

The experiences of early adopters of zero direct emissions heating systems in Scotland

► Kurt Borth, Isabella Impesi, Gwyn Rush, James Conway
Changeworks

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1 Executive Summary

1.1 Aims

Buildings account for around a fifth of Scotland's greenhouse gas emissions. Reducing these emissions is essential for Scotland to get to net zero. The Scottish Government's Heat in Buildings Strategy (HiBS), published in October 2021, sets out how to achieve warmer, greener and more efficient heating across all domestic and non-domestic buildings in Scotland by 2045. Achieving this transformation requires making changes to a large number of properties.

This report investigates the experiences of early adopters of zero direct emissions heating (ZDEH) systems amongst private homeowners in Scotland¹ in order to:

- better understand the experiences of early adopters of ZDEH systems and energy efficiency retrofit (eg motivations, consumer journeys, barriers and enablers)
- develop a series of detailed case studies / pen portraits that depict a range of different experiences of successful installation.

The report is based on a review of research on early adopters of ZDEH systems, qualitative interviews with households who had recently installed ZDEH systems, and testing of a series of pen portraits resulting from the research.

The findings will be used to inform the Scottish Government's forthcoming Heat in Buildings Public Engagement Strategy.

¹ In this report all examples of ZDEH are heat pumps.

1.2 Summary of findings and recommendations

This research focused on the highly motivated early adopters and innovator populations of ZDEH systems who are willing to overcome substantial barriers in order to achieve their goals. The main motivations for installing a heat pump and other energy efficiency measures were linked to environmental interests to decarbonise and to home renovations or broken heating systems.

Throughout the research and install process the interviewees demonstrated a formidable ability to overcome barriers and a commitment to complete installation. Systematic changes to reduce current barriers are necessary to engage the general public in the next phase of heat pump adoption.

The main barriers experienced by those interviewed for this project were:

- Finding credible sources for critical information
- Complicated Home Energy Scotland (HES) loan process
- Finding an installer in their local area
- Lack of installer handover and inconsistency in system operation information

To overcome these barriers and build on the experience of early adopters, the Scottish Government could:

- Support/increase information from trusted sources of information throughout the household's path towards adoption.
- Leverage opportunities for ZDEH system adoption and household energy upgrades to intersect with planned and unplanned renovations and life stage changes.
- Simplify the Home Energy Scotland loan and provide geographically-based resources for finding installers.
- Establish consistent standards and practices for post installation/handover of ZDEH systems.
- Utilise early adopters in helping to spread trusted information on ZDEH systems.

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2 Introduction

The Scottish Government aims to reduce emissions from buildings by 68% compared to 2020 levels by 2030 and reach net zero heating emissions in 2045 (Scottish Government, 2021). Achieving these targets requires upgrading Scotland's existing building stock and reducing demand by improving fabric efficiency and installing zero direct emissions heating (ZDEH) systems. Engaging, motivating and inspiring householders to engage with the low-carbon agenda at scale has proved elusive to date. The Government has set targets of 80,000-100,000 ground and air heat pumps installed cumulatively from 2021 to 2026, hitting 170,000 installations per year by 2030 with current total installations at 31,476 (MCS, 2023). Learning lessons from early adopters and their stories, both positive and negative, is an essential way of turning the tide.

The Scottish Government has stated that by 2045 “emissions from heating our homes and buildings will have all but disappeared” (Scottish Government, 2021). To meet this objective, over one million homes will need to convert to zero direct emissions heating by 2030 and the remainder by 2045, alongside a fabric-first approach to reduce energy demand. The Scottish Government has published the Heat in Buildings Strategy (HiBS) in 2022, to realise warmer, greener and more efficient heating across all domestic and non-domestic buildings in Scotland by 2045.

This research will aid in informing the HiBS Public Engagement Strategy, to be published in 2023. It aims to (i) better understand the experiences of early adopters of ZDEH systems and energy efficiency retrofit, eg motivations, consumer journeys, obstacles, and enablers; and (ii) develop a series of detailed case studies / pen portraits that depict a range of experiences of successful installation of ZDEH and energy efficiency measures, which can be used as an engagement tool with domestic property owners with a range of motivations and attitudes to the heat transition.

At the time of this research project, the UK has experienced significant increases in energy prices over the past year and a half due to increased energy demand during the post-Covid pandemic reopening of economies, which coincided with Russia's invasion of Ukraine. This current energy crisis context, coupled with unpredictable inflation rates and lower than average temperatures in December preceding the interviews in early January, most likely impacted the participants experiences of their heating costs (Energy Saving Trust, 2022; Met Office, 2022).

3 Methodology

3.1 Literature review methodology

Literature was reviewed from a wide range of academic, industry and government sources to gather data on the lived experiences of early adopters (motivations, consumer journeys, barriers and enablers) and any evidence of early-adopters segmentation. The search was conducted online on Scottish and UK based sources first, then Ireland, the EU and other relevant jurisdictions. Relevance was determined in collaboration with the steering committee, based primarily on similar geo-political context, heating system technology, housing stock and heating requirements. The primary search terms used were 'Heat Pump' and 'Early Adopter', with the search expanding into other ZDEH systems, renewable energy, and home retrofit. A full list of primary and adjacent search terms can be found in annex 1. The time scale was initially 2018 to present (5 years) but did include earlier literature if directly focused on heat pumps and early adopters or adjacent renewable energy or ZDEH areas (full literature review results matrix in annex 3).

3.2 Recruitment and interview methodology

Twenty private tenure households who had recently installed ZDEH systems (within 5 years but focused on 2-3 years) were recruited for 45-minute qualitative interviews. CXC sent out a recruitment call through various channels and the recruitment message was also sent out to over twenty Scottish energy groups and related partner organisations and relevant email lists across Scotland. All potential participants went through pre-screening to ascertain legitimacy before being interviewed. In recruitment we attempted to utilise a diverse demographic and housing type sample.

Interviews followed a thematic guide and were thematically analysed, resulting in the following high-level coding structure. These interviews provided valuable data with regards to motivations and experiences and were used to aid in the development of the pen portraits. The participants experiences provided significant information regarding all stages of the installation process, from becoming interested in acquiring a heat pump, identifying, and using various sources of information, contacting organisations to learn about funding and finding a suitable installer to carry out the work.

The recruitment email and interview guide can be found in Annex 3.

3.3 Pen portrait methodology

Pen portraits are used in marketing, qualitative research, and segmentation to provide an informal description or profile of a person or group of people. Participant interviews were analysed and coded to create the thematic foundational basis for the five pen portraits. These pen portraits will offer a quasi-representational (based primarily on the qualitative interviews) depiction of some early adopters of ZDEH technology, intended for use in the Scottish Government's Heat in Buildings Engagement Strategy (HiBS) engagement strategy.

The pen portraits were developed from interviewee responses and comprise information on housing type, priorities, and concerns of the household with regards to the heat pump/retrofit. Trusted sources of information used in the household's decision making and insights from the installation journey were also included on the front page. A back page consisted of more general heat pump information and resources to help begin the journey towards adoption.

3.4 Pen portrait testing methodology

Changeworks commissioned 56 Degree Insight to undertake a survey of Scottish adults to obtain feedback on the five pen portraits and a back page of further information. The survey included only those people who owned their own home (still paying or fully paid mortgage) and excluded outright rejectors of heat pumps. An initial screening question was used to identify those who were against or hostile to heat pumps in general and had them exit the survey.

A short questionnaire was designed in consultation with Changeworks with questions collecting background details on levels of interest in retrofit services, motivations, and barriers to action, which of the five pen portraits (if any) resonated most, and detailed feedback on two of the portraits. While the survey sought to obtain feedback on the five pen portraits and the more generic back page, to ensure a manageable survey length for respondents, the questionnaire was designed so that respondents evaluated a maximum of two pen portraits each. To allocate which two pen portraits were evaluated, each respondent was first asked to choose and review the pen portrait which they felt best reflected their own circumstances and then a second pen portrait was randomly assigned to them using the survey software.

4 Literature review

4.1 Early adopters

For this research, ‘early adopters’ represent the second group from E.M. Rogers Diffusion of Innovations theory (figure 1) which outlines the way a product or technology spreads through a population. This group are not the very first to adopt a new technology and follow the ‘innovators’ group who are considered very willing to take risks and are often the first to develop new ideas. Although we are using the term ‘early adopters’, according to Roger’s theory and the % of Heat pumps being adopted in Scotland and the UK at the moment we are most likely still technically in the innovator stage of adoption. Innovators and very early adopters are generally highly motivated to overcome barriers that the general population would not be. Very little, if anything, needs to be done to appeal to the innovators population while the early adopters require convincing with trusted information and sources. The barriers typically given by the general population for adopting new technology (cost, accessible information and lack of awareness, and reliability of technology) are overcome by early adopters. With renewable and ZDEH technology, environmental values and convictions have been provided as primary reasons for adoption, which help to overcome typical barriers (Dedehayir *et al.*, 2017; Meles and Ryan, 2020; Alvar, 2020). The early adopter’s group are also considered integral in spreading the message and knowledge to their networks (Rogers, 2010).

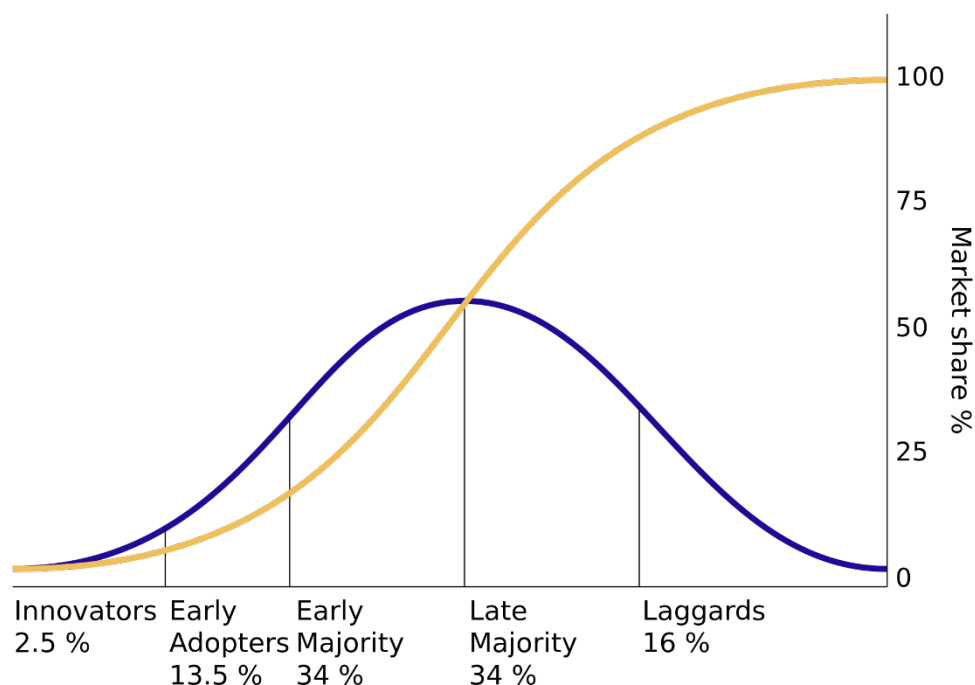


Figure 1. Rogers Diffusion of Innovation Curve (Adapted from Wikipedia Creative Commons).

4.2 Literature review findings

4.2.1. Environmental concerns

Literature focused on investigating the primary motivations for the adoption of heat pumps shows that households are more likely to be driven by environmental concerns (and other non-financial, value-based motivations like carbon emissions, future climate impacts etc) than other motivations (Palm, 2020). Conversely, cost tends to be a lower barrier for early adopters as most of them are more affluent than average and cost is ranked lower in their value-based decision making. Although early adopters of renewable and ZDEH may not represent a majority of the general public with regards to demographics (higher than average affluence, older demographic), they do overlap the majority of the Scottish public's view (82%) that recently reported they were concerned about climate change (Ipsos, 2022). These groups may overlap with regards to climate change concern but research shows that early adopters are understood to use this motivation to take action (purchase/install ZDEH systems) much more than the general public (Palm, 2020).

4.2.2. Traditional barriers

Literature (government surveys and programme evaluation, motivational research) on barriers to heat pump adoption has identified the primary barriers to include installation costs, disruption, noise (operational), supply chain, installer, lack of heat pump 'literacy' and comprehension of true operating costs (IEA, 2022; MCS, 2021; Palm, 2018; Ireland National Household Survey, 2018). The literature review conducted as part of this report mirrors our participants' experiences with barriers to heat pump and ZDEH adoption that are most often reported.

Recommendations for overcoming these barriers include calling for further provision of actionable information with regards to operating information and costs and improving home suitability (including possible required retrofit). Research findings and UK Government programme evaluation reporting also call for clearer provision of what the installation process truly involves to provide increased clarity for households throughout the installation journey (eg timelines, disruption, enabling works) (MCS, 2021; IEA, 2022; BEIS, 2021).

4.2.3. Trusted intermediaries and peer effects

Literature also points to the importance of intermediaries' roles in influencing heat pump/retrofit interest and adoption. These trusted sources of information can be found in various online, social and professional contexts like family and friends, online forums, social media, neighbours, co-workers and tradespeople. Research shows that messages that aim to motivate people to adopt/maintain 'desired' behaviours' from trusted sources can be powerful conscious and unconscious sources of influence. Both NESTA and Energy Saving Trust have undertaken successful projects, Nesta had over 150 signups for a home visit, and the Green Homes Network has over 300 homes across Scotland who are open to sharing their knowledge and experiences with adopters, that utilise trusted intermediaries to provide information and exposure to ZDEH systems to

influence adoption (Nesta, 2022; Energy Saving Trust, no date). Peer effects are also discussed in the literature as having a substantial effect on the adoption of renewable and low carbon heating technology.

5 Early adopters and their motivations

5.1 Who we interviewed

Early adopters that expressed interest in this study mainly included those with large houses, higher socio-economic backgrounds (based on conversations around home, habits and jobs that sometimes naturally occurred) and retired individuals who had either inherited money or who had had lengthy careers. Virtual interviews took place between December 2022 and January 2023. We spoke to 11 men and nine women. 13 interviewees are working adults, of which eight work in the environmental sector. The remaining seven are retired. The households split into eight in rural locations, six in urban areas and six in small towns. Figure 2 illustrates who we interviewed for this research.

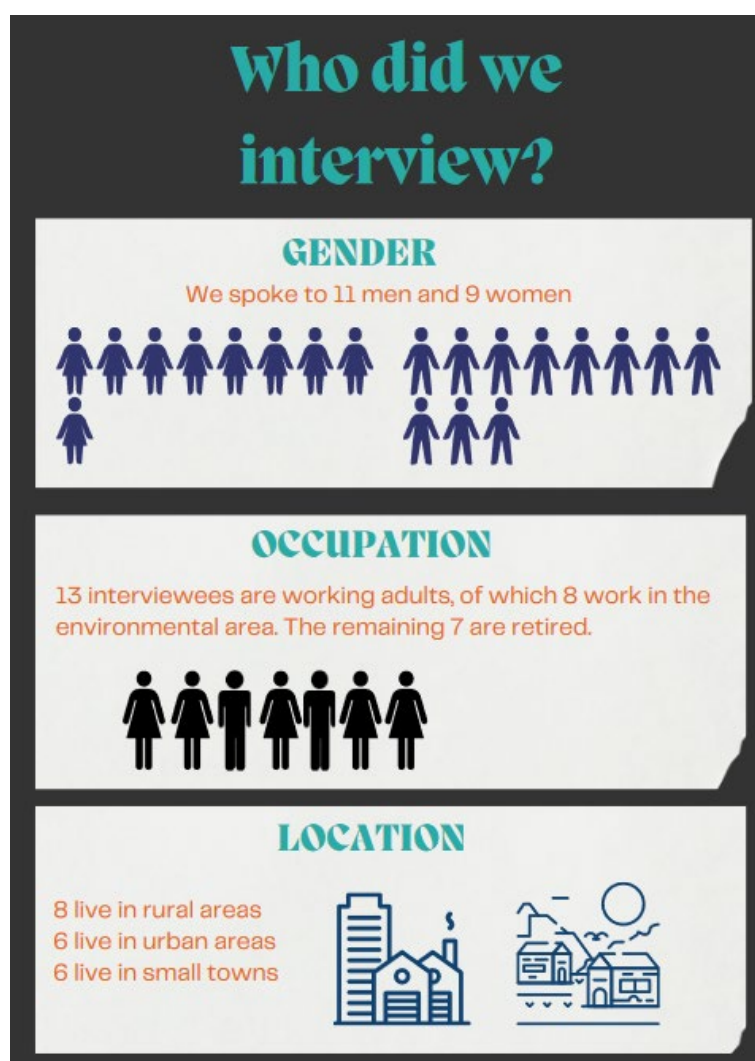


Figure 2: Illustration of who was interviewed for this research

The 18-month period prior to the interviews were conducted was characterised by a significant increase in energy prices due to increased energy demand during the post-Covid reopening of economies and Russia's invasion of Ukraine. It is important to point out that this context impacted the interviewees' experiences of their heating system costs.

5.2 Motivations

The main motivations for interviewees to go through the whole journey mainly related to environmental interests to decarbonise, and households who were going through renovations or had broken heating systems. The full list of motivations was:

- Environmental (16)²
- Renovations (6)
- Replacing an old heating system (5)
- Better heating regime (4)
- Future cost concerns (2)

These motivations align with the primary motivations found for early adopters in the literature review. Renovations were considered anything other than a heating system replacement (kitchen, bathroom, addition, or structural renovations); some participants undertook these before they moved into the home while others went through extensive works while in their homes. Heating system replacement was often seen as an opportunity to upgrade to a ZDEH system. Participants often mentioned more than one motivation.

5.2.1. Environmental

The main motivation for most interviewees to install heat pumps was environmental. They discussed the satisfaction of being able to be disconnected from the gas grid, to not rely on fossil fuels, and the need to act considering climate change. The following are examples of how interviewees expressed their environmental motivations:

- “Sustainability is my life’s greatest passion. As part of my job, I regularly tell people to install heat pumps. So that’s very much a secondary reason, but I would have felt like a hypocrite if I had the chance to install it, and I didn’t. The bigger reason is I want to do it to help fight against climate change and this is one of the biggest ways in which I can contribute.”
- “I’ve become a grandfather and I have responsibility for my children, and I wanted to decarbonise. The house is nearly as carbon neutral as it can be.”
- “I feel conscious of the harm I am causing with emissions. Climate change is related to individuals, we all have a part to play, and I want to do something to help.”

5.2.2. Renovations

Moving to a house that needed renovating/building or making renovations in current homes were the second most talked about reason to consider changing heating system and therefore move towards a heat pump.

One interviewee said: “Because the house was so old and with a single pipe basic system, we would need to replace the boiler, radiators and pipes anyway, so we decided to go straight to a heat pump.”

² Numbers in parenthesis represent number of interviewees who mentioned a certain theme/code. Interviewees often mentioned multiple themes.

5.2.3. Replacing old heating systems

Five interviewees started their heat pump journeys once the heating systems in their homes became too inefficient or broke down. These included:

- Replacing a 30-year old, E-rated boiler
- Unreliable oil system
- Boiler from the 1980s
- Issues with mains-gas pipe

5.3 Initial concerns

The internet and media contain many negative stories and myths around heat pumps (Prestridge, 2023; Ashkenaz, 2022). Our interviewees also discussed the initial concerns they had, which were often fuelled by the online research they did. Some of the things they had read up on which did not materialise included being told radiators would take up the whole wall, very high expenses, and that heat pumps would not work on older properties.

Interviewees were also initially concerned about not having enough insulation, breakdown costs, noise concerns and having enough hot water. The following are examples of how interviewees expressed their concerns:

“It was small comments, such as the idea that my radiators would take up the whole wall, which you can see is not the case at all. I was told I was better with a boiler, that a heat pump is too expensive and if they breakdown it will cost a lot, that they are unreliable etc. I went ahead with it anyway as it would not be worse than my old boiler.”

“I am so frustrated with the bad press, that people keep saying about heat pumps not working. It looks to me as though I’m going to get a return on investment in eight years. Having a technical background made me less sceptical. The bad press out there saying house is frozen and costs you a fortune, these people are not helping. A well-designed system to match the house will reap benefits. I’m convinced of that. More an inbuilt fear on what you were seeing in the press and tv. I have a vulnerable wife and I wondered if I was doing something wrong, but it never materialised. You only see complaints rather than compliments.”

“Jim had anxiety about the noise when we first got it installed. It’s installed in between our bedroom and Idris’ bedroom and it’s a low noise but were worried about the noise at night, as we have annoying neighbours. But we have all got over that now, that was an initial worry that went away. It’s not a loud noise, it’s not a problem at all. It was just an anxiety. I don’t think they can hear it to be honest.”

5.4 Barriers

Although a majority of participants expressed positive sentiments towards recommending heat pumps to others, when interviewees were asked to talk about the barriers and challenges they faced, they all did. Most of these concerned issues with the installers (communication difficulties, errors, availability) and delays in receiving the HES loan. As discussed in the literature review findings, early adopters are motivated by other

factors (environmental concerns, technology interest, energy independence) to overcome barriers. In some cases (below) these motivations drove participants to surmount challenging difficulties including contacting 14 separate installers to obtain a quote, others having trouble locating installers that would work in their area and overcoming issues with HES loan processes. Other interviewees spoke of the difficulty in finding anyone local that would even bother to return their calls. They also spoke of calling numerous installers as there was no way to tell where they worked or where they were willing to work from their websites. These have been summarised as follows:

- HES loan process (10)
- Installers (9)
- Costs (6)
- Post-install failures (5)
- Supply chain delays (4)
- Upheaval (4)
- Planning permission (1)

5.4.1. HES Loan process

Half of the interviewees discussed challenges they faced with regards to the Home Energy Scotland (HES) loan and cashback³. They found the process took a long time and often experienced delays of months. The process was criticised for being slow, clunky, not entirely straightforward, stressful, over technical, obscure and frustrating. Although interviewees were critical of the HES loan, they did all find the HES advisors extremely helpful in the earlier phases of the process. It should be noted that the HES loan process has changed since these participants went through it and these issues could have been addressed in the updated practices.

One participant said: “We tried to get through the loan but they were even slower, they could not adapt their processes for our situation, although the advisors were brilliant, you got constantly bumped into this slow process and they then send you an email asking you to call them, and they don’t answer because they are getting so many calls because of the energy crisis. So, we basically ended up approaching a bank for a loan to pay the costs.”

5.4.2. Installers

Householders faced the following difficulties with the installers:

- Low response rate of installers at quote stage and high variance of estimates (3)
- Mistakes made during installation (3)
- Installers giving quotes without taking measurements (2)
- Installers not wanting to take on an old house retrofit (1)
- Staff kept changing throughout the installation (1)
- Contractors unable to fix issues due to inexperience with the system (1)

³ Home Energy Scotland (HES) administer interest free loans for households to install energy efficiency and renewable technology.

The following are examples interviewees gave us:

- “I probably reached out to something like 14 installers and out of all of that I received 4 quotes. Some installers reached out to say sorry, we're too busy. Some never responded. Some I had an initial conversation with and said OK and they never followed up.”
- “The house needs to be properly investigated and then they need to tell you what size the heat pump should be. To just have these guys saying I can do it and its £x, is nonsense. Research needs to be done. That's the negative part of the industry, they don't want to do that, they just want to give you a price.”
- “Several mistakes were made in the installation. The wrong type of hot water tank was ordered, which could not accommodate our existing solar hot water input, so the tank had to be replaced. That meant another month's delay. Next, the radiator specified for one bathroom was of a size and shape that would not fit behind the door, so a quite different type had to be substituted. They made other mistakes in the installation, including attaching an input and output pipe the wrong way round on the hot water tank, and fitting a pressure release valve incorrectly and potentially dangerously.”

5.4.3. Cost

Six interviewees spoke about cost as being a barrier in their installation journey. Although a minority, it's important to point out that to access the HES loan, interviewees still had to find the money to pay for the system upfront.

An interviewee said: “The financing of it, we weren't planning to do this and so we hadn't budgeted for it. And the HES loan and grant made it possible for us but it wasn't compatible with not having the cash in the bank.’

5.4.4. Post-install failures

Some of the interviewees experienced faults with their system which had to be repaired. Sometimes the installers did not know what exactly was wrong with the system before finally fixing it. The interviewees experienced failed inverters, a broken pump and wrongly installed electrical connections.

An interviewee said: “I've have had quite a lot of issues: it hasn't been keeping the house to the temperature we would have hoped, the water wasn't heating. During May and June they were back three times, turning up the temperature of the water.”

5.4.5. Supply chain delays

Four interviewees experienced delays in their heat pumps arriving. These were due to the significant pressures the supply chain has been under alongside the Covid-19 pandemic.

An interviewee said: “We found it stressful with microchip shortage, there was a short period of uncertainty, we had to be patient.”

5.4.6. Upheaval

Four interviewees found dealing with the disruption during the installation challenging,

however, this was in relation to either insulation or underfloor heating aspects of the installation. Most found it a quick and straightforward process.

An interviewee said: “It was just manic. I was here with my daughters and dog, we had to move the furniture, all the walls had to be done internally, so I had to move everything away from the walls. There was quite a bit of mess, I hadn’t realised how much work it would be.”

5.4.7. Planning permission

One interviewee described the difficulties they faced in placing their heat pump at the front of their property. The householder jumped through the hoops required alongside hiring an architect to provide drawings to the council, but the most difficult part was proving that noise levels would be reasonable. The planning department told the interviewee that they did not know enough about heat pumps to say whether they are noisy or not so requested a noise impact assessment too. Eventually permission was granted.

They said: “In the year of 2023, for the Council Planning Department to tell me ‘we don’t know enough about heat pumps to say that they are not noisy’, when the Heat in Building Strategy is asking for 200,000, I think it was, heat pumps a year, it is nonsense! It’s obscene!”

5.5 Advice to others

Interviewees were asked what they would say to others who are considering installing heat pumps. Most interviewees responded positively (12/20), a smaller proportion shared neutral practical advice and one warned others off. As the literature review supports, early adopters are motivated to overcome barriers and having these recommendations following the number and scale of barriers they encountered provides evidence of the need for extensive reduction of these barriers if application to a wider general public is the goal.

5.5.1. Positive

Most interviewees were positively encouraging of others who wish to install heat pumps. Alongside encouragements, they also offered practical advice such as:

- Make sure to get a good installer
- Understand the controls and flow temperature
- Accept heating system is not a switch on/off like gas
- Focus on insulation
- Remember it’s not cost saving
- Do plenty of research
- Talk to someone who already has a heat pump

The following exemplify how they expressed this:

- “I would say just go for it, especially if you have an older boiler, if you’re looking to upgrade anyway, then just do it. They are a lot more energy efficient than you think.”

- “It’s important to reassure that it really does work. It’s expensive, but if you are investing over the next 10-20 years financially at the very least you are going to break even and in the long term you will benefit. For people who can afford it, even if they are not going to benefit financially, the environment will for sure. They are the ones who should be moving across first, so that the prices become more affordable for the rest of society.”

5.5.2. Neutral

Those who responded neutrally, gave advice and tips:

- Focus on draught-proofing and insulation
- Get calculations and radiator sizing for each room
- Inform yourself on radiators vs. underfloor heating decision
- Beware of running costs
- Use recommended HES installers
- Get lots of advice

An interviewee said: “Focus on draught proofing, it doesn't have to be expensive, but this makes a real difference.”

5.5.3. Negative

Only one interviewee would advise others against getting a heat pump. They said: “Don’t! I don’t know if there’s different types, but some of the [online] groups I’m on, they speak about flow temperatures, I have no idea about anything like that, if I can turn something down. I have no idea. There could be ways of saving money but I don’t know.”

This interviewee had the heat pump installed with the hope of saving money on their energy bills, but this was not achieved both due to the person not understanding the system and how to maximise its efficacy and the increase in energy prices.

5.6 Influencers: people and resources

Interviewees were asked what kind of information they accessed or who they may have spoken to/visited to come to the decision to install a heat pump. These influences and sources of information helped overcome initial concerns and barriers. These were:

- Home Energy Scotland (15)
- Online research (HeatGeek mentioned twice) (9)
- Green Homes Network (3)
- Home building exhibition (2)
- Viewing neighbours/friends heat pump (2)

Home Energy Scotland was praised for their advice and support by many:

- “The HES website gave excellent advice, very well made. It gave advice on selecting the installer, quotes etc. The phone consultation came next, we did it and that was excellent. They knew what they were talking about, gave clear advice, sent the information and forms. That’s all very good.”

- “We had a visit from a very helpful guy from HES, he came very early on and they compiled a report and made recommendations. And he has been a useful contact, I’ve made contact with him 2-3 times and he has always been responsive and helpful.”
- “We have also taken advantage of the interest-free loans for solar PV and EV, which are only available in Scotland. I’m not sure people in Scotland know how fortunate they are compared to the other parts of the UK. I hope they continue.”

5.7 Post-install

Interviewees were asked to share their experiences of living with the heat pumps, once installed. The following themes emerged:

Negative:

- Lack of understanding of the system and operation (13)
- Running costs information lacking (10)
- Noise and hot water availability (2)
- EPC conducted after install lower than previous (1)

Positive:

- Increased thermal comfort (11)

5.7.1. Lack of understanding

Thirteen interviewees (65%) were disappointed in the amount of information the installers provided them with. Many had been told by the installer to not touch the settings, or to call them back if changes needed to be made to them. This means that households who would like more control over their settings, or those who wish to find ways to run their system as efficiently as possible, may be lacking basic comprehension of the system due to a lack of information and knowledge sharing at the point of install. Those who had looked online for impartial information on running heat pumps efficiently could not find reliable sources pertinent to their homes, highlighting a gap in the trusted resources available online. Interviewees said:

- “If I wanted to change the settings I have no idea [how], and the company that put it in, the person was super and ran through it, but it went in one ear and out the other. He said if you want to change anything don’t do anything, just phone me [...] I’ve got friends with air source heat pumps and again they all say don’t touch it.”
- “Although the installation was good, we weren’t provided with any information on how to use it. Because it’s also new to them [the installers] they don’t really know the most useful info to tell you. They install it and tell [you that you] don’t need to do anything and just show you how to change the times. We felt we didn’t have the info to use the system. And we are still learning. I’m constantly looking on Twitter and internet feeds. Scrabbling around looking for information. It feels there is no support for that.”

5.7.2. Increased thermal comfort

Around half of the interviewees talked about the positive aspects they enjoy with their heating systems. These were mainly around the high levels of comfort that heat pumps offer, the constant temperatures and some of the environmental satisfactions mentioned in the motivations section above being realised. Participants said:

- “It goes through a lot of electricity overall, [...] but my consumption has gone down. The main difference is the house is warm whilst with Calor gas (LPG) it was inherently cold.”
- “Using and living a heat pump is absolutely fine, it works. We have thermostats per room and all works beautifully and runs really well.”

5.7.3. Running costs

Around half of the interviewees also shared some information around the running costs compared to their previous systems. As many had installed the heat pumps upon recently moving into a home, comparisons were not always possible. The timing of the interviews (January 2023) also meant that most households interviewed had been experiencing the increase in energy prices. In any case, most interviewees found the heat pump to cost about the same as their previous system:

“The heat pump on its own would have worked out equal. The heat pump is not a way of saving money, just a way to convert from gas to electricity which is a lot greener. It’s not a cost-saving exercise. It’s about equal.”

Those who had installed other low-carbon technologies, like solar PV and batteries, benefited from financial savings:

“The big thing is the economy of it all. My current electricity bill for all the year was £613, that’s because it’s Tesla batteries I have, and I am signed up to the Tesla energy plan. They control the batteries but put electricity into batteries when cheap, which gives them a profit and cheap energy for me. I’ve generated 9MW from the panels.”

5.7.4. Noise and hot water availability

Only two interviewees complained about their heat pumps after the installation. One interviewee found the noise of the heat pump slightly off-putting when the weather gets very cold, and another found the hot water tank not big enough for a family of four if they all showered on the same day. The interviewee who mentioned noise concerns, got used to the sounds whilst the family of four did not look to change water tank size and instead have ensured their showering habits stick to the capacity of the heat pump.

5.7.5. EPC conducted after install lower than previous

Two interviewees complained about the Energy Performance Certificate (EPC) rating done after the installation, which turned out to be lower than the EPC done pre-installation of the heat pump. This issue has been raised by the Climate Change Committee to the Scottish Government in a request to link the EPC rating to the direct emissions of the heating system installed (CCC, 2023).

An interviewee said: “I also found the EPC frustrating, because by changing my heating system to heat pump it devalued my property, we went down from an A to a D rating

because it's an old house. I don't think this is accurate.”

5.8 Process feedback

Since interviewees were briefed that this research was intended to inform Scottish Government, some comments from the interviews were aimed at process improvements, these have been summarised below:

- HES related
 - Improve the HES approved installer database showing which installers do new builds, retrofits, the geographical area they cover and availability
 - Use HES to deliver the room-by-room heat pump design and sizing
 - More adverts on TV about HES
- Improve the knowledge of heat pump installers around insulation and heat loss
- Push for higher building standards (PassivHaus)
- Improve the understanding of Council planning departments knowledge and support of heat pumps
- Focus funding more towards those less affluent
- Improve quality and accessibility of information
- More information around retrofitting (worked examples, guides, the running costs)

6 Pen portraits

As discussed earlier, pen portraits are used in marketing, qualitative research, and segmentation to provide an informal description or profile of a person or group of people. This profile may include traditional demographics like age and income levels but usually focuses on softer dimensions such as attitudes, appearance and lifestyle (The Association for Qualitative Research, 2023).

Five pen portraits were developed based on the interview findings in this research. The five property owner types are described as:

- Settled and hesitant
- Unfamiliar but undeterred
- Unexpected opportunists
- Retired researcher
- Clued up renovator

Each pen portrait describes the situation of the property owner and draws together information on housing type, priorities, initial concerns, the steps of the installation journey, the outcome following installation and how challenges were overcome, including trusted sources of information. At the back of each pen portrait is general information about heat pumps, how they work and where to find more information. The pen portraits can be downloaded as PDF files here

<https://www.climatexchange.org.uk/research/projects/the-experiences-of-early-adopters-of-zero-direct-emissions-heating/>

6.1 Pen portraits graphics

Heat Pump Early Installer: Clued Up Renovator



Installation Journey

After doing her own research Priya phoned Home Energy Scotland to check her plans and apply for their loan.

She contacted installers but some did not want to work on an older home so she had to contact more.

Priya hoped to install solid wall insulation but her rooms were too small for it. She installed underfloor heating instead.

Using a loan meant she had to negotiate with the installer to make sure her loan and install date lined up.

Outcome

Priya now has a modern heating system. Her home feels warmer and it isn't costing her any more than before.

Challenges overcome

Some installers wouldn't work on an older property and a lot of online advice wasn't. It took Priya more time and research to find the right installer and relevant advice for her home, but she got there in the end.

Trusted Sources Home Energy Scotland specialist advisor
Contractor trade show
Independent online research

About Priya

Priya moved into a Victorian property in the city and the heating system needed a serious upgrade. She was getting work done anyway, so it was a good time to make the green choice of installing an air source heat pump to heat her home.

Priya is confident doing a lot of research herself and shopping around for contractors. But she also appreciates a bit of expert know-how to make sure she's heading in the right direction with her choice of technology and the funding opportunities.

Priorities

Staying warm in an older home

Easy-to-use system once installed

Initial concerns

Finding a contractor to work on an older home

Not much technical support for her property

Created by ClimateXChange & Changeworks.

Are you thinking about a heat pump?

Did you know?

- Running costs will depend on how your heat pump is designed and operated. Savings on your energy bill will also depend on the system you are replacing and the levels of insulation and draught proofing in your home.
- You'll need some space outside for your heat pump, installers can often help identify the best location.
- Your existing radiators might be compatible with a heat pump. Depending on their size you might not have to opt for larger radiators, however it's often recommended to make sure you get the most out of your heat pump system.
- You might need to install a hot water tank if your property doesn't already have one.
- Loans and grant schemes can take time to arrive. It's best to plan ahead with any savings or other sources of funding to bridge any potential gaps until they arrive

How does an air source heat pump work?

Put simply, an air source heat pump takes warmth from the air outdoors (even when it's cold outside), heats it up some more, and lets us use that heat indoors. The hot air from the heat pump is then used to heat up water. The water then passes through the pipes in your radiators. It can also heat a hot water tank to provide hot water for your kitchen and bathroom. Your heat pump will still comfortably heat your home even if it is -15 degrees outside.

About terrace buildings

Air source heat pumps work better in homes that are less draughty. You may wish to install additional insulation where possible. An air source heat pump also needs some outside space for components. Terraced homes built before 1919 may require different insulation than ones with cavity walls (typically built after 1920). Contact one of the sources listed to begin the process.

Next steps

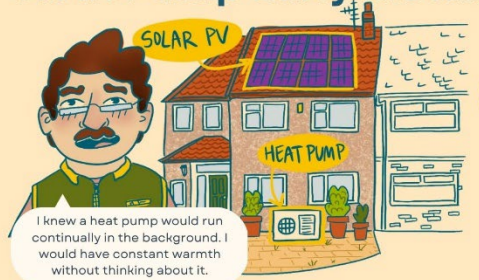
Find information specific to this house type below:

- House Type - Check if a Heat Pump is Suitable for Your Home (www.gov.uk/check-heat-pump)
- Guide to green renovation - Energy Saving Trust

To arrange a home visit or find out more about installing a heat pump, visit Home Energy Scotland [online](http://www.gov.uk) or call **0808 808 2282**



Heat Pump Early Installer: Settled and Hesitant



Installation Journey

Rob phoned Home Energy Scotland to get an expert to spec out a heat pump and solar panels.

He used the Green Home Network to speak to someone who had installed a heat pump. Seeing the system work for their home put some of his fears to bed.

Rob used the MCS certified installer list to find someone to get quotes from.

Rob had to get some extra work done such as new radiators. This made the project quite large but it finished up quickly.

Outcome

Rob's home isn't too hot or too cold - it's just right all the time. He notices it stays warmer for longer and, with the solar panels, they don't always need to buy electricity from the utility.

Challenges overcome

Rob's biggest challenge was the unknowns; Would it be right? Be too noisy? How much would it cost? Speaking to others gave him the confidence to finally install and it worked out in the end.

Trusted Sources Home Energy Scotland advisor
MCS certified installer list
Green Homes Network

About Rob

Rob lives in a semi-detached house in the suburbs with his wife and his two teenage daughters. Because of his job with a renewable technology company, he wanted to move to a greener heating system. He was unsure if a heat pump and solar panels were the right choices for his home in particular.

However, after speaking with Home Energy Scotland and other people who had installed the system, he was relieved to get the right system planned out and hear that it worked for others.

Priorities

Making his home fossil fuel free

A constant, comfortable temperature

Initial concerns

Potential noise

High costs

Created by ClimateXChange & Changeworks.

Are you thinking about a heat pump?

Did you know?

- Running costs will depend on how your heat pump is designed and operated. Savings on your energy bill will also depend on the system you are replacing and the levels of insulation and draught proofing in your home.
- You'll need some space outside for your heat pump, installers can often help identify the best location.
- Your existing radiators might be compatible with a heat pump. Depending on their size you might not have to opt for larger radiators, however it's often recommended to make sure you get the most out of your heat pump system.
- You might need to install a hot water tank if your property doesn't already have one.
- Loans and grant schemes can take time to arrive. It's best to plan ahead with any savings or other sources of funding to bridge any potential gaps until they arrive

How does an air source heat pump work?

Put simply, an air source heat pump takes warmth from the air outdoors (even when it's cold outside), heats it up some more, and lets us use that heat indoors. The hot air from the heat pump is then used to heat up water. The water then passes through the pipes in your radiators. It can also heat a hot water tank to provide hot water for your kitchen and bathroom. Your heat pump will still comfortably heat your home even if it is -15 degrees outside.

About semi-detached buildings

Air source heat pumps work better in homes that are less draughty. If you live in a semi-detached home you're already benefiting from sharing the attached wall with your neighbours. You may want to top up or install insulation in your loft or wall cavities, or install external or internal wall insulation. You should also ensure windows are double glazed, and draught proof to make your home more suitable for a heat pump. Installing solar PV would help supply the heat pump with electricity instead of buying from the grid.

Next steps

Find information specific to this house type below:

- House Type - Check if a Heat Pump is Suitable for Your Home (www.gov.uk/check-heat-pump)
- Guide to green renovation - Energy Saving Trust

To arrange a home visit or find out more about installing a heat pump, visit Home Energy Scotland [online](http://www.gov.uk) or call **0808 808 2282**



Heat Pump Early Installer: Unexpected Opportunists



We wanted a sustainable heating source because this is where we're settling down. There's a lot of potential to put solar or a battery in, too.

About Marta

Marta recently moved into a converted steading with her partner and child. She always had a long term plan to make her home greener. But recently they found out their gas system was faulty and needed disconnecting immediately.

Although not ideal timing, this was a good opportunity to move forward her green home plans. A heat pump was a good replacement option as they already had lots of insulation. At the time, Marta didn't have the time to get other works like radiators but she's planning to do so later.

Priorities

- Having a modern heating system
- Having an expert to guide her on the journey

Initial concerns

- Potential noise
- Install taking too long

Installation Journey

Marta didn't have time to research or have a home visit from Home Energy Scotland. So she relied on advice from family members who had heat pumps to guide her.

She phoned around a lot of installers to find one who could work on such short notice. Luckily she found someone understanding of the situation who expedited things for her.

Marta had to use different sources of funding to make sure she could bridge the gaps and pay installers on time.

She was worried about a long and disruptive install but was surprised how quick and smoothly it went by instead.

Outcome

Marta's heat pump was installed quickly so she wasn't left without heating. She's surprised how quiet it is, even right next to the nursery it doesn't bother her baby at all.

Challenges overcome

Tight timelines made it challenging to find bank loans. She was fortunate enough to be able to rely on savings to bridge the gap until her Home Energy Scotland loan arrived. But if she were to do it again, she'd have planned ahead with other funding sources.

Trusted Sources

Home Energy Scotland advisor
MCS accredited installers list
Green Homes Network

Created by **ClimateXChange & Changeworks.**

Are you thinking about a heat pump?

Did you know?

- Running costs will depend on how your heat pump is designed and operated. Savings on your energy bill will also depend on the system you are replacing and the levels of insulation and draught proofing in your home.
- Your existing radiators might be compatible with a heat pump. Depending on their size you might not have to opt for larger radiators, however it's often recommended to make sure you get the most out of your heat pump system.
- You might need to install a hot water tank if your property doesn't already have one.
- Loans and grant schemes can take time to arrive. It's best to plan ahead with any savings or other sources of funding to bridge any potential gaps until they arrive
- Ground source heat pumps are even more efficient than air source heat pumps, meaning you can be just as warm while using less electricity

How does a ground source heat pump work?

Put simply, a ground source heat pump takes warmth from the ground outside your home to heat the water that goes through your radiators or underfloor heating. It can also heat water stored in a hot water cylinder for your hot taps and showers. You can dig trenches or one deep borehole to get warmth from the ground.

About bungalows

Ground source heat pumps are a very efficient source of heat and work better in homes that are less draughty. You will need some area of garden or land to install the GSHP. If you live in a bungalow, you may want to top up or install insulation in your loft or wall cavities, or install external or internal wall insulation. You should also ensure windows are double glazed, and draught proof to make your home more suitable for a heat pump. Installing solar PV would help supply the heat pump with electricity instead of buying from the grid.

Next steps

Find information specific to this house type below:

- House Type - Check if a Heat Pump is Suitable for Your Home (heat-pump-check.service.gov.uk)
- Guide to green renovation - Energy Saving Trust

To arrange a home visit or find out more about installing a heat pump, visit Home Energy Scotland online or call **0808 808 2282**



Heat Pump Early Installer: Retired Researcher



I've become a grandfather recently and I feel like I have a responsibility to decarbonise. I'm very very happy with my set up and my brother is even spying what I've got.

About Donald

Donald is a retired engineer, living in a 1980s bungalow with his wife. He's recently installed solar panels, a battery, and an air source heat pump to make his home more environmentally friendly. As he's retired, Donald has lots of time to do thorough research to make sure the system is right for his home and likes collecting data on the performance of his new systems.

Donald's wife has dementia, and he wants his house to be warm and comfortable for her. It's important that the new system works for them and the installers understand their situation.

Priorities

- Making the low carbon choice for his family
- Keeping his home warm for a family member

Initial concerns

- Negative stories he'd heard in the news
- System wouldn't be as efficient as promised

Installation Journey

Donald did his own research of the technology then called Home Energy Scotland and spoke with a specialist.

He looked at quotes from different installers and investigated the Renewable Heat Incentive with Home Energy Scotland.

Donald needed an installer to work around his wife's needs. He found one through personal connections.

Once installed he looked at the system with the installer and monitored its performance to get the most out of it.

Outcome

Donald has a system that keeps his home comfortable for his wife and it's saving them money on their energy bills.

Challenges overcome

Donald wasn't sure that the system would be as efficient as it promised. He found getting clued up on how his system worked and how he could keep it running optimally gave him the confidence that he was getting the most out of his new set up.

Trusted Sources

Home Energy Scotland advisor
Heat Geek Website

Created by **ClimateXChange & Changeworks.**

Are you thinking about a heat pump?

Did you know?

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About bungalows

Air source heat pumps work better in homes that are less draughty. If you live in a bungalow, you may want to top up or install insulation in your loft or wall cavities, or install external or internal wall insulation. You should also ensure windows are double glazed, and draught proof to make your home more suitable for a heat pump. Installing solar PV would help supply the heat pump with electricity instead of buying from the grid.

Next steps

Find information specific to this house type below:

- House Type - Check if a Heat Pump is Suitable for Your Home (www.gov.uk/check-heat-pump)
- Guide to green renovation - Energy Saving Trust

To arrange a home visit or find out more about installing a heat pump, visit Home Energy Scotland online or call **0808 808 2282**



Heat Pump Early Installer: Unfamiliar but Undeterred



We relied on the coal fire and LPG gas for heating and it was always cold. The main difference now is the house is warm.

About Catriona

Catriona is retired and lives in her rural Highlands bungalow with her dog Hamish. She's always used coal and LPG gas to heat her home, but it still felt cold. She's part of her local environmental group and wanted to switch to a ground source heat pump.

After speaking with her neighbours, she had faith in the technology and was happy to leave the planning and details to the experts. The most important thing for Catriona was that she finally made the move away from fossil fuels after all these years.

Priorities

- Making the sustainable choice
- Staying warm

Initial concerns

- Not understanding the technical side
- Heating an older property

Installation Journey

Catriona knew switching her heating system was the right decision. She phoned Home Energy Scotland to get a home visit and plan her journey out.

With an older house, she was recommended to get more loft insulation by her Home Energy Scotland advisor.

Catriona used HES recommended installers to find someone to give her a quote. To simplify the process she chose a contractor who could do all the works in-house.

She found the system confusing so she paid the installer to be able to control it remotely and change as needed.

Outcome

Catriona's house feels much warmer. Her system still uses electricity but she's using less than before because it's more efficient. She's proud that she's moved away from fossil fuels.

Challenges overcome

Catriona knew she wasn't an expert but finding an installer and advisor she could trust meant she didn't have to worry if she wasn't sure about her system set up. Although she doesn't understand it fully, she's still very happy with her warm home.

Trusted Sources Home Energy Scotland specialist Advisor and home visit
Speaking to neighbours with the same system

Created by **ClimateXChange & Changeworks.**

Are you thinking about a heat pump?

Did you know?

- Running costs will depend on how your heat pump is designed and operated. Savings on your energy bill will also depend on the system you are replacing and the levels of insulation and draught proofing in your home.
- Your existing radiators might be compatible with a heat pump. Depending on their size you might not have to opt for larger radiators, however it's often recommended to make sure you get the most out of your heat pump system.
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About bungalows

Ground source heat pumps are a very efficient source of heat and work better in homes that are less draughty. You will need some area of garden or land to install the GSHP. If you live in a bungalow, you may want to top up or install insulation in your loft or wall cavities, or install external or internal wall insulation. You should also ensure windows are double glazed, and draught proof to make your home more suitable for a heat pump. Installing solar PV would help supply the heat pump with electricity instead of buying from the grid.

Next steps

Find information specific to this house type below:

- House Type - Check if a Heat Pump is Suitable for Your Home (heat-pump-check.service.gov.uk)
- Guide to green renovation - Energy Saving Trust

To arrange a home visit or find out more about installing a heat pump, visit Home Energy Scotland online or call **0808 808 2282**

climateXchange **CHANGWORKS**

6.2 Pen portrait testing

6.2.1. Findings

Fieldwork took place between 24 and 28 March 2023 with a total sample size of 254 taking part in the survey. Details of the sample demographics are shown in Figure 3, illustrating the wide range of ages, life stages and social groups taking part. The sample also included people living in a variety of urban and rural locations (26% in a large town or city, 32% in the outskirts of a town or city, 27% in small towns and 15% in more rural area/countryside).

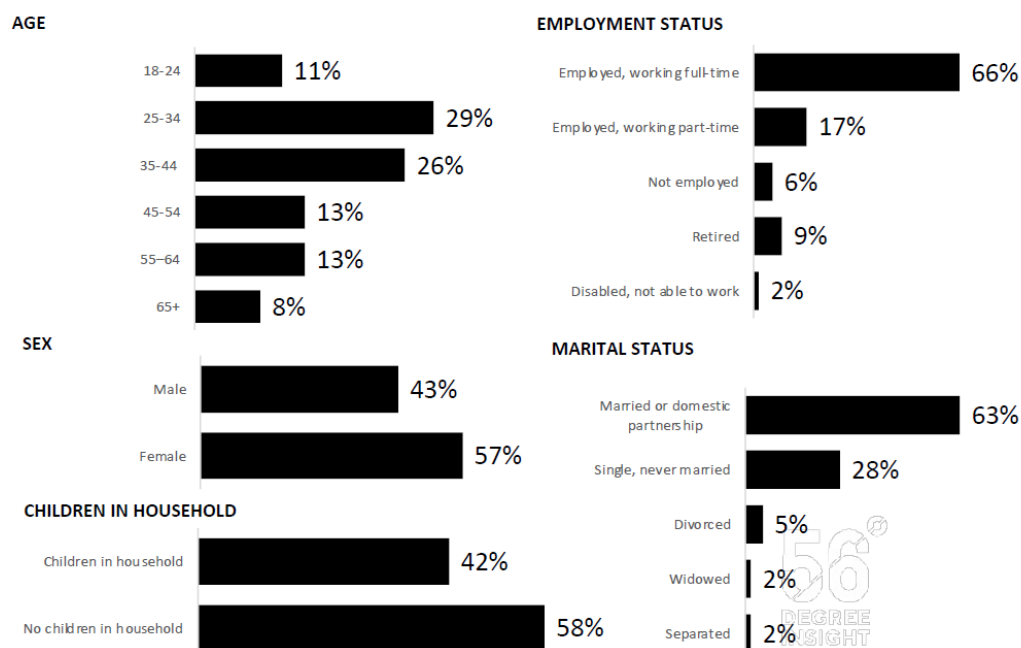


Figure 3. Demographics of Pen Portrait testing participants. From 56 Degree Insight.

Main feedback from the testing:

- When asked which pen portrait(s) best reflected their own situation and were most relatable, 'Settled and hesitant' or 'Unfamiliar but undeterred' were the most chosen first or second choices.
- Many respondents indicated the back page provided clear, detailed, accessible information that accompanied the front page well.
- 15 per cent stated that they could not relate to any of them but were still asked to reflect on the portraits in general.
- The most positive ratings were given to 'information is clear', 'usefulness' and 'the level of detail provided'. However, with half providing a rating of 3 or less, 'relevance to you' received the lowest overall rating (all data provided in full report).

6.2.2. Pen portrait preferences

Below are the responses to the questions:

"Which one of these pen portraits best reflects how you feel about the installation of a heat pump and is the easiest for you to relate to? And which of these, if any, is your second preference when you consider how you feel about the installation of heat pumps?"

Table 1: Pen portraits participants identified with

	Settled and hesitant	Unfamiliar but undeterred	Unexpected opportunists	Retired researcher	Clued up renovator	Cannot relate to any of them
1 st choice	31%	26%	14%	7%	7%	
2 nd choice	24%	15%	21%	9%	8%	
Total	55%	41%	35%	16%	15%	15%

6.2.3. Ranking of sections in the portraits

Although most respondents chose high levels of likelihood to install insulation and draught proofing to improve efficiency in the future, the respondents who identified with the ‘clued up renovator’ portrait reported they were likely to, or have already, installed a heat pump or solar panels. In terms of motivations for action, those who associated with ‘Unfamiliar but undeterred’ were more likely to want to reduce their impact on the environment while those who chose ‘Clued up renovator’ were more likely to hope to avoid temperature swings in their home.

With the results averaged across all five pen portraits, the pen portrait content sections on initial concerns, priorities and the installation journey were ranked as the most useful and engaging sections. The section on trusted sources was ranked least engaging and/or useful, see figure 4 below.

Table 2. Ranking of sections for Pen Portrait. From 56 Degree Insight.

Ranking (1=most engaging/useful)	Content section	Average ranking
1	Initial concerns	2.8
2	Priorities	2.8
3	Installation journey	3.3
4	‘About’ description	3.6
5	Outcome	4.0
6	Trusted sources	4.5

Comments, both negative and positive, from the top two pen portrait choices (‘Settled and hesitant’, ‘Unfamiliar but undeterred’) are detailed below. The testing specifically asked participants for the things they liked the most and the least about the portraits. Overall participants provided more positive than negative feedback. An equal number of examples of positive and negative feedback is provided here to give a flavour of the comments.

Settled and hesitant: What did you like the most about this pen portrait?

- “I like the graphics and how they are clearly broken up to make it easily understandable.”
- “It showed the steps and the outcome while making it personable.”
- “Matches my thoughts”
- “The installation journey is easy to follow and clearly laid out.”
- “I like the colours and the images used. I like the priorities and initial concerns lists. He seems like he lives in a similar way to us. Settled and happy and not wishing to make many changes. Doesn’t know enough about it all to confidently go for it.”

- “The colouration makes it more interesting and captivating. It helps drive home the story”
- “Colourful, easy to read layout, use of graphics”
- “I like that it is personalised with a customer name and clearly lays out both good points and challenges. I particularly like the outcome in green and how it means buying electricity isn’t always necessary after installation”
- “Rob looks very relatable. I like the journey idea and that it sets out his priorities”

Settled and Hesitant: What, if anything, did you like the least about this pen portrait?

- “There is a lot of text in the flyer, perhaps this can be condensed to make the most important parts stand out more”
- “It is a lot of information in one place so you really have to want to read it”
- “The ‘about Rob’ is very wordy and the text isn’t the clearest.”
- “About Rob – it is a good idea but if the person is real not a drawing”
- “The gentleman in the picture could be more suitable; a happier expression or use of women and children also.”
- “Images too childlike, need to be more mature/professional”
- “I don’t like that cost is not mentioned as in the current climate that is the deciding factor”
- “No actual costs except says ‘high’”

Unfamiliar but undeterred: What did you like most about this pen portrait?

- “I love the pictorial representation and colours. The different colours on text highlight the importance of each write up. I love how bold the trusted sources appear”
- “Good layout, lots of colours and easy to read”
- “She’s like me, she doesn’t understand the technical side”
- “The easy-to-read graphics, mix of text and graphic/ image”
- “Heating older property”
- “Easy to read. Colourful”
- “Don’t need to research too deep”
- “The ‘journey’ section is easy to follow and clearly written. The illustrations are nice.”
- “There is quite a lot of information, but I liked the summaries under the headings and the journey and outcome”
- “I could relate to this; I am also not sure how this works, but I am interested in the system”
- “Trusted sources, the fact there are others like me that have no idea”

Unfamiliar but Undeterred: What, if anything, did you like least about this pen portrait?

- “Not sure about the look of Catriona”
- “The face of the guy (not a friendly looking image)”⁴
- “Too one sided”
- “What I don’t like is how much this all costs. It sounds all very expensive and times are very hard, and money is tight.”
- “70s UK government cartoon feel”
- “The long descriptions - do bullet points”
- “Not sure about the colour scheme and there is a lot of text”
- “Doesn’t give the actual websites I need to go look at”

⁴ Edits to the illustration were made to address this comment, which are reflected in the updated pen portrait files included with this report.

- “The drawing looks childish and not really targeted toward adults who are the people who would be investing in the stuff being talked about.”

The back pages were highly regarded and received positive comments relating to the level of detail and usefulness of the information provided, its clear layout and how it builds upon the initial details on the front page. Some quotes, both positive and negative, are below:

- “It is very informative and includes really useful details that I was not aware of before.”
- “It has loads of details provided that make it seem more credible and informative.”
- “Makes me worried that I will have to do more to my home eg windows, insulation etc to make it worthwhile, so this puts me off.”

7 Conclusions and recommendations

Findings from the literature review and interviews, and insights from the pen portrait testing, offer insights on motivations that helped participants overcome obstacles and recommendations for enabling increased adoption of ZDEH systems. This highly motivated group reported encountering and overcoming numerous barriers and obstacles through their experience installing a ZDEH system.

7.1 Early adopters/ Innovators

Changeworks conducted 20 interviews over the course of this research. The participants' experiences echo evidence found in research regarding innovators/early adopters having higher than average access to resources such as knowledge and time for research (participants reported having the time/resources to perform online extensive research), technical skills and experience (many participants were in environmentally related careers), and knowledgeable networks (participants sought out advice and information from their networks). Due to responses and supporting evidence from the literature review, participants were also presumed to possess above average income or wealth as they were all homeowners that had purchased ZDEH (and often additional renewable energy and battery) systems.

This formidable ability to overcome the barriers mentioned in the findings above and commitment to complete installation are not qualities that the wider public will most likely possess, which leads to the need to address and reduce these barriers wherever possible across the entire ZDEH acquisition process from initial information gathering to post-installation instruction.

As prior research and ongoing peer ZDEH energy projects by NESTA and Energy Savings Trust have identified, the Government could utilise innovators/early adopters in the next phase of the diffusion process as trusted intermediaries for the later early adopters and early majority groups. Findings from the literature review show trusted intermediaries/peers can have significant influence on people's interest in and decision to adopt ZDEH and renewable energy systems. This could take the form of a structured peer digital database network like the Green Homes Network or a more informal online structure or forum. Utilising this group could include straightforward recruitment/sign up during HES involvement or installer leverage point interaction with opt out automatic sign up to help increase participation.

7.2 Information provision

A recurring theme that participants discussed was the overall challenge in finding credible sources for critical information, which aligns with findings citing a lack of reliable information as a barrier to heat pump adoption. Households relayed how they had to filter through an abundance of erroneous information regarding heat pumps and would have appreciated a trusted source. The back page of the pen portraits was designed to provide a wide array of basic information about heat pumps and compatibility for households and was received very positively by a large majority of testing participants.

To support and enable both the general public and early adopters in their journeys, a comprehensive portal allowing access to clear information across the install journey from pre-install (information provision on what a heat pump is/does and financing) to contacting trusted installers to post install, would be beneficial. The Scottish Government could support the development of a centralised solution, which allows for more locally relevant content, to support the entire install journey.

www.climatexchange.org.uk

7.3 Renovation/ life stage opportunity

Life stages and home upgrade renovations were cited by participants as opportunities to have ZDEH and renewable energy systems installed. Although some participants spoke of being predisposed to ZDEH and renewable technology, others were unsure of the low-carbon steps they should take, yet knew they wanted to take advantage of the home renovation or move.

Whether these home upgrades were planned (addition) or unplanned (heating system needed replacement), the opportunity exists for the Government to leverage these moments to promote further ZDEH adoption amongst the general public.

7.4 Post installation/ handover consistency

Installer handover and inconsistency in system operation information were often commented on by participants. Many spoke of little or no information provision on how the system was to be operated or they were often instructed to not touch it. Most participants had already done extensive research on their own, so inconsistent information was not a major issue for them, yet also spoke of issues in understanding the differences in the heating regime between their former systems and the heat pump. Less knowledgeable adopters (eg general public) will likely need clear consistent information to avoid system inefficiencies and failure.

The Government could provide or encourage a standardised level of handover information and operation instruction for ZDEH systems to be provided by installers or utilise an existing standard (PAS 2035). The Government could provide information on the differences between operating a gas boiler and a heat pump to prime and familiarise households. This information could be provided for initial interest and engagement as well as at the handover stage, to leave households with trusted operating information.

7.5 Process improvements

Participants also discussed the difficulty they experienced with HES loan processing as a possible barrier for future adopters. Most had to learn about the HES loan through online research or from a trusted intermediary or peer. They commented that the loan process was far too complicated and required simplification.

Receiving the payment from the loan at the end of the process was also very inconvenient. It was difficult for those without the necessary upfront financial resources that they could not access the loan funds until the job was completed. The Government could initiate changes to the HES loan to allow for a payment plan to installers from HES to reduce the burden on households and encourage low-income households to take part. The Government could also promote the HES loan to a wider audience to increase awareness.

Participants also discussed difficulties finding an installer in their own area, having to call numerous companies and be turned down. A map or geographic-based database of available and working installers in specific areas (and possibly recommended or certified like MCS) could alleviate these issues and make information more accessible.

7.6 Suggestions for future research

The following are suggested as future research areas:

- Feasibility and appropriateness of heat pumps in flats, both modern and legacy tenures like tenement flats, which are underrepresented in ZDEH adoption and adaptation.
- Peer learning and adoption of ZDEH technology. Does the neighbourhood effect apply to ZDEH systems? Are there methods to make ZDEH more visible for the possibility of normative influence?
- Information provision and myth busting through trusted community intermediaries such as service industries (barbers, pubs) and community organisations (churches, community groups).
- The requirement for both training and materials provision of supply chain stakeholders (eg installers, sales) to provide consistent and trustworthy handover information and instruction to households.
- Existing prevalence of myths and negative press regarding heat pumps and comparison with accurate sources and news articles.

8 References

- Ashkenaz, A. (2022) 'Heat pump horror: Britons facing 'significant jump' as gas alternative to cost £2,000 more', *Express*, 24 September. Available at: <https://www.express.co.uk/news/science/1672977/heat-pumps-cost-increase-inflation-gas-alternative-bills-soar-energy-crisis> (Accessed: 31 March 2023).
- Association for Qualitative Research (no date). "Pen portrait". Online: <https://www.aqr.org.uk/glossary/pen-portrait>
- BEIS. (2021). Innovation requirements for the deployment of heat pumps in the UK (online webinar and workshop hosted by BEIS, 11th May 2021)
- Brown, Marilyn A., Snehal Kale, Min Kyeong-Cha, and Oliver Chapman. "Exploring the willingness of consumers to electrify their homes." *Applied Energy* 338 (2023): 120791.
- CCC. (2023) "Reform of domestic EPC rating metrics to support delivery of Net Zero". Online: <https://www.theccc.org.uk/wp-content/uploads/2023/02/CCC-Letter-Reform-of-domestic-EPC-rating-metrics-to-Patrick-Harvie-MSP.pdf>
- Changeworks. "West Linton & District Heat Pump Pilot", Unpublished report, 2022. Access available on request.
- Dato, Prudence. "Investment in energy efficiency, adoption of renewable energy and household behavior: Evidence from OECD countries." *The Energy Journal* 39, no. 3 (2018).
- De Wilde, Mandy. "The sustainable housing question: On the role of interpersonal, impersonal and professional trust in low-carbon retrofit decisions by homeowners." *Energy Research & Social Science* 51 (2019): 138-147.
- Decuyper, Robbe, Ben Robaeyst, Liselot Hudders, Bastiaan Baccarne, and Dieneke Van de Sompel. "Transitioning to energy efficient housing: Drivers and barriers of intermediaries in heat pump technology." *En (Scottish Power 2022) Energy policy* 161 (2022): 112709.
- Dedehayir, Ozgur, Roland J. Ortt, Carla Riverola, and Francesc Miralles. "Innovators and early adopters in the diffusion of innovations: A literature review." *International Journal of Innovation Management* 21, no. 08 (2017).
- Energy Saving Trust (2022) "Why are energy bills going up?". Online: https://energysavingtrust.org.uk/why-are-energy-bills-going-up/?gclid=EAlaIqobChMl_pmB9Iaz_gIVB-3tCh2W2g_wEAYASAAEgIofD_BwE
- Energy Saving Trust (no date) "Green Homes Network". Online: <https://energysavingtrust.org.uk/tool/green-homes-network/>
- Energy Systems Catapult and NESTA. "How to Heat Scotland's Homes An analysis of the suitability of property types in Scotland for ground and air source heat pumps." Online, 2021. <https://es.catapult.org.uk/report/how-to-heat-scotlands-homes/>
- Gram-Hanssen, Kirsten, Nina Heidenstrøm, Gunnar Vittersø, Line Valdorff Madsen, and Mette Hove Jacobsen. "Selling and installing heat pumps: influencing household practices." *Building Research & Information* 45, no. 4 (2017): 359-370.
- IEA (2022) "The Future of Heat Pumps". Online: <https://www.iea.org/reports/the-future-of-heat-pumps>
- Ipsos (2022) "Majority of Scots are concerned about climate change and are aware of its risks to Scotland". Online: <https://www.ipsos.com/en-uk/majority-scots-are-concerned-about-climate-change-and-are-aware-its-risks-scotland>
- Ireland National Housing Survey (2018) "National Household Survey". Online: <https://www.ilo.org/surveyLib/index.php/catalog/7675/related-materials>

Lingard, Joseph. "Residential retrofit in the UK: The optimum retrofit measures necessary for effective heat pump use." *Building Services Engineering Research and Technology* 42, no. 3 (2021): 279-292.

Liu, Shuli, Ashish Shukla, and Yaqin Zhang. "Investigations on the integration and acceptability of GSHP in the UK dwellings." *Building and environment* 82 (2014): 442-449.

Martiskainen, Mari, and Benjamin K. Sovacool. "Mixed feelings: a review and research agenda for emotions in sustainability transitions." *Environmental Innovation and Societal Transitions* 40 (2021): 609-624.

Martiskainen, Mari, Johan Schot, and Benjamin K. Sovacool. "User innovation, niche construction and regime destabilization in heat pump transitions." *Environmental Innovation and Societal Transitions* 39 (2021): 119-140.

MCS (2023) *MCS Data Dashboard*. Online:
<https://certificate.microgenerationcertification.org/>

MCS (2021) "Addressing the key barriers to widespread heat pump adoption: a response to BEIS". Online: <https://mcscertified.com/addressing-the-key-barriers-to-widespread-heat-pump-adoption-a-response-to-beis/#:~:text=Addressing%20the%20key%20barriers%20to%20widespread%20heat%20pump,widespread%20heat%20pump%20adoption%20as%20described%20by%20BEIS.>

Meles, Tensay Hadush, and Lisa Ryan. "Adoption of Renewable Home Heating Systems: An Agent-Based Modeling of Heat Pump Systems in Ireland." (2020).

Met Office (2022) "December 2022". Online:
https://www.metoffice.gov.uk/binaries/content/assets/metofficegovuk/pdf/weather/learn-about/uk-past-events/summaries/uk_monthly_climate_summary_202212.pdf

Mukherjee, Sanghamitra Chattopadhyay, Tensay Hadush Meles, Lisa Ryan, Séin Healy, Robert Mooney, Lindsay Sharpe, and Paul Hayes. Renewable energy technology uptake: Public preferences and policy design in early adoption. No. WP20/04. UCD Centre for Economic Research Working Paper Series, 2020.

NESTA. "Heat Pump Show Homes" Online, 2022. <https://www.nesta.org.uk/project/heat-pump-show-homes/>.

Neves, Joana, and Tiago Oliveira. "Understanding energy-efficient heating appliance behavior change: The moderating impact of the green self-identity." *Energy* 225 (2021): 120169.

Nygrén, Nina A., Panu Kontio, Jari Lyytimäki, Vilja Varho, and Petri Tapio. "Early adopters boosting the diffusion of sustainable small-scale energy solutions." *Renewable and Sustainable Energy Reviews* 46 (2015): 79-87.

Olivia Chapman, Chrystalla Kapetaniou and Madeleine Gabriel. "Decarbonising homes: Consumer attitudes towards energy efficiency and green heating in the UK" Online, 2021. <https://www.nesta.org.uk/report/decarbonising-homes-consumer-attitudes/>

Outcault, Sarah, Angela Sanguinetti, and Leslie Nelson. "Technology characteristics that influence adoption of residential distributed energy resources: Adapting Rogers' framework." *Energy Policy* 168 (2022): 113153.

Owen, Alice, Gordon Mitchell, and Rachael Unsworth. "Reducing carbon, tackling fuel poverty: adoption and performance of air-source heat pumps in East Yorkshire, UK." *Local Environment* 18, no. 7 (2013): 817-833.

Palm, Alvar. "Peer effects in residential solar photovoltaics adoption—A mixed methods study of Swedish users." *Energy Research & Social Science* 26 (2017): 1-10.

Palm, Alvar. "Early adopters and their motives: Differences between earlier and later adopters of residential solar photovoltaics." *Renewable and Sustainable Energy Reviews* 133 (2020): 110142.

Parag, Yael, and Kathryn B. Janda. "More than filler: Middle actors and socio-technical change in the energy system from the "middle-out"." *Energy Research & Social Science* 3 (2014): 102-112.

Peñaloza, Diego, Érika Mata, Nathalie Fransson, Håkan Fridén, Álvaro Samperio, Ana Quijano, and Alessandra Cuneo. "Social and market acceptance of photovoltaic panels and heat pumps in Europe: A literature review and survey." *Renewable and Sustainable Energy Reviews* 155 (2022): 111867.

Philippe Bujold and Madhuri Karak. "To Scale Behavior Change: Target Early Adopters, Then Leverage Social Proof and Social Pressure" Online, 2021. <https://behavioralscientist.org/to-scale-behavior-change-target-early-adopters-then-leverage-social-proof-and-social-pressure/>

Prestridge, J. (2023) 'How heat pumps leave some homes so cold people are ripping them out - and even happy owners urge caution: Is the plan to replace our boilers wise?', *This is MONEY*, 7 March. Available at: <https://www.thisismoney.co.uk/money/bills/article-11830589/How-heat-pumps-leave-homes-cold-owners-having-ripped-out.html> (Accessed March 31 2023).

Rogers, Everett M. 'Diffusion of Innovations'. Simon and Schuster, 2010.

Santander. "Buying into the Green Homes Revolution" Online, 2022. https://www.santander.co.uk/assets/s3fs-public/documents/buying_into_the_green_homes_revolution_report.pdf

Scottish Government. (2021) *Heat in Buildings Strategy*. Available at: <https://www.gov.scot/publications/heat-buildings-strategy-achieving-net-zero-emissions-scotlands-buildings/pages/2/#:~:text=This%20Strategy%20outlines%20the%20steps%20we%20will%20take,water%20heating%20in%20homes%2C%20workplaces%20and%20community%20buildings.>

Scottish Power and WWF. "Better Homes, Cooler Planet - How low-carbon technologies." Online, 2022. <https://www.scottishpower.com/userfiles/file/Better%20Homes%2C%20Cooler%20Planet%20-%20Web%20Report%20-%203%20August%202022.pdf>

Valor, Carmen, Paolo Antonetti, and Benedetta Crisafulli. "Emotions and consumers' adoption of innovations: An integrative review and research agenda." *Technological Forecasting and Social Change* 179 (2022): 121609.

Wolske, Kimberly S., Kenneth T. Gillingham, and P. Wesley Schultz. "Peer influence on household energy behaviours." *Nature Energy* 5, no. 3 (2020): 202-212.

Zaunbrecher, Barbara S., Katrin Arning, Julian Halbey, and Martina Ziefle. "Intermediaries as gatekeepers and their role in retrofit decisions of house owners." *Energy Research & Social Science* 74 (2021): 101939.

9 Annex 1 Methodology - Search terms

SEARCH TERMS (for Early Adopters of Heat Pumps and ZDEH)

Early Adopters

OR

Owner Occupiers
Domestic
Able to pay
Householder Innovators
Adoption
Early adopter segment
Consumer behaviour

+

Heat pump

OR

Zero direct emissions heating (ZDEH)
Home/Household Heating
Low carbon heat

+

Scotland

UK

(Other comparable countries if literature is scarce)

+

Residential

OTHER TERMS (Motivations, influence etc)

Customer Journey

+

Motives

OR

Reasoning
Decision making

+

Willingness to adopt

OR

Segmentation
Lived experience
Barriers
Expectations

ENERGY EFFICIENCY RETROFIT

Fabric first
Insulation
Energy efficiency
Retrofit
Home energy upgrade

10 Annex 2 Glossary

Term	Definition
Able to pay	People who are willing and able to pay for a measure
ASHP	Air Source Heat Pump
Building stock	The collection of buildings in a city or region
EPC	Energy Performance Certificate
Fabric efficiency	How energy efficient the building itself is, impacted by draughtiness and levels of insulation.
Fabric first	Refers to the approach of making sure the building itself is efficient before upgrading anything else
EPC	Energy Performance Certificate: a rating scheme to summarise the energy efficiency of buildings. EPCs are mandatory when buying or selling property.
Heating regime	The temperature and amount of time a heating system is programmed for.
HES	Home Energy Scotland: regionally-based advice centres across Scotland that advise on energy efficiency, thermal comfort, Scottish Government funding, renewable energy, sustainable travel, and water waste.
HiBS	Heat in Buildings Strategy – Sets out the Scottish Government’s vision for the future of heat in buildings, and the actions we are taking in the buildings sector to deliver our climate change commitments, maximise economic opportunities, and ensure a just transition.
Owner occupier	A person who owns the flat or house they live in.
Passivhaus	Passivhaus is a building energy efficiency standard that provides a high level of occupant comfort using very little energy for heating and cooling.
Pen portrait	An informal description of a person or group of people - this may cover age and other 'hard' variables, but will focus on softer dimensions such as attitudes, appearance and lifestyle.
Retrofit	Fitting physical measures to an existing building, such as insulation, to reduce the amount of energy it consumes.
ZDEH	Zero direct emissions heating, a heating system that produces no emissions where it is used.

11 Annex 3 Interview guide and recruitment email

Aims of interview

- Motivations, barriers, and challenges
- Solutions and enablers to challenges
- Awareness (and if applicable satisfaction) of Scottish Government funding and advice services
- Post-installation experiences (satisfactions, lessons, challenges)
- Possibility of segmentation utilising motivations/preferences/attitudes/knowledge etc.
- Literature review gaps (any reported influence from intermediaries like heating technicians, social group, church friends, family etc))

INTRODUCTION

- Introduce:
 - **Yourself**
 - **Changeworks:** are an environmental charity who specialise in energy and fuel poverty. I work within the consultancy department and carry out research such as this project.
 - **The project: We are researching the experience of households in Scotland that have already been on the decarbonisation journey (ex: installed a heat pump and related home efficiency upgrades). Your experience will help the government understand how to better engage with households at various points along the heat pump customer journey. This is to help inform Scottish Government's work on future decarbonisation regulations.**
- About the interview:
 - The interview will last around 35-45 mins
 - It is anonymous and confidential – we will not use your name in any of the reporting. But we would like to share your story anonymously and use quotes from what you say as well as where you are based. Is this ok with you?
 - I have a list of questions which we will go through and then you will have an opportunity to add anything else at the end.
 - At the end of the interview, I will ask for your details so that I can send you the £35 voucher as a thank you
 - Does that all sound ok to you? Do you have any questions?
- Thank you for agreeing to take part today.
- Finally, are you ok for me to record the interview? This is to ensure we have a record of what you have said but will only be used internally and will not be shared with any other organisation.
- *Once recording on:* re-confirm that they are ok with data protection statement

QUESTIONS

- 1) Could you start by telling me a little about yourself and your household?
prompts: where do you live, how many people live in the household, do any of you work (full time/ part time), how long have you owned in this home, type of heating system and house type.
- 2) What led you to installing a heat pump?
- 3) Did you find any help and support at this initial stage? *(if yes ask who)*
- 4) Before starting your installation journey, what were your main concerns?
- 5) And what were your hopes/expectations?

- 6) Now could you describe to me the process you went through to complete the installation of x?
 - First thinking of changing heating system
 - Planning/quotes/organisation
 - Installation
 - Post-installation
- 7) What were the biggest challenges? *(for each make sure interviewee talks of how they resolved them)*
- 8) Were you aware of any funding? Did you apply/use any?
 - *(if yes to having used funding)* How did you find the process?
- 9) How long have you had x in your home now?
- 10) Could you share your main satisfactions and dissatisfactions with using/living with it?
- 11) Is there anything that has surprised you?
- 12) Has the installation of x had any impact on your energy bills?
- 13) Do you think the installer provided adequate guidance/information/instruction for x?
- 14) What guidance or information would you have liked to receive that you did not?
- 15) Had you ever seen a working heat pump before installing one? If not – do you think this would have been useful?
- 16) In thinking back on your entire journey from first thinking about getting a heat pump to having it heat your home, can you think of anything that could have made your journey easier?
- 17) What one thing would you say to someone else thinking of having a heat pump installed?

Additional comments

- Lastly, do you have any further comments you would like to add?
 - Do you know of anyone else who might be available to be interviewed for this project?
 - Ask for email address for (Love2Shop) voucher and if ok with digital voucher to spend online or needs a paper one. If paper then ask for house address.
 - Can we contact you if needed for clarification on any points?
 - We might be following up with a few interviewees to become case studies for SG, would you be interested?
- Interviewer to provide participant with their contact details.
-

Recruitment email

We need your help with a Scottish Government research project about heat pumps. The research is funded by ClimateXChange and is being carried out by Changeworks. Changeworks are Scotland's leading environmental charity delivering solutions for low carbon living. A trusted expert with over 35 years' experience. You will receive a voucher by taking part in the research project.

About the project

In order to meet Net-Zero targets, the Scottish Government wants to encourage more households to adopt heat pumps. This is to reduce carbon and reliance on fossil fuels like gas. To do this we want to understand what motivated households who have installed a heat pump (in the past 2-3 years). We'll ask about your experience and your journey.

What's involved?

We will conduct interviews over the phone or video calls online. Some interviews might also be in person. The conversation will take around 30-45 minutes. As a thank you, you'll get a £35 Love2Shop voucher for taking part.

In the interview, we'll ask about your experiences in installing a heat pump. We will ask you questions about your motivations, how easy it was to find information about heat pumps, what made you decide to install one, what challenges you had in buying and installing the heat pump, whether you made other changes to your property as part of the process, and what, if anything, you would have changed about the process

Interested in taking part? Please email us at consultancy@changeworks.org.uk
Please include when you are free in January for an interview.

Know someone who might be interested? Feel free to forward this on to anyone who might be interested.

We look forward to hearing from you.

All the best,

Isabella Impesi

Senior Researcher – Changeworks

Find out more about ClimateXChange [here](#) and Changeworks [here](#).

If you would like to know more about the research and how your information you provide will be used please contact Anne Marte Bergseng at annemarte.bergseng@ed.ac.uk

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climateXchange

Scotland's centre of expertise connecting
climate change research and policy

ClimateXChange, Edinburgh Climate Change Institute, High School Yard, Edinburgh EH1 1LZ

 info@climatexchange.org.uk
 +44(0)131 651 4783
 @climatexchange_
 www.climatexchange.org.uk