electricity north west

Bringing energy to your door

NIA Progress Report

Programme Summary

31 July 2018

VERSION HISTORY

Version	Date	Author	Status	Comments
V1.0	25 July 2018	Lucy Eyquem Innovation PMO Manager	Final	

REVIEW

Name	Role	Date
Geraldine Paterson	Innovation Engineer	26 July 2018
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APPROVAL

Name	Role	Date
Steve Cox	Engineering & Technical Director	31 July 2018

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1 EXECUTIVE SUMMARY

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

This summary will describe some of the 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 third year of NIA-funded projects Electricity North West has closed a further two projects, and has worked on expanding and building the 11 projects currently in flight, all of which reflect the aims of the innovation strategy which was updated in March 2018.

Highlighted below is some of what Electricity North West considers to be important for dissemination to the electricity community.

2 INNOVATION STRATEGY

In March 2018 Electricity North West updated its innovation strategy. The strategy still provides a clear link between the values and drivers for innovation objectives and project selection and delivery and includes our thoughts on the future of distribution network operators (DNOs) and the potential emergence of the distribution system operator (DSO).

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 seeks to innovate continuously across its business activities to ensure that obligations to customers are met and that there is a response to customers' evolving needs and expectations.

Electricity North West has also been heavily involved in the formation and production of the National Innovation Strategy published by the ENA in March 2018.

3 PROGRAMME OVERVIEW AND PROGRESS APRIL 2015 TO MARCH 2018

The following projects have been registered on the Smarter Networks Portal. In-flight projects have an annual report available on the portal and on our own website. For completed projects a closedown report is available on the NIA portal and our website.

Figure 1: NIA projects led by Electricity North West

Project							Joint	Timescales	Duration								
									2014	2015	2016	2017	2018	2019	2020	2021	2022
Demand Scenarios with Electric Heat & Commercial Capacity Options		✓	✓	✓		✓	No	May 2015 – Oct 2016				COMPLETED					
Distribution Asset Thermal Modelling			✓	✓			No	Jul 2015 – Jan 2017					COMPLETED				
P2/6 Rewrite		✓					Yes (ENW led)	Jan 2015 – March 2016				COMPLETED					
Combined Online Transformer Monitoring				✓			No	Sep 2014 – Sep 2022									
Asset Risk Optimisation	✓	✓		✓			No	Jul 2015 – Jul 2017					COMPLETED				
Sentinel	✓	✓		✓	✓		No	Sep 2015 – Sep 2019									
Reliable Low Cost Earth Fault Detection for Radial OHL Systems	✓	✓		✓	✓		No	Oct 2015 – Oct 2017					COMPLETED				
ATLAS		✓	✓	✓			No	Oct 2015 – Nov 2017					COMPLETED				

Project							Joint	Timescales	Duration								
									2014	2015	2016	2017	2018	2019	2020	2021	2022
Cable Health Assessment – Low Voltage	✓	✓		✓			No	Nov 2015 – Nov 2018									
Value of Lost Load				✓	✓		No	Oct 2015 – Oct 2018									
Enhanced Voltage Control		✓		✓	✓		No	Nov 2015 – Nov 2018									
Investigation of Switchgear Ratings	✓	✓	✓	✓			No	Dec 2015 – Dec 2016				COMPLETED					
Detection of Islands	✓			✓	✓		No	Dec 2015 – Sep 2018									
Optimisation of Oil Regeneration				✓	✓		No	Feb 2016 – Feb 2022									
Tapchanger Monitoring	✓			✓			No	Feb 2016 – Feb 2020									
Future Network Modelling Functions			✓	✓			No	Mar 2016 – Sep 2017				COMPLETED					
Electricity & Heat			✓	✓	✓		No	Jul 2016 – Jul 2018									
Project Avatar					✓	✓	No	Oct 2016 – Dec 2019									

Find out more about all our NIA projects at www.enwl.co.uk/innovation.

The following projects have been registered, led and reported by other organisations, but are supported by Electricity North West.

Figure 5: NIA projects supported by Electricity North West

Project							Joint	Timescales	Duration								
									2014	2015	2016	2017	2018	2019	2020	2021	2022
Reactive Power Exchange Application Capability Transfer (REACT)		✓	✓	✓			Yes (NGC lead)	May 2015 – May 2017					COMPLETED				
Smart Grid Forum workstream 7 DS2030			✓	✓		✓	Yes (NGC lead)	Jul 2014 – Sep 2015					COMPLETED				
Improved Statistical Ratings for Distribution Overhead Lines			✓	✓			Yes (WPD lead)	Jul 2015 – Jan 2018									
Environmentally Acceptable Wood Pole Pre-treatment Alternatives to Creosote (APPEAL)	✓						Yes (SP EN lead)	Mar 2016 – Sep 2018									
Management of plug in vehicle uptake on distribution networks			✓	✓	✓	✓	YES (SSE lead)	Mar 2016 – Jan 2018									

The individual project progress and completion reports reflect the depth of work completed. Our projects reflect a variety of delivery mechanisms and a wide range of partner engagement from business and customer experts, technology producers and developers as well as industry bodies and collaborations.

4 AREAS OF SIGNIFICANT NEW LEARNING

Further areas of new learning have been observed during 2017/18. In addition to the learning gained from NIA projects Electricity North West has one Second Tier and one NIC project ongoing. Our Second Tier project Smart Street was closed down earlier this year and the outcomes of this project can be found on the project website.

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

Key learning from specific NIA projects includes:

4.1 Value of Lost Load

Following a detailed programme of research involving 6,000 customer surveys, the Value of Lost Load (VoLL) project is reaching completion, with final reports due to be published in the coming weeks.

This study demonstrates how understanding relative VoLL components, at a much more granular level, provides an opportunity for greater efficiency in future investment decisions. The research has delivered a set of VoLL estimates that reflect the varying needs of different customer groups far more accurately than the single-value approach currently used. These values have been incorporated into a new VoLL calculation tool, which will enable DNOs to accurately assess the blended VoLL of customers served by specific assets. This new approach will deliver greater value by targeting investments which more accurately reflect customer need and dependence.

The research has wider implications for Ofgem and GB DNOs in planning their future investment and customer strategies. It is anticipated that the values for segmented VoLL, calculated as part of this study, will be important in informing DNO policies and investment plans for RIIO-ED2 and beyond.

4.2 ATLAS

The ATLAS project is now complete. It has developed methodologies and associated prototype tools for the long-term, half-hourly through year demand (MW and MVAr) and generation forecasting of grid and primary substations. The developed approach is now a business as usual process that has enhanced the way that scenario-based forecasts can support well-justified strategic planning of network capacity.

More specifically, the ATLAS project recognised that network planning decisions should consider not only peak demand forecasts (ie, as the previous business as usual process did), but also forecasts focusing on minimum demand (eg, used for DG connections), profile characteristics (ie, load factor assessments to define network asset ratings) and reactive power flows during periods of peak and min demand (ie, to assess effects on available transformer tap headroom and MVAr exchange interactions with transmission).

ATLAS has also enabled good decisions about solutions to capacity problems using credible demand and generation scenarios that reflect regional uncertainties, and allowed informed dialogue with the electricity system operator and other stakeholders.

4.3 Detection of Islands

A network management system has the functionality to detect an island. The current polling rate of a network management system is in the range of seconds. However, a transient event that can lead to an island being formed can take place in milliseconds which leads to a delay in the detecting the island. A review of the current polling rate is recommended to understand the change in the polling rate required to satisfactorily detect islanded networks.

If it is acceptable for the island to be operated as such, network switches that are associated with the potential island network should be monitored as well as the voltage and frequency of the island network. As frequency is currently not monitored in the distribution network, deploying frequency monitoring devices at strategic locations that have a high probability of forming an island should be explored.

Modelling was conducted on a section of the Electricity North West network to understand the impact of sustaining islands. Analysis of the network has shown there is sufficient capacity to sustain an island system and it can remain stable with changes in demand of around 10%.

4.4 Project Avatar

To better understand the way forward for customer service a structured customer engagement process was undertaken. Four groups of customers were asked to attend three panel sessions run by an independent professional moderator. At these sessions customers' thoughts on customer service were explored. To facilitate the discussions three prototypes were constructed which allowed customers to experience the conceptual network of 2027.

Prototype 1 allowed customers to visualise how they might self-manage their own electricity in the future and introduced the concept of data sharing with the DNO, allowing the project team to test customers' acceptability to sharing data (such as energy consumption) with the DNO to inform better management of the distribution network.

Prototype 2 was the intermediary communication platform between customers and DNOs. It demonstrated the potential for automated responses to customer enquiries managed via service desk knowledge repositories and learning machine technologies.

Prototype 3 provided a vision for centralised communication and control for network management and leveraged the data generated from prototypes 1 and 2 and could provide every Electricity North West colleague with real time visibility of all network events (or access to authorised levels of information).

4.5 Tap Changer Monitoring

Electricity North West has installed tap changer monitoring equipment at 21 of the 40 sites and is on target to complete installations by mid-September. The monitoring equipment generates a monthly report which highlights any potential issues and allows us to arrange for an investigation.

4.6 Sentinel

Installation for the Sentinel project has now started and progress is good. There are now two trial installations on the test network and Electricity North West is working towards the first live installation in August 2018. It is hoped that data from this new fault location equipment could significantly improve our ability to locate overhead line faults. Two techniques are being used, impedance-based and travelling wave. Comparisons will be made between the two to see which is more effective or produces the best results.

4.7 Reliable, low cost earth fault detection for radial OHL system faults

This project has specified, developed, tested, and demonstrated communicating FPI units that are suitable for application in 6.6/11kV OHL distribution networks. The use of such units has significant potential to speed up fault identification, location, and isolation, and consequently improve restoration times by providing reliable detection of downstream over-current and earth faults. A technical specification for was developed based on the learning of this project, including network and operational environment, fault detection, power supply, and communication requirements. The installation and removal procedures were purposely designed to allow for standard live-line working practices so that no planned outages are required. The FPIs are readily integrated via a DNP3 interface into Electricity North West's existing network management system and are monitored via Nortech's iHost system. This

allows for real time fault detection that has the potential to speed up tele-controlled switching, improve field staff deployment and increase efficiency of automatic restoration systems.

5 BAU TRANSITION

Electricity North West has been in the process of transferring elements of some of its NIA projects into business as usual as previously reported in 2017. As well as the projects reported in 2017 we are now using the methodology developed in the ATLAS project for our forecasting and investment planning and the methodology developed in the Asset Risk Optimisation project to prioritise our asset replacement programme.

6 SUMMARY

Our continuous improvement journey is led by the needs of our customers. Our approach to innovation is underpinned by the aim to understand and respond to the changing needs of our customers. Collaboration with partner organisations is vital in this arena and we have found it invaluable to work with our project partners within the NIA to ensure that potential innovation solutions deliver customer benefits.

We recognise that significant learning can be gained from these NIA projects and aim to disseminate this information and any lessons learned to the DNO community and the wider electricity industry.