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NIA Project Registration and PEA Document

Date of Submission

Nov 2015

Project Reference Number

NIA_SSEPD_0019

Project Registration

Project Title

Western Isles Network Resilient Zone Utilizing Embedded Generation – Feasibility Study

Project Reference Number

NIA_SSEPD_0019

Project Licensee(s)

Scottish and Southern Electricity Networks Distribution

Project Start

November 2015

Project Duration

0 years and 7 months

Nominated Project Contact(s)

SSEN Future Networks Team

Project Budget

£46,500.00

Summary

This project is innovative as it will consider options to make use of embedded wind turbines on the islands of Harris, Lewis, North Uist, South Uist and other islands forming part of the Western Isles located off the north west coast of Scotland.

The requirement for innovative commercial arrangements will be considered and identified as necessary as the operation of these non-SSEPD owned assets would assist and support operation in "island" mode.

The second aspect of the project relates to reducing diesel generation use and gaining increasing confidence in the contribution wind generation can make to supplying load to the islands in normal operating mode. In turn this will reduce the carbon emissions of the embedded diesel generation.

The potential for the application of the outputs from this study to other parts of the GB distribution network becomes greater as the amount of distributed renewable generation assets increases.

Third Party Collaborators

Smarter Grid Solutions

Nominated Contact Email Address(es)

fnp.pmo@sse.com

Problem Being Solved

Within the SHEPD licence area there are a large number of island communities and many of these communities now have an increasing amount of renewable generation connected to the local distribution network.

In the event of network failures due to weather related events or equipment failure then the established conventional practice is that

embedded renewable generation is disconnected from the network until the fault is rectified and the electrical network is returned to normal.

Many of these rural communities have difficult access arrangements such as those located on islands where the usual access is by sea which can often exacerbate the delay in reconnection due to their remoteness.

A second specific local issue on the Western Isles is that we are unable to include the renewable generation output when the local island demand exceeds the capacity of the mainland cable interconnector. The output from the renewable generation is considered less secure and, as a consequence, local island diesel generation is run to ensure import will remain less than the cable rating should the renewable generation be disconnected for whatever reason.

The concept of operating isolated sections of the GB distribution network in island mode has been considered previously but there are a number of factors preventing this being common practise.

Method(s)

The aim of this project is to determine the potential to improve the resilience of supply to customers in the Western Isles and to reduce the use of diesel generation by incorporating the output from embedded renewable generation.

A feasibility study will consider two aspects:

- in normal operational mode; when the island load minus the renewable generation output approaches the rating of the subsea interconnector cabling then the local diesel generation is started. At present a minimum of two sets are required to run to ensure that the network can cater for the loss of the largest diesel. Renewable generation installations and diesel generation units would work together. Innovative technical and commercial arrangements may be required. The local distribution network would require to operate effectively under fault conditions.
- in island running mode; in the event of disconnection of the Western Isles from the mainland grid then to continue operation utilising both the embedded diesel generation in conjunction with renewable wind generation. Renewable generation installations and diesel generation units would work together to assist in off-grid island operation. Innovative technical and commercial arrangements may be required. The local distribution network would require to operate effectively under fault conditions and to allow reconnection back to the mainland once grid power has been restored.

Scope

This project is innovative as it will consider options to make use of embedded wind turbines on the islands of Harris, Lewis, North Uist, South Uist and other islands forming part of the Western Isles located off the north west coast of Scotland.

The requirement for innovative commercial arrangements will be considered and identified as necessary as the operation of these non-SSEPD owned assets would assist and support operation in "island" mode.

The second aspect of the project relates to reducing diesel generation use and gaining increasing confidence in the contribution wind generation can make to supplying load to the islands in normal operating mode. In turn this will reduce the carbon emissions of the embedded diesel generation.

The potential for the application of the outputs from this study to other parts of the GB distribution network becomes greater as the amount of distributed renewable generation assets increases.

Objective(s)

The study is to determine the potential to improve the resilience of supply to customers in the Western Isles and to reduce the use of diesel generation by including the output from embedded renewable generation.

The aim of this project is to determine the viability of options to enhance the operation of remote rural networks by using embedded renewable generation.

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

n/a

Success Criteria

The delivery of a study which

- Determines the viability of options to permit the operation of the network in island mode.
- Determines the potential to utilize the increasing volume of wind generation on the islands and consequently to reduce the running

hours of the embedded diesel generation plant.

Project Partners and External Funding

n/a

Potential for New Learning

n/a

Scale of Project

The scale of this project is to cover the Western Isles with around 44MW of renewable generation and 34MW of diesel generation.

It is not feasible to study a smaller area as the Western Isles form a fully integrated network.

Technology Readiness at Start

TRL2 Invention and Research

Technology Readiness at End

TRL3 Proof of Concept

Geographical Area

The study will concentrate on the Western Isles off the north west coast of Scotland

Revenue Allowed for the RIIO Settlement

At this feasibility stage no saving on expenditure can be assumed.

Indicative Total NIA Project Expenditure

The indicative Total NIA Project Expenditure is £46,500, 90% of which (£42,000) is Allowable NIA Expenditure.

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)

Financial benefits arising from the greater use of embedded renewable generation will be gained by the turbine owners.

A potential saving derived from the reduction in diesel generation running hours can be expected from the increased contribution from local embedded wind generation. For example, in the year 2014 there were around 900 hours where the diesel generation was running and the export from the islands ranged between 1 to 15MW.

Over the past four years the cost of diesel generation on the Western Isles has been in the order of £10.6 Million.

A figure of 25% is considered possible which would lead to a saving of £4.6 Million over the RIIO-ED1 period.

Avoided carbon emissions are estimated to be worth in the region of £200,000.

Please provide a calculation of the expected benefits the Solution

N/A--Research Project

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

This methodology has the potential to be applied by all UK DNOs to remote communities with embedded renewable and conventional generation.

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

The application of this methodology across GB will incur minimal extra 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 learning will be useful for all other DNO's serving rural and island communities in establishing if the network can remain supported and times when the connection to the main grid fails.

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

- 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