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

Aug 2017

Project Reference Number

NIA_NPG_018

Project Registration

Project Title

Microresilience

Project Reference Number

NIA_NPG_018

Project Licensee(s)

Northern Powergrid

Project Start

September 2017

Project Duration

3 years and 1 month

Nominated Project Contact(s)

NPG Innovation Team

Project Budget

£1,700,000.00

Summary

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Third Party Collaborators

Smarter Grid Solutions

LCP Delta

Nominated Contact Email Address(es)

yourpowergrid@northernpowergrid.com

Problem Being Solved

Significant advances have been made in restoration of supplies by smart methods over recent years, in particular very short term restoration which is considered to be an increase in resilience. Conversely smart techniques have contributed less to increases in true resilience; situations when customers never experience an outage of any length in the first place.

In the near future however improvements and cost reductions in battery technology, the prevalence of distributed generation particularly at lower voltages, and improvements in measurement and communications will offer smart opportunities to improve resilience. This would seem to be a potential low-cost route to improved true resilience but which mix of technology options, operational approaches would suit particular circumstances and locations is not known and the residual risk and actual deliverable benefit is not understood.

Method(s)

The Microresilience project will examine the potential for new technology options, in combination, operating as micro-grids to provide gains in real resilience for customers.

It is intended to conduct field trials of three potential circumstances where technology combinations operating as part of a micro-grid might applied and one storage-based, simpler alternative to provide contrast and understanding of where part and full micro-grids might be applicable and where simpler solutions might be preferable.

*Critical customers on a vulnerable connection

This group of customers provides critical functions for the region and beyond, but due to the nature of their function is located in a place where the supply is at unusually high risk from natural forces. There is no cost-effective conventional network solution for improving their situation due to the physical location

*Remote customers on a vulnerable connection

This group of customers are fed on an unusually long generally overhead circuit. As such they suffer significant outage risk but due to the small size of the customer group there is no cost-effective conventional network solution for improving this risk

*Opportune micro-grid application

This customer group already has significant generation capacity and, and in a areas of significant outage risk, would benefit from being able to use that generation to maintain their demand and generation after suffering a loss of the network feeding them.

*Simple storage option

This customer group provide an vital emergency service often in poor weather conditions. They have the ability to function without an electrical supply, but it severely reduces the speed of their operation. We believe that a storage based alternative would significantly improve their response capability in the event of a loss of supply, but that they do not require the full synchronisation capability required to avoid all outages.

In all but the last option we are considering groups of customers not a single customer and for this reason a DNO micro-grid solution is appropriate and proposed.

The project intends to re-use relatively small-scale storage technologies and equipment previously deployed as part of the Customer Led Network Revolution (CLNR) project.

Scope

Confirmation and design work is still required at each of the selected locations. The system components will be selected from the following options:

- Battery storage
- Recharge terminals
- Isolation and re-synchronisation switchgear
- Synchronisation control systems
- Protection suitable for both normal and island mode operation

- Loss of mains protection (to initiate island mode)
- Potentially balancing and DSR equipment (including customer-owned DER)

The project intends to re-use relatively small-scale storage technologies and equipment previously deployed as part of the Customer Led Network Revolution (CLNR) project.

Virtual Private Wire, or similar, capability is not required at present however if the project progresses successfully this is potentially the next logical step and prpeparatory work to address this may be included in this project.

Synthetic synchronisation is not required at present however if the project progresses successfully these sites will become the test beds for that technology. Again cost-effective preparatory work may be undertaken.

The systems will require the ability to disconnect from the rest of the network while supporting the chosen demand by battery. Facilities to recharge the battery online with a mobile generator are envisaged and we will include terminals for that connection.

Objective(s)

The project will assess the technical viability and comparative economics (including non-financial benefits) of smart technology enabled resilience under the following circumstances:

- Critical customers on vulnerable connection
- Remote customers on vulnerable connection
- Opportune micro-grid application (using already present DG)
- Simple storage option

The project intends to provide guidance for the appropriateness of the various solutions tested and their technical benefits and disadvantages.

The level of resilience improvement will be assessed alongside the level desired by the customers. Critical customers on a vulnerable connection may have different requirements to a microgrid implementation with a significant degree of embedded generation.

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 technologies be used together and in what combinations, is there an economic case for doing so and under what circumstances can they be successfully applied to the network?

Project Partners and External Funding

n/a

Potential for New Learning

n/a

Scale of Project

The project envisages four separate field trials to provide comparative data, under various customer circumstances, to deliver the learning outcomes described above.

Technology Readiness at Start

TRL3 Proof of Concept

Technology Readiness at End

TRL6 Large Scale

Geographical Area

The precise geographic location of the various trial cells will be determined in the early stages of the project. Possible locations have been identified at Spurn Point, Byreness, Sunderland. A further site, still to be identified, is required for the microgrid implementation.

Revenue Allowed for the RIIO Settlement

None.

Indicative Total NIA Project Expenditure

The total project cost is approximately £1700k.

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 project seeks to assess the net financial benefits. By optimising a system with bespoke combinations of new technologies cost effective improvements in resilience should be achieved at cost levels below standard reinforcement approaches under some circumstances.

The precise potential of this approach is not currently known but the project aims to provide this information.

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 although it is anticipated that the economics of the method may make it an appropriate technology solution in a limited number of locations depending on the balance of cost and resilience improvement required. The project output will provide guidance on economics and therefore applicability.

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

Roll-out costs will depend on the final cost benefit case for the most economic, situation dependent, technology combinations and configurations, as well as the required resilience improvement required.

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. The project outcomes will be relevant to each individual Network Licensee all of whom have specific instances similar to those being studied in this project. Furthermore generic learning should also allow the project outcomes to be applied to circumstances that are significantly different to those under direct investigation which will extned applicabilty on the broader GB network.

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 customer's requirement for improved network reliability and availability, these having been identified as the most important innovation objectives from the perspective of our stakeholders. This project helps meet both of those key needs.

☑ 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

☑ Yes