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

Dec 2013

Project Reference Number

NIA_NGET0082

Project Registration

Project Title

Rating Impact of Non-isothermal Ground Surface (RINGS)

Project Reference Number

NIA_NGET0082

Project Licensee(s)

National Grid Electricity Transmission

Project Start

April 2012

Project Duration

4 years and 3 months

Nominated Project Contact(s)

Dan Morrice

Project Budget

£148,000.00

Summary

The IEC 60287 standard describes algorithms for use with various cable laying conditions including shallow buried cables. The standard assumes ground surface temperatures to be isothermal. The FEAR R&D project undertaken by Southampton University confirmed that the use of isothermal surface temperatures was valid for cables buried at more than 1 metre depth but for shallow buried cables, including those in surface troughs; this assumption was shown to be optimistic, leading to possible overrating of such cables. Conversely cables may be underrated to mitigate for the unknown affect of non-isothermal temperatures.

Nominated Contact Email Address(es)

box.NG.ETInnovation@nationalgrid.com

Problem Being Solved

Recent cable installations have also employed low Thermal Resistivity backfills enabling a higher heat transfer rate from the cable to ground surface, potentially increasing the ground surface temperature. This leads to uncertainty in the actual cable rating available in such situations.

It is proposed that monitoring equipment is installed at a site where this situation occurs with the aim of collecting temperature and air flow data over a one year period to cover all seasons and a wide range of loading. The site most suitable for this would be at the Woodhead tunnel where new trough systems have been installed between the sealing ends and the tunnel. This data would then be used by Southampton University to assess how surface temperature is affected leading to a recommendation of temperature range to be used in cable modelling.

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Method(s)

he method that has been proposed for this project is;

- Install temperature and air velocity monitoring equipment
- Set up remote visualisation of data
- Analyse data
- Report on data analysis

Scope

The IEC 60287 standard describes algorithms for use with various cable laying conditions including shallow buried cables. The standard assumes ground surface temperatures to be isothermal. The FEAR R&D project undertaken by Southampton University confirmed that the use of isothermal surface temperatures was valid for cables buried at more than 1 metre depth but for shallow buried cables, including those in surface troughs; this assumption was shown to be optimistic, leading to possible overrating of such cables. Conversely cables may be underrated to mitigate for the unknown affect of non-isothermal temperatures.

Objective(s)

The objectives for this project are to;

- Understand how the ratings of shallow buried cables and cables in surface troughs are affected by non-isothermal boundary temperatures; and
- Recommendations for temperature conditions to be used in modelling of shallow buried cables and cables in surface troughs.

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

n/a

Success Criteria

This project will be successful if we understand in greater detail the issues around Cable ratings in non-isothermal ground surfaces.

Project Partners and External Funding

-DOBLE
-C3
- Southampton University

There is no external funding being brought for this project.

Potential for New Learning

There is potential for new learning to assess how surface temperature is affected leading to a recommendation of temperature range to be used in cable modelling. This learning will be disseminated through the ENA portal, NationalGrid.com website and through conferences.

Scale of Project

This project is focussed on a laboratory scale

Technology Readiness at Start

TRL3 Proof of Concept

Technology Readiness at End

TRL5 Pilot Scale

Geographical Area

This work is being delivered in Southampton

Revenue Allowed for the RIIO Settlement

Zero

Indicative Total NIA Project Expenditure

IFI=85k

NIA=63k

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)

An estimation of the saving if the problem is solved is £15million

An understanding of how the ratings of shallow buried cable as affected by non-isothermal boundary temperatures will lead to accurate assessment of cable capability. In some cases this could lead to positive responses to cable rating enhancement requests. In the case of the Woodhead tunnel cables, when combined with low thermal resistivity backfill, this is expected to enable a substantially higher rating to be applied than at present. This would remove or defer the need for the installation of a second core per phase of cable at Woodhead following the commissioning of new generating in 2017, thus potentially saving £15 million of asset costs.

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Please provide a calculation of the expected benefits the Solution

Research Project - N/A

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

This project can be applied to the whole of the Transmission network, where cables are installed.

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

This knowledge will be rolled out within the project, but will undoubtedly fit into other pieces of work.

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 is addressing the issue of flexible networks and enhanced capacity, as detailed in the innovation strategy.

☑ 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.

Having completed a review of our standard supply base, including Universities, EPRI and the ENA Smart portal, National Grid confirm that this work has not been done before.

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