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

Feb 2014

Project Reference Number

NIA_NGET0121

Project Registration

Project Title

Avoiding voltage regulation action conflicts. (In conjunction with LCNF project CLASS)

Project Reference Number

NIA_NGET0121

Project Licensee(s)

National Energy System Operator

Project Start

April 2013

Project Duration

3 years and 1 month

Nominated Project Contact(s)

Alice Etheridge

Project Budget

£382,000.00

Summary

ENW have secured LCNF funding a project that will trial the use of tap changing at a number of primary substations. The purpose of the trial is to establish the degree to which voltage can be either increased or decreased to provide demand increase/decrease to manage DNO network constraints. In addition staggered tap changes will be trailed to establish what scale of reactive power absorption or injection can be provided. The main focus of the trial is to evaluate degree to which primary substations can be used in this novel way without causing a noticeable impact on electricity consumers.

From a NGET perspective, the effect that these actions have on existing Transmission assets and controls must be understood in order to:

- Ensure that no adverse impact occurs on the Transmission protection and control systems
- Conversely to ensure that existing controls do not immediately counter act the intention of the trial,
- To understand the implications of the trial on Transmission asset life on Transmission asset capacity requirements, e.g. transformer capacity and shunt reactors and MSC's for reactive power control.

Nominated Contact Email Address(es)

box.so.innovation@nationalgrid.com

Problem Being Solved

In National Grid's June 2011 update of 'Operating The Electricity Transmission Networks in 2020' the following forecast for balancing

activity has been identified:

'The greater variability in generation will inevitably increase the number of energy balancing actions enacted by National Grid. In the first 2020 consultation12 an estimate of a three fold increase in balancing actions was suggested and responses to the consultation generally agreed that the level of balancing activity will increase. Whilst balancing activity instructed by National Grid will be driven by the incentive on market participants to balance, it will be increasingly necessary to despatch generation and demand automatically.'

And, for a variety of reasons, including the intermittent nature of wind and solar generation, 'the average operating reserve requirement increases by 53% from 4777MW to

7335MW, between 2010/11 and 2020/21.'

National Grid is working with Electricity North West (ENW) on their Low Carbon Networks Fund project 'CLASS' that will trial the use of tap changing at a number their primary substations. The purpose of the trial is to establish the degree to which voltage can be either increased or decreased to provide an apparent demand increase/decrease to manage DNO network constraints. In addition staggered tap changes will be trailed to establish what scale of reactive power absorption or injection can be provided. The main focus of the trial is to evaluate degree to which primary substations can be used in this novel way without causing a noticeable impact on electricity consumers.

However, from a NGET perspective, it is unclear what effect that this proposal will have on existing Transmission assets and controls which must also be understood in order to:

- ensure that no adverse impact occurs on the Transmission protection and control systems
- conversely to ensure that existing controls do not immediately counter act the intention of the trial,
- to understand the implications of the trial on Transmission asset life and on Transmission asset capacity requirements, e.g. transformer capacity and shunt reactors and MSC's for reactive power control.

Method(s)

The Project will undertake three main Trials; described in detail below.

Trial 1 will investigate the voltage / demand relationship from the normal increment and decrement of system voltage at Primary substations across an annual period.

Trial 2 will investigate the viability of each of the proposed CLASS techniques in delivering a demand response, specifically:

- Demand Response for Peak Reduction at Primary substations - The test regime will investigate the use of a demand response, initiated by a voltage reduction, to manage the peak demand at a Primary substation. The outcome of this Trial is the confirmation that a demand response provided at the peak demand of a Primary substation (normally in winter) can defer network reinforcement;
- Demand Response for Frequency Response 1 support to NETSO - The test regime will investigate the use of a low frequency relay to switch out one transformer of a standard Primary substation and quantify the demand response;
- Demand Response for Frequency Response 2 support to NETSO - The test regime will investigate the use of demand response as a means of providing fast frequency response to the NETSO through the lowering of a Primary Substations taps.

Trial 3 will investigate the viability of the tap staggering technique for the provision of reactive power services (ie voltage regulation) to NETSO and DNO.

Scope

ENW have secured LCNF funding a project that will trial the use of tap changing at a number of primary substations. The purpose of the trial is to establish the degree to which voltage can be either increased or decreased to provide demand increase/decrease to manage DNO network constraints. In addition staggered tap changes will be trailed to establish what scale of reactive power absorption or injection can be provided. The main focus of the trial is to evaluate degree to which primary substations can be used in this novel way without causing a noticeable impact on electricity consumers.

From a NGET perspective, the effect that these actions have on existing Transmission assets and controls must be understood in order to:

- Ensure that no adverse impact occurs on the Transmission protection and control systems
- Conversely to ensure that existing controls do not immediately counter act the intention of the trial,
- To understand the implications of the trial on Transmission asset life on Transmission asset capacity requirements, e.g. transformer capacity and shunt reactors and MSC's for reactive power control.

Objective(s)

The objectives of the project include:

- The avoidance of any negative effects on Transmission protection and control systems,
- The prevention of counter action of the Transmission controls during the project's trials,
- Generate key learning relating to the asset capability of the Transmission systems and potential implications from the trials,
- To evaluate the technical and commercial viability of the potential ancilliary services being trialled under ENW's CLASS project

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

n/a

Success Criteria

The success criteria for the project will be based on the completion of the proposed trials under the CLASS that will investigate the viability of the tap staggering technique for the provision of ancilliary services to National Grid.

Project Partners and External Funding

n/a

Potential for New Learning

n/a

Scale of Project

The demonstation project will involve approximately 40 substations throughout the UK but has the potential to be implemented to all substations in the UK.

Technology Readiness at Start

TRL3 Proof of Concept

Technology Readiness at End

TRL7 Inactive Commissioning

Geographical Area

This project will be carried out in the North West of England within Electricity North West's distribution network.

Revenue Allowed for the RIIO Settlement

Funding for number of ICCP link is included in National Grid's RIIO Settlement, so the costs for setting up the ICCP link required for this project and the CLASS proect is therefore not being funded through the NIA. The esstimated costs for the ICCP link are reflected in the total project costs above, but not in the total NIA expenditure shown below.

Indicative Total NIA Project Expenditure

The total NIA expenditure is £134,000

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)

The project may reduce or defer the amount of capital investment required by the TO in reactive power controls. Approximately £70 million of investment is expected to be required over the RIIO period for convention means of reactive power management. If investment in just one shunt reactor can be avoided, cost savings would be achieved in the range £5-7million pounds.

Please provide a calculation of the expected benefits the Solution

Base Cost - £5 million

Method Costs - £0.4 million

Difference - £4.6 million

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

The CLASS project will generate key learning and benefits relating to increased reserve and balancing requirements which could be replicable to all Network Licensees.

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

Working alongside CLASS, this project has the potential to develop key learning relating to the asset life and management of transmission protection and control systems which could be replicated by all Network Licensees.

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

If the CLASS trials prove succesful and the technique is rolled out across the GB network, the learning from this input will be of relevance to the GBSO and the relevant TO and the DNO implimenting the technique.

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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.

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