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

Apr 2024

Project Reference Number

NIA_SPEN_0092

Project Registration

Project Title

Battery to Bypass Constraints for Smart Local Energy (BBC)

Project Reference Number

NIA_SPEN_0092

Project Licensee(s)

SP Energy Networks Distribution

Project Start

February 2024

Project Duration

1 year and 5 months

Nominated Project Contact(s)

Andrew Moon - a.moon@scottishpower.com

Project Budget

£188,400.00

Summary

Across the UK and SPEN licence area, residents are willing to use their local generation to power heat pumps, which would help balance the network, in turn helps to tackle fuel poverty and decarbonise. However, the LV networks are not designed with ample capacity to carry the new load and meet aspirations for LCT penetration. Many residences are hard to retrofit in terms of energy efficiency and space heating. Installing individual heat pumps in terraces, with narrow frontages often without direct road access is difficult. Laying higher capacity HV and LV cable, in congested streets, is expensive, time consuming and disruptive to residents. Therefore, managing constraints and using as much local power as possible, locally, will help run the network as efficiently as possible.

Third Party Collaborators

Energy Local CIC

Nominated Contact Email Address(es)

innovate@spenergynetworks.co.uk

Problem Being Solved

1) Across the UK, local residents are keen to install heat pumps to tackle fuel poverty and decarbonize, however, the low voltage network was not designed with sufficient capacity to carry this new load and fulfil aspirations for other low carbon technologies. This problem presents a useful case study, as once the existing capacity is used up, upgrades to the 33kV network would be required to provide more capacity taking several years at each primary site requiring reinforcement. Therefore, managing constraints and using as much local power as possible, locally, will help run the network as efficiently as possible.

2) Throughout SP Energy Networks license area, local residents want to use their local generation to power heat pumps, it would help

balance the network if suitable arrangements are found, however, network constraints could make this difficult, due to lack of capacity on the existing LV network. Many residences are hard to retrofit in terms of energy efficiency and space heating. Installing individual heat pumps in terraces, with narrow frontages often without direct road access is difficult. Laying higher capacity HV and LV cable, in congested streets, is expensive, time consuming and disruptive to residents.

Method(s)

A central GSHP would feed clusters of homes, providing them with space heating and hot water that then can be boosted with a low-capacity heat pump in the home. This reduces the power required, via the service cable and LV feeder, and allows for the central GSHP to be connected separately, without overloading the local LV network.

1) Support 1-2-1 discussion with residents, provide load monitoring and conduct Energy Performance

Assessments across Tanygrisiau to establish:

a. Residents existing and future electricity needs,

b. Identify existing PV installations (since some may not be recorded).

c. Investigate demand and voltage readings to improve local electricity network planning, using suitably designed consumer access devices, which will provide remote measurement of demand and voltage.

2) Work with the community and consultants to establish:

a. The optimum design of a community heat network, using GSHPs

b. The most efficient means to connect them to the network.

c. The connection topology (i.e., via separate dedicated feeder/ feeders, considering the position of central GSHP and physical routes to run any new feeders.).

3) Develop flexibility strategy including using a battery (in conjunction with method (2) to further manage constraints on the network.

4) Investigate the potential to use a battery, to charge from the hydro generation, then disconnect from the hydro generator circuit and connect to the dedicated feeder for the central GSHP. The amount of power required by the central GSGP can then be discharged from the battery resulting in the constraints further up the network being bypassed. The battery could also be used to help support network voltage and the Project would investigate the best ownership model and develop a planning framework for this arrangement.

5) Steps 1-4 would be replicable in other similar instances and therefore the process will be documented and made generic to use elsewhere.

Scope

Community Engagement

Input of best means to connect to the network for community heat including the potential for flexibility. Feasibility, design, and implementation of innovative battery design for flexibility and managing constraints.

Work Package 1 – Engagement, Future Demand and Generation Estimation

4 Months | October 2023 - February 2024 | Cost £47,200.00

Energy Local, Gwynedd Council and Y Draft.

In this WP, key information will be collected through community engagement events and collection of space heating based on stakeholder input. Based on this feedback, future demand and generation will be estimated and will be verified for the present day, using network monitoring points with locations determined as an output of the WP.

Work Package 2 – Detailed Design

3 Months | October 2023 - January 2024 | Cost £21,000.00

Energy Local and SP Energy Networks.

In the feasibility stage, the design of the heat network will be completed, together with the optimum network design for Communal Heat Pumps with a Hydro generator and Battery. Sizing of the Battery, Networks and LCT Plant will also be completed and disseminated in a design document.

Work Package 3 – DNO CBA and NPV - Traditional vs BBC Solution

3 Months | October 2023 - January 2024 | Cost £67,200.00

Energy Local and SP Energy Networks.

The CBA will be made more accurate by reducing uncertainty in the input costs through detailed design. A cost analysis will be completed comparing Traditional Reinforcement vs BCC Solution to update the NPV. Which stakeholders' benefit will be clearly summarised and quantified in a NPV report. Future funding models, commercial and connection arrangements will also be drawn up and detailed to quantify the flexibility payment revenue streams.

Work Package 4 – Project Management

7 Months | October 2023 - April 2024 | Cost £28,8000

Energy Local and SP Energy Networks.

Objective(s)

1) To demonstrate non-technical and technical means to collect data from households and remote points on the network to improve network planning and load forecasts.

2) Demonstrate how DNO involvement in the design of community heat networks can help reduce the costs of connection.

3) Carry out a feasibility study of the benefits of using a battery to help manage constraints and power new low carbon technologies from a technical and customer point of view.

4) Document the process for use elsewhere.

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

N/A

Success Criteria

The delivery of the above objectives, within budget and within agreed timelines, as is reasonable Provision of best practice project management to give the Project the best chance of success, including:

1) Identification and mitigation of all risks to Project delivery on a weekly basis.

2) Provision and maintenance of a detail program project which contains sufficient steps to meet the project objectives.

3) Regular meetings with Project participant with recording actions and their completion.

4) Keeping accurate, up to date record keeping and version control.

Collection of Project data non-technical to improve network planning.

Assessment of innovative use of batteries benefits to help manage network constraints and balance local networks using local generation.

Project Partners and External Funding

SP Energy Networks will work with technical and social partners working in the Tanygrisiau and Blaenau Ffestiniog area. These include Y Dref Werdd, Energy Local, Ynni Cymunedol Twrog, Gwynedd Council, and technical contractors for the design of heating systems.

Potential for New Learning

The DNO will gain understanding of:

1) Using social program of energy engagement how much additional information can be gathered for use with planning.

2) How collaborative approaches to innovative community heating ease connection issues and constraints and provide opportunities for flexibility.

3) How batteries charged from local generation can be used to by-pass network constraints and provide flexibility.

Scale of Project

This project will deliver:

1) An example data set from a community gathered using non-technical means. This process could be replicated elsewhere.

2) Process of design collaboration could be replicated elsewhere.

3) Use of battery to manage constraints – approach can be used elsewhere.

Technology Readiness at Start

TRL3 Proof of Concept

Technology Readiness at End

TRL5 Pilot Scale

Geographical Area

This project will cover the SPM Licence areas but can be replicated elsewhere

Revenue Allowed for the RIIO Settlement

NA

Indicative Total NIA Project 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:

The objective of D-Suite is to determine the feasibility and value of providing flexibility services to UKO DNOs through a district heating comminity Energy Company. Decarbinsation services the company provides would be available to hard to treat domestic properties in disadvantaged areas.

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 offers a £7.3M NPV following completion of Phase 3.

Please provide a calculation of the expected benefits the Solution

See CBA Project management sheet.

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

The system could be implemented across all DNOs as all DNOs have the similar use cases which could be solved using these approaches. Notably areas with constraint networks with high levels of embedded generation, these are typical of rural areas in North and South Wales, South West England, Cumbria and Scotland.

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

Assuming this is used in 100 locations, this would cost around £200 million.

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

☐ 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 project deliverables will be described in detail in our close down report, with contact information for other DNOs to use for more information.

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

Please demonstrate how the learning from the project can be successfully disseminated to Network Licensees and other interested parties.

All non confidential Project learning will be uplaoded to the ENA SNP.

Please describe how many potential constraints or costs caused, or resulting from the imposed IPR arrangements.<

NA

Please justify why the proposed IPR arrangements provide value for money for customers.

NA

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.

The use of batteries in this format have not been previously trialed within the UK, and there have been no previous Innovation projects covering this area.

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

Use of in-depth household surveys to gather network data and forecasting of demand.

Collaborative approach to design of innovative community heating is new as the heating itself is new. Use of batteries has not been tried as it is a new technology in itself.

Relevant Foreground IPR

All FIPR will be shared on the ENA SNP.

Data Access Details

NA

Please identify why the Network Licensees will not fund the project as apart of it's business and usual activities

This is an innovative project that requires the collaboration of different parties. There requires feasibility work initially to ensure it is practical.

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

As this technology has not been previously used for networks applications there are both commercial and technical risks, and the project can only be undertaken with the support of NIA.

This project has been approved by a senior member of staff

☑ Yes