UK Power Networks
Delivering your electricity

Network Innovation Allowance Annual Summary

Progress and results from regulatory year 2024/25

July 2025

Contents

Foreword

At UK Power Networks, our commitment to innovation is at the heart of everything we do. As we navigate the complexities of the energy transition, our focus remains steadfast on delivering tangible benefits to our customers and stakeholders. The 2024/25 regulatory year has been a testament to our dedication to turning innovative ideas into business-as-usual (BAU) products and services, ensuring that our network remains resilient, efficient, and future-ready.

Our innovation strategy is not just about exploring new technologies; it's about embedding these innovations into our daily operations. This year, we have 22 BAU solutions reporting benefits, demonstrating our ability to scale and integrate new solutions seamlessly. Meanwhile our three alpha strategic innovation fund (SIF) projects have moved into the beta phase, showcasing our capability to secure funding and progress projects that align with our long-term goals.

One of the highlights of this year has been the introduction of the Innovation Atlas, which has mapped out our strategic direction towards 2050 targets. This initiative has not only aligned our thinking but also provided a clear roadmap for the industry as a whole.

Our focus on robust processes and collaboration with partners and stakeholders has been instrumental in identifying new opportunities and maximising the impact of our services.

Throughout the year, we have continued to foster a culture of innovation within our organisation. By increasing internally funded innovation initiatives, our team has been able to work more closely with the business, conducting ideation sessions and delivering projects that address real-world challenges. This approach has allowed us to remain agile and responsive to industry changes, ensuring that our innovation pipeline remains robust and diverse.

Our commitment to innovation is also reflected in our performance metrics. During the 2024/25 regulatory year, a significant portion of our innovation project work was self-funded, with additional contributions from partners and regulatory bodies. This collaborative approach will enable us to deliver measurable benefits, with several projects moving into BAU operations.

As we look ahead, we remain dedicated to driving innovation that delivers real value to our customers and stakeholders. Our journey is far from over, and we are excited about the opportunities that lie ahead. Together with our stakeholders and project partners, we will continue to push the boundaries of what is possible, ensuring that UK Power Networks remains at the forefront of the energy transition.

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Matthew White
Head of Customer Services and Innovation

Our Innovation Strategy

This year UK Power Networks scaled up the investment of our own funds into innovation by building up on the framework that had been established in the 2023/24 regulatory year.

Alongside this it was also the first year of moving into the beta phase for the three SIF projects which UK Power Networks successfully secured funding for: Climate Resilience Demonstrator (CReDo+), Heatropolis, and Smart Heat and Intelligent Energy in Low-Income Districts (SHIELD).

In 2024/25 we have continued to focus our energy on working closely with the business to ensure that new innovation is delivered in collaboration with its key stakeholders, expediting deployment into BaU and a return on investment for our customers.

During the 2024/25 regulatory year, 41% of our innovation project work was self-funded (or business funded innovation (BFI)). The remaining portfolio was funded by the Network Innovation Allowance (NIA) 25% , SIF 20%, and the Network Innovation Competition (NIC) 14% as shown in Figure 01 below.

Figure 01: Share of £18 million expenditure across Innovation funding mechanisms in 2024/25

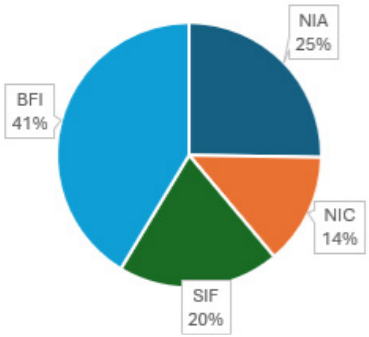
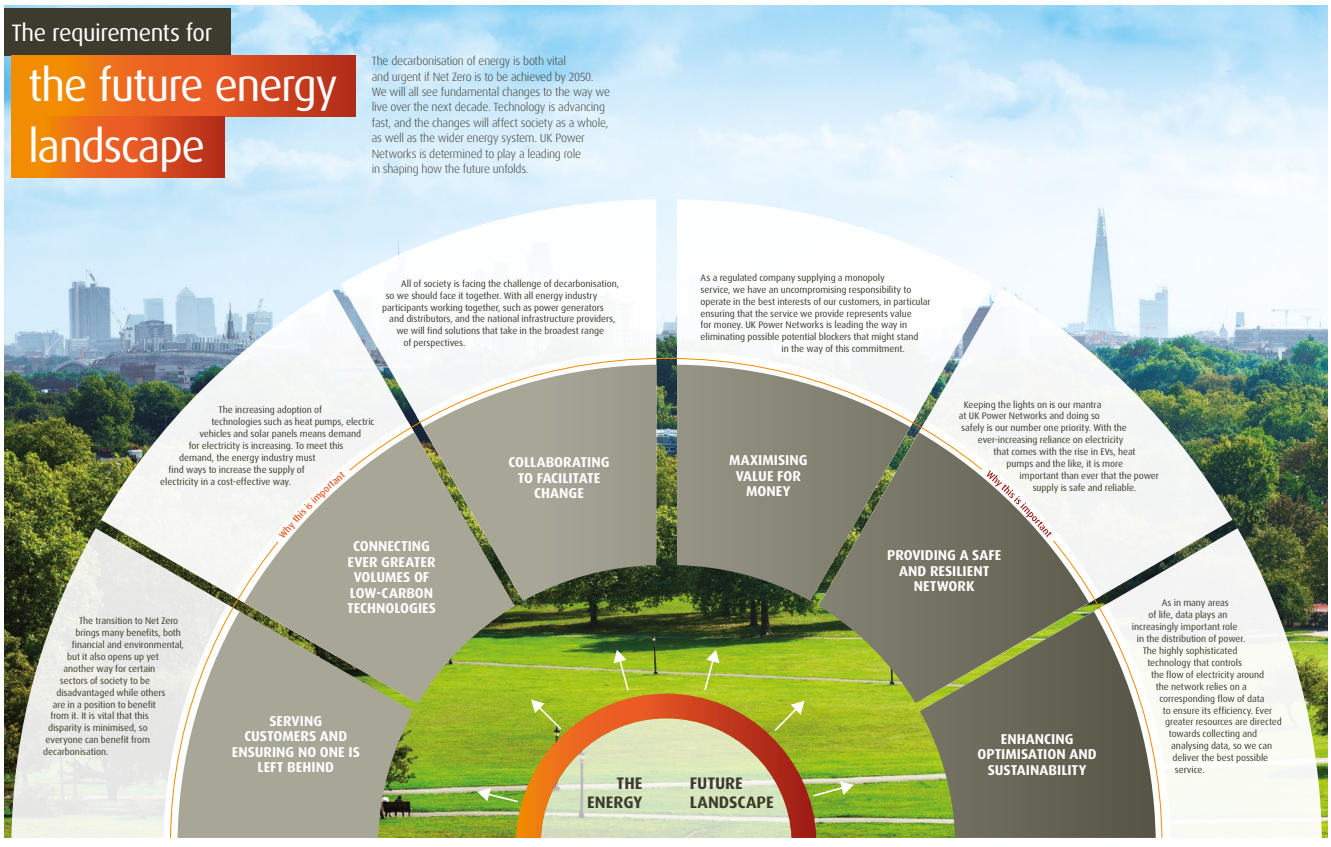


Figure 02 below shows an overview of our innovation strategy and how it is supporting the future energy landscape.

Figure 02: UK Power Networks' innovation strategy taken from our Annual Review 2024



Our Innovation Strategy

Continued

In the second year of RIIO-ED2 UK Power Networks' focus on innovation remains aligned with the themes set out by the Energy Networks Association (ENA).

In late 2024, the Innovation Atlas was also introduced, that mapped out a clear articulation of the ENA's vision up until 2050 for enabling the full decarbonisation of the UK through the delivery of a resilient and sustainable future energy system (see Figure 04 below from ENA's Innovation Strategy 2024.) Although this did not change the direction of travel for our innovation strategy, it did align our thinking around 2050 targets and what this would mean for the industry as a whole.

Figure 03: ENA's shared innovation themes.

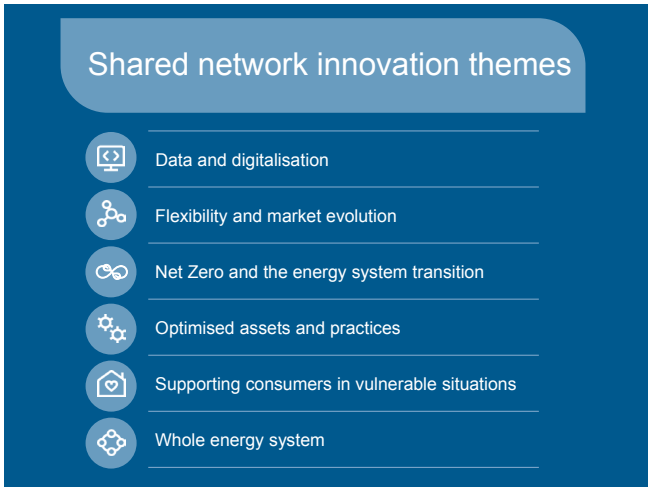
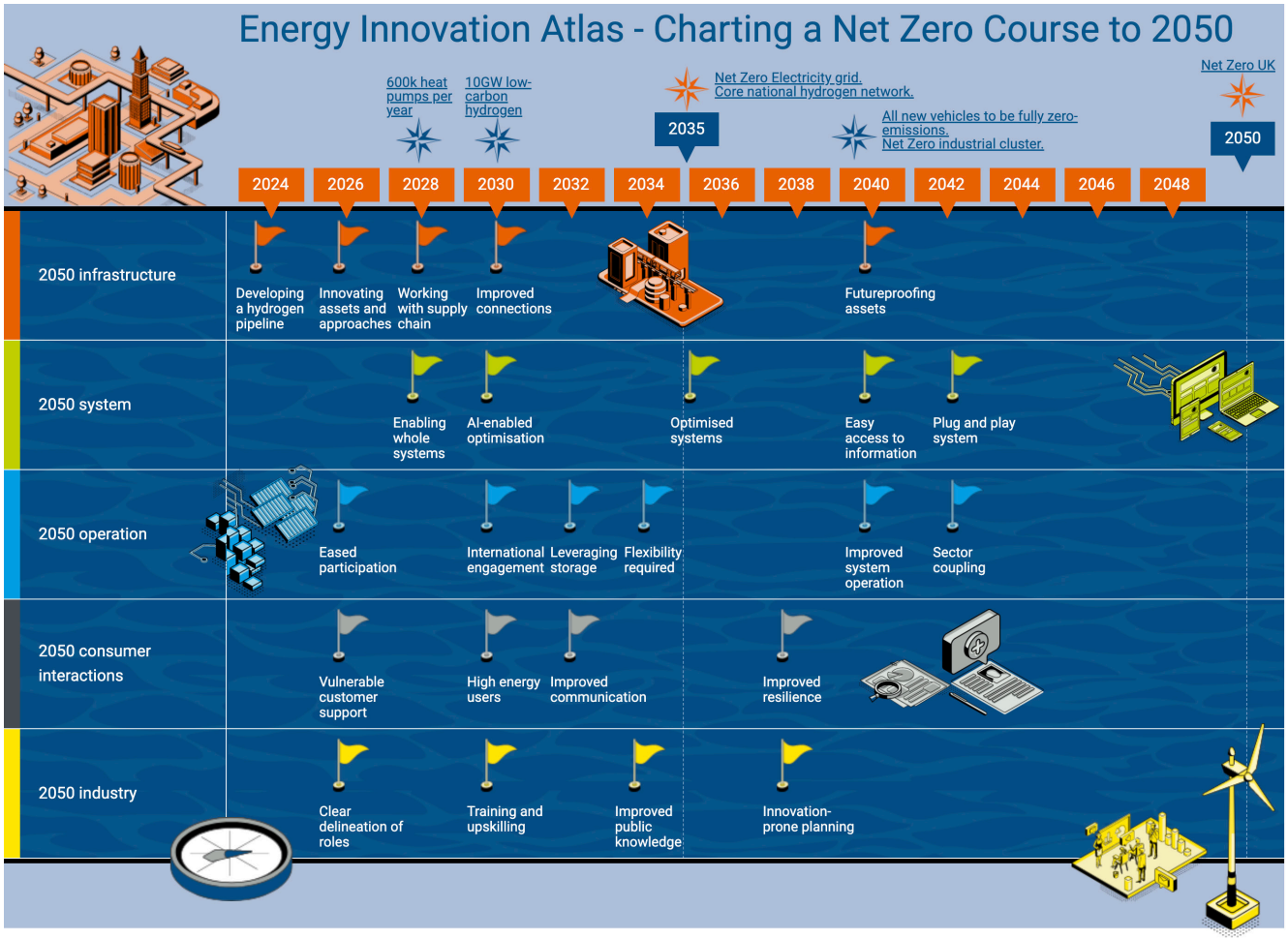


Figure 04: ENA's Innovation Atlas



Our Innovation Performance

How we are innovating

Robust Processes

Collaborating with Partners and Stakeholders

Collaboration is a cornerstone of a robust innovation portfolio, ensuring our work addresses the diverse challenges faced by our industry and customers. By partnering with stakeholders and customers, we identify new opportunities and maximize the impact of our services. To foster diverse perspectives, we have collaborated with a variety of partners, including technology vendors, software start-ups, energy suppliers, vehicle and fleet operators, local public bodies, and government entities.

Enhancing communication between our teams and the broader industry involves identifying and eliminating potential barriers to engagement. We strive to communicate our challenges to innovators clearly and increase the frequency of our calls to action. Additionally, we continue to leverage our strong relationship with the Energy Innovation Centre (EIC) and the PNDC to create a collaborative space for innovators and the industry.

Figure 05: Project Partners in the regulatory year 2024/25

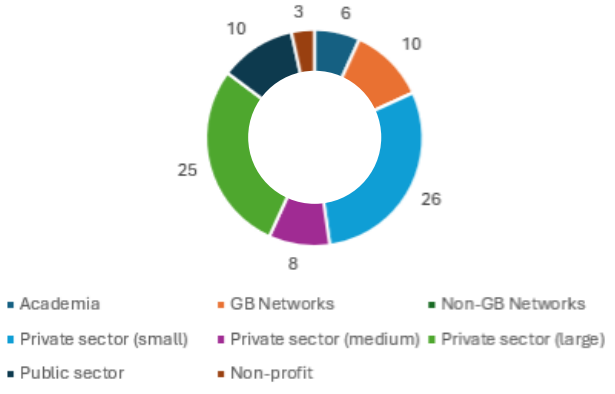
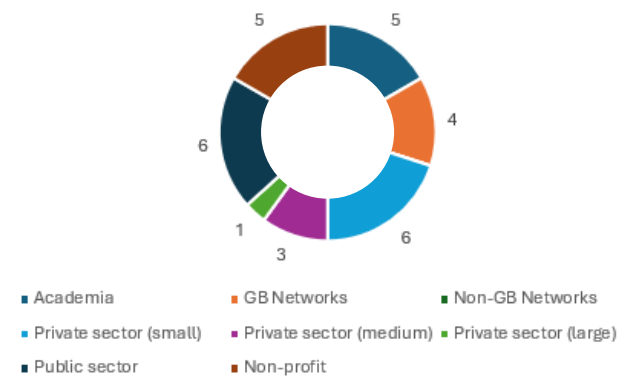


Figure 06: Project Supporters in the regulatory year 2024/25



We also readily engage to continuously improve the innovation approach across the wider industry. Led by UK Research and Innovation (UKRI), we helped co-author a comprehensive action plan to identify areas of further improvement of our culture of innovation for distribution network operators (DNOs) across the UK. We also work continuously with the ENA to develop strong relationships across network companies in the energy sector.

Figures 05 and 06 (below left) illustrate the range of project partners and supporters we have engaged with. In the regulatory year 2024/25, we collaborated with 88 partners, with the majority being large and small companies from the private sector.

Fostering a Culture of Innovation

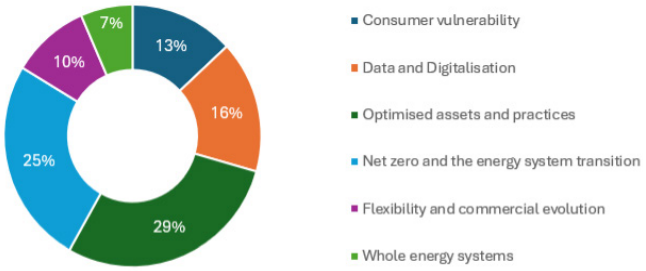
Throughout 2024/25 we have continued to embed innovative practices throughout our business. An increase in internally funded innovation to supplement our focus on Ofgem funded projects has meant that UK Power Networks' employees respond well to innovation challenges and our team is closer to the business and their needs than ever before, partnering with them to conduct ideation and deliver projects.

Our Innovation Pipeline

We continuously evaluate the robustness of our innovation pipeline by not only considering the value it provides to our consumers but also ensuring the diversity of our portfolio, which we monitor in alignment with our innovation themes. In crafting our innovation strategy for RIIO-ED2, we have committed to maintaining agility in our approach, enabling us to swiftly realign our priorities in response to industry changes. A diverse portfolio is instrumental in achieving this flexibility.

Figure 07 (below) demonstrates how our innovation projects align to the ENA themes.

Figure 07: Innovation projects alignment with the ENA Innovation Strategy in the regulatory year 2024/25



Our Innovation Performance

Continued

The results we are delivering

At UK Power Networks, the Innovation team is focussed on delivering benefits and maximising the return on investment, no matter where this investment comes from. This has meant developing robust processes to consistently baseline and track benefits, so that we can accurately account for these throughout RIIO-ED2 and beyond. This allows us to continue to communicate the value of innovation to our stakeholders.

This has also honed our focus on the deployment of innovation and how to set projects up for success beyond the direct involvement of the innovation delivery team. Depending on the readiness of the solution, or of the team receiving the solution, we know that careful change management is required to embed solutions and maximise its benefits.

UKPN has reported benefits from 22 solutions (an additional 19 solutions from the first year of ED2), which totalled £133.9m between April 2023 and March 2025, as shown in Figure 8 (for the solution Cleaner Engines the negative value is due to the investment cost of the solution being greater than the benefits realised in the first year of rollout).

Figure 08: Innovation benefits delivered in the regulatory year 2024/25

DATE OF SOLUTION ROLLOUT	SOLUTION NAME	BENEFITS DELIVERED ED2 TO DATE (£M)
01/11/2023	Active Network Management	86.31
01/04/2015	Automated Power Restoration System	16.93
04/01/2018	Timed Connection	10.59
01/04/2021	Smart Connect (Transpower)	8.01
01/04/2024	Spotlight	2.67
01/04/2017	The Perfluorocarbon Tracer (PFT)	2.54
01/04/2019	Pressurised Cable active management	2.35
01/04/2019	Primary Outage Restoration Tool PORT	1.44
01/04/2020	Smart Traffic Lights Kent	0.99
01/04/2020	Remote Portable Switch	0.72
07/11/2023	LV interconnected pairs	0.68
01/11/2023	Arc Aid	0.35
01/04/2024	LV Analytics Tool	0.27
01/04/2017	Joint Shell	0.22
26/06/2024	HVAQ	0.02
01/02/2024	Powercast	0.02
01/02/2024	Concerto	0.01
25/03/2024	GHSS V1	0.01
01/11/2023	Emerge	0.00
01/04/2024	Neighbourhood Green	-
01/04/2024	Power Protect	0.00
01/04/2024	Cleaner Engines / Hybrid Generators	-0.22
Total benefits from innovation		**133.90**

Highlights of our Innovation Project Portfolio

CLEO

Neat Heat

High Voltage (HV) Auto Quote

Shift 2.0

Blue Light

Our View

Almee

Flex Heat Networks

Keeping Comms Open

CommsConnect

Highlights of our Innovation Project Portfolio

CLEO

Background

Across the UK Power Networks' region, approximately 100 out of 133 local authorities have declared a climate emergency, reflecting a growing commitment to accelerating the transition to net zero. Nationally, over 300 local authorities have made similar declarations, with more than 60 of the 100 in our region setting ambitious targets to reach net zero by 2030 – well ahead of the national 2050 goal.

Regulatory expectations, particularly from Ofgem, emphasise that local energy plans should inform network investment decisions, ensuring that energy infrastructure aligns with long-term decarbonisation goals. However, each local authority has unique challenges, making it a complex, resource-intensive task to assess their energy needs, engage stakeholders, and develop comprehensive Local Area Energy Plans (LAEPs).

A significant barrier for many local authorities is limited expertise and capacity in energy planning. Many struggle to:

- Identify the energy and technology impacts of their development plans;
- Integrate multiple data sources and dependencies into a single LAEP;
- Assess the social equity implications of their decarbonisation strategies; and
- Effectively coordinate with regional and national energy stakeholders.

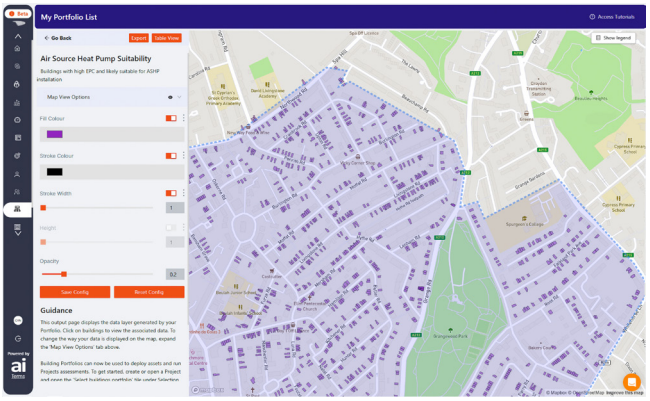
To bridge this gap, UK Power Networks has established a dedicated team that will work with all 133 local authorities throughout the RIIO-ED2 period. This team offers a structured, three-tiered support service, using a defined framework to assess, develop, and implement action plans, guiding investment decisions where a clear level of certainty is achieved.

To streamline collaboration and equip local authorities with the tools needed for effective energy planning, the project has delivered a free-to-use web-based geospatial platform. This tool enables local energy planners to:

- Layer and analyse multiple datasets to model Low Carbon Technology (LCT) deployment
- Visualise the impact of different decarbonisation scenarios
- Make data-driven decisions that align with the needs of their communities

By providing clear insights into how energy plans interact with local infrastructure, the tool enables planners to confidently develop, refine, and implement LAEPs, working in collaboration with UK Power Networks' Local Net Zero team. Once validated, these plans feed into long-term network forecasting, ensuring that reinforcement and investment decisions are made with greater certainty over the next 25 years.

Figure 09: Your Local Net Zero Hub - LAEP+ - Visualisation of the suitability of low carbon technologies on a map to identify the best potential placement to suit local authorities and their customer needs



Experience to date

The initial beta version of 'Your Local Net Zero Hub' was launched in July 2023, with 11 early adopters testing the platform's functionality and contributing feedback. Since then, the tool has undergone multiple iterations, improving usability, expanding dataset availability, and refining key features based on real-world use cases.

Highlights of our Innovation Project Portfolio

CLEO

Continued

Through iteration we learned more about local authority needs:

- We aligned to the Greater London Authority sub-regional LAEP programme so a London borough only needs to share their planned decarbonisation projects once.
- We also created digital tools so local authorities can more easily share their plans with us. For example, we introduced a Distribution Future Energy Scenario (DFES) widget that allows local authorities to share high-level targets with a drag and click.
- We proactively reviewed all 133 local authorities published decarbonisation plans and developed a personalised visual summary, 'Your decarbonisation journey'. This gives local authorities a single view of their existing plans and clarity on where we need further information.
- We supported and continue to support local authorities and development areas through the next stage by assessing their evolving plans against our forecasts, to mutually agree how and when to reflect their capacity needs in our forecasts.

By October 2023, the beta platform was open to all 133 local authorities. Driving engagement at this scale is no small task, as each authority is at a different stage in their net zero journey. To address this challenge, the UK Power Networks' Distribution System Operator (DSO), Local Net Zero Team led a second year of regional engagement in October 2024 providing a clear overview of the software, data and support available.

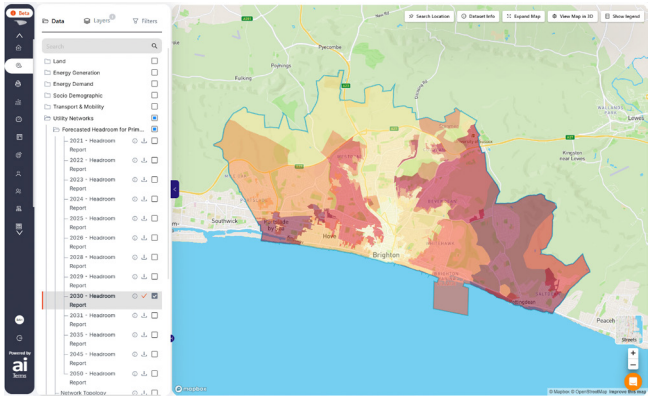
The response is overwhelmingly positive, with:

- 70% of local authorities signing up and actively using the platform
- Ongoing fortnightly training sessions to enhance user capability

28 training sessions have been held with a customer satisfaction score of 84.9% and designed to address key user challenges, including:

- Using the Your Local Net Zero Hub to design investable projects
- Leveraging 'Data Stories' to engage stakeholders and residents
- Uploading and integrating local datasets for enhanced analysis

Figure 10: Using Datasets in Your Local Net Zero Hub to design investable projects



From the outset, user-centred design has been at the core of the project, ensuring that local authorities play an active role in shaping the tool's features and datasets. The approach to user engagement was recognised externally by being awarded the Energy Institutes, International Energy Engagement award in 2024.

Figure 11: Awards Ceremony

Highlights of our Innovation Project Portfolio

CLEO

Continued

Future Developments

Building on the work that has been completed to date the Your Local Net Zero Hub is continuously evolving, guided by the needs of local authorities, energy partners, and community groups.

The CLEO project was adopted into a solution used by the Local Net Zero team planning to further develop the services, data, and tooling that they offer local authorities as they formally transition the tool into BAU.

Areas of further development will include:

- Working with Regional Energy Strategic Planner (RESP) to develop a standards-based approach LAEP
- Exploring methods and means to develop decarbonisation projects at a property-level
- Continue to engage with customers to explore how best to facilitate stakeholder consultations on energy strategies

With local authorities empowered to create robust, data-driven LAEPs, UK Power Networks can strengthen its forecasting models and proactively invest in network reinforcements to meet the needs of low-carbon communities of the future.

Highlights of our Innovation Project Portfolio

Neat Heat

Background

Heating is responsible for 37% of the UK's carbon emissions. In order to meet the net zero targets, this sector must be decarbonised – primarily through electrification.

While heat pumps are expected to be a core part of the 'electrification of heat', we understand that one size fits all does not work for heat. It can be a challenge to install these in homes with no outside space or limited internal space – specifically terraced housing archetypes. Even in units where external wall space is available, there is a significant disruption associated with heat pump installation, e.g. radiator replacements and pipework upgrades.

Heat pumps and their installation can be costly and, in some cases, up to £19,000. Even with the £7,500 grant available through the Government's Boiler Upgrade Scheme, this could still result in an end-cost of about £11,500 per home.

This subsidy makes heat pumps more affordable yet still expensive compared to typical boilers. Hence, these challenges require an alternative LCT solution for locations where heat pump installations are either impractical, non-desirable, or less cost-effective.

This project aimed to investigate the potential of tepeo's Zero Emission Boilers (ZEB), specifically smart electrical storage heaters, as an alternative to carbon-intensive gas boilers in areas where a heat pump is unsuitable for the reasons described above.

Neat Heat used a combination of qualitative customer research, quantitative analysis on monitoring data (supply point half-hourly consumption & dedicated asset monitoring), analysis of installations (time, disruption, upgrades required, etc) and industry subject matter expert interviews to determine the applicability and implications of using ZEBs at scale.

Figure 12: ZEB Installed in a kitchen

The ZEB is powered by electricity and works like a battery to store heat very efficiently until it is needed. When the thermostat asks for heat, air is circulated around a closed-loop system within the ZEB - the air picks up heat from the core and then transfers it to a heat exchanger with the central heating water running through it. The air is passed through specially designed channels within the core which optimise how heat is transferred around the system

Experience to date

The trial installations planned to include thirty customer homes as part of the project. The participating customers were chosen based on specific selection criteria and aimed to capture at least one full heating season. The data collected from this trial included electrical consumption and heating supply as well as the reliability of the product. After the trial, participants were able to keep the product for their personal use at no cost.

Highlights of our Innovation Project Portfolio

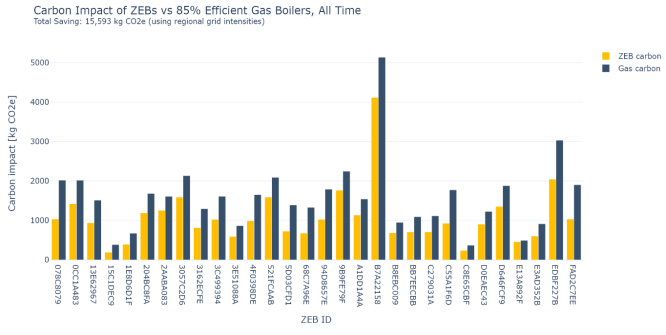
Neat Heat

Continued

The experience gained during the trial highlighted a number of key learnings:

- Customer satisfaction with heat batteries is very high: all participants interviewed at the end of the trial would recommend a ZEB. This is a strong signal that there is potential for this form of LCT.
- Installation of heat batteries is quick and non-disruptive: taking 1-2 days on average. This demonstrates the potential for it to be used in cases where time would be a blocker for heat pumps as a solution.
- Heat Batteries are highly flexible and able to decarbonise heating, with minimal grid impact: >95% of the electricity consumption was outside periods of traditional peak demand.
- There is headroom available for heat batteries to provide DSO & NESO flexibility services alongside optimising for energy price signals.
- A primary motivation for most customers was reducing carbon emissions. For a full year across the project (June 2023 to May 2024), the Neat Heat ZEBs saved ~15,600 kgCO2e compared to if these homes were running gas boilers at 85% efficiency. This equates to ~560kg CO2e per ZEB.

Figure 13: ZEB electricity consumption & heat output. January 2024, all ZEBs on smart charging



Future Developments

The Neat Heat project successfully completed in 2024 and, during its delivery, identified a number of areas that could be explored further. These could form important areas for future development in allowing adoption of these technologies:

1. **New Tariffs for Heat Storage:** We validated the potential for new tariffs to incentivise the use of ZEBs. An innovative "Type-of-Use-Tariff" was trialled, which charges customers a flat rate for using their heating regardless of the time of use. This approach aims to encourage customers to invest in low-carbon technologies like the ZEB. Additionally, the project identified the need for policy changes to make these technologies more accessible and compelling to homeowners, including VAT relief and access to the Boiler Upgrade Scheme. These areas should be further developed to provide a catalyst for customer uptake.

2. **New Propositions:** The project also identified novel sources of potential value, enabled by the introduction of such systems, for example, using behind-the-meter data to support network monitoring.

3. **Promotion of Thermal Storage as an Alternative to Homes Unsuitable for Heat Pumps:** The Neat Heat project demonstrated that ZEBs offer a viable alternative for homes that are not suitable for heat pumps due to physical constraints, cost, or customer preference. The project highlighted that ~40% of homes lack the internal or external space for a typical air source heat pump setup, making ZEBs a crucial option for decarbonising heating in these properties. The project also emphasized the need for other solutions beyond heat pumps and heat networks to achieve net zero. Opportunities to develop ways to spread awareness of ZEBs as an alternative should form part of the future roadmap in this space.

4. **Analysis of Impact on the Network with the DSO and the National Electricity System Operator (NESO):** The project showed that ZEBs can provide network flexibility services, system balancing, and deliver user comfort with a familiar heating experience. The project also highlighted the headroom available for DSO and NESO signals to complement energy price signals, helping to avoid network congestion and optimally utilise network capacity. Additionally, the project identified the potential for using ZEBs to shift heat demand to off-peak times, effectively delaying the need for network upgrades. These elements could form the basis of future innovation projects, in order to validate the potential for these capabilities.

These next steps focus on leveraging the insights gained from the Neat Heat project to promote the adoption of ZEBs and other low-carbon heating solutions, while addressing policy, customer education, and network impact considerations.

Highlights of our Innovation Project Portfolio

High Voltage (HV) Auto Quote

Background

Offers for new HV connections require several manual activities that are not always linear. UK Power Networks receives the connection application from a customer who will want a budget estimate or a firm connection offer, (or frequently both), which UK Power Networks is obliged to provide. UK Power Networks undertakes a series of assessments including a site visit where appropriate, to generate the budget estimates and firm connection offers.

This manual process can delay completion, especially when the requests are complex in nature. Once a customer receives the quotation, they may query the costs and the point of connection due to lacking visibility of the available capacity on the network and the nearest available connection points. This means the application experience can become drawn-out for the customer and is labour intensive for UK Power Networks.

This can lead to a protracted period of discussion between the customer and UK Power Networks to determine the most cost-effective point of connection for the customer, which adds additional time to the whole process. Ultimately the connection offer may not be accepted and the time spent could have been used to serve other customers. This places pressure on UK Power Networks' customer facing connections teams who are intent on providing excellent customer service. Furthermore, only 26% of the connection offers are currently accepted.

Customer expectations are rising in terms of the ability to self-serve and have access to all relevant information immediately, rather than having to wait for a response to their requests. For example, other DNOs such as Northern Powergrid (NPG) and Scottish Power Energy Networks (SPEN) are already utilising EA Technology's AutoDesign product for budget estimates.

Anecdotal feedback from a HV street charge point provider, Connected Kerb, indicates the target market is already using these self-service tools, which is raising the bar for network operators. HV Auto Quote has extended the application of the solution to the next level, offering firm connection offers, rather than only budget estimates.

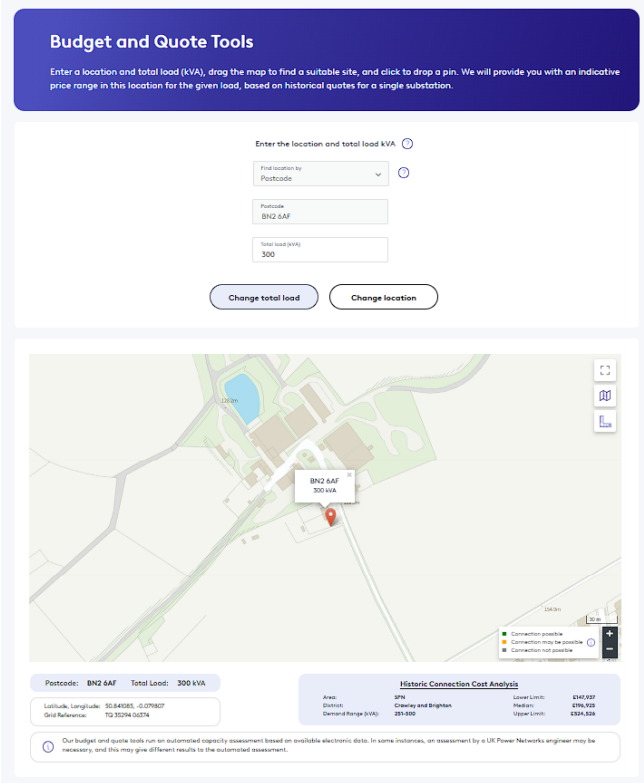
New innovation was required to bridge the gap between estimates and firm offers. This was achieved by incorporating traffic management costing into the tool, which allowed the level of detail required to provide firm offers.

Experience to date

The overall aim of the project was to enable self-service connection offer functionality for HV connections customers between 300 kVA and 1 MVA and budget estimates for connections between 300kVA and 2.5 MVA.

The tool provides three levels of functionality:
Optioneering: Shows historic price ranges, on screen, for jobs in the area the customer selects, allowing optioneering during early stages of a project.

Figure 14: Customers are able to access options by providing only minimal information



Budget Estimates: Allows customers to receive a more accurate estimate by providing additional information about their job, enabling them to plan costs more accurately.

Connection Offers: Enables customers to receive a formal, binding quotation if they provide even more detailed information above the requirements of budget estimate quotes.

Highlights of our Innovation Project Portfolio

High Voltage (HV) Auto Quote

Continued

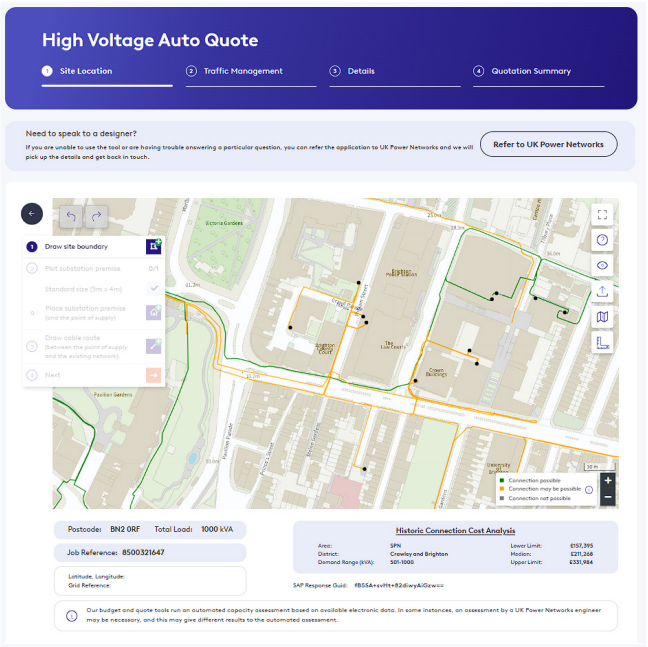
The project delivered an externally available website to UK Power Networks' customers using an interface designed to allow customers to describe their site, substation and cable route on a map. This required detailed discovery and documentation of current manual processes and underlying data. The processes and data were then codified and tested against manually generated connection offers to ensure they remained true to the output of existing procedures.

The implementation and delivery phase of HV Auto Quote started in December 2022 and finished in November 2024. During this phase, the project fully developed the customer journey and integrated the supporting UK Power Networks enterprise systems.

HV Auto Quote was successfully completed with a phased go live approach to customers undertaken between June and November 2024 to launch the different features of the tool. Some of the work completed to enable this include:

- A series of customer feedback sessions took place in June 2023, November 2023 and April 2024 with a mix of HV customers. They provided feedback on the customer journey, data input questions and other topics which has helped to inform the design and requirements of HV Auto Quote. Future features and enhancements that were not within the scope of the project have been captured and documented, and the backlog handed over to the BAU Product Manager. Designers continue to ask customers for feedback on the tool to help shape its future.
- High-level costing logic was developed to determine the cost of the work and the correct traffic management scheme. The customer journey and business processes have been mapped out and associated customer input questions were defined. This included the information that HV Auto Quote will require from a customer to produce a formal connection offer or budget estimate.
- The HV Auto Quote formal connection offer logic was deployed to the BAU environment with its full functionality, including traffic management. The tool allows the customer to draw their site boundary, pinpoint their point of supply and draw a cable route to the point of connection on the HV network and complete traffic management requirements for the site. This is currently available to applications within the South Eastern Power Networks (SPN) area. An ongoing project is exploring vectorisation for our other two regions.

Figure 15: Customers draw their job on a map on HV Auto Quote



Future Developments

Feedback from customer engagement sessions and internal testing has highlighted several potential enhancements for the tool. These enhancements have been added to the product backlog for future consideration. Of these enhancements, two are seen as priorities:

Designer Mode

The tool greatly reduces the time taken to produce formal connection offers. Despite the introduction of HV Auto Quote, other methods of new connection application requests must remain available to customers. We plan to create a designer mode, allowing designers to produce designs on behalf of customers using the tool. Whilst this requires slightly more resource than the fully self-serve journey, it still significantly enhances efficiency when compared to the fully manual process.

Low Voltage (LV) Auto Quote

The largest volume of applications received by UK Power Networks is for the LV network. We are therefore considering extending the product to also cover these types of connection applications.

Highlights of our Innovation Project Portfolio

Shift 2.0

Background

Our previous project, Shift, demonstrated that electric vehicle (EV) customers will change their demand patterns based on economic incentives; this is referred to as "herding" or "price herding". Today, this mostly leads to managed charging occurring in the overnight period (i.e. after midnight) when electricity prices are lowest. This tends to coincide with times when the distribution network is less heavily loaded, so managed charging tends to be of benefit to the distribution network operator (DNO) compared to unmanaged charging. However, in the future, with the rapid growth of LCTs alongside new electricity tariffs and wider energy market signals are likely to cause challenges such as secondary peaks overnight or herding.

Over the next decade, increases in wind and solar generation are expected to lead to low or negative wholesale prices occurring at different times across the day. We also anticipate more participation in flexibility services (e.g. demand turn-up) from domestic customers as NESO widens access. Domestic EVs under managed charging would be well-placed to offer such services.

This proposes a risk that customers might be incentivised to charge their vehicles at times when the distribution network is heavily loaded. In the Shift 2.0 impact assessment, we analysed the expected incidence of low wholesale price events at different points in the day. To do this, we used wholesale price projections to examine how the frequency and timing of these low-price events might evolve over time. We then examined the potential impact of such low-price events on network loading, assuming that flexible EV charging would optimise around these signals.

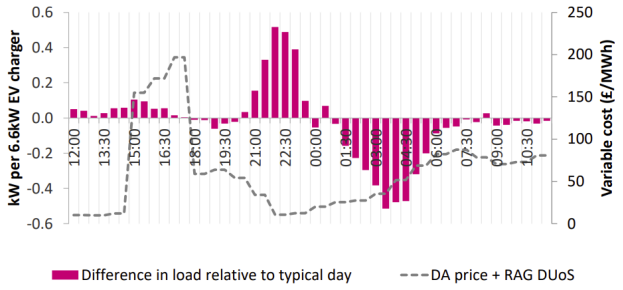
The objectives of the project were to understand and evidence the current charging behaviour of EVs in relation to price signals, and how this may change in the future. Additionally, the project aimed to develop a price signal that could mitigate the risks of wider market signals concentrating flexible demand into periods that cause more or larger local network peaks.

Experience to date

In the first phase of Shift 2.0, we modelled how EV load could shift when charging in response to low wholesale prices arising at different times of the day. This showed that by 2030, the expected increase of low wholesale prices in the evening period could lead to increased herding of EV charging at these times. The high levels of unmanaged electricity usage, also known as non-smart load, during this period, combined with the anticipated increase in EV adoption, were seen to create a risk of network overloading. This, in turn, would likely increase the network size that DNOs need to build.

In a trial with Octopus EV customers, we demonstrated that setting the highest day-ahead wholesale prices in the early evening and the lowest in the late evening, represented by the grey dotted line, can effectively shift charging behaviour. This pricing strategy encouraged customers to charge their cars later in the evening, when the network is under less strain. The impact is shown by the pink bars, which illustrate the change in load compared to a typical day without extreme day-ahead wholesale price signals incentivising customer consumption behaviour.

Figure 16: Results of Trial 1: Shifting Octopus Customers EV Charging Behaviour using DA Price Signals



Highlights of our Innovation Project Portfolio

Shift 2.0

Continued

The second phase of Shift 2.0 trialled ways in which DSOs could mitigate the effects of herding into undesirable times of day by using a market-responsive locational price signal. The use of a price signal can be an alternative or a complement to flexibility procurement. By exposing suppliers and aggregators to higher prices in some time periods, and lower prices in others, a DSO can encourage EV charging behaviours that better utilise the distribution network and reduce the risk of exceedances occurring.

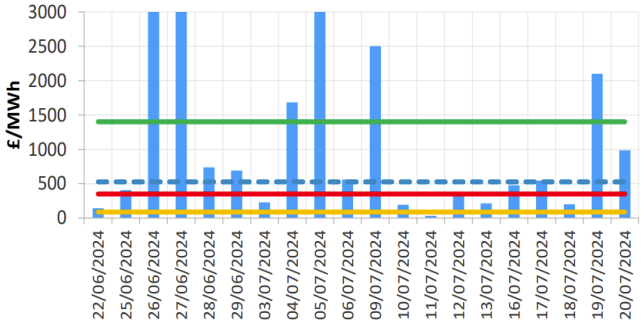
The price signal is locational in the sense that it responds to an individual substation's unique demand profile and is market-responsive in the sense that it incorporates the effect of short-term signals such as the day-ahead wholesale price on smart load, specifically EVs.

We iterated the price signal several times during the project, with the final signal determined according to three steps:

1. Forecasting the following day's demand at the substation chosen for the trial using UK Power Networks' existing short-term forecast of background demand plus a forecast of 'smart demand' based on an assumed number of EVs along with actual data aggregator (DA) wholesale electricity prices and Distribution Use of System (DUoS) charges. The relationship between smart EV charging and prices was inferred based on pre-trial analysis of Octopus data;
2. Identifying periods where the forecast may exceed the maximum capacity of the network;
3. Calculating a price in 'nearby' settlement periods that makes charging in those settlement periods cheaper than in those where an exceedance is forecast.

The price signal was calculated to influence the relative cost of charging, based on DA wholesale electricity prices and variable DUoS charges. If a flexibility service provider were to optimise primarily around other factors, such as the balancing mechanism or provision of an ancillary service, this price signal would likely be less effective.

Figure 17: Settled cost of the price signal for a selected substation



The trial included 1,349 EVs from Octopus and 477 from ev.energy, testing price signals from 22 June to 20 July in two phases: payment-only incentives (22 June – 5 July) and a £10/MWh cost during peak times (5 – 20 July).

Key findings:

- Price signals based on wholesale price and variable DUoS reduced charging by up to 35% during peak periods;
- Adding a cost component led to a stronger response than incentives alone, effectively discouraging charging during constrained times; and
- EV response depends on charging algorithms, requiring accurate forecasting to design effective price signals.

Future Developments

The trial proved successful as the price signal mechanism demonstrated its potential to manage EV herding behaviour and reduce network stress. To integrate this project into BAU, further work around the automation and commercialisation of the price signals is needed, as well as further supplier and aggregator engagement. An additional phase to explore further use on other flexible assets such as heat pumps could open even more opportunities for flexibility.

Highlights of our Innovation Project Portfolio

Blue Light

Background

The emergency services face unique challenges in their quest to decarbonise. The technology must align with their existing operational models, considering heightened reliability and security needs. Retrofitting existing estates presents considerable challenges, including limited space on sites.

The emergency services have large, distinct fleets and estates that stretch across all DNOs, presenting an ideal opportunity to learn from best practice and share the findings. To complicate matters, the emergency services have large disparities in decarbonisation maturity between them.

With specific targets in place for all emergency services, we are likely to see all emergency services organisations develop decarbonisation plans, requiring support, information and connections to the network. This will lead to a complex picture for network reinforcement.

Blue Light aims to support the decarbonisation of emergency services in the UK by developing and implementing innovative tools and strategies to facilitate their decarbonisation plans. The project will focus on comprehensive research, stakeholder engagement and technical development to address the unique challenges faced by the emergency services in electrifying their fleets.

The project will include research and engagement, followed by the development of a proof-of-concept solution for the tool and an implementation plan for BAU. The project is relevant to all blue light emergency services organisations in UK Power Networks' area, including 34 police, fire and ambulance organisations. The "Research and Engagement" work package looked to engage with as many of these as possible.

Experience to date

The first work package (WP1) has been completed, entailing engagement with multiple emergency services organisations to gather detailed information on their decarbonisation plans, key stakeholders involved, main concerns and risks, and operational requirements. WP1 successfully engaged 32 organisations across all police, ambulance, and fire and rescue. Four key challenge areas were identified that are highly relevant to the emergency services and have considerable implications for UK Power Networks:

Challenge 1

Emergency services connection requirements are uniquely complex and expensive, whilst facing significant budget constraints

Due to the intricacies of the estates and fleets operated by emergency services, decarbonising them presents a unique challenge. Increasing cost and time pressures are resulting in the condensing of connections applications into an increasingly small window, with UK Power Networks aiming to be an enabler of decarbonisation programmes, rather than a blocker.

As an example, one police authority noted that they had over 50 buildings, most of which were old with poor insulation and with limited space for any additional EV infrastructure. It was also noted that due to the nature of their operations, they would require very high energy consuming ultra-rapid chargers. As the services cannot be moved due to the operational importance of services within that community, installing the required LCTs for fleet and heat decarbonisation will be exceedingly expensive to overcome the building and operational constraints.

Challenge 2

Optioneering requires considerable input from DNO resources

The emergency services lack sufficient knowledge, information and technical resources to identify and analyse the different options associated with their connection requirements. This results in sub-optimal applications being prepared and submitted to DNOs. UK Power Networks invest considerable resources into supporting applications that have been made in a sub-optimal way.

There is a large opportunity to open access to the information required to analyse options and grid-specific conditions before the emergency services spend time and money on an application that is not optimised for a specific site.

Highlights of our Innovation Project Portfolio

Blue Light

Continued

Challenge 3

Connections planning requires a more consolidated approach between both departments and organisations

There is a lack of coordination within organisations, between fleet and estate decarbonisation efforts. These teams have been managed individually historically, but electrification is now aligning their priorities and programmes.

There is considerable opportunity for efficiencies and learnings to be shared between organisations, as there are similar operational constraints, risks and challenges. There is also a lack of coordination between different emergency service organisations.

Challenge 4

There is uncertainty around emergency services' resiliency planning

As the emergency services become progressively reliant on their electrical connections, the risks associated with outages and fluctuations in electricity prices increases. UK Power Networks has the potential to play a critical role in the development of a resilience strategy, supporting the identification of resilience options and risk mitigation strategies.

Future Developments

Two work packages (WP2 and WP3) are currently ongoing simultaneously alongside three project partners: London Fire Brigade, Essex Police and East of England Ambulance.

WP2 focuses on developing a solution that enables emergency services to map out their electrification plans and optimise the connection of EVs across their estate. This will be delivered by gathering data from partners to build the prototype, while simultaneously engaging with users to design how the end solution should be used.

WP3 focuses on developing archetypal sites for each partner and determine the behind-the-meter options for reducing connections requirements. This will feed into the end solution, enabling the emergency services organisations to see the options available to them at each site across their estate.

Subsequently, the fourth work package will develop the proposed solution from WP2 and WP3.

Figure 18: Assisting emergency services in decarbonisation planning ensuring UK Power Networks can facilitate the connections they require to continue to serve society effectively

Highlights of our Innovation Project Portfolio

Our View

Background

UK Power Networks constantly strides to improve the support we offer customers. Customers often are unable to provide the required information about electricity issues, leading to inefficiencies in addressing reports of no supply to premises.

The project aims to enhance customer service and safety by introducing a video-sharing platform. This solution will enable visual assessments during customer calls to improve the accuracy of network damage information collected from members of the public.

The project allows customers to provide visual information through photos and video calls, as seen in Figure 19, enabling more accurate and efficient issue resolution. Customers can report network damages, such as low/grounded overhead lines more effectively, ensuring that the information is clear and accurate. This reduces the need for unnecessary engineer visits (during events such as energy meter issues or downed British Telecom poles) and speeds up the resolution process, ultimately improving customer satisfaction and service quality.

Additionally, the quality of current site safety assessments could be improved by capturing more visual records and tracking and reporting data driven hazard metrics. The project aimed to improve on the existing safety assessments with artificial intelligence (AI)-driven video evaluations through a mobile app. This will enable better hazard identification and improve capturing of effective mitigations.

The safety assessment in this project involves capturing visual data of the worksite, which helps in identifying known hazards and monitoring changes over time. This method enhances the accuracy of hazard identification, supports audits, and provides valuable insights for training and improving safety. Therefore, this project has a dual focus both on customer services and safety at UK Power Networks.

Experience to date

Through trialling the live video calling solution with customers an improved level of support has been demonstrated during power outages. The additional guidance through video for customers to locate their consumer unit and reset their trip switches has led to many cases where power has been restored for customers thanks to the use of the video call where in previous cases they would wait until a UK Power Networks engineer arrives to site.

There has been a reduction in cases of UK Power Networks engineers being dispatched to sites but unable to restore power due to the power outage being caused by internal electrical issues (which requires customers to contact their suppliers or electricians).

UK Power Networks' Low and Grounded Conductors Team in our call centre have also benefited from this improved method of capturing information from customers. Members of the low and grounded conductors team can now enter live video calls with customers to address their concerns with potentially dangerous situations while continuing to advise customers as opposed to asking customers to take photos/videos and share via email if a low or grounded conductor is identified.

Through trialling the use of artificial intelligence (AI) driven video site assessment, example in Figure 20, UK Power Networks now has a better understanding of the current state of advancement in this area and are working to improve their current methodology to best capture the learnings from the project and incorporate feedback from field staff.

Highlights of our Innovation Project Portfolio

Our View

Continued

Future Developments

There is a plan in place for UK Power Networks' Customer Services team to adopt the ongoing provision of live call services with customers. Full training on use of the live video calling solution has been provided to all inbound customer service call agents. During the trial, from 1 April 2024 to 31 March 2025, the average number of customers who elected to use the new video capabilities was 101 per month. The service has been well received by customers to date. UK Power Networks' Safety team are working to implement the learnings from the project into their BAU practices.

Figure 19: Live video calls with customers to troubleshoot internal faults

Figure 20: AI detection of Hi-Vis being worn on site

Highlights of our Innovation Project Portfolio

Almee

Background

The energy transition presents various challenges for households, influenced by their unique situations and the ongoing energy crisis. In response, UK Power Networks is dedicated to helping vulnerable consumers who may be at risk of being excluded from the transition to net zero. Currently we collaborate with several service delivery partners that assist vulnerable consumers, and are identifying ways that we can more effectively enable support to be delivered to those that need it.

The Almee project aims to develop a new digital tool to help vulnerable consumers engage with the energy system transition. This initiative will use new technologies such as machine learning and AI to provide personalised support at scale. By collaborating with service delivery partners, the goal is to enhance existing services and offer new options for consumers who prefer to use digital channels for self-service.

Experience to date

To develop the detailed scope of the tool we worked with AI experts and third sector organisations that provide direct support to vulnerable consumers. We interviewed three third sector organisations – Citizens Advice Arun & Chichester, Community Energy Pathways and Social Enterprise Kent. This helped us to better understand the actions they take to support consumers, including the most effective methods and the long-term customer outcomes and impact.

The organisations explained that customers often reach out for support with a specific problem such as struggling to pay their bills or discomfort at home affecting their health, rather than calling specifically asking for energy advice. Through engagement with consumers, it is often identified by call agents that (for example) energy advice can help customers lower their bills or more comfortably heat their home, and therefore address their original problem. This has enabled us to understand a variety of consumer support journeys and how effective solutions can be provided.

The engagement with third sector organisations was key to understanding the challenges that call agents face when providing support to customers. For example, often effectively identifying grant eligibility can be complex and time consuming due to the large number of grants and differing requirements that vary across geographic regions. Consumers also often 'shop around' for advice, so being able to provide consistent, accurate information across services and agents can build consumer trust and increase efficiency.

Technology experts then identified the features, functions datasets and outputs needed for the digital tool to be effective. The benefits and challenges of leveraging AI to provide support have been considered, to ensure that trusted and reliable information is provided to consumers while retaining the personalised elements. Following a period of development, the third sector organisations also provided feedback on the proposed tool design. They expressed an interest and excitement in the benefits that technologies such as AI could bring, combined with recognition that a self-serve approach would not be appropriate for every case.

Humans and computers each have different strengths, so recognising that and ensuring that they cooperate effectively will deliver the optimum results. This will enable AI to enhance UK Power Networks' existing portfolio of support for vulnerable consumers.

Future Developments

Having developed initial tool proposals based on research and collaborative workshops, we are now planning to test them directly with consumers. By testing proposals and receiving feedback on them directly from consumers it validates that we are delivering what they would like to use.

Once we have refined the detailed scope of the tool, we will initiate the design and build phase. We are planning to take an agile approach with development cycles based around product testing. This will require engagement from key stakeholders and customer testing, to ensure the final product aligns with our company and consumer values and delivers a tool that can effectively help consumers with the targeted support they need.

Once the tool has been developed it will be trialled directly with consumers at scale to confirm that it delivers on the proposed benefits. Should the tool be successful, this approach will improve the efficiency and effectiveness of support while empowering consumers to manage their own energy needs through user-friendly digital tools.

Figure 21: Almee

Highlights of our Innovation Project Portfolio

Flex Heat Networks

Background

Heat represents a large part of UK's energy demand and total emissions. Heat networks are seen as one of the most cost-efficient ways to decarbonise heat and achieve the nation's net zero goals. Heat networks distribute heat from a central source to multiple buildings using a system of pipes, utilising various technologies like heat pumps, gas combined heat and power (CHP), electric boilers, or waste heat.

Today, heat networks account for 2% of UK's heat market and it is estimated, that by 2050, this number will rise to 18%. While most heat networks currently rely on fossil-fuels, in the near future, a major percentage of heat networks will be powered by electricity, creating a significant impact on the country's electricity infrastructure capacity. For the electricity network, ensuring sufficient network capacity in urban areas is a focus for network planning. Considering the potential flexibility of heat networks through thermal storage in the design stage could reduce peak demand by 20-40%.

The Flex Heat Networks project aims to explore the impact of fully or almost fully electric heat networks on the power grid and how to manage them flexibly. By using external datasets, to obtain a detailed insight of the potential uptake of district heating and modelling tools to understand the network impact, the goal is to allow more accurate and realistic representation of heat networks and energy centres than what is possible today and to ascertain the scalability of the proposed connection scheme for heat networks.

Experience to date

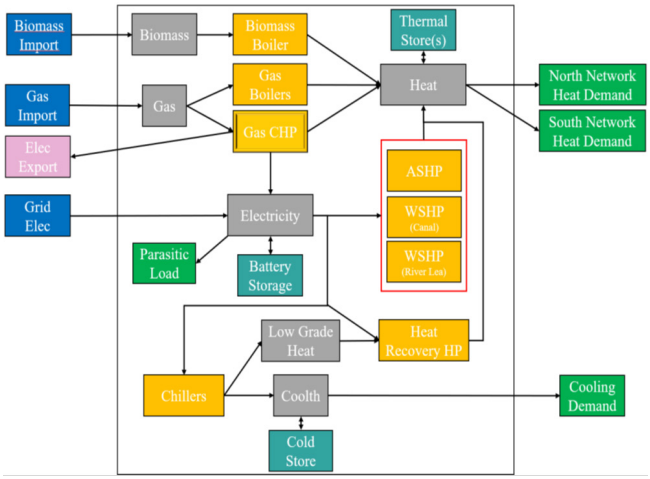
To explore the impact of heat network electrification on the electricity network, we collaborated with industry experts and a heat network operator to assess how the flexible operation of heat networks can help ease the increasing stress on the electricity infrastructure. By working closely with the heat network operator, we gained valuable insights into the challenges and opportunities that come with transitioning to low-carbon heating solutions.

Using real-world data, including load profiles and operational characteristics of a live heat network, we carried out a techno-economic analysis to explore different electrification scenarios (model diagram visualised in Figure 22). We examined the trade-offs between electricity connection costs and heat network performance, uncovering the potential benefits of optimising network design to reduce connection costs while ensuring reliable operation.

The findings demonstrated a clear business case for integrating flexibility into heat network planning, offering a pathway for scaling these solutions across UK Power Networks' areas. While our analysis confirms that optimising load profiles and deferring reinforcement costs are feasible strategies, the long-term electrification timeline introduces some uncertainty as future grid conditions evolve.

Understanding these dynamics is key to ensuring that heat networks play an effective role in the wider energy transition, balancing decarbonisation goals with the resilience of the electricity network.

Figure 22: High-level model (Calliope software) of the trial heat network energy centre in 2030 including new electrified heating equipment as well as additional thermal storage (HP = heat pump; ASHP = air-source; WSHP = water-source)



Future Developments

Following the completion of this work, a decision has been made to close Flex Heat Networks as there were no suitable sites identified which aligned to the project timescales. However, the insights gained will be instrumental in shaping a new initiative focused on mapping existing and future heat networks within UK Power Networks' licence areas. This future project will build on our learnings and incorporate modelling of different decarbonisation scenarios to assess the electricity network impact.

The methodologies and findings developed through Flex Heat Networks will continue to support ongoing work in understanding the interaction between heat and electricity systems.

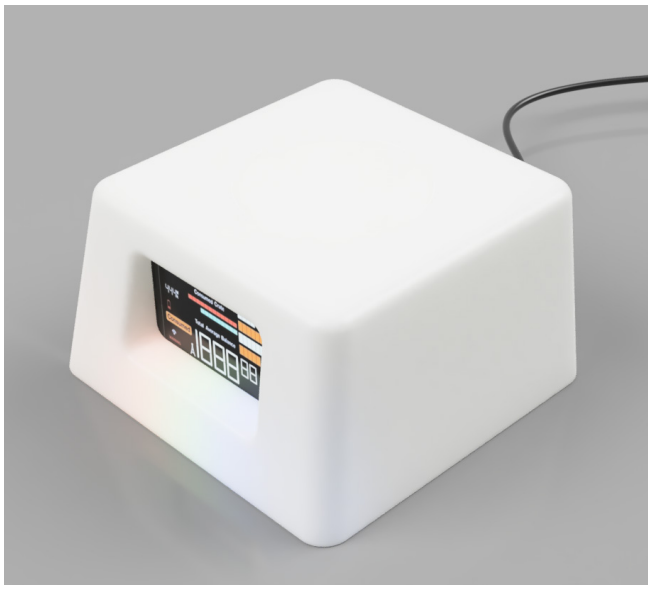
Highlights of our Innovation Project Portfolio

Keeping Comms Open

Background

The Public Switched Telephone Network (PSTN) is undergoing a shift away from copper cabling to a faster fibre optic-based network, because of this, the new fibre optic network will no longer be powered by the telephone exchange. The telephone network will therefore be reliant on a power supply from customers' properties.

Figure 23: Digital rendering of Smart-UPS device



In the event of a storm, extensive damage to the HV overhead network, may result in large numbers of customers off supply for extended periods of time. Mobile phone coverage would also be affected with poor or no signal coverage due to loss of supply to the mobile network mast.

Without any mobile coverage, customers may experience difficulties staying in contact with colleagues and family. Having access to a Community Satellite phone or a Smart uninterruptible power supply (UPS) would allow those customers to call emergency services and their DNO. Operational staff could also benefit from having access to these devices as it will allow them to maintain contact with their depots, and the operational control centre in the event of a prolonged outage.

Experience to date

Keeping Comms Open is being delivered by DefProc Engineering in partnership with ourselves and the EIC. The project was mobilised in January 2025 alongside network partners NPG and SPEN.

So far, we have organised workshops with charities and representative user groups to understand the needs of vulnerable consumers and ensure that the devices are inclusive by design.

An updated Smart UPS and Satellite phone prototype are currently being built. They will be ready for testing later this year before deployment into homes, community spaces and substations.

Future Developments

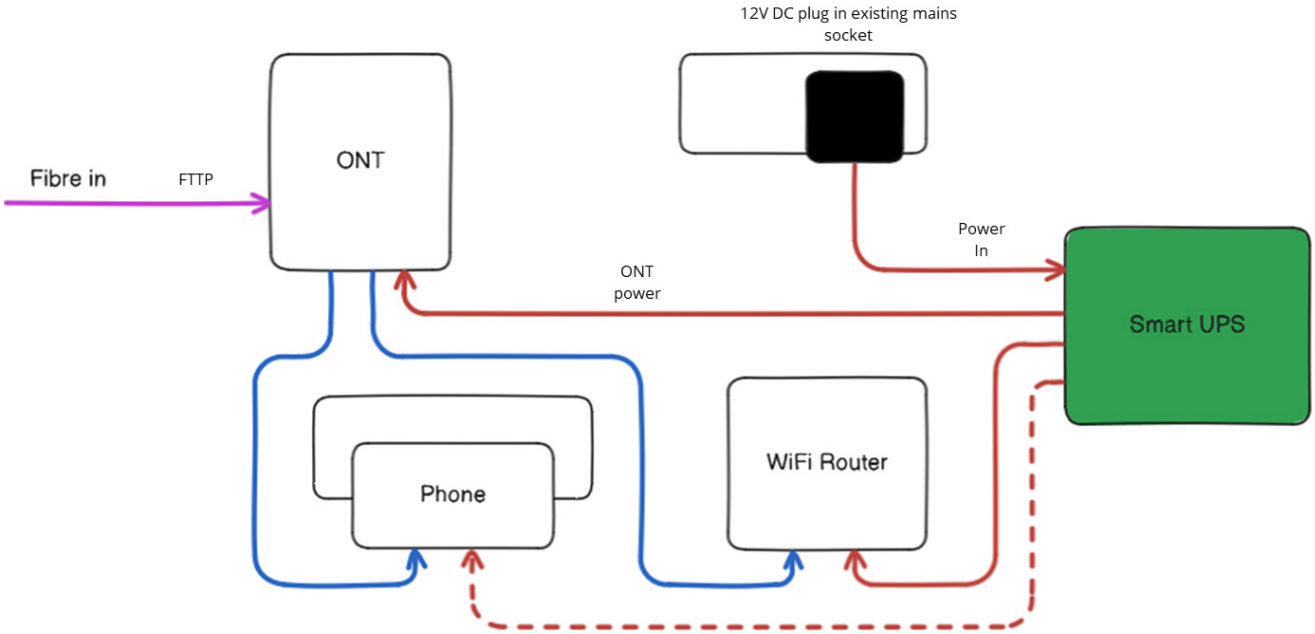
DefProc Engineering will develop an existing Smart UPS that has previously been used for telehealth purposes. The new device will provide power to an optical network terminal (ONT); a device that connects a user to a fibre-optic network and provides internet access. The intention is to enable multi-day fibre to the premises power for domestic and emergency phones in the case of power loss.

Highlights of our Innovation Project Portfolio

Keeping Comms Open

Continued

Figure 24: Connection of Smart UPS device into customers ONT



They will also develop a satellite phone box for remote communities and substations to provide connectivity to the DNO in the event of a complete communication loss to an area. This will provide the option to assist operational staff and support individual vulnerable customers and communities as appropriate to their needs.

A number of Smart-UPS units will be supplied to conduct customer acceptability tests. Customers will be invited to trial the Smart-UPS where, should they have a power cut, they will be able to maintain telecommunications and receive appropriate support.

Similarly, a number of community satellite phones will also be deployed to remote communities or substations in areas with poor mobile coverage. Field staff will be asked to trial the satellite phone and receive instructions from the control room.

To prepare for these trials, UK Power Networks and our project partners will analyse the Priority Services Register (PSR) to understand the number of customers who could benefit from this project. We will also analyse the prevalence of mobile not-spots as we seek to identify the best locations to deploy the community satellite phones.

Highlights of our Innovation Project Portfolio

CommsConnect

Background

Electricity networks depend on communication systems to carry Supervisory Control and Data Acquisition (SCADA) messages to allow the network to function effectively.

In select cases DNO SCADA messages are handled using public mobile networks. In these cases electrical networks and mobile networks are interdependent. Electrical networks need reliable communication systems to transmit data and receive commands from the control room. Conversely, the electrical network's availability is essential for powering telecommunication infrastructure. A disruption in the electrical supply can affect the performance of public mobile networks, highlighting the mutual dependence between the two systems.

The project seeks to improve data availability on the health and status of public mobile networks, reduce electrical network communication failures by identifying poor coverage areas, and prioritising resilient communication options. As a result, this project aims to enhance the resilience and reliability of communication systems used by DNOs which are crucial for monitoring and controlling the electricity network.

The project will understand the interdependence between DNOs and public mobile networks by increasing the visibility of power autonomy and redundancy within public mobile infrastructure. This will enable DNOs to make informed decisions about where to utilise public mobile communication as a means of communication. By proactively providing information on resilient communication forms based on historic mobile network performance, the project aims to reduce communication faults and associated costs. Additionally, improving the understanding of the interdependence between mobile and electrical networks will benefit IT operations and support field staff in using mobile devices more effectively.

The project will collaborate with mobile network operators to share knowledge about operational networks and power autonomy. It aims to develop and deploy software upgrades for substation routers, monitor public mobile network health, and detect outages dynamically.

Experience to date

CommsConnect is being delivered in partnership with Neutral Networks. The project was mobilised in January 2025 and so far workshops with UK Power Networks' subject matter experts have begun with works ongoing on a detailed specification for the delivery of the upgraded software update with the router manufacturers.

In parallel, sites are being selected for the deployment of prototype devices which will give an indication of the type of data which will be collected at sites and inform the design of a centralised server to capture this information.

Interaction with mobile network operators has also commenced with a view to entering into mutually beneficial data sharing agreements which will allow both parties to share data during storm events.

Future Developments

The project will first deploy prototype network sensing devices at sites with previous cellular communications issues to gather information about the potential impact of any communications interruptions. Examples of these devices can be seen in Figure 25 overleaf. They will be representative of the mobile network routers which are currently deployed by UK Power Networks. A centralised data collection server will be set up to capture field information from these devices.

The output of such a server could be visualised per Figure 26 overleaf. The small blue dots would represent the deployed network routers with their connection to mobile masts shown and the status of mobile masts reported by a colour code.

Following on from initial prototyping a detailed specification will be created to inform the mobile router manufacturers of the functionality which is being explored with the prototype devices. Development of this functionality and testing on deployed mobile routers will be carried out.

In parallel discussions with mobile network operators will continue with the aim of setting up mutually beneficial data sharing agreements. Information on mast locations, levels of site resilience and planned/unplanned mobile network outages would all be of benefit to DNOs. Information such as mast site electrical network feeding, and estimated times for restoration at mobile mast sites in the event of DNO power outages would be of benefit to mobile network operators. The embedding of this information into BAU operations will be examined as part of the project.

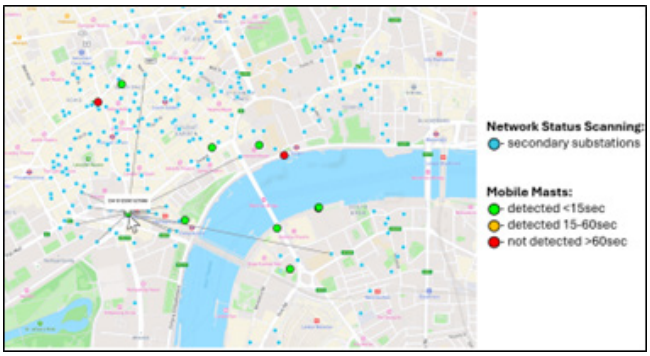
Highlights of our Innovation Project Portfolio

CommsConnect

Continued

Figure 25: Prototype mobile network sensing device

Figure 26: Mock up view of monitoring portal showing which mobile mast site is providing communications to electrical network assets



SIF and BFI Projects

Our SIF Projects

What is SIF? And why is it important?

If we are to deliver net zero carbon emissions by 2050, the wider energy system and society at large will undergo significant changes over the next decade. This cannot be done without innovation.

The next decade is essential for decarbonisation and will bring major change to the lifestyles of people and communities – from the way we refuel our vehicles, to heating our homes and using energy more wisely. In the energy sector it is recognised, that we have a key role to play in decarbonisation to develop and deploy new ideas to drive the transition - on a large scale, as fast as possible, and at the lowest cost to consumers.

This is why the SIF was established in 2021, a collaboration between Ofgem and Innovate UK, as a programme with funding of £450m+ over five years, to drive innovation and transformation in energy networks. This new funding mechanism is designed to drive the innovation needed to energy networks for a low-carbon future.

How it works

Every year Ofgem and Innovate UK launch "rounds" of industry challenges, while networks collaborate with innovators, technology developers, academia and other potential project partners to identify suitable projects to develop solutions for these challenges.

Projects initially enter a 'discovery phase' to help define the problem and what value there is in solving it. This phase also helps find a common understanding of what energy consumers and network users need from the innovation and identify any constraints that may impact the solution to the problem.

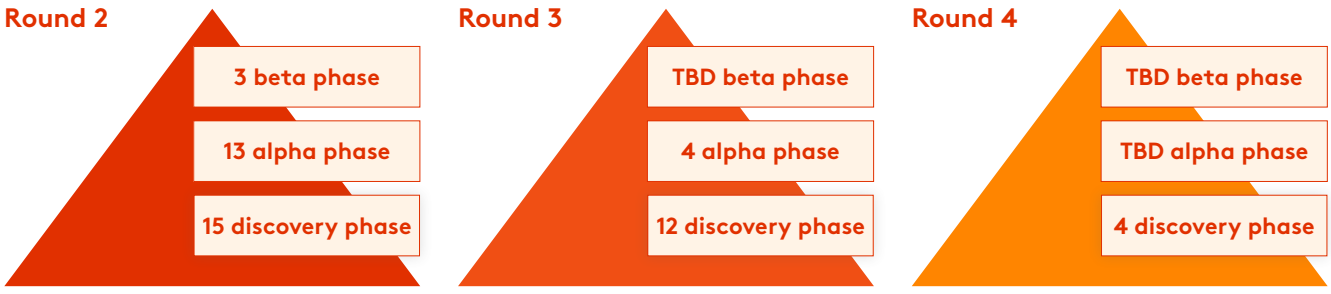
Successful projects may then apply for additional 'alpha phase' funding where participants will focus on small scale demonstrations of the different solutions to the problem identified during the discovery phase. It will also include testing of the riskiest assumptions.

Following alpha phase funding, projects may apply for additional 'beta phase' funding. This focuses on the deployment of the solution to the problem with the duration depending on the scale and complexity of the solution deployed.

Our track record

Electricity distribution networks were invited to participate in the SIF for the first time in 2023. Since then, we have helped launch over 30 new projects and have secured over £35m available for innovators across discovery, alpha and beta phase projects.

Figure 27: Our SIF projects section



TBD - To be decided, these are future phases at this time.

Our SIF Projects

Continued

Key project examples

CReDO+ beta phase

Climate change and extreme weather events are occurring on an increasingly frequent basis and to greater severity. More intense and frequent weather extremes are predicted by the Met Office, with winter storms causing severe flooding, and intense summers causing heatwaves.

The interconnected nature of UK's infrastructure means such weather events can have large ramifications throughout the energy, water and telecoms systems, impacting public health and safety. If one piece of infrastructure fails, this can cause a domino effect with power cuts leading to homes without means for communication or access to water. In emergency situations, the effect is devastating.

CReDo+ will develop the Climate Resilience Decision Optimiser digital twin and data sharing platform, enhancing resilience investment planning and reporting. The project will scale the CReDo technology across the electricity, gas, water and telecommunications sectors to understand infrastructure interdependencies and cascading risk from extreme weather including flooding, extreme heat, and strong winds.

Tools will be developed to transform the knowledge and expertise from subject matter experts into new asset risk models, with a risk modelling framework to cascade asset failures through individual networks, between networks, and across sectors. This whole system approach to climate resilience will ensure we can continue to "keep the lights on" at the lowest cost for our customers.

Heatropolis beta phase

It is estimated, that by 2050, UK Heat coming from heat networks will rise to 18% from the current 2%. While most heat networks currently rely on fossil-fuels, the Seventh Carbon Budget set out ambitious targets for 40% of existing heat networks to be decarbonised by 2030, and 100% by 2040 in the Balanced Pathway, which will have major implications for DNOs.

Heatropolis is a demonstration project focused on developing a novel framework, that involves unlocking better outcomes between heat and electricity networks, to support the acceleration of heat network decarbonisation. Heatropolis aims to demonstrate the use of innovative commercial and technical arrangements to unlock heat network flexibility, by conducting a number of iterative winter trials across multiple heat network archetypes.

The project will trial a range of first-of-its-kind solutions including:

- Enhanced integration and automation between heat network operators (HNO) and DNOs.
- Commercial arrangements for provision of flexibility services from non-firm connections.
- Digital customer connection optioneering tools.

These iterative trials will build the evidence case to support the BAU adoption of the solution and benefits realisation. Additionally, the project incorporates stakeholder engagement to maximize learnings and disseminating project knowledge through targeted channels.

SHIELD beta phase

The current approach to decarbonising heat and energy in consumers' homes is not inclusive of vulnerable and low-income households. The considerable upfront costs alongside the running costs of these solutions are too high for many to afford. Fuel poverty is a growing issue in the UK, six million UK households experiencing fuel poverty.

The SHIELD project is aimed at making the net zero transition accessible to low-income residents of social housing and other tenures who cannot afford LCTs. It uses distributed data centres to capture waste heat from data processing for low-cost domestic heating, photovoltaic (PV) and battery storage to intelligently balance supply and demand.

An innovative Social Energy Services Company (ESCo) model provides these LCTs at zero upfront cost by selling unused generated electricity and grid services to fund the capital required. The project will trial these solutions in up to 300 homes to cut energy costs for those in fuel poverty and support the clean energy transition.

Our SIF Projects

Continued

Electric Thames alpha phase

Today, the vessels, docks, and ports operating on the Thames run mostly on fossil fuels, but this is changing as the river's economy decarbonises. Previous decarbonisation planning has considered marine requirements and network requirements in isolation. There is a risk that the extensive increases in energy demand along the Thames will lead to a considerable increase in decarbonisation costs.

Electric Thames is developing scalable, sustainable business models to identify the best path for decarbonising the river's diverse fleet. By examining new revenue streams and ways to share costs and risks, the project will create a commercially viable roadmap to decarbonisation.

Working together with stakeholders across the marine and energy industry, we will map out the future of maritime transport in the central Thames area and explore the potential benefits of vessel to grid charging. This technology allows electric vessels to act as floating energy assets, feeding surplus power back into the grid when moored.

This would provide a valuable service, helping balance supply and demand during peak periods while offering operators potential cost savings.

We hope to extend the initiative's impact far beyond London, showcasing how the UK's maritime sector can contribute to a cleaner, more sustainable energy future.

Our BFI Projects

The business funded innovation (BFI) projects are focused on optimising assets and practices, that support UK Power Networks in boosting its ability to deliver innovative initiatives that unlock quick return of investment while achieving our RIIO-ED2 Ofgem commitments.

The BFI projects support a range of directorates and business units. Whilst most are commonly associated with Asset Management and Network Operations, we also work with our DSO, Information Systems, and Customer Services teams. The lessons learned from these projects will be crucial in guiding our future initiatives and ensuring their success.

The projects have also contributed to enhanced governance, documents, and processes to accommodate speed and improve impact. This has been crucial in ensuring that our projects are well-managed and deliver the desired outcomes.

We also work with a wide network of innovators around the world. Leverage existing relationships, including the EIC and new small and medium-sized enterprises (SMEs) to channel innovation efforts where they can be of biggest value to UK Power Networks, and ultimately, our customers.

There are also key themes we seek to address with BFI. Reactive and proactive fault management, which seeks to improve both the number of interruptions we observe on our networks, as well as the number of customer minutes lost. Other themes, such as quality of supply, Climate Resilience, LCT rollout are all key to how BFI funds are allocated.

One such example of these projects is the Real-time Fault Level Monitoring initiative. In collaboration with SP Energy Networks, the project holds promise for providing better monitoring capabilities, which can lead to improved operational efficiency when it comes to understanding the impact of fault current on our network, and the investment decisions this information drives.

The project selected seven sites within our southern region, at a range of voltage levels; from low voltage (LV) to 132kV. A number of other sites were surveyed at the initial site selection phase. The selected sites were chosen based on their suitably for connection. For example, the available of LV boards, voltage transformers (VTs) etc. The work to complete the design, delivery, and set-up were all completed in the first quarter of 2025.

Once installed, the output of each unit was monitored and analysed to understand their performance against the initial project deliverables and success criteria. Once this analysis was completed, a full report will be made available and further decisions on the potential BAU rollout of real-time fault level monitors across UK Power Networks' licence areas will be made later in 2025.

Our Network Innovation Allowance Portfolio

Our Network Innovation Allowance Portfolio

REFERENCE	PROJECT NAME	RESEARCH AREAS	START DATE	END DATE	BUDGET
NIA_UKPN0078	Right to Heat	Consumer Vulnerability	01/02/2022	30/04/2025	£952,774
NIA_UKPN0079	Collaborative Local Energy Optimisation (CLEO)	Net zero and the energy system transition	01/03/2022	31/03/2025	£3,026,436
NIA_UKPN0081	High Voltage (HV) Auto Quote	Net zero and the energy system transition	01/09/2022	30/06/2024	£2,851,182
NIA_UKPN0083	NeatHeat	Net zero and the energy system transition	01/09/2022	30/06/2024	£473,000
NIA_UKPN0084	Power Protect	Consumer Vulnerability	01/10/2022	31/05/2024	£246,250
NIA_UKPN0086	Shift 2.0	Net zero and the energy system transition	01/10/2022	31/10/2024	£619,300
NIA_UKPN0087	Our View	Optimised assets and practices	01/10/2022	28/02/2025	£442,836
NIA_UKPN0089	Fluid Cable Care Phase 3	Optimised assets and practices	01/03/2023	30/09/2024	£809,433
NIA_UKPN0090	Flex Heat Networks	Whole energy systems	01/07/2023	31/08/2025	£501,600
NIA_UKPN0092	Spotlight	Consumer Vulnerability	01/10/2023	30/11/2025	£2,370,000
NIA_UKPN0100	Trading Connections: Exploring a novel approach to connections queues	Net zero and the energy system transition	01/02/2024	31/12/2025	£773,000
NIA_UKPN0103	Aimee	Consumer Vulnerability	30/11/2024	30/11/2026	£1,389,091
NIA_UKPN0105	Keeping Comms Open	Consumer Vulnerability	31/01/2025	31/12/2027	£635,102
NIA_UKPN0106	CommsConnect	Optimised assets and practices	31/01/2025	31/03/2026	£512,000
NIA_UKPN0101	Innovation Highway	Net zero and the energy system transition	30/05/2024	30/04/2025	£1,720,000
NIA_UKPN0102	Blue Light	Whole energy systems	30/09/2024	28/02/2026	£1,188,442
NIA_UKPN0104	AI for Visibility and Forecasting of Renewable Generation	Flexibility and market evolution	31/10/2024	28/02/2026	£455,000

Innovate with us!

We believe that collaboration is key for successful innovation, and our door is always open for new proposals. If you have an idea or want to collaborate with us, we would be delighted to hear from you.

Please get in touch at **innovation@ukpowernetworks.co.uk**

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