SP Electricity North West

NIA ENWL037

Delta Detect

Progress Report

July 2026

Version History

Version	Date	Author	Status	Comments
0.1	30 05 2026	RS	Draft	
1.0	15 07 2026	RS	Final	

Review

Name	Role	Signature
A Howard	Innovation Programme Mgr.	*A J Howard*
G Paterson	Innovation PMO Manager	*G Paterson*

Approval

Name	Role	Signature & Date
R Moulton	Head of Innovation	*R Moulton – 28 July 2026*

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Glossary of terms

Acronym	Description
LV	Low Voltage (0.4 kV)
HV	High Voltage (6.6/11 kV)
PNDC	Power Networks Demonstration Centre, University of Strathclyde

Project fundamentals

Project title	Delta Detect
Project reference	NIA_ENWL037
Funding licensee(s)	Electricity North West Limited
Project start date	Nov 2024
Project duration	1 year and 8 months Amended June 26 to 2 years and 4 months
Nominated project contact(s)	Rachel Stanley

1. Project background

There is an increasing reliance on the electricity network to accommodate low carbon technologies. The reliable and efficient operation of these networks is crucial for ensuring the uninterrupted supply of electricity to consumers. Faults and disturbances can occur, leading to power outages, equipment damage and safety hazards. Predicting, detecting, and locating these faults promptly is essential for minimising downtime, optimising maintenance efforts and improving network resilience. Traditionally, HV network monitoring has relied on costly and complex systems, often requiring extensive infrastructure and specialised equipment which has limited mass deployment on the network.

The project aims to leverage the capability of existing LV monitoring devices at secondary substations and extend their functionality to monitor HV underground networks. To do this, existing LV monitoring will be adapted, and an innovative algorithm will be developed to reverse engineer signals from LV side of the transformer onto the HV network. By monitoring critical parameters such as voltage, current, power factor and harmonics the system aims to identify abnormal conditions indicative of faults, such as insulation breakdown or equipment malfunction allowing for faults to be proactively detected, located, and repaired reducing downtime and leading to improved reliability and customer satisfaction.

2. Project scope

The project will research into adapting the existing technology to be able to deliver benefits to the 6.6/11 kV ring main circuits.

The research will study how waveforms triggered and recorded by LV monitors on the secondary mains (0.4 kV) network around the ring can be used to help sectionalise the fault.

By predictively sensing faults, providing information on the section this fault is likely to lie in, it provides the DNO with an opportunity to find and effect a repair before any customers are affected.

The project will undertake research into adapting the existing technology and developing suitable algorithms to collect and process HV events. These algorithms would then be tested in a controlled lab trial.

The project is split into three tasks:

1. Research on Voltage dip and swell triggers –investigate novel voltage dip and swell triggers to enhance fault detection capabilities in high voltage underground ring main circuits.

2. Modelling of HV switching events - develop models of existing high voltage switching events and their impact on underground ring main circuits, aiding in fault prediction and localisation.

3. Testing - Conduct testing and validation in a lab to assess their performance under realistic operating conditions.

3. Objectives

The objectives are:

Enhance reliability and resilience of high voltage underground ring main circuits to ensure uninterrupted energy supply, especially in areas with vulnerable customers

Provide a cost-effective solution for monitoring high voltage networks that delivers tangible benefits to consumers and the electricity distribution licensees

Conduct research and demonstrate the effectiveness of adapting LV monitoring technology for high voltage networks

4. Success criteria

The project delivers a cost-effective solution for monitoring and detecting faulty sections of cable in high voltage underground ring main circuits.

5. Performance compared to the original project aims, objectives and success criteria

Significant progress has been made on this project; however, issues including resourcing, unanticipated complexity and some additional design iterations have resulted in project delays and an increase in the required time to complete

The initial project requirements were to deliver a representative HV model of a DNO network onto which HV fault scenarios could be modelled and the effect of those faults be described through the system to the point on the LV network where that effect could be identified and analysed.

The second requirement was to generate a full spectrum of HV Fault scenarios and use the model to generate the expected outcome at the LV monitoring point. These could then be compared against real measured LV data to start calibration of the model and the development of the signatures the LV devices would use as HV fault detection triggers.

In parallel with the above was the development of a real-world testing facility to replicate the modelling work.

With the technical data provided, initial network models were built but the complexity required to demonstrate the propagation of fault signals was found to be much greater than anticipated during project development. Several design assumptions had to be reviewed, and a more robust but complex solution developed. Initial comparisons to real world measured data also generated some further reviews of the core model to ensure it was fit for purpose.

Both the Model and HV scenarios are now complete, and work is in progress in developing the trigger signal for the LV monitoring devices to use to identify a HV fault has occurred.

The work to develop a real-world testing facility has continued in parallel, with the requirements for the physical test system being developed and real-world assets (faulty cable sections) collected ready for testing. Physical testing is dependent on the modelling and fault scenario work.

The partners recognise that the early phases of this project were possibly the most innovative and hardest to estimate to deliver but are confident what has now been delivered will support the rest of the project well.

All appropriate additional information will be made available via the SP ENW Innovation website and the Smarter Networks Portal.

6. Required modifications to the planned approach during the course of the project

Mobilisation of the project took longer than anticipated with access to key technical and subject matter experts being slower than planned due to partners resourcing issues.

The scope of work to develop the quality of model required was underestimated and additional development cycles were therefore required to refine and improve the model and compare it successfully against historic real world LV data.

The largest impact of these modifications is to the planned timeframe, as the remainder of the project require these items to be established first. A project extension has therefore been required.

The project expects to fully achieve the original aims, objectives and success criteria, to the revised timelines.

7. Lessons learned for future projects

For future projects ensure all key resources can be made available to commence work to meet the agreed project timelines.

Consider how uncertainty of scoping work, that is innovative and therefore not fully understood, can be budgeted in project development.

8. Data access & quality details.

There is no data available associated with this project at this stage.

Anonymised data can be made available in line with our innovation data sharing policy, which can be found on our website.

9. Foreground IPR

There is no foreground IPR associated with this project at this stage.

10. Standards documents

Not applicable.