

## Date of Submission

May 2021

# Network Innovation Allowance Progress Report

Notes on Completion: Please refer to the appropriate NIA Governance Document to assist in the completion of this form.

Network Licensees must publish the required Project Progress information on the Smarter Networks Portal by 31st July 2014 and each year thereafter. The Network Licensee(s) must publish Project Progress information for each NIA Project that has developed new learning in the preceding relevant year.

## Project Progress

### Project Title

Informed Lightning Protection

### Project Reference

NIA\_SSEN\_0035

### Funding Licensee(s)

Scottish Hydro Electric Power Distribution, Southern Electric Power Distribution

### Project Start Date

March 2019

### Project Duration

4 years and 0 months

## Nominated Project Contact(s)

SSEN NIA Programme Delivery Manager –Joe McNeil

## Scope

Lightning strikes are known to cause a significant number of supply interruptions to our customers. In our Scottish Network, lightning strikes are the second highest cause of customer interruptions and minutes lost and in our Southern Network it is the fifth highest cause. Therefore, there is a need to reduce the impact that lightning related faults have on our customers.

One method of reducing lightning related faults is to install surge arresters. Present practice of installing surge arresters involves identifying circuits that historically experienced large numbers of lightning related faults and applying blanket coverage of surge arresters on these circuits i.e. installing surge arresters on every third pole. However, many of our circuits extend long distances i.e. over 30km in length, which means thousands of surge arresters would be necessary for blanket protection. Not only is this expensive but it may be ineffective as lightning may only strike in small hot spots around the network. There is a need to identify where lightning hot spot locations occur and to understand the impacts of supply interruptions to our customers in these areas. This will help inform us on where to install surge arresters for maximum prevention of supply interruptions at minimum cost. To do this, we plan on combining multiple data sets e.g. lightning strike location data, ground resistance data, etc. and perform advanced data analytics to identify key locations for surge arresters to be installed.

Our surge arresters are designed to withstand multiple lightning strikes and operate for about 12 years. However, from past experience we are aware that many of these surge arresters can fail prematurely without protecting against a lightning strike. When a surge arrester fails it causes a fault, which then leads to a supply interruption until the fault is fixed. So, rather than preventing supply interruptions, they can cause them. Furthermore, it is difficult to diagnose when one of these types of surge arresters has failed as often there are no visible signs of failure. This increases the time taken to identify and fix/replace the failed arrester, which means customers are potentially off supply for long periods of time or expensive and carbon intensive diesel generators are used. There is a need for an in-depth trial of surge arresters with the ability to disconnect, which are designed to sacrifice themselves in the event of a lightning strike or premature failure. This will prevent supply interruptions occurring and make it easier for field staff to identify which surge arresters have failed (as the earth lead will have disconnected), so they can be more easily replaced.

### Lightning Development Phases

Phase 1a – Data Analytics Pre-Execution Phase. This phase involves preparation work to ensure the execution phase runs smoothly. Specifically, it involves the following tasks;

- Define model success criteria
- Create model requirements specification
- Provide Data Analytics Team (DAT) with necessary data sources required to implement functional requirements
- Perform data compatibility testing
- Perform GDPR & Security Assessment

Phase 1b– Data Analytics Execution Phase. This is the actual 'analytical' phase of the project, where a geospatial model is created to analyse various data inputs including;

- Lightning strike location data
- Customer number data
- Lightning IIS fault data
- Lightning Opex data
- Ground resistivity data
- GIS asset data

The objective of this phase is to identify high risk areas or 'hot spots' where lightning protection should be installed. Both probability of strike and impact of strike will be utilised in the identification process i.e. high-risk sites will not only be susceptible to lightning strikes, but also contain a significant number of customers that are at risk of experiencing a lightning related outage.

Phase 2 – Internal review of high-risk sites: Once the high-risk sites have been identified, the specific sections of these circuits, identified for lightning protection, will be reviewed internally. This is to confirm they are suitable for protection e.g. confirm no investment is planned to take place that may address the lightning issue and to sense check that they are suitable.

Phase 3 – Lightning protection procurement: Surge arresters will be installed on the network i.e. surge arresters with earth lead disconnects. Surge arresters with earth leads that disconnect can prevent outages from occurring if the surge arrester unit faults. This is a common occurrence that can lead to an unplanned outage. We will also consider the installation of novel surge arresters, such as those with drop out mounts, that are able to prevent the need for unplanned outages after the arrester is spent or reaches end of life.

Phase 4 – Installation: Lightning protection equipment will be installed in locations defined by the data analytics model.

Phase 5 – Monitoring & Analysing: Weekly monitoring of IIS and strike data will take place, possibly moving to fortnightly or monthly depending on the value of frequent monitoring. Annual reporting will take place detailing lightning strike frequency and IIS costs on selected locations. Any learning will also be detailed here e.g. faulty equipment, issues, etc.

Phase 6 – Reporting, Dissemination & Closedown: learnings derived from the project will be used to create new policy and processes on lightning protection investment methodology. Any learning will be shared with the wider DNO community.

### Objectives(s)

- 1) Develop a 'point in time' lightning analysis tool that can be used to locate lightning protection equipment in the most optimal way i.e. integrate various data sets and update visual display as described in phase 1a and 1b above.
- 2) Install lightning protection equipment in 'optimal' locations provided by the lightning analysis tool.
- 3) Monitor and analyse fault data to confirm effectiveness of lightning protection.
- 4) Update internal policies and procedures if the project is successful.
- 5) Share learnings with a wider audience.

### Success Criteria

The project will be a success if;

- 1) A point in time analytical tool is sufficiently developed so that it can integrate the different data sources described in phase 1b and perform advanced analytics, so that it can be used for the purpose of deciding where to place lightning protection equipment down to the nearest pole.
- 2) We install lightning protection equipment safely, on time and within budget.
- 3) We prove the effectiveness of this methodology for protecting against lightning related faults from a cost and fault reduction point of view.

### Performance Compared to the Original Project Aims, Objectives and Success Criteria

Project is still in early phases with no significant updates.

### Required Modifications to the Planned Approach During the Course of the Project

No modifications to date.

### Lessons Learnt for Future Projects

Project is still in early phases with no significant updates.

### The Outcomes of the Project

Project is still in early phases with no significant updates.

### Data Access

Project is still in early phases with no significant updates.

**Foreground IPR**

Project is still in early phases with no significant updates.