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

Feb 2021

Project Reference Number

NIA_SPEN_0056

Project Registration

Project Title

Flexible Tower Block

Project Reference Number

NIA_SPEN_0056

Project Licensee(s)

SP Energy Networks Distribution

Project Start

February 2021

Project Duration

1 year and 4 months

Nominated Project Contact(s)

Gavin Montgomery

Project Budget

£140,000.00

Summary

Around 260,000 households in Scotland have electric storage heaters installed. A significant proportion of these are likely 'here to stay' in the long term, and therefore will be a part of a decarbonised heating sector in Scotland.

Nominated Contact Email Address(es)

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Problem Being Solved

Around 260,000 households in Scotland have electric storage heaters installed. A significant proportion of these are likely 'here to stay' in the long term, and therefore will be a part of a decarbonised heating sector in Scotland.

Storage heating is seen as a non-flexible load and vulnerable customers are suffering as a consequence of night-time-only charging; heating performance is poor and expensive; On Peak supplementary heating is often required at the daily evening peak. The experience for customers can be improved by introducing flexible storage heater charging in conjunction with tariffs to achieve better heating profiles and costs.

There is a considerable opportunity for networks to benefit if this load can be made more flexible. For example, as EVs become increasingly co-located with accommodation such as tower blocks then there is a risk of LV constraints arising from EV charging and heating coinciding, requiring re-enforcement or limiting the availability of EV charging infrastructure. The ability to flex or adjust the heating is potentially part of the solution to enable EV uptake.

SPEN is actively considering how it can support and benefit from smart controls to influence the timing of when storage heaters are charged for the benefit of the distribution network. It is also aware of the wider whole system benefits – to the ESO and to electricity suppliers – that smart controls could bring. In doing so, benefits must also be brought to householders – through improved provision of comfort at a lower cost. This could be of considerable value to these householders given the prevalence of fuel poverty in Scotland.

Whilst technical solutions exist to facilitate using storage heaters for these purposes, the biggest barriers to practical deployment has been commercial arrangements including the limit in retail tariffs for residents in these tower blocks. Economy 10 has been determined to be the most appropriate tariff but offers limited flexibility and set times which do not necessarily align with network needs. In addition, there are limited suppliers who offer Economy 10 and these limits add complexity and barriers to householders. To realise all of these benefits, a number of questions need to be answered before it is appropriate to support a roll-out of smart controls for storage heaters.

Method(s)

The project method includes desk-based research focusing on commercial, market and business issues and a trial within a tower block which has storage heaters fitted with smart in home controllers.

The desk based exercise is focused on how the benefits of smart storage heaters can be captured for the whole system, while delivering customer benefits. Technical and modelling research, together with trials and demonstrations have been carried out to demonstrate that there are material benefits available however it is not yet clear how to capture these benefits – while delivering a great customer experience.

There will be 6 key tasks within the desk based work:

1. Current knowledge - a synthesis of existing research on storage heaters.
2. Supplier tariffs - what is available today, why, and future outlook. DSO and ESO requirements - what are the use cases and associated flexibility requirements.
3. At a high level, do customer, supplier, DSO and ESO requirements align with each other? To what extent may they conflict?
4. What controls hierarchy and strategy can be used - maximising whole system value while always being in the customer's interests?
5. What business models and commercial arrangements can be used to best capture the benefits for all stakeholders?
6. Next steps and recommendations: what needs to happen for SPEN (and others) support roll-out / scale-up?

The desk based work will be complemented by a trial which will demonstrate demand shifting using the storage heaters at the Cartcraigs Tower Block on the southside of Glasgow. The housing association are installing temperature sensors and smart control switches which will improve the residents' comfort and reduce costs. In addition, EV chargers will be installed in the tower block car park by Glasgow Housing Association.

The work being carried out within the NIA scope includes:

- Investigate the potential for local (at the tower block) EV charging to coincide with storage heater charging/water heating, and the resulting increase of maximum demand.
- Trial and monitor the capability of smart-control of the storage heating and hot water to reduce the resulting maximum demand on the network.
- Model and trial the potential for storage heater charging to be randomised in cold load pick-up situations, and for tower block EV charging to be similarly modelled.

Scope

The scope of the project consists:

- Desktop tariff modelling outputting the best options for customers and networks to make use of storage heaters within tower blocks.
- Trial and monitoring of demand shift in Cartcraigs tower in southside of Glasgow.

Objective(s)

The objective of the of the project is to demonstrate through trial the ability of storage heaters to shift demand and answer questions required to enable households, and others in the electricity value chain to capture the benefits that smart storage heaters can bring.

Particular questions relating to the rollout which to be answered are:

· What tariffs are currently available for customers with storage heaters in the SPEN area? Why are these tariffs as they are, what will drive or constrain any change to time of- use tariffs (including metering arrangement and half-hourly settlement), and how open are

suppliers to such change?

· What are the possible requirements and use cases from smart control of storage heaters from SPEN's perspective and from the ESO's perspective – today and in the future?

- To what degree can smart storage heater controls provide these benefits? And to what degree are the interests of the supplier, SPEN and the ESO pulling in the same or in different directions?
- What control hierarchy or strategy could be used to manage potential 'conflicts' between the supplier, SPEN and the ESO?
- What business models could be used so that the benefits of smart control accrue to the household? Are any changes required to regulations (in general, or a specific regulation) and market structures, and how might these be achieved? Are there any barriers to householders accessing these benefits?
- How can these business models ensure a positive customer experience, and ensure that comfort (or even enhanced comfort) is provided at a lower cost?

Objectives of the trial will be:

- Demonstrate the shifting of demand using thermal storage heaters whilst maintaining customer warmth and comfort in the tower block.
- Show that the storage heating demand shift in the tower block can support local EV charging requirements.
- Show that the storage heating demand shift can be randomised to support cold load pick up and support use of constrained wind.

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

n/a

Success Criteria

The project will deemed a success if the following criteria are met:

- Demonstrating demand shift using thermal storage heaters whilst maintaining customers comfort and warmth requirements.
- Delivery of desktop investigation which provides advice and guidance to enable rollout across SPEN.

Project Partners and External Funding

Connected Response, Glasgow Housing Association, Delta-ee.

Potential for New Learning

The project will generate knowledge and learning surrounding the commercial arrangements required to enable the rollout of benefits available from storage heating to households, SPEN and wider system (including ESO and electricity suppliers).

Scale of Project

The project consists a desktop study and trial at a tower block on the southside of Glasgow.

Technology Readiness at Start

TRL4 Bench Scale Research

Technology Readiness at End

TRL6 Large Scale

Geographical Area

The trial will take place at Cartcraigs Tower Block, Glasgow. Central Scotland

Revenue Allowed for the RIIO Settlement

None

Indicative Total NIA Project Expenditure

The project expenditure comprises:

Desktop tariff study - £70k

Tower block trial- £50k

Project Management - £20k

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 detailed analysis of suppliers and tariffs undertaken within the project will identify the benefits that can be made the customers in Cartcraigs tower block and provide wider guidance across the SPD area.
Network benefits of up to £3.25m have been identified should there be opportunity to roll out across GHA's portfolio.

Please provide a calculation of the expected benefits the Solution

In the area surrounding Glasgow there are 130 tower blocks which may benefit from the project. There could be benefits to the network through avoiding substation upgrades in the order of £3.25m.

This is a high level calculation based on:

Number of tower blocks - 130
Avoided cost per substation – £25k

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

The method will be focussed on areas within the SPEN area but replicable to other areas of GB in urban areas with high density of tower blocks.

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

The findings from the study will be made available to enable roll out 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

Post-trial, the learnings from the Flexible Tower Block project will be shared with network licensees which will help in developing common approaches to assist stakeholder deployment of electrification of heat at scale. The learnings provided by the project will be directly transferrable to similar households across GB and therefore all network license areas.

Or, please describe what specific challenge identified in the Network Licensee's innovation strategy that is being addressed by the project (RIIO-1 only)

Our Innovation Strategy has a strong focus and a specific strategic goal to prepare the network for the changing energy landscape. The changes of customer behaviour, demand profile and socio economic environment post the Pandemic require us to accelerate the transition. We are committed to maximising the benefits of Low Carbon Technologies to wider society, ensuring our network can accommodate increasing levels of renewable generation and facilitate transfer towards the electrification of heat and transport.

This project has a particular focus on enabling benefits for vulnerable customers which is a key aspect of our innovation strategy.

☑ 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.

A search of the ENA smarter network portal and publication on the ENA huddle portal has revealed no other projects carrying out this specific work.

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

The project undertakes a novel approach to address how present tariff availability can benefit customers, many of whom are vulnerable, and networks through the use of storage heaters to shift demand. This will be the first study to carry out such an investigation and be backed up with a trial to show the demand shift within the households.

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 novel aspects of the project are activities which are not included within our business as usual activities and without innovation funding the business would not commit.

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 includes a research aspects not fundable through any other means than the NIA.

This project has been approved by a senior member of staff

☑ Yes