Notes on Completion: Please refer to the appropriate NIA Governance Document to assist in the completion of this form. The full completed submission should not exceed 6 pages in total.

NIA Project Registration and PEA Document

Date of Submission

Jun 2020

Project Reference Number

NIA_UKPN0059

Project Registration

Project Title

Miles better fault location

Project Reference Number

NIA_UKPN0059

Project Licensee(s)

UK Power Networks

Project Start

May 2020

Project Duration

3 years and 1 month

Nominated Project Contact(s)

Kelvin Lee

Project Budget

£1,838,000.00

Summary

MILES is a system which aims to give a location of a fault along a feeder. It uses low voltage power quality sensors, voltage drop location algorithms and cloud computing to detect, locate and classify permanent and transient faults.

Nominated Contact Email Address(es)

innovation@ukpowernetworks.co.uk

Problem Being Solved

Locating faults on the network is a challenge.

· Permanent faults - locating the fault is a time consuming exercise (unless a third party has directly caused the fault on a known location), as field staff need to carry out a number of fault location exercises with limited accuracy.

· Transient faults - identifying the cause of the fault and the exact location is not currently possible and transient faults remain active on the network until they turn permanent.

Current methods of categorising and locating a fault (permanent & transient) using fault passage indicators give a direction along a feeder where a fault may be located. For transient faults, this method present additional challenges to field staff as they are required to significant amount of time investigating the local network. It can often times require multiple visits before faults are found and addressed.

Method(s)

MILES is a system which aims to give a location of a fault along a feeder. It uses low voltage power quality sensors, voltage drop location algorithms and cloud computing to detect, locate and classify permanent and transient faults. The system aims to provide sufficient pre-fault information to enable proactive asset intervention to prevent the fault from happening.

The project will consider: firstly a theoretical test using UK Power Networks' (UKPN) specific network topology data; and secondly a field test using QinetiQ's low voltage LineWatch sensors. MILES will then be benchmarked against alternative fault location solutions to

determine the best value approach for UKPN to adopt across its network.

Once the technology is proven, the project will delve into the integration with existing UKPN systems such as PowerOn, following successful results from before. This latter half of the project aims to address the issues of integration with an active network that can reconfigure itself.

Scope

1. Desk study of estimated efficacy of algorithm on UKPN network
2. Installation of sensors
3. Deployment of platform
4. Live-trial at selected sites
5. Report of platform's results

Objective(s)

We aim to determine the following:
1. Permanent fault location accuracy and efficiency
2. Transient fault detection accuracy and efficiency

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

n/a

Success Criteria

We will measure success using the following metrics:

1. Determine best value of fault location system (when compared to Fault Passage Indicator (FPI) and impedance based systems)

2. Determine the value of accuracy of fault location (ie: costs of getting 10m, 100m, 1000m accuracy on Underground and Overhead networks)

3. Determine how to rollout the Miles system(using existing sensors, and/or procuring additional sensors)

Project Partners and External Funding

Primary Supplier – CGI UK.
Subcontractors: Hydro Quebec, CGI Canada and Qinetiq
No additional external funding besides NIA will be used.

Potential for New Learning

Yes, there are potentially learnings around how the algorithm may be applied to GB networks.

Scale of Project

The scale of the project is limited to a small subset of different types of feeders, where we aim to compare the efficacy of the MILES technology with existing fault locating techniques, thus maximising learning from a small subset of test sites.

Technology Readiness at Start

TRL5 Pilot Scale

Technology Readiness at End

TRL8 Active Commissioning

Geographical Area

The project will be carried out across SPN.

Revenue Allowed for the RIIO Settlement

None at the moment.

Indicative Total NIA Project Expenditure

The total expenditure that UKPN expects to incur for this project is £1,838,000, of which 90% will be recovered from NIA.

Project Eligibility Assessment Part 1

There are slightly differing requirements for RIIO-1 and RIIO-2 NIA projects. This is noted in each case, with the requirement numbers listed for both where they differ (shown as RIIO-2 / RIIO-1).

Requirement 1

Facilitate the energy system transition and/or benefit consumers in vulnerable situations (Please complete sections 3.1.1 and 3.1.2 for RIIO-2 projects only)

Please answer **at least one** of the following:

How the Project has the potential to facilitate the energy system transition:

n/a

How the Project has potential to benefit consumer in vulnerable situations:

n/a

Requirement 2 / 2b

Has the potential to deliver net benefits to consumers

Project must have the potential to deliver a Solution that delivers a net benefit to consumers of the Gas Transporter and/or Electricity Transmission or Electricity Distribution licensee, as the context requires. This could include delivering a Solution at a lower cost than the most efficient Method currently in use on the GB Gas Transportation System, the Gas Transporter's and/or Electricity Transmission or Electricity Distribution licensee's network, or wider benefits, such as social or environmental.

Please provide an estimate of the saving if the Problem is solved (RIIO-1 projects only)

We estimate that benefits on the order of £500k from CI/CML reductions are expected, if the license fees are marginal on a site by site basis. However if the license fees are high for each site, the benefits case would be reduce greatly.

Please provide a calculation of the expected benefits the Solution

Base Cost = £6k
Method Cost = £1.838mn
Method Benefits = £2k/yr

There are no expected financial benefits within the project scale.

Please provide an estimate of how replicable the Method is across GB

Method cost: £2,730k

Based on the assumption that this is the cost of sensors to cover feeders in UK Power Networks
Using the scale factor of 6.5 the estimated method costs of rolling out across GB is £17.745m.

Please provide an outline of the costs of rolling out the Method across GB.

n/a

Requirement 3 / 1

Involve Research, Development or Demonstration

A RIIO-1 NIA Project must have the potential to have a Direct Impact on a Network Licensee's network or the operations of the System Operator and involve the Research, Development, or Demonstration of at least one of the following (please tick which applies):

☑ A specific piece of new (i.e. unproven in GB, or where a method has been trialled outside GB the Network Licensee must justify repeating it as part of a project) equipment (including control and communications system software).

☐ A specific novel arrangement or application of existing licensee equipment (including control and/or communications systems and/or software)

☐ A specific novel operational practice directly related to the operation of the Network Licensees system

☐ A specific novel commercial arrangement

RIIO-2 Projects

☐ A specific piece of new equipment (including monitoring, control and communications systems and software)

☐ A specific piece of new technology (including analysis and modelling systems or software), in relation to which the Method is unproven

☐ A new methodology (including the identification of specific new procedures or techniques used to identify, select, process, and analyse information)

☐ A specific novel arrangement or application of existing gas transportation, electricity transmission or electricity distribution equipment, technology or methodology

☐ A specific novel operational practice directly related to the operation of the GB Gas Transportation System, electricity transmission or electricity distribution

☐ A specific novel commercial arrangement

Specific Requirements 4 / 2a

Please explain how the learning that will be generated could be used by the relevant Network Licensees

Using the learning, the relevant network licenses will be able to determine if the methodology is efficient for their applications in terms of fault locating and in reducing CI/CMLs for their customers. Of note will be a cost efficiency of the method versus existing technologies. Should a relevant network licensee determine that it is of good value to them, they are free to engage with the supplier to adopt the algorithm into their network.

Or, please describe what specific challenge identified in the Network Licensee's innovation strategy that is being addressed by the project (RIIO-1 only)

n/a

☑ Has the Potential to Develop Learning That Can be Applied by all Relevant Network Licensees

Is the default IPR position being applied?

☑ Yes

Project Eligibility Assessment Part 2

Not lead to unnecessary duplication

A Project must not lead to unnecessary duplication of any other Project, including but not limited to IFI, LCNF, NIA, NIC or SIF projects already registered, being carried out or completed.

Please demonstrate below that no unnecessary duplication will occur as a result of the Project.

UK Power Networks is not aware of any similar projects which are being undertaken by GB DNOs covered by the NIA or any other outside funding initiative.

If applicable, justify why you are undertaking a Project similar to those being carried out by any other Network Licensees.

n/a

Additional Governance And Document Upload

Please identify why the project is innovative and has not been tried before

The project makes use of a proprietary and patented algorithm with a set of sensors on the LV side of a distribution transformer to detect and locate faults on the HV side of the feeder. The application of the algorithm with the sensors is not something that has been done in GB before, and thus is innovative.

Relevant Foreground IPR

n/a

Data Access Details

n/a

Please identify why the Network Licensees will not fund the project as apart of it's business and usual activities

The project carries some inherent risks, as the network that has used this technology has a different arrangement of transforms from the GB network. Hence the algorithm may not be directly transferred over with no issues. Therefore, we are not able to procure the algorithm and software without having a demonstration trial first.

Please identify why the project can only be undertaken with the support of the NIA, including reference to the specific risks(e.g. commercial, technical, operational or regulatory) associated with the project

This project can only be taken with the support of the NIA as it carries with it significant technical, commercial and operational risks. Confidence and certainty in the technology needs to be gained first, before taking steps to integrating it with existing control platforms.

This project has been approved by a senior member of staff

☑ Yes