Electricity Distribution

EQUINOX Horizon Scan

Tracking relevant developments and learnings from previous/ongoing projects, initiatives, and policies

Q3 2024

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Document Details	
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Links to previous Horizon Scans

Q4 2022
Q1 , Q2 and Q3 2023
Q1 2024

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1

Introduction

Document purpose, contents, scope, usage

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Context and Purpose: What is this Horizon Scan and why is it needed?

This Horizon Scan is a tracker of projects, policies, market design and regulation relevant to EQUINOX

EQUINOX is unfolding to a backdrop of three years of policy and regulatory change in many areas relevant to project delivery like flexibility market design and heat pump rollout.

As a **condition of Ofgem funding**, EQUINOX must **directly acknowledge** and **build upon** other innovation projects relating to electrification of heat and flexibility by **UK DNOs** and others.

To ensure EQUINOX tests commercial arrangements **which reflect reality**, it is important to **keep abreast of current and upcoming** policies and regulations.

Collating all relevant projects facilitates the identification of opportunities to **disseminate EQUINOX learnings** to other projects who can benefit from them, fulfilling **another Ofgem funding condition.**

Guide: What is included within this Horizon Scan?

This Horizon Scan collates and summarises research and innovation projects, plus regulations and policy, which are deemed relevant to the delivery of the EQUINOX project and the wider domestic flexibility market. The document is split into two main parts

Innovation projects from the UK and abroad

Summary of Coverage

Section Contents

- Scope of projects covered.
- List of the projects (53 collated so far) and countries (7) covered.
- Collated and themed summary of most relevant key learnings for EQUINOX.
- Project deep dives for more information.

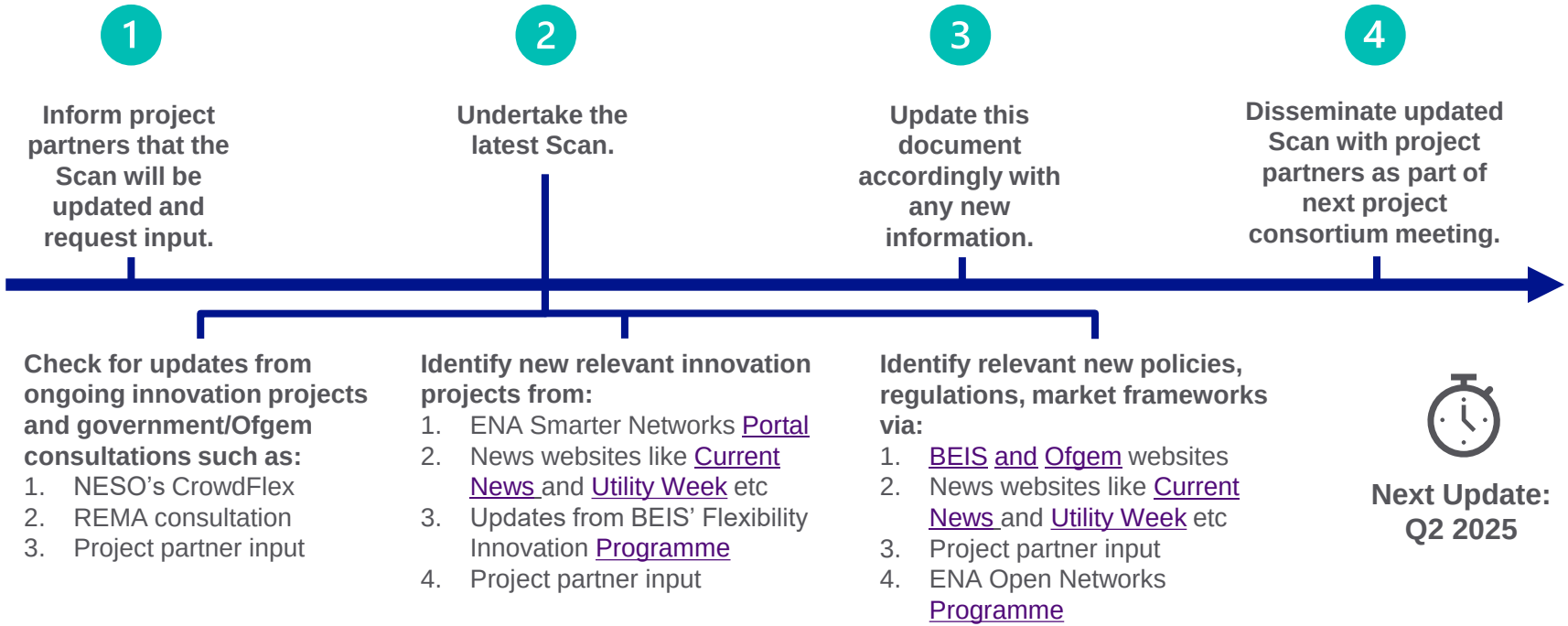
UK policy, regulation, strategy and markets

Summary of Coverage

Section Contents

- Coverage within the latest iteration.
- UK flexibility strategy and innovations.
- UK technology strategy and rollout.
- The UK's approach to energy bills.
- Future flexibility market arrangements.

Guide: The Horizon Scan will be updated periodically via the following process



Horizon Scan Coverage: Innovation projects from the UK and abroad

Go to section

The scan pools insights and learnings from completed and ongoing innovation projects across the following themes: [1]

1 Domestic energy flexibility

Projects focusing on innovation in domestic flexibility from any source, not exclusively low carbon heat.

Relevance for EQUINOX
Learnings on the approach towards domestic consumers, modelled and experimental aggregated flexibility provided.

2 Commercial trials at scale

Projects focusing on a larger scale (1000+ participating households) trial of an innovative flexibility proposition.

Relevance for EQUINOX
Learnings on customer recruitment, minimising dropouts, regularity of engagement, results analysis.

3 Low carbon heating innovation

Projects focusing on domestic low carbon heating, not necessarily from a flexibility perspective.

Relevance for EQUINOX
Learnings on customer preferences, experience with remote control, common heat pumps concerns.

Projects found via:

1. Smarter Networks Portal
2. Flexibility Innovation Programme
3. News sites
4. Input from project partners

[1] Not mutually exclusive

Horizon Scan Coverage: UK policy, regulation, strategy and markets

Go to section

The scan extensively covers the UK's current and proposed approach towards:

1	2	3	4
UK flexibility build-out	**UK technology rollout**	**UK approach to energy bills**	**UK future flexibility market**
Track progress towards and changes to the UK's flexibility strategy/ targets/ product deployment.	Track strategy, regulation, and progress for heat pump & smart meter rollout.	Track UK energy costs and government support measures.	Track the options being considered for future market operation in the UK.
Relevance for EQUINOX EQUINOX must align with UK high level strategy.	**Relevance for EQUINOX** Project must react based on regulation for and pace of heat pump /smart meter rollout.	**Relevance for EQUINOX** Trial design and incentives must reflect the current and future energy costs landscape.	**Relevance for EQUINOX** Final BaU-ready commercial offering must fit within the UK's realigned electricity market.

Major sources include: Department for Business, Energy & Industrial Strategy; ofgem; Climate Change Committee; NESO National Energy System Operator; ena energynetworks association

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Innovation Projects

Projects covering domestic flexibility, low carbon heating innovation, and commercial trials at scale

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Horizon Scan coverage: innovation projects from the UK and abroad

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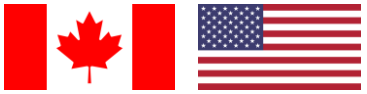
Relevance for EQUINOX
Learnings on customer preferences, experience with remote control, common heat pumps concerns.

Projects found via:

1. Smarter Networks Portal
2. Flexibility Innovation Programme
3. News sites
4. Other sources like EQUINOX project partners, IEA, etc.

[1] Not mutually exclusive

EQUINOX is UK-based so the scan primarily focuses on the UK, although large-scale projects abroad are included

Country			
Key project leads	nationalgrid, UK Power Networks, octopus energy, Scottish & Southern Electricity Networks, SP ENERGY NETWORKS, NESO National Energy System Operator, ovo energy	TenneT, IBM, VIESMANN, ENERGINET.DK, POWEO	alectra, London Hydro, DUKE ENERGY
Reason for inclusion	As a UK-based project, EQUINOX stands to gain from key learnings coming out of other UK innovation projects, particularly those by other suppliers and DNOs. They can provide insights into UK consumer behaviour and preferences towards heat pumps and flexibility.	Germany, France, Switzerland and Denmark have some of the highest heat pump installation rates in Europe, so can offer insights on commercial scale domestic heating flexibility innovation trials and programmes.	Project partner Guidehouse has experience with projects in the USA and Canada which have a similar premise to EQUINOX – namely large-scale commercial trials of domestic heating/cooling flexibility.

Key learnings from 52+ projects have been summarised within seven buckets

1

Customer Offering

How to achieve a compelling proposition.

2

Flexibility Impact

How to ascertain the overall flex benefits.

3

Recruitment

How to maximise and maintain participation.

4

Customer Preference

How to meet participant needs.

5

Engagement Strategy

How to optimise engagement throughout the trials.

6

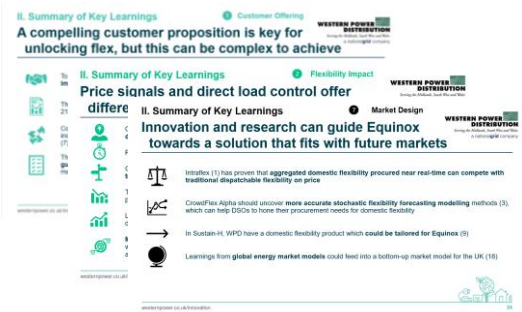
Trial Design

How to design and analyse the trials being undertaken.

7

Market Design

How to ensure EQUINOX is ready for business as usual.



A compelling customer proposition is key for unlocking flex, but this can be complex to achieve

To maximise uptake of demand side response (DSR) / flex services, focus on **financial concerns of participating households** by **improving customer proposition** (Projects 4, 13, 30, 37 on project list). This proposition should be adapted based on prevailing market conditions (37).

To maximise flex potential, increase the uptake of eligible heating technologies **across demographics and buildings with lower penetration** e.g. social housing residents and multi-occupancy buildings (41, 44-46).

There are **many ways of reimbursing customers** for flexibility, from **different tariffs** (5, 21, 22, 28, 33), **bill rebates** (6, 23, 25), and **per kWh payments** (24). **Sign up bonuses** are also common for trials (12, 21, 23, 24, 46).

Complexities of contract approval process and service design can **present delays and challenges** (13), including concerns about **personal data sharing** (24), **explicit consent requirements** (9), **authentication** (7), etc.

The service summary from NGED's Sustain-H domestic flexibility product, which came out of the Future Flex project, **provides guide elements** which need to be considered for EQUINOX commercial arrangements (9). An element that made this service proposition successful was its **simplicity**.

Price signals and direct load control offer different flexibility benefits for networks

Critical peak pricing can motivate changes in space heating **even when there is no direct price signal to do so** (projects 20 on project list). i.e. price signals can induce **wider behavioural change and flexibility.**

Participants can **respond at short notice** to price signals (2, 6, 21, 22), with high participation rates (26).

Giving participants control over temperature limits results in **hugely varying flex potential**, with households **tending towards the extremes** of min and max flex provision (22).

Time of use tariffs and turn-down events can **significantly reduce peak demand** (2, 5). Turn-down can induce increases elsewhere (4, 26) but overall energy consumption across the day remains similar (33).

Large-scale **turn-up trials** have also demonstrated that there is **significant flexibility potential** from domestic assets when consumers are asked to increase their usage (2, 6).

Modelling project results aid understanding of the role HP turn-down could play in a peak 1-in-20-year winter (10), how HP turn-up can reduce wind curtailment (11), and the flexibility potential of aggregated low carbon domestic heating assets (3, 16).

Recruitment requires proactive engagement and careful consideration of incentives

Risk-free aspect of trials can be a **crucial incentive to enrol customers** (22 on project list). Conversely, other trials saw a **lack of awareness** from participants that incentives had been made available to them (23).

Working with a **trusted third party** (e.g. charity) **adds legitimacy** to recruitment efforts, with **face-to-face interactions** important for building trust and engagement **with vulnerable customers** (4). A voluntary compliance scheme will help build consumer and DNO/NESO trust in domestic flexibility (20).

Customers need **support and resources** to understand new systems, tariffs, etc, and to encourage the switch to **new routines** (5, 7, 13, 14).

Initial concerns for V2G centred around general EV price and operational concerns like charging time (7).

Interactive diagrams and videos are a great resource for making recruitment **more accessible** (8, 24).

Cost of heat pump and accompanying required retrofits can be **prohibitively high barrier** to hitting recruitment targets (12, 27, 45), though this is expected to change over time as costs fall.

Targeted recruitment is useful for trials with specific eligibility criteria to **reduce screening time** (28, 29, 47)**.**

Acknowledging and aligning with customer preferences is necessary for success

Opt-out flexibility initiatives offer **more flex** than opt-in, provided the **incentive is sufficiently high** (5 on project list).

Unacceptable noise from hybrid/ heat pump systems for participants in some trials (14).

Ease of use, comfort, **reliability**, and upfront and running costs are the primary aspects of a heating system that customers **value** (18).

Do not overpromise: on one trial, many customers did not achieve the bill savings they were promised, with some actually paying more (13).

One trial allows customers to **block times** for which they would not like to have their heat pump remotely controlled (25). There is typically very high satisfaction amongst remote control participants (23, 25, 26, 33).

Simple technology is preferred e.g. a one-app solution (7) or a simple proposition (9).

Cost savings and **revenue opportunities from domestic DSR need to stack together** for consumers to create a range of incentives to help **overcome barriers** arising from **consumer preferences** and technical limitations of heat flex (40, 46).

Active and continuous engagement better guarantee longer-term participation

Customers can be initially **highly concerned** about **changing their routine**, so must be **guided** through the early behaviour change (5, 7 on project list). Personalised tracking and advice empowers participants (8, 26).

Engaging through existing channels such as **organisations representing the community energy/community groups** is effective in improving consumer engagement (21, 37, 46).

Without **continuous engagement**, participation dropped off in certain trials (4), and has been shown to be higher **directly after engagement**. This must be balanced with **messaging fatigue** which causes disengagement (5). Furthermore, contractual documentation should be simple and easy to understand (37).

Large-scale domestic flexibility trials have generally seen **large and enduring buy-in**. For one SPEN trial, **almost 100%** of participants found the experience easy and beneficial. ~70% said they would consider managing their energy use **at least three days per week** (6).

In CrowdFlex, participants who switched to a flex price signal tariff **consistently changed their demand profile** over the six months of the trial (3).

Ongoing communication between members of project staff is key to successful external communication (32).

Various projects assist the setting of ambitious trial objectives and robust impact evaluation

Large-scale heating flexibility trials in the UK (3), Germany (24, 25 on project list), Canada (21, 22), and USA (23) all offer slightly varied trial designs.

Standard event time for customers is a **maximum of two hours** (2, 6, 24), though other trials went with four hours (5) and one hour (25).

If designed well, direct load control can occur **without participants even noticing** when there has been a control event (13, 23, 33, 46).

Projects like Right to Heat (15) can provide insights to accompany Sero data on **how heat pump use interacts with other low carbon technologies** like solar PV, thus how to account for these in the trial design.

The Modelled trial in France introduced **gamification as an engagement tool** (26), rewarding ‘better consumption’ with points.

Innovation and research can guide EQUINOX towards a solution that fits with future markets

Intraflex (1 on project list) has proven that aggregated domestic flexibility procured near real time can compete with traditional dispatchable flexibility on price.

CrowdFlex Alpha's work on the statistical nature of domestic flexibility **highlighted the opportunity for, and commercial value of, probabilistic forecasting to increase reliability** (3), which can help DSOs hone their procurement needs for domestic flexibility.

NGED have existing flexibility products which **could be tailored for EQUINOX** (9).

Learnings from **global energy market models** could feed into a bottom-up market model for the UK (19).

GOFLEX has created a data services platform to provide **localised estimation and short-term predictions of energy demand/generation**, which will help create the market for distributed flexibilities and automated dynamic pricing (31).

Commander (34) is exploring stackability and primacy rules for UK system operator flexibility services.

The Universal Smart Energy Framework (USEF) and domestic flexibility Code of Conduct (20) can promote residential participation and reliability in the delivery of flexibility (38).

Projects for key learnings – Horizon Scan Q3 2024[1]

Project	Country	Lead	Description	Domestic flexibility	Trials at scale	Low carbon heat	Project dates
46: Carbon Flex		UK Power Networks	Explores space and hot water heating flexibility in multi-occupancy buildings	✓		✓	Mar – Jun 2024
47: KnowMyFlex		UK Power Networks	Proposes to create Energy Flexibility Certificates like EPCs.	✓		✓	Mar – Jun 2024
48: EquiFlex		SP ENERGY NETWORKS	Aims to promote equal access to participation in flexibility markets.	✓		✓	Mar – Jun 2024
49: Balancer		UK Power Networks	Designs business models for front-of-the-meter community batteries on the grid edge.	✓			Feb – Nov 2024
50: Equal LCTs		Scottish & Southern Electricity Networks	Aims to accelerate development of enabling propositions for hard to reach/ left behind consumers.	✓		✓	Feb – Nov 2024
51: Market Signals for the Electrification of Heating		NESO National Energy System Operator	Explores how flexibility market signals can encourage heating electrification and flexibility.	✓		✓	Mar 2024 – Jan 2025
52: CoolDown		electricity north west	Explores impact of cooling on network capacity and potential to unlock space-cooling flexibility.	✓		✓	Mar – Jun 2024
53: REACH		nationalgrid	Helps rural customers make cost-effective decarbonisation choices.	✓		✓	Mar 2024 – Mar 2025

[1] Project Deep Dive List 1-45 can be found here

46: CarbonFlex

Project Overview

Description	• CarbonFlex demonstrated how socially-inclusive demand side flexibility can be used to support a net zero secure urban energy system. In turn, enabling surrounding communities to electrify and decarbonise quickly, cost-efficiently and equitably. More info
Project Dates	Mar 2024 – Jun 2024
Project Partners	UK Power Networks, SIAPARTNERS

Project Scope

1. Optimise demand flexibility from house based on the carbon intensity of electricity by using 'Carbon flexing' algorithms coupled with smart controls to match electric residential space and hot water heating demand in multi-occupancy buildings with periods of low carbon electricity and an expected high network flexibility demand.
2. Enhance opportunities for domestic customers (and other disadvantaged end users) to partake in flexibility through social, technical and market interventions.

Learnings for flexibility and heat decarbonisation

- During the 2-week trial with 24 tenants, the participants who had their charge times optimised for carbon avoidance achieved a 15% carbon saving whilst ambient temperatures were maintained at 21-23ºC.
- Customers were motivated by positively impacting the climate and helping their local area as their primary motivations for participating in the trial.
- Customers noted that the gift voucher also helped but was not the primary motivation.
- The trial receive positive feedback. Only three tenants noticed changes demonstrating that **heat can be delivered as a service without adversely affecting the end consumers.**
- While the trial wasn't located in a constraint managed zone**, the analysis found that the trial activity would not negatively impact the DNO calls for flexibility or other services** such as UK Power Networks and Octopus Energy's 'Power Ups'. Further research is needed to confirm this, if scaled across all network locations
- **Pre-trial engagement with tenants made the user journey successful.** Face-to-face events, telephone calls and written communication helped identify user needs and appropriately explain the trial. Participants were given the option to opt-out and a 24/7 helpline.
- The tariff structure removed tenant price risk (also meaning direct financial savings weren't available during the trial).

47: KnowMyFlex

Project Overview

Description	• KnowMyFlex proposes to create Energy Flexibility Certificates (EFCs) – similar to EPC ratings – to provide a centralised view of the existing and future flexibility potential of homes and buildings – to help customers engage with flexibility to reduce their bills. More info
Project Dates	Mar 2024 – Jun 2024
Project Partners	UK Power Networks, Baringa, University of Reading

Project Scope

1. Determine appropriate use cases for EFCs.
2. Develop route to market and commercial model for EFCs, including a high level CBA model.
3. Define requirements for data models behind the EFC framework and included metrics.
4. Define requirements for infrastructure enabling EFCs: Architecture, access procedures, data gathering methods, operating model.

Learnings for flexibility and heat decarbonisation

- EFCs can guide customers on suitability of smart energy products for their homes. They help customers understand how they can participate in flexibility opportunities across their building stock.
- EFCs inform consumer choices, therefore increasing uptake of flexibility, as they compare the impact of different technologies on ability to deliver flexibility.
- The project identified 15 possible use cases for EFC data. Two key identified use cases include:

DSO flexibility procurement	Flexibility dispatch/ manage network load
• EFCs can help to target flexibility procurement with greater success rate as they can provide a more accurate view of available flexibility supply in the present and the future. • EFCs can make flexibility services procurement a more reliable mechanism for planning network reinforcement efficiently. • EFCs can help to build targeted flexibility service products for specific customer groups.	• EFCs can help inform short-term forecasting and subsequent scheduling and dispatch of flexibility services. • EFCs can help prioritise the dispatch of reliable and cost-effective flexibility, which reduces the impact of over-procurement and over provisioning.

48: EquiFlex

1 Customer Offering
2 Flexibility Impact
3 Recruitment
4 Customer Preference
5 Engagement Strategy
6 Trial Design
7 Market Design

Project Overview

Description	• EquiFlex aimed to promote equal access to the participation in flexibility markets, ensuring no customers are unfairly left behind and enabling a just transition to NetZero. More info
Project Dates	Mar 2024 – Jun 2024
Project Partners	SP ENERGY NETWORKS; energy action SCOTLAND; East Ayrshire Council Comhairle Siorrachd Air an Ear; FRAZER-NASH CONSULTANCY A KBR COMPANY

Project Scope

1. Understand the current flexibility market with a focus on barriers and opportunities for vulnerable and less engaged customers.
2. Investigate whether the characteristics of energy consumption among the target groups provides opportunities to develop new flexibility products.
3. Begin developing a 'toolkit' to help stakeholders like DNOs, local authorities and community energy groups to determine the best flexibility options to pursue in a particular area based on its energy needs, network configuration and consumer demographics.

Learnings for flexibility and heat decarbonisation

- Learnings will become apparent as the outputs of the project are shared.
- EquiFlex should share learnings on how to enable access to participation in flexibility markets beyond the most affluent and engaged customers.
- EquiFlex should provide a 'toolkit' to identify optimal localised flexibility options given network parameters and customer demographics, this should be useful for supporting future trial designs.

49: Balancer

Project Overview

Description	• Balancer designed business models for front-of-the-meter community batteries placed on the grid edge, with an energy equity lens. More info
Project Dates	Mar 2024 – Jun 2024
Project Partners	UK Power Networks Delivering your electricity; centre for sustainable energy; frontier economics; ECOJOULE ENERGY

Project Scope

1. Challenge regulatory barriers and develop innovative commercial and technical framework for front-of-the-meter community batteries that can provide services to communities, flexibility providers and DNOs.
2. Focus on giving access and enabling disadvantaged customers to participate in flexibility markets using these battery commercials.

Learnings for flexibility

- The project identified that two business models should be considered going forward, summarised below:

Community Network	Community Storage
What: Improve the quality of the local network, reducing need for reinforcement and supporting earlier rollout of LCTs.	**What:** Allow local communities to consume locally produced renewables and shift their consumption to off-peak times.
How: Flexibility services, voltage control services, (potentially) resilience services	**How:** Storage services provided direct to local community.
Benefits: Easiest (alongside Market) to implement within existing regulatory and commercial framework.	**Benefits:** Offers greater direct benefits to local community (compared to Community Network and Market).
Issues: Unless communities own the battery, offers fewer direct benefits to local community than Community Storage.	**Issues**: Will require changes to supplier tariff and billing structures to allow local community consumption/export net of the battery – further investigation required.

50: Equal LCTs

Project Overview

Description	• Equal LCTs aimed to accelerate the development of enabling propositions for hard to reach and left behind consumers so that all segments of society can benefit from LCTs, energy efficiency, and LV flexibility and the enabling investments being made in electricity networks. More info
Project Dates	Feb 2024 – Nov 2024
Project Partners	Scottish & Southern Electricity Networks; Baringa; centre for sustainable energy

Project Scope

1. Identify segments of society that have existing support to take part in the energy transition versus those currently left behind.
2. Understand what flexibility benefits/opportunities LCTs can offer per region and current barriers to flexibility participation and investment.
3. Define a prioritised list of consumer segments to be targeted, by region and LCT type, to meet consumer and network needs.
4. Define the consumer propositions and commercial models for each segment.
5. Design a trial to test technical and commercial viability of the chosen model(s) and measure their success with consumers.

Learnings for flexibility and heat decarbonisation

- Learnings will become apparent as the outputs of the project are shared.
- Equal LCTs should identify segments of society who should maintain a focus for future flexibility and heat decarbonisation innovation projects.
- The trials testing commercial models and technical viability should provide learnings that can be used in future projects.

51: Market Signals Heating Electrification

Project Overview

Description	• Seeks to understand how flexibility market signals can encourage electrification of heating, and the adoption of flexible heating practices from domestic consumers and their homes. More info
Project Dates	Mar 2024 – Jan 2025
Project Partners	NESO National Energy System Operator; WSP

Project Scope

1. Understand what market signals NESO should develop to encourage electrified heating and flexibility practices, and where these sit in the wider context of market signals for domestic consumers.
2. Create a roadmap for implementation of the optimal enablers, including design of a trial.

Learnings for flexibility and heat decarbonisation

- Learnings will become apparent as the outputs of the project are shared.
- Understanding the signals identified by this project will help with the design of future flexibility trials for various low carbon heating technologies.
- The lessons from this project should facilitate the use of flexibility market signals to encourage electrification of heating, and the adoption of flexible heating practices from domestic consumers and their homes.

52: CoolDown

Project Overview

Description	• CoolDown is exploring the impact of cooling on network capacity by producing improved uptake and demand projections as well as developing novel commercial models to incentivise and unlock space-cooling flexibility, More info
Project Dates	Mar 2024 – Jun 2024 (Discovery), Oct 2024 – Mar 2025 (Alpha)
Project Partners	electricity north west, Guidehouse, UCL, Oaktree Power, nationalgrid Electricity Distribution, IMPACT

Project Scope

1. CoolDown will improve understanding of the relationship between electric heating and Space-Cooling (SC), helping to maximise the energy system flexibility which building temperature management can provide as a consequence of heating electrification.
2. CoolDown will explore SC's relationship with peak summer substation demand and distributed renewables output to quantify the network impact including the need for, and value of, SC flexibility to minimise network reinforcement and contribute to efficient grid operations.

Learnings for flexibility and heat decarbonisation

- The project modelled the over heating risk of buildings connected to ENW secondary substations. The simulations found that by 2050 for each of the two substations modelled, 16 out of 46 and 80 out of 121 buildings would experience overheating.
- For buildings that were forecasted to overheat, reinforcement triggers and opportunities for demand response (DR) were identified. The project found that :
  - substation reinforcement was deferred by DR for:
    - 100% uptake of SC - 2 of 36 substations by 2030 (6%) and 1 of 36 substations by 2050 (3%)
    - 50% uptake of SC - 1 of 36 (3%) substations by 2030 and 0 of 36 (0%) substations by 2050
  - the potential for DR - Demand exceeding asset firm capacity
    - 100% uptake of SC - 1.4MW by 2030 and 3MW by 2050
    - 50% uptake of SC - 0.3MW by 2030 and 1.4MW by 2050
- For 50% cooling with DR up to £57m of cumulative benefit can be achieved by 2050 when scaled across 17,00 ENW substations.
- Cooling DR programmes are most prevalent in North America and Australia.
- 5 possible commercial models were identified for SC DR and their possible barriers to deployment.
- The alpha phase will delve deeper into the value of SC flexibility products and design 4-6 commercial arrangements in detail to be trialled at scale in a potential Beta phase.

1 Customer Offering
2 Flexibility Impact
3 Recruitment
4 Customer Preference
5 Engagement Strategy
6 Trial Design
7 Market Design

53: Rural Energy and Community Heat (REACH)

Project Overview

Description	• Rural Energy and Community Heat (REACH) is helping rural customers/ communities navigate the complex decision-making process for decarbonising, and assessing methodologies for localised heat pump control aimed at mitigating upstream network constraints, More info
Project Dates	Mar 2024 – Jun 2024 (Discovery), Oct 2024 – Mar 2025 (Alpha)
Project Partners	nationalgrid

Project Scope

1. Refine the design of the REACH Energy Centre, focusing on techno-economic aspects to ensure effective and efficient energy solutions to manage peak electricity demand in constrained parts of rural network.
2. Develop tools for a broader cohort of communities to understand their options for decarbonisation. The tools will assist communities in determining their requirements. It will specify a modular solution, outputting indicative carbon reduction metrics, physical install requirements, and project costs.

Learnings for flexibility and heat decarbonisation

- The Discovery phase included an assessment of which low carbon heat technologies (ASHP, GSHP, Shared Ground Loop Arrays) would be best suited for the local environment. This decision was found to be mostly site specific, with GSHPs providing the best option for minimising annual and peak grid load.
- The Alpha phase will look at a more detailed quantitative analysis of heat flexibility that is availability from shared heat pump control. If network conditions require, customers will allow the REACH energy centre to control their heat pump profile to mitigate upstream 11kV constraints. In addition, battery storage located in the Energy Centre will be used to supplement the electricity network at peak demand, demonstrating a new approach to managing heat flexibility at a local, community owned level.

Electricity Distribution

3

Policy, Strategy, Markets and Regulation

Relevant policy and market designs and reviews relevant to EQUINOX

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Horizon Scan Coverage: UK policy, regulation, strategy and markets

The scan extensively covers the UK's current and proposed approach towards:

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UK flexibility build-out	**UK technology rollout**	**UK approach to energy bills**	**UK future flexibility market**
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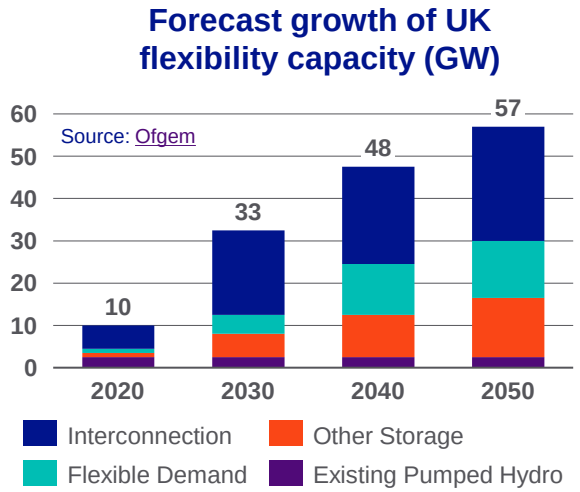
Major sources include: Department for Business, Energy & Industrial Strategy; ofgem; Climate Change Committee; NESO National Energy System Operator; ena energynetworks association

Ofgem expects 4GW of flexible demand needed by 2030, en route to 57GW total flexibility capacity by 2050



Interconnection is expected to be the major source of flexibility capacity, but flexible demand grows enormously.

To progress towards these goals, Ofgem's Smart Systems and Flexibility Plan sets out a vision for the mid 2020s.

It expects that all flexibility technologies will have improved access to flexibility markets and can stack revenues across multiple value sources. Innovative products, smart tech and rewards for demand response are encouraged.

Smart meters penetration should be near-100% for smaller scale consumers. Market-wide half-hourly settlement by October 2025 will incentivise energy suppliers to develop new tariffs encouraging demand response.

Ofgem's significant code review (SCR) aims to change the cost-reflectivity of network usage to a way that better reflects variations in network costs associated with location and time of use.

RELEVANCE TO EQUINOX

- EQUINOX will deliver its BaU product by the end of 2025 – it is important to ensure that this is consistent with Ofgem's vision for flexible consumer demand in the UK.
- Elements like the SCR should be tracked closely to see what BaU will look like from a regulatory perspective by 2025.

DSOs have established more detailed definitions of five new flexibility products (1/2)

Peak Reduction

Seeks a reduction in peak power utilised over time.

The product can manage peaks in demand and could be provided by long-term energy efficiency activities.

This product could be used where energy efficiency measures are planned that would reduce a sites overall electricity consumption across the year but specifically during high peak periods.

Scheduled Utilisation

Schedules the time that flexibility is delivered and pre-agrees it in advance with the provider.

This product will primarily benefit FSPs that cannot respond in real time or near to real time. This service can be used by the Network Companies to manage seasonal peak demands and defer network reinforcement.

Operational Utilisation

This product allows for the use case where the amount of flexibility delivered is agreed nearer to real time.

This product can be utilised to facilitate a change in demand profile from FSPs based on network conditions close to real time. The assets will be dispatched for the required level of service that is required based upon actual network measurement data thus managing the cost.

ENA Flexibility Review and Alignment for more details

DSOs have established more detailed definitions of five new flexibility products (2/2)

Operational Utilisation + Scheduled Availability

This product procures, ahead of time, the ability of an FSP to deliver an agreed change following a network abnormality.

The availability will be defined at the point of procurement and cannot be modified once the contract has been agreed. The assets will be dispatched for the required level of service that is required based on actual network measurement data, meaning that the DNO/NESO is only paying utilisation payments based upon the actual needs of the network.

Operational Utilisation + Variable Availability

This product allows for DNOs and NESO to procure a level of contracted capacity, but then refine the requirements in terms of availability closer to the event.

The assets will be dispatched for the required level of service that is required based upon actual network measurement data, meaning that the DNO/NESO is only paying utilisation payments based upon the actual needs of the network.

RELEVANCE TO EQUINOX

- These five products offer different potential routes for domestic assets to access the flexibility market.
- It is essential to understand how DSOs define parameters such as minimum capacity, utilisation, and notice period for each flexibility product to develop a product that is interoperable between networks in a BaU scenario.
- Note that these five products replace the four existing products that were previously defined.

ENA Flexibility Review and Alignment for more details

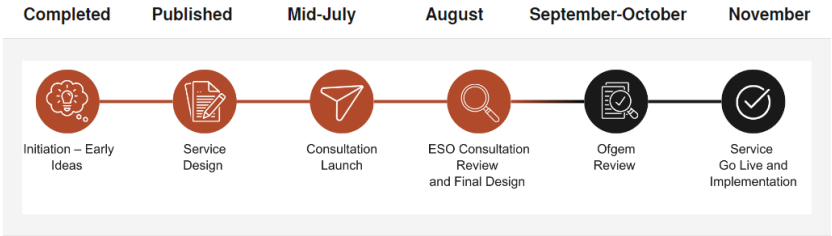
NESO's Demand Flexibility Service is to become year round commercial service

Demand Flexibility Service (DFS[1]) has continued as an enhanced service to focus on maximising volumes, incentivise new demand flexibility and bridge the gap to market-wide half-hourly settlement and entry into NESO's Ancillary services

Areas of consultation

- **Service Positioning**: evolve the service and move it to a commercial merit-based margin tool ensuring that participants and new flex volume will continue to see a route to market.
- **Stacking**: remove previous clauses preventing stacking with capacity market and DNO's flexibility markets. No stacking would be retained for the balancing markets.
- **Metering: widening the opportunity for asset meter participation by removing the requirement for the boundary meter to be half-hourly settled.**
- **Performance Incentives:** introducing a performance incentive mechanism ensuring the providers are accountable for delivery and incentivise accurate forecasting/ bids.
- **Procurement/ utilisation:** Moving the services to within day only by removing the day ahead capability.
- **Data/process:** removing the requirement to share incentive file data with NESO as the DFS moves towards a more commercial service.

Timelines to update the DFS



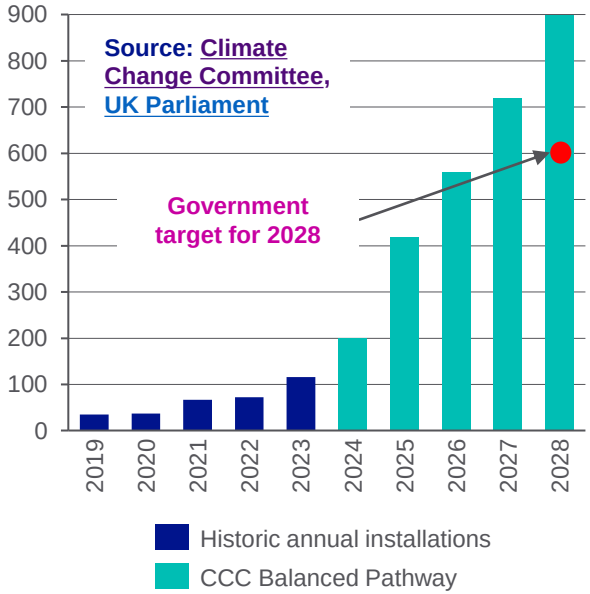
RELEVANCE TO EQUINOX

- This service provides details on how residential flexibility is valued by NESO, improved baselining methodologies for calculating demand reduction, and will serve EQUINOX discussions on ESO and DSO product stacking for trial 3.
- The evolved design will be consulted on in summer 2025 before being sent to Ofgem for approval.

[1] National Grid ESO For more details on DFS 2022/23 results and 2023/24 conditions, see previous Horizon Scan

The UK is making slow progress towards an ambitious 2028 goal of 600k/year heat pump installations

Historic and required UK annual installations of residential heat pumps (100s of thousands)



The UK is **well behind** in its current rollout – There are 4.1 installations per 1,000 people compared to 30.7 in Europe. 15.3 is the required rate.

The UK's 2035 ban on new gas boiler sales was scaled back to an 80% phase out by 2035 in September 2023, the new government has indicated it would scrap this target.

UK govt aims to **reduce** hardware and installation **costs by 25-50% by 2025**, and **parity with gas boilers by 2030.**

Boiler Upgrade Scheme (BUS) provides £7,500 for ASHPs and GSHPs **since 23 October 2023**, up from £5,000 and £6,000, respectively. The increased grant offering resulted in more applications (see slide 40). £1.5 billion extra funding announced for 2025-2028, on top of initial £450 million.

Future Homes Standard will from 2025 mandate heat pumps in all new build properties. Clean Heat Market Mechanism[1] currently slated for 2025 launch, penalising manufacturers for missing heat pump production targets.

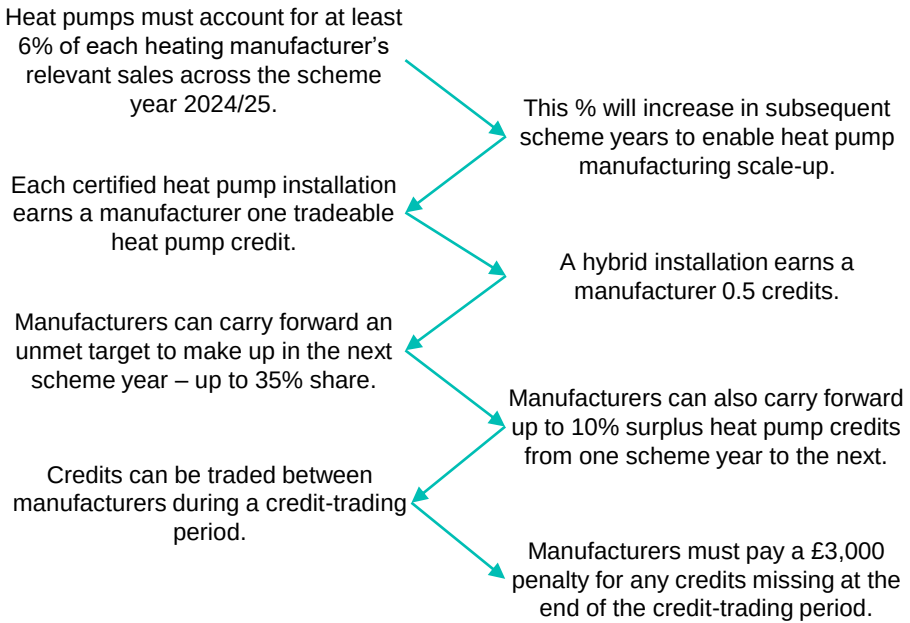
RELEVANCE TO EQUINOX

- Project will need to track rollout progress to understand how quickly recruitment pool is expanding, for both the winter trials and the BaU product.

[1] See Slide 35 for more details

The Clean Heat Market Mechanism is a market approach to scaling up heat pump deployment by manufacturers

How the Clean Heat Market Mechanism will work



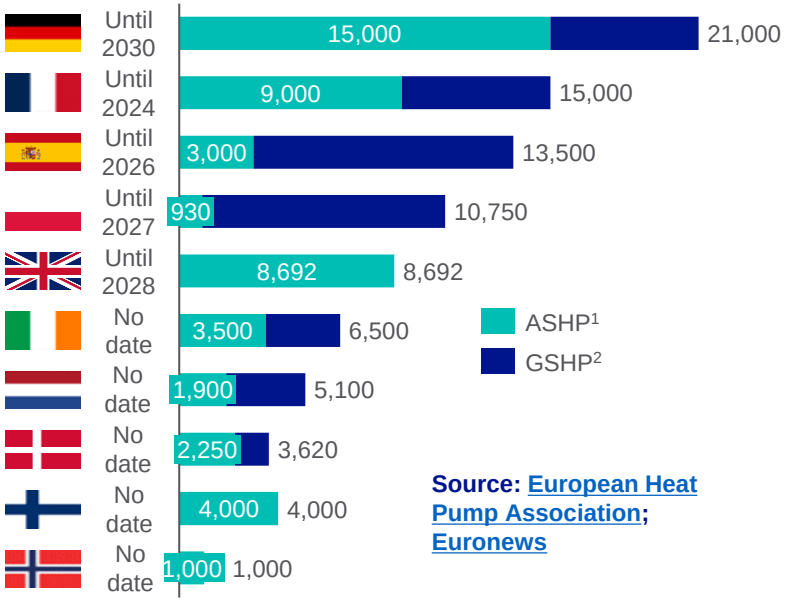
- The government has shifted the mechanism's start date from April 2024 to April 2025 to give businesses more time to prepare.
- Manufacturers are not requested to produce supply chain plans to keep reporting and administrative burdens to a minimum in early scheme years.
- The scheme will be managed and regulated by the Environment Agency (EA)
- Labour indicated when in opposition that they would continue to support the CHMM

RELEVANCE TO EQUINOX

- The delayed rollout of the scheme is indicative of the slow ramp up of heat pump production in the UK – this limits the pool of customers for EQUINOX's final year of trials.

UK offers generous grants for ASHPs compared to most European peers, bar France & Germany

Grants available for heat pump installations in selected European countries (€)



Source: European Heat Pump Association; Euronews

Poland plans to stop consumers who buy heat pumps certified under the KEYMARK scheme being eligible for subsidies from 2025.

Schemes like FranceRenov (Up to €10k per household to help with installation costs), reduced VAT rate of 5.5% for renovation projects including heat pump installs and Ma Prime Renov (Up to €10k per household for renovation projects) have maintained France's strong heat pump growth.

Germany will spend €2.4bn less on heat pumps in 2025 than 2024 – a cut of 16%. The subsidies on the left could reduce.

Denmark restarted its heat pump subsidy scheme in May 2024. DKK 17k for air-to-water, DKK 27k for liquid-to-water.

RELEVANCE TO EQUINOX

- Being aware of policies in place elsewhere indicates how new or amended UK policies may change UK heat pump installation rates, which impacts the reach of EQUINOX's BaU arrangements.

[1] Minimum grant for an ASHP; [2] Maximum grant for a GSHP

New partnerships and incentives intended to accelerate the heat pump rollout (Q3 2024)

Halifax boost green home improvement incentives

Halifax mortgage customers are now able to earn thousands in cashback for making improvements to the energy efficiency of their home, thanks to a boost in the bank's Green Living Reward (GLR) scheme.

Customers can now claim £2,000 cashback for installing a home heat pump, Octopus Energy has been named as a preferred partner for heat pump installation.

Octopus launches new referral scheme

Octopus Energy has announced the launch of its low carbon domestic technology referral scheme, offering £100 worth of incentives for heat pump and solar installations.

New low carbon heating trainee scheme

Aira, has opened its new training academy in Sheffield to close the green skills gap by developing heat pump installers and renewable technicians.

Aira also opened its first training centre in London.

Vaillant is supporting the inaugural cohort of Low Carbon Heating Technician Apprentices (LCHTA) accredited with the King's Standard.

New partnerships and incentives intended to accelerate the heat pump rollout (Q3 2024)

ScottishPower launches two clean heating schemes

ScottishPower has announced the launch of two clean heating schemes. This includes the appointment of ScottishPower's second heat pump installation provider, Plug Me In.

The second scheme was launched in conjunction with Energy Systems Catapult as the company's first trial of its Warm Home Prescription (WHP).

Kensa, GTC partner to deliver heat pumps for new build homes

The new solution from Kensa and GTC would see a ground source heat pump installed in each property, connected to a shared network of hidden underground pipework, to provide home heating and hot water.

Octopus adds to its partnerships for Zero Bills scheme

Octopus aims to partner with housebuilders to deliver 50,000 'Zero Bills' homes globally by 2025. These houses aim to be bills-free for five years, guaranteed. Each house is fitted with low carbon technologies, optimised by the Kraken tech platform.

Housing developers Tilia Homes and Hopkins Homes, both owned by Terra Firma, have joined Octopus Energy's 'Zero Bills' proposition.

UK approves over-allocation of BUS vouchers

DESNZ has permitted Ofgem to over-allocate vouchers for the BUS by up to £50 million in this financial year - a 33% increase. July 2024 saw the second-highest applications since the scheme's launch.

A Centre for Net Zero study found that the BUS provides societal benefits of £1.24 are achieved per £1 of government spending.

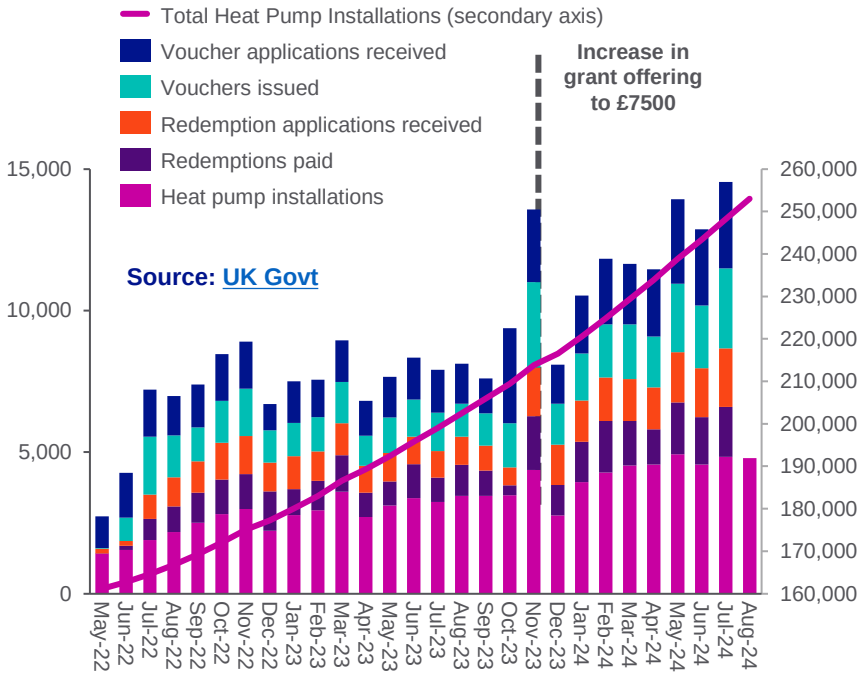
New data for the UK shows promise for accelerating heat pump installations towards targets

July BUS applications second-highest on record

- New data on the BUS shows that July 2024 saw the second-highest number of applications since the scheme launched in April 2022.
- The scheme received 3,047 applications in July, only beaten in November 2023 immediately after the grant offering was raised from £5,000 to £7,500.
- Redemption numbers also saw an uplift, with July 2024 BUS voucher redemptions setting a new record for the scheme and surpassing 2,000 redemptions for the first time.
- Over 1,757 grants were paid out in July 2024, bringing the total number of grants paid through the scheme to 30,354.

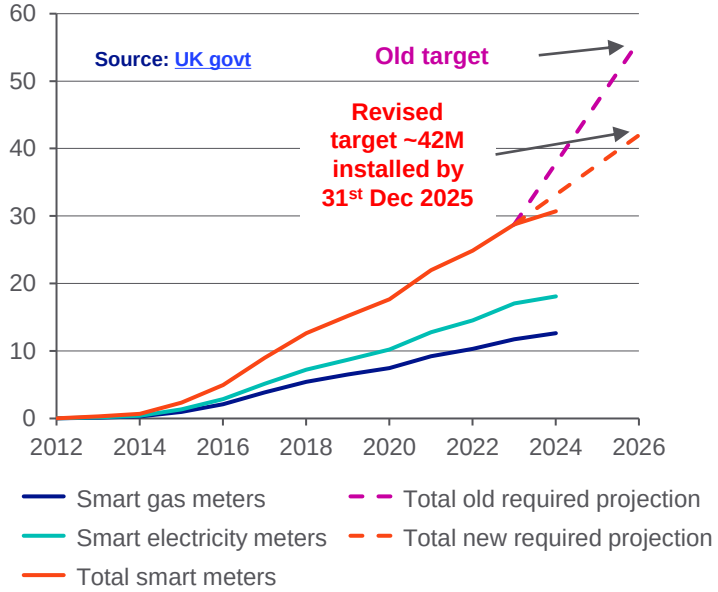
RELEVANCE TO EQUINOX

- As heat pumps proliferate, there will be more assets available to provide distribution-level flexibility.



Smart meters targeted for most homes by the end of 2025, requiring accelerated rollout

Historic and required UK cumulative rollout of domestic smart meters operated in smart mode (millions)



Target to install a smart meter in 100% of domestic properties by the end of 2025 was scaled back to 74.5% in July 2023.

Since January 2022, all suppliers have had **binding annual install targets** through to 2025. Targets will be **reset annually** based on the proportion of a supplier's customer base **still with a non-smart meter.**

Installation trend is falling off track for revised 2025 target, which will still leave one in four homes without a smart meter even if met.

SSEN are the first DNO to publish full smart meter half-hourly consumption datasets. All UK DNOs have collaborated on interoperable sharing method.

RELEVANCE TO EQUINOX

- Project close, and thus recommendations for business as usual commercial arrangements, is also scheduled for the end of 2025.
- Only customers with a smart meter can participate in EQUNIOX, so understanding the pace of the smart meter rollout helps with forecasting potential future reach for the service.

Ofgem announce Elexon as market facilitator for local energy flexibility

Key purpose

- Its mission is to spearhead and enable greater flexible energy use across GB's local electricity distribution networks.
- It will act as a single, expert entity that will work closely with Ofgem, NESO (National Energy System Operator), ENA (Energy Networks Association), local networks, and Flexibility Service Providers (FSPs) to drive alignment between local and national flexibility markets and remove any barriers.

Next Steps

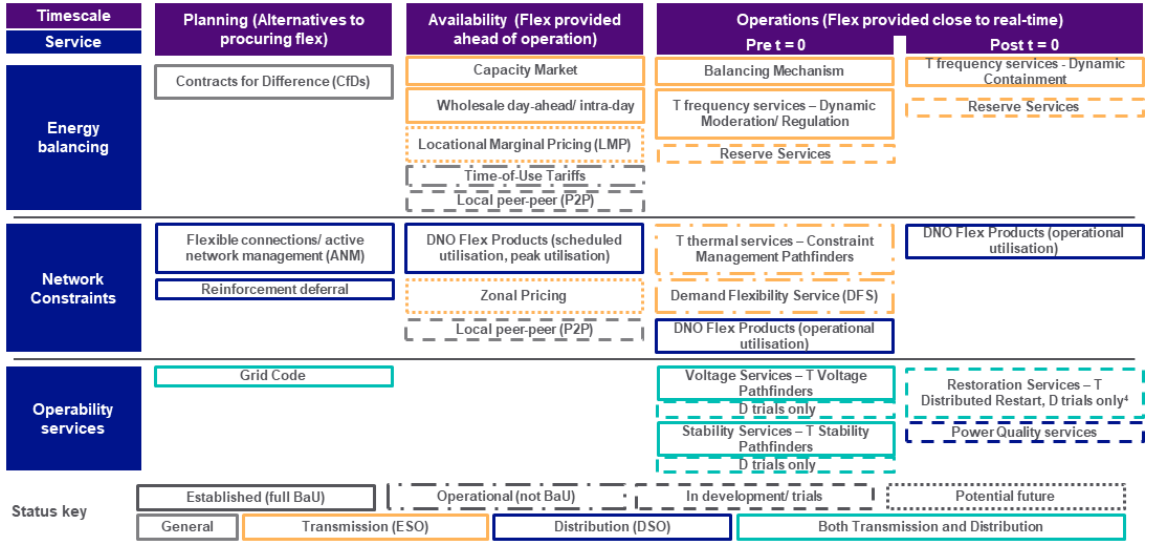
- Ofgem launched a consultation to get views on delivering a common Flexibility Market Asset Registration, these included:
  - prioritising common Flexibility Market Asset Registration as the first step in achieving the overall Flexibility Digital Infrastructure vision and scope, as well as the functions and principles it should deliver; and
  - the Market Facilitator being responsible for delivering enablers and design activities, through Working Groups.

RELEVANCE TO EQUINOX

- The appointment of Exelon may lead to changes in how the flexibility market operates which is where the EQUINOX project will ultimately slot into. Assets that are part of the EQUINOX project may need to feature on the Flexibility Market Asset register in order to partake in the flexibility market.

NESOs update to the DFS will provide new opportunities for stacking ESO and DSO products

NESO's plan to make the DFS a year round commercial service in November 24 is also presenting new opportunities for the stacking of flexibility products including the possible removal of previous clauses preventing stacking with capacity market and DNO's flexibility market.

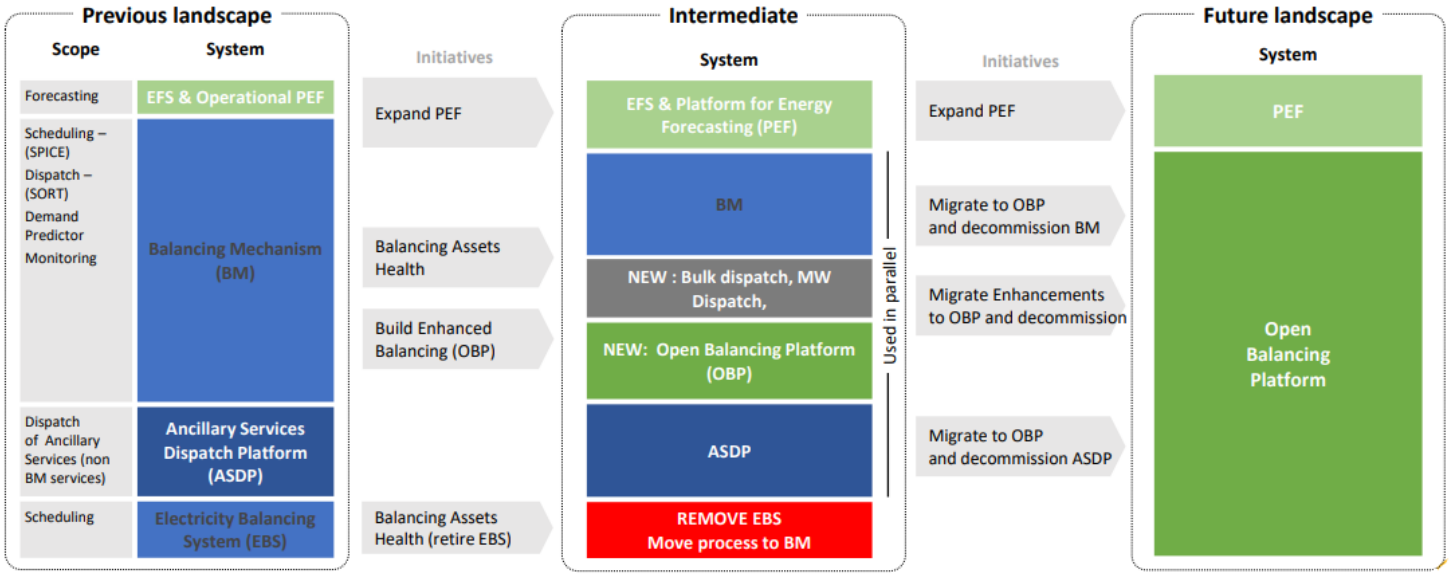


RELEVANCE TO EQUINOX

- It will be important for EQUINOX to keep track of which ESO products can be stacked with each other, and with DNO flexibility products.
- This will enable the project to appreciate whether/when/how DNO requirements should be prioritised over ESO ones (and vice versa).
- The removal of restriction of some stacking may open up the market to new entrants and increase the competition for EQUINOX.

NESO's Balancing Transformation Programme presented a proposal for the future of the Balancing Mechanism (BM)

The programme will deliver the Open Balancing Platform (OBP), a new real time capability to replace legacy ESO balancing systems (EBS, BM and ASDP).



RELEVANCE TO EQUINOX

- It will be important for EQUINOX to keep track of which ESO products can be stacked with each other, and with DNO flexibility products

Electricity Distribution

A1

List of Previous Projects Identified and Selected Updated Deep Dives

nationalgrid Guidehouse

Projects for key learnings 1/5[1]

Dates in bold indicate that this project's deep dive slide is in this Appendix because there has been an update since a previous Horizon Scan

Project	Country	Lead	Description	Domestic flexibility	Trials at scale	Low carbon heat	Project dates
1. Intraflex		nationalgrid	First close to real time trading of domestic flex, allowing market to determine price.	✓	✓		Oct 2019 - Nov 2021
2. Crowdflex NIA		NESO National Energy System Operator	Large-scale commercial trial to understand the domestic flexibility across various LCTs.	✓	✓		Apr 2021 - Mar 2022
3. Crowdflex SIF Alpha		NESO National Energy System Operator	Deeper dive into the system role of domestic flexibility, plus potential stacking opportunities.	✓	✓		Aug 2022 - Jan 2023
4. Energywise		UK Power Networks	Understand and trial energy efficiency and commercial arrangements with fuel poor customers.	✓	✓		Jan 2014 - Sep 2018
5. SAVE		Scottish & Southern Electricity Networks	Understand whether price signals can impact household peak demand.	✓	✓		Jan 2014 - Jun 2019
6. Flexibility Demand Shift Trial		SP ENERGY NETWORKS	Turn-up trial where consumers were rewarded with free energy for using abundant renewables.	✓	✓		Mar 2022 – Apr 2022
7. Powerloop		octopus electric vehicles	Residential V2G trial with Nissan Leafs.	✓	✓		Mar 2018 - Mar 2022
8. Vehicle-to-Grid Trial		energy	Use bidirectional charging to balance the grid and improve energy efficiency.	✓	✓		Jan 2021 - Jan 2023
9. Future Flex		nationalgrid	Design and trial a new flexibility product for unlocking domestic flexibility.	✓	✓		Nov 2021- Mar 2023

[1] Link to previous Horizon Scan iteration for deep dives on full list of projects 1 - 45

Projects for key learnings 2/5[1]

Dates in bold indicate that this project's deep dive slide is in this Appendix because there has been an update since a previous Horizon Scan

Project	Country	Lead	Description	Domestic flexibility	Trials at scale	Low carbon heat	Project dates
10. Peak Heat		nationalgrid	Desktop modelling study to better understand impact/ flexibility of HPs.	✓		✓	Feb 2021 - May 2022
11. 4D heat		Scottish & Southern Electricity Networks	Flexible residential heating demand to absorb wind power that would otherwise have been curtailed.	✓		✓	May 2020 - Nov 2020
12. LEO – Smart Flex		LEO Local Energy Oxfordshire	Understand the potential for flexibility services to help enable a zero-carbon future for rural communities with planning constraints.	✓		✓	Jan 2022 – Jun 2023
13. No Regrets		passivSYSTEMS	Bring a novel hybrid HP commercial offer to market, and experiment with DSR viability.	✓		✓	Oct 2018 - Apr 2019
14. HyCompact		UK Power Networks	Trial of 7 new single unit hybrid heating systems.	✓		✓	Aug 2020 - Jun 2022
15. Right to Heat		UK Power Networks	Develop best practice decarbonising heat and decreasing bills in gas grid connected urban social housing.	✓		✓	Feb 2022 - Jul 2023
16. Neighbourhood Green		UK Power Networks	Propose an industry standard view on diversity factors for heat, understand flex potential.	✓		✓	Feb 2022 - Feb 2024
17. CommuniHeat		UK Power Networks	Developing a roadmap for how rural communities can switch to low carbon heat.	✓		✓	Oct 2020 - Jun 2022

[1]Link to previous Horizon Scan iteration for deep dives on full list of projects 1 - 45

Projects for key learnings 3/5[1]

Dates in bold indicate that this project's deep dive slide is in this Appendix because there has been an update since a previous Horizon Scan

Project	Country	Lead	Description	Domestic flexibility	Trials at scale	Low carbon heat	Project dates
18. Freedom		nationalgrid	Balancing networks through optimising use of HHPs.			✓	Oct 2016 - Jan 2019
19. Redmast		nationalgrid	Evaluating current energy market set-up to investigate future market designs.	✓			Jan 2022 - Aug 2022
20. HOMEflex		Scottish & Southern Electricity Networks	Development of a Code of Conduct to build trust in domestic flexibility market and support consumer engagement.	✓		✓	**June 2022 – May 2024**
21. Regulated Power Pricing pilot		London Hydro	Critical peak pricing trial of cooling flex with & without real time data.	✓			May 2016 - Apr 2019
22. Advantage Power Pricing Pilot		alectra	Tests response of technology-enabled residents to dynamic price signals.	✓	✓	✓	Nov 2015 - Aug 2019
23. EnergyWise Home		DUKE ENERGY	Residential trial of direct load consumption for heating/cooling.	✓	✓	✓	Jan 2014 - Sep 2018
24. Viflex		VIESMANN	Test how reduced HP demand can stabilise transmission system.	✓	✓	✓	Dec 2020 - Ongoing
25. HeatFlex		TenneT	DNO cooperation to intelligently use flexibility from distributed heat pumps to avoid grid bottlenecks.	✓	✓	✓	Jul 2018 - Jun 2020
26. Modelec		POWEO	Test load shedding models for consumers in response to different demand responses.	✓	✓	✓	Jan 2011 - Jul 2014

[1] Link to previous Horizon Scan iteration for deep dives on full list of projects 1 - 45

Projects for key learnings 4/5[1]

Dates in bold indicate that this project's deep dive slide is in this Appendix because there has been an update since a previous Horizon Scan

Project	Country	Lead	Description	Domestic flexibility	Trials at scale	Low carbon heat	Project dates
27. Electrification of Heat		CATAPULT Energy Systems	Technical and practical feasibility of a large-scale heat pump rollout into existing British homes.		✓	✓	June 2020 – Dec 2022
28. NeatHeat		UK Power Networks	Test how Zero Emission Boilers (ZEB) interacts with the electricity network.	✓		✓	**Sep 2022 – Feb 2024**
29. ReHeat		SP ENERGY NETWORKS	Trial network solutions to mitigate the effects of increased demand from domestic electrical heating on the distribution network.	✓	✓	✓	June 2021 – Oct 2024
30. Flexible Tower		SP ENERGY NETWORKS	Demonstrating ability of electric storage heaters to shift demand.	✓			Feb 2021 – May 2022
31. GOFLEX		IBM	Technology solutions for distributed flexibilities and automated dynamic pricing market.	✓	✓		Nov 2016 – Feb 2020
32. EcoGrid EU		ENERGINET.DK	Using market mechanisms and smart control of electricity to balance the energy system.	✓	✓		2011-2015
33. HeatFlex UK		Centre for Net Zero Powered by Octopus Energy	Improve understanding of heat pump flexibility potential and circumstances for participating in flexibility events.	✓	✓	✓	Sept 2022 – Sept 2024
34. Commander		NESO National Energy System Operator	Method for coordinating stackability and primacy for ESO/DSO flexibility.	✓			**Oct 2022 – Jan 2024**

[1]Link to previous Horizon Scan iteration for deep dives on full list of projects 1 - 45

Projects for key learnings 5/6[1]

Dates in bold indicate that this project's deep dive slide is in this Appendix because there has been an update since a previous Horizon Scan

Project	Country	Lead	Description	Domestic flexibility	Trials at scale	Low carbon heat	Project dates
35. Net Zero Terrace		electricity north west	Explores how to decarbonise a terraced street using a network-integrated smart local energy system.	✓		✓	Apr 2023 – June 2023
36. Community DSO		NORTHERN POWERGRID	Initial assessment into the feasibility of smart local energy systems as a future option.	✓	✓		Jan 2022– Dec 2027
37. Transition		Scottish & Southern Electricity Networks	Aims to adapt electricity infrastructure as system moves towards a more distributed and flexible network.	✓	✓		Jan 2018 – Jul 2021
38. Fusion		SP ENERGY NETWORKS	Trial of local demand side flex through a structured and competitive market to unlock the value of network flexibility.	✓			Oct 2018 – Dec 2023
39. Flex Heat Networks		UK Power Networks	Investigates how all-electric heat network could affect the network and how DNOs can manage them flexibly.	✓		✓	Jul 2023 – Aug 2025
40. Watt Heat		UK Power Networks	Investigates potential of thermal storage technologies to mitigate peak electricity load growth from domestic heat.	✓		✓	Apr 2023 – Jul 2023
41. Net Zero Terrace SIF Alpha		electricity north west	Explores how to decarbonise a terraced street using a network-integrated smart local energy system.	✓		✓	**Oct 2023 – Apr 2024**

[1] Link to previous Horizon Scan iteration for deep dives on full list of projects 1 - 45

Projects for key learnings 6/6[1]

Dates in bold indicate that this project's deep dive slide is in this Appendix because there has been an update since a previous Horizon Scan

Project	Country	Lead	Description	Domestic flexibility	Trials at scale	Low carbon heat	Project dates
42. Whole Energy System Accelerator		CATAPULT Energy Systems	Utilises real time customer electricity usage data to inform, design and simulate future networks, and send real time price signals to customers.	✓		✓	Jan 2023 onwards
43. CrowdFlex SIF BETA		NESO National Energy System Operator	Trials NESO capability to procure flexibility from domestic customers through availability and utilisation payments.	✓	✓		Dec 2023 – Jan 2026
44. Heat Risers		UK Power Networks	Aims to overcome network connection barriers that hold back multi-occupancy building heating decarbonisation.			✓	**Oct 2023 – Apr 2024**
45. SHIELD		UK Power Networks	Aims to develop low-cost low carbon heating solutions for vulnerable customers and social housing tenants using waste heat recovery from small distributed data centres.	✓		✓	**Oct 2023 – Apr 2024**

[1] Link to previous Horizon Scan iteration for deep dives on full list of projects 1-45

20: HOMEflex

Project Overview

Description [More info]	Develop a **Code of Conduct** to create an **inclusive, fair, and transparent marketplace** for domestic flexibility services.
Project Dates	June 2022 – May 2024
Project Partners	Scottish & Southern Electricity Networks; Flex Assure; centre for sustainable energy

Project Methodology

- Develop Code of Conduct by mapping emerging business models, identifying actors/relationships, and considering how to treat different parties under this Code.
- Establish steering committee composed of key stakeholders to provide input to and oversight of project.
- Engage consumers by undertaking four focus group sessions throughout the project to inform drafting of Code of Conduct and assess potential impact of voluntary compliance scheme on market take up.
- Establish frameworks for a voluntary compliance scheme, including a dispute resolution mechanism.

Learnings for flexibility and heat decarbonisation

Each section of the HOMEflex Code of Conduct was consulted on and has specific feedback from the participants as follows:

Sales and Marketing

- Financial information should be tailored to specific household circumstances, to indicate timeframes of benefits and to acknowledge any relevant uncertainties in forecasting. Geographical limits of service provision and measures should be specified to facilitate comparison.

Contracts and Terms and Conditions

- Terms and Conditions should be concise and easy-to-read.
- Key areas of discussion included transparency on financial elements, clarity around insurance and guidelines around what happens in case of supplier insolvency.

Technical Due Diligence, Data and Cyber Security

- Participants from low income and low confidence groups were keen that any technologies or services were properly explained and, where possible, standardised in terms of warranties and compatibility.
- Others felt that they wanted providers to provide some insight on their energy data: for example, providing tips for maximising savings.

Complaints and Redress

- Participants cited the need for an independent body (an ombudsman or regulator) to deal with complaints and redress and enforce standards.

Ethical Considerations

- Participants requested more clarity around: how the ability to manage financial risk was measured, which consumer vulnerabilities are included in consideration, and what constitutes inclusive design.

28: NeatHeat

1 Customer Offering
2 Flexibility Impact
3 Recruitment
4 Customer Preference
5 Engagement Strategy
6 Trial Design
7 Market Design

Project Overview

Description	• Test how Tepeo's innovative Zero Emission Boiler (ZEB) interacts with the electricity network, allowing DNOs to use existing infrastructure in a smarter way and suppliers to develop new offerings which reduce customer costs More info
Project Dates	September 2022 – February 2024
Project Partners	UK Power Networks, OVO energy, tepeo

Project Methodology

- Installed tepeo's ZEB in 8+ households for free, replacing current heating system, assessing compatibility and the challenges that arise.
- Monitored ZEB performance throughout the trial to understand the charging pattern and test various optimisation mechanisms that will provide flexibility to the network.
- Engaged with participants throughout the process to gather feedback and understand customer needs.
- Tested first of its kind 'Type-of-use-Tariff' that allows customers to use clean heat at a lower cost.

Learnings for flexibility and heat decarbonisation

- ZEBs draw 95% of their electricity **outside** the four most expensive tariff periods, which typically align with network **peak demand** in the evening. This shows that thermal storage is an effective solution to low carbon heating.
- Tepeo are investigating how to display planned charging to customers to improve confidence in **automatically scheduled devices**.
- Installers, energy suppliers and manufacturers will need to develop clear and concise **educational materials** to create a positive experience for consumers.

34: COMMANDER

Project Overview

Description	• Coordinated Operational Methodology for Managing and Accessing Network Distributed Energy Resources. More info • Considering ways to improve coordination between DSOs and NESO by developing a roadmap of coordination scenarios for flexibility services.
Project Dates	October 2022 – January 2024
Project Partners	NESO National Energy System Operator; Electricity Distribution; WSP

Project Challenge

- There is uncertainty around DSO and NESO roles and responsibilities in the rapidly developing, smart, more flexible electricity system.
- The roadmap developed in COMMANDER will include clearly defined NESO/DSO roles and responsibilities and potential coordination options for accessing and managing the services of distributed energy resources (DERs) connected to the distribution networks.

Learnings for flexibility and heat decarbonisation

- Most modelled cases showed the maximum whole system benefits would be realised by delivering enhanced coordination as early as **2028**.
- Integrated Whole Energy Systems (IWES) 2050 analysis shows that flexibility services are expected to be substantial (~140TWh/annum) for a fully decarbonised energy system and this will be instrumental in delivering net zero.
- Key focus areas to develop coordination: standardisation of data exchange, visibility of network assets, resolution of primacy rules for system actors and policies.
- The IWES model is extremely adaptable to changing industry dynamics.
- These types of projects would benefit from shorter timescale of implementation, given the frequent policy changes.

41: Net Zero Terrace (NZT) Alpha

1 Customer Offering
2 Flexibility Impact
3 Recruitment
4 Customer Preference
5 Engagement Strategy
6 Trial Design
7 Market Design

Project Overview

Description	• SIF Alpha project aiming to decarbonise a terraced street using a Smart Local Energy System (SLES) that is integrated with the network, optimised, affordable to consumers, and replicable. More info.
Project Dates	Oct 2023 – Apr 2024
Project Partners	electricity north west; NORTHERN POWERGRID; BURO HAPPOLD; north east & yorkshire NET ZERO HUB; Rossendale BOROUGH COUNCIL

Project Scope/Methodology

- Aims to tackle challenges of deploying low carbon heating solutions for terraced housing, which is impacted by space and noise constraints.
- Aims to create a Smart Local Energy System (SLES) comprised of ambient loop ground source heat pumps (GSHPs), community-provided storage and solar PV, and local peer-to-peer Power Purchase Agreements (PPAs) controlled by optimisation software.
- Will provide a replicable model that integrates with the electricity network, reduces bills, and defers the need for reinforcement.
- Innovative in working across mixed-ownership buildings for the first time, making use of the DNO network.

Learnings for flexibility and heat decarbonisation

- Their techno-economic model showed there are still challenges to make their solution affordable. This may delay the widespread deployment of heat pumps for low income households.
- Integrating a Smart Local Energy System (SLES) is achievable but may require active network management.
- CBA shows that solutions such as “overlaying LV cables and increasing local transformer capacity” is financially sensible over a 20-year period.

44: Heat Risers

Project Overview

Description	• Strategic Innovation Fund (SIF) Alpha project aiming to remove blockages to heat decarbonisation of multi-occupancy buildings (MOBs). More info
Project Dates	Oct 2023 – Apr 2024
Project Partners	UK Power Networks

Project Scope

- Discovery demonstrated a one-size-fits-all approach is not appropriate for MOBs given the diversity of characteristics and local network constraints.
- Subsequent phases aim to develop and test a decision-making framework, recommend new funding and incentive mechanisms, and boundaries of responsibility.
- Alpha explores the value of providing a self-serve planning tool for building owners and managers to give a clearer view of how to decarbonise their portfolio of buildings.
- The focus is on developing solutions to unlock connection cost barriers.

Learnings for flexibility and heat decarbonisation

- Decarbonisation of heat in MOBs is difficult because:
  a) There is a lack of customer understanding of solution space and connection costs.
  b) Most funding is currently focused on other building types.
  c) Policies negatively affect MOBs leading to unusually high costs.
  d) There is a lack of individual responsibility.
- A trial version of a “Decision-Making Framework” (DMF) has been developed to aid MOBs chose their heating solution. 31 building archetypes have been modelled using this tool.
- This project was unsuccessful in receiving SIF Beta phase funding.
- Through these efforts, Heat Risers may increase adoption of heat pumps.

45: SHIELD

Project Overview

Description	• Strategic Innovation Fund (SIF) Alpha project aiming to develop low-cost low carbon heating solutions for vulnerable customers and social housing tenants. More info
Project Dates	Oct 2023 – Apr 2024
Project Partners	UK Power Networks, Power Circle, thermify, Essex County Council, Citizens Advice Essex, Eastlight Community Homes, CW community works

Project Scope

- SHIELD installs distributed data centres (HeatHubs) into peoples' homes, focusing on vulnerable and/or social housing tenants. These data centres provide heat as a by-product. The project aims to test whether this is a commercially efficient way of providing:

1. An additional heat source for homeowners - the hubs adjust activities based on household temperature e.g., to avoid overheating in summer.
2. A reliable revenue stream for manufacturer Thermify - they use the hubs to provide data services to clients.
3. A source of flexible supply and demand for networks - the hubs are connected to smart local energy systems to provide flexibility and balancing services.

Learnings for flexibility and heat decarbonisation

- UKPN estimate they will deliver a 40% reduction in energy costs for households in fuel poverty.
- With Thermify's product, tenants do not need to make a behavioral change to make savings.
- The product can be installed in less than 5 days.
- HeatHubs can compete with heat pumps in three areas: price, installation time and comfort impact. Overall, this means that heat pump adoption, especially for lower-income households may be slow.

Electricity Distribution

A2

Abbreviations

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List of abbreviations

Abbreviation	Means
BaU	Business as Usual
BEIS	Department for Business, Energy and Industrial Strategy
BUS	Boiler Upgrade Scheme
CMZ	Constraint Managed Zone
CPP	Critical Peak Pricing
DFS	Demand Flexibility Service
DLC	Direct Load Control
DNO	Distribution Network Operator
DSO	Distribution System Operator
DSR	Demand Side Response
ENA	Energy Networks Association
ESO	Electricity System Operator

Abbreviation	Means
EV	Electric Vehicle
HP	Heat Pump
LCT	Low Carbon Technology
NESO	National Energy System Operator
OFGEM	Office of Gas and Electricity Markets
PV	Photovoltaic
REMA	Review of Electricity Market Arrangements
RT	Real Time
SIF	Strategic Innovation Fund
SLES	Smart Local Energy Systems
ToU	Time of Use
V2G	Vehicle to grid

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