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 2014

Project Reference Number

NIA_NGET0143

Project Registration

Project Title

Transient and Clearances in the Future Electrical Transmission Systems (ICASE Award)

Project Reference Number

NIA_NGET0143

Project Licensee(s)

National Grid Electricity Transmission

Project Start

September 2012

Project Duration

3 years and 10 months

Nominated Project Contact(s)

Chris Land

Project Budget

£171,000.00

Summary

An ICASE award has been set up by National Grid to investigate transient and clearance levels in the future transmission electrical system.

Nominated Contact Email Address(es)

box.NG.ETInnovation@nationalgrid.com

Problem Being Solved

With the move to new transmission system technologies and the possible use of live line working on both overhead lines and substations, it is timely and important to review the magnitude and frequency of transients. Of particular importance are switching transients that in the majority of cases drive the need for safety clearances and have an impact on the reliability of the equipment used on the network. Previous work reviewing the magnitudes of over voltages observed on a simple overhead line circuit have demonstrated the need for clearances higher than those previously used and above the level typically stated as safety clearances. Operating experience would, however, suggest that the existing safety clearances are adequate.

Method(s)

To develop appropriate clearance standards, National Grid will benchmark other standardisation bodies and assess existing guidelines to produce an overview of the current ‘state of the art’ being adopted throughout the industry. To support this, an assessment of the modern simulation packages available will identify the best suited to carrying out insulation co-ordination studies based on technical capability and ease of integration with existing National Grid models. The findings from these studies will influence the development of a simplified National Grid model capable of being used for a range of overvoltage studies within a chosen simulation package.

Scope

An ICASE award has been set up by National Grid to investigate transient and clearance levels in the future transmission electrical system.

Objective(s)

The objectives of the project include:

- A review of the following areas to produce an overview of the current 'state of the art' and the areas with the highest priority for further work:
  - The existing insulation coordination methodology within National Grid
  - The historical background behind the definition of the existing safety clearances and the guidance of standardisation bodies such as IEC and CIGRE in this area
  - The differing clearance requirements for standard substation working and live line working
  - The different methodologies employed across global transmission systems to manage overvoltage levels
  - The impact of new technologies on overvoltage levels
- A review of the capabilities offered by modern simulation packages (to include EMTP, EMTDC and Digsilent) to make a recommendation on which is best suited to carry out insulation coordination studies as judged on the basis of technical capability and ease of integration with existing National Grid models.
- The development of a simplified National Grid system model capable of being used for a range of overvoltage studies within the chosen simulation package. This model should represent a section of the actual transmission system and have the capability to include new technologies (the connection of offshore HVDC for example).

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

n/a

Success Criteria

The success criteria of the project will be

- The delivery of a report that critically examines the safety clearances applied to the high voltage system and those which are applied in the case of live line working both on overhead lines and within substations.
- A model of part of the National Grid system delivered in such a way that electromagnetic transient studies can be quickly / easily run by National Grid staff in the future
- A report highlighting the opportunities and/or threats that could be derived from a modification to the existing insulation coordination methodology within National Grid including a change to the overvoltage levels stated in technical specifications and the use of different forms of protective devices

Project Partners and External Funding

n/a

Potential for New Learning

n/a

Scale of Project

The research will involve a desktop study.

Technology Readiness at Start

TRL2 Invention and Research

Technology Readiness at End

TRL3 Proof of Concept

Geographical Area

The research will be carried out at the University of Manchester

Revenue Allowed for the RIIO Settlement

None.

Indicative Total NIA Project Expenditure

NGET NIA project expenditure is £103,000

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)

This project is reviewing the clearances required to allow live work to be carried out safely taking into account transient overvoltage events. This cost of constraints that could be avoided as a result of enabling more wide spread use of live work working can be in the region of £10,000 to £1million per day, the learning developed from this project is expected to enable future costs from de-energising equipment for mantenance activities to be reduced.

Please provide a calculation of the expected benefits the Solution

Not required for Research projects.

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

The output from this project will be replicable for all Network Licensees as it will generate an improved understanding of managing and maintaining overhead lines in a safe manner.

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

At this early stage an implementation cost has not been quantified, at the end of the project a better understanding of this cost will be achieved.

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

The knowledge and outcomes from the project will generated key learning of the working arrangement and safety parameters linked to operating on high voltage systems, overhead lines and substations which will be relevant to all relevant Transmission Network Licensees.

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