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

Jan 2016

Project Reference Number

NIA_SSEPD_0024

Project Registration

Project Title

Network Optimisation Project (NOP)

Project Reference Number

NIA_SSEPD_0024

Project Licensee(s)

Scottish and Southern Electricity Networks Distribution

Project Start

January 2016

Project Duration

0 years and 10 months

Nominated Project Contact(s)

SSEN Future Networks Team

Project Budget

£185,000.00

Summary

The project aims to utilise an optimisation tool in order to address the undergrounding of overhead lines within the test site. The anticipated benefit includes the reduction of the cost for the undergrounding of overhead lines through the design of optimal routes. The scope of the project is outlined below:

- Definition of Input. SSEPD along with the selected supplier will define the requirements and inputs of the optimisation tool that will be used for the project.
- Data Collection & Analysis. SSEPD will undertake the required data analysis in order to provide to the selected supplier the data required for the optimisation exercise. The selected supplier will also prepare the data in a format that will be used by their optimisation algorithm.
- SSEPD will select an external network planner in order to undertake the traditional network planning approach, define the design criterions of the optimisation assessment and support the project in reaching its goal.
- Design, Mapping and Testing. The selected supplier will undertake the mapping of SSEPD input in their existing optimisation tool, run the optimisation process and test the outcome. SSEPD will be involved in the stage by providing continuous support and steering the process.
- Results Evaluation. SSEPD will undertake the network planning process and determine the route for the proposed underground work using traditional processes. The outcome of the traditional process will be used as the baseline for the comparison with the outcome of the optimisation tool undertaken by the selected supplier. Within this stage, and if the method is successful, SSEPD will scope the follow on steps.
- Project Close Out. SSEPD will develop and produce a project close out report.

Third Party Collaborators

TNEI Services Ltd

ADAS

Glanville

Route Monkey

Nominated Contact Email Address(es)

fnp.pmo@sse.com

Problem Being Solved

Distribution network operators plan networks using network planning principles and processes that have mainly been developed at times when optimisation tools were not available. It is believed that data analytics and optimisation techniques can bring benefits in the operations and investment decisions of network operators. SSEPD has committed to undergrounding 500km of 11kV overhead lines within RIIO-ED1. The traditional approach would involve prioritising the undergrounding of overhead lines based on historic fault performance and manual selection of a route for the proposed undergrounding work. Although the traditional approach is a well understood process focusing on compliance with relevant network planning standards, a network optimisation method would be able to assess a wider range of data and examine all options for the route selection through an automated process and could result in increased efficiency and improved network planning.

Method(s)

The project aims to address the problem of undergrounding overhead lines in the trial site. In order to do so, the method will utilise an optimisation tool in order to produce optimal routes for undergrounding the overhead lines. The optimisation tool will optimise routes against a weighted balance of cost, time to construct, social acceptance and other parameters that will be defined during the course of the project. The optimisation tool will take into account data available to network operators (such as historic fault performance, construction costs, asset costs), consider network planning criteria and external constraints, process them through appropriate computing processes and produce a list of route options for undergrounding the overhead lines along with their anticipated performance against defined metrics. The outcome would provide the means to network operators to select the optimal option after aligning the produced route options with their strategic priorities. It is anticipated, that if the method is successful, it will increase the cost efficiency to network operators and the customers.

Scope

The project aims to utilise an optimisation tool in order to address the undergrounding of overhead lines within the test site. The anticipated benefit includes the reduction of the cost for the undergrounding of overhead lines through the design of optimal routes. The scope of the project is outlined below:

• Definition of Input. SSEPD along with the selected supplier will define the requirements and inputs of the optimisation tool that will be used for the project.

• Data Collection & Analysis. SSEPD will undertake the required data analysis in order to provide to the selected supplier the data required for the optimisation exercise. The selected supplier will also prepare the data in a format that will be used by their optimisation algorithm.

• SSEPD will select an external network planner in order to undertake the traditional network planning approach, define the design criterions of the optimisation assessment and support the project in reaching its goal.

• Design, Mapping and Testing. The selected supplier will undertake the mapping of SSEPD input in their existing optimisation tool, run the optimisation process and test the outcome. SSEPD will be involved in the stage by providing continuous support and steering the process.

• Results Evaluation. SSEPD will undertake the network planning process and determine the route for the proposed underground work using traditional processes. The outcome of the traditional process will be used as the baseline for the comparison with the outcome of the optimisation tool undertaken by the selected supplier. Within this stage, and if the method is successful, SSEPD will scope the follow on steps.

• Project Close Out. SSEPD will develop and produce a project close out report.

Objective(s)

The project will determine whether the optimisation tool offered by the selected supplier can result in more cost effective options for the undergrounding of overhead lines, in comparison to traditional network planning approaches.

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

n/a

Success Criteria

The project will be considered a success if it can determine whether the optimisation tool offered by the selected supplier can result in

more cost effective options for the undergrounding of overhead lines, in comparison to traditional network planning approaches.

Project Partners and External Funding

n/a

Potential for New Learning

n/a

Scale of Project

The method will be trialed in a pilot area/ site which contains 33km of 11kV overhead lines. The pilot site is considered of sufficient scale and provides the necessary area to the optimisation tool to consider a range of route options and provide meaningful outcomes for the evaluation. The pilot site has been selected upon historic fault performance and network topology which will be of use to the project learning.

Technology Readiness at Start

TRL5 Pilot Scale

Technology Readiness at End

TRL7 Inactive Commissioning

Geographical Area

The project will be focused in SEPD (south central England).

Revenue Allowed for the RIIO Settlement

SSEPD has been awarded allowances for undergrounding 500km of 11kV overhead lines, including the 33km of the trial site. This project will generate an optimised route which is applicable to the design stage of the project. Should the developed route be adopted by the business, the associated benefit will be at the scale of the financial benefits reported in the following section and adjusted during the course of the project. Any savings that will be realised if the outcome of the project is adopted by the business will be reported by SSEPD.

Indicative Total NIA Project Expenditure

Total NIA expenditure will be £185,000 of which 90% (£ 166,500) 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)

The financial benefit of the optimisation tool relates to the performance of the tool and will be quantified within the course of the project. The initial estimates are of a financial benefit of £363,000 for the scale tested within the project. As explained earlier, the project is related to the design phase of a commercial project and thus the financial benefit will only be realized if the business accepts and implements the proposed solution produced as an outcome of the proposed innovation project.

Please provide a calculation of the expected benefits the Solution

The financial benefits result from achieving a 10% reduction in unit cost for the undergrounding of 33km of overhead lines and is estimated at £363,000

- Distance of overhead lines targeted for undergrounding = 33km
- Base Cost of undergrounding 33 km of HV (11kV) overhead lines = £3,630,000
- Method Cost = 90% * Base Cost = £3,267,000
- Net Financial Benefit = £3,630,000 - £3,267,000 = £363,000

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

The identified and selected optimisation tool(s) will be applicable across all GB DNOs depending on the availability of their data.

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

The costs to DNOs will include the optimisation tool of the selected supplier along with necessary costs for hosting the tool to internal or external servers. SSEPD will negotiate the license and level of support required during the course of the project. The applicability of the roll out cost to other DNOs will also depend on the availability of their data and their particular circumstances (i.e. internal/ external servers, etc.).

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 project will provide UK DNOs with evidence on whether the optimisation tool offered by the selected supplier can provide cost effective options for the undergrounding of overhead lines. Such knowledge and evidence will allow for the DNOs to decide whether the optimisation tool could be used and offer benefits to their networks

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

- [x] Yes