Electricity Distribution

Customer Perceptions on Unlocking Flexibility from Heat

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nationalgrid

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Name	Role
Alyssa Fournier, Gemma La Guardia	Author
Ryan Huxtable, Jacob Lynch	Reviewer
Yiango Mavrocostanti	Approver

Contact Details

Email:

ngedinnovation@nationalgrid.co.uk

Postal:

Innovation Team
National Grid
Pegasus Business Park
Herald Way
Castle Donington
Derbyshire DE74 2TU

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National Grid Electricity Distribution 2022

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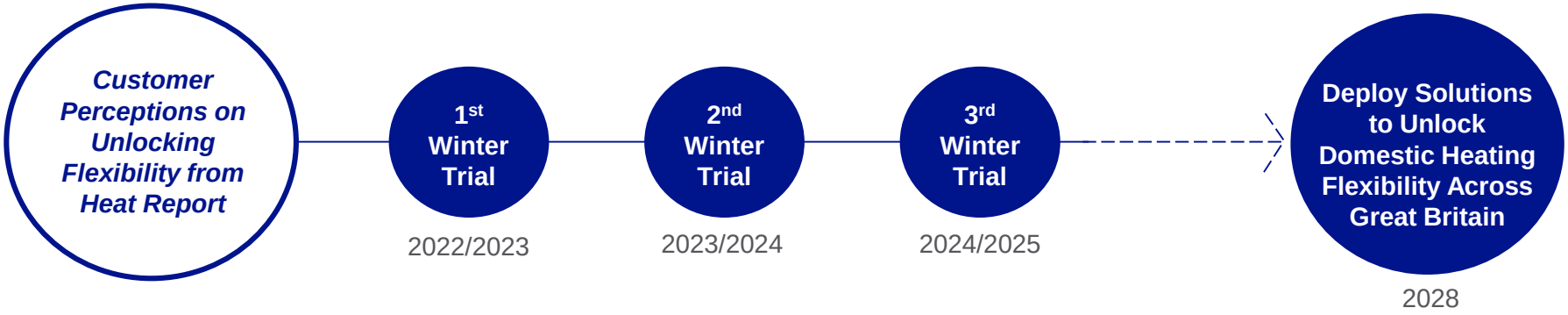
The Problem

The increase in heat pumps connected to the distribution network over the next five years will create the need for network reinforcement. There are currently no proven solutions for Distribution Network Operators (DNOs) to unlock flexibility needed to mitigate the scale of network reinforcement from residential electric heating.

The Project

EQUINOX is an innovation project that will test new **commercial and technical arrangements** to reward households with heat pumps for temporarily altering their heating choices without compromising on comfort. **EQUINOX will save consumers money by lowering energy bills and mitigating costly system upgrades**, while contributing to a more resilient and equitable low-carbon energy system.

This Report Informs the EQUINOX Trials and Provides Insight for the Broader Market



The Big Picture

Gas central heating is the primary source of domestic heating in the UK (close to 80%).

Due to rising energy prices, participants are taking interest in their heating systems, as they look to save money on bills.

But most participants feel uninformed about alternative heating solutions, and feel available resources are not easily accessible.

Heat pumps are not on the general public's radar in the way they need to be if the government is to hit its targets of installing 600,000 new heat pumps a year by 2028. Most participants were not planning on installing heat pumps or thermal storage systems in the foreseeable future, though smart thermostats and flexible tariffs were more popular. If more information is made available from trusted sources, the public may be more interested in them.

Conducting Market Research to Improve Understanding

Objectives of consumer centred research:

- To evaluate the general UK attitudes on low-carbon heating alternatives, especially heat pumps, and flexibility offerings.
- To decipher the key drivers, enablers and barriers to consumer adoption of heat pumps and flexibility offerings.
- To understand how to shape customer preference to improve adoption of heat pumps.
- To provide early learnings on attitudes toward the EQUINOX trial (communications, commercial arrangements, etc.).

Research Methodology:

- An online survey with over 2,000 participants plus 400 face-to-face surveys with digitally disconnected and individuals from hard-to-reach groups between August and September 2022. Participants were representative of the UK's demographics.
- 18 qualitative focus groups and 6 additional interviews to connect with digitally disconnected and individuals from hard-to-reach groups in October 2022.

Key Drivers and Enablers, Barriers and Perceptions

Drivers and Enablers

Flexibility: The cost-of-living crisis has caused participants to prioritise saving costs now rather than later. This is a significant barrier to installing heat pumps as the payback period for installation is longer term due to the high upfront cost. **People are more focused on actions that will yield short term financial gains, like flexibility offerings and insulation that will lower energy bills.**

Heat Pumps: It is evident that a "trigger" is needed to nudge people to install heat pumps. Triggers include the breakdown of a current heating system, moving house and renovating.

Barriers

Heat Pumps: Self exclusion, or the feeling from participants that heat pumps were not applicable to them, is the primary barrier in their adoption. This self-exclusion is for a variety of reasons, ranging from personal reasons to property flaws.

Heat Pumps: In both focus groups and the survey, other barriers like limited education on low-carbon alternatives, lack of trust in new technology, and installation and operational costs also acted as barriers.

Heat Pumps: Unknowns about frequency of maintenance and the look of heat pumps were raised as less important, but additional barriers to adoption.

Perceptions of Flexibility

There is no one-size-fits-all solution for flexibility. Customers prefer different control methods, payment systems and heating temperature ranges.

Participants find that notions of flexibility were complicated to understand and trials would be complicated to follow.

Potential bill savings is driving demand for flexibility, although customers are unsure whether financial remuneration is enough to make up for the effort. EQUINOX will test the value for money during the trials.

Key Lessons Learned from Surveys and Focus Groups

Heat Pump Adoption

- There needs to be a trigger to motivate people to change their heating systems.
- Availability of grants is helpful, but not currently enough for people to feel heat pumps are affordable.
- Utilities, energy suppliers, and the government can do more to provide reliable, trustworthy, easy to understand information on alternatives to natural gas heating.

Providing Flexibility

- There is demand for flexibility offerings driven by the potential for bill savings. This is especially true due to the cost-of-living crisis and rise in energy prices which are impacting customers. This makes it an opportune time to run flexibility trials.
- Heightened engagement with energy-related topics due to the cost-of-living crisis means that the time is ripe to recruit customers to flexibility trials. Consumers need to be convinced flexibility offerings are worth-it.
- In order to maximise engagement, flexibility offerings need to be designed with simplicity and comprehensibility in mind.
- Customer choice must be prioritised. Optionality is key to making sure everyone can access the benefits of flexibility.

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Project Overview

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EQUINOX Overview

What is EQUINOX? EQUINOX is an innovation project that will test new commercial and technical arrangements to reward households with heat pumps for temporarily altering their heating choices without compromising on comfort. EQUINOX will save consumers money by lowering energy bills and mitigating costly system upgrades, while contributing to a more resilient and equitable low-carbon energy system.

Who is it funded by? EQUINOX is supported by the energy regulator Ofgem and funded through the regulator's Network Innovation Competition (NIC).

Who is it led by? EQUINOX is sponsored by National Grid Electricity Distribution (NGED), formerly Western Power Distribution, who are the Distribution Network Operator for the East and West Midlands, the South West and South Wales. They distribute the electricity that comes from the transmission system to the local businesses and homes in their areas.

Who else is involved? The project is undertaken in partnership with Octopus Energy, Passiv UK, Sero, SP Energy Networks, Welsh Government, West Midlands Combined Authority, National Energy Action, Scottish Power Energy Retail, and Guidehouse.

Key Facts:

- Equinox will run from 2022 to 2025, with the project's first trial taking place between December 2022 and March 2023.
- Over 1,000 households that have heat pumps within NGED's distribution region (Southwest England, the Midlands and South Wales) will take part over the course of 4 years, with over 350 already signed up for the first trial in winter 2022-2023.
- EQUINOX trials will include households from all sectors of society, ensuring that when designing commercial and technical arrangements, they are done equitably, and vulnerabilities are taken into consideration.

The Problem that EQUINOX Aims to Resolve

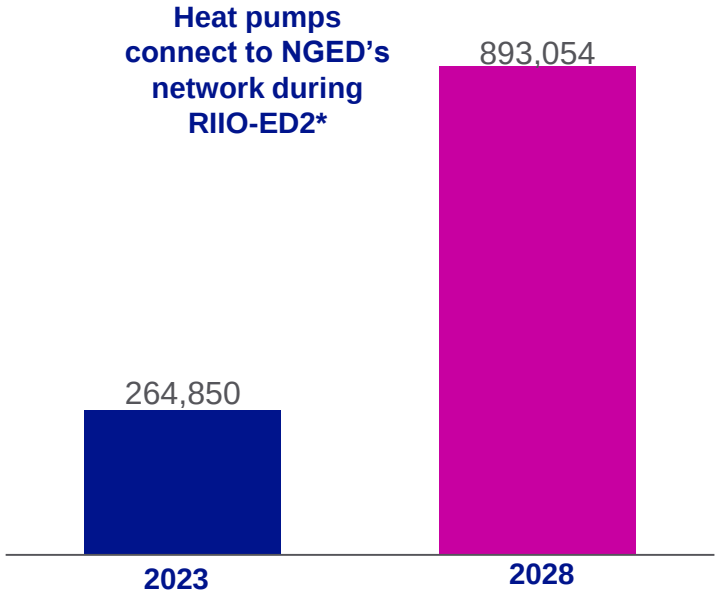
The increase in heat pumps connected to the distribution network over the next five years will create the need for network reinforcement. There are currently no proven solutions for Distribution Network Operators (DNOs) to unlock the flexibility needed to mitigate the scale of network reinforcement from residential electric heating.

NGED is **expecting over 600,000 heat pumps to connect** to its distribution network between 2023 - 2028, creating **a significant increase in demand.**

The detailed nature of this heating load and the flexibility of the load is not proven in trials.

No proven solutions that enable DNOs to **unlock flexibility from residential electric heat** at scale in a reliable and cost-effective way.

Ensuring that all customers, including the **2.4 million households in fuel poverty,** can access and benefit from smart solutions is vital.



New solutions are required to unlock the flexibility from low carbon heat at scale in an equitable way

**RIIO-ED2 is a price control that sets the output that UK DNOs need to deliver, and the revenues it is allowed to generate off this basis between 1st April 2023 to 31st March 2028.*

Flexibility Minimises the Need for Network Reinforcement

Findings: To date unlocking flexibility from residential heating has been an under-researched sector, with potentially important learnings for the power sector as electricity usage increases of the next decades.

What is Flexibility?

Flexibility in the electricity industry is the ability to adjust the consumption or generation of electricity.

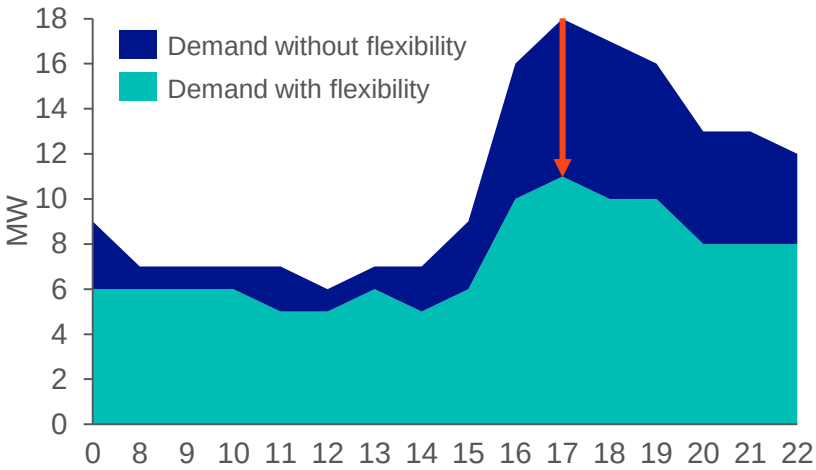
Flexibility can be used to:

- Reduce network peak demand, thus enabling DNOs to defer network upgrades (cables/wires/substations etc).
- Balance supply (generation) & demand (consumption), resulting in lower costs to maintain system balance.
- Align consumption of power with the availability of low carbon generation, thus supporting the clean energy transition.

What are EQUINOX's research aims?

- To understand whether and to what extent domestic heat pumps can contribute to network flexibility.
- To understand how heat pump flexibility incentives can help decarbonise residential heating.

Illustration: The role flexibility can play in minimising demand



By minimising the amount of electricity used, flexibility helps to minimize the need for costly system upgrades.

What EQUINOX is Testing

How the Trial Works

Participants will be asked to turn off and turn down their heat pumps during “EQUINOX events”. EQUINOX events occur from 5-7pm to reduce network constraints during peak times. In the first trial, they will occur on average 2-3 times a week during the trial period, though this may change in subsequent trials. In its first winter, EQUINOX will test two different commercial arrangements and two different heat pump control methods.

Commercial Arrangements

1. **Payment M1: ‘Save in Advance’**: Participants will be paid **fixed monthly instalments in advance** of EQUINOX events.
2. **Payment M2: ‘Save as You Go’**: Participants will be paid **per EQUINOX event—after it has occurred and** considering level of participation.

Heat Pump Control Methods

1. **Direct Load Control (DLC)**: Customers will allow their supplier to control their heat pump **remotely** during EQUINOX events. Customer can choose to opt out before or during an event.
2. **Behavioural Demand Response (BDR)**: Customers will be asked to **manually turn** off their heat pump during EQUINOX events.

Purpose of This Report

As Outlined in Project Full Submission Application

- Project Deliverable 1 presents insights from customer surveys and customer focus groups on the barriers and enablers for unlocking flexibility from heat.
- This report shares findings from primary market research conducted to understand customer perceptions to electric heating and providing domestic flexibility.

For the EQUINOX Trial

- The learnings from this UK-wide research study were taken and applied in the design of the first EQUINOX trial in winter 2022-2023.

For Other Energy Market Participants

- The purpose of this document is to share learnings with other players within the heat pump, energy efficiency and electricity industries.

Limitations

- This work was undertaken to research barriers and enablers to unlocking flexibility from heat. However, as per the results of the research, limited education on low-carbon and currently low-levels of electric domestic heating amongst the general population presented challenges.
- Additionally, this research was conducted during the cost-of-living crisis and amongst the political and economic uncertainly of this autumn.

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Research Overview

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Purpose of Research

EQUINOX aims to put customers at the centre of the trial. To support this aim, customer research was conducted to obtain insights to inform trial design and recruitment. The research included both quantitative and qualitative approaches in order to obtain both a depth and breadth of insights. In both approaches, reaching customers with vulnerabilities was a key focus.

The Objectives of the Customer Research:

- To evaluate the general UK attitudes on low-carbon heating alternatives, especially heat pumps, and flexibility offerings.
- To decipher the key drivers, enablers and barriers to consumer adoption of heat pumps and flexibility offerings.
- To understand how to shape customer preferences to improve adoption of heat pumps.
- To provide early learnings on attitudes toward the EQUINOX trial (communications, commercial arrangements, etc.).

The Research Methodology:

- A quantitative survey with over 2,400 participants.
- 18 qualitative focus groups and 6 interviews.

Methodology: Quantitative Research

The quantitative methodology centred on a large survey with participants representative of the UK public.

Quantitative

Format:

- Online and face-to-face survey.

Participants:

- **2,423** participants for the online survey.
- **400 face-to-face surveys** with digitally disconnected and individuals from hard-to-reach groups (e.g., Black, Asian and minority ethnic (BAME), financially vulnerable, English as second language).
- Participants are **representative of latest UK census** across age, gender, and region, as well as other factors such as homeowner vs tenant status, financially vulnerable, and age of property.

Types of Questions:

- **Demographic characteristics** – Questions to obtain a better understanding of participants (e.g., location, ethnicity, occupation, household composition).
- **Attitudes** – Questions to understand participants' prior knowledge and perceptions of the topics (environment, alternative home heating, heat pumps etc.)
- **Likelihood of implementation** – Questions on likelihood of adoption of heat pumps, flexible tariffs, and thermal storage systems.
- **Interest in Trial Participation** – Questions to provide insight for trial design, including willingness to allow third-party control of heating system, openness to altering home temperature, etc.

For more details on the methodology, see the full method statement linked in Further Research.

Methodology: Qualitative Research

Based on the results of the quantitative survey, the qualitative research was designed to delve deeper into areas of interest illuminated.

Qualitative

Format:

- Online (Zoom) group focus groups and one-on-one phone interviews.

Participants:

- **91 participants** using 18 online focus groups.
- **6 one-on-one phone interviews.**
- Focus groups segmented into by life. stage, homeowners/tenants, and property age.
- All participants had gas central heating and properties built from 1900 – 2000.
- One-on-one interviews used to connect with digitally disconnected and individuals from hard-to-reach groups (e.g., BAME, financially vulnerable, English as second language).

Types of Questions:

- **Current home heating set-up** – Describe current heating system, outline positives and negatives.
- **Knowledge of alternative heating methods** – Discuss information on low carbon heating available and ease of finding trusted, reliable, sources.
- **Perceptions of heat pumps and thermal storage** – Offer explanation of new systems and discuss and measure initial impressions and opinions.
- **Barriers and enablers** – Discuss what is holding consumers back from switching to another heating source and what events could prompt change.
- **EQUINOX trial**– Discuss upcoming trial and present initial communications and commercial arrangements to garner feedback on appeal and deterrents.

For more details on the methodology, see the full method statement linked in Further Research.

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Research Findings

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4.1

The Big Picture of Heating

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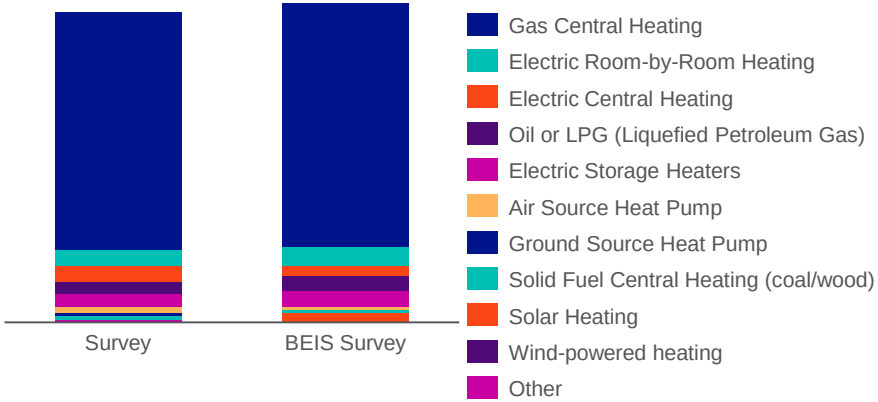
Gas is the Most Common Heating Source in the UK

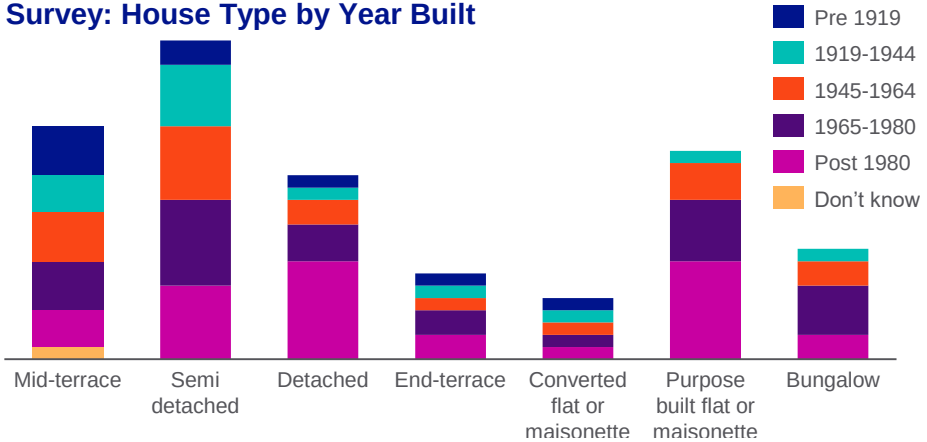
Findings: Three quarters of people use gas boilers to heat their homes, which broadly corresponds to the UK Government's Department for Business Energy and Industrial Strategy (BEIS) equivalent survey in winter 2021.

Survey vs BEIS Survey: Heating Type



Only 3% of people in the UK use heat pumps.

Survey: House Type by Year Built



30% of people live in houses built after 1980, mainly in semi-detached or mid-terrace houses. 10% of people live in period homes (pre-1919). Most live in houses constructed between 1980 and 1919 (55%).

Implications: The overwhelming primacy of natural gas to heat homes, as shown in both EQUINOX's and BEIS' surveys, coupled with the relatively old housing stock, reinforces the need to study how the UK can decarbonise residential heating.

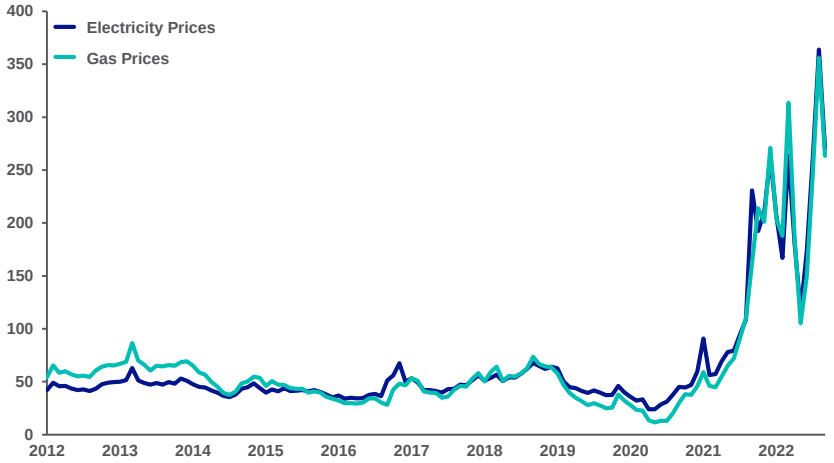
High Prices are Causing People to Rethink Gas

Findings: Participants are rationally attached to gas for heating because it is efficient and has traditionally been inexpensive. Recent rises in energy bills have pushed households to explore options to save on energy bills.

Focus Groups Findings:

- Gas heating has been a preferred heating method as it has traditionally been cheaper than electricity.
- Combi boilers are popular because they provide immediate hot water, are easy to use, and fast to repair.
- People build trusted relationships with gas engineers.
- People have been told that gas is a more efficient, clean energy source than other options (e.g., oil).
- Participants do not think about their heating systems unless there is an issue and changing heating systems or repairing boilers is seen as a hassle.
- However, due to rising energy prices, participants are taking interest in their heating systems, as they look to save money on bills.

Gas and Electricity Day Ahead Baseload Contracts, Monthly Average (GB), 2012-2022



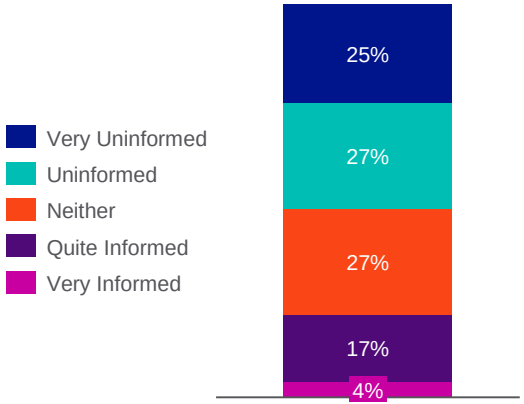
Source: OFGEM

Gas and electricity prices have been historically low, but since 2021 have been rapidly increasing.

Most Participants Knew Little About Alternative Heating

Findings: Most participants feel uninformed about alternative heating solutions, and feel available resources are not easily accessible.

Survey Question: How informed do you feel about heat pumps and thermal storage systems for household heating?



Over 50% of participants felt either uninformed or very uninformed about heat pumps and thermal storage systems and less than 25% felt informed about these topics.

Focus Groups Quotes:

I have very little knowledge of non-gas home heating systems. I know of alternative energy types […] and traditional electricity but not enough about the alternatives to know if they are used for home heating systems. So quite uninformed I would say.

Being completely honest I feel completely uninformed about alternative (non gas) home heating systems. It isn't something I have really had to give any thought to before.

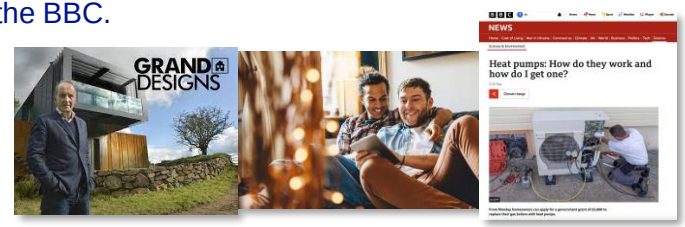
I would say I'm quite uninformed about alternative forms of heating. The only ones I can think of are solar panels and heat source pumps which I know little about.

People Don’t Know Where to Look for Information

Findings: When asked to research alternatives ahead of the focus group and share their findings, participants found that available information online was confusing and misleading

Focus Group Findings:

- Participants felt they can talk to their gas installers and receive trusted information about gas heating. They noted there is no Gas Safety Register certified installer or industry equivalent for low-carbon heating.
- Participants found that there was a lack of reliable sources of information on the internet about heat pumps and researching sent them down rabbit holes which they felt even more confused by. Other sources of information included TV shows such as Grand Designs, and articles on the BBC.



Focus Groups Quotes: Awareness about heat pumps

A lack of reliable facts leaves space for misunderstandings and misconstrued facts about heat pumps, for example:

You need something different for hot water

Cost is so expensive to install but cheaper to run

You have to be in detached/semi/end of terrace

You would need to rip out your (new) radiators/underfloor heating

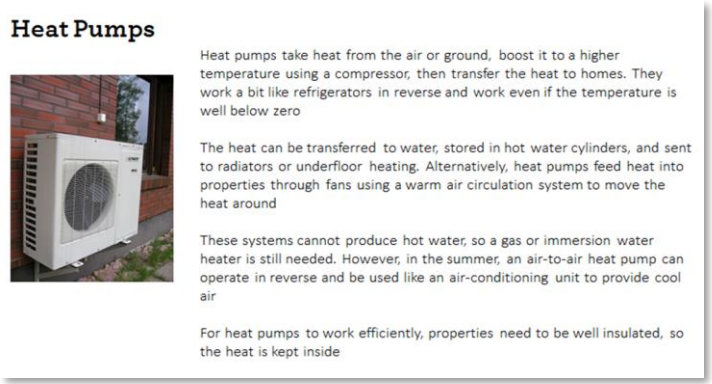
Implications: The lack of media coverage and reliable sources on alternative sources of heating leaves consumers confused. There is therefore a gap to be filled in terms of knowledge sharing between industry and the government, and the wider population of the UK.

People are Interested in Heat Pumps

Findings: Despite a low-level of initial reported awareness on heat pumps, participants were curious about heat pumps when given information about them.

Survey and Focus Group Design:

Survey and focus group participants were provided with foundational information about heat pumps, including how they work and costs to install and run.



Heat Pumps

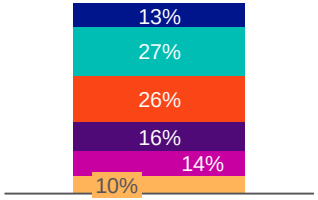
Heat pumps take heat from the air or ground, boost it to a higher temperature using a compressor, then transfer the heat to homes. They work a bit like refrigerators in reverse and work even if the temperature is well below zero

The heat can be transferred to water, stored in hot water cylinders, and sent to radiators or underfloor heating. Alternatively, heat pumps feed heat into properties through fans using a warm air circulation system to move the heat around

These systems cannot produce hot water, so a gas or immersion water heater is still needed. However, in the summer, an air-to-air heat pump can operate in reverse and be used like an air-conditioning unit to provide cool air

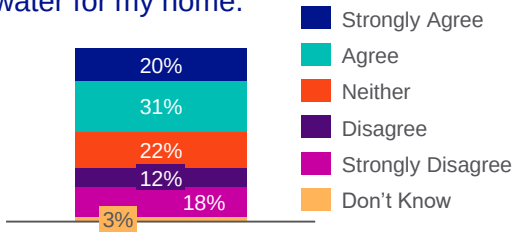
For heat pumps to work efficiently, properties need to be well insulated, so the heat is kept inside

Survey Question: Heat pumps are appealing and of interest to me.



40% of participants said that heat pumps were appealing and of interest.

Survey Question: I would like to learn more about heat pumps as a means for providing heating and hot water for my home.



51% said they would be interested in learning more about heat pumps.

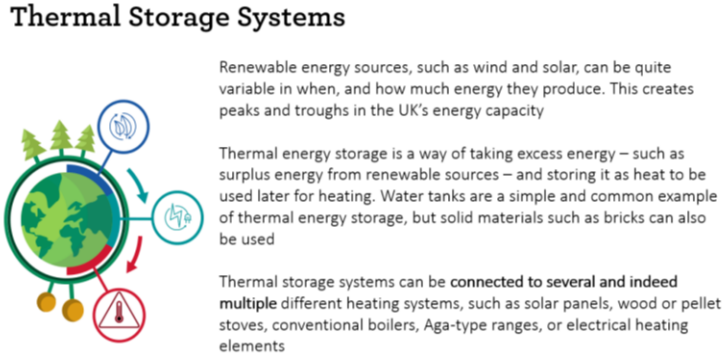
Implications: Heat pumps are not on the general public's radar in the way they need to be if the government is to hit its targets of installing 600,000 new heat pumps a year by 2028. If more information is made available from trusted sources, the public may be more interested in them.

People are Also Interested in Thermal Storage

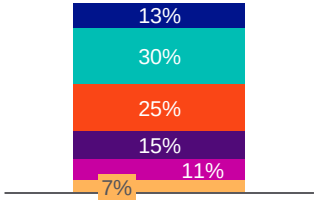
Findings: The trends seen in the heat pump questions were broadly echoed with thermal storage. Although while many were interested in the technology, less thought thermal storage systems were suitable for their households.

Survey and Focus Group Design:

Survey and focus group participants were provided with foundational information about heat pumps, including how they work and costs to install and run.

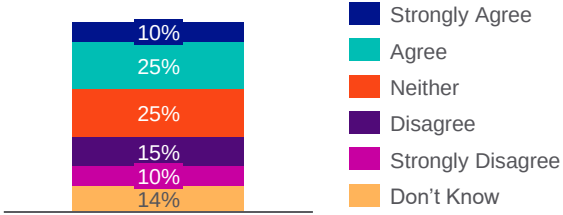


Survey Question: Thermal storage systems are appealing and of interest to me.



43% of participants said that thermal storage was appealing and of interest.

Survey Question: Suitable for my household.



35% said they thought thermal storage was suitable for their household.

Implications: Thermal storage units were marginally more interesting (by 3%) to participants than heat pumps, but otherwise broadly echoed the findings of heat pumps – were there to be higher levels of education about thermal storage, there may be a bigger market for it them. More can be done to explain thermal storage and its benefits to customers.

Smart Thermostats Were Most Appealing

Findings: 1 in 5 (21%) of participants reported they already had a smart thermostat in their home and more people thought that smart thermostats would be suitable for their household than any other technologies (i.e., heat pumps and thermal storage systems) explored by the survey.

Survey and Focus Group Design:

Survey and focus group participants were provided with foundational information about heat pumps, including how they work and costs to install and run.

Smart Thermostats

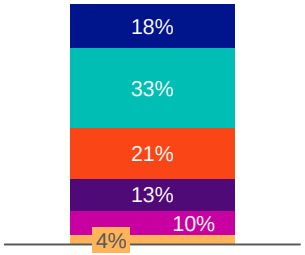
Smart thermostats are connected to the household Wi-Fi

They are like programmable thermostats, where timings can be set for the heating to be on using a schedule. However, because they are Wi-Fi connected, heating settings can be set remotely using other devices such as a laptop or smart phone

They can also be connected to other in-house automated systems such as smart speakers

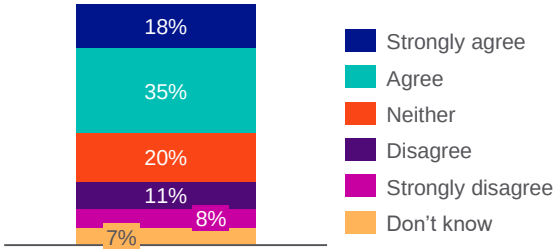
Smart thermostats can also record internal and external temperatures

Survey Question: Smart thermostats are appealing and of interest to me.



51% of participants said smart thermostats were appealing and of interest.

Survey Question: Suitable for my household.



53% of participants said smart thermostats were suitable for their household.

Implications: There is a substantial, but not complete, overlap between people who agreed the technology is appealing and suitable and those who are likely to install it in the next 5 years. 51% of people who agreed smart thermostats are appealing, and 53% of people who agreed they are suitable for their home said they are likely to install one.

4.2

Factors that Influence Attitudes

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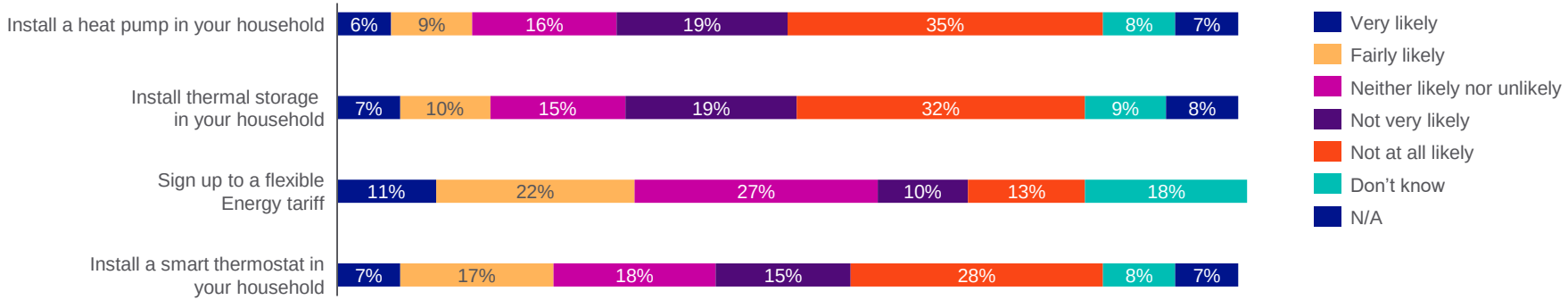
Likelihood of Alternative Heating Adoption

Findings: Most participants were not planning on installing heat pumps or thermal storage systems in the foreseeable future, though smart thermostats and flexible tariffs were more popular.

Survey Question: How likely are you to…



54% of participants said they were not likely to install a heat pump in the next 5 years. Only 16% said that they were likely to.

33% of participants stated they would be likely to sign up to a flexible tariff, while 24% said that they would be likely to install a smart thermostat.

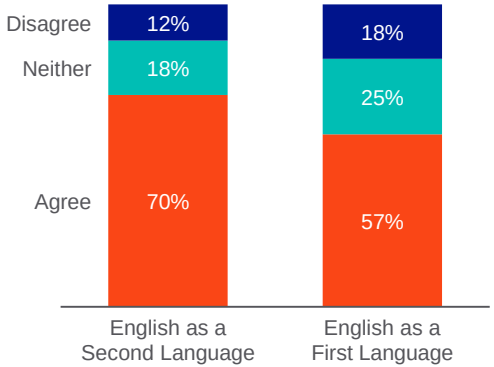
Implications: Smart thermostats and flexible tariffs are the most popular choice with participants, indicating that participants are currently engaging more with ideas of flexibility and saving money on bills as opposed to undertaking major heating system changes.

Perceptions from Hard-to-Reach Groups

Findings: Characteristics such as ethnicity, digital exclusion, and financial vulnerability could influence perceptions, although not necessarily.

English as a Second Language

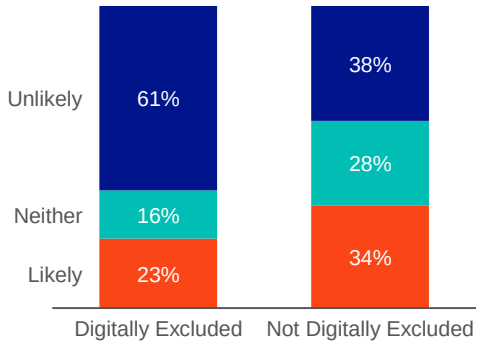
Survey Question: I am interested in learning about different heating systems.



70% of non-native English speakers were willing to learn more about different heating technologies as opposed to 57% of native English speakers.

Digital Exclusion

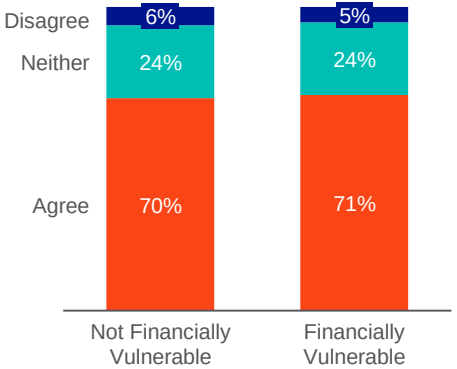
Survey Question: I would pay more for electricity produced by green technologies.



Digitally excluded participants were more unlikely (61%) than non-digitally excluded participants to pay more for green electricity (38%).

Financial Vulnerability

Survey Question: Heat Pumps are too expensive to buy.



There was no statistically significant difference between customers experiencing financial vulnerability and those who are not when it came to perceptions regarding costs of heat pumps.

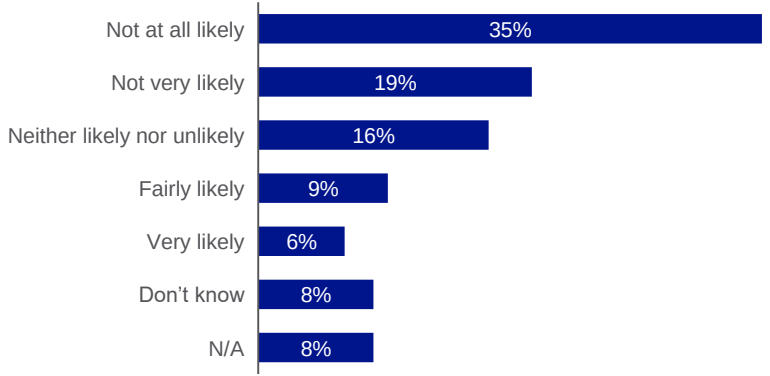
Data Segmenting Provides Potential Customer Insights

The participants were segmented into three groups based on their attitudes towards adopting a heat pump using the question “How likely are you to install a heat pump in your household within the next 5 years?”

Personas: The three personas represent what a type of customer might look like, although they do not present an absolute portrait.

1. **Likely Adopters:** Either agreed or strongly agreed that they would be likely to install a heat pump in the next five years.
2. **Ambivalent:** Neither agreed nor disagreed that they would be likely to install a heat pump in the next five years.
3. **Avoiders:** Disagreed or strongly disagreed that they would be likely to install a heat pump in the next five years.

Survey Question: In the next five years, how likely are you to install a heat pump?



Implications: Population segmentation can help to identify key groups that could be willing to install heat pumps, and design enabling mechanisms that help uptake.

The Likely Adopters Persona

Findings: Likely adopters of heat pumps and thermal storage systems are very similar. Compared with the overall sample, they are more likely to be younger, high-income families with children and environmentally conscious. Despite high engagement with environmental issues, most were not solely motivated to reduce energy consumption purely on this basis. Most are also motivated by both financial concerns.

Likely Adopters

Age: Under 44

Gender: Male

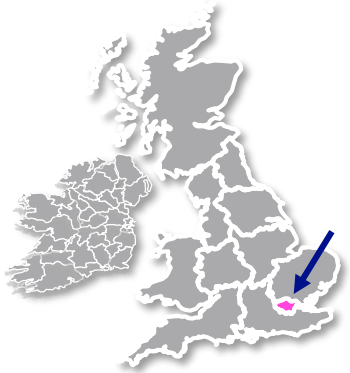
Other Characteristics:

- Digitally Connected.
- Has children.
- Owns their own home, built post 1989.
- Plans on moving in the next 10 years.

Environmental Attitudes:

- Informed about heat pumps and smart thermostats.
- Energy conservers.
- Worry about climate change.

Region: London



Income: + £50k

Social Grade: AB

Case Study from Focus Groups: **John, aged 42**

John is a management consultant and lives in Greater London with his wife and their two young sons, while expecting a third. They currently live in detached home built in 2004, which they own with the help of a mortgage. With a growing family, they will likely upsize in the next 5 years. He is plugged into current affairs and feels informed about environmental issues. He wants to leave a positive environmental legacy for the next.

John knows about heat pumps as a low-carbon heating solution because colleagues and neighbours have already had them installed. He feels their home is suitable for a heat pump, as it is relatively modern and well-insulated, but is mindful of the installation costs given a future home move is on the cards. The decision will depend in great part on whether spending on this ‘upgrade’ now will be reflected in the value of their home went they come to put it on the market.

The Ambivalent Persona

Findings: Consumers who were neutral about adopting heat pumps were more likely to be younger (under 29) and from a rural area. There was no noticeable skew toward gender, regions or income. While they were less likely to be informed about heat pumps, some showed a neutral or positive attitude toward environmental issues.

Ambivalents

Age: 18-29

Gender: Even split

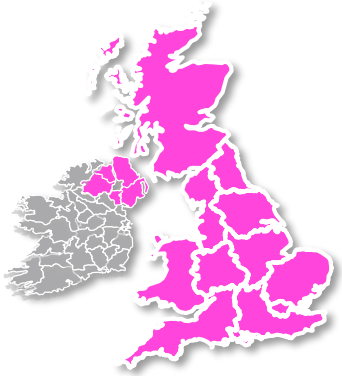
Other Characteristics:

- Digitally connected.
- Mixed households.
- Live in terraced/semi-detached properties.
- Live in rural areas.

Environmental Attitudes:

- Not informed about heat pumps.
- Neutral or worry about climate change.
- Neutral or likely to sign up to a flexible tariff and thermal storage.

Region: Mixed



Income: Even split

Social Grade: C2

Case Study from Focus Groups: **Neha, aged 27**

Neha lives in a village in Somerset with her boyfriend and works as a social media manager. They bought a 2-bed mid-century terrace a year ago with a gas combi boiler. It is similar to the system Neha had when living with her parents. She thinks she knows about climate change, but she doesn't think about it excessively. She and her boyfriend try to save energy where they can, but mostly to help contain household costs.

Gas boilers are all Neha knows and she doesn't feel informed about low-carbon alternatives. Heat pumps seem like a 'like a 'pretty new thing' and she would want to know more about them before deciding if they are a suitable heating solution for them. While she understands the environmental benefits of moving away from gas heating, she's unlikely to install a heat pump due to the cost and because it's not their "forever home". She also doesn't think they're suitable for their type of property.

The Avoiders Persona

Findings: The Avoiders group were more likely to be slightly older (over 45) and earn less than £30k/year. They tended to live in older houses as owner-occupiers and in adult-only households, with no plans to move. They were much less informed about heat pumps and smart thermostats. These participants were also likely not to worry about climate change or conserving their energy.

Avoiders

Age: Over 45

Gender: Even split

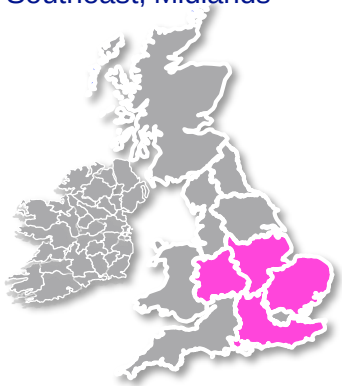
Other Characteristics:

- Digitally disengaged.
- Adult only households.
- Own their own home, built pre-1919.
- No plans to move.

Environmental Attitudes:

- Not informed about heat pumps.
- Not informed about smart thermostats.
- Not energy conservers.
- Not worried about climate change.

Region: East Anglia, Southeast, Midlands



Income: < £30k

Social Grade: C1 or DE

Case Study from Focus Groups: Beverley, aged 72

Beverley is a retired local authority officer, who lives alone in Dudley, West Midlands after losing her husband. She still lives in the 1890s semi where she raised her family. She doesn't think she'll move home again. She's financially comfortable thanks to her and her late husband's pensions but lives within her means. She doesn't really use the internet, and only recently got a mobile phone, which she uses for calls and the occasional text message. She keeps up to date with the news and feels that there is often too much about climate change and our 'carbon footprint' on TV.

Her late husband looked after bills and home maintenance, so Beverley admits she knows little about her heating and hot water system or the alternatives.

Factors that Influence Attitudes

Findings: When explored in focus groups, we found that there were other factors at play which impacted attitudes toward flexibility, heat pumps and thermal storage systems.

Homeowner vs Tenant Status

Homeowners were more likely to consider heat pumps as they have more influence over the decisions made about their homes. Tenants engaged with the idea of a heat pump, but ultimately felt they did not have control over the decision of their landlord. Tenants engaged more with flexibility as it allowed them to save on bills.

Life Stages

Prior to having a family, participants were keener to explore new heating technologies but were more aware of financial constraints than other groups. Families tended to prioritise children's heating needs, while empty nesters and retirees were concerned about whether they would live long enough to reap the benefits of installing a new heating system.

Attitudes Towards the Environment

By and large, participants are worried about the effects of climate change, but this worry does not translate into a willingness to invest or pay more for green heating systems or energy solely based off climate sentiment.

Age and Type of Property

Older homes posed significant barriers, as residents worried about the costs of first insulating homes. Flat residents' lack of space was also a major factor that impacted attitudes towards heat pump adoption.

Homeowner versus Tenant Status

Findings: Homeownership status affected the likelihood to adopt heat pumps. Homeowners felt more agency than tenants over decisions to install heat pumps. Tenants feel restricted in choice of heating technology but do engage with idea of flexibility.

Homeowners

- In focus groups, homeowners were far more responsive to heat pumps than tenants.
- This is because homeowners have greater control over decisions about their homes. Additionally, as they own their property, they felt they could earn return on the investment through making their homes more profitable at sale or through recouping higher up-front costs throughout the lifetime of the heat pump.

"How much is it going to cost me upfront, and how much am I going to save on what I'm paying now? If there are savings to be made in the longer term, I'd consider it."

Tenants

- Tenants felt they did not have the power to install heat pumps. They feel it is the responsibility of the housing associations or private landlords that they rent from.
- Tenants were engaged with the idea of a heat pump, but they would not invest in one, nor would they likely be allowed to by their landlord.
- Tenants were more interested in home insulation, especially those living in houses owned by Housing Associations. Many felt insulation was more pressing than a new heating system.

"If the boiler broke down then I'd tell the landlord and they would decide."

"I would be very interested but it would be up to my landlord."

Implications: Homeowners (and not tenants) are the most likely to install heat pumps. Tenants are less likely to be able to provide or benefit from it for decarbonized heat projects (like EQUINOX) if they are less able to obtain heat pumps. However, both groups are open to flexibility offerings, especially if they result in cost-savings with little inconvenience.

Life Stages: Pre-Family

Findings: People tended to be more enthusiastic about heating technology in the earlier years but were often constrained financially.

Pre-family

- Prior to having children, participants expressed a ‘starting out’ and **optimistic mentality**. They were also **keen to ‘future-proof’** their homes, despite not knowing whether they would stay in the property long term.
- They tend to be **digitally engaged** and use **apps and smart appliances.** Are on the lookout for new innovations (e.g., infrared heating, smart timers, low carbon heating) to optimise their homes.
- **But, are conscious of prioritising costs,** as many are not yet financially secure.

Focus Groups Findings:

"Again, similarly the cost; how much is it going to cost me upfront? How much am I going to save on what I’m already paying now? And then also, how difficult is it [to install]?"

Case Study from Focus Groups:
Neha, aged 27

Neha is part of the “Ambivalent” persona described on page 27.

While she understands the environmental benefits of moving away from gas heating, she’s unlikely to install a heat pump in their existing home; primarily due to cost and because it’s not their “forever home”.

She also doesn’t think they’re suitable for their type of property.

Implications: Pre-family groups households could be a key target for heat pumps, especially if they can benefit from programs such as installation grants or recruitment to flexibility trials.

Life Stages: Families

Findings: Parents put the comfort of their children first, and worried about their climate legacy.

Families

- Once people have children, heating behaviour shifts to the comfort and needs of their children, especially in the early years.
- Participants in this phase expressed **guilt about turning down heating** because they wanted to **prioritise children's comfort,** especially those with babies and small children.
- Simultaneously, they faced the conundrum of wanting to play their part in creating a better future for their children and are concerned about the economic and environmental legacy for their children.

Focus Groups Findings:

"Yes, I am fully for it [low carbon heating, electric]. It being cheaper than gas would be an absolute positive. I really like all of this kind of stuff anyway. I'm one of those weirdos that use crystals as deodorant. I really care about this kind of stuff but even if it was more expensive to begin with, I'd be like, 'yeah I don't care'."

Case Study from Focus Groups: **John, aged 42**

John is part of the "Likely Adopters" persona described on page 26.

John is keen that he and the rest of his generation leave a positive environmental legacy for the next.

However, despite being part of the "Likely Adopters" group, John is also conscious that undertaking this type of work might be quite disruptive given their young family.

Implications: Families are the most responsive to heat pumps because of their twin needs of providing comfort and a more climate resilient future for their children.

Life Stages: Empty Nesters/Retirees

Findings: The group least responsive to heat pumps were retirees/empty nesters, though the younger of the cohort were more willing to undertake renovations to install a heat pump.

Empty nesters/retirees

- Those of retirement age or with an "empty nest" have a **hardier attitude towards house temperatures** as some said they grew up with no central heating and frost on the windows.
- The **younger segment** of this group were **receptive to upgrading or renovating their heating** systems, while the older ones were less likely to feel it was worthwhile as they worried about living long enough to benefit.
- This group also hosted a **cohort of climate deniers**, meaning that they were also less likely to be interested in heat pumps.

Focus Groups Findings:

"Someone who's like my children who are in their mid-30s, they would think, 'well it's worth investing because it's going to come in in a few years and it's got to improve', whereas our age group, not being morbid, but we might have 1) not the money and 2) not the reasons to think it would be important to us. I'm not saying that we shouldn't do it, but I think you'll have a different mindset from different age groups"

"Oh god, I take the view that I'm 70 – I'm not going to be replacing another boiler!"

Focus Group Case Study: Beverley, aged 72

Beverley is part of the "Avoiders" persona described on page 28.

Beverley feels that heat pumps are expensive to both install and run, even before recent energy price rises.

She doesn't like the look of them and was unsure where one might be installed at her home.

She also worries that changing to a very different system would be a challenge to get to grips with at her age.

Implications: This group is the least responsive to heat pumps and low carbon heating, meaning they are not a key demographic

Attitudes Towards the Environment

Findings: Despite widespread acceptance of the climate crisis, only a small percentage of participants reported high levels of knowledge with government and industry initiatives to curb greenhouse gas emissions.

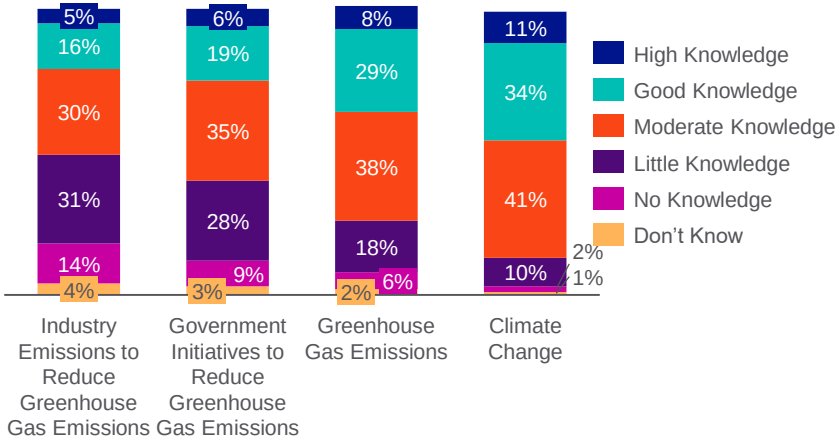
Surveys: Attitudes towards the climate

- In the surveys and the focus groups, participants broadly cared and worried about climate change. In the surveys, 45% of participants claimed to have high knowledge about climate change. Highly engaged participants tended to be younger and those with children.
- There was also a significant cohort of people that were less engaged with the climate debate, with reasons ranging from confusion about all the information available, to denial of climate change.

Survey Question: To what extent were you aware of the UK`s net zero target?

- 67% of participants have little to no knowledge about the UK's Net Zero target.

Survey Question: How would you rate your knowledge on the following topics?



- 45% of participants have good to high knowledge of climate change.
- 45% and 37% had little to no knowledge about industry and government initiatives to curb emissions, respectively.

Attitudes Towards the Environment

Findings: Despite widespread acceptance of the climate crisis, only a small percentage of participants are highly engaged with government and industry initiatives to curb greenhouse gas emissions.

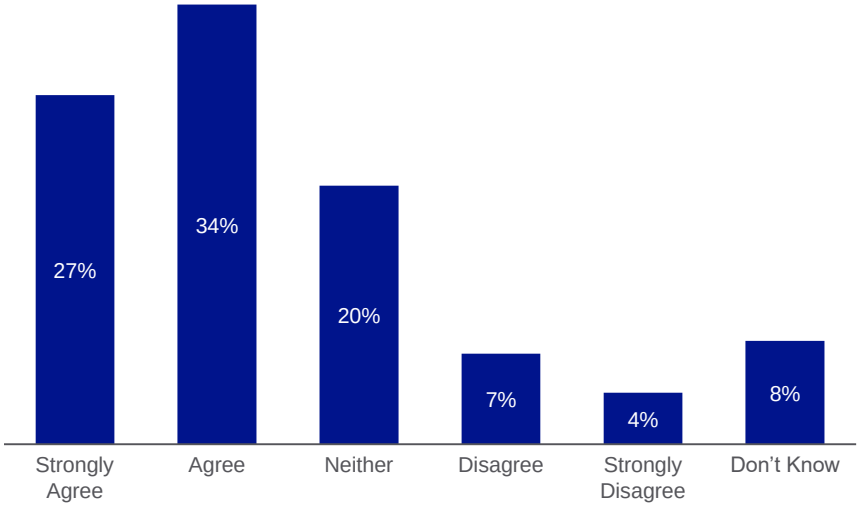
Focus Group Findings: Perspectives on climate change in politics and the media

- Regardless of their position on the engagement spectrum, all participants sensed a shift in media and political discussions around climate change and an increased sense of urgency.
- Despite this, when participants were probed about their knowledge about certain subjects, they knew the least about government and industry initiatives to curb drivers of climate change.

"I'm not too sure about government initiatives, but I'm not sure it matters that much. Unfortunately, I do not trust the government to honour their pledges."

"I don't know enough to comment on it. I think it's more big industry like flying and gas emissions from cars that have an impact."

Survey Question: To what extent do you agree or disagree with the UK`s net zero target?



61% of participants agree with the UK's Net Zero target, while only 11% disagree.

Attitudes Towards the Environment

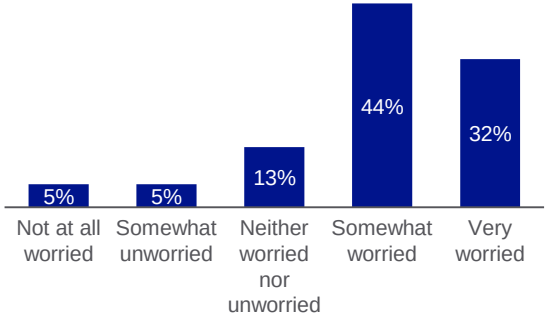
Findings: Despite widespread concerns about climate change, this alone is not enough to motivate participants to install heat pumps.

Focus Group Findings:

- In the focus groups, high engagement with climate topics did not translate into a willingness to invest in a heat pump.
- The environmental story needed to be coupled with economic incentives and value for money in order to be effective.

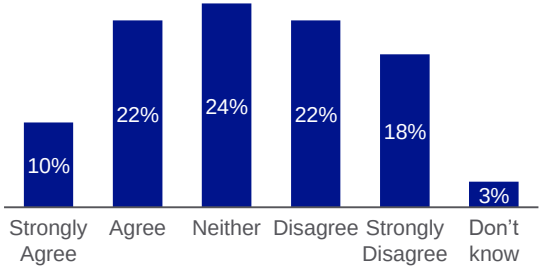
"I don't really have a lump sum that I could invest in something like this [heat pump] right now. If I thought I could get a renewable heat incentive and help the environment, then yes."

Survey Question: How worried or unworried are you about the impact of climate change?



76% of people are worried about climate change.

Survey Question: How much would you agree with the following statement: "I would pay more for electricity produced from green technologies



More participants (36%), would not pay more for green energy than those who would (32%).

The surveys largely corroborated the fact that while people were worried about the environment, they were less willing to pay more money for more sustainable energy.

Implications: The climate story alone was not enough to convince most people to invest significant amounts of money in alternative heating systems. A strong personal hook is the main driver and climate is a secondary driver.

Age and Type of Property

Findings: The age and type of home that people live in significantly alters their attitudes towards heat pumps. Older building stock means that houses need to be insulated before installing a heat pump. Meanwhile, flat residents grapple with issues around lack of space.

Old Homes

- The UK's housing stock is relatively old, which is reflected in the high proportion of participants who felt their home may not be suitable, especially due to their more pressing need to insulate their homes.
- Particular types of older homes, such as those made of old brick, pose a challenge to installing heat pumps due to limited cavity wall insulation.
- Other issues such as single glazed windows which would need to be retrofitted prior to installing a heat pump, mean incurring extra costs residents are concerned with.

Modern Homes

- Modern homes were generally felt to be designed better. Participants felt they provide better insulation and keep the home relatively warm in winter (though reportedly too hot in summer).
- 30% of participants live in buildings made post-1980 in detached, semi-detached or bungalows. These buildings are high the most likely to be suitable for heat pumps.

Apartments

- People living in flats reported different problems, namely a lack of space to put heat pumps. People living in urban areas often reported having limited or no outdoor space.

"We need better insulation for it to, you know, to really benefit from it. So I think until things are done on the more basic level we don't really have a huge incentive."

"I would want to know what exactly they mean by 'well insulated'. How do I know that my house is well insulated enough for it to be effective?"

Implications: Increasing ease of access to insulation and heat pump grants by packaging or bundling them could increase adoption rate.

4.3

Drivers & Enablers

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The Cost-of-Living Crisis is Driving Behavioural Change

Findings: This research was conducted between August and November 2022 as the cost-of-living crisis squeezed consumers' real incomes. It showed an unprecedented shift in consumer behaviour related to energy.

Focus Groups: The cost-of-living crisis has triggered unprecedented behavioural shifts

- For the first time, people are engaging more with their energy bills and taking an interest in how their heating systems work.
- The uncertainty over the energy price cap has left participants wary of spending money in case they need it later.
- Factors such as sustainability have taken a back foot in the name of affordability.

"I've just been putting it on in the evening before our son has his bath, things like that. If anyone says they're cold in the house, I'm the first one to say, "Get a jumper on"."

Focus Groups:

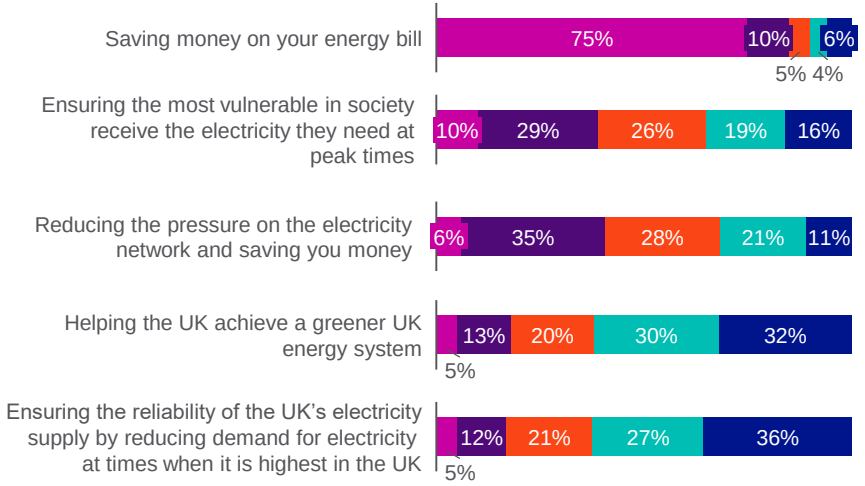
- Participants have reported flexing their thermostats to help conserve energy, with people turning their thermostats to anywhere between 5 and 26 degrees.
- More engaged participants have been flexing their thermostats at peak hours independently of utility or government-led trials to see the impact on their bills.
- Participants are also undertaking a range of "low-tech" methods to save money on bills such as heating the body, not the house , turning the heating down, using draught excluders, reducing time on the washing machine , investing in electric throws or space heaters.
- More generally, they are also buying cheaper food and buying 2nd hand clothing/furniture.

Implications: Consumers are increasingly invested in finding ways to minimise costs over a winter of high energy bills and are getting increasingly creative in their ways to do so.

Offers of Bill Savings Can Shift Heating Behaviour

Findings: Saving money on bills was the biggest driver for participants to engage with flexibility and alter their home heating behaviour during the winter months. Such a positive response could be due to current high heating bills which affect all households in the UK.

Survey Question: In order of importance, which would most encourage you to alter the times when you heat your home in the winter months?



- Saving money on bills was by far (75%) the main driver to alter heating behaviour.
- Supporting a greener energy system and ensuring reliability were also rated similarly and were most often ranked as the least or second least important incentive.

> *"Before this year I didn't really think about our heating. But I've had to think about it because it's so expensive."*

Implications: The time for flexibility trials is ripe as consumers grapple with high energy bills and look for opportunities to save money. The offer to reduce energy bills is an attractive hook to consumers and essential to uptake in flexibility offerings. The environmental hook is less strong, and indicates that when framing flexibility offerings, more emphasis could be put on other hooks to engage participants.

Reducing Costs Will Help Enable Heat Pump Adoption

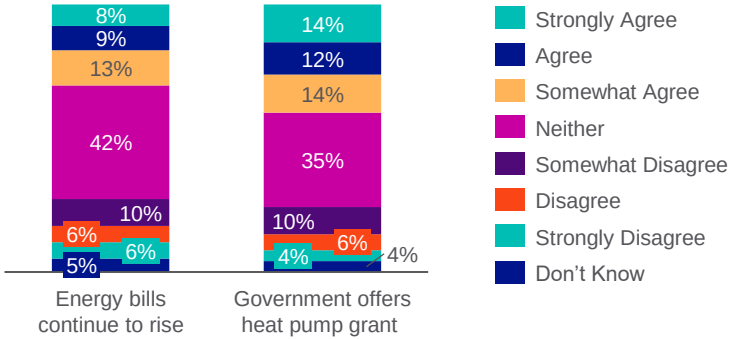
Findings: The cost-of-living crisis has caused participants to prioritise saving costs now rather than later. This is a significant barrier to installing heat pumps as the payback period for installation is longer term due to the high upfront cost. People are more focused on actions that will yield short term financial gains, like flexibility offerings and insulation that will lower energy bills.

Focus Group Findings: Participants are focused on reducing expenditures today and less focused on long-term

- Participants' shared priority is to save money on immediate bills on a month-to-month basis.
- The COVID-19 pandemic and now the cost of living crisis has left many participants in perpetual "crisis mode", meaning that they feel unable to plan long-term and are reluctant to make substantial financial investments given the current uncertainty.
- People have expressed more interest in easier fixes to their current property that would improve heating efficiency such as insulation rather than overhauling their current heating system.

"Because of the cost-of-living crisis, it feels like this is on the back burner a bit."

Survey Question: How much impact would the following events have on your decision to install a heat pump?



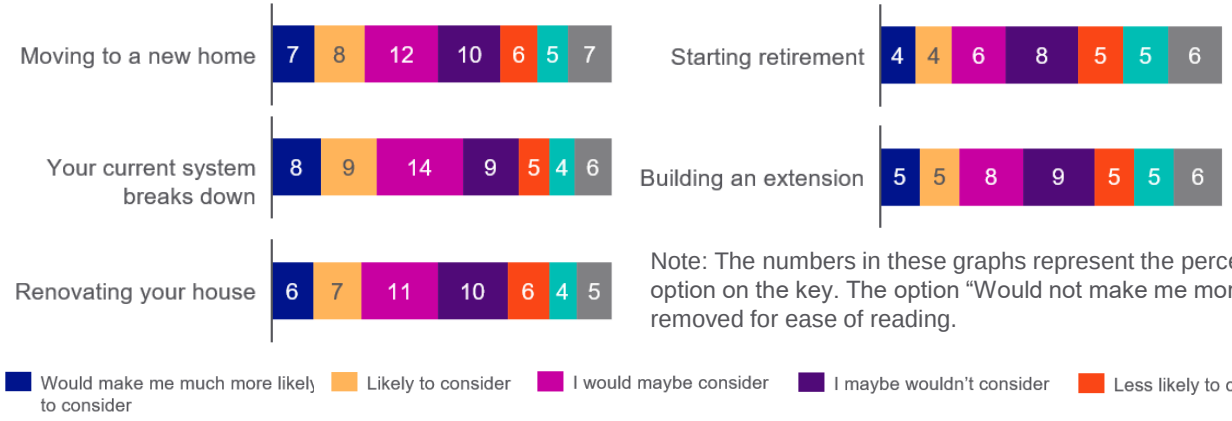
30% of participants would be motivated to change heating systems should energy bills continue to rise, and 40% noted that government heat pump grants would impact their decision.

Implications: When shown heat pumps can be more cost efficient, either due to a continued rise in gas prices and / or through government support grants, participants were more willing to consider investing. Demonstrating cost effectiveness is critical to adoption.

Life Triggers Are Also Important Drivers of Adoption

Findings: Life triggers, such as moving to a new home or having a current heating system breakdown, encouraged participants to reflect on their home heating set-up and be more amenable to installing heat pumps.

Survey Question: How much impact would the following events have on your decision to install a heat pump?



Note: The numbers in these graphs represent the percentage of participants who selected an option on the key. The option "Would not make me more likely nor unlikely to consider" was removed for ease of reading.

The biggest driver for installing a heat pump was when a current heating system breaks down (31%). The least likely driver was starting retirement (14%).

Implications: It is evident that a "trigger" is needed to nudge people to install heat pumps. The biggest trigger for participants is the breakdown of a current heating system, which creates a need for a new one. This breakdown allows for customers to rethink what their heating needs and priorities are. A move to a new home was another trigger for switching to a heat pump, as was undertaking home renovations. People entering retirement and with some disposable income also signalled they would consider installing a heat pump, but out of all the options given in the survey (see graphs to the left), this was the least popular.

4.4

Barriers to Heat Pump Adoption

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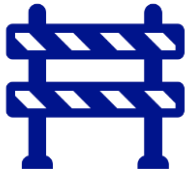
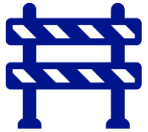
Heat Pump Adoption: Barriers Overview

Findings: Self-exclusion is the primary barrier to the adoption of low carbon heating, especially in the absence of a trigger to change heating systems. Addressing these barriers will be key to unlocking flexibility through domestic heat.



Primary Barriers

- Self-Exclusion



Secondary Barriers

- Cost
- Lack of Trust
- Information and Knowledge

Tertiary Barriers

- Ongoing Servicing
- Cosmetic
- Practical

Survey and Focus Groups Findings:

- The quantitative survey showed that life triggers motivated people to install a new heating system, such as moving home, needing to replace a broken boiler, or starting retirement. In the absence of a life trigger, participants self excluded themselves.
- The need for a life trigger to install a heat pump was corroborated during the focus groups. While many expressed interest in heat pumps, they also believed that they were not applicable to their own situation.

The Primary Barrier to Installation is Self Exclusion

Findings: Self exclusion, or the feeling from participants heat pumps were not applicable to them, is the primary barrier in their adoption. This self-exclusion is for a variety of reasons, ranging from personal to because of property flaws.

Personal

- People excluded themselves most often because they have fully functioning heating systems and felt there was no immediate need to install a new system.
- Furthermore, some had recently invested in new boilers, and therefore did not want or need the extra expense or hassle that comes with such a change.

"You're taking away something we've had and know well."

"It's [combi boiler] pretty simple, straightforward to run. We've tended to just stick with what we've always known, really."

Property

- Property-related reasons were another reason why many self-excluded themselves from potential installation.
- Many viewed their properties as incompatible. For example, people living in flats worried about space for a heat pump. Inadequate insulation was also a key worry for participants, who felt like this was an increased cost and / or more important to address than a new heating system.

"If I was living in a new build I'd consider it [installing a heat pump], but we live in an old granite cottage in Cornwall with almost no insulation."

Implications: Without a significant life trigger or a shift in mentality, there is very little impetus to change behaviours. A "why fix it when its not broken" mentality is a significant barrier to overcome. Without more work to change consumer mindsets, the heat pump rollout will not gain the speed needed and consumers may still choose to replace broken systems with what they know (i.e., gas) by default.

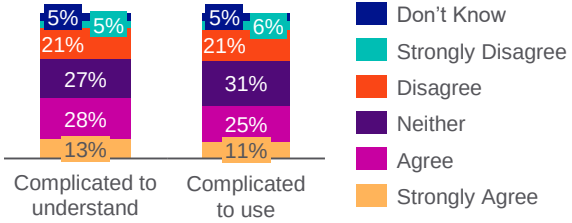
Secondary Barriers Include Knowledge, Trust, and Cost

Findings: In both focus groups and the survey, other issues like limited education on low-carbon alternatives, lack of trust in new technology, and cost to install and operate also acted as barriers.

Lack of Information & Knowledge

- Participants felt they do not have easily accessible information about heat pumps that is written for consumers.
- Competing opinions on heat pumps on the internet leave people confused.
- Many were conditioned to think combi boilers were best, and that gas is a “cleaner” option.

Survey Question: Heat pumps seem…



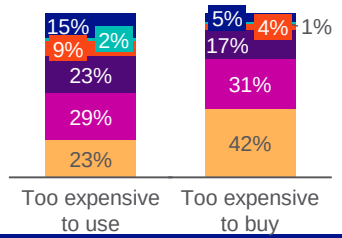
Lack of Trust

- Participants worried frequency of technology breakdown, given a lack of proven track record.
- Participants also expressed a lack of trust given the push to install heat pumps is a government-led initiative (which they are more reluctant to trust following political turmoil over 2020-2022).
- The lack of equivalent to the Gas Safety Register means people lack trust in heat pump installers.
- Concerns about whether heat pumps are even really that green given source of electricity.

Cost

- Installation costs were a primary worry for participants, especially since many would need to first insulate their homes. Higher running costs also acted as a barrier.
- The addition of the government grant, however, made the proposition more attractive to participants.

Survey Question: Heat pumps seem…



71% of participants felt that heat pumps were too expensive to buy while 52% felt they were too expensive to use

Implications: Low hanging fruit to help people surmount these barriers would be to create resources such as a government-approved heat pump installer register, and further promotion of the government grant for heat pumps especially via trusted community sources.

Tertiary Barriers Include Cosmetics and Upkeep

Findings: Unknowns about frequency of maintenance and the look of heat pumps were raised as less important, but additional barriers to adoption.

Installation & Maintenance

- Participants were unsure about the frequency of maintenance, the availability of service contracts and the availability of engineers.
- Participants also did not want the installation to cause disruptions in their home and were especially concerned if additional changes would be needed (i.e., is it just as simple as swapping out the gas boiler) to make their home heating system work for a heat pump.

"So I take it that [heat pump] still needs an annual service? When you sell your home you need proof you've serviced your gas boiler. What's the cost of that for a certified heating engineer to test it once a year? What's their charge? Is it going to be more expensive [cf. gas boiler]?"

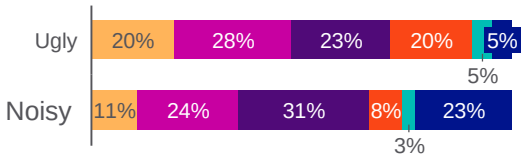
Cosmetics

- Participants also did not like the look and feel of heat pumps, with some stating they thought they were ugly.
- Because heat pumps are at an early technological stage, participants also thought that they would get smaller as newer models were released.

"It's a definite no go. It's more expensive, you've got that big ugly heat pump outside your house."

"If I had to get underfloor heating as well, for example, would all the floor need to be lifted up? All those kinds of logistics of installing something as significant as that…"

Survey Question: Heat pumps seem..



- 51% of participants felt heat pumps were ugly
- 35% of participants felt heat pumps were noisy

4.5

Customer Perceptions of Flexibility

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Initial Impressions of Planned EQUINOX Flexibility Trial

Findings: When shown draft EQUINOX communications, participants were positive about the trial and receptive to the flexibility offering. Personal motivators were the main driver, while contributing to a climate friendly initiative was important but secondary.

Reasons to Participate

- ✓ Bills will be cheaper.
- ✓ £100 incentive is attractive in current cost-of-living crisis.
- ✓ Reducing consumption without doing anything.
- ✓ Reassurance that house will still be warm.
- ✓ Helping the UK.
- ✓ 2-hour timeframe is manageable (for most).
- ✓ Helping the environment.
- ✓ Tried and tested in other places e.g., North America.

Barriers to Participation

- ✗ Reluctant to be cold.
- ✗ Heating the house beforehand will negate energy bill savings.
- ✗ Confusion over reason for trial - reducing consumption to stop network overload NOT cleansing the energy mix.
- ✗ Effectiveness – feeling that this only shifts peak usage.
- ✗ Hassle - practicalities/mechanics of 'switching off', including one participant who has been told NOT to switch device on/off.
- ✗ High frequency – 2-3 times a week feels a lot for some.

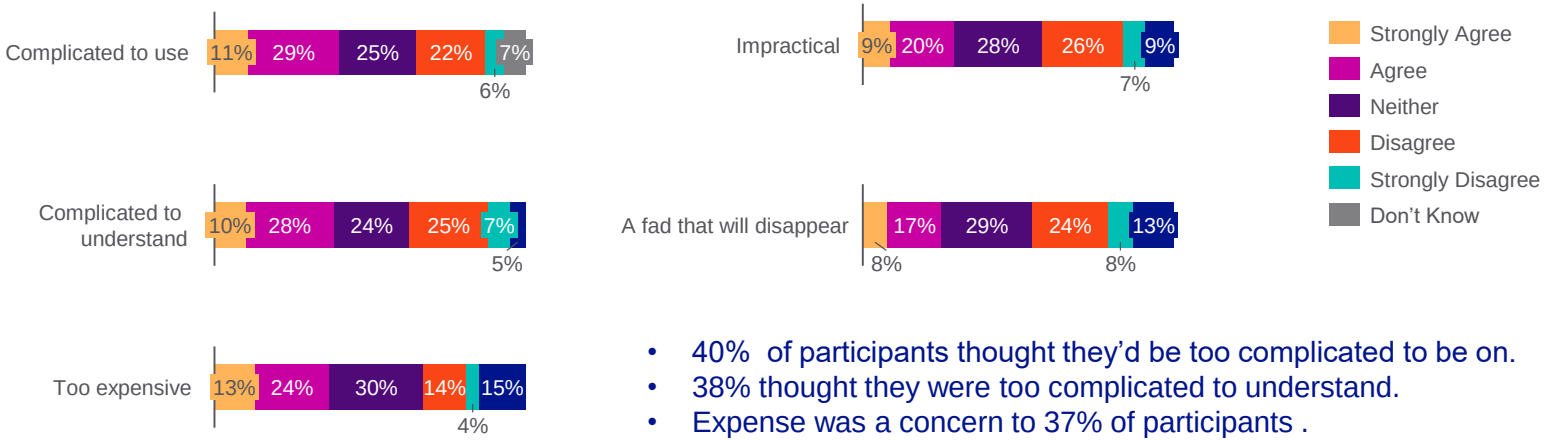
8

When focus group participants were asked to rate their interest in participating in EQUINOX on a scale of 1-10 , the average response was 8. The primary reason provided was the benefit of receiving credit on their heating bills.

There Are Concerns About Complexity of Flexible Tariff

Findings: When asked about flexible tariffs, 40% of survey participants were concerned about how complicated they are to use, while 38% found it too complex to understand.

Survey Question: How much do you agree or disagree with the following statements? Flexible tariffs seem…



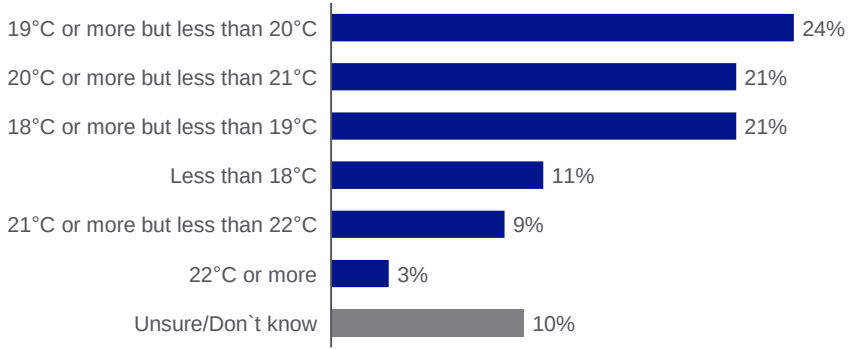
- 40% of participants thought they'd be too complicated to be on.
- 38% thought they were too complicated to understand.
- Expense was a concern to 37% of participants .

Implications: When taking barriers into account for the EQUINOX trial design, attention has been given to ensure that processes are as simple as possible in order to maximise engagement with the trial and minimise dropouts.

Home Heating Habits and Tolerance to Change Varied

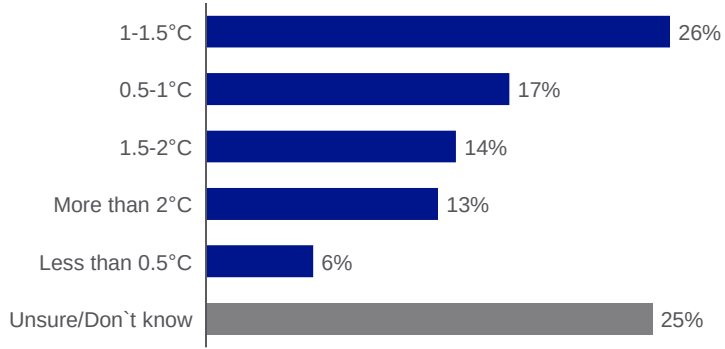
Findings: Over 50% of respondents considered themselves tolerant of a greater than 1°C change their home temperature. However, a quarter were unsure of what they could handle. Comfortable temperature ranges varied widely from less than 18 °C to over 22 °C.

Survey Question: What room temperature do you usually feel most comfortable in when at home with the heating on?



10% of people don’t know the temperature they prefer in their house. The most common response was 19-20°C.

Survey Question: How many degrees do you think (or know) you could tolerate above or below your most comfortable room temperature at times when you have the heating on?



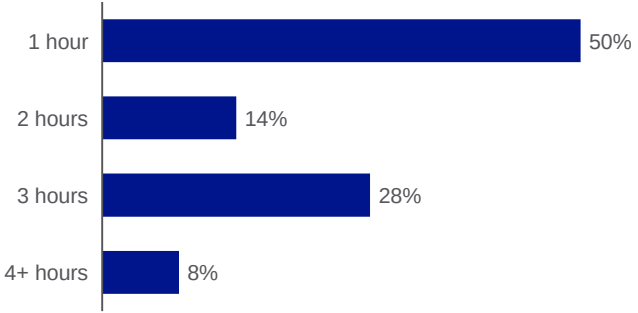
25% of people don’t know the amount of temperature variation they’d be comfortable with, but the most common response was 1-1.5°C.

Implications: These insights can help to inform trial design, particularly to provide key metrics for measuring during trials 2 and 3, such as tolerance of heating temperature changes, and to guide exploration of personalized comfort envelopes for customers vulnerable to cold.

Attitudes Towards Third-Party Control Were Mixed

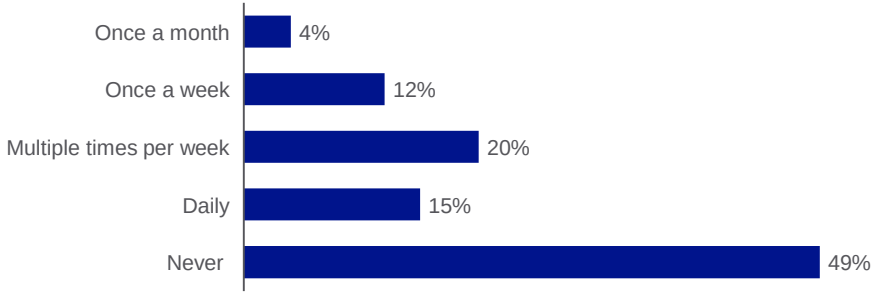
Findings: Participants had a range of preferences for how often and how long they would be willing to have their heating system controlled by a third-party. Participants who reported they would be likely to sign up to a flexible tariff (i.e., flexible tariff adopters) were more likely to select longer durations and more frequent occurrences than participants on average.

Survey Question: For how many hours at a time would you be willing to have your heating system controlled by a third-party?



- 50% of participants said they would be willing to let a third-party control their heating for an hour at a time.
- When segmenting by likely flexible tariff adopters, more were likely to say 3 hours (41%).

Survey Question: How frequently throughout the winter months would you be willing to have your heating controlled by a third-party?



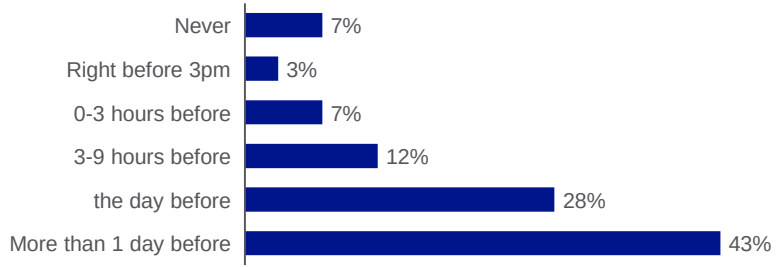
- Multiple times per week was the most common frequency reported (20%).
- When segmenting by likely flexible tariff adopters, 24% of flexible tariff adopters said ‘daily’ and 30% said ‘multiple times a week.’

Implications: These insights, especially likely flexible tariff adopter attitudes, informed trial design. EQUINOX events for Trial 1 will be two hours maximum for participating households and events will occur on an average 2-3 times per week.

More Notice for Events and Cheap Energy is Preferred

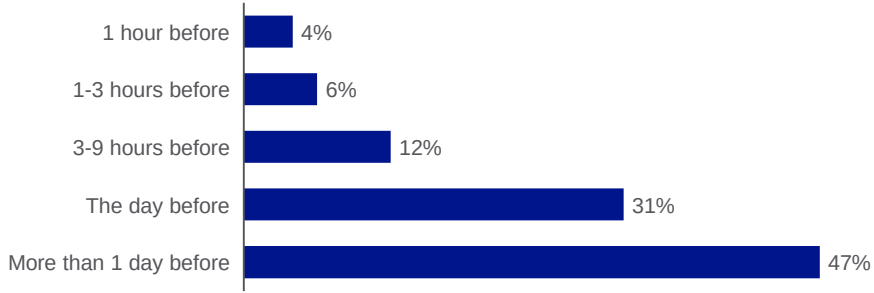
Findings: The survey showed that participants preferred more notice to less notice when it came to being informed of events where their heating would be controlled by a third-party or where electricity would be cheaper to use.

Survey Question: How far in advance would you want to be informed about an event where your heating will be controlled by a third party, which you can accept or deny?



- 43% of all participants said they would want to be informed more than 1 day before.
- When segmenting by likely flexible tariff adopters, slightly more (36%) said ‘the day before’ but 31% still said ‘more than 1 day before.

Survey Question: How far in advance would you want to be informed about a period between 3-5pm where electricity becomes much cheaper to use?



- When segmenting by likely flexible tariff adopters, slightly more (38%) said ‘the day before’ but 33% still said ‘more than 1 day before.

Implications: Communications for EQUINOX events are planned for at least 24-hours in advance. While more notice may be preferable, in balancing other considerations, we plan to begin with 24-hours and gather feedback from trial participants on approach.

Choice of Control Needed as Competing Concerns Raised

Findings: Despite overall positive responses to the two heat pump control mechanisms being trialled in winter 2022/23, many participants expressed concerns about handing over control of their heat pumps to their suppliers due to privacy fears. Conversely, others felt like turning the heat pump up and down manually was too much of a hassle and preferred to give control over to suppliers.

Behavioural Demand Response:
Customer controls heat pump

Description:
Customers informed of EQUINOX events by their supplier and opt in by **manually** turning their heat pump off. They can opt out during an event by turning the heat pump back on.

Participant Feedback:
- Manual is good as it allows for greater control for the customer.
- Manual has negative impact on participants' time. Participants feel they are too busy and don't want another thing to think about.
- Feel it will put pressure on consumer to participate.

Direct Load Control:
Supplier controls heat pump

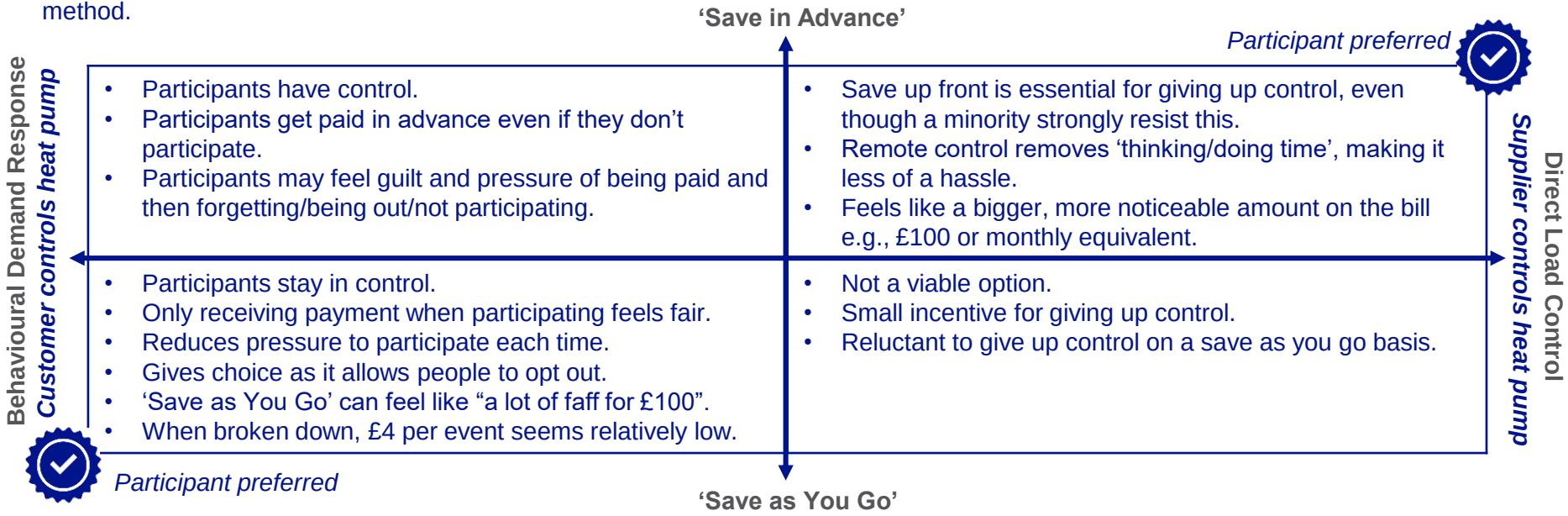
Description:
Customers will allow their supplier to control their heat pump **remotely** during EQUINOX events. Customer can choose to opt out before or during an event.

Participant Feedback:
- Creates fear of losing control for some participants.
- Participants felt like giving control would be inching towards a dystopian world like "Big Brother".
- Risk of something going wrong.
- Potential for hacking.
- Concern that supplier takes advantage.

Implications: EQUINOX trial will provide real-world insight on both customer preferences for control mechanisms and each mechanism's ability to provide reliable flexibility. Customer choice is important for flexibility offerings in business-as-usual setting, but effectiveness of the approaches may be different. We will explore the prevalence and urgency of concerns raised here among trial participants.

Preferred Payment Differed by Control Method

Findings: The 'Save as You Go' commercial arrangement was most palatable to participants when coupled with the manual control method and the 'Save in Advance' commercial arrangement was preferred for ceding control to a supplier for the 'Remote' control method.



Implications: Success of the behavioral demand response option relies on an easy way for participants to turn off their heat pump manually (e.g., app) and adequate (~24-hour notice) to avoid the need for participants to be at home. While the success of the direct load control option relies on trusting the supplier and noticing no differences in temperature plus a high financial reward.

Participants are Unsure if EQUINOX is Worth the Effort

Findings: While the total £100 expected reduction to energy bills is a strong hook for participants and incentive for them to participate, once learning more about the trial, participants are not sure it's worth the effort.

Focus Group Findings:

- £100 is probably enough to get people to sign-up for the trial, especially for the manual control option.
- Relinquishing control via the direct load control method may require a higher incentive.
- Cash is more interesting than bill credit—for some—as it allows choice to spend on something else and is more noticeable.
- If participation in EQUINOX events is minimal hassle and no impact in terms of comfort in home then £2-3 payment per event is probably adequate.

"Oh God this feels like a lot of effort for £100."

"Just in terms of every time you have to turn it [heat pump in 'manual/save as you go' option] off, if it's like, 'Oh, that's £3', whether I'd be like, 'that's such a small amount of money I'm not going to bother'."

"I'm not sure, the incentive of £100; if people like my son, with babies and that, whether they would have the incentive to do that for £100."

Implications: Learnings from the trial are needed to determine if payment amount per EQUINOX event is adequate to incentivise participation and unlock domestic flexibility from electric heating. Learnings will also inform payment amounts for future events.

Customer Research has Fed into the Trial 1 Design

Findings: Initial research into the public's views on a hypothetical EQUINOX scheme will soon be able to be compared against customer feedback from the real EQUINOX trial 1 in winter 2022/23, whose design has also been partially shaped by the research.

Acknowledging that bill savings were overwhelmingly picked as the primary driver for shifting heating behaviours:

- The commercial arrangement design involved careful consideration of the appropriate amount of money to provide for the initial trial in winter 2022/23, where people are providing their data as well as reducing stress on the electricity system.
- Trial participants can expect to earn around £100 for participating in EQUINOX events in winter 2022/23 via credit to their bills.

Understanding customer concerns surrounding the different heat pump control methods and payment methods:

- Supplier communications to Trial 1 participants have proactively acknowledged these concerns where possible.
- All the control/payment method grid options will be tested in Trial 1 to compare public responses to hypothetical scheme with Trial 1 participant feedback.

Seeking to better understand acceptable lengths of time for third-party control of heat pumps:

- EQUINOX events will be a maximum of two hours. Trial participants with Direct Load Control can opt out during the event should they prefer to take back control of their heating.

Acknowledging the wide range in home heating temperature habits and tolerance to variation:

- Trials 2 & 3 may consider 'temperature envelopes' for trial participants who may be less tolerant to temperature change (due to preference or vulnerability). For the Trial 1, a pilot trial, such envelopes were deemed to complex to implement.

Appreciating concerns from many respondents that flexibility schemes can be complex:

- The commercial arrangements have been kept as simple as possible to encourage engagement and participation.

5

Conclusions and Next Steps

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Affordability and Complexity Put Customers Off

Findings

1. Environmental reasons alone will not motivate adoption. Affordability is more important to consumers than sustainability in the current economic climate.
2. Customers are focused on covering their bills in the short term instead of making long term capital investments in new home heating systems.
3. Cost of heat pumps alongside other requirements to maximise efficiency (i.e., installation) discourage uptake, especially as it is hard for customers to understand total costs given variability of price based on needed property changes, etc.

Implications

- There needs to be a trigger to motivate people to change their heating systems.
- In the absence of triggers, governments and utilities need to do more to nudge and incentive customers.
- Availability of grants is helpful, but not enough for people to feel heat pumps are affordable.
- There is appetite for more bundled solutions (i.e., insulation and heat pump deal) to make it adoptions easier for consumers.

Education and Engagement are Needed to Enable Adoption

Findings

1. People feel uneducated about heat pumps.
2. There is a lack of trusted sources of information on alternatives to gas heating.
3. People tend to only to think about their heating system when it doesn't work. However, the increase in energy costs is shifting this as consumers looks for ways to save.
4. Flexibility is a difficult concept for consumers to understand and they worry about complexity of flexible tariffs and flexibility offerings.

Implications

- Utilities, energy suppliers, and the government can do more to provide reliable, trustworthy, easy to understand information on alternatives to natural gas heating.
- Heightened engagement with energy-related topics due to the cost-of-living crisis means that the time is ripe to recruit customers to flexibility trials. Consumers need to be convinced flexibility offerings are worth-it.
- There is a large middle ground that is undecided about heat pumps – initiatives need to focus on making it an easier choice in order to enable adoption.

Opportunities for Bill Savings Make Flexibility Appealing

Findings

1. A desire to save money on energy bills is motivating a large change by customers in their heating behaviours.
2. Many customers find the notion of flexibility confusing and are concerned complexity of flexibility offerings.
3. Responses to potential commercial arrangements and control methods for EQUINOX varied widely.
4. Customers are unsure about the level of temperature change they can tolerate and level of financial incentive needed to make participation in EQUINOX worthwhile.

Implications

There is demand for flexibility offerings driven by the potential for bill savings. This is especially true due to the cost-of-living crisis and rise in energy prices which are impacting customers. This makes it an opportune time to run flexibility trials.

In order to maximise engagement, flexibility offerings need to be designed with simplicity and comprehensibility in mind. The EQUINOX trial aims to do this and will gather feedback from its participants this winter to see if it's been successful and understand areas for improvement.

Customer choice must be prioritised. Optionality is key to making sure with different preferences can access the benefits of flexibility.

Next Steps for EQUINOX Customer Research

EQUINOX Engagement with Trial Participants

- EQUINOX will continue to engage with trial participants during the trial in order to better understand their experiences during the trial. The focus will be on gaining insights to improve customer experience and the trialed commercial arrangements.
- Learnings will be gathered through in-depth surveys of trial participants (one planned for mid-trial and one at the end) and focus groups.
- Shorter post-EQUINOX event surveys will also be deployed to monitor comfort levels and provide a quick, easy, mechanism for participants to share experiences with their suppliers, especially during the beginning of the trial.

Further UK-wide Research

- EQUINOX will run until spring 2025, and in the later stages of the trial, further UK-wide research will be undertaken to monitor the shift in opinions against the quantitative research used to inform this report.
- Given the speed of the energy transition and changes, the hypothesis is that attitudes may look significantly different in the near-term, especially given the visibility of demand response offerings (e.g., National Grid ESO's Demand Flexibility Service) today.

6

Further Reading

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Further Reading

Name	Description	Link
Quantitative Report	Full results from quantitative surveys conducted during this market research excerpts of which are included in this report.	**https://www.nationalgrid.co.uk/downloads-view-reciteme/620303**
Method Statement	Statement from research partner Accent detailing methodology use in this research, includes full research questionnaires.	**https://www.nationalgrid.co.uk/downloads-view-reciteme/620302**

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