

Project Deliverable 1

Site Selection & Front End Engineering Design



Document Control

Document Ownership

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Version Control

Version	Date	Authors	Status
1.0	25/02/2021	Sarah Rigby	Final version for submission following SSEN internal review and sign-off

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Project Overview

The Resilience as a Service - RaaS - innovation project seeks to improve the operational resilience of electricity distribution networks in remote areas.

The aim is to develop and trial a new market-based solution which can swiftly, automatically, restore supply to customers in the event of a fault, using services procured from a local Battery Energy Storage System together with local Distributed Energy Resources. Figure 1 provides a high level illustration of the RaaS scheme.

The RaaS concept represents a flexible solution for areas where traditional reinforcement or use of DNO owned standby generation to provide network resilience would be prohibitively costly. Through temporary operation of the network in islanded mode, RaaS will maintain supply to customers during the time required for a DNO to respond to a fault.

The key benefits of this approach in providing cost effective, local network resilience will include an improved service to customers, together with a lower carbon solution than the conventional option of transporting a temporary diesel generator to site, supporting the UK's transition to Net Zero.

The project is a partnership between Scottish and Southern Electricity Networks (SSEN), E.ON and Costain, with funding of £10.9m through Ofgem's Network Innovation Competition (NIC).

In addition to demonstrating the technical concept, the work will develop the commercial framework for RaaS - evaluating the financial case from a DNO perspective and assessing the investment case for RaaS service providers with options for revenue stacking in other flexibility services markets.

The first phase of the project focuses on site selection, system design for the chosen demonstration site, and refinement of the business case for RaaS. This stage will validate whether the concept is technically feasible and financially viable, to inform a decision during 2021 on whether to proceed with the deployment and operation of a RaaS system at the chosen site for a trial period of up to two years.

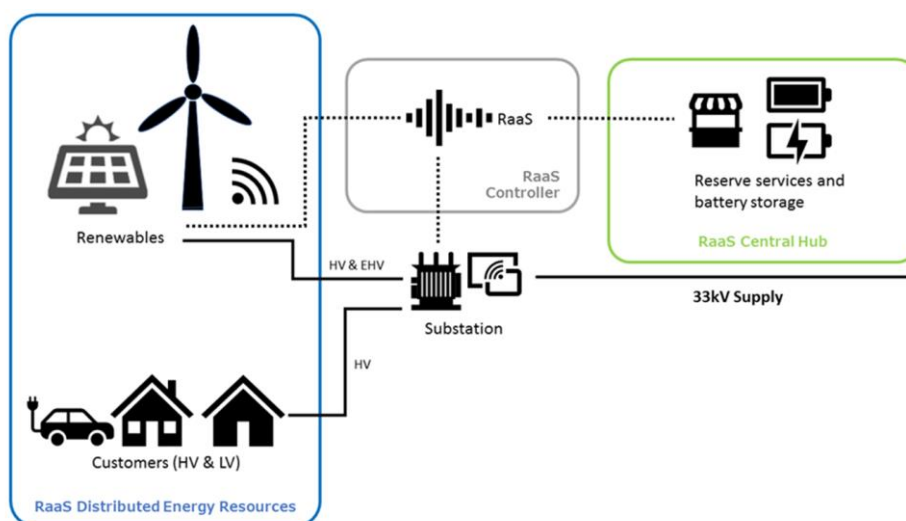


Figure 1 - Schematic of the RaaS solution supporting a 33kV to 11kV primary substation

Introduction to PD1

This PD1 overview document sets out the work undertaken within the RaaS - Resilience as a Service - project to meet the requirements of Project Deliverable 1, defined in the Project Direction as:

RaaS Project Deliverable 1

PD1.1 Report detailing the selected site for demonstration and proposed use case(s) for the RaaS demonstration

PD1.2 External peer review of FEED

The paper introduces the work undertaken to identify the site for potential application and trial of the RaaS use case, and describes the peer review process used to publicise and seek external views and feedback on the FEED (Front End Engineering Design) created to present initial proposals for the design of the RaaS scheme.

This Project Deliverable, together with associated project material, will be published on the project website - www.project-raas.co.uk - and made available to all interested parties.

To provide the context for PD1, Appendix 1 presents the Project Deliverables defined in the RaaS Project Direction.

RaaS Trial Site Selection

Introduction to the RaaS Trial Site Selection Report

A detailed assessment process was established to select the SSEN primary substation to be taken forward to the design stage of Phase 1 and the potential demonstration stage in Phase 2 of the project.

The accompanying document 'E2a.1 Site Selection Report' describes the process used to identify the proposed trial site for applying the RaaS use case. The site selection criteria addressed four key considerations relevant to the development and implementation of RaaS, which are described in more detail in the report:

- potential benefits of the solution for the site
- suitability for meeting project objectives (inc. potential incorporation of local Distributed Energy Resources)
- practicality of delivery and operation within project timeframes and budget
- technical design and integration

The report presents the stages of identifying a longlist of potential sites, shortlisting them, assessing the shortlist through analysis and site surveys, and evaluating criteria to reach a decision. Selecting a site with suitable prerequisites for the RaaS use case is fundamental for achieving the project goals, and close collaboration between SSEN and E.ON has supported this process.

Descriptions of each of the shortlisted sites are provided, together with a detailed comparative analysis based on criteria determined by SSEN and E.ON.

The chosen trial site for RaaS is Drynoch primary substation on the west coast of Skye.



location of Drynoch primary substation

RaaS Front End Engineering Design & Peer Review Process

Introduction to the RaaS FEED - Front End Engineering Design - Report

The accompanying document 'E2a.2 FEED Report' has been developed by RaaS project partner E.ON in close consultation with SSEN, and is the document issued to external reviewers to invite feedback on the proposals for the scheme.

The report sets out the technical challenges and potential resolutions identified with regard to the RaaS scheme and its integration with the existing 11kV network, including:

- detail on the modelling and grid studies undertaken
- an assessment of the required energy capacity for RaaS
- the BESS design for the selected trial site - Drynoch primary substation
- operational considerations associated with the implementation of RaaS

Purpose of the FEED Peer Review

The FEED external peer review process was incorporated into PD1 to obtain a wide range of perspectives necessary to validate or challenge the proposals, and promote a clear understanding of requirements.

It's clear that progressive stages of review are valuable during the development of technologies that offer enhanced automated control functionality to electricity networks. Successive stages of review allow additional considerations or potential issues to be identified in a timely manner prior to further development or more involved design or implementation activities.

All feedback received will be used to inform development of the detailed design for the proposed scheme, and help ensure that what's developed through the project is as broadly applicable as possible across different networks.

Identification of Peer Reviewers

Potential peer reviewers were identified through the project's stakeholder engagement activities, and comprise other network operators, related innovation projects, consultants, academics, and SSEN colleagues. Further, the working relationship developed with National Grid ESO's Distributed ReStart¹ project team and RaaS involvement with their Stakeholder Advisory Panel presented further opportunities to invite comment, and promote awareness of the how the use cases explored through RaaS and Distributed ReStart align.

Consequently, the FEED has been issued for Peer Review to eight external organisations in addition to SSEN colleagues from the Design and Operational Technology teams, and Transition & LEO projects. External reviewers include individuals involved with the Distributed ReStart Power Engineering & Trials (PET) team (inc. Scottish Power Energy Networks and consultancy WSP), Northern Powergrid's Innovation team, University of Strathclyde/Power Networks Demonstration Centre (PNDC), Cardiff University's Centre for Integrated Renewable Energy Generation and Supply; consultants involved with the Future Power System Architecture Delivery Board, and consultancy SGS appointed by SSEN to develop the DNO side architecture for RaaS. Appendix 2 sets out the range of organisations & individuals who consented to contribute to the peer review.

Engagement with Peer Reviewers

SSEN oversaw the peer review process, including the following key interactions with those who'd expressed an interest in reviewing the FEED:

- to support respondees in allocating time for the review, individuals were informed of the planned timeframes during conversations, or if some time had passed since discussing the review process, an email was sent 20 January 2021 to provide prior notice of the intention to issue the FEED for peer review from 1 to 12 February 2021 - a redacted example of a 'forthcoming review of RaaS FEED' email is provided as Appendix 3
- the completed FEED report was subsequently issued to each individual/organisation 2 February 2021 via emails which gave a brief overview of the report, indicated what we would welcome and value by way of responses, inviting people to get in touch with any questions or points they would like to discuss, and again noted that responses were requested by 12 February 2021 - a redacted example of a 'RaaS - FEED peer review' email is provided as Appendix 4
- as responses were received, each was acknowledged with thanks, noting that all comments would be assessed to identify how they will be addressed during further project work and/or factored into the detailed design stage - a redacted example of a 'response acknowledgement' email is provided as Appendix 5

Form of Responses Invited

Comments, observations and questions on all aspects of the work presented in the FEED report were invited. To support participation in ways relevant to each organisation/individual, reviewers were also welcomed to focus on areas of particular importance and relevance to them. Further, thoughts on the specific scheme and on considerations related to wider application across different network locations were encouraged.

All feedback will be reviewed by SSEN and E.ON to evaluate how each point raised will be addressed during the detailed design and trial planning stages of the project. This assessment will be shared with all peer reviewers.

FEED Peer Review Responses

The RaaS project team express sincere thanks to each participant for their time and for the highly relevant comments provided. These considered responses are very much valued in contributing additional perspectives, knowledge and expertise to support development of the RaaS concept.

A positive response was received to the project itself and the work undertaken in development of the FEED, with comments including:

“Many thanks for making the RaaS FEED report available to us. It strikes me as a helpful document that sets out the thorough engineering work undertaken so far.”

“Thanks for sending the documents through, it is very thorough”

“it’s a very comprehensive report and an exciting project ... looking forward to seeing how the system will be tested and eventually deployed”

“Congratulations, I can see a lot of good work is being put into the RaaS project”

“The project is very exciting ... the level of detail was certainly there regarding operation, protection and hierarchy of command protocol”

“I look forward to the follow up documentation”

“There are parallels with the ESO’s Distributed ReStart project, but these are overlaps not duplications. Both projects are timely and relevant to addressing the Net Zero challenge and I would expect there to be mutual benefits.”

“We look forward to receiving your thoughts on some of the questions in the attached and discussing others with you in the coming weeks”

Analysis of Responses

The range of comments received from our external colleagues represents a detailed appraisal of the FEED.

E.ON and SSEN have collaboratively assessed all of the points raised to identify how each will be addressed during further project work and/or factored into the detailed design stage. Responses represent both questions and observations, and relate to points of clarification or points for further consideration (those planned within the project programme and additional requirements identified through the peer review process).

Appendix 6 ‘RaaS FEED - peer review responses’ presents the feedback together with the RaaS project team’s intentions for incorporating this additional thinking into project plans. In response to the comments, a small number of minor revisions have been made to the report itself, and the proposed placeholder for a section on engagement with National Grid ESO’s Distributed ReStart¹ project has been completed.

This assessment will also be shared with all peer reviewers to coincide with submission of PD1.

¹ Distributed ReStart explores how Distributed Energy Resources can be used to restore power in the highly unlikely event of a blackout of the GB transmission system - this represents a complementary use case to the RaaS security of supply concept with clear distinctions at distribution and transmission level, and so the project teams are working closely to share knowledge and experience which can inform development of the solutions and support future participation of flexibility service providers - www.nationalgrideso.com/future-energy/projects/distributed-restart

Contact Details

Interested parties are very welcome to contact the RaaS project team with any enquiries via the contact details below:

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email RaaS@costain.com

website www.project-raas.co.uk

Appendices

Appendix 1 - RaaS Project Deliverables

Appendix 2 - RaaS FEED Peer Reviewers

Appendix 3 - a redacted example of a 'forthcoming review of RaaS FEED' email

Appendix 4 - a redacted example of a 'RaaS - FEED peer review' email

Appendix 5 - a redacted example of a 'response acknowledgement' email

Appendix 6 - RaaS FEED Peer Review Responses

Appendix 1 - RaaS Project Deliverables

To provide the context for PD1, Table 1 presents the Project Deliverables defined in the RaaS Project Direction.

Table 1 - RaaS Project Deliverables

Deliverable	Description	Evidence
1	Front End Engineering Design (FEED)	Report detailing the selected site for demonstration and proposed use case(s) for the RaaS demonstration. External peer review of FEED.
2	Detailed Design	Detailed design of controls, electrical integration, available DER and the BESS complete. Publish Trial Programme on SSEN RaaS webpage.
3	Business Model for potential RaaS suppliers	Construct investment business case for RaaS supplier. Produce draft Heads of Terms for RaaS method.
4	Stakeholder Feedback Event (Stage Gate)	Stakeholder feedback event to disseminate and gather feedback on outputs.
5	Supply Chain Engagement	Publish Commercial Strategy on SSEN RaaS webpage. Present Enterprise design for Resilience as a Service on SSEN website.
6	Network Adaptation and Acceptance Testing	Produce interface and configuration specifications and commissioning reports.
7	Trial 1 - Demonstration at first site complete	Publish Demonstration analysis results on SSEN RaaS webpage covering both technical and commercial aspects. Stakeholder dissemination event showcasing learnings.
8	BAU Preparation	Technical design to support second demonstration site. Consultation with potential RaaS market for second demonstration site.
9	Comply with knowledge transfer requirements of the Governance Document	Annual Project Progress Reports which comply with the requirements of the Governance Document. Completed Close Down Report which complies with the requirements of the Governance Document. Evidence of attendance and participation in the Annual Conference as described in the Governance Document.

Appendix 2 - RaaS FEED Peer Reviewers

Table 2 presents the range of organisations & individuals who consented to participate in the FEED peer review process (redacted for publication).

Table 2 - RaaS FEED Peer Reviewers

Organisation	Relevance	Contact
Scottish Power Energy Networks / National Grid ESO	Distributed ReStart - Power Engineering & Trials (PET) team	
WSP / National Grid ESO	Distributed ReStart PET team	
Northern Powergrid	Innovation Project Manager, involved with the Microresilience NIA (Network Innovation Allowance) project	
Independent Consultant	involvement with a range of initiatives related to electricity network evolution, including the FPSA programme (Future Power System Architecture - IET / Energy Systems Catapult)	
Independent Consultant	former chair of the D-code Review panel, involved with the FPSA programme	
Mott MacDonald	Group Strategic Development Director; Chair of the FPSA Delivery Board	
University of Strathclyde / Power Networks Demonstration Centre (PNDC)	Research & Development and Proposals teams	
Cardiff University	Centre for Integrated Renewable Energy Generation and Supply	
SGS	appointed by SSEN to develop the DNO side architecture for RaaS	
SSEN	Design team	
SSEN	Operational Technology team	
SSEN	Transition & LEO innovation projects	