Heating our homes in a Net Zero Future: Understanding what matters to consumers

Project Report for

nationalgrid

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Foreword by Nicola Shaw CBE, UK Executive Director, National Grid

The next three decades will see one of the biggest transformations in the UK as we look to achieve net zero emissions across the economy by 2050. A big part of this will be changing the way we heat our homes.

To successfully decarbonise heat, the pace and scale of change will be immense. Over 20,000 homes per week from 2025 to 2050 will need to switch to a low carbon heat source. This will require a mosaic of solutions, and at National Grid, our engineers are innovating to meet this challenge, such as trialling alternative gases like hydrogen in our gas network.

Product innovation is just one aspect of the change, however. Another is making sure that consumers are engaged early so that they can drive forward the options they want to have in the future – we must listen to their views if the process of change is to be designed effectively. However, we don't yet know a lot about consumer priorities for the change – nor do we know how they will engage with the new technologies.

That's why we commissioned this research, undertaken on our behalf by ICS and eftec, to help us understand what really matters to consumers when thinking about how they will heat their homes in a net zero future. The team talked to people in different parts of the country, from all walks of life, about their heating experiences and what concerns or ambitions they had for the future of heat.

The findings set out in this report highlight a diversity of views, depending on people's differing circumstances, but also reveal a common theme: consumers are willing to change, but will need the right information and support to do so. Fairness is also a top priority, affirming that we must bring everyone with us on the road to net zero.

As we focus on recovering from the impact of COVID-19, there is a huge opportunity to create a cleaner, greener economic future. Transforming how we heat our homes can play a major part in this, and we hope that this report will help to inform the debate on this topic, putting people at its heart.

Nicola Shaw CBE

UK Executive Director, National Grid

Foreword by Dr Lisa Gahan, Director of the ICS/eftec research project

Over the last few decades, we have grown used to warm and comfortable homes, with heating available instantly and on demand. There is no appetite to re-live the heating experiences of previous generations, when heating homes involved considerable effort, but still left many cold. If the UK is to meet our target of net zero carbon emissions by 2050, we will need to change the way that we heat our homes and businesses forever, while maintaining the heating experience consumers know, if not enhancing it.

Decarbonising heat will be one of the biggest transformations that we have undertaken in the UK. Ensuring that we put consumers' needs at the heart of our plans will be vital to its success, but at the moment, the overwhelming majority of consumers are unaware of the need for change.

This report sets out the results of an independent programme of research gathering diverse consumers' views from across the country. It seeks to understand their experiences, attitudes and motivations. It provides valuable insight into how best to manage the transition in ways that are seen to be fair and leaves no one behind. We have balanced and synthesised these insights to help understand the scale of the challenge required to engage and support consumers through the transition.

We have great pleasure in sharing these insights in the hope that they will be used by National Grid and wider policy makers to ensure consumer perceptions and narratives are at the heart of policy development through the transition.

The decarbonisation challenge to meet net zero will be a challenge, but also an opportunity. But with consumers fully engaged and at the heart of future plans, the transition can be undertaken in a way that benefits and protects us all.

Dr Lisa Gahan

Director, ICS

Executive Summary

Background

The next three decades will involve one of the biggest transformations as we decarbonise the UK economy, including how we heat our homes and businesses. Eighty five percent of UK households currently use fossil-fuel based natural gas to heat their homes[1]. If the UK is to meet its target to achieve net zero emissions across the economy by 2050, there is an urgent need to decarbonise heat; and the 2020s will be an important decade to lay the foundation for this transformation. If we get this right, there are opportunities for jobs and economic growth across the country.

The transition will likely require a mosaic of different low carbon heating solutions to meet the needs of a wide variety of heat consumers, types of homes and geographies. This is a significant opportunity and the heat transition will need to be implemented in a way that delivers for the economy while being fair to all parties, and ensures no one is left behind. If this transformation is to be successful, consumers will need to be actively involved in conversations and decision-making.

With policy discussions on the future of heat ramping up, we conducted this programme of research to help National Grid, Government and policymakers understand what matters to consumers, so that the findings can inform policy development on the domestic heat transition. The research has provided valuable insights into consumer perceptions of the heat decarbonisation challenge, the options available to lower emissions from homes across the UK, and what consumers feel is most important in how the transformation of our heating systems is delivered in the coming years. To note, this research was conducted prior to Covid-19. Nevertheless, this research provides important insight for decision makers and industry to consider.

Research Approach

To understand the needs of consumers in the energy transition, ICS and eftec worked with National Grid to develop a deliberative research programme involving 60 consumers to understand consumers' views in this important area, to inform public policy development.

The objectives set for the research can be summarised as:

- To understand how decarbonisation of heat can be delivered in a way which works best for consumers, with a fair and just transition for all in society.
- To learn more about consumer perceptions and acceptability for the different heat decarbonisation options and payment methods – including what drives acceptability.
- To hear from consumers how best National Grid and other stakeholders can continue to engage and communicate, to ensure that consumer focussed options are developed.

This has been delivered through a programme of deliberative research and focus groups with consumers across England and Scotland. The deliberative approach ensures that the discussion, debate and trade-offs for consumers are better understood, and that it provides detailed insights into how consumers perceive and assess low carbon heat options, and what matters most in how these options are delivered.

[1] *Committee on Climate Change (2018): Cleaning up the UK's heating systems: new insights on low-carbon heat.*

Key Findings

The research has highlighted key themes that matter to consumers in the transition to alternative low carbon heating options. These are summarised below, with more detailed findings available in the report and appendices.

There's a major knowledge gap, but a willingness to act

Ninety-three percent of consumers said that climate change was a serious or very serious issue. Despite this, only 5% identified heat as a main contributor to the UK's carbon emissions, and were more likely to cite power, transport or agriculture as key contributors. Consumers were confused by the different government targets but were still taking actions and modifying behaviours to reduce their contribution to climate change.

Public awareness is needed to help drive uptake

Consumers felt that the low carbon heating alternatives were rarely advertised, with many citing plumbers and those replacing gas boilers as key sources for advice, often when they experience a boiler breakdown. For example, only 20% were very or quite familiar with ground source heat pumps, 18% with air source heat pumps and 2% with heat networks when first introduced.

Warm and comfortable homes are top priorities

'Warm' and 'comfortable' were the phrases that were most often used to reflect what consumers want from their home heating systems. Overall, consumers are not wedded to their current heating systems (primarily gas boilers and central heating systems) and are open to changing to low carbon heating alternatives if they can meet their needs. Across all demographics – and especially those in the higher age brackets – there is no appetite to see a reversal in their heating experiences to the past when heating was not 'on-demand'.

One size doesn't fit all

We heard that the types of challenges and experiences that consumers face are wide and varied; and they highlighted the need for a positive experience from installation, through to everyday use, and affordability of ongoing costs. Consumers were interested to engage in discussions about the trade-offs between the different options to understand which solutions might be most suitable for their own types of housing and personal needs.

Addressing the high upfront cost barrier is important

We saw a polarised response from consumers when the costs of low carbon heat options were presented in different ways. When no solutions were presented to the higher upfront costs of low carbon heating solutions, all the options were received negatively. However, when workable funding solutions were presented, consumers had a more positive reaction to the options. The upfront costs were seen to be directly related to the affordability of the options.

Trust and accountability in decision-makers and authorities is crucial

Consumers cited the need for independent authorities who they could trust to deliver the transition, and who could hold government to account on delivering the heat transition. Consumers want factual, trusted information on issues such as safety, reliability and security of supply when shown the alternative heating options. While the cost of alternatives was important, consumers were also interested in other aspects of conversion, such as disruption, space, and quality of their heating experience.

A fair and just transition is non-negotiable

Related to the ability to trust independent authorities, consumers wanted confidence that there would be a 'just transition' that was accessible and financially viable, and that consideration and protection will be in place for the most vulnerable in society. They want assurance that the most vulnerable will not be left behind or imposed on, and that heating solutions will be designed to support those who are least able to adapt.

Recommendations

Based on the findings of this research and from our discussions of them with National Grid, we propose five recommendations for Government and policymakers to consider, which reflect consumers' views and will facilitate the decarbonisation of heat.

#1 – Promote public awareness and make consumer advice readily available

To address the ***major knowledge gap*** and the ***public awareness*** needed to drive uptake of the low carbon options, establish a delivery body to be responsible for consumer communication, advice and delivery of the heat transformation (in a similar capacity to previous successes such as Digital UK with the Digital Switchover Campaign).

#2 – Take a partnership approach for a successful transition

To maximise ***trust and accountability*** in the transition, industry, stakeholders and Government should work together to establish a Heat Transformation Council - like previous initiatives for offshore wind and Carbon Capture Usage & Storage - to assess the deliverability of various low carbon heating options and make recommendations to Government. Co-chaired by senior ministers from both BEIS and Treasury, the Council could include representation from such sectors as consumer groups, energy, local government, social housing and the supply chain.

#3 – Ensure regulation offers adequate protection for the diverse consumer landscape

To ensure a ***fair and just transition***, review existing regulation to ensure it offers adequate protections for consumers in different types of residences (such as tenants) and those using different types of heat technologies.

#4 – Remove the consumer barrier of high upfront costs and prioritise investment in energy efficiency

To address the issue of ***high upfront costs***, and recognising that ***'one size doesn't fit all'*** for domestic heating, extend the Clean Heat Grant (the proposed successor to the Renewable Heat Incentive scheme) to incentivise relevant forms of low carbon heating technologies – not just heat pumps. This should be backed up with even greater investment in housing energy efficiency, than is currently provided in the Green Homes Grant, to help achieve ***warm, comfortable homes*** for all, particularly improving the quality of life for the fuel poor and vulnerable. Consideration should also be given to green home finance products to incentivise energy efficiency retrofit.

#5 – Ensure the availability of skills to enable the transition

To ensure the right advice and support is given to households, implement a training programme to re-skill existing gas installers and new entrants on the alternative low carbon heating options. It should also become mandatory that advice on energy efficiency and low carbon heating alternatives is provided to the home owner when gas installers are supporting them with boiler replacements to help improve ***public awareness*** and confidence that consumers are receiving ***trusted*** advice.

1. Introduction

1.1 Why explore consumer perceptions of low carbon heat?

The heating sector (across homes, businesses and industry) accounts for over one third[2] of the UK's current greenhouse gas emissions. It is widely acknowledged that to meet the net zero targets on greenhouse gas emissions, the UK will need to decarbonise domestic heat. This will likely require a mosaic of different low carbon heat solutions for the wide variety of heat consumers across the country, and transformational change from how energy is produced and transported, through to changes within our homes.

If the decarbonisation of heat is to be successful, consumers will need to be empowered and be at the heart of the decisions made on heating. The heat transition will need to be delivered and paid for in a way that delivers for the economy while being fair to consumers, so that no one is left behind.

ICS Consulting and eftec have worked with National Grid to develop a consumer research programme to understand consumers' views in this important area and develop the evidence base to inform public policy. The objectives set for the research can be summarised as:

- To understand how decarbonisation of heat can be delivered in a way which works best for consumers, with a fair and just transition for all in society.
- To learn more about consumer perceptions and acceptability for the different heat decarbonisation options and payment methods – including what drives acceptability.
- To hear from consumers how best National Grid and other stakeholders can continue to engage and communicate – to ensure that consumer focussed options are developed.

1.2 How the research was approached

In scoping and designing the research, it was essential that it would provide robust insights from consumers, which can be used with confidence in developing policy in this important area. To achieve these outcomes, we undertook a programme of qualitative research which would allow for detailed deliberative conversations with consumers. A sample size of 60 reflected this research method.

The research project was conducted in two phases, recognising that before we discussed the subject of heat and low carbon heating in homes with consumers, we would need to first gauge their overall understanding of climate change, energy and carbon in Phase 1; and then customise the Phase 2 discussions to the levels of understanding identified in Phase 1.

Phase 1 introduced the options and explored what additional information was required to have a more informed debate with consumers in Phase 2. To be effective, it was important to spend time to allow enough context for participants to then consider the specific actions they could take on heat. As such, the content focused on climate change as well as decarbonisation of heat.

[2] *BEIS (2018). Clean Growth -Transforming Heating. Overview of Current Evidence. December 2018.*

Figure 1.1: How the research was conducted

Recruitment was an essential part of the research design. **We recruited a broad range of consumers to provide breadth and depth of insight into consumer needs.** To ensure credibility, a good representation of consumers was required across a range of locations, with the focus groups held in Hull, Taunton, Dumfries, and London. This avoided location bias overall and helped with understanding how location might impact perception.

It is worth noting that this research was conducted prior to Covid-19. The impact of Covid-19 on consumers' views is therefore not covered in this research. Nevertheless, this research provides important insight for decision makers and industry to consider in the UK's approach to lowering emissions from domestic heating.

Further information on how the research was conducted and how information was presented to consumers can be found in Appendices A and D.

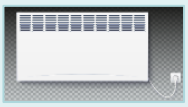
1.3 The low carbon heat options discussed with consumers

During this research, we explored six different types of low carbon heating options with consumers. Some are available today, while others could be available in the near future. Some heating options have a limited application to certain types of buildings, whereas some could be applied to a broader range of buildings.

Overleaf we set out the key features of the options discussed with consumers.

The Future of Heat Explained – What are the Options?

Direct Electric Heating - Heat is provided through existing electricity networks rather than through gas. Gas boilers, radiators and appliances would be replaced with electric ones.



Reliable but without gas on a mass scale there may be implications for the electricity grid meeting peak heat demand.

✓ Available today
✓ Individual switching
✓ Applicable to most buildings

A consumer can switch to this heating source at any time.

Heat Pumps - Ground source heat pumps use electricity to circulate water around a loop of pipe in the garden/ground. Heat from the ground is then absorbed into the water and passed into the building. Air source heat pumps absorb heat from the air, and this can 'reverse' to cool homes in the summer.

Homes must be well insulated to be effective so may not be practical for older housing.

✓ Available today
✓ Individual switching
✓ Applicable to buildings with space

Hybrid Heat Pump
Combines air source or ground source heat pumps with a gas boiler.

Gas boiler remains for very cold conditions. Can work well in homes that are difficult to insulate.

✓ Available today
✓ Individual switching
✓ Applicable to buildings with space

Carbon levels are reduced, but the gas network is still there as a backup when needed.

Biomass Boiler burns plant-based material (e.g. wood pellets, which produce less carbon than burning gas) and replaces gas boilers.

The average household needs 30kg of pellets a day.

Larger boilers may not be suitable in some homes due to limited space or physical challenges loading the pellets into the boiler.

✓ Available today
✓ Individual switching
✓ Applicable to buildings with space

Heat networks burn mass such as wood, but in a central combined heat and power plant. The mass is burned to make electricity, and the heat associated with this (which is usually lost) is used to heat water that is then distributed to heat homes.

✓ Available today
✓ Collective switching
✓ Applicable to denser housing

Requires areas of dense population and coordination to collectively switch homes to the heat network. Already in use around the world.

Hydrogen Boiler This option involves changes to gas appliances to run on hydrogen rather than natural gas. 'Hydrogen-ready' boilers have already been developed, which could switch from using natural gas to hydrogen once a hydrogen network becomes available.

Hydrogen can be produced by using natural gas with carbon capture and storage technology, or by using renewables for electrolysis.

✓ Available this decade
✓ Collective switching
✓ Applicable to most homes

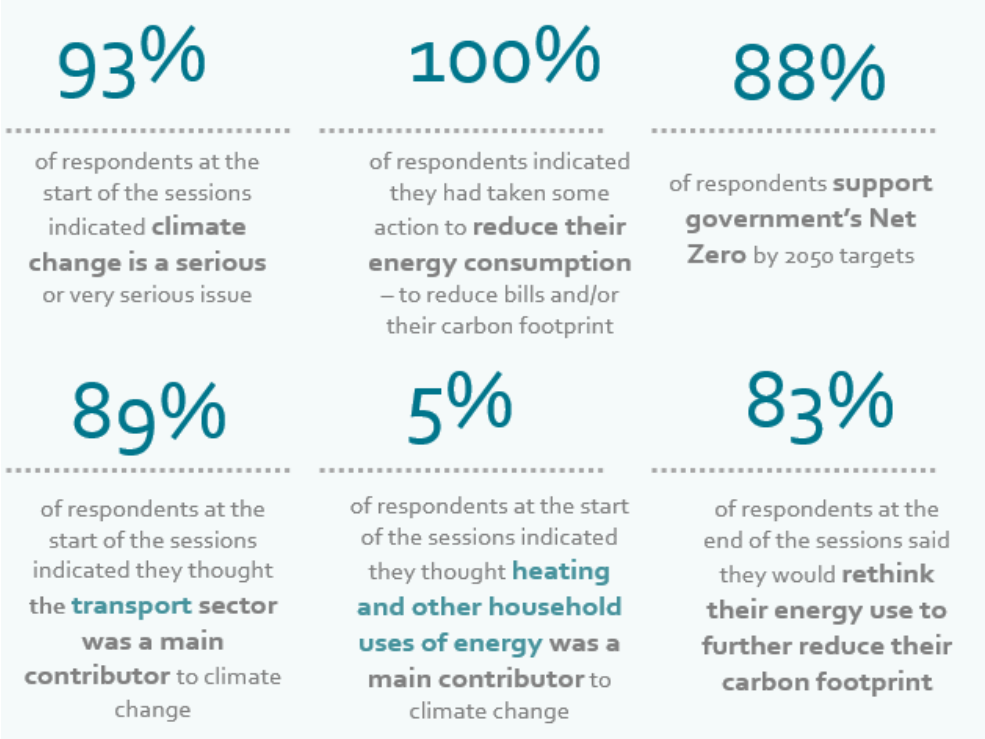
2. Consumer views on the UK's role in reaching Net Zero

Summary of Findings

- Consumers lack awareness of the government's emissions reduction targets, with a minority of research participants having a vague idea about the 2050 targets, and a handful knowing what net zero meant.
- Despite being unaware of the targets, consumers are modifying their behaviours to support carbon reduction through actions such as recycling waste.
- Consumers would like to see everyone play their part. Consumers felt a sense of resignation that their actions will have little effect if businesses, as well as other countries, do not do their bit.
- Public awareness can lead to considerable support for government's net zero ambition. 85% of participants strongly agreed or tended to support the government's 2050 targets, once these were explained to them.
- Consumers want government to promote what it is doing to meet the 'ambitious', but 'achievable' 2050 target. 48% of participants tended to disagree or strongly disagree that the government is doing enough today to meet the 2050 target.

In order to understand the consumer perspective on the UK's role in climate change and the net zero target, we explored several topic areas that included: consumer familiarity with the energy industry; the issue of climate change; and their understanding of the drivers of climate change and relevant targets (including 'net zero' by 2050). We also delved into consumer perception of how the UK was performing against current and future climate change targets and the need to lower emissions from heating. This chapter summarises these findings, with further information and insight available in Appendix B.

Consumer perceptions on climate change – at a glance



There is a lack of awareness of the Government's climate change targets and wider net zero agenda

Awareness of government targets, progress against targets and the role of heat decarbonisation is very low. Across the groups, at best a minority of people had a vague idea about Government's legally binding targets to achieve net zero emissions across the economy by 2050, and a handful knew what net zero meant. No one was familiar with differences in targets in Scotland versus the rest of the UK. While 49% of consumers identified transport as the sector which contributes most to carbon emissions in the UK, only 5% recognised heat and power in homes as a major contributor to emissions. Consumers were most familiar with transport targets, such as phasing out diesel cars, but overall, there was a confused picture of the UK's commitments and track record around climate change.

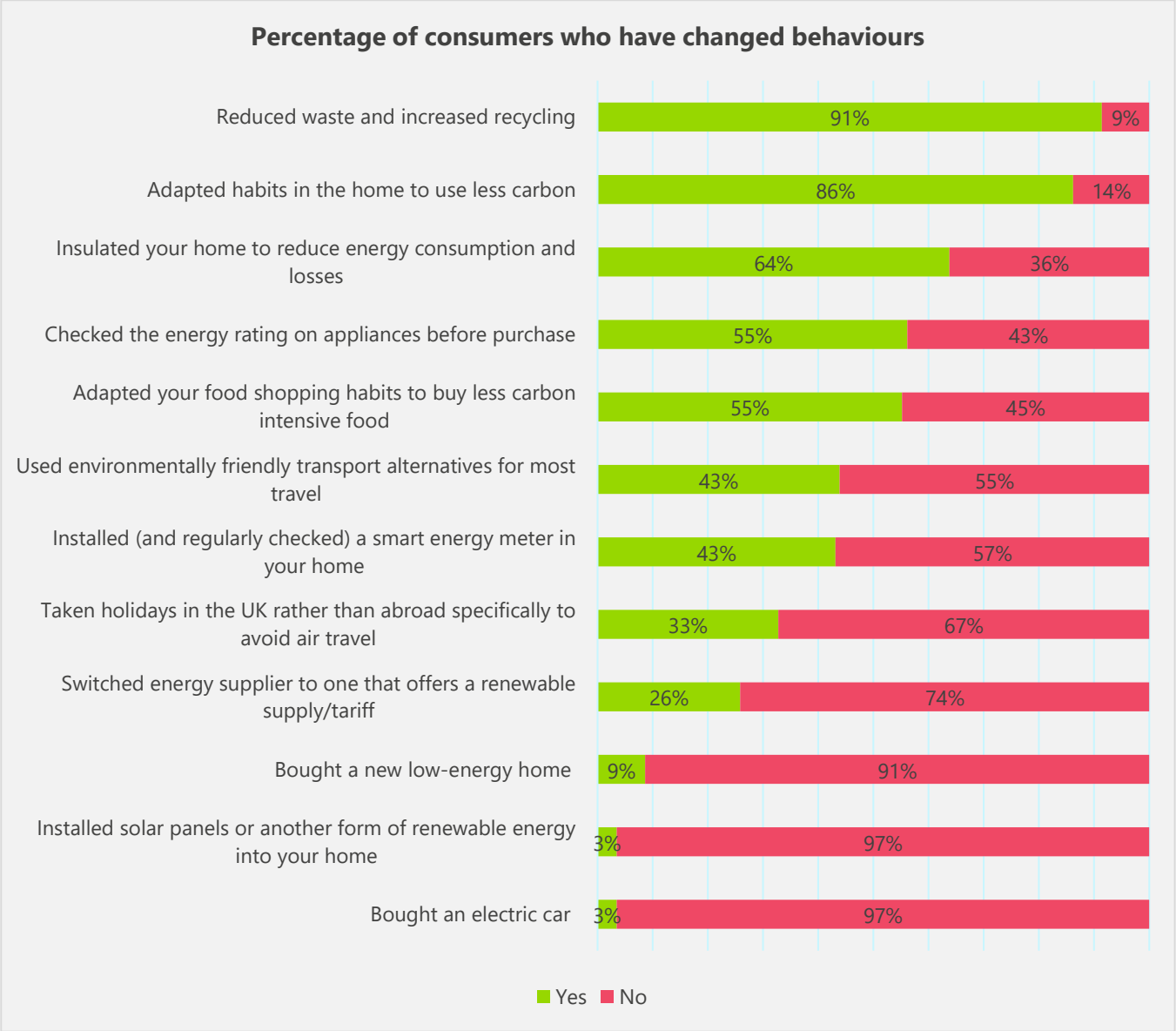
Despite this, consumers consider climate change to be an issue and are willing to act

Consumer awareness of climate change as an issue of concern is high. At the start of each session, consumers were asked their views about the seriousness of climate change, and 93% said that climate change is a serious or quite serious problem. This viewpoint was consistent across the sessions.

Despite the overall lack of awareness of the Government's exact ambitions, consumer behaviours in relation to reducing their carbon footprint was high, with everyone we spoke to indicating they were doing something to a greater or lesser extent.

Figure 2.1 shows the breakdown of mitigating actions taken by consumers to reduce energy or carbon emissions. This figure shows a low percentage of consumers had undertaken large personal investments in order to reduce emissions from homes and transport, e.g. buying an electric car or installing solar panels. However, those behaviours that do not require upfront investment have been adopted by many consumers, such as increased recycling and adapting habits to use less carbon at home. We did not observe any demographic pattern to the personal steps indicated, with consumers from all socio-economic groups and ages sharing similar behaviours. However, we did observe that those consumers that have invested in low energy homes were generally the consumers that had invested in solar panels too.

Figure 2.1: Pre-session voting form: Actions undertaken to reduce carbon footprint



Base – 58; two people did not answer

There's a desire for everyone to play their part

Consumers do not consider their actions to be very effective if other parties do not do their bit – they want everyone to play a part: homes and businesses; in the UK and further afield.

Consumers were shown information on UK performance for carbon emissions compared to the rest of the world. The overwhelming view is that current UK performance is good, both in terms of the historical downward trend from 1990, and when compared to other countries. But consumers do not think this is a reason to be complacent: the UK needs to continue to reduce emissions, working alongside and encouraging other nations.

> ***"I think [it] does look impressive, but I still think we have a long way to go to bring it down" – More affluent (ABC1), 18-45 London***

There was a feeling that a greater sense of urgency is needed to convey key messages on reducing carbon footprints and achieving net zero by 2050. Critical to this was mitigating the effects of resignation that consumers feel, whereby their actions will have little effect if businesses and other countries do not play their part.

Greater awareness could help gain public support on net zero

There is clearly an appetite for people to take part in contributing to reducing carbon emissions, but there is a disconnect between people's actions and their understanding of Government ambition. Consumers want Government to take a stronger lead in raising awareness and driving the debate. Once UK targets were explained, there was considerable support for them, with 85% strongly agreeing or tending to support the Government's 2050 targets. Despite a lack of understanding of the targets on climate change, the overwhelming view is that ambitious, legally binding targets are needed to drive change, with 88% of consumers agreeing that the UK should lead by example in reducing carbon emissions. These targets need to be communicated effectively.

Consumers generally see the net zero 2050 target as ambitious, for some it is very ambitious and possibly not achievable. For the majority, 2050 is a long enough time period to make the necessary change. Very few in the groups had strong views on bringing this target forward given the scale of investment needed to achieve it. Overall, 2050 seemed a sensible and reasonable target.

> ***"2050 is not that far away"***
> ***Just about managing (C1C2), 31-50, Dumfries***

There was some distrust regarding whether current or future governments could or would achieve the target, with 48% tending to disagree or strongly disagree that the Government is doing enough today to meet the 2050 target. This is because of the perception that future governments cannot be made to deliver current government targets. When discussed in the focus groups, consumers felt that there have been mixed or potentially contradictory messages from Government on targets. Examples raised included the January 2020 announcement from Government that they would provide some financial support to Flybe in the aviation industry; and recent political issues, notably Brexit, were considered to have eroded trust in the government[3].

[3] *Note, the research was conducted pre-Covid.*

Case study: The importance of consumer-centric solutions – from installation to everyday experience

Gary (More affluent, Aged 46+)

Gary was a consumer in one of our focus groups in Hull. He has made significant changes to his energy use by purchasing solar panels, insulating his home (including replacing the glazing in his home), and buying an electric car. His main driver was to reduce bills.

"My house - I bought it 7 years ago, I haven't finished it yet but I'm getting there, I bought solar panels, it's really well insulated, newly double glazed: I'm doing the best I can to keep my bills down".

"It's a bit about this stuff (climate change)- but it's about getting my bills as low as possible."

Gary was much more aware of targets and government actions, including the 2050 targets, and targets on diesel cars. Gary was very supportive of the UK having ambitious targets on emissions, even though he thought that people in general will, and do, struggle to change and adapt. But he thought the UK approach would only be effective if other countries had the same targets.

Gary thought that gas will run out, so we need to change heating anyway.

"Well, we're going to run out, I guess, eventually, aren't we? So, in terms of heating, will it have to be electric powered?"

Despite his enthusiasm for change, he personally found some of his changes to be difficult, especially solar panels which he found to be troublesome to install and run. He was critical of the journey distance on his car charge, and said driving a green car and being green overall was *"not exciting."*

3. Consumer views on alternative low carbon heating options

Summary of Findings

- Consumers have a low awareness of the low carbon heating options – they think this is because these are rarely advertised.
- Consumers are not wedded to gas or oil – the priority is a warm, reliable and affordable sources of heating.
- Plumbers and gas installers are key sources of advice for consumers. None of the participants in the research had been recommended the low carbon options when they replaced their boilers.
- 37% of consumers indicated they were very or quite familiar with biomass boilers; 20% with ground source heat pumps; 18% for air source heat pumps; and only 2% were very or quite familiar with micro-generation/heat networks.
- Overall, where consumers could see a clear application of the option to their type of housing situation, they were potentially more favourable to the option. It is important to demonstrate success stories where low carbon heat options have been deployed to support acceptability.
- Energy efficiency needs to improve. Consumers highlighted the challenge of making current housing stock more efficient, especially older homes.

To help consumers understand the alternatives to reduce emissions from heating, we explored their familiarity with different low carbon heating options. In Phase 1 of the research, we presented consumers with a high-level summary of the options to test their familiarity with existing technologies. In Phase 2 we tested the acceptability of the options, including future technologies that are not deployed commercially at scale today, notably hydrogen boilers. We presented consumers with more detailed information on the options to ensure they could make informed choices.

Consumers were asked to state which options are acceptable to them and their household based on the information provided. The information presented to consumers included the level of maturity of the option (e.g. some options are available today, such as ground and air source heat pumps, whereas some may be options for the future, such as hydrogen) as well as cost and disruption information. It is important to stress that consumers wished to see more information on costs and long-term estimates of energy bills than could be provided at this time.

We sought to understand how these options were perceived across the different locations, as well as the needs of vulnerable consumers and tenants. We were particularly interested in understanding the factors that drove acceptability of the different low carbon heating options and how consumer choices changed as scenarios changed (whether considering options for their own home versus homes in general). This chapter summarises the key findings. Further information and insight can be found in Appendix B – Sections B.10 to B.12.

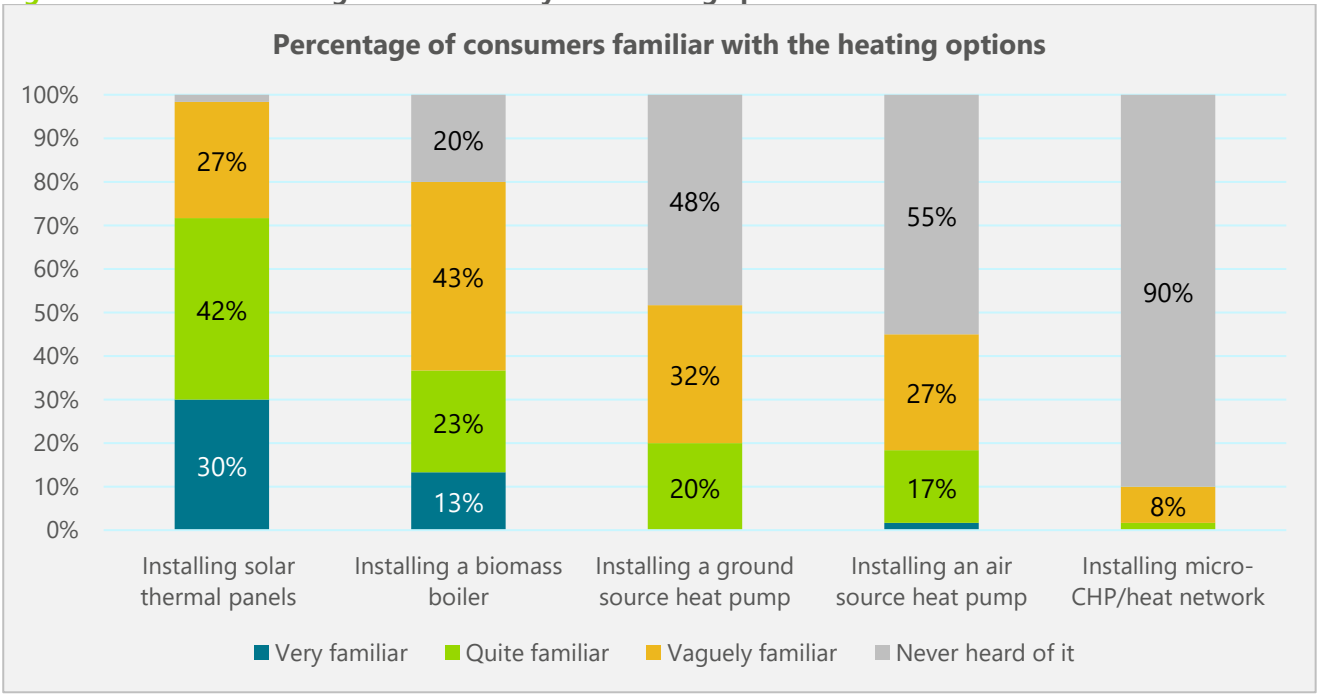
3.1 Familiarity with the options

There's a low level of familiarity with the low carbon heating options

In order to assess consumer perceptions on current low carbon heating options, consumers were asked to indicate their familiarity with them before any detailed deliberations. Figure 3.1 shows that 37% indicated they were very or quite familiar with biomass boilers; 20% with ground source heat pumps; 18% for air source heat pumps; and only 2% were very or quite familiar with micro-generation / heat networks. Consumers thought the low awareness was mainly because low carbon options are rarely advertised. This is despite government schemes such as the Renewable Heat Incentive which aimed to increase the installation of low carbon heating options, such as heat pumps.

> ***"You don't hear about these schemes" - Financially struggling (DE), 18-45, Hull***

Figure 3.1: In-session voting form: familiarity with heating options



Base - 60

Plumbers and gas installers are key sources of advice for consumers

The groups deliberated on topics such as when they had last made a decision on home heating. A few people across the groups had changed their boiler in recent years following a breakdown. They all indicated they only considered purchasing energy efficient replacement gas boilers, as recommended by their plumbers, and plumbers were frequently cited as the key source of advice for home heating. No plumbers offered or recommended alternatives to gas boilers.

There's a willingness to switch from gas heating if homes are still warm and comfortable

Overall, consumers are open to adopting low carbon heating. Consumers across the groups indicated they would be willing to switch from gas heating, however, the right option for their household needs to meet their requirements in terms of reliability and affordability. Ensuring homes are warm and comfortable are key priorities in moving to low carbon heating.

3.2 Acceptability of the options

The consumers in our focus groups were asked to "Indicate the overall acceptability of each option based on the information provided", prior to deliberation, to explore perceptions of the options generally (not specific to their households). It is important to note that the statistics demonstrate current acceptability of options as presented (including one which is not available at scale today) but should be understood in conjunction with the trade-offs described in Table 3.1 later in this section.

Reliability, disruption, cost and safety influence consumer choice

When presented with initial general information on the low carbon technologies, consumers indicated that 'most acceptable' option initially was heat networks, despite few consumers being familiar with heat networks prior to this. In contrast, biomass boilers were considered the least acceptable despite 80% of consumers having heard of the option previously. While both had similar benefits such as being controllable, responsive, tried and tested methods, it was the downsides of biomass boilers that made the option much less acceptable.

- **Biomass boilers** were seen as impractical and only 14% of consumers thought this was acceptable as a large-scale viable option. Although, it was recognised that at a local level some households may find this an enjoyable option. The main issues are the manual pellet loading and ongoing boiler cleaning and maintenance requirements – which are perceived as highly unworkable for all households, with concerns that the vulnerable and elderly would struggle. Other concerns included the considerable space required to store pellets, again seen as impractical especially in urban areas, and the potential impact on local air quality levels.
- **Heat networks** were seen as similar to existing gas heating in terms of controllability, safety, disruption and reliability. They would be warm irrespective of their property type and size. Therefore, 79% of consumers thought this was an acceptable option. There were some concerns about disruption from installation – namely road congestion and digging up driveways and gardens – especially in London; and the need to establish the right regulations to protect consumers from poor service. But once the installation is complete the view was that this was very close to the current heating arrangements, which appealed to consumers. Younger consumers were slightly more favourable towards heat networks than older consumers.
- **Direct electricity** was difficult for consumers to appraise. The impact of this option on ongoing energy bills was deemed completely unacceptable (as the unit cost of electricity is currently higher than for gas). Consumers were also concerned about losing heating if they lost electricity – especially in rural areas where electricity reliability is an issue. Fifty percent of consumers considered this to be an acceptable option. However, some of the more sceptical consumers indicated they would support this option if this could be delivered at the current cost of gas. Moreover, consumers noted that for many households, other options that they prefer may not be feasible for their circumstance; for example, if there is insufficient space. Hence, whilst considered somewhat acceptable in terms of reliability and disruption, it was considered too expensive to be viable in practice.

- **Heat pumps and hybrid heat pumps** were also considered favourably by most participants. Overall 57% of participants indicated initial acceptance of heat pumps. Initial reactions were that consumers were concerned by some of the practical considerations in terms of the space requirements and suitability for older properties. Older consumers in particular were worried about being warm enough as well as the potential noise disruption, and were more likely to consider this form of heating unacceptable. Consumers in urban areas were more concerned about the space requirements which were often seen as infeasible. Hybrid heat pumps were seen as having a place – that is, when pure heat pumps are unlikely to be effective enough. But there were concerns about the complexity and ongoing maintenance of dual heating systems, meaning that 43% of consumers thought hybrid heat pumps were acceptable as a primary solution, though there was considerable acceptance of this option for harder to decarbonise properties.
- **Hydrogen gas boilers** are an emerging technology as a viable alternative to natural gas but there is very little public awareness at present. Initially, 21% of consumers responded positively to this option. Interestingly, consumers were quite accepting of the use of hydrogen for other purposes, such as powering cars, but when discussing heating in the home, would want additional reassurance about its safety. When probed in greater detail, the view is that consumers would be accepting about the safety of this option, but that consumer communication and education would be essential to achieving this.

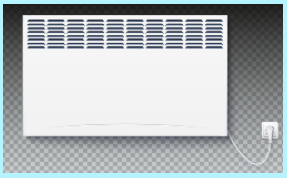
From the initial voting on acceptable options and the follow-on discussions, it emerged that most options are seen as potential replacements to gas boilers. Only biomass boilers (considered too disruptive due to the need to continually feed pellets) and direct electricity (too expensive due to higher unit cost of electricity) were options that, after considerable discussion, consumers felt were not as favourable at this stage. The remaining four options (heat pumps, hybrid heat pumps, heat networks and hydrogen gas boiler) are all considered to be potential options for consumers.

> ***"There is something for everyone."***
> ***More affluent (ABC1), 18-45, London***

Consumers recognise there are trade-offs with all the heating options

It is important to understand what it is consumers like or have concerns about regarding the different low carbon heating options, particularly as attention turns to increasing public awareness of the need to decarbonise heating. We summarise the trade-offs we heard discussed by consumers in Table 3.1 below. More detail is given in Appendix B.

Table 3.1: Summary of the trade-offs: consumer initial views on what they like and dislike

Option	What consumers like	What consumers dislike
Direct electricity 	• Perceived as reliable and safe • Familiar, tried and tested • Suitable for all types of households	• Unit cost of electricity is around five times that of gas[4] • Lack of control and responsiveness – e.g. lack of heat control and drying out the air • Disruption from removing radiators and associated water plumbing • Impact of power cuts on heating – a particular concern for rural consumers experiencing lower electricity reliability
Heat pumps 	• Provides temperature control – heating and cooling • Effective in the right types of locations and households • Perceived as tried and tested technology	• Not suitable for all households – as requires energy efficiency measures to be in place • Reliability issues for rural consumers – i.e. loss of power = loss of heating • Minor concerns over visual amenity and noise
Hybrid heat pumps 	• Provides heating and cooling - temperature control • Provides back up resilience when one heating source is unavailable • Tried and tested, and suitable for most household types	• Servicing and maintaining two heating systems; ensuring the boiler is reliable in winter if not used in the summer months • Needs long term solution to the carbon from the residual gas used • Minor concerns over visual amenity and noise
Biomass boilers 	• Perceived as very controllable and responsive heating • Effective and applicable for most households • Well understood, tried and tested	• Impractical due to need to manually feed fuel, ongoing cleaning and maintenance, and storage space requirements • Concerns over local air quality • Potential shortages of crops as some farmers look to grow biofuels such as wood
Heat network 	• Perceived as very controllable and responsive heating; seen as very similar to current gas heating • Effective and applicable for all types of households • Tried and tested technology, most similar to current gas heating	• Potential shortages of crops as some farmers look to grow biofuels (e.g. wood) • Disruption from putting hot water pipes in the ground • Potential disruption from truck deliveries of fuel supplies (e.g. wood) to the power plant
Hydrogen gas boiler 	• Perceived as very controllable heating; most aligned with current heating experience • Suitable for all types of households • Potential solution to the residual gas if combined with hybrid heat pumps	• Lack of familiarity leads to initial concerns around safety • Not perceived as a fully tested technology • Cost difference of hydrogen compared to gas on ongoing bills

[4] *To illustrate, see https://www.theenergyshop.com/guides/energy-prices-per-kwh*

Consumers' views vary across regions and demographics, but are influenced by relevant success stories

Throughout the discussions, there were reflections shared on how options had already been deployed in similar circumstances. Where focus groups included participants with experience of the low carbon heating options who could share their experiences, there was greater acceptability of the options relative to focus group without that experience to share. For example, in the rural locations of Dumfries and Taunton, there were a greater proportion of off-gas grid homes, and participants were more familiar with low carbon heating options overall.

Consumers like options that give them flexibility in relation to when they change over as opposed to mandated switching, as this could be scheduled to coincide with home and garden renovations and the end of life for the current heating source. Consumers were concerned by options that require electricity to work (direct electricity and heat pumps) given that losing heating and electricity at the same time is a worry, especially for vulnerable households. This was a particular concern for rural consumers who feel electricity reliability is an issue in cold periods.

> ***"Electricity is not reliable everywhere" – Financially struggling (DE), 46+, Dumfries***

We also observed higher acceptance levels for heat networks in urban areas, especially the London focus groups, as these groups found that the examples of international experiences from deploying heat networks demonstrated this option could be well suited to the types of housing in urban areas. This indicates the importance of demonstrating success stories where low carbon heat options have been deployed to support acceptability and applicability.

Across all the groups, consumers were concerned that the heating option most preferable and acceptable to them may not be possible in their local area. There was often a disconnect between what consumers like and consider to be acceptable and what they consider to be feasible in their home given where they live, their housing type, and available space. Overall, where groups were aware of the application of an option to their type of housing situation, they were potentially more favourable to the option. For example, we generally observed that where people were more familiar with heat pumps (such as from seeing this form of heating being applied by councils in their local area), they indicated higher acceptability.

Energy efficiency needs to improve alongside changes to heating, with older homes seen as a challenge

An important consideration for all groups was the need to improve energy efficiency; i.e., insulate homes, use efficient appliances, and improve windows. Some groups also mentioned the challenge of making current housing stock more efficient, especially older homes. Linked to this, there was also a sense that more needs to be done to encourage the use of low carbon energy in the home, such as continuing to fund renewables in the home (e.g., solar power).

Consumers may need to be financially compensated for unacceptable options

Consumers feel they may need to be compensated if they must adopt an unacceptable heating option. But if households can receive their preferred option(s), they generally do not need their bill to reduce as compensation. This is important as option feasibility is an issue for some consumers. If consumers are expected to accept a less preferred option, then potentially they would expect their bill to go down – up to several hundreds of pounds as compensation in some cases. Where consumers can receive their preferred option, there is less demand for energy bill reductions.

> ***"We just have to be confident that we are going to be warm enough" – More affluent (ABC1), 18-45, London***

4. Consumer views on how the transition to low carbon heating should be funded and delivered

Summary of Findings

- Consumer perception on option acceptability is affected by how option costs are presented. Cost is only one part of what drives the acceptability of options, but if consumers do not have confidence there is a 'solution' to upfront costs they do not engage with the options.
- Trust in the organisations delivering the transition is important for success. Consumers trust network energy companies, under Ofgem regulation, and independent public bodies.
- Consumers worry that the Government may not be consistent with its strategy – and change direction mid-way. The change in government policy from supporting to discouraging diesel cars is a source of frustration. Government needs to consider how decarbonisation actions in other sectors could impact perceptions for the heat transition.
- Early communication of messages on decarbonising heat are needed, so that households can start to prepare.
- The transition needs to be fair and just with no communities left behind. Vulnerable and elderly customers will need to be supported through the transition.
- Protecting the voice of tenants during the transition is important. There was concern that landlords will not act in tenants' best interests, and tenants do not have control in this area.

To understand how decarbonisation of heat can be delivered in a way which works best for consumers, we discussed the different possible payment options to fund the low carbon heating transition with our focus groups, as well as exploring how they would like to be communicated to and engaged with on the heat transition. This chapter summarises these findings. Further insight and information can be found in Appendix B – Sections B.13 to B.14.

4.1 Funding the low carbon heat transition

The focus groups demonstrated that consumer perception on option acceptability is affected by how option costs are presented. Cost is only one part of what drives the acceptability of options, but if consumers do not have confidence there is a 'solution' to upfront costs they do not engage with the options.

We presented consumers with a summary of different options on how the transition to low carbon heating could be funded and focused on the following two aspects:

- How the finance should be raised; and
- Who should organise and be responsible for how the money is spent?

Regarding finance raising, we explored if this should be done through: energy bills; taxation in the form of income tax; VAT; variable council tax; or stamp duty – with the variability based on type of heating system. On the point of who should organise and be responsible for how the money is used, we explored with consumers if this should be left to energy companies, local councils, other organisations that consumers trust, or if schemes that give consumers household grants and subsidies should be set up. Examples of such schemes could include: equity loans that are repayable on the sale of the property; subsidy or boiler scrappage schemes; or savings scheme that assist households to save for the future switch.

When presented with the options, there were mixed views as to whether energy bills and grants/vouchers are the best payment option. To some extent it does depend on the heating option, and various points were raised on the tools that could be used to deliver low carbon heating.

Taxation links to ability to pay, which is seen as fair

The benefit of paying through tax is that it is linked with the ability to pay and is generally considered fair. Those on lower incomes need to be protected, therefore income tax was considered a good way to raise the monies. In contrast, consumers were against raising the funds through VAT, except if it is used to selectively target certain goods and behaviours.

Council tax was the least popular approach of all. Whilst in theory local authorities work for the common good of those they serve, in practice they are perceived as disorganised with opaque decision-making processes. They are currently not trusted enough. There was also the worry with council tax that central government may use this as a means of giving councils less funds from the centre, putting this and essential services at risk.

Stamp duty was also dismissed as not workable, especially given some parts of the UK do not pay stamp duty.

Consumers liked taxation being used to fund a scrappage scheme or a grant. The view was, that this needed to be voucher and not cash based, overseen by an independent body, and ensuring consumers are in control and have autonomy.

> ***"The Government only get its money from tax so at the end of the day it is us paying for it." – Just about managing (C1C2), 51+, London***

Energy bills are considered a potential funding option

Energy bills were also seen as a potential payment approach. The perceived benefits of using energy bills to raise the funds are that it links paying for it with energy usage and could therefore link to further incentives to improve energy efficiency.

> ***"Keep it simple and just pay for what you use" – Just about managing (C1C2), Aged 31-50, Dumfries***

Consumers stressed that they prefer funds raised via energy bills to be undertaken by well-regulated energy companies, rather than those seen as more market-led and having less oversight from energy regulator Ofgem. Those energy network companies with clear and transparent regulatory oversight from Ofgem are considered a safe pair of hands, trusted and effective at providing services to consumers, as evidenced by high levels of gas

and electricity reliability. However, there were some concerns with any private companies having the potential to make excessive profits from the transformation.

The other payment options presented – e.g. saving schemes and equity loans, were roundly rejected. These were considered as having limited application in practice – and therefore not suitable for all households.

Addressing the high upfront cost barrier is important

We note that getting the funding right for low carbon alternatives is a key consideration, as consumers' perceptions of the need for the options changes depending on how option costs are presented. Particularly, when consumers are informed that the upfront cost will be handled by an agent such as regulated energy companies or a public body (i.e. bodies subject to governance / public accountability), consumers perceive the need for transformation, and each option, in a much more positive light. Conversely, without presenting a 'solution' to the upfront costs, consumers have a very negative reaction to the low carbon options overall. So cost is a key part of what drives the acceptability of options.

4.2 Delivering the low carbon heat transition

Trust in the organisations delivering the transition is important to consumers

In delivering the transition, the communication of the low carbon heating options will be important given they are not initially perceived as equal in terms of safety, reliability and affordability. For example, hydrogen boilers may be associated with safety concerns (even though hydrogen is perceived as safe in other applications such as transport); and options that require electricity can be associated with reliability concerns (e.g., if you lose electricity you lose heating too). The transition will need to be supported by factual information provided by visible, trusted bodies to address public perceptions on safety, reliability and security of supply.

Consumers felt they could trust network energy companies, under Ofgem regulation, and independent public bodies. However, it is worth noting that consumers expressed uncertainty around how the industry is structured overall and were unfamiliar with the role of National Grid and other organisations in the energy industry prior to reading the literature provided.

The complexity of the energy industry and the roles and responsibilities aren't necessarily an area that consumers need more information on, and clearly coordination will be needed between decision makers and industry to enable the large-scale transformation needed on heat in the coming decades. However, consumers want to know who they can trust for advice, information and to inform their choices and actions. Those that are trusted should be empowered by Government to take the transition forward and hold the Government to account.

> ***"Shouldn't it come from Ofgem the regulator because they are neutral in the sense they are a regulator, they are there to regulate this?" More affluent (ABC1), 18-45, London***

Overall, consumers expressed less trust in energy suppliers, citing less oversight from Ofgem overall and concerns regarding energy bills in general. Local authorities were thought to be inefficient and lacking in transparency.

> ***"I wouldn't trust the council; I would trust even less the private suppliers." Just about managing (C1C2), 51+, London***

There's a desire for Government to be consistent in its policy signal and not change direction mid-way

Consumers were concerned about the impact of any potential changes in direction to the Government's long-term strategy and targets on net zero overall, citing changes in specific policies such as banning petrol and diesel cars by 2035 as an example. During the discussions, some cited considerable frustration in recent years with buying diesel cars based on perceptions at the time that this was the right thing to do – only to be told these are the worst polluting cars. The moves to discourage diesel cars has affected trust, especially among older consumers and those that said they could not afford to change their car. In communicating the potential actions that consumers can take to lower emissions from their heating sections, it will be important for decision makers to consider how policy changes made for other sectors on decarbonisation, such as vehicle sales, could impact consumer action on heat.

Beyond the changes seen in the transport sector, some of the older consumers recognised the importance of starting to plan now for an end to natural gas, citing that North Sea gas will run out in the future. This demonstrates that particularly amongst older consumers, who may have witnessed declines in other energy forms in the past (e.g. coal), preparation and transition for those industries is important.

Start communicating the message now, rather than later

A key finding is that messages regarding the decarbonisation of heat need to be communicated soon. Consumers said that households will need years to understand that change is coming, to prepare for alterations to their heating system, and to be assured that the regulations, laws and protections are in place to ensure they receive a safe, reliable and consistent form of heating. If households are informed now about the changes expected over the coming years, they can get prepared.

Another important part of the narrative is to communicate front and centre what the targets are, and by when they need to be achieved. A major concern for consumers is that the heat transformation will not be communicated effectively. Consumers perceive there to be very little communication about this currently, despite the climate change debate dominating newsfeeds. The emphasis on transforming transport and agriculture needs to widen out to include heat. This was manifest by the lack of awareness on how much heat contributes to carbon emissions and to future heating options.

4.3 Fairness in the low carbon heat transition

The transition should be just, with no communities left behind

All the consumers in the focus groups agreed the UK must take a balanced approach and deliver a fair and just transition. Households, businesses and Government all have a role to play; and the transformation must recognise the importance of ensuring affordable energy bills and protections for vulnerable consumers.

Some consumers recognised this transition could be an opportunity for the UK. But they suggested that more low carbon technology needs to be developed or built in the UK for that to happen. Added to this sentiment was the desire for no communities to be left behind, and the transition is an opportunity to support all regions of the UK.

> ***"If turbines are made abroad it may not be jobs here" - Lower SEGs (C2DE), 46+, Taunton***

All consumers need to be protected and supported

In all groups there were concerns about how wholesale changes in heating homes would affect vulnerable and elderly consumers. Overall, the view was that the elderly and disabled would need to be especially supported, and that those on lower incomes would be unable to pay for any transition to a new heating system. Generally, it was felt that the options with less maintenance and requiring less change were best for vulnerable households, and that organisations such as housing associations would need to have a clear remit to help vulnerable consumers.

> ***"Every age and every ability have to be able to deal with it" - More affluent (ABC1), 46+, Hull***

> ***"The elderly like to stick to what they know" – Financially struggling (DE), 18-45, Hull***

Case study: The importance of no one being left behind

Alison (Financially struggling; Aged 18-45)

Alison was in the first Hull focus group. She is a carer for her husband, who has a number of health issues, including vision impairment.

Alison and her husband do not pay much attention to climate change, although they hear about it on the news a lot. Alison was vaguely aware of climate change targets – but could not give any dates or specify what the targets were. She is generally sceptical about low carbon energy and does not consider taking steps to protect the environment a priority.

Her main concern is about the impact that changing the heating system will have on her husband. He has learned how to control the heating without being able to see when his carer is out of the house. It would be a challenge to familiarise himself with new controls.

"My husband's got bad eyesight. He knows how to work the heating now - but if it were to change that's something that would be difficult for him. He's got those bobbly things - so he knows where to turn it to. If he didn't have that it would be difficult for him. "

"He would struggle to change"

On vulnerable customers Alison thinks additional support will be needed, and untested technologies need to be avoided.

"I think they'd need extra support. They'd need to learn how to use it properly."

"I'd be willing to be a guinea pig and maybe give it a try, but I wouldn't want to put ill people or elderly people in that position… I wouldn't want to put that extra stress on to them."

Another customer group particularly singled out in the discussions were tenants. There was concern that landlords will not act in tenants' best interests – focusing on what heating system has the lowest installation and maintenance costs for them, without thinking about whole life costs and tenants' energy bills.

Consumers who rent their homes expressed concern that they do not have control in this area. Questions were asked about what rights tenants will have, and what happens if landlords do not go for the best option.

> ***"The biggest barrier to us becoming more environmentally friendly is the fact we are renting - we can't put solar panels on the roof, the landlord has to make their own decisions, so we are not in control. So, there are 10 million households in the private rented sector and if they were all upgraded to the most environmentally friendly policies, best insulation - that would be a massive chunk straight out of the way."***
> ***Just about managing (C1C2), 31-50 Dumfries***

Case study: The importance of protecting the voice of tenants through the transition

Declan (Financially struggling; Aged 18-45)

Declan was in the first Hull focus group. Declan lives in a rented home that is not connected to mains gas. He uses electric heating and struggles with affordable heating.

Declan's rented home is poorly insulated. It is not affordable to heat the whole house given he has direct electric heating, so he heats the rooms that his family uses as they use them.

"I'm on electric heating – I only heat the rooms we're in."

"I'm only heating the rooms I'm in as opposed to heating the full house."

This has led to damp in parts of the house that are rarely heated, which in turn has caused disputes with his landlord.

"My house is all damp and mouldy at the moment which I'm in dispute with my landlord about. They're trying to say that it's my fault that there's damp because I'm not heating the full house, but if it was insulated properly it wouldn't be a problem. It's a problem. Landlords need to be told that they need to properly insulate their houses - which I think is a thing they're bringing in, if I'm right."

Declan was nervous and worried about future energy bill rises. He does not want changes to the energy options to make his heating more expensive than it currently is.

Declan also worried about the impact on other consumers, especially vulnerable people.

"I think elderly people like to stick to what they know. So, my grandparents - if you told them they had to change their boiler to some new system, they'd just go into meltdown. My grandpa has Alzheimer's and my grandma would just panic because they're old and vulnerable, and they rely on their central heating. If they had something new, they'd be worrying – is it going to keep us warm, is it going to work, if it going to cost a lot more. I think young people don't bother but the elderly would worry a lot."

5. Conclusions

Changing how we heat our homes is not just about investing in the right fuel, technology and smart services. When it comes to transforming how we heat our homes, this research has shown that for the transition to be successful, consumers need to be empowered and enabled to not just support the transformation, but actively be part of conversations and decision-making. It will take coordinated and sustained change inside and outside our homes. It will need changes to how we manage our heating day-to-day, the options we install in our homes, and the infrastructure to produce and transport the energy to meet our heating needs. It will require putting the experience and needs of every consumer across the country at the heart of the low carbon heat transformation.

Overall, the research shows that consumers are keen for government to make informed decisions quickly and ensure there is trusted information that can help consumers to start making the right decisions for their homes and businesses with confidence. Given that not all low carbon heat technologies are at a similar level of maturity and commercial deployment today, it will be important for government (from national to local level), the regulator and industry (within and beyond the energy sector) to work together to develop and deliver the options, including the infrastructure to support those technology options.

The research has also highlighted some questions and gaps in both the consumer and industry knowledge base – without this knowledge base, a smooth transition that facilitates informed decisions won't be easily achieved. Our research highlighted key questions from consumers including how the upfront heating system costs will be financed, the impact on energy bills, who will organise and deliver the transformation, and how will households be helped and supported during the transition. **It is essential that government, regulators, local decision-makers and industry continue to seek the voices, experiences and opinions of consumers to ensure a successful transition to low carbon heating.**

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