WPD INNOVATION

Transforming the electricity network

Pre-Fix

NIA Major Project Progress Report

October 2021 – March 2022

WESTERN POWER DISTRIBUTION

Serving the Midlands, South West and Wales o

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Western Power Distribution 2022

Contents

1. Executive Summary

Project Pre-Fix is funded through Ofgem's Network Innovation Allowance (NIA) funding mechanism and has a budget of £1.64M. Project Pre-Fix was registered in autumn 2021 and will be complete by March 2023.

We are conducting this project with the intention of being able to improve our customer's experience of power cuts. We think that the Pre-Fix project can achieve this by enabling faster restoration and potentially intercepting defects before they occur. Innovation funding is being spent as this project seeks to overcome the barriers to wide-spread High Voltage (HV) pre-fault capability represented by developing alternatives to a vendor tie model in that is associated with proprietary software. Overcoming vendor tie in will mean that WPD can interoperate pre-fault sensitive devices. This interoperability will translate into a lower unit cost to deliver this capability.

This project will utilise HV pre-fault capture capable devices from different manufacturers to demonstrate how they can all contribute into a common data platform. This project will also demonstrate how existing network devices, such as power quality monitors, protection relays and Low Voltage (LV) monitors, might also help contribute to HV pre-fault detection in addition to their typical function. This project will also show how consistent operational dashboards and reports can be developed from this platform to enable a consistent policy driven approach to be implemented across an organisation. Key activities that will be carried out during the project include:

- Use of trial data from other DNO's to inform platform design and support testing
- Architecture specification for the Common Distribution Information Platform (C-DIP)
- Interoperability specification and setting of pre-fault gathering devices
- Design of common operational user interfaces
- Live trial of devices, platform and reports

This report details progress of the project, focusing on the last six months from October 2021 to March 2022. During this period we have delivered project specifications and early stage development of the C-DIP. During this period we have also conducted site surveys and trial installation of trial devices.

1.1. Business Case

Pre-fix is based on the expectation that better fault information can avoid operational costs and customer disruption. Cost benefit analysis was carried out to demonstrate the effect of a Pre-fault capability on the last three years of all WPD unplanned HV outages. This exercise observed that:

- The baseline costs were at least £7.4M per year in avoidable customer disruption and at least £3.4M per year in avoidable operational expenditure through avoiding the engineering time associated with customer restoration of unplanned faults.
- The Pre-Fix method cost will vary between £15k to £35k per primary substation, which will cost a total of between £20M to £48M across four electricity licences.

There is little reliable evidence that demonstrates the likely range of efficacy rate for pro-active fault management. Therefore, a sensitivity study has been undertaken to explore the financial outcomes for customers under different efficacy rates.

- Under best case efficacy rate of 80% with a unit cost of £15k per substation, customers will save £50M over 15 years.
- At an efficacy rate of 65% and a unit cost of £40k per primary substation, then customers will save £5.7M over 15 years

It is important to understand that the Pre-Fix solution puts a downward pressure on unit prices due to the ability to use a variety of devices, some of which already have alternative uses on the power system. This value-for-money market mechanism is not necessarily feasible using proprietary fault information systems.

1.2. Project Progress

This is the first progress report on Pre-Fix. It covers progress from initial registration in October 2021 to the end of March 2022.

Since project initiation, work has taken place to specify the platform requirements, commence development of the platform and effort towards installation of the data capture devices.

1.3. Project Delivery Structure

1.3.1. Project Review Group

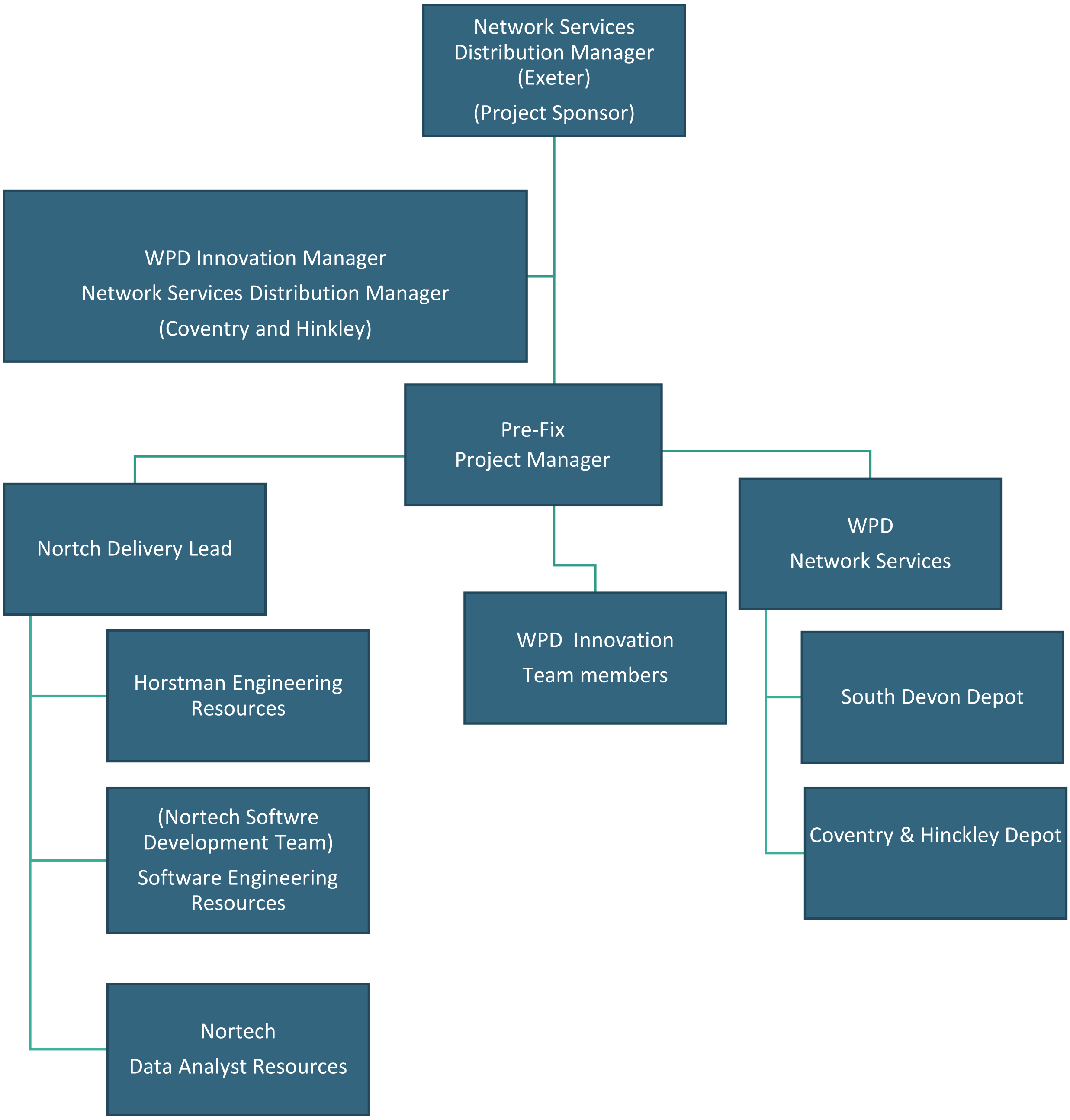
The Pre-Fix Project Review Group (PRG) meets on a quarterly basis. The role of the Project Review Group is to:

- Ensure the project is aligned with organisational strategy;
- Ensure the project makes good use of assets;
- Assist with resolving strategic level issues and risks;
- Approve or reject changes to the project with a high impact on timelines and budget;
- Assess project progress and report on project to senior management and higher authorities;
- Provide advice and guidance on business issues facing the project;
- Use influence and authority to assist the project in achieving its outcomes;
- Review and approve final project deliverables; and
- Perform reviews at agreed stage boundaries.

The last Project Review Group took place in February 2022. A key focus of this most recent review group was installation of the data capture units.

1.3.2. Project Resource

Project Prefix is being delivered through the following delivery team:


Network Services Distribution Manager (Exeter)
(Project Sponsor)
WPD Innovation Manager
Network Services Distribution Manager
(Coventry and Hinkley)
Pre-Fix Project Manager
Nortch Delivery Lead
WPD Innovation Team members
WPD Network Services
Horstman Engineering Resources
South Devon Depot
(Nortech Softwre Development Team)
Software Engineering Resources
Coventry & Hinckley Depot
Nortech Data Analyst Resources

1.4. Procurement

Table 1 details the status of procurement for this project.

Table 1: Procurement Details

Provider	Services/Goods	Area of project applicable to	Anticipated Delivery Dates
Nortech	Devices for live trial	Capturing Pre-Fault data and proving data flows	56 Smart Navigator devices have been delivered to WPD
Nortech	Software Development	Development and trial of the C-DIP	Summer 2022
GE	One relay and application support	Bench test of 3rd party devices into the C-DIP	Under negotiation, but targeted for Q2 2022
PNDC	System testing of LV devices	Verification of LV devices	Under negotiation, but targeted for Q2 2022

We is currently exploring the potential to increase the number of suppliers participating in the bench testing phase. This additional learning would be justified in demonstrating that the C-DIP can include multiple suppliers

1.5. Project Risks

A proactive role in ensuring effective risk management for Project Pre-Fix is taken. This ensures that processes have been put in place to review whether risks still exist, whether new risks have arisen, whether the likelihood and impact of risks have changed, reporting of significant changes that will affect risk priorities and deliver assurance of the effectiveness of control.

Contained within Section 7of this report are the current top risks associated with successfully delivering Project Pre-fix as captured in our Risk Register. Section 7 provides an update on the most prominent risks identified at the project bid phase.

1.6. Project Learning and Dissemination

Project lessons learned and what worked well are captured throughout the project lifecycle. These are captured through a series of on-going reviews with stakeholders and project team members, and will be shared in lessons learned workshops at the end of the project. These are reported in Section 5 of this report.

To date the Pre-Fix project has disseminated its aims at WPD's innovation showcase in December 2021.

2. Project Manager's Report

2.1. Project Background

We are conducting this project to build a capability that will enable us to react more efficiently to faults that have occurred or defects that are about to occur. To enable this, we will need to be able to share information with operational staff about these defects; but to obtain this information, we will need to be able to gather and process information from devices on the network. Building a DNO platform rather than relying on vendor platforms means that we will be able to ensure that different devices can all inter-operate and drive consistent operational policy.

Over an 18-month project duration, Pre-Fix was planned to deliver a pre-fault and disturbance information platform. The extent of the platform is depicted in Figure 1. The overall aim of the project is to develop a common disturbance information platform (C-DIP) that can gather disturbance information from various network devices (PQ monitors etc.). By running automated analysis on the data gathered from network devices and aligning it with network information operationally, useful information would be shared with field staff and fault restoration managers.

This project seeks to establish whether devices already in WPD's supply chain can deliver HV pre-fault data. Demonstration of this feature would help keep the unit cost of introducing a pre-fault capability lower than using bespoke pre-fault devices and potentially help increase the accuracy.

This project will be delivered using the Work Packages (WP) summarised in Table 2.

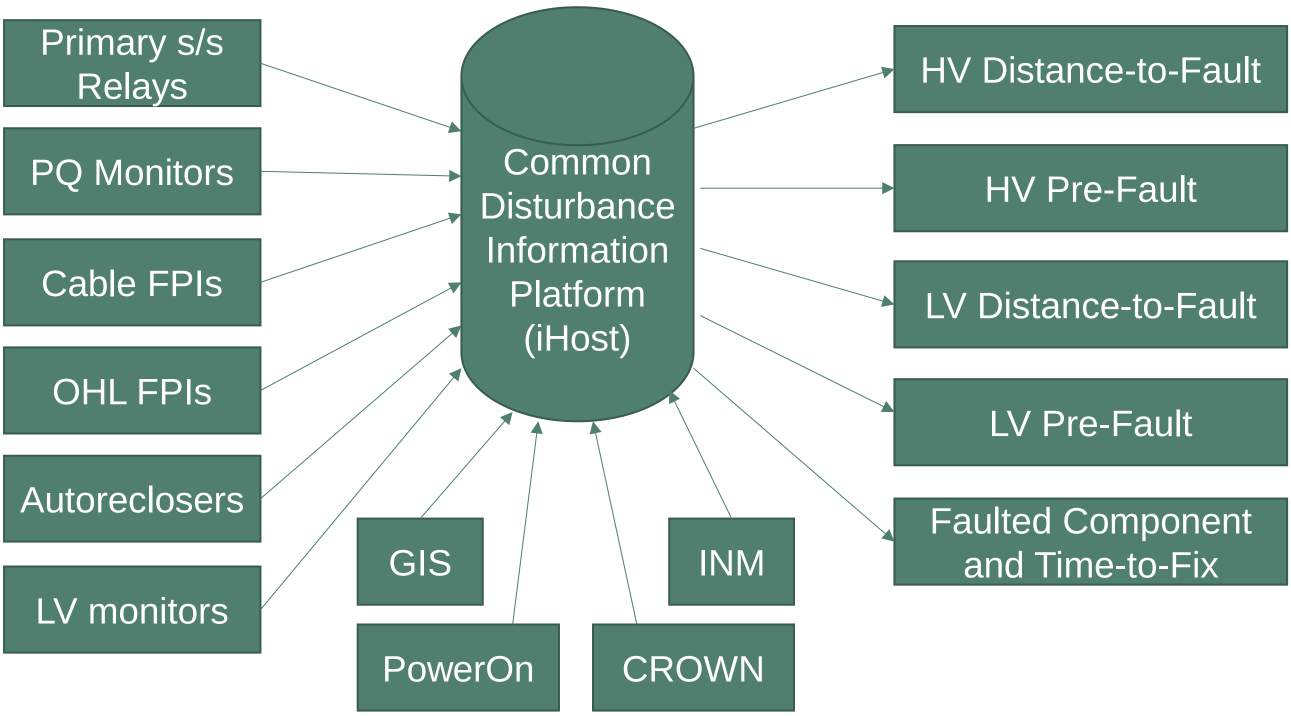


Figure 1: Common Disturbance Information Platform (C-DIP) architecture

Table 2: Pre-Fix work package summary

Package	Description	Baseline plan
WP1 Specification:	This work package records the requirements that must be delivered from all of the systems to be developed within this project	30/09/21-23/12/21
WP2 Design/Development	This work package conducts the deeper design requirement to deliver WP1, including design documentation and operational protocols, which will explain: (i) Deployment and application guidelines; (ii) Design and setting Documentation (for permanent fit devices); and (iii) Communication philosophy and requirements.	11/11/21-20/01/22
WP3 Build and Install	This work package constructs the systems required to deliver the functionality, installs the trial infrastructure and tests ahead of trial.	17/03/22-12/05/22
WP4 Testing	This work package tests the components and system ahead of trials	12/05/22-27/05/22
WP5 Trial	This work package conducts a system trial prove the system requirements in an operational context.	24/06/22-27/03/23

The progress within each of these WPs is shown within section 2.2 below.

2.2. Project Progress

The following sub-sections record the progress to date within each of the five project work packages.

2.2.1. Work Package 1 - Specification

Within this period, a number of specification documents have been delivered. The delivery of specification documents is important as allows us to explain what we need the platform to do and how we will assure the quality of subsequent development activity in WP2 and WP3. These documents are summarised in Table 3. Work Package 1 is now complete and the four deliverables have been agreed and approved.

Table 3: Work Package 1 deliverables.

Title	Scope	Progress
WPD user requirements	This document recorded our requirements for the C-DIP platform, user interfaces and trial devices.	Delivered
Common Disturbance Platform (C-DIP) specification	This document records detailed requirements for the data processing required for the proposed iHost Pre-Fix Dashboard.	Delivered
Algorithm specifications	This document required the specified functionality and requirements for the algorithms.	Delivered
Device requirements	This document records compatibility requirements expected of devices that could contribute onto the C-DIP. This document discusses the requirements for triggering of disturbance recording and arrangements for file transfers.	**Delivered**

2.2.2. Work Package 2 – Design and Development

This package responds to the requirements set by documents in WP1 and provides design intentions. These design intentions are then be reviewed before progression onto development. Overall progress within work package 2 is summarised within Table 7 and some examples of the work completed is shown in the sub-section beneath on wireframe dashboards.

Table 4: Work Package 2 deliverables.

Title	Scope	Progress
Wireframe design of User Interface for trial purposes	Work has been underway on developing wireframe visualisations for what the User Interfaces should look like. These visualisations give different users varying levels of abstraction to be able to utilise pre-fault data. Examples are shown in the figures beneath this table.	Delivered
Data dictionary for data gathered/used onto the C-DIP	The data dictionary defines the different data types and flows within the Pre-Fix project	This document is underway, but not yet due. This document is expected to be complete within the next reporting period.
First-pass algorithm provision for: detect, locate & timing functions	This product develops the capability to translate network measurements into impedance path and early stage insight into informing time to fail from network measurements.	The requirements for this algorithm were set in WP1 and development is now

		underway. Algorithms are being prototyped, leading to a test document.
Setting documentation for capture devices	This product records the communications and triggering settings for the devices that will be used on the pre-Fix trial. Learning about capture triggering is expected to evolve over the Pre-Fix project and beyond.	Settings have been developed for the first installation of SN2's, NX44's and PQubes.
System design approach record	This is a live document which records any deviations in product performance relative to the specifications set is WP1.	This document is updated when any deviations from specification are sanctioned.

2.2.2.1. Dashboard Wireframes

In developing user output screens we have developed visualisations of what the output to operational users should look like. These have helped us verify whether the screens will deliver what our operational teams will need. We have also developed simple excel sheets to demonstration the logical and mathematical functional that will underpin the dashboard. These excel sheets allow us to quality review the functions that drive the operational information dashboards before they are implemented in the development environment.

The three figures beneath depict the dashboards that for operational users. Figure 2 provides a depiction of a summary of the pre-fault risk carried across an entire depot area.

- Features 3 and 4 on this dashboard provides the user an insight as to how many customers are at imminent risk of unplanned outage.
- Features 5, 6 and 7 allows the user to obtain insight into which primary substations and feeders represent the immediate risk to supply.

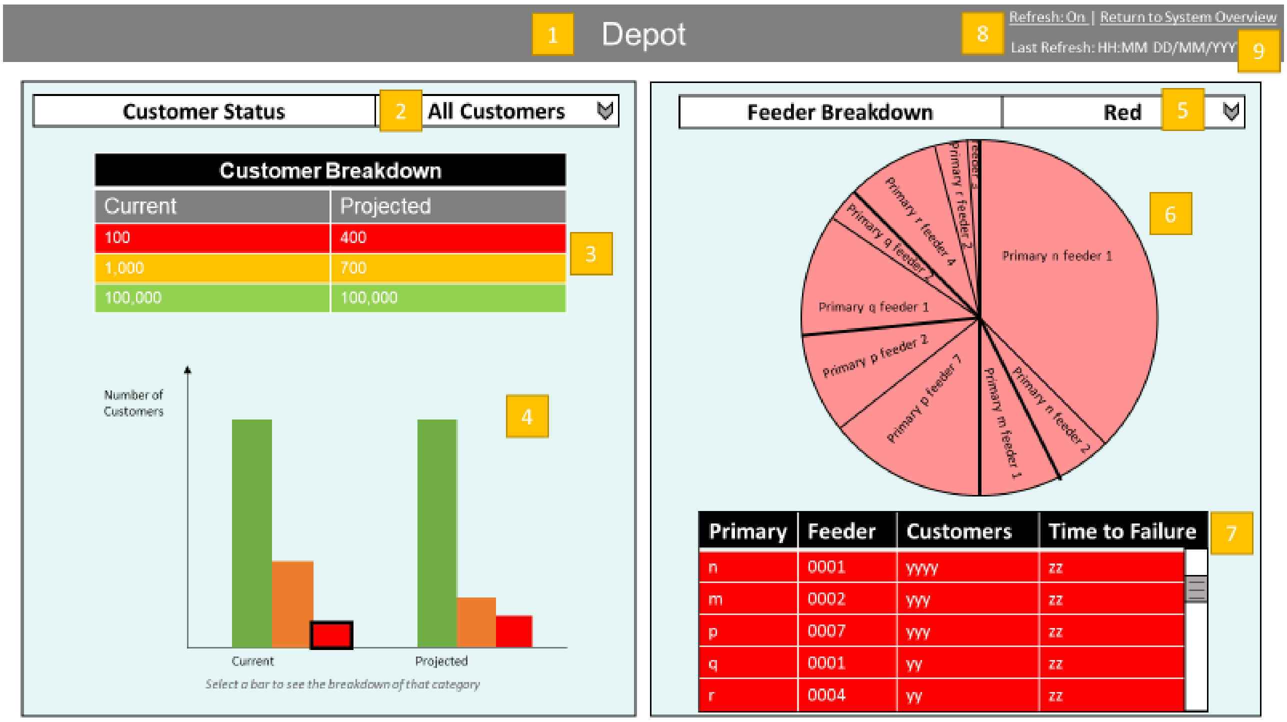


Figure 2: Depot level summary of Pre-Fault information

Figure 3 provides a depiction of a summary of the pre-fault risk carried across a primary substation.

- Features 3 and 4 on this dashboard provides the user an insight as to how many customers are at imminent risk of unplanned outage and upon which feeder these risks reside.
- Feature 6 allows users to understand which feeders host the pre-fault activity.
- Features 7 and 8 allows users to understand where the predicted location of the pre-fault activity sits upon a nominated feeder.

These dashboards have already been presented to senior user representatives in WPD to gather their feedback, which was incorporated in, to the design.

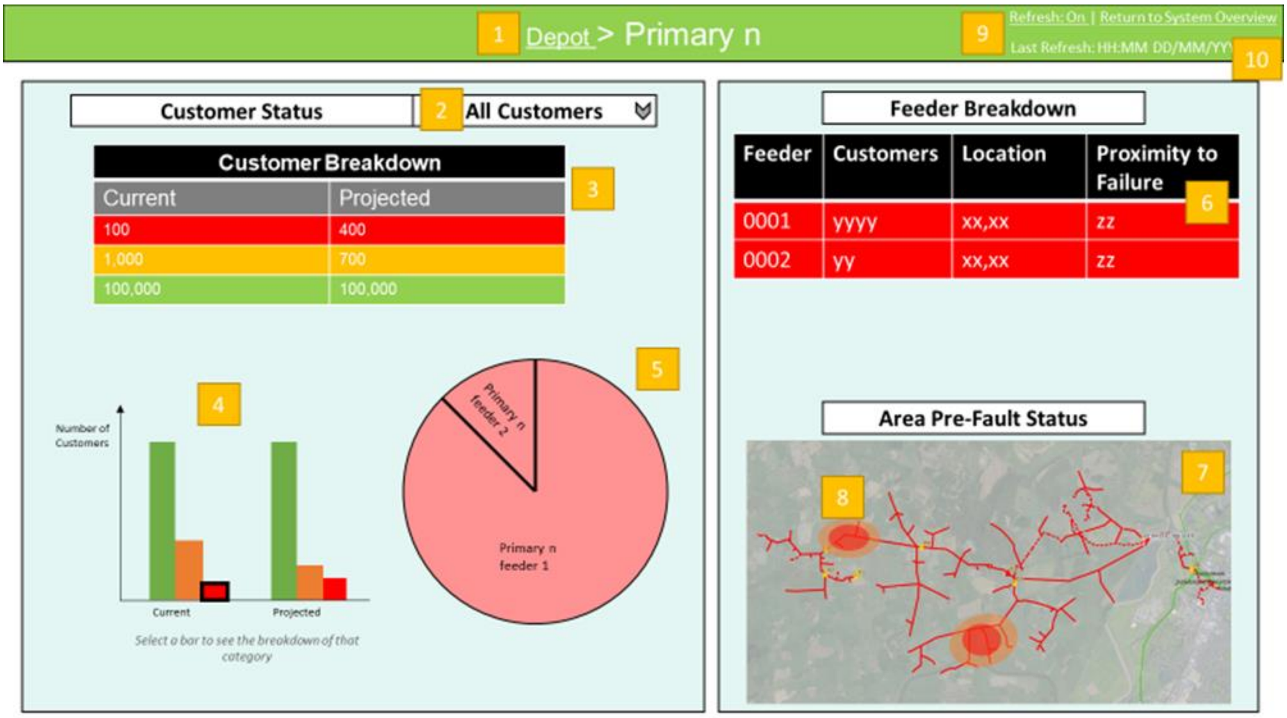


Figure 3: Primary substation level summary of Pre-Fault information

Figure 4 provides a depiction of the screen that is intended to provide users with a detailed insight into the Pre-Fault activity on a feeder. Feature 2 gives the user the general context of the recent feeder performance, whereas features 3,4,5,6 and 7 are intended to give users more detailed information with which to narrow down the seat of the defect.

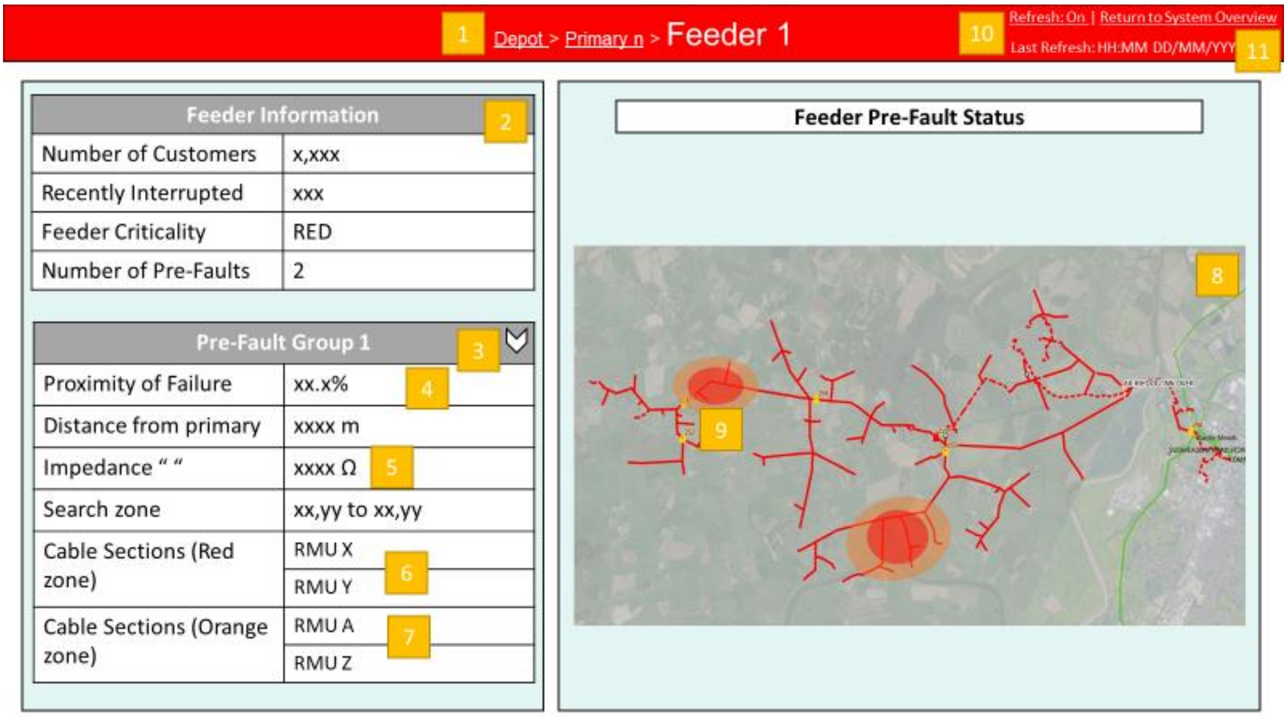


Figure 4: Feeder substation level summary of Pre-Fault information

2.2.3. Work Package 3 – Build and Install

Table 6 summarises the work undertaken in work package three today and upcoming steps. More detail delivered as part of this Work Package during this reporting period is provided in subsection 2.2.3.1.

Table 5: Work Package 3 deliverables

Title	Scope	Progress
Build of C-DIP & algorithm engine	This product develop the database that hosts disturbance information, the logic and functions that convert network measurements into network locations and the databases that record location predictions.	Early development sprints underway focussing on utilisation of distance to defect information. See Figure 5 beneath.
Build of live user interfaces	This product delivers the dashboards already discussed in this document	This product is not yet due but is expected to be complete by the next performance report.
Installation of test of desktop trial devices	This product demonstrates how 3rd party devices can be co-ordinated to contribute network measurements onto the C-DIP.	This product is not yet due. Detail planning underway with initial results expected by the next performance report.
Installation and site test of live trial devices	This product stream installs live devices onto the system to capture real-life pre-fault information.	**Installation protocols and training have taken place.** The first installations have taken place
Guidance documentation for user interfaces and trial system admin	This product stream provides user documentation for the Pre-Fix systems	This product is not yet due, but is expected to be complete by the next performance report.

2.2.3.1. Network Defect Location

Work has been underway in building the functionality, which allows network measurements to be translated into locational information. We have witnessed (but are not yet due to test) the functionality which allows the feeder positions to be marked for a given impedance to defect measurement.

Figure 5 shows new functionality that enables a common impedance contour to be plotted across a geo-schematic of the network. This means that once the impedance to defect and been distilled from system measurements the likely potential locations can be plotted and cross-referenced against smart fault passage indicators to refine the location.

Figure 5 shows one application of this where this new functionality indicates all of the locations downstream of a primary that share the same electrical distance from the primary (i.e. the feeding path between each red dot and the primary all have an equal impedance). We have witnessed functionality which demonstrates how the impedance contour alters in response to the inputted impedance to defect. The use of this functionality will underpin the functionality seen in Figure 4 where the locations can be shared in written and geographic form.

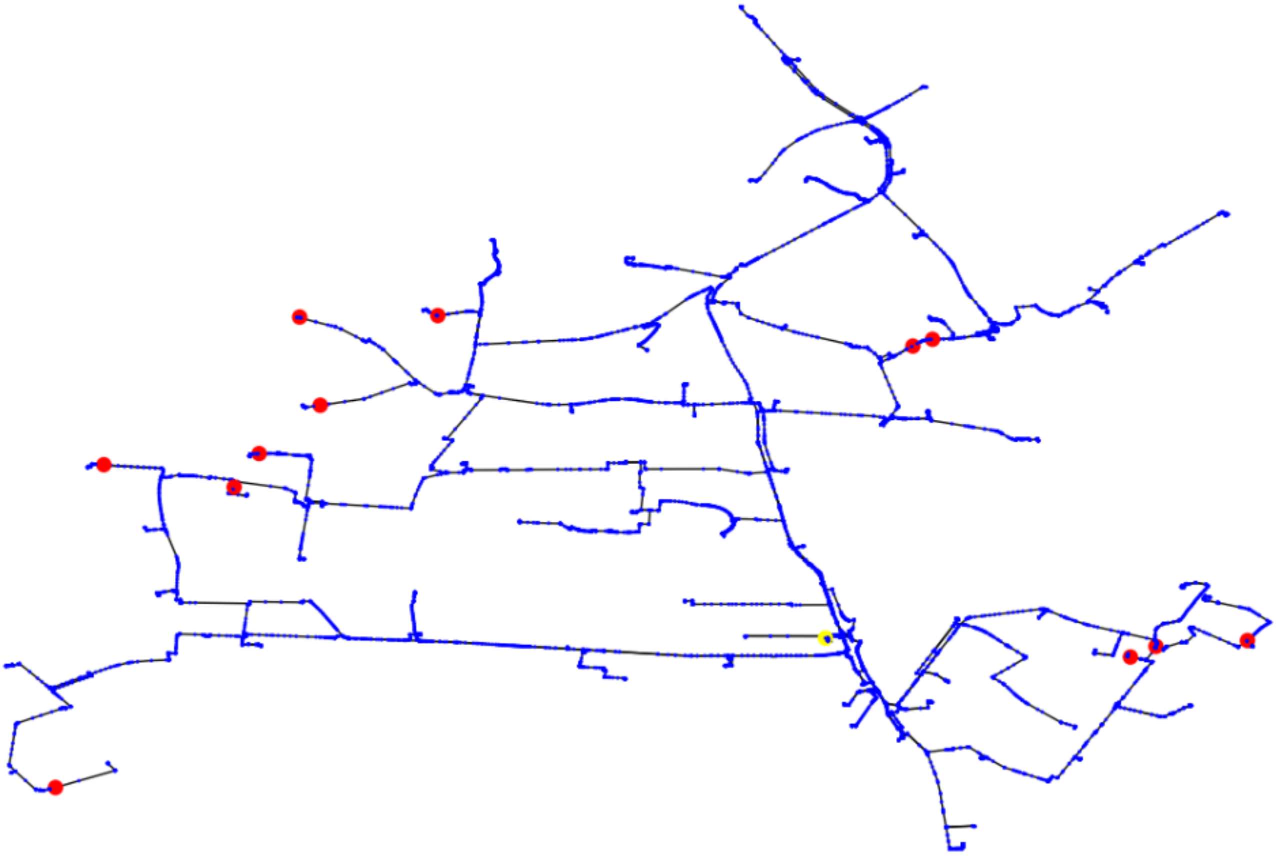


Figure 5: Example of network location indication using SINCAL and Distance to fault information.

2.2.3.2. Installation works

To date, installation works have commenced on deploying NX44, SN2 and PQube units. The first installation efforts have been used to develop a trial installation policy for these devices. An example of one of the first NX44 installations on our network is shown in Figure 6. This picture shows the mounting arrangements for an NX44, but does not reveal the additional effort required for the connection onto the Current Transformer (CT) or the arrangements for powering the unit.

The scope of work used is limited to ring main units that already have spare CT's that are available and enables an NX44 to be connected to the CT and the local 230V AC supply without outage of the main power circuit. Learning from these initial exercises indicates that several NX44's can be installed at proximate locations within one day. Additional learning from the prior site selection exercises indicate that the availability of locations with spare CT's on ring main units is actually relatively sparse.

As a result of this learning, feasibility studies have been undertaken to indicate whether the NX44 units can be modified to use a "clip-on" style high-accuracy current transducer. This would enable the NX44 units to be deployed in secondary substations where the CT's are already in use by clipping onto the secondary wiring to monitor primary current waveform.

Figure 6: Example of NX44 installation

2.2.4. Work Packages 4 and 5 – test and trial

These work packages are not yet due to be underway, but planning for these work packages is underway hence, there is no commentary within this first six monthly report. Within the next six-month period, work is planned to construct and test the C-DIP platform and embark on the live trial.

3. Progress against Budget

Table 6 summarises the project budget performance to date.

Table 6: Progress against Budget

Spend Area	Budget(£k)	Expected Spend to Date (£k)	Actual Spend to Date (£k)	Variance to expected (£k)	Variance to expected %
WPD Innovation project management and technical authority	**£240,916**	**£112,896.00**	**£49,907**	**-£90,761.00**	**-95.71%**
Network Services	**£151,815.00**	**£94,831.00**	**£4,070.00**	**£203,500.00**	**105.17%**
Nortech Equipment	**£524,500.00**	**£193,500.00**	**£397,000.00**	**£13,190.00**	**3.97%**
Nortech Delivery	**£603,250.00**	**£332,521.00**	**£345,711.00**	**-£75,000.00**	**-100.00%**
Bench test Hardware	**£75,000.00**	**£75,000.00**	**£0.00**	**-£15,000.00**	**-100.00%**
WPD IT Hardware	**£30,000.00**	**£15,000.00**	**£0.00**	**£0.00**	**0.00%**
Testing	**£48,123.00**	**£24,061.00**	**£24,061.00**	**-£27,060.00**	**-3.19%**
Total	**£1,673,604.00**	**£847,809.00**	**£820,749.00**	**-£90,761.00**	**-95.71%**
Contingency	**£182,460**	**£0**	**£0**		

Comments around variance

There is a general underspend on parts of the project due to the fact that overall project sanction was achieved two months later than planned which has delayed delivery in some areas.

The project management and technical authority budget is running under budget due to the fact that the deliverables to date have been delivered with less internal resource than was expected. This underspend is planned to be utilised in 22/23 in wider than planned exploration of integration of supply chain devices onto the Pre-Fix platform.

Engineering services spend has been impacted by the later than expected start to the project and resourcing issues in the wake of Storm Eunice, the majority of this variance is expected to move into the financial year 22/23.
A number of milestone payments have been brought forwards that are related to milestone payments for to equipment that has been prepared at a faster rate than planned.

4. Progress towards Success Criteria

Table 7 summarises the progress that the project has towards the Success Criteria.

Table 7: Progress towards success criteria

Success Criteria	Progress
Demonstration of how to gather and then utilise data from existing WPD specification equipment in the pre-fault data chain, devices to include protection relays and power quality monitors.	Underway Planning is underway for bench testing of devices to enable testing to commence. Installation is underway of devices that will capture live pre-fault information
Demonstration of how to gather than then utilise data from temporary pre-fault monitors.	Underway Installation planning has been underway for the data capture devices, and preparation is underway for installation of these devices.
Demonstration of how pre-fault information from diverse devices can be gathered into a central location.	Underway This work is underway. The specification for 3rd party capture device has been reviewed. Preparation is underway for bench testing of devices to verify third party contribution onto the platform.
An application guide for how, where and when to deploy different pre-fault equipment.	Not Yet Started This task is dependent on real world learning. This will be done by reviewing the operational learning developed by this project and other NIA projects.
A user interface to present pre-fault data in a manner that is useful and meaningful to operational users.	Underway This work has been started and designs are complete. The User interface specification has been written and wire-framed.
An prototype operational protocol for how to leverage technical application into operational outcomes	Not yet started, This will be done by reviewing the operational learning developed by this project and other NIA projects.

5. Learning Outcomes

Table 8 summarises the learning points encountered on Pre-Fix to date.

Table 8: Learning points to date

Package	Learning Points
WP1 Specification:	1. The original intention of Pre-Fix was to use our Integrated network Model (NIM). We have subsequently discovered that our recent investment into constructing a HV model within the SINCAL environment could also be used. This learning is useful as it proves another controlled model that could be used to populate the C-DIP. 2. We have had preliminary conversations with 3rd party suppliers regarding wider integration of the C-DIP platform. To date it appears that Comtrade files can generally be supported, but there may be other protocols that would be more advantageous in the long run.
WP2 Design/Development	1. Learning has been captured with regard to the fact that the distance to fault functionality will need to be sensitive to inaccuracies in network data, varying quantities of earth return impedance and non-linear arc behaviour.
WP3 Build and Install	1. Site selection works have demonstrated that only around 30% of HV ring main units will have Current Transformers (CT's) that will enable connection of NX44's. This will have implications on the potential for retrofit of smart Fault Passage Indicators (FPI's) onto the system. 2. Not all primary substations have three phase Voltage Transformers available at 11 kV. We have learnt that PQUBes can reconstruct the three-phase waveform from two-phase VT's, but not from single phase VT's. This is typically only a problem at older sites though. 3. We have learnt that introducing the capability for Smart FPi's to be able to clip-onto the secondary wiring of existing secondary wiring increases the number of sites where smart FPI's can be retrofitted. 4. Site inspections have confirmed that three different types of PQUBE installation pattern are required to enable accommodation across the network. This includes installation within a transformer control panels, Switchgear Risers and within transformer 11 kV circuit breaker panels.
WP4 Testing	Not yet underway
WP5 Trial	Not yet underway

6. Intellectual Property Rights

A complete list of all background IPR from all project partners has been compiled. The IPR register is reviewed on a quarterly basis.

No relevant foreground IPR has been recorded within this reporting period. The majority of this learning is expected during the next six monthly period when the functionality within the C-DIP platform is developed.

7. Risk Management

Our risk management objectives are to:

- Ensure that risk management is clearly and consistently integrated into the project management activities and evidenced through the project documentation;
- Comply with our risk management processes and any governance requirements as specified by Ofgem; and
- Anticipate and respond to changing project requirements.

These objectives will be achieved by:

- ✓ Defining the roles, responsibilities and reporting lines within the Project Delivery Team for risk management;
- ✓ Including risk management issues when writing reports and considering decisions;
- ✓ Maintaining a risk register;
- ✓ Communicating risks and ensuring suitable training and supervision is provided;
- ✓ Preparing mitigation action plans;
- ✓ Preparing contingency action plans; and
- ✓ Monitoring and updating of risks and the risk controls.

7.1. Current Risks

The Project Pre-Fix risk register is a live document and is updated regularly. There are currently 18 live project related risks. Mitigation action plans are identified when raising a risk and the appropriate steps then taken to ensure risks do not become issues wherever possible. In Table 9, we give details of our top five current risks by category. For each of these risks, a mitigation action plan has been identified and the progress of these are tracked and reported.

Table 9: ***Top five current risks (by rating)***

Details of the Risk	Risk Rating	Mitigation Action Plan	Progress
Obtaining access to Current Transformers to ensure sufficient coverage and visibility of cable feeders	Severe	1. Investigate RN2C and VRN2 CT availability around selected areas. 2. To enable NX44 use at sites with 11kV automation, develop a modification that allows NX44 units to use Clip-On power quality current transducers. 3. To enable NX44 use within primary switchgear, pursue a modification that enables NX44 units to be powered by 110V DC.	1. First installations have now taken place on RN2C's and VRN2 2. Modification proposal to allow NX44 to use clip on power quality transducers complete 3. **Modification proposal to enable NX44's to accept 110V DC complete.**
Lack of activity during trial period, leading to insufficient demonstration of the platform and reduced learning regarding pre-fault behaviour	Major	1. Installation of data capture devices ahead of platform readiness to maximise opportunity 2. Use of data from other DNO projects to be used to help validate the platform	First NX44 devices installed 1 PQUBE installed

Reduced Staff Availability to install units	Major	1.	Storm Eunice has put back the installation expectations for the SN2's in the south west.
Failure to agree NIA terms with relay suppliers means that there would be a reduced validity of 3rd party demonstration of the C-Dip	Major	1. Progress negotiations with selected suppliers 2. Select additional suppliers as back up	Negotiations underway
Additional PQubes may be required at sites than provisioned for at sites with complex incoming arrangements	Major	1. Utilise contingency funding where required	

Table 10 provides a snapshot of the risk register details graphically, to provide an on-going understanding of the projects' risks.

Table 10: Graphical view of risk register

	Minor	Moderate	Major	Severe	
Legend	4	9	4	1	**No of instances**
Total	18				No of live risks

Likelihood = Probability x Proximity						
	Certain/Imminent (21-25)	0	0	0	0	0
	More likely to occur than not/Likely to be near future (16-20)	0	0	0	1	0
	50/50 chance of occuring/ Mid to short term (11-15)	0	0	1	3	0
	Less likely to occur/Mid to long term (6-10)	0	2	5	0	0
	Very unlikely to occur/Far in the future (1-5)	0	1	1	2	2
		1. Insignificant changes, re-planning may be required	2. Small Delay, small increased cost but absorbable	3. Delay, increased cost in excess of tolerance	4. Substantial Delay, key deliverables not met, significant increase in time/cost	5. Inability to deliver, business case/objective not viable
		Impact				

Table 7-3 provides an overview of the risks by category, minor, moderate, major and severe. This information is used to understand the complete risk level of the project.

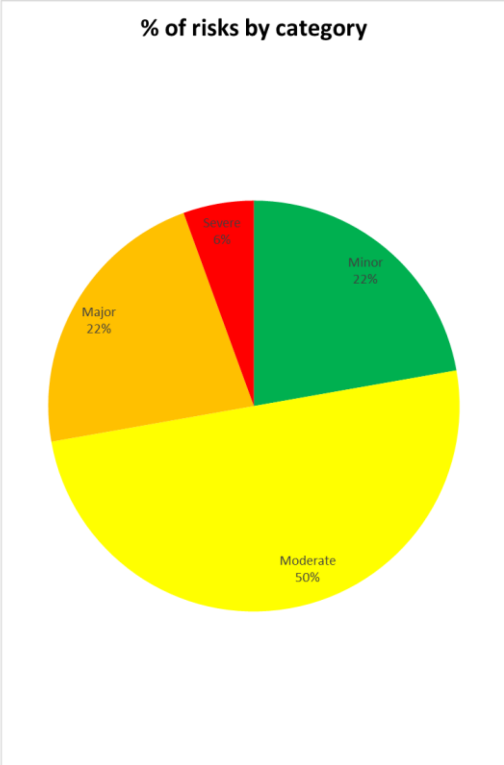


Figure 7: Percentage of risk by category

7.2. Update for risks previously identified

This section compares project progress against the risks that were identified at project initiation. Descriptions of the most significant risks that were identified prior to the start can be found in Table in with updates on their current risk status.

Table 11: Risks *identified in the previous progress report*

Details of the risk	Previous risk rating	Current risk rating	Mitigation Action Plan	Progress
Fault data does not materialise during project timescales.	Minor	Major	Expedite installation of data capture devices	See **Table** *9*
Nexus 44 units require a HV CT that monitors the circuit. There is a risk that there is an absence of suitable CT locations to connect NEXUS 44 units	Major	Severe	Investigate RN2C and VRN2 CT availability around selected areas. To enable NX44 use at sites with 11kV automation, develop a modification that	See **Table** *9*

within cable networks.			allows NX44 units to use Clip-On power quality current transducers. 3. To enable NX44 use within primary switchgear, pursue a modification that enables NX44 units to be powered by 110V DC.	
Ingestion of the INM proves that the data is incomplete or incorrect	Major	Resolved		Although C-Dip could ingest INM format, it was proven that it can also ingest SINCAL models which are at a greater state of readiness. These models will be used in the trial.

8. Consistency with Project Registration Document

The scale, cost and timeframe of the project has remained consistent with the registration document, a copy of which can be found here Western Power Distribution - Pre-Fix.

9. Accuracy Assurance Statement

This report has been prepared by the Pre-Fix Project Manager (Paul Morris), reviewed and approved by the Innovation Manager (Yiango Mavrocostanti).

All efforts have been made to ensure that the information contained within this report is accurate. WPD confirms that this report has been produced, reviewed and approved following our quality assurance process for external documents and reports.

Glossary

Abbreviation	Term
C-DIP	Common Disturbance Information Platform
CT	Current Transformer
DMS	Distribution Management System
DNO	Distribution Network Operator
FPI	Fault passage indicator. Device for tracking abnormal current transients throughout the network
HV	High Voltage. Taken to be 11kV or 6.6kV within this report.
INM	Integrated Network Model
LV	Low Voltage. Taken to be 415V within this report.
NX44	A smart fault passage indicator that is mounted upon a ring main unit
RMU	Ring Main unit
SN2	Smart Navigator 2 – a self-powered overhead line monitoring device

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