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

Jan 2014

Project Reference Number

NIA_NGET0091

Project Registration

Project Title

Impact Assessment of Seismic Analysis on Electricity Towers and Substation Equipment / Structures

Project Reference Number

NIA_NGET0091

Project Licensee(s)

National Grid Electricity Transmission

Project Start

February 2014

Project Duration

2 years and 2 months

Nominated Project Contact(s)

Gibson Bhunu

Project Budget

£234,500.00

Summary

This assessment will be based upon assessment of the seismic response of an example Over Head Line (OHL) Tower and substation support structure.

An initial screening process will be undertaken to review what structure types present the highest risk in terms of potential failure during a seismic event.

A fracking study will be undertaken to assess the potential impact to National Grids assets by adjacent fracking activities and subsequent induced ground movement events. In particular, consideration will be given to potential increased maintenance requirements and reduction in asset life, based on the British Geological Survey information on likely fracking areas and National Grid's Assets.

Nominated Contact Email Address(es)

box.NG.ETInnovation@nationalgrid.com

Problem Being Solved

GB Transmission network design standards to date have been based on withstanding the forces experienced in the event of an electrical fault which are considered to be greater than the forces from credible natural seismic events likely to occur in the UK.

However, with recent developments in energy sourcing, including fracking, National Grid propose to verify that this approach to seismic reslience remains valid in the future.

Method(s)

Research

Using a widely accepted risk assessment process commonly used in other industry sectors (for example Oil & Gas, Wind generation owners, and the PetroChemical Processing businesses), National Grid with Mott Macdonald will consider a full risk based approach to seismic analysis, covering the following areas:

- Seismic Hazard
- Vulnerability
- Exposure
- Network Integrity

Scope

This assessment will be based upon assessment of the seismic response of an example Over Head Line (OHL) Tower and substation support structure.

An initial screening process will be undertaken to review what structure types present the highest risk in terms of potential failure during a seismic event.

A fracking study will be undertaken to assess the potential impact to National Grids assets by adjacent fracking activities and subsequent induced ground movement events. In particular, consideration will be given to potential increased maintenance requirements and reduction in asset life, based on the British Geological Survey information on likely fracking areas and National Grid's Assets.

Objective(s)

The objective of this work is to gain a better understanding of whether the current design specification is adequate to cope with the largest credible earthquake in the UK.

The second objective is to understand any implications to the National Grid system and assets from a lower intensity, higher frequency seismic activity, that might be induced by fracking activities.

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

n/a

Success Criteria

- Production of a network model, based on the impact of earthquake
- Production of a network model, based on the impact of fracking

Project Partners and External Funding

n/a

Potential for New Learning

n/a

Scale of Project

This project is being delivered as a desktop study. The scale connot be reduced further and still deliver the objectives.

Technology Readiness at Start

TRL2 Invention and Research

Technology Readiness at End

TRL3 Proof of Concept

Geographical Area

The project is being undertaken in Birmingham.

Revenue Allowed for the RIIO Settlement

Zero

Indicative Total NIA Project Expenditure

£234,500

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)

In a GB context a damaging seismic event is regarded as a high impact but low probability event. The impact of such an event on the GB transmission system could be very signifiacnt and it is credible to consider the loss of parts of the network until emergency repairs could be completed.

To minimise the implications of such an event, if possible power flows were to be diverted to avoid affected areas which would most likely involve constraint actions by the GB System Operator, similar to that which is sometimes required when a circuit is denergised for planned maintenance. These constraining actions can cost between £10,000 and £1m per day depending on which generators are affected.

Please provide a calculation of the expected benefits the Solution

Research Project - Not required.

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

This work will be applied to the whole of the National Grid transmission system as part of this work, but will be widely applicable to all network licensees.

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

We have not discussed the roll-out costs for other networks as part of this work, because of the complexities and differing policies of the energy networks. However, we would envisage the costs being similar to the cost incurred for this project.

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)

This project addresses the following theme of the Innovation Strategy:

Reliability - Optimising Asset Management

☑ 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