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## NIA Project Registration and PEA Document

### Date of Submission

Jul 2021

### Project Reference Number

NIA\_SSEN\_0055

## Project Registration

### Project Title

Net Zero Service Termination Project

### Project Reference Number

NIA\_SSEN\_0055

### Project Licensee(s)

Scottish and Southern Electricity Networks Distribution

### Project Start

August 2021

### Project Duration

2 years and 1 month

### Nominated Project Contact(s)

Kevin Dennis – Project Manager

### Project Budget

£625,000.00

## Summary

A project report capturing learnings on the suitability of service cables and cut-outs to accommodate the increased loading as a result of connection of EVs and heat pumps will be produced.

## Third Party Collaborators

EA Technology

## Nominated Contact Email Address(es)

fnp.pmo@sse.com

## Problem Being Solved

Cut-outs and service terminations are located in customers premises either internally or externally in an outdoor meter cabinet (OMC). The rollout of Low Carbon Technologies (LCT) such as Electric Vehicles (EV) and heat pumps will place additional demands on service cables, terminations and cut-outs. These new LCT devices will result in both an increase in peak demand and an increase in overall energy consumption. It is therefore critically important that DNOs assess the suitability of both existing and new service termination cut-outs and service cables to support these new load flows. If it is found that existing assets need to be upgraded, this could cause significant disruption to customers, resulting in potential delays in connecting LCTs and increased customer expenditure required to accommodate new demands, negatively impacting LCT uptake.

The fundamental factors that impact suitability of DNO service termination assets for LCT connections include:

- Ability of existing service terminations to support the additional loads produced by these technologies;
- Ability of existing service cables to withstand the additional loads produced by these technologies;
- Ability of cut-outs installed in customer properties and street furniture, which can be located in confined spaces or subject to solar radiation, to withstand increased loads produced by these technologies.

Traditionally the performance testing of cut-outs has taken place in factory conditions which do not take into account the ambient temperature and conditions associated with domestic environments. When these factors are considered, there is a lack of understanding as to the performance of a cut-out. This may result in the de-rating of the cut-out, but these scenarios need to be tested. After assessing the temperature performance of various types of cut-outs and cables under LCT loads in a variety of operating conditions, benchmark ratings can be established. These can then be used as a database to assess if an upgrade to either service cable or cut-out is required.

## Method(s)

The idea for this project was identified by the work already underway via the ENA's Low Carbon Technology (ENA LCT) Working Group which has identified service cables, terminations, looped services and cut-outs as being potentially impacted by changes in loading. The method used by the project is summarised below, and will involve a combination of desk top research and physical testing using a test network which can simulate the various testing environments:

1. Understand the ability of service termination cut-outs, looped services and service cables in customer premises to withstand additional loading applied by LCTs;
2. Understand and test the de-rating effects on customers service cables under practical operating conditions, when subject to additional LCT loading.
3. Understand the ability of street furniture service cut-outs and cables to withstand additional loading applied by EVs;
4. Understand and test the de-rating effects on street furniture service cables under practical operating conditions, when EVs are connected to them;
5. Test cut-outs and service cables, with the new LCT duration curves and identifying the level of de-rating against the original cut-out/cable standards;
6. Once any de-rating has been identified, the project will make recommendations on how these may be incorporated with future network design methodologies.

The outputs of this project can be used as learning by network companies and LCT installers to establish the suitability of cut-outs and service cable types for the connection of LCTs, thus avoiding this equipment from being overloaded and damaged.

## Scope

The ENA LCT Working Group has identified a range of cut-out and service cable types, as well as a range of installation scenarios which will be tested and analysed by the project. The outputs from the project will provide important learning for other projects which are looking at how DNOs can accommodate a very high number of connection applications anticipated to transition to Net Zero. One such project which will benefit from this learning is the SPEN iIdentify NIA project which is looking at the potential to digitise the process for applying to a DNO when a customer wants to connect LCT devices to their property. The iIdentify project, has a primary purpose of employing Artificial Intelligence to identify the make and model of cut-outs, including their ratings and other information relevant to DNOs and also LCT devices, i.e. domestic EV charge points and HPs to be installed. The learnings from this project could improve project iIdentify's outputs.

## Objective(s)

The learning from this project will help inform the DNOs and LCT installers of the suitability of cut-outs and service cable types for the connection of LCTs, thus avoiding such equipment from being overloaded and damaged. A comprehensive analysis of the de-rating of LCT connections on service termination equipment and service cables will create an understanding of these issues and allow a standard planning approach to be adopted on a nationwide basis. The resulting ratings could also be applied to DNO Business as Usual activities, such as allowing certain service positions to be operated under LCT loads or justifying the expense of upgrading cables and cut-outs to allow connection of LCT loads. The output from the project will be disseminated in the form of a database that will be publicly available. A custodian for this database will be identified as part of the project.

## Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

Not Applicable

## Success Criteria

The outputs of this project can be used as learning by DNOs, customers and LCT installers to establish the suitability of cut-outs and service cable types for the connection of LCTs, thus avoiding this equipment from being overloaded and damaged.

Publication of a database with recommendations on any changes to network design criteria will be published alongside a closedown report.

## Project Partners and External Funding

This project is being supported by the ENA Low Carbon Technology Working Group. It will be a collaboration between the following DNO groups with, the £625,000 project budget will be distributed evenly amongst the participating DNO's.

1. Scottish and Southern Electricity Networks (Lead DNO group)
2. SP Energy Networks
3. Western Power Distribution
4. Electricity North West Limited
5. Northern Powergrid
6. UK Power Networks

## Potential for New Learning

A database capturing new learning on the suitability of service cables and cut-outs to accommodate the increased loading as a result of connection of EVs and heat pumps will be produced and disseminated to DNOs, customers and LCT working groups.

## Scale of Project

The LCT Working Group has identified cut-out types and service cable types which are representative of the majority of GB installations. All of the cut out and cable types will be investigated within the project.

## Technology Readiness at Start

TRL7 Inactive Commissioning

## Technology Readiness at End

TRL8 Active Commissioning

## Geographical Area

N/A desktop and using a test network which can simulate the various testing environments:

## Revenue Allowed for the RIIO Settlement

None

## Indicative Total NIA Project Expenditure

The total expenditure expected from the project is £625,000. 90% of which is allowable NIA Expenditure (£562500). The external expenditure will be split evenly across all DNO partners.

## 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)

SSEN's demand growth forecasts (Distribution Future Energy Scenarios) for achieving Net Zero by 2050 suggest that around 70% of homes will require LCT connections. This equates to 2.8 million homes (of the current housing stock).

Experience of connecting LCT to existing homes has shown that domestic loading assessments are required in 42.6% of cases and cut-out upgrades in 6% of cases. The outputs of this project, combined with SPEN's iIdentify project, could avoid the need for individual loading assessments for new LCT connections.

This could save up to £10.8m in loading assessment costs in SSEN's license area between 2021 and 2030.

#### Please provide a calculation of the expected benefits the Solution

##### SSEN LCT connections by 2030 to meet DFES net zero projections

###### Base cost

SSEN potential new LCT connection requests between 2021 and 2030 = 676,493

LCT connection requests requiring a loading inspection (42.6%) = 288,186

Inspection cost = £14.4m

Total cost = £14.4m

###### Method cost

LCT connection requests requiring a loading inspection (10.7% - assumes 75% of inspections avoided) = 72,384

Inspection cost = £3.6m

Total cost = £3.6m

Base cost – Method cost = £14.4m – £3.6m = £10.8m saving between 2021 and 2030

In addition to this there will be safety benefits through ensuring service terminations can sustain additional LCT loading, mitigating potential overheating, fire or injury.

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

This is a challenge for all GB DNOs, so could be replicated across the whole of GB. Assuming SSEN represents 2/14ths of the GB network, the potential saving nationally could be up to £75.6m by 2030.

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

The cost of roll out will be determined by the success of the method and as a result the answer to this question will be an output from the project itself.

### **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 outcomes from the project will be directly relevant to all network licensees as they look to address decarbonisation and transition to net zero.

#### **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.**

The Energy Networks Association portal has been checked to confirm there is no duplication.

No duplication

**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**

Service cables and cut-outs are well established and proven equipment on the GB distribution system, in general they operate comfortably within their design ratings, with highly cyclical loading patterns. These design ratings were determined using established and well understood demand patterns which did not include LCTs. The installation of LCTs in a household will substantially increase the peak demand in a property and the overall energy consumption with longer periods of sustained demand. This will subject the equipment to an entirely new set of demands, which need to be better understood to inform DNOs' approach to managing these assets in the future. Cut-outs and service cables are particularly important in this context as they are located within customers properties, in a variety of locations and environmental conditions.

**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**

This work needs to be completed to provide a detailed understanding of the impact of LCT demand on cut-outs and service cables. This is a GB wide issue which needs a consistent and coherent approach from all DNOs. The need for this work has been accelerated by the increasing focus on delivering Net Zero and the cost for this have not been budgeted for in the current 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 need for this work has been accelerated by the ever-increasing focus on delivering Net Zero and the cost for this will not have been budgeted for in the current price control.

**This project has been approved by a senior member of staff**

Yes