SIF Beta Round 2 Project Registration

Date of Submission

Oct 2024

Project Reference Number

NPG_SIF_013

Initial Project Details

Project Title

MultiResilience Project – Enhancing Energy Network Resilience

Project Contact

Ben Sibree-Paul

Challenge Area

Improving energy system resilience and robustness

Strategy Theme

Net zero and the energy system transition

Lead Sector

Electricity Distribution

Project Start Date

01/12/2024

Project Duration (Months)

45

Lead Funding Licensee

NPg - Northern Powergrid (Northeast) Limited

Funding Licensees (not required)

SSEN - Scottish Hydro Electric Power Distribution Plc

Funding Mechanism

SIF Beta - Round 2

Collaborating Networks

Scottish and Southern Electricity Networks Distribution

Technology Areas

Community Schemes

Control Systems

Network Automation

Network Monitoring

Distributed Generation

Energy Storage and Demand Response

Resilience

Storage

Substation Monitoring

Substations

Project Summary

Resilience is increasingly important as customers rely more on electricity for heatand transportation, with greatest value in rural locations that have a heightenedrisk of outage. Proliferation of Low Carbon Technologies across LV and HVsystems present opportunities, if coordinated appropriately, for delivery ofresilience services that maintain customer supply during unplanned grid outages.Previous projects have demonstrated separate approaches via LV-connected andHV-connected resilient DERs. Coordination of such solutions can enhance thevalue case of resilience. The project will compare and contrast technologies andoptimise hybrid applications of the two approaches to deliver cost-effectiveresilience to customers.

Add Third Party Collaborator(s)

Smarter Grid Solutions

TNEI Services Ltd

Project Budget

£8,317,990.00

SIF Funding

£6,255,384.00

Project Approaches and Desired Outcomes

Solution statement and solution focus

The ongoing electrification of heat increases customer reliance on electricity supply to meet basic needs. The project addresses the challenge of improving the resilience of distribution networks, reducing the frequency and duration of customer interruptions through coordinated operation of the growing number of distributed energy resources deployed on distribution networks. MultiResilience will establish the standard designs, technology interfaces, operational control principles and commercial arrangements that facilitate truly coordinated resilience from customer devices across distribution system voltage levels.
The project builds on learning from SSEN's Network Innovation Competition Resilience as a Service (RaaS) and Northern Powergrid's (NPg) Network Innovation Allowance (NIA) MicroResilience projects, which have demonstrated solutions for customer-driven HV resilience and DNO-provided LV resilience respectively.
RaaS has studied and demonstrated third-party delivered resilience, maintaining customer supply under grid outages via a single HV-connected Battery EnergyStorage System (BESS) deployment. The project has explored the commercial/revenue stacking opportunities for the BESS operator, alongside the technical specification that must be met to ensure the BESS can safely meet the energy needs of the network area and within the technical restrictions of grid operation.
MicroResilience has demonstrated a bottom-up approach to maintain supply to local distribution networks through restoration of the LV network. The project has
deployed MicroResilience solutions consisting of a Microgrid Controller, BESS, and a Power Electronics Device (PED) that provide supply to LV networks under outage whilst supporting system restoration, planned transition to islanded mode and resynchronisation to grid-connected mode.
Both projects have delivered crucial learning that informs the deployment of individual technology solutions. However, they have not demonstrated coordination between solutions. Study and demonstration of coordination of multiple MicroResilience deployments, then enhanced by the RaaS solution to support the EHV/HV network, can allow DNOs to ensure enhanced resilience: maintaining grid supply under a wider range of outage conditions, extending the period of supply through resilience solutions during outages, and reducing overall cost of delivering resilience -- all of which present value to network users. This ambition is directly aligned with the Competition objective of Improving Energy System Resilience and Robustness.
The project will demonstrate the deployment of multiple MicroResilience solutions to LV networks all located below a single Primary substation, exploring the feasibility and impact of MicroResilience support to the HV network or neighbouring LV networks under certain outage conditions. This requires an extension to the deployment model which to date has focused on maintaining supply in the deployed LV network. The approach will extend the number of outages that can be supported through MicroResilience and extend the network areas (and number of customers) supported by the solution. Like the deployment of multiple MicroResilience solutions, this demonstration will define the value case in terms of extending number of outages supported, the network area covered by resilience, and ultimately reducing the cost of delivering resilience to customers, while considering how third-party owners might operate batteries.
The project will demonstrate the inclusion of distributed, smaller-scale, third-party owned energy resources that can operate during outages to complement the keysource of resilience and add value to the overall solution. This incorporation of multiple devices and monitoring/controlling their operation (as required) can significantly add value to resilience solutions, particularly as the number of deployed customer energy assets increases.
The coordination between MicroResilience solutions and where, appropriate, the RaaS solution will be achieved by deployment of the DNO Resilience Controller to provide functionality to assign grid-forming devices from the available portfolio and coordinate energy resources to support the network. The project will define the standard specification and design for a controller to ensure scalable roll-out as BaU in future.

Innovation justification

The project applies within the Improving Energy System Resilience and Robustness challenge theme and directly meets the requirements through demonstration of coordinated approaches to delivering distribution network resilience, specifically delivering supply to customers in rural areas during higher-probability-than-average grid outage conditions.
The project builds on learning from both MicroResilience (NIA) and RaaS (NIC) projects, taking the single-deployment cases from both projects and demonstrating the enhanced value of coordinated deployment of multiple MicroResilience solutions in a network area, complemented by coordination with the RaaS HV resilience solution. Both projects have featured widespread dissemination and stakeholder engagement.
The project will deliver resilience through the islanded operation of HV and LV network areas, where electricity supply is provided via existing distributed energy resources connected to the network. This is not standard practice for distribution network

operations, where traditionally resilience is provided by network infrastructure redundancy, and where temporary supply under outage conditions is provided (eventually) via diesel generators. The entire MultiResilience proposition presents a new way of operating rural networks under outage conditions and involves the novel real-time coordination of both network assets and third-party energy assets.
The closest state-of-the-art is reflected in the MicroResilience and RaaS innovation projects, which have demonstrated the delivery of resilience from single-source solutions to very specific network areas. MultiResilience will expand on these projects significantly, where the coordination of the distinct solutions will enhance the value case and improve the scalability of these solutions. We note these previous demonstrations have been solely in the context of innovation trials.
The proposed MultiResilience solution expands on solutions that have been recently demonstrated to TRL7 at single locations. These have levels IRL5 and CRL5. The proposed MultiResilience solution of coordinating these higher TRL solutions will enter this project at TRL3 and following demonstration achieveTRL7/8.
The project builds on existing innovations that are being demonstrated on networks today. To achieve the full coordination of these solutions and enhance the resilience provided by the solutions, a network demonstration is required to explore the operational interactions between solutions and evidence the value case under grid outage conditions.
The project introduces undemonstrated technical innovations, consisting of solutions to manage network areas as electrical islands, which has untrialled technical risk requiring funding through innovation channels . There are also substantial economic and social challenges, such as (i) what is the best way to incentivise the resilience from third-party providers, (ii) how strong should these incentives be at different voltage levels and (iii) how can rural customers and communities be encouraged to participate.
Without this project, a counterfactual approach would be to deploy RaaS and MicroResilience as single point-solutions that address a reduced range of outages on highly specific network areas. But without demonstrating the coordination between the solutions, any overlapping deployment of the solutions to a similar network area will introduce potential conflicts and require a single solution to be picked as a 'winner'. This would overlook the value case of the complementary solutions and would fail to derive value from the combination of both solutions.
Another alternative might be to reinforce the network. For resilience, this may have limitations as the redundant assets are generally close to each other and therefore subject to similar weather and storm risks. Further this approach does not embed resilience deep within the network and provide security beyond its immediate location . Finally, reinforcement in rural areas can often be very challenging due to the required circuit lengths, and environmental and consenting challenges. Consequently, the improvement in resilience using additional network may be expensive and of low benefit.

Impacts and benefits selection (not scored)

Financial - future reductions in the cost of operating the network

Financial - cost savings per annum on energy bills for consumers

Financial - cost savings per annum for users of network services

Revenues - improved access to revenues for users of network services

New to market – processes

Impacts and benefits description

When deployed at scale, MultiResilience will allow third party distributed energy resources (DERs) to enhance more efficiently HV and EHV network resilience, compared to uncoordinated energy resources. Once RaaS and MicroResilience are complete, DERs in the LV network will support secondary networks, and DERs in the HV networks will support primary networks. MultiResilience enables a smaller total volume of DERs (e.g., fewer MW and MWh of batteries) to deliver the same resilience outcomes for consumers. If this resilience is remunerated through a new service, then this will mean reduction in the costs that DNOs spend on 3rd party resilience services, leading to cost savings in bills, and cost savings for users of network services without impacting network resilience.
Potential benefits have been estimated against a counterfactual where DERs in HV networks (like RaaS) are used to enhance resilience. We assume there will be widespread need for these services due to (i) an increase in unforeseen and extreme weather events with a changing climate, and (ii) the electrification of heat and transport increasing society's willingness-to-pay for a more resilient electricity system.
We have conservatively assumed that, in the counterfactual, a RaaS-type service would be required on all the most rural networks in NPg's licence area. Analysis of NPg data shows that there are 65 primaries for which almost 100% of the downstream secondary substations are located in rural areas, according to 2011census classifications. This is around 10% of the primaries in

NPg's two licence areas. We assume that the resilience of each primary would rely on a RaaS solution sized to 2/3rd of its peak demand, receiving a payment of £10,000 / MW /year. Peak demand projections for each primary come from NPg's DFES for the Consumer Transformation scenario. These figures combined give an estimate of the total payment required for third-party resilience services in the counterfactual.
We also assume that there is widespread deployment of additional DERs and batteries in the LV network, and behind the meters of domestic and non-domestic customers, including agricultural customers. MultiResilience will enable these DERs to support the larger RaaS-style battery, meaning it can be smaller and reducing the capacity for which the DNO needs to contract. These are rolled outgradually during RIIO-ED3. We have assumed these resources allow the RaaS-style service capacity to be reduced by 20%. We assume that each deployment of MultiResilience requires an upgrade to the RaaS control system at a cost £50,000each. This leads to benefits of £13.9M for NPg, scaled up to £27.8M for NPg andSSEN and £106.9M for all DNOs.
These benefits have been explored through sensitivity analysis, through consideration of different DFES, and by varying the costs of deploying the control systems and the achievable reduction in resilience service fees. The highest calculated benefit is £235.0M, and the lowest is £42.8M. In general, these estimates are conservative, and in practice it is very possible that MultiResilience could be deployed at an even greater scale than assumed here.
The implementation of MultiResilience will increase the access for DERs in the LV networks to revenues associated with resilience services, which will help increase the business case and profitability of small DERs throughout the country. This will also further promote the concept of local energy empowerment and sovereignty from by projects like Community DSO and project LEO-N.
Finally, combining DERs from different voltage levels for resilience might lead to lower volumes of expected energy not served, fewer customer interruptions and shorter durations of customer minutes lost. All these potential benefits will be explored and quantified in more detail through the delivery of the Beta project.

Teams and resources

The project will be delivered by
Northern Powergrid (NPg), TNEI, Smarter GridSolutions (SGS), Scottish Hydro Electric Power Distribution (SHEPD) building on learning from the previous successful collaboration on the MicroResilience project as well as the work SHEPD has done with support from TNEI for the Resilience as a Service (NIC) project.
The project team offers a best-in-class collaboration between the Consultants at SGS, bringing expertise in the modelling of DER optimisation and design of innovative network control solutions, TNEI with their network analytical skills, and the Innovation Engineers at NPg and SHEPD who are well-versed in both the development and demonstration of innovation concepts across their distribution network and ensuring solutions that are fit for post-project implementation.
TNEI is a specialist in modelling and analysis of transmission and distribution networks across GB and internationally. TNEI will work with NPg to analyse network impacts, lead the development of specifications of MultiResilience, and undertake virtual trial simulations to understand and confirm the implications for the broader network.
SGS is a UK-based vendor of DER Management System (DERMS) software that provides monitoring, optimisation and dispatch functionality to distribution utilities and DER owner/operators. In addition to teams dedicated to the design and development of innovative control solutions, SGS has a team of consultants that deliver novel modelling and analysis studies that explore the impact and value case of new control solutions.
Northern Powergrid is responsible for expert steering and review roles within the project, ensuring that all project outputs and learning outcomes are relevant, feasible and tailored for distribution licensees to derive value from.
Northern Powergrid will also provide the network facilities and site for the field installation and operation of the individual MultiResilience devices and broader aggregate MultiResilience system. Along with SHEPD, NPg will ensure that all network implementation issues are properly considered to allow for subsequent technology roll-out.
SHEPD are delivering the Resilience as a Service (RAAS) project. This NIC project uses a utility scale battery to maintain supply to remote community in the event of grid failure, alongside acting in the energy market to increase value. The project enables local network areas to be operated in islanded mode to ensure customers have a resilient supply. RaaS provides some of the tools and controls which enable local parts of the network to be operated in isolation to the benefit of the network, but also exploiting market drivers. This provides a similar service to MultiResilience, albeit at a different scale. SHEPD will ensure that the high-quality learning of RaaS is considered within the MultiResilience implementation. Further, SHEPD provide a second DNO perspective on any implementation and specification developed, especially with a view to post-project roll-out of either technology.
The project will subcontract two further significant roles to bring additional expertise into the team. Firstly, real-time network simulation capabilities will be delivered by a University research team with expertise in battery operation and an existing a smart grid laboratory. Secondly, a commercial battery operator will be contracted, both for sharing appropriately anonymised data on battery operation that can be used in simulation and analysis, as well as demonstrating decision making within project trial settings. Positive initial discussions have already taken place with organisations of both types.
The project will also repurpose existing NPg owned battery units originally procured for the Customer Led Network Revolution

(CLNR) project. Some subcontracting support may be required to deploy these, such as civil engineers to install the batteries in the new locations, or specialists to refurbish and reconstitute the battery system in new configurations.

Project Plans and Milestones

Project management and delivery

The proposed governance arrangements, including key roles and responsibilities, are like those successfully deployed in previous projects such as Community DSO and the CLNR LCNF project.

An experienced innovation project manager from within NPg will be appointed to manage key project activities, ensuring tasks across each work package are progressing on schedule and within budget. The project manager will be responsible for keeping the project plan and risk register updated and liaising withother parts of the NPg business as required. This includes a design authority, within NPg, with expertise in key topics such as network design, ICT systems, and commercial aspects of resilience. The design authority will help to ensure that workstream outputs are aligned, and that project recommendations have been designed holistically.

Steering and broader governance is in addition to the usual regular project progress activities required to ensure delivery of the project outcomes. The project will establish a steering board with senior representatives from all the project partners. This group will meet quarterly and take overall responsibility for the delivery of the project, will sign-off on critical decisions and deliverables, and help manage critical risks. The steering board will be accountable to NPg's Director of Energy Systems and the Director of Engineering, who are the Project Sponsor'swithin NPg.

Managed via the steering board, the project will also utilise the skills and expertiseof NPg's extant Independent Stakeholder Group. This brings an external perspective that provides a much broader range of opinions in directing the project and sharing its outcomes.

The project is planned over 45 months and across 4 work packages and includes a project mobilisation period of 3 months where partner contracting, and other procurement, can take place alongside establishing the project management programme and bodies within the governance structure. This will help to mitigate the risk of project delays from these crucial activities. The risk associated with the cost and procurement of battery assets, critical for the project, has been mitigated by obtaining a fixed-price contract for the refurbishment of existing battery assets from CLNR for re-use in MultiResilience. One other key risk to the project is that faults may not be experienced during live trials, limiting the scope for testing resilience, however simulated trials are also planned.

The project Gantt chart highlights the critical path and the dependency between trial design and physical trial delivery. The plan for offline simulations can be very flexible to complement the specifications of the physical trials, or even replace part of the physical trials if this is deemed better value for money or supports higher quality project outputs if any issues impact the physical trial delivery.

The first stage gate is September 2025, following the first stages of trial design and the continued operation of the existing MicroResilience trial site but prior to the refurbishment of the CLNR batteries and deployment at the MultiResilience trial sites. A second follows mid-2026 between trialling individual and thencoordinated solutions. The final stage gate review is planned for June 2027 following a review of the physical trials, to determine if the project should proceed to the full final analysis work package or limit the scope of this, depending on the trial outcomes.

There are no planned supply interruptions as part of this project, however site selection for the physical trials will be informed by analysis of historic faults/supply interruptions to ensure the areas of the network selected will benefit most from the resilience provided. It is therefore expected that supply interruptions will occur, however any extreme events or longer duration interruptions will be examined through simulated rather than physical trials.

Key outputs and dissemination

The key objectives for the project are to determine, record and disseminate the following:

Establish a template for interoperability between multiple resilience solutions (and assets). This includes the following key deliverables:

1. A technology design template (including communication technology options vs resilience solutions) (SGS);
2. A commercial business model and/or market template (TNEI, NPg and SHEPD)
3. DNO procedural templates (including but not limited to processes for restorationand operational decision making in the control room) (NPg, SGS, SHEPD).

Understanding and managing emergent behaviours from conflicting and coordinated resilience solutions and assets in real-time operational timescales, operational planning timescales, and investment / strategic planning timescales (All Partners).

1. This includes quantifying the additional value of coordinating solutions across all voltage levels, which will be presented in an updated cost-benefit analysis forthe MultiResilience concept (TNEI).

Adaptation of commercial structures to incentivise resilience solutions to be in the "right" place (e.g. at which voltage levels, or in

customer premises) and behave in the "right" way.
1. Findings here will be published in a report that supports the successful adoption of the MultiResilience concept after project completion (TNEI, NPg, SHEPD).
By understanding technical performance, economics and social acceptability when fleets of these devices are deployed across the network, these objectives will ensure that technically and commercially optimised resilience solutions are available for deployment by all GB DNOs. This will ensure that customers have sufficient confidence in the improved continuity of supply that network reliability is not perceived as a barrier to the electrification of society.
A live log of lessons learned will be maintained as one of the responsibilities of the NPg project manager, alongside the other PM tools, which will be populated as the project progresses. Reflective sessions with the project team will be arranged following key delivery points in the project, and the lessons that emerge from these sessions will be incorporated into approach for subsequent tasks or will inform updates to the project plan, as appropriate.
Dissemination of both project outcomes and more general lessons learnt will be through a wide variety of complementary channels. The ENA's Electricity Innovation Forums, the Energy Innovation Summit Conference, project partner websites and webinars, conference papers, such as CIRED and CIGRE, as well as current bilateral and multi-lateral channels such as NPg's Independent Stakeholder Group will all be utilised. Managing the dissemination and publicity programme will be the responsibility of the NPg project manager, and will be an ongoing activity throughout the project.
The project partners each have considerable experience in innovation and will collectively foster the open and collaborative ways of working required to successfully deliver and disseminate the project outcomes. This can readily be achieved through online shared working environments and regular meetings, supported by periodic in person meetings at critical times during project delivery.The project team has already established a successful, collaborative working relationship for this proposal, building on experiences in recent innovation projects (for example, NPg and SGS for MicroResilience, and TNEI and SHEPD for RaaS,and TNEI and NPg for Community DSO).

Commercials

Intellectual Property Rights, Procurement and Contracting (not scored)

IP arrangements will be in line with the standards set for SIF projects in the governance documents. The project will publish all outcomes and findings. These will primarily be in the form of reports and guidance on the application of MultiResilience or hybrid systems including a Resilience as a Service (RaaS) element. The project is not expected to develop any inventive IP. To ensure the development of a market the project will publish sufficient technical information to allow the development of open functional specifications and operating procedures to allow second and third parties to easily participate in future calls for the operation of resilience systems compatible with MultiResilience.
The project anticipates the selection of an academic subcontractor, contracted to NPg, to provide real-time simulation in a laboratory environment as part of the testing and analysis of any network configurations both prior and post filed implementation. This is a specialist requirement and the opportunity for a full tender may be limited but we will assess this once the technical requirements have been defined in earlier project phases.
The project will want to consult with a commercial BESS operator about providing appropriate technical and commercially attractive propositions to attract secondand/or third-party participants in MultiResilience roll-out post project, as well as providing insights and data about how commercial battery systems will operate onthe network. This work is expected to be contracted on a commercial basis.
Subcontracting will also be needed to support engagement with the types of ruralcustomers and communities that are expected to be involved in MultiResilience.
These are skills that NPg use in many projects and will select the contractor at the appropriate time via tender. Finally, subcontractor support is expected to be required to refresh, set-up, and install the NPg-owned batteries in the trial locations.

Commercialisation, route to market and business as usual

Commercialisation is designed into the structure of the project and the MultiResilience concept; using existing DERs on the network to enhance resilience with no need for dedicated new assets. Accessing resilience that is naturally made available by a diverse range of DERs participating in other competitive markets ensures that commercialisation will not undermine these.
Interoperability and standardisation are central to the project's scope. The project team includes two DNOs covering diverse network and consumer archetypes. It also involves companies that own and operate DERs, particularly batteries. This ensures that solutions are generalisable and scalable, while also being attractive for third-party providers, accelerating the adoption into business-as-usual.
A commercialisation plan will be produced from project outputs, including:
Standardised resilience service offerings, which combine the learning from the RaaS and MultiResilience projects and integrate these services into flexibility markets.
Standardised, interoperable templates for implementation across the business, including specifications, policies and processes.
The cross-compatibility and adaptability of the solutions ensures that success is not dependent on any specific vendors.
Proposed changes to technical codes like the DCUSA and Distribution Code.
Incentives to encourage battery build locations which maximise contribution to resilience. As well as service payments, this might include non-financial incentives (e.g., accelerating the grid connection process for LV and HV batteries).
Early learning from the design stages and early trials will be reflected within the RIIO-ED3 Business Plan submissions, informing activities around digitalisation, system development, and customer engagement. For example, early work will indicate what might be an efficient balance between LV and HV resilience assets, or what locations are most likely to benefit from an earlier service rollout. Essential to the plan will be the close collaboration between NPg and SSEN, to ensure findings, plans and recommendations have applicability GB wide.
All project partners have high commercial readiness, however, the focus on interoperability and delivery of standardised templates will ensure that business-as-usual adoption is not dependent on any one project partner.
The precursor MicroResilience project was sponsored by NPg's Director of Energy Systems. The MultiResilience phase, moving towards large scale-implementation, will be sponsored by NPg's Director of Engineering. Both will be represented in the project steering board.
OT and IT integration will be essential for BAU rollout, with ANM / DERMS and flexibility platforms. These will need to work at multiple scales, from domestic to HV and EHV scale batteries. NPg's market development functions will need to ensure there is an active supply chain of potential resilience providers. This might include raising awareness from possible providers who are currently not engaged in DSO flexibility. For example, rural hotels and farms could be incentivised to deploy BESS (and participate in resiliency) as back up supply if there are appropriate financial and non-financial incentives. The project will create

learning to inform all these aspects of integration.
We expect deployment, scaling, and integration to take place across ED3, with widespread adoption by ED4. Success might be measured by, for example, the MWh of battery capacity that is taking part in different resilience services across and between different voltage levels, or through more sophisticated metrics like Expected Energy Not Served. These metrics will be developed and tested during the Beta.
Project outcomes will be delivered into BAU through NPg's Engineering Directorate. They have the ultimate authority for connection of MultiResilience to the network and are the custodians of the standards required to allow that. They are key internal customers for MultiResilience and are represented in the project through both the steering group and the design authority role. They are also key in the dissemination of standards to other DNOs.

Policy, standards and regulations (not scored)

We do not consider there to be any barriers with respect to meeting the requirements of regulations, policy, or standards. Progression into business-as-usual does not depend on any specific government policy changes or decisions, or changes to any standards, although the project may identify specific changes that might promote faster or more widespread business-as-usual adoption. In the final work package of the project, we will make recommendations about anychanges that could be made to industry regulations (e.g., technical, andcommercial codes) or other industry documents (such as standardised flexibilityservices agreements , including versions for resilience services).

Consumer impact and engagement

We expect the MultiResilience solution will benefit consumers by lowering the costs of DNOs accessing third-party resilience services, increasing the resilience of the network, or a mix of both. These benefits are discussed in Question 5 and Question 6 but, with very conservative assumptions, lead to a benefit of £124.8M in reduced service payments.
Considerable consultation has taken place with customers and rural stakeholders as this project was developed. The original MicroResilience unit was developed and trialled near Byrness in Northumbria. This location is at the end of a long HV pole-supported feeder and is therefore a vulnerable part of the NPg network. Additional work was also undertaken through workshops with rural communities inthe Rural Electrification 2.0 project. Issues of resilience for rural communities were identified and the increasing importance of electrical reliability in supporting communities now, but more so in the future, was identified.
Of note was the impact of long duration events on the vulnerable -- rural locationsbeing more prone to these. Maintenance of supply, or substantial mitigation of outage events, does prevent the creeping temporal impact on all sectors of society but especially those who do not have access to generators or personal low carbon technologies. The impact may be exacerbated where a customer may be medically dependent on the electricity system. Equipment may have some degree of power back-up, but this is limited and improved resilience helps mitigate some of the potential additional harm during storms for example.
The impact of the reliability of electricity on the development of rural jobs was also raised. Improvements in reliability and resilience allows business to be established where those jobs are badly needed.
There may also be an opportunity to support connections customers. Part of the project will look at whether smaller scale storage can be installed and operated at preferential turnkey MultiResilience locations. This may be attractive to businesses currently queuing for higher voltage connections or may encourage the development of smart local energy systems. Such local systems can drivedown fuel costs.
This successful engagement will continue throughout the MultiResilience project and there will a comprehensive comms and engagement plan developed.
The design of the MultiResilience project ensures that all downstream customerson a feeder get the same benefit from the project and post-project implementation.This is not dependent on personal LCTs as projects like Resilient Customer Response will be.

Value for money

The total project cost is £8.32M, split across the partners Northern Powergrid (£5.32M), SHEPD (£0.07M), SGS (£1.93M), and TNEI (£0.99M).
While the enduring BAU rollout will use third-party batteries, these assets do not tend to be deployed in the right places or at the right scale required for the MultiResilience concept. This means the project cannot rely on having third party batteries in the locations for the trials that can be contracted for the project, and instead needs to rely on DNO-owned batteries. NPg's costs therefore include £2.7M for reconstituting and redeploying the existing ~3 MW of batteries from CLNR in five new locations, as well as an estimated value of £1.37 M associated with these batteries which NPg is providing to the project as an in-kind contribution. A further £795 k is included for other subcontracted expertise including real-time network simulation (£545 k), commercial battery operation(£150 k) and rural customer engagement and behavioural research (£100 k).

All partners will provide significant contributions to the project. Northern Powergrid will contribute 10% of their project costs, as well as the existing battery equipmentthat will be refurbished and re-used for this project. SHEPD will also provide 10% of their project costs. Partners SGS and TNEI will provide in-kind contributions by way of a discount to their respective day rates, and all day-rates are cost-competitive. Total partner contributions to the project, including the repurposed batteries, is worth over £2.06 M.
Costs for batteries have been affected in recent years by supply chain disruptions, and are very uncertain, as is the level of capacity required for the trials. Reusing existing batteries protects the project from these supply chain risks and potentialcost escalations, while offering significant flexibility in the scope, and presents significant value for money for customer. Furthermore, this avoids the need to dispose of these existing batteries. We expect disposal would cost around £600 k, and would not be a sustainable option, as the second-hand use-case for thesebatteries has not been properly considered in the sector.

The project will use simulations, including real-time digital simulations in a lab, to ensure that credible data is collected about how the system will behave during a wide range of interruptions, even if the actual trial networks do not experience any events. Without these simulations, the project would depend on faults occurring on the trial networks, which, even in the worst case, might be limited to a handful ofevents over a year.
The real-time digital simulations will be subcontracted to a research organisation rather than trying to work with more commercially available off-the-shelf solutions.This will ensure that the project can fully access a bespoke solution tailored to the requirements for the project in collaboration with the project partners.
We expect that by the end of the project there will be two primaries with established MultiResilience capability, each comprising three MicroResilience schemes. The legacy of these trial solutions may depend on future appetite and regulations for DNOs to continue to use batteries for resilience. Nevertheless, there is likely to be a role for these assets to support network resilience long after the trials have concluded. If not, there may be options for repurposing the batteries again for future innovation projects.

Is this an associated Innovation Project?

- ○ Yes (please remember to upload all required documentation)
- ○ No (please upload your approved ANIP form as an appendix)

Supporting documents

File Upload

SIF Beta Round 2 Project Registration 2024-10-22 2_58 - 80.4 KB
Associated Network Innovation Projects (ANIP) Form for completion Beta Rd 2 MultiResilience project.pdf - 171.6 KB

Documents uploaded where applicable?

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