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

Development of Advanced Line-Commutated Converter (LCC) HVDC Model for System Studies

Project Reference Number

Project Licensee(s)

National Energy System Operator

Project Start

August 2008

Project Duration

3 years and 11 months

Nominated Project Contact(s)

National Grid TO Innovation Team

Project Budget

£37,000.00

Summary

As a consequence of the European Union Renewable Energy Directive, the UK is committed to a target of more than 30% of electricity to be generated from renewable sources by 2020. The transmission network reinforcements and expansion necessary to allow the EU 2020 renewable target and long-term energy goals to be achieved in an effective and efficient manner were studied by ENA's Electricity Network Strategy Group and detailed in their report Our Electricity Transmission Network: A vision for 2020.

It was recognized in the report that due to planning constraints and environmental concerns, traditional methods of enhancing system capacity can be difficult to achieve and consideration was given to employing the latest technology, especially where this would yield additional economical and environment benefits. One such technology potentially contributing to the achievement of the above aims is HVDC transmission.

The Western High Voltage Direct Current (HVDC) link uses the thyristor based AC/DC converter technology and was proposed to be built as a major link across the Anglo-Scottish border to increase the inter-area power transfer capability and eliminate the constraints currently imposed on the border transfer for stability reason. In addition, there are many more HVDC projects that are currently under consideration and require a model which can be used in simulation studies effectively, accurately and easily.

National Grid has not previously implemented HVDC modelling in the old system analysis suites. The model provided by DIgSILENT in PowerFactory has been studied comprehensively and the results were reported in TR (E) 466; Computer simulation Tests of HVDC converter model in DIgSILENT. One of the major short comings identified in the model is the lack of the representation of the reactive power control while the converter operation moves from one level to another. It is essential and urgent to develop the reactive power control function and incorporate it into the current model for future use. The developed model will be crossed checked and verified by means of a real time digital simulator.

Nominated Contact Email Address(es)

box.so.innovation@nationalgrid.com

Problem Being Solved

Method(s)

Scope

Objective(s)

The objective of the project is to develop the PowerFactory Line-Commutated Converter (LCC) HVDC converter model for performing power flow studies and the network stability studies by National Grid engineers. The project aims to add the reactive power control, the filter switching and the converter transformer tap changes into the PowerFactory model. These areas have been identified as requiring to be addressed when the model is used to represent the thyristor based HVDC systems and operate not only at the DC system full rating but over a wide range of power transfer levels of the DC link. The project will deliver a model that can be integrated with any simplified circuits and the entire National Grid network model for power flow studies and stability studies. The work forms an essential step in developing National Grid's capability of network performances studies

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