Date of Submission

Feb 2019

NIA Project Registration and PEA Document

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.

Project Registration

Project Title

Network Islanding Investigation

Project Reference

NIA_WPD_039

Project Licensee(s)

Western Power Distribution East Midlands, Western Power Distribution South Wales, Western Power Distribution South West and Western Power Distribution West Midlands

Project Start Date

January 2019

Project Duration

1 year and 1 month

Nominated Project Contact(s)

Jonathan Berry

Project Budget

£224,408.00

Nominated Contact Email Address(es)

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Problem(s)

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.

Objectives(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'.

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.

Technology Readiness Level at Start

TRL 3

Technology Readiness Level at Completion

TRL 5

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.

Geographical Area

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

Revenue Allowed for in the RIIO Settlement

None

Indicative Total NIA Project Expenditure

£170,467.20

Project Eligibility Assessment

Specific Requirements 1

1a. A 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 the GB the Network Licensee must justify repeating it as part of a Project) equipment (including control and communications systems and software)	
A specific novel arrangement or application of existing licensee equipment (including control and/or communications systems and/or software)	X
A specific novel operational practice directly related to the operation of the Network Licensee's System	X
A specific novel commercial arrangement	X

Specific Requirements 2

2a. Has the Potential to Develop Learning That Can be Applied by all Relevant Network Licensees

Please describe what specific challenge identified in the Network Licensee's innovation strategy that is being addressed by the Project.

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.

2b. Is the default IPR position being applied?

Yes	X

2c. Has the Potential to Deliver Net Financial Benefits to Customers?

Yes	X

Please provide an estimate of the saving if the Problem is solved.

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 financial benefits of a Development or Demonstration Project (not required for Research Projects). (Base Cost - Method Cost, Against Agreed Baseline).

N/A

Please provide an estimate of how replicable the Method is across GB in terms of the number of sites, the sort of site the method could be applied to, or the percentage of the Network Licensees system where it could be rolled-out.

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.

2d. Does not Lead to Unnecessary Duplication

Yes	X

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.

This NIA project will build on the learning generated from ENW's NIA project "Detection and prevention of formation of Islands via SCADA". ENW's project is currently active and is investigating if SCADA systems can provide a method to reliably and economically detect the formation of network islands and safely remove them from the distribution network. The specification for the detection technology proposed by ENW will form an important input into our research. In addition, ENW's investigation will provide complementary learning that could lead to the amendment of the Distribution Code (or other regulatory standards) following completion of the studies.

Additional Governance Requirements

Please identify

that the project is innovative (ie not business as usual) and has an unproven business case where the risk warrants a limited Research and Development or Demonstration Project to demonstrate its effectiveness	X

i) 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.

ii) Please identify why the Network Licensee will not fund such a Project as part of its business as 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.

iii) Please identify why the Project can only be undertaken with the support of the NIA, including reference to the specific risks (eg 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