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

Nov 2022

Project Reference Number

NIA_SPEN_0077

Project Registration

Project Title

Truly Sustainable D&T Substations

Project Reference Number

NIA_SPEN_0077

Project Licensee(s)

SP Energy Networks Transmission

Project Start

November 2022

Project Duration

1 year and 7 months

Nominated Project Contact(s)

Steve Vallance, Claire Roxburgh

Project Budget

£150,000.00

Summary

Embedding sustainable principles at the earliest stages of a substation development project is critical for the future resilience of the electricity network and the protection of the natural environment and climate. Innovation will be targeted to develop the principles of circular design, minimise whole life carbon emissions and embed nature-based solutions to restore biodiversity and maximise the natural capital value around our substations.

Third Party Collaborators

CEE

Nominated Contact Email Address(es)

innovate@spenergynetworks.co.uk

Problem Being Solved

The future resilience and robustness of substations can be affected by several evolving external factors which necessitate a critical analysis of sustainable design, including:

- Evolving energy landscapes – which may require significant upgrades across the normal design life of a substation
- Evolving geopolitical factors – which can interrupt supply chains, disrupting the development of new substations and the refurbishment of existing substations
- Climate change and the frequency of climate disasters – which can threaten existing infrastructure and must be increasingly considered when designing new substations
- Evolving technical and regulatory standards – which may have significant associated costs and cause operational challenges

associates with retrofitting (e.g., net zero targets, PCB removal, SF6 etc).

Method(s)

1. Review of current circularity, carbon and nature-based solutions in transmission and distribution substations
2. Develop opportunities register and implementation roadmap for circular substation design, whole life carbon reduction and nature-based solutions, including supply chain collaboration and regulatory barriers.
3. Sustainable Substation Visualisation Development and Redesign in BIM.

Scope

Design / build transmission and distribution substations with 'net zero' emissions to meet evolvong technical and regulatory standards target.

Embed the principles of the Circular Economy to meet evolving geopolitical factors and the evolving energy landscapes.

Implement Nature Based solutions in line with evolving climate and the frequency of climate disasters. Additinally, offsetting and biodiversity net gain requirements.

Objective(s)

- Create an implementation roadmap capable of minimising electricity Transmission and Distribution substations lifecycle carbon emissions through a review of current design and best practice options by May 2023
- Increase circularity in design of substations through the creation of an opportunities register and circular roadmap by May 2023
- Develop opportunities register of nature based solutions by May 2023 to enhance biodiversity and natural capital on substation sites
- Collaborate with the value chain, through the trade association BEAMA, to create a barriers and opportunities register for sustainable assets
- Create a project risk register including regulatory barriers and opportunities by July 2023
- Create a sustainable substation BIM design with all best practice sustainable options by July 2023

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

This project has been assessed as having a neutral impact on customers in vulnerable situations.

Success Criteria

The project will deliver success by meeting the project objectives:

- Create an implementation roadmap capable of minimising electricity Transmission and Distribution substations lifecycle carbon emissions through a review of current design and best practice options by May 2023
- Increase circularity in design of substations through the creation of an opportunities register and circular roadmap by May 2023
- Develop an opportunities register of nature based solutions by May 2023 to enhance biodiversity and natural capital on substation sites
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- Create a project risk register including regulatory barriers and opportunities by July 2023
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Project Partners and External Funding

Project Partners:

- BIM Model Designers (SPT BIM Team)
- Zero Waste Scotland & other not for profit groups
- BEAMA
- ScottishPower Distribution and ScottishPower Manweb
- Electricity Transmission Operators
- DNOs
- Energy Innovation Centre

- Specialist carbon / circular / nature-based solutions consultants

Potential for New Learning

A variety of new learning will be generated by carrying out this project. We will create a blueprint for best practice in sustainable substation design. This will include cost and environmental benefits analysis crating a roadmap of the most efficient environmental options. The project will also learn about opportunities and challenge in the supply chain to delivering sustainable materials and products. The final crucial element will be to increase knowledge of any regulatory implications of moving to BAU. Learning will be disseminated through the project partners and through an end of project report and webinar.

Scale of Project

The project aims to take a holistic look across a range of sustainability topics to produce a design for a truly sustainable substation. The project could take any one of the key topics separately i.e. carbon, circularity or nature based solutions and be of a smaller scale. However, this would not provide a truly sustainable picture and would miss identifying the synergies or conflicts between implementing the different sustainability areas.

Technology Readiness at Start

TRL2 Invention and Research

Technology Readiness at End

TRL3 Proof of Concept

Geographical Area

The project will take place in the SPT and SPD geographic areas of the central belt and south of Scotland and the SPM area of North Wales, Merseyside, Cheshire, and North Shropshire.

Revenue Allowed for the RIIO Settlement

None

Indicative Total NIA Project Expenditure

£130,000

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:

- Evolving energy landscapes – which may require significant upgrades across the normal design life of a substation
- Evolving geopolitical factors – which can interrupt supply chains, disrupting the development of new substations and the refurbishment of existing substations
- Climate change and the frequency of climate disasters – which can threaten existing infrastructure and must be increasingly considered when designing new substations
- Evolving technical and regulatory standards – which may have significant associated costs and cause operational challenges associates with retrofitting (e.g., net zero targets, PCB removal, SF6 etc).

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.

Please provide a calculation of the expected benefits the Solution

This is a research projec.

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

A roadmap will be created for both Transmission and Distribution substation sustainable design. Elements of the design could be replicated across all electricity network substations in the UK.

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

Not known at this stage, the roadmap will provide a cost benefit analysis of options which could then be extrapolated across GB.

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

The opportunities register and sustainable substation implementation roadmap will be published at the end of the project. Other electricity Transmission and Distribution licences will be able to use these documents to make informed decisions to improve the sustainable design of their substations.

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.

We have advertised the project to other licence operators and also work closely in collaboration groups with TOs and DNOs on the sustainability topics included in this project. There are elements of good practice that the project will build on eg energy efficiency in substation design but there is no duplication regarding creating a roadmap including a range of sustainability elements.

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

Substation design does not currently include holistic sustainability optioneering. There are elements of good practice but an in-depth critical analysis is required to provide an efficient sustainable design roadmap. This project is innovative in bringing together a range of expertise on carbon, circularity and nature-based solutions.

Relevant Foreground IPR

The foreground IPR will be the knowledge associated with the development of the implementation roadmap, opportunities register for circulay substation design and nature-based soutions, project risk register and substation design (inclding BIM design).

Data Access Details

Data can be made available in line with our information sharing policies.

Please identify why the Network Licensees will not fund the project as apart of it's business and usual activities

The project requires significant external expertise in carbon, circularity and nature-based solutions and therefore cannot be achieved by internal SPEN resource.

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

There are technical, commercial and operational risks associated with the project that need to be further understood, as outlined below. NIA support will help mitigate some of these risks:

- Low carbon and circular alternatives are not generally part of current specification, a transparent study looking at viable options which meet quality and technical standards, as well as providing improved sustainability performance, is necessary for the step change required for BAU and to address risks associated with adopting new options.
- The project is expected to lead to wide dissemination of options with other network licence organisations trialling options identified, this will facilitate greater information sharing and spread the risk associated with early adoption.
- Some sustainable options may increase the initial price of substations and have commercial implications, it is therefore imperative that the whole life costs are investigated, transparent and communicated widely so that the real cost is realised.
- Dissemination of regulatory implications of adopting sustainable measures is also essential in helping to address these and avoid duplication

This project has been approved by a senior member of staff

☑ Yes