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

Jul 2018

Project Reference Number

NIA_NPG_026

Project Registration

Project Title

Resilient Homes

Project Reference Number

NIA_NPG_026

Project Licensee(s)

Northern Powergrid

Project Start

July 2018

Project Duration

3 years and 1 month

Nominated Project Contact(s)

Jess Cook

Project Budget

£550,000.00

Summary

Northern Powergrid recognise that power cuts can cause problems for all customers, but particularly for those customers registered on the Priority Services Register (PSR) or customers who rely on electrically powered medical equipment to support health and wellbeing. Northern Powergrid realise that even a short power cut can have a significant impact to the health or wellbeing of dependant customers, compounded by the worry caused to customers (and their carers) in these situations, fearing what they might do and how they may cope in the event of a power outage.

Northern Powergrid are seeking to deliver a low-cost customer focussed solution to temporary disconnections, making use of re-purposed electric vehicle batteries, whereby the technology will protect their customers from any negative impact of a break in supply. This is particularly relevant to customers dependent on electrically powered essential medical equipment.
Subject to a confirmed feasibility study, the project proposes to install 30 Nissan batteries into the homes of customers relying on electrically powered critical medical equipment and to assess their viability and effectiveness.

Nominated Contact Email Address(es)

yourpowergrid@northernpowergrid.com

Problem Being Solved

The electricity sector in the UK is undergoing unprecedented change, with significant value being released for those in a position to take advantage of the changes. For those less able to take advantage, there is a risk that costs increase or service decreases. For example demand side response may encourage the fuel poor to do without electricity at times of high demand (typically winter evenings) so as to save money.

There is therefore a need to consider innovations which benefit the less advantaged in society while remaining fair to all.

Northern Powergrid recognise that power cuts can cause problems for all customers, but particularly for those customers registered on the Priority Services Register (PSR) or customers who rely on electrically powered medical equipment to support health and wellbeing. Northern Powergrid realise that even a short power cut can have a significant impact to the health or wellbeing of dependant customers, compounded by the worry caused to customers (and their carers) in these situations, fearing what they might do and how they may cope in the event of a power outage.

Such customers are unlikely to have the means to address this issue themselves.

Method(s)

Northern Powergrid are seeking to deliver a low-cost customer focussed solution to temporary disconnections, making use of re-purposed electric vehicle batteries, whereby the technology will protect their customers from any negative impact of a break in supply. This is particularly relevant to customers dependent on electrically powered essential medical equipment.

Northern Powergrid have asked NEA to lead on a feasibility study in the first instance, to assess the practicality of delivering such a programme, and ascertain the technical needs, potential social impacts, and understand the associated risks and implications of delivering such a programme to the customer, to the network more broadly and to Northern Powergrid.

Subject to a confirmed feasibility study, the project proposes to install 30 Nissan batteries into the homes of customers relying on electrically powered critical medical equipment and to assess their viability and effectiveness.
Northern Powergird will be using specialist support from NEA and Newcastle University as part of this trial.

Scope

The project is designed to assess the ability of second use vehicle batteries to provide small scale resilience to individual customers at particular risk during unplanned outages. Scope includes the assessment of technical feasibility and the identification of issues that would prevent broader scale roll-out of this technological approach.

Objective(s)

The project will be delivered in two separate phases.

The initial phase will investigate the project feasibility and design to assess the practicality of the proposed project, specify equipment required and assess the appetite for take-up within the target customer segment, alongside other technical and non-technical factors presented later. The feasibility will look to determine the potential technical and social implications of installing Nissan second life batteries in a domestic setting, with vulnerable residents, and the practical alterations needed to accommodate such a supply, and the education and support the end user may require on its use and limitations. The project objective is to assess the technical and economic feasibility of such an approach.

Subject to successful feasibility the second phase of the project will test the practical reality through a programme of installation of up to 30 (appropriate numbers to be determined through feasibility) second life Nissan batteries into the homes of customers dependent on critical electrically powered medical equipment.

This second project phase intends to evaluate the actual social and performance benefits of utilising second life batteries in this manner principally to the customer but also to the grid and contrast them against the forecast benefits from phase 1.

A further objective, assuming a successful assessment, is the design of a technical and economic approach for a wider area, higher volume roll-out of the technology, although the roll-out itself does not form part of this trial.

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

n/a

Success Criteria

A successful project will provide positive or negative assessment of the objectives laid in in the previous section : can the identified resilience system deliver an appropriate level of customer service at an economically sensible cost? If so how could such an approach be roll-out?

Project Partners and External Funding

n/a

Potential for New Learning

This project will address the social and technical issues associated with the Resilient Homes concept and provide the following new learning:

• How are the critical services identified and how can it be ensured that they remain connected to the battery supported circuits?

• What would the minimum cost be for a battery system designed and built to provide reliable supplies to critical services during a power cut to the home given the likely available technology?

• What is the appropriate length of time and associated battery size needed for the critical services?

• Should the system maintain the entire home or is it restricted to the critical services and what is the magnitude of cost differential and addition complexity in each case?

• What are the trade-offs between introduced safety risks, inconvenience, location of installation and cost for an appropriate sized battery sited in or on typical affected homes and how acceptable would this be for customers with different medical conditions?
• If the system is designed such that the storage can be traded at times when there is no power cut, what is the effect on its dependability in addressing power cuts when they do occur?

Scale of Project

The project is small scale. A desktop assessment will be supported by a small scale field trial of up to 30 installation to test and verify that assessment.

Technology Readiness at Start

TRL3 Proof of Concept

Technology Readiness at End

TRL8 Active Commissioning

Geographical Area

The precise geographic area for installations has still to be assessed but the project will probably be spread across both of Northern Powergrid's licences.

Revenue Allowed for the RIIO Settlement

None

Indicative Total NIA Project Expenditure

£550k

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 intended that the battery system is developed in such a way that it can provide tradable services into the flexibility market via an aggregator to allow an eventual self-funding roll-out.

Indications from early work on the e4Future project suggested there may be income from transmission related services in the region of £1000 per annum for a vehicle to grid customer. The batteries envisaged in this project are around one tenth of the size of a vehicle battery (although this is subject to the design phase) but will be connected to the system at all times, which cars will not.

With present (installed) battery prices, and assuming a 10 year battery life, an income of £870 per annum would be needed to make the batteries cost neutral. It is unlikely that the transmission related services alone would provide this. An optimistic, but reasonable estimate of transmission related income might be £200 per annum.

To make it feasible, a combination of two things would have to happen:

Distribution and other general benefits would have to be added, some of which such exist now such as a marginal reduction in fault related costs (provision of generators and care services, transfers to hospitals) and some of which are being investigated by projects such as CLDS. In particular energy arbitrage for domestic customers will become attractive as renewable generation becomes more dominant in the market.

Additionally installed battery costs will fall as second life batteries become more plentiful and domestic installations become more common.
It is likely then that the financial breakeven point is an income of around £400 per annum giving a positive NPV over 10 years and assuming the battery and installation last 10 years.

Please provide a calculation of the expected benefits the Solution

Not required. Project currently at TRL 3 – " Active research and development is initiated. This includes analytical and laboratory studies to physically validate analytical predictions or models of separate elements of the technology. Examples include components that are not yet integrated or representative but operate in a standalone basis. (ie Low System Readiness Level, SRL)".

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

The nature of the proposed method is that it is entirely replicable across the whole of the GB energy network and all DNOs have issues of network resilience specific to vulnerable customers.

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

Roll-out costs will be dependent on the final form of the technology that is chosen and on the economic case that the configuration enables. Additionally such costs are currently in flux as the market for second life EV batteries develops and matures. Where such technology can form part of service provision to DSO or transmission related services it is anticipated that the net cost over time for rollout would be neutral.

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

All Network Licensees will be able to use the learning generated as the outcomes will be relevant to each individual Network Licensee, all of which have similar issues in providing resilience support to vulnerable/medically dependent customers.

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

The Northern Powergrid innovation strategy specifically details the requirement to improve network reliability and availability. This project specifically addrsses that need for a sub-set of our customers. The project will also support thinking and design options for other resilience focussed projects such as Microresilience.

☑ 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.

No similar projects have been identified as having been conducted on the GB network.

NPg's own Barnsley Distributed Storage & Solar Study and WPD's SoLar Bristol also examined domestic storage however they were focused more on behind the meter energy arbitrage and reducing LV network congestion caused by domestic solar generation,

whereas this project is aimed at improving the reliability of supply for individuals who are heavily dependent on electricity. Also this project does not consider solar generation as it is believed that to do so would lead to a more complex control and changeover system.

Further although this project does not consider the revenue from trading distributed storage services, which will be left for a second larger trial, knowledge from our own V2G project, the e4Future large scale vehicle to grid project led by Nissan and the Customer Led Distribution System project which is examining the value of flexibility has informed our thinking, not least in the size of a commercially meaningful trial, which has led us to split the work into a smaller social and technical project followed by a commercial viability project.

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