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

Jan 2019

Project Reference Number

NIA_WPD_039

Project Registration

Project Title

Network Islanding Investigation

Project Reference Number

NIA_WPD_039

Project Licensee(s)

National Grid Electricity Distribution

Project Start

January 2019

Project Duration

1 year and 2 months

Nominated Project Contact(s)

Jonathan Berry

Project Budget

£224,408.00

Summary

It is anticipated that proactive islanding may be a valuable tool for DNOs to respond to considerable changes to their networks resulting from increasing numbers of Distributed Generation (DG) and Low Carbon Technologies (LCTs) connecting to them as the economy decarbonises. There is a need for distribution networks to become more flexible to manage and utilise these assets in a manner that promotes low carbon networks and utilises network capacity more efficiently to save money for customers.

Typically, network islanding is an undesirable operational scenario and DG is configured to disconnect in the event of islanding to avoid abnormal system frequency and voltages. However, we will seek to determine through research whether careful management of loads and generation within network islands may provide a new flexibility solution for network operators.

Third Party Collaborators

GHD

Problem Being Solved

The connection of Distributed Generation (DG) and Low Carbon Technologies (LCT) to the distribution network has now reached a level where traditional reinforcement options are no longer always suitable and alternative technical and commercial flexibility solutions are now routinely employed.

There are currently a limited number of ways for operators to actively manage the network to provide this flexibility, principally employing wide scale load turn up or generation turn down, however, a more localised approach to system balancing and flexibility has many potential merits. Typically, network islanding is an undesirable operational scenario and DG is configured to disconnect in the event of islanding to avoid abnormal system frequency and voltages. However, management of loads and generation in islands may provide a new flexibility solution for network operators, with significant benefits to the network and current and future connected customers, such as more locally mitigating short term network constraints or facilitating customers in a specific area with a means to operating a self-sufficient network to be energy neutral.

Method(s)

This project aims to investigate the technical and commercial options, challenges, and potential benefits of operating parts of the LV,

11kV and 33kV distribution network in islanded mode under different conditions.

The investigation will involve a review of the latest islanding technologies and case studies of islanding in other networks around the world. This will include an assessment of existing approaches to network islanding from a variety of literature sources. A selection process will then be used to identify a number of network islanding approaches to be taken forward from the review based on a high level assessment of the drivers, benefits, regulatory impact and commercial arrangements for each approach, including the trade-offs between cost, security and quality of supply.

For each of the approaches identified, there will be a detailed investigation of the current and future drivers, benefits, legal and regulatory impact, and commercial arrangements to operating networks in island mode. It will include a preliminary assessment of the costs and benefits of network islanding as well as identifying the barriers, if any, that exist to operation in various network island modes and proposed solutions to overcome them. Evidence will be gathered about the theoretical advantages of islanding, and provide assessment of the viability and practicality of approaches as a solution for DNOs.

A feasibility study will then identify suitable areas within WPD's network that would benefit from network islanding approaches, confirmed through analysis of network models developed for those areas. The models will be used to demonstrate the operation of different islanded network modes / approaches in the identified areas. They will also quantify the potential carbon and financial savings, and capacity release benefits.

Scope

1.Conduct desktop research to identify different suitable technical assets and approaches to facilitate network islanding along with a preliminary assessment any current legal, regulatory or commercial barriers that exist and the costs and benefits of each approach;

2.Carry out a feasibility study that will identify suitable areas of WPD network that would benefit from the network islanding approaches;

3.Network modelling and analysis to demonstrate the operation of the islanding approaches and to quantify the carbon, financial and capacity release benefits;

4.Detailed investigation of the legal and regulatory issues that may impact the implementation of an islanded network and proposed solutions and revised methodologies to enable implementation; and

5.A final report that will present the findings of the investigation, including learning related to technology integration on the network and recommendations for further project development.

Objective(s)

The objective of this project is to understand the technical, commercial, regulatory and legal options and challenges, and potential benefits of operating parts of the distribution network in islanded mode under different conditions.

The investigation of islanded operation is necessary to demonstrate that, while commonly considered to be undesirable, it may provide a valuable additional solution for operators to actively manage the network and add to the 'toolkit' to provide flexibility when acting in the role of DSO.

This project aligns with our Innovation Strategy which identifies research and system modelling of Network Islanding under the research area 'Network Improvements and System Operability'.

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

n/a

Success Criteria

The project will be deemed successful if the research studies generate learning on the technical, commercial and regulatory feasibility of network islanding and the scale of environmental, financial and capacity benefits from its implementation on the network.

Project Partners and External Funding

The project partner is GHD. GHD will contribute £35k to this NIA through reduced consultancy fees.

Potential for New Learning

This project will provide learning on whether intentionally islanding sections of distribution network is technically feasible and also quantification of the benefits under different operational conditions. There may be substantial financial savings for customers with the roll-out of this solution. In addition to the technical and commercial learning, the project will provide insight into the regulatory and policy barriers that may currently exist along with proposed short and long terms solutions. Reports generated through the project will be disseminated to other DNOs and other relevant stakeholders. The reports will also be published on WPD's website and the ENA Smarter Networks Portal.

Scale of Project

The NIA project will be a desktop investigation exercise to examine the feasibility and benefits of network islanding. The combination of detailed research along with a feasibility study and system modelling is required to provide sufficient evidence to investigate the technical viability and demonstrate the range of potential benefits of islanded operation to DNOs and customers.

Technology Readiness at Start

TRL3 Proof of Concept

Technology Readiness at End

TRL5 Pilot Scale

Geographical Area

The project is desktop based and will consider WPD's licence areas.

Revenue Allowed for the RIIO Settlement

None

Indicative Total NIA Project Expenditure

£170,467.20

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 financial benefits for network islanding will be estimated in detail as part of the project scope. Estimates will be prepared for the Base Case and project Method(s) and use NPV analysis to establish the projected financial benefit. Costs will also be calculated for WPD and GB roll-outs.

Please provide a calculation of the expected benefits the Solution

N/A

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

The project will focus on our four licence areas where we have access to salient network data and the power system models required to carry out the research studies. However, our network is representative of both typical urban and rural environments and therefore the findings of the study are very likely to be applicable to the whole of GB.

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

The costs associated with rolling out the Method across GB will be determined as part of this project.

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

n/a

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 2018 Innovation Strategy specifically discusses the need to investigate network islanding through system modelling to understand the potential benefits to customers and network operators. In addition, the ENA Joint Innovation Strategy and Northern Powergrid's innovation strategy also identify the need to investigate network islanding.

☑ 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.

There currently isn't a DNO that is investigating how targeted network islanding could be used as an operational process to increase network flexibility and to release environmental, financial and capacity benefits for network operators and customers.

National Grid and SP Energy Networks are investigating the use of power islands as a means to provide black start capabilities. This project uses islands for the event of a wide-scale loss of supply, where this project will focus on the creation of islands of intact networks for loclalised short term constraint mitigation or a customer or series of customers' aiming to operate a self sufficient network.

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 because it aims to investigate how network islanding could be utilised as a viable tool to generate financial, carbon and/or capacity benefits through increased distribution network flexibility. Intentionally islanding sections of distribution network is a significant departure to the current operational philosophy of the network where islanding is seen as an undesirable network operating scenario.

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

UK DNOs haven’t previously carried out a project to investigate how the intentional use of network islanding could provide benefits to network operators and customers. In addition, the TRL of network islanding as a flexibility tool is low (2) and requires substantial research and demonstration before being considered as a business as usual activity. Therefore, a research based project to understand if the technology is feasible and can provide benefits is suitable for funding through the NIA mechanism.

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 commercial, technical, operational and regulatory risks of intentional network islanding are currently unknown and have not been investigated by a research project. However, there could be significant benefits of adopting network islanding to increase network flexibility, both to network operators and customers. A research NIA project is therefore appropriate since the technology is very immature but could also prove to be a significant innovation for distribution network operation and the transition to DSO.

This project has been approved by a senior member of staff

☑ Yes