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

Mar 2024

Project Reference Number

NIA_SPEN_0097

Project Registration

Project Title

Real Time Fault Level Monitoring Stage 2 (ED-2)

Project Reference Number

NIA_SPEN_0097

Project Licensee(s)

SP Energy Networks Distribution

Project Start

March 2024

Project Duration

2 years and 4 months

Nominated Project Contact(s)

Ralph Eyre-alker

Project Budget

£1,980,000.00

Summary

Fault Level is already one of the greatest network challenges. The network has a safe fault level design limit which cannot be exceeded without splitting up the network, reducing the fault in-feeds or adding new equipment. Generation growth is expected to continue and accelerate as UK generation decentralises to meet net zero 2050 targets. Innovation is needed to avoid fault level becoming a barrier to the low carbon transition.

Preceding Projects

NIA_SPEN_0050 RTFLM Stage 2 - Real Time Fault Level Monitoring Stage 2

NIA_SPEN0015 - Real Time Fault Level Monitoring (RTFLM) - Stage 1

Third Party Collaborators

Energy Innovation Centre

Nominated Contact Email Address(es)

innovate@spenergynetworks.co.uk

Problem Being Solved

Fault Level is already one of the greatest network challenges. The network has a safe fault level design limit which cannot be exceeded without splitting up the network, reducing the fault in-feeds or adding new equipment. Generation growth is expected to continue and accelerate as UK generation decentralises to meet net zero 2050 targets. Innovation is needed to avoid fault level becoming a barrier

to the low carbon transition.

Method(s)

RTFLM Stage 1 project demonstrated a proof-of-concept design to measure fault level in real time. This has been successful, with changes in network fault level registering within a number of seconds. Two prototype devices were built with measurements taken at both 11kV and 33kV in SPEN's SPM network. As SPM run an interconnected network, this also demonstrated success with this network type.

RTFLM Stage 2 will extend the trials across multiple networks and network locations. Trials will be extended to include 132kV, split board configurations, and different substation design scenarios. SPEN also intend to undertake a combined trial with a separately NIA funded project looking at Active Network Management based on Fault Level.

Scope

WP1 – Product Development, Project Management, build and trial of devices - £1,710,000

- Refine and complete development of the prototype RTFLM devices ready for production.
- Development of "split-busbar" system that prevents mutual jamming.
- Overall Project Management for all parties.
- 13 devices to be trialed on the GB electricity networks. Eight of these will be full RTFLM devices and split between SP Energy Networks' (SPEN's) SP Manweb and SP Distribution networks and combined with the existing two prototype devices already in-situ. Six further full RTFLM devices to be trialed on UK Power Networks' network.
- In addition, two subset "split-busbar" units will be produced for trial on UK Power Networks' network, and a "Traveller" system will also be developed for SPEN.
- Extended trials of novel Real Time Fault Level Monitoring device covering differing network situations, including but not limited to:
  - areas under FL restrictions but where FL capacity can be released by combining with ANM
  - 132kV Fault Level Measurement
  - Fault level on feeders from renewable generation
  - 33kV interconnected network (SP Manweb)
  - 33kV interconnected network (UK Power Networks
  - 3 node sites (i.e. two bus sections) (UK Power Networks)
  - Site with DZ11 Transformers (UK Power Networks)
  - Other sites with FL restrictions/above 95% capacity to evaluate accuracy of existing network modelling software
  - LV Interconnected network in London (UK Power Networks)

WP2 - External evaluation (test networks) - £140,000

Develop a test methodology and undertake controlled calibration measurements at a third-party facility to ratify measurement results obtained. Likely to involve both UK based and overseas test network facilities.

Objective(s)

- To progress the device from a working prototype design to a fully tested and ratified device for use on the GB electricity networks.
- Complete trials on various network configurations and demonstrate potential benefits.
- Develop and produce a system for measuring fault level in real time across split busbar configurations
- Develop and produce a portable "traveler" version of the device
- Undertake a live trial combining with Active Fault Level Management (SPEN only)
- Disseminate results to the industry

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

The Assessment has shown no impact on customer vulnerability

Success Criteria

- Completion and acceptance of SP Energy Networks' and UK Power Networks' requirements, design and safety assessment
- Successfully interface with the AFLM application in the SPM trial location

- External ratification of RTFLM results completed at a suitable test site location (to be identified)
- Successful implementation of an extended RTFLM trial, incorporating at least 10 strategic network locations including 11kV, 33kV and at least one 132kV site
- Successful implementation of split bus bar system for measuring fault level both sides of a split board with a single RTFLM device
- Results disseminated, BaU strategy defined

Project Partners and External Funding

SP Energy Networks (Lead DNO) (SP Transmission, SP Manweb and SP Distribution)
UK Power Networks (Eastern Power Networks, London Power Networks and South Eastern Power Networks)
Outram Research Ltd
Energy Innovation Centre
£130,000 – Outram Research funded
£1.85m – NIA Funding

Potential for New Learning

Proving this device will provide the following new learning:

- Capability to measure fault level on a widescale basis on interconnected networks, to improve knowledge of fault level restricted areas against the existing approaches based on modelling
- Capability to measure changing fault level in real time will change how the network can be managed, to release currently restricted capacity and facilitate new connections to the network.

Scale of Project

£1.98m

36 months

Technology Readiness at Start

TRL7 Inactive Commissioning

Technology Readiness at End

TRL9 Operations

Geographical Area

SP Energy Networks and UK Power Networks license areas.

Revenue Allowed for the RIIO Settlement

N/A

Indicative Total NIA Project Expenditure

£1.665m

Approximate split:

- £832.5k for SP Energy Networks
- £832.5k for UK Power Networks

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)

N/A

Please provide a calculation of the expected benefits the Solution

Based cost: network reinforcement using traditional methods: £2m

Total development and trial costs: £1m

Financial benefits: £1m

These benefits can be exceeded with the planned integration with other innovative technologies such as Active Fault Level Management.

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

Estimated applicable to 60-70% of all GB electricity licensees' networks.

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

£1m per Licence

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

Fault level is a common issue across all UK electricity network licenses. The technology can be readily applied to any 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

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.

Technology is not available anywhere else in the world.

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

This is a first of its kind technology demonstration in the UK, it is believed to be a world first in addition.

Relevant Foreground IPR

N/A

Data Access Details

The SP Energy Networks Data Access Policy can be found here.

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

Development is not competed, still innovation activity.

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

Risk that the technology might not succeed or may not pass the ratification tests.

This project has been approved by a senior member of staff

☑ Yes