Network Innovation Competition Screening Submission Pro forma v.5

Notes on completion

Before completing this form, please refer to the relevant Network Innovation Competition (NIC) Governance Document.[1]

Please use default font (Verdana size 10) in your submission and retain 1.5 line spacing.

We will only accept the text visible in the text entry areas.

The text entry areas are predetermined and should not be changed.

The full-completed submission should not exceed 19 pages in total.

Ofgem will publish all the information contained within this Screening Submission.

Funding Licensee
Scottish Hydro Electric Power Distribution
Project Partners including other Licensees
To be confirmed at Full Submission
Project Title
Net Zero Island

[1] https://www.ofgem.gov.uk/publications-and-updates/version-30-network-innovation-competition-governance-documents All capitalised terms used in this document have the meaning given to them in the respective NIC Governance Document.

Project Summary			
SSEN's network serves the island communities of the North of Scotland, they are supplied from the mainland by subsea assets. In the event of a fault, repair durations can extend for months as a result of weather, geography and the supply chain. The predominant existing mitigation is carbon rich diesel generation. These generators provide a critical service, however, are not compatible with the transition to Net Zero. This project seeks to use whole system principles to find a more sustainable, economic and efficient means of providing island resilience. The project will deal with all aspects of the solution, technical, market, regulatory, to deliver an output which is replicable and implementable. The project will assess not only alternative solutions which have been tested and deployed elsewhere, but also emerging technologies, and market models which are unproven, to provide a new Low Carbon solution compatible with the challenge. Building on tools which have been developed from previous projects and new technology this project will run a design and procurement process to procure all appropriate services and create a complete system that can operate "electrically islanded" as would be required during a cable fault. SSEN will develop a template which can be replicated in other locations. We will implement the solution in one location to prove that template works economically, societally, and technically. Once this project has proven and demonstrated that the solution is appropriate, the locally based, low carbon, sustainable and affordable Whole Solution be rolled out to other suitable Distributed Embedded Generation (DEG) locations. The challenge of meeting the need for long duration islanding makes this project unique and worthy of innovation support.			
Estimated Start Date		**Estimated End Date**	
1 Feb 2023		1 May 2027	
Total Project Cost	£14.5m	**NIC Funding requested**	£13m
Technology Readiness Level (TRL) at start and end of project			3-7

What is the Problem that the Project seeks to address?
SSEN delivers electricity to people in our North of Scotland licence area including 59 remote island communities, supplied and interconnected through 110 subsea cables. SSEN currently owns and operates seven diesel-powered DEG sites on the islands, which provide continuity of service if the cables are on outage or have faulted. As required, we also use Mobile Diesel Generators to support resilience on islands without DEG stations in an outage. Importantly, these outages can extend for a prolonged period. The current diesel generation solutions are a major source of controllable carbon emissions. The existing back up diesel infrastructure is reaching or has reached its design life and there is currently not an obvious alternative to the use of diesel. SSENs ambition is to move away from dependency on diesel as a back-up solution and eliminate current emissions by exploring long term, locally based, innovative and enduring solutions. These would ideally bring value to the system and community all year round rather than only during faults. SSEN want to ensure security of supply for customers, achieve decarbonisation commitments and deliver a 1.5-degree carbon reduction pathway in line with our Science Based Targets. As GB moves toward Net Zero, securing a reliable electricity supply will become increasingly more critical for remote communities, therefore, it is essential that SSEN move to an alternative low carbon solution for providing resilience. Failure to do so could hinder the progress of the low carbon energy sector in these locations. There are multiple drivers for change on the islands, including additional renewable generation looking to connect, potential further investment in transmission links, as well as changes to access and charging policy which may further stimulate demand for connections. Simultaneously we predict an increase in demand on the islands from the ongoing decarbonisation of heat and transport. Other previous innovation projects have looked at how network resilience can be maintained, with high penetrations of renewable energy for short periods. The challenge of maintaining this for a prolonged period has yet to be addressed, therefore, further work is required to ensure that these carbon intensive solutions can be replaced by more efficient, low carbon options, which produce the best whole system outcomes for electricity consumers and residents. There are multiple potential options for technology and commercial solutions, some are still emerging, unproven or immature, SSEN will remain technology agnostic and engage with other current industry innovation programmes to investigate multiple technical options to offer the best Whole System long-term enduring resilience solution.

What Method(s) will be used and why? Ie, what is being demonstrated or developed? Please describe in terms of the NIC eligibility criteria. (page 1/3)

The Net Zero Island project will remove the use of existing standby diesel powered DEGs, along with the associated carbon emissions and replace them with innovative, reliable, sustainable and commercially viable long-term alternatives. The project will deliver financial and environmental benefits for customers, as well as wider societal benefits. The Net Zero Island innovation project is proposed to run in four phases.

- Phase 1 Define requirements:

The first phase will be to understand the current energy usage as well as the predicted future electricity demand on islands. SSEN will leverage previous studies carried out by local and national government, as well as the use of our Distributed Future Energy Scenarios to understand the future resilience requirement in the event of a cable fault. We will engage with stakeholders to better understand their needs and validate our assumptions. We will then look to understand how these needs can be delivered from existing techniques, such as Active Network Management (ANM) enabled local renewables and flexibility services like demand side management and commercial arrangements such as Constraint Managed Zones (CMZ). Where possible we will look to include learning from ongoing innovative projects such as SSEN's Resilience as a Service (RaaS) and NPG's Microresilience. Having undertaken this assessment, we will have a clear understanding of the residual requirements that can only be met from a specific resilience solution – i.e. the DEG replacement. This requirement will include the ability to provide the energy required for prolonged periods in the event of a subsea cable failure, as well as the ability to provide all relevant ancillary services and balancing functions. As well as the technical requirements, we will assess the differing commercial options and business models to provide the best whole system outcomes. SSEN has identified the local community and businesses as key contributors to this solution, we will involve them and fully consider local solutions to ensure our solution is aligned with local plans and delivers value for money for electricity customers all year round.

- Phase 2 Detailed Design, Option Appraisal and Simulation:

Once the likely range of options have been defined, SSEN will commence phase two, which is Design and Site Selection. During this stage SSEN will confirm what proportion of the island's demand can be achieved using established solutions and the residual requirement to be supplied from the new low carbon alternative to DEG.

What Method(s) will be used and why? (page 2 / 3)

By engaging with other innovation programmes, SSEN will consider a wide range of potential technology options and emerging solutions. The project will develop an assessment framework to consider the options identified and select the best whole system outcome. Given that the need for long duration energy storage is likely to form a key requirement, we plan to undertake a comprehensive assessment of the potential technical solutions, as well as the likely business models and commercial arrangements required to ensure the best whole system outcome. We have ongoing engagement with several industry innovation programmes, which are specifically funding the development and demonstration of long duration energy storage technologies [redacted] Our intention is to align investment and identify which of the options being developed by them has most potential to meet the resilience requirement for the island network. We would then demonstrate the technology on one of the island sites. Ahead of this we will undertake detailed technical, economic, and commercial simulations to ensure the viability of the solution. This will also help identify the best sites for a potential trial. This would be used to re-evaluate and validate the business case ahead of any potential demonstration.

- Stage Gate

Between phase 2 and 3, SSEN propose a stage gate to review solution design and business case ahead of phase 3 and 4 Demonstration/ Deployment and Operation. The Stage Gate is also an opportunity to test the marketplace for emerging technologies, give further certainty on funding and review the Business Case.

- Phase 3 Demonstration/ Deployment:

The third phase is Demonstration/ Deployment. Once options are appraised, assessed and the preferred option(s) is selected, SSEN will demonstrate the new technology option(s) at small scale on one of a short list of islands. This proof of concept of a long term, lasting and innovative solution will be used to inform future investment and future deployment to all DEG sites.

What Method(s) will be used and why? (3/3)

- Phase 4 Operate

The final phase is Operate. This phase is the rollout of the solution to defined areas and user groups to demonstrate real-world operation, record customer experience, and identify any unforeseen risks or unintended consequences.

The project output will be a roadmap to achieve decarbonisation of our DEG sites and deliver a more environmentally sustainable back up distribution generation solution with lower emissions and running costs. This will have considered a wide range of emerging and innovative technical options, as well as new business and commercial models.
SSEN also commit to sharing knowledge so that other opportunities can be created to roll out this solution across other GB networks where long term resilience options may be required, to meet both the challenge of delivering enhanced resilience as we move to net zero and maintaining network security during extreme weather events.

Funding Commentary (page 1/2) Licensee must provide a commentary on the accuracy of its funding estimate. If the Project has phases, the Licensee must identify the approximate cost of each phase. If the NIC is being used as match funding, please state the other sources of funding.

The Net Zero Island project will run for four years with a total cost of up to £14.5 million. These costs are based on an initial set of assumptions to ensure that the project outcomes are successfully delivered. The project can be divided into a number of discrete phases, which are broadly set out below

- Phase 1 – Define Requirements, approx. 10% of costs;
- Phase 2 – Design and site selection, approx. 20% of costs.
- Stage Gate
- Phase 3 – Deployment, 55% of costs; and
- Phase 4 – Additional Operational costs for demonstration, approx. 15% of costs.

The bulk of the costs will be incurred from Phase 3 onwards, therefore, it is proposed to have a Stage Gate at the end of Phase 2. This will allow the project costs to be better understood following completion of the initial phases of the project, allowing a robust review of the project business case to ensure that it still has the potential to deliver benefits for customers.

Funding Commentary (page 2 / 2)

Once confirmed, the project partners plan to make a contribution of at least 10% of the project value. The contribution will include in-kind provision of time, resources and data, ensuring that the project can proceed at a lower cost than if it was delivered commercially and allowing the project to utilise existing expertise and previous learning held by the partners.

At this early stage one of the key criteria in any enduring solution will be the requirement to include an element of long-term energy storage to meet the evolving energy needs of island communities. There are currently several ongoing industry-wide innovation programmes specifically focused on developing new options for long term energy storage. Further funding options are also likely to emerge as we move through the first two phases of the project and will be leveraged against the NIC funding.

These funds are supporting the wider development and demonstration of energy storage technology options, including technologies that may have the potential to fulfil some of the requirements necessary to reduce SSEN's reliance on embedded diesel generators.

Therefore, it is our intention to fully engage with the funding bodies to learn from progress to date and investigate options for further alignment, including requirements definition and potential technology demonstrations. This will help alignment of the funding streams and leverage additional value from both the NIC funds and the other funds. We will provide further details in the Full Submission Proforma.

Further details on the project costs and funding will be included in the Full Submission Proforma. We will also continue to endeavour to identify efficiencies and further sources of external funding to try and reduce the total funding requirement from NIC.

Which specific requirements does the Project fulfill?	
Mark YES in the appropriate box(es)	
A specific piece of new (ie unproven in GB) equipment (including control and/or communications systems and/or software)	**YES**
A specific novel arrangement or application of existing electricity transmission and/or distribution equipment (including control and communications systems software)	**YES**
A specific novel operational practice directly related to the operation of the electricity transmission and/or distribution systems	**YES**
A specific novel commercial arrangement	**YES**

How does the Project accelerate the development of a low carbon energy sector and have the potential to deliver net financial benefits to existing and/or future customers in the relevant sector? (page 1/2)
Looking to the future, many areas across our island network will experience concurrent and material drivers for investment. These include condition driven replacement of subsea cables, DEG plant reaching its end of life and stringent environmental legislation limiting our ability to continue to use diesel embedded generation. DEG stations are large polluters of CO2 due to the engines within the standby stations being diesel fuelled. This project will look to identify potential options for the use of low carbon innovative solutions as an alternative to our reliance on diesel as fuel source - significantly reducing emissions during unplanned outages. Currently it is necessary to curtail existing renewable generation on the islands due to the additional technical requirements of maintaining network stability when operating in “island mode”. Developing a solution which builds on earlier innovation projects (RaaS and Microresilience) could allow for greater access for renewable generation when running islanded or mainland connected. This will help support the viability of this renewable generation and the Net Zero Island Project will look to develop solutions which facilitate the connection of renewables during outage periods.

Accelerates the low carbon energy sector (page 2 / 2)

All Distribution Network Operators (DNOs) have responsibility to continually improve network reliability and provide appropriate levels of resilience for customers. The challenge of maintaining security will become ever more important as demand grows due to the electrification of heat and transport. The project will develop and demonstrate at scale, an innovative business model combining the necessary technical and commercial learning to maintain security of supply in these remote locations. Our island communities also possess some of the richest renewable resources and there are already substantial volumes of renewable generation on the island networks. There is significant appetite to further increase this. The rate and scope of this expansion will be driven by factors such as the outcome of the latest UK Government Contract for Difference auctions and Ofgem's final decision on Access SCR. This could materially change the network requirements needed to connect these locations, but there will still be an enduring need to provide a local resilience solution. The project will look to consider solutions which are adaptive enough to respond across a range of network scenarios.

Potential to deliver net financial benefits

The development of a low carbon locally based option for providing network resilience will reduce costs and deliver benefits for consumers. This will be from a combination of;

Reduced Operating Costs - Associated with the operating, maintaining and potentially replacement of assets that are approaching the end of their design lives.

Reduced Fuel Costs – by delivering a solution which utilises local renewable resources by building on ANM and CMZ techniques it will reduce the fuel cost for any embedded power station

Capital Cost – undertaking a detailed option appraisal across a range of emerging technology options, combined with a potential demonstration of the most appropriate options will provide SSEN with new learning and experience. This will allow SSEN to make a better-informed proposal for the long term replacement of all of our embedded power stations, thus reducing the cost and risk for consumers.

However, the project will also provide environmental and whole system benefits. SSEN will optimise the use of local solutions, bringing further economic benefits for both network customers and local residents. We will consider how best to use Whole System and Social Return on Investment approaches to support our assessment to deliver the best outcomes.

How will the Project deliver value for money for electricity customers?
The challenge of maintaining security in our island networks will become more crucial as demand grows due to the electrification of heat and transport. As part of the drive to Net Zero there is a requirement to reduce the environmental impact of our operations, in particular, highly carbon intensive options, such as the standby diesel generators used on our Scottish Islands. The Net Zero Island project will develop and demonstrate at scale, an innovative business model combining the necessary technical and commercial learning to show how local resources can be used to maintain security of supply. The long-term cost of replacing the existing DEG sites with low carbon alternatives is significant, however, the learning from this project will be used to help develop alternative options, which will reduce the overall cost for consumers, whilst driving a more sustainable solution. The project has been designed to ensure the solution is proven to be safe, replicable, and acceptable through robust demonstration of the methods. The development and demonstration of the Methods will prove network resilience on the island network can be maintained using new techniques using local assets supported by new long duration energy storage equipment. The project will engage with the most appropriate energy storage technologies by leveraging additional value from other ongoing innovation programmes. The project will investigate new innovative business models or commercial arrangements to ensure the long-term economic sustainability of the solution, as well as ensuring it produces the best whole system outcome for consumers. The Net Zero Island project will allow network investment to be deferred, avoided, or substantially reduced, whilst still maintaining the long-term reliability of the island network, and ensuring that both SSEN and the wider community are able to realise their environmental objectives. The project will build on earlier innovation projects in this area including the technical learning from the NINES project, long term energy planning from SSENs RESOP project and the resilience aspects of RaaS and Microresilience projects. The project will also draw upon the learning from Project LEO to develop locally based energy systems, as well as further developing initiatives such as ANM and CMZ. This will give a firm foundation for the development of the Net Zero Island project, and ensure it is delivered within budget to ensure that customer benefits are realised.

How will the Project generate knowledge that can be shared amongst all relevant Network Licensees?
SSEN's RaaS and NPG's Microresilience projects demonstrated the technical potential for delivering resilience, focusing on securing supplies during short periods. The repair times for subsea cables are significantly greater, than those on land, therefore a much longer duration solution is required for our island networks. A locally based, low carbon commercially driven resilient microgrid installation has never been undertaken on the GB network. Consequently, there are many questions about the application of this type of approach. There is no blueprint for the balance of technical, commercial, logistic, environmental and social activities that is needed to deliver this solution, particularly in the context of the GB network and regulatory regime. This project aims to deliver this blueprint. The project learning will also support several other activities that are currently underway and will actively engage with those. There are three broad areas where learning can be categorised; • The project will facilitate the increased uptake of low carbon technology, to help achieve legally binding commitments to deliver Net Zero, and other societal needs of interest to regional and national government, regulatory and associated commercial stakeholders, such as energy resource developers. • Open Networks, ENA working groups on low carbon technologies and resilience are tasked with the development of future network architectures. This project will help transition theory into real life demonstration to inform and consolidate this work. Flexibility service markets are new and the range of tested applications are relatively narrow. This project will evolve and test the capabilities of the commercial and market arrangements so increasing their use, access and effectiveness from market participants, and the Network and System Operators; and • The project will be of interest to groups that will benefit directly from the use-cases, which will be demonstrated and tested. Organisations representing community groups, agriculture, and other rural interests will be actively engaged, consulted and informed as part of the project. A comprehensive strategic and tactical workstream to disseminate new learning will be delivered as part of this project.

Answering Yes or No, does the Project conform to the default Intellectual Property Rights (IPR) arrangements set out in the NIC Governance Document? If answer is NO, the Licensee must demonstrate how learning will be disseminated to other relevant Licensees and how value for money will be ensured. The Licensee must also outline the proposed alternative arrangements and justify why the arrangements are more suitable than the default IPR arrangements.
Yes

How does the project demonstrate it is innovative (ie not business as usual) and has an unproven business case, that the innovation risk warrants a limited Development or Demonstration Project to demonstrate its effectiveness?
This project will see the development and demonstration of a low carbon whole system solution that will allow remote island networks to operate “electrically islanded” for an extended duration. The focus of previous projects does not extend to the required timescales and as such a new approach and new technologies are required. Whilst there have been previous NIC projects (RaaS and Microresilience) that build on technical demonstrations, this approach has never been previously implemented on the GB network. The project will also look to utilise flexibility services to manage demand on the islands and optimise the use of local renewable generation. However, the key requirement to be able to operate “islanded” for months at a time; presents an additional set of economic, technical, commercial, and regulatory challenges which will need to be addressed, if an appropriate solution is to be found to this issue. The range of potential future energy scenarios on these islands and the broad range of emerging technical options for energy storage, which could be available in the future, mean that there is currently no proven business case for a “Net Zero Island”. Specific challenges and uncertainties include: **Requirements Definition** - a validated set of requirements for Net Zero Island is needed to enable DNOs to define the solution required. **Technical Standards** - need to be developed for this mode of network operation, in particular the role of long duration energy storage, network stability, earthing and protection. **Market Readiness** - there is currently no reliable market information available to potential service providers allowing them to consider this potential service when developing their projects. **Investment and operating costs**. At present any projects in this field have been highly bespoke and customised. Without the additional learning delivered from this project it is unlikely that this solution would be delivered via the BaU mechanisms. Therefore, the project requires additional NIC support to realise the benefits to customers and allow GB to achieve its carbon reduction targets.

How were Project Partners, external resources / funding identified, and what are their respective roles in the Project? Please evidence how Partners were identified and selected, including the process and rationale that has been followed. The Licensee should provide details of any Project Partners who will be actively involved in the Project and are prepared to devote time, resources and/or funding to the Project. If the Licensee has not identified any specific Project Partners, it should provide details of the type of Project Partners it wishes to attract to the Project.

A successful Net Zero Island project will engage with partners in the following three areas;

Islands Energy Scenarios – in the development of our RIIO-ED2 business plan, we engaged with stakeholders on the islands including local communities, regulators, local and national government who all agreed that lack of reliability had a high impact on both demand and generation customers. They support low carbon options and local engagement. [redacted]

Technology – a long term solution is longer duration energy storage to support the network during a prolonged cable outage. At this stage none of the potential technology options are mature enough to be considered for deployment. Therefore, it is important to remain technology agnostic until we better understand the requirements and assess the options to meet our needs. However, we have engaged with other innovation funds with a specific focus on long duration energy storage [redacted] We are investigating options to leverage additional value across the various funding options.

Commercial and Market place – a proposed solution must be cost effective and deliver value for consumers. This requires a robust assessment of the options to identify the best whole system outcomes. The project will investigate alternative market arrangements or new business models to support the innovative solution. There are specialist consultancies who could deliver this work with whom SSEN will engage on a commercial basis to secure best value.

We are engaging with potential partners but we are not yet in a position to confirm their involvement in the project. As part of the Full Submission we will align project timelines to maximise delivering value to both SSEN and island consumers.

Would the Project require any derogations or exemptions to current regulatory arrangements? If YES, please provide details of the required changes.
At this stage it is not anticipated that any exemptions or derogations will be required.

How will the Project activities impact customers? The Licensee should outline any planned interaction with customers or customers' premises as part of the Project, and any other direct customer impact (eg amended charging arrangements, supply interruptions).
At this stage we do not anticipate any direct interaction with customers; however, we do anticipate that some of the solutions that will be assessed may involve third party engagement with Customers (e.g. Energy Suppliers providing flexibility through optional local tariffs). This is an area which we will continue to review, and we will provide further details in the Full Submission as appropriate.

Are there any further details the Licensee considers would support its submission?
None currently.

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