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

Oct 2015

Project Reference Number

NIA_SPEN0007

Project Registration

Project Title

SUSCABLE 2

Project Reference Number

NIA_SPEN0007

Project Licensee(s)

SP Energy Networks Distribution

Project Start

July 2014

Project Duration

4 years and 6 months

Nominated Project Contact(s)

Geoff Murphy, David Ruthven, & Paul Cunnigham

Project Budget

£586,369.00

Summary

This project is a continuation under NIA of IFI project, IFI 1302, which was included in SP Energy Networks Annual Report 2014/15. The scope of the project is to design, develop and test a 35kV MV cable that is compatible with 120°C continuous operating temperature and 150°C conductor emergency rating.

Preceding Projects

PRJ_1140 - SUSCABLE 2

Third Party Collaborators

Kinectrics Inc

University of Southampton

Nominated Contact Email Address(es)

innovate@spenergynetworks.co.uk

Problem Being Solved

First generation PVC insulation restricted power cable ratings to 60 - 70°C, subsequent cross linking (XLPE) to prevent the plastic melting offered a continuous rating of 90°C. Recyclable polymer blend materials and process conditions have been developed that

avoid the crosslinking and consequently require much lower energy use in manufacturing when compared to that of XLPE cables. The new cable technology also offers the ability to recycle all of the materials at end of life. The new thermosplastics under consideration offer the prospect of an enhanced operating range of 120°C to 150°C. This increased operating head room will lead to improved cable performance.

Method(s)

The objective of the SUSCABLE 1 project was to develop new power cable material technologies with reduced manufacturing environmental impact, increased power system efficiency with enhanced sustainability (increased peak-load thermal tolerance) and increased security of supply in urban and environmentally sensitive areas. The outcome of SUSCABLE 1 was new polymer blends with high thermal stability materials with enhanced electrical performance, reduced production costs and improved environmental performance. The SUSCABLE 2 project aims to deliver a 35kV cable based on the new materials and also put in place the materials specification for a 400kV cable.

Scope

This project is a continuation under NIA of IFI project, IFI 1302, which was included in SP Energy Networks Annual Report 2014/15. The scope of the project is to design, develop and test a 35kV MV cable that is compatible with 120°C continuous operating temperature and 150°C conductor emergency rating.

Objective(s)

The objectives of the project are as follows:

Design, develop and test a MV polypropylene (PP) blend cable, preferably 35kV, utilising existing cable accessory technologies that are compatible (or readily made compatible) with up to 150°C conductor emergency rating and 120°C continuous operating temperature.

Refine the PP blend materials to achieve the MV cable design, processing and cable production processes. The development efforts will also be used to specify material enhancements for EHV cable applications up to 400kV.

Undertake cable manufacturing and testing with structured development to generate experience that will be of value in 400kV design, manufacture and testing.

Undertake MV cable deployment and operational studies to define the best operating mode and value proposition for Network operators and other MV cable users including economics of deployment with incorporation of risk factors and environmental benefits assessment.

Review material thermal properties, cable thermal performance and cable ratings to meet current international standards and develop an action plan to address any identified performance gaps.

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

n/a

Success Criteria

The project success criteria is the realisation of the following key project activities:

Determination of suitable MV cable design

Determination of MV cable rating data including deployment and operational studies

Deriving optimum PP blend composition and tolerance

Identifying preferred semiconductor screen material

Identifying preferred cable jacket (sheath) material

Testing MV cable

Define the HV / EHV cable development programme

Determine whole life cable costs and environmental performance

Finalising MV cable design and production process

Project Partners and External Funding

n/a

Potential for New Learning

n/a

Scale of Project

The scale of the project is restricted to 35kV cable development, however the learning in materials technology, cable design, manufacturing and testing will be of value at higher voltage levels up to 400kV

Technology Readiness at Start

TRL2 Invention and Research

Technology Readiness at End

TRL6 Large Scale

Geographical Area

Network operators and other MV cable users throughout GB

Revenue Allowed for the RIIO Settlement

N/A

Indicative Total NIA Project Expenditure

NIA expenditure £130,000 Spend under IFI was £71,370

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)

It is anticipated that there will be some financial savings and significant process energy and carbon emission saving in the cable production process when compared to XLPE cable production. However, at this stage these it is not possible to quantify these precisely.

Network operational benefits are expected from the higher operating temperature limits of the new cables to support highly peaking loads particularly in the connection of wind turbine renewables and in managing network constraints.

Please provide a calculation of the expected benefits the Solution

This project is a research project that will result in appropriate learning for the cables companies to allow them to develop and manufacture the cable.

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

The Method is replicable across GB and applicable to all Network Licensees system operating at 33kV. It is anticipated that the learning from the project will also be applicable at higher voltage levels up to 400kV.

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

Given the research nature of the project it is too early to determine such costs.

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

It is intended that the Network Licensees will use the cable that is developed by this project

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