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 2013

Project Reference Number

Project Registration

Project Title

Voltage Transformer Comparison

Project Reference Number

Project Licensee(s)

National Grid Electricity Transmission

Project Start

February 2007

Project Duration

7 years and 2 months

Nominated Project Contact(s)

National Grid TO Innovation Team

Project Budget

£34,000.00

Summary

There are an escalating number of increasingly complex and non-linear loads and generators being connected to the transmission network. To ensure that the network remains secure, background harmonic levels must be checked before a new generator is connected. At present measurements are usually taken up to the 50th harmonic, but recently it has not been unusual for measurements to be required up to the 100th harmonic. A lot of work is being carried out to find suitable and reliable monitors to measure and record the data.

When a portable monitor is taken to a substation to measure harmonic data, it is connected to a Voltage Transformer (VT). At present, there are three types of VT, a Wound VT (WVT), a Capacitor VT (CVT) and a Resistor Capacitor Divider VT (RCD VT). It is commonly accepted that the RCD VT is the most suited to this purpose, as it specially tuned to each application; unfortunately this also makes it very expensive. A WVT is also more expensive due the amount of copper required and although it is more expensive it is not particularly suited to measuring harmonics as it has a low bandwidth, only allowing measurements up to around the 12th with any good accuracy. The third option is to use a CVT that has been fitted with a PQ Sensor. This is a simple technology that increases the accuracy and the bandwidth of the CVT, which is otherwise limited in accuracy to measurements at fundamental frequency.

At present there are only six RCD VTs on the network and a very limited number of CVTs that have been retro fitted with a PQ Sensor (PQCVT). This means most of the Quality of Supply (QoS) measurements are carried out using a WVT. It is proposed that National Grid install a PQ Sensor at a site and do a comparison of the three VTs, to confirm or refute the hypothesis surrounding Voltage Transformers with regards to QoS. Once this study has been carried out it will provide a sound understanding of VTs and aid informed decisions when reviewing any policy surrounding the use of VTs for QoS and dynamic system monitoring applications.

A difficulty with this trial has been finding a site with the three types of VT on the same circuit. One such location is Singlewell 400 kV Substation. The next problem was finding an outage on the correct circuit to provide us with an opportunity to retrofit the CVT with a PQ Sensor. The next outage that National Grid could do this during is 31/10/11 – 04/11/11. If this outage is missed a comparison will not be possible for another two years (2013).

To make this VT comparison fair three identical monitors are to be used. Although National Grid have two types of power quality monitor, of which National Grid have three units, these monitors are not able to measure over the 50th harmonic. For the purposes of

this trial National Grid would like to measure as high as possible to give us a true indication of the accuracy and capability of each VT. It is also proposed to purchase two power quality monitors to carry out this comparison.

Nominated Contact Email Address(es)

box.NG.ETInnovation@nationalgrid.com

Problem Being Solved

Method(s)

Scope

Objective(s)

To evaluate the performance of the three types of Voltage Transformer used in National Grid with respect to QoS and system monitoring capabilities.

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