

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

Sep 2013

Project Reference Number

Project Registration

Project Title

Alternative Differential Unit Protection for Cable only and Cable & OHL

Project Reference Number

Project Licensee(s)

National Grid Electricity Transmission

Project Start

September 2010

Project Duration

3 years and 4 months

Nominated Project Contact(s)

National Grid TO Innovation Team

Project Budget

£100,000.00

Summary

Public perception towards OHLs and limitations on rights-of-ways in populated areas could potentially lead to an increase in construction of cable only and cable & OHL hybrid circuits in future. This situation presents a unique challenge for cable protection systems especially on the hybrid one as protection systems must differentiate between cable and OHL faults to ensure the greater reliability of the power system. Current practice in National Grid is to implement two main unit protection schemes sourced from two different suppliers by using conventional CTs for 275kV and 400kV cable systems. However, CT installation and maintenance on cable circuits is immensely cumbersome due to bulk structure of CTs and space constraints associated with cable tunnels and trenches.

Moreover, CTs on cable circuits are subject to a high magnitude of charging/discharging current during switching on and off, a condition which could lead to potential CT core saturation and mal-operation of the protection relays. For green field application these constraints may be addressed by an appropriate design solution; however on refurbished circuits especially where part of the OHL circuit is undergrounded by using cables, it becomes challenging to achieve the prescribed selectivity and security with the conventional CT based protection scheme.

In addition, to increase the operational reliability and reduce down time it is imperative to detect and discriminate transient faults i.e. lightning strikes on OHLs of hybrid systems to enable the Delay Auto Re-close as stated in TS 3.24.7 and PS (T) 10.

Through work with CIGRE and contacts with other utilities, an alternative non conventional current sensor i.e. Rogoswki coil base cable protection system by Cooper Power Systems has been identified as a potentially ideal solution which could offer greater operational, safety, and construction benefits over conventional protection systems due to the following features:

Linearity and no saturation even at high fault currents and magnetising inrush reducing the likelihood of protection mal operation. This characteristic could also be used for monitoring and profiling of insulation degradation which could lead to better asset management practice.

Light weight and compact size to address the space constraint issue.

Increased safety as opening secondary wiring during operation does not result in hazardous voltages.

Installation does not require opening of the primary conductors owing to the splitcore design which could reduce outage time for installation and hence has the potentiality to be deployed as ERTS system.

Nominated Contact Email Address(es)

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Problem Being Solved

Method(s)

Scope

Objective(s)

To evaluate the practicability, reliability and benefits of implementing alternative non conventional current sensors (i.e. Rogowski coil) based differential unit protection for Cable systems (i.e. Cable only and Cable & overhead line (OHL) hybrid installations) over conventional Current Transformer (CT) based protection. To carry out the preliminary evaluation a pilot installation is recommended on Pitsmoor-Wincobank cable circuit in April 2012 as a monitoring unit.

To determine the system's suitability to be utilised as Emergency Return to Service (ERTS) system.

This will help to formulate a technical and operational knowledge base for Non Conventional Instrument Transformer (NCIT) protection systems which could lead to evaluation of future technical and procurement strategy to deploy as replacement and/or new cable system protection.

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

n/a

Success Criteria

n/a

Project Partners and External Funding

n/a

Potential for New Learning

n/a

Scale of Project

n/a

Geographical Area

Revenue Allowed for the RIIO Settlement

Indicative Total NIA Project Expenditure

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

n/a

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

n/a

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

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)

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

Please demonstrate how the learning from the project can be successfully disseminated to Network Licensees and other interested parties.

Please describe how many potential constraints or costs caused, or resulting from the imposed IPR arrangements.<

Please justify why the proposed IPR arrangements provide value for money for customers.

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.

n/a

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