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NIA Project Registration and PEA Document

Date of Submission

Dec 2013

Project Reference Number

NIA_NGET0064

Project Registration

Project Title

Alternative Bus Bar Protection Solution

Project Reference Number

NIA_NGET0064

Project Licensee(s)

National Grid Electricity Transmission

Project Start

March 2011

Project Duration

5 years and 4 months

Nominated Project Contact(s)

Simon Pomeroy

Project Budget

£158,000.00

Summary

A policy for single Digital Bus Bar Protection has been employed on the National Grid UK Transmission network since 2002 either as a replacement system (for duplicated high impedance schemes) or for all new build double bus bar substations. These systems have a distributed architecture with remote bay units (interfacing to the plant) for each protected circuit with ruggedized cross site fibre connections to a central processing unit. Where a substation has a centralised relay room (e.g. GIS) layout, the bay units are colocated in a suite of cubicles and connected with a network of fibre patch cords.

Nominated Contact Email Address(es)

box.NG.ETInnovation@nationalgrid.com

Problem Being Solved

A number of systems and versions have been installed from National Grid's preferred protection suppliers and Alliances over the past 20 years and these have required additional support through contracted PDSAs to provide field staff with the resources to manage faults and defects. A recent protection policy change also requires a second (hot standby) central processing unit to be deployed (with its own dedicated fibre connections) to better manage contingency issues for central processing unit failures.

The systems installed to date have proven to be generally reliable; however each system is bespoke to each supplier with a limited technical life, leading to issues with future substation extensions and potentially the need to consider equipment upgrades and early asset replacement of the complete system. This will have major issues on future system access to carry out this work across a complete substation.

Through work with CIGRE, contacts with other utilities and National Grid US, it has been found that an alternative centralised bus bar protection system may offer greater asset management benefits in the longer term, especially when managed and supported by well trained internal staff.

Method(s)

Development

This project proposes the following methods;

1. Initial Appraisal and a set of application interface designs and layouts
2. Stakeholder review and a finalised set of application interface designs and layouts
3. Evaluation and Recommendations

Scope

A policy for single Digital Bus Bar Protection has been employed on the National Grid UK Transmission network since 2002 either as a replacement system (for duplicated high impedance schemes) or for all new build double bus bar substations. These systems have a distributed architecture with remote bay units (interfacing to the plant) for each protected circuit with ruggedized cross site fibre connections to a central processing unit. Where a substation has a centralised relay room (e.g. GIS) layout, the bay units are co-located in a suite of cubicles and connected with a network of fibre patch cords.

Objective(s)

This R&D Project aims to deliver an evaluation and desk top design solution of an alternative digital bus bar solution architecture. This will help formulate a future technical and procurement strategy for bus bar protection, potentially leading to a pilot installation, evaluation and deployment as a replacement (or new) bus bar protection system.

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

n/a

Success Criteria

This project will be successful when it reviews designs and products used by other utilities for adoption on the UK Transmission system. Further success is an option to install a viable digital bus bar protection system.

Project Partners and External Funding

SEL

There is no external funding being brought to this project.

Potential for New Learning

If the output from initial study is successful, the project will feed into a second stage project to establish options for a pilot installation. We envisage this will give us new learning in the way a digital protection system for busbars can be retrospectively applied to the National Grid network.

Scale of Project

Feasibility study followed by an installation in one substation as a pilot trial. We cannot reduce the scale any further and still provide benefit to the end customer.

Technology Readiness at Start

TRL6 Large Scale

Technology Readiness at End

TRL8 Active Commissioning

Geographical Area

This project is applicable to the whole of the GB transmission system.

Revenue Allowed for the RIIO Settlement

Zero

Indicative Total NIA Project Expenditure

IFI - £123,000

NIA - £35,000

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)

Development of Bus Bar Protection Strategy and Policy changes standardised plant interface and "one off" standard solution through the CAPEX savings (reduced equipment costs) ABB quotes £450k for an 18 bay Busbar replacement Alston have quoted £192k for a 10 bay Busbar Replacement. Schweitzer alternative is current quoted at \$85,000, which is approximately £55K. This equates to a saving of £130K per Bay replacement. National Grid carry out approximately 5 bay replacements per year equating to a saving of £650K if this is implemented across the business which is shared with the consumer.

There will be additional benefits as stated below but these are difficult to quantify at this stage.

OPEX savings (train internal staff)

Extended Asset Life (elimination of short life components e.g. fibres)

Reduced System Access for extensions and future replacement

Please provide a calculation of the expected benefits the Solution

Base Cost - £190,000

Method Cost - £55,000

B-M = £135,000

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

This method is replicable across the whole network.

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

National Grid carry out approximately 5 bay replacements per year equating to a saving of £650K if this is implemented across the business. Therefore £55,000 x 5 bays = £275,000 per year.

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

n/a

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

This project addresses the reliability theme with a focus on improved network protection and control.

- 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.

Having checked our standard suppliers, including Universities, EPRI, and the ENA Smart portal, National Grid confirm that this work has not been completed before.

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

n/a

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

n/a

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

n/a

This project has been approved by a senior member of staff

Yes