Energy Networks Innovation Process

Annual Project Progress Report Document

The voice of the networks

Date of Submission: 28th July 2022

Annual Project Progress Report Document

Notes on Completion: Please refer to the NIA Governance Document to assist in the completion of this form. Please use the default font (Calibri font size 10) in your submission. Please ensure all content is contained within the boundaries of the text areas.

Project Title (*This cannot be changed once registered*)	Project Reference
Low Voltage Feeder Cable Open Circuit Detection	NIA_SSEN_0052
Funding Licensee(s)	**Project Start Date**
Scottish Hydro Electric Power Distribution Southern Electric Power Distribution	December 2020
Project Duration	**Year**
21 months	2022

Nominated Project Contact(s)

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1. Scope

The Scope of this project is to manufacture and test the proof-of-concept technology on the LV Network to detect Open Circuit Faults which will include as a minimum;
· Proof of Concept Models - prove the concept and confirm the theory of the Open Circuit Detector, to a level where factory testing can be undertaken.
· Develop enhanced location accuracy using Global Position System (GPS) technology - Current GPS technology provides a positional accuracy of between 5m and 10m. Enhancement will provide a GPS accuracy of less than 2m. This increased accuracy will allow the remedial works to be carried out more efficiently
· Manufacture ‘A’ Model (Prototype) The ‘A’ Model (Prototype) units will be the first models used to locate ‘real’ open circuit faults on a ‘real’ low voltage Network.
· Trial ‘A’ Model (Prototype) - Trial to locate ‘real’ open circuit faults on a ‘real’ low voltage Network.
· Manufacture ‘B’ Model (Pre-Production) - From learnings captured in the trial of ‘A’ Model, manufacture 10 ‘B’ Model units, to enable the DNO to perform trials.
· Trial ‘B’ Model (Pre-Production)- The final trial of the units to include thorough testing on real open circuit faults, diverse locations on an assortment of LV cable types.

2. Objective(s)

The projects objectives are as follows;

1. To prove the concept and confirm the ability to accurately detect open circuit cable faults, including in buried cables.
2. Production to a level of TRL 8 technology with the device enabling a Field Operative to accurately identify an open circuit cable fault, on an operational LV Network, reducing time Customers are off supply at time of fault or subsequent planned outages. This will include locating open circuit fault when power has been restored to the customer.

3. Success Criteria

• Open Circuit location accuracy. The achieving of the design goal of locating the open circuit fault with an accuracy of less than 2 metres Including GPS coordinate accuracy of uploaded positions.
• Locating the open circuit fault on a variety of cables with varying shielding used in its construction, and understanding any limitations, if any.
• Acceptance of the units by the DNO. Ensuring that the user community is involved with the development from the beginning.
• Cost effective equipment.
• More efficient planning of remedial repairs.
• Greatly reduced Customer Minutes Lost (CMLs).

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

Details of how the Project is investigating/solving the issue described in the NIA Project Registration Pro-forma.
Details of how the Project is performing/performed relative to its aims, objectives and success criteria.

Project background

DNOs currently identify open circuit faults location using equipment from a variety of manufacturers with a variety of accuracy of results, which sometimes requires an excavation for the equipment to work. This project will investigate different signal types and injection methods during cable fault location events to investigate which is best at pin-pointing and locating the position of the cable open circuit fault.

Project Progress

The project started in December 2020, procurement and contracts are now in place with HAYSYS Ltd.

HAYSYS Ltd are continuing the project development. The equipment specification for the detection of LV faults is a 'live' document to aid product development. The initial project meeting which sets the project framework out in detail and preliminary design reviews have been completed. Engagement with the User Group has progressed and requirements meetings have been held with field staff.

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

The Network Licensee should state any changes to its planned methodology and describe why the planned approach proved to be inappropriate. Please confirm if no changes are required.

Concurrent development of the Injector and Detector equipment

The initial approach to the development was to develop the injector unit first, as this was seen to have the highest technical risk, followed by the development of the Detector equipment. This approach has now been modified as the detector is required to fully test the effectiveness of the injector. As a result, the injector and detector are now being developed concurrently.

6. Lessons learnt for future projects

Recommendations on how the learning from the Project could be exploited further. This may include recommendations on what form of trialling will be required to move the Method to the next TRL. The Network Licensee should also state if the Project discovered significant problems with the trialled Methods. The Network Licensee should comment on the likelihood that the Method will be deployed on a large scale in future. The Network Licensee should discuss the effectiveness of any Research, Development or Demonstration undertaken.

It is possible that the injector technology and approach used could be adopted for other projects that could be developed to aid other fault-finding tools, where known signals are required to be injected into the feeder cables.

7. The outcomes of the project

When available, comprehensive details of the Project's outcomes are to be reported. Where quantitative data is available to describe these outcomes it should be included in the report. Wherever possible, the performance improvement attributable to the Project should be described. If the TRL of the Method has changed as a result of the Project this should be reported. The Network Licensee should highlight any opportunities for future Projects to develop learning further.

The development of the Open Circuit Finder tool includes the reporting of data to the HAYSYS electrical portal. The portal has proven very beneficial for capturing the data from the equipment, during trials and usage by the user community. This will help format and shape the reporting of the project outcomes and the learnings from the project.

8. Data Access & Quality Details

A description of how any network or consumption data (anonymised where necessary) gathered in the course of the Project can be requested by interested parties. This requirement may be met by including a link to the publicly available data sharing policy.

For information on how to request data gathered as part of this project see Network Innovation Competition (NIC) and Network Innovation Allowance (NIA) Data Sharing Procedure at https://ssen-innovation.co.uk/wp-content/uploads/2022/04/Network-Innovation-Competition-NIC-and-Network-Innovation-Allowance-NIA-Data-Sharing-Procedure-PR-NET-ENG-020.pdf

9. Foreground IPR

A description of any foreground IPR that have been developed by the project and how this will be owned.

It is anticipated that the project will produce Foreground IPR, that will be owned by HAYSYS, the equipment developer. This IPR will also be freely accessible by UK DNOs. To date, the foreground IPR is likely to be related to the following developments

- The method of detecting the open circuit fault.
- The use of GNSS (Global Navigation Satellite System) in this application.