EQUINOX

Learning from trial three: Executive Summary

August 2025

nationalgrid

nationalgrid.co.uk

Version control

Issue	Date
do.1	August 25
do.2	September 25
FINAL	October 2025

Publication control

Name	Role
Ewan Steen, Raeesa Hirji, Samantha Piller (Guidehouse)	Author
Jessica Colleen, Tessa Marianne Hillen (Octopus Energy) Callum Coghlan, Alex Jakeman (Guidehouse) Stuart Fowler (National Grid) Helen Stockton (National Energy Action) Watson Peat (ScottishPower)	Reviewers
Ryan Huxtable (National Grid)	Approvers

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 se of, or for damage resulting in any way from the use off, any information, apparatus, methos or process disclosed in the document.

Table of contents

1. Report purpose and context

1.1 Report purpose

This report provides an overview of the Equitable Novel Flexibility Exchange (EQUINOX) project's third year of heat pump flexibility trials ("trial three"), held between September 2024 and April 2025.

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 partners[1]. EQUINOX is developing, trialling, and where proven, implementing suitable arrangements at scale that can maximise participation of domestic heat pumps in DNO procured flexibility[2] while meeting the needs of all customers, including those with potential vulnerabilities.

Trial three comprised five mini-trials, each exploring different aspects of heat pump flexibility. This report summarises the principal design features and results of the mini-trials. Each mini-trial also has its own dedicated report with full details on methodology and results.

1.2 EQUINOX context

Heat pumps are expected to become a mainstream choice to decarbonise home heating in the United Kingdom (UK). The National Energy System Operator (NESO) forecasts an increase in annual heat pump installations from 95,000 in 2024 to more than 1.1 million by 2035[3]. The electrification of heat therefore stands to substantially increase electricity demand. If this new demand coincides with existing demand peaks, demand may more frequently exceed the capacity of DNO infrastructure e.g. substations and cables. Increased demand could exacerbate existing constraints or create new ones. Constraints can be ultimately resolved through network reinforcement but can also be managed in the short- to medium- term through procurement of flexibility.

EQUINOX is iteratively testing novel commercial arrangements for heat pump flexibility across three trial periods between 2022-25 (Figure 1). The trials measure demand response from heat pumps homes in order to better understand the extent to which customers with heat pumps can provide flexibility, as well as the customer appetite for and experience of doing so.

[1] EQUINOX project partners are Guidehouse, Octopus Energy, Sero, ScottishPower, Passiv UK, West Midlands Combined Authority, Welsh Government, and SP Energy Network. National Energy Action and National Energy System Operator are project collaborators.

[2] As defined by NGED: flexibility is about reducing loads on the network by using customers' ability to change their usage patterns by either reducing consumption, changing their electricity habits, or (at a larger commercial scale) switching on generators. Flex In Five An Overview of Flexibility

[3] NESO records show over 95,000 annual heat pump installations in 2024, rising to 1.13 million to 1.46 million by 2035 across its three net zero compatible Future Energy Scenarios (FES): Hydrogen Evolution, Electric Engagement, and Holistic Transition. Future Energy Scenarios 2025 Data Workbook V001

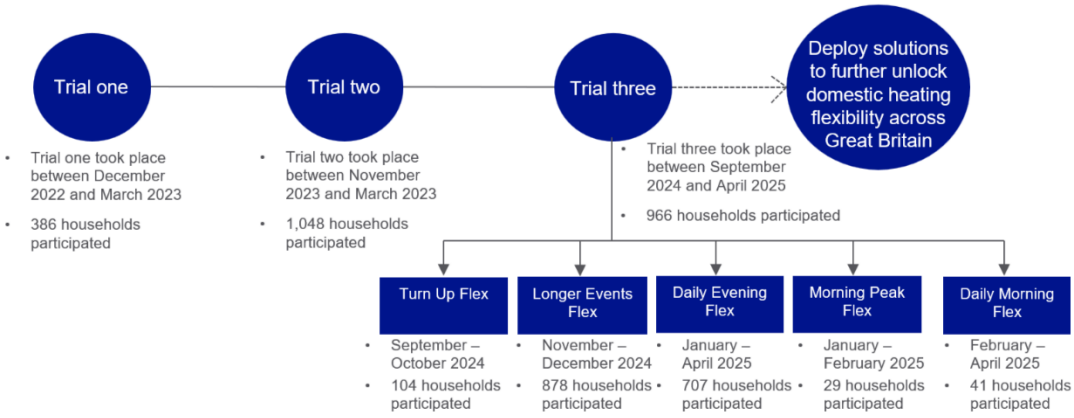

Figure 1: EQUINOX project overview

Trial one[4] ran across winter 2022-23 with almost 400 participating households ("participants") and was a successful proof of concept for heat pump flexibility. Trial two[5] (winter 2023-24) iterated on the results of trial one, increasing the participants pool to over 1,000 customers. This increased scale permitted closer analysis of demand response volumes and used commercial arrangements that more closely mimicked existing DNO flexibility products typically used for unlocking flexibility from electric vehicle charging or other assets.

1.3 Introduction to trial three

Trial three, held between September 2024 and April 2025, built upon the results of trial one and two to investigate additional opportunities for heat pump flexibility to support networks. Specifically, trial three aimed to:

- Test potential for domestic heat pump flexibility during the morning peak as well as the evening peak.
- Uncover the potential for domestic heat pump homes to offer daily flexibility.
- Explore longer heat pump flexibility events, beyond the two-hours tested in trials one and two.
- Test the customer proposition for stacking flexibility from heat pump homes through EQUINOX with an active flexibility product run by NESO. Stacking offers the prospect for customers to unlock greater rewards from flexibility participation and the opportunity for DNOs and NESO to procure flexibility services from the same assets[6].
- Improve understanding of how customer vulnerability should be defined in the context of heating flexibility.

To achieve these aims, we split trial three into five mini-trials each focusing on different aspects of demand response and customer experience.

[4] Trial one report: Initial Insights on the Effectiveness of Commercial Methods
[5] Trial two report: Learning from trialling novel commercial methods Project deliverable 4
[6] Stacking is when assets provide flexibility to more than one flexibility service. See the Energy Network Association's report: Revenue Stacking Explainer and FAQ's.

1.4 Introduction to trial three's mini-trials

Each mini-trial focused on different aspects of heat pump flexibility. Table 1 outlines the focus of each mini-trial, a link to their full report and the reference terms used to refer to them in this report.

Table 1: Trial three mini-trials summary

Mini-trial name	Reference term	Mini-trial Focus
Heat pump turn up flexibility	'Turn Up Flex'	Demand turn up[7] events on non-consecutive days, between 11am-1pm
Longer heat pump flexibility events	'Longer Events Flex'	Demand turndown[8] events of differing lengths, on non-consecutive days, between 4-8pm
Daily evening heat pump flexibility	'Daily Evening Flex'	Daily demand turndown events on weekdays, across consecutive weeks and occurring 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'	Daily demand turndown events on weekdays, across consecutive weeks and between both 8-10am and 5-7pm

[7] Demand response when more electricity is consumed relative to a baseline.
[8] Demand response when less electricity is consumed relative to a baseline.

2. Trial three mini-trial design

As outlined in the Section 1.3 Introduction to trial three, trial three was structured to explore a range of flexibility scenarios, across five focused mini-trials. Full details on each of the mini-trials and their design is provided in the individual mini-trial reports, linked in Section 1.4 Introduction to trial three's mini-trials. Table 2 summarises their principal design features and overall assessment aims.

The numbers of customers recruited into each mini-trial is also shown in Table 2. 966 households were recruited in trial three across one or more of the five mini trials. Across all mini-trials, customer recruitment was led by the energy suppliers. They targeted specific customers based on the mini-trial eligibility criteria. 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, with due consideration given to customer protection.

Table 2: Summary of principal design features and aims of each mini-trial

Mini-trial	Aims: this mini-trial tested…	Mini-trial structure
Turn Up Flex	• Whether heat pumps can provide measurable demand turn up during the day[9]. • How much of that turn up could be attributed to heat pump activity. • The customer experience of participating in this type of flexibility.	• Midday turn-up events (11 am–1 pm). • Three "heat pump only" events, where participants were asked to turn up only their heat pump activity. • Three "general" turn-up events, where participants were encouraged to increase usage of any electrical device in their home. • 106 customers of Octopus Energy were recruited.
Longer Events Flex	• Whether heat pump homes can deliver demand response for 2-hour, 3-hour and 4-hour event lengths during the network evening peak. • Whether there is consistency in the magnitude of this demand response for different event lengths, and across settlement periods within an event. • Which event lengths, if any, are preferred by different customer groups based on shared characteristics, particularly those indicating potential vulnerability.	• Variable-length (2-, 3- and 4-hour) evening (4–8 pm) turndown events. • 878 customers of Octopus Energy were recruited.

[9] As is discussed in the main report, the Turn Up Flex mini-trial's events were scheduled to coincide with times of the day with high solar generation but low periods of demand.

Daily Evening Flex	• Whether heat pump homes can deliver daily demand response in the evening for 2 hour or for 4-hours, depending on customer preference. • Whether this daily demand response can be achieved alongside high rates of participant satisfaction and with no or minimal impact on comfort – including for those with potential vulnerabilities. • The customer experience of stacking daily EQUINOX trial events with ad-hoc NESO DFS events.	• Daily weekday turndown events (4–8 pm) over 11 consecutive weeks. • Daily Evening Flex was also stacked with NESO's Demand Flexibility Service (DFS) through Octoplus Savings Sessions to enable EQUINOX participants to both support, and benefit from participation in two flexibility services. • 706 customers of Octopus Energy were recruited.
Morning Peak Flex	• Whether heat pump homes can deliver daily demand response during the morning peak. • Whether this daily demand response can be achieved alongside high rates of participant satisfaction and minimal impact on comfort – including for those with potential vulnerabilities.	• Morning (8–10 am) turndown events. • 29 customers of ScottishPower were recruited.
Daily Morning Flex	• Whether heat pump homes can deliver daily demand response in the morning, and later in both morning and evening periods. • Whether this daily demand response can be achieved alongside high rates of participant satisfaction and minimal impact on comfort – including for those with potential vulnerabilities. • The customer proposition for stacking daily EQUINOX trial events with ad-hoc NESO DFS events[10].	• Daily weekday morning (8-10 am) events over four consecutive weeks, immediately followed by daily morning and evening turndown events (8–10 am and 5–7 pm) over four consecutive weeks. • Daily Morning Flex was also stacked with a simulated version of NESO's Demand Flexibility Service (DFS) to test EQUINOX participants' ability to both support, and benefit from participation in two flexibility services. • 41 customers of ScottishPower were recruited.

Analysing demand response allowed us to assess the potential for domestic heat pump flexibility across all the novel commercial offerings tested in the five trial three mini-trials. Following industry best practice for evaluating trial programmes, we leveraged a Difference-in-Difference (DiD) approach for calculating demand response. DiD approaches provide an unbiased estimate of programme demand response when energy consumption from the entire treatment group[11] is compared to the entire control group[12] for each event.

We also closely tracked customer experience across all mini-trials. We employed a mixed-methods approach, combining quantitative surveys with qualitative interviews and focus groups. This allowed us to explore customer willingness to engage in heat pump flexibility and to understand the experiences and barriers to participating and accessing benefits. EQUINOX has explored how to enable equitable participation and access to direct flexibility

[10] In practice we tested simulated DFS events during Daily Morning Flex. Greater context is provided in the main report.
[11] Participants who participated in trial events directly.
[12] Participants who did not participate in trial events directly, instead their data was used for comparison purposes.

benefits for all customers, including those experiencing vulnerability and/or fuel poverty. 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 equitable participation framework (EPF) which aimed to assess ways to enable participation and the trial's impact among potentially vulnerable participants[13].

Overall, the design of each mini-trial enabled us to gain valuable insights from participants into the feasibility of a range of novel commercial offerings. We examine these insights further in Section 3, where we present the results across all five mini-trials.

[13] See "Project Deliverable 5: Learning from Engaging Customers" for detailed explanation of customer engagement.

3. Trial three mini-trial results

This section summarises key findings from each of the five trial three mini-trials. Our findings provide insight into the feasibility of heat pump homes providing demand turn up (Section 3.1 Turn Up Flex), demand response for up to 4-hours (Section 3.2 Longer Events Flex), morning peak demand response (Section 3.4 Morning Peak Flex) and daily demand response in the evening (Section 3.3 Daily Evening Flex) and morning peaks (Section 3.5 Daily Morning Flex).

3.1 Turn Up Flex

The key findings from the Turn Up Flex mini trial are that:

1. **Customers with a heat pump can provide demand turn up during the middle of the day (11am-1pm) via their heat pump and doing so will provide a significant proportion of potential overall demand turn up even when customers are able to turn up any asset.** On average, participants provided 0.88 kW of demand turn up during "heat pump only" events, relative to 1.35 kW for the "general turn up" events. These results suggest that heat pump homes can deliver measurable turn-up demand response for network services, with participants able to achieve nearly two-thirds of the total demand response in general events through changes in heat pump behaviour alone.

2. **Providing demand turn up is well tolerated by customers.** 94% of participants self-reported being satisfied with their participation in Turn Up Flex. These survey results suggest that customers would be willing to participate in similar trials or sign up to an ongoing turn up product.

3. **Smart thermostat uptake may increase if customers can participate in demand turn up services.** 48% of participants reported that would install a smart thermostat if there were ongoing turn up trials in the summer, and 49% reported they would do so if there were ongoing turn up trials in the winter.

4. **Day ahead notification is sufficient for customers to provide turn up flexibility.** 89% of participants indicated they were satisfied with a day-ahead notification. This demonstrates customers can respond to network flexibility requests within operationally relevant timescales.

Overall, the Turn Up Flex mini-trial results demonstrate the potential for heat pumps to provide demand turn up, with participants reporting positive experiences of the trial. These conclusions indicate that domestic demand turn up from heat pump homes can be a promising tool for networks that are managing increasing volumes of variable renewable energy generation. Using heat pumps in this way could be an exciting opportunity to reduce customer heating costs while providing a network benefit.

3.2 Longer Events Flex

The key findings from the Longer Events Flex mini-trial are that:

1. **Heat pump homes can achieve demand turndown response during the evening peak for up to 4-hours.** Our DiD analysis found statistically significant demand reductions during 2-hour events (0.42 kW average, within 90% confidence interval (CI) of 0.16 - 0.68 kW) and during 4-hour events (0.27 kW average, within a 90% CI of 0.10 - 0.44 kW). The 2-hour and 4-hour volumes are not statistically different from one another. They also align closely with demand response results in EQUINOX trial two. The 3-hour events did not yield statistically significant results, but observational analysis and survey responses suggest that demand response likely occurred. Additionally, we observed that heat pump homes maintained the same magnitude of demand response across the full event window, including for events up to 4-hours. This finding suggests heat pump homes can provide consistent demand response during events up to 4-hours long.

2. **Trial satisfaction was high, suggesting willingness to participate in longer duration flexibility events. Half of participants preferred 2-hour events, though large minorities preferred 3-hour and 4-hour events.** Participants were willing to engage in longer duration events, with 78% reporting they were satisfied with the trial. Satisfaction levels aligned with those in EQUINOX trial two at 79%, when just 2-hour events were tested. When asked about their preferred event length, 46% preferred 2-hour events, 32% preferred 3-hour events, and 22% either preferred 4-hour events or had no preference. This suggests that large minorities of heat pump homes can support 3- or 4-hour durations to help networks better manage constraints – though 2-hours is the preferred length for many.

3. **Poor insulation was the only identifiable determinant of event length preference.** Amongst participants with self-reported 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 treatment group on event length preference. This suggests that except for poor insulation, which may predicate a customer to prefer shorter events, any other variation in event length preference could be due to individual customers' personal preferences rather than specific characteristics.

4. **Most participants did not experience a change in comfort due to events. For those who did, the change was overwhelmingly mild, with little variation among potentially vulnerable and non-vulnerable participants.** Of all participants, 89% reported no change or slight change in comfort throughout the trial. Of the 59% who experienced any change, only 3% (eight participants) said it became "too cold." This suggests heat pump homes are on average, likely to experience no change or only a slight change in comfort during longer duration flexibility events. Of potentially vulnerable participants, 39% reported feeling no change in home comfort at all, and in general across all participants the defined change in comfort was overwhelmingly mild in characterisation. The results present a nuanced picture of comfort impacts for potentially vulnerable participants, indicating that the most appropriate approach to determining participation in longer events is to rely on individual customers' self-reported preferences.

5. **Trial participants expressed strong satisfaction with day ahead event notification and end-of-event notifications.** 91% of participants were satisfied with day ahead event notice periods. 42% of non-vulnerable participants found the reminder to turn their heating back on alongside the post-event survey helpful, compared to 49% of potentially vulnerable participants. This suggests day ahead notification is an effective design approach for domestic flexibility procurement.

Overall, The Longer Events Flex results provided a strong foundation for exploring customer willingness to provide flexibility on a more structural basis. We found that half of participants preferred 2-hour events, but sizeable minorities were open to 3- or 4-hour durations. Poor insulation emerged as the only clear factor influencing event length preference. These key findings informed our design for Daily Evening Flex, where we ultimately decided to divide participants into different event length groups defined by their own self-declared event length preferences.

3.3 Daily Evening Flex

The key findings from the Daily Evening Flex mini-trial are that:

1. **The 2-hour group participants provided statistically significant average demand response in 7 out of the 11 trial weeks, primarily in the first half of the mini-trial.** Our DiD analysis detected statistically significant demand response primarily in the first half of the mini-trial, across weeks 1-6, and then again in week 10 – with an overall downtrend from 0.38 kW turndown per treatment participant in week 1 to -0.11 kW by week 11. This trend was not explained by participation rates, with more than half of participants continuing to self-report turning down by the final of three check-in surveys. We believe that lower performance in the final weeks was a result of early 2025 being unseasonably warm, with temperatures exceeding 10°C by the end of the trial. Based on these findings, it's likely that 2-hour participants were successfully carrying out the requested behaviours. The limited impact observed as the trial progressed was likely due to falling heating demand.

2. **The 4-hour group participants provided statistically significant demand response in weeks 1-5 in the first half of the trial**. Our DiD analysis detected statistically significant demand response for trial weeks 1-5. In the second half of the trial, the 4-hour group provided statistically significant negative turndown by the close of the trial (meaning treatment participants consumed more than the control group). This trend cannot be explained by falling participation, with higher self-reported participation for the 4-hour group compared to the 2-hour group. We believe that the 4-hour group's results in the final weeks occurred due to the same high temperatures affecting the 2-hour group, coupled with a general mismatch of unabated consumption of the 4-hour group with the control group, which became more pronounced as both groups progressively heated less due to warmer weather. Based on these findings, it is likely that 4-hour participants were successfully carrying out the requested behaviours.

3. **Both overall trial satisfaction and satisfaction with the event frequency was high, suggesting willingness to participate in daily flexibility.** 78% of participants reported they were satisfied with the trial, at similar rates across both the 2-hour and 4-hour groups. This result also aligned with the satisfaction rate reported for EQUINOX trial two, which is particularly encouraging given the increased intensity of the requested turndown behaviour in Daily Evening Flex. Additionally, 70% of the 2-hour group reported they were happy with the event frequency, as did 84% of the 4-hour group. This suggests daily flexibility with both event length durations can be suitable for different types of customers. However, it is important to note that the temperatures observed in the trial were unseasonably warm, thus we cannot confirm that the response would have been the same if the trial was held during a colder winter.

4. **Control method was highly correlated with event frequency satisfaction, suggesting that improving accessibility to remote control methods could greatly improve rates of public willingness to participate in daily flexibility**. 83% of participants who could control their heat pump remotely (e.g. by phone app) approved of the daily frequency of events, falling to 63% amongst participants who had to control their heat pump manually from within the home. Additionally, 60% of those with remote control reported their control method made participation easier, compared to just 19% with manual control.

5. **Participants generally maintained comfort during the events across both 2- and 4-hour groups, with minimal disruption reported. Comfort for potentially vulnerable participants was in line with that of the wider group.** 89% of participants noticed no change or a slight change in comfort, while only 2% found it too cold. These results suggest daily flexibility can be achieved with minimal impact on comfort, though we acknowledge that the winter season was unseasonably warm and we cannot be certain what the response would have been during a colder winter. While 91% of non-vulnerable participants reported no or only a slight change in comfort, only slightly fewer (84%) potentially vulnerable participants reported the same. The results present a nuanced picture of comfort impacts for potentially vulnerable participants, who appeared to be interested and able to take part in and benefit from heat pump flexibility.

6. **Participants successfully stacked Daily Evening Flex with events in NESO's DFS programme, unlocking greater value for trial participants.** 71% of participants self-reported taking part in DFS events concurrent with the timing of their heat pump turndown events in Daily Evening Flex. By stacking these events and engaging in general turndown in addition to heat pump turndown, these participants collectively earned an additional £96. Customer satisfaction with the experience was high, with 78% of the treatment participants involved reporting that they would recommend the arrangement to others.

Overall, the Daily Evening Flex results demonstrate a strong willingness for heat pump homes to participate in commercially procured daily events during the evening peak. Most participants are likely able to do so for just 2 hours per evening, though a sizable minority in our trial could do so for up to four hours per evening. Daily Evening Flex also demonstrates an instance where heat pump homes can successfully participate in stacked DNO trial events and NESO's DFS events.

3.4 Morning Peak Flex

The key findings from the Morning Peak Flex mini trial are that:

1. **Heat pump homes can provide flexibility in the morning without experiencing inconvenience.** The DiD results were inconclusive, and likely due to reduced reliability of the DiD method at small sample sizes (29 participants in this mini-trial). Yet survey results indicated participants were providing flexibility as requested, with an average of 50% of participants self-reporting participating in all or part of the events in the post-event surveys and 67% of participants reporting satisfaction with the morning events. Most participants reported that alignment with their schedule was the primary reason for liking morning event times, as they were not home or were able to easily heat their homes before the events.

2. **Providing morning peak demand turndown will not significantly discomfort customers.** 86% of participants reported experiencing no change or a slight change in comfort. Just 5% (one participant)

reported feeling too cold during events and that person was not potentially vulnerable. These results indicate that most customers can participate in morning peak events without experiencing discomfort.

3. **Sending a reminder that an event has ended could be especially important for potentially vulnerable customers.** Participants received a notification to complete a post-event survey at the end of each event, which also served as a reminder to turn their heating back on. 35% of all participants and 50% of potentially vulnerable participants reported that this notification reminded them to turn their heating back on.

Overall, the Morning Peak Flex results demonstrate strong potential for heat pump homes to participate in morning peak flexibility. EQUINOX's first investigation into morning peak flexibility shows that participants, both potentially vulnerable and non-vulnerable, reported positive experiences, highlighting the potential for morning peak flexibility to be implemented at scale.

3.5 Daily Morning Flex

The key findings from the Daily Morning Flex mini-trial are that:

1. **Overall, our findings suggest heat pump homes can engage in daily morning and evening flexibility. Participants achieved statistically significant demand response during the second half of the mini-trial, when events were held in both the mornings and evenings**. The DiD analysis produced inconclusive results for weeks 1–4's morning-only events, but participants conclusively reduced their demand by an average 0.14 kW in the mornings and 0.20 kW in the evenings for weeks 5-8. Self-reported turndown participation remained stable averaging 39% for each half of the mini-trial. While temperatures rose significantly over the trial period, it is unclear whether this had a causal or merely coincidental correlation to rising demand response. We detected no evening demand response during the two warmest weeks of the trial, marking a major outlier in the increasing demand response trend. We believe the trend in demand response is more likely due to limitations of the DiD method in small trials, where individual behaviour can disproportionately influence results.

2. **High satisfaction rates indicate willingness to participate in daily flexibility.** 83% of participants reported they were satisfied with the trial overall. 88% of participants reported they were happy with the daily event frequency and 71% of participants were happy with the twice-daily event frequency. These figures suggest daily and twice daily flexibility are suitable for most customers, with a stronger preference shown for daily events.

3. **Morning events were slightly preferred to evening events.** More participants preferred morning events (46%) to evening events (21%). Preferences were primarily driven by participants' individual schedules. These results highlight the potential for widespread acceptance of morning peak flexibility amongst heat pump homes.

4. **Participants generally maintained comfort during the events, with minimal disruption reported.** Over half (54%) noticed no change, while 33% felt their home was slightly cool and only 13% found it cool. Just 8%

experienced a change in comfort every day. These findings suggest daily flexibility can be implemented without a substantial impact on comfort.

5. **Participants successfully engaged in Daily Morning Flex alongside a simulated version of NESO's DFS, unlocking greater value and demonstrating a model for stacking of flexibility services**. 54% of treatment participants self-reported participating in simulated DFS events, 85% of whom reported that they would recommend the dual services participation approach arrangement to others.

Overall, Daily Morning Flex results indicate a strong potential for heat pump homes to participate in commercially procured daily peak flexibility events during both morning and evening times. It also demonstrates a mechanism for enabling customers to engage in both DNO and NESO procured flexibility, suggesting these markets can be complementary.

4. Key trial three learnings and recommendations

EQUINOX trial three has provided insights into the feasibility and customer acceptance of various commercial flexibility offerings through the five mini-trials, building upon trials one and two where we saw that heat pump flexibility can deliver measurable demand response and is typically a positive customer experience. Trial three has demonstrated that heat pump homes can furthermore provide demand turn up, demand response for up to 4-hours, demand response in the morning peak, and daily demand response in both the morning and evening peaks. These findings offer important insights into the potential for commercial participation of heat pump homes in Business-as-Usual (BaU) flexibility services. These key findings include:

1. **Customer satisfaction was consistently high and there was minimal impact on comfort reported throughout trial three for all groups, including potentially vulnerable and fuel poor participants.** These findings highlight that, with the appropriate considerations, potentially vulnerable customers are interested and can be equitably engaged in heat flexibility offerings.

2. **Turn Up Flex found that participants can provide demand turn up during the middle of the day (11am-1pm) via their heat pump,** indicating that heat pump homes can deliver measurable turn up demand response for network services.

3. **Longer Events Flex found that while nearly half of heat pump homes preferred to turn down for 2 hours, the rest were able to reduce demand for longer periods.** This suggests that large minorities of heat pump homes can support 3- or 4-hour durations to help networks better manage constraints – though 2-hours is the preferred length for many.

4. **Daily Evening Flex and Daily Morning Flex found high satisfaction with daily flexibility.** Most Daily Evening Flex participants reported that they were satisfied, across both the 2-hour and 4-hour groups. Daily Morning Flex likewise saw most participants report satisfaction with morning, and then morning and evening combined, daily events. These findings provide encouraging evidence that networks can leverage heat pump flexibility through daily events.

5. **Daily Evening Flex found that having a smart thermostat improves how a customer tolerates daily flexibility requested from their heat pump.** Improving accessibility to remote control methods could greatly improve the rates of public willingness to participate in daily flexibility.

6. **Participants successfully stacked Daily Evening Flex with NESO's DFS.** 65% of treatment participants self-reported participating in DFS events, unlocking greater value for trial participants and suggesting that DNO and NESO procured flexibility markets can be complementary.

7. **Morning Peak Flex found that heat pump homes can provide flexibility in the morning without compromising on convenience or comfort**. This highlights the potential for morning peak flexibility to be implemented at scale.

EQUINOX has also identified several important findings specific to the successful delivery of large-scale innovation trials. These include:

1. **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 will become one of the most prevalent 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.

2. **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. These helped explain certain trends or findings from the quantitative demand response analysis. Supplementing this quantitative survey data with qualitative insights from focus groups and interviews allowed us to understand specific customer experiences even more deeply.

In conclusion, the EQUINOX trials have demonstrated the strong potential for integrating heat pump flexibility into business-as-usual flexibility services. Trial three significantly expanded on the insights from trials one and two, offering a broader evidence base. Together, the trials also established a model for customer engagement that can inform future innovation projects.

These insights are especially valuable as we move towards defining the recommended commercial arrangements and procurement strategies needed to unlock heat pump flexibility at scale. For DNOs and NESO, these findings offer important insights into the potential for commercial participation of heat pump homes in BaU flexibility services. For Flexibility Service Providers (FSPs), these results provide insight into how to effectively engage customers with heat pumps in flexibility programmes. For policymakers, the results demonstrate the potential for consumer led-flexibility as the decarbonisation of heat accelerates. We will build on these learnings when we develop project Deliverable 6: Recommended transition of learning to BaU (December 2025) – which will outline in full how we see heat pump flexibility being introduced into BaU.