

EQUINOX



Learnings from
engaging customers
throughout the
EQUINOX trials:
barriers & enablers of
the electrification of
heat and unlocking
domestic flexibility

Project deliverable 5

August 2025

national**grid**

nationalgrid.co.uk

1. Executive summary

To examine the potential for domestic heat pump flexibility to act as a demand response asset for networks, Equitable Novel Flexibility Exchange (EQUINOX) trials occurred over three consecutive winters and collectively onboarded over 2,000 participants. Each participant household used a heat pump as their primary source of home heating and was drawn from the customer pools of three different 'suppliers' (Octopus Energy, ScottishPower and Sero). These participants were at the heart of each EQUINOX trial, and from the project outset we prioritised ensuring that all customers, including potentially vulnerable and fuel poor customers, could comfortably participate and benefit equitably from the trials. Enabling all customers to benefit from flexibility underpinned trial design factors. Our aim was to reward customers' time and efforts within the trial structure, without losing sight of how equitability could later be maintained in enduring flexibility services. Methods for engaging potentially vulnerable and fuel poor customers evolved across the three trials based on lessons learnt and was broadly successful at enabling broader participation across different vulnerability factors.

This report shares learning and best practice from engaging and assessing the experiences of trial participants, including potentially vulnerable participants, throughout the four years of the EQUINOX project. It provides an overview of the role of different stakeholders in engaging potentially vulnerable and fuel poor customers in flexibility and how these households can best be supported throughout the energy transition.

Our findings provide novel, real-world insight into the experiences throughout the customer journey. They demonstrate that vulnerable and fuel poor groups can engage in heat pump flexibility, while also showing the key points of difference and support required throughout that engagement. Policymakers can use these insights in support of enabling the take-up of consumer flexibility and decarbonised heating, and industry to design the products and services required.

Some key findings specific to the commercial rollout of heat flexibility include:

1. **Vulnerable and fuel poor groups are interested in taking part in heat pump flexibility and can equitably benefit from taking part.** The heat pump flexibility demonstrated in EQUINOX trials led to participation and engagement from all participants, including vulnerable customers, with minimal negative impacts. In trial three, 47% of trial participants were classified as potentially vulnerable customers and demonstrated similar levels of participation, trial satisfaction, and engagement as non-vulnerable participants. This was also consistent across trial one and trial two. In general, heat pump customers are interested in heat pump flexibility, including vulnerable groups.
2. **Customer-centric design enables high customer engagement rates.** Embedding customer experience directly into the trial design process, rather than treating it as a separate consideration, helped to deliver consistently high engagement and satisfaction rates in EQUINOX. Prioritising voluntary participation and empowering households to engage on their own terms may be valuable approaches too for commercial flexibility products, which must be practical and appealing for a wide range of customers.

Some key findings specific to innovation trials include:

3. **Customer recruitment methods are important to consider from the outset as they can impact the diversity of customers recruited to trials.** Understanding how representative the EQUINOX customer pool was in comparison to the UK population is an important consideration as over time heat pumps are likely to become one of the most prevalent heating technologies. As heat pumps continue to be installed in more homes, the population of heat pump users is changing and will begin to more closely match the UK population. If we can understand how well our trial participants represent the general UK population, we can then have some measure of assurance that our results will or will not continue to be relevant as DNOs undertake future planning activities.
4. **Qualitative research enables better understanding of the complexity of heating behaviours and habitual practices which might impact demand-shifting.** Throughout EQUINOX we conducted numerous surveys to understand customer experiences and preferences. Supplementing this data with qualitative insights was helpful in providing nuance to the quantitative data from the trials. Focus groups and interviews allowed us to more deeply understand specific customer experiences.
5. **The development and implementation of vulnerability frameworks should be tailored to specific trial programmes and customer circumstances.** It is important to consider developing bespoke customer personas and hypotheses to capture specific circumstances that customers could be exposed to when evaluating customer experiences. The development and implementation of the equitable participation framework (EPF) in trial three was one of the contributing factors to being able to more robustly understand how different customers could benefit and equitably engage with the trial.

Version control

Issue	Date
do.1	June 20, 2025
do.2	July 18, 2025
V1.0	August 27, 2025

Publication control

Name	Role
Raeesa Hirji, Samantha Piller (Guidehouse), Stuart Fowler (National Grid)	Author
Jessica Colleen, Tessa Marianne Hillen (Octopus Energy) Callum Coghlan, Alyssa Fournier, Alex Jakeman (Guidehouse) Ayah Hatim, Helen Stockton (National Energy Action) Kate Ashworth (West Midlands Combined Authority) Watson Peat (ScottishPower) Nicki Johnson, Sam Griffin (National Grid)	Reviewers
Ryan Huxtable (National Grid)	Approver

Contact details

Email

For further information, please contact: nged.innovation@nationalgrid.co.uk

Postal

Innovation Team
National Grid Electricity Distribution
Pegasus Business Park
Herald Way
Castle Donington
Derbyshire DE74 2TU

Disclaimer

Neither National Grid, nor any person acting on its behalf, makes any warranty, express or implied, with respect to the use of any information, method or process disclosed in this document or that such use may not infringe the rights of any third party or assumes any liabilities with respect to the use of, or for damage resulting in any way from the use of, any information, apparatus, method or process disclosed in the document.

National Grid 2025

No part of this publication may be reproduced, stored in a retrieval system or transmitted, in any form or by any means electronic, mechanical, photocopying, recording or otherwise, without the written permission of the innovation manager who can be contacted at the addresses given above.

Table of contents

1.	Executive summary	2 -
2.	Glossary of terms	7 -
3.	Context and purpose	8 -
	3.1 Context.....	8 -
	3.2 Introduction to EQUINOX and the trials	8 -
	3.3 Purpose of this report	9 -
4.	Engaging customers throughout the EQUINOX trials	10 -
	4.1 Overview of customer research	10 -
	4.2 Overview of customer engagement research methods	11 -
	4.3 Recruitment approach	12 -
	4.4 Participant details	14 -
	4.5 Trial results	17 -
	4.6 Lessons learnt from engaging customers	23 -
5.	Enabling equal opportunities.....	25 -
	5.1 Overview of equitability across EQUINOX trials	25 -
	5.2 Assessing for potentially vulnerable customers	26 -
	5.3 Equitable participation framework	28 -
	5.4 Lesson learnt from assessing and engaging vulnerable customers	29 -
6.	Recommendations on the role of DNOs in engaging customers in heat flexibility.....	31 -
	Appendix A: Project partners	32 -
	Appendix B: Customer eligibility criteria.....	33 -
	Appendix C: Low-income classification.....	34 -

2. Glossary of terms

Control group participants: Participants used for comparison to measure an intervention's effects.

Customers: Term used when referring to customers of energy suppliers generally.

Longer heat pump flexibility events ('Longer Events Flex'): Investigated demand turndown for two hours or more, on non-consecutive weekdays, during the network evening peak.

Morning heat pump flexibility events ('Morning Peak Flex'): Investigated demand turndown on non-consecutive weekdays, during the morning network peak.

Heat pump turn up flexibility ('Turn Up Flex'): Investigated demand turn up on non-consecutive days, around midday, including a weekend event.

Equitable participation framework: A framework developed to identify potentially vulnerable participants and understand how intersecting energy vulnerabilities could impact participation in flexibility services.

Daily evening heat pump flexibility ('Daily Evening Flex'): Investigated turndown across consecutive weekdays, during the network evening peak.

Events: Periods of the day when trial participants were asked to provide demand response.

Flexibility service providers: Organisations that offer flexibility services to electricity network operators.

Households: Households that use a heat pump as their primary method of space heating.

Daily morning heat pump flexibility ('Daily Morning Flex'): Investigated turndown across consecutive weekdays, during the network morning peak.

Participants: Term used when referring to customers taking part in EQUINOX trials.

Potentially vulnerable participants: Participants who were segmented based on various vulnerability indicators.

Treatment group participants: Participants who received the intervention.

Trial one: The trial events that occurred between December 2022 – March 2023.

Trial two: The trial events that occurred between December 2023 – March 2024.

Trial three: A collective term for the five mini-trial events that occurred between December 2024 – March 2025.

3. Context and purpose

3.1 Context

Energy affordability is a key challenge for many, especially vulnerable or fuel poor households. The UK government has committed through its 2025 Plan for Change to ensure the public 'enjoy the full benefits of home-grown clean power' and to bring consumers' bills down.¹ Its recent fuel poverty strategy consultation has specifically set out the its intention to support fuel poor households with installation of low-carbon heating systems and to ensure that decarbonisation and reduction in fuel poverty can go hand-in-hand. The UK government's forthcoming Warm Homes Plan, confirmed at the June 2025 spending review, will "help to cut bills by £600 for families across the country by upgrading homes through energy efficiency measures, alongside installing heat pumps and other low-carbon technologies"².

Electrification of heat is crucial to decarbonisation and heat pumps are expected to be the main low carbon heating technology for achieving the UK decarbonisation ambitions. In addition to moving away from fossil fuel heating sources, heat pumps can be particularly advantageous for homes as they are highly efficient and can contribute to the reduction of energy bills. EQUINOX is exploring how these benefits can be expanded through heat pump flexibility, while exploring how engaging with flexibility can be accessible and equitable to all customers, including vulnerable and fuel poor customers.

3.2 Introduction to EQUINOX and the trials

Equitable Novel Flexibility Exchange (EQUINOX) is a Network Innovation Competition (NIC) project funded by the Office of Gas and Electricity Markets (Ofgem). It is led by National Grid Electricity Distribution (NGED), the UK's largest regional Distribution Network Operator (DNO) and supported by multiple project partners³. It is developing, trialling, and, where proven, implementing suitable arrangements at scale that can maximise participation of domestic heat pumps in DNO procured flexibility while meeting the needs of all customers, including those with potential vulnerabilities.

EQUINOX has tested multiple novel commercial arrangements across three trial periods between 2022-25, to measure demand response from heat pump homes and to better understand the customer experience of heat pump flexibility. Trial one ran across Winter 2022-23 with almost 400 participating households ('participants') and was a successful proof of concept for heat pump flexibility, testing three commercial arrangements for customers. Trial two followed in Winter 2023-24, iterating on the results of trial one and increasing the participants pool to over 1000 customers. This scale permitted closer analysis of demand response volumes and used commercial arrangements that more closely mimicked existing DNO flexibility products. Trial three, held between September 2024 and March 2025, built out from the learnings in trials one and two to investigate further ways that heat pump flexibility can be used to support

¹ [Fuel Poverty Strategy for England](#), HM Government, 2025.

² [Spending Review 2025](#), HM Treasury, 2025.

³ A full list of project partners can be found in Appendix A.

networks. This trial was split into five mini-trials each focusing on different aspects of demand response and customer experience:

- **Heat pump turn up flexibility ('Turn Up Flex')**: demand turn up events on non-consecutive days, between 12 - 2pm.
- **Longer heat pump flexibility event ('Longer Events Flex')**: demand turndown events of differing lengths, on non-consecutive days, between 4 - 8pm.
- **Morning heat pump flexibility events ('Morning Peak Flex')**: demand turndown events on non-consecutive days, between 8 - 10am.
- **Daily morning heat pump flexibility ('Daily Morning Flex')**: 'everyday' demand turndown events on weekdays, across consecutive weeks and between both 8 - 10am and 5 - 7pm.
- **Daily evening heat pump flexibility ('Daily Evening Flex')**: 'everyday' demand turndown events on weekdays, across consecutive weeks and occurring between 4 - 8pm.

Customer experience was a key focus in addition to demand response. EQUINOX trials have prioritised equitable access and participation for all customers, including those experiencing vulnerability or fuel poverty. We employed a mix-methods approach, combining quantitative surveys with qualitative interviews and focus groups to explore customer willingness to engage in heat pump flexibility and understand the experiences and barriers for potentially vulnerable customers. Throughout the trials we have been encouraged by customer appetite to participate in a range of novel commercial offerings while also being able to maintain high customer satisfaction and comfort across three winter trial periods.

3.3 Purpose of this report

This report aims to share learnings and best practices from engaging and assessing the experiences of participants, including potentially vulnerable participants throughout the four years of the EQUINOX project. It is also intended to provide an overview of the role of different stakeholders in engaging potentially vulnerable and fuel poor customers and how these households can be best supported throughout the energy transition.

Heat pump flexibility has the potential to deliver energy bill savings while not impacting the customer experience. Ensuring those benefits are extended to all consumers, including the vulnerable and fuel poor is of material concern to both policymakers and industry. Often these consumers have the most to gain but may also need extra support to engage. There is currently limited research and data into those groups' willingness and ability to engage.

The findings and learnings in this report provide novel, real-world insight into the experiences throughout the customer journey. They demonstrate that vulnerable and fuel poor groups can be engaged in heat pump flexibility, while also showing the key points of difference and support required throughout that engagement. Policymakers can use these insights in support of enabling the take-up of consumer flexibility and decarbonised heating, and industry to design the products and services required.

4. Engaging customers throughout the EQUINOX trials

This section outlines how customers, including vulnerable and fuel poor participants, were engaged throughout EQUINOX, the outcomes of these efforts, and lessons learnt.

4.1 Overview of customer research

Directly engaging participants underpinned the customer research conducted during the EQUINOX trials. This research included both qualitative and quantitative methods, including surveys, interviews, and focus groups.

The customer research aimed to understand:

- Why participants signed up and were motivated to participate.
- How participant demographics compared to the UK population.
- How satisfied participants were with the trial design and experience.
- How EQUINOX events altered participant behaviour and if they impacted thermal comfort.
- What the barriers and benefits were of participating.
- Whether or not participants with potential vulnerabilities were equally able to take part in events and benefit from participating.
- How participant experiences were shaped by trial design factors.

The results presented here need to be interpreted in the context of two limitations of trial and customer research design:

- Participants were self-selecting. This has been an effective strategy within EQUINOX trials, ensuring that customers always had a choice to take part in trials once invited. Nonetheless, it presents a challenge in that we do not have representation from customers who do not choose to take part, and we acknowledge that there may be customers who do not feel able to take part in heat pump flexibility who simply did not enrol into the trials.
- Participants were not representative of the UK population more broadly. The experiences of these customers cannot be interpreted as representative of all households. However, they are thought to be representative of existing heat pump homes and are likely to be representative as heat pumps become more widely adopted. Important insights can be drawn, particularly for consideration in future iterations of heat pump flexibility offerings.

Keeping these limitations in mind, we are able to draw important insights from the customer engagement research which can be applied to future low carbon heating flexibility offerings.

4.2 Overview of customer engagement research methods

Customer engagement in EQUINOX was primarily led by the energy suppliers⁴ collaborating on the project. Participants received communications from their supplier throughout the trial experience. For both Octopus Energy and ScottishPower customers, customer engagement in EQUINOX leveraged existing communication channels, issuing invitations, notifications and surveys by email, with some event notifications through mobile apps. This approach mimics the business-as-usual (BaU) set up where customers engage with their energy supplier rather than the DNO, increasing the chances of greater customer participation.

Customer engagement in EQUINOX was, however, more frequent than in a BaU context to enable collection of ongoing feedback on customer experience during the trials. To mitigate against information fatigue, messages were kept as clear and concise as possible, with any new details specifically highlighted for participants' attention. Messaging was adapted based on participant feedback, particularly where the same questions arose repeatedly.

Throughout the trial, we captured the experiences and perceptions of trial participants through surveys, interviews and focus groups. Beyond trial participants, we ran a survey of social housing tenants in and around the West Midlands⁵ and two nationally representative surveys of around 2000 adults. These additional surveys aimed to assess broader customer perceptions of heat pumps and the energy transition to benchmark our findings and enhance our understanding of a wider group of customers. Table 1 describes each customer research method.

Table 1: Customer research methods conducted throughout the trial

Customer research method	EQUINOX trial	Description
Recruitment survey	Trial 1, 2 and 3	Administered to participants when they were recruited. Collected information about the participant's heat pump and household characteristics.
Start of trial survey	Trial 2 and 3	Administered before the start of each trial. Collected information on the demographics of trial participants. ⁶
Post event surveys	Trial 1, 2 and 3	Sent after each EQUINOX event to gather information on whether households participated and their comfort levels during the events. Short - two to five questions.
Mid-trial survey	Trial 2	Administered to participants in the middle of the trial to assess early perceptions of the trial design.

⁴ Organisations acting as energy suppliers included Octopus Energy, ScottishPower and Sero.

⁵ This occurred in conjunction with the social housing provider Bromford.

⁶ For trial one, this information was collected in the end of trial survey.

Check in survey	Trial 3	Sent fortnightly to check in on participant's comfort and satisfaction. Short – two to five questions.
End of trial survey	Trial 1, 2 and 3	Administered to participants at the end of the trial to understand the overall experience.
Interviews	Trial 1, 2 and 3	Held to gain deeper insights on participant's experience with the processes of the trial. One-to-one, semi structured.
Focus groups	Trial 1, 2 and 3	Four to six customers per group were asked similar questions as one-to-one interviewees, but with the added benefit of a chance to learn how others may have experienced the trial.
Social housing tenant survey	Distributed to non-EQUINOX participants ⁷	Distributed to a selection of social housing tenants in and around the West Midlands with a heat pump installed in their home to gauge their use and opinions of their heat pumps, and self-projected engagement with heat pump flexibility offerings.
UK-wide survey	Distributed to non-EQUINOX participants ⁸	Assessed average customer attitude related to adoption of heat pumps, as well as ways of shaping customer preference to drive uptake of heat pumps and their flexible operation.

4.3 Recruitment approach

Customer recruitment was a particularly successful aspect of EQUINOX, exceeding the project aim of recruiting 1000 participants and when considering each trial as its own cohort, over 2000 participants were enrolled over the course of the project. EQUINOX onboarded 1282 unique customers across all three trials. Centring customer experience as a key consideration during the trial design phase made the trials an appealing prospect during recruitment. Customer satisfaction was very high in each trial, and 45% of participants who participated in EQUINOX at some point participated across multiple trials. 136 participants participated in all three winter trials.

4.3.1 Customer sign-up journey

Customer recruitment was led primarily by the energy suppliers. They targeted specific customers based on the trial eligibility criteria⁹.

⁷This survey was distributed to non-EQUINOX participants to supplement the insights from the primary customer research gathered through the surveys distributed to EQUINOX participants.

⁸This survey was developed and conducted by Accent to act as a comparison for the insights gathered through the surveys distributed to EQUINOX participants.

⁹Detail on the customer eligibility criteria can be found in Appendix B.

Energy suppliers predominately conducted customer outreach via emails which included messaging about EQUINOX project aims, a description of what would be requested of customers participating in each of the trials, and the potential financial benefits of taking part. Wherever possible, recruitment happened shortly before trial events began (e.g. 1-2 weeks before trial start). Participation in the trials was framed as an opportunity to take part in an innovation project furthering collective understanding of how low carbon heating could be utilised flexibly for wider network benefits.

As part of the recruitment process, customers completed a recruitment survey. The customer recruitment survey collected key information about each participant's property, heating system attributes, and the presence of any other low carbon technologies (LCTs) in the home. This data was used to confirm eligibility for the trial (e.g. presence of a heat pump), to allocate participants to different trial groups, and for post-trial analysis.

Following the customer recruitment phase, participants were asked to agree to the trial terms and conditions. The trial terms and conditions set out the supplier's expectations of their customers participating in the trials and what customers could expect from their supplier while participating in the trial. This included how financial incentives would be paid to customers. It was stressed that participants were under no obligation to participate in events, they would not be penalised for under-participation in events, and that they could exit the trial at any time by contacting their supplier with such a request. There was no cost to customers to sign up to EQUINOX and no penalty if a customer later changed their mind and chose to exit the trial. This approach kept EQUINOX open to as many customers as possible. Data collection, processing, use, and sharing were also covered in the terms and conditions, with consent to these data uses forming part of the agreement.

Overall, customer recruitment aimed to maintain principles of clear communication, with sufficient information to allow customers to understand what they were signing up to and clear assurances that there was no minimum performance standard or penalties for later deciding to stop participating in the trial. This ensured that the trials were equitable and accessible to all customers.

4.3.2 Additional recruitment methods trialled

Ahead of trial three ScottishPower installed a significant number of heat pumps as part of the ECO4 (Energy Company Obligation) Government Obligation. Recruitment for trial three was targeted at these customers. Due to the eligibility criteria for ECO4, there was a greater proportion of low income and potentially vulnerable participants in this group compared to the overall EQUINOX participant pool which provided an opportunity for additional equity learning in the trial. These customers were offered £10 sign-up bonus to help incentivise greater representation from ScottishPower customers in the overall participant pool.

Trial three also tested if recruitment of households with more vulnerability factors would increase through a non-digital outreach approach. To test this, the West Midlands Combined Authority (WMCA) conducted a recruitment drive involving a door knocking campaign in an area of social housing known to have had heat pumps installed through grant funding schemes. This door-knocking did not contribute to significant uptake among social housing tenants. We believe the limited success was due to most social housing tenants contacted being ineligible to participate in EQUINOX because they were not with an eligible energy supplier. Of the over 300 households that were targeted

during this exercise, 10% responded. Additionally, we found many were somewhat reluctant to engage in something on the doorstep or did not answer the door.

4.4 Participant details

This section describes trial participant demographics across all three trials, with a focus on trial three. Trial three made progress in recruiting a more diverse customer base than in previous trials and in recruiting more potentially vulnerable customers as demonstrated in Section 5.2¹⁰. Wider customer representation is important especially within the EQUINOX context of testing scalable and equitable heating flexibility. One of the main goals of the trials was to inform future flexibility services that can be rolled out at scale.

4.4.1 Energy affordability

As part of the start of trial survey, we collected information on customers' pre-trial perspectives on energy affordability. Figure 2 shows trial three participants' self-reported ability to pay their energy bills compared to the responses from the UK wide survey undertaken in 2024. 58% of trial three participants reported always being able to afford their energy bills, compared to the UK average of 40%¹¹. This was a similar distribution to trial two. However, both were more aligned to the UK average when compared to trial one.

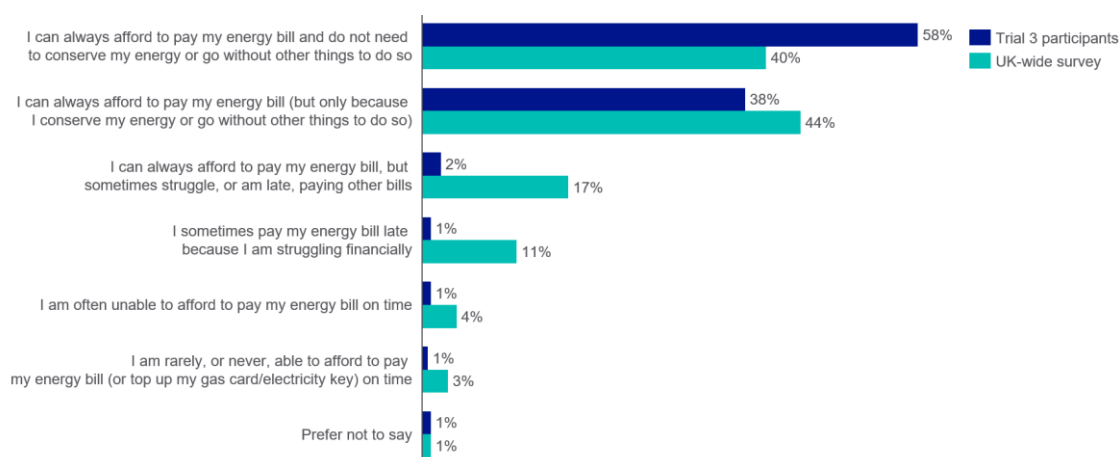


Figure 1: Trial three participants self-reported (in a pre-trial survey) their ability to pay their energy bills (n=602), compared to the wider UK survey (n=2404)

¹⁰ More details on trial one and trial participants can be found [here](#).

¹¹ UK-wide survey and start of trial survey question stated: "Many people are struggling to pay their household bills due to the current economic situation. Which of the following best describes how affordable you find your energy bills (energy costs if you do not receive a bill) and other household bills?"

4.4.2 Income level

We also investigated participants' income level alongside their household occupancy. In trial three we classified households as low-income households based on the minimum income standard¹², which identified a participant as low income based on their self-reported household occupancy and income levels. As shown in Figure 2, 25% of trial three participants were living below the minimum income standard compared to 36% of the UK average¹³.

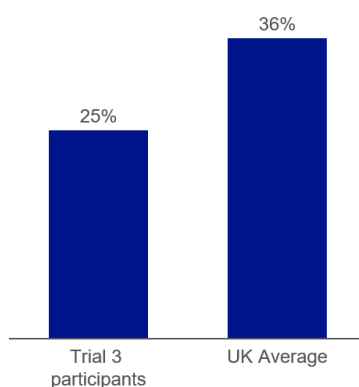


Figure 2: Households living below the minimum income standard in trial three (n=602) compared to the UK average

4.4.3 Housing tenure

Most trial participants across all three trials owned their home, as shown in Figure 3. While the proportion of homeowners remained consistent across all three trials, we saw increased participation from social housing, from a negligible number in trial one to 9% of the total pool in trial three. Although this is still below the UK average of 17%¹⁴, this is consistent with our understanding that homeowners tend to have more control over altering their home heating, making heat pump installations more viable for them compared to tenants. There also tends to be slower uptake for landlords installing heat pumps so far¹⁵. These factors lead to homeowners being an over-represented demographic in the trial.

¹² [The Minimum Income Standard for the United Kingdom](#), Loughborough University.

¹³ [Households living below a Minimum Income Standard](#), Joseph Rowntree Foundation.

¹⁴ [Office for National Statistics](#), Census 2021.

¹⁵ [UK Collaborative for Housing Evidence](#), Heat Pumps and Domestic Heat Decarbonisation in the UK, 2023.

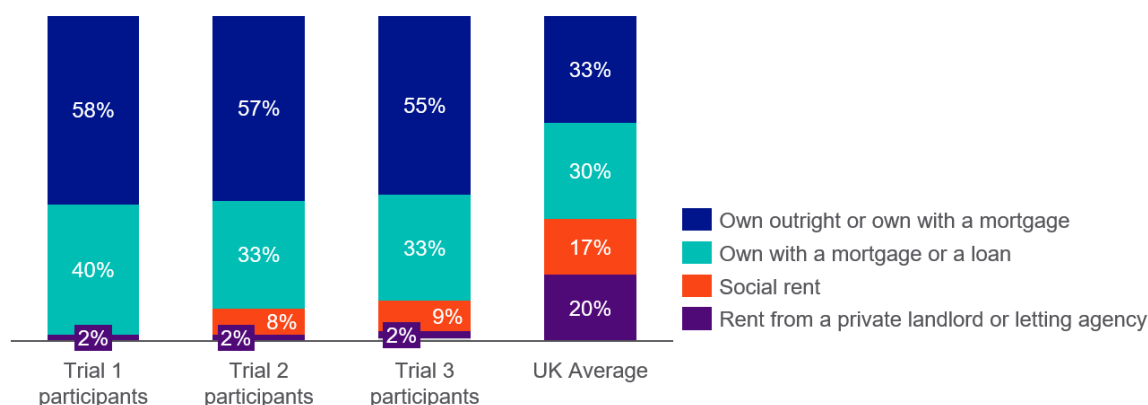


Figure 3: Trial one (n=256), two (n=732) and three (n=602) participants' relationship with their home compared to the UK average

4.4.4 Heat pump uptake

In the UK-wide survey undertaken in 2024, we asked respondents how likely they were to install a heat pump in the next five years¹⁶. 28% of respondents indicated they were either very likely or likely to install a heat pump in the next five years. The demographics of the respondents likely to install a heat pump closely aligns to the demographics of customers who participated in EQUINOX trials. The demographic similarities between non-EQUINOX respondents and EQUINOX participants is important, especially within the EQUINOX context of testing scalable and equitable heating flexibility. One of the main goals of the trials was to inform future flexibility services that can be rolled out at scale. The following EQUINOX participants demographics were compared to the respondents of the UK survey who indicated they would be likely to install a heat pump: those with an income over £50,000, those who are owner occupiers, those who have children in their home, and those who are over 65. These characteristics were selected as we saw high proportion of trial participants across each trial cohort matching these demographics. Therefore, the aim was to assess whether these patterns were unique to the trial participants or reflective of broader trends among current and prospective heat pump owners.

¹⁶ Respondents were asked "How likely are you to install a heat pump in your household within the next 5 years?"

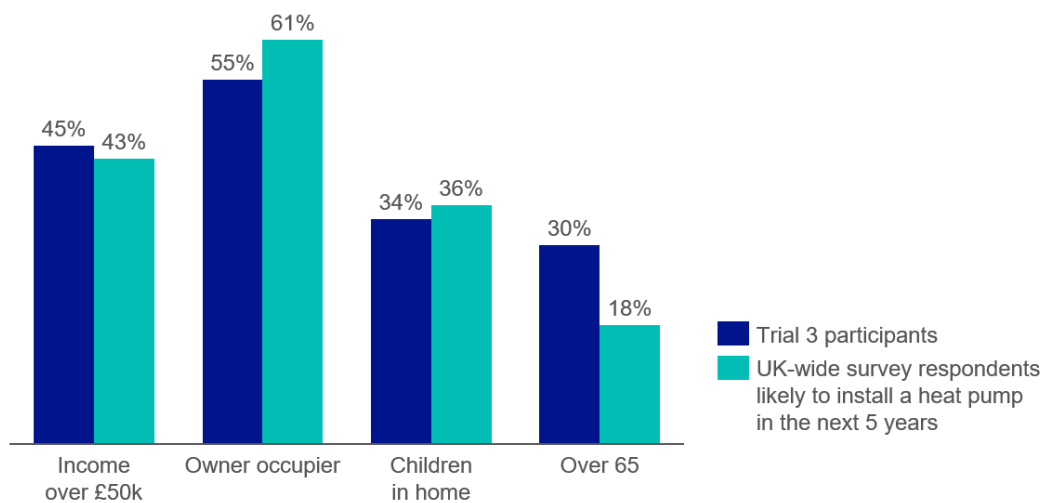


Figure 4: Demographics of 2024 UK-wide survey respondents who self-reported they were likely to install a heat pump in the next 5 years (n=620) compared to trial three participants (n=602)

Figure 4 shows the comparisons between some self-reported demographic factors that were gathered during the EQUINOX trial three start of trial survey, and the demographics of respondents from the broader UK-wide survey who reported they were likely to install a heat pump in the next five years. There are similar proportions of trial three participants and UK-wide survey respondents who have an income over £50k, are owner occupiers, and have children in the home. However, only 18% of those who were likely to install a heat pump in the next five years were over 65 compared to 30% of trial three participants. The demographic similarities between trial three participants and those who are likely to install a heat pump gives a good foundation for understanding which subset of the population could be interested in participating in heat flexibility offerings in the near future.

4.5 Trial results

This section highlights key customer engagement results from all three trials, with a specific focus on trial three results. The results were obtained through the customer research methods outlined in Section

4.2 Overview of customer engagement research methods. For more information on the results on trial one and trial two, see summary reports [here](#).

As described in Section 3, trial three was a series of five mini-trials. Each mini-trial trialled different aspects of heat pump flexibility.

- **Turn Up Flex:** demand turn up events on non-consecutive days, between 12 - 2pm.
- **Longer Events Flex:** demand turndown events of differing lengths, on non-consecutive days, between 4 - 8pm.
- **Morning Peak Flex:** demand turndown events on non-consecutive days, between 8 - 10am.
- **Daily Morning Flex:** 'every day' demand turndown events on weekdays, across consecutive weeks and between both 8 - 10am and 5 - 7pm.
- **Daily Evening Flex:** 'every day' demand turndown events on weekdays, across consecutive weeks and occurring between 4 - 8pm.

The trial results in this section are predominately from qualitative and quantitative analysis from Longer Events Flex, Morning Peak Flex, Daily Morning Flex and Daily Evening Flex. Additional detail on trial three results can be found in [Trial 3 Mini-Trial Reports](#).

To understand the experiences and perceptions of all participants, including potentially vulnerable participants, we disaggregated the trial results into two categories: all participants and potentially vulnerable participants. Potentially vulnerable participants were identified by using eight self-reported vulnerability indicators. More details on how vulnerability categorisation was assessed can be found in Section 5 of this report. Overall, we are encouraged by the findings from the trial as they offer real-world insight into the experiences of participants, including potentially vulnerable participants. They demonstrate that vulnerable and fuel poor groups can be engaged in heat pump flexibility, while also showing the key points of difference and support required throughout that engagement.

4.5.1 Post-event notifications

Email reminders after each event were useful in prompting participants to turn their heating back on and specifically to help prevent vulnerable participants from underheating. In trial three Morning Peak Flex and Longer Events Flex mini-trials, participants received a notification to complete the post-event survey at the end of each event. These results are applicable to the dynamic style¹⁷ manual turndown events that were trialled in the trial three Morning Peak Flex and Longer Events Flex mini-trials and therefore would not apply to other kinds of flexibility, including automated or daily provisions. This notification served both as a reminder to complete the survey and that the event had ended. We asked participants in the end of trial survey if this notification helped remind them to turn their heating back on. As shown in Figure 5, it offered a helpful reminder to 45% of all participants and 51% of potentially vulnerable participants. This suggests that post-event notifications could be a useful lever to safeguard potentially vulnerable customers from unintentionally underheating in manual, non-daily flexibility events.

¹⁷ Dynamic is a DNO flexibility product that is designed to respond to network needs in near real-time.

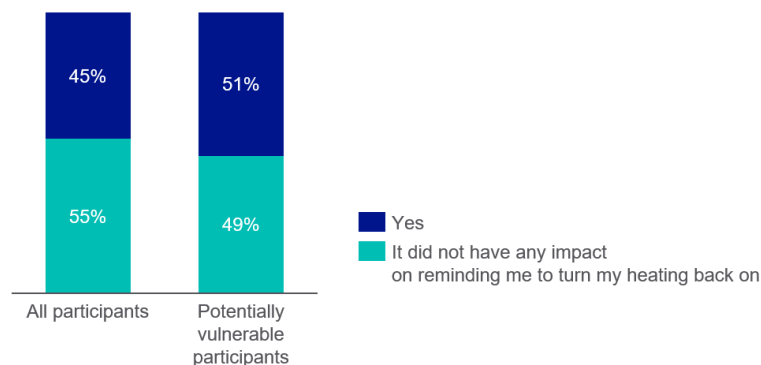


Figure 5: Trial three participant responses to the question 'Did the email about post event survey help remind you to turn your heating back on?' (n=412) compared to vulnerable participants (n=167)

4.5.2 Event notice periods

Event notice periods was a trial design factor that we continually tested throughout the project. In trial two, we tested various service-relevant event notice periods, including notifications two-hours prior to an event, the morning of an event, and a day prior to an event. In trial two, participants reported a preference for day ahead notice. However, most participants also indicated that the notice period did not affect their ability to participate. This was particularly true for those who could control their heat pump via an app or smart thermostat as this control approach offered them more flexibility in how and when they participated.

This finding was further tested in trial three and an important result was determining that day ahead notice periods are an adequate event notice period for all participants. We provided day ahead notice of events in the Morning Peak Flex, Longer Events Flex, and Turn Up flex mini-trials. As shown in Figure 6, 91% of participants self-reported being satisfied with the day ahead notice period in trial three. There was no meaningful difference between the notice period preferences of potentially vulnerable and all participants. Results from the social housing survey indicate that 69% of social housing tenants would prefer a day ahead notice period were they to participate in an event¹⁸. Adults aged over 65 were more likely than other groups to have no preference, but this still only represented 19% of the respondents from this age group (n=16). These results indicate that day ahead notice periods are sufficient for all customers, including those who are potentially vulnerable.

¹⁸ Respondents of the social housing survey did not participate in the EQUINOX trial, and provided responses based on what they think they would prefer if they were to participate in an EQUINOX event.

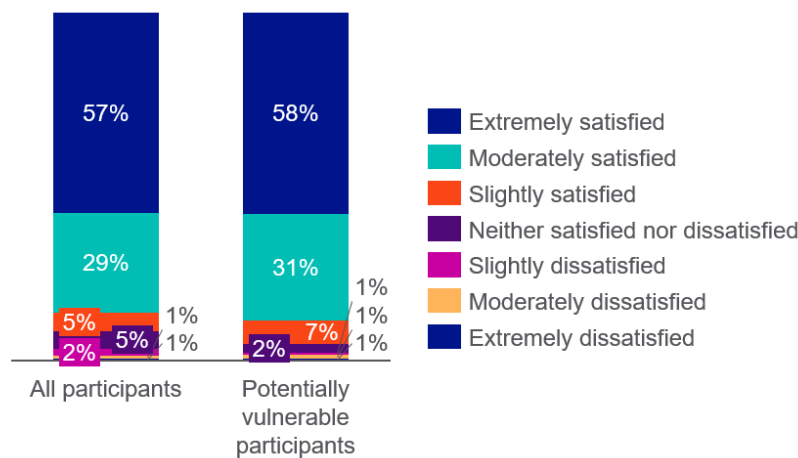


Figure 6: Trial three treatment participant responses to 'How satisfied were you with the day-ahead notice periods for the EQUINOX events?'(n=395) compared to vulnerable participants (n=163)

4.5.3 Advice on heat pumps and the trials

In trial three, we also explored if customers felt that additional guidance or support on how to most efficiently operate their heat pump would impact their ability to participate in EQUINOX events. We heard in focus groups and interviews that additional guidance on heat pump efficiency may be useful to some customers to maximise their household energy efficiency. While this wasn't the focus of the EQUINOX trials there could be appetite from customers to learn more about their heat pump and overall energy efficiency.

Control group participants who didn't take part in the trial events directly but had their heat pumps monitored through the trial were asked if they would participate in heat pump flexibility events¹⁹. Some free text responses noted that they would be hesitant to participate as it would go against advice they have received from installers. One participant stated that they were "Happy to avoid using other appliances at cheaper times but heat pump needs to run constantly". Another participant stated that learning "how to optimise the heat pump to make best use of cheap rate night electricity rates" would benefit them. These anecdotes suggest that some customers who have not previously engaged in heat pump flexibility may be hesitant due to advice they have received or may require more guidance to confidently make the best use of flexibility offerings. This highlights the potential benefits of additional advice services to support households on how they could use their heat pumps to further engage flexibility programmes.

Control group participants who didn't participate in the trial events directly but had their heat pumps monitored were also asked what kind of guidance or information would help them better use their heat pump²⁰. The results in Figure 7

¹⁹ Respondents were asked: "Flexibility offerings like Octopus Saving Sessions or Octopus Free Electricity sessions reward customers for a temporary reduction or increase in their electricity usage at specific times, often called 'events'. Would you be open to taking part in short 'events' in which you would be paid for turning down your heat pump for short periods of time in winter?"

²⁰ Respondents were asked: "What kind of guidance or information would help you better use your heat pump?"

show that 72% of participants reported that receiving some form of additional guidance or information would be helpful for operating their heat pump. This figure was lower among social housing tenants, at 56% (110 respondents), but still shows that a majority of these households would value advice. This is an important consideration as heat pump roll out continues to increase, additional guidance, especially targeted guidance for potentially vulnerable and fuel poor households, may be required to make best use of flexibility offerings.

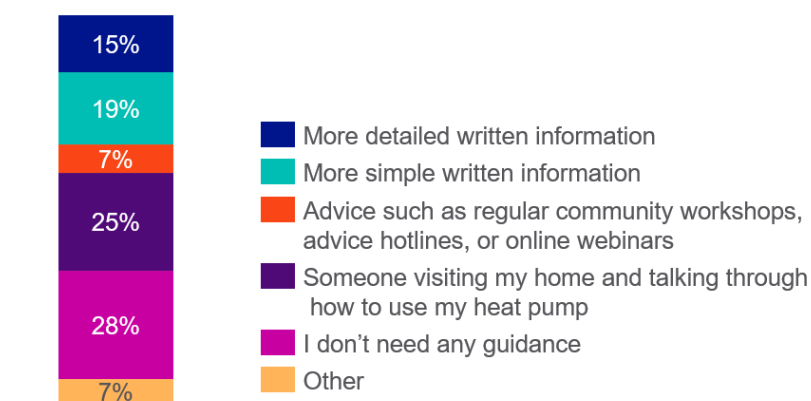


Figure 7: Self-reported additional guidance desired by participants (n=186)

4.5.4 Key household characteristics

In trial three, we tested various event configurations including longer events and daily events²¹. We assessed how household factors like insulation, presence of additional LCTs, or potentially vulnerable households, would respond to these various event configurations that represent different aspects of existing DNO flexibility services.

To explore the reasons behind participants' event length preferences, we analysed their responses based on household characteristics we considered might affect their ability to participate in longer events. Varying event lengths were explored in Longer Events Flex mini-trial where customers were invited to participate in events up to 4h long if they felt that it may be suitable for their home and household. There was no penalty for not taking part in events or for participating in only part of an event. Customer incentives were based on survey participation, with the aim of identifying which event length each participant felt best suited them. Overall, we found that nearly half of trial participants preferred 2-hour events, though 32% preferred 3-hour events, 6% preferred 4-hour events and 16% had no event length preference. We tested how these preferences related to specific home demographic factors that we hypothesised might impact their preference towards longer events, as seen in Figure 8²². Most notably, amongst participants with poor insulation, none preferred 4-hour events and only 10% reported no preference. Across other factors such as home battery ownership, access to additional heating and potential vulnerability, there was no deviation from the overall group on event length preference. This suggests that except for insulation, which may impact a participant's event length preference, any other variation in event length preference is likely due to individual customers' personal preferences rather than driven by specific household characteristics.

²¹ Daily events refer to events that occurred for five consecutive days in a week.

²² Treatment participants' responses to "Of the two-, three- and four-hour event lengths, which event length did you prefer?"

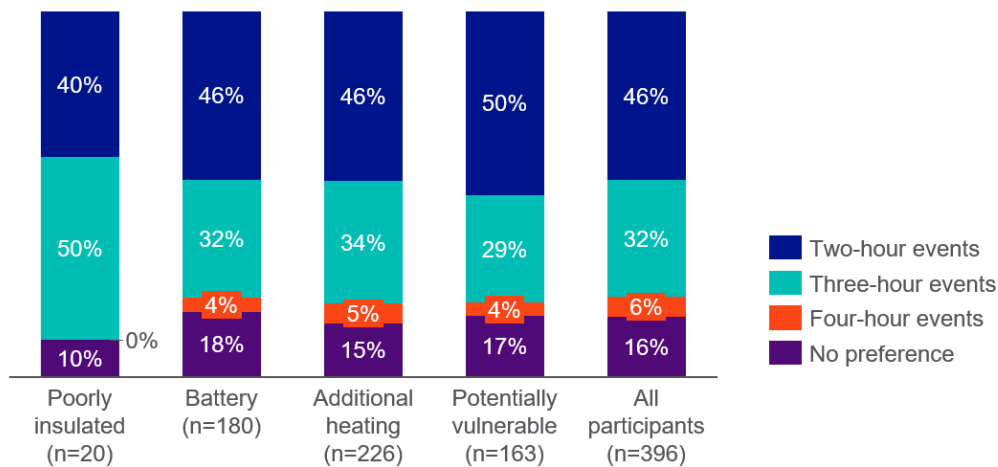


Figure 8: Participants' event length preference segmented by household factors reported in start of trial survey (n=396)

In the Daily Evening and Morning Flex mini-trials that had daily events, the ability to control a heat pump remotely via an app or by setting a schedule ahead of time was a key factor that impacted trial satisfaction. We segmented participant's views on daily events by their control type, as shown in Figure 9²³. Notably, 84% of participants (108 participants) with remote control found events on every weekday basis was just right or too little compared to 63% of participants (83 participants) with manual control. These findings are reinforced by insights shared during focus groups. One participant using manual control explained that they couldn't participate daily due to the nature of their control method: "I don't mind how often the events are, but I didn't do them all, because it was so often and because I have to manually [turndown]." In contrast, a participant with remote control noted that the daily frequency enabled them to establish a consistent routine from the start of the trial: "It's not difficult. You just program the heat pump to do that. It doesn't matter whether it's a weekend or a weekday; we've just left it the same." Overall, these results suggest an advantage of remote control in supporting consecutive day flexibility, especially for daily events. The results suggest that the control technology customers use to operate and schedule their heat pumps may play an important role in how well different types of flexibility services are tolerated by customers.

One caveat of these findings is that customers who were already using a time of use tariff that incentivises everyday flexibility during the day (not just overnight) were not eligible to participate in the Daily Evening and Morning Flex mini-trials. These EQUINOX findings may represent an under-reporting of impact or satisfaction, if some customers in the daily flex mini-trials have already chosen to not use a time of use tariff that incentivises similar behaviours.

²³ Treatment participants' responses to "During the EQUINOX daily morning and evening mini-trials, there was events daily for 5 consecutive days. What is your view on this frequency?"

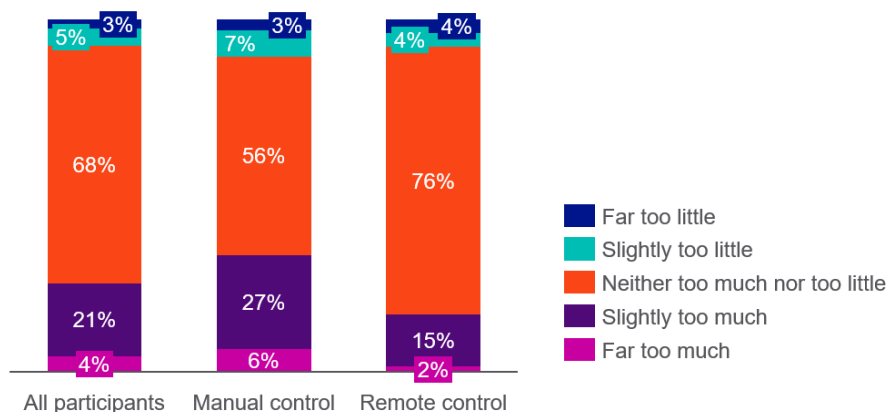


Figure 9: Participants' preference on daily event frequency split by manual control (n=124) and remote-control participants (n=129)

Understanding the additional factors that can allow customers to more easily and comfortably participate in flexibility offerings can contribute to the equitable participation of all customers. Available government funding schemes such as ECO4, which targets vulnerable customers, offer funding for both insulation and smart thermostats. Complementary initiatives can benefit customers who choose to take part in heat pump flexibility programmes and may impact how well different styles of heat pump flexibility are tolerated. The design of customer propositions in a BaU scenario should consider how events will be experienced differently depending on household characteristics and markers of vulnerability.

4.6 Lessons learnt from engaging customers

We are encouraged by the number of customers we were able to engage throughout the three winter trials, including EQUINOX participants and non-EQUINOX customers. This engagement has shaped subsequent trials within the project and provided important considerations for future flexibility offerings. Below are the key learnings from engaging customers throughout EQUINOX trials.

1. Supplementing trial results and findings with additional research can add nuance and context. We contracted a third-party agency to understand the broader perspectives and opinions on heat pump adoption and the energy transition. This was beneficial to EQUINOX as heat pump owners are not currently representative of the broader UK demographic. Therefore, being able to use this secondary research to be able to benchmark against our trial results allowed us to understand the similarities and differences between different demographics. We also conducted a survey for social tenants in the West Midlands area which again provided additional insights that we could use to inform how flexibility can benefit a diverse subset of customers.
2. Although customers with heat pumps could generally be considered as early adopters and highly engaged at this stage, participants had diverse experiences in the trials based on their individual circumstances and the way they use electricity. This has clear impacts on trial results and on data analysis, but also impacted how we

communicated with customers, requiring a balance between simplicity and making sufficient information available for interested participants.

3. Customer-centric design enables high customer engagement rates and should be considered throughout the trial design process. Embedding customer experience directly into the trial design process, rather than treating it as a separate consideration, helped to deliver consistently high engagement and satisfaction rates in EQUINOX. Prioritising voluntary participation and empowering households to engage on their own terms may be valuable approaches too for commercial flexibility products, which must be practical and appealing for a wide range of customers. For example, per-event opt-ins were a point of friction in the customer experience in early trials. This allowed us to evaluate whether they were necessary in the trial design and decide to include them in trial two but not then in trial three.
4. Qualitative research can help contextualise insights gathered from quantitative research. Throughout EQUINOX we conducted numerous surveys to understand customer experiences and preferences. While these results provided insightful data, supplementing this data with qualitative insights was helpful in providing nuance to the quantitative data. Focus groups and interviews allowed us to more deeply understand specific customer experiences. Qualitative research enables better understanding of the complexity of heating behaviours and habitual practices which might impact demand-shifting.
5. Consider broader supplier participation or alternative recruitment pathways such as trusted community organisations to ensure equitable representation of harder-to-reach groups. We saw the benefits of this in trial three whereby we saw a greater proportion of low income and potentially vulnerable participants due to the fact that ScottishPower was targeting customers who were eligible for the ECO4 Government Obligation.

5. Enabling equal opportunities

This section provides a summary of how the EQUINOX trials enabled equitable and equal opportunities and benefits for potentially vulnerable and fuel poor customers relative to the overall participant pool. It also examines the learnings from developing and implementing an equitable participation framework (EPF) and the benefits we saw in these trials, which could have wider applications in future service design or other trials.

5.1 Overview of equitability across EQUINOX trials

To examine the potential for domestic heat pump flexibility to act as a demand response asset for networks, EQUINOX trials were conducted over three consecutive winters and collectively onboarded over 2000 participants. Each participant household used a heat pump as their primary source of home heating and was drawn from the customer pools of three different 'suppliers' (Octopus Energy, ScottishPower and Sero²⁴). These participants were at the heart of each EQUINOX trial and from the project outset, we prioritised ensuring that all customers including potentially vulnerable customers and fuel poor customers could participate and benefit equitably from the trials. Enabling all customers to benefit from flexibility underpinned trial design factors. This approach valued customers' time and efforts within the trial structure, without losing sight of how these factors could later be maintained in enduring flexibility services. Methods for engaging potentially vulnerable and fuel poor customers evolved across the three trials based on lessons learnt.

Focusing on the customer experience aspect of each trial: trial one served as a foundation for refining the customer engagement strategy and methods for capturing vulnerability. We wanted to be able to test the customer willingness to participate in heat pump flexibility while monitoring customer comfort and accessibility. Trial two was at a much larger scale and engaged over 1000 participants. Trial two built on trial one learnings, evolving how to assess vulnerability while ensuring that a wider participant pool maintained high levels of satisfaction and comfort across the trial.

To evaluate equitability in trial participation and benefits, we identified customers with potential vulnerabilities and compared them with the wider participant pool. Potentially vulnerable customers were identified based on self-reported characteristics as detailed in Section 5.2.

Building on the success of trial two, trial three delved deeper into the experiences of potentially vulnerable participants. This included developing a broader definition of vulnerability, tailored communications and testing specific hypotheses related to customer engagement. Ahead of the trial, we developed the EPF which aimed to assess the trial's impact on potentially vulnerable participants. Section 5.3 describes the EPF further.

Further information on trials one, two and three, including detailed reports on the wider trial design, customer engagement, and trial results can be found, [here](#).

²⁴ Sero is not an energy supplier but assumed the role for the purpose of trial two.

5.2 Assessing for potentially vulnerable customers

Defining and assessing vulnerability was an important aspect of ensuring that the trials were inclusive, equitable and reflective of the diverse needs of UK households. Assessing and segmenting for vulnerability was not just a methodological choice but a strategic imperative grounded in fairness, representation and impact measurement.

Segmenting for vulnerability allowed us to compare the experiences and outcomes of potentially vulnerable participants against the broader participant pool. This was essential for understanding how different customers perceived key trial performance metrics, such as satisfaction with financial incentives and comfort levels. We recognise that vulnerability is multifaceted and can be influenced by different factors, and these factors interact in complex ways. Therefore, developing and iterating how vulnerability was assessed was crucial for understanding how heat flexibility can benefit different customer groups, including potentially vulnerable customers²⁵.

Table 2 outlines the self-reported vulnerability indicators considered in each trial and demonstrates that trial three took a broader approach to segmentation.

Table 2: Vulnerability indicators used to segment potentially vulnerable participants across trials

Vulnerability indicator	Trial	Definition
Low-income household	Trial 1	Self-reported income level below £30,000.
Energy and household bill affordability	Trial 1 and 2	Self-reported that they were sometimes, often and/or rarely/never able to afford their energy bills and other household bills (a pre-trial metric).
Disability and/or long-term health condition	Trial 1 and 2	Answered >0 to "Including yourself, how many people in your household meet the following criteria? – Has a disability or long-term health condition?"
Health condition exacerbated by the cold	Trial 2 and 3	Answered yes to "Do you feel this disability or long-term health condition is made worse or more difficult to cope with when it's cold?"
Suffer from a cognitive impairment, physical condition or other health issue	Trial 3	Answered >0 value to "Including yourself, how many people in your household meet the following criteria? - Has a disability or long-term health condition."
Children under 5 years old	Trial 3	Answers >0 to "Including yourself, how many people in your household meet the following criteria? – Children under 5 years old."

²⁵ Following customer segmentation, we classified customers who met the vulnerability classification as potentially vulnerable rather than just vulnerable, as customers did not self-disclose that they were vulnerable and whilst our methodologies try to accurately capture vulnerabilities it may include customers who would not consider themselves to have vulnerabilities.

Over 75 years old	Trial 3	Answered >0 to "Including yourself, how many people in your household meet the following criteria? – Over 75 years old."
Home poorly insulated	Trial 3	Answered "My home is not very well insulated and impacts the way I heat my home" to "How would you describe the quality of your home insulation?"
Live alone	Trial 3	Answered 1 or more to "Including yourself, how many people permanently live in your household?"
Lone parent	Trial 3	Answered children but not spouse/partner to "Who do you share your household with? Select all that apply:"
Low-income household	Trial 3	Combined indicator including their self-reported household income, their self-reported household occupancy and whether they indicated if they could easily pay their bills, in alignment with the UK minimum income standard ²⁶ . More detail on this analysis is described in Appendix A: Project partners.

In trial one customers were segmented as potentially vulnerable if they were considered low income, self-reported that they were sometimes, often and/or rarely/never able to afford their energy bills and other household bills and indicated that someone in the home had a disability or long-term health condition.

In trial two customers were categorised as vulnerable if they self-reported that they or someone in the home had a disability and/or a disability that was exacerbated by the cold, or if customers indicated they had difficulties with their energy affordability.

Trial three took a broader approach to segmentation by including more vulnerability indicators. To minimise the risk that our segmentation methodology for trial three may be over-representative, we considered that there are many interacting factors that determine how a vulnerability factor affects a household. We considered that some households who meet one vulnerability factor may have this factor mitigated by income or other factors. Moreover, we removed customers classified as low-income from the vulnerability segmentation if they self-reported that they never had problems paying their energy bills.

We therefore classified households as vulnerable only if they met one of the following three circumstances:

1. The household was defined as having a low income²⁷ according to their household composition²⁸,
2. Someone within the household self-reported having a health condition exacerbated by the cold

²⁶ [UK minimum income calculator](#), Centre for Research in Social Policy, 2025.

²⁷ Households were classified as low income based on their household composition and annual household income, in alignment with the [UK minimum income standard](#).

²⁸ Households were also removed from the vulnerability segmentation if they were classified as low income, but self-reported that they were able to regularly afford their energy bills.

3. The household met at least two of the other EPF indicators as shown in Table 2.

This resulted in 47% of participants being classed as potentially vulnerable in trial three. This compares to only 22% and 20% of trial one and trial two participants, respectively.

Applying trial two's vulnerability classification methodology to trial three's participants, only 33% of customers are classified as potentially vulnerable, further highlighting that the trial three classification methodology led to a greater proportion of participants being classified as potentially vulnerable. This could suggest that the vulnerability methodology used in trials one and two may have under-represented vulnerability, emphasising the importance of considering all facets of vulnerability in relation to heating flexibility. However, it is important to note that this refinement in methodology does not disadvantage earlier trial participants; rather, it reflects an evolving understanding of vulnerability that builds on previous learnings.

While we do see greater proportion of vulnerable participants in trial three, we caveat that the EPF approach may over-represent potential vulnerability where the presence of other characteristics or counter-factors not measured here could mitigate the impact of individual vulnerability factors by countering the mechanisms by which they can act. This highlights the importance of using a comprehensive and balanced approach when assessing vulnerability in the context of heating flexibility.

5.3 Equitable participation framework

Ahead of trial three, we developed the EPF to facilitate greater representation of potentially vulnerable households, while also being a useful reference for future flexibility services and products to evaluate equitable participation. Trials one and two relied on a select group of vulnerability indicators: long-term disability and chronic illness, health conditions exacerbated by the cold and low income.

The EPF is a new process developed for this project whereby vulnerability factors are identified based upon the specific project criteria and applied to trial three (or any other similar incentives) with the aim to identify where policies can be developed to minimise inbuilt disadvantages.

For trial three, the EPF defined a wider breadth of vulnerability factors affecting access and engagement with heat flexibility offerings. The EPF enabled us to consider more factors in trial design and helped to define specific hypotheses related to potentially vulnerable customers which we wanted to test. This was important because generally we found very little distinguishing potentially vulnerable participants from the wider participant cohort in trials one and two.

We developed the EPF through a comprehensive process of literature reviews, expert consultations and analysis of existing frameworks in the energy and vulnerability space. This identified an initial longlist of potential vulnerability factors that could be relevant to heat flexibility. We conducted further analysis to understand how these vulnerability factors could be exacerbated through individual circumstances or interactions with each other, leading to a shortlist

of 'primary vulnerability factors'²⁹. While the presence of all fourteen shortlisted primary vulnerability factors would ideally be identified for households taking part in the trial, the hypotheses we could test were constrained by what was reasonable, safe and practical in the context of the trial. Therefore, we selected eight vulnerability indicators to assess vulnerability in trial three - further explained in Section 5.2.

Beyond EQUINOX, the EPF highlights the importance of considering specific factors when trying to understand how flexibility offerings can enable equal opportunities. It also spotlights potential risks or challenges associated with potentially vulnerable customers benefiting from heat flexibility offerings. Applying the EPF to trial three clearly shows how expanding the range of vulnerability factors increases the proportion of customers classified as potentially vulnerable. 47% of trial three participants were classified as potentially vulnerable using the EPF approach, compared to only 22% and 20% in trial one and trial two, respectively, with their more limited approach.

Overall, we are encouraged that potentially vulnerable participants are interested in participating in heat flexibility and reported high satisfaction with the trial.

5.4 Lesson learnt from assessing and engaging vulnerable customers

Below are key learnings from EQUINOX's efforts to enable equal opportunities for customers throughout the trials. The learnings are specific to EQUINOX, but insights that can be leveraged by other trials that seek to enable equal opportunities for all customers.

1. Vulnerable and fuel poor groups are interested in taking part in heat pump flexibility and can equitably benefit from taking part. Heat pump flexibility as demonstrated in trials has participation and engagement from all participants, including vulnerable customers, with minimal negative impacts. In trial three, 47% of trial participants were classified as potentially vulnerable customers and demonstrated similar levels of participation, trial satisfaction, and engagement as non-vulnerable participants. This was consistent across trial one and trial two. In general, heat pump customers are interested in heat pump flexibility, including vulnerable groups.
2. Customer recruitment methods are important to consider from the outset as they can impact the diversity of customers recruited. For EQUINOX, recruiting a customer pool representative of the UK population was challenging as heat pumps are not yet widespread across all demographics. This is an important consideration as over time, heat pumps will become one of the main heating technologies. As heat pumps continue to be installed in more homes, the population of heat pump users changes and will begin to more closely match the UK population. If we can understand how well our trial participants represent the general UK population, we can then have some measure of assurance that our results will or will not continue to be relevant as DNOs undertake future planning activities. To reach a greater diversity of heat pump households, it was important that we engage organisations that serve underrepresented groups and local authorities to promote the trial and help to recruit underrepresented customers.

²⁹ The fourteen shortlisted primary vulnerability factors are: low income, health condition exacerbated by the cold, disability or long-term health condition, age over 75, age under 5, poorly insulated home, living alone, lone parent household, low literacy or illiteracy, limited English proficiency, no access to internet or digital services, situational vulnerability, fuel poverty, and situational factors including house instability, overcrowding or temporary hardship.

3. Vulnerability depends on the situation and the conditions the customer is subject to. Whilst there is a lot of pre-existing work on vulnerability which should be used as an initial resource to identify factors that may contribute to a person or a household being in a potentially vulnerable situation, projects should refine their approach to vulnerability to capture the specific nuances that may be more relevant to trial participants.
4. It is important to consider how different vulnerability indicators interact with and even mitigate each other. Therefore, such factors should be controlled for when segmenting customers or analysing results. For example, in EQUINOX, we removed customers classified as low-income from the vulnerability segmentation if they self-reported that they never had problems paying their energy bills. This can help prevent the over-representation of potentially vulnerable customers in trial analysis.
5. The development and implementation of vulnerability frameworks need to be tailored to specific programmes and customer circumstances. It is important to consider developing bespoke customer personas and hypotheses to capture specific circumstances that customers could be exposed to. The development and implementation of the EPF in trial three was one of the contributing factors to being able to more robustly understand how different customers could benefit and equitably engage with the trial.

6. Recommendations on the role of DNOs in engaging customers in heat flexibility

DNOs have traditionally delivered the maintenance and operation of infrastructure that distributes electricity from the national transmission network to consumers. However, DNO roles and responsibilities have evolved to cover effective management and improvement of consumer flexibility and the integration of new technologies.

As we reflect on how EQUINOX has successfully engaged a wide range of customers over the past three winter trials, and the learning this has generated that can be directly applied to the recruitment of customers into flexibility, we would also encourage DNOs to continue to engage customers and customer groups in the following areas:

1. DNOs can leverage the learnings from EQUINOX to help inform how heat pump and heat pump flexibility uptake could potentially grow across license areas and specific substations. This can feed into network planning and help identify which substations will be constrained. This can enable DNOs to target specific areas where heat pump flexibility can be a useful tool in mitigating constraints or enabling additional connections.
2. Work with energy suppliers, local authorities, and non-profit organisations across the UK to support customers transition from gas, while navigating alternative technologies. In many cases, this will be likely be to heat pumps. By working together, we can help accelerate the energy transition and ensure fair and equitable access to low-carbon heating initiatives and products.
3. DNOs should continue to invest and engage in innovation projects and trials to improve energy affordability, grid flexibility, and the integration of new technologies. This enhances the resilience of the network to cope with demand fluctuations and climate-related risks, while empowering customers to participate and benefit from innovation offerings. Innovation projects like EQUINOX allow customers to further benefit from access to affordable, low-carbon heat, benefitting stakeholders across the energy value chain.

Through the adoption of these recommendations DNOs can ensure the reliable and efficient distribution of electricity, support the decarbonisation of heat, and can effectively engage with customers to promote energy efficiency and innovation.

Appendix A: Project partners

EQUINOX is led by NGED, along with multiple project partners and collaborators, as detailed in Table A1.

Table A1. List of EQUINOX partners and collaborators

Name	Project function	Role
National Grid (Electricity Distribution)	DNO	Project lead. Responsible for running the technical integration, trial design, and project management and knowledge workstreams.
Guidehouse	Consultancy	Partner. Responsible for supporting the commercial arrangement design and customer engagement workstreams. Supports trial design, data analysis, project management, and knowledge dissemination.
Octopus Energy	Energy supplier	Partners. Responsible for planning and delivering EQUINOX trials with participants from their customer base. Supporting on all project workstreams as commercial flexibility service providers and customer experts.
Sero	Energy supplier ³⁰	
ScottishPower	Energy supplier	
Passiv UK	Smart technology company	Partner. Responsible for simulating the flexibility impacts for different intervention strategies and household archetypes.
West Midlands Combined Authority (WMCA)	Local government	Partner. Responsible for coordinating a social housing survey initiative to contribute to the broader understanding of customer preferences. Also advising on equitable participation.
Welsh Government	Government	Partner. Responsible for contributing customers throughout trials.
National Energy Action (NEA)	Charity	Collaborator. NEA ensured the needs of customers with vulnerabilities are accounted for in the trial design and in qualitative research.
SP Energy Networks (SPEN)	DNO	Partner. A DNO brought on board to ensure that the design is interoperable for all DNOs. SPEN's license areas joined in trial three.
National Grid (Electricity System Operator)	NESO	Collaborator. Responsible for sharing learnings between EQUINOX and other NESO flexibility programmes, notably the Demand Flexibility Service and CrowdFlex project.

³⁰ Sero is not an energy supplier but assumed the role for the purpose of trial two.

Appendix B: Customer eligibility criteria

The following table is the eligibility criteria to participate in EQUINOX.

Table B1. EQUINOX participation eligibility criteria

Eligibility criteria	Applicable trials
Be aged 18 or over.	Trial 1, 2, and 3
Be a current electricity supply customer of Octopus Energy.	Trial 1
Be a current electricity supply customer of Octopus Energy or ScottishPower.	Trial 2 and 3
Have a working electricity smart meter that has been successfully sending meter readings on a half-hourly basis for at least 80% of the time in the 15 days prior to being invited to take part in a trial.	Trial 1, 2, and 3
Consent to, and not remove consent for, allowing half-hourly meter reads.	Trial 1, 2, and 3
Opt-in to be part of the EQUINOX trials by completing sign-up surveys as requested and accept terms and conditions of the trial.	Trial 1, 2, and 3
Have and use a heat pump as the primary method of heating their home (and this heat pump must not be shared with any other residence(s)).	Trial 1, 2, and 3
Be a resident within the NGED license area.	Trial 1 and 2
Be a resident within the NGED license area, or the SPEN license area.	Trial 3 only
Be a resident within specific post code areas within the NGED license area.	Trial 3 Turn Up Flex only
Be using an electricity import tariff that does not have different prices for electricity during the 'day' (between 0800 and 2200) (e.g. a tariff with an off-peak price 1300 - 1600 is not permitted). Customers may be using a tariff that has different prices within each 24-hour period, e.g. with an overnight off-peak price, or a tariff that does not change prices within a 24-hour period.	Trial 3 only

Appendix C: Low-income classification

The low-income classification was used as one of eight vulnerability classifications considered in trial three. To classify a participant as low income, household composition alongside self-reported income and ability to pay their energy bills was considered. Informed by the UK minimum household income calculator³¹, Table C1 illustrates the threshold to consider a household low income.

Table C1: Low-income thresholds

Household composition	Income threshold
1 adults + 0 children	£25,000 - £39,999
1 adults + 1 children	£50,000 - £54,999
1 adults + 2 children	£60,000 - £64,999
1 adults + 3 children	£75,000 and over
2 adults + 0 children	£40,000 - £44,999
2 adults + 1 children	£55,000 - £59,999
2 adults + 2 children	£70,000 - £74,999
2 adults + 3 children	£75,000 and over
2 adults + 4 children	£75,000 and over
3+ adults	£70,000 - £74,999

If a participant reported their household income below the income threshold and did not self-report that they could always afford their energy bills and do not need to conserve energy or go without other things to do so, they would be considered low income.

³¹ [UK minimum household income calculator](#), Centre for Research in Social Policy, 2025.

