CHOOSING FOR THE FUTURE: Why Scottish homeowners install heat pumps and solar PV

Exploring consumer motivations and experiences of installing heat pumps and solar PV in Scotland

April 2024

Final report

CHANGEWORKS.

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Executive summary

This research provides an evidence base outlining the experiences of consumers in Scotland who have recently purchased heat pumps, solar photovoltaic (PV) panels or both. The findings are based on 24 interviews with owner-occupiers across Scotland. The research has been commissioned by Consumer Scotland to inform its policy and advocacy work in relation to low carbon technologies and energy efficiency.

The research outlines the common motivations, enablers and prompts for installing heat pumps and solar PV. The findings provide an insight into people's decision making processes and can be used to inform behavioural focused policy to increase the uptake of heat pumps and solar PV.

Customer journeys

We identified three types of customer journeys:

1. **"Pre-planned vision"** was the most common customer journey (14 participants). These householders had a clear vision of the technologies they planned to install. Often these householders had been planning their retrofit for years.

2. **"Influenced by advice"** was the second most common customer journey (6 participants). Householders in this group planned to install one technology and ended up installing another as well. This was the result of advice, mostly from installers or peers, but also advice services.

3. **"Grasped an opportunity"** was the third customer journey (4 participants). These participants installed a heat pump, solar PV, or both without any long term plans to do so. Their decisions to install were primarily a response to a funding opportunity.

Motivations to install

Environmental concerns were the most common motivation for participants to install heat pumps and/or solar PV. Other than environmental concerns, people's motivations were more specific to the technology. Other motivations for installing heat pumps were:

- **Saving money** on energy bills, only among participants switching from expensive 'unregulated' heating fuels such as oil or LPG.
- Preparing for **future regulations** around heating and energy efficiency of homes.

For participants who installed solar PV, the two key motivations were:

- **Saving money** on electricity bills, sometimes motivated by the energy price crisis.
- Wanting to achieve a level of **energy independence** by reducing the amount of energy they purchase from the national grid. This was a motivation for participants in both urban and rural parts of Scotland.

Prompts to install

We identified common reasons, moments or opportunities that prompted participants to install. While motivations explain why someone considered a technology, prompts explain why they installed when they did. **Moving house** was a common prompt for people who installed heat pumps, solar PV or both. Sometimes, participants were buying their first home or buying a more suitable detached or semi-detached property. Many of these householders intended to install technologies long term but were not able to install until moving. The **availability of funding**, or becoming aware of funding, was also a key prompt.

The main prompt that was specific to installing a heat pump was **needing a new heating system**. This was sometimes motivated by the desire to move away from unregulated fuels such as oil and LPG. Notably, none of the participants bought a heat pump as a distress purchase. Instead, householders installed heat pumps through careful and intentional planning.

Prompts to install solar PV were more varied than for heat pumps. In some cases, participants installed because they were already getting a heat pump. Other prompts included getting an electric vehicle, taking a recommendation from an Energy Performance Certificate (EPC), and social media. The wider variety of prompts to install solar PV could be due to the market being more established, and having a wider consumer base, than the heat pump market.

Perceptions

Participants had more positive preconceptions of solar PV than heat pumps. **Solar PV was assumed to be a trusted and cost-effective technology.** However, three participants mentioned concerns about the effectiveness of solar PV in the short daylight hours of the Scottish winter.

Some householders had **negative perceptions of heat pumps**. They thought that heat pumps would make people's homes **colder** and that they are **noisy, temperamental, and expensive**. A key enabler for overcoming negative perceptions of both heat pumps and solar PV was the ability, confidence, and time for participants to conduct their own research. This was often detailed and technical. Additionally, seeing heat pumps and solar PV installed in their local area instilled confidence in the technologies.

Participants with a background in environmental or STEM (science, technology, engineering, and maths) sectors generally reported more positive perceptions of both technologies and were more confident deciding to install them despite hearing negative viewpoints.

Enablers

Advice and information are important enablers that support people to install heat pumps and solar PV. In fact, a quarter of householders we interviewed were in the **"influenced by advice"** group and installed an additional low carbon technology because of advice from installers or Home Energy Scotland (HES). Peers and online sources were also valuable sources of advice for some participants. **Householders valued advice most when it is tailored** to householders' circumstances and their home. Advice must also be considered credible, meaning that there is no ulterior motive such as number of sales or delivering government targets. Participants carefully sifted and selected their sources of information and advice based on these two qualities. Some participants also sought a lot of technical information to reassure themselves about heat pump performance and solar PV generation capacity.

Installers often influenced householders' choice of technology or recommended additional systems to install such as batteries. All participants who installed a hybrid heat pump system were recommended this by an installer.

Time was a key enabling factor throughout the customer journey. Householders felt more confident about the technology after they **spent time doing their own research**. Some householders were also surprised at the amount of time it took to get quotes from installers and apply for funding.

The significant funding available to households installing solar PV and/or a heat pump was a key enabler. All but three participants received funding. The most common source of funding was HES, with seventeen households accessing this. Thirteen received the HES grant and interest-free loan, while four received only the interest-free loan. Nine of these participants said that **funding made their installation possible or realistic** for them. Four reported that the funding available made the choice to get these measures a "no brainer".

Barriers

Eight participants installed solar PV and decided not to install a heat pump. This provided some insight into the barriers for householders who are already motivated and engaged to consider low carbon or renewable technology. **Disruption and a lack of trust in heat pump technology** were the two main reasons that participants decided not to install a heat pump. The cost of heat pumps was also a barrier, but this was never the sole reason.

Among the participants there were very few barriers to installing solar PV, although this will not be reflective of the general population. Only three participants had not installed solar PV, but all three indicated they wanted to. These participants did not install due to an unsuitable roof, low generation potential, or realising they wanted solar PV at too late a stage in the process of installing their heat pump to get funding. There have been recent changed to the HES funding packages that may help householders consider multiple technologies early in the process.

Although the availability of funding was a significant enabler for householders, 12 participants found it **challenging to access funding from HES or Area Based Schemes**. Additionally, two participants turned down a HES interest-free loan for solar PV because the processing time took too long.

The installation process

Householders were concerned about installers being inexperienced or selling them a system that is not the most appropriate for their circumstances or home. However, the biggest challenge was that **householders reached out to installers but heard nothing back.**

Participants generally had much more positive installation experiences with solar PV than with heat pumps. Four participants reported that their **heat pump installers seemed unfamiliar with the technology or made mistakes**.

Living with heat pumps and solar PV

The majority of participants are very happy with their systems. This was often despite a lengthy, time-consuming or challenging process of choosing suitable technologies, selecting an installer, applying for funding, and overseeing the installation. The main negative experience was difficulty understanding and operating heat pumps. Some participants received assistance from their installer. Others were left with no post-installation support from their installers, in some cases despite paying for a service and maintenance contract. One participant is also facing extremely high running costs for their heat pump. This participant has not received any support to investigate the reasons for this from their installer.

The findings indicate that householders who have already installed these two low carbon technologies are becoming key sources of information for others. Almost half of the householders we spoke with are now influencing their peers or workplaces to install heat pumps or solar PV. This includes sharing their experiences of living with the systems and information on available funding.

Glossary

Acronym	Term	Description
ASHP	**Air source heat pump**	An air source heat pump is a heating system that transfers heat from the outside air to water. This in turn heats rooms in a building via radiators or underfloor heating. It can also heat water to be used in the property.
	Air-to-air heat pump	Air-to-air heat pumps are reverse air conditioning units. They transfer heat from the outside air to the air inside a building. Warm air enters the building through a series of fan coil units, or 'blowers'. It does not heat water.
ABS	**Area Based Scheme**	Funding awarded by the Scottish Government to local authorities to develop and deliver energy efficiency programmes in areas with high levels of fuel poverty.
	Battery storage	Electrical battery to store electricity generated by renewable technology, such as solar PV. Electricity can be used when renewables are not generating electricity, such as at night in the case of Solar PV.
ECO4	**Energy Company Obligation 4**	UK Government energy efficiency scheme. It is an obligation placed on energy companies to deliver energy efficiency measures to homes.
EPC	**Energy Performance Certificate**	A document that provides information about how energy efficient a property is and what measures could be installed to make it more efficient.
GSHP	**Ground source heat pump**	A ground source heat pump transfers heat from the ground outside a building to heat in radiators or underfloor heating. It can also heat water.
HiBS	**Heat in Buildings Strategy**	Scottish Government strategy published in 2021 to outline the steps they will take to reduce greenhouse gas emissions from Scotland's buildings and to remove poor energy performance as a driver of fuel poverty. The linked Heat and Buildings Bill, which proposes new laws around heating systems that can be used in Scotland, had just closed its consultation at time of writing.
	Heat pump	A central heating system, powered by electricity. They heat buildings by capturing heat from the air, ground, or water. Heat pumps are more efficient than conventional heating technologies such as boilers or electric heaters because the heat is transferred, not generated.
HES	**Home Energy Scotland**	Scotland-wide impartial energy advice service funded by the Scottish Government. Also provides grants and loans for householders.
	Hybrid heat pump	A system that uses a heat pump alongside another heating system, such as a gas boiler.
LPG	**Liquid Petroleum Gas**	Unregulated fuel used to heat some households that are not on the gas grid.

MCS	**Microgeneration Certification Scheme**	Demonstrates compliance of both products and installation contractors with recognised industry standards. It also means that installers have been assessed as competent for the installation of their chosen renewable technology.
	Owner occupier	A person who owns the flat or house they live in.
	Renovation	Returning the home to a good state of repair.
	Retrofit	Adding something that was not included when the property was built, such as a different type of heating system, double glazing, or insulation.
	Rural household	Defined using the Scottish Government 8-fold Urban Rural Classification, based on population size, and driving distance to populated areas.
Solar PV	**Solar photovoltaic panels**	Solar photovoltaic panels capture the sun's energy and convert it into electricity that can be used in the property.
	Solar thermal panels	Panels that use energy from the sun to warm water for storage in a hot water cylinder or thermal store. Designed to provide water for bathing, showering, and taps. They differ from solar PV, which generate electricity that can be used for any purpose. Also known as solar water heating systems.
ToU tariff	**Time-of-use tariff**	Time-of-use tariffs are a type of energy pricing plan. They use different prices to encourage consumers to use electricity at times when more is available cheaply.
	Unregulated fuel	Heating fuel where the prices are not regulated. Includes heating oil, LPG, biomass, pellets, and more.
	Urban household	Defined using the Scottish Government 8-fold Urban Rural Classification, based on population size, and driving distance to populated areas.
WHS	**Warmer Homes Scotland**	A Scottish Government grant scheme for insulation, efficient heating and renewable technologies in the homes of households who are struggling with the cost of high energy bills.
	Water source heat pump	A water source heat pump uses the heat energy from water to provide heating and hot water to a building.

1. Introduction

1.1. Policy context

Scotland has an ambitious and legally binding target to achieve net zero carbon emissions by 2045. Reducing emissions from homes and buildings is one of the most important changes required to meet the overall net zero target. The Heat in Buildings Strategy (HiBS) sets out how the Scottish Government will accelerate the deployment of energy efficiency and zero emissions heating systems.

By 2045 at the latest, all buildings will need to switch away from polluting heating. This will be achieved by changing heating systems to heat pumps, electric heating, or connecting to a heat network. The UK government has set a target to install 600,000 heat pumps a year by 2028.[1] The Scottish Government has also committed to a target of four to six gigawatts of solar generation in Scotland by 2030. This will include solar PV on homes, as well as commercial installations. To achieve these targets, the rate of installations must increase. Almost two thirds (62%) of all homes in Scotland are owner occupied, and therefore owner occupiers will play a key role in meeting these targets.

At present, heat pumps and solar PV are at different stages in terms of levels of consumer familiarity, market presence and the rate of installations. Data collected by the Competition and Markets Authority[2] in 2023 indicates that the number of solar PV installations in the UK is over three times that of heat pumps. In Scotland, there have been 54,657 MCS certified solar PV installations in homes since 2009, compared to 23,952 MCS certified air source heat pump installations.[3]

The number of heat pumps installed in Scotland would suggest that people who install them are 'innovators' in the diffusion of innovation curve of adoption[4]. Innovators are a group who are willing to persevere through challenges and uncertainty to adopt a new product. Solar PV is a more established product, and people installing solar PV are more likely to be 'early adopters', the second stage on the curve of adoption.[5] This research explores the differing motivations for installing these two technologies.

1.2. Research aims

This research has been commissioned by Consumer Scotland. It aims to build upon existing research and provide an in-depth understanding of the experience of consumers in Scotland who have recently purchased heat pumps, solar PV panels or both. The research seeks to identify enablers and barriers to the installation of these specific low carbon technologies. The findings will build an evidence base to inform Consumer Scotland's policy and advocacy work in relation to low carbon technologies and energy efficiency.

The research provides insight into:

- **The motivations and decision making processes** of consumers in Scotland who have recently installed heat pumps or solar PV (or both)

- **How consumers researched and obtained information to inform decision making** to install a heat pump and/or solar PV
- **Consumer experiences of installing** heat pumps and/or solar PV in Scotland **and of using them**
- **Enablers and barriers consumers in Scotland may experience** in relation to installing and using heat pumps and/or solar PV
- **Any key differences that can be identified between different demographic groups**, fuel types or consumers living in rural or urban parts of Scotland

2. Methodology

Scoping and research framework

The scoping exercise identified the existing evidence base and any behavioural theories that could inform our research design and analysis. We reviewed previous research on consumer decision making for heat pumps, solar PV, and general retrofit. The scoping exercise informed the development of the research framework. The framework listed the specific research questions for the project, alongside their priority.

Participant recruitment and sampling

The primary recruitment tool was a call for participants. Eligible participants were owner-occupiers living in Scotland, who had installed a heat pump or solar PV in the last two years. The call was shared via trusted intermediary organisations across Scotland. An online recruitment campaign was also conducted. This was a combination of organic social media posts and targeted search engine adverts. The campaign utilised adverts based on browsing activity to target households who had recently installed heat pumps or solar PV. The adverts also enabled us to target specific areas of Scotland to boost the reach of our campaign in rural areas.

Screening questionnaire and sample selection

Participants indicated their interest in the research by completing a short screening survey. This allowed us to collect key information to select a sample. The survey collected data on which technologies participants had installed and demographic information, to allow us to select a diverse sample. Interview participants were selected using purposive sampling. The sample was selected to provide insights from a range of rural and urban participants, ages and household incomes.

Interviews

A topic guide was developed based on the scoping exercise. The topic guide focussed on participant decision making processes, prior perceptions of the technologies, the sources of information they used, and their experiences of installing. The topic guide was designed to give equal focus to both heat pumps and solar PV (where relevant), and to investigate how the technologies were considered in relation to each other. We conducted 24 semi-structured interviews with householders using video call software or by telephone and ranged between 30 and 90 minutes. Our analysis was based on interview notes and we referred back to interview recordings for clarity.

Participants received a shopping voucher on completion of their interview.

Analysis

The analysis was performed by creating a high-level coding structure based on the topics from the topic guide, in addition to other key themes that emerged from the interviews. This framework was applied using the coding software NVivo. Throughout the coding process additional codes were added. We analysed the findings to draw out common journeys to installation, and investigate any differences based on demographics or participant's locations.

Limitations

The research has limitations that should be considered when reviewing the report findings.

As the research explored the experiences of participants who completed the installation of a heat pump and/or solar PV, it does not reflect the experiences of those who:

- Considered installing but decided to against it.
- Wanted to install but did not have the resources.
- Tried to install but could not complete the process, for example due to funding or installation issues.
- Had other unexpected/negative experiences, such as scams.

We primarily recruited participants online which will have excluded potential participants who are less digitally literate or active. These limitations reflect the scope of the research, and they also indicate where additional research may be necessary and useful.

3. Householder insights

Existing research has shown the following demographic factors may make some people more likely to install heat pumps and/or solar PV than others:

- High levels of environmental awareness[6]
- High incomes, increases in income, or affluence[7] (specific to solar PV in Scotland[8])
- Older householders[9]
- Living in a local community that motivates uptake[10]

3.1. Research participants

We interviewed 24 householders as part of this research, all of whom are owner occupiers. The research participants partially aligned with the demographic groups that previous research has found are more likely to retrofit. Our research participants had high levels of environmental awareness and higher levels of income but were not primarily older households.

The vast majority (22) of research participants are aged between 30 and 69.

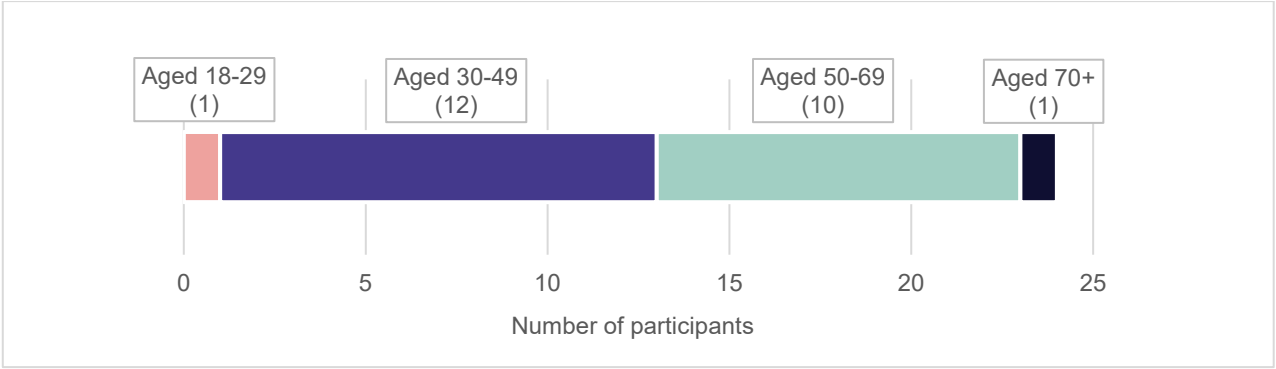


Figure 1: The age range of interview participants.

Thirteen participants had a household income of more than £40,000. Nine participants had less than £40,000. The rest did not specify their income. Given that this study only included homeowners, this skew towards higher-income households is not surprising and aligns with previous research.[11]

Most of the participants (14) were in full-time employment, and three were in part-time employment. Six were retired or semi-retired. One participant did not provide information about their employment.

Men and women were evenly represented in the interviews, alongside one non-binary participant. Only one research participant lived alone, and all others lived in households where decision making was shared with one or more other members of the household. The content of our interviews therefore reflected a process of joint decision making.

Most participants live in detached houses (18). The remaining participants either live in semi-detached (4) or terraced houses (2).

We selected participants from both urban and rural households. A majority (15) live in urban areas (green), while nine live in rural areas (striped red). Of the urban households, most (11) live in or near to Edinburgh.

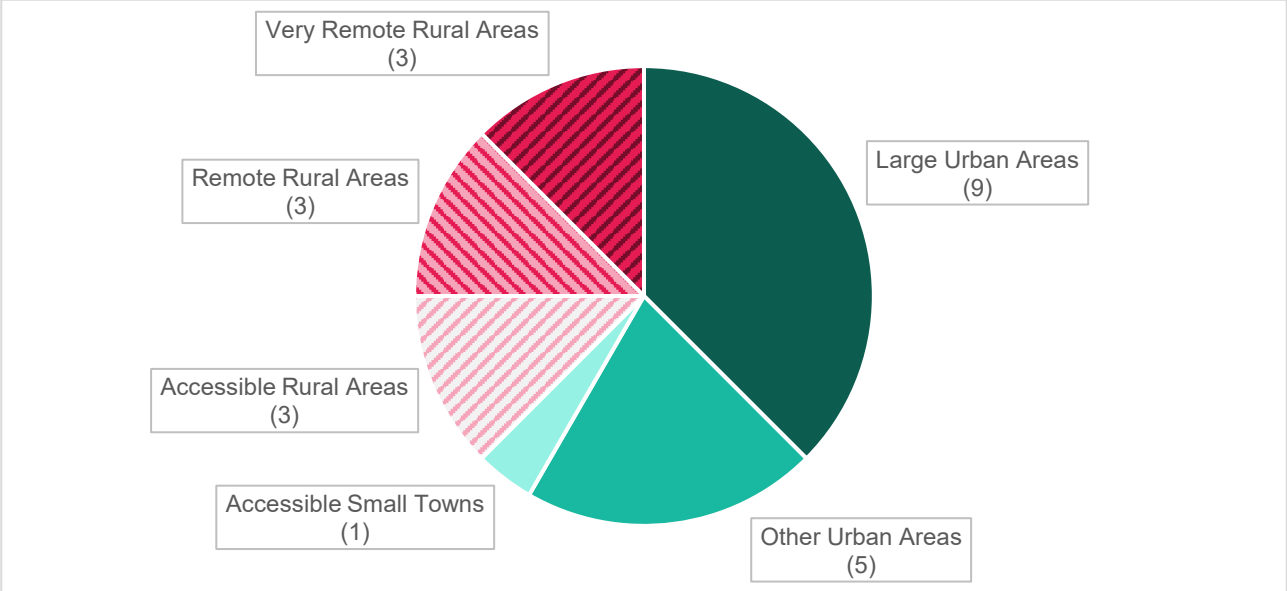


Figure 2: Participants grouped according to the Scottish Government's Urban Rural Classification.

3.2. Systems installed

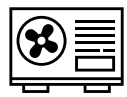
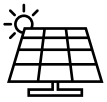
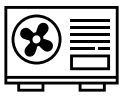
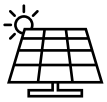
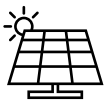
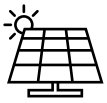
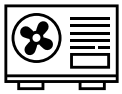
The people who participated in the research had installed either a heat pump, solar PV or both. In total, we spoke to 21 households with solar PV, and 16 households with an air source heat pump (including four hybrid systems and one air-to-air). See Table 1 below for a breakdown of how many participants installed each technology.

Thirteen participants had installed both a heat pump and solar PV. Heat pumps are powered by electricity so householders often install solar PV to generate electricity to decrease their bills. Heat pumps use the most electricity in the winter when the heating is on. However, this is when solar PV usually generates least electricity. None of the householders we spoke with expected to power their heat pump with solar PV alone. They were more interested in saving money on electricity bills overall, especially if they did not use electricity for their heating system before.

The research was open to participants with any type of heat pump, however all participants have installed an air source heat pump. These are much more common than other types such as ground or water source heat pumps because they are cheaper and easier to install.

Eight households who installed solar PV have also installed batteries. Energy storage systems such as batteries are used to capture free or cheap electricity and store it for later use.[12] This energy can generally come from two sources: microgeneration, such as solar PV, or off-peak electricity rates (accessed through time-of-use tariffs).

Table 1: Technologies installed by interview participants

Technologies installed	Households
 Heat pump +  Solar PV	8
 Heat pump +  Solar PV +  Battery storage	5
 Solar PV	5
 Solar PV +  Battery storage	3
 Heat pump	3

3.3. Three types of customer journeys

Based on our interviews, there were three types of customer journeys:

14

Pre-planned vision

6

Influenced by advice

4

Grasped an opportunity

Pre-planned vision

The first type of journey is **householders with a clear vision of the technologies they plan to install**.

Often householders had been researching and planning for years, in one case over the course of a decade. Fourteen participants were in this category, six of whom installed (or plan to install) both a heat pump and solar PV.

Some householders in this group (7) installed solar PV but not a heat pump, the reasons for which are explained later in the report. Only one participant in this group installed a heat pump and decided not to install solar PV. However, they did install a solar thermal system, as they felt they would derive greater benefit from hot water than from additional electricity.

Five participants with a 'pre-planned vision' decided to also install a battery, some alongside solar PV alone and others with solar PV and a heat pump.

Influenced by advice

Householders in this group **planned to install one technology and ended up installing another as well.**

Six participants were in this group and all installed both a heat pump and solar PV. Participants responded to a suggestion to install an additional system, mostly from an installer or peers. In a few cases, participants were influenced to install an additional system by advice from Home Energy Scotland (HES). One participant changed their mind, having previously decided not to install a heat pump. This was mostly motivated by increases in the cost of LPG.

While householders used advice in different ways, participants on this customer journey demonstrate that advice at the right stage of a consumer's journey can increase installation rates of low carbon technologies.

Grasped an opportunity

Four householders **did not have long term plans to install either a heat pump or solar PV** but did install one or both technologies.

Their decisions to install were primarily a response to an opportunity. Three participants in this category used grant funding from a Scottish Government Area Based Scheme or Energy Company Obligation (ECO4) for their installations, and the fourth participant used the HES loan and grant.

Two participants were looking for a replacement heating system due to their current heating system nearing the end of its life. These were not distress purchases, as both participants were proactively seeking a replacement. However, they were not committed to a low carbon system from the outset and did consider other heating systems. The availability of funding was a key factor in their decision to choose a heat pump, with one participant also installing solar PV at the same time.

3.4. Behavioural model

For each of these three customer journeys we have drawn on the Fogg Behaviour Model[13] and the COM-B Model for Behaviour Change[14] to understand the factors that influenced participants' decisions to install. These are influential behaviour change models, which have informed local and national government policies across a range of sectors.[15] [16] [17] The models describe that a behaviour, in this case installing a heat pump and/or solar PV, is a function of:

- Core motivation.
- Ability to act, which is based on enabling factors and barriers.
- A prompt or trigger to act.

The motivations for participants to install a heat pump and/or solar PV are outlined in section 4, and prompts are explored in section 5. Enabling factors and barriers, which impacted participants' ability to install, are discussed in sections 7 and 8.

4. Motivations for installing

Motivations are the factors that drove people to consider these technologies in the first place. Participants we interviewed often had more than one motivation.

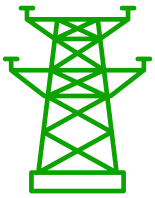
The following motivations were mentioned by two or more participants:

Environmental concerns

Needing a new heating system

Saving money on bills

Future regulations



Energy independence

4.1. Common motivation: environmental concerns

Concern for the environment was by far the most common factor that motivated householders to install heat pumps and solar PV. Participants shared that:

> ***"I did it for my grandchildren"***

> ***"I do virtually everything I can to reduce my personal carbon footprint. That's a really a big thing for me."***

These findings were consistent with previous research that identifies environmental concerns as a top motivator for retrofit.[18] [19] [20] [21] [22] However, it was rarely the only motivation.

Besides environmental concerns, the motivations for installing heat pumps and solar PV are generally specific to the technology. The following sections discuss these other motivations. Most of the following were in addition to environmental concerns. However, six interviewees did not explicitly include the environment in their list of motivations. Their motivations included future heating regulations, improving their EPC rating, to save money on bills, and replacing an inefficient heating system.

4.2. Motivations to install heat pumps

For two participants, **saving money on energy bills** was a key motivation for installing a heat pump. These households previously used LPG and heating oil. One person explained that:

> ***"The financial thing for me is long term. I know that oil is just going to get more expensive. It's not gonna get any cheaper."***

Energy bill savings were not a motivating factor for any households previously using mains gas or electric heating.

Two participants specifically mentioned futureproofing their homes for **future regulations** as a motivating factor. Their awareness of future regulations was likely because they worked in a field related to energy or sustainability. For example, one was an architect.

Lastly, one participant who lives in a rural area noted that they chose a heat pump to provide more security in their energy supply. They previously used LPG and were concerned about the reliability of deliveries, in addition to the high cost.

4.3. Motivations to install solar PV

As mentioned above, environmental concern was a common motivation to install solar PV. The following motivations were usually in addition to environmental concerns. Nine participants said they installed solar PV to **save money on energy bills**. Two participants specifically mentioned the energy price crisis and the high cost of electricity as a motivation for deciding to install solar PV.

Another key motivation for installing solar PV was the ability **to be less reliant on electricity from the national grid**, also referred to as energy independence. Seven participants mentioned this motivation. Of these, five participants lived in urban areas. Three wanted to be self-sufficient to shield from rising energy costs. Others mentioned concerns such as the electricity grid being unreliable in the future, power cuts due to storms, black outs during the energy crisis, and opposing the idea that oil and gas companies make significant profits from energy. Both householders who mentioned concerns about losing supply, either because of storms or blackouts from grid failure, lived in remote or very remote rural areas. One householder explained:

> ***"Now the news of incoming storms does not cause us stress and worry. Because we have the solar panels and battery system, we know that we will be safe."***

One participant specifically mentioned they were motivated by the fact that other people were installing solar PV. This suggests that they were motivated by social norms, which can influence retrofit purchasing behaviour.[23] [24] The majority of research participants had friends, family or neighbours who had already installed a heat pump or solar PV. The influence of this on their decision making is explored in section 6.2. Another participant stated that their main motivation was to improve the EPC rating of their house.

5. Prompts for installing

Prompts are specific reasons, moments or opportunities when a householder decides to install a heat pump or solar PV. While motivations describe why someone considered installing, prompts describe why they installed when they did. Not all participants mentioned a prompt, while others mentioned more than one.

5.1. Common prompts for heat pumps and solar PV

Moving home was a prompt for installing both heat pumps and solar PV. Two of the participants explained that it was their first time owning a home, which incentivised them to invest in it. Moving into a different property type can also impact householders' decisions. One participant moved from a flat to a detached house. This this enabled them to install a heat pump. Existing research has also frequently cited moving home as a reason to install these technologies.[25]

Several participants across all three customer journeys were prompted to install because of **funding availability**. Most people were referring to funding from Home Energy Scotland, though not all. Funding was a particularly significant prompt for those who **"grasped an opportunity"**, three of whom received grant funding through an Area Based Scheme or ECO4.

5.2. Prompts for heat pumps

The most common prompt for installing a heat pump was **needing a new heating system**. This was the case for six of the participants. Three of them had gas boilers that were nearing their end of life. The other three did not have mains gas heating. One householder was prompted by their oil boiler breaking down more and more frequently. Another householder was informed that their oil supplier could no longer supply oil through pipes under their house due to regulatory changes, and this prompted them to look at other heating options. Lastly, one householder had had ongoing issues with the heating in their new-build home, which had a wood burning stove and mechanical ventilation with heat recovery (MVHR). They wanted to finally resolve the issue by getting a new heating system. These were not distress purchases, meaning none of the householders were prompted because their heating system failed completely. This aligns with recent research which identifies replacing an old heating system as a common motivation for installing heat pumps.[26] [27] [28]

One participant was prompted by a recommendation from an installer, and another found out about heat pumps when researching solar PV. Some participants did not specify a prompt but had long-term plans to install a heat pump.

Existing research indicates that renovations are a common prompt for householders to retrofit, including installing heat pumps.[29] [30] Renovation refers to returning the home to a good state of repair, and may include projects such as decorating or replacing outdated features.[31] Retrofitting means adding something that was not included when the home was built, such as a different type of heating system, double glazing, or insulation.[32] Many people do not differentiate between renovation and retrofit and will do different types of disruptive work all at once. However, only one of the participants we interviewed was prompted to install a heat pump because they were already doing renovations.

5.3. Prompts for solar PV

Other than moving home and funding availability, the prompts for installing solar PV were more varied than for heat pumps. Two did so because they were **already getting a heat pump installed**. While a number of participants identified unique triggers: getting an electric vehicle, speaking with friends, taking a recommendation from an EPC, the energy price crisis, Facebook adverts and anticipating weather or grid-related power cuts. Six participants did not identify a particular prompt, two of which had planned to install solar PV over a long term.

The wide range of prompts for people to install solar PV may reflect the fact that the solar PV market is more established and draws in a more varied customer base.

Why did people choose not to install?

All the participants in this research have installed one or more low carbon technologies, so there are limited findings around the barriers or reasons for not installing.

However, eight participants installed solar PV and decided not to install a heat pump. This provides some insight into the barriers to installing a heat pump amongst an already motivated and engaged group of householders.

The cost of heat pumps was a barrier to some, but this was never the only reason. The disruption associated with installing a heat pump was a barrier identified by three participants. They mentioned the need to change radiators, pipes and remove flooring as key issues. Participants also made comparisons between the expected disruption of installing a heat pump versus solar PV:

> ***"We thought about a heat pump, but that seemed like more of a challenge [than solar PV]."***

Some householders did not trust heat pumps. Two householders decided not to install because of negative preconceptions. One was put off by the idea of noise. Another householder turned down an offer of a fully funded heat pump due to the range of negative perceptions they had heard from peers. They shared:

> ***"My husband won't have a heat pump. We were offered that free of cost as well through the [Area Based Scheme]. He doesn't think the lifespan, the cost to run it and the low temperature makes it worthwhile. He got those ideas from his workmates. A man down the road has a heat pump, and he was speaking about the cost of the electricity to run it. There was no talking my husband into it. My husband thinks they only work in smaller houses as well."***

We discuss negative preconceptions of heat pumps more in section 6.1.

Another participant did not install a heat pump as their home was very well insulated, so they do not need much heating to stay warm. They felt that their low heating demand did not justify the cost and disruption of a heat pump.

All three participants who only installed a heat pump revealed in their interviews that they were also interested in solar PV. Their reasons for not installing were either due to an unsuitable roof or to a lack of awareness about solar PV. For example, one participant decided against installing solar PV as they thought it would not generate enough electricity for their needs. They installed a solar thermal system instead but are now considering installing solar PV.

Another had already started the loan process when they realised that they wanted to also install solar PV. However, it was too late to add another measure. Recent changes to the HES loan to fund packages of measures could make householders aware of different technologies earlier in their process. This gives them a prompt, and information, to decide if solar PV is suitable for their home.

Additional research with participants who express interest in installation but have yet to do so would provide a fuller understanding of the reasons for not installing heat pumps and solar PV.

6. Researching technologies and installers

6.1. Perceptions

Preconceptions about both solar PV and heat pumps influenced participants' decisions on whether to install these technologies. In some cases, participants overcame negative preconceptions, whilst others decided not to install these technologies because of their initial assumptions.

Confidence and trust

The majority of **participants reported that they had an overall positive impression of solar PV** before they started researching the technology. They were also not aware of any specific challenges involved with the installation, which could have deterred them from considering or researching solar PV. In addition, four participants perceived solar PV to be affordable or cost effective.

A third of the householders who installed solar PV had some initial concerns about the technology. The most common one, expressed by three householders, was that solar PV would not perform well during winter in Scotland because of limited daylight and overcast weather. Additionally, two householders had been concerned about leaks or damage to the roof, and two thought that solar PV looks bad on older buildings. However, no participants were deterred by their initial concerns after further research.

In contrast, many **participants reported encountering negative viewpoints around heat pumps**. Some encountered negative coverage even without seeking those stories out. For example, on social media. The most common preconception was that heat pumps do not keep homes as warm as other heating systems (8). Several participants also had the impression that heat pumps are noisy (5). Householders also had questions about the cost to run and the reliability of systems.

Seeing that other people have installed these technologies helped build trust among householders. Half of participants mentioned that seeing heat pumps and/or solar PV installations influenced their decision to install. This was usually in their local area, either on private homes or seeing large scale installation schemes on social housing. One participant also mentioned seeing heat pumps on large commercial buildings which reassured them that if a heat pump can heat a large building, it would work for their home. One participant mentioned having stayed in a holiday home with a heat pump. This increased their confidence in the technology as it provided a chance to experience living with a heat pump.

Overcoming negative preconceptions

It was noteworthy that some participants **had negative preconceptions around the technologies and still decided to install** them. Key factors that enabled them to overcome these negative preconceptions were having the time to conduct their own research and being able to access funding to install the technology.

All three participants who initially thought that solar PV would not operate well in Scotland did decide to install the technology. Two of these householders got funding to fully cover the installation. One householder explained:

> ***"I'm not sure we would have installed the solar PV if it wasn't offered to us as we assumed it would not work well here – being in the west of Scotland – due to the weather. We didn't investigate this too much though, as the measures were offered free of charge."***

The other participant self-funded their installation and overcame negative perceptions through their own research. They said the mainstream press gave the impression that solar PV is not a good option in Scotland because of the limited daylight hours in winter. They said:

> ***"I found more specialist research articles which set out the exact expected generation at different points of the year. We found that this presented a more positive picture, especially when paired with the battery."***

Research also played a key role for participants who installed a heat pump despite encountering a lot of negative stories. Three householders overcame their preconceptions about heat pumps being noisy through research. For example:

> ***"I heard a lot of negative things about heat pumps, how extortionate they are to run. How they're noisy. There was a lot of negative stuff, but I did more research and debunked a lot of those things."***

> ***"[Before we decided to install a heat pump] people would talk about the noise […] we heard lots of negative rumours around air source heat pumps and we dug into it they turned out to be garbage."***

The process of conducting their own research gave participants the confidence to change their minds and to debunk myths. However, this requires the **time, inclination, and ability to conduct**

research, and the self-confidence for householders to trust their own conclusions. This was discussed directly by three participants who acknowledged it is unlikely that all householders be able to do this:

> ***"I love technical things, so it was a great incentive for me to do my own research […] I know that this can't happen for everybody, but I decided to become a lay expert in heat pumps, solar PV and other aspects of home renewables. So, for a lay person, I went from about a 1 to a 10 […] it's not lost on us that we have time."***

Prior experience

Eight participants had a background in STEM (science, technology, engineering, and mathematics) or environmental sectors. This seemed to correlate with more positive preconceptions of both technologies. For example, a participant linked their work in sustainability with positive preconceptions, despite not specifically working in sustainable energy. They said:

> ***"I did my master's degree in climate policy, so I guess I knew a lot about solar PV from an academic background. Through this I had a positive view about the technology and knew that it was generally quite a cost-efficient way of generating electricity […] My partner and I both work in the environmental charity sector, so although we don't work in energy specifically, we both knew that they are positive and that they work."***

In addition, those with a technical background had more confidence in overcoming preconceptions. For example, a participant whose partner was an engineer explained that this background gave them the confidence to install technology despite negative stories. They shared:

> ***"[My husband] is […] more maths and science-y, and he had much more knowledge about at least the technology of heat pumps. […] I don't really know anything about these things […] in fact, I said to [him], 'Well, I'm sure in very cold weather we might need backup heating'. And he was like, 'No we won't'."***

Working in a related industry helps householders feel more positive about heat pumps and solar PV and more confident in navigating conflicting information.

6.2. Choosing suitable technologies

Advice from Home Energy Scotland

Most of the householders (20) spoke with Home Energy Scotland (HES) at some point in their installation journey. Some used HES as a source of advice on which system(s) to install, while others primarily used HES for information on funding. **The HES advice service was described as a clear and accessible resource** for most people exploring low carbon heating and renewable energy opportunities. However, when householders used HES to access funding, they found the application process challenging (see section 7).

Research participants had varied opinions on the advice provided by HES (Figure 3). Nine felt positive about the experience and explicitly said the advice was useful. These householders highlighted that HES was an impartial, reliable and trustworthy source of information and advice. Participants commented that the Home Energy Improvement Reports were a useful resource. These reports identify appropriate renewable technologies and are tailored to the householder based on building archetype, insulation levels, and other personalised data. However, the amount of detail that participants received did vary.

> ***"The Home Energy Scotland process and advice, which we used for the heat pump, was seamless. We would have been much less likely to get a heat pump installed without them. […] Getting the Home Energy [Improvement] Report from Home Energy Scotland was probably they key thing that made it all feel more real and not just like general internet research."***

Seven participants received advice from HES but did not use it as their main source of information, and did not comment on whether they found it useful or not. These participants used HES as a starting point in their decision-making process, or only for accessing funding. Four found that HES had not been a helpful source of information. They attributed this to the information and recommendations being too general and **not tailored enough to their circumstances or their home**, for example that the advice was too factual and did not provide enough information on the pros and cons.

> ***"Their advice was very generic. It wasn't very helpful. Yes, I know a heat pump is a big white box – can you imagine? It's like if you want to buy a new phone or TV, but you have no way of finding out about what make or model, and it costs £19,000. You just have to go with it and see what happens. It was nerve-racking."***

These participants either turned to installers for advice or conducted their own research online.

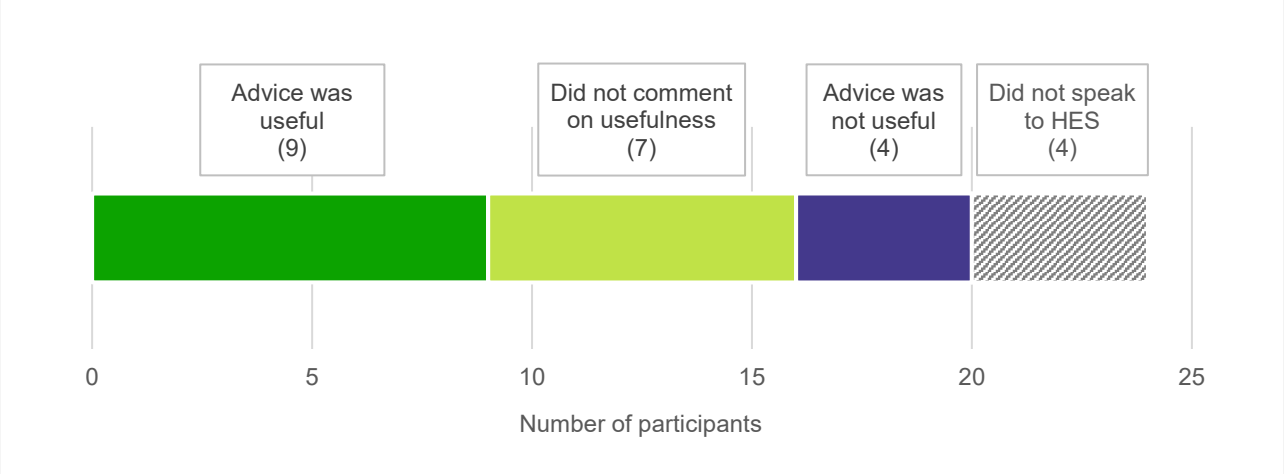


Figure 3: Experiences with advice from Home Energy Scotland.

Overall, people's different expectations and existing knowledge influenced their opinion of the advice they received. Some perceived HES as a good starting point for their own further research, but others were disappointed not to get more bespoke advice and recommendations.

Advice from installers

Installers are an important source of advice, even in the early decision making stages. The majority of householders described getting advice or information from installers. Most householders found that the **installers were able to provide helpful and detailed information** about heat pumps, solar PV and batteries.

Seven participants noted that **installers influenced their decision** about which technology to install or not install. In two cases, the installer reassured the householder that solar PV would be a viable option. Four households were introduced to the option of a hybrid heat pump by their installer and decided to install it as a result. The main reason for installers to recommend hybrid heat pumps is reduced disruption during installation. Overall, people had positive experiences with the advice from installers. They felt that installers were able to provide detailed technical advice on different technologies. However, one householder regretted following an installer's advice to not install a battery with their solar PV. Additionally, one householder later questioned the decision to install a hybrid heat pump rather than a regular heat pump:

> ***"We chose the hybrid heat pump as the installer offered and presented the hybrid system as a clear choice. However, with the benefit of hindsight, this may not have been the most future proof choice."***

At least nine participants felt that **advice from installers was not accurate or impartial**. The distrust is partly because installation companies sometimes sent a sales representative rather than a technical expert:

> ***"Some of the sales reps couldn't put two and two together. They'll sell you whatever you want. There's some lack of experience and lack of training, that's obvious across the industry."***

Others felt that even with good knowledge of the technology, installer's priorities were still to sell a product rather than provide advice:

> ***"[The information] was all quite helpful but wasn't impartial information as they are trying to sell you their specific systems."***

> ***"I mean this is the kindest way possible […] the supply chain are only responsible for selling you the product."***

There were several factors that made **householders trust some installers more than others**:

- Speaking to someone with more technical knowledge, rather than a sales representative
- Home visits rather than consultations online or over the phone
- Being able to compare installer assessments to assessments from impartial sources such as Home Energy Scotland
- Explaining the pros and cons of different systems to the householder
- Reading good reviews online about the installer

Online and published information

Nearly all participants (21) relied on **a range of published or online sources of information**. It was clear that a lot of householders wanted to gain a thorough understanding of the technologies that they were considering or installing. Sources included online forums, information found through online searches, podcasts, YouTube, and Facebook groups.

Specific websites which participants found helpful included Energy Saving Trust (4), Heat Geek (2) and Microgeneration Certification Scheme (MCS) (2). Other published resources included Our World in Data (1), Which? (1), New Scientist (1) and The Economist (1).

Three participants mentioned that they read academic journal articles and research papers, and one mentioned a book on clean energy.

Advice from peers

Many of the research participants had friends (15), family (8), or neighbours (9) who had already installed a heat pump or solar PV. Some participants knew more than one person. A few householders said that advice from peers was a defining moment in the decision-making process. In one case this was because information on air-to-air heat pumps was not readily available, as this is a less common technology:

> ***"It was actually a neighbour who mentioned that his stepmum had had this technology in her small house and said it worked really well, and he questioned why we were going for a more expensive wet system. But we couldn't find anything about it until we stumbled on it by chance, it was in a thread on some kind of discussion board. But it's not very prominent on the internet."***

Eight participants had family members who already installed a heat pump or solar PV. However, only half had asked their family members for advice. Householders relied more on advice from friends and acquaintances than they did from family members. Some participants gained a lot from speaking with friends:

> ***"Speaking to others about their experience helped us to do calculations on the payback period for the technology. Speaking to people we know helped us to find the installers we went with, and the company we went with were good."***

Neighbours were another source of information for participants. Nine householders knew someone in their local area who had installed either heat pumps or solar PV. Of these, seven spoke to them for advice, mostly regarding heat pumps:

> ***"I made it down the road to have a look [at my neighbour's heat pump]. He's got a new build house; it's very efficiently insulated. But other than that, I don't know anyone else who has got one. He said it was good, efficient, and a lot better value."***

People living nearby were able to provide credible information about living with the technology:

> ***"I did find it helpful to chat to my neighbour who had a heat pump, because it was more of an impartial view, compared to installers who are all keen for your money."***

Even when they knew someone who had already installed the technology, **many participants did not seek advice from friends or family**. There were different reasons for this. Specifically relating to solar PV, several participants knew people who had installed them many years earlier. As a result, they did not feel that their experiences of the technology or the costs were relevant or comparable. Regarding heat pumps, householders did not seek advice from peers in cases where there were significant differences between the house types, age, and condition.

Over a third of **participants installed a technology and did not know anyone who had previously installed** it. This was the case for both solar PV and heat pumps. This reflects the fact that both markets are still relatively new. These research participants were willing to install an unfamiliar technology, without peers as a point of reference. This is a trait often associated with innovators and early adopters, who are more willing to take risks than the general population.

6.3. Finding an installer

Many householders said that finding an installer was a significant and time consuming step for them. Most **participants contacted multiple installers for quotes** for their installations. Householders often contacted between three and twelve installers. In one extreme case, someone contacted 20. Those who installed through an Area Based Scheme or ECO4 did not need to seek quotes or select an installer.

A key reason for contacting such a high number of installers was that **participants often received no response**. It was common for participants to contact more than five installers and receive only one quote. This made the process frustrating and time consuming. A small number of participants contacted only one installer and then proceeded with them for the installation. One participant in a remote rural area explained that they only spoke with one installer as there are not many local installers where they live.

Choosing the right installer is an important part of the process. Four participants reported that a positive experience with installers at the start of the process made them more confident to commit to the install. This was the case when installers seemed knowledgeable and tailored their advice to specific properties. One householder installing both a heat pump and solar PV sought a different installer as they did not trust their recommendation for a hybrid heat pump:

> ***"It took a while to find the right installer. A previous installer had recommended the hybrid system, which I'm glad we didn't go for. It took quite a while to find an installer I was happy with."***

Nine participants reported that they had **challenges with choosing a suitable installer**, both for heat pump and solar PV installations. Participants described different priorities and criteria for selecting their installer. These included looking for "reputable installers" (primarily judged by online reviews), locally based installers, installers with prior experience, or who could install a specific technology. One householder said:

> ***"There were not many installers in our area that were accredited for the funding, but the installer we reached out to was very well reviewed, so we trusted them."***

Finding an installer was a significant step in the customer journey for many householders. Social relationships between householders and installers can have a considerable impact on if, when, and how a householder proceeds with retrofit. Previous research has found that to establish trust, householders often rely on recommendations from personal contacts or other people online to find installers for retrofit projects.[33] [34] Whilst some participants identified an installer based on a personal recommendation, the majority relied on HES tools or online reviews.

Two participants found installers via Facebook adverts. One participant felt that Instagram was a good resource:

> ***"Instagram was good as well, because many installers who do a good job post their work."***

7. Funding process

The availability of funding was both an enabler and a prompt for participants to install. The research participants had used different sources of funding to support their installations. Most (17) accessed funding from Home Energy Scotland (HES). Thirteen of these received the grant and loan, while four received the interest-free loan only. These differences could be due to HES funding availability and criteria changing over time. Of the remaining households, two were fully funded through Area Based Schemes and two used ECO4 funding. Three were self-funded.

HES grant and loan funding was previously available for individual measures. Since June 2023, funding for solar PV and for batteries is only available as part of a package alongside a heat pump (or another low carbon system in cases where a heat pump is unsuitable). Participants in this research had accessed funding both before and after this change. Based on the interviews, there is no clear indicator that the change has significantly affected people's decision to install.

Two research participants shared their reaction to the change in funding:

- One householder who was looking into solar PV decided to also have a heat pump installed. The HES funding policy change was one of multiple factors in this decision.
- Another householder, who had installed solar PV with support from HES before the policy change, pointed out that they would not have been able to do this under the new funding structure. This would likely have prevented their solar PV installation as they did not want to install a heat pump due to the high installation cost and their low heating demand.

Overall, the research participants were very positive about the existence and scale of the funding. Six participants highlighted that the funding available made the installation affordable or realistic for them. Three said that it would not have been financially possible without the grant:

> ***"It would have been twice the cost – maybe more – without the Home Energy Scotland grant and loan scheme. The costs were huge. [...] If it wasn't for the funding, we would have probably gone for a gas boiler as it would have been a simple replacement with less disruption and cost."***

The existence of HES funding was a significant enabling factor in householders' decision making, across all three customer journeys. Participants explained that the level of funding available made their decision to install a 'no-brainer':

> ***"The grants and 0% interest loans available from Home Energy Scotland were also a determining factor, and because of this, it felt mad not to [install solar PV]."***

Challenges

The research has highlighted some ways in which funding application processes could be improved. Of the 17 people who accessed funding through HES, 11 found the process difficult. Householders described the process as confusing, complicated, frustrating, tedious, onerous,

arduous, and disjointed. Three householders had positive experiences, finding the process smooth and not too difficult. The remaining three had mixed or neutral feelings about the process.

Householders identified several challenges with the process. Many said the paperwork to apply for the funding was complex and time consuming. Others mentioned that the approval process was slower than they hoped. Several householders mentioned the fact that they had to pay installers before receiving the funding was challenging. In one case, this experience deterred a householder's neighbour from using the HES loan. In two cases, the installers helped the householders with their application, which made the process easier.

Two research participants turned down an interest-free loan for solar PV from HES due to the long application processing times. One had previously received the grant and loan for a heat pump. They did not want to repeat the time-consuming process and sought a loan from elsewhere. The other participant explained that they had savings available, interest rates were low, and they did not want to delay the installation.

One participant had been referred to the Warmer Homes Scotland scheme by HES. However, they turned it down since they did not feel confident in the advice provided by the installer. Instead, the householder had solar PV funded through ECO4, though they expressed that they felt this scheme was pushing them to get a heat pump.

For one of the participants who received Area Based Scheme funding, the process was made complicated by disjointed communications from different organisations involved in the customer journey. This included advice services, the scheme managing agent, and sub-contractors such as installers and electricians. They explained that this could be confusing for households and a more cohesive experience was needed:

> ***"It would have been better if someone could sit us down and explain the process. We were relaxed about this, as we both work for environmental charities, but if someone was more nervous or sceptical this would have been off-putting, or even distressing."***

These experiences indicate how funding application processes could be improved. This may make incentives more attractive and improve the experience for consumers who are considering installing a heat pump or solar PV.

8. Installing and living with technology

8.1. Installation process

Participants had varied experiences with the installation process. Problems during the installation were mentioned by seven participants and were mainly regarding heat pumps. The installers themselves were a key concern for several householders (5). A few expressed serious doubts about the installers' ability and knowledge:

> ***"As it turned out, they probably didn't really know what they were doing. They were early on in their career as heat pump installer, which they did not make clear to us… They overbooked themselves with a system which I don't really think they knew how worked."***

> ***"The install of the heat pump did not work. They sent the wrong heat pump. They sent the wrong tank. Then we couldn't get the settings right. The company has stretched itself way too far, too thin. It's good on the sales, but they don't have enough people to get the work done. A one-week job ended up taking two months."***

Other participants, however, were positive about the installation process. Several noted how simple and non-disruptive the installation of solar PV installation was:

> ***"The physical installation process was actually even easier than I expected."***

Our interviews indicate that people have much more positive installation experiences for solar PV. This is likely due to the installation of solar PV being a less disruptive process than for heat pumps. Additionally, the solar PV supply chain is more established. As interviewees noted, some heat pump installers seemed unfamiliar with the technology and made mistakes. Despite some challenges, the majority of participants (19) mentioned at least one aspect of the technology that they were happy with once it was installed.

8.2. Living with the technology

Most participants are satisfied with the way their heat pumps and solar PV systems are working and feel it has been worth the effort and investment. Householders with heat pumps recounted feeling warmer than previous winters, and those who had installed solar PV have seen their energy costs decrease.

> ***"In terms of our happiness level […] it must be about a 10 out of 10. We'd do it all again in a heartbeat."***

> ***"For me it's great. I think it's a great system, I love the way it works, it makes good sense in general. For all the issues we've had with it, I'm glad I've got it and that I'm not buying oil anymore."***

> ***"We were paying three times as much last winter compared to what we pay now the heat pump, solar PV and roof and cavity wall insulation has been installed."***

> ***"It's just nice and warm all the time, which it never used to be."***

Some participants who installed heat pumps, even those that are happy with their system, have run into issues. The most common complaint was that householders had trouble learning how to properly operate the system. The instruction manuals and installer guidance on how to use the heat pump were inadequate for at least six participants. One participant, who is an engineer, shared that:

> ***"I think it could be quite overwhelming for someone who didn't have a technical background. ... For people who didn't understand the manual or who didn't want to invest […] the time […] to read through it, they would be entirely relying on the installer that the system has been set up correctly."***

This was the case for another participant who approached their installer for further guidance on how to operate their heat pump:

> ***"They couldn't explain to me how it worked. […] So when my heat pump is costing me like £120 a week to run, I don't know if there is anything I can do to reduce that problem."***

This participant indicated that this was still the case at the time of the interview.

Other participants had more luck. One householder said that after many phone calls to their installer in the first year, they are starting to relax and trust that the system is set up to work well.

Two participants also noted issues getting their heat pump serviced by the installer. In one case, the installer stopped operating for a period. If they had problems during that period, they would not have had someone to turn to. The installer later reopened under a different name. In another case, the householder was paying for a servicing and maintenance contract but did not get the support they paid for when the system broke. They shared that:

> ***"[The] heating engineer [from the installer] said he doesn't recommend the care contract because they don't have the bodies on the renewables side."***

8.3. Influencing others

As highlighted in section 6.2, some participants did not heavily rely on information from peers or know anyone who had installed the technology they were installing. However, following their installation process, almost half of the householders we spoke with mentioned that they are influencing their peers to install heat pumps or solar PV.

Seven participants mentioned that they were **sharing their experience with peers and encouraging others to install**:

> ***"People are interested in chatting to me about [solar PV], and I'm learning from chatting to friends who've had it for a while… My colleagues are happy that I know the lingo now."***

> ***"People have all kind of prejudices about [heat pumps]. And having friends you can talk to about these things is important. We have friends that are very interested in our system and ask us how warm our house is***."

Five participants mentioned they were **providing advice about technology or funding** to their peers:

> ***"No one had shared a positive experience before we had installed the system, but we are now recommending it to peers. I think sharing our advice has been useful for others."***

Some introduced HES or Area Based Schemes funding to their peers for the first time:

> ***"When we were in the process of applying for the grant funding from Home Energy Scotland, we mentioned the funding to a few people that weren't aware of it, as the funding options are quite generous at the moment."***

Lastly, two participants mentioned **having an impact on other peoples' decisions to install** solar PV and heat pumps:

> ***"I've now persuaded some colleagues at work to get solar panels on our work building.***"

These findings are key to considering the rollout of heat pumps and solar PV across Scotland. As we note in section 3.3 most participants we spoke with had long term desires to install these technologies and did so through intentional and careful planning. Householders who have already installed are now becoming prompts and key sources of information for others.

9. Conclusions

This research provides an insight into people's decision making processes. It highlights key stages in the consumer journey where policy interventions could help to increase the number of installations of heat pumps and solar PV.

The findings indicate that **people who currently install heat pumps are innovators**. They are highly motivated and may not know anyone who has already installed a heat pump. Our research indicates that householders who install heat pumps often have a combination of high motivation and resources, such as time, money, and some technical knowledge of the system. This indicates that **there are still a number of barriers along the consumer journey that are not conducive to mass take-up**.

In comparison, several factors indicate that the **solar PV market is more established**. The motivations for installing solar PV were more varied and indicate a more varied customer base. This included people being motivated by social norms. There were also fewer barriers to install.

Motivations to install

Motivations describe the reasons why people considered installed heat pumps or solar PV in the first place. They describe *why* people install. Most people had multiple motivations.

Environmental concerns were the most common motivation for participants to install a heat pump and/or solar PV. Other than environmental concerns, people's motivations were more specific to the technology. People were motivated to install heat pumps by **energy bill savings** (when moving from expensive heating fuels) and to **prepare for future regulations** around heating and energy efficiency of homes. People mainly install solar PV to **save money on energy bills** and to be more **independent from the national grid**.

Prompts to install

Prompts describe specific reasons, moments or opportunities when people decide to install. They describe *when* people install. Not everyone we spoke with had a specific prompt.

Moving house is a common prompt for people to install either heat pumps, solar PV or both. However, these householders often already intended to install these technologies long term. The other main prompt for installing a heat pump was **needing a new heating system**. Prompts for installing solar PV were more varied than for heat pumps. We found evidence that **installing a heat pump may be a prompt for installing solar PV**, but not necessarily the other way around.

Funding sometimes prompted people to install heat pumps, particularly consumers who **"grasped an opportunity"**. Some people installed when they did because they found out about funding or because new funding options became available. However, it was more common for funding to be an enabler rather than a prompt.

Enablers

Enablers are factors that make installing a heat pump or solar PV easier or more likely. When people are already motivated to install, enablers help them make it a reality.

Grant and loan funding, usually from Home Energy Scotland, enabled a lot of people to install heat pumps and/or solar PV. All but three participants received funding.

Advice from Home Energy Scotland, installers, and peers was a key enabler for participants. People valued advice most when it was tailored to their situation and impartial. While HES provides impartial advice, and installers sometimes provided tailored advice, most householders did not feel they could make a decision based on advice alone, especially for heat pumps. Most participants conducted significant research in addition to the advice they received from HES, installers or peers. The **time and ability to conduct research** was a key enabler for overcoming negative perceptions of both heat pumps and solar PV.

Additionally, seeing heat pumps and solar PV installed **in the local area** instilled confidence in the technologies.

Barriers

Barriers are factors that make installing heat pumps or solar PV more difficult. Everyone we spoke to successfully installed at least one technology. However, they often faced barriers throughout the installation process.

Although the availability of funding was a significant enabler for householders, 12 participants found it **challenging to access funding**. Participants were wary of inexperienced installers and being sold an unsuitable technology. However, the main challenge seemed to be getting a response from installers. **Finding an installer** was a time-consuming process. Participants generally had more positive installation experiences with solar PV than with heat pumps.

Despite the challenges, the majority of **participants are happy with their heat pumps and solar PV once they are installed.**

The research also provided some insight into the barriers which are currently preventing motivated and engaged householders from installing. **Disruption and a lack of trust in heat pump technology** were the two main reasons that participants decided not to install a heat pump. The cost of heat pumps was also a barrier, but this was never the sole reason. We identified fewer barriers to installing solar PV, as only three participants had not installed solar PV.

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