reason given	12%
Other	2%

Decision making drivers

The qualitative interviews suggested that larger NDCs were more likely to have a carbon reduction strategy (even if informal) and were pragmatic about the challenges of decarbonising their heating by a deadline.

“I think every person on this planet has a responsibility to contribute to a reduction in CO2 emissions. As ever, the devil is in the detail and there has to be a pragmatic approach to wean people off who are particularly vulnerable, because they are off the main gas grid and therefore highly dependent on heating oil, for example. Many rural areas are in that bracket and, therefore, yes, I would support it in principle but the Government must put in place a mechanism that weans these individuals or organisations off highly polluting carbon fuels to new technology”. (Large non-domestic consumer, high carbon heating, building renter)

³² Respondents were able to select multiple responses

Some of the smaller NDCs were concerned about how they would be able to finance such an upgrade to their heating. The NDCs most anxious were those with a small turnover but a large physical footprint such as a charity that provides group holidays on a large site:

“We try to marry the two up but if we have to choose then we would choose finance [affordability] over environment”. (Large non-domestic consumer, high carbon heating, building renter)

Many NDCs spoke about what other companies were (or were not) doing to reduce carbon emissions. This highlights how it is important to get buy-in from a whole range of NDCs within local and sector networks and use early adopter case studies to reassure and motivate others.

Interviews with NDCs demonstrated that the current state of organisations’ buildings can influence their attitudes towards upgrading their heating systems. Some NDCs interviewed were in old and/or poorly-insulated properties, often with single glazing and even leaking roofs. Some relied on electric heaters next to desks/work areas in the winter and small fans in the summer. These NDCs cited a range of reasons for these building issues, including unhelpful landlords, cashflow pressures, or a company mindset of not investing in infrastructure. Whatever the reason, these NDCs felt that moving to newer low carbon heating technology would be unrealistic and that they would rather focus on solving basic workplace comfort problems first.

“These are bog standard buildings, there’s no insulation here...We haven’t, no [looked into improving the insulation]. I think it would cost a fortune to do it here.” (Medium sized non-domestic consumer, electric heating, building renter)

“It’s not well insulated at all... single glazing pretty much through the whole building” (Large non-domestic consumer, high carbon heating, building renter)

An additional barrier faced by the NDCs interviewed was the use of the building they own/rent, and perhaps some misunderstanding around the feasibility of certain heating systems. One NDC interviewed had a shop with a number of fridges and freezers. They did not want to install a heating system as they thought it would reduce the efficiency of the fridges and freezers (even though the working environment is cold and they use inefficient fan heaters). Getting buy-in from this business would involve supporting them to understand how best to manage the heating and cooling needs of the whole business and advising on the best solution.

Six of the qualitative interviews were with NDCs that rent or lease their premises. For these NDCs, having a good relationship with the landlord was crucial to getting buy-in for any changes to the heating system.

“We’ve made other changes to the building and they’ve been happy. They would win in the long run [if we installed a heat pump] and they might consider sharing the cost” (Medium sized non-domestic consumer, electric heating, building renter)

The NDCs with the best landlord relationships were mostly in the manufacturing and wholesale sectors (requiring large warehouse / factory spaces) but also included a youth holiday camp

owned by a charity and spread over a large site. Only one NDC had a poor relationship and did not expect the landlord to invest in the building; based on a small industrial park, they thought that their landlord would close the site down and evict the tenants rather than fund any upgrade of the insulation, glazing or heating in the business units.

The other rented or leased NDCs had good relationships, where either the landlord would be supportive of changes the business wanted to make, or the landlord would fund improvements themselves.

“They are actually prepared to invest in their own [listed] building to improve its thermal efficiency.” (Large non-domestic consumer, high carbon heating, building renter)

All NDCs agreed that communications/details of incentives for any planned change must be sent directly to landlords as well as businesses.

NDCs understanding of low carbon heating options

The interviews identified potential misconceptions about low carbon heating (especially heat pumps) that should be addressed when raising awareness of the options available. As highlighted previously, awareness amongst NDCs appears to be higher than the general public, however the 40% of NDCs who have either ‘never heard of them’ (6%) or are aware but, ‘don’t really know what they are’ (34%), highlights that a knowledge gap still exists.

Of the NDCs interviewed who were aware of heat pumps, most were only aware of one type - ground source heat pumps. One NDC assumed they could not have this installed as they didn’t have the space for the shallow trenches, or their ground was unsuitable for deep boreholes. More accessible information about air source heat pumps could help make NDCs more likely to consider them.

“We had problems with the diggers when we put the [mains] drainage connected to the property; the ground is so hard here.” (Medium-sized non-domestic consumer, high carbon heating, building owner)

Others questioned the real impact on their energy bills once a heat pump was installed, as some assumed they would increase whereas others suggested they would expect them to decrease. They were also unclear why heat pumps driven by electricity were lower in carbon than the latest, highly efficient electric heaters.

NDCs interviewed raised a number of personal concerns about low carbon heating: these included perceived performance deficiencies compared to their current systems and concerns that installers might overpromise on the reliability and performance of a new technology in order to win business. Solutions suggested by NDCs included having access to case studies and testimonials from other companies in the same sector or region and reading reviews of different brands of heat pumps by trusted experts. An industry backed upgrade or replacement scheme would also reassure NDCs that they could easily upgrade if technology advanced quickly after they purchased a heat pump.

“The practicalities around it would be what stopped us installing a heat pump, rather than the cost. My worst fear is you spend £20,000 on a new heating system and then everyone complains it’s cold. It just needs to work and be reliable.” (Medium-sized non-domestic consumer, high carbon heating, building owner)

One NDC who had installed an air source heat pump explained that he was initially put off as he believed it would be noisy. After the installation, he was pleasantly surprised that it was not and stated that he might have invested in this option sooner if he had known this.

“Our big concern was that a heat pump would be noisy, but it’s absolutely fine. Unless it’s on full whack you can barely hear it indoors, and you can’t hear it over normal daily noise.” (Medium sized non-domestic consumer, heat pump owner, building owner)

In addition, heat pumps were sometimes perceived as requiring much more space than conventional boilers.

“We’d need to find space for something the size of a fridge!” (Small non-domestic consumer, electric heating, building owner)

In addition, there was some cynicism around the environmental impact of increased electricity demand from heat pumps and whether it would result in a net carbon reduction, particularly as the electricity grid comes under greater pressure due to increasing electric vehicle ownership.

“We are going to need lots and lots of electricity because cars are being powered by electricity, and we need to be careful about where that is coming from.” (Small non-domestic consumer, electric heating, building owner)

Increased demand for wood pellets for biomass boilers was also mentioned as this could lead to pellets being imported from non-sustainable forests which would add to their carbon footprint through shipping. It will be important to reassure NDCs that the whole supply chain can meet the environmental demand.

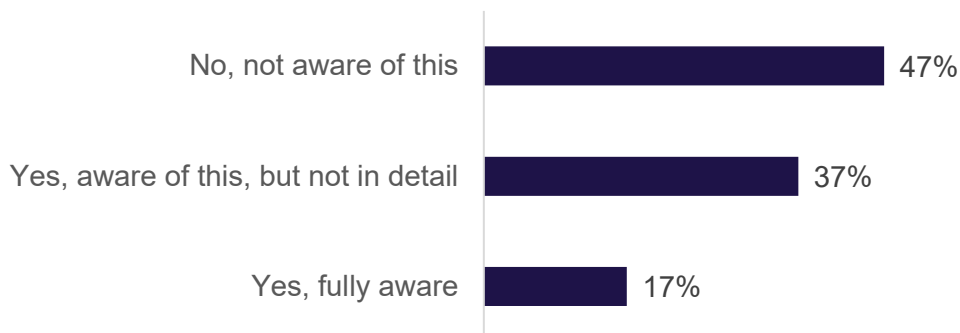
Phasing out fossil fuel heating systems in non-domestic buildings

Awareness and perceived impact of government plans to phase out high carbon fossil fuel heating in buildings off the gas grid

The NDCs surveyed were fairly evenly divided in terms of awareness of upcoming legislation to phase out high carbon fossil fuel heating in off gas grid buildings, with 53% aware (either fully or in general terms) and 47% unaware. These findings were generally consistent across all business types, particularly organisation size.

Figure 3: Awareness of upcoming legislation to phase out high carbon fossil fuel heating

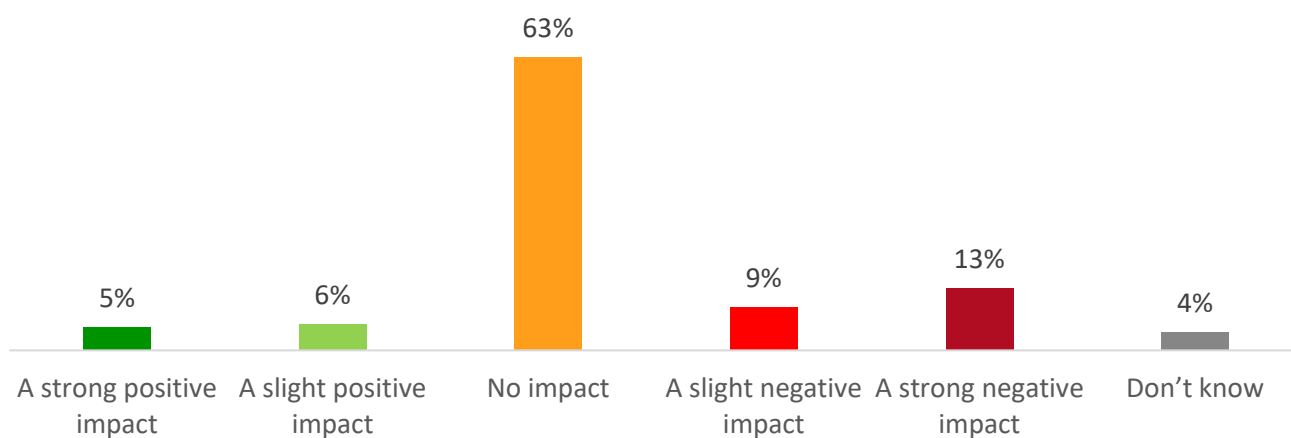
Base: All NDCs (300)



NDCs were then asked what impact they thought this legislation would have on their business: 63% expected it would have no impact, 22% thought it would have a negative impact and 11% thought the legislation would have a positive impact.

Figure 4: Impact of legislation to phase out high carbon fossil fuel heating systems

Base: All NDCs (300)



A greater proportion of NDCs with oil (34%) and LPG (33%) boilers believed the legislation would have a negative impact. In the qualitative interviews, they suggested they may need to make a significant financial investment into changing their boiler and removing large tanks which are often buried underground. Furthermore, LPG was perceived to be a cheap fuel which can make the decision to switch unattractive.

“Normally we are conscious of our carbon footprint and would love to save some money as well as saving the environment but we went for this as the cost of LPG is so low. At the time it was presented as the only viable option but I do have some regrets.” (Medium-sized non-domestic consumer, high carbon heating, building owner)

Those who expect to be affected less include NDCs using electricity to heat their premises, although some of these are dissatisfied with their current heating solution (e.g., storage heaters) therefore they are considering switching at this point anyway. This could be an opportunity to encourage them to invest in more energy-efficient technologies. For NDCs already using low carbon technologies, they will not be affected by the move to the same extent, but sharing their experiences could help motivate others to switch by providing reassurance about ‘real world’ applications of these options. It is worth highlighting, that these NDCs could still be impacted if increased demand for low carbon systems led to less installer availability, higher repair costs or further advances in innovation, that these NDCs have been unable to take advantage of.

Opinions on the effectiveness of different government measures to encourage a switch to low carbon heating systems

NDCs were asked to consider a range of different measures that the Government could introduce to encourage NDCs like their own to change to low carbon heating systems. The measure perceived to be most effective was action which would result in lower energy bills following installation; 87% of NDC’s suggested this would be either very or fairly effective. Measures to increase the installation or running costs of fossil fuel heating systems were generally considered less effective, with ‘increasing the cost of fossil fuels’ (47%) and ‘increasing the cost of high carbon technologies and parts’ (44%) being the two measures rated least effective. 76% of NDCs thought an outright ban of high carbon heating systems by 2030 would be very or fairly effective. More information about this question is shown in Table 5.

Table 5: Effectiveness of potential measures the Government could introduce to encourage switch to low carbon heating systems

Base: All NDCs (300)

Potential measures	Very/fairly effective	Not very/not at all effective	Don't know
Lower energy bills following the installation of a new system	87%	8%	5%
Banning the installation of new fossil fuel heating systems by the year 2030	76%	18%	6%
Loans to help make low carbon technology affordable	75%	21%	5%
Improved accessibility to expert heating and energy advice (e.g., through free independent buildings audits)	72%	24%	4%
Boiler scrappage scheme	65%	29%	7%
Increasing the cost of fossil fuels for heating	47%	46%	6%
Increasing the cost of higher carbon technologies and parts	44%	48%	8%

All NDCs interviewed supported the Government’s ambition to reduce carbon emissions, although awareness of steps already taken was low. Interviewees agreed reducing carbon emissions is important in order to fight climate change and better manage our finite natural resources.

*“I think everybody is open to changes and to help the environment and the climate.”
(Medium sized non-domestic consumer, electric heating, building owner)*

One interviewee was cynical about climate change but did appreciate the need to better manage finite natural resources such as fossil fuels. They also suggested that the Government needs to be measured in its strategy and not expect too much from businesses straight away.

“We need to be responsible in the use of a finite resource like oil, and I think as long as the Government is measured in its response, I will support that. If they start going crazy on climate change grounds then they will quickly lose my support (Medium sized non-domestic consumer, heat pump owner, building owner)

Explaining the Government’s plans resulted in concern for some NDCs, as Covid-19 has affected their finances.

“Anything the Government does, it really needs to be tailored towards the size of the business. Just small companies are having a really bad time of it [due to Covid-19].” (Large non-domestic consumer, electric heating, building owner)

In addition, the interviewed NDCs felt that if they were to be forced into spending money on something by the Government (e.g. solely legislated, rather than being supported and incentivised), then attitudes may change and could be counterproductive, with one NDC referencing what could happen in the future with electric cars.

“Everyone’s going to get charged unless they change their car, which you’re a little bit forced into it, which is a bit unfair (Large non-domestic consumer, high carbon heating, building renter)

Increasing awareness of low carbon heating systems

This research identified NDCs’ lack of awareness of low carbon heating systems as a key barrier to uptake.

NDCs interviewed generally felt that a two-pronged approach would be the most effective way of raising awareness of low carbon heating. There were suggestions from NDCs that first, a large-scale, national communication campaign using a variety of media channels, including TV, radio and social media could be used to create impact and get key messages across. Secondly, localised and personalised communications could follow and explain the detail of the plans and recommend the most suitable technologies for each area and size of organisation.

NDCs interviewed would like to have communication from a mixture of national bodies such as the Government and Ofgem, but also local trade bodies, chambers of commerce and local authorities.

“It should be directed straight to businesses, even through the Government website. At the minute a lot of businesses are looking at the Government website due to the changing landscape due to Covid. Ordinarily I get my information from the chamber of commerce... they send weekly updates.” (Medium sized non-domestic consumer, heat pump, building owner)

Some NDCs interviewed would prefer that commercial advice does not come directly from the Government, while others are wary of local trade bodies and tradespeople being impartial, and

so it is important to cover both. Consistency of messaging, timescales, and support available is important across all communications.

Lessons can be learnt from other national and local communication campaigns, around getting complicated messages out to a wide variety of people (and businesses) quickly. For example, one NDC mentioned a successful campaign by the Welsh government to provide free smoke alarms and advice via door-to-door leaflets.

Specific communication channels suggested included:

- TV and radio advertising and inclusion in news/current affairs reporting
- Brochures/leaflets clearly explaining the pros and cons of different heating technologies
- Personalised letters sent to businesses and landlords explaining why it is necessary for them to take action and setting out the support available
- A website with information and the ability to give personalised recommendations based on the size, location, premises type and environmental attitudes of the business.

“It would be useful if the Government could put up a “go to” website so it isn’t so hard to get prices out of people. It could tell you the cost of heating your building using different fuels, and help find an installer” (Large non-domestic consumer, high carbon heating, building owner)

It was felt that some element of personalisation would be key in encouraging action by organisations and landlords. Personalisation could include letters sent to named contacts, interactive online tools, and access to booking in-person energy audits giving business-specific recommendations.

Increasing awareness of government ambitions for low carbon heating systems

The national media was again seen as having a key role to play in raising awareness of the commitment to phase out high carbon heating in off gas grid buildings and some were already aware of the plans from this communication channel. NDCs also felt that the media can help with presenting the commitment as a positive ambition.

There was also a suggestion from one NDC that the regulator, Ofgem, should be involved but were quick to point out any messaging needs to be consistent to that of the Government.

“It needs to be a combination of things. Some of it needs to be done centrally so that there’s a consistent, unequivocal message coming from, say, the regulator, from Ofgem and, in addition to that, of course it will be supported by industry so the representative bodies should also be promoting the Government’s message and should not contradict it in any shape or form.” (Large non-domestic consumer, high carbon heating, building owner)

Involvement of planning authorities was also mentioned as important – some NDCs expected that there would be delays in some low carbon installations unless planning regulations were amended.

Tradespeople were also felt to play an important role in encouraging organisations to take action. While some were wary of an increase in companies trying to sell them their products and services once a government announcement is made, most said they would trust the advice of a tradesperson they knew.

“If my plumber comes along and says “This is wonderful, you need you use one of these” then I would go ahead and do it” (Medium size non-domestic consumer, high carbon heating, building owner)

Many NDCs said that ‘sticks as well as carrots’ would be needed to drive change. Some NDCs indicated they were primarily financially motivated and would only take action if the Government, regulator, or local authority have the power to enforce switching to low carbon heating.

“If it’s law then people will have to take notice. If Boris stands up and says you have to do this by 2025 then people have a few years to do it. You will always have people moaning but you have to do what is best for the country. I think 5 years is more than adequate.” (Large non-domestic consumer, electric heating, building owner)

This emphasises how consistent messaging and timelines are a critical factor in encouraging uptake. This includes messages and timelines from the Government or agencies, Ofgem and more local or sector-specific networks.

Opinions on possible deadlines for replacement of heating systems

A deadline for the replacement of high carbon heating in off gas grid areas during the 2020s (i.e., in the next nine years) was seen as realistic by most that were interviewed, as long as exceptions are made, or certain buildings and areas given extra support. One example cited was large historic buildings whose listing may mean that they are unable to improve air tightness sufficiently to make a heat pump viable.

One NDC also suggested that areas such as the Yorkshire Dales may also struggle to meet the timescale without exemptions or support, as much of its off gas grid building stock is old and built on tough bedrock (a problem for ground source heat pumps). Some small NDCs rely on coal, and perceive that it is easier to swap an oil boiler for a heat pump, than it is to replace a coal furnace.

NDCs interviewed suggested that they would like at least five years’ notice of any deadlines, with regular reinforcement and reminders during that time. One reason suggested by an NDC was to avoid a price hike immediately after the legislation came in.

“In reality we would need something like 5 years nationally as by the time it is announced in the next 18 months there will be a mad rush for everyone to get it done and prices will go up” (Large non-domestic consumer, high carbon heating, building owner)

A common concern raised in the interviews was that if an NDC decided to invest in a new high carbon heating system in the next few years, they may then be required to change it soon afterwards. A further concern is that unless they are aware of plans and options in advance, they may make the wrong decision should they need to immediately install a new system if their current system were to fail. They may not have enough time to do the research fully into which low carbon technology would suit them best.

A minority of NDCs interviewed felt a deadline in the next nine-years was too ambitious. They felt that they would be unlikely to take action until near the deadline and would then struggle to find an installer if other NDCs also left it until the last minute. They worry that this rush could encourage dishonest tradespeople to take advantage of the high demand to raise prices, lower workmanship, or even act fraudulently. As this could happen with any deadline, it was suggested that the phase out should be done in stages, starting with larger NDCs or “easier” areas/sectors in order to manage demand over the next decade. Some thought that one to two-year deadlines should be used to allow enough time to arrange financing but keep the issue top of mind.

Support mechanisms to overcome financial barriers

Most of the NDCs interviewed indicated the desire for financial support to move to low carbon heating, however they also stated that they were not motivated by loans. The COVID-19 pandemic has put a financial strain on many NDCs and many were wary of further debt.

There are also concerns about how any financial support would work and who it would apply to. In particular, while incentivising organisations that currently use high carbon heating to switch to low carbon is seen to be important, there are also NDCs using electric heating and old low carbon technology that would benefit from financial help to upgrade to new low carbon technology.

“We believe there are more efficient versions on the market now so if the maintenance costs started to creep up [on the heat pump] then we would look to upgrade it.” (Medium-sized non-domestic consumer, heat pump, building owner)

Some medium and large NDCs interviewed had a planned schedule for upgrading or replacing their heating system and were putting money aside for this in advance.

“We plan ahead and set budgets for any large procurements in the next five years and we’re constantly looking at that.” (Medium-sized non-domestic consumer, heat pump, building owner)

Other NDCs suggested they would only invest in a new heating system when it was no longer cost-effective to maintain their current system (for example if the cost of a one-off or ongoing repair was higher than the cost of replacement). These NDCs suggested they would need to source additional funding (either from internal budgets or external sources) at the time a replacement system was needed.

Some NDCs that were interviewed suggested they would want to finance upgrades from their existing bank balances. Loans would only be considered if the cash was not available and they felt legally compelled into upgrading their heating system.

“We prefer to have the money ourselves and then make capital investments...but we did take out the ‘bounceback’ loan recently because we didn’t have to pay interest for the first year and it is backed by the Government. So, something like that might work” (Medium sized non-domestic consumer, electric heating, building renter)

There is a difficult balance between setting unpopular deadlines that businesses must meet and encouraging businesses to upgrade voluntarily. The NDCs explained they do not want to be forced into spending money on something they do not choose, yet many admit that they would not take action unless they were given firm deadlines and the threat of a penalty. Two NDCs interviewed were registered charities and thought that they would find it hard to fundraise via their usual donors for something as “boring” as a new boiler and would therefore have to explore specialist charity funding channels instead.

If loans were to be used as a financial support mechanism, the NDCs interviewed stated they would expect a low interest rate over a 5-10-year repayment period. The overall cost of the loan would be considered when making an investment decision. It is important that the repayment period (and the ROI period) doesn’t exceed the likely lifespan of the equipment. Most of the NDCs interviewed were unaware of the life expectancy of a heat pump with the majority feeling it would last around ten years, whilst the CCC suggest that the average life expectancy of a heat pump would be 18 years³³.

“Anything around 10 years or less is fine but once you get to 15 [years to pay back] you might need to replace the equipment within that time so it has cost you. Particularly with this new technology, new more efficient versions will come out and I’ll need to replace it” (Medium non-domestic consumer, high carbon heating, building owner)

Some questioned the administration involved in running a loan scheme and thought that an upfront grant would be quicker and simpler to manage. Some did not like the idea of having to go through a lot of forms and stages only to find out they may not be eligible after all.

“I think the Government would be wise to consider a grant, even if it is only a small amount. You have all of the hassle of forms and credit checks with a loan for possibly a small net saving. With a grant it is done and dusted.” (Medium-sized non-domestic consumer, heat pump, building owner)

Interviewees suggested that a government-run loan scheme would have credibility and be trusted. Interviewees also discussed how high street banks would not be preferred as a lender

³³ A report for the Committee on Climate Change, Currie & Brown (2019) - The costs and benefits of tighter standards for new buildings <https://www.theccc.org.uk/wp-content/uploads/2019/07/The-costs-and-benefits-of-tighter-standards-for-new-buildings-Currie-Brown-and-AECOM.pdf>

(as their motivation would be profit), but a specialist green bank would be acceptable. Some NDCs were aware that there are already a number of specialist funding mechanisms available and would research all of these before considering a government loan.

“There are so many innovative financial products out there...and it would depend on what was most appropriate at the time. I think it is unlikely that would be a high street bank, I think there are other mechanisms, the Green [Investment] Bank for example which is more suited as they would understand the industry and the limitations and logistics. So, it might be a specialised financial with a part Government stake or something wholly in the private sector.” (Large non-domestic consumer, high carbon heating, building owner)

Innovations in financing and repayments would be welcomed, including specialist schemes and the idea of ‘green credits’ used to reduce loan repayments depending on how environmentally friendly a business can prove itself to be. Any accreditation or acknowledgement of a business’s efforts to decarbonise would be popular; many mentioned that there was currently very little motivation for them to improve on environmental metrics.

Some NDCs had successfully used previous government schemes including one NDC that received free installation of a biomass boiler in return for buying wood pellets from the installer for a contracted number of years³⁴. Another had installed a biomass boiler eight years ago which is now almost cost neutral due to payments from the Government Renewable Heat Incentive (RHI) scheme. This NDC did, however, warn that he had put a lot of work into finding a reputable installer and felt there were some installers that wanted to apply for (and keep) the RHI income themselves, referencing when the scheme was first launched.

“At the time that Ofgem released its RHI scheme an awful lot of charlatans got wind of this and were offering their nefarious services to apply on our behalf and take ownership of the equipment and the RHI income. There were a lot of horror stories going around.” (Large non-domestic consumer, high carbon heating, building owner)

One heat pump owner said that they received a government grant³⁵ for 20% of the installation of their heat pump in 2017 and that this was a key factor in her decision making.

“Grant funding is great because it is money that you wouldn’t ordinarily have in your cashflow. You had to make the spend before you could draw the grant, but nevertheless its cash isn’t it? It enables you to consider things that would normally pass you by as too expensive. But loans do complicate things.” (Medium-sized non-domestic consumer, heat pump, building owner)

Most NDCs interviewed expressed a strong preference for a grant, free installation offer, subsidised electricity tariff, scrappage scheme or tax break in preference to a loan. This partly backs up the survey findings shown earlier on in Table 5, with reduced bills being suggested

³⁴ Respondent did not specify exact scheme they were referring to

³⁵ Respondent did not specify exact scheme they were referring to

as the most effective way to encourage businesses to change to low carbon technology, though there was more support for a loan scheme in the quantitative phase. In the interviews, NDCs explained that being offered a loan would make them feel that they were being encouraged to increase debt and spend money at a financially precarious time (interviews were conducted after the first COVID-19 lockdown). They would prefer a financial incentive such as a grant, subsidised tariff or tax break.

A potential reason for loans gaining higher support in the survey than in the interviews, could be NDCs liking the idea of a loan payment initially, then it becoming less appealing once it is discussed in more detail and the reality of needing to pay it back setting in, leading to other schemes being preferred. It should also be noted that the quantitative survey was conducted prior to the COVID-19 lockdown and the financial troubles that came with it for some, therefore NDCs may not have been as averse to receiving a loan payment as they are now. Saving on the upfront cost of an installation, without the need to pay the money back would therefore, be a more attractive incentive.

Businesses expect new low carbon technology to be relatively expensive, therefore, this could bring it more in line with the cost of an oil boiler or electric heaters. Reduced energy bills would also be popular, particularly with oil heating users who are subject to wide variations in the cost of oil each time they refill their tanks.

As mentioned earlier, a key barrier to companies switching to low carbon heating is financing, with over half (55%) of NDCs surveyed reporting cost was the primary reason they had not replaced their current heating system with a low carbon alternative. NDCs interviewed expected low carbon technology to cost more to install than high carbon or electric heating. However, there is also an expectation that the cost of the equipment will fall and the cost of installation will become more competitive as demand rises.

“The prices of heat pumps will come down won’t they, because more people will have to put them in”. (Small size, heat pump owner, building owner)

Landlord engagement is key for rented/leased premises. Some NDCs interviewed who lease their buildings are liable to pay for heating upgrade costs themselves but they would still like to gain their landlord’s permission and hope to share some of the cost with them. A specific landlord incentive for increasing the environmental rating of buildings would be beneficial in these cases.

Conclusions

Research question 1: How are non-domestic consumers going to be affected by the move towards modern low carbon heating solutions?

Overall, the NDCs interviewed had a reasonable knowledge of low carbon heating systems. However, few had any practical knowledge of how they worked or whether they would be suitable for their premises, other than those who already had a low carbon heating system installed.

63% of NDCs surveyed felt a move towards modern low carbon heating solutions would have no impact on their businesses. However, 1 in 5 (22%) felt the impact would be negative for their businesses, rising to 1 in 3 among those with oil (34%) and LPG (33%) boilers installed.

One third of the NDCs surveyed claimed to be likely to switch to a low carbon heating option if their current heating needed replacing. This suggests there is opportunity to intercept organisations that are at the point of replacing their high carbon heating systems now, with the aim of improving the likelihood that they choose low carbon replacements.

Cost was seen as the most critical factor in deciding to switch to low carbon heating, with the implication that demand for low carbon heating systems is likely to be suppressed until the financial outlay is comparable with less environmentally friendly options. This echoes the findings from a 2015 DECC survey of 501 non-domestic RHI applicants³⁶ which identified that financial factors play a key role within the decision-making process. Applicants to the scheme were heavily motivated by financial reasons (for 58% it was the most important factor), and the upfront costs were the principal concern prior to installing a new system for 42% of applicants. The same study also found that a majority of NDCs (63%) would not otherwise have installed a renewable heating system, had the RHI scheme been unavailable.

A subsidy or grant scheme (rather than a loan that incurs company debt), both for installation and decommissioning of old heating systems, could bridge the gap before low carbon heating options become more affordable to consumers, though there was support for a loan and for other cost saving measures for NDCs in the quantitative survey.

³⁶ Renewable Heat Incentive Evaluation (Wave 2)
https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/498787/Survey_of_non-domestic_RHI_applicants_wave_2.pdf

Research question 2: What are the attitudes of non-domestic consumers to government commitments to phase out the use of high carbon fossil fuels in off gas grid buildings?

Around half (53%) of NDCs surveyed claimed to be aware of the Government plans to phase out installation of fossil fuel heating in off gas grid buildings.

The majority of NDCs who participated in this qualitative research supported the idea of moving to low carbon options in principle, but felt they would need 5 years' notice or more to build in the potential investment into their business planning, if a deadline for replacement of high carbon system was mandated. If relying on voluntary take up, it is likely businesses would be looking for financially attractive support options to encourage them to make the change. Financing a transition to low carbon heating was felt to be exacerbated for existing LPG or oil heating systems and the potentially larger scale infrastructure changes needed to remove existing tanks and decommission the old system.

There were perceived barriers faced by some NDCs specific to their circumstances. For example, one NDC explained they felt it was impractical to target the use of certain types of heat pumps in some areas of the UK (e.g., the Yorkshire Dales) believing the foundations used in many buildings made them unsuitable. Another suggested there were considerations that had to be made as the building they operated out of was listed and therefore, perceived that they could not fully insulate to make it suitable for a heat pump.

Therefore, NDCs would likely benefit from more education on the low carbon heating options available, as well as the logistics of installation and how to make the change. Any information provided should include the benefits of low carbon heating, with comparison with other heating systems, both in terms of their low carbon credentials but also running costs.

Interviews with NDCs highlighted the trade-offs organisations make between benefit to the environment versus financial outlay required when considering new heating systems; where the latter is seen to outweigh the perceived environmental benefit, they are still tending to choose financially preferable options. This was the case even for NDCs interviewed who already have a strong environmental focus.

Increasing demand for low carbon systems might be most effectively achieved through installers' recommendations. This is based on suggestions from NDCs that they trust their installers' advice, so if an installer recommended using a low carbon system, they could be more likely to install one. However, if customers were more aware of (and convinced of) the benefits, this could lead to increased demand. NDCs suggested they would like to see case studies and testimonials from other NDCs that have previously installed such systems, to give them assurance around factors such as reliability and performance. Channels for these case studies could include TV, leaflets, letters and a purpose-built website.

Research question 3: What kind of support mechanisms are appropriate to encourage uptake of low carbon heating systems in off gas grid buildings?

This research suggests that consistent messaging and timelines from all NDCs' points of contact, will be a critical factor in encouraging uptake. This includes messages and timelines from the government/agencies, Ofgem and more local or sector-specific networks. In addition, any messaging needs to be supported and reinforced by installers, who were suggested by NDCs as key points of contact for them in their process of installing a new system.

The prospect of lower energy bills for NDCs following the installation of a low carbon heating system, as well as initiatives to improve accessibility to expert heating and energy advice, were perceived to be most effective in encouraging uptake of low carbon heating systems among those surveyed.

In addition, the availability and nature of funding available to support NDCs in replacing their heating was seen as crucial to support uptake. NDCs in the interviews suggested that grants, discounts or subsidies are preferred to loans which incur debt and interest payments. The findings from the survey did suggest that loans would be an effective measure, but once discussed in more detail, NDCs suggested they would prefer other measures. There was particular scepticism around securing a loan for a new heating system, as NDCs suggested they were wary of further debt having felt the financial strain of the COVID-19 pandemic. If loans were the only option available to NDCs, they suggested that government backed loans are preferred to high street banks.

NDCs welcomed innovations in financing and repayments, including specialist schemes and the idea of 'green credits' used to reduce loan repayments depending on how environmentally friendly a business can prove itself to be. Accreditation or acknowledgement of a business's efforts to decarbonise were also popular; many mentioned that there was currently very little motivation for them to improve on environmental metrics.

Some NDCs interviewed who lease their buildings are liable to pay for heating upgrade costs themselves but they would still like to gain their landlord's permission and hope to share some of the cost with them. They felt a specific landlord incentive for increasing the environmental rating of buildings would be beneficial in these situations.

Although not explicit in this research, it is likely that whilst relying on voluntary uptake of low carbon heating systems, subsidies and grants are more appealing. However, once any elements become mandated, businesses might be more accepting of taking up loans to meet the new requirements.

Research question 4: How would non-domestic consumers respond to the ending of installing fossil fuel heating systems in new build non-domestic properties from 2025?

There was little resistance to ending fossil fuel heating installations in new build properties from NDCs; 76% of NDCs surveyed thought banning the installation of new fossil fuel heating systems by the year 2030 would be an effective measure. Moreover, some NDCs even suggested it could move heat decarbonisation in non-domestic buildings along as the sector upskills, potentially lowering installation costs.

From the interviews, it was clear that some NDCs are becoming more aware of environmental issues and are starting to prioritise them more internally, especially where there are no associated financial burdens. It is possible that NDCs who are becoming increasingly concerned about their environmental impacts would be less likely to move somewhere with a high carbon heating system installed when they are looking to move location or rent new premises. Therefore, in these cases it would be beneficial if there were more buildings with low carbon systems installed for these businesses to choose from.

Annexes

Annex A: Literature review

Property Industry Alliance, Property Data report (2017)

<https://www.bpf.org.uk/sites/default/files/resources/PIA-Property-Data-Report-2017.PDF>

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<https://www.theguardian.com/environment/2014/nov/18/how-to-make-old-homes-energy-efficient>

Eurostat, Energy Consumption in households https://ec.europa.eu/eurostat/statistics-explained/index.php/Energy_consumption_in_households

The European Heat Pump Association, Market Data <https://www.ehpa.org/market-data/>

Association Française pour les Pompes à Chaleur, French Market

https://www.ehpa.org/fileadmin/red/09_Events/2019_Events/Market_and_Statistic_Webinar_2019/EHPA_webinar_FR_market_AFPAC.pdf

International Energy Agency, Heat Pumps <https://www.iea.org/reports/heat-pumps>

UKERC Technology and Policy Assessment, Best practice in heat decarbonisation policy: A review of the international experience of policies to promote the uptake of low-carbon heat supply <https://www.theccc.org.uk/wp-content/uploads/2017/01/UKERC-for-the-CCC-Best-practice-in-heat-decarbonisation-policy.pdf>

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BEIS Building Energy Efficiency Survey (2014-2015)

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CPS Fuels, Fake News: No oil boilers by 2030 <https://www.cpsfuels.co.uk/news/fake-news-no-oil-boilers-by-2030>

Non-Gas map <https://www.nongasmap.org.uk/>

The MCS Service Company <https://www.microgenerationcertification.org/about-us/statistics/>

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<https://www.theccc.org.uk/wp-content/uploads/2017/01/Annex-2-Heat-in-UK-Buildings-Today-Committee-on-Climate-Change-October-2016.pdf>

Alternative Heat Solutions, Converting a town to low carbon heating (2019)
https://assets.publishing.service.gov.uk/Government/uploads/system/uploads/attachment_data/file/794998/Converting_a_town_to_low_carbon_heating.pdf

Electrification of Heat Demonstration Project, BEIS, 2019
<https://www.gov.uk/guidance/electrification-of-heat-demonstration-project>

Annex B: Contact Records for Telephone Survey

The table below shows the response from the numbers dialled as part of the quantitative survey. Please note, this shows the most recent attempt on the number, so does not reflect the total number of attempts made to each number.

Table 6: Numbers dialled

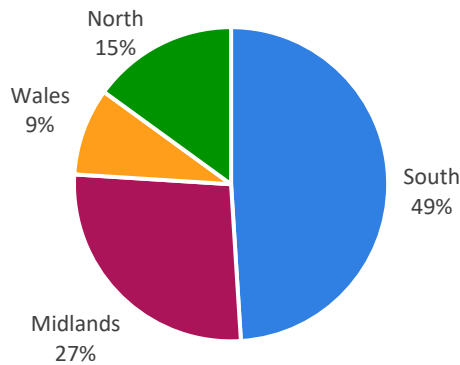
Total numbers / leads	6218
Survey completed	300
No answer/engaged	2094
Call back requested	800
Contact out of date	178
Number not recognised	482
Declined survey	2364

Annex C: Phase 2 sample

Over half of the buildings occupied by the non-domestic consumer organisations surveyed were used as offices or workshops (Table 7). Almost all organisations had fewer than 100 employees (Table 8). The most common type of heating system installed was electric (Figure 7), mainly electric heating, storage heating or electric radiators.

Figure 5: Locations of non-domestic consumers surveyed³⁷

Base: All non-domestic consumers (300)



³⁷ North: North East, North West, Yorkshire
Midlands: East of England, East Midlands, West Midlands
South: London/Greater London, South East, South West.

Table 7: Industry of non-domestic consumers

Base: All non-domestic consumers (300)

Industry	Proportion³⁸
Offices and workshops	54%
Industrial/manufacturing	15%
Agricultural	15%
Storage and distribution	9%
Retail and financial	8%
Hotel	6%
Restaurant, café or takeaway	6%
Education	4%
Public assembly	3%
Healthcare	3%

³⁸ Respondents were able to select multiple responses

Figure 6: Size of non-domestic consumers' buildings³⁹

Base: All non-domestic consumers (300)

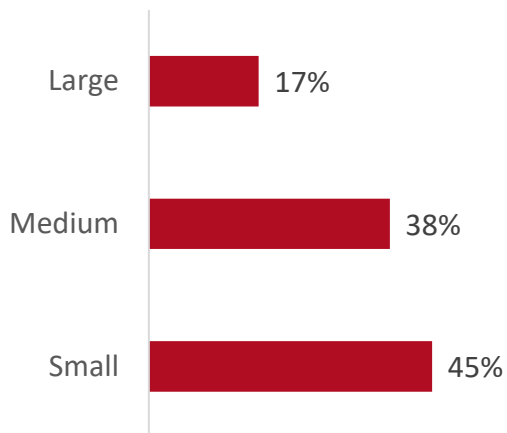


Table 8: Number of employees

Base: All non-domestic consumers (300)

Number of employees	Proportion
1-9	63%
10-99	35%
100-249	1%
250 or more	1%

³⁹ Small: Up to the size of a 4- or 5-bedroom house

Medium: About the size of a local convenience store or supermarket (e.g. Sainsbury's local)

Large: About the size of a larger in-town supermarket (e.g. Tesco superstore) or larger

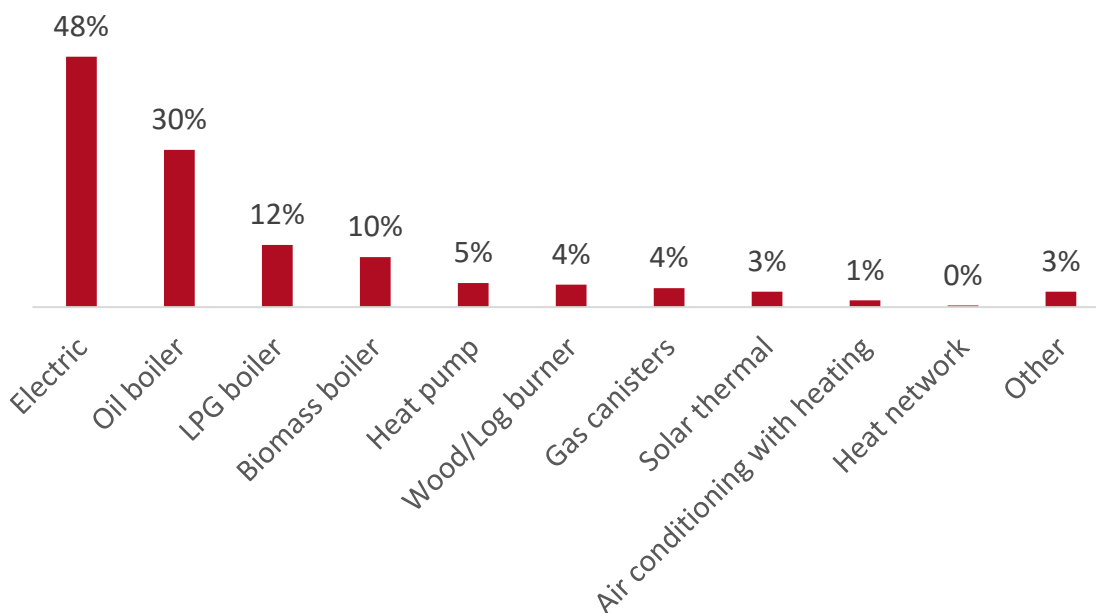
Table 9: Building tenure

Base: All non-domestic consumers (300)

Tenure	Proportion
Owned by you or your organisation	64%
Rented from a private or commercial landlord	30%
Leased	9%

Figure 7: Heating system types currently installed in non-domestic consumers' buildings⁴⁰⁴¹

Base: All non-domestic consumers (300)



⁴⁰ 'Electric' was largely a combination of electric heating, storage heaters and electric radiators. 'Other' included halogen heating, diesel heater and straw boilers.

⁴¹ Respondents were able to select multiple responses

Annex D: Quantitative survey questionnaire

INTRODUCTION TO THE RESEARCH AND ADHERENCE TO MRS CODE OF CONDUCT AND GDPR

Good morning/afternoon/evening. My name is And I am calling from Impact on behalf of the department for Business, Energy and Industrial Strategy.

TEXT 1 We are carrying out a survey about low carbon heating in buildings without a gas supply on behalf of the Department for Business, Energy and Industrial Strategy and your opinion and judgment is very important to us. The results will be used by the Government to feed into their design of future policies in this area. The survey should take no more than 15 minutes to complete, depending on the answers you give us.

SC ASK ALL

INTRO 1 Are you, or someone else in [ORGANISATION] able to take part in this survey around heating and energy use?

- Yes, now - Continue
- Yes, but at more convenient time. INTERVIEWER: RESCHEDULE CALL
- No – Close
- The organisation is no longer operating – CLOSE

SC ASK ONCE INITIAL CONSENT FOR INTERVIEW ESTABLISHED

INTRO 2 Thank you. In relation to your role, can I confirm you have responsibility for decisions regarding energy and heating at [ADDRESS] and would be able to answer questions about [ORGANISATION] energy usage and heating at this address?

- Yes - Continue
- No

SC ASK IF CODE 2 AT INTRO 2

INTRO 3 Is there someone else within your organisation who we may be able to speak to that is responsible for making these decisions.

- Yes – INTERVIEWER: ONCE SPEAKING TO ‘NEW’ PERSON, LOOP BACK TO TEXT 1, FOLLOWED BY INTRO 2 and TEXT 2
- No – Close

TEXT 2: READ OUT TO ALL: This is a genuine research study and no sales call will result from our contact with you. The interview will be carried out in strict accordance with the Market Research Society's Code of Conduct and GDPR, with all results anonymised

SCREENING

Firstly, I have some questions about you and your place of work.

SC ASK ALL

S1 Can I just check that the organization occupying the premises is called [SAMPLE]?

- Yes
- No. Thank and close

SC ASK ALL DECISION MAKERS

S2 Does your organisation's premises at [ADDRESS] have access to the gas grid?

- Yes - Close
- No
- Don't know

SC ASK ALL WITHOUT ACCESS TO GAS GRID

S3 Still thinking about [ADDRESS], does your organisation have separate premises to your or someone else's home address? i.e. your organisation is based somewhere else other than at your or someone else's home.

- Yes
- No - Close
- Don't know - Close
- Refused - Close

SC ASK ALL WITH SEPARATE PREMISES FROM HOME ADDRESS/ES

S4 Approximately, how many people are employed at the organisation that you work for?

- 1-9

-
- 10-99
 - 100-249
 - 250 or more

FURTHER CONTEXTUAL QUESTIONS NEAR FRONT OF SURVEY

SC ASK ALL QUALIFIED FROM SCREENER (hereafter referred to as Ask All, unless specified)

- Q1 Can you tell me if your organization operates on a single site or across multiple sites?
- Single
 - Multiple
 - Don't know

SC ASK ALL

- Q2 Which of the following best describes the premises at [ADDRESS]? Does your organisation have full use of...?
- A whole building
 - A collection of buildings
 - Part of a building

MC ASK ALL

- Q3 Which of the following sources of power is used to heat the [INSERT TEXT "building" IF Q2 = CODE 1, 3, OR "buildings" IF Q2 = CODE 2] at [ADDRESS]? READ OUT
- Mains gas boiler - Close if single coded
 - Oil boiler
 - LPG boiler
 - Biomass boiler
 - Heat network [IF NECESSARY ADD Sometimes called district heating, a heat network is a distribution system of insulated pipes that takes heat from a central source and delivers it to a number of domestic or non-domestic buildings]
 - Heat pump
 - Solar thermal

-
- Combined Heat and Power System
 - Other (please specify)
 - There are no fixed premises that need heating – Close
 - Don't know - Close

MC ASK IF Q3 = 6

Q4 What type of heat pumps are used at [ADDRESS]? PROMPT IF NECESSARY

- Air-to-air heat pump
- Air-to-water heat pump
- Ground source heat pump
- Water source heat pump
- Hybrid heat pump
- Other (please specify)
- Don't know

QUESTIONS ON THE BUILDING

The next few questions are specifically about the [INSERT TEXT "building" IF Q2 = CODE 1, 3, OR "buildings" IF Q2 = CODE 2"] at [ADDRESS].

O/E ASK ALL

B1A What is the main use of the [INSERT TEXT "building" IF Q2 = CODE 1, 3, OR "buildings" IF Q2 = CODE 2"]?

OPEN-ENDED

MC INTERVIEWER TO CODE

B1B Building use(s)

- Retail and financial
- Offices and workshops
- Public assembly (e.g. community centres, day centres, places of worship, leisure and entertainment, libraries, museums and galleries)
- Restaurant, café or takeaway
- Industrial / Manufacturing
- Storage and distribution
- Hotel

-
- Healthcare
 - Education
 - Emergency service
 - Agricultural
 - Other (please write in)

SC ASK ALL

B2 Which of the following comes closest to describing the size of the [INSERT TEXT “building” IF Q2 = CODE 1, 3, OR “largest building” IF Q2 = CODE 2]? READ OUT

ALLOW MC IF CODE 2 AT Q2

- Small – up to the size of a 4- or 5-bedroom house
- Medium – about the size of a local convenience store or supermarket (e.g. Sainsbury’s Local)
- Large – about the size of a larger in-town supermarket (e.g. Tesco Superstore) or larger

SC ASK All

B3 Which of the following best describes your premises at [ADDRESS]? READ OUT

ALLOW MC IF CODE 2 AT Q2

- Rented from a private or commercial landlord
- Owned by you or your organisation
- Leased
- Other (please specify)
- Don’t know
- Refused

SC ASK All

B4 Do you / your organisation have the authority in your building to make fundamental changes to the heating system(s) at [ADDRESS]? For example, change from an oil boiler to a new technology

- Yes

-
- No
 - Don't know

SC ASK ALL

B8 Overall, how satisfied are you with your existing heating system(s)? Would you say Very satisfied, Fairly satisfied, Neither satisfied nor dissatisfied, Fairly dissatisfied or Very dissatisfied?

- Very satisfied
- Fairly satisfied
- Neither satisfied nor dissatisfied
- Fairly dissatisfied
- Very dissatisfied
- Don't know

QUESTIONS ON LOW CARBON HEATING

The next few questions are about low carbon heating systems. By low carbon heating we mean heating systems which use energy from biomass or the sun, or which use electricity to draw heat from the ground, water, or air to heat your [INSERT TEXT "building" IF Q2 = CODE 1, 3, OR "buildings" IF Q2 = CODE 2"]

SC ASK ALL

C1 Which of the following best describes how much, if anything, you know about low carbon heating systems? This includes air source heat pumps, ground source heat pumps and biomass boilers. Would you say...? READ OUT

- I know a lot about low carbon systems
- I know a little about low carbon systems
- I am aware of low carbon systems, but don't really know what they are
- I have never heard of low carbon systems

SC ASK IF Q3 SINGLE CODED

C2 Thinking again about the sources of power used to heat the [INSERT TEXT “building” IF Q2 = CODE 1, 3, OR “buildings” IF Q2 = CODE 2] at [ADDRESS], were these already present, or has your organisation installed new heating systems since occupying the site?

- Already installed
- Organisation has installed new heating system since occupying site

SC ASK IF [Q3 ≠ 4-8] i.e. currently no low carbon heating system OR

ASK IF [Q3 = 1-3 AND Q3 = 4-8] i.e. currently mixed high & low carbon heating system

C4A If your current heating system was to stop working and needed to be replaced, how likely would you be to consider replacing it with a low carbon heating technology such as a heat pump or biomass boiler? Would you say very likely, quite likely, neither likely nor unlikely, quite unlikely or very unlikely?

- Very likely
- Quite likely
- Neither likely nor unlikely
- Quite unlikely
- Very unlikely
- Don't know

O/E ASK IF C4A, C4B, OR C4C = 1-2

C5A Why is your organisation considering installing a low carbon heating system at [ADDRESS]?

OPEN-ENDED

MC INTERVIEWER TO CODE

C5B Why considering low carbon heating installation ALLOW DON'T KNOW

- It is already installed at another building/site
- Easier to use/operate
- To help save money on energy bills
- To help the environment

-
- To improve our green credentials
 - To help meet the low carbon targets for my place of work
 - The previous heating system was faulty
 - The new system is more convenient for my place of work
 - To meet planning requirements
 - Other (please specify)

O/E ASK IF C4A, C4B OR C4C = 1-2

C5C What are the barriers to installing a low carbon heating system at [ADDRESS]?

OPEN-ENDED

MC INTERVIEWER TO CODE

C5D Why not considering low carbon heating installation ALLOW DON'T KNOW

- Too costly
- We don't own the building / landlord will not give permission
- Would be too disruptive whilst installation implemented
- Technologies do not fulfil heating requirements at our site
- Don't have enough information / don't know enough about low carbon heating systems
- Other (please specify)

O/E ASK IF C4 = 3-6

C6A Why isn't your organisation considering installing a low carbon heating system at [ADDRESS]?

OPEN-ENDED

MC INTERVIEWER TO CODE

C6B Why not considering low carbon heating installation ALLOW DON'T KNOW

-
- Too costly
 - We don't own the building / landlord will not give permission
 - Would be too disruptive whilst installation implemented
 - Technologies do not fulfil heating requirements at our site
 - Don't have enough information / don't know enough about low carbon heating systems
 - Other (please specify)

SC ASK IF Q2 = 2 AND Q3 = 4-8

C7 Earlier you said that your organisation has a collection of buildings at [ADDRESS] and use low carbon technology for heating. How many of the buildings are low carbon heated?

- All of them
- Some of them
- None of them
- Don't know

MC ASK IF C7= 2, 3, 4

C8 What are the barriers to using low carbon heating across all the buildings at [ADDRESS]? Please select all that apply. READ OUT

- Too costly
- Don't own the building / landlord will not give permission
- Would be too disruptive whilst installation implemented
- Technologies do not fulfil heating requirements of all buildings
- Don't have enough information / don't know enough about low carbon heating systems
- Other (please specify)
- Don't know

MC ASK ALL

C10 What sources of information would you use for exploring low carbon heating? Please select all the apply. READ OUT

-
- Local installer
 - Online
 - Independent assessors
 - Friends/family/existing users
 - Consultant
 - Housing association
 - Other (please specify)
 - Don't know

QUESTIONS ON POLICY INTERVENTIONS

During the 2020s the Government plans to phase out high carbon fossil fuel heating in buildings off the gas grid. Liquid Petroleum Gas (LPG), coal and oil are likely to be replaced with low carbon technologies and fuels.

SC ASK ALL

P1 Before today, to what extent were you aware or not about this? READ OUT

- Yes, fully aware
- Yes, aware of this, but not in detail
- No, not aware of this
- Don't know

SC ASK ALL

P2 Thinking now about measures the Government could introduce to encourage businesses like your own to change to low carbon heating systems, how effective, if at all, do you think each of the following would be?

Please use a scale of Very effective, Fairly effective, Not very effective and Not at all effective.

- Loans to help make low carbon technology affordable
- Lower energy bills following the installation of a new system
- Improved accessibility to expert heating and energy advice (e.g. through free independent buildings audits)

-
- Banning the installation of new fossil fuel heating systems by the year 2030
 - Increasing the cost of higher carbon technologies and parts
 - Increasing the cost of fossil fuels for heating
 - Boiler scrappage scheme
-
- Very effective
 - Fairly effective
 - Not very effective
 - Not at all effective
 - Don't know

SC ASK ALL

P3 If the Government were to prevent any further installations of high carbon fossil fuel heating technologies such as oil and LPG boilers by the mid-2020s, what do you foresee the impact being on your organisation? Would you say this would have...? READ OUT

- A strong positive impact
- A slight positive impact
- No impact
- A slight negative impact
- A strong negative impact
- Don't know

CLASSIFICATION

SC CODE ALL

QD1 Code respondent gender [DO NOT ASK – INTERVIEWER TO CODE]

Male

Female

O/E ASK ALL

QD2 What is your job role / title?

OPEN-ENDED

SC ASK ALL

QD3 For classification purposes, can you tell me which of the following age bands you fit into? READ OUT

- 18-24
- 25-34
- 35-44
- 45-54
- 55-64
- 65+
- Prefer not to say

SC ASK ALL

QD4 Which of the following best describes the location of the premises at [ADDRESS]?

READ OUT

- City location
- Other urban location
- Semi-rural
- Rural
- Don't know

SC ASK ALL

QD5 Which sector does your organisation operate in?

- Private sector
- Public sector
- Third sector

-
- Don't know

SC ASK ALL

QD6 What is the principal activity of your organisation? READ OUT

ABDE - Agriculture, Mining, Quarrying & Utilities

C – Manufacturing

F – Construction

G – Wholesale, Retail, Motor Trades

H – Transport & Storage (incl. Postal)

I – Accommodation & Food Services

J – Information & Communication

K – Finance & Insurance

L – Property

M – Professional, Scientific & Technical

N – Business Administration & Support Services

PQ – Education & Health

RS – Arts Entertainment & Recreation / Other Service Activities

WRAP-UP

SC ASK ALL

DP2 Would you be happy for Impact Research to get in touch with you again in the future to discuss the results you have given in this survey?

Yes, I'm happy to be contacted again to discuss my answers

No, I do not want you to get in touch again to discuss my answers

SHOW ALL

Finally, we are very interested in hearing your views on our survey design

G ASK ALL

DP3 Using the rating please let us know how you would rate each of the following:

	1 Very Bad	2	3	4	5 Very Good
Length of survey					
Ease of completion					
Ability to express my true opinion					
Overall experience					

If you have any additional feedback, please enter your comments here:

SHOW ALL

Thank you for taking part in the survey. Your feedback is greatly appreciated. Would you like to write down our telephone number, should you have any queries?

Annex E: Phase 3 sample

20 non-domestic consumers were interviewed during this qualitative phase of the research.

Of the 20 non-domestic consumers interviewed, 55% used an electric heating system, 25% used an oil boiler and 25% had a heat pump. The full breakdown is given in Table 10. 70% of the buildings were used as offices or workshops, as shown in Table 11.

Figure 8: Location of non-domestic consumers interviewed⁴²

Base: All non-domestic consumers (20)

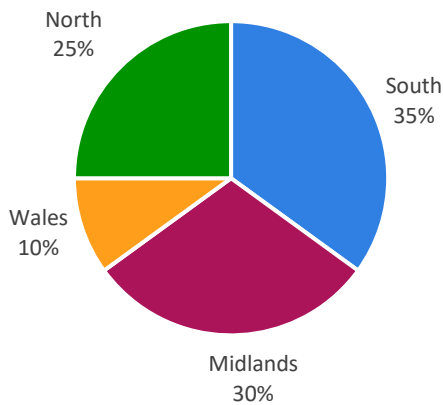
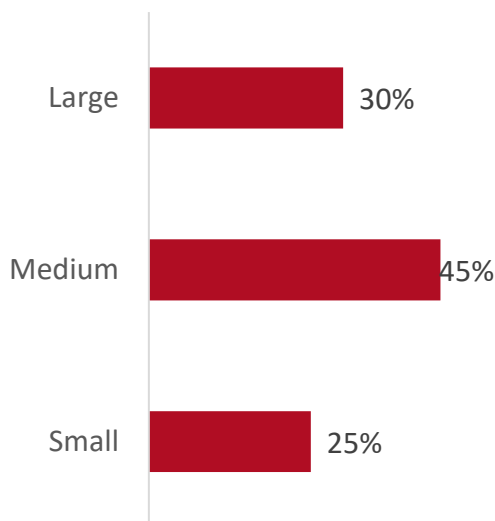


Figure 9: Size of non-domestic consumers' buildings⁴³

Base: All non-domestic consumers (20)



⁴² North: North East, North West, Yorkshire

Midlands: East of England, East Midlands, West Midlands

South: London/Greater London, South East, South West.

⁴³ Small: Up to the size of a 4- or 5-bedroom house

Medium: About the size of a local convenience store or supermarket (e.g. Sainsbury's local)

Large: About the size of a larger in-town supermarket (e.g. Tesco superstore) or larger

Table 9: Building tenure

Base: All non-domestic consumers (20)

Tenure	Proportion
Owned by you or your organisation	70%
Rented from a private or commercial landlord	30%

Table 10: Types of heating system installed

Base: All non-domestic consumers (20)

Tenure	Proportion ⁴⁴
Electric	55%
Oil boiler	25%
LPG boiler	5%
Biomass boiler	10%
Heat pump	25%

Table 11: Industry

All non-domestic consumers (20)

Industry	Proportion ⁴⁵
Offices and workshops	70%
Industrial/manufacturing	30%

⁴⁴ Respondents were able to select multiple responses.

⁴⁵ Respondents were able to select multiple responses

Agricultural	5%
Storage and distribution	10%
Retail and financial	10%
Hotel	10%
Public assembly	5%

Annex F: Qualitative interview topic guide

INTRODUCTION TO THE RESEARCH AND ADHERENCE TO MRS CODE OF CONDUCT AND GDPR

Good morning/afternoon/evening. My name is And I am calling from Impact on behalf of the department for Business, Energy and Industrial Strategy.

Introduction (2-3 minutes):

- Introduce yourself
- Explain that the research is being conducted on behalf of BEIS (the Government department for Business, Energy & Industrial Strategy).
- Explain purpose of discussion (understand the opinions of non-domestic customers in relation to low carbon heating technologies available and the phase-out of high carbon technologies)
- No right/wrong answers, interested in your opinions, in as much detail as possible
- Request permission for audio recording and explain interview is confidential and bound by the MRS Code of Conduct. Also ask permission to use their name and quotes in analysis for internal BEIS use only.

Warm-up (5 minutes):

In relation to your role, can I confirm you have responsibility for decisions regarding energy and heating at [ADDRESS] and would be able to answer questions about [ORGANISATION] energy usage and heating at this address?

IF NO: END INTERVIEW

- What is the company / organisation you work for and what is your role?

Ownership	Is the building you work in owned? Rented?	Owned, Rented
Location	Where is the location of your business?	Rural, Town, Business Park?
Purpose	How would you describe the main purpose of the building/s at the premises?	Retail and financial, Offices and workshops, Public assembly (e.g. community centres, day centres, places of worship, leisure and entertainment, libraries, museums and galleries), Restaurant, café or takeaway, Industrial / Manufacturing, Storage and

		distribution, Hotel, Healthcare, Education, Emergency service, Agricultural
Floor space	Roughly how large is the building you work in?	<p>IF UNABLE TO GIVE INDICATION OF FLOOR SPACE PROMPT WITH:</p> <p>Small – up to size of a 4 or 5 bedroom house</p> <p>Medium – about size of a local convenience store or supermarket (e.g. Sainsbury’s Local)</p> <p>Large – about size of a larger in-town supermarket (e.g. Tesco Superstore) or larger</p>
Tenure	How long has the business been based at the current premises?	
Future tenure	<p>How long does the business plan on staying at the current premises?</p> <p>How has Covid-19 affected longer-term decision making around the building you occupy?</p>	
Staff	How many staff work in the building?	

- How do you currently heat the building/s?
 - Was this your decision to install this heating?
 - If no, why – someone else’s or done before you moved in?
 - If yes, why did you choose to install this?
 - Prompt for: Cost? Performance? Practical reasons?
 - What was the cost? Was this in line with expectation? Would you have been willing to pay more?
 - How many times have you made changes to the heating system at your building/site?

- Are you happy with the current heating system set up?
 - Prompt for: Cost? Performance? Easy to maintain? Good for the environment?
- What and who drives the decisions you make over which heating system to have?
- If you need to replace your heating system, who in the business, alongside yourself, makes final call about what they install?

RENTERS ONLY	
Within your lease, who is responsible for managing the heating systems in the building you occupy?	
LANDLORD RESPONSIBLE FOR HEATING SYSTEM	BUSINESS IS RESPONSIBLE FOR HEATING SYSTEMS
Does your business directly contribute to the cost of the heating system, or is it included in the overall rental payment?	Does the business own the heating system? Yes / No
IF DIRECTLY CONTRIBUTE TO COST OF HEATING SYSTEM: Is the cost fixed, or can it vary?	IF NO: Do you require consent from your landlord to make changes to your heating system? Yes / No IF YES: How likely / receptive do you think your landlord would be to allow you to change your heating system to a low carbon system such as a heat pump?
Are there provisions for costs relating to the heating system in a dilapidation process at the end of your contract? IF NECESSARY, PROMPT: In the commercial property world, 'dilapidations' refers to breaches of lease covenants relating to the condition of a property, and the process of remedying those breaches. Tenants enter commercial leases agreeing	Are there additional heating costs, such as administration fees, you incur arising through leasing your premises? IF YES: What are these costs and how much are they?

<p>to keep premises in repair; if they do not, the law of dilapidations applies.</p>	
<p>How likely / receptive do you think your landlord would be to allow you to change your heating system to a low carbon system such as a heat pump?"</p>	<p>Have you any experience of trying to make changes to your heating system before?</p> <p>IF YES: What were these changes?</p> <p>IF NO: are there changes you would like to make and what are these?</p> <p>What happened when you tried to make changes to your heating system before?</p>
<p>Have you any experience of trying to make changes to your heating system before?</p> <p>IF YES: What were these changes?</p> <p>IF NO: are there changes you would like to make and what are these?</p> <p>What happened when you tried to make changes to your heating system before?</p> <p>Was your landlord supportive of your ideas?</p>	
<p>Do you think landlords and tenants can work together more to transition from high carbon to low carbon heating systems? IF YES: How can landlords and tenants work together more in this area?</p> <p>Whose role do you think it should be to install low carbon heating systems in buildings such as yours?</p> <p>Who should be responsible for paying for these changes?</p> <p>Would you be willing to paying more for a rental building with a low carbon heating system?</p> <p>Why is this?</p> <p>IF YES: how much more?</p>	

Interviewer: give brief explanation of heat pump, if respondent not aware: A low carbon heating alternative that extracts heat from one place and transfers to another, using electricity

-
- What are your opinions on these?
 - Do you see these as suitable alternatives for your current heating system?
 - If have heard of Heat Pumps, where did you first hear about them?
 - Have you done any research into them? Where did you look to find out information?
 - Can you tell me any pros or cons?
 - Prompt on e.g. cost, performance, ease of repair
 - How do you think awareness of Heat Pumps can be increased?
 - Would you consider installing any of these in your building?
 - Why is this?
 - How feasible would it be to change your existing heating systems to one of these alternatives?
 - How would you go about doing this? i.e. what processes and steps would you follow?
 - Would you ask/look for advice?
 - Who would you ask?
 - Where would you look?
 - How much would it disrupt your business if your whole heating system was changed?
 - Would you have to shut while the installation is occurring? For how long?
 - Could your business still operate if your building were to temporarily shut?
 - What would be the impact is your business had to close for a week?
 - Would you expect support if your business was affected in the changeover period?
 - Who would this support come from / What kind of support would you need / For how long?
 - What are the practical considerations for changing your heating system? Before, during and after installation?
 - Do these factors put you off wanting to change your heating system?
 - Why is this?
 - What would the benefits of installation be?
 - What barriers, if any, prevent your business from making changes to your heating set-up to make it more environmentally responsible?
 - What could alleviate these barriers?
 - Would it help if incentives were available?

Moderator read out: Finally, a recent survey found that a significant proportion of businesses felt that having access to loans to pay for the installation of a low carbon heating system, would be effective in increasing the uptake of these new heating technologies.

If you needed to replace your heating system, how would your organisation feel about accessing finance to pay for or pay in-part for low carbon installations such as heat pumps? PROMPT FOR: Is that view impacted by the COVID-19 situation? In pre-COVID times, would the business's attitude to accessing finance for this purpose be different?

IF BUSINESS OPEN TO ACCESSING FINANCE	IF BUSINESS NOT OPEN TO ACCESSING FINANCE
What kind of terms of the loans would be most attractive to you (interest, repayment periods)?	What would make you more likely to take on a loan?

Who do you think should run the loan scheme (Government? private banks?)

Moderator read out: The same survey found that if new technologies provided savings on heating bills, businesses would be more likely to install a low carbon heating system.

What level of savings on your energy bills would incentivise you to invest in a new low carbon heating system?

Over what time-period would you want to see a return on your investment?

What form of financial support would be most useful to you?

Prompt for: Loan, reduced bills, upfront lump sum?

HAVE INSTALLED HEAT PUMP RECENTLY ONLY

- How important is reducing your environmental impact to the business?
 - Have you taken any measures to reduce this? Particularly around the heating of the business?
 - E.g. Have you re-insulated?
- Can you talk me through the process you went through for installing a heat pump?
 - Why did you choose to install a heat pump?
 - If you need to replace your heating system, who in the business, alongside yourself, makes final call about what they install?
 - What type do you have? How did you choose? Installer influence in decision?
 - What was the installation process like?
 - How did you go about finding an installer?
 - Was it easy to book in the installation?

- What was the installer like? PROBE FOR: Knowledge, Efficiency, Putting you at ease
- Did the installer provide any advice on how to find the installation (e.g. available finance options)?
- Did the installation disrupt your business?
- Did your organisation have to close temporarily while the work was undertaken?
 - IF YES: For how long
 - IF YES: How was this managed?
 - IF YES: What was the cost implication, if any?
 - Was this in line with expectation?
- Were the changes made as part of a wider refurb?
 - What were these?
- What information did you require before installation?
 - How/where did you find this?
- How well does it operate?
 - Does it meet your heating needs? Is it what you expected?
 - Have you experienced any issues?
- Have you seen any changes in heating costs?
- Has it impacted the business and/or staff in any other way?
- Were there any aspects of the installation that did not go well? What could have made it better?
- How satisfied have you been overall since the heat pump was installed?
 - Would you recommend a heat pump to a similar type of business to yourself?
 - Was there anything you did not know about heat pumps/the installation process prior to installation that would have been helpful to have known?
 - How do you think awareness of Heat Pumps can be increased?

Phasing out fossil fuels (5 minutes):

Moderator read out: During the 2020s the Government plans to phase out high carbon fossil fuel heating in buildings off the gas grid. Liquid Petroleum Gas (LPG), coal and oil are likely to be replaced with low carbon technologies and fuels.

- Is this something you were aware of?
 - How did you become aware? Have you done any research into it at all?
- What would be the effect on your business if this were to go ahead?
 - Would you have to make any changes to the way your business operates?

- What kind of changes?
- How do you think this would affect the stakeholders in your business?
- How much lead-time would you need to transition to low carbon heating systems?
- Are there any particular issues that need to be considered for off gas grid businesses?
- What support would you need as high carbon fossil fuel heating is phased out in buildings off the gas grid?
 - Prompt for support beyond money e.g. information, training
- Who should provide that support?
- For how long would you need support?

HAVE INSTALLED HIGH CARBON RECENTLY ONLY

Can you talk me through the process you went through for installing this?

Why did you choose to install it?

Who in the business ultimately made the decision to install the heating system you did?
Were you personally involved in this decision?

How did you choose?

What was the installation process like?

What was the installer like? PROBE FOR: Knowledge, Efficiency, Putting you at ease

Did the installer provide any advice on how to find the installation (e.g. available finance options)?

Did the installation disrupt your business?

Did your organisation have to close temporarily while the work was undertaken?

IF YES: For how long

IF YES: How was this managed?

IF YES: What was the cost implication, if any?

Were the changes made as part of a wider refurb?

What information did you require before installation?

How/where did you find this?

What were the main influences of your decision to install what you did?

PROMPT FOR: Cost? Performance? Familiarity? Ease of use? Installer recommendation?

Did you consider installing a heat pump at all? Yes / No

Why? Why not?

Is your building suitable for the installation of low carbon technology such as a heat pump?
Yes / No

YES – BUILDING IS SUITABLE FOR INSTALLATION OF LOW CARBON HEATING SYSTEM	NO – BUILDING NOT SUITABLE FOR INSTALLATION OF LOW CARBON HEATING SYSTEM
Have you made any upgrades to your building in the last year to make it more suitable for installation of low carbon technology? Yes / No	What upgrades would you need to make for the building to be suitable for a low carbon heating technology?
IF YES: Please describe the nature of these upgrades IF YES: Roughly how much did this cost?	How much would this cost?

If low carbon heating were to cost more to install than your traditional heating system, roughly how much more would you deem as reasonable for upfront costs and on-going maintenance?

At what cost would it have a significantly negative impact to your business?

Heating system financing (5 minutes): NON-RENTERS (and renters who own the heating system)

Have you / your organisation installed a new heating system at the building/ site you currently occupy? How many times?

Have installed new system	Have not installed new system
How did you fund the cost of the new heating system(s), i.e. through existing capital or financing?	How would you fund the cost of the new heating system(s), i.e. through existing capital or financing?
IF installed via financing	IF DON'T KNOW ON FINANCE QUESTIONS – who was responsible for these decisions in the organisation?

<p>What form of financing did you take out on the most recent occasion?</p>	<p>What form of financing would you take out?</p>
<p>PROMPT FOR:</p>	<p>PROMPT FOR:</p>
<p>Traditional bank loan? Other source?</p>	<p>Traditional bank loan? Other source? Existing capital?</p>
<p>Who was responsible for this decision?</p>	<p>Who would make this decision and on what basis?</p>
<p>What was your experience of this finance process? How long did it take between applying for the finance and it being approved?</p>	<p>What total cost would you expect/ be willing to pay for a new system at the point of replacing an existing system?</p>
<p>PROMPT have you installed more than one / check whether they followed the same financing process each time?</p>	<p>What percentage of your turnover would the cost of changing your heating system be acceptable?</p>
<p>If you use financing, what factors, such as payback period and interest rate, do you look for when selecting a loan? Who makes decisions and on what basis?</p>	<p>Would you consider paying anymore beyond this? If so under what circumstances?</p>
<p>What percentage of your turnover did the cost of changing your heating system represent? How did you budget for this?</p>	<p>Would your cost expectations be the same for a low carbon system such as a heat pump as for a fossil fuel system such as oil or LPG?</p>
<p>IF DON'T KNOW ON FINANCE QUESTIONS – who was responsible for these decisions in the organisation?</p>	<p>Are heating systems included in the refurbishment of your building, how often does this happen and how much is allocated for a new heating system?</p>
<p>What was included in your quote and how much did you pay for the installation of your current heating system? Please break this down into capital, installation, and maintenance costs.</p>	<p>Have you or would you consider paying for a connection to the gas grid? If this is feasible for your building how much would it cost and why did you decide against connecting?</p>
<p>Were these costs in line with your expectations? Would you have been able/ willing to have paid any more than you did?</p>	
<p>Would your cost expectations be the same for a low carbon system such as a heat pump as for a fossil fuel system such as oil or LPG?</p>	
<p>Are heating systems included in the refurbishment of your building, how often does</p>	

this happen and how much is allocated for a new heating system?

Have you or would you consider paying for a connection to the gas grid? If this is feasible for your building how much would it cost and why did you decide against connecting?

IF used existing capital for previous install

Have you installed more than once / check whether they followed the same financing process each time?

What form of financing would you consider taking out in a future install?

Traditional bank loan? Other source?

If you would consider financing, what factors, such as payback period and interest rate, would you look for when selecting a loan?

IF DON'T KNOW ON FINANCE QUESTIONS – who was responsible for these decisions in the organisation?

What was included in your quote and how much did you pay for the installation of your current heating system? Please break this down into capital, installation and maintenance costs.

Were these costs in line with your expectations? What percentage of your turnover did the cost of changing your heating system represent? How did you budget for this?

Would you have been able/ willing to have paid any more than you did?

Would your cost expectations be the same for a low carbon system such as a heat pump as for a fossil fuel system such as oil or LPG?

Are heating systems included in the refurbishment of your building, how often does

<p>this happen and how much is allocated for a new heating system?</p>	
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<p>Have you or would you consider paying for a connection to the gas grid? If this is feasible for your building how much would it cost and why did you decide against connecting?</p>	
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Wrap up (2-3 minutes)

Is there any further feedback you would like to give BEIS on this subject?

Ask if willing to:

- be re-contacted about this survey
- be contacted for further research opportunities
- have their details passed on to BEIS for further research opportunities