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NIA Project Registration and PEA Document

Date of Submission

Oct 2024

Project Reference Number

NPG_NIA_051

Project Registration

Project Title

Resilient Customer Response NIA

Project Reference Number

NPG_NIA_051

Project Licensee(s)

Northern Powergrid

Project Start

November 2024

Project Duration

1 year and 2 months

Nominated Project Contact(s)

Chris.Goodhand@northernpowergrid.com

Project Budget

£495,000.00

Summary

This project is following on from the SIF Discovery project 'Resilient Customer Response'. The project is exploring solutions to use behind-the-meter (BTM) assets to deliver resilience to not only the owner of the assets but other local network customers, in particular vulnerable customers.

Preceding Projects

NPG_SIF_004 - Resilient Customer Response

Third Party Collaborators

Centre for Energy Equality

University of Strathclyde

Nominated Contact Email Address(es)

yourpowergrid@northernpowergrid.com

Problem Being Solved

Distribution networks have an obligation to ensure customers have a reliable and resilient connection, with a particular need for the protection of vulnerable customers from loss of supply. Resilience has traditionally been provided by the network operators, with for example diesel generators deployed in the event of local outages. Recent events such as storm Arwen (which are expected to become more frequent under future climate change scenarios) have demonstrated that network outages can be significant and restoration of services can be challenging.

Method(s)

The previous stage of the project explored different solutions that could use BTM assets to provide resilience and identified the solution of using a microgrid as the secondary substation level using a central grid-forming battery to restart the grid, in the event of a power cut, and behind-the-meter assets to provide supply to customers. This stage of the project is exploring the proposed technical solution and business models in further detail.

This project will carry out a technical feasibility trial at the University of Strathclyde's Power Network Demonstrator Centre (PNDC). This trial will aim to demonstrate that an "islandable" microgrid with a centralised battery to restart the network and BTM assets to support vulnerable customers in outages is technically capable, attractive and economically beneficial for DNOs. This will include testing a series of simulations, to explore the effects of different variables, including:

- Capacity
- Impact of weather on loads / generation
- Outage duration
- Network characteristics

The project will also explore the customer proposition and business models to support this solution. Focus groups with customers will be carried out to better understand customer views to feed into the design. The project will also map out the customer journey for two groups of customers; vulnerable customers and customers with BTM assets.

Scope

The project will be carried out over 8 work packages:

1. Project management and governance
2. Technical trials
3. Customer engagement and Customer journey mapping
4. Stakeholder committee engagement (engaging with key stakeholders on the design of the solution)
5. Business model design
6. Network impact and HEM model
7. Analysis, reporting and dissemination

Objective(s)

The project will include both theoretical design and physical technical trials on a laboratory installation to test the engineering practicalities and level of resilience which can be achieved under different scenarios.

It will also explore business models and include potential customer responses to potential participation.

The learning outcomes of this project include:

- The technical viability of using a microgrid with a central grid-forming battery and BTM assets, including key challenges with operating the design in a live setting.
- Consumer demand profiles and consumptions based on outage scenarios, BTM asset performance and grid signal influences.
- Customer views on resilience and power outages; including:
 - o How vulnerable customers prioritise resilience and their dependence on different electrical loads.
 - o Views of BTM asset owners on participating in an RCR scheme (e.g. what would incentivise their participation (levels of payments, administration requirements or trust in delivery partners).

- o Options for the business model to deliver RCR.

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

This project has been assessed as having an overall positive impact on consumers in vulnerable situations. The project aims to reduce the impact of supply interruptions and satisfy essential needs during interruptions.

Success Criteria

On the technical side, the key learnings that we will be monitoring progress towards are:

- Evaluation on how the Resilient Customer Response control scheme developed during the project (for management of the network) performs during different operational scenarios.
- Analysis of the performance of the control scheme when interacting with the electrical network monitoring data (i.e. electrical network rms sampled data) coming from the amplifier system (see Figure 2).
- Stability of the LV network and testing how long it can remain operational (i.e. resilience in islanded mode) with a modelled grid forming converter implemented in simulation

On the social side, the aim is to have a customer roadmap and outline business model for the RCR solution. These solutions will be used in the identification of future project partners for a trial stage to deliver elements of RCR.

Project Partners and External Funding

LCP Delta - contributing 10% of their project cost.

Potential for New Learning

The RCR solution is an innovative solution that requires further feasibility testing ahead of future stages, which could include live trial on the network. The learnings will provide feasibility assessments on the project which will be delivered through reports and disseminated through the ENA portal, conferences and events and other media. The engagement with customers through the panels will be able to inform the wider vulnerability strategy for Northern Powergrid, and other networks.

Scale of Project

This project will cover of a variety of research activities, with including technical trials, customer engagement panels, model development and report outputs.

Technology Readiness at Start

TRL2 Invention and Research

Technology Readiness at End

TRL6 Large Scale

Geographical Area

This project is based on research, modelling and computer simulations. Models to developed to be reflective of electricity networks arrangements across the UK.

Revenue Allowed for the RIIO Settlement

None

Indicative Total NIA Project Expenditure

£495,000

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:

This project has the potential to facilitate the energy system transition through enabling the use of higher levels of distributed generation and reactive power technologies, by reducing the potential for mismatches of duty and capability of switchgear equipment.

How the Project has potential to benefit consumer in vulnerable situations:

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

A calculation cannot be provided as this project will carry out research and desktop analysis. However, the guidance produced by this project will facilitate the connection of new network technologies and services, and facilitate new network connections with reduced requirements for reinforcement.

Additionally the project aims to help mitigate potential problems that might be caused by excessive duties being placed on network equipment as new technologies and services are introduced. There are examples of equipment damage and network interruptions due to mismatches of network design and equipment duty capability historically would might become more prevalent as networks evolve.

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

The guidance produced through this project will be able to be used by all Network operators.

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

As the project will give guidance documents as an output, this will not have a significant rollout cost.

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 Guidance developed will be able to be used by all network licensees, as all network licensees will be affected by new reactive power technologies, and the increased uptake of distributed generation.

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.

A search of existing projects has shown no unnecessary duplication will take place in the course of this project, to the best of our knowledge, but learning will be taken from all related research activities both with UK and in the wider industry.

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 is innovative as this large-scale study of the effects of future technology on the GB network has not been carried out previously, and there has not been holistic guidance on the safe and responsible integration of such technologies produced for network designers.

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 project is being created collaboratively between a number of network operators across the industry, and is contributing to the research for Transition to a low carbon future; as such, along with the scale of the studies required, innovation funding is appropriate for this.

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 studies will identify a number of risks across networks in the UK license area – in order to mitigate these risks and integrate new technologies and services safely, a study of this scale is necessary.

If individual network licensees created guidance individually, there would be a disparity between how reactive power technologies and distributed generation would be connected and managed across the country. This introduces risk to the customer as they may be faced with different requirements and standards to connect in different areas. Unified guidance will reduce this risk by ensuring all network licensees have consistency.

This project has been approved by a senior member of staff

Yes