SSET2001	SHEPD – NINES Project
Proforma box number / Spreadsheet	**Where the latest information can be found**
Box 4 **Derogations or Exemptions**	Responses to **SSE028, SSE034, SSE045** and **SSE046** elaborate on our position on whether there is any need for a charging derogation
Box 5 **Project Plan**	Response to **SSE006** highlights key points in 2011 which will show the project is on track
Box 7 **Equipment**	Response to **SSE029** provides further information on the applicability of frequency responsive storage heaters at UK level. Response to **SSE030** gives a further explanation of decommissioning costs
Box 11 **Cost over-runs and unrealised benefit**	Response to **SSE008** gives further details on ERDF funding
Box 13 **Successful Delivery Reward Criteria**	Response to **SSE031** and spreadsheet **SSE031 Completed Revised Box 13**, replaces the original information provided in Box 13 relating to Successful Delivery Reward Criteria.
Box 18 **Dissemination**	Response to **SSE009** provides further detail on how information will be disseminated; **SSE009 Learning Matrix** replicates the learning matrix submitted as Appendix 7 to the Full Submission Pro-forma.
Box 22 **External Collaborators**	Response to **SSE010** provides more information on Smarter Grid Solutions
Box 23 **Other Partners**	Response to **SSE011** provides more information on the role of Highlands and Islands Enterprise within NINES
Box 24 **Relevance of Learning**	**SSET2001 Follow Up Answer to Bilateral** provides clarification of the learning and benefits to be gained by the UK from the NINES project in Shetland
Box 26 **Managing Risks**	Response to **SSE008** gives further details on ERDF funding Response to **SSE012** provides further information on customer payments
Appendix A **Full Submission Spreadsheet**	**SSE013 NINES Full Submission Spreadsheet inc UK Carbon Benefits** replaces the original Appendix A

Low Carbon Networks Fund

Full Submission Pro-forma

In completing this proforma DNOs should consider the regulation, governance and administrative processes set out in the LCN Fund Governance Document

Section A: Project details

Project Summary

Box 1: Please provide details of the Project, the Method and Solution

Problem

DECC's Low Carbon Transition Plan demonstrates a clear trajectory of the UK's renewable energy use to 2020. With 7% renewable energy usage in 2010, Shetland's non-connected grid system represents the stage at which the UK is anticipated to be in 2015.

Shetland is the only place in the UK which is currently experiencing both frequency and stability constraints. These constraints are as a direct result of the high penetration of renewable generation. This means that in an area recognised as having the richest renewable energy resource in Europe:

- no new generation of any scale can connect to the network
- new development is obstructed by restrictions on new electrical connections
- communities cannot benefit from feed in tariffs or other similar initiatives

Similar problems lie ahead for the UK grid, as stated in Ofgem's Discussion Paper 'Demand Side Response' (July 2010), as the country moves towards its 2020 targets for renewable generation. Such a situation would seriously jeopardise the achievement of deriving 15% of energy from renewable sources.

Ref: Ofgem Discussion Paper 'Demand Side Response'
http://www.ofgem.gov.uk/Sustainability/Documents1/DSR%20150710.pdf

The challenge is to find cost effective ways of operating the system that will allow renewable energy to flow unhindered by network constraints. To find those solutions, projects that are of sufficient scale and able to deliver valuable learning are essential. Northern Isles New Energy Solutions is such a project.

Northern Isles New Energy Solutions (NINES)

Solution

We will undertake a project in Shetland's controlled electricity environment which will contribute to resolving problems on a much wider scale. We will develop new knowledge and capture the learning from this work and facilitate its application to the UK system.

We will deploy proven technologies in ways they have never been used before, specifically to:

- allow more renewable generation to be connected to the system
- manage existing demand to keep the system balanced
- develop more flexible connection arrangements
- reward communities for helping us balance the system
- reduce reliance on fossil fuel consumption at the islands' main generation sources

The NINES project involves a broad spectrum of customers including large scale generation, small community scale generation, industrial customers and up to 1,000 domestic customers, which represents around 12% of households in Shetland. To put this in context, an equivalent trial on the GB system would need to involve around 1.6m households.

By undertaking a large scale project on Shetland's dedicated network, clear and statistically valid findings can be confidently used to inform decisions at both distribution and transmission level on a national scale.

Put simply, NINES will seamlessly allow the output of the islands' intermittent renewable energy sources to be optimised. We will do this by storing some of the energy they produce in a new form of storage heating which will replace existing inefficient systems in people's houses. We'll reward the owners of the storage heaters for allowing us to do this.

Method

With our partners Shetland Heat Energy and Power (SHEAP) and SSE Renewables we have identified potential for a new large controllable demand. This will allow the expansion of the existing Lerwick District Heating Scheme by combining a new 7MW wind farm with a 4MW boiler.

See Appendix 1: Lerwick District Heating Scheme, Proceedings of the Institute of Civil Engineers

Driven by Scottish Housing Quality Standard requirements, Shetlands Islands Council (SIC) and Hjaltland Housing Association (HHA) are required to replace ageing storage heaters. To meet this requirement, SIC, HHA and SHEPD have commissioned new heaters, which in addition to being more efficient, have greater storage capacity and crucially provide frequency responsive capability.

With our technical partners, Smarter Grid Solutions (SGS) we will implement an active network management system which will allow the integrated operation of these controllable components to optimise the costs, electrical losses and carbon intensity of the network.

See Appendix 2: Shetland Islands smart grid requirements specification and architecture

In conjunction with commercial incentives, NINES will provide the catalyst for three 'virtuous cycles' which will reduce losses, reduce carbon and help prevent fuel poverty.

See Appendix 3: NINES virtuous cycles

We have collaborated with National Grid to ensure that the project is fully aligned to the needs of the GB system and we have engaged KEMA to undertake an independent review of our NINES proposals to ensure the project meets the objectives of the Low Carbon Networks Fund (LCNF).

Project

The project comprises two phases, each of which is viable individually but which together form an even greater whole, which would lead to Shetland being able to meet its electricity demand from zero carbon sources for periods of time. **This submission relates to the first phase as described below**; an outline of phase 2 is provided for information.

Phase 1

- installing domestic Demand Side Response (DSR) with Frequency Response (FR) in up to 1000 homes in the form of more efficient storage heaters and water tanks with enhanced storage capabilities to help network stability
- introducing a DSR-controlled 4MW electric boiler to the existing district heating system
- allow installation of up to 10MW of new renewable generation, including the 6.9MW Gremista wind farm which is linked to the new district heating boiler
- establishing new commercial arrangements for generators which allow the DNO to manage the output to maintain stability
- widen opportunities for interested parties to provide support (ancillary) services on Shetland
- developing network modelling and system forecasting tools
- deploying an ANM system to allow SHEPD to manage the various elements to optimise performance and maintain stability
- continuing training, education and engagement on a local and national basis
- exploring the practicalities of integrating thermal generation and storage at the existing Lerwick Power Station to develop a hybrid power station as part of the Repowering proposal
- establishing an energy information centre on Shetland

Phase 2

Introduction of industrial DSR with FR; continuing generation connections; analysis of customer behaviour and attitudes; develop new charging arrangements for customers, informed by Phase 1; continuing customer engagement; installing 10MW of electrical storage; network reactive compensation devices; celebrating Shetland's first Zero Carbon Hour

Box 2: Please provide a description of the Project

Location

Our project will take place in the Northern Isles of Scotland, the largest groups of which are Shetland and Orkney. Orkney is situated around ten miles off the north coast of Scotland, with Shetland around 150 miles from the mainland. Phase 1 of the project, to which this application relates, will take place across the Shetland electrical network.

See Appendix B(i): Geographical location

Existing system

Shetland is part of the Great Britain electricity market, but it hosts the only substantial non grid-connected electricity network in the UK. Around 93% of electricity used on the islands is produced from fossil fuels (mostly from SHEPD's 65MW diesel-fuelled Lerwick Power Station, with the remainder from gas at a facility associated with Sullom Voe oil terminal) and 7% is from onshore wind turbines. Another key part of the energy infrastructure in Shetland is the 12MW Lerwick District Heating Scheme which is fuelled by a combination of fuel oil and heat from the islands' waste to energy plant and supplies approximately 1,000 customers. The islands' network extends to 900km and supplies 15 islands.

See Appendix B(ii): Single line diagram

The NINES project will solve the UK's network problems of tomorrow by solving Shetland's problems of today.

NINES will:

- allow new generation to connect in 2011, where otherwise connections would be delayed until at least 2015, when the planned HVDC cable to the GB mainland is completed (date is dependent on Viking wind farm being consented without recourse to a public enquiry)
- increase, by 2014, the proportion of electricity generated from renewables on Shetland's network to a level greater than GB's 2020 target.

Customers involved

Our project, which will increase the amount of renewably generated electricity used on Shetland to approximately 25 - 30% by 2014, the level expected for GB in 2020, will directly involve a wide range of network customers, including:

- up to 50 generators
- up to 1,000 domestic customers
- several industrial and commercial customers participating in demands side management and potentially additional energy storage providers

Customers not directly involved in the project on Shetland will benefit from an increased awareness of renewable energy and electricity network matters, and will have their carbon footprint reduced due to the almost four-fold increase in green energy being supplied via the network. There will be no negative effects on such customers.

We are conscious that to help customers engage with the programme we must ensure that the interface they have with the technology is straightforward. As Ofgem says:

"The main issues to address for customers [include] overcoming difficulty in changing consumer behaviour and increasing discretionary demand through automated response."

Demand Side Response – Discussion Paper: Ofgem 2010

The NINES project involves:

- installing a 1MW battery, part-funded by DECC, at our existing diesel power plant in Lerwick, to create Lerwick Hybrid Power Station, the largest of its type in the UK
- introducing domestic DSR with FR in 1000 homes, by working with Shetland Islands Council and Hjaltland Housing Association to install advanced storage heating and water heating in 1,000 homes in Shetland by 2014, part funded by the European Regional Development Fund (ERDF) *See Appendix 4: SIC/HHA ERDF application*
- introducing industrial scale demand side response, part funded by ERDF, by facilitating the connection of a 4MW extension to Shetland Heat and Power's Lerwick district heating system which will be supplied by the planned Gremista wind farm *See Appendix 5: SHEAP ERDF application*
- establishing new commercial arrangements for customers and generators, by working with several generators and potential providers of storage who have expressed an interest in being involved with the project
- deploying an active network management ANM system which will provide fine control over the elements mentioned above and over the network as a whole to allow us to manage it such that security of supply is maintained and the maximum possible amount of renewable energy can be accommodated on the Shetland system
- developing network modelling and system forecasting tools

This work, which will resolve Shetland's frequency and network stability problems, will allow us to facilitate connection of up to 10MW of new generation, anticipated to be predominantly renewable, under new commercial arrangements linked to ANM.

We will ensure that all possible learning is extracted from NINES and disseminated to all interested parties, including via academic studies and publications, local and national exhibitions, internet communications and through education and training. Complementing this, we will undertake an extensive planned programme of communication to inform, educate and engage all stakeholders at local and national level.

Economic development

NINES will provide a solid platform on which to develop a thriving renewable energy industry on the Northern Isles. A clear example is the ability NINES provides for more renewable generation to connect by 2011. NINES will also increase opportunities for new entrants to the energy market at all levels, widening the spectrum of participants – for example to storage heating customers and other providers of flexible demand services. On a wider UK basis, as well as informing the development of low carbon networks on the mainland, with similar benefits, NINES supports the expansion of one of Northern Ireland's most prominent employers, Glen Dimplex, into providing specialist flexible energy storage devices.

Shetland as a microcosm of Great Britain's future

In terms of penetration of renewable energy and provision of ancillary services, Shetland now is at the level the GB system is aspiring to reach in 2015. The NINES project will deliver a number of sustainable alternatives to traditional means of providing ancillary services in an environment where the requirement for such services is expected to double.

Ref:National Grid: Future Requirements
http://www.nationalgrid.com/uk/Electricity/Balancing/services/FutureRequirements/
See Appendix B (iii): Shetland as a microcosm of the GB System

Working with partners on Shetland, NINES will enable Shetland to substantially exceed the UK's 2020 targets for renewable energy as early as 2014.

Box 3: Please outline the changes which you have made to the Project since the Initial Screening Process

Does the high level Solution being demonstrated and the high level Method being trialled in the Project remain the same as that contained in your Screening Submission? Yes

Our high level Solution remains the same: allow more renewable generation to be connected to the system and manage existing demand to keep the system balanced. However, we have introduced some refinements:

Phasing

Our project now comprises two complementary phases, as described in Box 1. This full submission pro-forma relates to Phase 1 only.

Battery

Since submission of the ISP, SHEPD has progressed with the procurement of a 1MW battery installation. As part of the tender assessment process it was identified that Shetland would provide a much better location for the battery than its planned location in Perth, Scotland. The network conditions on Shetland are such that it provides an opportunity to expand the range of operating parameters to which the battery will be exposed and also reduce potential standing losses.

Therefore, it is proposed to install the battery on the Shetland network as one of the initial elements of the NINES project. Installation is scheduled for March 2011with full commissioning in September. The installation of the battery and associated ANM functionality will immediately facilitate the connection of up to 400kW of new renewable generation on the Islands.

This aspect of the NINES project is to be partially funded by a £1,049,600 grant from DECC Smart Grid Demonstration Grant Programme.

The early installation of the battery will provide a range of learning on the operation of large scale storage assets on the Islands. In the ISP, we identified having up to 10MW of electrical storage; this has been deferred until Stage 2 of the project in order to give time to receive feedback on the performance of the battery. This is reflected in a revised capital cost and spend profile.

Project Costs

These should be the same amounts as detailed in the Full Submission Spreadsheet tab entitled 'Second Tier Funding Request' included as Appendix A

Total Project Cost	£ 51,610,000
External Funding	£ 23,383,000
DNO Extra Contribution	£ 0
DNO Compulsory Contribution	£ 2,822,750
Second Tier Funding Request	£24,404,445

Project Completion date	04/2016

Derogations or exemptions

If awarded funding, will you require a derogation, licence consent or exemption, or any change to the regulatory arrangements in order to undertake the Project or cater for contingencies? No

Box 4: If Yes, DNOs must provide a summary of the details of the derogation, licence consent or exemption, or change to the regulatory arrangements required

Whilst we are seeking to engage with domestic customers to actively manage their heating demand, we do not intend to change our UoS methodology for the period of the trial. We intend to seek agreement from the participating customers and / or their suppliers to manage their supplies and charge UoS accordingly. As such we intend to make some *ex grati*a payment to domestic customers for the period of the trial and will seek to develop our charging structures for this class of customer following the trial assessment.

We are, however, also seeking to encourage large customers to shift and flex demand patterns. This will require designing new commercial arrangements, including incentive schemes to promote participation. Our intention is to develop these as Ancillary Services. If changes are required to our charging methodology, they will require Authority approval and we will therefore work closely with Ofgem whilst we develop these trial products to ensure that current licence obligations continue to be met.

Our preference is not to seek derogations from our licence obligations, but if these are the most practical way forward for the duration of the trial we will discuss them further with Ofgem.

Section B: Project Management

DNOs must provide an organogram outlining roles and responsibilities in the Project and the organisational structure. This must be included as Appendix C.

Contact details of DNO Principle Project Manager:

Name and Title:	**Stewart Reid**
Telephone:	**01738 455746**
Email:	**stewart.a.reid@sse.com**

Address:	**Low Carbon Networks Team** **Scottish Hydro Electric Power Distribution** **Inveralmond House** **200 Dunkeld Road** **Perth** **PH1 3AQ** **NINES@sse.com**

Box 5: Please provide details of your Project plan

DNOs should outline up to ten key milestones associated with their Project.

Date	Milestone
09/2011	**Initial Active Network Management (ANM) scheme commissioned for 1MW battery installation**: facilitates connection of additional 300-400kW of small scale community-based renewable generation.
07/2012	**SHEAP 4MW electric boiler connection available**: a 'flexible' connection to allow SHEPD to manage the boiler's demand to maintain system stability on the system.
07/2012	**Gremista Wind Farm 6.9MW connection available**: a 'flexible' connection to allow SHEPD to manage the wind farm's output to maintain system stability on the system.
07/2012	**Commissioning completed of the network infrastructure for new storage and water heating in 250 homes:** creates further controllable demand to allow effective management of the system.
07/2012	**Capacity available for a further 500kW of renewable generation:** reflects ability of network to accommodate an increasing percentage of renewable generation.
12/2012	**Publication of first formal technical, regulatory and economic report on learning achieved to date:** this will inform the Lerwick Repowering proposal
08/2013	**Commissioning completed of the network infrastructure for new storage and water heating in 500 homes:** creates further controllable demand to allow effective management of the system.
08/2013	**Capacity available for more renewable generation:** reflects ability of network to accommodate an increasing percentage of renewable generation.
08/2014	**Commissioning completed of the network infrastructure for new storage and water heating in 750 homes:** creates further controllable demand to allow effective management of the system.
08/2014	**Capacity available for more renewable generation:** reflects ability of network to accommodate an increasing percentage of renewable generation.

A full Project plan, presented as a Gantt chart, must be provided as Appendix D: DNOs must include a month by month breakdown of the activities associated with a Project; milestones, delivery of outputs and deliverables, dependencies, critical path, responsibilities, phases and key decision points.

Project Budget

DNOs must complete the Full Submission Spreadsheet tab entitled 'Second Tier Funding Request' and include it within Appendix A

Box 6: Please provide a breakdown of your total employment costs for the total Project which you are project managing and highlight where these are funded by, or provided by others

Total employment costs should include all the costs used for labour, including pensions but excluding Contractors (whose costs are detailed separately). Personnel with the same role can be grouped together

Staff type	Total Costs	Person days	Funding
Senior Manager	£0.906m	1000	The funding provided by external collaborators is against the entire project and not specifically allocated to each individual element, therefore, we have assumed that the proportion of funding will be the same for each staff type ie 4%, the remainder being provided by the LCN fund.
Principal Power Systems Engineer or Project Manager, Lawyer	£2.108m	2700	
Senior Power System Engineer, Project Engineer, Senior Wayleave Officer, Accountants, Stakeholder Manager	£5.230m	8000	

Power Systems Engineer/Draughtsman	£0.896m	1750	
Technician	£1.508m	3500	
Craftsman / Admin Support	£0.899m	2600	

Box 7: Please outline the main Equipment costs required for the total Project which you are project managing

Item description & No. of units	Function in Project	Cost per unit	Total Cost	Funding	Direct Benefit

Communications and Interface Equipment	To allow ANM scheme communicate with various network elements including 1000 domestic premises, network monitoring points, generation connections and commercial customers	£0.750m	£0.750m	LCNF	No Direct Benefits arise from NINES: see Box 12
1000 x Frequency Responsive Storage Heaters and Immersion heaters	New frequency responsive storage heaters and immersions heaters developed by Dimplex to be installed in homes across the Islands.	£0.0045m	£4.500m	External Partner: £2.29m LCNF: £2.21m	
3 x 2.3MW wind turbines and associated civils at Gremista	The Gremista Wind Farm is an essential element of the NINES project and will lead to a substantial increase in wind generation on the Islands.	£3.66m	£11.000m	External Partner	
1 x frequency responsive electric boiler and Thermal Store	The new electric boiler will replace the existing oil fuelled boilers at the Lerwick District Heating Scheme operated by SHEAP and provide a significant controllable demand.	£3.700m	£3.700m	External Partner	
10x Non Domestic Storage Installs	Provision of additional responsive demand by non domestic customers i.e. schools, hospital, industrial, care homes etc	£0.075m	£0.750m	External Partner: £0.450m LCNF: £0.300m	

1 x 1MW, 6MWh battery	The battery will be installed at Lerwick Power Station. The additional flexibility brought by the battery will provide additional capacity for new renewable generators.	£3.335m	£3.335m	External Partner: £2.000m LCNF: £1.4M	
Other assorted equipment	Equipment such as learning materials, communications equipment, monitoring equipment etc having an individual value less than £50k		£2.785m	LCNF	

Box 8: Please outline the Contractor costs required for the total Project which you are project managing

Contractor	Role in Project	Funding	Expected length of contract	Total Cost
Universities of Reading/ Strathclyde, EA Technology and others	Produce and promote learning material from the project to the benefit of other DNOs and the UK as a whole.	LCNF: £1.932m External: £1.348m	60	£3.280m
Subject to ongoing procurement process.	Installation, civils and maintenance services for 1MW battery .	LCNF	60	£0.718m
Smarter Grid Solutions	Design, provision and support of ANM scheme for Shetland	LCNF: £2.620m External: £0.300m	60	£2.920m

Other contractors	Smaller scale contracts for various civil works, exhibitions, publicity etc, having an individual value less than £50k	LCNF: £1.045	60	£1.045m

Box 9: Payments to users or Customers

Please outline the details of any payments you wish to make to users or Customers as part of the Project.

Type of user or Customer	Payment per User	Total Payment	Funding
Ex gratia payments to **owners of responsive domestic storage heating**. Project aims to target up to 1000 domestic properties during 5 year period. This will be replaced by new commercial arrangements in the long term	£250/annum	£0.625m	LCNF Annual payments to be reviewed with Ofgem, informed by learning gained from project.
Ex gratia payments to **owners of responsive demand in small commercial premises**. Project aims to target up to 10 commercial properties during 5 year period. This will be replaced by new commercial arrangements in the long term	£12,000/annum	£0.240m	LCNF Annual payments to be reviewed with Ofgem, informed by learning gained from project.

Payment to **SHEAP** for allowing SHEPD to control demand. SHEAP demand profile will be directly influenced by the project which may lead to electricity suppliers charging a premium to reflect this additional risk. This will be more accurately assessed when SHEAP attempt to secure a supply contract.	£460,000/annum	£1.6m	LCNF Annual payments to be reviewed with Ofgem, informed by learning gained from project.

Box 10: Other costs for the total Project which you are project managing. This should be categorised into the following categories: IT costs, Contingency costs, IPR costs, decommissioning costs, abnormal travel costs and costs associated with public engagement and dissemination of learning

Cost Category	Cost Item	Cost
	Travel	£0.162m
	Learning and dissemination	£0.350m
	Information technology	£2.10m
	Other	£0.554m
		£
		£
		£
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Cost over-runs & Unrealised benefit

Box 11: Please detail any cost over-run you anticipate requiring for the Project and express this as a percentage of the funding you are requesting

DNOs must outline (as a percentage of the Second Tier Funding Request[1]) the level of protection they require against cost over-runs

5 %

Managing costs

Whilst we do not anticipate any cost over-runs it should be recognised that there are cost uncertainties associated with elements of the project. By using good procurement practice we will seek to tender various work elements in order to minimise the potential impact on the project. The result of this process is expected to be a reduction in our costs hence the potential for greater value for money.

It should be recognised that due to the nature of the project many of these items will still be subject to fluctuations in exchange rate, volatility in commodity prices etc which may have a negative effect on our costs.

However, we believe that overall we have a made a reasonable estimation of the overall costs and with our robust approach to cost management we do not anticipate any cost over runs.

There are also elements of the project which may need to be revisited throughout the project depending upon market conditions and customer reaction. This is particularly relevant to payments to customers, which is an essential part of the learning from the project. We will work closely with Ofgem to review these payments based on the experience gained.

External funding

We have identified a significant level of external funding for the project, whilst we and our collaborators are confident that this can be secured, it should be recognised that elements of the funding such as ERDF are still subject to formal approval by the funding bodies. If these are unsuccessful, via our Head of Partnership funding we will look to secure alternative funding sources or with Ofgem's agreement alter the scale of the project.

These risks along with the appropriate mitigations are discussed further in Box 26.

[1] In the LCN Fund Governance Document the term Approved Amount is used since the description relates to the implemented Project.

Box 12: Please detail the level of protection required against Direct Benefits in excess of the DNO Compulsory Contribution

DNOs must outline the level of protection against Direct Benefits that they wish to apply for

0%

This project will deliver significant benefits through reduced operating costs for Lerwick Power Station in the form of reduced fuel use and reduced maintenance requirements.

These benefits are however a direct benefit to *all* SHEPD customers as the existing funding mechanism allows a pass through of these costs. As a result these benefits that are not directly realised by SHEPD. They are 'real benefits' but they do not require protection.

For information, these cost savings are described in detail in Appendix A(ii).

See Appendix A(ii): SHEPD carbon and other savings

Successful Delivery Reward Criteria

Box 13: Please set out your proposed Successful Delivery Reward Criteria

Successful Delivery Reward criterion	Evidence
DECC Low Carbon Transition Plan (LCTP) – 1 **Encourage and facilitate demand management** The project will have control of 4MW of demand (Shetland Heat Energy and Power) to the Shetland network by end Q3 - 2013	We will present operational data from the live plant to validate its operation. Initial report by Q2 2014. Final Report Q4 - 2015
DECC Low Carbon Transition Plan (LCTP) - 2 **Encourage and facilitate demand management** The project will have control of the heating and hot water demand in 250 Shetland homes by end Q3 – 2013.	We will present operational data from the live plant to validate its operation. Initial Technical Report by Q2 2014. Final Report Q4 - 2015
DECC Low Carbon Transition Plan (LCTP) **Increasing production of renewable energy** The Project will have increased the capacity of renewable generation permitted to connect to the Shetland Network.	We will produce an annual report to identify theoretical constraint thresholds based on out dynamic network model. This will demonstrate the increased potential for connection of renewables as the level of controllable demand increases and we gain confidence in the operation of the scheme. Q 3 – 2013, annually thereafter
DECC Low Carbon Transition Plan (LCTP) **Improved monitoring and information for network operators** Install additional network monitoring equipment and commission initial stages of ANM scheme	Commissioning reports, demonstration, data capture on systems and photographic evidence.

Successful Delivery Reward criterion	Evidence
DECC Low Carbon Transition Plan (LCTP) **Increasing number of renewables** We will produce a report on the economic performance of the scheme including customer acceptance (domestic and commercial), report on costs /benefits to customers, impact on fuel poverty, identify changes to current business arrangements and inform DPCR6	Initial report on Q4 2014 Final Report Q4 2015
DECC Low Carbon Transition Plan (LCTP) **Optimal use of networks** Produce joint report by SHEPD, National Grid and University of Strathclyde on the extrapolation learning and benefits of NINES to GB	Initial report on Q4 2014 Final Report Q4 2015
DECC Low Carbon Transition Plan (LCTP) **Optimal use of networks** Produce interim report on NINES project to inform design of replacement for Lerwick Power Station	Initial report on Q3 2012

Section C – Evaluation Criteria

Accelerates the development of a low carbon energy sector

Box 14: Outline how the Solution accelerates the development of a low carbon energy sector

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

Cutting emissions

- greater matching of generation and demand on a local basis: allowing the connection of more renewables by trialling network arrangements that on the GB system could facilitate the production of over 30% of the UK's electricity from renewables
- Matching demand to periods of lowest carbon generation: trialling arrangements that will focus demand on periods with the highest proportion of renewables
- Minimising 'power miles': facilitating the matching of local demand to local generation on an instantaneous basis to reduce losses: scaleable for the GB system

Ref: National Grid:'Gone Green' Future Reguirements consultation
http://www.nationalgrid.com/uk/Electricity/Balancing/services/FutureRequirements/
See Appendix A(ii):SHEPD carbon and other savings

Maintaining secure energy supplies

- Using stored energy to keep supplies secure: trialling ways of combining stored energy with energy from intermittent sources on a system with a high proportion of renewable energy
- Allowing 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
- Enhancing the stability of the network: reducing the probability of frequency excursions such as the network event that occurred on 27 May 2008

See Appendix E: National Grid Frequency Excursion May 2008

Maximising economic opportunities

- Introducing novel charging and reward structures: creating a market place of up to £1bn for the provision of ancillary services at a domestic and commercial level giving both new income streams and new business opportunities
- Making the grid more accessible to allow the UK to map out a sustainable economic future less dependent on oil-related income
- Encouraging a 'whole community' approach which will engage local government, industry and householders in reducing their carbon footprints

Ref: Ofgem Discussion Paper 'Demand Side Response'
http://www.ofgem.gov.uk/Sustainability/Documents1/DSR%20150710.pdf

Protecting the most vulnerable

- Helping prevent fuel poverty: encouraging a 'whole community' approach involving symbiotic relationships between local government, industry, housing associations and householders
- Facilitating individual's participation in the energy market: Recognising the contribution that home-based facilities can make to the management of local constraints and the provision of national ancillary services, eg creating new tariffs for frequency responsive demand, such as storage heating, which channel financial benefits to householders

Ref: Ofgem Discussion Paper 'Demand Side Response, as above

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

DNOs must complete the spreadsheet tab 'Net benefits' within the Full Submission Spreadsheet and include as Appendix A.

Box 15: Please provide a qualitative account of the net benefits which the Solution has the potential to deliver if rolled out across GB.

Lerwick Power Station's carbon emissions will be reduced by 25,432tCO_2 per annum and fuel costs will reduce by £2.626m per annum. This is as a direct result of the connection of additional renewable generation that is currently unable to connect due to the constraints which this project seeks to remove. This in itself is a good achievement. However it is the effect of applying these technologies and arrangements to the GB system that sets the NINES project apart.

The University of Strathclyde's report gives validity to our assertion that findings on Shetland can be scaled up for application to the GB system. For this reason Shetland provides an extremely cost effective location in which to observe the impact of a massive roll out of renewable generation, demand side response and storage in the UK.

See Appendix B(iv): Description of Shetland Electrical System and prospective projection of NINES project results to GB – University of Strathclyde

Our project on Shetland, scaled up to GB level, represents:

- Ancillary services provided by 1.6million homes
- Storage provided by 1GW of battery
- Controllable renewables generation at gigawatt scale

Scaled up to GB level, savings of £143-555m per year would be delivered by avoiding the need to build new power stations to allow for peak demand. Additionally, the NINES approach in GB would redirect £450m per year back to customers for providing ancillary services in their homes. This will result in net savings to UK electricity customers of up to £1bn per annum.

Ref: Ofgem Discussion Paper 'Demand Side Response'
http://www.ofgem.gov.uk/Sustainability/Documents1/DSR%20150710.pdf
Ref: National Grid Balancing Summary: http://www.nationalgrid.com/uk/Electricity/Balancing/Summary

Under the 'Gone Green' scenario, and with ancillary services remaining at existing levels in 2025, the network in the UK will suffer constraints of a similar nature to those experienced in Shetland at the moment.

Storage at domestic level

The NINES project will allow DNOs and TNOs to confidently utilise a range of new, more sustainable, more cost effective ancillary services to accommodate the anticipated much greater of proportion of renewable energy on the GB network.

NINES will prove that customers themselves on the GB network can have assets to provide these ancillary services avoiding significant capital investment and creating new income streams for participating customers. It will demonstrate that 'feed out tariffs' recognising the value of the service their storage heaters provide, can sit alongside existing feed in tariffs.

Community approach

NINES will show that allowing a greater range of participants in the supply chain leads to more effective use of system resources; encouraging, for example, generators and storage providers to co-operate will lead to an efficient system which can accommodate more green energy.

Hybrid power station

We intend to use the 1MW battery for; network stability, power station running optimisation, and fast response. These modes are will be applicable to the UK mainland: Shetland allows us to trial all of these modes in one location. Providing relevant learning for the scaling up of battery storage systems for use at GB level.

Direct Impact on the operation of the Distribution System

Box 16: Explain the way in which the Project/Solution has a Direct Impact on the Distribution System

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:

- 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, planning and operational management in order to maintain secure and stable operation. This will result in modification or creation of new industry operating standards.
- The availability of a range of energy storage technologies will ensure network stability as the proportion of renewable generation increases
- 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 project will also look to inform the development of new charges and incentives that will encourage consumers to participate and ultimately benefit from the scheme, whilst looking to maintain 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 both domestic, commercial and industrial consumers.
- 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, and active network to lower the total carbon content of the islands' energy system.

The net benefits shown in Appendix A are largely realised due to the reduction in the proposed running hours at Lerwick Power Station as the proportion of renewable generation on the islands is increased. This increase in renewables being facilitated by the creation of a range of energy storage and manageable demand to provide the necessary network stability.

As stated previously (Box 12) these benefits are not directly realised by SHEPD but will significantly reduce the level of 'pass through' costs. For information, we have identified the level of savings below and have appended a fuller description.

See Appendix A(ii): SHEPD carbon and other savings

Year	2009	2010	2011	2012	2013	2014	2015	2016	2017
Total Shetland Electrical Demand - GWh	214	214	214	220	220	219	219	219	219
Residual Generation Requirement from Lerwick	114	114	113	106	88	85	83	81	80
Total Renewables - GWh	16	16	17	30	48	50	52	54	55
Reduction in Operating Hours at Lerwick			1%	7%	23%	25%	27%	29%	29%
Annual Fuel Saving Saving £000s		£ -	£ 51	£ 416	£ 1,314	£ 1,437	£ 1,535	£ 1,633	£ 1,672
Reduced O+M Costs £000s		£ -	£ 29	£ 238	£ 750	£ 820	£ 876	£ 932	£ 955
Total Savings		**£ -**	**£ 80**	**£ 654**	**£ 2,064**	**£ 2,257**	**£ 2,411**	**£ 2,565**	**£ 2,627**

Generates new knowledge that can be shared amongst all DNOs

Answers to this section should be detailed in boxes 17 to 19

Box 17: Explain the new learning which will result from a successful Project

-

Shetland's status as an electrical island, not connected to the UK grid, makes it the ideal research environment where rigorous study can be undertaken at a manageable scale, the results of which can be cleanly extrapolated for application at GB mainland scale.

The exceptional and unique learning opportunities provided by the NINES project are perhaps best summed up by our partners, National Grid, who state:

"an understanding of the behaviour and performance of the entities connected to [the Shetland Grid] will provide an ideal insight into how renewable generation and demand response might behave on the GB mainland given the right control environment, market arrangements and incentives."

Ian Welch, Research and Development Strategy Manager National Grid

See Appendix 6: National Grid - NINES project relevance to GB mainland network

Level of incremental learning

We anticipate that learning from this project will lead to the review of the relevance of existing industry standards to ensure they encompass new technologies, techniques and operating methodologies and the creation of new standards relating to energy storage and active system management.

Along with Professor Graham Ault and his team from our partners University of Strathclyde, we will derive learning from the NINES project which will answer the following questions:

- How can a distribution system be securely operated with a high penetration of renewable generation?
- What is the relationship between intermittent generation and responsive demand, including storage?
- Areas in which we will generate most learning will include the effectiveness of frequency responsive demand side management, maintaining network stability in an active operational environment and the interaction of the numerous variables on Shetland's closed electrical system.
- What is the economic impact on industry participants and other stakeholders of the low carbon operation of the network?
- What new commercial arrangements are needed to support a low carbon network?
- What is the impact of the low carbon network on domestic and industrial customers?
- Key learning points will include the effect on fuel poverty, changes of attitudes, awareness and behaviours amongst consumers and the extent of the financial impact on participants.
- To what extent do the new arrangements stimulate the development of and connection to the network of more renewable generation and reduce the area's reliance on fossil fuels?
- What effect does the NINES project and its legacy have on Shetland's economy and on the area's carbon footprint?

See Appendix B(iv): Description of Shetland Electrical System and prospective projection of NINES project results to GB - University of Strathclyde

The findings of the NINES project in relation to these questions are universally applicable to DNOs: we are undertaking a project which uses the unique aspects of Shetland's closed system, a microcosm of the GB system, to deliver learning that will inform the decisions of all GB DNOs.

Box 18: Outline the arrangements for disseminating learning from the Project

Taking learning from Shetland to GB

As noted in Box 17, the NINES project will generate high quality learning, clearly scaleable to the GB system. A key aspect of NINES is the effective dissemination of the knowledge gained from the project to industry participants and other stakeholders, in particular DNOs.

Learning from the NINES project will be disseminated in a wide variety of ways, reflecting the breadth of knowledge that the project will generate. The dissemination method will be tailored to each audience, although clearly there will be efficiency-driven overlaps where one dissemination route serves a number of audiences. A spreadsheet detailing how the different aspects of learning will be communicated to the various audiences is attached.

Efficiency is as relevant to this part of the project as to all others and we will periodically review the way in which we are disseminating information to ensure it delivers the most useful learning to the most relevant audiences.

See Appendix 7: Learning dissemination matrix

We will put in place an effective system to capture all learning from the project from the outset, with the core tool for this being an Electronic Content Management System (ECMS).

The key communication methods for sharing learning to the relevant audiences are noted below:

DNOs

Information will be made available to industry participants via a variety of methods, including conferences and seminars, via the ENA, professional bodies including the Institute of Engineering and Technology, technical and vocational training and the NINES websites along with other online channels. Industry participants will also be alerted to the publication of academic papers. All learning accumulated through academic study (below) will be made available to DNOs.

Reporting for DNOs

The NINES Annual Report, aimed at DNOs but accessible to all, will contain a summary of key learning extracted from the project each year. This will cover both technical and non-technical aspects. The broad distribution of the report, and its publication on the NINES website will ensure that the widest possible audience is aware of the learning being generated by the project.

Face to face

We will invite all DNOs to attend annual meetings with a cross section of participants on the islands including residents associations, generators, demand customers and local representatives. We will work with Shetland Renewable Energy Forum to ensure that a broad range of stakeholders are represented. This will allow DNOs the opportunity to gain first hand feedback about the experiences of everyone involved in the NINES project.

Wider audience: academia

Key to the academic learning is the publication of papers which will be published in relevant journals and online, and presented at key technical committees. Learning will be shared directly with students undertaking qualifications at undergraduate and postgraduate level. Several post doctorates will be linked directly linked to the NINES project.

Wider audience: communities

In addition to effective community liaison on Shetland, which will facilitate the dissemination of key learning, we have planned a multi-layered programme of communication which will bring the learning from NINES to a wide audience. Central to this is the development of an installation at Glasgow Science Centre where we will host visits from groups including DNOs, local authorities, industry participants, elected representatives, housing federations, government executives and NGOs.

Box 19: Outline the arrangements for Intellectual Property Rights (IPR)

Does the Project conform to the default arrangements for IPR? Yes

The NINES project consists of existing technologies from Transmission, Consumer Electronics, Existing communications solutions and technologies used in different applications elsewhere in the world. As such we do not anticipate the generation of significant IP.

All of our partners are satisfied with the standard IP conditions as laid out in Governance Document V3.

Involvement of External Collaborators and external funding

Does the Project involve External Collaborators and/or external funding? Yes

Box 20: If you have been unsuccessful in attracting External Collaborators and/or external funding to the Project, please detail your endeavours to do so

Scottish Hydro Electric Power Distribution has established a robust and comprehensive partnership to develop and deliver the NINES project. All relevant actors have been actively engaged in the development process and strong positive and productive relationships are firmly in place. Primary evidence for the strength of the partnership is as follows:

The high level of partner finance contributions that have been pledged in support of the project. Partners will provide 45% of the overall project costs or £23.4m of the £51.6m cost. This is highly significant and demonstrates the level of partner support for the project's aims and ambitions.

The range of the finance sources pledged. Our financing partners include a local authority, two charities, a housing association, two academic institutions and six private sector companies inclusive of SHEPD and, importantly, National Grid. The partnership has also applied for European Regional Development Funding and have secured finance from DECCs Smart Grid Demonstration Grant Programme to complement LCNF.

In summary, we believe we have engaged all the key actors required to ensure successful delivery of the project and secured the maximum amount of financial contributions possible from non-LCNF sources. This approach of maximising external contributions to advance the project aims will be maintained throughout delivery. Indeed, discussions are currently being held with EU Commission Officials in relation to Framework Programme 7 funding availability in 2011.

Box 21: Where funding is provided by a third party that is not an External Collaborator, DNOs should provide details of the funder. If there is more than one External Funder, details of others can be included as an appendix:

Organisation name	**Department of Energy and Climate Change**
Type of organisation	Government department
Amount of funding	£1,049,600
Funding arrangements	Smart Grid Demonstration Capital Grant Programme, December 2009
When funds will be provided	31/10/07: £209,920 on completion of design 30/11/10: £524,800 second stage construction payment complete 31/03/11: £314,880 report on project capital expenditure complete
Conditions of funding	Funding must be spent by 31/03/2011. Also standard DECC conditions.
Risks/uncertainties	All parties signed agreement and first tranche of funding received. Final payment subject to condition of funding above, i.e. funding must be spent by 31 March 2011.
Details of contract or agreement	All parties signed agreement and first tranche of funding received.

Box 22: Details of External Collaborators

DNOs should provide details of the 6 main parties who are collaborating with them on a Project. Details of any further External Collaborators should be included as an appendix.

See Appendix 8: Extra External Collaborators

Organisation Name	**National Grid**
Relationship to DNO (if any)	National Grid is a privately owned company and is not part of SHEPD.
Type of Organisation	National Grid's role is to partner SHEPD in developing the understanding and knowledge gained in relation to the GB system for the NINES project. To this end, both parties have agreed to share information and commit the necessary resources.
Role in Project	National Grid is an international electricity and gas company. It owns the high-voltage electricity transmission network in England and Wales and operates the system across Great Britain. National Grid recognises that there is relevant learning and application to the mainland GB system from the proposed Northern Isles New Energy Solutions (NINES) project.
Prior experience brought to Project	National Grid brings extensive Supply Chain and System Operation experience hence the project will be enhanced in the following areas: Development of demand responsiveness Integration of micro generation and 'large scale' generation Integration of low carbon heat and transport Efficient and reliable network investment and operation Dynamic behaviour of renewable generation and flexible demand Development of forecasting tools and techniques for demand behaviour Despatch methods Frequency control methods Development of contingency arrangements Local network constraint management and how this impacts on balancing Assessment and quantification of reserve holding Development of any balancing services required (both type and quantity). For example: arrangements for calling off a Reserve Service (type) of x MWs (quantity)
Funding	National Grid intends to commit, technical and commercial resource on a consultative and information sharing basis estimated at sixty person-days per year. It is envisaged this expertise will be at senior power system engineer level. Subject to change as the exact requirements emerge.
Contractual relationship	Letter of Intent signed and appended. *See Appendix 9: National Grid partner letter*
External Collaborator benefits from the Project	Details are provided in National Grid's paper on the NINES Project's Relevance to Mainland GB. *See Appendix 6: National Grid NINES project relevance to GB mainland network*

Organisation Name	**Shetland Islands Council – Housing Service**
Relationship to DNO (if any)	Local Authority Housing Provider
Type of Organisation	Local Authority Housing Provider Provide 520 replacement heating systems
Role in Project	Provide 520 replacement heating and hot water systems as part of larger housing refurbishment project driven by Scottish Housing Quality Standard.
Prior experience brought to Project	Contract management and housing management experience. Professionally qualified technical and housing staff. Close working relationship with tenant's representative groups. Also commitment to improving the standard of housing provision and quality of services for all tenants
Funding	£692,000 - SIC £854,000 – SIC share from ongoing ERDF grant application *See Appendix 4: SIC/HHA ERDF application*
Contractual relationship	Contractual arrangements will be finalised on confirmation of ERDF grant conditions.
External Collaborator benefits from the Project	Tenants will gain more efficient heating systems which should lead to cheaper fuel bills and reduce the levels of fuel poverty. Also, using the Feed in Tariff model we would also see a benefit to the Council in terms of a rebate scheme being returned to the owner of the equipment. Installation of advanced electrical heating systems will assist the Council to meet the Scottish Housing Quality Standard.

Organisation Name	**Shetland Heat Energy and Power Limited, 'SHEAP'**
Relationship to DNO (if any)	No Relationship.
Type of Organisation	Scottish Company, SC 181964. Operates an existing, successful, energy from waste based, district heating scheme in Lerwick, Shetland.
Role in Project	The project involves the use smart grid technology (ie demand side management and active network management) to allow an additional 10MW of renewable energy to be connected to the grid. SHEAP will build and operate a large thermal store (c. 150MWh), which will give the DNO the necessary stabilisation and control of load to allow the connection of the Gremista windfarm. SHEAP will be a co-investor in the Gremista windfarm along with the SSE Renewables. SHEAP will use the heat from the thermal store to extend the Lerwick district heating scheme.
Prior experience brought to Project	One element of the project is the large thermal store and associated expansion of the Lerwick district heating scheme, to be built and operated by SHEAP. SHEAP has been successfully operating the existing waste to heat based scheme for 12 years. SHEAP has over 1,000 commercial and residential customers. The existing district heating scheme infrastructure includes a smaller scale thermal store. SHEAP has successfully processed grant claims in the past for both EU and UK Government grant schemes.
Funding	SHEAP will contribute c.£10 million: c.£6 million co- investment in the 6.9MW Gremista windfarm and c.£4 million on the large thermal store and district heating scheme infrastructure. *See Appendix 5: SHEAP ERDF application*
Contractual relationship	Contractual arrangements will be finalised on confirmation of ERDF grant conditions.
External Collaborator benefits from the Project	The large thermal store is a demand side management facility. In exchange for facilitating the 'smart' grid, SHEAP will get lower cost heat, which will allow the expansion of the existing district heating scheme to include a further 300 commercial and residential customers, who in turn, will benefit from cheaper, renewable heat and greater price stability. SHEAP will also be able to co-invest in the commercial Gremista windfarm.

Organisation Name	**Glen Dimplex**
Relationship to DNO (if any)	Glen Dimplex is a privately owned company and is not part of SHEPD
Type of Organisation	Glen Dimplex designs and manufactures domestic and commercial electric heating appliances and is the world's largest electric heating business. Glen Dimplex have identified the potential to store renewable generation in storage heaters and water cylinders and thereby help SHEPD utilise renewable electricity generation in the future.
Role in Project	Glen Dimplex will develop and supply storage heaters and water cylinders for trial purposes, capable of receiving and responding to demand side management signals. The water cylinders and storage heaters will also incorporate the capability to respond to frequency signals.
Prior experience brought to Project	Glen Dimplex is the world leader in the design and manufacture of thermal storage heating. It has the expertise and resources to maximise the benefits from this technology and support trials.
Funding	Glen Dimplex will pay for the development of the thermal storage appliances, the DSM / frequency response controls and communications interface. The value of this will be £200,000
Contractual relationship	Glen Dimplex's contractual relationships in relation to the NINES project are with SIC and HHA.
External Collaborator benefits from the Project	The future of electric heating relies on reducing the carbon intensity of the electricity grid. It is hoped that this project will demonstrate that thermal storage heating devises are a useful tool in helping utility companies achieve there renewables targets through flexible DSM and frequency response.

Organisation Name	**Smarter Grid Solutions Ltd (SGS)**
Relationship to DNO (if any)	A minority equity share in SGS is held by SHEPD's ultimate owner, Scottish and Southern Energy plc.
Type of Organisation	SGS provide a range of products and services to help electricity network operators to avoid or defer network reinforcement costs through the active management of network constraints.
Role in Project	SGS have unique knowledge in the application and implementation of Active Network Management products and will bring their expertise to the broad-based solution for constraint management and system stability. SGS will provide automated real-time control solutions to actively manage loads, generators, and storage devices to resolve thermal, voltage and frequency constraints.
Prior experience brought to Project	SGS have unique understanding of the technical and commercial issues involved in the deployment of Active Network Management (ANM) solutions. The project will be significantly enhanced by applying the lessons learned by SGS in planning, designing and delivering ANM solutions that avoid network reinforcement. SGS will build upon the success of the world's first multiple generator / multiple constraint ANM scheme commercially deployed in collaboration with SHEPD in November 2009 as part of the previous Ofgem RPZ initiative to stimulate new technical and commercial practises.
Funding	Estimated to be £400k in direct funding relating to the supply of products at no cost to the project (£300k) and the assistance of SGS in learning and dissemination of results (£100k).
Contractual relationship	A commercial delivery contract will be put in place with SGS to deliver the required Products and Services.
External Collaborator benefits from the Project	SGS will benefit from a demonstration of our ANM solutions being applied to new constraints (principally frequency) and identifying the role that ANM can play in delivering system stability and enhancing the provision of ancillary services from distribution networks. SGS would expect the successful funding of this project to lead to job and value creation in the UK and additional export potential for SGS products.

Organisation Name	**Hjaltland Housing Association Ltd**
Relationship to DNO (if any)	No relationship to SHEPD
Type of Organisation	Housing Association. Provide affordable housing throughout Shetland.
Role in Project	Provide 230 homes replacement heating and hot water systems as part of larger housing refurbishment project driven by Scottish Housing Quality Standard.
Prior experience brought to Project	Contract management and housing management experience. Hjaltland also employ qualified energy surveyors who are certified to carry out Energy Surveys and produce Energy Performance Certificates.
Funding	£384,000 - HHA £427,000 – HHA share from ongoing ERDF grant application *See Appendix 4: SIC/HHA ERDF application*
Contractual relationship	Contractual arrangements will be finalised on confirmation of ERDF grant conditions.
External Collaborator benefits from the Project	Tenants will gain more efficient heating systems which should lead to cheaper fuel bills and reduce the levels of fuel poverty. Also, using the Feed in Tariff model we would also see a benefit to the Association in terms of a rebate scheme being returned to the owner of the equipment.

Box 23: Other partners

As outlined in section 20 SHEPD has built a comprehensive and solid partnership to ensure the effective development and delivery of the NINES project. This twelve strong partnership is comprised of companies and organisations that have committed resources, either expertise or finance, demonstrate their commitment to the project goals.

As outlined in Box 20 SHEPD has built a comprehensive and solid partnership to ensure the effective development and delivery of the NINES project. This twelve strong partnership is comprised of companies and organisations that have committed resources, either expertise or finance, to demonstrate their commitment to the project goals.

In addition to these core partners, a range of other organisations are involved in and supportive of the project and some may have a more formal role as the delivery proceeds.

Highlands and Islands Enterprise (HIE): HIE is the economic development agency for the Highlands and Islands area of Scotland, which includes the Northern Isles. Energy, and specifically renewable energy, is a target growth industry for the agency and HIE have been engaged at all stages of the project development process. The agency is keen to ensure that the maximum economic benefit is gained from NINES and is particularly keen to assist participation of the Shetland business sector to reduce energy costs and aid profitability.

Scottish Government: The Scottish Government is highly supportive of the project aims. The Climate Change (Scotland) Act 2009 received Royal Assent on August 5, 2009. This is one of the most ambitious climate change programmes in the world. The Bill creates a long-term framework that will:

- introduce a statutory target to reduce Scotland's greenhouse gas emissions by at least 80 per cent by 2050
- establish an interim target of at least 42 per cent emissions reductions by 2020, with a power for this to be varied based on expert advice from the UK Committee on Climate Change.
- Introduce a target to generate 50 per cent of Scotland's electricity from renewable sources by 2020 (~8 gigawatts) with an interim target of 31 per cent by 2011(~5 gigawatts), and 20 per cent of Scotland's total energy use to come from renewables by 2020.

The devolved government officials and Ministers have been appraised of the project aims. They strongly support NINES and have expressed this in a letter, which is appended.

See Appendix 10: Scottish Government letter of support for NINES

The Shetland Community: Perhaps the most important stakeholder in NINES is the Shetland Community, householders and businesses. Active engagement of the community will be crucial to the project's long-term success. To facilitate this active engagement the project incorporates a Community Liaison Officer and an information centre in the islands capital- Lerwick. The officer and centre will provide detailed advice on the storage heating systems, particularly on how to use them most efficiently. They will also work closely with householders to ascertain the benefits gained and monitor all feedback on the customer experience. A key role will also be to ensure that the heating systems are targeted at those most at risk of fuel poverty.

Further community engagement will be facilitated through **Community Energy Scotland** (CES), a core partner in the project. CES is a not-for-profit company established to support communities to develop, and benefit from, renewable energy projects. Through CES the project will reach and benefit many community groups and facilities on the islands by allowing local renewable energy projects to proceed that are currently not possible due to the grid constraints.

Relevance & Timing of Project

Box 24: Please outline why the learning from the Project is relevant to Network Operators

Evidence of the problem

At this point in time Shetland is suffering the impact of a constrained system which is **preventing the connection of new renewable energy sources**, this has emerged from the growth in renewables on the islands, the basis for the constraint is:

- Observed system behaviour
- Network stability

See Appendix 11: Additional Wind Generation Connection to the Shetland Power System - University of Strathclyde

Evidence of the problem presents itself regularly in the form of frequency excursions following system disturbances e.g. overhead line faults.

The normal response to such a situation in the UK mainland would be to increase the amount of plant in reserve and increase other ancillary services. In Shetland with no ability to export or store energy the only option currently available is to constrain renewable generation preventing total generation exceeding demand. Large amounts of 'diesel' spinning reserve would be self defeating in relation to the challenge of lowering carbon emissions. This same increasing requirement for ancillary services is highlighted in a recent National Grid paper.

Ref: National Grid :'Gone Green' Future Requirements consultation
http://www.nationalgrid.com/uk/Electricity/Balancing/services/FutureRequirements/

Under this project we will be using demand at domestic, I&C and SME levels to balance the network (both instantaneously and dispatched) using assets otherwise used for heating and hot water, this will direct funds that would have gone into traditional ancillary services back to the customer providing overall cost savings, and stimulating three 'Virtuous Cycles':

- Carbon Cycle
- Network Losses Cycle
- Fuel Poverty Cycle

See Appendix 3: NINES virtuous cycles

All three of these have an impact and contribute to DECC's Low Carbon Transition place.

In addition Shetland suffers from localised thermal and voltage constraints; our solutions will demonstrated the simultaneous management of Zonal and Global constraints.

Application of the solutions

These solutions will directly inform the design of the 'Shetland Repowering' project to ensure that future design encompasses the full potential of renewables. If successful they will result in a Hybrid power station, powered partly by a combination of diesel and battery, similarly to a Toyota Prius. Secondly with the learning from this project we will be operating in a situation where local voltage and thermal constraints on the network interact with more global stability and market constraints.

Timeliness

By December 2013 we need to produce a plan for 'Shetland Repowering which is consistent with the industry's low carbon challenge. It is also timely in that the benefits of basic ANM have been demonstrated in Orkney and are ready to move to the next level in preparation for wider application in GB. With the planned decommissioning of teleswitching, this project will develop a replacement for use in the Smart Grid world. With National Grid's forecast of step changes in the need for ancillary services this project will provide an evaluation of a significant and radical new approach that could accelerate the low carbon economy before significant investment is made in traditional solutions.

Demonstration of a robust methodology and that the Project is ready to implement (answers should be detailed in boxes 25 to 27)

Box 25: Please demonstrate that the Project has a robust methodology and can start in a timely manner

The NINES Project will be delivered in accordance with SHEPD's Large Capital Project Governance Framework and its associated documents and procedures. This process has been prepared to assist in the delivery of approximately £6.7bn of capital investment over the period 2000-2013. This process is compulsory for all capital projects with a value over £10m. (This manual can be made available upon request).

Project Governance structure is appended and the sponsorship and engagement of senior management reflects the profile and level of support afforded to this project. It also includes the range of external partners committed to the delivery of the NINES project.

See Appendix C: Organogram

SHEPD's preparation for this Bid Submission has comprised the completion of detailed Work Packages for the various elements of the project. This reflects a significant level of project readiness against which to implement the project. (These Work Packages can be made available upon request). Key early stage activities have been scoped in detail ready for commencement :

- Detailed design and subsequent procurement process for 1MW battery have been concluded. Installation and commissioning are planned for March 2011
- Shetland Islands Council, along with a range of partners including SHEPD, submitted formal applications for £2m of ERDF funding as part of a programme to upgrade heating and hot water installations in over 750 homes on the Islands. This programme must commence 2011 to meet ERDF /SHQS standards
- Six homes trial installation of new responsive immersion heaters with associated communications and IT equipment to commence October 2010 to inform full roll out
- Partners SHEAP and SSE Renewables are jointly developing necessary information to submit planning applications for Gremista Wind Farm and associated electric boiler for submission in September 2010

SHEPD has established significant full-time resource, along with collaborator resource for the preparation of the necessary project materials. This is reflected in the appended Project Plan.

See Appendix D: Project plan

In compliance with the Construction (Design and Management) Regulations 2007, we have completed relevant F10 Health and Safety Executive documentation for NINES, indicating our readiness to proceed.

Following Bid Submission, the SHEPD and collaborator team will continue further detailed project preparations in order to be active and ready to commence work immediately on Project Award.

The Costs and Benefits have been reasonably estimated through the detailed Work Package preparation, and with reference to available public source information, international comparisons, and academic input. Uncertainties may prevail due to certain assumptions made – for example the availability of technical installation resources, assumed prices for equipment provision still subject to tender response, and the prevailing exchange rate and commodity prices.

Box 26: Please provide details of the risks associated with the Project

Managing Risks

Risk management will be conducted in accordance of SHEPD's Large Capital Project Governance Framework Manual – 'Project Risk Management Plan (a copy of which can be made available upon request). This document requires the Project Director to be responsible for the creation of a register of risks, containing as a minimum, SHE, commercial, reputation, intellectual property, development, construction and operational risks shall be compiled, complete with costed mitigation and planned responses.

The full initial draft Risk Register is appended. The key risks identified are identified below.

See Appendix 12: Initial risk register

RISK	MITIGATION
Technology fails to perform	Where applicable utilise technology and equipment which has been previously proven e.g. in the Orkney RPZ scheme. We have also engaged KEMA to undertake an independent technical review of our proposal prior to implementation.
New Generation fails to materialise	Publicise new connection arrangements to potential developers at public event planned for Lerwick in September. Significant volume of generation connections are already in place for Shetland.
New Flexible demand connections fail to materialise	Work closely with SHEAP , SIC and HHA to ensure identified demands are delivered. Publicise new arrangements to encourage applicants.
Partner Funding is not secured	SHEPD have been heavily involved in the preparation of SIC and SHEAP applications for ERDF funding. Whilst initial discussions appear to be favourable, contingency plans will be put in secure alternative funding or amend project scope should this not be achieved.
Battery installation not concluded by March 2011	Procurement process progressed – preferred bidder identified. Closely monitor and assess performance.
Costs – payment to customers	We have set payments to customers participating in the scheme at a level at which we believe is appropriate. However, this remains to be "tested" and may need to be altered depending upon feedback from customers. Understanding the level of support required to encourage customers to participate in DSM schemes is an essential part of the learning from the project. We would look to work closely with OFGEM to review the level of payments and alter as necessary (either up or down) – this may have an impact on the project costs.

The risk register will be developed and monitored throughout the project to identify all risks and associated mitigating actions.

The project has been constructed as an integrated whole, and any scope changes (if required) by Ofgem prior to Project Award will require period of replanning and possible renegotiation with Collaborators/Suppliers which would delay commencement, and possibly impact on some critical path elements.

Avoiding the risk of stranded assets

Our NINES project is complementary, but not dependent on, Scottish Hydro Electric Transmission Limited's proposal to build a high voltage direct current link from Shetland to mainland GB. When the cable is completed, the NINES work will help optimise the efficiency of the cable and maximise its export capability. NINES and Lerwick Repowering will also provide the required security of supply for the islands.

Box 27: Please provide details of the risk monitoring procedures you will put in place for the Project

Framework

As stated previously the NINES project will be delivered in accordance with SHEPD's Large Capital Project Governance Framework. Risk Management is a fundamental element of our Framework. The relevant activities are described in the 'Risk House of Control'.

See Appendix 13: Risk house of control

As identified in the organogram (*Appendix C*) the **Project Director** will be responsible for:

- the overall co-ordination of relevant project materials – risk/issue registers; planning; document control; finance control and project status reporting.
- preparing materials for the monthly **Project Review Board** and quarterly **Steering Group** meetings.

The **Project Development Manager**, **Project Delivery Manager**, **Support Manager** and **Stakeholder Manager** will be responsible for :

- preparing regular control reports

Risk Monitoring

Risk monitoring procedures will be in accordance with SHEPD's Large Capital Project Governance Framework and associated documents (copy available upon request).

The Project's risk monitoring procedures will be supported by the establishment of a Project Review Board for quality management an technical review purposes.

See Appendix C: Organogram

These Boards will be drawn from relevant SHEPD personnel and the key external collaborators, whose credentials in this area are vital to the status of the Project and will provide an essential 'peer review' of the project. Furthermore, KEMA will provide a vendor-independent view of the technical proposals and solutions.

The Project Review Board will meet on a quarterly basis, ahead of the Steering Group – which will be convened at a suitable time prior to the required quarterly Ofgem reports. The Steering Group will also meet as required by any urgent risk/issue escalation actions.

An initial **Project Risk Register** has been prepared and this will be maintained following the Bid Submission.

Risk and issue identification will be the responsibility of all participants in the Project. **Risk Review** workshops will be held to generate the initial Project Risk Register together with the appropriate mitigations. The **Project Risk/Issue Register** will be reviewed by the Monthly Project Review Board – including the Project Director; and risks/issues categorised as 'High' (impact/likelihood) will be tabled at the Project Steering Group – unless a Risk/Issue warrants an exceptional meeting of the Steering Group – for example for significant cost over-run.

Section D: Appendices

Please list all the appendices you have attached to this pro-forma and outline the information which they provide. Where these appendices support any information provided in the pro-forma, that information should be adequately referenced

Appendix A (i)	**Full Submission Spreadsheet**
Appendix A(ii)	**SHEPD carbon and other savings**
Appendix B(i)	**Geographical location**
Appendix B(ii)	**Single line diagram**
Appendix B(iii)	**Shetland as a microcosm of the GB system**
Appendix B(iv)	**Description of the Shetland electrical system and prospective projection of NINES project results to GB – University of Strathclyde**
Appendix C(i)	**Organogram**
Appendic C(ii)	**Roles and responsibilities**
Appendix D	**Project plan**
Appendix E	**National Grid frequency excursion May 2008**
Summary	If DNOs include further information attached to this Pro-forma than that required by Ofgem then they must provide an executive summary of that information in less than 1000 words which should be attached to this pro-forma after Appendix D, and before the numbered appendices. All further details in the numbered appendices must be clearly referenced in the text in the pro-forma.
Appendix 1	Lerwick District Heating Scheme, Proceedings of the Institute of Civil Engineers
Appendix 2	Shetland Islands smart grid, requirements specification and architecture
Appendix 3	NINES virtuous cycles
Appendix 4	SIC/HHA ERDF application
Appendix 5	SHEAP ERDF application
Appendix 6	National Grid - NINES project relevance to GB mainland
Appendix 7	Learning dissemination matrix
Appendix 8	Extra External Collaborators
Appendix 9	National Grid partner letter
Appendix 10	Scottish Government letter of support for NINES
Appendix 11	Additional wind generation connection to the Shetland power system – University of Strathclyde
Appendix 12	Initial risk register
Appendix 13	Risk house of control
Appendix 14	SHETL partner letter