DISTRIBUTION NETWORK INNOVATION ALLOWANCE

SUMMARY REPORT
1 APRIL 2021 TO 31 MARCH 2022

Scottish & Southern Electricity Networks

Powering our community

CONTENTS

FOREWORD

During this year, we have continued to progress a diverse and successful portfolio of innovation projects which support the progress to Net Zero, the electrification of heat and transport as well as facilitating the transition to the Distribution System Operator model. Projects such as Whole System Growth Scenario Modelling Phase 2 known in the industry as; RESOP[1], where we are collaborating with Dundee City Council to develop a whole system planning tool to support the development of their local area energy strategies, and NeRDA[2] which is developing innovative new options for near real time data sharing with stakeholders, along with other projects such as LEO[3] are providing valuable learning to meet our role in facilitating the transition to Net Zero. Alongside this we continue to deliver projects such as Equal EV which focused on identifying the barriers that motorists with mobility impairments face in their Electric Vehicle (EV) transition. In our programme, we have made progress with projects such as Synaps 2 which are looking to better predict and pre-empt faults and avoid customer interruptions. If successful, these have the potential to bring significant benefits to consumers.

We have also further embedded innovative solutions into our Business as Usual (BaU) operations to improve customer service, increase network reliability and resilience through continued use of Low Voltage automation, LIDAR and new methods of vegetation management. We have also introduced new processes for LV fault location using phase identification units and innovative acoustic technology. These deployments have driven efficiency across our operations reducing costs and improving resilience for our customers.

Throughout, we have continued to work with stakeholders to develop and co-create our innovation projects to ensure that we are addressing their needs. For further details on our approach to innovation going forward or if you have an idea or area where you think we should be focusing innovation, then we want to hear from you via **www.ssen-innovation.co.uk**.

Stewart A Reid
Head of Future Networks
Scottish and Southern Electricity Networks

1. Regional Energy System Optimisation Planning
2. Near Real-Time Data Access
3. Local Energy Oxfordshire

INTRODUCTION

This report presents a summary of all Network Innovation Allowance (NIA) activities carried out in Scottish and Southern Electricity Networks' (SSEN) license areas: Scottish Hydro Electric Power Distribution (SHEPD) in the North of Scotland and Southern Electric Power Distribution (SEPD) in central southern England between 1 April 2021 and 31 March 2022. Our current portfolio consists of 22 NIA projects, 19 of which we are leading on and are summarised in this report.

This Summary Report details all of our NIA projects to date and identifies how our NIA projects corresponds to our strategic objectives, which align to the ENA Networks Innovation Strategy. For more information on our innovation strategy please click **here**.

OUR SSEN STRATEGIC OBJECTIVES

DELIVERING A SAFE, RESILIENT AND RESPONSIVE NETWORK

ACCELERATING PROGRESS TOWARDS A NET ZERO WORLD

PROVIDING A VALUED AND TRUSTED SERVICE FOR CUSTOMERS AND COMMUNITIES

MAKING A POSITIVE IMPACT ON SOCIETY

WHY WE INNOVATE

Innovation has always played an important role as a key enabler within SSEN, and the need to innovate becomes imperative as we look to achieve our ED2 Strategic Outcomes. Specifically, we aim to use innovation to: Support and enable the efficient delivery of new capabilities to meet consumer needs and deliver value.

Our wide-ranging approach to innovation includes:

- Engaging with a wide variety of stakeholders to identify new challenges and opportunities across the whole system.
- Co-creating innovation projects with partners from across the energy supply chain including other licensees, Original Equipment Manufactures (OEMS), innovators, academics etc.
- Identifying opportunities to share best practice and 'fast follow' to deliver benefits for both customers and stakeholders.
- Trialling new tools, techniques, systems and methods of work to improve reliability and deliver efficiencies.
- Developing new knowledge and gathering evidence to shape future plans. Widely disseminating and sharing the new knowledge we discover.
- Identifying and testing the functions to support the transition to DSO.
- Demonstrating new and emerging capabilities to de-risk and learn by doing.

OUR INNOVATION DELIVERY PRINCIPLES

Our innovation delivery principles of Collaborative & Open, Agile, Relevant, Data Driven and Innovation Culture are underpinned by a strong commitment to "learn by doing". In addition to this we have established key partnerships with; Power Networks Demonstration Centre, Energy Innovation Centre and UKPN.

Collaborative & Open

Working with the supply chain and peers to facilitate the innovative aspirations of stakeholders

Agile

Setting the standard, fast to follow and quick to learn

Relevant

Applicable and connected to what our stakeholders and consumers need

Data Driven

Using data and analytics to anticipate issues, support decision making and ensure our network is ready for Net Zero

Innovation Culture

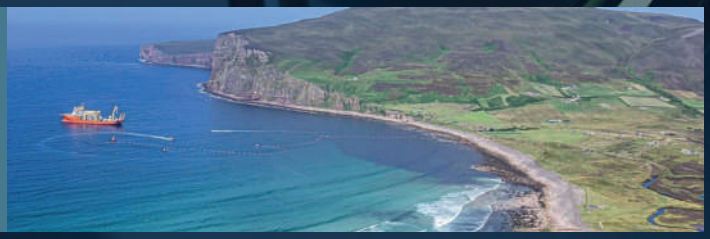
Evolve our culture to achieve maximum value from our innovation activities

Learn by doing

NOTABLE INNOVATIONS BENEFITS AND LEARNING AGAINST OUR STRATEGIC OBJECTIVES

We always make sure that all our Innovation Projects are aligned to our strategic objectives, which remain at the core of our overall strategy, to achieve maximum benefit to our customers. Click **here** for more information on our Innovation Strategy.

DELIVERING A SAFE, RESILIENT AND RESPONSIVE NETWORK



Understanding the health of our existing assets is key to improving our overall network reliability through better coordination of remedial and investment actions. We are developing new approaches when monitoring the health of our assets to better understand condition and anticipate failure, allowing us to proactively intervene thus minimising customer disruption.

We are a project partner on UK Power Networks (UKPN) HV feeder Monitoring to pre-empt Faults project, which is exploring the benefits of monitoring our overhead and underground High Voltage (HV) and Extra High Voltage (EHV) Networks. The project aims to test a solution, "Distribution Fault Anticipation" (DFA), to monitor feeders to pre-empt faults.

The DFA solution consists of a disturbance recorder which can be installed on HV or EHV feeders to monitor network characteristics and a "Master station" cloud-based service which provides the secure conduit and main data repository between the DFA and the Distribution Network Operator (DNO). This will be trialled alongside a network analysis tool (ASPEN Distriview) and Fault Passage Indicators (FPIs) to monitor a selection of HV and EHV feeders to identify the location of network issues before they materialise into faults.

SYNAPS 2 is exploring the benefits of monitoring our underground Low Voltage (LV) Networks through Waveform Analysis. The monitoring technique is looking to forewarn against faults on our LV underground system. The outcome of this project will not solely be a system that warns against pre-fault activity but will generate data to support the management of our LV underground assets within our Investment Management process.

The SYNAPS 2 and HV Feeder Monitoring to pre-empt Faults projects are showing that we can anticipate faults, and potentially categorise their cause and location – this challenges us and our regulatory framework to develop new proactive ways of working on faults.

PROVIDING A VALUED AND TRUSTED SERVICE FOR CUSTOMERS AND COMMUNITIES

Co-creation and collaboration are essential to our innovation portfolio.

In our Smart Hammer project, we have partnered with a local Small to Medium Enterprise based on the Western Isles to develop a tool which can be used as a consistent and reliable alternative to traditional wood pole inspection techniques.

The tool has been co-created with Spectral Line Systems using a multi-disciplinary team to develop the tool and mobile app, with engagement from both internal and external stakeholders.

The tool takes the form of a Smart Hammer that connects to the operator's smart phone, providing an asset score of a pole's health.

Following a number of strikes, the data produced will provide a consistent output score that is weighted. This score is based on where any pole deterioration has been found, with the end goal being a Red, Amber or Green status as well as an asset health score. This will give the operative a clear visual on the condition of the pole. Earlier detection of deteriorating poles will enable proactive replacement and reduce unplanned supply interruptions, thus improving system reliability.

MAKING A POSITIVE IMPACT ON SOCIETY

Our Equal EV project has identified gaps in market offerings to drivers with disabilities which could impact a just transition to net zero. The project published a report warning that some groups risk being unfairly excluded from the transition to electrified transport and call for proactive measures to deliver an inclusive net zero. The report was written for the Equal EV project by the Energy Systems Catapult and maps out journeys for people with disabilities and vulnerabilities such as high levels of anxiety, which is experienced by an estimated 6.6% of UK adults in any given week. The customer journeys cover the stages of switching to an EV: acquisition (contemplation, investigation, and decision); familiarisation; charging at home; charging away from home; smart charging; and making long journeys.

People with mobility impairments were most likely to highlight pain points around acquiring an EV and using public charge points. People with high levels of anxiety identified pain points at all stages of the customer journey, including concerns around making a long journey. The second stage of the Equal EV project examined the viability of technology to remove those barriers and proposed measures to tackle the issues. It also identified potential roles for electricity distribution network operators (DNOs), like SSEN.

To mark publication of the Equal EV report, SSEN has published videos featuring interviews with drivers who have disabilities and a strong interest in EVs. The drivers give powerful examples of the challenges they face and how the current public EV charging infrastructure is failing to meet their needs.

The Equal EV project was the first time a DNO in the UK had examined barriers and challenges faced by motorists with disabilities and vulnerabilities in transitioning to EVs. Building on this project, SSEN will be working with Disabled Motoring UK to continue to raise and address the issues faced by drivers and ensure a fair transition to electrified transport.

Video interviews were held with:

1. Mat, who has been an EV driver since 2018 and was a Team GB athlete in wheelchair fencing. He told us that ensuring public EV charge points are accessible will benefit people with disabilities, but equally will help anyone with their hands full: "holding a baby or holding shopping. ...If you improve accessibility for one group, you improve it for everyone."

2. Nigel, who is an EV driver found that "it does just come down to the fact that there aren't enough charging points," and many are poorly designed. "On my own, on a number of occasions I have found that the charger is completely inaccessible to somebody in a wheelchair and without the kindness of strangers, I would have been completely stuck."

3. Simone, who is considering switching to an EV, told us that "Some of the concerns I have when it comes to charging an electric vehicle is the dexterity needed to plug in the charging cable. Those things are convenient for most people ...but I am not most people."

Sales of EVs are increasing rapidly in the UK, totaling nearly 18% of all vehicle sales in March 2022. Public charge point provision is also increasing and the Government anticipates a tenfold increase by 2030 (with nearly 30,000 installed as of March 2022). While these changes are welcome the potential difficulties faced by key groups of people when considering adopting an EV have received relatively little consideration to date.

ACCELERATING PROGRESS TOWARDS A NET ZERO WORLD

The SSEN NeRDA project is a small-scale demonstration project which makes near real-time DNO network data available to stakeholders. The project will assess and understand the useability and benefits of this data. Ofgem have made it clear that Open Data is one if the key focus areas for driving decarbonisation and accelerating progress towards a Net Zero world. We know that flexibility will be crucial, facilitating significant deployment of renewables. The learning from NeRDA helps us to understand a variety of stakeholder needs for network data. Working closely with our stakeholders over the last year has developed key learning on how stakeholders access and understand network data, specifically around the need to provide this along with connectivity data and other data sources to contextualise the network data and unlock its value. This key learning has been used to shape the future of the NeRDA project.

Other key learning from projects that are accelerating progress toward Net Zero is our Western Islands Inertia Project. This project installed measurement technology in the Western Isles to monitor power quality and inertia during extended network outages known as island mode. Data gathered from the project will be used to validate the existing network operating models used during island mode. The Western Isles Inertia project has measured an islanded network to inform its ability to accommodate distributed generation when disconnected from the GB network. In addition to confirming that the allocated capacity is correct, its learning will inform our work to decarbonise our island networks.

NeRDA
Near Real-time Data Access

An example of the NeRDA dashboard and data available to users.

SUMMARY OF PROGRESS

In the the year ending 31 March 2022, there were 22 projects funded under SEPD and SHEPD Network Innovation Allowance (NIA). Of these, 19 projects were led by us and the remaining 3 were managed by other DNOs.

Each project accumulates knowledge and learning which aligns with one or more of our Strategic Objective(s). The appropriate primary Strategic Objective is denoted via the inclusion of its icon.

DELIVERING A SAFE, RESILIENT AND RESPONSIVE NETWORK

PROVIDING A VALUED AND TRUSTED SERVICE FOR CUSTOMERS AND COMMUNITIES

ACCELERATING PROGRESS TOWARDS A NET ZERO WORLD

MAKING A POSITIVE IMPACT ON SOCIETY

2.1 NIA SSEN 0034 SUBSENSE

KEY ACTIVITIES

The project aims to install a real time monitoring system using Distributed Acoustic Sensing (DAS) on several new subsea cables. The DAS system will utilise the single mode fibre optics embedded within the cable. A DAS interrogator unit connects to the optical fibre which essentially turns the fibre into an array of virtual microphones. Short pulses of highly coherent light are transmitted down the fibre by an interrogator unit, and backscatter returns are observed. The backscatter observations detect minute cable strains induced by acoustic events, which when passed through to a processing unit can provide interpretations and visualisation of the signal. https://www.subsense.co.uk

EXPECTED BENEFITS

Real time monitoring of submarine cables will give SSEN a greater understanding of the conditions in which our cables operate and to proactively manage mechanical wear and tear of the cable, thus preventing associated lost or interrupted supplies. This monitoring will notify us when there is an immediate concern regarding the health of the submarine cable. Submarine cables are one of the costliest assets within the distribution network. Being able to identify a fault location in real time will allow us to carry out repairs quickly and effectively before they pose a potential risk to other marine users.

PROGRESS

The SUBsense project presents the opportunity of using a DAS type system within the Scottish Hydro Electric Power Distribution in the RIIO-ED2 price control.

Discussions are ongoing with the responsible RIIO-ED2 team to investigate how we can best use DAS to monitor and improve understanding of submarine cable asset life.

PRIMARY STRATEGIC OBJECTIVE

DELIVERING A SAFE, RESILIENT AND RESPONSIVE NETWORK

COLLABORATORS

AP SENSING advanced photonic

Wireless innovation

FUNDING
£1,458,218

START/END DATE
August 2018 / March 2023

WEBSITE
www.smarternetworks.org/project/project/nia_ssen_0034

2.2 NIA SSEN 0035 INFORMED LIGHTNING PROTECTION

KEY ACTIVITIES

Lightning strikes are known to cause a significant number of supply interruptions to our customers and damage to the network which is costly to resolve. In our Scottish Network, lightning strikes are the second highest cause of customer interruptions and minutes lost, whilst in our Southern Network it is the fifth highest cause. Therefore, avoiding the impact that unplanned outages have on our customers is an important issue for SSEN.

EXPECTED BENEFITS

The main benefit of this project is expected to be a reduction in customer supply interruptions caused by lightning-related faults.

PROGRESS

The data analytics phase of the project has been successfully completed, with the identification of a number of locations which are suitable for the installation of surge arresters aimed at protecting the circuits against lightning strikes. Up to March 2022, 150 surge arresters have been installed in SEPD and another 300 installed in in SHEPD. Due to the initial performance success of these surge arresters protecting against lightning, there are plans to protect additional high risk circuits during RIIO-ED2 through BaU funding.

PRIMARY STRATEGIC OBJECTIVE

DELIVERING A SAFE, RESILIENT AND RESPONSIVE NETWORK

COLLABORATORS

ElectraLink

Open Grid Systems

Tyco Electronics

FUNDING
£521,000

START/END DATE
March 2019 / March 2023

WEBSITE
www.smarternetworks.org/project/project/nia_ssen_0035

2.3 NIA SSEN 0038 E-TOURISM

KEY ACTIVITIES

The project's aim is to carry out traffic flow and network modelling to understand the impact of EV charging on the distribution network. It includes the design and development of specific network and local flexibility solutions to assist with security of electric supply to EV charging hubs to deal with highly seasonal charging peaks in the tourist season.

EXPECTED BENEFITS

The benefits of this project will be an improved understanding of how increased EV uptake, combined with tourist behaviour, will impact seasonal peak electric demand on the network, identifying the scale, location and duration of any increased charging followed by an in-depth study of specific locations. It will look to enhance stakeholder engagement by helping local community groups, local authorities and other organisations to understand the impact that heightened EV tourism will have on local demand. It will also inform investment strategies for network development based on expected impacts of EV uptake and tourist patterns, thus coordinating future network capacity efficiently.

PROGRESS

A change request was submitted in May 2021 to expand the project to include our southern region. SSEN are working with an already formed consortium on the Isle of Wight. We are replicating the approach used in Scotland to understand the differences in available data between Scotland and England to develop a UK replicable methodology for realising seasonal charging impacts.

Working with the Isle of Wight consortium has highlighted opportunities to complete the remaining objectives to test suitable local solutions to support the seasonal increase in network demand which was not available in Scotland after the study.

PRIMARY STRATEGIC OBJECTIVE

ACCELERATING PROGRESS TOWARDS A NET ZERO WORLD

COLLABORATORS

elementenergy

Scottish Government
Riaghaltas na h-Alba
gov.scot

TRANSPORT SCOTLAND
CÒMHDHAIL ALBA

FUNDING
£401,000

START/END DATE
July 2019 / September 2022

WEBSITE
https://www.smarternetworks.org/project/nia_ssen_0038

2.4 NIA SSEN 0043 WHOLE SYSTEM GROWTH SCENARIO MODELLING PHASE 2

KEY ACTIVITIES

To enable the UK's goal to efficiently achieve its low carbon ambitions, a holistic whole system approach is required involving key external stakeholders as well as other energy vectors such as gas. There is a wider awareness of the climate emergency, which has resulted in national, regional and local government bodies beginning to set strict targets to reduce greenhouse gas emissions to Net Zero. Many of these targets rely on electrification of heat and transport. Individual local authorities are beginning to create their own strategies for low carbon technologies, e.g. EVs and heat, as well as detailed local energy strategies. This project is a partnership to help explore the range of whole system growth scenarios to achieve both Net Zero whilst also facilitating the economic development plans of the local area.

EXPECTED BENEFITS

The benefit of this project will be the development of a methodology to improve coordination between local energy planning and network development, enabling the Distribution Network Operator (DNO) to engage with local authorities in a structured way. As part of that methodology, the project will refine the initial model tool developed in the first stage of the NIA project to produce a local energy network model which will allow stakeholder information to be easily incorporated into network planning and for stakeholders to better understand the network implications of their decisions.

PROGRESS

Significant changes have taken place between April 2021 and March 2022. The project has partnered with Arup who will utilise their own cost optimisation tool on their own premises. Arup will also take the lead on stakeholder engagement to create a Local Area Energy Plan (LAEP) and a Local Heat and Energy Efficiency Strategy (LHEES) for Dundee City Council. We plan on using Advanced Infrastructure's (AI) LAEP+ tool, which is a web Geographical Information System (GIS) tool that visually displays a variety of data sets, to enable collaboration between Dundee City Council, SSEN and SGN. Additionally, we will be utilising Derryherk's Navi tool that was developed by a Scottish Power Energy Networks (SPEN) NIA project. This tool will provide power flow capabilities to the LAEP+ tool and enable our planners to assess energy projects proposed by the Council. Finally, we plan to bring Oxford City Council into the project to provide additional testing for the LAEP+ tool.

PRIMARY STRATEGIC OBJECTIVE

ACCELERATING PROGRESS TOWARDS A NET ZERO WORLD

COLLABORATORS

Dundee City Council

Baringa Brighter together

CATAPULT Energy Systems

FUNDING
£853,000

START/END DATE
January 2020 / June 2023

WEBSITE
https://www.smarternetworks.org/project/nia_ssen_0043

2.5 NIA SSEN 0044 SMART HAMMER

KEY ACTIVITIES

The Smart Hammer project will develop a new hammer tool for testing and inspecting the asset health of wood poles. The project will field trial the Smart Hammer on completion of development across the SSEN Operational Regions. Repeatedly striking a pole with the hammer measures the health of the pole and its asset health score is recorded in an accompanying Smart Hammer app.

EXPECTED BENEFITS

Benefits of this project will be the establishment of a technically and commercially viable Smart Hammer, with accurate and repeatable results to help detect internal rot or damage to wooden poles. The project aims to identify if the Smart Hammer is a consistent and reliable alternative to the traditional method of wood pole inspections, which use a conventional hammer and the operator's interpretation of the strike. Earlier detection of deteriorating poles will enable proactive replacement, preventing unplanned supply interruptions due to broken poles thus improving system reliability.

PROGRESS

Through stakeholder engagement we have been able to test the prototype versions of the hammer in the field environment. Operational personnel that are involved in wood pole testing have been using the prototype versions of the hammer, in addition to their normal procedures. The capture of data from the field trials has been fundamental to the hammer prototype development process and will continue to be further evaluated. The project has identified the requirements around the integration of field data collected from the Smart Hammer into our asset databases. This was successfully trialled, and the project was able to demonstrate how the Smart Hammer data can be integrated into the SSEN MAXIMO asset management database.

PRIMARY STRATEGIC OBJECTIVE

PROVIDING A VALUED AND TRUSTED SERVICE FOR CUSTOMERS AND COMMUNITIES

COLLABORATORS

Spectral Line System Ltd

FUNDING
580,000

START/END DATE
February 2020 / July 2022

WEBSITE
https://www.smarternetworks.org/project/nia_ssen_0044

2.6 NIA SSEN 0047 TRADER

KEY ACTIVITIES

TraDER will provide a platform, creating a single access point, to make it easier for distributed energy resources to provide vservices such as balancing, stability, and network capacity. In this way, "whole system value" is maximised by enabling price-driven coordination between NGESO, DSO and other market participants. Project TraDER will both develop and trade flexibility in as near real-time as possible. The solution will integrate the flexibility market both horizontally (i.e. with other, longer term Distribution System Operator (DSO) products) and vertically (i.e. other trades within the same time period, such as the Balancing Mechanism).

EXPECTED BENEFITS

There are significant learning benefits associated with the project as SSEN will act as a facilitator to TraDER by delivering data from the Active Network Management (ANM) system currently operating in Orkney and then facilitating changes to the ANM system in order to execute flexibility trades created by the TraDER platform. In return, TraDER will deliver outputs which will allow SSEN to assess the impact of how trades can be implemented on the ANM scheme, e.g., changes to Last In First Off (LIFO) connection order, and associated costs to SSEN.

PROGRESS

To date, the project has successfully designed a process from which ANM data can be captured and transmitted to Electron in near real-time. The work required to enable headroom data to be transmitted from the Orkney ANM to Centralised ANM system has been completed. The works to enable the real-time link from SSEN's Centralised ANM to Electron's market platform is in delivery and will be completed in 2022.

PRIMARY STRATEGIC OBJECTIVE

PROVIDING A VALUED AND TRUSTED SERVICE FOR CUSTOMERS AND COMMUNITIES

COLLABORATORS

ELECTRON

FUNDING
£275,000

START/END DATE
March 2020 / February 2023

WEBSITE
https://www.smarternetworks.org/project/nia_ssen_0047

2.7 NIA SSEN 0048 SKYLINE

KEY ACTIVITIES

To develop a central asset database of domestic electric EV charge-points, providing detailed visibility of their geographical emergence as early as possible. Early visibility will allow DNOs to use the lead times to better plan for the required network investments or alternative solutions to support the uptake of EVs in the locations in which they are most likely to connect.

EXPECTED BENEFITS

The earlier the DNOs can have visibility regarding new (or potential) EV charge point connections, the better they can:

- Be proactive in targeting where and when investment is needed to accommodate increasing EV uptake;
- Defer or even avoid the disruption and costs of reinforcing a network by using smart solutions like smart charging and flexibility first;
- Minimise delays and disruption for customers by making sure networks are already invested in before they look to have a charge point installed.

PROGRESS

Data requirements for use in the notification system have been identified by the project team by engaging with key third-party data source companies for early visibility of EV charging connections. The Data Source Companies engaged with so far include EV dealers, charge point installers, car leasing companies and car manufacturers. These data include geolocation such as MPANs and address details, as well as technical data on the type of EV charge point installation, and the supply voltage of customers' premises.

PRIMARY STRATEGIC OBJECTIVE

ACCELERATING PROGRESS TOWARDS A NET ZERO WORLD

COLLABORATORS

UK Power Networks

ElectraLink

CrowdCharge

EIC Together we innovate

FUNDING
£811,624

START/END DATE
September 2020 / June 2022

WEBSITE
https://www.smarternetworks.org/project/nia_ssen_0048

2.8 NIA SSEN 0050 NeRDA

KEY ACTIVITIES

NeRDA is a small scale demonstrator project which will make near real-time DNO network data available to stakeholders. This will be tested by engaging with stakeholders including those already involved in ongoing local energy innovation projects.

EXPECTED BENEFITS

The benefit of this project will be to make near real-time data for the Oxfordshire area available to stakeholders and assess its usefulness to them. This will be enabled through the implementation of a technology solution for near real-time DNO data to enable its collation and presentation through an Application Protocol Interface (API). The project will assess the benefits and usability of the data through this API with stakeholder groups such as local community energy action initiatives and the Local Energy Oxford (LEO) project.

PROGRESS

The NeRDA Application Protocol Interface (API) and dashboards are now live and have external users accessing real-time data about SSEN's network in the Oxfordshire area. The dashboards and APIs were developed by Open Grid Systems (OGS) using their CIMphoney tool which means that all data being provided is CIM compliant. Stakeholders in Oxfordshire have been fully engaged throughout the project and have participated in developing the business and technical requirements for the dashboard and API. This informed a greater emphasis on connectivity as well as real-time network data.

Currently users are being given the time to explore the dashboard and use the APIs, the next stage of the project will collect extensive feedback from them on how they use the real-time data. Feedback that has been given so far has also been actioned on the platform where possible.

PRIMARY STRATEGIC OBJECTIVE

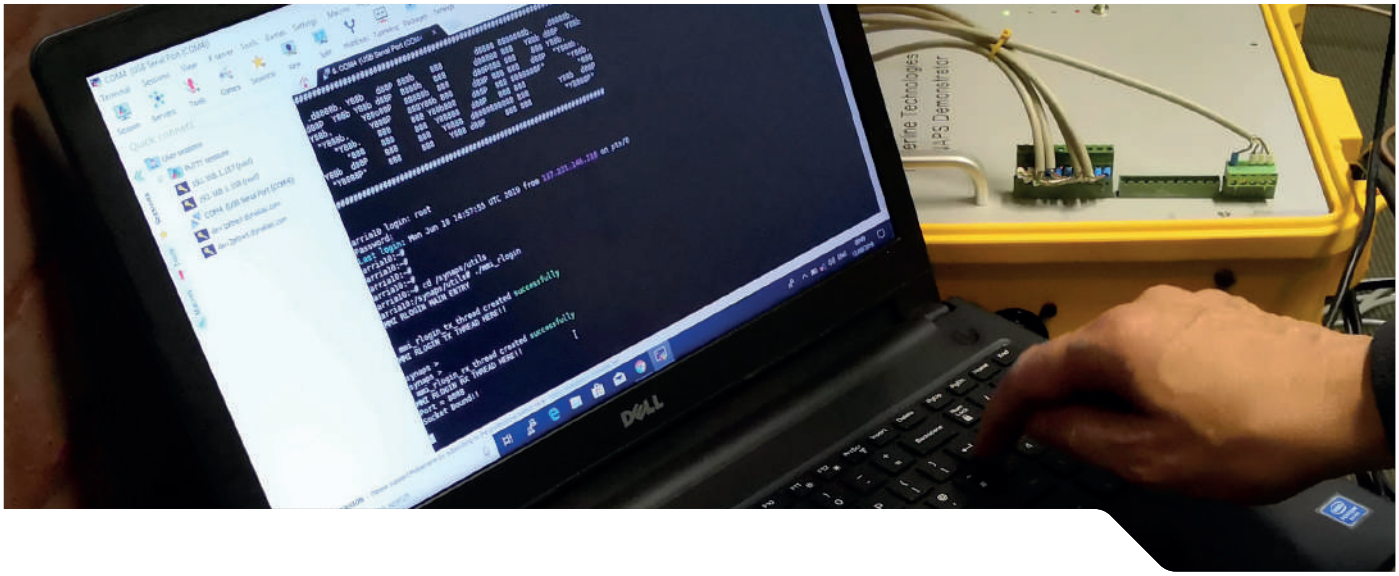
ACCELERATING PROGRESS TOWARDS A NET ZERO WORLD

FUNDING
£806,207

START/END DATE
November 2020 / February 2023

WEBSITE
https://www.smarternetworks.org/project/nia_ssen_0050

2.9 NIA SSEN 0051 SYNAPS 2



KEY ACTIVITIES

The SYNAPS Fault Detection, Classification & Location Solution (SYNAPS 1 NIA_UKPN0037) project was successful in trialling a solution which predicted fault locations from electrical waveforms gathered through monitoring equipment prior to any noticeable LV activity, detecting transient or "pecking" fault events of short duration and low energy that did not rupture a fuse or trigger an LV network circuit breaker. Whilst not yet ready for a wider rollout, this technology was certainly of interest and the Synaps 2 project is aimed at increasing the technical readiness level (TRL) to a commercially ready solution.

EXPECTED BENEFITS

The project has the potential to develop a commercial underground cable fault-finding device with improved accuracy, along with developing procedures for operational staff to use the technology.

PROGRESS

The procurement and legal activities have been completed regarding the contract with the Energy Innovation Centre (EIC), who will co-ordinate the project on behalf of the Distribution Network Operators (DNOs). Over the duration of this project ten sets of next generation sensors have been developed by PowerLine Technologies – and deployed on the distribution network. The existing first generation of prototype sensors from the SYNAPS 1 project have remained installed on the low voltage underground network in South East Region of SEPD the distribution network to collect further data to improve the algorithm model. The information collected will help inform and develop second-generation sensors.

PRIMARY STRATEGIC OBJECTIVE

PROVIDING A VALUED AND TRUSTED SERVICE FOR CUSTOMERS AND COMMUNITIES

COLLABORATORS

UK Power Networks

Powerline TECHNOLOGIES LIMITED

EIC Together we innovate

FUNDING
£661,140

START/END DATE
December 2020 / July 2022

WEBSITE
https://www.smarternetworks.org/project/nia_ssen_0051

2.10 NIA SSEN 0052 OPEN CIRCUIT DETECTION

KEY ACTIVITIES

DNOs currently identify open circuit fault locations using equipment from different manufacturers with varying accuracy of results, which sometimes requires an excavation for the equipment to work. This project will investigate different types and ways of sending signals during cable fault location events to investigate which of them is best at pinpointing and locating the position of the cable open circuit fault.

EXPECTED BENEFITS

During this project the following benefits could be realised:

- More accurate location of underground cable open circuit faults on a variety of cables; of various shielding construction, and understanding any limitations of the device;
- More efficient planning of remedial repairs; and
- Greatly reduced Customer Minutes Lost (CMLs).

PROGRESS

HAYSYS Ltd are continuing the project development. The equipment specification for the detection of LV faults is a 'live' document to aid product development. The initial project meeting which sets the project framework out in detail and preliminary design reviews have been completed. Engagement with the User Group has progressed and requirements meetings have been held with field staff.

PRIMARY STRATEGIC OBJECTIVE

PROVIDING A VALUED AND TRUSTED SERVICE FOR CUSTOMERS AND COMMUNITIES

COLLABORATORS

HAYSYS

FUNDING
£408,169

START/END DATE
December 2020 / September 2022

WEBSITE
https://www.smarternetworks.org/project/nia_ssen_0052

2.11 NIA SSEN 0054 ALTERNATIVE JOINTING TECHNIQUES

KEY ACTIVITIES

This project will Introduce the concept of a new cable jointing system that will require a new methodology for installation compared to existing systems. The new learning will be based around new processess, new materials and equipment and potentially new measurements to assess when it is safe to backfill.

EXPECTED BENEFITS

This is an early stage research project and will inform the potential for future projects looking at new jointing techniques for cable insulation.

PROGRESS

The original project aims, objectives and success criteria focuses on a resin-based putty but the initial stage of the project involved a wide assessment of existing jointing techniques and products as well as research into different potential materials: putties, fillers, foams, resins and curing mechanisms. The scope was altered early in the project to reflect difficulties in developing a hardening putty and the discovery of lightweight fillers and a silicone based gel which may better meet the projects aims and objectives. After laboratory trials examining a range of alternative fillers and materials the project split into two parts. One part of the project is looking at replacing the sand as a filler with lightweight Fillite and the other part of the project is developing an improved clamshell filled with a lightweight material such as foam or gel.

Compared to the original project aims a product specification has been produced and a time in motion study was completed to generate process targets.

PRIMARY STRATEGIC OBJECTIVE

DELIVERING A SAFE, RESILIENT AND RESPONSIVE NETWORK

FUNDING
£92,394

START/END DATE
July 2021 / June 2022

WEBSITE
https://smarter.energynetworks.org/projects/nia_ssen_0054

2.12 NIA SSEN 0055 NET ZERO SERVICE TERMINATION

KEY ACTIVITIES

A project report capturing learnings on the suitability of service cables and cut-outs to accommodate the increased loading as a result of connection of EVs and heat pumps will be produced.

EXPECTED BENEFITS

SSEN's demand growth forecasts (Distribution Future Energy Scenarios) for achieving Net Zero by 2050 suggest that around 70% of homes will require LCT connections. This equates to 2.8 million homes (of the current housing stock).

Experience of connecting LCT to existing homes has shown that domestic loading assessments are required in 42.6% of cases and cut-out upgrades in 6% of cases. The outputs of this project, combined with SPEN's iDentify project, could avoid the need for individual loading assessments for new LCT connections.

This could save up to £10.8m in loading assessment costs in SSEN's license area between 2021 and 2030.

PROGRESS

Service terminations and service cable testing methodologies have been designed and agreed through a project team workshop. The design and approval of the service cable installations and test stations scenarios that have been recommended is now underway.

Project planning workshops identified the three-service cable installation test scenarios recommended within the service cable Installation Literature Survey and these have been discussed and agreed upon.

Construction of mock cut-out enclosures has been completed. This includes the construction and testing of the five-signal conditioning and precision rectifier units and their incorporation in the test rig. This will enable a very low AC voltage drop to be measured across the cut-outs and logged whilst the rig is running. This will allow the power dissipation to be calculated over time which will give a very valuable (but hitherto unavailable) insight as to the heating effects of the individual cut-outs compared to the other components housed in the meter enclosure.

The test enclosure is currently undergoing calibration testing. Safety features such as warning beacons, emergency stop buttons, smoke detectors and overheating sensors are currently being installed around the test rig and incorporated into the rig controller to render it safe in the event of an emergency.

PRIMARY STRATEGIC OBJECTIVE

ACCELERATING PROGRESS TOWARDS A NET ZERO WORLD

FUNDING
£625,000

START/END DATE
August 2021 / December 2022

WEBSITE
https://smarter.energynetworks.org/projects/nia_ssen_0055

2.13 NIA SSEN 0056 WESTERN ISLES INERTIA

KEY ACTIVITIES

This project aims to install measurement technology in the Western Isles to monitor power quality and inertia during extended network outages known as island mode. Data gathered from the project will be used to validate the existing network operating models used during island mode. In island mode, distributed generation (DG) is curtailed to 10% of network load with diesel generation supplying the bulk of electricity and network inertia. The learning from the project will inform future studies which may allow an increase in DG, which in turn will reduce the reliance on diesel generation reducing overall costs carbon emissions and increased revenue to generators; many of which are community owned. Monitoring the network real-time whilst in island mode will provide a detailed investigation into the stability and power quality on the island. This investigation may help future process change which may allow DG output to be increased and reduce the volume of higher cost diesel generation used during extended outages.

EXPECTED BENEFITS

This is an investigative research project, if results are positive then cost savings can be estimated from the project learning and be reported at the end of the project.

Results from the inertia measurements provided the following learning:

- Clarification that the existing approach to stability and DG export on the WI in island mode is appropriate.
- The ability to use the recorded inertia value to estimate the inertia contributions from the SHEPD diesel generators, DG and the WI demand at a given time.
- The opportunity to consider additional equipment/ flexibility services to provide the following when the WI is operating in island mode to increase the levels of DG export and reduce the need for SHEPD to run their back-up diesel generation:
  - system inertia.
  - reliable energy sources to reduce the intermittency of existing DG.

PROGRESS

The trials have confirmed that the current DG export limit of 10% of daily demand is appropriate to maintain system stability.

PRIMARY STRATEGIC OBJECTIVE

ACCELERATING PROGRESS TOWARDS A NET ZERO WORLD

FUNDING
£485,000

START/END DATE
May 2021 / May 2022

WEBSITE
https://smarter.energynetworks.org/projects/nia_ssen_0056

2.14 NIA SSEN 0057 DECARBONISING UTILITY TRANSPORT

KEY ACTIVITIES

The aim of the project is to report on the extent to which utilities are on the decarbonisation journey of their vehicle fleets.

Key outputs include reporting on the present-day composition of utility fleet vehicles (mixture of electricity and gas network operators). Understanding the challenges, needs, global logistic trends and options for on-road and off-road vehicles. The project will also create a roadmap, including a gap analysis and assessment of intervention options to support utility fleet decarbonisation between now and 2050.

EXPECTED BENEFITS

This project will be collecting vehicle fleet data from a range of gas and electricity utility companies. The aim is to create a fleet decarbonisation Road Map for all utilities to benchmark their own progress against and use to inform strategy. The Road Map will also identify hard to decarbonise vehicles such as unique tree cutters, heavy machinery, etc. As there will be a large number of utilities participating the outputs of the Road Map Report can help focus innovation in areas of concern and to also promote investment in these areas by companies looking to benefit from assisting with the Net Zero transition. Energy Systems Catapult will be using their whole system model to perform this study on behalf of Utilities.

PROGRESS

The project is in early stages and a collaboration agreement is being developed and agreed upon by all parties.

PRIMARY STRATEGIC OBJECTIVE

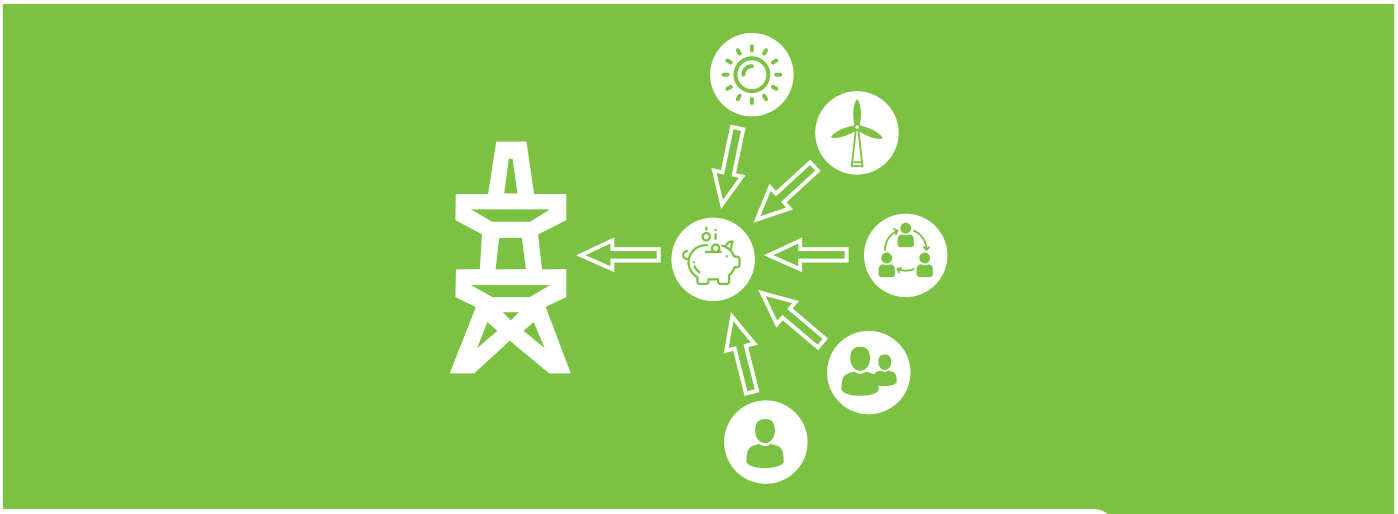
ACCELERATING PROGRESS TOWARDS A NET ZERO WORLD

FUNDING
£117,920

START/END DATE
February 2022 / November 2022

WEBSITE
https://smarter.energynetworks.org/projects/nia_ssen_0057

2.15 NIA SSEN 0040 TECHNICAL INTERFACES TO SCALE AS A DSO



KEY ACTIVITIES

This project will determine the requirements for safely and securely communicating with customers' end point devices, such as small generation connections, to enable more flexible connections and flexibility services at a smaller scale and at a lower cost. Initially, investigation will take place into the existing international communication protocols and interface devices that could be used for distributed energy resource management. A subset of the protocols and devices identified will be assessed within laboratory-based trials.

EXPECTED BENEFITS

A key benefit of this project is the creation of a technical specification of requirements around communication with customers' end point devices, alternatively known as Technical Interfaces, that can be used by the electricity industry. The trial aims to assess the readiness of the selected protocols and devices for DSO applications, the compatibility of these interfaces with our existing systems and the cyber security implications of using these interfaces.

PROGRESS

The project is now closed and all project reports are available on the website. The project has highlighted a number of requirements for end-point devices and makes some recommendations on specifications (specifically employing zero trust architecture including a trusted boot). Each of the frameworks tested, benefit from standardization and built-in cyber security. The testing showed that the frameworks would be able to cope with standard Distribution Network Operator (DNO) operations within a range of typical internal network deployments. For interfaces at scale, standardization of APIs (Application Programming Interfaces) and importantly authentication mechanisms are critical. Learning in this report details these requirements and extends into additional testing which would be required for a large-scale deployment.

PRIMARY STRATEGIC OBJECTIVE

ACCELERATING PROGRESS TOWARDS A NET ZERO WORLD

COLLABORATORS

University of Strathclyde

SGN Your gas. Our network.

wipro

UK Power Networks

UNIVERSITY of STRATHCLYDE POWER NETWORKS DEMONSTRATION CENTRE

FUNDING
£448,000

START/END DATE
September 2019 / September 2021

WEBSITE
https://www.smarternetworks.org/project/nia_ssen_0040

2.16 NIA SSEN 0041 MERLIN

KEY ACTIVITIES

The project is testing the economic impact that a variety of flexibility scenarios could have in a future DSO world. The objective is to inform the wider DSO work that is ongoing, especially the TRANSITION and LEO projects.

EXPECTED BENEFITS

The project will have a variety of benefits including:

- Improving the 11kV network design process by providing insight into automation through Common Information Models (CIM)
- Reducing risk of flexible service procurement through model studies
- Assisting with flexible service investment decision making processes

PROGRESS

This project is now closed and all reports are available on the project website. The project has produced a number of tools, reports and recommendations,some of which are being further tested on the TRANSITION project as part of the Local Energy Oxfordshire programme.

PRIMARY STRATEGIC OBJECTIVE

PROVIDING A VALUED AND TRUSTED SERVICE FOR CUSTOMERS AND COMMUNITIES

COLLABORATORS

Department for Business, Energy & Industrial Strategy

opus one solutions

Open Grid Systems

Hydro Ottawa

University of Cambridge | Energy Policy Research Group

FUNDING
£338,600

START/END DATE
October 2019 / October 2021

WEBSITE
https://www.smarternetworks.org/project/nia_ssen_0041

2.17 NIA SSEN 0046 LOCAL ELECTRIC VEHICLE ENERGY LOOP (LEVEL)

KEY ACTIVITIES

Increased use of EVs requires greater resilience of the electricity network. This project is investigating the specification of temporary and portable EV charging infrastructure devices to provide additional capacity to meet short-term demand in a location.

EXPECTED BENEFITS

This project will develop a standard and specification for portable temporary EV chargers to assist with network resilience and meet short term demand.

PROGRESS

The project is now closed and reports are available on the website, LEVEL has investigated the associated use cases for a mobile charging unit and the outline requirements of a portable charging solution. The project was prematurely closed due the limited benefits which are immediately available as EV uptake is still low and it may be something which is needed to be investigated further in the future. The learnings around temporary charging are still being investigated through E tourism and WPD's NIA_WPD_056 Temporary Event Charging projects.

PRIMARY STRATEGIC OBJECTIVE

ACCELERATING PROGRESS TOWARDS A NET ZERO WORLD

FUNDING
£320,000

START/END DATE
April 2020 / October 2021

WEBSITE
https://www.smarternetworks.org/project/nia_ssen_0046

2.18 NIA SSEN 0049 EQUAL EV

KEY ACTIVITIES

There are over 2.4 million disabled parking badge holders in the UK, with approximately 630,000 vehicles registered through the Motability Scheme – a scheme focused on vehicle leasing for motorists with disabilities and their care providers. Disabled motorists are often overlooked with regards to EV charging. There is a need to investigate and understand the enablers for both public and domestic charging solutions, not just for drivers with a disability but also for a wider range of potentially vulnerable customers such as elderly people or those with chronic illnesses.

EXPECTED BENEFITS

The benefit of this project will be identification of solutions to overcome barriers for EV adoption and ensure 'no one is left behind' in the EV roll out.

PROGRESS

The project is now closed. Two comprehensive reports were produced as part of the project outcomes to document the findings. The first report, produced by Impact Research, focused on identifying the barriers that motorists with mobility impairments face in their EV transition. The second report, produced by Energy Systems Catapult, focused on identifying potential solutions to address these barriers and propose innovative solutions for further investigation. Both reports are available on the project website.

PRIMARY STRATEGIC OBJECTIVE

MAKING A POSITIVE IMPACT ON SOCIETY

COLLABORATORS

DM UK DISABLED MOTORING UK

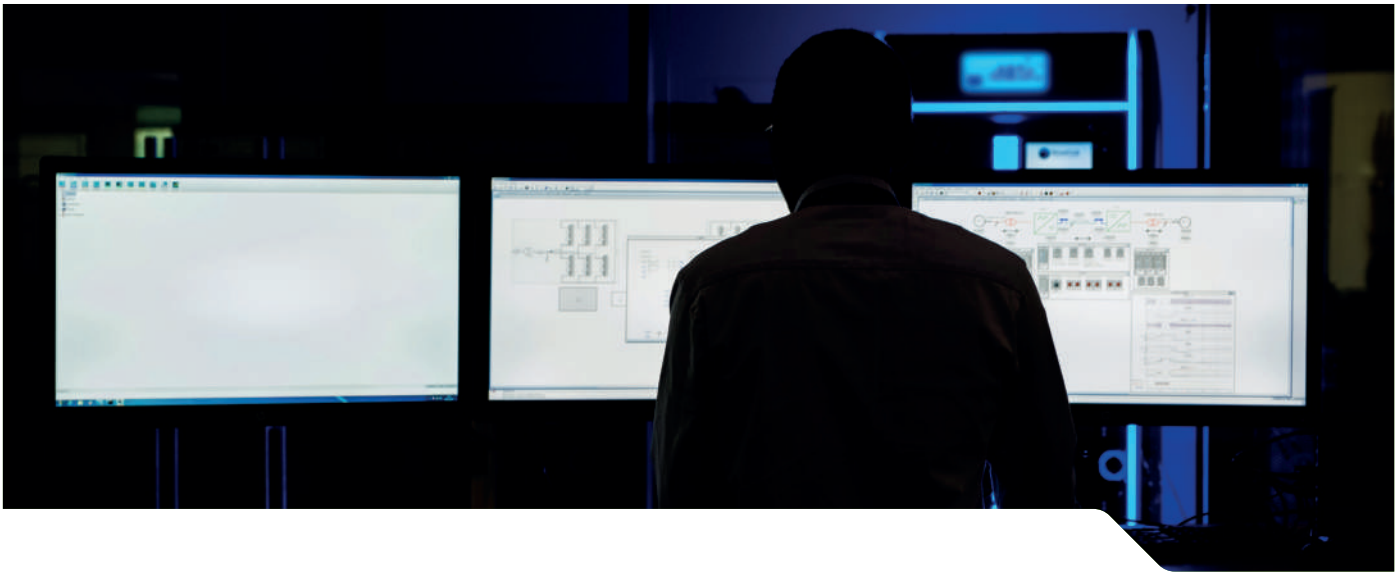
IMPACT FROM INSIGHT TO INFLUENCE

FUNDING
£345,000

START/END DATE
October 2020 / April 2022

WEBSITE
https://www.smarternetworks.org/project/nia_ssen_0049

2.19 NIA SSEN 0053 FUTURE CONTROL ROOM



KEY ACTIVITIES

The project will consider the requirements, the high-level architecture, operational need, and business impact of the future DNO control room. The outputs will also include an initial roadmap and architectural design for the future control room simulator. This project will also make recommendations for future development, further work required, use cases and user requirements for the future DNO control room to assess any challenges, opportunities and ongoing benefits to the electricity industry

EXPECTED BENEFITS

The project will provide new learning on the functionality and requirements of future control rooms, including: user requirements, technical architectures, data analysis and cyber security needs across a range of future operating scenarios. The project will also evaluate the potential use of new analytical techniques such as machine learning and artificial intelligence, to better maintain network resilience in a network which has widespread use of automation, Active Network Management (ANM) and flexibility, as well as a huge range of new monitoring/power flow data available from Low Carbon Technologies, smart meters and enhanced network monitoring. The project will also provide insights into the role of the DNO Control Engineer (HV and LV) when managing an increasingly complex network in the future. The project will also provide an overview of the research program required to develop a robust evidence base to allow for adoption of these new techniques into future control rooms.

PROGRESS

Through a mixture of industry engagement and academic insight, this project has informed and accelerated the evolution of the user cases for the DNO control room. This has been achieved through capturing the requirements from a range of internal and external stakeholders for a future control room. The project is now closed and all reports are available through the project website.

PRIMARY STRATEGIC OBJECTIVE

DELIVERING A SAFE, RESILIENT AND RESPONSIVE NETWORK

COLLABORATORS

UK Power Networks

Baringa
Brighter together

UNIVERSITY of STRATHCLYDE
POWER NETWORKS DEMONSTRATION CENTRE

FUNDING
£445,000

START/END DATE
January 2021 / April 2022

WEBSITE
https://www.smarternetworks.org/project/nia_ssen_0053

2.20 COLLABORATION PROJECTS LED BY OTHER NETWORK LICENSEES

Below is a list of other projects that SSEN is participating in. The projects are led by our collaboration partners hence further details of those projects can be found in their relevant summaries and project progress reports. To provide some indication of where those details can be found, the leading parties are given below next to each project.

Project number	Project title	Lead party
NIA_SPEN_008	Appeal (Wood preservatives)	SP Energy Networks
NIA_UKPN_047	Feeder monitoring to pre-empt faults	UK Power Networks
NIA _SPEN_0057	Enabling Renewable Heat	SP Energy Networks

FURTHER INFORMATION

The Innovation Strategy for SEPD and SHEPD can be found at the link below:

Distribution Innovation Strategy

https://ssen-innovation.co.uk/innovation-strategy/

Further details of all the NIA projects summarised above can be accessed through the following link:

ENA Smarter Networks Portal – SSEN Projects

https://www.energynetworks.org/electricity/futures/network-innovation/electricity-networks-innovation-strategy.html

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