

NIA Progress Report

Programme Summary

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CONTENTS

1	EXECUTIVE SUMMARY	4
2	INNOVATION STRATEGY	4
3	PROGRAMME OVERVIEW AND PROGRESS APRIL 2015 TO MARCH 2021	6
4	AREAS OF SIGNIFICANT NEW LEARNING	8
5	SUMMARY	9

1 EXECUTIVE SUMMARY

Electricity North West is delighted to present this sixth summary of activities and learning from the projects funded under Ofgem's Network Innovation Allowance (NIA).

This summary highlights key findings and important learning from projects currently in flight, of which full information can be found in the associated annual reports on the ENA Smarter Networks Portal.

During this seventh year of NIA-funded projects, Electricity North West has closed two projects and registered no new projects. Currently, there are 14 projects in-flight, each reflecting the aims of the innovation strategy, which was updated in February 2021.

Highlighted below is a synopsis of what Electricity North West considers to be important for dissemination.

2 INNOVATION STRATEGY

Electricity North West carried out an update of its innovation strategy in February 2021, following on from an update of the Energy Networks Association's national strategy. Whether it be in response to external trends, the needs and expectations of our customers, or changes in regulatory and government policy, the need for innovation has never been greater. The UK became the first major economy in the world to pass laws to end its contribution to global warming and bring carbon emissions to net zero by 2050. Here in the North West, we are supporting our stakeholders' desires to go further and faster than the national target and deliver net zero even sooner. These changes bring with them uncertainty. Uncertainty as to the energy system and the composition and volume of generation and demand, and uncertainty of technology with continued introduction of innovations that have the potential to transform much of what we do. As the distribution network operator (DNO) for the North West of England, it is our responsibility to help meet this challenge by managing uncertainty and leading the way in the energy revolution in the North West.

This is a significant challenge, and it is through targeted and effective use of innovation and subsequent investment in energy needs that we will help the North West to decarbonise, pave the way for the growth of renewable energy and support the transition to distribution system operation (DSO) – an industry-wide initiative to drive the changes needed to achieve net zero carbon emissions in the UK. But it does not stop there, we must also continue to improve the ways we operate and maintain our network, improve our efficiency and protect the environment and the needs of our consumers in vulnerable circumstances.

Innovation extends across all areas of our business and our innovation strategy looks to facilitate our delivery of many of our other key business wide strategies, thus forming an integral part of our overarching business plan.

The strategy describes how innovation will help to address the challenges of energy system transition, while maintaining a safe and reliable network and ensuring that the most vulnerable in our communities can benefit from changes we make elsewhere in the energy industry. We outline the five principles that support our innovation decision-making; our innovation themes, which ensure our plans are aligned with those across the energy industry and supported by stakeholders; and our innovation life cycle, which ensures we take a fit-for-purpose approach to delivering our projects and ensuring their rapid transition to business as usual.

An important driver for us is to understand and respond to the needs of our customers and wider energy stakeholders. Working together is the core of our company purpose – engaging with our

stakeholders on innovation, collaborating, sharing learning and listening and acting on what we hear is vital to our success. We know that we can only be successful when we deliver outcomes that are valued by the communities we serve.

To ensure we target our innovation resources appropriately across the full range of current and future challenges, and our stakeholders have visibility of the areas on which we are focused, we have forged our innovation strategy and associated plan around three core challenges facing distribution network operators: the energy system transition (where passive networks become increasingly active), asset management (further optimising our use of existing assets), and vulnerability (ensuring everyone benefits from our innovation and that no one is left behind).

Each of our innovation projects seek to explore a range of technological and commercial issues and trial solutions to one or more of the problems associated with each of the three key challenges as below.

Our challenge

Our target areas

Core to the principles of the [RIIO framework of electricity regulation](#), is that network operators must continue to provide and plan for a reliable and efficient network, while preparing for the net zero future, keeping costs low and ensuring that all our customers are included and treated fairly and equitably.

Successfully delivering against our RIIO objectives presents several challenges right across the organisation, and it is in these areas that we aim to focus our innovation efforts.

For the purposes of thinking about innovation, the challenges can be split into three broad areas:

OUR CURRENT CHALLENGES

- Energy system transition
- Asset management
- Vulnerability

The strategy is easily accessible to stakeholders and demonstrates a clear and logical link from high level objectives to individual projects. The innovation strategy, this summary, the NIA project reports and many other supporting documents are easily accessible on the innovation pages of Electricity North West's [website](#).

Electricity North West was also involved in the formation and production of the [National Innovation Strategy](#) which was completely updated and published by the ENA in March 2020. We have also submitted our draft business plan for ED2 to Ofgem, which includes proposed changes to our innovation strategy. Going forward the NIA project will be more focussed on customer vulnerability and the energy system transition as these are seen as key areas within the industry. We will also be publishing our updated Innovation strategy which will expand the specific challenge areas we look to investigate.

3 PROGRAMME OVERVIEW AND PROGRESS APRIL 2015 TO MARCH 2022

The individual project progress and completion reports reflect the depth of work completed and can be found on the Portal and our website. The table below shows the percentage progress made on our portfolio of projects.

NIA PROJECTS							
No	Description	Collaborative	Start Date	Completion Date	Status	Period	% completed
NIA-ENWL001	Demand Scenarios with Electric Heat & Commercial Capacity Options	No	Apr-15	Oct-16	Closed	18 months	100%
NIA-ENWL002	Distribution Asset Thermal Modelling	No	Jul-15	Jan-17	Closed	18 months	100%
NIA-ENWL003	Review of Engineering Recommendation P2/6	Yes (ENW lead)	Jan-15	Mar-16	Closed	14 months	100%
NIA-ENWL004	Combined Online Transformer Monitoring	No	Sep-14	Sep-22	Live	8 years	94%
NIA-ENWL005	Asset Risk Optimisation	No	Jul-15	Jul-17	Closed	2 years	100%
NIA-ENWL006	Sentinel	No	Sep-15	Dec-22	Live	7 years 3 months	62%
NIA-ENWL007	Reliable Low Cost Earth Fault Detection for Radial OHL Systems	No	Oct-15	Oct-17	Closed	2 years	100%
NIA-ENWL008	ATLAS - Architecture of tools for load scenarios	No	Oct-15	Nov-17	Closed	2 years 1 month	100%
NIA-ENWL009	Cable Health Assessment - Low Voltage	No	Nov-15	Aug-21	Closed	5 years 9 months	100%
NIA-ENWL0010	Value of Lost Load to Customers	No	Oct-15	Oct-18	Closed	3 years	100%
NIA-ENWL0011	Enhanced Voltage Control (CLASS 2)	No	Nov-15	Nov-18	Closed	3 years	100%
NIA-ENWL0012	Investigation of Switchgear Ratings	No	Dec-15	Dec-16	Closed	1 year	100%
NIA-ENWL0013	Detection & prevention of formation of Islands via SCADA	No	Dec-15	Jun-18	Closed	2 years 6 months	100%

NIA-ENWL0014	Optimising Oil Regeneration for Transformers	No	Feb-16	Feb-22	Live	6 years	100%
NIA-ENWL0015	Tap Changer Monitoring	No	Feb-16	May-22	Live	6 years 3 months	97%
NIA-ENWL0016	Future Network Modelling Functions	No	Mar-16	Sep-17	Closed	18 months	100%
NIA-ENW0017	Electricity & Heat (Futurebay)	No	Aug-16	Jun-19	Closed	2 years 10 months	100%
NIA-ENW0018	Project Avatar	No	Oct-16	Dec-21	Live	5 years 2 months	100%
NIA-ENW0019	Interface	No	Oct-18	Oct-21	Live	3 years	100%
NIA-ENW0020	Machine Learning	No	Oct-18	Oct-21	Live	3 years	100%
NIA-ENW0021	VOLL 2	No	Nov-18	May-20	Closed	18 months	100%
NIA-ENW0022	Reflect Uncertainties around E-Vehicle Charging to Optimise Network Forecasting	No	Mar-19	Mar-21	Closed	2 years	100%
NIA-ENW0023	Intelligent Network Meshing Switch	No	Apr-19	Apr-20	Closed	1 year	100%
NIA-ENW0024	Smart Heat	No	Apr-21	Apr-22	Live	1 year	92%
NIA-ENW0025	Online Netural Assessment (Broken Neutral)	No	Apr-21	Mar-23	Live	1 year 11 months	48%
NIA-ENW0027	Enhanced LFDD	No	Jun-21	Jan-23	Live	1 year 7 months	47%
NIA-ENWL0028	LV Predict	No	Jul-21	Jan-23	Live	1 year 6 months	44%
NIA-ENWL0029	A statistical Model for determining cut out failures	No	Dec-21	Jun-23	Live	18 months	11%
NIA-ENWL0030	Hyperspectral Imaging	No	Jan-22	Jul-23	Live	1 year 6 months	11%
NIA-ENWL0031	Automated Transformer Monitoring System	No	Mar-22	Aug-23	Live	1 year 5 months	0%
NIA-NGET0100	Reactive Power Exchange Application Capability Transfer (REACT)	Yes (NGC lead)	May-15	May-17	Closed	2 years	100%
NIA-NGET0154	Smart Grid Forum workstream 7 DS2030	Yes (NGC lead)	Jul-14	Sep-15	Closed	14 months	100%
WPD-NIA-008	Improved Statistical Ratings for Distribution Overhead Lines	Yes (WPD lead)	Jul-15	Jan-18	Closed	2.5 years	100%
NIA_SPEN0008	Environmentally Acceptable Wood Pole Pre-treatment Alternatives to Creosote (APPEAL)	Yes (SP Energy Networks lead)	Mar-16	Sep-18	Closed	2.5 years	100%
NIA_SSEPD0026	Management of plug in vehicle uptake on distribution networks	YES (SSE lead)	Mar-16	Jan-18	Closed	22 months	100%

4 AREAS OF SIGNIFICANT NEW LEARNING

Further areas of new learning have been observed during 2019/20.

The learning gained is shared at dissemination events and on our website and includes all projects that Electricity North West is involved in.

The areas of significant new learning identified this financial year relate to the Machine Learning and Smart Heat projects and a summary of the findings are as below.

Machine Learning

The Machine Learning project closed in October 2021 on schedule. The project was set up to look at ways of collating the various data sets now being generated by the proliferation of monitoring solutions that are being applied to the network, and to see if a combined analysis of this data could be used to detect and prevent issues from developing.

Data collation activities are currently underway, with large volumes of information from low voltage networks, as well as tap changer monitoring and transformer monitoring being transferred into a streamlined system implemented and utilised by the Parma group.

In addition, new triggering methods for field deployed equipment have been developed by the DSP and Firmware engineering team, allowing additional information outside of the standard triggering/data gathering scope to be captured for analysis. This has undergone rigorous testing before being deployed to a large number of field devices. The new data collected by the new triggering methods will improve understanding of the signatures from the loads on the network.

Data has now been collected for a full year using the updated triggers developed as part of this project and deployed as a firmware update to a number of devices installed in the network. This data collection was and continues to be essential to the modelling and analysis activities of this project.

An advanced LV model for classification of load types attached to each feeder has been created and run on a large data set, producing a total of 16 individual classifications, with 12 uniquely identifiable and labelled with their type, and 4 highly mixed load types.

A second model uses device information to perform a basic health assessment and ranking of the health of cables, and a report including the ranking of networks is produced on a weekly basis for the Rising and Lateral Mains installations, helping to prioritise resources.

A third model is currently being developed by a team specialising in machine learning, targeted firstly at identifying existing issues created by low carbon technologies. Continuation of this work will be used to predict feeders and network areas that will likely develop problems in the future.

Additional stages of the LV modelling will attempt to identify any unknown patterns and relationships that may exist in the data.

It is our intention to continue to refine the fault location algorithms defined during the project in order to increase their accuracy. This will be done by creating a feedback loop whereby data from site is compared to the algorithm outputs

Smart Heat

The Smart Heat project was a desktop study to investigate the impact of heat pump uptake and the use of variable ratings and flexibility solutions to accommodate this. The project found that there is likely sufficient existing network capacity to accommodate a low uptake of HPs.

The use of variable ratings could enable the uptake of higher numbers of HPs, but additional research and demonstration is required to build up confidence in the method.

Heat flexibility measures enable relatively small reductions in peak demand. Many customers would be willing to provide heat flexibility provided they have override control and are suitably compensated. An appropriate flexibility mechanism requires further development.

This desktop research project has provided a methodology to quantify the problem and conducted initial investigations into appropriate interventions. Further research and development is required fully develop the interventions into Business as Usual (BAU) solutions.

As part of this process we are reviewing the heat pump profiles created during the project and looking to use these to refine our existing forecasting methodology. We will also be looking to define the scope and assess the need for any further work in this area going forward.

5 SUMMARY

Despite the ongoing challenges of Covid and ongoing supply chain issues, Electricity North West has continued its strong performance on delivering innovation via the NIA. As seen above, we continue to look at a variety of areas that can deliver benefits to the network, and therefore customers, in the short term whilst also supporting the longer-term work to transition to net zero. Looking ahead to the next twelve months, we will be completing work on our remaining project to ensure the learning is available for the start of RIIO-ED2. We will also be looking to run some short term projects around our key challenges on customer vulnerability and the energy system transition that should set us up for future projects – either through NIA or as part of the new SIF process in RIIO-ED2.