Consumer Scotland
Luchd-Cleachdaidh Alba

Heat in Buildings - supporting the rollout of heat pumps and solar PV in Scotland

This report provides evidence-based findings to support the rollout of heat pumps and solar PV in Scotland

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Executive Summary

The Scottish Government has a statutory obligation to reduce the net emission of designated greenhouse gasses in Scotland to zero by the end of 2045.[1] Heating, ventilating, and cooling Scotland's buildings currently accounts for almost a fifth of these emissions in Scotland each year.[2] To achieve this goal, significant action needs to be taken to reduce emissions and decarbonise Scotland's buildings over the coming years.

The Scottish Government is proposing to introduce a Heat in Buildings Bill. To achieve change, consumers across Scotland will need to adopt low carbon technologies to heat their homes and improve their energy efficiency. Action and engagement to make this change achievable for consumers is essential if Scotland is to meet its climate targets and obligations.

Heat pumps and solar photovoltaics (solar PV) are two of the technologies that are likely to play an important role in the journey to decarbonise Scotland's homes. The heat pump and solar PV markets are still at a relatively early stage of development in Scotland. At present, access to grant funding is a key enabling factor for consumers to install these technologies.

Understanding the motivations, enablers, prompts and barriers to the uptake of these technologies will help Consumer Scotland understand what can be done to better support consumers along this journey. It is essential to understand consumer experiences of installing but also living with these technologies in order to build an overall picture of how well they work to heat our homes.

In this report, Consumer Scotland sets out its findings around supporting consumers to install heat pumps and solar PV based on qualitative research conducted in 2024 that explored the motivations and experiences of consumers installing these low carbon technologies. If we can support consumers to have a better overall experience of installation and using these technologies, then this will help to drive the wider uptake and rollout.

Key findings

- **Action is needed to reduce the barriers consumers face when looking to retrofit low carbon technologies in their homes**

  Consumers who took part in the research faced a significant number of barriers when they started their journey to install low carbon technologies and some of these barriers are still hard to overcome.

  Cost is a significant barrier to heat pump installation. Recent changes to available funding could also reduce the incentives for consumers installing complementary low carbon technologies, such as coupling a heat pump installation with solar PV or battery storage technologies, which would help to maximise the benefit of the heat pump by reducing running costs. The disruption associated with heat pump installation is also a significant barrier for consumers which makes installation less likely unless a consumer is moving property.

  The lack of technical understanding of how some low carbon technologies work in practice is likely to be a barrier to consumers. Not all consumers have the time to carry out their own research to overcome this. The journey from enquiry to installation is still too long and a cause of frustration to consumers. Action is needed to address each of these challenges and make heat pump installations in particular a simpler and easier option for consumers.

- **Consumers require more support to access funding opportunities and area based schemes**

  The existence and the scale of the funding available in Scotland to support low carbon technology installation was a significant enabling factor in the decision making process for the consumers who took part in the research. However, research has highlighted several challenges regarding consumers' experience of the funding application process. Some of the challenges identified included the application paperwork being complex and time consuming. Action has already been taken to address some of those concerns. However, where consumers are not so strongly motivated, more will be required to make this process easier and more accessible for consumers and reduce long processing times. Some consumers may also require additional support to complete the application process. Recent changes to funding criteria would also have excluded many participants in our research from being enabled and supported by available funding schemes.

- **Solutions are needed to support consumers without high levels of capacity, agency or motivation**

  Consumers who participated in the research were innovators/early adopters, motivated by environmental concerns with a strong understanding of how low carbon technologies work. Not all consumers will be motivated by the same reasons or have the time and knowledge to research technologies and how they work. Government and industry will need to develop solutions to better support consumers through this part of the journey.

- **Action is needed to tackle myths, misconceptions and misinformation on the effectiveness of low carbon technologies**

  Preconceptions of the effectiveness of low carbon technologies had a strong influence on participants' early decision making on whether to install them. Action could be taken to better support consumers in the decision making process to overcome the myths, misconceptions and misinformation they encounter with more proactive information on the effectiveness of low carbon technologies. Consumers require support and guidance to carry out their own research through better signposting to trusted sources of impartial, easy to understand information such as Home Energy Scotland. Helping consumers to meet with others who have already installed these technologies can help them to overcome initial doubts or concerns.

- **Moving home is a key enabling factor for consumers to carry out installation of low carbon technologies or energy efficiency measures**

  Moving home presents consumers with the opportunity to overcome some of the barriers to installing low carbon technologies that they may normally face. If consumers can be upskilled and educated on the relevant technologies, how they work and why decarbonisation is necessary, there may opportunities to drive the rollout across Scotland. If consumers are already aware of technologies and actively thinking about retrofit this will help to remove existing barriers in advance of regulation coming into effect.

- **Energy independence and security can be a driver for retrofit for some rural and urban consumers**

  Saving money on energy bills has become a strong motivating factor for consumers to consider the installation of low carbon technologies. The installation of these technologies can help to provide long term energy security and better protection from volatile, high cost fuel and energy prices. Consumers living in rural and remote areas, where they are more susceptible to power cuts and storm damage saw the installation of solar PV, coupled with battery storage, as a way to provide more energy independence and protection from these issues.

Further action is needed to support consumers to find a heat pump installer

Many of the consumers in the research struggled to find an installer to carry out the installation of a heat pump. Finding an installer was a significant step in their consumer journey and having a positive relationship with installers can have a considerable impact on if, when and how a householder proceeds with retrofit. Problems or delays to finding an installer could be a significant barrier in the installation journey. While there is work being done to develop supply chains to support the wider rollout and installation of heat pumps consumers will need additional support to identify appropriate suppliers.

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.
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 significantly more efficient than conventional heating technologies such as boilers or electric heaters because the heat is transferred, not generated. It can also heat water to be used in the property.
HES	**Home Energy Scotland**	Home Energy Scotland provides an impartial advice service to support homeowners in Scotland to make their homes warmer and reduce their energy bills.

		The Home Energy Scotland Grant and Loan Scheme provides homeowners in Scotland with a grant, interest free loan or a combination of both to install clean heating systems and energy efficiency measures. Energy Saving Trust manages the Home Energy Scotland Grant and Loan Scheme and the advice service on behalf of the Scottish Government.
LCT	**Low Carbon Technologies**	Low carbon energy or heating systems are those that emit zero or low CO2 emissions. For the purposes of this report we specifically consider heat pumps, solar PV and battery storage systems.
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.
	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 market is not regulated. Includes heating oil, LPG, biomass, pellets, and more.
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.

Who we are

1.1 Consumer Scotland is the statutory body for consumers in Scotland. Established by the Consumer Scotland Act 2020, we are accountable to the Scottish Parliament. Consumer Scotland's purpose is to improve outcomes for current and future consumers and our strategic objectives are:

- To enhance understanding and awareness of consumer issues by strengthening the evidence base
- To serve the needs and aspirations of current and future consumers by inspiring and influencing the public, private and third sectors
- To enable the active participation of consumers in a fairer economy by improving access to information and support

1.2 Consumer Scotland uses data, research and analysis to inform our work on the key issues facing consumers in Scotland. In conjunction with that evidence base we seek a consumer perspective through the application of the consumer principles of access, choice, safety, information, fairness, representation and redress.

Research methodology

1.3 In 2023, Consumer Scotland commissioned Changeworks to conduct qualitative research on our behalf so that we can better understand the experiences of consumers who have recently installed heat pumps, solar PV or both in Scotland. This will help to provide Consumer Scotland and policy makers in Scotland with an evidenced-based understanding of the enablers and barriers that consumers can face when installing these low carbon technologies.

1.4 The purpose of the research was to provide a rich, in-depth understanding of the motivations and decision-making processes of consumers that have recently decided to install these technologies in Scotland. Specifically, it aimed to provide key insights into:

- How consumers in Scotland 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
- The enablers and barriers consumers in Scotland may experience in relation to installing and using heat pumps and/or solar PV

1.5 In this research, 24 semi-structured interviews were conducted online with participants which focused on their decision making process in relation to their perceptions of low carbon technologies and their installations of these. Research participants were owner-occupiers living in Scotland, who had installed a heat pump, solar PV or both in the last two years.

1.6 The findings from these interviews help us to understand the motivations, prompts, enablers and barriers that consumers are confronted with when they look to install solar PV and heat pumps in their homes. An infographic which captures the key discussion points that emerged in relation to the consumer journey to install these low carbon technologies is provided on the following page.

1.7 The full research report by Changeworks, which contains more detail around the methodology and findings, has been published on Consumer Scotland's website alongside this policy briefing.

1.8 This research was one of six projects Consumer Scotland commissioned in 2023/24 to better understand consumer attitudes, views, behaviours and perceptions of the transition to net zero and climate change adaptation across a range of consumer markets.[3]

1.9 These projects were:

- A quantitative survey of consumers' general attitudes to net zero
- Qualitative research on consumers' participation in net zero
- A survey of current and prospective electric vehicle drivers
- Qualitative research with homeowners who had installed heat pumps and/or solar photovoltaic panels
- Deliberative research looking at the future of Scotland's water sector as it responds to the challenges of climate change
- Qualitative research exploring the decarbonisation of postal services with consumers and small businesses

1.10 Consumer Scotland is also currently undertaking a number of projects that are relevant to the development of the market for low carbon technologies in Scotland and how this may support the development of the proposed Heat in Buildings Bill. This covers issues including regulation, redress, consumer protection and market stimulation. This report provides a foundation that will inform the further development of that work.

Introduction

1.11 The Scottish Government has a statutory obligation to reduce the net emission of designated greenhouse gasses in Scotland to zero by the end of 2045.[4] Heating, ventilating, and cooling Scotland's buildings currently accounts for almost a fifth of these emissions in Scotland each year.[5] To achieve this goal, significant action needs to be taken to reduce emissions and decarbonise Scotland's buildings over the coming years.

1.12 The Scottish Government is proposing to introduce a Heat in Buildings Bill. To achieve change, consumers across Scotland will need to adopt low carbon technologies to heat their homes and improve their energy efficiency. Action and engagement to make this change achievable for consumers is essential if Scotland is to meet its climate targets and obligations.

1.13 Heat pumps and solar PV are two of the technologies that are expected to play an important role in the journey to decarbonise Scotland's homes. Heat pumps are energy efficient heating systems which take heat from colder areas, raise the temperature and use this to heat the home. They are expected to play a significant role in decarbonising many of Scotland's homes as they produce far few carbon emissions than traditional gas boiler heating systems. Solar PV takes solar energy and converts this into electricity for use in the home. This technology supports consumers to take advantage of clean, renewable power and can also help to lower electricity costs.

1.14 At present, the heat pump and solar PV markets are still at an early stage of rollout in Scotland. However both markets are currently at different stages of development, rollout and general public awareness. Between January 2009 and October 2024, 61,816 MCS certified domestic solar PV installations were registered in Scotland; compared to 28,137 MCS certified heat pump installations.[6] Other official data sources indicate a higher number of solar PV installations in Scotland. The UK Government (2024) Solar Photovoltaics Deployment statistics have recorded 118,430 PV installations in Scotland. The Scottish Household Conditions Survey (2022) has recorded approximately 166,000 installations.

1.15 Understanding consumer experiences and the difficulties they currently face installing these two technologies can help identify the specific actions that are needed to support the further rollout of these particular technologies across Scotland over the coming years. It can also provide a window into the broader issues that consumers may experience when seeking to adopt low carbon technologies in their homes and can further support the development of Scotland's green heating market.

Why do Scottish households install heat pumps and solar panels?

Types of customer journeys

Based on interviews with 24 Scottish households.

14 households

Pre-planned vision

Clear vision of the technologies they plan to install.

6 households

Influenced by advice

Plan to install one technology, install another one after advice.

4 households

Grasped an opportunity

No long term plans to install either a heat pump or solar PV.

Motivations

What makes people consider heat pumps or solar PV in the first place.

- #1 Environmental concerns
- #2 Saving money
- #3 Future regulations
- #4 Energy independence

Prompts

Specific reasons, moments or opportunities when people decide to install.

- #1 Moving home
- #2 Funding availability
- #3 New heating system
- #4 Installing a heat pump

+ Enablers

- Grant and loan funding
- Knowing others who have installed
- Tailored and credible advice
- Time to do research

× Barriers

- Lack of trust in technology
- Complicated funding process
- Not hearing back from installers
- Inexperienced heat pump installers
- Disruption

You can find more information in the full report: ***Choosing for the future: Why Scottish households install heat pumps and solar PV (2024)***

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Findings and Policy Implications

Action is needed to reduce the barriers consumers face when looking to retrofit low carbon technologies in their homes

1.16 The research found that even when consumers in Scotland are strongly motivated to install heat pumps and solar PV, they face big challenges to doing so. Whilst the participants in the research did overcome these challenges, the findings suggest that where consumers are not so strongly motivated they are likely to find some of these issues too difficult to overcome. The main barriers identified include:

- **Cost remains a significant factor and likely the main barrier to heat pump installation for many consumers.** The Scottish Government has taken action to mitigate this through the funding of the Home Energy Scotland Grant and Loan Scheme administered through Energy Saving Trust. This has helped to bring down the cost of installation and make installation more financially viable. However, even with considerable funding and financial support available, cost is still a significant barrier that consumers encounter.[7] Recent changes to the Grant and Loan Scheme mean that it now excludes funding for solar PV and battery storage technologies; both measures that when coupled with a heat pump can make it a more cost effective heating solution. Alternative financial offerings could help consumers to overcome the higher upfront cost of purchasing a heat pump but these options are still very limited.[8] The Green Heat Finance Task Force has produced a report which explores alternative finance models that could be considered in future.[9]

- **Lack of technical awareness and understanding of how the technology works is likely to be a barrier to consumers.** There is a lack of understanding and awareness of how heat pumps work and this can leave consumers vulnerable to the myths, misconceptions and misinformation that they can encounter with regard to these technologies. Having a limited understanding of the technology can be a barrier to consumers even considering a heat pump as a potential heating solution. Research also indicated that even the current group of innovators/early adopters that are installing the technology can be heavily influenced by negative public perceptions or discourse.[10] There are a number of campaigns and initiatives[11], such as Nesta's Get a Heat Pump resource, the Green Homes Network[12] and Home Energy Scotland's 'Heat Pump Heroes'[13], all aimed at supporting consumers to overcome this barrier. Recent work carried out by the Competition and Markets Authority (CMA) has also aimed to support consumers when purchasing low carbon heating

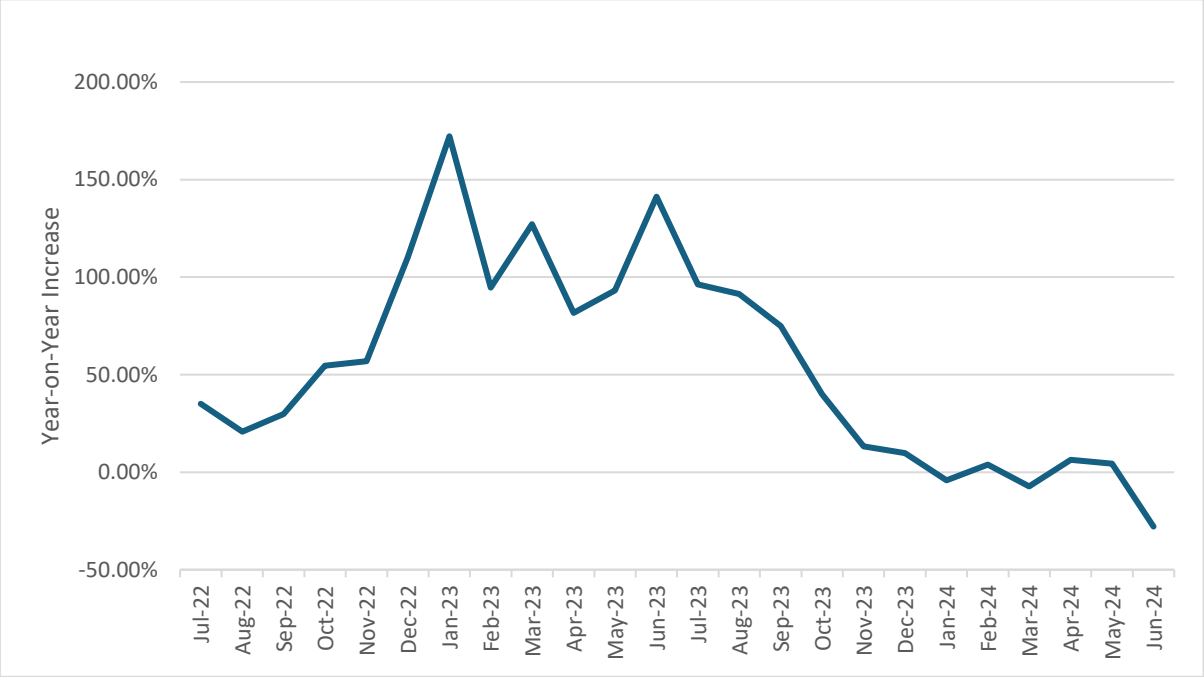
systems, including new information to help consumers better understand the technology.[14]

- **The disruption associated with installing a heat pump is a barrier to uptake.** The potential need to change radiators and pipes or disrupt flooring is still considered a reason by consumers not to proceed with installation of a heat pump. This helps to explain why moving home is an enabling factor for installation as consumers may have greater scope to mitigate and manage disruption before moving into the property.

1.17 Consumers who took part in the research experienced fewer barriers during the process to install solar PV in their homes. The main barriers were normally associated with the effectiveness of the technology in a particular property, including unsuitable roofs or low generation potential; which are harder to directly overcome. This suggests that the solar PV market may have started to overcome some of the barriers that the heat pump market is experiencing now and lessons could be learned from this. However cost could be re-emerging as a barrier due to the reduction in available funding for this technology.

1.18 Recent changes to the Scottish Government's funding of the Grant and Loan Scheme [15] has removed support for solar PV. Figure 1 shows that growth in MCS accredited domestic solar PV installations in Scotland has fallen since the Grant and Loan Scheme was restricted in 2023.[16]

Fig 1 - Growth of Domestic Solar PV Installations in Scotland



1.19 In terms of overcoming cost barriers, the research also found that the participants were more likely to install more than one technology because funding was available to do so; and this enabled them to go further than their initial ambitions.[17] The availability of funding, coupled with independent and trusted advice, made the decision to install these technologies much easier and often reinforced the case for installing a heat pump.

1.20 A separate report from Consumer Scotland on the net zero transition found that the main barriers to consumers undertaking more sustainable behaviours across a wide range of markets relate to cost, convenience, clarity and confidence and accessibility.[18] It states that more action is needed generally to support consumers to overcome these barriers. It found that consumers are concerned about climate change, but that they consider government and industry to have primary responsibility for tackling this. Consumers are looking to policymakers and business for leadership, guidance and support to implement any necessary changes. These findings resonate strongly with our research on heat pumps and solar PV where costs, inconvenience/disruption and lack of access to sources of trusted information, advice and installers to help navigate important technical information, all played a role.

Consumers require more support to access funding opportunities and area based schemes

1.21 Without access to funding such as the Home Energy Scotland Grant and Loan Scheme funded by the Scottish Government, many consumers who took part in the research would have been unable to undertake the installation or would have reduced the ambition of their retrofit plans. The existence and the scale of the funding available in Scotland has, until recently, been a significant enabling factor in the decision making process for consumers.

1.22 Consistent with research from Climate XChange[19] the research also identified concerns about consumers' experience of the funding application process.[20] Some of the challenges identified included the application paperwork being complex and time consuming. Long processing times were a factor in some participants turning down interest-free loans to fund their retrofit. Some participants noted that they sought a loan from elsewhere with higher interest rates as they did not want to repeat the time-consuming application process and delay the installation further. Other participants found the approval process much slower than they had hoped. One of the difficulties mentioned was that installers wanted consumers to pay installers upfront, in advance of receiving the funding, which was not always practical or possible. Others required support from their installer to complete the application as they found it to be complicated and confusing. This research indicates that these issues can serve as a deterrent to consumers taking advantage of available funding opportunities.[21]

1.23 The research highlighted similar issues with other funding schemes. Two participants also turned down a referral to the Warmer Homes Scotland Scheme, the Scottish Government's national fuel poverty programme, as they did not feel confident in the advice provided by the installer. Area Based Schemes have supported over 108,000 homes in Scotland to improve their energy efficiency and heating systems since 2013.[22] A participant in our research who received funding through an Area Based Scheme felt that the process was made more complicated by disjointed communications from the different organisations that were involved in the consumer journey.[23]

1.24 The availability of funding across different schemes was a significant factor in the decision making process for the consumers who took part in the research. This underlines the importance of making sure that the process to access this funding works smoothly for

consumers and can help to encourage and support them to go beyond their initial ambitions. The consumer experiences outlined in the research suggest that the funding application processes could be improved through:

- **Timescales from inquiry to full installation could be made shorter and more streamlined.** From navigating the available information and advice, completing the funding process and finding an appropriate installer to carry out the work, the process needs to be made easier and less time consuming.

- **More support during the application process to support consumers if they have any difficulty.** Some consumers in the research found the funding application process to be complicated, confusing and challenging to complete.

- **Support better communication between the different agencies involved in delivering area based schemes.** Communication between advice services, scheme management agents and sub-contractors can be confusing for households. This communication could sometimes be disjointed and there is an opportunity for this communication to be more coordinated.

1.25 Addressing these challenges could help to remove some of the barriers that consumers face and make incentives more attractive. Positive experiences of the funding process will help to drive more people through these schemes and ultimately improve the experience for consumers who are considering installing a heat pump or solar PV. To ensure the best possible outcomes it is also essential for services such as the Home Energy Scotland advice service to be fully resourced in order to provide consumers with the best possible experience when seeking impartial advice or access to available funding.

Solutions are needed to support consumers without high levels of capacity, agency or motivation

1.26 The widespread adoption of heat pumps in Scotland will require solutions to be developed to support consumers without such high levels of capacity, agency, or motivation. It was common for the consumers who took part in the research to have a pre-planned vision about the technology they wanted to install. With this vision came an existing understanding of how the relevant technology works, coupled with the motivation to research it in more detail. This means that these consumers already start with a pre-existing knowledge at the outset of the installation journey.

1.27 Changeworks found that consumers who participated in the research were 'innovators' with knowledge and understanding of how these low carbon technologies work and operate.[24] This reinforces previous research carried out by Climate XChange which found that those currently installing heat pumps are highly motivated early adopters/innovators.[25] These consumers are strongly motivated by environmental concerns and want to do their part to address this. This group of consumers have the time, inclination and ability to carry out significant research to understand how the technology works and also how it can work for them. It is unlikely that all consumers will have the same capacity and inclination to carry out the same level of research. In this context, significantly increasing the uptake of low carbon technologies, amongst consumers who

are less engaged than those consumers who have already made these changes, appears unlikely to be achieved unless steps are taken to make the consumer journey easier. It also raises questions as to whether too much responsibility is being placed on individual consumers instead of taking a more coordinated area-based approach.

1.28 Consumer Scotland has commissioned additional qualitative research to better understand how consumers engage and participate in the transition to net zero. This research also suggests that the way consumers engage in the energy market is largely driven by cost and the ability to implement changes.[26] Heat pump installation in particular was seen by those consumers as a significant financial and life change. The same research also found that some consumer behaviour relies on participants having an awareness and understanding of the issues that many consumers currently don't have. For the majority of consumers, cost and convenience remain key factors in driving consumer purchasing decisions rather than environmental concerns.

1.29 A systemic approach at all levels of government will be required if consumers are going to be supported to make the changes required to deliver the wider roll out of low carbon technologies. While ensuring that consumers have access to meaningful and trustworthy advice will be important, information alone will not be enough. Information provision must be situated within a clear framework, which provides incentives for sustainable use of resources, regulates problematic products and services and supports the design and development of more sustainable options.[27] Funding, sufficient supply chains, consumer protection and access to redress are all essential.

Action is needed to tackle myths, misconceptions and misinformation on the effectiveness of low carbon technologies

1.30 Initial preconceptions and negative assumptions about the effectiveness and running of heat pumps and solar PV played a role in the decision making process of consumers who took part in the research. These consumers overcame these preconceptions and decided to install the technologies. Three key factors helped to overcome initial scepticism:

- **Having the time and capacity to carry out detailed research and the confidence in understanding and using that information** - previous survey research by Consumer Scotland has already highlighted a lack of consumer awareness and knowledge around less familiar low carbon technologies.[28] Time was a key enabling factor that allowed consumers to research and engage with these technologies in the qualitative research.

- **Access to independent advice and funding** - access to funding and advice is also a means to overcoming hesitation to installing these technologies. The majority of consumers who took part in our research engaged with the Home Energy Scotland advice service during their installation journey, either as a source of advice and information or for funding.

- **Access to peer and community support** - seeing that others had installed technologies helped to build trust in their effectiveness. Consumers who know someone who has already installed these technologies are able to see live, practical

examples of them running in their local communities. This helps to challenge any initial misconceptions or misunderstanding about how the technology works.

1.31 There are further actions that could be taken to better support consumers in the decision-making process to overcome the myths, misconceptions and misinformation they encounter. These include:

- **Supporting consumers with more proactive information of the effectiveness of low carbon technologies –** Consumers in our research often found misinformation about the effectiveness of these technologies, sometimes without looking for it. More needs to be done to proactively counter this misinformation through the better promotion of the facts of how these technologies work by Government, industry and others. Trials and research conducted by Energy Systems Catapult has debunked many of the myths perpetuated about the effectiveness of heat pumps, including the suitability[29] and efficiency.[30] The upcoming Heat in Buildings regulations will require significant public engagement to inform and support consumers through what is required of them and the journey to comply with the regulations. The Scottish Government will need to take a rapid and more proactive role in challenging the myths, misconceptions and misinformation about low carbon technologies. This is an opportunity to work with other key partners such as Energy Saving Trust and Nesta to signpost consumers to reputable sources of information and advice.

- **Support consumers to conduct their own research through better signposting to different trusted sources of impartial, trustworthy easy to understand information** – The research found that consumers gained confidence from carrying out their own research, enabling them to overcome initial myths or misconceptions about the technology. Existing information sources are seen as useful but also as a starting place for further research. There must be a recognition that not all consumers will have the time and capacity to carry out this level of research. Consumers need to be signposted to a range of different trusted sources of information to help and support them to find and access the level of information they want to receive.[31] This will make it easier for consumers to find and access information they need to support the decision making process but could also help to join up and coordinate between existing sources of information to provide a better consumer experience. Consumer Scotland would encourage the Scottish Government, advice bodies and industry to consider how it can make it easier for consumers to conduct their own research through better coordination of existing sources of information.

- **Support consumers to meet others who have installed these technologies -** Consumers in the research benefited from speaking to someone who had installed the relevant low carbon technology to see it work in practice. This indicates that programmes such as Nesta's Visit a Heat Pump scheme[32] and the Green Homes Network[33] could play an important role to support the wider rollout of these technologies – supporting and providing consumers with the opportunity to visit and talk to others who have already been through this journey. As part of the Heat in Buildings public engagement programme, the Scottish Government could look to

utilise existing networks like these to support consumers to access others who have already carried out their installation journey.

1.32 The research indicates that negative preconceptions, which can be heavily influenced by myths, misconceptions and misinformation had a significant impact on participants decision making process to install a heat pump. There is still work to be done, therefore, to enhance the consumer experience of access to information, advice and support. While most of the participants in our research overcame initial scepticism or negative perceptions, some still decided against installing the technology due to their initial assumptions. If this is true of a group of consumers who were already highly motivated by environmental concerns, it is likely to act as an even greater barrier for consumers who are less motivated by these drivers.

Moving home is a key enabling factor for consumers to carry out installation of low carbon technologies or energy efficiency measures

1.33 Moving home presents consumers with an opportunity to overcome many of the barriers to installing low carbon technologies that they normally face. In this circumstance the disruption normally associated with installation of a heat pump can potentially be more easily mitigated and built into other property renovations that the consumer is undertaking. The process of moving home presents consumers with an opportunity to think about how they will heat their home in the medium to long term and the cost implications of the different options available to them. This creates a window of opportunity for a less invasive installation process which consumers can see as an investment in their new property. This reinforces existing research and which lay behind the Scottish Government's previous plans in the Heat in Buildings Bill proposals[34] for change of property tenure to become the main trigger point for consumers to decarbonise to a clean heating system.

1.34 Consumer Scotland acknowledges there is a good case for property purchase being considered as a possible trigger point to encourage consumers to undertake retrofit. Such an approach would potentially support consumers to carry out installation at a point that the research indicates it could be much easier to do so.[35] [36] However, for it to be a reasonable expectation of consumers they would need to have access to sufficient supply chains, appropriate financial and funding mechanisms, consumer protection and redress in the market and time is needed for such a supporting environment to develop. Supporting consumers to be more aware of the technologies available and to actively think about retrofit will help them to build installation plans into property purchases.

Energy independence and security can be a key driver for retrofit for some urban and rural consumers

1.35 Energy independence and security was a motivating factor to install low carbon technologies for consumers in both rural and urban areas in our research. The cost of living crisis had a significant impact on the cost of heating homes in Scotland. Unsurprisingly, saving money on energy bills is consequently a strong motivating factor for consumers considering the installation of low carbon technologies. The installation of these

technologies can help to provide long term energy security and protection from volatile, high cost fuel and energy prices. But they can also provide consumers with reassurance and protection during power outages.

1.36 The installation of technologies such as a heat pump, solar PV or a battery storage system presented consumers, particularly in rural areas, with the opportunity to enhance the resilience of their energy supply, by transitioning away from unregulated, potentially expensive fossil fuels such as LPG and heating oil. Fossil fuels are subject to external market shocks, such as the Ukraine crisis; which can leave consumers vulnerable to high price increases. Limited local competition can also drive high prices and poorer outcomes for consumers. The installation of low carbon technologies can help to provide longer term energy security and more protection from volatile fuel pricing. Saving money on energy bills was also a motivator for urban consumers who wanted to reduce the amount of energy they purchased from the national grid. Low carbon technologies can also be utilised to help to make heating more affordable for consumers transitioning from more expensive electric storage heating systems.

1.37 The installation of solar PV was also an enabler of energy resilience and independence for some rural and urban consumers. Consumers living in rural and remote areas, where they are more susceptible to power cuts and storm damage saw the installation of solar PV, coupled with battery storage; as a way to provide more energy independence and protection from these issues. As part of the planned public engagement to support the heat in buildings regulations there could be an opportunity as part of the messaging on low carbon technologies such as solar PV and batteries to highlight this benefit more to drive uptake in rural areas.

1.38 These issues may also help to inform other significant work underway in the energy market, including work on the future structure of the retail market and work to support consumers in vulnerable circumstances.

Further action is needed to support consumers to find a heat pump installer

1.39 A challenge identified in the research was that participants often found it difficult to find an installer to carry out the installation of the low carbon technologies. Finding an installer was a significant step in the consumer journey and having a positive relationship with installers can have a considerable impact on if, when and how a householder proceeds with retrofit. Most participants in the research reached out to multiple installers for a quote after they had received no response from initial contact with an installer. Many reached out to local installers with limited success before contacting a wider range of installers.

1.40 While finding an installer was a significant challenge for participants, a further concern was finding an installer that was not experienced who would either badly install the system or that would sell them a system that was not appropriate for their circumstances or home. Participants also relied on online resources such as the EST installer tool[37] or on online reviews to support them to find a suitable installer. It is positive that consumers find these

resources useful when looking to carry out research and source information on reputable installers.

1.41 The relationship between consumer and installer can be a positive influence on a consumer's decision making process. Installers can often provide more technical detail about the operation and installation of the system than others along the consumer journey can provide. Problems or delays to finding an installer could be a significant barrier in the installation journey.

1.42 There is still a lack of installers of low carbon technologies particularly in rural areas in Scotland and this is an area of concern, although we note that the Scottish Government are taking action to mitigate this through the Heat in Buildings supply chain delivery plan.[38] If not sufficiently addressed this could potentially slow down the rollout of heat pumps and other technologies in rural areas. The lack of suppliers, and ultimately competition; could mean higher costs and delays for consumers. If supply chains are not sufficiently developed; this could ultimately affect consumers' ability to comply with regulation.

1.43 We are aware that there is considerable work being done by both UK and Scottish Governments to develop supply chains for the wider rollout and installation of low carbon technologies. The rollout of solar PV in Scotland could be considered an example of how this could be done successfully. The development of the solar PV market has led to the growth in the number of installers in the market to meet consumer demand which ultimately has helped to provide greater choice and more competitive prices.[39] However our research suggests that the supply chain for heat pumps is currently less developed and as a result consumers will require additional support to identify and secure local suppliers to carry out their installation.

Next steps

1.44 Our research into heat pumps and solar PV is one part of a much wider programme of work that Consumer Scotland is undertaking in this area. This will help to inform and support the ongoing work that the Scottish Government are pursuing to decarbonise heat in buildings and improve energy efficiency for consumers across Scotland.

1.45 Consumer Scotland set out to understand the prompts, enablers and barriers that consumers face when looking to install specific low carbon technologies. Our research in this space contributes to the evidence which indicates that Scotland is still at an early stage of the rollout of these technologies. Those who participated in our research should be regarded as 'early adopters/innovators' and their experiences to date indicate that a range of actions are required to enable the significant scale-up of both the solar PV and heat pump rollout in Scotland. The research provides valuable insight into the consumer journey and the different challenges along this installation journey that consumers encounter, highlighting where action to improve the consumer experience should be prioritised.

1.46 The upcoming Heat in Buildings Bill will have a significant impact on consumers and how they heat their homes. Consumer Scotland will continue to work with the Scottish Government as it develops plans for the Bill. We will provide evidence and advice to ensure that policymakers have a clear understanding of the implications for current and future consumers and of the actions required to address consumers' requirements.

1.47 The work so far has highlighted the need to further understand the challenges and barriers facing consumers as they look to install low carbon technologies. One particular area of interest is the group of consumers who start applications through the Home Energy Scotland Grant and Loan Scheme and ultimately decide to abandon the process. This could be an area worthy of further research as there would be an opportunity to learn from and understand why these consumers did not complete the process.

1.48 Consumer Scotland is currently investigating the consumer protection frameworks in the market for energy efficiency and low carbon heating products.[40] This will review whether consumers can access quality sources of advice and information, fair and affordable incentives, competitive and clear product choices, and strong consumer protections in this sector. Following this work, Consumer Scotland will make recommendations to better deliver the protections and confidence needed for consumers in Scotland to decarbonise and improve their home energy efficiency.

1.49 Finally, Consumer Scotland's report on consumer perceptions of and engagement with the transition to net zero has highlighted the need for systemic approaches to support effective consumer engagement in the transition to net zero. [41] It found that the majority of consumers firmly believe responsibility for tackling climate change resides with

governments, businesses, and industry players. Consumers don't fully understand what action is expected of them for Scotland to meet its climate change targets. Cost and convenience remain key factors in driving consumer purchasing decisions. The sustainable actions that consumers do take are often more influenced by ease and cost than by environmental benefits.

1.50 These findings resonate strongly with this research on heat pumps and solar PV. The consumers in this research were highly motivated, climate conscious with a technical interest in how this technology works. They are unlikely to be typical of the broader consumer population. Given the considerable number of barriers that consumers currently have to navigate and considering the pace and scale of change required, a much more systemic approach to support wider uptake will be needed. In time, there may be merit in the development of a more coordinated area-based approach to support a faster, safer rollout.

References

[1] Climate Change (Scotland) Act 2009 https://www.legislation.gov.uk/asp/2009/12
[2] Scottish Government (2023) Scottish Greenhouse Gas Statistics 2021, Annex B: Table 1
[3] Copies of the published reports are available on our website and we make reference to these other projects where appropriate.
[4] Climate Change (Scotland) Act 2009 https://www.legislation.gov.uk/asp/2009/12
[5] Scottish Government (2023) Scottish Greenhouse Gas Statistics 2021, Annex B: Table 1
[6] MCS Data Dashboard accessed October 2024 – Figures represent number of MCS certified domestic solar PV installations from 2009 until June 2024. Number of MCS certified domestic heat pump installations is a combined figure for both Air Source Heat Pumps (ASHP) and Ground Source Heat Pumps (GSHP).
[7] Nesta (2024) How to make heat pumps more affordable
[8] Climate Xchange (2023) Heat pumps on subscription
[9] Green Heat Finance Task Force Report Part 1: Green-heat-finance-taskforce-part-1-report.pdf
[10] Consistent with research by Nesta and for Climate Xchange we are using the term 'innovators/early adopters' in the report to reflect that we are likely to still be in the very early stages of adoption in Scotland. While both innovators and early adopters are very motivated to overcome the barriers that the general public will not be, innovators are much more willing to take risks and will be the first to adopt the new technology while early adopters will still require convincing with trusted sources of information. For a discussion on this see Climate Xchange (2023) The experiences of early adopters of zero direct emissions heating systems in Scotland and Nesta (2021) How understanding the user journey for heat pump adoption will generate innovation
[11] Nesta's Get a Heat Pump resource looks to provide consumers with information and advice to learn about heat pumps and whether one would be right for their circumstances. Energy Saving Trust publish information, advice and in-depth guides on the operation of heat pumps to support consumer decision making. They also signpost to available funding schemes.
[12] The Green Homes Network operated by Energy Saving Trust also gives consumers the opportunity to search case studies of people in Scotland who have already carried out their retrofit journey.
[13] Home Energy Scotland - Heat Pump Heroes
[14] The Competition and Markets Authority (CMA) also produced guidance for consumers to support them buying green heating and insulation products.
[15] From 6 June 2024 onwards, the Home Energy Scotland Grant and Loan will no longer provide new referrals for solar PV and energy storage systems, including electric and heat batteries.
[16] MCS Data Dashboard accessed October 2024
[17] Changeworks (2024) Choosing for the future: Why Scottish homeowners install heat pumps and solar PV - This research was carried out before recent changes to the HES Grant and Loan Scheme which removed financial support for solar PV and battery storage technologies.
[18] Consumer Scotland (2024) Consumer perceptions of and engagement with the transition to net zero
[19] Climate Xchange (2023) The experiences of early adopters of zero direct emissions heating systems in Scotland
[20] Changeworks (2024) Choosing for the future: Why Scottish homeowners install heat pumps and solar PV
[21] Consumer Scotland staff have engaged with Energy Saving Trust to better understand the service and the consumer journey, particularly in relation to the findings of the Changeworks research. This research was carried out during a specific period of time and we are aware that since then Energy Saving Trust have made changes to the service to improve the customer experience and respond to and address some of the challenges consumers have experienced.
[22] Scottish Government (2023) Heat in Buildings progress report

[23] 17 consumers who took part in the research had accessed funding from Home Energy Scotland (HES). Thirteen of these received the grant and loan, while four received the interest-free loan only. Of the remaining households, two were fully funded through Area Based Schemes and two used ECO4 funding. Two participants also turned down a referrals to the Warmer Homes Scotland scheme, the Scottish Government's national fuel poverty programme, as they did not feel confident in the advice provided by the installer

[24] Changeworks (2024) Choosing for the future: Why Scottish homeowners install heat pumps and solar PV

[25] Climate Xchange (2023) The experiences of early adopters of zero direct emissions heating systems in Scotland. This report stated that whilst they were using the term 'early adopters' that, "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" (p.7).

[26] Consumer Scotland (2024) Consumer perceptions of and engagement with the transition to net - Final report

[27] Consumer Scotland (2024) Consumer perceptions of and engagement with the transition to net - Final report

[28] Consumer Scotland (2023) Consumers and the Transition to Net Zero Consumers and the transition to net zero

[29] Department of Business, Energy and Industrial Strategy (2022) Electrification of Heat Demonstration Project – Heat Pump Installation Statistics conducted by Energy Systems Catapult found that all housing types are suitable for heat pumps,

[30] Department for Energy Security and Net Zero (2023) Electrification of Heat Demonstration Project conducted by Energy Systems Catapult found that heat pumps can be up to three times more efficient than gas boilers

[31] Competition and Markets Authority (2023) Buying green heating and insultation products. The Competition and Markets Authority also recently produced advice for businesses on marketing green heating and insulation products which includes principles to help businesses understand and fulfil their obligations under consumer law.

[32] Nesta have launched a service connecting people who are interested in getting a heat pump with local heat pump owners.

[33] The Green Homes Network features more than 300 homes across Scotland, with homeowners who have installed renewable technologies at home such as heat pumps and solar panels and want to share their experiences. The network comprises homes of all kinds; from eco-builds to historic stone cottages, listed buildings and everything in between.

[34] Scottish Government (2023) Delivering Net Zero for Scotland's Buildings - A Consultation on proposals for a Heat in Buildings Bill

[35] Climate Xchange (2023) The experiences of early adopters of zero direct emissions heating systems in Scotland

[36] Consumer Scotland (2024) Response to Heat in Buildings Bill consultation

[37] Energy Saving Trust operate a Renewables Installer Finder tool available to consumers online which can highlight available installers within the consumers local area

[38] Scottish Government (2022) The Heat in Buildings Supply Chains Delivery Plan: Towards an Industry for Green Heat

[39] Solar Energy Scotland (2021) Scotland's fair share - Solar's role in achieving net zero in Scotland

[40] Consumer Scotland (2024) Converting Scotland's Home Heating consumer-scotland-investigation-converting-scotlands-home-heating.pdf

[41] Consumer Scotland (2024) Consumer perceptions of and engagement with the transition to net - Final report