

Low Carbon Network Fund: Screening Submission Pro-forma

Notes on completion

Before completing this form, please refer to the LCN Fund Governance Document.

The typeface, font size and colour for the text entry areas are predetermined and cannot be changed. Please ensure all content is contained within the boundaries of the text areas. The full-completed submission should not exceed 6 pages in total.

Ofgem will publish all the information contained within section 1.1 following the ISP deadline and the information contained within section 1, 2 and 3 will be published following the Full Submission decision.

Section 1: Project outline

1.1. Project Summary

Project title

Northern Isles New Energy Solutions (NINES)
Addressing network challenges today to deliver a low carbon future.

Project purpose

Provide a narrative which explains the problem the project is seeking to address and the solution it is using to solve the problem. Detail how the project meets one or more of the specific requirements set out in paragraph 2.8 of the LCN Fund Governance Document

Shetland and Orkney - the Northern Isles – are poised to move from meeting their energy demands from mainly carbon sources to becoming one of the country's most productive sources of renewable energy, thanks to their rich wind and marine resources. Representing a microcosm of a possible future for the Great Britain mainland system, the operation of networks on the Northern Isles needs fundamental change to allow them to work effectively in a low carbon future. We need to make sure that the energy customers need can be provided in a reliable and sustainable way, by facilitating the flow of renewable energy without the need for costly network reinforcement.

We propose a project which could begin this process of change by:

- In Shetland, connecting up to 10MW of wind generation to a responsive demand side management scheme which includes around 4MW of industrial and 9MW of domestic load and up to 10MW of electrical storage;
- In Orkney, integrating 2 to 4 MW of energy storage and enhancement of our existing active network management system to further improve network utilisation; and
- Assessing a new zonal constraint charging structure to encourage responsive load management, energy storage and embedded responsive generation, and working with suppliers to evaluate the resulting end user benefits.

We will assess the success of this project by measuring the proportion of energy produced on the islands that is derived from renewable sources.

Estimate Project funding

Please provide an approximate figure of the total cost of the project and the LCN funding you are applying for

Total cost of Project	£81m	LCN funding requested	£51m
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1.2. Additional Project details

Funding commentary

Provide a commentary on the accuracy of your funding estimate. If the Project has phases, please identify the approximate cost of each phase

The funding for this project will cover a number of specific elements including:

- Project administrative costs, project study, network modelling and design and academic review and reporting;
- Active network management hub, communications infrastructure;
- Domestic and industrial DSM controllers, communications infrastructure and interfaces;
- Storage controllers, smart space and water heating appliances (external funding being sought)
- Underwrite charging mechanism to encourage involvement in DSM schemes at industrial and commercial level; and
- Thermal store and industrial electrical heating boiler (commercial funding being sought).

Alternative funding sources are being actively progressed with committed partners in order to leverage maximum benefit from the Tier 2 funding. Potential sources include the European Development Fund, Framework Programme 7, local government and INTERREG.

Project costs and funding requests identified here may vary at the bid stage due to certain funding alternatives not materialising, some project deliverables remaining subject to scope and scale clarification, and issues such as exchange rate fluctuation.

Anticipated funding requirements are:

Year 1: £14m Year 2: £17m Year 3: £17m Year 4: £1.5m Year 5: £1.5m

Project solution

Provide specific details of the solution which you are trialling, including details of specific network conditions where the trial is taking place

We propose trialling the following solutions:

Implementing new active network management system

- We will build on experience from the Orkney Registered Power Zone to minimise the effect that network constraints have on the connection of new renewable generation or the availability of demand reduction services.

Actively managing heating demand

- Electricity demand related to heating is high on Orkney and Shetland as neither island group has a mains gas supply, a situation representative of a future decarbonised network. A key project solution will be to propose to a number of householders a system of active heating demand management, combined with thermal storage which can be applied to existing homes with minimum disruption for customers and deliver for them a more controllable and comfortable heating system.

Facilitating increased participation by industrial and commercial users in demand modification and time-shifting

- We will encourage large customers to shift and flex demand patterns and, where it supports a decarbonising approach, to increase demand at appropriate times thereby enhancing the ability of the network to accommodate renewables. We will introduce technical and commercial enablers to facilitate this. We will undertake rigorous analysis to evaluate the effectiveness of this approach.

Designing new charging structures and incentive schemes to promote participation

- Providing large scale electrical storage capacity, both thermal and chemical, to assist with balancing and network constraint management.

A key milestone for this project will be to supply the entire Shetland electricity demand from renewable sources for a one hour period: the zero carbon hour.

Scottish Hydro Electric Power Distribution – Northern Isles New Energy Solutions (NINES)
Section 2: Eligibility criteria

In the space provided below, please demonstrate below how your project meets all of the following eligibility criteria:

Accelerates the development of a low carbon energy sector

Demonstrate how the Project makes a contribution to the UK's Low Carbon Transition Plan, as set out by DECC. Outline carbon benefits which the Solution you are trialling delivers and explain why the solution accelerates the realisation of these benefits over and above conventional solutions. These benefits can be explained in a qualitative manner for the purpose of screening.

Our project will focus on making sure that the energy customers need, can be provided in a reliable and sustainable way by minimising the need for fossil-fuelled generation, facilitating the flow of renewable energy and accelerating low carbon benefits prior to network reinforcement.

We will maintain secure energy supplies by operating the network in a way that combines generation from intermittent sources with stored energy.

Our project supports the Low Carbon Transition Plan in the following ways:

Cutting emissions

- Trialling network arrangements that could facilitate the production of 30% of the UK's electricity from renewables, and a far greater proportion on a local basis by directly supporting the connection of more renewable energy in an area rich in wind and marine resources.

Maintaining secure energy supplies

- Trialling arrangements that will allow energy from intermittent renewable energy sources to be effectively combined with stored energy to ensure secure supplies to customers in a system distributing a much increased proportion of renewable energy.

Maximising economic opportunities

- Introducing novel charging structures which will help businesses control costs while reducing their carbon footprint.
- Allowing the renewable energy industry to flourish in an area which in recent times has been economically driven by the oil industry, and to create wider opportunities for new commercial developments, a specific example being large data centres which could have their substantial energy requirements more easily met under the new system arrangements.
- Encouraging a 'whole community' approach to delivering low carbon homes which will engage local government, industry and householders.

Protecting the most vulnerable

- Helping prevent fuel poverty by encouraging a 'whole community' approach involving symbiotic relationships between local government, industry, housing associations and householders.

Has a direct impact on the operation of the distribution network

Set out the Solution you are trialling and make a clear case as to how the Solution described in Section 1 directly impacts on the operation of your network.

Scottish Hydro Electric Power Distribution – Northern Isles New Energy Solutions (NINES)

The solutions we propose will radically alter the design and operation of the Northern Isles networks and will inform the design and operation of the UK power network of 2020 and beyond. Specific examples include:

- The project will inform the design of the proposed replacement for Lerwick power station. The aim is to create a hybrid power station incorporating energy storage supported by system stabilisation, demand side management, active network management and traditional generation to lower the total carbon content of the islands' energy system.
- As the level of connected renewable generation increases, the dynamic behaviour of the network in response to disturbances will change. This will require new approaches to monitoring and operational management in order to maintain secure and stable operation.
- Demand will increasingly be viewed not simply as something to be met, but rather as an operational tool for ensuring security of the network and achieving lowest cost new capacity.
- By increasing network flexibility and providing more detailed 'real time' information on system operation, the installation of ANM equipment will assist network operators with essential tasks, such as maintenance and supply restoration.
- The availability of storage on the network will support network stability as the proportion of renewable generation increases.
- The project will also look to develop a set of charges and incentives that will encourage consumers to participate and ultimately benefit from the scheme, whilst looking to maintaining current market freedoms.
- The project seeks to develop knowledge on consumers acceptance of the new arrangements and analyse resulting changes in their behaviour. This is intended to cover domestic, commercial and industrial consumers.

Focuses on a network solution which is at the trialling stage and which require Second Tier funding

Demonstrate why you have not previously used this Solution (including where the Solution involves commercial arrangements) previously and why LCN funding is required to undertake it. This must include why you would not run the trial as part of your normal course of business and why the Solution is not R&D.

The project involves the integration of a range of initiatives to significantly increase the penetration of renewables on the Northern Isles. These include frequency based DSM, large scale ANM, MW scale storage and the creation of zonal charging and incentives. All of these are concepts that have been applied elsewhere, but never in such an integrated way to address high renewables penetration.

These solutions are expected to be cost effective in comparison with traditional network investment. However there are a number of risks which make this investment unattractive without LCN funding:

- The behavioural response of customers, suppliers and other parties may not be as anticipated;
- The broad range of complex relationships with stakeholders;
- The uncertainty of network behaviour with multiple measures installed;
- The regulatory framework: for a project to be successful, it must extend beyond the traditional DNO boundaries (i.e. beyond the meter and to include the use of storage);
- Interactions between different aspects of the project; and
- The longevity and sustainability of the commercial arrangements that will be put in place.

While we will build on our learning from our existing ANM scheme on Orkney and our storage project in Perth, these technologies are untested at scale. This project aims to build upon the experience gained and integrate other technologies such as demand side management capability.

For the above reasons, SSE would not implement this project without the availability of the LCNF and the risk protection and funding that Tier 2 provides.

Has the potential to deliver net benefits to existing and /or future customers

Demonstrate that the Solution you are trialling has the potential to deliver net carbon and financial benefits to GB energy customers.

Scottish Hydro Electric Power Distribution – Northern Isles New Energy Solutions (NINES)

SSE has identified the following potential benefits for customers and interested parties :

Existing customers – Enhanced ability to more easily connect and manage new low carbon devices (e.g. Electric Vehicles, micro-generation, heat pumps). By participating in an active demand management scheme, customers will have access to new charging and incentive regime to reduce overall energy costs.

New customers – Better access to the distribution system for both renewable generators and commercial users by facilitating by new, more flexible commercial arrangements.

Local Government –Enabling Shetland Islands and Orkney Islands Councils’ achievement of economic and environmental objectives and targets.

Energy suppliers – Development of new products to support low carbon future.

Regulator / policy makers – Provide information on operation of new network and develop new charging and reward mechanisms to encourage application of DR and storage solutions.

Transmission Network Owners / Transmission System Operators – Provide insight into the operation of the UK network of the future to enable the low carbon economy.

Generators – Findings to inform future capital investment decisions in response to changing demand patterns.

Technology providers – Deployment of large scale demonstration of innovative technologies to provide insight for product evaluation and future development.

Creates new knowledge that can be shared amongst DNOs

Explain the learning which you expect the Solution you are trialling to deliver. Describe the methodology you will use to capture the learning from the trial.

The project will generate answers to a long list of questions relevant to multiple stakeholders. These questions are incorporated in the project plan to ensure the relevance of the solutions being trialled. Some of the specific areas SSE will focus on include:

- Identifying and understanding the relationship between new variable generation such as wind and an actively managed demand;
- Developing improved system models for an actively managed network;
- Assessing the optimum operating regime for low carbon networks of all scales;
- Understanding the impact of low carbon networks on future network reinforcement plans including the replacement of the power station at Lerwick;
- Understanding how customers and suppliers will respond to actively managed networks; and
- Identifying the most effective methods for customer engagement and communication.

Learning will be captured and disseminated by the structured gathering, modelling and analysis of key technology, commercial and social issues and risks throughout the life of the project. This will be supplemented by the creation of both virtual and physical access points to the project via an open access online portal to project learning and resources and a Low Carbon Energy Systems Visitor Centre on Shetland. Foreground IPR will be treated in accordance with Tier 2 governance.

Does the project conform to the default IPR arrangements set out in the LCN Fund Governance Document? (Y/N)

Yes

If no, then please describe the IPR arrangements and demonstrate how the learning from the Project can be disseminated to other DNOs taking into account any potential constraints or costs caused or resulting from, the proposed IPR arrangements.

Scottish Hydro Electric Power Distribution – Northern Isles New Energy Solutions (NINES)
Section 3: Additional information

Please use the following section to add any further detail you feel may support your submission

Working towards a hybrid power station

The project will provide essential information which will inform plans to replace Lerwick power station with a hybrid power station incorporating energy storage supported by system stabilisation, demand side management, active network management and traditional generation. This would lower the carbon intensity of the islands' energy system.

Leveraging over £12m of additional funding

We are proceeding, along with committed partners, with applications for over £12m of additional funding from external sources to deliver the best possible solution for Shetland's energy system, from which learning will allow other system operators to consider innovative approaches to securing a low carbon future for the UK.

Section 4: External Collaborators

External Collaborators' details

Please use the space below to provide the name and business type of any External Collaborators who have contributed Funds and /or to a Project, or describe the type of External Collaborators you may be seeking to attract

Lead Sponsors / 'Steering Committee':

SSE Power Distribution, Shetland Islands Council, Orkney Islands Council, KEMA

Project Suppliers:

Smarter Grid Solutions , University of Strathclyde

Equipment providers – Glen Dimplex, Alstom, GE, Arqiva, Electralink, Nortech, Sentec and DigSilent amongst others

Technology providers - energy efficiency providers such as Geothermal International

Generation – Shetland Heat and Power, SSE Renewables

Energy Suppliers - SSE Supply, Scottish Power, Good Energy and other energy suppliers

External Collaborators / Funders:

Shetland Islands Council, Hjatland Housing Association, Highlands and Islands Enterprise, Shetland Charitable Trust, Shetland Heat and Power, Community Energy Scotland

The number and involvement of each of the partners will change depending upon the final project scope and the availability of funding streams.

Section 5: DNO details

DNO name

Scottish Hydro Electric Power Distribution

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