

# LATENT

## Residential **L** He**AT** As An **E**Nergy Sys**T**em Service

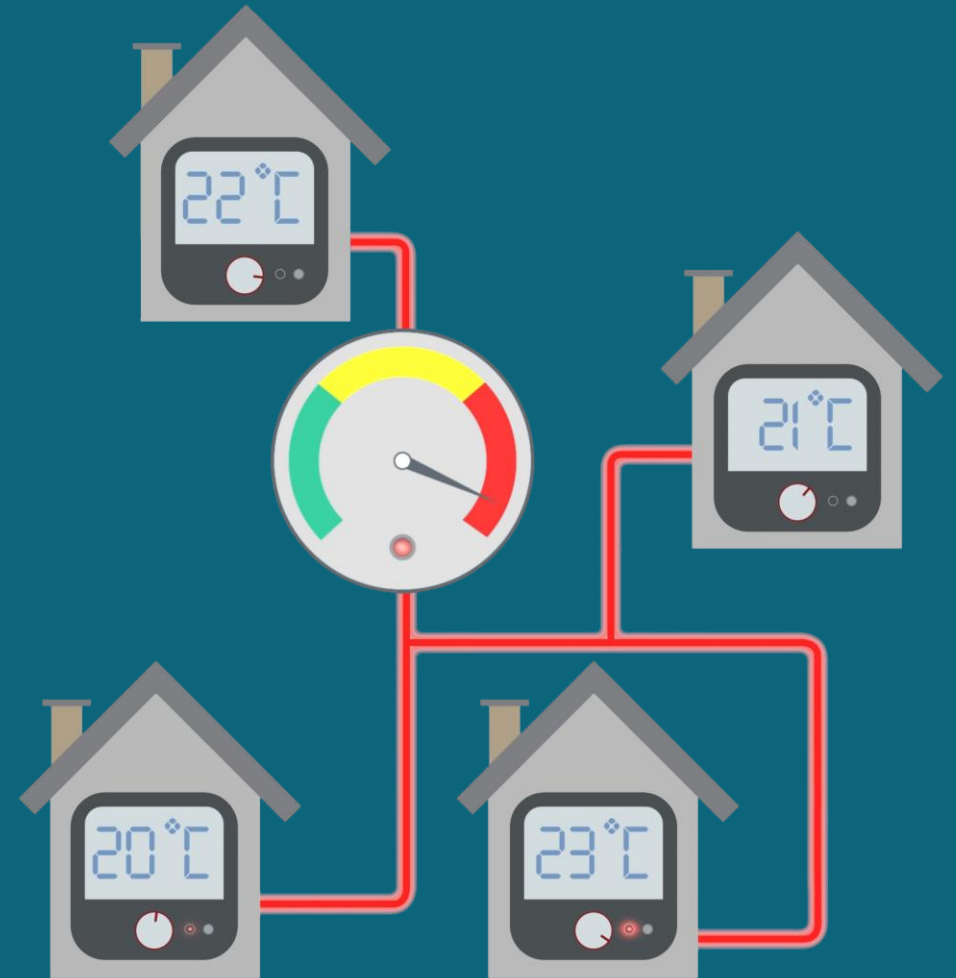
06/11/2024

Cracking the zero-carbon space heating problem: disruptive approaches  
IMechE, London

**Patrick James**, AbuBakr Bahaj, Stephanie Gauthier, Massimiliano Manfren,  
Tom Rushby, Phillip Turner

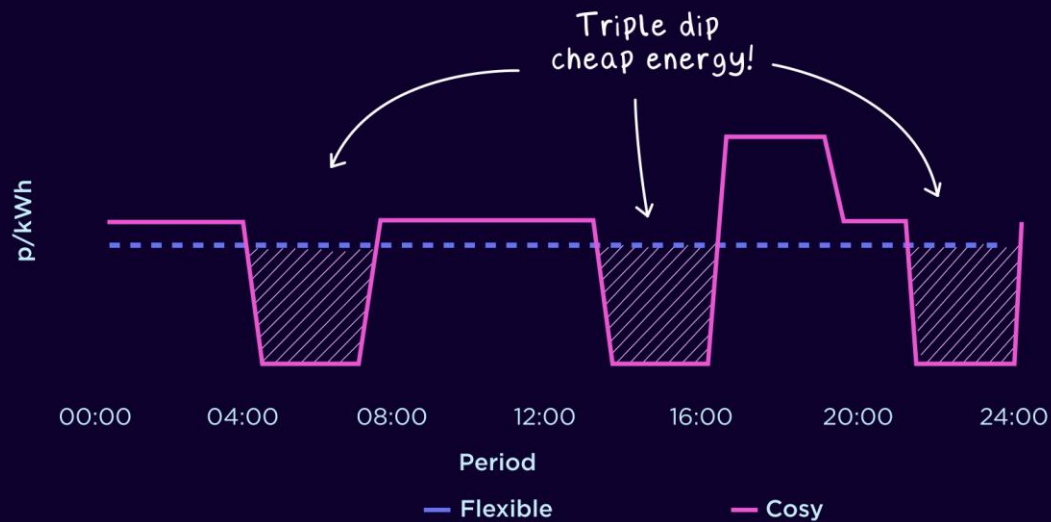
Faculty of Engineering, University of Southampton  
[www.energy.soton.ac.uk](http://www.energy.soton.ac.uk)  
EP/T023074/1

Research project in partnership with **good energy**



# Conscious heat deferral is already part of the UK energy landscape

## Cosy Octopus Tariff



1. Three cosy periods of **super cheap rates** between 04:00 - 07:00, 13:00 - 16:00 and 22:00 - 00:00 every day, 51% cheaper than the Day rate in your region.
2. A **peak rate** between 16:00 - 19:00, 45% above the Day rate in your region.

Ref: Octopus Energy (2024) Introducing Cosy Octopus [Available at: <https://octopus.energy/smart/cosy-octopus/>]

## Sunday Saver Challenge

### Earn free electricity on a Sunday!

We're on a mission to help you save cash and carbon while contributing to a more sustainable national electricity grid. That's why we've launched our **Sunday Saver challenge!**



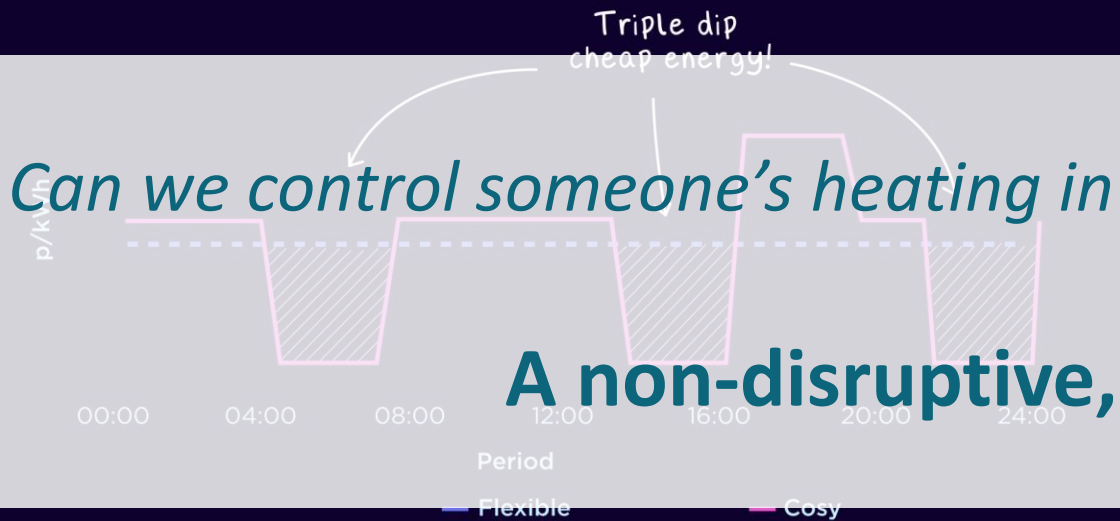
Everyone who signs up to the challenge will get a target to shift some of their electricity usage away from peak hours (usually 4pm to 7pm).<sup>(1)</sup>

The more you shift during the week, the more free electricity you get. Shift 40% of your peak-time usage to earn the maximum of 16 free hours to use the following Sunday.<sup>(2)</sup>

Ref: EDF (2024) Sunday Saver Challenge [Available at: <https://www.edfenergy.com/energy-efficiency/sunday-saver-challenge>]

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For more info on the aims and objectives of the project scan the QR code or visit [www.energy.soton.ac.uk/latent-residential-heat-as-an-energy-system-service](http://www.energy.soton.ac.uk/latent-residential-heat-as-an-energy-system-service)

# Would you allow someone to control your heating?

**Opinion**  
Life and style

## What keeps couples warm in winter? The battle over the thermostat


*Zoe Williams*



Tue 17 Oct 2023 07:00 BST

[Share](#) 467

The UK has suddenly gone from summer heat to shivering cold and across the land the annual arguments have begun



Who could ever live in this heat, apart from your mum? Photograph: RossHelen editorial/Alamy

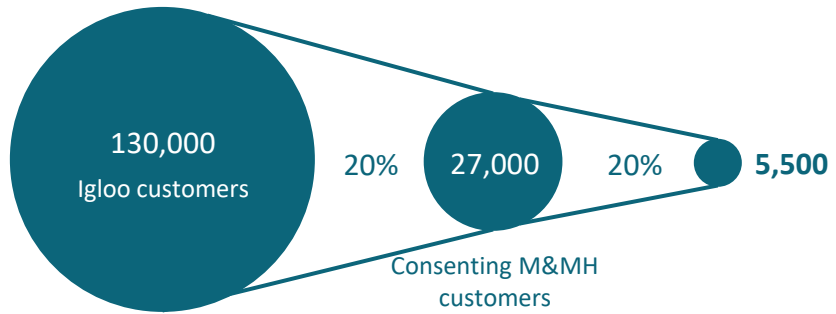
Ref: Williams, Z. (2023) What keeps couples warm in winter? The battle over the thermostat, Guardian [Available at: <https://www.theguardian.com/commentisfree/2023/oct/17/what-keeps-couples-warm-in-winter-the-battle-over-the-thermostat>]

“53% of British households argue over whether or not to turn the heating on.”

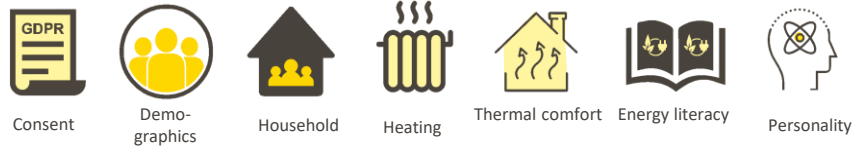
Ref: ElectricRadiatorsDirect (2024) Heated Debates: New Survey Uncovers Brits' Battles Over the Thermostat [Available at: [www.electricradiatorsdirect.co.uk/news/heated-debates-new-survey-uncovers-brits-battles-over-the-thermostat](http://www.electricradiatorsdirect.co.uk/news/heated-debates-new-survey-uncovers-brits-battles-over-the-thermostat)]

# Viabile approach?

## Areas of concern



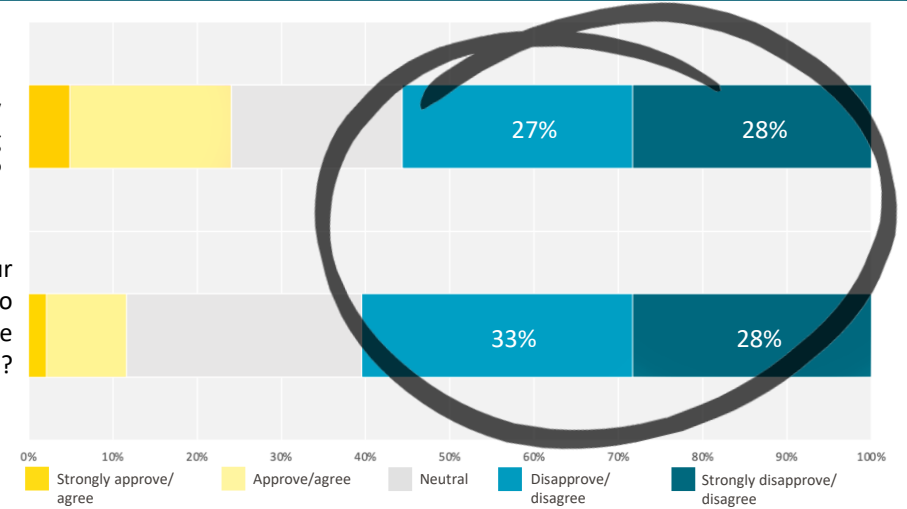
Survey deployed on Tuesday 6<sup>th</sup> April 2021 to 26,754 Igloo Energy customers for a 2-week period.



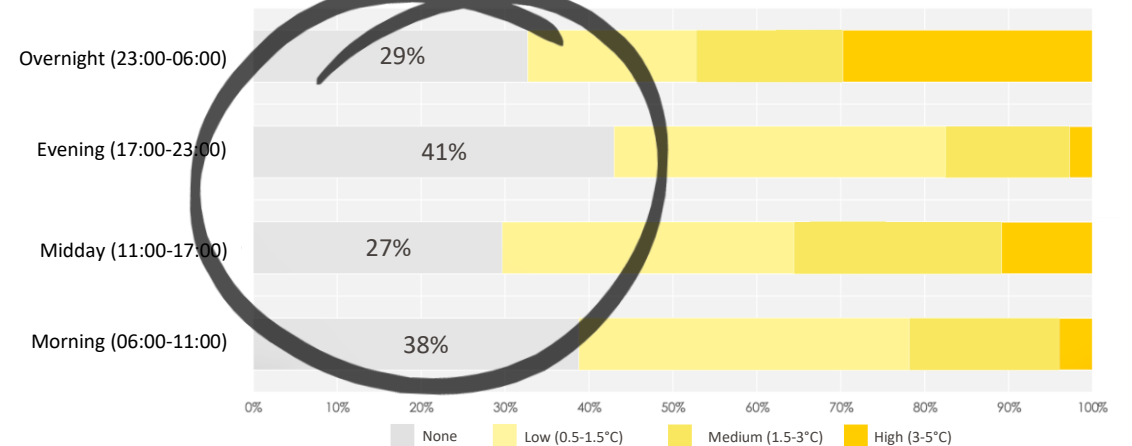
Survey obtained **5,500 responses**

Would you approve of an energy company remotely adjusting your heating system?

Would people in your community expect you to allow for your heating to be remotely adjusted?



What level of heat deferral would be acceptable?



# Viabile approach?

## Further investigation

### KEY BARRIERS



**Mistrust in government & energy companies**



**What's in it for me?**  
A need for personal gain & reassurance that others are contributing.

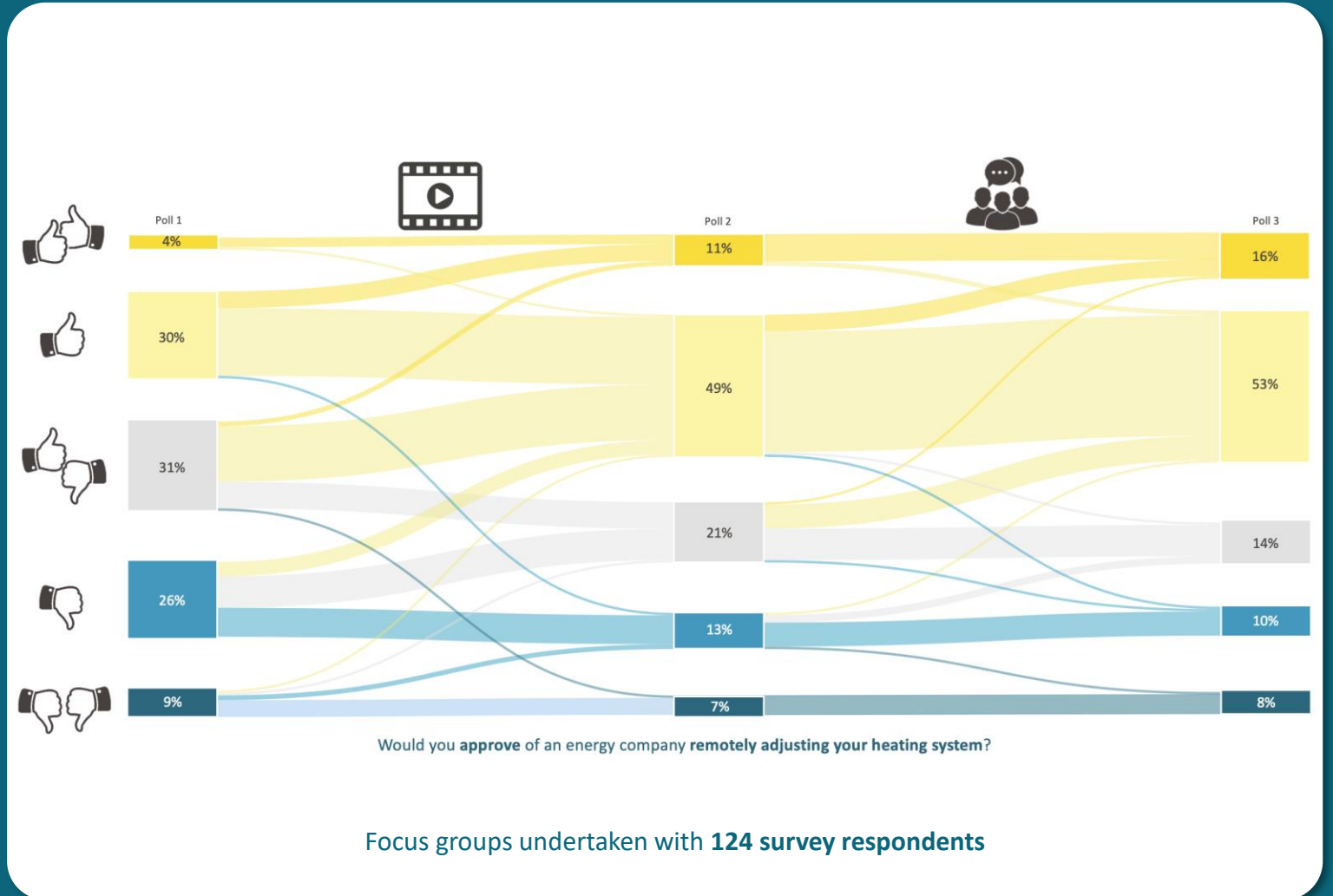
### KEY OPPORTUNITY



**Explain the need**  
Assist the wider community through softening the curve



**Opportunity to override**  
Personal choice when heating is a need not a want



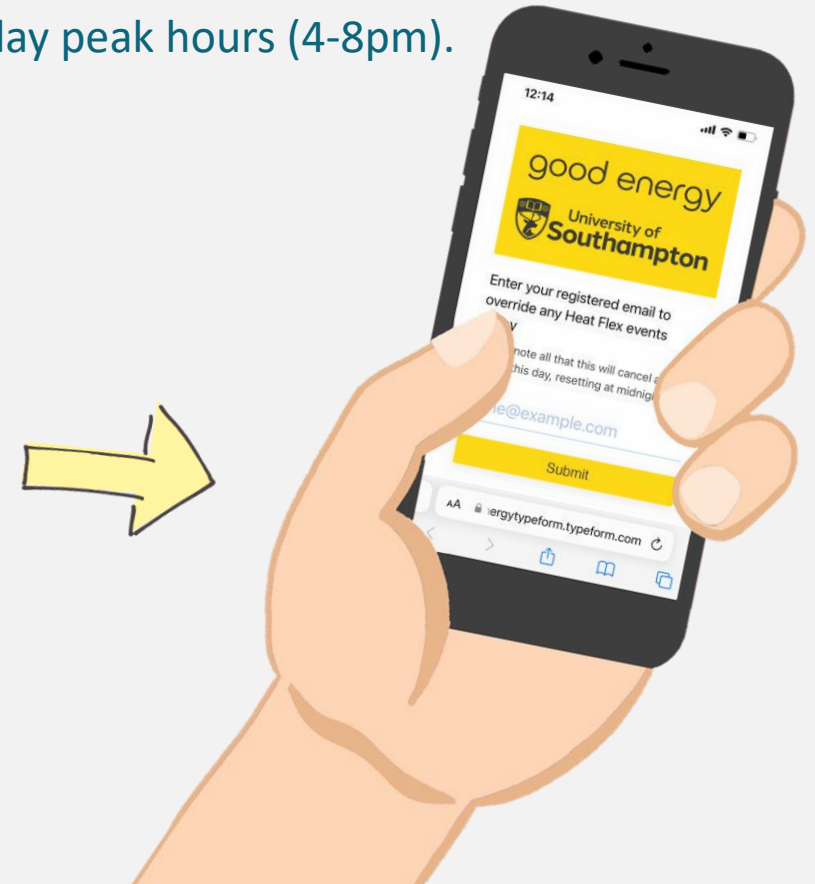
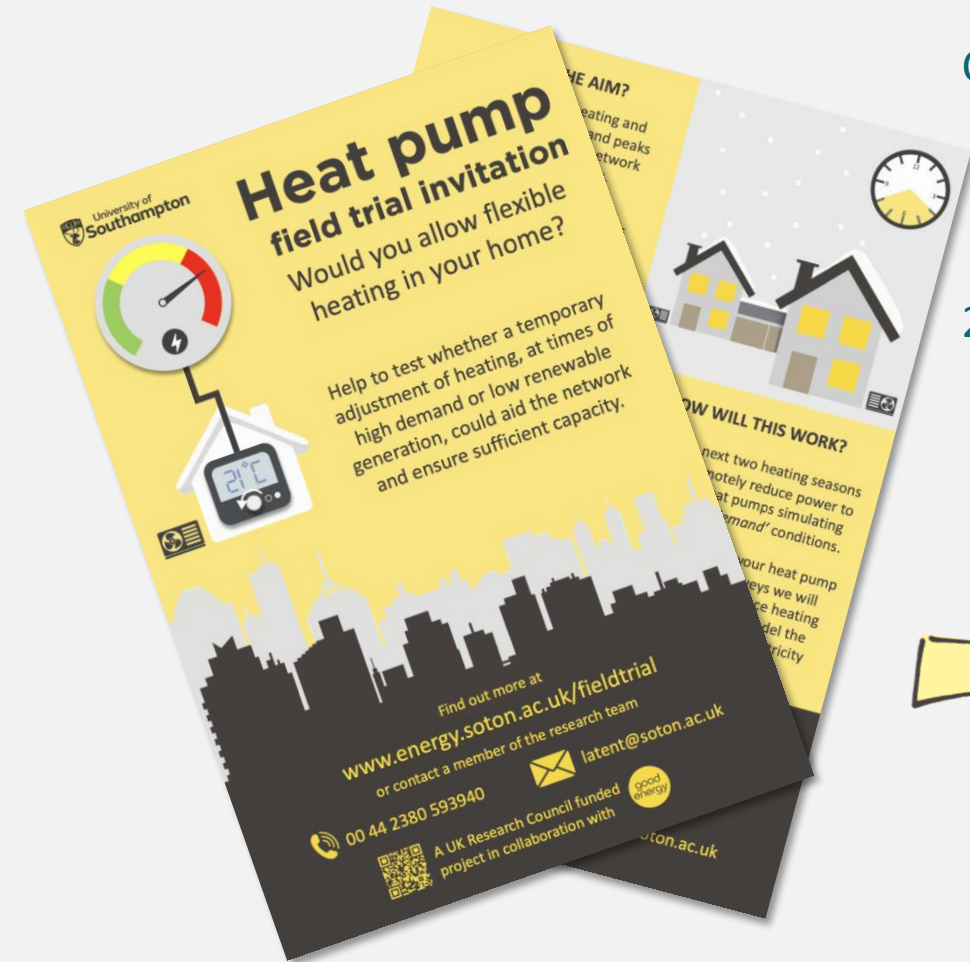
# Heat pump field trial

*Testing impact and acceptance*

Conducted field trial over 2 heating seasons

- Jan. 2023 – April 2023 (30 HP households & 30 control)
- Nov. 2023 – April 2024 (65 HP households & 40 control)

2-3 events each week during weekday peak hours (4-8pm).



For more information on the field trial, scan the QR code or visit <https://energy.soton.ac.uk/field-trial-good-energy/>

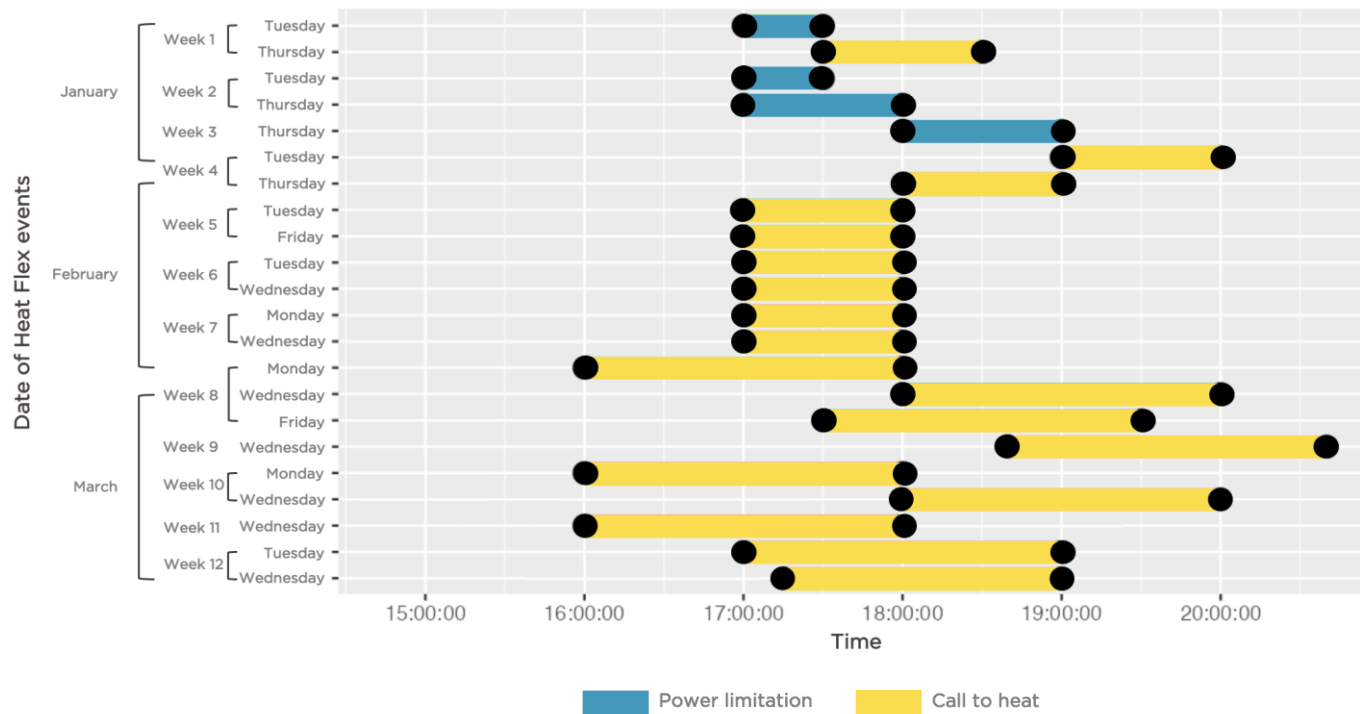
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Testing impact and acceptance

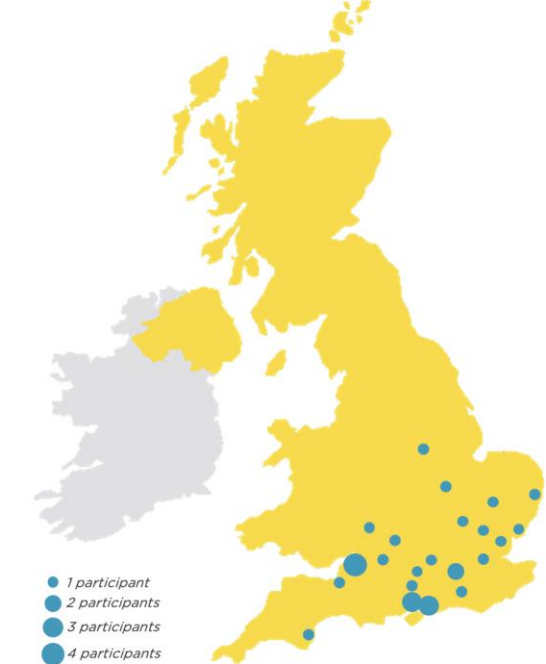
## First heating season

Jan. 2023 – April 2023

30 HP households & 30 control



## The *accelerator* group



Age		Household income	
30-49	16 53%	Less than £20,000	1 3%
50-64	12 40%	£20,000-£39,999	2 7%
65-74	1 3%	£40,000-£59,999	7 23%
75 and over	1 3%	More than £60,000	20 67%
Education		Type of household	
O levels / GCSEs (any grade)	2 7%	one person	2 7%
2+ A levels / 4+ As levels	1 3%	couple, no dependent child(ren)	9 30%
Apprenticeship	1 3%	couple with dependent child(ren)	13 43%
Degree or higher degree	24 80%	lone parent with dependent child(ren)	2 7%
Other	2 7%	other multi-person household	4 13%



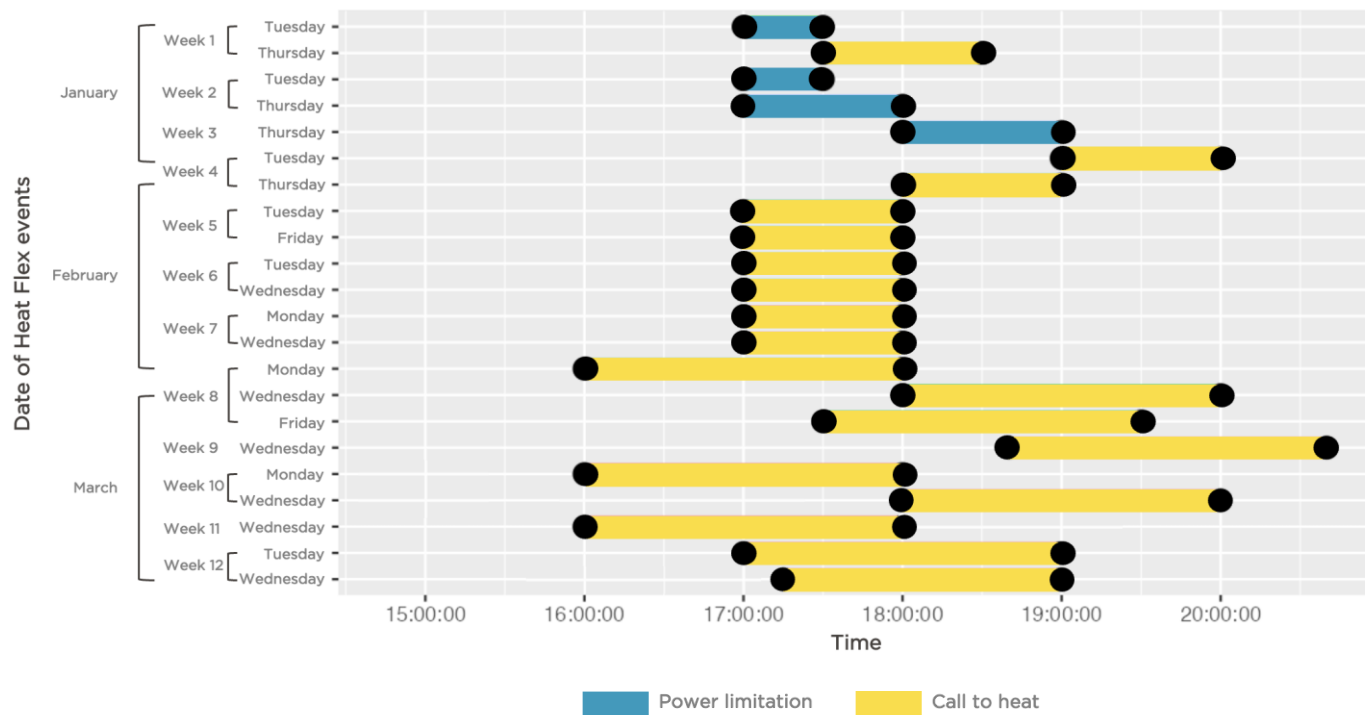
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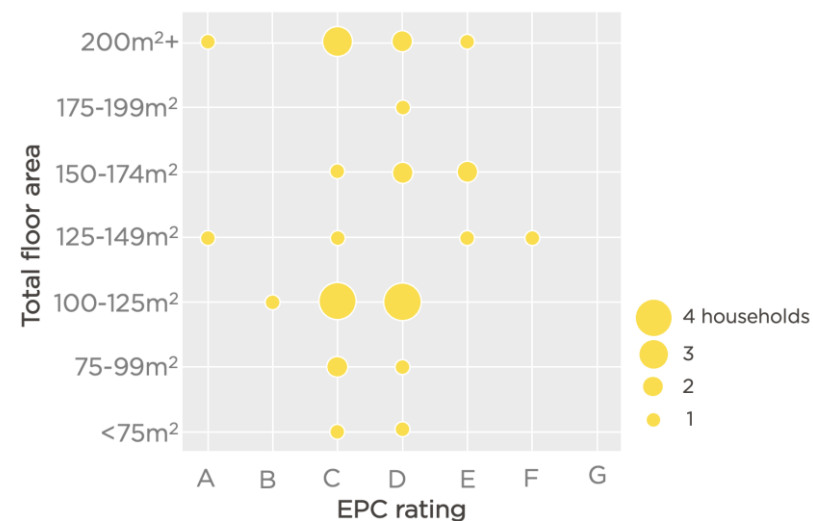
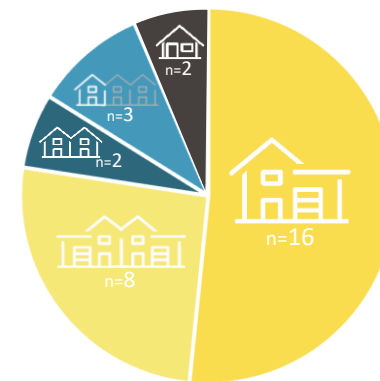
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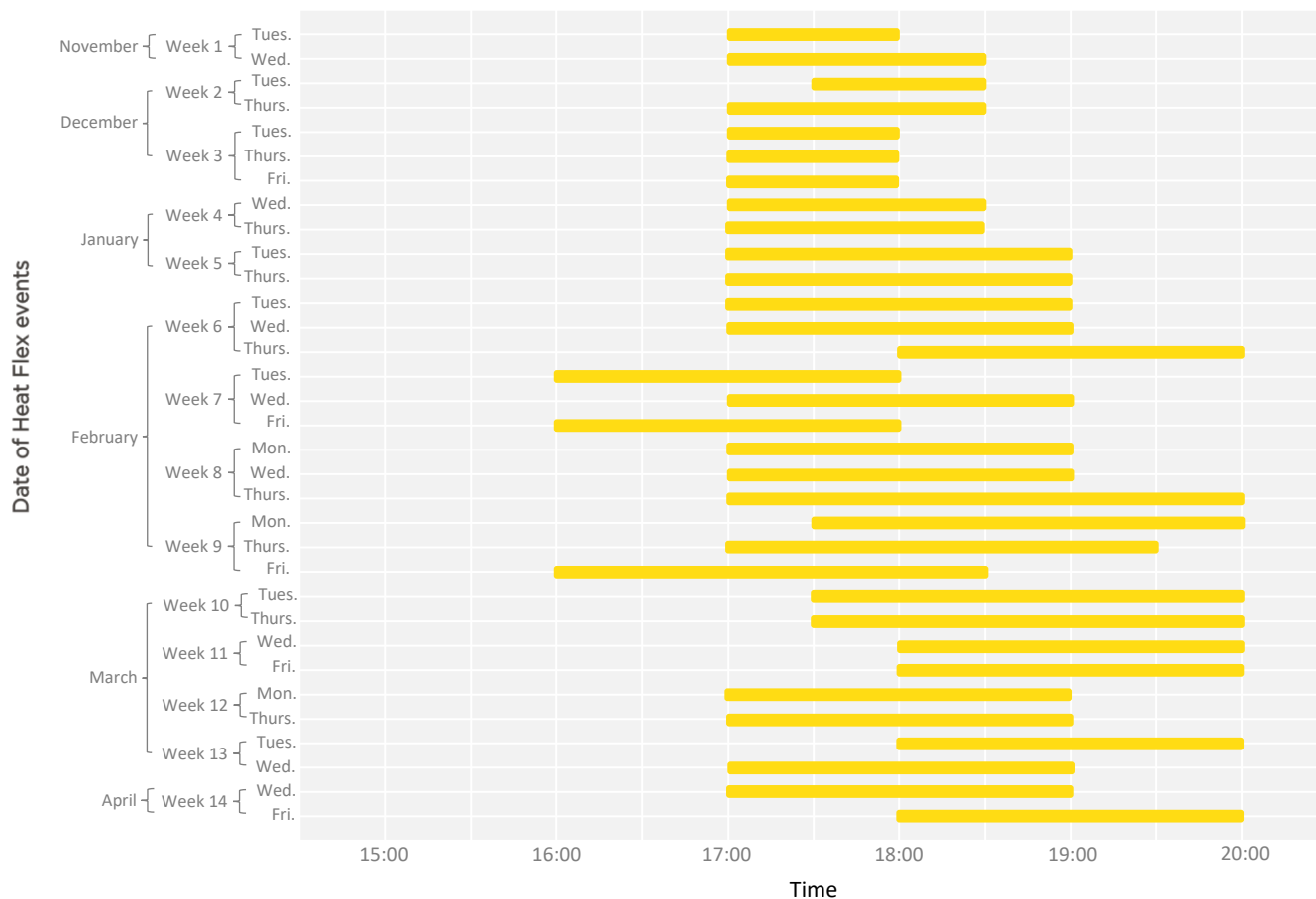
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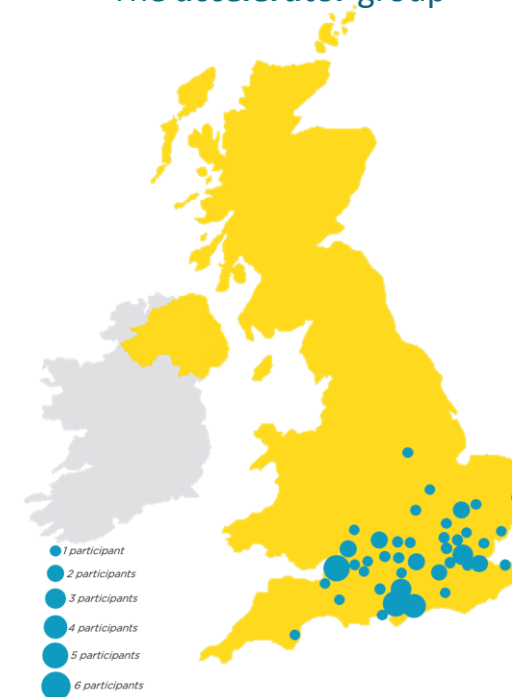
### Second heating season

Nov. 2023 – April 2024

65 HP households & 40 control



### The *accelerator* group



Age	
30-49	29 45%
50-64	26 40%
65-74	5 8%
75 and over	5 8%

Household income	
Less than £20,000	2 3%
£20,000-£39,999	7 11%
£40,000-£59,999	15 23%
More than £60,000	40 62%

Education	
O levels / GCSEs (any grade)	4 6%
2+ A levels / 4+ As levels	2 3%
Apprenticeship	3 5%
Degree or higher degree	51 78%
Other	5 8%

Type of household	
one person	4 6%
couple, no dependent child(ren)	23 35%
couple with dependent child(ren)	25 38%
lone parent with dependent child(ren)	4 6%
other multi-person household	9 14%

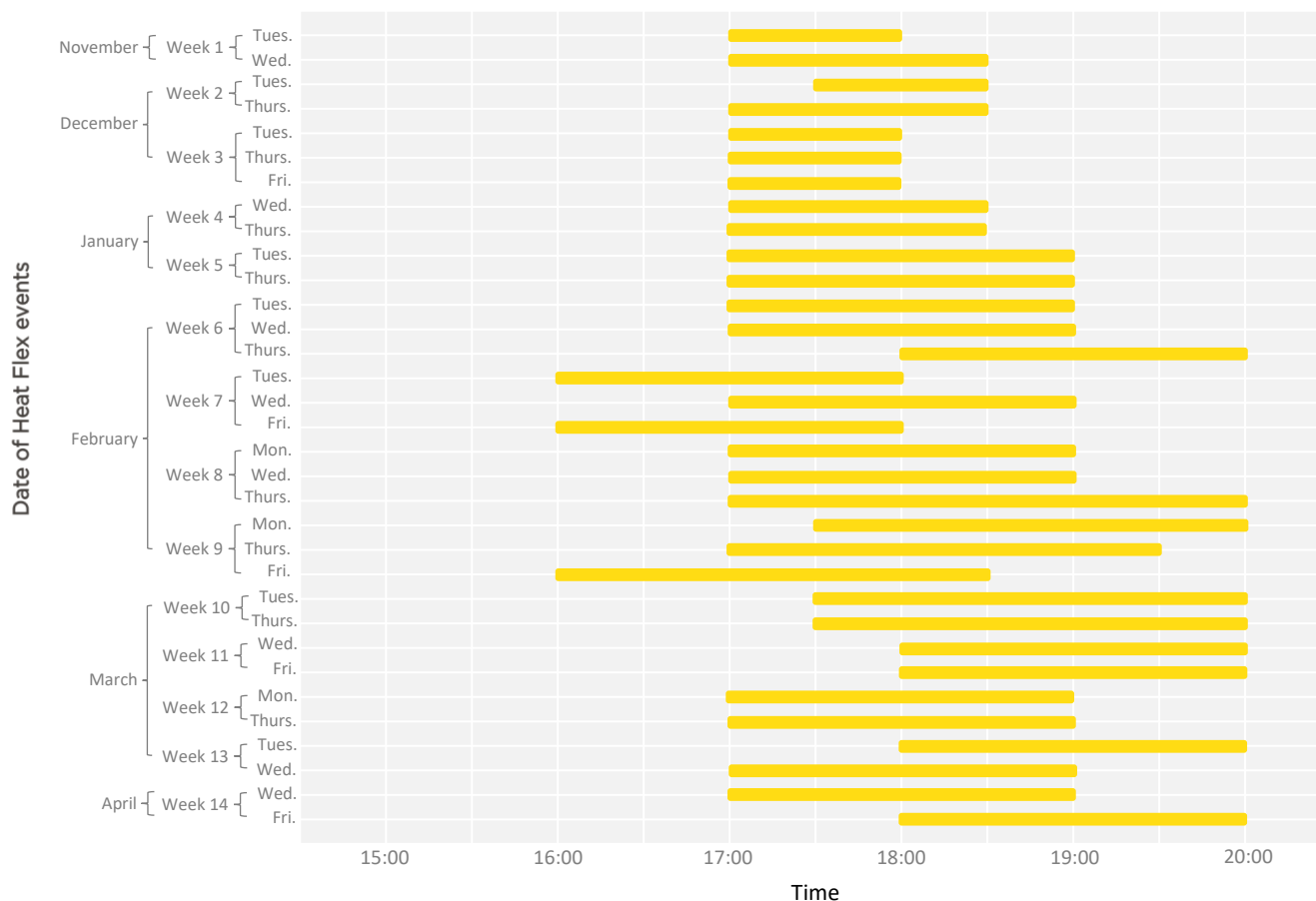
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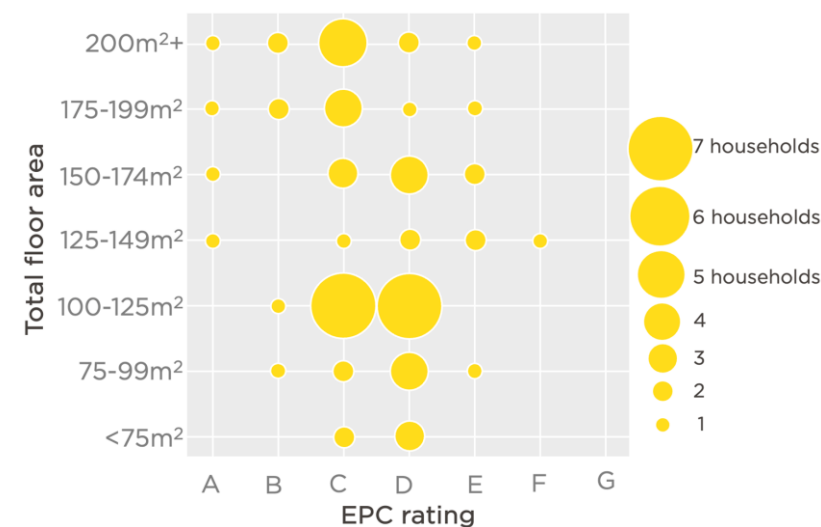
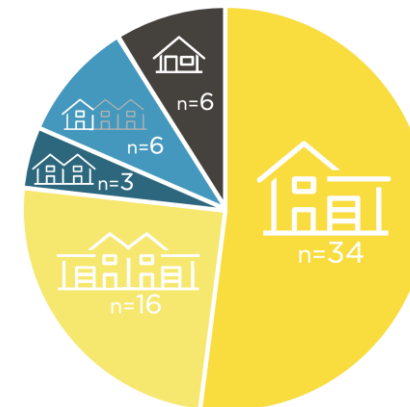
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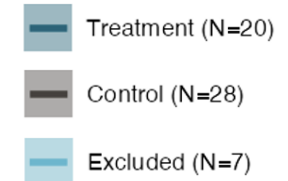
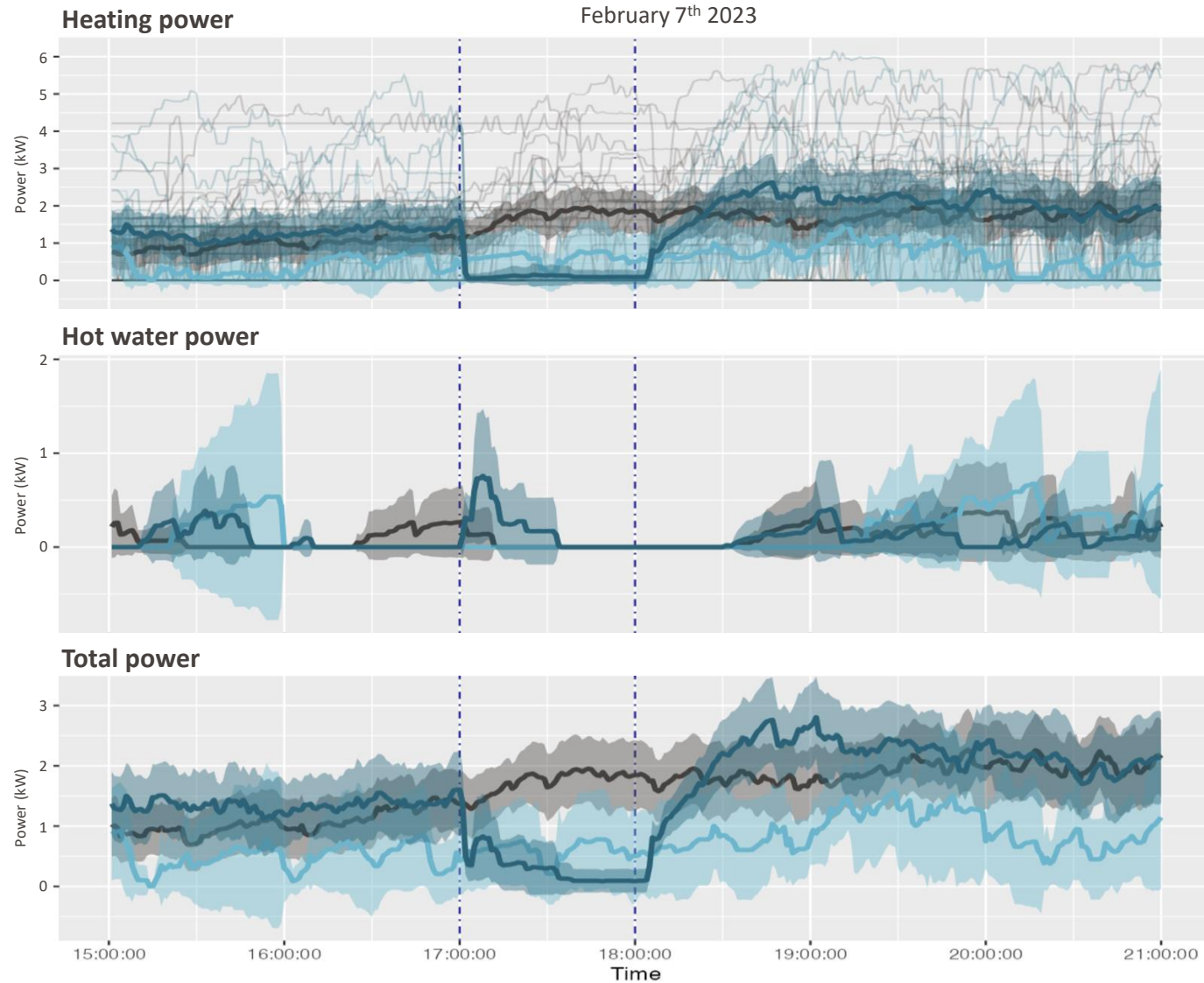


The *accelerator* group



# Heat pump field trial (1<sup>st</sup> heating season)

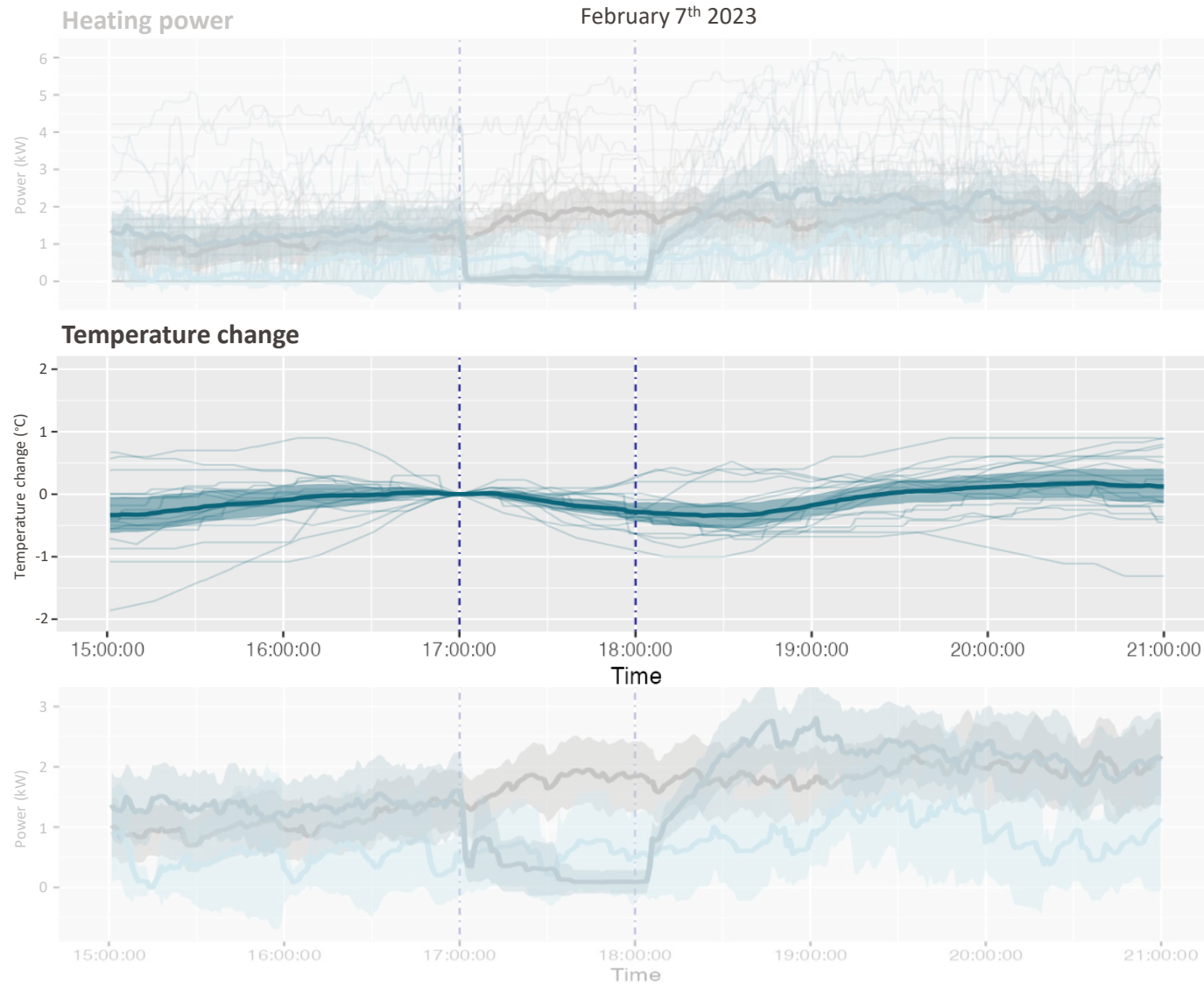
## Impact of heat deferral – call to heat



*Excluded participants are those with a living space temperature below 18 during the event.*

# Heat pump field trial (1<sup>st</sup> heating season)

## Impact of heat deferral – call to heat

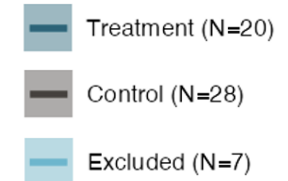
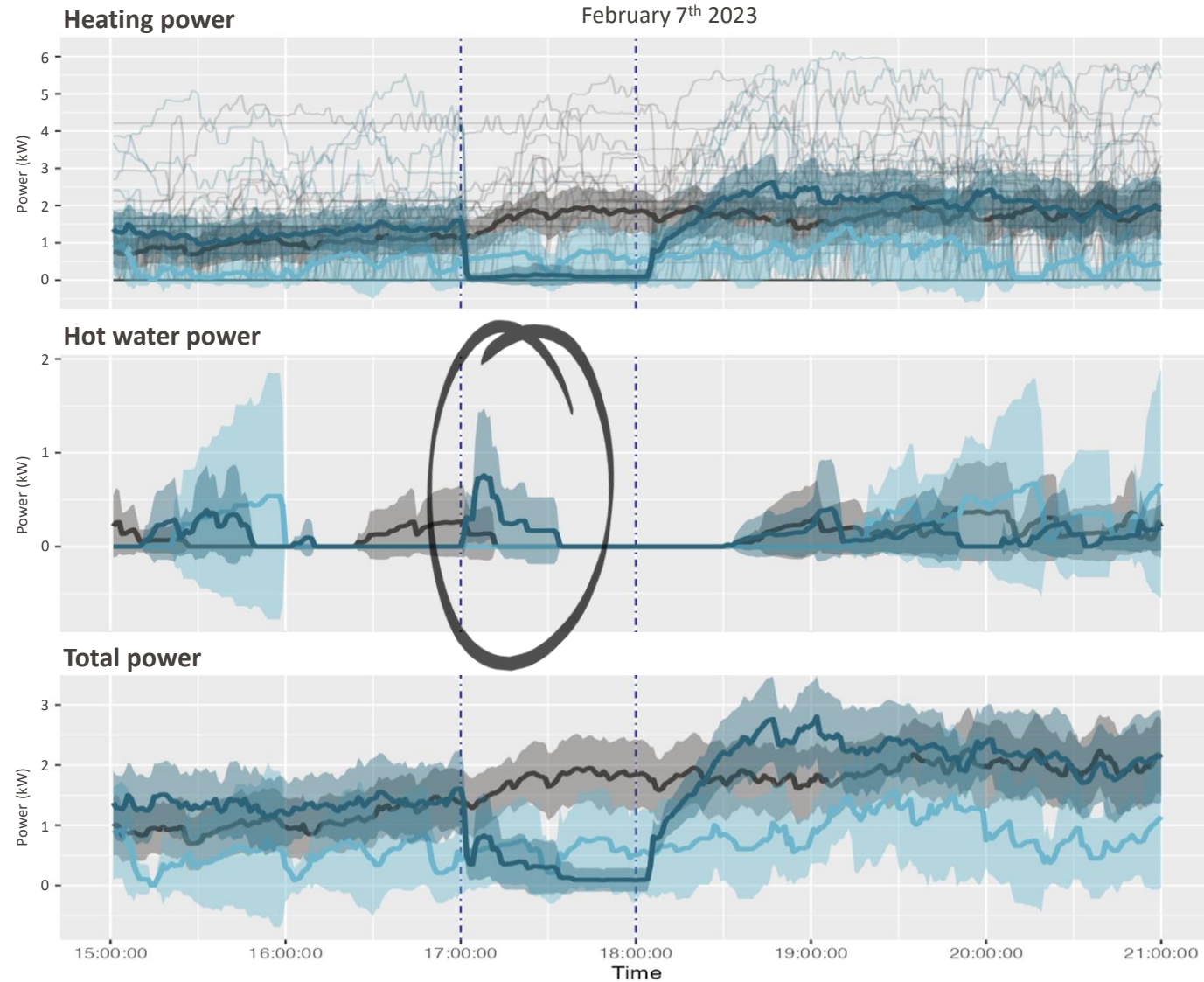


- Treatment (N=19)
- Control (N=28)
- Excluded (N=7)

*Excluded participants are those with a living space temperature below 18 during the event.*

# Heat pump field trial (1<sup>st</sup> heating season)

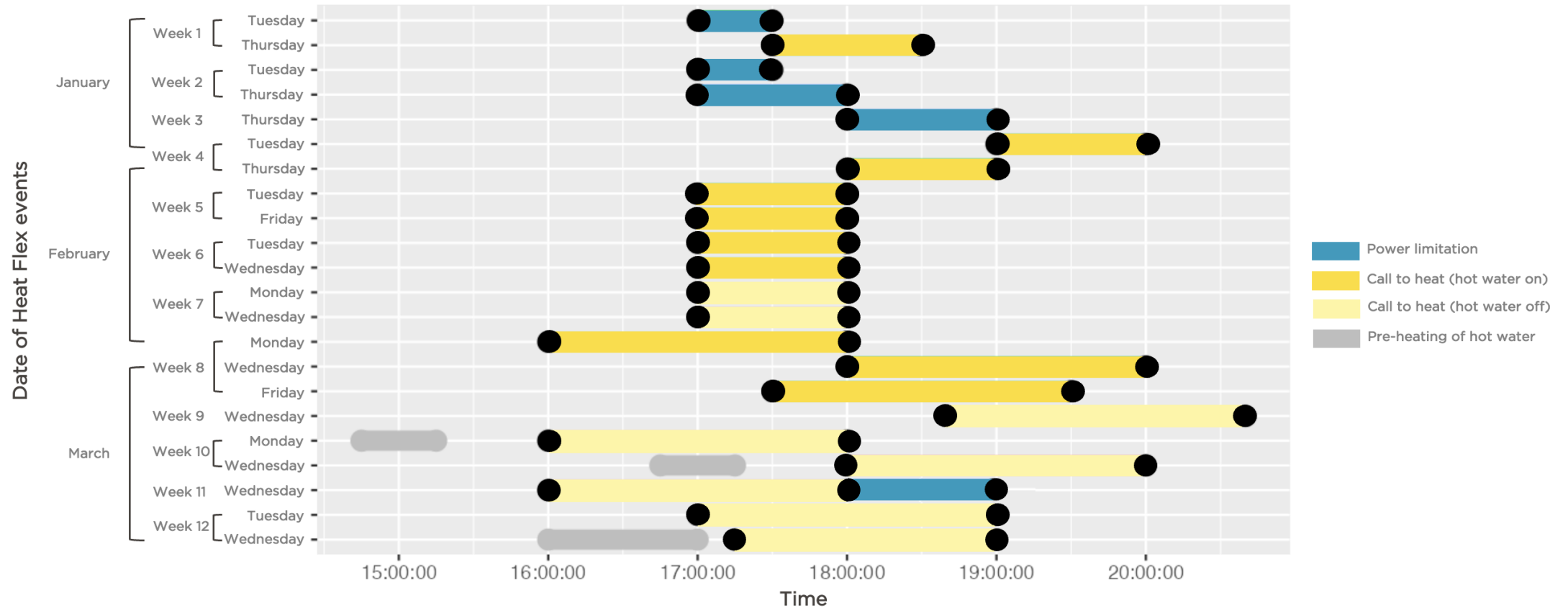
## The hot water problem



*Excluded participants are those with a living space temperature below 18 during the event.*

# Heat pump field trial (1<sup>st</sup> heating season)

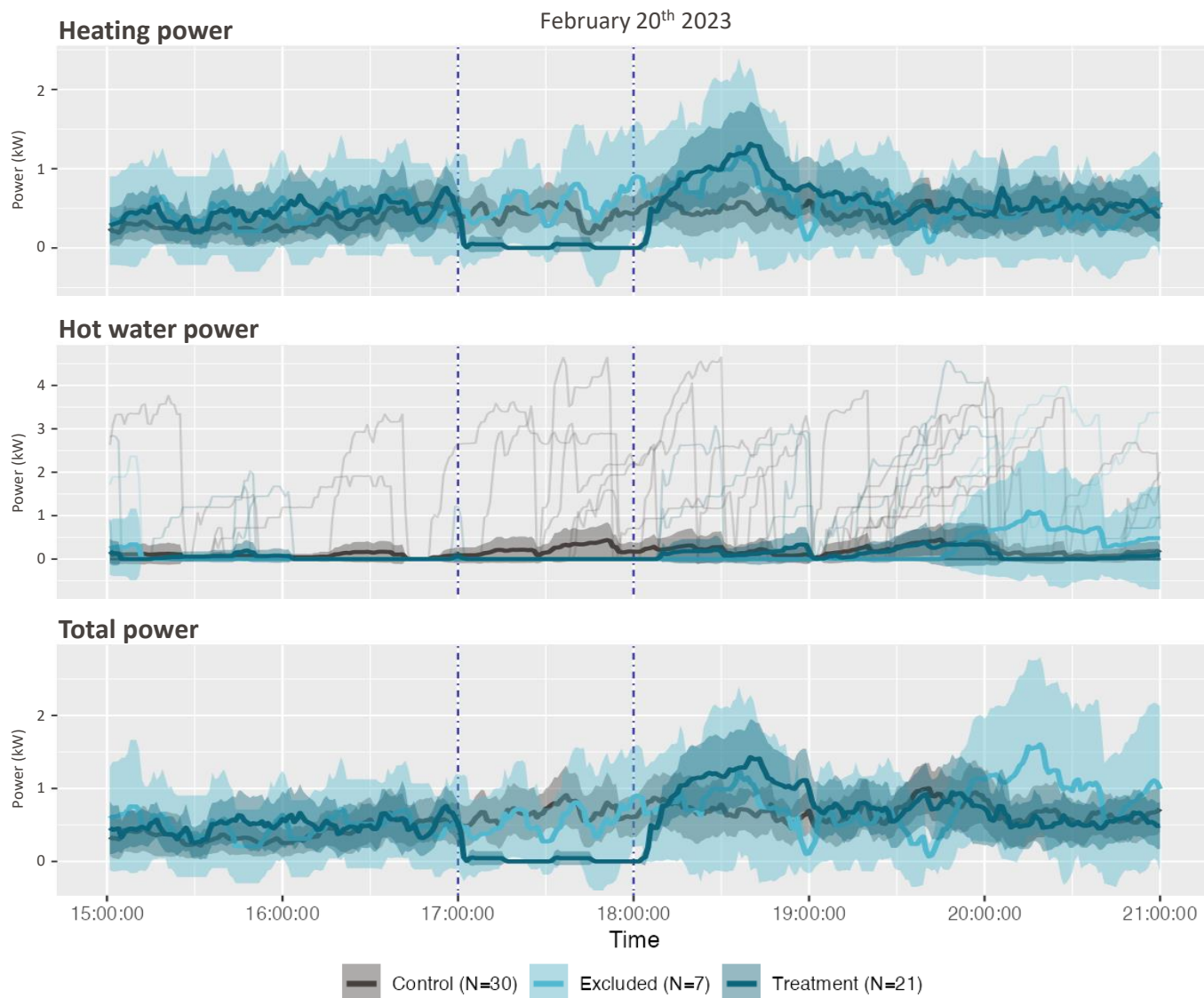
## Heat flex event schedule – v2



The schedule was redesigned to test turning off hot water and pre-heating hot water.

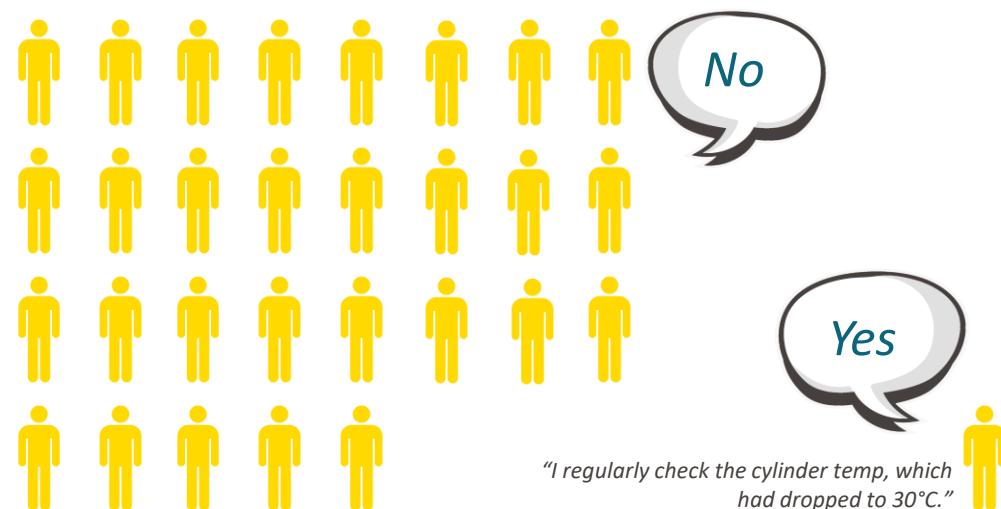
# Heat pump field trial (1<sup>st</sup> heating season)

## What happens if we turn off the hot water?



Trialling of no hot water or heating power was found to work and be generally acceptable.

Mid-trial participants were asked if they had noticed any changes to the supply of hot water in their home

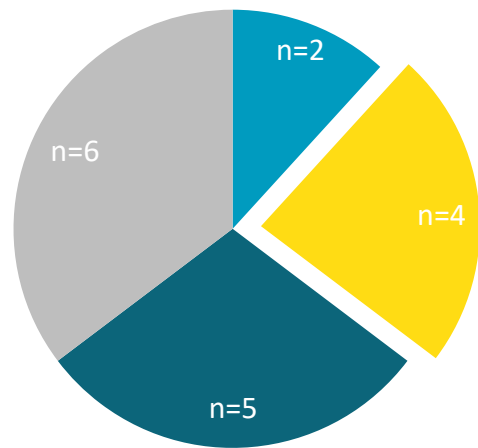




# Heat pump field trial (1<sup>st</sup> heating season)

How did the participants respond?

Only 17 override requests during the field trial



12% before a heat flex event

**24% during a heat flex event**

29% post heat flex event

35% during a non-event day

Event duration	Number of requests	Number of events	Mean requests per event
30 mins	2	2	1
60 mins	3	11	0.3
120 mins	12	10	1.2

# Heat pump field trial (2<sup>nd</sup> heating season)

*Pushing the boundary of acceptability*

Schedule of events for  
2<sup>nd</sup> heating season

5 – 1hr

4 – 1hr 30mins

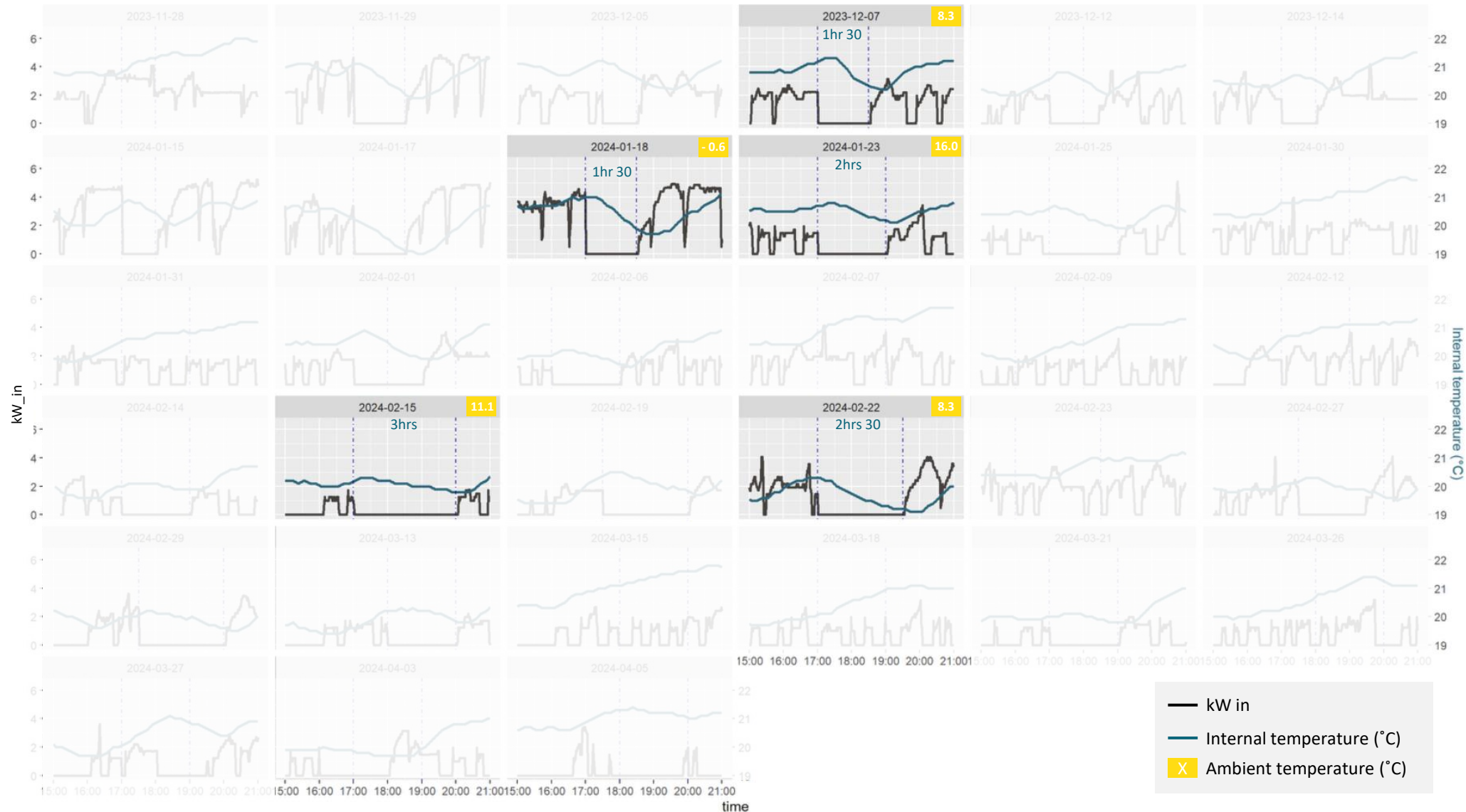
18 – 2hr overrides

5 – 2hr 30mins

1 – 3hr overrides

Select household  
response across 2<sup>nd</sup>  
heating season

- Semi-detached house
- 1919-1930
- 113m<sup>2</sup>
- EPC - D



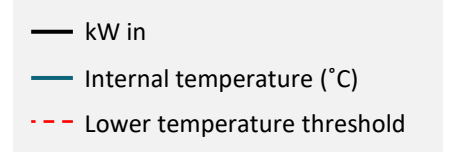
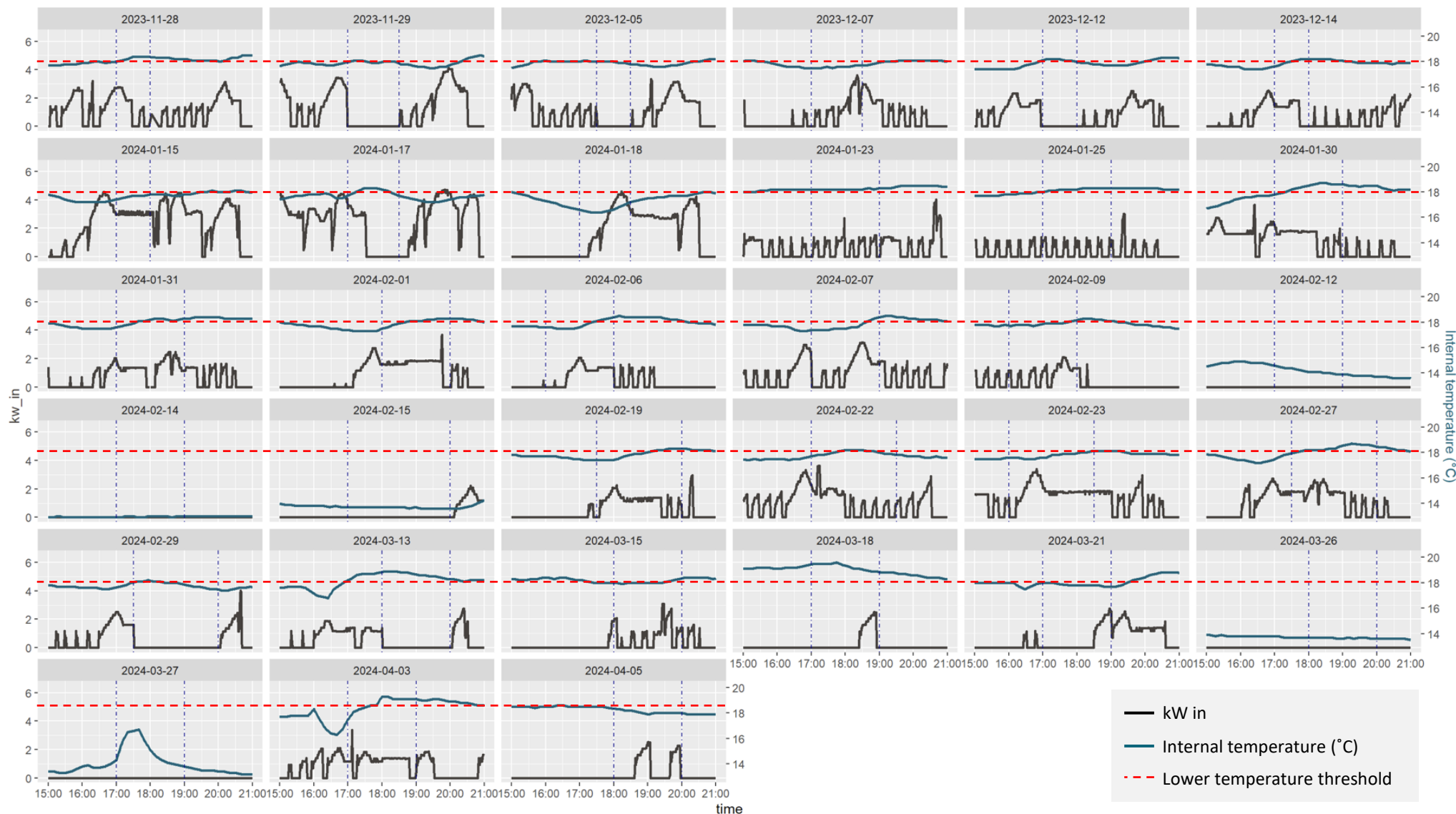
# Heat pump field trial (2<sup>nd</sup> heating season)

## Understanding internal temperatures – building response & safeguarding

Throughout both field trials we found typical internal temperature to be below expected.

The average self-reported set temp was 20°C, but was found to be closer to 18°C.

Multiple participants were living well below the temperature threshold.



# Heat pump field trial (2<sup>nd</sup> heating season)

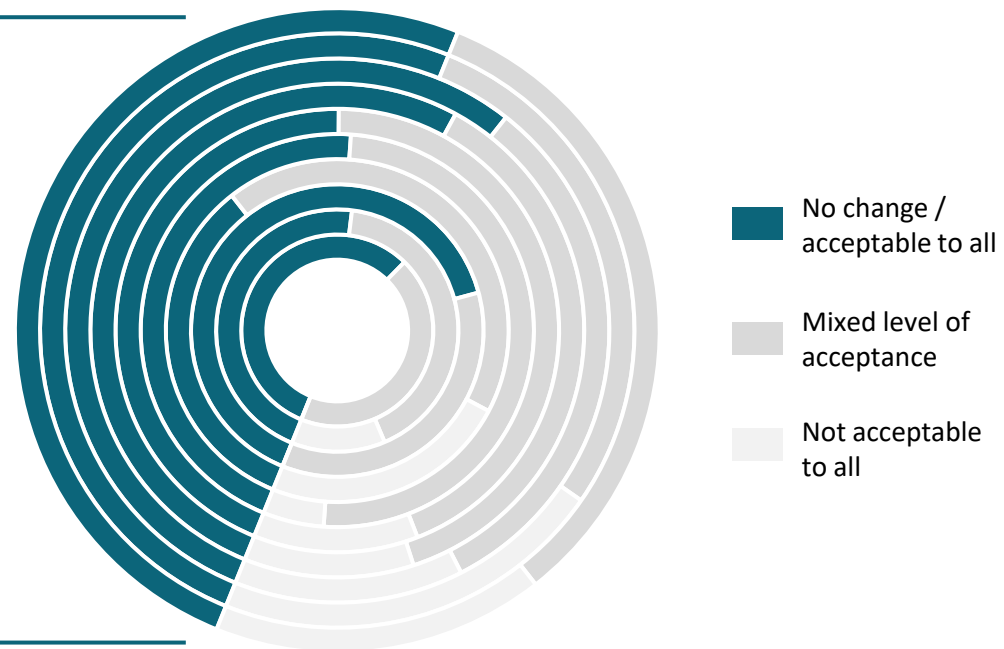
What did the participants think during the trial

Over the past 2 weeks, do you think we controlled your heat pump?



Were you comfortable with the temperature in your home during the Heat Flex events?

Only asked to those that thought there had been a Heat Flex event



- No change / acceptable to all
- Mixed level of acceptance
- Not acceptable to all

# Heat pump field trial (2<sup>nd</sup> heating season)

## What did the participants think after the trial

Online focus groups were undertaken with 39 of the field trial participants

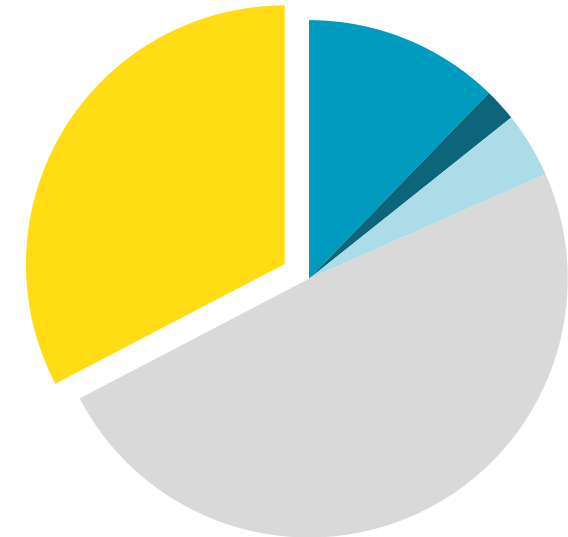
### Reasons households participated in the study

- 13% Interesting idea
- 29% Incentive (1 year service)
- 9% To learn more
- 36% Altruism
- 13% Existing eco-lifestyle



### Initial concerns with participating

- 12% Health and comfort
- 2% New technology
- 4% Doing things wrong
- 49% No concerns
- 33% Trust and control



- 33% of participants stated they would happily continue heat deferral if it was imposed upon them by an energy company or at governmental level.
- A third of focus group participants (13) stated they would have liked to know when the heat deferral events happened / were happening.

# Going forward

*No longer a trial*

*Will people sign up?*

*Will overrides increase?*




*Can this be scaled to the  
required levels?*

The image shows a digital advertisement for 'good energy'. At the top, the 'good energy' logo is displayed in a yellow bar. The main headline reads 'Earn cash by supporting the grid with your heat pump' in large white text, with a sub-headline 'Receive £50 for joining today!\*'. Below this, three white boxes with yellow icons describe the benefits: 'Help the grid' (power line icon), 'Zero effort' (mug icon), and 'Get paid for participation' (pound sign icon). A 'Join now' button is at the bottom.

good energy

## Earn cash by supporting the grid with your heat pump

Receive £50 for joining today!\*

- **Help the grid**  
We'll adjust your heating when the infrastructure is strained
- **Zero effort**  
We'll automatically preheat your water before an event
- **Get paid for participation**  
Each month we'll reward you for the flexibility you provided to the grid

Join now



Any questions please contact  
**[latent@soton.ac.uk](mailto:latent@soton.ac.uk)**



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