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

Jun 2021

Project Reference Number

NIA_SSEN_0054

Project Registration

Project Title

Alternative Jointing Techniques

Project Reference Number

NIA_SSEN_0054

Project Licensee(s)

Scottish and Southern Electricity Networks Distribution

Project Start

July 2021

Project Duration

1 year and 5 months

Nominated Project Contact(s)

Kevin Dennis - Scottish and Southern Electricity Networks

Project Budget

£118,000.00

Summary

This project will Introduce the concept of a new cable jointing system that will require a new methodology for installation compared to existing systems. The new learning will be based around process methodologies, new equipment to use and potentially measuring when the product is cured and when it is safe to backfill.

Nominated Contact Email Address(es)

fnp.pmo@sse.com

Problem Being Solved

Jointing of many underground cable types requires the use of resin for electrical insulation and mechanical protection of joints. To complete a resin joint, operatives must mix resin from a bag on site and use a mould to form a secure seal around the joint. The excavation carried out to access the cables is only refilled once the resin has fully cured. The use of resin joints can be labour-intensive as the resin mixture must be carried to site and mixed by hand to the correct viscosity. Additionally, the mixing equipment and resin take up space and weight on operational vehicles.

Method(s)

The proposed technology is to replace a liquid thermoset resin with a semi-solid thermoset putty compound that is pre moulded inside a clamshell. The clamshell is simply placed around the joint (once made), closed and the putty is cured either by application of heat, ultraviolet light or through another initiator (e.g. chemical) means. There is therefore no requirement to mix resins which can introduce variability and air entrapment in the cured resin. Liquid resins can cure either too quickly or too slowly if incorrectly mixed or if the mixing is performed on hot or cold days. The putty will be manufactured and pre-assembled in a factory environment resulting in high tolerances to ensure a repeatable chemical reaction takes place. There is little-to-no waste as the putty is pre-applied to the inside of the clamshell. The speed of operation is also reduced by making this a one-step process with the putty tailored to an idealised cure-time as per operator requirements.

Scope

Stage 1 Proof of Concept
The Scope is to develop the putty material to a proof of concept/component validation in a laboratory, experimenting with the same scale of joints that used currently.
The output of stage 1 is to prove the feasibility that using a resin-based putty can be used to encapsulate a LV joint and withstand the electrical voltages.
Output 1: Validate that it is feasible to create a mouldable putty solution that meets the
mechanical and electrical requirements of an LV joint. There will also be potential additional benefits in the following areas: -
• Cost reduction and efficiencies operational time and effort
• SHE (Safety, Health and Environment) impact

Objective(s)

The projects objectives are as follows;
Develop Requirements
To describe the specific requirements of the technology in terms of:
material performance, process methodology needs, cost targets, process duration targets.
• Product specification
• Process specification / targets
• Cost targets
Investigate
Manufacture of a resin based putty system with standard curative systems.
• Measure the ability to mould the joint between clam shells

• Measure the base dielectric strength or other electrical requirements

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

N/A

Success Criteria

• Be applicable to all LV Waveform and PILC cable types.
o System passes accelerated ageing and electrical testing programme
• Competitive unit and operational cost compared to current method.
o Cost modelling of resin and equipment as well as measured time savings
• Be able to work as a 1 man lift in harsh environment
o Putty mass target to be < 10kg
• Be safe to use on site.
o Written risk assessment
• Provide operational benefits e.g. number of trips required back and forth from van
o Time-motion comparison of new versus existing techniques
• Be transportable within van weight limit and size.
o Measure complete package mass
• Have an acceptable level of cable damage resistance.
o Report comparing the cable damage resistance of the putty repair process against conventional repair techniques
• Practicable without requiring intensive/excessive operational training
o Obtain operator feedback
• Be applicable to Consac cables.
o Successful Laboratory and field trials

Project Partners and External Funding

Project Partner Hive Composites and EIC (Energy Innovation Centre)

Potential for New Learning

This project will Introduce the concept of a new cable jointing system that will require a new methodology for installation compared to existing systems. The new learning will be based around process methodologies, new equipment to use and potentially measuring when the product is cured and when it is safe to backfill.

Scale of Project

This proof of concept project will take the solution from TRL3 to TRL4 over a period of 7 months, achieving a conclusion before the end of ED1 which if successful could lead to a follow-on project. The project will consist of the following: -
•Resin(s)/putty will be developed and tested in the lab to prove the concept

Technology Readiness at Start

TRL3 Proof of Concept

Technology Readiness at End

TRL4 Bench Scale Research

Geographical Area

Trials will take place on selected SEPD and SHEPD networks.

Revenue Allowed for the RIIO Settlement

There was no revenue allowed in the RIIO settlement for investigating innovative ways of alternative cable jointing techniques.

Indicative Total NIA Project Expenditure

The total expenditure is £92,394, of which 90% (£83,154.60) is allowable NIA 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 Research proof of concept project (TRL3)

Please provide a calculation of the expected benefits the Solution

N/A Research project (TRL3)

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

The proposed method could be adopted by all DNOs as they all carry out jointing activities on their networks.

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

Costs and the associated benefits can be extrapolated out to include other GB networks if the technology is taken up. These will depend on the region-specific requirements, i.e. number of units required, number of jointing activities on the network etc. We are not able to give an indicative cost of rolling out the method as the materials are yet to be developed.

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 DNOs with underground cables carry out jointing on their networks. This will be applicable to all DNOs

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

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.

There is no replication or duplication on this project as it is utilising a different type of technology that has not been used in any other type of jointing solution project.

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

This type of jointing technology has not been explored before.

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 project is still at a low TRL level and there are a number of issues and risks to overcome before the technology is mature enough for it to be used as part of business as usual activity.

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 project can only be undertaken as an innovation project given the operational risks associated with the deployment of an unproven solution in network operations. The technology has yet to be tested in a laboratory environment and will require a true network test to prove its viability. As noted in the NIA guidance, certain projects are speculative in nature and yield uncertain commercial returns. This is the case with this project following the trial period. This could be due to the fact that the solution has not reached the level of TRL 8 required for business-as-usual application. If the project is successful, further development will be required to reach a commercial solution. The specific details regarding the benefits are captured under section 2b of this document. There is a commercial risk that the solution trialled in the project is not adopted by the stakeholders involved

This project has been approved by a senior member of staff

☑ Yes