electricity north west

Bringing energy to your door

NIA ENWL006
Sentinel

NIA Progress Report

31 July 2017

VERSION HISTORY

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REVIEW

Name	Role	Date
L Eyquem	Innovation Programme Assistant	10 July 2017
G Bryson	Innovation Engineer	10 July 2017
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APPROVAL

Name	Role	Date
Steve Cox	Engineering & Technical Director	20 July 2017

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1 PROJECT BASICS

Project Title	Sentinel
Project reference	NIA_ENWL006
Funding licensee(s)	Electricity North West Limited
Project start date	September 2015
Project duration	4 years
Nominated project contact(s)	Geraldine Bryson (Geraldine.Bryson@enwl.co.uk)

2 SCOPE

The fault location equipment will be installed on approximately 10 – 20 HV networks, monitoring faults across the feeders. The precise numbers will be informed by the cost and the need to obtain data to support development. Networks will be chosen based on length of overhead line, earthing arrangement and network topology. Consideration will also be given to those circuits which have a higher incidence of faults. The fault sensing technologies will be integrated into a central dashboard which will display the results from all of the selected sites.

3 OBJECTIVES

- To install a range of fault location equipment expected to cover two main techniques ie impedance-based and travelling wave
- To develop preferred methods for the installation of distance to fault systems including equipment at the primary substation and distributed devices such as sensors on OHLs etc. This will include an assessment of the preferred location of the sensors and where/how precisely these sensors will be connected to the system
- To compare and contrast the performance of the different techniques and/or different manufacturers against the different network types. The results of these trials will be used to inform specification and engineering policy for the application of HV distance to fault on UK distribution networks.

4 SUCCESS CRITERIA

- Development of functional specifications for fault location technologies
- Successful deployment of fault location techniques
- Specification for the integration of results from trial equipment into a central dashboard
- Verification of the accuracy of the techniques by confirming the fault location
- Understanding of how each technique works for the different network types.

5 PERFORMANCE COMPARED TO THE ORIGINAL PROJECT AIMS, OBJECTIVES AND SUCCESS CRITERIA

The challenge for Sentinel is to integrate two technologies capable of providing distance to fault locations for low impedance (high current) faults and high impedance (low current) faults. The solution to low impedance faults is mature technology; however, the solution to high impedance faults including identification of low clearance lines is novel and innovative. The challenge is to not only develop the technologies to work independently but to also complement one another.

Following two workshops the project research and concept development phase has been completed along with the product requirements. An outline of the complete system architecture has been completed including a project initiation document (PID) which details the functional design.

The system will include numerous devices, some of which are mature technologies. The first prototype device for high impedance fault identification went into the design and build phase in May 2016. The high impedance fault location system will use a high frequency signal injection method. In order to develop the algorithms, electromagnetic transient studies have been carried out using network data for multiple OHL circuits, typical of the environment/construction in which the devices will be deployed.

Prototype Sentinel electronic circuitry has been designed, built and tested. The electronic circuitry is used to acquire, condition, process, store and communicate data for the Sentinel system. Sensing technologies have been investigated. Suitable instrumentation and techniques have been selected and evaluated for the measurement of load and fault parameters, to be used by the Sentinel system.

Following laboratory testing and evaluation, Sentinel system components are being revised for preliminary trials on 11kV overhead lines. Device software has been developed to deliver basic functionality. System software and fault detection/location algorithms concepts have been developed and agreed. These components will be refined as data becomes available from trials on test and customer networks.

6 REQUIRED MODIFICATIONS TO THE PLANNED APPROACH DURING THE COURSE OF THE PROJECT

There have been no changes to the planned approach.

7 LESSONS LEARNED FOR FUTURE PROJECTS

The project is in its early stages and at this point there are no lessons to share. This will change as the project progresses.

8 THE OUTCOMES OF THE PROJECT

Not applicable.

9 PLANNED IMPLEMENTATION

Not applicable.

10 OTHER COMMENTS

Not applicable.