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

May 2020

Project Reference Number

NPG_NIA_034

Project Registration

Project Title

Resin Mixing

Project Reference Number

NPG_NIA_034

Project Licensee(s)

Northern Powergrid

Project Start

May 2020

Project Duration

0 years and 7 months

Nominated Project Contact(s)

Chris Goodhand/Dave Whelan

Project Budget

£120,000.00

Summary

Invetsigation of method for improving resin mixing for joint-potting to provide joints less prone to failure due to water ingress.

Nominated Contact Email Address(es)

yourpowergrid@northernpowergrid.com

Problem Being Solved

A key feature of managing the underground cable network is the jointing of cables to facilitate repairs and to join shorter cable runs together. To protect joints from damage and prevents moisture ingress a plastic shell surrounds each of the joints as they are made and this is filled with a resin mix to pot the joint.

The resin is delivered to site in large (several kg), pre-packed, self-contained bags of two part resin made up of the resin itself and a hardener. To cure the resin an internal seal in the bags is broken and the resin and hardener, still within the bag, are agitated by hand for a minimum of five minutes to ensure the resin is adequately mixed before it is poured into the joint. Often several bags of resin are required for a single joint and each bag requires manipulating for several minutes before use.

The manual method used to mix the resin can lead to inconsistency in the distribution of the hardener in the resin. This, in turn, leads to inconsistent resin quality within the joint shell which potentially provides a system weakness which can manifest itself as faults in the same location due to mechanical or moisture ingress issues. These faults may take many years to appear but analysis indicates that water ingress and mechanical failure of joints is a significant contributor to emergency repairs.
Method(s)

Method(s)

The project proposes to investigate methods of producing consistent, high-quality potted joints through the automation of resin/hardener mixing. The method needs to be easy to use, provide a consistent output and, while suitable for vehicle mounting, be of small physical size and require the minimum energy required to operate successfully. The initial phase will be a desktop and engineering analysis of options.
Having identified possible designs the project will deliver a prototype of the preferred approach to demonstrate and prove the concept

and to identify a design that can be taken forward, post-project,

Scope

The scope of this project focuses on small scale resin mixing typically used for jointing cables up to high voltage. Scope is limited to the physical process of current resin supplies and does not include development or improvement of the resin itself.

Objective(s)

The objectives of this project are to:

* Review the range of possible approaches to resin mixing.

* Identify the key success criteria for resin mixing for electricity cable jointing.

* Identify a candidate technology that meets those criteria.

* Build, test and assess a prototype based on that technological approach.
* Make recommendations on a new approach which produces more consistent resin mixing and therefore improves the quality of cable joints and confirm a final design.

This in turn should improve long-term cable performance and reliability of the network as a whole.

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

n/a

Success Criteria

Project success criteria are the successful delivery of the listed project objectives or the halting of the project, having concluded that the objectives are either not technically and/or economically feasible, at any of the project stage gates. In either case a successful outcome would include dissemination of the project findings and the learning developed.

Project Partners and External Funding

None. The project has been designed in collaboration with the Energy Innovation Centre.

Potential for New Learning

DNOs currently have no automated technique for the mixing of resin and this project will develop options that fill that gap in knowledge and technology.

Scale of Project

Project scale is limited to the production of a prototype mixing systems suitable for vehicle mounting. This is built on substantial desk-top analysis.

Technology Readiness at Start

TRL4 Bench Scale Research

Technology Readiness at End

TRL8 Active Commissioning

Geographical Area

N/A although the project is applicable to all areas of the network, NPg and others, that use underground cables.

Revenue Allowed for the RIIO Settlement

None.

Indicative Total NIA Project Expenditure

£120,000

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)

Analysis of joint failures due to long term water ingress on the NPg network indicate that they account for about 5% of those seen at LV. Based on current costs avoidance of these failures would save approximately £1.9m per annum. Timeframes from jointing to failure are typically 10yrs.

Please provide a calculation of the expected benefits the Solution

There are no direct financial benefits from the project itself.

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

The method will be directly applicable to all GB network operators.

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

A target cost for a vehicle mounted mixer is £2k anmd an estimate of the cposts to fit out an appropriate proportion of the GB fleet would be in the range £1-2M. Thsi cost would genrally be amortised over the life of the vehicles involved and, it is hoped, that the technology will be robust enough to justify transfer from vehicle to vehicle as fleets are refreshed..

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

All GB networks use cable jointing and the methoid that the porject developes will be of direct use to all GB operators. .

Or, please describe what specific challenge identified in the Network Licensee's innovation strategy that is being addressed by the project (RIIO-1 only)

The project contributes to improved reliability, albeit long term.

☑ 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.

No similar technology avialble or developed by other DNOs.

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

The preecise reason for this is not clear. Investigation of the market shows that such technology is not available for utility use. Supply-chain separtaion of the resin manufacturing (as a chemical manufacture) and of a suitable mixer (as a mechanical manufacture) may account for this. Alternatively a lack of appreciation of the long term impact of joint qualityand the role of resin mixing in that may also be a contributory factor.

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

The long term nature of the issue involved means that any benefit will occur beyond the end of ED1 and possibly ED2. Such long term and uncertain paybacks are likely to be ceded back to customers in the course of normal price control.

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

The risks are both technical and commercial. The technology has a relatively low initial TRL and is therefore not guaranteed to delivere the benefit. Any benefits are likely to accrue over an extended period of time, and while improving the network, are unlikely to be commercially beneficial to NPg.

This project has been approved by a senior member of staff

☑ Yes