



Department for  
Business, Energy  
& Industrial Strategy

# The Future of Heat

Synthesis report

BEIS Research Paper Number 2020/048

March 2020

## Acknowledgements

This independent research report was produced by Dr Ceri Davies and Dr Sarah Cheesbrough from NatCen Social Research.

We would like to thank Joshua Philipps, Harry Bradwell and the wider steering group at BEIS for feedback during the project and comments on the report.



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# Introduction

In January 2019 the Department for Business, Energy and Industrial Strategy (BEIS) appointed the National Centre for Social Research (NatCen) and Eunomia to undertake research exploring public views on a future transition to low-carbon heating.

This exploration involved:

- gauging levels of awareness about the need to transition;
- exploring current levels of understanding about the need to transition and some of the technologies available to do so; and
- investigating attitudes to various possible elements of such a transition.

## Background

The UK government has set a legally binding target to achieve net zero greenhouse gas emissions by 2050 (with the target for Scotland set to 2045). Heat and hot water from buildings (which the UK has relied on primarily natural gas supplied through the national grid to provide) accounts for around a third of the UK's energy consumption and just less than a quarter of greenhouse gas emissions. BEIS has identified the need to increase wider public awareness of, and engagement with, low carbon heating and its importance in meeting wider UK climate commitments<sup>1</sup>. Whilst there is likely to be no single technological solution for this transition, with 85% of UK homes currently on the gas network (and a further 5% relying on oil, liquefied petroleum gas, or coal as their primary source of heat), decarbonising heating requires a fundamental change to enable a transition away from a reliance on fossil fuels towards low-carbon energy sources. However, it is not yet clear which combination of technologies and routes to decarbonisation will work best at scale, cost-effectively or with the widest overall benefits.

## Aims of the research

This research had the following aims and research questions:

Aim a) To provide a clear understanding of current public awareness, understanding and preferences towards different approaches for implementing a low-carbon heating transition and the technologies involved.

RQ1: What is the current level of public awareness and understanding regarding the need and rationale for a heating transition?

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<sup>1</sup> For example, see - Department for Business, Energy and Industrial Strategy (2018) *Clean Growth - Transforming Heating: Overview of Current Evidence* <https://www.gov.uk/government/publications/heat-decarbonisation-overview-of-current-evidence-base>

RQ2: What are current attitudes towards a future transition to low-carbon heating?

Aim b) To identify and assess plausible and realistic aims and options for engaging the public with the future of heat and provide related strategic advice and expertise.

RQ3: What are the different dimensions and options for engaging the public with low-carbon heat?

RQ4: What are the strengths and weaknesses of the different options, approaches and framings for engaging the public with low-carbon heat?

## Methods

The research questions were addressed across two phases:

1. A survey conducted in May 2019 of a general GB population sample of 2907 adults<sup>2</sup>. The survey asked questions to assess current levels of public awareness and understanding; levels of support for a transition; attitudes towards low-carbon heating among people living in homes off the gas grid using high carbon technology<sup>3</sup> and which sources the public currently trust to provide information and advice.
2. Four deliberative workshops<sup>4</sup> with 134 participants in England, Scotland and Wales in January and February 2020, commissioned jointly by BEIS and the Scottish Government. The purpose of the workshops was to explore attitudes to the heating transition in greater depth and identify drivers of some of these views. Two of these workshops involved participants that were predominantly living in homes on the gas grid, and two with people living in homes that were entirely off the gas grid with most using high carbon heating technologies. The on-gas grid workshops focused on discussing a range of possible approaches to, and implications of, a transition to low-carbon heat.<sup>5</sup> The off-gas grid workshops focused on four hypothetical regulatory approaches that could be introduced to help phase out high-carbon off-grid heating<sup>6</sup>.

This synthesis report draws together the findings from both these phases (which are published separately) to summarise the key conclusions to our research questions. Whilst findings relate to people across the UK, unless otherwise highlighted below, there were no distinct differences in aggregate views between the countries.

Survey findings are drawn from random probability survey carried out via the NatCen panel which uses a statistically representative general population sample which supports findings

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<sup>2</sup> The sample was taken from the NatCen Panel, a random-probability research panel recruited from the British Social Attitudes survey.

<sup>3</sup> e.g. oil, liquified petroleum gas (LPG) and coal heating.

<sup>4</sup> Deliberative workshops are a form of facilitated group discussions that provide participants with the opportunity to consider an issue in depth, challenge each other's opinions and develop their views to reach an informed position.

<sup>5</sup> Specifically, we asked participants what they thought about making changes to their home, the timing and planning of any transition, and choice of low-carbon heating system.

<sup>6</sup> These were: (i) a ban on the sale of new fossil fuelled heating systems, (ii) mandatory change of heating system during other major renovations, (iii) mandatory change of heating system prior to selling a property, and (iv) an outright ban on the continued use of fossil fuel heating systems.

being generalisable to the wider population with high levels of reliability. Qualitative findings are derived from methods designed to explore issues in depth in targeted populations or places and make use of non-numerical data. We have used purposive sampling<sup>7</sup> to achieve range and diversity amongst those in our workshops which means findings represent the specific views of these participants and cannot be taken to be the views of the public at large. Whilst we deliberately avoid giving numerical values in our qualitative findings, the data included helps us identify trends in the meanings and explanations behind people's attitudes.

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<sup>7</sup> Purposive sample is non-probability based. Researchers generate a sample of participants based on select characteristics of interest to the study.

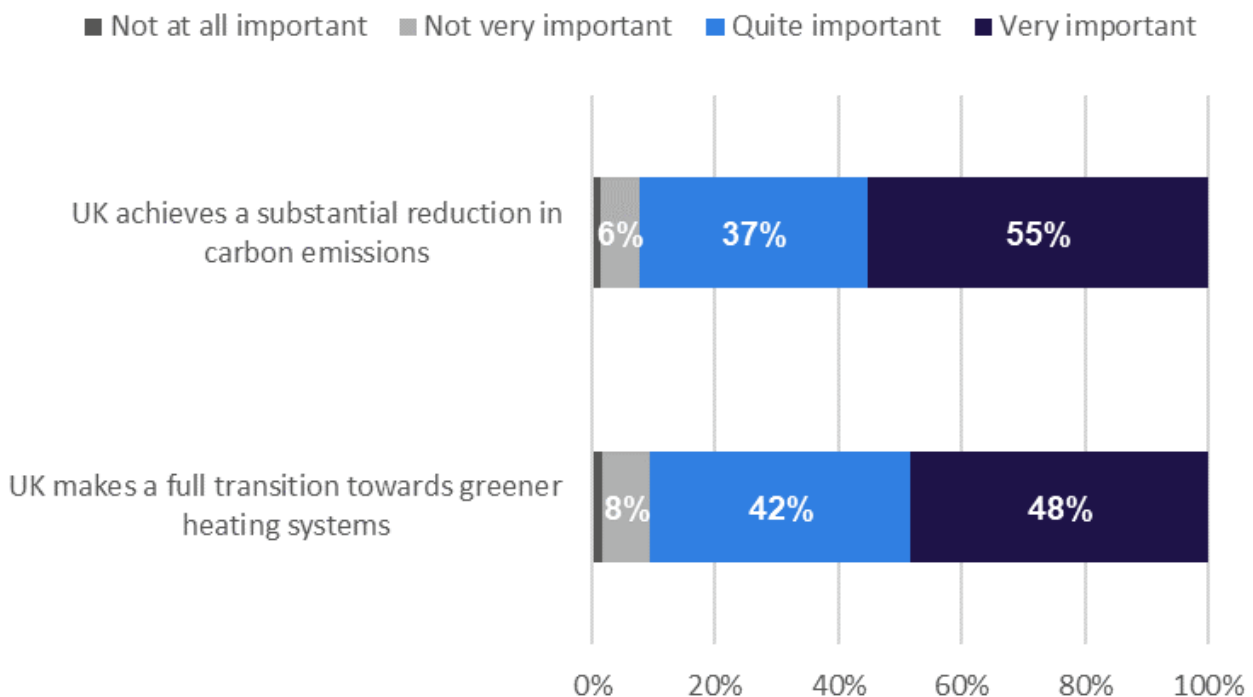
# Public awareness and understanding

We explored public awareness and understanding of both the need for a heating transition in terms of mitigating climate change and the contribution of domestic heating to current levels of carbon emissions. We also explored people’s existing knowledge of low-carbon technologies and their attitudes towards them in both phases of the research.

## The need to transition – reducing carbon emissions

Shown in Figure 1, over nine out of ten (92% of) British people consider it ‘quite’ or ‘very’ important that the UK achieves a substantial reduction in carbon emissions. However, the survey also showed lower awareness of Government targets with only 37% of survey respondents feeling they know ‘a little’ or ‘a lot’ about the UK’s legally binding emission reduction targets for 2050.

**Figure 1: General population support for the government’s carbon emissions targets**



Base: British population aged 18+  
[UK achieves a substantial reduction in carbon emissions (2,901)]; UK makes a full transition towards greener heating systems (2,896).

Workshop participants demonstrated existing levels of awareness about the role of carbon emissions in climate change but there was greater variation in their knowledge of UK government and devolved government carbon reduction targets. Whilst people were broadly understanding of the need for governments and society more generally to take steps to reduce the rate at which the world is warming, a minority felt that responsibility for change should be

located with other countries (e.g. China) or other sectors (e.g. car manufacturing and diesel vehicles) that generated high levels of emissions.

## The contribution of heating to carbon emissions

We found that people consistently underestimated the contribution that heat in buildings makes to UK carbon emissions. Of the five largest contributors, heat in buildings, transport and industry each make up 20 to 25% of the UK's annual emissions. After these, agriculture and non-heating energy use in buildings each contribute 10 to 15%.<sup>8</sup> However, less than half (46%) of people correctly identified heating/cooling in buildings as one of the three highest contributors and, on average, respondents estimated the level of emissions to be closer to that of agriculture and non-heating energy use in buildings than transport and industry. These perceptions did not vary significantly by socio demographic characteristics or level of concern about climate change and environment friendly behaviours.

On the basis of existing evidence that public awareness of both the contribution of domestic heating to carbon emissions and available low-carbon technologies is low, workshops were designed to include presentations on these aspects to support participants to deliberate. Participants generally expressed surprise at the level of carbon emissions produced by domestic heating, and there was some indication that people don't think about their heating as a contributing source (in the way they do think about switching off lights in energy saving measures). There was broad agreement that information should be more widely available or circulated to the public given the importance and time critical nature of the issue.

The survey also asked people their levels of support for a few specific climate policies. With regards to a low carbon heat transition, two thirds (66%) of respondents supported phasing out of gas boilers and just under half of respondents (46%) supported the prospect of phasing out gas cookers in favour of electric ones (over one in five (21%) were against it). For comparison, 61% were in favour of phasing out petrol/diesel cars for electric/hybrid ones and over three in four (76%) supported subsidising renewable energy through taxes on fossil fuels. Policies to combat climate change were generally better supported among higher educated and income groups. Looking by age, younger age groups (those under 50) were more likely to support policies to phase out domestic gas use.

## Awareness of and views on low-carbon technology

Other than those already using low carbon heating, the majority of people did not believe that their current heating system was environmentally friendly, but there were nevertheless substantial minorities of fossil-fuel system users who did. Those using an off-grid high carbon system were least likely to believe their system was environmentally friendly (19%), followed by those using mains gas (28%) and those using an off-grid electric system (36%). Over half (57%) of those using low carbon or other systems believed they had environmentally friendly heating although the total number in this group was small.

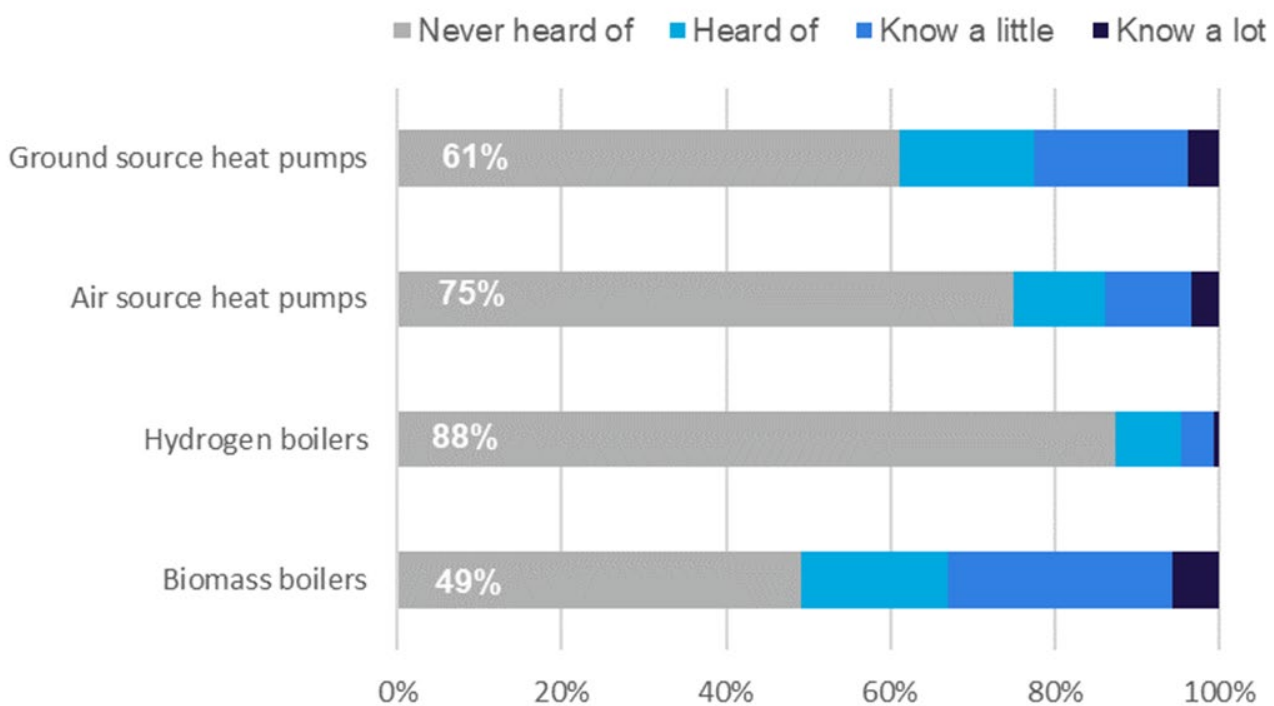
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<sup>8</sup> BEIS analysis. See also: <https://www.gov.uk/government/publications/heat-decarbonisation-overview-of-current-evidence-base>



We know from existing evidence that there is a self-declared low level of awareness among the population of low-carbon heating technologies including biomass boilers, hydrogen boilers, air source heat pumps and ground source heat pumps. Nearly nine out of ten (88%) respondents had never heard of hydrogen boilers but this is not surprising given they are not currently available to consumers (see Figure 2 below). People were most aware of biomass boilers with 51% of respondents having heard of them or knowing something about them. Awareness of ground and air source heat pumps was also relatively low with 61% of respondents having never heard of ground source and 75% of air source pumps. People living off the gas grid using high-carbon heating systems were more likely to report knowing a ‘little’ or a ‘lot’ about heat pumps than other people (50% compared to 23%).

**Figure 2: Levels of awareness and knowledge of low-carbon heating technologies**



Base: British population aged 18+  
 [Biomass boilers (2,906); Hydrogen boilers (2,907); Air source heat pumps (2,906); Ground source heat pumps (2,905)]

We found an association between knowledge of heat pumps and opposition to the phasing out of gas boilers. Respondents among the 10% who ‘somewhat’ or ‘strongly’ opposed the phasing out of gas boilers were more likely to be aware of or knowledgeable about heat pumps (38% heard of/know something) than those who support the policy (23% heard of/knowing something).

After receiving information at the start of the off-gas grid workshops on heat pump and biomass boiler technology, participants discussed their merits and were more generally in favour of heat pumps rather than biomass boilers. Reservations on the latter were due to the size and the challenges of fuel storage, and respondents also expressed concern about whether they could be considered carbon neutral, sharing their thoughts that a lack of trees in the UK means having to import from overseas.

In on-gas grid workshops, participants viewed the low-carbon technologies they were shown as unusual and continued to express a preference for their existing systems. There was some discussion about preferences for keeping existing appliances, e.g. gas cookers as they were familiar, and people liked using them. Participants gave less attention generally to weighing up the pros and cons of different options – citing a preference that rather than have choice over technology, they would just want the system that was most efficient and environmentally friendly.

## Levels of Support for Transition

The survey demonstrated there were high levels of support for making the full transition to greener heating systems (with 90% saying it is 'quite' or 'very' important), though as highlighted above, support for specific elements of this such as switching away from gas cookers was more varied. This and the survey findings that only 24% feeling they knew 'a little' or 'a lot' about the UK ambition to eliminate nearly all emissions from heating buildings mean findings are set alongside fairly low levels of familiarity with low-carbon technologies. Awareness tended to be higher among older age groups, those with higher education and income levels and those responsible for paying energy bills and taking decisions about household heating. Those with a higher level of concern about climate change and demonstrating more environmentally friendly behaviours were unsurprisingly most aware of the ambition.

Whilst the approach to uncovering public attitudes and the factors that influenced them on levels of support for transition varied across the different phases of the research, the survey and workshops both focused to some degree on some similar characteristics for participants to consider. This included local vs national planning of a transition, how much choice people wanted over things like available technology, when changes would come in and when they would experience impacts in their home as well as the levels of disruption they would accept. Respondents were told to assume that costs were the same across all scenarios. This section focuses on these themes across the survey and workshops for those living on the gas grid. The attitudes of people living off-gas grid are collated in the section that follows.

### Planning

Survey findings indicate that respondents tended to find a nationally managed transition more acceptable than a locally managed one. Across all workshops, participants were in agreement and thought UK government leadership would be necessary. However, people wanted to see citizens engaged with the government's work to ensure local contexts and public views are incorporated.

- Participants felt less certain that local authorities would have the resources or capacity to oversee something at scale and also believed that some centrally driven arrangements would be needed to ensure everyone took appropriate action.
- In those workshops in devolved nations some concerns were raised that UK government were potentially too distant to understand the specific contexts of people living in some parts of Scotland and Wales. However, these views were also relevant when people discussed rural communities, so it was not clear whether the main driver of these views related to devolved powers per se or were bound up in broader concerns about geography.

## Choice and control

Survey respondents were asked to consider scenarios in which households would have individual choice or whole neighbourhoods would be switched over at a given time. Findings indicate the public very slightly preferred to have individual household choice over timing compared to neighbourhood level switchovers. In contrast, on-gas grid participants in the workshops had a preference for limiting disruption to the home caused by the transition and participants demonstrated greater willingness to lose choice on when any changes would be made in order to do so. On the whole workshop participants felt the scale and nature of the transition meant they were not realistically likely to have much personal choice and there were some citizens, such as council tenants, who they assumed would have even less of a say.

## Disruption and changes to the home

Respondents to the survey were shown scenarios that implied different levels of disruption from low (described as two to three days over a few months to replace appliances) or higher (described as major works over eight consecutive weeks). The public were slightly more likely to favour a low disruption scenario over a high disruption one. Workshop findings indicate:

- People were more concerned with the day to day changes implied with any new technology than with the disruption related to installation. For example, people who currently had gas appliances indicated they would accept a level of disruption to their homes if they could keep a cooker that was similar to their existing appliance
- There was some view that new technologies were not 'normal' and were therefore implicitly measured against traditional systems in terms of acceptability.

A more positive view on acceptability of disruption emerged when workshop participants were thinking more explicitly about the need for change. Participants correlated the climate emergency with needing to act urgently and felt that giving the public information about what is happening, and raising awareness, could lead to greater acceptability of disruption.

A theme that appeared at a range of points across workshops relevant to the general points discussed above was people wanting to see a fair distribution of benefits and risks in any transition. This was the case when discussing financial implications, the timing of any transition and in terms of the impact on personal circumstances or particular groups (e.g. rural communities).

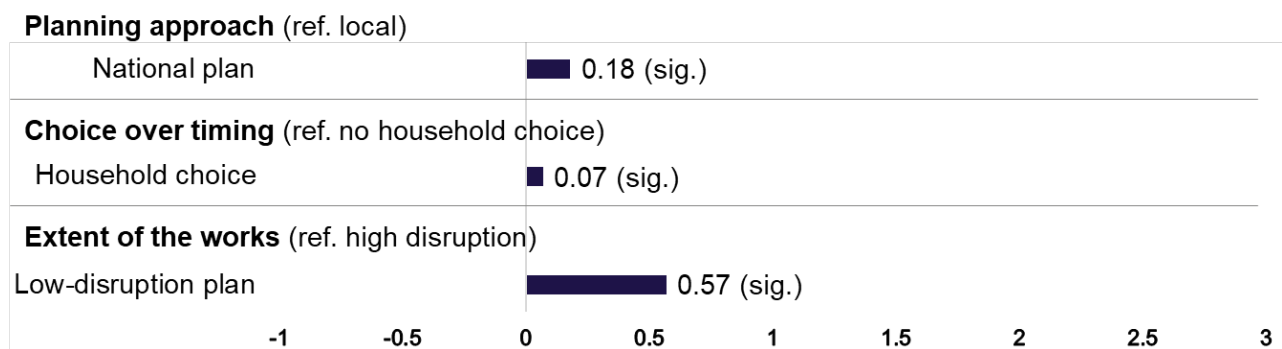
The survey findings suggest that as show in Figure 3, controlling for socio-demographic characteristics and attitudes towards climate change:

- A low-disruption approach is more acceptable than a high-disruption one (on average, a low-disruption plan was 0.57 points more acceptable than a high-disruption plan);
- a national approach is more acceptable than a local one (a national approach was on average 0.18 points more acceptable than a local approach);

- an approach where a household has control over the timing of the transition is more acceptable than one that does not (overall, the former was considered 0.07 points more acceptable than the latter).

Of the three elements, the level of disruption contributes more to the overall acceptability of the transition than whether or not there is choice over the timing, or whether or not it is a national or locally-developed plan. However, the size of the effects in each case and in combination are very small.

**Figure 3: Effect of the scenario elements on the public acceptability of heating transition**



Base: British population aged 18+  
 [10,662 observations | 2,745 respondents].  
 (sig.) = statistically significant effects in the model.

## Sub-group differences in survey responses

When we used regression modelling to explore the impact of attitudes and socio-demographic characteristics on attitudes to a heating transition we found that tenure type was a slight differentiating factor in acceptability of the scenarios. Private and social renters found any transition scenario more acceptable than homeowners, which is understandable given the latter group are perhaps more likely to be calculating the direct cost to them.

Concern about climate change was the strongest driver of a higher level of acceptance of a heating transition over and above other characteristics.

Workshop participants also identified the environmental argument to make change as most important in driving their views. Concerns about aspects that would affect them personally, such as disruption to the home, were frequently weighed up against these larger ideals. This suggests that participants understood the urgency of the need to reduce carbon emissions through using new technology and associated policy change.

Not surprisingly, those who agreed at the beginning of the survey that it was ‘quite’ or ‘very’ important for the UK to make the full transition to greener heating systems were more likely to find any of the scenarios acceptable. This attitude to the policy was understandably highly correlated with the level of concern about climate change.

In total, concern for climate change and, in turn, support for the UK moving to greener heating systems had more impact on the acceptance of heating transition than any of the elements of

how we might achieve that transition. These findings are a snapshot at this moment in time, and once the public become more aware of the features and practicalities of a transition, these may become stronger influences of public views. That said, at the time of this research those most concerned about carbon emission reduction are more likely to accept any approach if it achieves our targets. However, those who were less concerned about climate change or committed to the policy plans showed more interest in their household having a choice over the timing of the transition.

## Attitudes of people living off-gas grid

People living entirely off the gas-grid were asked additional questions in the survey. This group tended to have more familiarity with non-gas grid technologies and are likely to be encouraged to switch sooner in any transition. Consequently, in the deliberative workshops, off-gas grid participants were given specific regulatory scenarios to consider.

People living off the gas grid with high-carbon heating systems (fuelled by oil, coal, bottled or tanked gas) made up 4% of survey respondents (n=116)<sup>9</sup>. These people were more likely to be homeowners (85% compared to 64% of other respondents<sup>10</sup>), older (with 71% aged over 50, compared to 49% of other respondents), as well as having higher levels of education and income on average. Although this group had similar levels of concern about climate change and knowledge and support for heating transition policy as the wider group of survey respondents, their knowledge and awareness of certain low-carbon heating technologies was much higher than average. 50% of this group knew 'a little' or 'a lot' about either air or ground source heat pumps compared to 23% of other respondents. Similarly, 58% knew about biomass boilers compared to 32% of remaining respondents.

### Attitudes to transition

People living off the grid with high-carbon heating systems were more likely to disagree with the statement that 'My heating system is environmentally-friendly' (42%) than the rest of survey respondents (25%).

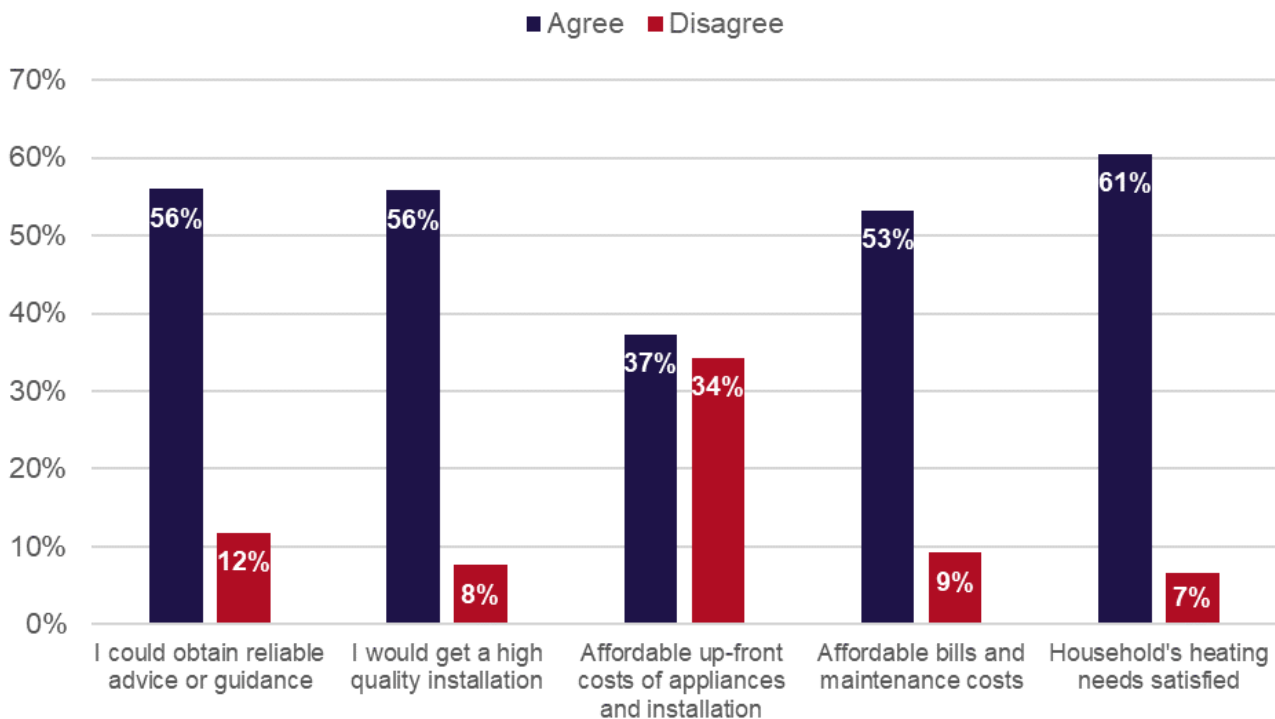
The off-gas grid high-carbon group were asked in the survey about replacing their heating system with low-carbon heating technologies. As summarised in Figure 4, over half of the group believed if they made the switch their 'bills and maintenance costs would be affordable' (53%) and their 'household's heating needs satisfied' (61%). Similarly, 56% felt both that they could 'obtain reliable advice or guidance' for making the switch and that 'would get a high-quality installation'. However, only 37% felt that the 'up-front costs of appliances and installation would be affordable' and over one third (34%) disagreed with this statement.

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<sup>9</sup> Since the incidence of the population not connected to the mains gas grid is relatively small (c. 13% of total households), to increase the sample size for this group and enable more robust analysis, a 'boost' sample of additional panellists identified as living in off-grid post-codes were issued. This meant an unweighted response number of 228 participants. To ensure the estimates produced through the survey were as representative as possible of the general population, a survey weight was computed accounting for oversampling of off-grid cases and differences in levels of non-response. This produced a weighted number of 116 respondents.

<sup>10</sup> Other respondents included those living on the grid or those living off the grid with and electric, low-carbon, district, communal or other heating system.

**Figure 4: Attitudes of the off gas grid population to what they perceived as positive aspects of switching to low-carbon technology**



Base: Off-grid respondents using a high-carbon heating system

[Obtain reliable advice or guidance (228); Get a high-quality installation (227); Affordable up-front costs of appliances and installation (228); Affordable bills and maintenance costs (228); Household's heating needs satisfied (227)]

Workshop participants were asked more directly about their priorities and preferences for four possible regulatory scenarios. For this group, preferences about transition were linked to people's priorities as follows:

- Having choice over the timing of when they would have to transition, for example in a policy of replacement on sale of the home, was more important than the costs they would be subject to as a result. Whilst this sort of choice was seen as more likely in sale/renovation rather than policies banning the installation of new or continued use of existing fossil fuel systems, there were also a range of concerns raised about possible unintended consequences of these specific policy scenarios, e.g. you replace a system to one a potential buyer doesn't want.
- Financial support for changes in technology being available to all, with no cap on earnings. Respondents were keen to stress that it was not just vulnerable people who would be struggling to meet the cost of new systems.
- A staggered roll-out, in which people would not have to replace their heating systems at the same time, was preferred to allow time for testing and because participants thought the price of new technology may reduce over a period of two to three years.

For a few respondents, cost was still the most important factor and where they assumed costs would be covered (through financial assistance) they were less concerned about the choice of timing on a transition. A lead in period was also suggested, of a minimum of five years before any policy implementation, to give residents time to plan and save for associated costs.



# Summary

This research has demonstrated that people are largely supportive of the need for a heating transition in principle. Concern about climate change was the strongest driver of a higher level of acceptance of a heating transition. This research also confirms existing evidence on the low level of awareness of the contribution of heating to carbon emissions. For most – with those in off-gas grid properties generally the exception, people also have low levels of awareness of low-carbon technologies. The research has found few apparent differences between England, Wales and Scotland with the exception of increased discussion on a centrally planned transition. However, as indicated in the report, it was not clear whether the main driver of these views related to devolved powers per se or were bound up in broader concerns about geography.

Weighing up different options for a transition, survey findings indicate the public:

- Were more likely to favour a low disruption scenario over a high disruption one.
- Tended to find a nationally managed transition more acceptable than a locally managed one.
- Very slightly preferred to have individual household choice over timing compared to neighbourhood level switchovers.

Findings from deliberative workshops corroborate these points but introduce (un)familiarity and understanding the day to day impact of a change as an important driver of people's views on acceptability. In addition, people in on-gas grid properties in particular were less concerned with the choice of technology they might use and more concerned that they should be offered the most energy efficient available.

In contrast, those in off-gas grid workshops, to whom the transition may have seemed more imminent, put more emphasis on choice as driver for acceptability. They demonstrated a preference for heat pumps over biomass boilers (the two technologies they were invited to discuss) and policy scenarios that gave them more individual choice over when they would have to make a switch (e.g. on selling the home) were preferred.

The research also found that public have important views on how a transition should be implemented. They think leadership from UK government will be necessary, but they would like to see citizens engaged with the governments work to ensure local contexts and public views are incorporated. People in the deliberative workshops also wanted to see a fair distribution of risks and benefits for everyone in a transition and picked out particular groups whose needs they thought would require better understanding to ensure it worked for them including the rural and the vulnerable. In general, respondents agreed that it should not be compulsory to change heating systems until individuals have the finances available to do so. People were also clear on the importance to them of independent and expert advice, to help people understand and make good choices about new technologies.

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