2022 Heat Network Consumer and Operator Survey

Kantar Public

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Contents

Glossary

BEIS

The Department for Business, Energy and Industrial Strategy. In 2023, BEIS was restructured with heat networks policy moving to the Department for Energy Security and Net Zero (DESNZ).

CATI

Computer Assisted Telephone Interviewing. This was used to collect data from heat network operators.

Cost-of-living crisis

A term used to refer to the situation the UK has experienced since late 2021, in which the cost of basic, essential items such as food and energy bills has increased rapidly in a short period of time at a faster pace than average household wages. The impact of the crisis on energy supply and prices was exacerbated by Russia's invasion of Ukraine in early 2022.

Communal heat network

This is where heating is provided by a shared boiler, or another heat source, that is located outside a home but in or near the same building. The boiler provides heat to all homes within that building. An example of this is a block of flats with a shared communal boiler in the basement.

District heat network

This is where heating is provided by a shared boiler or heat source that provides heating and hot water for multiple buildings. This could be multiple houses or multiple blocks of flats. Often, the central heat source has its own small building near these homes, sometimes called an 'energy centre'. Heat is provided to homes via a heat network and heat exchangers inside each person's home.

The Energy Bills Support Scheme (EBSS)

A government initiative to support consumers with rising energy costs during the cost-of-living crisis. All domestic electricity customers were eligible to receive £400 towards their energy bill split into six payments and discounted from bills between October 2022 and March 2023.

Energy Performance Certificates (EPC)

A rating scheme summarising the energy efficiency of a property. Ratings, ranging from A-G, provide an indication of how much it will cost to heat and power the property, and include recommendations for energy efficient improvements and indicative costs.

Heat network

Heat networks, also known as district or communal heating, are distribution systems of insulated pipes that take heat from a central source and deliver it to a number of domestic or non-domestic properties. The heat source might be a facility that provides a dedicated supply to the heat network, such as a combined heat and power plant; or heat recovered from industry and urban infrastructure, canals and rivers, or energy from waste plants.

Heat Supply Agreement

A legal document that regulates heating supplies. Network Heat Supply Agreements regulate supplies between heat network operators and users. Use of these agreements is inconsistent across operators.

HMBR

Heat Network (Metering and Billing) Regulations 2014. The Heat Network (Metering and Billing) Regulations 2014 implement the requirements in the Energy Efficiency Directive (EED) with respect to the supply of distributed heat, cooling, and hot water. The regulations stipulate that suppliers of heat networks must notify the Office for Product Safety and Standards (OPSS) at BEIS (as it was at the time of survey) of their existence, including various details about their heat network. The sample of operators of heat networks was taken from the 2018 database of heat networks supplied by BEIS.

Logistic regression modelling

Logistic regression is a statistical technique to analyse the relationships between multiple variables where the outcome variable is binary. It finds the equation that best predicts the probability of the outcome given the variables included in the model.

Operators

Heat network suppliers and operators. Kantar Public aggregated the names of heat network suppliers and operators listed in the 2018 HMBR database of Heat Networks to produce a file containing unique suppliers and operators. In the survey, respondents were asked about operating status (such as ‘own and operate the heat network myself’ or ‘I am contracted by someone to operate the heat network’). For more information see question A9 in the Operators questionnaire. In this report the word ‘operator’ is commonly used to describe all heat network suppliers and operators. This file is based on the 7,400 unique Heat Networks identified in the HMBR file following the aggregation to one row per energy centre postcode.

Statistically significant differences

Statistically significant differences are differences that are very unlikely to occur by chance. Kantar Public used statistical tests to determine the probability of these differences occurring. Unless otherwise specified, all commentary in the main report focuses exclusively on

differences that are statistically significant at a 95% confidence level[1]. In basic terms, this means that if the survey was conducted 100 times, a finding of the same nature would be found in at least 95 cases. In a few exceptional circumstances, survey findings which were not statistically significant have been presented where their inclusion was important for context or was consistent with a wider trend.

Voluntary standard scheme

Initiatives designed to encourage best practice and drive up standards in the heating industry by establishing minimum quality standards around consumer protections. Operators can register with these schemes, which include standards outlined by the Heat Trust.

Vulnerable consumers

BEIS requested that the definition of 'vulnerable consumers' used the same categories as agreed in 2017 to allow for comparability of data. The data is taken from responses to the consumer questionnaire. This is where at least one person in a household has any of the following:

- A long-term illness, physical or mental health problem or disability which limits their daily activities or the work they do
- Any caring responsibilities for a member of their immediate family, or, a close relative outside of their household who has any long-standing illness, physical or mental health problem or disability
- Any hearing or visual impairments or other communication needs, which limit their daily activities or the work they can do
- An injury or any other temporary problems which affect their ability to use their heating system
- Extra support or assistance from their gas or heating supplier

[1] Differences across sub-groups were tested using chi square tests.

Executive Summary

Background and policy context

Heat networks are a cost-effective low-carbon heating solution when deployed in dense urban areas. They are expected to play a crucial part in the UK achieving its Net Zero targets[2], for which new policies are expected in the 2020s to encourage heat network growth. To ensure that the expansion of heat networks does not disadvantage end users relative to those on other heating sources, it is important to understand the current experiences of heat network consumers.

In 2017, the Department of Business, Energy and Industrial Strategy (BEIS) commissioned Kantar Public to conduct the first large-scale survey of domestic heat network consumers, the Heat Networks Consumer Survey.[3] It was found that heat network consumers were less able to control their heating, experience more over-heating and service interruptions, and had bills which were less frequent and contain limited information, when compared to non-heat network customers. This formed the evidence base for reforms to the existing Heat Network (Metering and Billing) Regulations 2014 and the development of a Market Framework, on the recommendation of the Competition and Markets Authority.

Given that it was expected that the heat networks market had grown since 2017, in 2021 BEIS[4] and the Scottish Government commissioned Kantar Public to repeat this research. The aim was to better understand (a) how consumers' experiences differed from those using other heating systems and how this had changed since 2017, and (b) how operators manage their heat network.

Research method

The research took a mixed methods approach of surveys and follow-up interviews with consumers and operators.

The Consumer survey took place between 22 March and 12 July 2022. It was carried out using a mixed-mode (online and postal questionnaires), self-completion approach. It compared domestic consumers on heat networks (2,244 responses) with a statistically matched sample of domestic consumers in properties with no heat network (1,733 responses). This made it possible to attribute differences between the two groups to the heating system, rather than other unrelated differences between the two populations[5].

[2] https://www.gov.uk/government/publications/heat-and-buildings-strategy
[3] https://www.gov.uk/government/publications/heat-networks-consumer-survey-consumer-experiences-on-heat-networks-and-other-heating-systems
[4] Since the project was commissioned, BEIS has been restructured and the heat networks team moved to The Department for Energy Security and Net Zero (DESNZ).
[5] For more information on the Propensity Score Matching technique used, see the technical report.

The Operator survey was conducted between 18 March and 30 May 2022 using Computer Assisted Telephone Interviewing (CATI) with 130 heat network operators.

The follow-up interviews were conducted between 15 November 2022 and 30 January 2023 with 50 heat network domestic consumers and 18 operators. Topic guides were developed based on areas from the survey which would benefit from a more in-depth understanding, and emerging priority topics, such as the cost-of-living crisis.

Key findings

Characteristics of consumers and heat network operators

- Compared to the national average, heat network properties were more likely to be smaller properties, which were often flats, and heat network consumers were more likely to own their property. The interviews revealed that heat network consumers had a low engagement with and understanding of their heating system. Heating was viewed as a utility and therefore expected to be reliable and have manageable costs.
- Operator profiles were varied, particularly in the extent to which heat networks represented an important element of their overall business operations. Operators with a greater strategic focus on heat networks were more likely to have varied and structured strategies in place regarding billing, customer service and decarbonisation.

Perceptions of low-carbon heat sources

- Although most heat network consumers (79%) believed it is important to protect the environment by using low carbon heating, they were generally not willing to pay more to do so (40% willing to pay more).
- As for operators, although 44% did not use any form of low carbon heat source, half of those said they were likely to switch to low carbon. For operators with specific environmental strategies, heat networks often tended to be linked with other related initiatives (e.g., renewable energy sources) and embedded in wider sustainability strategies.

Satisfaction and service provision

- Heat network consumers reported slightly higher levels of satisfaction with their heating and hot water system (74%) than those not on a heat network (67%). Findings across the survey and interviews indicate that higher satisfaction among heat network consumers was influenced by costs being perceived as fair and relatively low, satisfaction with the amount of information received on their bills, satisfaction with how complaints are handled and outages being mostly temporary.
- Despite higher levels of satisfaction, heating outages, although often short, were more commonly experienced in the last 12 months by heat network consumers (50%) than by

those not on a heat network (29%). This was an increase relative to 2017 where 37% of heat network consumers had experienced at least one outage. The severity of outages and their impact on consumers' satisfaction depended on factors including receiving advanced notice; the duration and timing of the outage; whether vulnerable household members were affected; and if both heating and hot water were turned off.

- One in four heat network consumers reported having made a complaint about their heating in the last 12 months, which is consistent with 2017 levels and higher than non-heat network consumers. Only four in ten (39%) heat network consumers were satisfied with the way the complaint was handled. The main barriers consumers raised around complaining were a lack of a suitable contact, lack of time to complain, relevant information to make the complaint[6], or money to support legal action, as well as fear of evictions. Indeed, not all operators (only 74%) had a formalised complaints procedure.

Heating costs and billing arrangements

- On average, the reported annual cost of bills was lower among heat network consumers (£600) than the statistically matched sample of non-heat network consumers (£960)[7]. However, there was still a wide variation in costs for heat network consumers: one in ten reported an average bill of £2,000 or more.
- Consumers on a heat network were less likely than those not on a heat network to perceive that costs had increased in the last year (78% compared with 84%) and to be struggling to keep up with heating and hot water costs (45% compared with 62%).
- In the interviews, conducted between November 2022 and January 2023, heat network consumers connected being on a heat network with limits to price increases, but often did not know why. Some renters reported feeling shielded, for now, from the effects of the cost-of-living crisis by fixed prices, receiving income support from their council or having heating costs included in their rent.
- Two thirds of operators said that they provided a bill or statement of some form to consumers. Heat network consumers were more likely to receive a bill in 2022 (70%) than in 2017 (62%), although still less likely than non-heat network consumers (84%). Heat network consumers were also more likely to receive a contract in 2022 (35%) than in 2017 (21%).
- Clear information on bills was important to heat network consumers and linked to them perceiving that costs were fair. Three in ten (28%) that received a bill reporting it had too little information. Heat network households with vulnerable people were more likely to disagree (21%) that the information provided was clear, compared to those with no vulnerable consumers (12%).

[6] For example, information on hours heating or water was lost, or number of households affected, or information on how to complete a formal complaint process.
[7] However, it is important to note that information on billing was self-reported and not provided by about a quarter of survey respondents. Surveys were conducted between March and July 2022 so the increase in energy costs may not have filtered through to survey respondents bills by this point in time.

Operator processes

- Around four in ten operators of residential schemes reported maintaining a register of vulnerable consumers, while only 7% of operators said they were a member of a voluntary standard scheme, designed to provide consumer protections. Only two thirds of operators (66%) were aware of the Heat Network (Metering and Billing) Regulations (HMBR), despite this being the source of their contact details for the research.
- Around half (52%) of operators said that they reviewed the energy supplier providing the heat source to their heat networks at least annually. Both the survey and follow-up interviews indicated that exits of energy suppliers were rare and caused minimal disruption.
- Cost was the main barrier to heat networks expansion or extension, while government subsidies were a significant driver of future investment decisions.

Conclusion

Certain aspects of heat network consumer experiences have improved since 2017, such as being more likely to receive a contract and bills. They also report higher satisfaction levels and lower median heating and hot water costs compared to non-heat network consumers. However, compared to those on other heating systems, heat network consumers remain more likely to experience outages (although mostly short) and more likely to make a complaint.

Operators differ in their profile and business focus, which affects how they interact with their consumers and handle issues such as outages and complaints. This suggests areas where future consumer protections could play a role. In terms of their investment decisions, three quarters of operators did not anticipate the number of networks they operated to change. The main barrier identified was the cost involved in expanding or extending their heat networks. Operators indicated that government funding would be an essential component in helping them overcome this barrier, alongside awareness-raising of heat network benefits and better sector leadership and co-ordination.

Introduction

Policy context

Heat networks are a form of heating expected to play a crucial part in the UK achieving its Net Zero targets. Also known as district or communal heating, heat networks are distribution systems of insulated pipes that take heat from a central source and deliver it to a number of domestic or non-domestic buildings. The heat source might be a facility that provides a dedicated supply to the heat network, such as a combined heat and power plant; or heat recovered from industry and urban infrastructure, canals and rivers, or energy from waste plants.[8] They can usually be decarbonised by switching heat source after installation.

As the Heat and Buildings Strategy[9] sets out, heat networks are a cost-effective low-carbon heating solution when deployed in dense urban areas. New policies are expected in the 2020s to encourage heat network growth and reach the scale required to meet net zero targets. For example, heat network zoning, expected no later than 2025, will involve identifying areas particularly suited to heat networks, where certain buildings may be required to connect to a heat network[10]. To ensure that the expansion of heat networks does not disadvantage end users relative to those on other heating sources, it is important to understand the current experiences of heat network consumers.

In 2017, the Department of Business, Energy and Industrial Strategy (BEIS) commissioned Kantar Public to conduct the first large-scale survey of domestic heat network consumers, the Heat Networks Consumer Survey.[11] It was found that heat network consumers were less able to control their heating, experienced more over-heating and service interruptions, and had bills which were less frequent and contained limited information, when compared to non-heat network customers. This formed the evidence base for reforms to the existing Heat Network (Metering and Billing) Regulations 2014 and the development of a Market Framework, on the recommendation of the Competition and Markets Authority. This research was supplemented by a further qualitative study of heat network consumers and operators in 2018[12] commissioned by the Competition and Markets Authority. Understanding how consumers and operators experience the market today is crucial for understanding existing policies and their future development.

Given that it was expected that the heat networks market had grown since 2017, in 2021 BEIS[13] and the Scottish Government commissioned Kantar Public to repeat this research, with

[8] https://www.gov.uk/guidance/heat-networks-overview
[9] https://www.gov.uk/government/publications/heat-and-buildings-strategy
[10] https://www.gov.uk/government/publications/energy-security-bill-factsheets/energy-security-bill-contextual-note-heat-network-zoning-and-the-planning-system
[11] https://www.gov.uk/government/publications/heat-networks-consumer-survey-consumer-experiences-on-heat-networks-and-other-heating-systems
[12] https://www.gov.uk/cma-cases/heat-networks-market-study
[13] Since the project was commissioned, BEIS has been restructured and the heat networks team moved to The Department for Energy Security and Net Zero (DESNZ).

the addition of operators. The aim was to better understand (a) how consumers' experiences differed from those using other heating systems and how this had changed since 2017, and (b) how operators manage their heat network.

Research objectives

This research aimed to better understand the population and experiences of heat network consumers and operators. For consumers, the focus was on how their experiences differed from those using other heating systems and how this had changed since 2017. They were compared to a 'matched sample' of non-heat network consumers to explore topics such as how the populations differed, their heating experiences and satisfaction, and their pricing and billing arrangements. For operators, the aim was to understand their profile and business models, how they manage their heat networks and any future investment plans.

Method

Domestic Consumer Survey

Questionnaire development and testing

In order to build on and compare findings with the 2017 survey, the 2017 questionnaire was used as the basis for the 2022 survey. However, in order to cover recent policy concerns, some existing questions were adapted and new questions were included. The questionnaire was tested through cognitive interviews (via video conference) with five heat network consumers. Cognitive interviews examined respondents' understanding of the questions, comprehension of specific question wording and the extent to which questions provided consistent responses.

Consumer sample and weighting

An address-level sample frame of households on Heat Networks across Great Britain was produced using the Heat Networks (Metering and Billing) Regulations (HMBR) data, shared by BEIS, and publicly available Energy Performance Certificates (EPC) databases. Weighting was required to compensate for variation in the probability of sample selection and systematic differences in response rate between population sub-groups.

Further details on sample selection and weighting can be found in the technical report.

Consumer survey approach

The survey was carried out using a mixed-mode (online and postal), self-completion approach. Consumers were initially sent an invitation to complete the survey online. Those who had not responded were sent a reminder letter (including a paper questionnaire) asking them to either complete the survey online or complete a paper questionnaire and send back to Kantar Public. Following this a final reminder letter was sent (without a paper questionnaire). A £5 incentive was provided upon completion of the survey.

The initial approach included a survey of non-domestic consumers. However, due to poor response rates to a soft launch[14] of the non-domestic consumer survey, it was decided to discontinue this strand of the research[15]. Where the report refers to consumers, it is domestic consumers only.

Fieldwork for the domestic consumer survey took place between 22 March and 12 July 2022. The average survey length online was approximately 25 minutes. In total, there were 2,244 valid responses from domestic Heat Network consumers and 1,733 valid comparison group responses. The final response rate was 10%. There were slightly more surveys completed online. 2,124 (53% of all surveys) were completed online and 1,853 (47%) were postal surveys.

Quantitative analysis

Differences between heat network consumers and non-heat network consumers were analysis, as well as differences between heat network consumers in 2017 and 2022. Differences between sub-groups of the population are only reported when they are both statistically significant and relevant to the survey objectives. Additional analytical conventions include:

- Statistical significance judged at the 95% confidence level
- Percentages for single-response questions may not always add up to exactly 100% because of rounding
- Where respondents have given multiple responses to a question, the sum of the individual responses may be greater than 100%

Regression modelling

A number of logistic regression models were carried out[16] which predict overall satisfaction[17], satisfaction with the level of control[18] and the perceived fairness of cost, based on specific aspects of a domestic consumer's experience of their heat network reported in the survey. Additional information on the regression modelling can be found in the appendix of this report.

Operator survey

Questionnaire development and testing

An initial questionnaire draft was put together following a review of BEIS specified research questions and a questionnaire development workshop held between Kantar Public and BEIS.

[14] Survey invites were sent to c. 1/3 of the non-domestic sample to test response rates.
[15] 102 surveys were returned out of 8,326 non-domestic properties that received the survey invitation. Upon further analysis there were only 32 completed surveys of non-domestic consumers on a heat network.
[16] Logistic regression is a statistical technique to analyse the relationships between multiple variables where the outcome variable is binary. It finds the equation that best predicts the probability of the outcome given the variables included in the model.
[17] Respondents were classified into one of two groups depending on whether they said they were satisfied with their heating system (either 'Very satisfied' or 'Satisfied'), or not (either 'Neither satisfied nor dissatisfied', 'Dissatisfied', or 'Very dissatisfied').
[18] Respondents were classified into one of two groups depending on whether they said they were satisfied with the level of control over their heating system (either 'Very satisfied' or 'Satisfied'), or not (either 'Neither satisfied nor dissatisfied', 'Dissatisfied', or 'Very dissatisfied'.

Following a series of revisions this was cognitively tested (via video conference) with four heat network operators. Interviews examined respondents' understanding of the questions and whether the questions provided accurate and consistent responses.

Operator sample and weighting

The HMBR stipulates that suppliers of heat networks must notify the Office for Product Safety and Standards (OPSS) at BEIS (as it was at the time of survey) of their existence, including various details about their heat network such as the operator. Kantar Public aggregated the names of heat network suppliers and operators listed in the 2018 HMBR database of Heat Networks to produce a file containing unique suppliers and operators. In the survey they were asked about operating status (such as 'own and operate the heat network myself' or 'I am contracted by someone to operate the heat network'. For more information see question A9 in the Operators questionnaire. In this report the word 'operator' is commonly used to describe all heat network suppliers and operators. Kantar Public used the 2018 HMBR dataset, supplied by BEIS, to produce a sample file containing a list of unique Heat Network operators. In total there were 634 operators included in the telephone survey sample. The survey data was weighted to match the profile of the population of operators identified from the HMBR sample file.

Further details on sample selection and weighting can be found in the technical report.

Operator survey approach

Kantar Public conducted a telephone survey with 130 heat network operators. Fieldwork took place between 18 March and 30 May 2022. The final response rate was 25%.

Supplementary qualitative phase: consumer and operator interviews

Supplementary qualitative research was conducted to enrich the survey findings with an in-depth understanding of consumer and operator experiences, and operator business models.

Consumer Interviews

Interviewees were purposively recruited from a sample of heat network consumers who completed the survey and consented to be recontacted.[19] Interviews were carried out by telephone or through video meeting software. A £30 incentive was awarded upon completion of the interview.

The sample was designed to ensure a balance of communal and district heat networks consumers and a range of tenure types, among other characteristics. Minimum numbers of dissatisfied and vulnerable consumers were set to explore these experiences. To provide region-specific insight for the Scottish Government, Scottish consumers were also targeted.[20]

A topic guide was developed based around key questions following the presentation of survey results and emerging priority topics, including the cost-of-living crisis.

[19] There were 765 consumers in the recontact sample frame
[20] Additional detail on the consumer sample frame (qualitative interviews) can be found in the Appendix

Fieldwork was completed from 15 November 2022 until 18 January 2023. 50 semi-structured interviews in total were conducted, typically lasting between 30 and 45 minutes each.

Operator Interviews

Respondents were recruited from a mixture of the 33 heat network operators surveyed who consented to be recontacted, and further outreach from BEIS and the Scottish Government. Purposive sampling was used to recruit a balance of operator sizes and ages, with a particular focus on including some who were responsible for 10 or more heat networks. [21]

A topic guide was developed based around key questions from the presentation of the survey results and policy priorities such as operators' investment decision-making. A £50 incentive was awarded upon completion of the interview.

Operators were a difficult-to-reach audience, partly due to the presence of gatekeepers, major variations in profile and challenges identifying the right role to speak to. This resulted in fewer interviews achieved than the 50 originally targeted. Findings are based on the 18 achieved semi-structured interviews with operators across England and Scotland, typically lasting 45 minutes. Fieldwork was conducted between 17 November 2022 and 30 January 2023.

Qualitative analysis

A framework analysis approach was used to synthesise the responses and experiences of both audiences. This involved constructing a thematic framework against which qualitative data was synthesised and then mapped to identify features and patterns by different profiles. Consumers were analysed based on profile criteria contained within the sample (e.g. vulnerable/non-vulnerable, district/communal heat network, satisfied/dissatisfied etc.) while the analysis framework for operators was built around qualitatively identified profiles (e.g. non-operators, public entity etc.).

Limitations

Consumer survey

The survey was conducted between March and July 2022. As the questionnaire asked respondents to consult their most recent energy bill, it is likely that the cost estimates calculated did not reflect the continued price rises over spring and summer 2022. Billing data were based on self-reported data from those who could provide an estimate. The response rate (10%) was lower than intended and this may affect the representativeness of the sample and robustness of survey estimates.

Operators survey and interviews

The small sample size achieved with operators meant that only limited sub-group analysis could be conducted. Small sample sizes in the interviews meant that analysis focussed on illustrative examples of the broad spectrum and variety between operators, rather than an in-depth profiling of different operator categories.

[21] Additional detail on the operator sample frame (qualitative interviews) can be found in the Appendix

Profiles of consumers, their properties, and operators

This chapter maps key consumer and operator characteristics and differences, in order to inform heat network experiences. This includes examining the profile of heat network-supplied properties and understanding how consumers view their network and engage with the topic of heating in general. This chapter also sets out the spectrum of operator-types; an important framework to understand the different operator perspectives discussed in this report.

Key findings

- Most heat network consumers lived in smaller households. Nine in ten (91%) heat network consumers lived in a flat or maisonette, compared to 21% of the general population.
- Over half of heat network consumers said their home was part of a communal system (54%) while 16% said it was part of a district network. Heat network consumers were more likely to have a central thermostat compared with non-heat network consumers.
- Heat networks and heating in general are thought of primarily as a utility, meaning they are judged against reliability and manageable costs. While most consumers showed a low awareness and engagement with their heat network, experience of serious disruptions or in an energy-adjacent role led to higher levels of awareness. These consumers tended to be more informed and provided more detailed feedback during interviews.
- Regarding operators, the vast majority reported owning their networks, with 47% owner-operators, and 35% subcontracting their operation[22].
- The interviews revealed a broad spectrum of operators based on organisational characteristics and the extent to which operating a heat network was an important focus of their business. This spectrum is a useful framework for understanding key differences in operator business models and their heat network operations.

Consumer characteristics

Heat network consumer characteristics compared to the wider population

The characteristics of heat network domestic consumers (and how this compares with the 2017 survey) is outlined in the appendix below. Most heat network consumers lived in smaller

[22] See figure 2 for more information

households. Nine in ten (91%) heat network consumers lived in a flat or maisonette, compared to 21% of the general population[23].

Heat Network consumer characteristics compared with 2017

There were differences in the heat network consumer household profile compared with the profile from the 2017 research. It should be noted that the 2022 research additionally covered Scotland, with the 2017 survey covering England and Wales only, although this is not likely to have substantially affected accuracy of comparison. As shown in Table 1, compared with the 2017 profile, 2022 heat network consumer households were younger, more affluent and less likely to include a vulnerable consumer, and lived in relatively small households (although fewer lived in 1 bedroom households in 2022 than in 2017), that were more likely to be owned or rented privately.

While consumers were more likely than in 2017 to say someone was at home during the daytime, this could be related to increased hybrid working patterns, given that consumers were also more likely to be in employment in 2022, and less likely to be retired.

A summary of the follow up interview samples is included in Annex Table 4.

Table 1: Consumer profile - Heat network consumers 2022

Household composition	**HN 2022**	**HN 2017**
Any children	14%	11%*
Anyone aged 65+	31%	43%*
	HN 2022	**HN 2017**
Vulnerable household[24]	31%	40%*
Annual household income	**HN 2022**	**HN 2017**
Under £16,000	29%	42%*
£16,000 or over	59%	37%*
Size of household	**HN 2022**	**HN 2017**
1 person	52%	60%*
2 people	29%	25%*
3 people or more	17%	13%*

[23] UK Census 2011

[24] This was defined as a household where anyone has a long-term illness, physical or mental health problem or disability which limits their daily activities or the work they do; Any caring responsibilities for a member of their immediate family, or, a close relative outside of their household who has any long-standing illness, physical or mental health problem or disability; Any hearing or visual impairments or other communication needs, which limit their daily activities or the work they can do; An injury or any other temporary problems which affect their ability to use their heating system; or whether they get extra support or assistance from their gas or heating supplier

Property size	**HN 2022**	**HN 2017**
0-1 bedrooms	52%	60%*
2 bedrooms	33%	28%*
3+ bedrooms	15%	9%*
Tenure	**HN 2022**	**HN 2017**
Own/mortgage/part own	33%	20%*
Rent privately	22%	11%*
Rent from Housing Association	22%	34%*
Rent from Local Authority	22%	32%*
Property age	**HN 2022**	**HN 2017**
Built before 2000	38%	55%*
Built between 2000-2009	6%	7%
Built 2010 or later	40%	20%*

Base: all respondents at each question: 2022 (n=2182-2224), 2017 (3716)
* Statistically significantly different from 2017 in 2022

Communal and district systems

Over half of heat network consumers said their home was part of a communal system (54%) while 16% said it was part of a district network. The remaining 30% either did not know or said their building had some other form of heating system; these consumers were excluded from analysis of differences by type of heating system.

Compared with households in a district scheme, households in a communal scheme tended to be older, smaller and less affluent, and with the property more likely to be rented from a Local Authority or Housing Association.

Perceptions of heat networks

Interviews aimed to understand how consumers think about their heat networks. Responses highlighted that heat networks are regarded simply as utilities supplying heating and hot water which ought to provide an affordable and reliable service. The perception of heat networks as a simple utility gave these low salience, meaning they were rarely considered, let alone a dealbreaker, when selecting a property. Similarly, consumers showed limited knowledge of heat networks' environmental performance or benefits. The responses outlined below illustrate many consumers' low engagement with their heat network.

"Can you tell me what a Heat Network is? [All I know is] I'm in a flat that is restricted [in terms of] what supplier we have." District HN consumer, satisfied, vulnerable

"I just think about it as central heating, the radiators will come on and I can operate it via thermostat." District HN consumer, dissatisfied, not vulnerable

However, interviews identified exceptions to a low awareness and engagement with heat networks. Consumers who experienced a disruption or discomfort as a result of their heat network became more aware of their heating system as a result. They were also more likely to have engaged with the building manager and their heat network operator. The example below shows poor experiences leading to increased awareness around heat network systems.

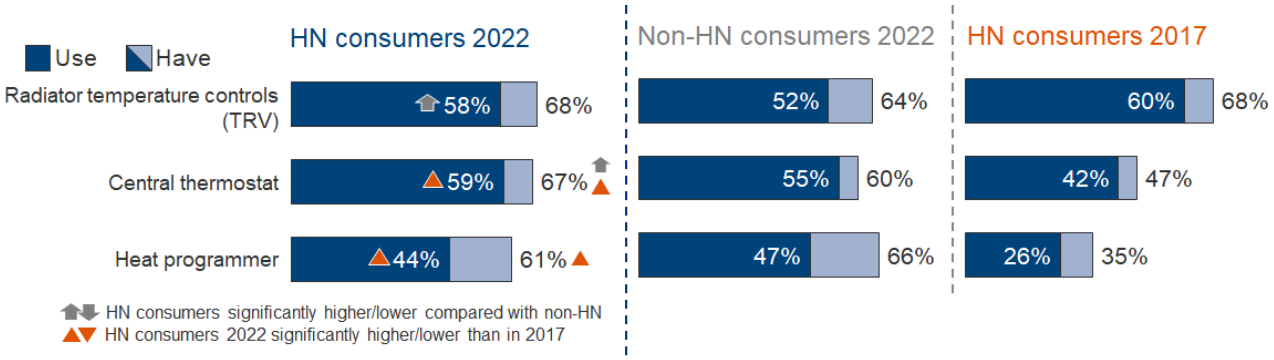
"I'm at the end of line, with the way this network is laid out, and it means you can get lower pressure, which has happened over the years." Communal HN consumer, satisfied, not vulnerable

Greater awareness also resulted from professional experience such as engineering or having lived in countries where heat networks were more common. Increased awareness led in cases to more extreme positive or negative views, such as more nuanced feedback or scepticism on heat networks' environmental performance.

Property characteristics

While the reported presence of thermostatic radiator valves (TRVs) to control home temperatures was largely consistent between 2017 and 2022 among heat network consumers, there were increases in the presence and use of central thermostats. There were similar increases in presence and use of heat programmers. Furthermore, heat network consumers were more likely to have a central thermostat compared with non-heat network consumers.

Figure 1: Presence and use of temperature control in home - consumers



CONTROL: Does the property have any of the following?
Base: All consumers for each of (TRV's, Central Thermostat, Heat programmer): Heat Network Consumers 2022: (2116, 1929, 1885), 2017: (3716); Non-Heat Network consumers 2022: (1629, 1587, 1577)

TRVs were present more often in slightly older properties built before 2010 (76%), with central thermostats (79%) and heat programmers (83%) relatively more common in those built since 2000. Reflecting this variation by age of property, central thermostats and heat programmers were also more likely to be present in homes supplied by private heat networks. Heat programmers were more often reported in larger properties (75% with three bedrooms or more compared with 53% with at most one bedroom).

The interviews showed that other sources of heating were only used by consumers for exceptional tasks such as using an electric heater for quickly drying clothes or using gas fires for aesthetic purposes. Some consumers discussed being restricted in their housing association contracts from using these sources.

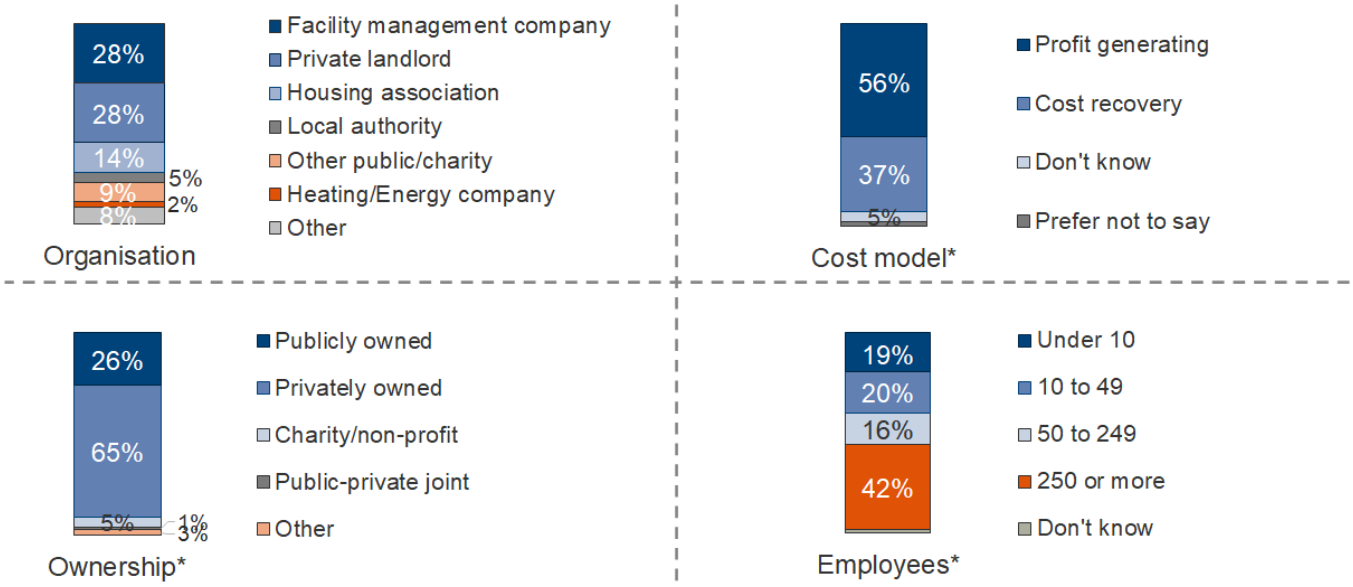
Operator characteristics

Organisation profile

As shown in Figure 2, operators were most likely to be property companies, split evenly between facility management companies and private landlords. The vast majority reported owning their networks, with 47% owner-operators, and 35% subcontracting their operation.

Reflecting the type of organisation, a majority of owners reported that their organisation was operated for profit and privately owned. They were most likely to be small and medium enterprises (SMEs) with under 250 employees, though four in ten had 250 employees or more[25].

Figure 2: Organisation characteristics - operators



Base: All operators 2022 (130); *All heat network owners (124)

Heat network type, size and installation

The majority of operators said they operated communal networks (see Figure 3). The number of communal networks per operator was higher than the number of district networks. Around one in five said they anticipated a change to the number of networks they owned or operated in the next year, with this most likely to be installing new networks.

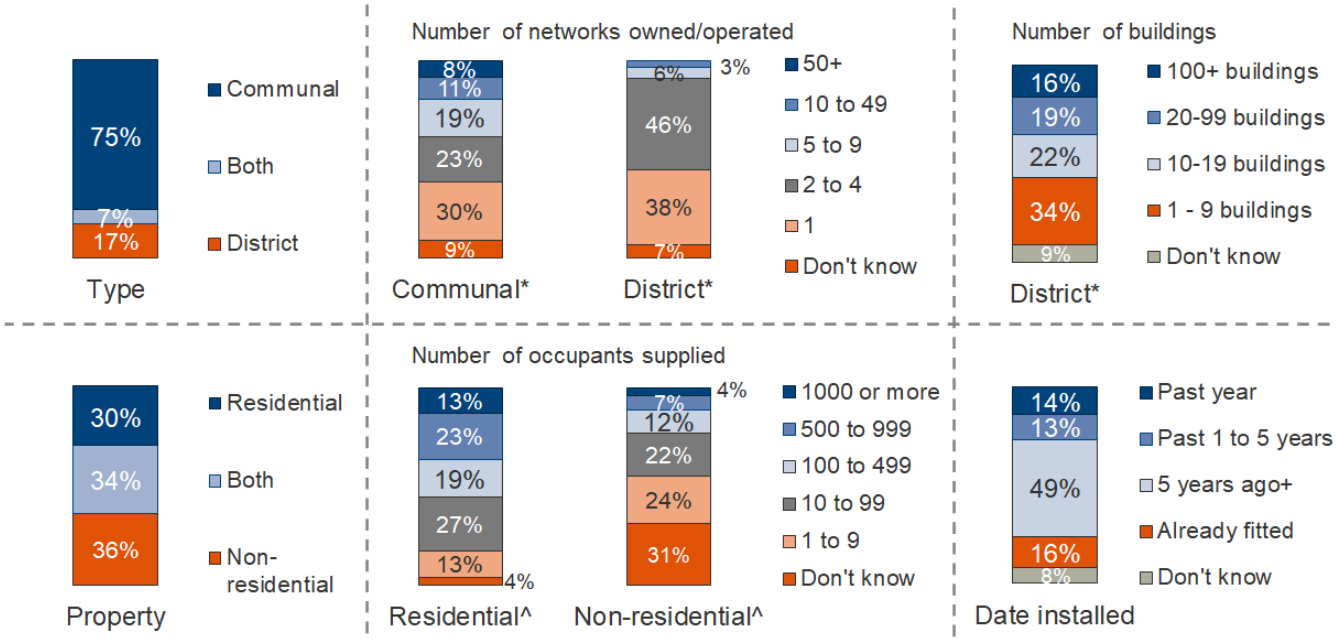
[25] Respondents were asked about the number of employees within their organisation with the exception of those in local authorities who were asked about the number of employees within their department.

One in three district scheme operators reported that their district network served fewer than 10 buildings, one in four served 10-99 buildings and 16% reported having 100 buildings or more (Figure 3). Figure 3 also shows information regarding the property types operated by operators, the number of occupants supplied, and the date that operators' heat networks were installed

Given the relatively small number of operators interviewed, it is not possible to look at how their experiences and perceptions vary depending on the nature of their operation.

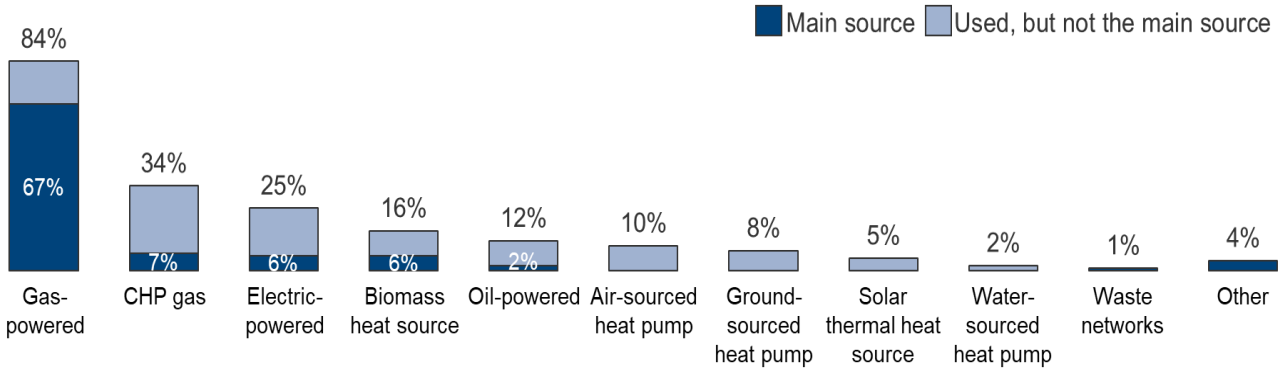
The heat source reported most often by operators was a gas-powered boiler or some other gas-powered system (see Figure 4).

Figure 3: Heat network characteristics - operators



Base: All operators 2022 (130); * Those who operate communal network (102) / district network (40); ^ Those who

Figure 4: Heating sources used for heat network(s) - operators

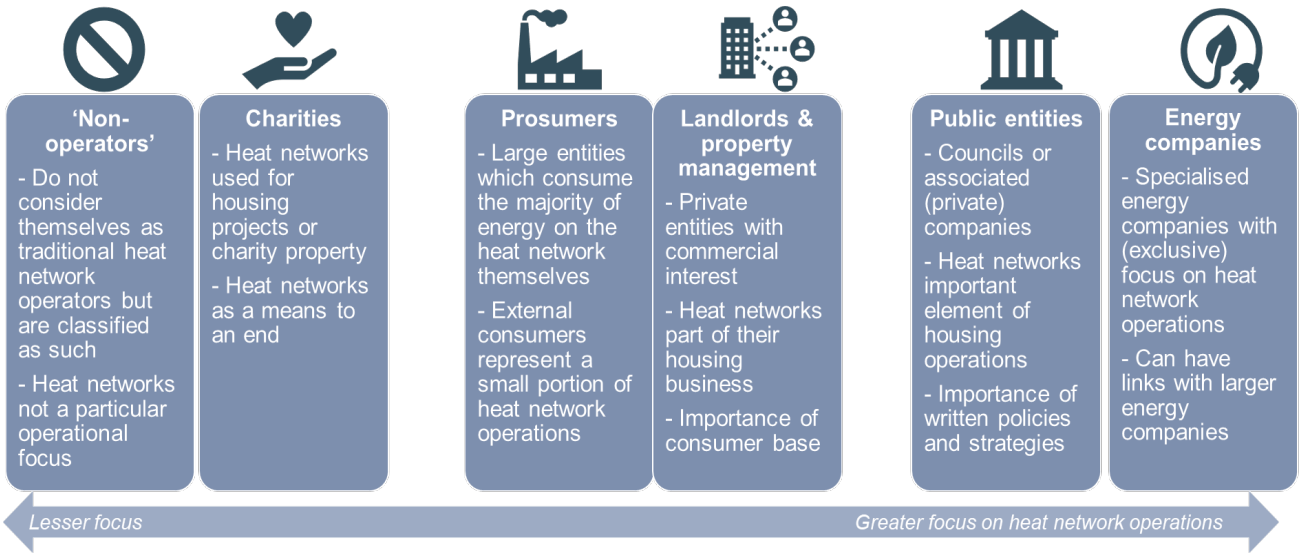


HEATING_SOURCES: What heating sources are used for your heat network(s)? HEATING_SOURCES_B: Which of the following heating sources are primarily used for your heat network(s)?
Base: All operators (130)

Qualitative operator profiles

The interviews revealed a broad spectrum of operators as shown in Figure 5. Operators could be classified based on organisational commonalities as well as the extent to which operating a heat network represented an important focus of their overall business. This greater or lesser focus on operating a heat network resulted in having more or less nuanced energy policies in place.

Figure 5: Qualitative operator profiling



'Non-operators' included companies that rented out space within their office to other companies. While they were classified as an operator due to sharing a boiler, they did not consider themselves as such and therefore did not have relevant policies and systems in place to manage their network and engage with their consumers.

Charities included those who had inherited rather than chosen their heat network and networks were mainly often viewed as a means to end to supply commercial properties and housing. Decision-making was focused on reducing cost and might involve trustees and independent advisers.

Those categorised as 'prosumers' included an NHS trust or university with a heat network, consuming vast amounts of energy on the network internally while only small shares were used by external consumers such as shops or cafes. High energy consumption led to more nuanced environmental strategies, while consumer relations were less refined.

For landlords and property management operator types, housing and heating represented a key business focus. This group encompassed the most prevalent group of operators: facility management companies and private landlords (see Figure 2 on page 19). Operating a heat network and providing housing required dedicated customer service systems and billing strategies. However, it should be noted that the systems and strategies in place also depended on the size of these operators. Smaller operators focused on the importance of offering direct support to their customers, as seen the response below.

“We've got our customers, who are our primary focus. We have a responsibility and a duty to supply them with heating & hot water. We feel like part of the community.”
Landlord and property management operator

Larger property management companies tended to have more nuanced systems and strategies than smaller private companies. The need for profit generation could also limit the implementation of nuanced environmental strategies. Prioritising low cost energy production with existing infrastructure could outweigh investments in environmental protection such as renewable energy sources.

Public entities entailed operators such as councils or private housing companies with links to local councils. For this category of operators, operating a heat network was an important focus of their housing operations. Their operations were highly affected by wider political targets. For example, they could target a higher provision of housing with affordable heating to local communities. In this case, heat networks could represent a relevant solution. For larger public entities, heat network strategies, particularly around further expansions, were often guided by Net Zero targets.

“That's the end game probably for every Heat Network in the country. [It] is to decarbonise… We don’t like to get involved in terms of individual households’ billing. We bring in a contractor that deals with that for us, issues all the bills to the individual tenants.” Public Entity operator

Similar to public entities, energy companies were more focused on the running of heat networks and meeting sustainability goals than other operators. However, as private entities they prioritised commercial targets and were less politically motivated in future planning.

This spectrum is an important framework to understand operators and differences in their business models and heat network operations in the following chapters.

Perceptions of low carbon heat sources

Building on the insight around consumers' low awareness and engagement with heat networks and the full range of operator profiles, this chapter explores perceptions of and the importance given to sustainable energy production from the perspective of both groups.

Key findings

- While eight in ten (79%) heat network consumers agreed that it is important to protect the environment by using low carbon heating where possible, they were less likely to agree that they were willing to pay more to do so (40%).
- 44% of operators reported not using any low carbon heat source. Of those, half said they were likely to switch to low carbon.
- Operators varied in the importance they gave to environmental strategies. For those with environmental strategies, heat networks often tended to be linked with other related initiatives (e.g., renewable energy sources) and embedded in wider strategic goals around sustainability.

Consumers

Consumer views towards low carbon heat sources reflected the limited engagement with their network discussed in the previous chapter. In discussions, consumers often claimed sustainable energy production was extremely important while admitting they would most often prioritise low cost.

Overall, consumers tended to fall into three categories[26]:

- those who considered cost and efficiency to always be more important than environmental considerations
- those for whom heat networks made intuitive sense as way to reduce emissions but without knowing why
- those who were sceptical about environmental claims of heat networks and considered them either as a 'marketing hook' or felt able to think of 'better' solutions.

This final group were most informed, made up a small part of the interview sample and included those who had worked adjacent to the energy sector and whose homes were supplied with alternative energy sources.

Consumer quotes illustrate this range of views on Heat Networks' environmental performance:

[26] These qualitative groupings are based on themes emerging from interviews. They should not be taken as rigorous consumer segments.

- Cost prioritised: *Having environmentally friendly heating is as a positive, but cost is probably always going to be a more important factor."* Communal HN Consumer, satisfied, not vulnerable
- A sense of intuitive benefits*: "I assume mass generation can be done more economically than localised generation."* Communal HN Consumer, satisfied, vulnerable
- Scepticism around eco-credentials*: "Heat Networks are not an environmental opportunity as they are operated on gas."* District HN Consumer, satisfied, not vulnerable

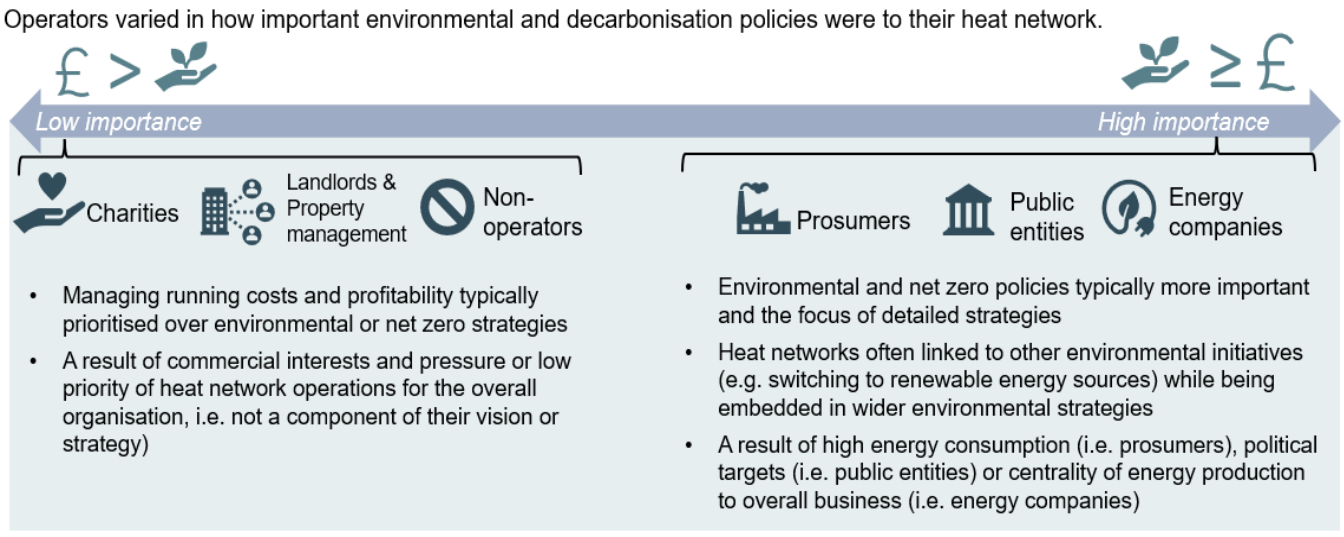
These categories mirror the survey findings. While eight in ten (79%) heat network consumers agreed that it is important to protect the environment by using low carbon heating where possible, they were less likely to agree that they were willing to pay more to do so (40%).

Operators

From the perspective of operators, 44% of them reported not using any low carbon heat source (Figure 4). Of those, half (48%) said they were likely to switch to low carbon, while a third said they were not likely. Around a third (32%) said they were intending to switch, although for half of these operators this would not happen until the end of generation asset lifetime.

The interviews highlighted how operators differed in the extent they prioritised environmental strategies, with energy companies, public entities and prosumers being particularly focused on the topic (Figure 6).

Figure 5: Priority given to environmental strategy by operators



Satisfaction with heating

Consumers' satisfaction with their heat networks was identified as a key topic to explore through this work. Alongside consumers' levels of satisfaction, it was important to understand whether satisfaction differed between heat network and non-heat network consumers. Most consumers simply expect their heating to work. Therefore, research also sought to understand what being satisfied means to consumers in this context.

Key findings

- Heating was rarely thought about by consumers until something went wrong, meaning that satisfaction was the result of minimal disruption and manageable costs.
- Overall, consumers on a heat network were more likely to say they were satisfied with their heating and hot water system compared with non-heat network consumers (74% and 67% respectively).
- Satisfaction among heat network consumers for their heating and hot water system was lower for local authority schemes (67%) compared with both private (73%) and housing association schemes (78%).
- Satisfaction with the level of control over the temperature of heating was also higher among consumers whose properties were built more recently (73% 2010 onwards, 62% pre-2010).

Consumer satisfaction

Interviews suggested that heating was rarely thought about by consumers until something changed or went wrong. Therefore, satisfaction was primarily a result of their lower-order needs - minimal disruption and manageable, stable costs - being met. Consumers with negative experiences included those who highlighted additional unmet higher-order needs such as supplier transparency, and 'fairness' around billing and usage calculations.

The most satisfied consumers highlighted affordability, having sufficient warmth for their households' needs, and having problems solved centrally and quickly without them having to worry about calling a supplier. This can be seen in the comment below.

"[Being on a Heat Network] gives you the reassurance that there is someone if something goes wrong, you have the back-up of the company to call if there is an issue. Whereas if you weren't on a network, it would all be on you." District HN consumer, satisfied, not vulnerable

Heat networks also allowed collective bargaining to reduce costs. While environmental benefits were seen as a positive, these were rarely mentioned unprompted, and so were not front-of-mind.

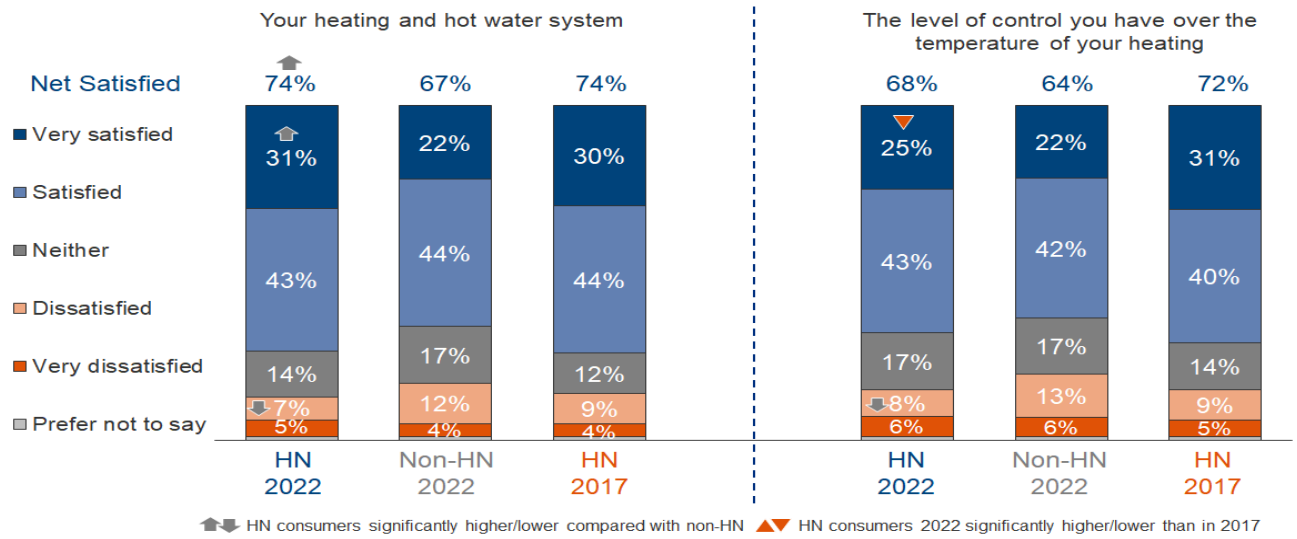
Dissatisfied consumers made up less than 1 in 10 (12%) of survey responses. In interviews, they focused on outages, unreliable systems, and poor and slow maintenance in leading to their dissatisfaction. They were more likely to express a lack of control over their system or choice of provider, or around unfair bills they found hard to query. Some faced a combination of these issues. For example, a consumer who was without heating for 6 months, received no compensation, and was made to pay a standing charge for the time period.

"It caused stress and discomfort. Imagine, you just can't take a shower. it is kind of ridiculous. you then have to go to work the next morning. it is really stressful." District HN consumer, dissatisfied, not vulnerable

"Am I getting the best deal? I don't know." District HN consumer, dissatisfied, vulnerable

In comparison to non-heat network consumers, consumers on a heat network were more likely to say they were satisfied with their heating and hot water system (see Figure 7 below).

Figure 6: Satisfaction with heating and hot water system - consumers



SATISFACTION: Overall, how satisfied are you with...
Base: All consumers: Your heating and hot water system - Heat Network Consumers 2017: (3716); 2022: (2225); Non-Heat Network consumers 2022: (1726); The level of control you have over the temperature of your heating? - Heat Network Consumers 2017: (3716); 2022: (2065); Non-Heat Network consumers 2022: (1665)

Satisfaction among heat network consumers for their heating and hot water system in general was lower for local authority schemes (67%) than consumers on private schemes (73%) or housing association schemes (78%). Certain groups of consumers expressed frustration with an 'opaque' billing processes in interview discussions - for example those on heat networks operated by local authorities. These consumers were more concerned about subsidising others on their network with higher energy consumption than themselves.

There was no difference in satisfaction levels for heat network consumers when looking at household income levels, whether the household was in an area of greater deprivation or whether there was a vulnerable person in the household.

When looking at satisfaction with the level of control over the temperature of heating, this was also lower among those on local authority schemes (58%) than private (69%) or housing

association schemes (68%). Satisfaction with the level of control was higher among consumers in properties built since 2010 (73%) than those in properties built in 2010 or earlier (62%). This is perhaps unsurprising given the greater prevalence of temperature control in newer houses, seen in the previous chapter.

Regression modelling showed that consumers who perceived the price of their energy as very fair or fair were more likely to be satisfied with the level of control than those who perceived the cost to be not very or not at all fair. Consumers who had complained and were dissatisfied (or neither satisfied nor dissatisfied) were less likely to be satisfied with the level of control compared to those who had no reason to complain. For more information on the factors driving satisfaction please see Annex Table 2.

Heating costs

The previous chapter showed how heating costs are an important component of consumers' overall satisfaction with their heat network. This section explores the topic in more detail. Reflecting the need to better understand heating costs within the context of the developing cost-of-living crisis, it also examines any impact of this crisis reported by consumers and operators during the qualitative fieldwork period (November 2022 – January 2023).

Key findings

- Just over half (53%) of heat network consumers said their heating and hot water costs were based on actual or estimated use by their property. This was considerably lower than among non-heat network consumers (80%).
- Heat network consumers' median annual cost of heating and hot water was lower than non-heat network consumers. This appears to be driven, at least in part, by non-heat network consumers higher costs per KWh (for energy as whole).
- More heat network consumers agreed that keeping up with heating and hot water costs was "a bit of a struggle" (45%) than in 2017 (27%), but the proportion of heat network consumers reporting this was considerably lower than non-heat network consumers (62%).
- Interviews highlighted increased awareness and proactivity from consumers as a response to the cost-of-living crisis. This was evident in more frequent customer service enquiries or meter readings to monitor energy consumption.
- The interviews showed changes in spending patterns as a result of the cost-of-living crisis. However, despite some anecdotal examples of extreme heating cost increases, changes to heating usage were mainly precautionary.
- Consumers' tenure status had implications for the extent they were impacted by the cost-of-living crisis, with some renters shielded by heating being included in their rent.
- The interviews with operators saw limited reports of any drastic price increases being passed on to consumers at the time of interviewing. The focus was on preventative measures and support for vulnerable groups.

Consumers

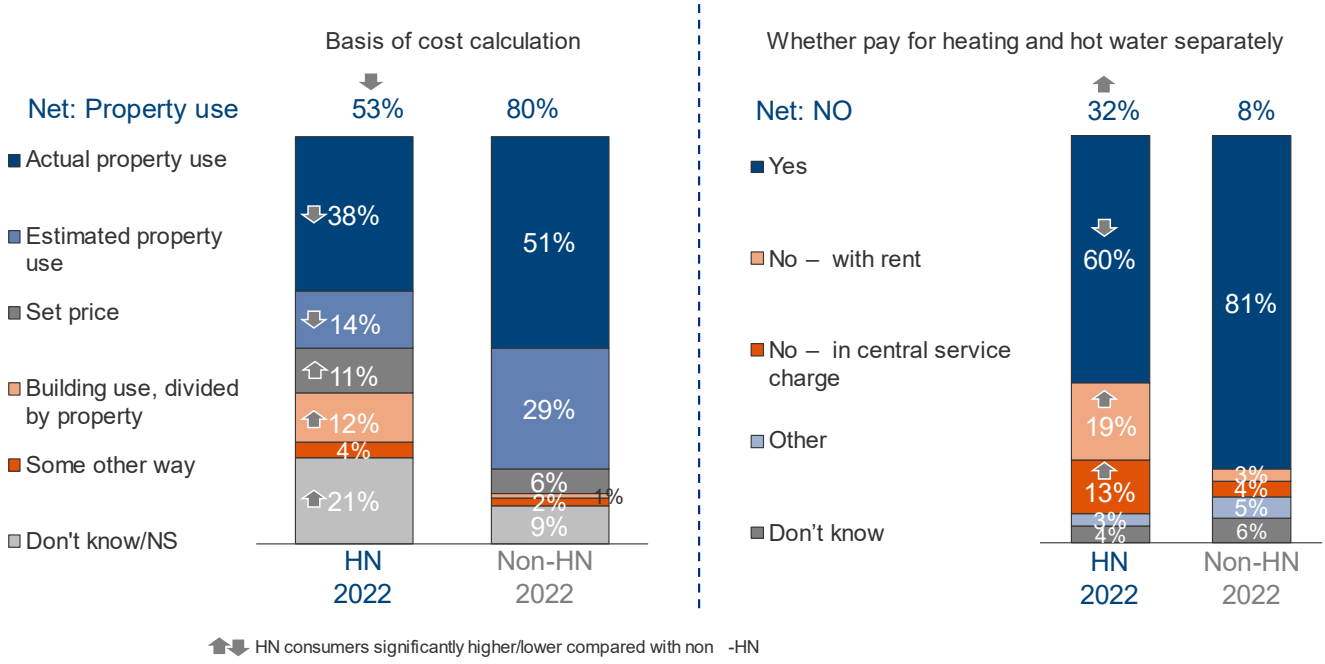
How heating costs are calculated and billed

A range of different billing processes was identified. For example, non-heat network consumers were more likely to report a variable tariff: 41% compared with 23% of heat network consumers, with both equally likely to report a fixed rate (35% of heat network and 38% of non-heat network consumers).

Just over half of heat network consumers said their heating and hot water costs were based on actual or estimated use by their property, considerably lower than among non-heat network consumers (see Figure 8). In contrast, they were more likely, compared with non-heat network consumers, to pay a set price or to pay a share of building use.

Heat network consumers in 2022 were more likely than non-heat network consumers to say they paid for heating and hot water together with other utility bills. Six in ten responded that they paid these separately, compared with a greater proportion of non-heat network consumers. More heat network consumers said they paid for heating and hot water separately in 2022 than in 2017.[27]

Figure 7: Basis of heating and hot water costs - consumers

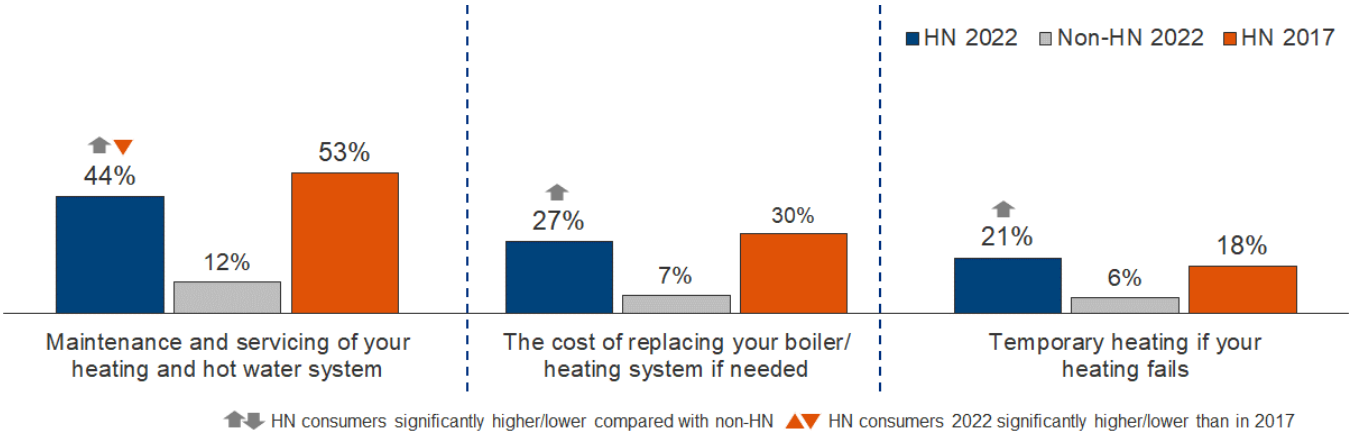


PAYCALC: How is the amount you pay for heating and hot water calculated?
Base: All respondents: heat network consumers 2022 (2188), non-heat network consumers (1704)
SPLITBILL: Do you pay for heating and hot water separately to other utility bills e.g. such as water bills?
Base: All respondents: heat network consumers 2022 (2204), non-heat network consumers (1706)

The cost of heating and hot water was more likely to include additional services or benefits compared with non-heat network consumers (see Figure 9).

[27] To note that the wording of this question was similar but not exactly the same in 2017 and 2022.

Figure 8: What else is included in price paid for heating and hot water - consumers



PAYCOVER: Which of the following are covered by the price you pay for your heating and hot water?
Base: All respondents for each of maintenance/replacement/temporary heating: heat network consumers 2022 (2168/1960/1964), non-heat network consumers (1688/1634/1623), heat network consumers 2017 (3716)

All three additional services shown above were reported more often by heat network consumers on housing association schemes compared with other scheme types. For example, the inclusion of the cost of boiler replacement was reported by 39% on housing association schemes compared with 27% on local authority schemes and 22% on private schemes.

Those consumers who said they receive a bill or statement setting out the costs of their heating were asked additional questions about their bills and how these were paid. As shown in Figure 10, heat network consumers were more likely to say that their bill covered their heating and hot water alone, with non-heat network consumers far more likely to say it was billed along with other energy use. Bill payments for heating and hot water only were reported more often by heat network consumers:

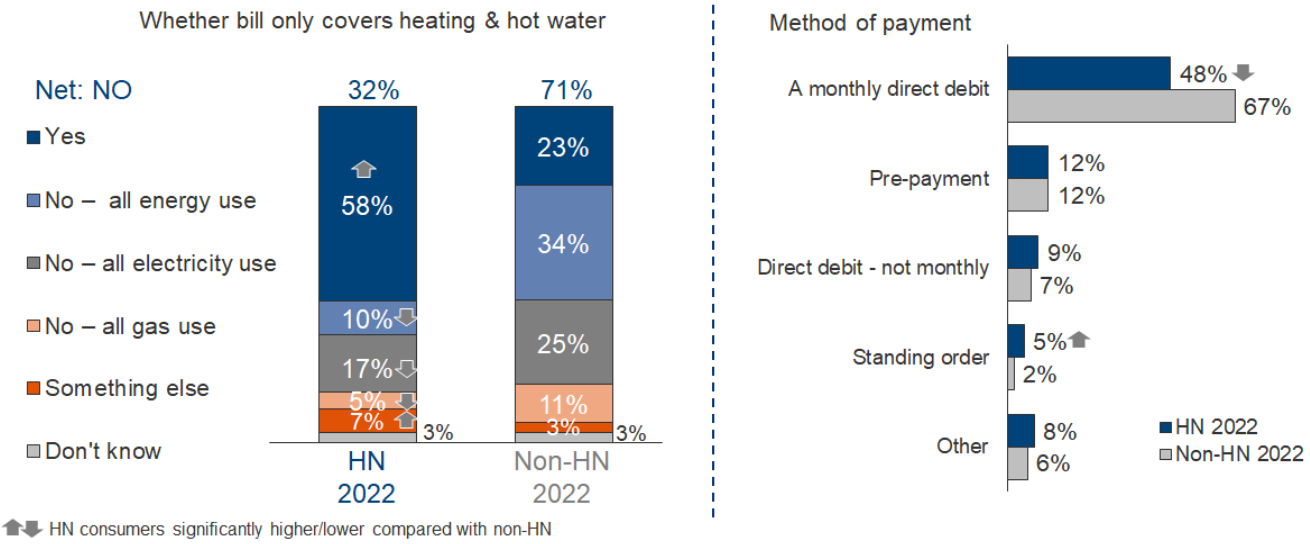
- in properties with district schemes (77% compared with 59% of those in properties with communal schemes)
- in properties built since 2010 (72% compared with 45% of those in pre-2010 properties).

The most frequently reported means of bill payment in 2022 was via monthly direct debit (see Figure 10), although this was much more frequent among non-heat network consumers.

This variety in billing methods informs the differences in billing experiences observed in the interviews. Consumers tended to fall into one of two groups when it came to their billing experiences. One group (particularly those without a metered billing method) were concerned about paying too much and subsidising others. They often perceived their billing process and mode as opaque and the information provided as unclear. This reflected findings through the regression modelling, where perceived fairness of cost was strongly associated with overall satisfaction.

In contrast, other consumers were happy with their billing process and expressed a feeling of ‘having a good deal’. They often perceived the billing mode and process as transparent and the provided information as clear and sufficient. These consumers tended to be billed based on individual meters within their property and satisfied with their network.

Figure 9: What bill covers and method of payment - consumers who receive bill



BILL2: Is your bill, account summary or statement just for your heating and hot water?
Base: All who receive bill: heat network consumers 2022 (1503), non-heat network consumers (1464)
BILLPAY: How do you pay for heating and hot water?
Base: All who receive bill: heat network consumers 2022 (1482), non-heat network consumers (1466)

Cost of heating

Data in this section should be interpreted with caution as it is based on self-reported costs, excluding about a quarter of survey respondents who did not report these[28].

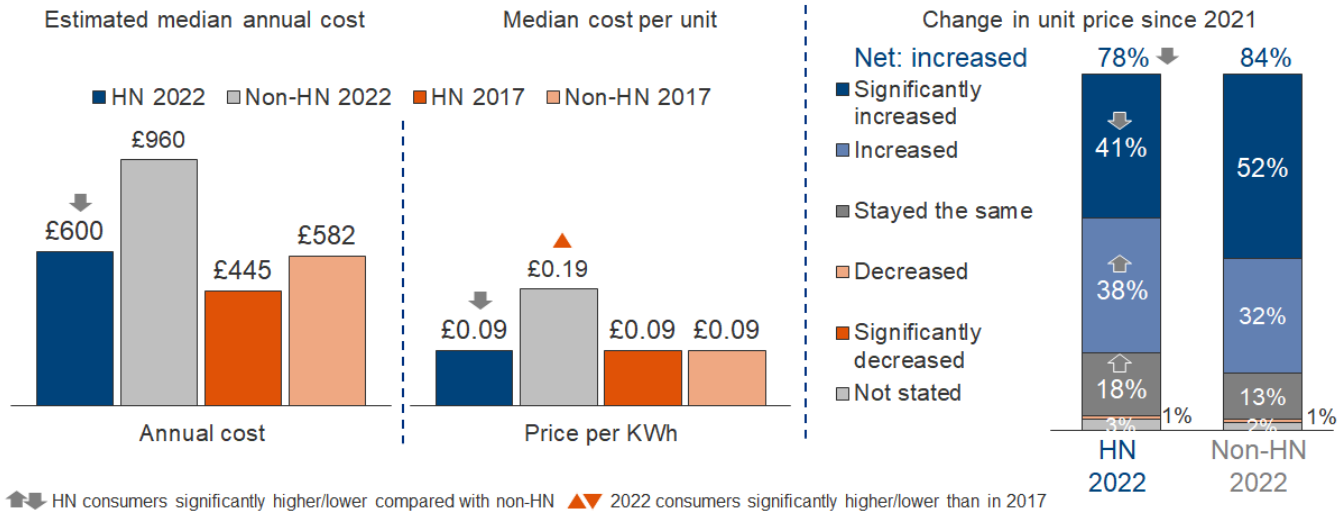
Cost of heating – annual cost of heating

Participants of the survey reported paying £600 for their median annual cost of heating and hot water for heat network consumers. This is lower than the median annual cost for non-heat network consumers (£960).

There were higher costs per KWh for non-heat network consumers than for heat network consumers at the time of the survey. However, a majority of heat network consumers still reported their price per unit having increased since 2021, with four in ten reporting it had increased significantly (only slightly fewer compared with non-heat network consumers).

[28] An annual estimate of heating and hot water costs was calculated for 1,071 heat network consumers and 1,104 non-heat network consumers based on information on their most recent bill. Information on billing was not provided by about a quarter of survey respondents and those with incomplete data were also excluded from the analysis. Analysis of detailed billing data was also mostly limited to those who had their last bill or statement with them when completing the survey. It should also be noted that all data is self-reported and caution should therefore be taken when using these estimates. The 2022 survey was conducted between March and July and asked in relation to a recent bill. This means it is likely that survey estimates do not take into account recent increases in energy prices. The 'average' figures provided are median values as these are less sensitive to large variations in response compared with the mean value.

Figure 10: Estimated costs of heating and hot water - consumers



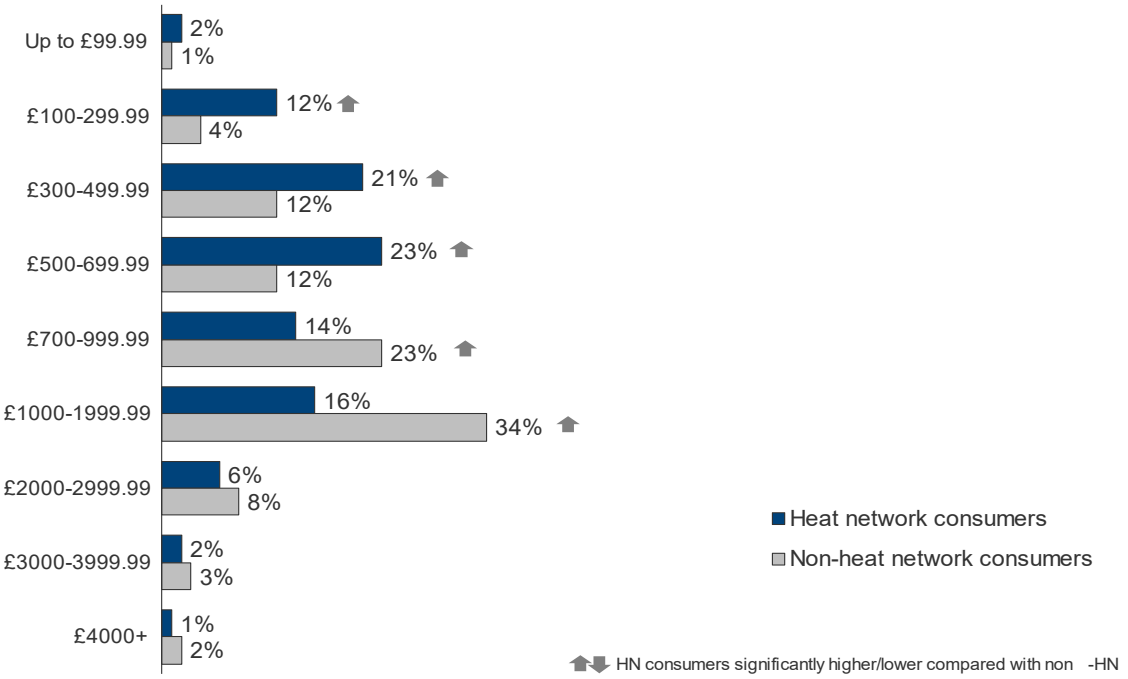
DERIVED DATA FROM RANGE OF QUESTIONS ASKED TO THOSE RECEIVING BILLS / PAYKWH: How much did you pay for each Kilowatt Hour (kWh) including VAT?; Base: All respondents giving details for each of annual cost/cost per KWh: heat network consumers 2022 (1071/1543), non-heat network consumers (1104/1486), heat network consumers 2017 (1344/712), non-heat network consumers 2017 (780/454l)
PRICECHANGE: Thinking about your energy use overall, how has the price you pay for energy, per unit, changed since 2021? Base: All respondents: heat network consumers 2022 (2180), non-heat network consumers (1712)

The 2022 data also suggests higher levels of energy consumption among non-heat network consumers contributed to their bills being higher compared with heat network consumers. Non-heat network consumers reporting being billed for a median of 500 Kwh units on their last bill, compared with 319 Kwh units for heat network consumers.

Variation in annual costs for heat network consumers

While the reported average cost of heating was lower for heat network consumers than non-heat network consumers there was still substantial variation among survey respondents. Figure 12 below shows the variation in annual heating costs among survey respondents. At the time of the survey, 9% of heat network consumers and 13% of non-heat network consumers reported paying £2,000 or more per year.

Figure 11: Variation in annual costs of heating and hot water - consumers

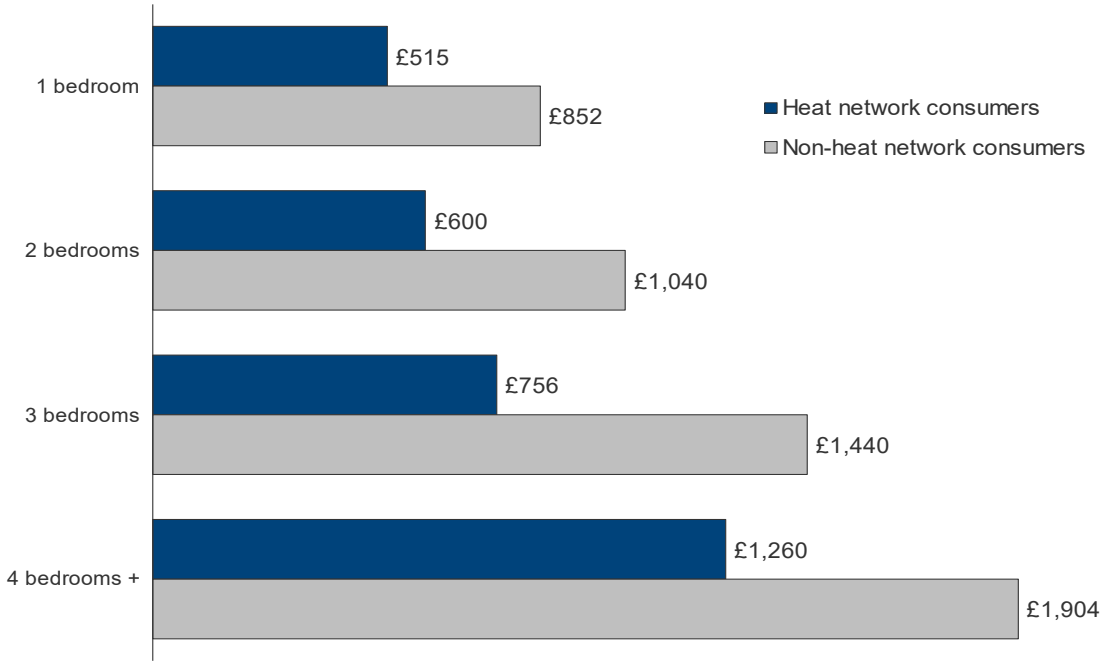


Q060 PAYANNUAL: Thinking about the last payment you made for heating and hot water, what was the total amount paid? Base: All respondents giving details for each of annual cost/: heat network consumers 2022 (1071), non-heat network consumers (1104)

Survey results suggest heat networks consumers pay less if they are on a communal scheme, with energy supplied by a local authority or housing association, with a vulnerable person in the household. Specifically, the median annual cost of the bill was £533 for those on communal schemes, and £639 for those on district schemes. The median annual cost was higher among those whose bill was provided by an energy supplier (£600) compared with a local authority or housing association (£432). The median annual cost was similar for heat network consumers who had vulnerable people in the household (£588) and those without a vulnerable person (£600).

As would be expected, the annual cost of bills was higher in larger households (houses rather than flats, those with a higher number of bedrooms or inhabitants). Figure 13 below shows the variation in annual heating costs by house size (number of bedrooms). Non-heat network consumers' annual bill costs are higher for each corresponding size of household.

Figure 12: Variation in annual costs of heating and hot water by number of bedrooms - consumers



Q060 PAYANNUAL: Thinking about the last payment you made for heating and hot water, what was the total amount paid? Base: All respondents giving details for each of annual cost/: heat network consumers 2022 (1071), non-heat network consumers (1104)

There were differences in the type of heat sources used when comparing heat network and non-heat network consumers. Heat network consumers were more likely to have central heating as the main heating source than non-heat network consumers (86% and 76% respectively) and less likely to have electric heating as the main heat source (8% and 20% respectively).

Heat network consumers' annual bills for energy were lower than non-heat network consumers for those whose main source of heat was central heating (£595 and £936 respectively) and electric (£720 and £1162 respectively).

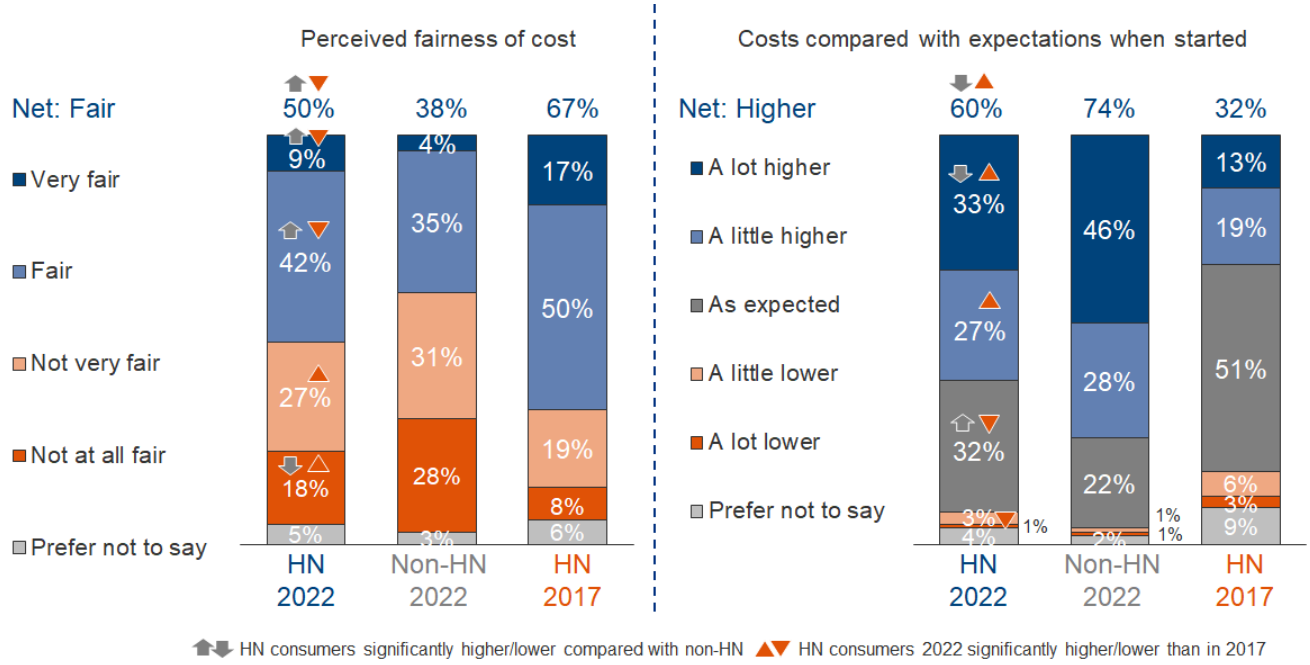
Impact of heating costs

In line with the increases in energy costs discussed earlier in this chapter, six in ten heat network consumers said that their heating and hot water costs were higher than they had expected when they started using the system, and just half felt the costs were fair (see Figure 14). This had shifted considerably compared with 2017, when two-thirds of heat network consumers felt prices were fair and just one-third felt costs were higher than expected. However, in 2022, heat network consumers were considerably more positive than non-heat network consumers. Fewer non-heat network consumers felt prices were fair, while more felt that prices were higher than expected compared with heat network consumers.

Regression modelling found that perceived fairness of cost was strongly associated with overall satisfaction; consumers who perceived the cost as 'very fair', or 'fair' were more likely to

be satisfied than those who were perceived the cost as 'not at all fair'. Further information on this model is in Annex Table 1.

Figure 13: Fairness of costs, and costs compared with expectations - consumers



FAIR: Based on the service you receive, do you think the price you pay for heating and hot water is typically fair?
EXPECT: Is the price you pay for heating and hot water as you expected when you first started using your current system?
Base: All respondents for each of fairness/expectations: heat network consumers 2022 (2200/2198), non-heat network consumers (1707/1705), heat network consumers 2017 (3716)

Heat network consumers on a local authority (54%) or housing association (62%) scheme were more likely to see the cost as fair compared with those on a private scheme (44%). Related to this, households with an annual income below £16,000 were also more likely to report the price as fair (60%) than those with an income of £16,000 or more (46%). Similarly, heat network consumers who had vulnerable people in the household were more likely to report it as fair (58%) than those without a vulnerable person (47%).

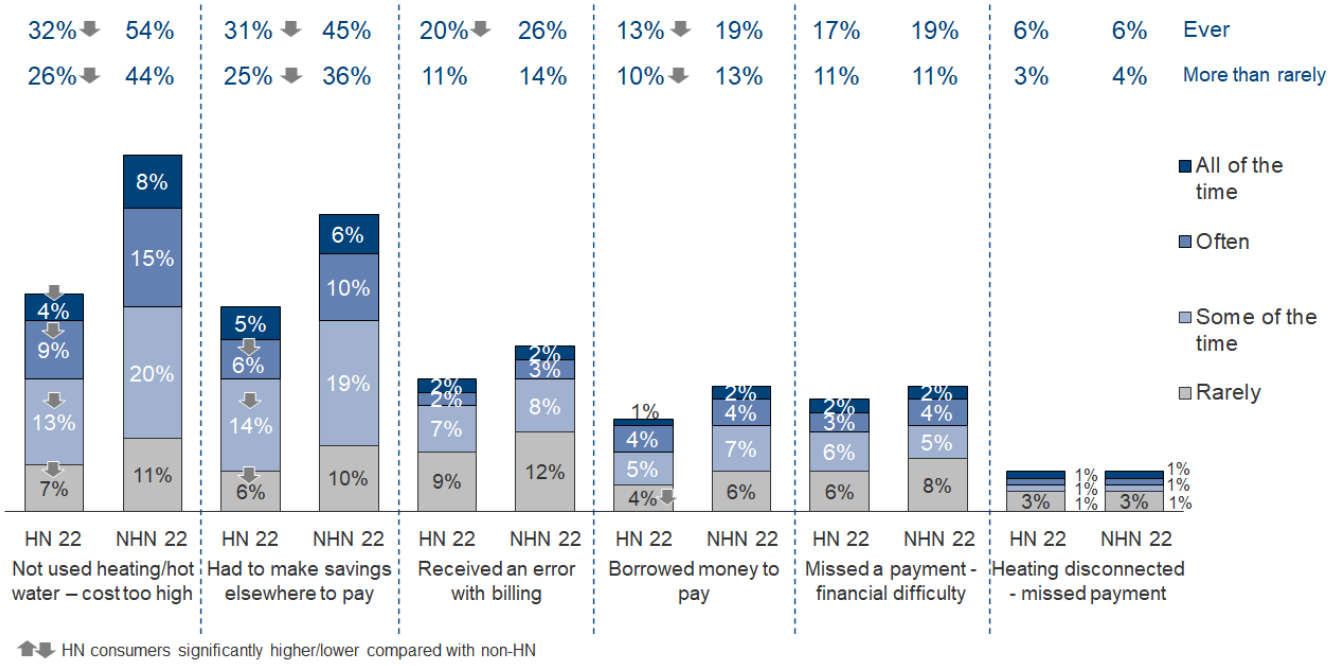
Keeping up with heating and hot water costs

Almost half of heat network consumers (45%) agreed that keeping up with heating and hot water costs was "a bit of a struggle", an increase from 27% in 2017. Despite this, the proportion of heat network consumers reporting that this was a struggle was considerably lower than the level seen among non-heat network consumers (62% in 2022).[29] While heat network consumers who had vulnerable people in the household were more likely to report that the price for heating and hot water was fair, they were also more likely to report that keeping up with the costs was a bit of a struggle (53%, compared with 42% of heat network consumers without a vulnerable person).

[29] Note the samples of consumers on a heat network and those not, have been calibrated using Propensity Score Matching (see technical report). The nature of this method means that there are relatively similar income profiles between the two groups. Therefore, any self-reporting of 'struggling' with bills cannot solely be attributed to income.

Around a third reported not using heating or hot water because the cost was too high, and having to make savings elsewhere to pay for heating and hot water. This was in comparison with around half of non-heat network consumers. Borrowing to pay heating and hot water bills was reported less by heat network consumers compared with non-heat network consumers.

Figure 14: Frequency of problems with heating and hot water bills - consumers



PAYPROBLEMS: Have any of the following happened in the last 12 months? Base: All respondents for each of statements: heat network consumers 2022 (2007-2040), non-heat network consumers (1612-1647)

As might be expected, each type of problem shown in Figure 15 tended to be reported more by heat network consumers in larger, less affluent households, particularly those with children, in households with prepayment meters and social renters. Problems were consistently reported higher for those not on a heat network compared with those who were.

Affordability and the impact of the cost-of-living crisis

Interviews explored consumers' views on the affordability of heating in the context of the ongoing cost-of-living crisis. Consumers were highly aware of the effects of the crisis and reported changes to spending patterns, such as on their weekly shop, and energy usage, for example ensuring appliances were turned off. However, despite anecdotal mentions of rapidly rising heating costs in the interviews, changes of heating usage mentioned were mainly precautionary. For some, heating was much less of a concern than electricity, where costs were seen to be increasing more rapidly despite the energy price guarantee and receiving the £400 credit EBSS on electricity bills.

"I worked out the cost of a single radiator in my living room this week. It's £7.20 [a day and so] £2500 a year. I'm comfortable but that's completely unacceptable. It's disturbing." Communal HN consumer, satisfied, vulnerable

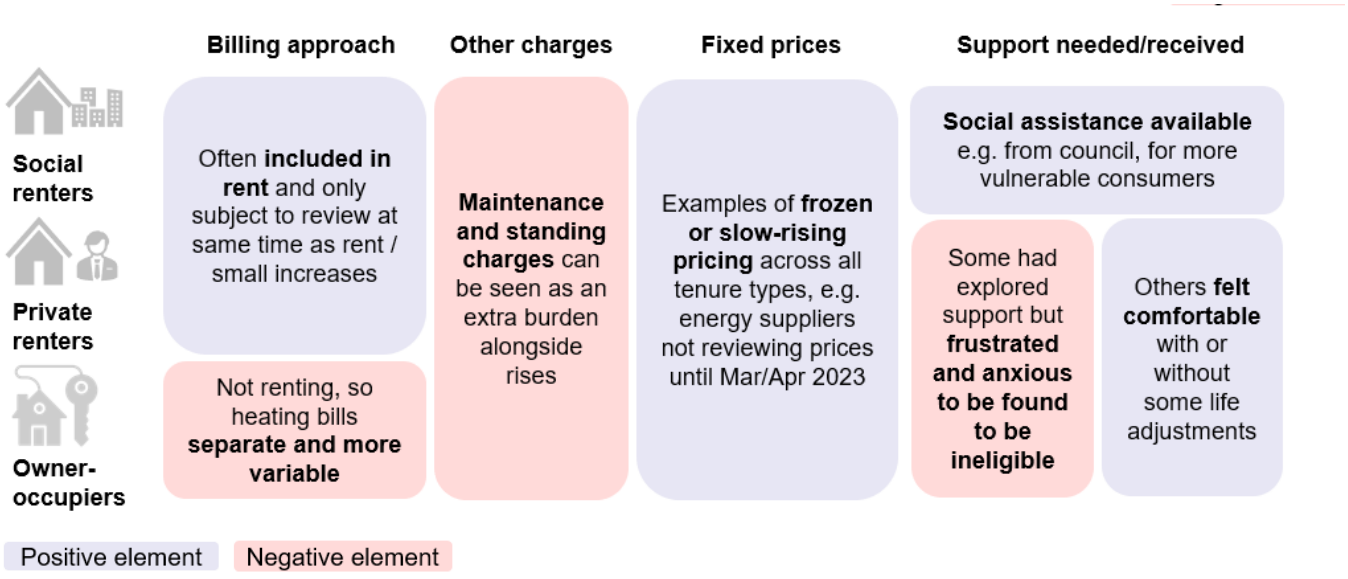
"I would say the cost-of-living crisis has not significantly affected us. Our bills have gone up, but the subsidy from the government helped. We've also had an electricity meter installed and reduced our usage by 20% for this." District HN consumer, dissatisfied, not vulnerable

"Ring me next year and I'll tell you, I'm expecting a shock then." District HN consumer, dissatisfied, not vulnerable

Overall, consumers identified being on a heat network as a major factor in limiting cost increases when it came to their heating and hot water, although they were not sure why this was the case. In addition, sustained government support (e.g. through energy credit) was felt to be an important factor in ensuring future heating bills were affordable.

Consumers' tenure status had implications for the extent they were impacted by the cost-of-living crisis, with some renters shielded by heating being included in their rent (see Figure 16). For example, for social and private renters heating bills were often included in their monthly rent which prevented consistent increases over time as rent was only reviewed over long-term intervals (i.e. 6 month, 1 or 2 year contract). In contrast, for owner-occupiers heating costs were separate and therefore more exposed to the possibility of frequent increases. Charges such as maintenance costs or standing charges affected all consumers equally regardless of their tenure status.

Figure 15: Cost-of-living crisis and tenure status (qualitative themes)



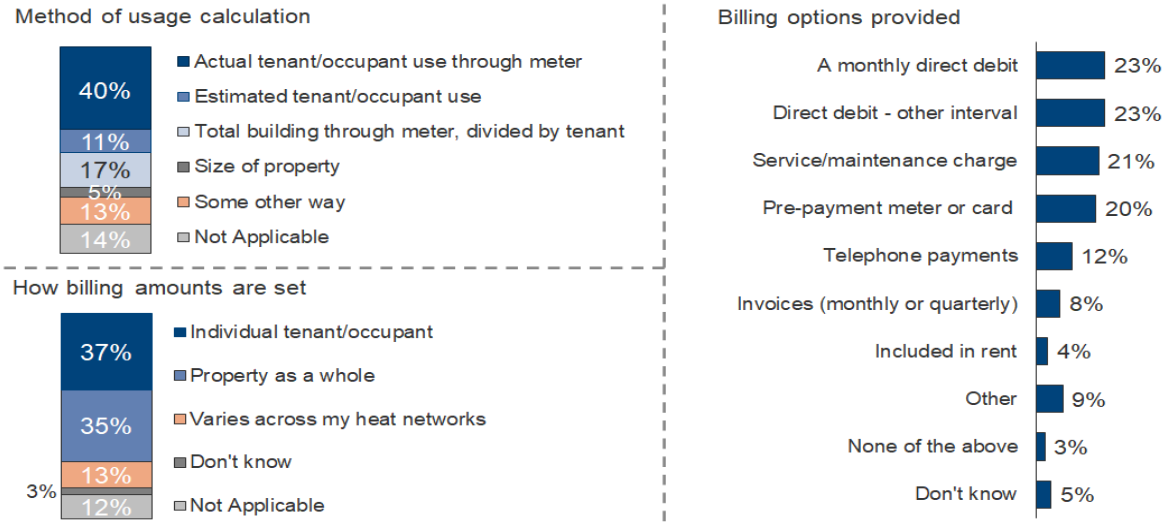
Operators

How heating costs are calculated and billed

In addition to the consumer perspective, the survey and interviews also explored the perspective of operators on the topic of heating costs, billing and the cost-of-living crisis.

Operators were most likely to report calculating usage based on actual or estimated tenant or occupant use. However, some operators meter the total building usage and dividing it up between tenants (Figure 17).

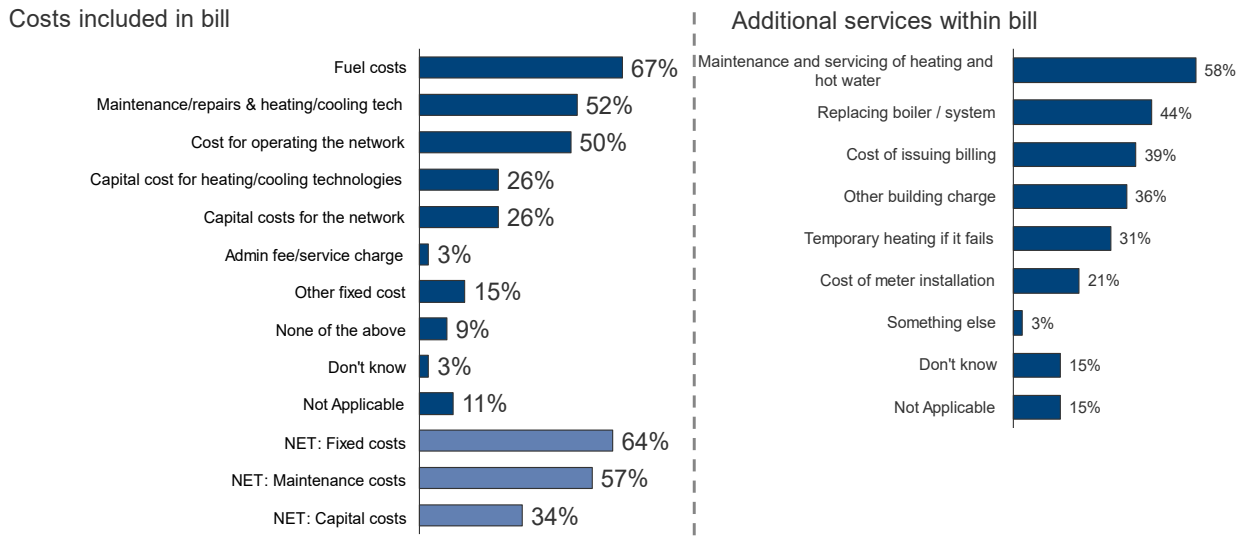
Figure 16: Billing calculations and options - operators



BILL_CALCULATIONS: How do you calculate the amount that tenants/occupants pay for heating, hot water and cooling based on their usage? BILL_DISTRIBUTION: Are billing amounts set for the property as a whole or per individual tenant/occupant? BILL_PAYMENTS: What billing options, if any, do you provide tenants/occupants to pay for heating, hot water and cooling?
Base: All operators 2022 (130);

As shown in Figure 18, two in three operators reported including fuel costs in tenant or occupant bills (67%) with a similar proportion including fixed costs (64%) and slightly fewer maintenance costs (57%). Around a third (34%) reported including capital costs in consumers bills (34%).

Figure 17: Costs and additional services in tenants' bills - operators



BILL_COSTS: Which of the following costs, if any, are included in your tenant's/occupant's bills? ADDITIONAL_SERVICES: Which of the following additional services are included within the bill issued to tenants/occupants for their heating, hot water and cooling charges? Base: All operators 2022 (130);

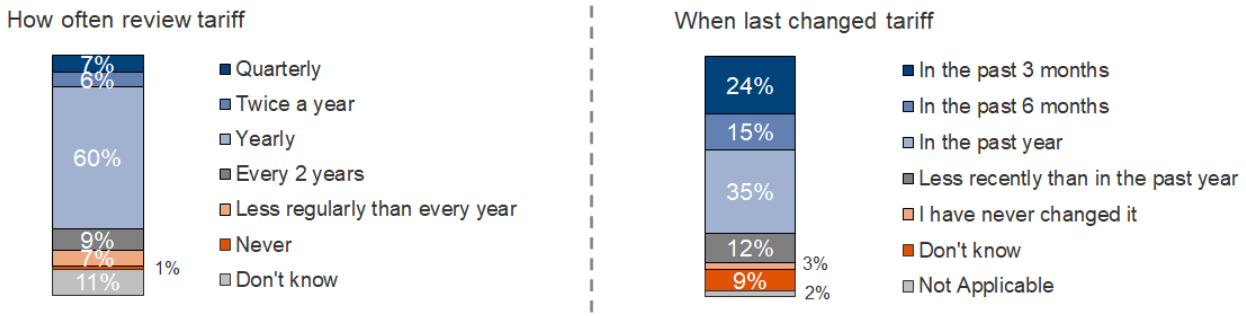
The interviews revealed a range of billing strategies. For operators with less of a direct focus on running a heat network (i.e., charities and non-operators) as well as operators with a limited group of external consumers (i.e., prosumers), billing strategies were less refined. Operators could rely on simplified billing strategies such as charging consumers based on the space they occupy and include all the costs in their monthly rent

In contrast, for operators with a greater focus on strategizing heat network operations (i.e. public entities and energy companies, landlords & property management), billing strategies were often more refined. Due to a large and diverse consumer base, such operators had specialised billing policies in place. For example, they tend to rely more on individual metering to calculate bills while offering different tariffs. There could also be differences in billing for non-domestic and domestic consumers such as annual billing for commercial and quarterly bills for residential consumers.

Tariffs and pricing structure reviews

A majority of operators reported an annual review of their tariffs and pricing structures with 13% doing so more frequently (see Figure 19) Of those who reviewed their tariff, three-quarters had changed their tariff in the past year.

Figure 19: Frequency of tariff review and change - operators



TARIFF_REVIEW: How often, if at all, do you review the tariffs / pricing structures that are used to calculate the charges for your heat network(s)?
TARRIFF_CHANGE: When, if at all, did you last change these tariffs or pricing structures?
Base: Operators who calculate amount of bill / those who review tariffs: 2022 (118/100)

Cost-of-living crisis[30]

Operators were aware that heat networks generally provided cheaper heating and hot water compared to individual boilers, which had limited the relative impact of the energy crisis on their operations. They reported increased awareness and proactivity (such as more frequent meter readings) from consumers. There were very limited reports of any drastic price increases being passed on to consumers (at the time of interview). The focus of operators was on preventive measures and support for vulnerable consumers.

Operators were affected in different ways by ongoing developments in the energy market. For operators who were affected by price increases to their primary energy sources, three options

[30] This topic was only discussed in detail in the later qualitative interviews and was not a focus for the survey conducted earlier in the year, due to the timings of both fieldworks.

were available: 1) passing costs on to consumers with a slight increase or advance notice; 2) avoiding passing price increases on to consumers (and reusing profits to compensate); or 3) looking into long-term investment in energy efficiency, home insulation or alternative energy sources. This long-term investment could also be combined with options 1 or 2.

For operators who were not affected by price increases (e.g. due to fixed contracts with prices pre-dating 2022), they also looked into long-term investments in energy efficiency to accommodate anticipated price increases in the future.

Some operators noticed more requests and concerns from consumers about potential price rises. During interview discussions, operators outlined three main ways of reacting to it this, which could be combined: 1) Engaging in more pro-active and transparent communications with consumers, 2) introducing flexible payment methods (PAYG); or 3) prioritising vulnerable consumer groups. Some operators noted that their investment decision-making regarding energy efficiency was in counterbalance to responding to consumers with higher bills.

Operators also reported consumers being unable to pay bills due to the general cost of living crisis. In this case, operators either (a) reduced the tariff for respective consumers or (b) did not take any measures and tried to absorb the impact of delayed or missed payments on their business.

Overall, operators were aware that the cost-of-living crisis was an ongoing and unpredictable situation with the potential to change the relationship between operators and consumers, and posing challenges unique to each group.

Contracts and billing information

In addition to heating costs, the contract and information contained on bills were a priority topic for research to explore. Transparency and fairness were important elements shaping the satisfaction of heat network consumers. This chapter explores the details of contract and the information contained in bills.

Key findings

- Around a third of heat network consumers said they had received a contract document, such as a Heat Supply Agreement (35%), when they moved into the property or when the system was installed.
- Heat network consumers who received bills were more likely than non-heat network consumers to say these included a total charge (74% and 66% respectively).
- Three in ten operators (31%) reported providing a heat supply contract or agreement to their consumers.
- Consumers' information needs are tied to a desire for clarity and fairness. Those whose usage was estimated (due to lack of personal meter) rather than measured were often frustrated and wanted to see more accurate information.

Consumers

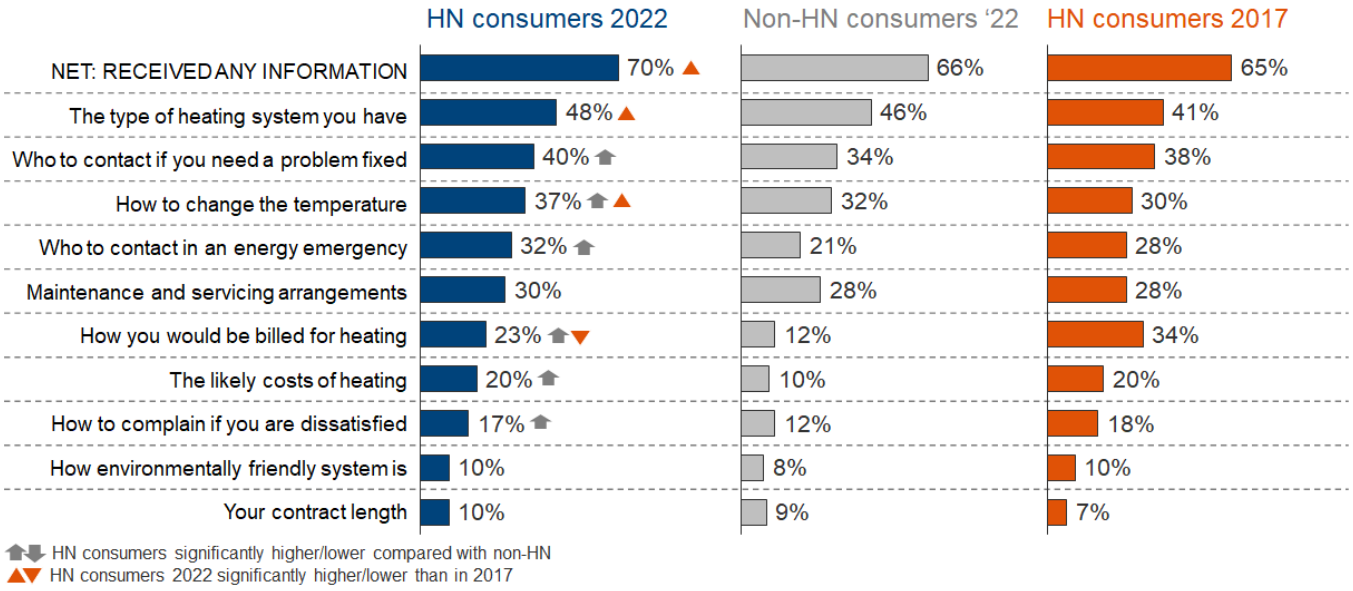
Information provided on joining heating systems

Around a third (35%) of heat network consumers said they had received a contract document, such as a Heat Supply Agreement, for the supply of their heating when they moved into the property or when the system was installed, higher than in 2017 (21%)[31]. Seven in ten heat network consumers reported receiving some information about their system when they first started using it (Figure 20).

In 2022, heat network consumers were more likely than non-heat network consumers to report receiving a range of information about who to contact, and billing and cost information (see Figure 20).

[31] This question was only asked to consumers that were on a heat network.

Figure 20: Information received when first used system - consumers

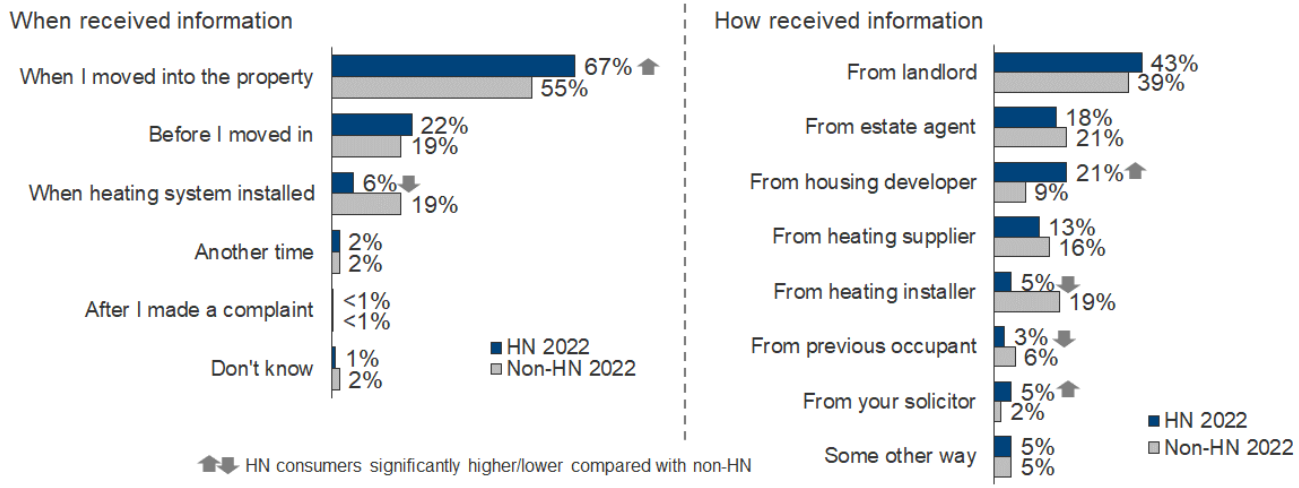


RECINFO: When you first started using your current heating system, did you receive information about any of the following?
Base: All consumers: Heat Network Consumers 2022: (2211); Non-Heat Network consumers 2022: (1715); Heat Network Consumers 2017: (3716)

Heat network consumers were more likely to report having received any information if they were homeowners (77% compared with 64% of those renting from the council or local authority) and on district schemes (85% compared with 69% of those in communal schemes).

Most heat network consumers who had received any information said they had got this when they moved in (as shown in Figure 21). The information provided to heat network consumers was most likely to have been received from a landlord (43%), an estate or letting agent (18%) or a housing developer (21%). Non-heat network consumers were less likely to say they had got their information from a housing developer (9%), reflecting that they were less likely to live in newly-built properties compared with heat network consumers.

Figure 21: When and how they received information – consumers who received any



WHENINFO: When did you receive this information? INFOHOW: How did you receive this information?
Base: All who received information when/how: heat network consumers 2022 (1530/1481), non-heat network consumers (1135/1113)

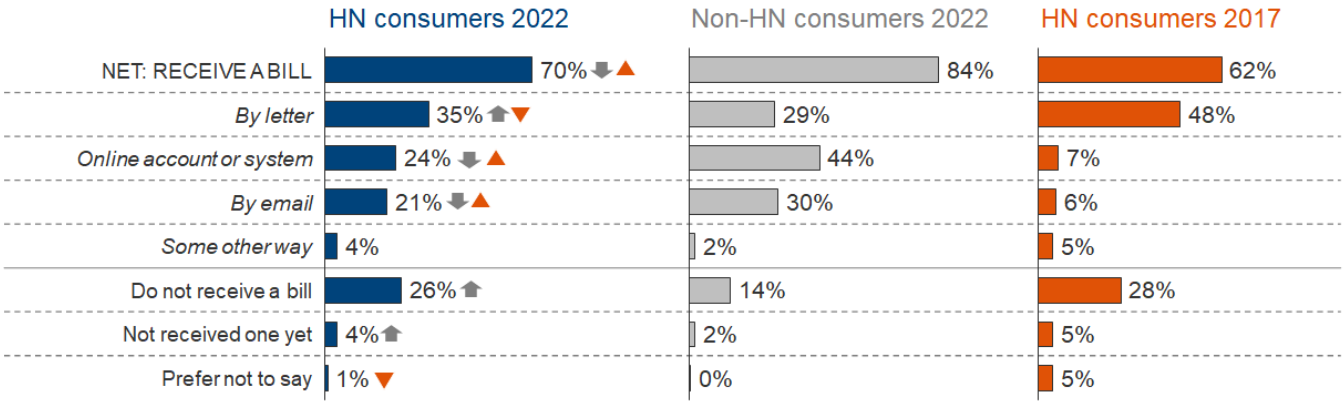
Billing information

Seven in ten heat network consumers reported receiving a bill, account summary, statement or something else, which detailed how much they pay for heating and hot water. This is a lower proportion compared with non-heat network consumers.

The lower proportion of heat network consumers who received a detailed statement of cost was reflected in themes discussed during interviews. It showed that consumers' information needs are tied to a desire for clarity and fairness. Those whose usage was estimated (due to lack of personal meter) rather than measured were often frustrated and wanted to see more accurate information.

As in 2017, this type of information was most likely to be received by letter, although there had been a shift since 2017 away from receiving letters and towards using an online system or emails. In contrast, non-heat network consumers were most likely to use an online system. One in four heat network consumers said they did not receive any form of bill or statement, stable compared with 2017.

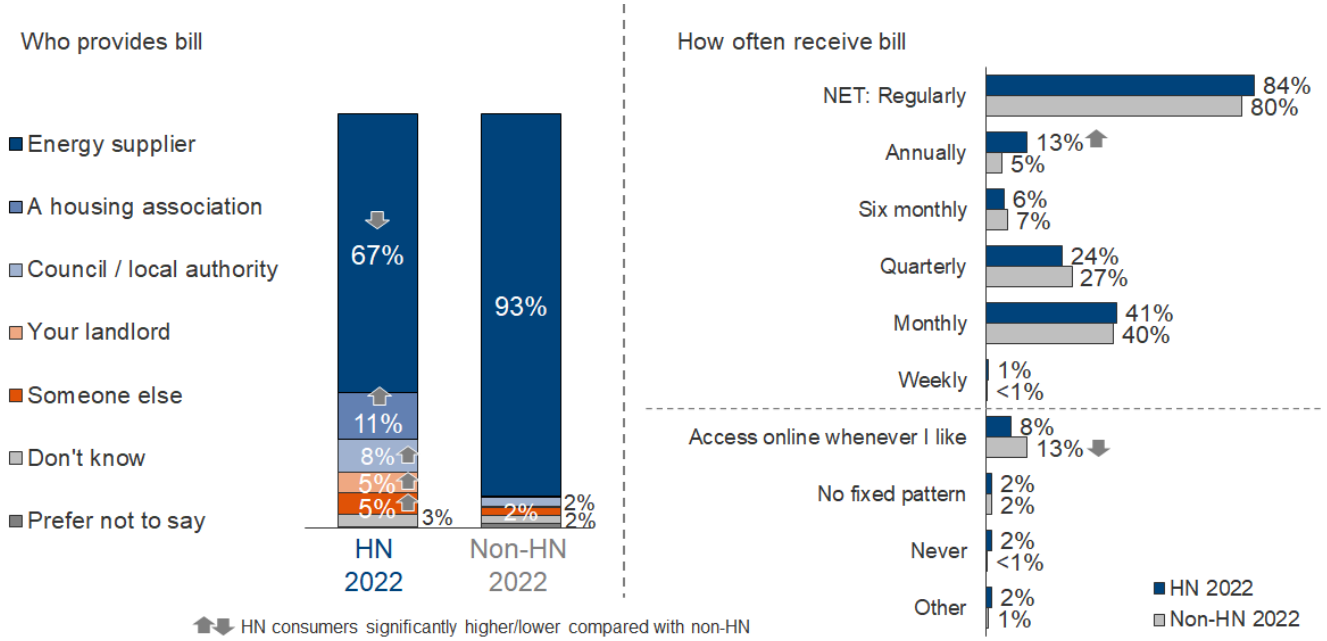
Figure 22: Whether and how receive bill - consumers



BILL: Do you receive a bill, account summary, statement or something else, which details how much you pay for heating and hot water?
Base: All consumers: Heat Network Consumers 2022: (2183); Non-Heat Network consumers 2022: (1710); Heat Network Consumers 2017: (3716)

Heat network consumers on district heat networks were more likely to report receiving a bill, account summary or statement (86%) than those on communal systems (63%). Homeowners were more likely than renters to have received a bill (82% homeowner compared with 58% social rent or 69% private rent) and to receive it through an online system or email.

Figure 23: Who provides a bill and how often (Of consumers who receive a bill)

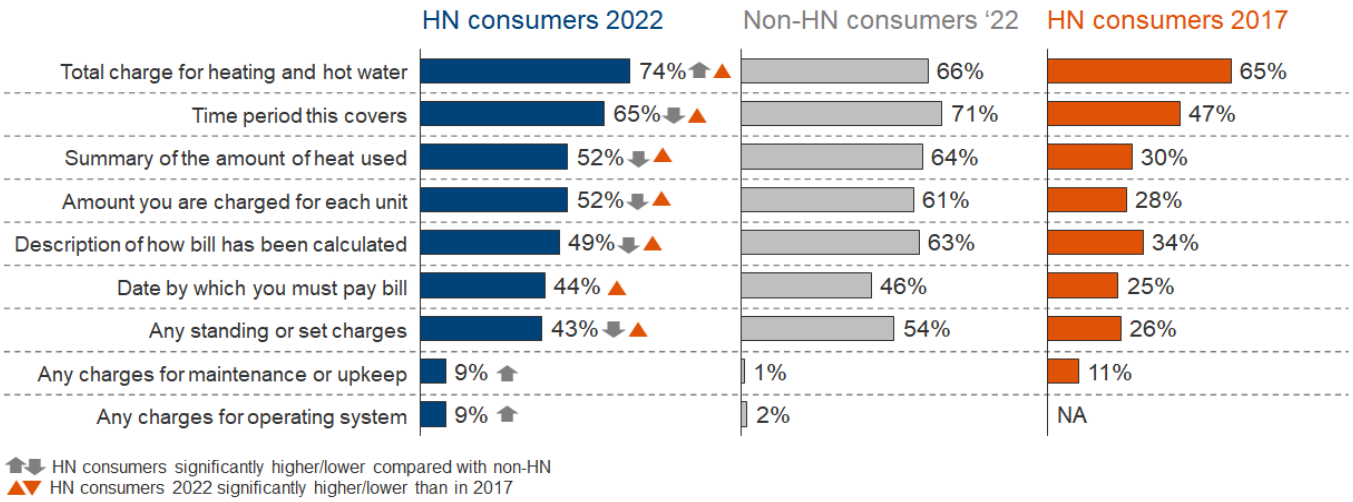


BILLPROV: Who provides this bill or statement?
BILLHOW: How often do you receive your bill, account summary or statement?
Base: Consumers who receive a bill - who/how often: heat network consumers 2022 (1495/1522), non-heat network consumers (1454/1472)

Heat network consumers using a district network were more likely to say the bill was monthly (48%) than those on a communal network (35%). Frequency of bill provision appeared related to the ownership of the heat network. More frequent bills, for example monthly, were more commonly provided by energy companies (50%) than by local authorities (16%) or housing associations (13%). Heat network consumers with vulnerable people in the house were twice as likely to only receive one bill a year (20%) than heat network consumers with no vulnerable person (10%).

Heat network consumers who received bills were more likely than non-heat network consumers to say these included a total charge. They were, however, less likely than non-heat network consumers to report their bills including more detailed charging information. Despite this, there appear to have been improvements in billing information for heat network consumers since 2017 – with increases in the proportion receiving information on time periods that bills cover, amount of heat used and cost per kWh.

Figure 24: Information included on bill – consumers who receive a bill

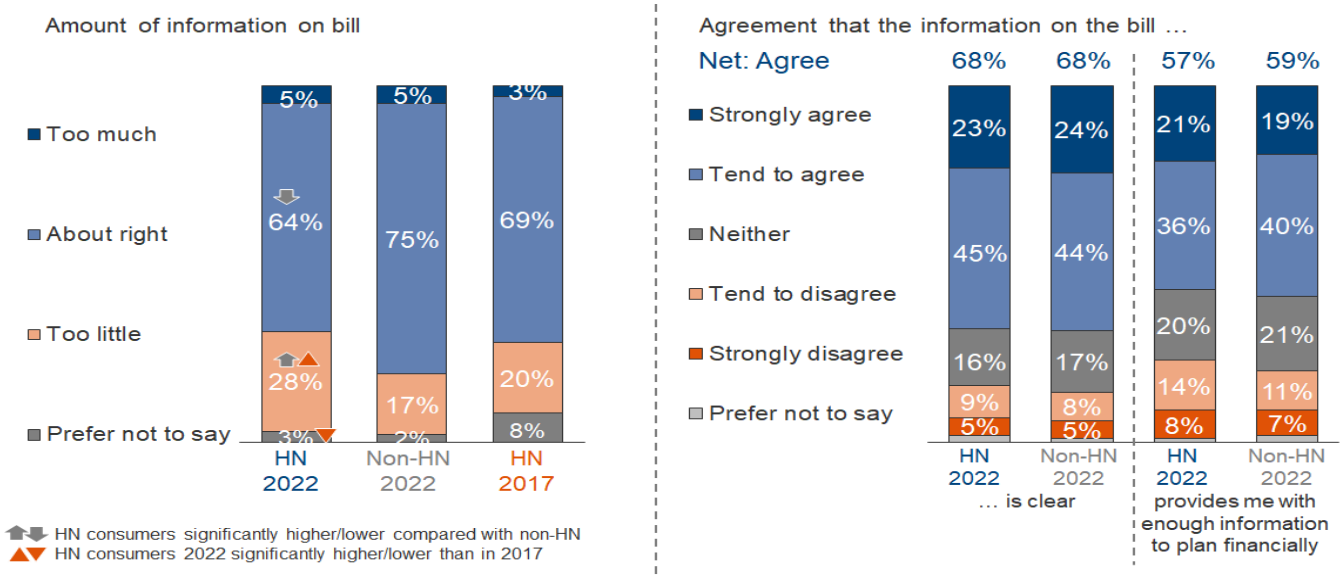


BILLINC: Which of the following is included on your bill, account summary or statement?
Base: Consumers who receive a bill: Heat Network Consumers 2022: (1519); Non-Heat Network consumers 2022: (1474); Heat Network Consumer 2017: (2539)

Heat network consumers on district heat networks were more likely than those on communal systems to say that they received information on the total charge for heating and hot water (87% compared with 73%), the time period covered (77% compared with 63%) and any standing charges (57% compared with 40%). Bills provided by local authorities were more likely to contain none of the information elements list above (9%) than bills provided by an energy company (3%) or landlord (1%).

In 2022, most heat network consumers who received a bill felt the amount of information on their bills was about right, in line with 2017 but lower compared with non-heat network consumers in 2022 (see Figure 25). Regression modelling showed that perceived fairness was strongly linked with agreement that information on bills is clear (see Annex Table 2 for more information).

Figure 18: Opinion of information on the bill – consumers who receive a bill



BILLINFO: Would you say that you receive too much or too little information in your heating and hot water bills, account summaries or statements?

INFOSAT: To what extent do you agree or disagree with the following statements?
Base: Consumers who receive a bill amount/clarity/able to plan: heat network consumers 2022 (1514/1506/1440), non-heat network consumers (1466/1460/1403); heat network consumers 2017 (2539/NA/NA)

Reporting that there was too little information on the bill was more common among those whose bills were based on building use rather than their properties use (41% compared with 25%). Households with a vulnerable consumer in particular disagreed that the information provided was clear (21% disagreed among households with a vulnerable consumer compared with 12% of household with no vulnerable consumers).

Operators

Three in ten operators reported providing a heat supply contract or agreement to their consumers (31%), 18% saying they did this before the tenant or occupant moves in and 13% on moving in.

Two thirds of operators (65%) said that they provided a bill, account summary, statement or something else, which details how much tenants and occupants pay for heating, hot water and cooling. These were most likely to be sent by letter (28%) or email (36%) with 18% saying they used an app or online account system.

Heating outages

The reliability of the heat network was a key factor influencing consumers' satisfaction with their heat network. This chapter explores the topic in more detail, including frequency of outages experiences and which factors influence consumers' experience of them. It also examines operators' approaches and policies in this area.

Key findings

- Half (50%) of heat network consumers reported having had some loss of hot water or heating in the property in the last 12 months, which mostly lasted less than one day.
- One in three (33%) heat network consumers reported that their property had felt uncomfortably cold at some point in the past 12 months, lower compared with non-heat network consumers (42%).
- The impact of outages depended on factors such as: advance notice, duration and timing of the outage, vulnerable household members being affected as well as heating and hot water being affected.
- Four in ten operators (40%) reported unplanned outages and a quarter (25%) reported planned outages across their portfolio in the past 12 months. Over a third (35%) of operators with outages expected tenants to pay at least some of the costs. Electric heaters were a common strategy to compensate for a loss of heating while few received financial compensation.

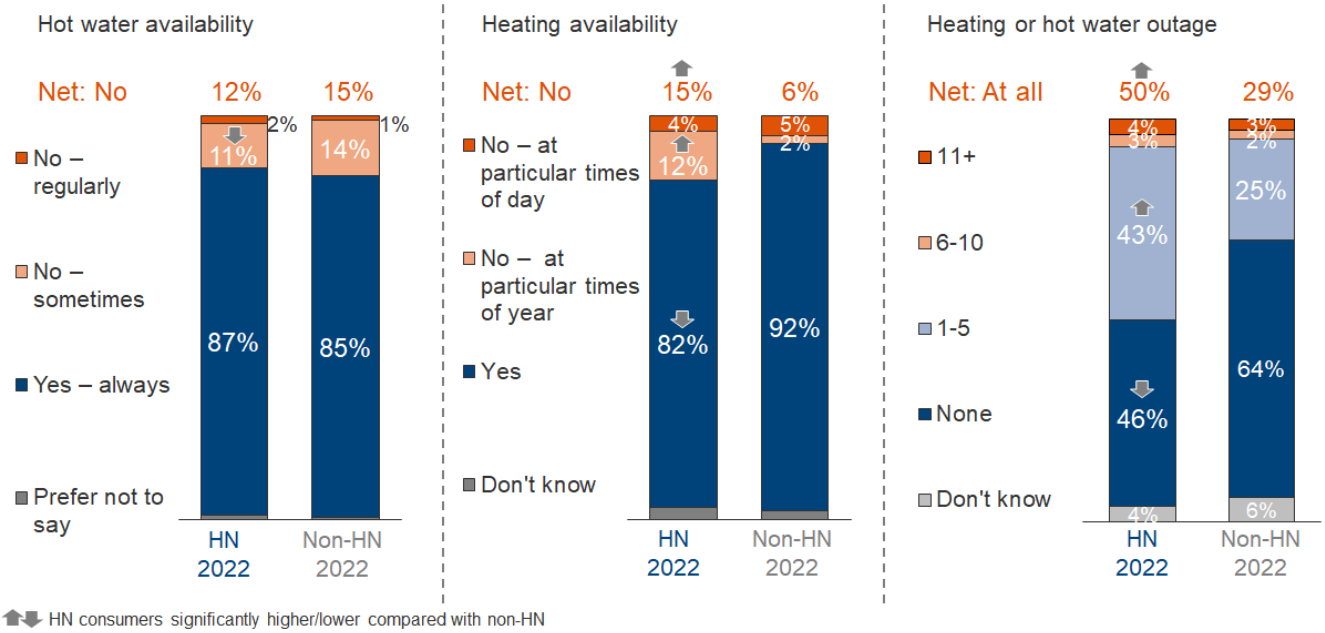
Consumers

Availability of heating and hot water

Half of heat network consumers reported having had some loss of hot water or heating in the property in the last 12 months, with most saying this was between one and five times in this period. This was higher than the proportion who reported any outages in a similar question in 2017 (37%).

Non-heat network consumers were less likely to report heating not always being available (6%) compared with heat network consumers (15%), and also less likely to report having experienced any outages (29% compared with 50%).

Figure 26: Availability of hot water and heating, and frequency of outages - consumers



HOTWATER: Is hot water available when you need it? TIMING: Is heating available at all times? HEATLOSS: In the past 12 months, how many times, if at all, have you had a loss of heating or hot water in the property?
Base: All consumers: hot water & heating / outage : heat network consumers 2022 (2223/2235), non-heat network consumers (1724/1728)

District heat network consumers were more likely (20%) to experience a loss of hot water compared with communal heat network consumers (12%). By contrast, communal heat network consumers were more likely to have experienced a loss of heating (19%) compared with district heat network consumers (12%).

For heat network consumers, heating outages were more common in older properties than newly-built properties (35% in properties built pre-1960 or 25% 1960-1999 compared with 9% built between 2000 and 2010 and 3% in properties built after 2010). There was no significant difference in heating outages between heat network consumers who had vulnerable people in the household and heat network consumers without a vulnerable person.

The interviews revealed the factors which influenced the severity of consumers losing their heating, some of which operators had some control over whereas others not. Factors with a level of operator control included being given advanced notice about the outage, the duration (hours, days, weeks etc.) as well time of the outage (e.g., morning or night-time as well as summer or winter). It also mattered whether consumers experienced a loss of hot water or heating only or both at the same time. This element is particularly important in combination with other factors. For example, losing only heating for several hours in summer was more manageable than losing both hot water and heating in winter. Factors where operator control was limited included vulnerable household members being affected or the location and weather conditions.

While consumers often felt that while outages were frustrating, they were typically planned, short-lived, and required only small life adjustments. Reasons for this included that outages were brief and heating was back swiftly, advance notice was given or being able to find quick workarounds to loss of heating and hot water. This reflected quantitative findings that, despite

more frequent outages, satisfaction was higher among heat network consumers than non-heat network consumers.

However, certain types of consumers were more likely to struggle with outages or become increasingly frustrated by these, including, those with young children, the elderly, or disabled / with disabled family members. These groups felt the impact of outages more intensely – at a daily level on their routine and lifestyle, and more fundamentally on their mental and physical health.

Higher frustration around outages was usually the result of consumers having experienced a loss of heating for longer periods of time or consumers having engaged with a poor or unresolved customer service.

Thermal comfort – under-heating

One in three heat network consumers reported that their property had felt uncomfortably cold at some point in the past 12 months which was an increase from 2017 (see Figure 27). This was most likely to be just one to five times in the past year.

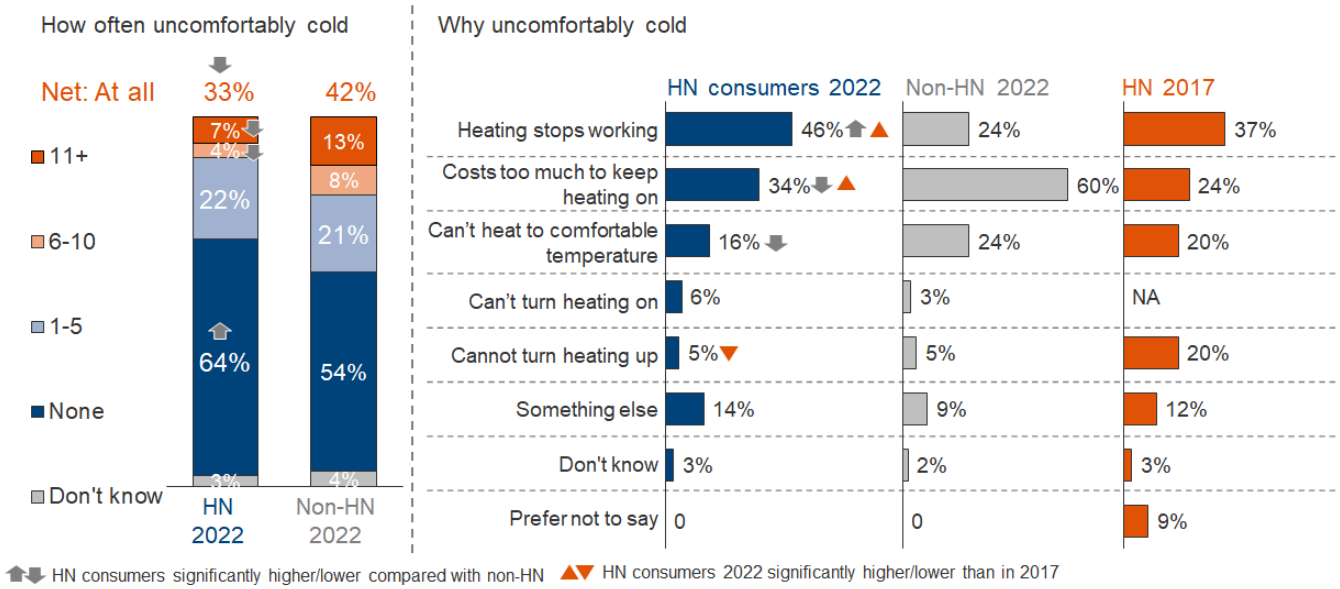
The most common reason given for feeling uncomfortably cold was the heating had stopped working, followed by the cost of keeping the heating on and issues around ability to control the heating system, particularly not being able to heat the property to a comfortable temperature. It is worth noting that the cost of heating as a reason for being uncomfortably cold was much less of an issue for heat network consumers compared with non-heat network consumers.

Compared with heat network consumers in 2017, the heating stopping working and cost of heating were more likely to be given as reasons for having felt uncomfortably cold, while an inability to turn the heating up was cited less often in 2022.[32]

Regression modelling showed that consumers who had not experienced underheating were more likely to be overall satisfied with their heat network system, compared to those who had experienced underheating. For more information see annex table 1.

Heat networks consumers in smaller properties were much less likely to report experiencing the property as uncomfortably cold (55% experienced cold in properties with 4+ bedrooms compared with 28% in properties with 1 bedroom and 35% in properties with 2 bedrooms). There was no significant difference in properties being uncomfortably cold between heat network consumers who had vulnerable people in the household and heat network consumers without a vulnerable person.

Figure 27: How often uncomfortably cold and why - consumers



COLD: In the past 12 months, how many times, if at all, has the property been uncomfortably cold? WHYCOLD: Is this because…
Base: All consumers / those ever cold: heat network consumers 2022 (2234/743), 2017 (NA/625); non-heat network consumers (1724/693)

Thermal comfort – over-heating

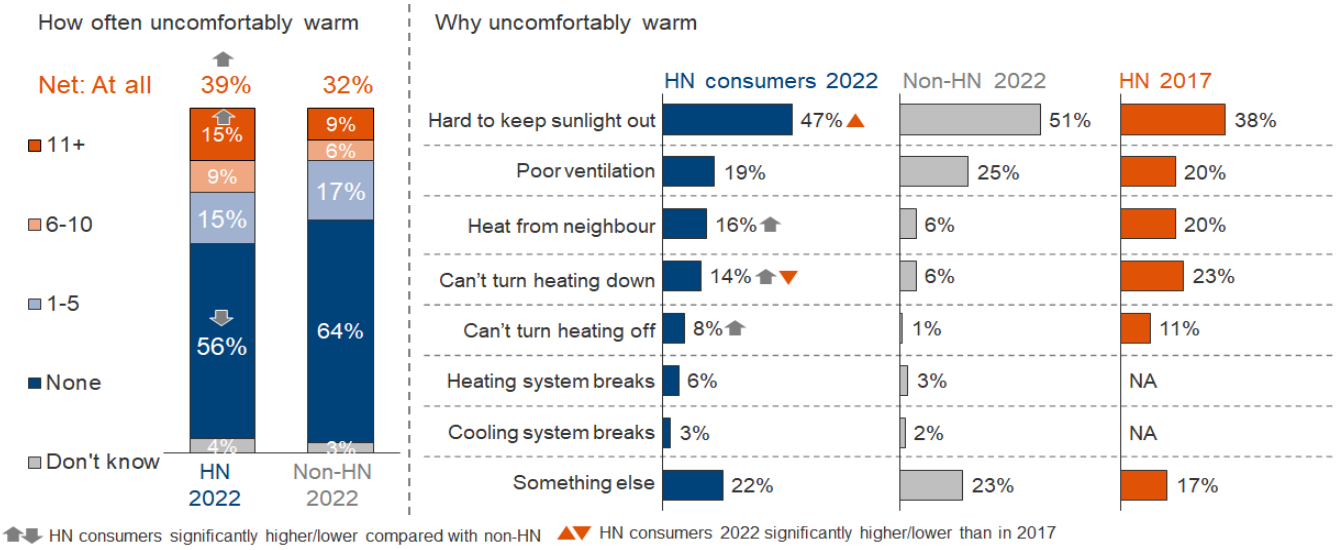
Heat network consumers were more likely to report their property being uncomfortably warm in the last 12 months (Figure 28) than to report it being cold, and compared to non-heat network consumers. There was no significant difference in properties being uncomfortably cold between heat network consumers who had vulnerable people in the household and heat network consumers without a vulnerable person.

The main reason given was the difficulty of keeping sunlight out of the property, an increase from 2017 for heat network consumers. These consumers were more likely to be homeowners (56% own compared with 30% social rent) or living in newer properties (55% in properties built from 2010 onwards compared with 27% in properties built pre-1960).

The inability to turn the heating down was cited less as a cause than in 2017. Not being able to turn the heating off was reported to be an issue among those living in older properties (19% in properties built pre-1960 compared with 4% built from 2010 onwards). Those who report being able to turn the heating down or off has increased significantly compared with 2017.

Just over half of heat network consumers whose property had felt uncomfortably warm reported that this typically lasted less than a day, with similar levels seen for non-heat network consumers reporting such problems.

Figure 28: How often uncomfortably warm and why – consumers

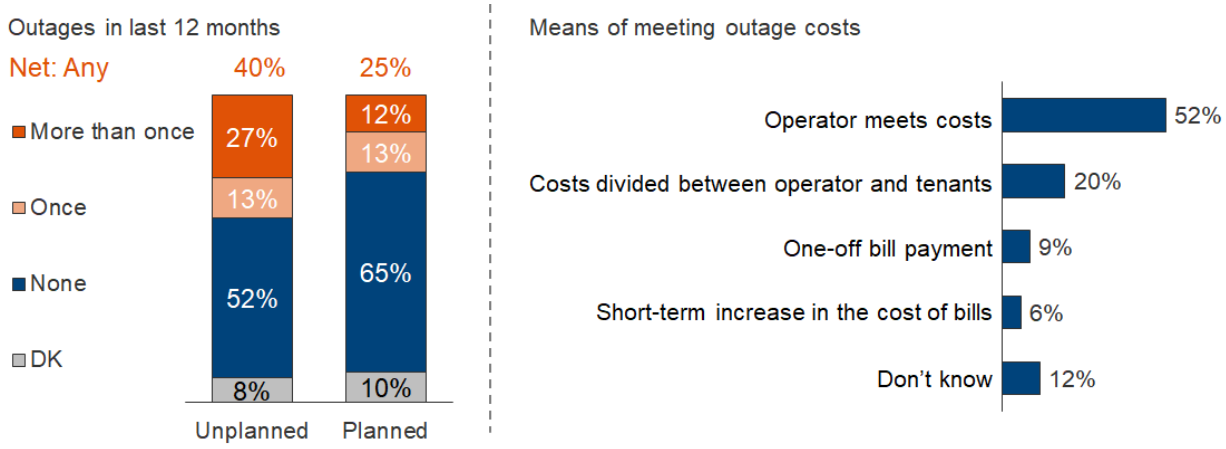


WARM: In the past 12 months, how many times, if at all, has the property been uncomfortably warm?
WHYWARM: Why does the property get uncomfortably warm?
Base: All consumers / those ever warm: heat network consumers 2022 (2227/806), 2017 (NA/1522); non-heat network consumers (1722/448)

Operators

Four in ten operators reported unplanned outages and a quarter reported planned outages across their portfolio in the past 12 months (See Figure 29). A quarter of operators also reported more than one unplanned outage. About half of the unplanned outages lasted up to a day. The costs of planned outages were most likely to be met by the operator but over a third of those with any outages expected tenants to pay at least some of the costs.

Figure 29: Number of outages in past year and how costs are met - operators



HEATING_OUTAGE_EXPERIENCED1/2: In the past 12 months, have any of your tenants/occupants experienced a loss of heating from unplanned heating outages / how many, if any, of your heat networks have your tenants/occupants experienced a loss of heating from unplanned heating outages?
PLANNED_INTERRUPTIONS: In the past 12 months, have any of your tenants/occupants experienced a loss of heating from planned heating outages? OUTAGE_COSTS: Which of the following best describes how the costs incurred by a planned or unplanned heating outage are met?
Base: All operators / those with any outages in past year: 2022 (130/68)

Interviews explored how operators planned for outages and which process and compensations schemes they had in place. While operators aimed to avoid outages, they prioritised outages during the summer where they had less impact on consumers. Operators also aimed to schedule planned outages after 9am and finish by the end of the day as well as giving notice in advance (ranging from 8 hours to one week in advance). Electric heaters were a common strategy to accommodate for longer (several days) planned outages of heating. However, financial compensation was very rare. For longer, rarer, outages, alternative accommodation could be offered.

Regarding unplanned outages, operators reported these to be very infrequent with larger operators having emergency hotlines in place or contingency planning, particularly for critical infrastructure such as hospitals. While the majority of interviewed operators did not have a compensation scheme for unplanned outages in place, very few offered a day rate reduction in the case of an unplanned outage for more than 24 hours.

Consumer interaction and complaints

While few consumers were found to be actively dissatisfied with their network, understanding negative experiences and complaints was a key priority for the research. This included the prevalence of complaints amongst heat network consumers, insight into the ways in which complaints were handled, and which factors prevented or facilitated effective complaints processes. The chapter also examines the perspective of operators in managing complaints.

Key findings

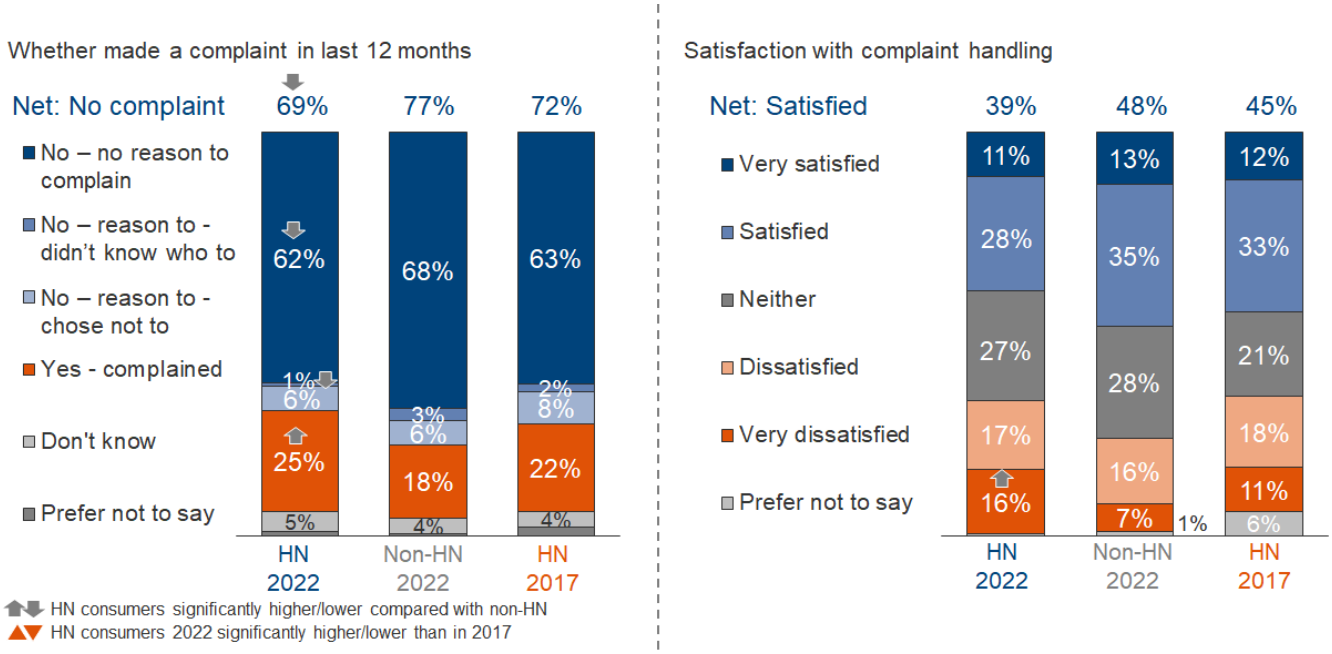
- One in four (25%) heat network consumers reported having made a complaint about their heating in the last 12 months, among whom four in ten were satisfied with the way it was handled.
- Complaints were more common among heat network consumers who had vulnerable people in the household (30%, compared with 22% without a vulnerable person in the household).
- The interviews showed that a lack of time, information (e.g. on who to contact, how to issue a formal complaint or how many hours heating was lost) or money (for legal proceedings for escalated complaint) as well as a fear of evictions were barriers to making complaints.
- Similarly, a lack of time as well as unresponsive operators were barriers to effectively resolving complaints. Co-ordinated and collective complaints were discussed as beneficial to resolving complaints effectively.
- Around three in four operators said that they had a formalised complaints procedure in the event that tenants/occupants of their properties wished to make a complaint about their heating, hot water or cooling.

Consumers

One in four heat network consumers reported having made a complaint about their heating in the last 12 months (Figure 30), higher than the level seen among non-heat network consumers, but consistent with 2017 levels.

Among those who had complained, four in ten heat network consumers in 2022 were satisfied with the way the complaint was handled. Satisfaction was slightly better for non-heat network consumers. Complaints were more common among heat network consumers who had vulnerable people in the household (30% with vulnerable people compared with 22% no vulnerable people).

Figure 30: Whether made complaint and satisfaction with handling - consumers



COMPLAINT: Have you or anyone else made a complaint about your heating in the last 12 months?
COMPLAINSAT: When you last made a complaint, how satisfied or dissatisfied were you with the way your complaint was handled?
Base: All consumers / made a complaint: heat network consumers 2022 (2231/562); non-heat network consumers (1727/258); heat network consumers 2017 (3716/872)

Among those interviewed, formal complaints were rare even for those with low levels of satisfaction. Barriers to making complaints were usually linked to not knowing who to contact or a lack of time or information (i.e. on hours heating or water was lost or household affected or how to issue a formal complaint). Consumers also perceived some issues to be inherent to heat networks and therefore not worth complaining about. Others discussed how concerns around legal proceedings (for escalated complaints) or a fear of being evicted for being a difficult tenant prevented them from complaining. These potential barriers are illustrated by the quote below.

"The line between the [Housing Association & Heat Network] is blurred. [Our complaint] was a mass complaint from a huge number of people…every individual has to claim compensation and it is off-putting, people can't be bothered to go through the claims process." Communal HN Consumer, dissatisfied, not vulnerable

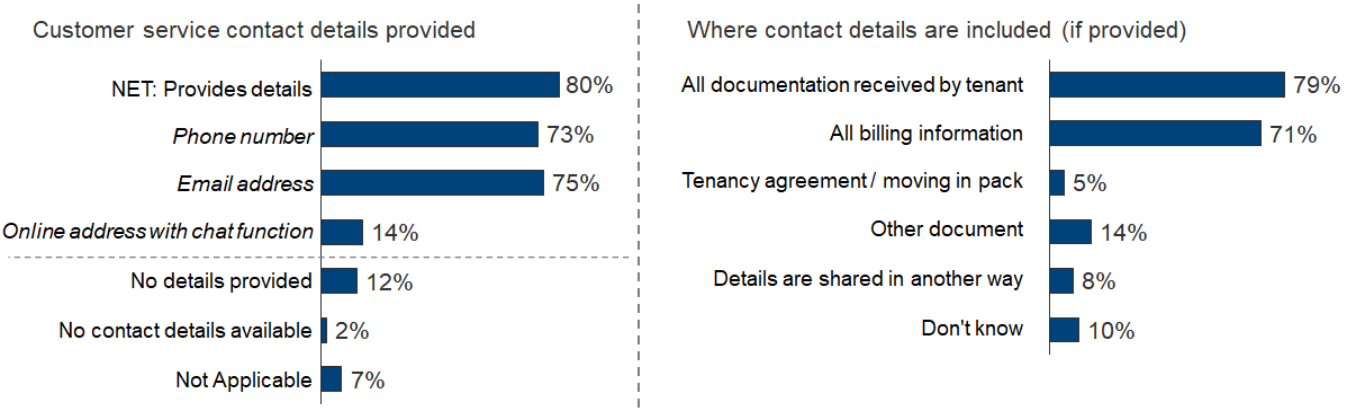
Similarly, a lack of time to go through a formal complaint process as well as unresponsive operators were barriers to effectively resolving complaints. Taking coordinated and collective action, while challenging, as well as having a direct or close relationship with the operator or respective building managers helped in formulating and resolving complaints.

Operators

Around three in four operators (74%) said that they had a formalised complaints procedure in the event that tenants/occupants of their properties wished to make a complaint about their heating, hot water or cooling.

Eight in ten operators said that they provided customer service contact details to tenants and occupants (Figure 31), most often an email address or phone number. Those who provided any details were most likely to include it on all documentation received by the tenant.

Figure 31: Whether and how contact details are provided: operators



CUSTOMER_SERVICE_DETAILS: Do you/your organisation provide customer service contact details to your tenants/occupants? WHERE_DETAILS_ARE_INCLUDED: Are the customer service contact details included in any of the following?
Base: All operators / those who provide any contact details: 2022 (130/103)

Almost eight in ten operators (78%) reported being contacted by tenants or occupants, in line with the proportion who provided contact details. This was most likely to be at least weekly (25%) or monthly (18%). Missed payments were most likely to be collected via a payment plan established with the tenant or occupant (39%).

While survey findings showed most operators had a formalised complaints procedure, the interviews showed again how operators' strategies differed depending on their profile. Operators such as charities, non-operators or prosumers tended to have less professional customer service policies and systems in place. In this case, customer service was often streamlined with other services (e.g., a general help desk). For prosumers, customer interactions were often of lower importance due to their small share in the overall energy consumption across the network.

In contrast, public entities and energy companies tended to have more specialised and tailored customer service systems in place. Operating a heat network was often an important part of their overall organisation or business which increased the importance of engaging efficiently with customers through various means. For example, operators could have specific online portals or different customer hotlines (e.g., general enquiry, emergency, maintenance etc.) in place. Landlords and property management could be located between both ends of the

spectrum. Their customer service strategy often depended on their size (e.g. a small landlord versus a large property management company).

Regulations, rights and powers

During outages, operators reported prioritising vulnerable consumers, while compensation and complaints procedures differed. Building upon the survey findings, this chapter shows to what extent operators monitor vulnerable consumers and which regulations are most important for their operations.

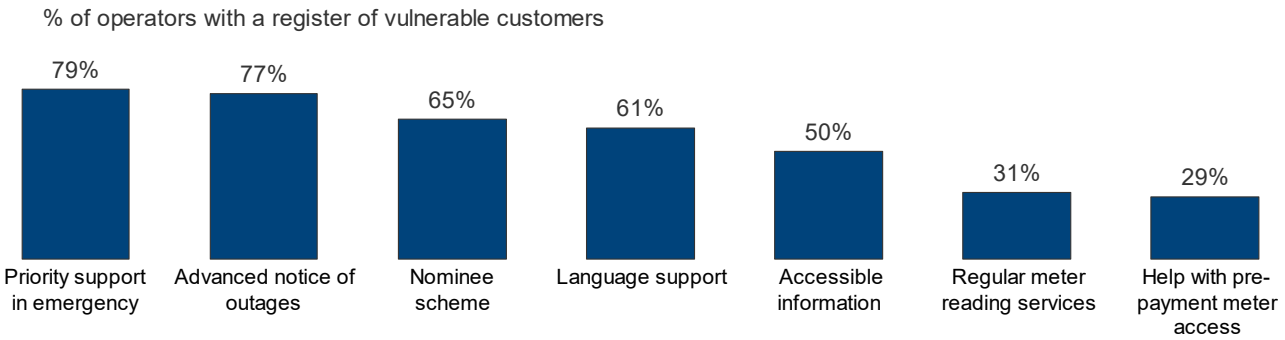
Key findings

- Around four in ten operators of residential schemes reported maintaining a register of vulnerable consumers, while just 7% of operators said they were member of a voluntary standard scheme.
- Over three quarters of operators were aware of some of the industry regulations, schemes and codes of practice, and of those aware of the HMBR, most were aware of at least some of its requirements and definitions.
- Around half of operators reported some impact of current heat network regulations on their organisation.

Vulnerable consumers

Operators were asked whether they maintain a register of vulnerable customers. Four in ten (39%) operators that that supply heating, cooling or hot water to residential customers[33] reported that they maintain a register of vulnerable consumers. Figure 32 (below) shows support offered among operators that maintain a register of vulnerable consumers. About eight in ten offered priority support in an emergency (79%) or advanced notice of outages (77%). Six in ten (61%) offered language support and 31% offered regular meter-reading services. In the interviews, operators reported that vulnerable consumers were prioritised in cases of outages, complaints processes or during the cost-of-living crisis.

Figure 32: Support offered to vulnerable consumers – operators of residential schemes



[33] Some heat network operators only supplied non-domestic consumers and are not included within the analysis of this question.

VULNERABLE_CUSTOMER_SUPPORT: Which of the following, if any, do you offer in order to support vulnerable customers?
Base: All operators of heat networks in residential properties that maintain a register of vulnerable customers (n.46)

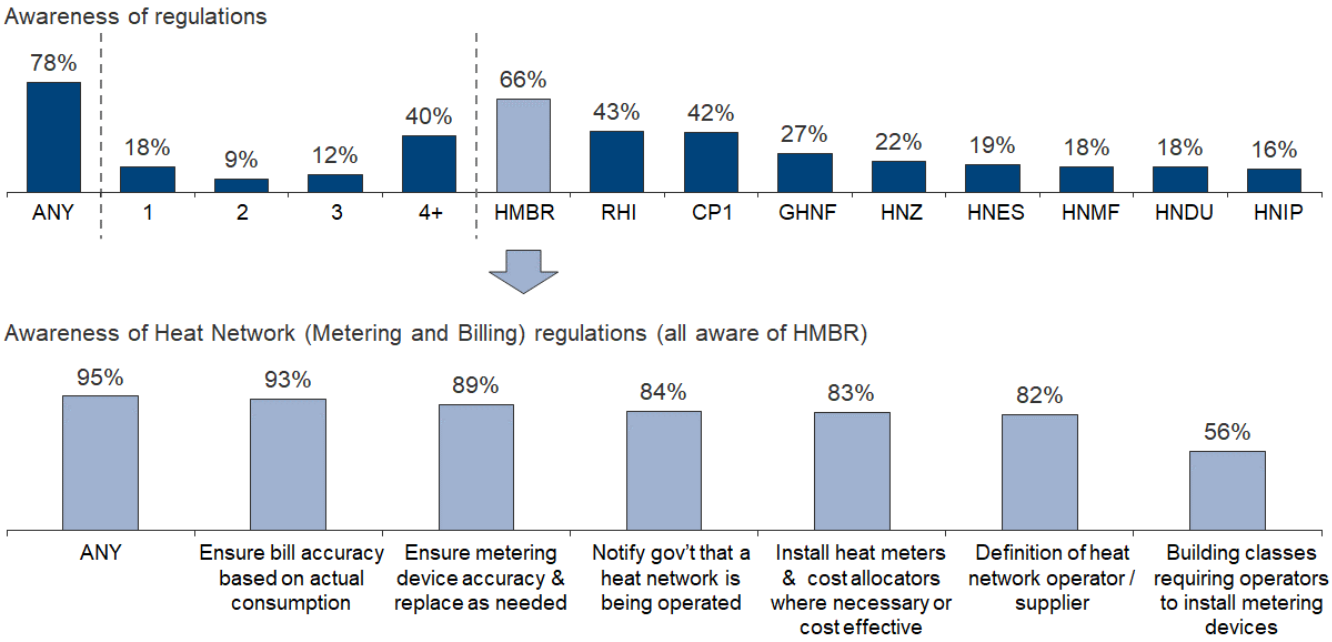
Awareness of regulations, rights and powers

Just 7% of operators said they were member of a voluntary standard scheme, with 3% reporting membership of the Heat Trust.

Over three quarters of operators were aware of one or more of the industry regulations, schemes and codes of practice (Figure 33). Awareness was highest for the Heat Network (Metering and Billing) Regulations (HMBR), followed by Renewable Heat Incentive (RHI) and Heat Networks: Code of Practice for the UK (CP1). All operators interviewed were part of the HMBR data set, and therefore had some interaction with these regulations. In this context, awareness of the regulations is low and suggests a lack of organisational knowledge among operators.

Of those aware of the HMBR, most were aware of at least some of its requirements and definitions. Awareness was highest for the requirement for billing accuracy (93%) and the need to ensure metering devices are accurate and replaced when necessary (89%). Awareness was lower, however, for building classes (Viable, Open, Exempt) that require some operators to install metering devices (56%).

Figure 33: Awareness of regulations – operators



REGULATIONS_AWARENESS: Which of the following, if any, are you aware of? Heat Network (Metering and Billing) Regulations (HMBR), Renewable Heat Incentive (RHI), Heat Networks: Code of Practice for the UK (CP1), Green Heat Network Fund (GHNF), Heat Network Zoning (HNZ), Heat Network Efficiency Scheme (HNES), Heat Network Market Framework (HNMF), Heat Networks Delivery Unit (HNDU), Heat Networks Investment Project (HNIP); HMBR_AWARENESS: Which of the following aspects of Heat Network (Metering and Billing) Regulations are you aware of?
Base: All operators/ operators aware of HMBR (130/93)

Of those who were aware of CP1, 70% said they were compliant with its requirements (with 46% saying they were fully compliant).

Impacts of regulations on operators

Around half of operators (52%) reported some impact of current heat network regulations on their organisation, with this most likely to be the requirement to complete a viability exercise to determine whether to install heat meters or heat cost allocators (33%), but with just slightly fewer reporting an impact from each of the other requirements.

One in ten (10%) said they would be likely to apply for optional licensing from the future regulator, with 36% saying this was not likely. Relatively few (14%) had obtained or attempted to obtain rights and powers related to their scheme, with this most commonly planning permission to maintain, develop or expand your heat network (6%). Virtually all of those who had applied (n=18) reported having been able to obtain everything they had applied for.

Energy suppliers, market exits, and future investments

This chapter covers findings relating to operators' planning for the future. Research identified the frequency of energy supplier reviews and assessed the potential impact of market exists of energy suppliers. Discussions with operators explored drivers of and barriers to future investments, including cost and advice provided.

Key findings

- Around half (52%) of operators said that they reviewed the heating supplier for their heat networks at least annually, with a fifth (21%) saying this was done every two years.
- For operators affected by a market exit of their energy supplier over the last 5 years, 100% of operators reported no disruption to their network.
- Investment plans in heat network expansions or extensions differed depending on the importance of operating of a heat network for the overall operator organisation. The main barrier which prevented operators from investing was cost and government funding was important for future investments.

Energy suppliers and market exits

Around half of operators said they reviewed the supplier for their heat networks at least annually (52%), with 21% saying this was done every two years, 10% less often and 8% never.

Just over one in ten (12%) reported that their heating supplier had left the market in the last five years. None reported the change causing any disruption to supply. The interviews aligned with these findings. During interviews, operators identified increasing prices and losing fixed rate tariffs through setting up a new contract as the greatest risks of market exits.

The interviews showed how potential market exits of suppliers could be an important factor for long-term planning. Contingency planning was important to ensure operators were internally prepared to deal with a potential energy supplier exit. It could also be relevant externally by being able to explain their contingency planning to new customers and alleviate their concerns in order to win new business. Operators without a contingency planning in place could also just hope that the regulator steps in.

If they were no longer able to operate a heat network, around half of operators (53%) said there were no contractual arrangements in place, but that they would be likely to appoint a new organisation to permanently take over the operation of the heat network. Around three in ten (28%) said there were contractual arrangements in place to ensure to continued operation of

the heat network. However, just 3% of operators said that they anticipated no longer operating heat networks in the next 12 months.

Heat network investments

The interviews aimed to understand how operators decide whether to expand their existing heat network portfolio or extending their existing networks. It highlighted a broad spectrum with operators varying in the extent they actively sought out investing in their networks.

Charities and non-operators (see Figure 5 on page 21) tended to not actively look into investing in their existing networks. For these operators, heat networks were a means to an end, i.e. providing heating and hot water. It was not an important focus for the overall organisation. Investment decisions around heat networks were therefore strongly linked to other investment decisions such as acquiring new properties.

Operators such as landlords & property managers, prosumers, public entities and energy companies tended to be more actively interested in extending or expanding their heat networks. Heat networks were also often linked to investments into renewable energy sources as part of wider sustainability initiatives or aims to reduce dependency on fossil fuels such as gas. Depending on the size of the organisation, a range of stakeholders and consultants could be involved in decision-making. Planning around heat networks is usually more long-term and lasts beyond a 12 month window.

Cost was the main barrier to investment in heat networks. For example, a council operator pointed out the high costs for installing new piping networks as well as the ongoing costs of an inner-city construction site. In addition to capital investment costs, this barrier covered concerns around hidden costs for first time installation. This is also supported by the survey results, which showed that upfront costs for operators were by far the greatest barrier to installation among those not currently using a low-carbon system, with a reduction in such costs also most likely be a potential driver of installation (83%).

Other barriers emerging from the interviews were connected to ground and space restrictions. For example, operators mentioned environmentally sustainable equipment often requiring more space than conventional machinery such as gas boilers. One operator stated that variations in developer relationships, such as differences in the ways of working of urban and countryside developers, represented another barrier for operators working across the country. Obtaining planning permission or changing stakeholders' attitudes towards new or unfamiliar technologies such as heat networks was discussed as another barrier impeding the investments in heat networks.

Operators also identified key factors driving investment. The survey results highlighted that low cost advice on maintenance compared with high level maintenance (62%) and ease in accessing planning permission (60%) were named as drivers of new installations. The interviews revealed a different perspective on investment drivers. For example, if operators had to meet sustainability targets (e.g. NHS trust or council with net zero objective in place),

investing in heat networks was often used as a mechanism to achieve them. Similarly, if operators were interested in cost-saving (e.g. property management or council interested in offering low cost heating), investing in new heat networks could be a way of ensuring this. Other drivers included being able to identify benefits for local communities of having a heat network such as lower energy bills for residents (particularly for councils/public entities) or having easy local access to primary energy sources such as biomass.

Due to costs forming a significant investment barrier, operators pointed to the high importance of government funding in this area.

Conclusions

This report provides an update to the findings from the 2017 Heat Network Consumer Survey and presents results from new research on heat network operators. It allows us to make comparisons between the experiences and views of heat network consumers and a comparable of group of consumers who are not on heat networks.

Heat network consumers generally had a low awareness of their heating system. Reliability and costs of heating were often prioritised over environmental considerations. Any promotion to increase the use of heat networks should therefore be built around cost and reliability while taking into account the limited importance of heat networks as a significant factor consumers consider when choosing a property.

How do the experiences of consumers on a heat network compare to those on other heating systems, and has this changed since 2017?

Overall, heat network consumers were more satisfied than non-heat network consumers (74% compared with 67%) and their satisfaction level remains stable compared to 2017.

A reason for this could be related to the cost of being on a heat network. Indeed, consumers perceiving that they pay a fair price has a positive impact on satisfaction. On average, heat network consumers reported paying less than non-heat network consumers, with a median of £600 per annum for heating and hot water compared with £960. This is a larger gap seen than in 2017 (£445 and £582 respectively). However, there was large variation within heat network prices where 9% of consumers reported prices of over £2,000 per year, although 13% of non-heat network consumers did as well.

While heat network consumers were less likely to report struggling with their bills compared with non-heat network consumers, (45% and 62% respectively), this is an increase from the 2017 survey (27%). It should be noted that the survey took place between March and July 2022 and bills may not have been impacted by the cost-of-living crisis. Follow up interviews between November 2022 and January 2023 found that heat network consumers associated being on a heat network with a limited price increase. The dependency on (future) government subsidies was highlighted as an important factor mitigating the impact of the crisis.

Although this could explain why heat network consumers are more satisfied, there remain factors which suggest they are having a more negative experience than those on other heating systems. Heat network consumers were more likely to have made a complaint in the previous 12 months (25%) than those not on a heat network (18%). 50% reported having had an outage in the last 12 months (although mostly for a short period), which is higher than non-heat network consumers (29%). This has also risen since 2017 (37%).

Heat network consumers also experience issues relating to their billing. Three in ten (28%) who received a bill reported that it had too little information, higher than non-heat network consumers. This was higher among those whose charges were based on the building’s heat

consumption rather than based solely on their own consumption (41% compared with 25%). Vulnerable consumers were less likely to perceive the information on their bills as clear. An unsatisfactory level of information on bills directly affected perceived fairness of price, and in turn satisfaction.

Although heat network consumers may report being more satisfied than those on other heating systems, there remain notable disparities in their experiences.

How are aspects linked to consumer protections experienced by consumers and handled by operators?

There has been an increase in the proportion of heat network consumers receiving documentation related to their heating since 2017, although this is still less frequent compared to non-heat network consumers. Heat network consumers were more likely to receive a contract in 2022 (35%) than in 2017 (21%). They were also more likely to receive a bill in 2022 (70%) than in 2017 (62%), although still less likely than non-heat network consumers (84%). This aligns with only two thirds of operators saying they provided a bill or statement of some form to consumers. Future regulations could consider the implications of a lack of contract or bill on heat network consumers.

Heat network consumers experience problems in relation to how outages and complaints are handled, which suggests a role for future consumer protections. They were less likely to be satisfied with how complaints were handled compared with non-heat network consumers (39% compared with 48%). This represents a 6% decrease from 2017. Although outages, underheating and overheating were no more common for heat network consumers with a vulnerable person in the household, they were more likely to have made a complaint than those without a vulnerable person. In terms of compensating consumers for outages, vulnerable consumers were usually prioritised and provided with replacement heaters. However, financial compensation schemes were rarely encountered. Future consumer protections would be helpful here, particularly considering that heat network consumers were considerably less likely to pay for their heating and hot water based on actual or estimated usage.

Operators varied in how they handled complaints, which could explain variation in consumer experiences and satisfaction. Close relationships with heat network operators or responsible local staff (such as building managers) were important to effectively resolve complaints, as were clear customer service systems and contacts. Only 39% of the operators of residential schemes surveyed maintained a vulnerable consumers register. Of those, 79% offered vulnerable customers priority support in an emergency, 61% offered language support and 31% offered regular meter-reading services. There is therefore a need for policies to ensure vulnerable customer support is widespread among heat network operator processes.

In addition, operators showed low awareness of heat network schemes and policies, which has implications for their effectiveness. Only 7% said they were a member of a voluntary standards schemes, designed to provide consumer protections. Only two thirds of operators were aware of the HMBR (66%), despite HMBR being the source of their contact details when recruited to

participate in the research. Overall, 22% had no awareness of any of the regulations listed in the survey. Regarding upcoming policies, only 22% were aware of Heat Network Zoning. An increase in awareness and participation is needed to for future consumer protection and policies to be implemented effectively.

What influences operators' investment decisions?

Three quarters of operators did not anticipate the number of networks they operated to change. Barriers to investment included cost, space availability and planning permission. Drivers included operator's own sustainability targets, chances to save heating costs and the perceived benefit of heat networks to the community. Operators interviewed, particularly large ones, highlighted the importance of government funding around infrastructure and development to their future success.

However, there was significant variation amongst the profile of operators and the extent to which operational decisions like these were proactively strategized. This variety affected all levels of their operations and should be taken into account to understand what motivates investment decisions like these.

Limitations and future research

This report shows that the experiences of heat network domestic consumers have in some ways changed since 2017, which could be a response to the reforms to the existing Heat Network (Metering and Billing) Regulations 2014. However, there are still instances where heat network consumers have a more negative experience than those on other heating systems, with significant variation between consumers, suggesting a role for implementing further consumer protections. It would be beneficial to repeat this survey in the future to understand what impact these have had.

Future research on non-domestic consumers is also needed given that this report was unable to present findings on non-domestic consumers due to very low response rates. It may also be beneficial to conduct additional research on the different types of operators with a higher sample size to understand more about what targeted support and policies they may need.

Appendix

Regression modelling

The regression models included six variables thought to be influencers of the outcome variables, these were:

1. Experience of underheating (whether a consumer reported experiencing their property being too cold)
2. Experience of overheating (whether a consumer reported experiencing their property being too hot)
3. Satisfaction with the information provided about their system on the bill
4. Satisfaction with handling of complaints
5. Perceived fairness of cost[34]
6. Satisfaction with the level of control[35]

The models also contained control variables for a range of other characteristics relating to households and the heat networks they use. These were included to ensure that the associations identified between the influencer variables and the outcome were not caused by differences in sample profile.

The control variables included in the model were:

- Heat network operator
- Heat network type (communal vs district)
- Heat Trust registered
- Property age
- Property type
- Presence of vulnerable people in household
- Presence of older people in household (65+)
- Presence of children in household
- Household size
- Whether receiving a separate bill
- Whether they think they receive too little information on their bill
- Whether the household is financially struggling

[34] This variable was not included in the model for perceived fairness of cost
[35] This variable was not included in the mode for satisfaction with the level of overall control

Details of the full models, including these control variables, are included in the technical appendix to this report. In this discussion, the focus is on the six influencer variables listed above (rather than the control variables).

Overall satisfaction

Domestic consumers overall satisfaction with their heat network system is likely to be affected by different a range of influences. These influences could include different aspects of their heating systems, such as the type of network they are on, and the type of heat network operator. Other influences may be the level of service consumers receive, and how the service is perceived by consumers.

The principal outputs from a logistic regression are the odds ratios, summarised in Annex Table 1. All of the predictor variables in the model were categorical variables and the odds ratio indicates the magnitude of the association of the predictor on the outcome variable when comparing one category to the reference category.

- An odds ratio below 1 indicates that consumers in the specified category were less likely to be satisfied than consumers in the reference category.
- An odds ratio greater than 1 indicates that consumers in the specified category were more likely to be satisfied than consumers in the reference category.

For example, Annex Table 1 shows that for fairness of cost, a consumer was 3.6 times more likely to say they were satisfied if they perceived the cost as ‘fair’ in comparison to respondents that perceived the costs are ‘not at all fair’. The table only shows the variables that had a significant influence on satisfaction with the heating system. Full results from the modelling are included in the technical report.

Annex Table 1: Results from the regression model: significant influences on overall satisfaction with heating system

Influencer variable	Odds ratio	Confidence interval	
		Lower limit	Upper limit
Satisfaction with level of control			
'Very Satisfied' vs. 'Not satisfied/Neither/no answer'	22.488***	11.078	45.650
'Fairly Satisfied' vs. 'Not satisfied/Neither/no answer'	9.523***	5.869	15.451
Perceives cost as Fair			
'Very fair' vs 'not at all fair/no answer'	2.436**	0.916	6.482
'Fair' vs 'not at all fair/no answer'	2.082***	1.252	3.462

'Not very fair' vs 'not at all fair/no answer'	1.481	0.878	2.497
Satisfaction with the amount of information received			
Did not receive vs. 'Neither'/'dissatisfied'/'very dissatisfied'/ no answer	2.743***	1.463	5.142
'Very satisfied'/'satisfied' vs. 'Neither'/'dissatisfied'/'very dissatisfied'/ no answer	3.160***	1.681	5.940
Not experienced under-heating vs. under-heating/no answer	2.534***	1.641	3.915
Not experienced overheating vs. over-heating/no answer	0.754	0.500	1.138
Satisfaction with handling of complaint			
'Very satisfied'/'satisfied' vs. Did not complain	1.606	0.772	3.343
'Neither'/'dissatisfied'/'very dissatisfied' vs. Did not complain	0.367***	0.212	0.637

Results significant at 95% are marked **, results significant at 99% are marked ***. Base: All heat network consumers (2,444).

As shown in Annex Table 1, four of the six predictor variables were strongly associated with overall satisfaction.

Satisfaction with the level of control

Annex Table 2 shows the results for a logistic regression model for satisfaction with the level of control. The model contains the same predictor and control variables as the overall satisfaction model (except for satisfaction with the level of control). The table only shows the variables that had a significant influence on satisfaction with the level of control. Full results from the modelling are included in the technical report.

Annex Table 2: Results from the regression model: significant influences on satisfaction with level of control

	Odds ratio	Confidence interval	
		Lower limit	Upper limit
Perceives cost as Fair			
'Very fair' vs 'not at all fair/no answer'	2.863***	1.518	5.400
'Fair' vs 'not at all fair/no answer'	2.452***	1.608	3.738
'Not very fair' vs 'not at all fair/no answer'	1.721**	1.114	2.660
Satisfaction with handling of complaint			
'Very satisfied'/'satisfied' vs. Did not complain	0.858	0.518	1.420
'Neither'/'dissatisfied'/'very dissatisfied' vs. Did not complain	0.309***	0.189	0.504

Results significant at 95% are marked **, results significant at 99% are marked ***. Base: All heat network consumers (2,444).

As Annex Table 2 shows, two of the predictor variables were significantly associated with satisfaction with the level of control of the heating system.

Perceived fairness of cost

Annex Table 3 shows the results for a logistic regression model for perceived fairness of cost. The model contains the same predictor and control variables as the overall satisfaction model (except for perceived fairness of cost). The table only shows the variables that had a significant influence on perceived fairness of cost. Full results from the modelling are included in the technical report.

Annex Table 3: Results from the regression model: significant influences on the perceived fairness of cost

	Odds ratio	Confidence interval	
		Lower limit	Upper limit
Satisfaction with the amount of information received			
Did not receive vs. 'Neither'/'dissatisfied'/'very dissatisfied'/ no answer	2.072***	1.273	3.373

'Very satisfied'/'satisfied' vs. 'Neither'/'dissatisfied'/'very dissatisfied'/ no answer	3.658***	2.328	5.748
Not experienced under-heating vs. no under-heating/no answer	1.607**	1.091	2.368
Satisfaction with handling of complaint			
'Very satisfied'/'satisfied' vs. Did not complain	0.665	0.382	1.155
'Neither'/'dissatisfied'/'very dissatisfied' vs. Did not complain	0.345***	0.190	0.626
Not experienced overheating vs. over-heating/no answer	1.340**	0.949	1.892

Results significant at 95% are marked **, results significant at 99% are marked ***. Base: All heat network consumers (2,444).

As shown in Annex Table 3, four of the predictor variables were strongly associated with whether a consumer perceived the cost of heating as very/fairly fair.

Qualitative sample frame

Annex Table 4: Qualitative sample frame – domestic consumers

Domestic consumers		Number achieved
Total		50
Region	Scotland	15
	England	35
Heat network type	Communal	23
	District	27
Satisfaction with heating and hot water system	Satisfied	34
	Dissatisfied	16
Vulnerable consumer	Vulnerable[36]	15

[36] Domestic consumers were classified as vulnerable if (a) they or anyone in their household had a long-term illness, physical or mental health problem, disability, injury or other impairment (b) they had any caring responsibilities for immediate family members (c) they or anyone in their household got extra support or assistance from their gas or heating supplier

	Not vulnerable	35
Tenure	Owns home	17
	Privately rents	14
	Socially rents	19
Heat network scheme type	Private	25
	Local authority	10
	Housing association	15
Metering	Whether meter for individual property	33
	Whether meter for entire building	17
Age of scheme	Installed within the last year	1
	Installed 1 to 5 years ago	11
	Installed more than 5 years ago	38
	Don’t know	0

Annex Table 5: Qualitative sample frame – operators

Operators		Number achieved
Total		18
Region	Scotland	7
	England	10
	Both	1
Heat network type	Communal	3
	District	14
	Both	1
	1 to 4	12

Numbers of heat networks responsible for	Between 5 and 9	4
	10 or more	2
Whether operator has had to change energy supplier	Yes	10
	No	7
Age of heat network	Already installed in property	2
	Installed in the last 5 years	10
	Installed 5 or more years ago	6

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