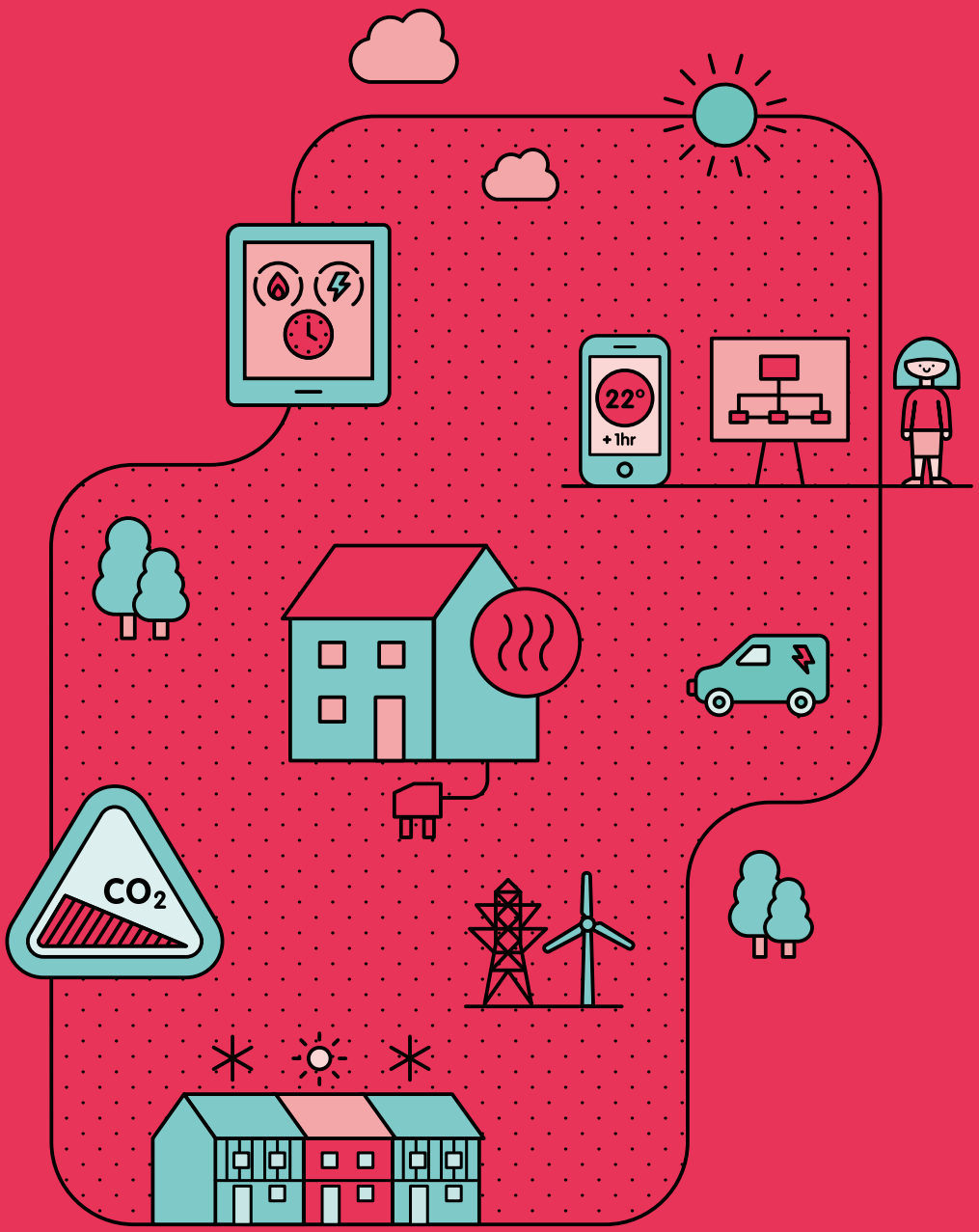
CATAPULT
Energy Systems



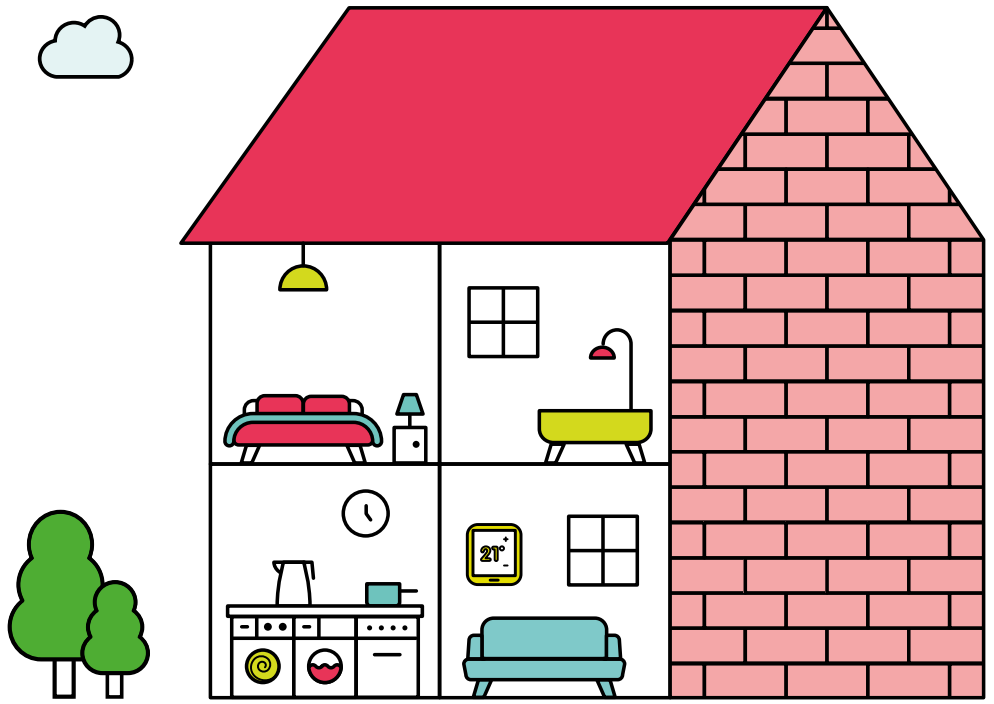
Delivering an effective field trial:
Lessons from the Living Lab

Introduction

Between October 2017 and June 2018, Energy Systems Catapult ran a field trial working with 108 households to learn more about how people actually use heat. The aim was to test responses to ways of controlling and purchasing heat, and to generate a range of consumer data and insights that will help energy innovators to identify, develop and test new energy products and services.

You can learn more about the findings of the field trial in the Field Trial Learnings Insight Report.

This short report draws together some of the insights gathered by Energy Systems Catapult about the process of running an effective field trial. We hope that the lessons and insights shared here will be valuable to energy innovators, researchers, academics, businesses, communities and other organisations considering similar trials.



Background

Heating accounts for almost one-third of total UK carbon emissions. To achieve our 2050 target of an 80% reduction in carbon emissions, the UK must decarbonise the domestic heating market at the rate of 20,000 homes a week by 2025. The current rate is less than 20,000 homes a year.

Our field trial ran from October 2017 to June 2018. Each household received an advanced heating controls system which provided room by room control of their heating. Each household could control the temperatures of individual rooms in their homes independently of each other and at different times. Control was through a web-based user interface accessible from mobile phones, tablet, laptops and PCs.

In Spring 2018, each household was introduced to the concept of Heat as a Service and were offered the option to transfer to one of three test Heat Plans. Heat Plans allow consumers to get the heating they want while paying a predictable fixed plan price during the year (with, in some cases, a set price for additional time on top of the plan). Heat as a Service in the field trial was an initial attempt to mimic the services that may be available in a future energy service market.

You can read more about our methodology, the sample of participants in the field trial, how the controls system operated and how the energy service plans were designed in our technical report 'HESG Trial: System Test Reports and Trial Conclusions' – available on request.

Our Living Lab offers innovative energy providers and device manufacturers the opportunity to test new products, services and business models in over 100 real-world consumer homes, upgraded to smart home levels that will be common by the middle of 2020s, by connecting to our cloud-based digital platform. You can find out more at **es.catapult.org.uk/living-lab**

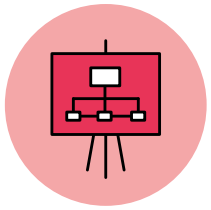
Summary of key successes

Key successes during the field trial included:

Households recruited to participate in the trial.

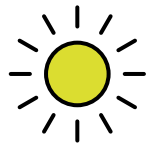
No households were left without heating during the trial period.

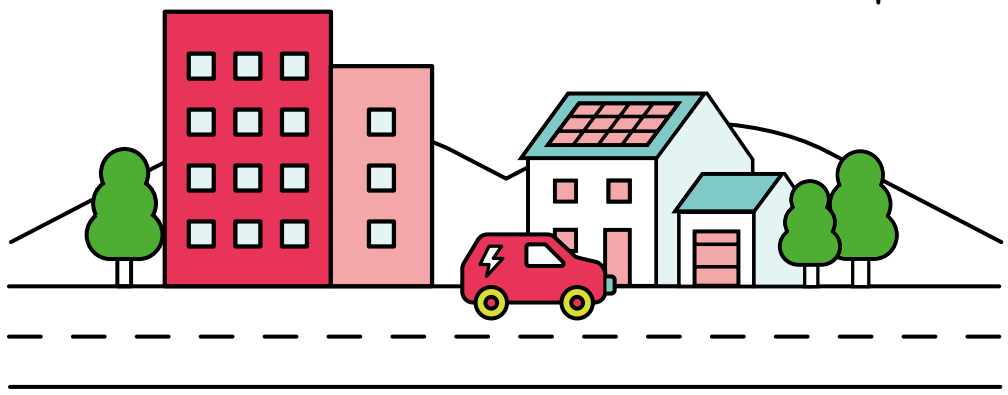
There were no Health and Safety incidents reported during the field trial.



Classroom and in-home training helped to increased installation rates nine fold during the early phases of the trial.

Participating households agreed to participate in future trials as part of our Living Lab.





Ways of working

Our experience of working with the Living Lab has suggested five key principles for the delivery of an effective field trial:

1. Put the householder first

Without an active group of participants, there can be no field trial. We built long-term relationships with householders and we made sure that no-one was left without access to heating after a fault.

It is important to have empathy with the trial participants, taking time to understand their situation and to notice which aspects of the trial they might find easy or difficult.

2. Stay focused...

A successful field trial will be based on a clear set of objectives and a timeline that sets clear targets for certain activities. There will inevitably be delays but good planning can help in anticipating when these might occur and act to mitigate against them.

3. ... But be flexible

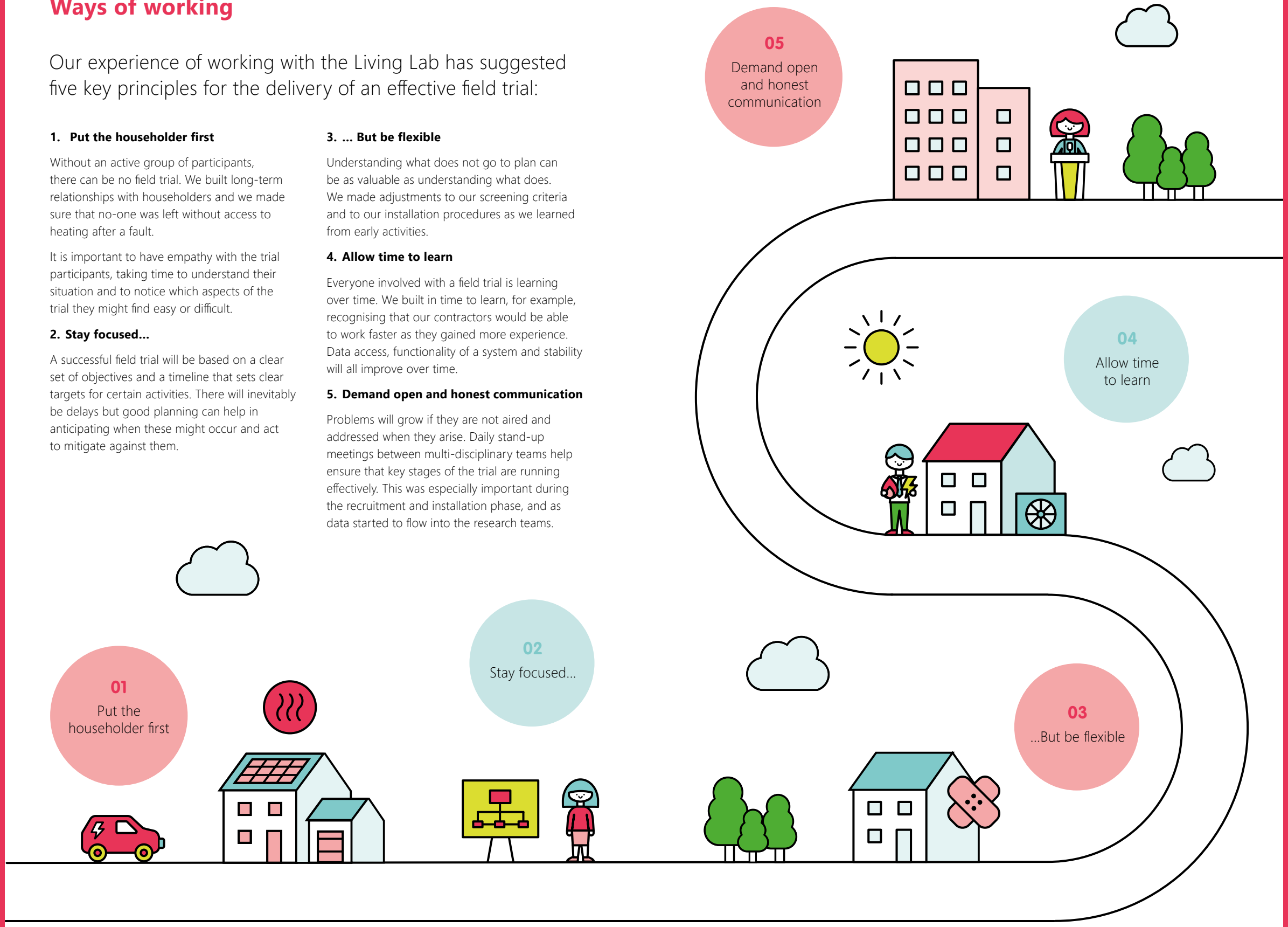
Understanding what does not go to plan can be as valuable as understanding what does. We made adjustments to our screening criteria and to our installation procedures as we learned from early activities.

4. Allow time to learn

Everyone involved with a field trial is learning over time. We built in time to learn, for example, recognising that our contractors would be able to work faster as they gained more experience. Data access, functionality of a system and stability will all improve over time.

5. Demand open and honest communication

Problems will grow if they are not aired and addressed when they arise. Daily stand-up meetings between multi-disciplinary teams help ensure that key stages of the trial are running effectively. This was especially important during the recruitment and installation phase, and as data started to flow into the research teams.



Insights through the process

We gained valuable insights at different stages of the field trial process and these are summarised below.

You can read more about our experiences in the Home Energy Service Gateway (HESG) reports 'HESG Customer Recruitment', 'HESG Installation Lessons' and 'HESG Decommissioning', and discover the findings of the field trial in the technical report 'HESG Trial: System Test Reports and Trial Conclusions' (all available on request).

1. Setting objectives

We set out with a clear set of objectives and sub-objectives for what we wanted to explore and achieve during the field trial.

Things changed over time. During the development process, we realised that testing Heat Plans would be a greater priority during the trial, and we were able to dedicate more resource to testing customer expectations around different aspects of these.

It was important to be flexible to change, with a readiness to revise the scope of what would be deployed and tested, while still remaining true to the original objectives for the trial.

2. Designing the trial

There was strong clarity about the types of households who were being targeted to participate (including their broad location) and the timetable for the project. This helped with project and resource planning.

The trial was in part a continuation of earlier work, so many team members were familiar with the types of equipment that would be installed. However, there was also a migration process for software that had been developed by others. This demonstrated the importance of clear, complete documentation and having a robust process for user training.

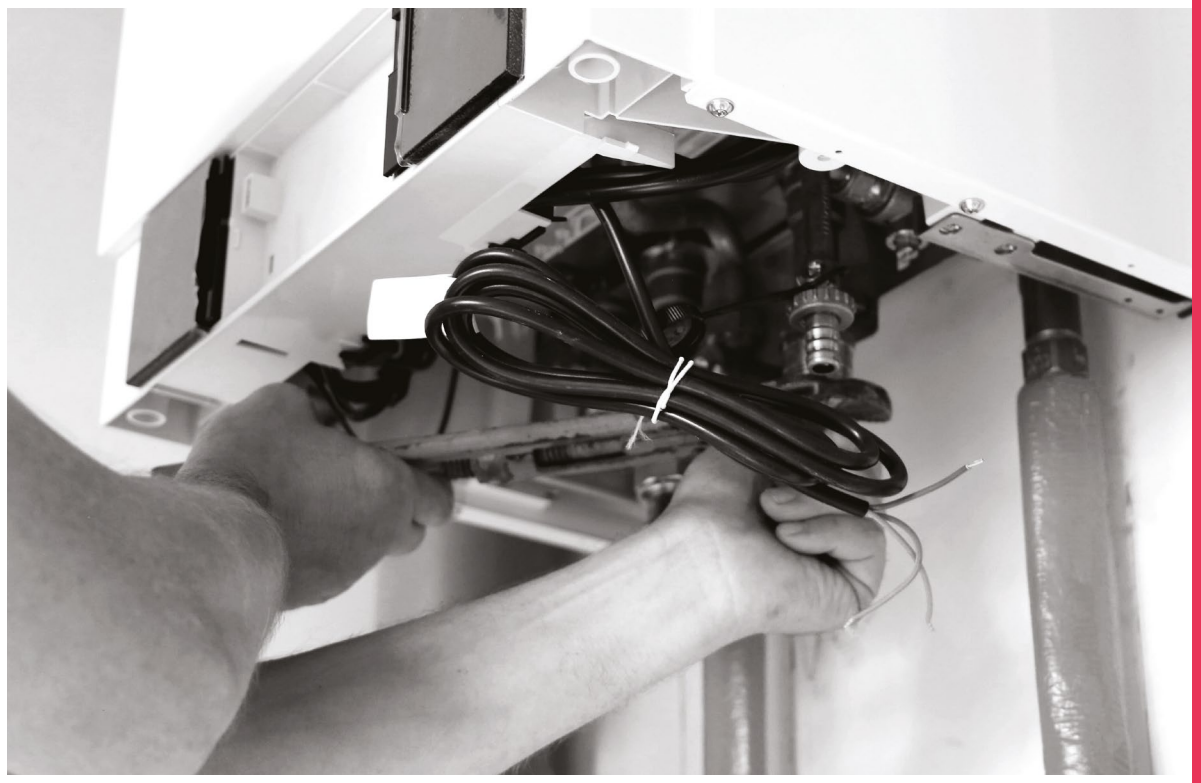
Some functionality took longer to deliver than anticipated; this had an impact on the data that was available to the research team. In some cases, manual processes were substituted to ensure that the trial's objectives could be achieved.

In other cases, data was generated but was not available for analysis until later than planned. The key here was to anticipate risks and issues and to develop contingency plans for other methods of securing the output or data that is needed.

Taking on software that had been developed by others also meant consideration of ownership of Intellectual Property. This was addressed very early in the trial design and supported by sub-licencing and Non-Disclosure Agreements to set clear expectations and parameters with contractors and other trial partners.

Similarly, Data Protection was an important and complex factor that we addressed early on. We carried out comprehensive planning before the trial started and created standard key documents for households, contractors and the Catapult team to ensure consistency and rigour of approach.

Field trials often come in phases, building on initial success to continue with further exploration and research. Designing a trial so that it can be easily extended allows for continuity and removes duplication of effort (for example, decommissioning and further installation of equipment). Planning for the longer-term is an important part of the design process.



3. Working with partners and contractors

The Living Lab involved the installation of a range of equipment in people's homes. This meant that we needed trusted local installation partners who could carry out quite complex installations to a consistent high level of quality.

The field trial was funded by the Department for Business, Energy and Industrial Strategy and, as such, we undertook a full procurement process to ensure value for public money. Procurement takes time, so it is important to manage the expectations of funders as to when contracts can be in place and when the trial period can begin.

A full procurement process provides the opportunity to fully assess the quality of bidders. One effective approach was to visit contractors at their locations. This helped to assess quality across an organisation rather than purely based on tender documents and presentations.

The contractors working with the Living Lab were primarily heating installers. This meant that there were certain elements of the work that were very familiar to them and others (wireless sensors and controls) which were very new. One advantage of this was that it was a valuable demonstration of the learning curve that the installation market will need to go through as we move to a more digitalised and service-oriented heating and energy market.

Before installations began, we took the contractors through a comprehensive training process. This covered strategic issues such as Health and Safety, Data Protection and Intellectual Property, and also included a hands-on opportunity to "play with the kit" so that installers were familiar with it and could learn by doing before going into people's homes. For Health and Safety, we used the Construction (Design and Management) Regulations 2015 (CDM). This is widely used across the domestic heating sector and gave a common ground for talking about Health and Safety throughout the trial.

4. Recruiting participants

Channels

It takes time to recruit participants for a field trial so it's valuable to use multiple channels to try and reach people. We ran an extensive outbound telephone campaign. We also found that encouraging word of mouth ("recommend a friend") led to a significant boost in recruitment numbers.

If working with partner organisations, it's important to frame the target audience clearly so that they can target their efforts. Some partner organisations – for example, local authorities – will have strong links with certain householder groups within an area but may have weaker links with others.

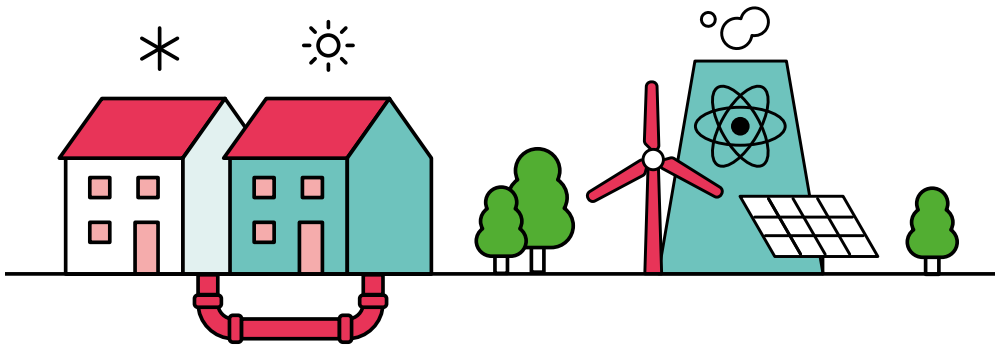
Process

Households were screened through a specialist agency who took prospective participants through a 30-minute telephone screening to test their eligibility for the trial. The screening covered basic requirements, for example, that the householders owned their own home, that they had a gas boiler, reliable WiFi and appropriate energy meters and that there were no members of the household who had vulnerabilities related to living in a cold home.

The screening criteria was adapted based on learnings from the process. For example, more emphasis was placed on identifying whether a household had vulnerabilities to ensure that there was no risk of trial participants suffering detriment if they were without heating. We also asked for photographs of meters as many householders did not know what type of meter they had; this reduce the number of unnecessary in-home surveys.

People who met the criteria and were interested in learning more about the study were referred to a website that had been set up to explain how the trial would work. This allowed people to find out more and to reassure themselves that it was legitimate.

Eligible households were then visited by a third-party engineer who surveyed their homes to make sure that the equipment would function and that there were no safety issues for the household in participating in the trial. Checklists were used during the survey which were then shared with installation engineers so that they could see the full scope of works that were required.



"Households were screened through a specialist agency who took prospective participants through a 30-minute telephone screening to test their eligibility for the research."

Criteria

Knowing the target households or consumers for a field trial is essential. We developed a long list of screening criteria, used in the process described above. It also defined who we were not targeting – for example, those in different tenures, those working in the energy industry or those in vulnerable circumstances.

Some households were able to participate based on only providing a landline number or an email address. This made contact later in the trial more difficult. At the start of the trial, establish multiple routes to reach people (landline, mobile and email) as this will reduce delays later.

Time and timings

We anticipated that it would take two months to recruit around 100 households, however it took four. Starting recruitment earlier would provide more margin within the overall project timetable. Being responsive through the process also made a difference. We adapted the screening process to prioritise those criteria which regularly arose as causes for people to be ineligible (for example, having the wrong kind of meter).

Around half of our participating households were families with dependent children, many of whom were difficult to contact during school holiday periods. These periods were difficult for arranging surveys, installations and visits. The majority of participants were in full- or part-time employment, however this was not a barrier to setting up installation appointment during typical working hours.

Householder needs

As part of our screening process, we deliberately excluded people in vulnerable circumstances, such as those with young infants, the elderly or those suffering from cold-related health conditions, as we did not want to place them at risk from any disruption in their ability to stay warm.

At survey stage, we identified some households with mental health issues which might have been disrupted by changes in the heating regime. We responded by building this into our screening process.

5. Installation

To test the installation process, we carried out early installations with participants who were very enthusiastic about the project.

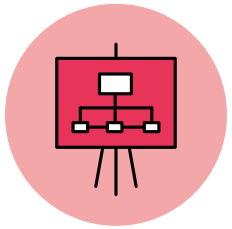
Most aspects of the installation process were routine for the heating contractors, based around equipment and technologies that they use every day.

However, digital controls and wireless networks were less familiar and took more time to install. This led to a risk of leaving people without heating if an installation could not be completed on the same day.

We recognised that different installers found different elements of the system easier or more difficult to install.

We therefore adapted the installation process in a number of ways:

Providing an IT engineer to support and train each heating contractor team. This helped to improve performance and to build self-confidence among the installers with new or unfamiliar technologies.



Changing the order of activities so that the installation started with the most risky or time consuming activity. This allowed installers to dedicate time to the most difficult aspects of the process.

Creating a timeline for installations with check-in points through the day so that progress towards completion is monitored and any potential delays can be anticipated and managed with the householder.

Guiding the commissioning process from the central helpdesk so that the coordinating team at the Catapult could confirm each stage was complete.

6. Managing the participant's experience

It is important to recognise – and to communicate – that a field trial can demand a significant amount of time from its participants. After installation, householders were asked to participate in further interviews, surveys and workshops and to write blogs about their experiences. Not all participants will complete all activities and this should be anticipated in the trial design.

Once the trial is under way, regular contact with participants can help them to get used to their new systems so that they can participate fully. We provided support through a dedicated freephone helpline and an email address. Early calls to the helpline were often in response to changes in how the heating system was working (for example, coming on earlier or later in the morning than the householder anticipated in response to external temperatures). In response to this, we provided materials so that householders could self-help on these sorts of issues – these could be stickers, brochures or "how to" leaflets. This helps to minimise the number of non-urgent calls to the helpline.

A good quality helpline can make a difference to the retention of participants during a trial. Our team had a mix of technical and communication skills along with the patience to walk households through the steps of a process to fix any problems. The helpline managed relationships with both the householders and the contractors, acting as a bridge and making the overall experience feel more integrated and more personal for the participants.

Heating system faults are unpredictable, and calls could come into the helpline outside standard office hours. The helpline provided extended support to 8pm to cover any faults when householders returned from work, and support from 9am to 5pm on weekends and Bank Holidays. The availability of support should be planned based on the needs of the trial participants and should be clearly communicated to participants and to those providing first- or second-level support or those on call.

Managing the experience of householders often involved setting up appropriate systems behind the scenes. For example:

- Incoming calls were prioritised as urgent, high priority, medium priority or low priority, based on the extent to which the householder was likely to be left without heating. This allowed for the support and breakdown teams to be utilised more efficiently to address the most serious issues first.
- The technical, research and support teams had daily triage meetings during the installation period and throughout the trial. This helped to identify which households were facing technical issues and to share research insights as to what households were saying about the system. This gave the full team visibility of how the trial was progressing and how we could be more proactive in anticipating and managing any issues.

"Once the trial is under way, regular contact with participants can help them to get used to their new systems so that they can participate fully."

7. Data gathering and analysis

With a technically complex field trial, data will inevitably come online at different times. This can mean that analysis happens later in the trial than anticipated. Data will be more accessible and easily analysed if it is held in one place and with a consistent structure. This should be established at the start of the trial, allowing time for users (especially participants) to be set up on and familiarised with any shared systems.

The more data that is collected, the more requirement to process and store it, and this can add to the costs of a trial. A clear Data Strategy at the design stage can help to anticipate data collection, processing and storage requirements.

Where trials last for longer periods than planned, there may be issues around battery lifetime in sensors and monitors. During this trial, each household had 30-40 sensors. It is worth spending time during the design and specification of the trial to plan for a longer field trial period to minimise interruptions to data flow and the need for interventions in the home.

8. Planning for the end

The decommissioning phase at the end of a field trial is important but can feel like less of a priority. Householders will not feel under the same time pressure as they did when the trial was starting and it can be harder to schedule appointments to take back equipment. Timing considerations are again important: holiday periods present difficulties.

Clear communication can help the householder to understand what equipment you do or do not need back, what will happen to any other items (for example, batteries) and how you will resolve any damage that may have occurred.

Some households saw damage to paint or wall coverings where monitors had been affixed. Most were happy to receive a voucher towards the DIY cost of touching up paintwork. Households leaving the trial were offered a replacement of their digital controls with a new smart heating control (rather than reverting to the controls they may have had before the trial).

Seventy-eight households have opted to stay involved and participate in future trials. Anticipating this meant that the decommissioning process could be designed around only that which was needed, leaving the householder with some equipment on site to reduce the installation timeframe for future trials.

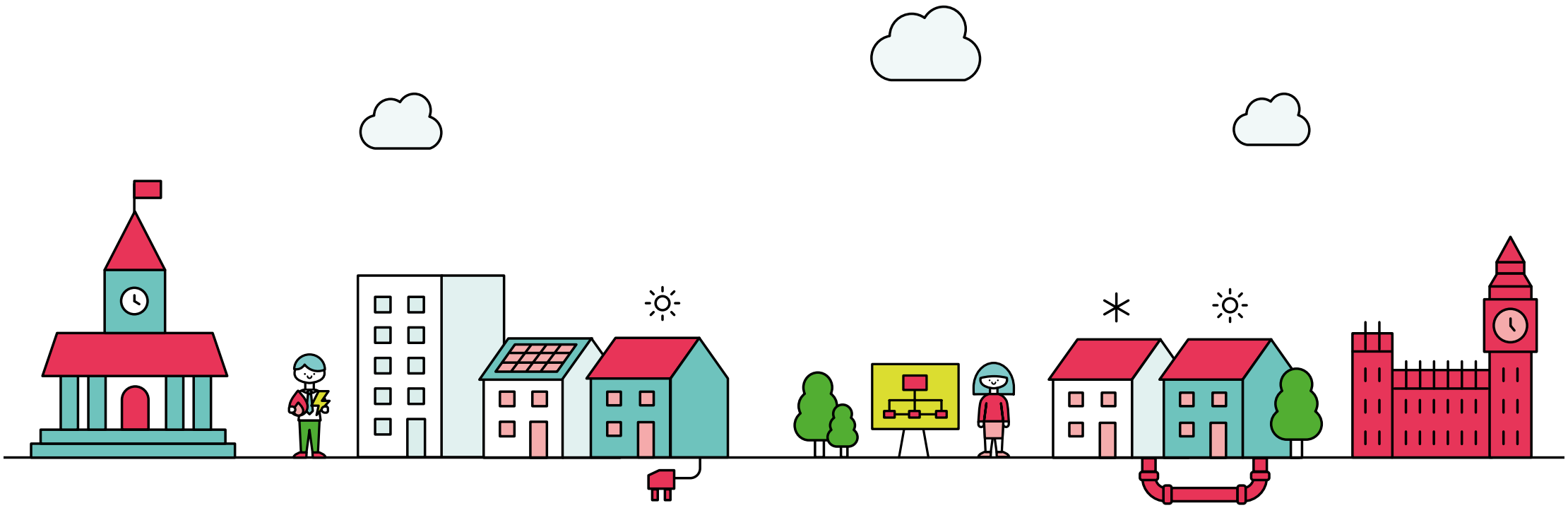
9. Reporting

Field trials generate a great deal of information and data. We coupled daily stand-up meetings between researchers and data scientists with periodic longer sessions to review conclusions against the original research questions. This helped the Catapult to retain a live view of the trial, enabling us to report to funders and to respond to the needs, choices and behaviours of trial participants.

Reporting and review can take time, particularly where you have a blend of qualitative and quantitative data sets. There should be one clearly defined owner for the research report and a clear and generous timetable for review at different stages.

How to get involved

For more information, please email us at **ssh@es.catapult.org.uk**



Energy Systems Catapult supports innovators in unleashing opportunities from the transition to a clean, intelligent energy system.

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