

Project Deliverable 5

Supply Chain Engagement - Commercial Framework



Document Control

Document Ownership

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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 and automatically restore supply to customers in the event of a fault using services provided by an Energy Storage System, and incorporating 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 Distribution Network Operator (DNO) owned standby generation to provide network resilience would be prohibitively costly. Through temporary operation of the network in islanded¹ mode, RaaS will maintain supply to customers allowing time for the DNO to respond to the issue. At other times, a RaaS Service Provider (RSP) would be able to use the battery to provide other services to the electricity system, supporting the economics of the solution.

The key benefits of this approach in providing cost effective, local network resilience centre on improved security of supply for communities in areas susceptible to power outages, with local renewables also able to continue generating and exporting energy at times when that zero carbon electricity, and any associated income, would otherwise have been lost. The scaled deployment of RaaS will support wider national and regional policy aims including the UK's transition to Net Zero.

The project is a partnership between Scottish & Southern Electricity Networks Distribution (SSEN-D), E.ON and Costain, and has been awarded funding through Ofgem's Network Innovation Competition (NIC).

In addition to demonstrating the technical concept, the project will develop a commercial framework for RaaS - recognising the investment case for RaaS Service Providers with options for revenue stacking in other markets, and the financial case from a DNO perspective to represent a cost effective solution for customers.

The first phase of the project focused on site selection, system design for the demonstration site, and refinement of the business case for RaaS to validate the technical feasibility and financial viability of the concept. Following a positive stage gate decision informed by stakeholder engagement, the project has now moved into the trial phase. This will see installation of a pilot scheme to support the 11kV network at the selected site², with operation over the trial period used to evaluate and verify the technical capability of the system.

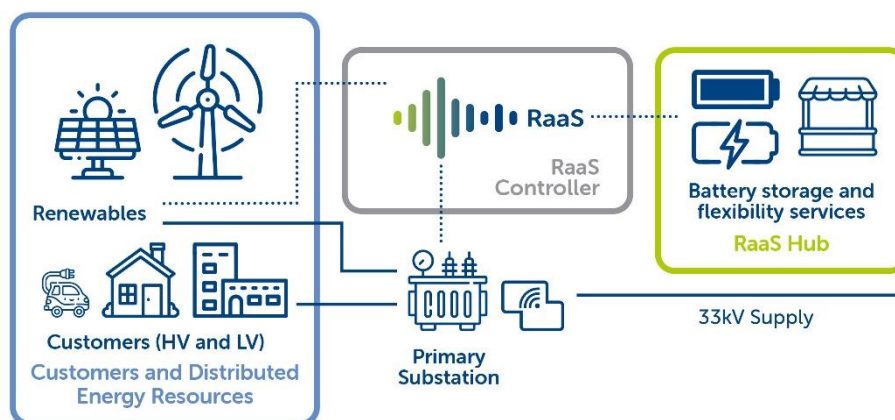


Figure 1 - Schematic of the RaaS solution supporting a 33kV to 11kV primary substation

¹ in islanded mode, an area of the network is disconnected from the main electricity grid and operates independently

² Drynoch, Skye - the trial site selection process is documented in RaaS E2a.1 '[Site Selection Report](#)'

Introduction to PD5

This PD5 overview document sets out the work undertaken within the RaaS - Resilience as a Service - project to meet the requirements of Project Deliverable 5 - Supply Chain Engagement - Commercial Framework, defined in the Project Direction as:

RaaS Project Deliverable 5

PD5.1 Publish commercial strategy on SSEN RaaS webpage

PD5.2 Present enterprise design for Resilience as a Service on SSEN website

The document sets out the approach to developing the commercial framework for RaaS, and the supply chain engagement activities used to present the project team's thinking to date and invite external perspectives on the potential future route to market. It then provides a summary of key aspects of the commercial strategy for RaaS, with decisions informed by the feedback received.

Project stage engagement serves to provide the foundation for future rollout of RaaS following successful technical trial. By raising awareness of this planned new market-based approach to improving security of supply and understanding the views of potential future service providers, the commercial approach can be designed to promote market development, enhance the attractiveness of bidding for and delivering RaaS in remote areas, and enable market participants to efficiently engage with RaaS.

Supply chain engagement is also important given key distinctions from other current Distribution System Operator (DSO) and Electricity System Operator (ESO) markets and flexibility services products, including:

- the nature of the locations that would benefit from RaaS deployment
- provision of RaaS is automated (rather than dispatched manually) and instant
- RaaS would be awarded for the duration of the contract (years), rather than market participation based on assets bidding into individual events with dispatch decisions made by the network operator
- service requirements and price will be set at contract placement

The aim is to create a product which optimises benefit across all parties - a solution which is attractive to potential RaaS Service Providers (RSPs), and beneficial and cost effective for DNO customers.

This Project Deliverable, together with associated project material, will be published on the project website - <https://ssen-innovation.co.uk/raas> - and made available to all interested parties.

To provide the context for PD5, Appendix 1 presents the Project Deliverables defined in the RaaS Project Direction.

Development of the Commercial Framework for RaaS

Approach to Developing the Commercial Framework

Development of an appropriate commercial framework is key for both the introduction and evolution of new electricity network flexibility services products. A clear and well targeted strategy will create service provider value propositions that align with DNO objectives and enhance market participation through rollout at scale.

The commercial strategy for RaaS will also provide the basis for future adaptation as the electricity industry and its market participants continue to evolve, bringing new technologies and solutions for efficient, sustainable network operation.

Figure 2 illustrates the approach taken to form a commercial framework for RaaS and use the early market engagement of PD5 to understand the perspectives of potential future service providers.

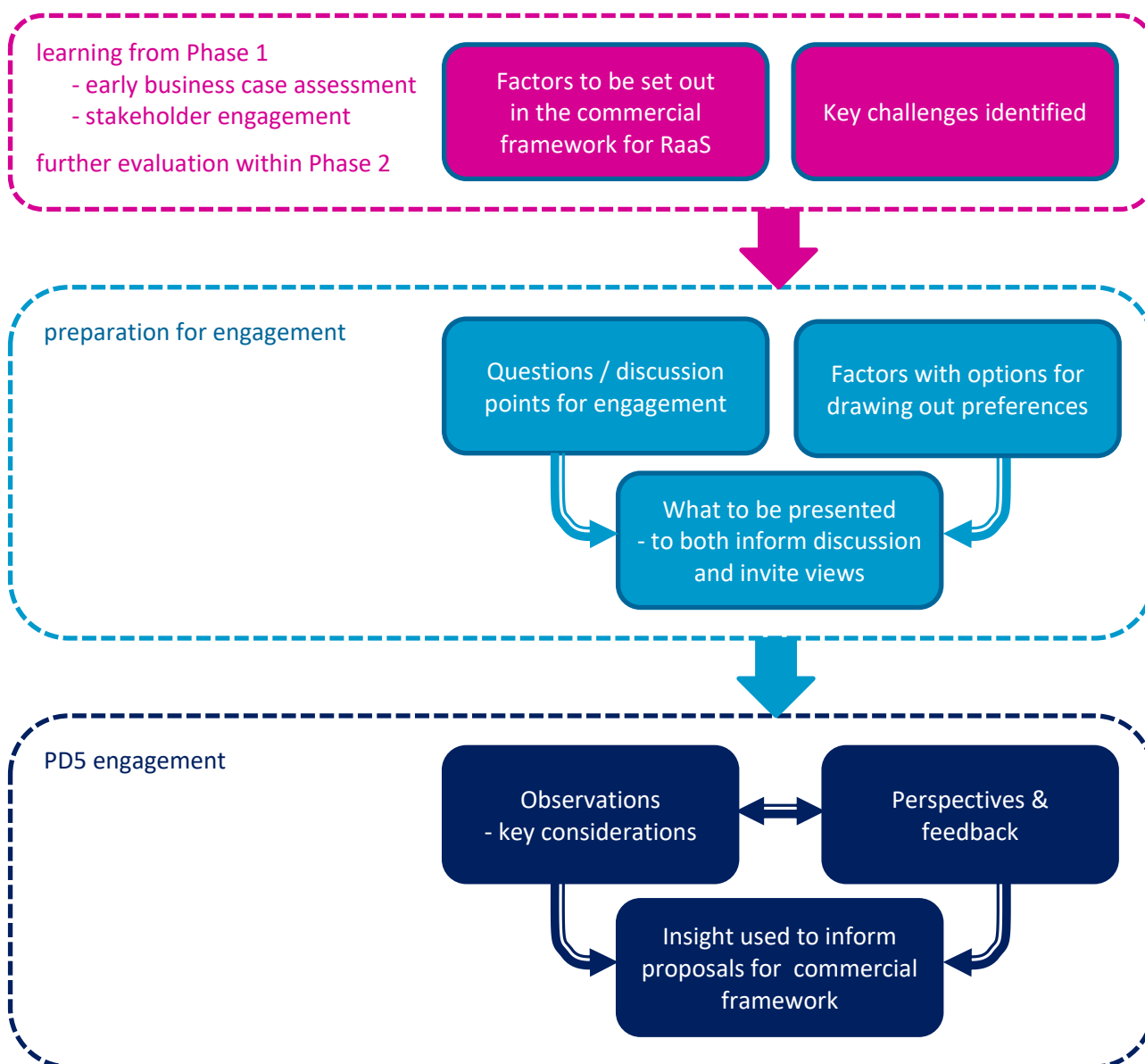


Figure 2 - Approach to developing the commercial framework for RaaS

This work drew on learning from prior project activities and engagement, as presented in reports and associated material available via the project website - <https://ssen-innovation.co.uk/raas>.

For some aspects of the commercial strategy insight was clear, for example with experience based on engagement during E.ON's procurement process for the RaaS project trial BESS (Battery Energy Storage System), learning from the initial Phase 1 business case assessment and Stage Gate consultation events, and engagement with community energy organisations over the course of the project to date.

Where questions or options to seek further perspectives on were identified, these were initially discussed with the external Stakeholder Advisory Board for RaaS to reach consensus on the key points to explore through PD5 engagement.

The points to raise awareness of with participants, and views to be sought, shaped the information presented to support conversation and discussion with respondents.

To provide context, the subsections below set out key considerations used by the project team in developing the commercial framework and material for PD5 engagement with the supply chain.

Who can provide RaaS ?

The RaaS concept is centred around services provided by local energy assets. The commercial framework must therefore ensure that RaaS is an attractive investment proposition, and open to as many potential RaaS Service Provider (RSP) participants as possible.

When considering who could provide RaaS, essentially this could be any entity with an energy asset or scheme that can be configured to respond to automated signals and provide both grid forming capability ('anchor generator'³) and power export to grid. This may comprise new or existing assets, and the grid forming element could be part of a broader energy scheme, for example:

- co-located with renewables or other energy schemes (electric vehicle (EV) charging infrastructure, heat, hydrogen, etc.)
- operated by an aggregator or a microgrid/virtual power plant (VPP) scheme alongside distributed energy resources (such as renewables, demand side response (DSR), vehicle to grid (V2G), etc.) for local energy management
- installed as a stand-alone asset to participate in a range of markets and ESO/DSO services to stack revenues
- installed by a company or organisation to balance onsite energy use (to e.g. reduce energy costs or avoid network reinforcement costs) and/or provide independent resilience, which could add capacity and capability to support the local network too, providing an additional income stream for the owner

Table 1 gives examples of how assets installed for different purposes may align with provision of RaaS.

³ an energy asset capable of providing an independent voltage source, controlling frequency and voltage, and supporting demand pickup

Table 1 - Examples of RaaS hub asset role and owner/operator formation

	Alignment with RaaS	Examples of Asset Owner	Examples of Asset Operator
asset installed for a focused purpose	asset has one primary use case with RaaS as an additional income stream	<ul style="list-style-type: none"> • commercial generation scheme • community energy scheme • community shared ownership scheme • individual business / large energy use site • housing estate management company 	<ul style="list-style-type: none"> • the owner (automated for RaaS, no participation in other ancillary/flexibility services markets)
asset built to participate in a range of ancillary/flexibility services	asset has many use cases with RaaS as part of the revenue stack	<ul style="list-style-type: none"> • flexibility service provider • community energy scheme • asset investor • land owner 	<ul style="list-style-type: none"> • the owner • an asset optimiser

The fundamental technical requirements for a scheme to participate in provision of RaaS include:

- an asset with connection to the 11kV network
- capability to provide fault ride through or very quick black start when transitioning to islanded mode, including allowance for associated inrush currents
- grid forming capability to maintain frequency within limits (49.7 Hz to 50.3 Hz) - during a RaaS event frequency control may be supplemented by other assets that are part of the overall RaaS scheme
- grid forming capability to maintain voltage within limits (within +/- 3% at point of common coupling (PCC)) throughout a RaaS event
- grid forming capability to maintain the generation/demand balance when operating in islanded mode, including being subject to credible disturbances
- ability to provide power to maintain stable supply to customers in islanded mode during a RaaS event - in future configurations of the service the energy could be provided by the grid forming asset or one or more other generation assets
- capability to resynchronise to grid following a RaaS event
- communications & signals for interface with the electricity network and DSO

The RaaS asset may also stack revenues from participation in other markets - example income streams from other markets/services include:

- ESO services
 - frequency response - Dynamic Containment (DC), Dynamic Moderation (DM), Dynamic Regulation (DR)
 - Balancing Mechanism (BM)
 - reserve services
- local DSO services
- arbitrage in the wholesale market

Commercial Factors to be Represented

This subsection gives an overview of the themes to be reflected in the commercial framework for RaaS.

RaaS Product - DSO Service Requirements

The Energy Networks Association (ENA) collaborative Open Networks⁴ project provides a foundation for DSO flexibility services and products. To support the future rollout of RaaS, there is clear value in aligning the commercial strategy for RaaS with the recommendations and standardisations being developed through Open Networks. Those activities continue to shape the development of RaaS, and the project team will continue to provide input on any perspectives or adaptations relevant to a RaaS solution.

The requirements specification for RaaS draws on the structure and terminology adopted by Open Networks to promote participation in DSO flexibility services.

The definition of service requirement for RaaS will include:

- Locations - the areas of the network where a RaaS solution is sought
- Service Periods - periods of the year when a RaaS service would be required
- Service Windows - where a reserved capacity is to be maintained for the provision of RaaS in response to an unpredictable fault, the Service Windows are the blocks of time (e.g. seasons, days, within day time periods) within the Service Periods that will have distinct reserved capacity requirements
- Energy Capacity Requirement - the maximum reserved capacity figures (MWh) associated with each Service Window sought by the DSO - the capacity available equates to a duration of time over which local demand can be met during a RaaS event
- Power Capacity Requirement - the ability to meet peak primary substation demand (MW) and provide stable operation of the island, also recognising fault current requirements (i.e. a possibly higher MW value deliverable for 3 seconds)
- Detail on any potential, optional deviations from the defined service that may be made available to an RSP (such as limited options to 'opt of' of being available for RaaS a number of times across a year, in agreement with the DSO)

Tender Process

RaaS contracts will be awarded through a competitive procedure. Key stages of the proposed tender process for RaaS are represented in Figure 3.

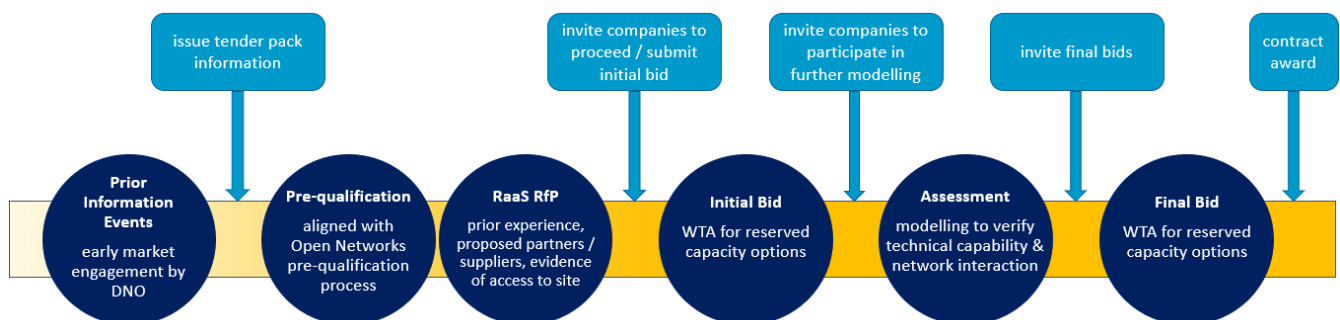


Figure 3 - Proposed tender process for RaaS

⁴ the [Open Networks](#) programme brings together the nine electricity grid operators in the UK and Ireland to collaborate in standardising experiences and aligning processes for connecting to networks and participating in network services

These stages comprise:

- Prior Information Events - run by the DSO to publicise the plan to tender for RaaS, provide information on how to participate in the tendering process, invite early questions or points of clarification, and raise awareness to promote interest
- Pre-qualification process - this stage will align with the Open Networks approach to flexibility service pre-qualification⁵ to establish the credibility and interest of those registering, potentially incorporating factors reflective of SSEN-D specific procurement requirements and business values - this process would only be required once per organisation
- RaaS RfP (Request for Proposals) - a stage seeking evidence of technical competence, commitment, etc. specifically relevant to RaaS
- Option to submit an initial bid - early assessment of potential RaaS fee sought by the RSP, to allow evaluation of acceptability prior to progressing to detailed technical modelling - this stage represents an option which RSPs may find beneficial in advance of the detailed assessment stage - submissions will not be used for shortlisting, and RSPs may choose not to submit an initial bid
- Assessment - detailed modelling and assessment to verify technical capability and understand the interaction of the RaaS BESS with the electricity network in a given area - close cooperation with the DSO, working with network information and technical specifications provided in the tender pack
- Final bid submission - final bids invited following successful technical modelling and evidence
- DSO awards contract

Other aspects relevant to the tendering process include:

- the platform to be used - the tendering process for RaaS would employ the platform(s) used by SSEN-D for other DSO products⁶ as appropriate, and it is recognised that over time wider industry initiatives may introduce new digital and/or dynamic platforms for flexibility market services, for example:
 - shorter term - the Open Networks project's work⁷ to align sign-up and pre-qualification processes for flexibility service procurement to provide a simpler and more consistent user experience for service providers and DSOs
 - mid/longer term - outcomes from Ofgem's Future of Distributed Flexibility (FoDF) Flexibility Digital Infrastructure (FDI)⁸ work
 - further ahead - outcomes from ESO's Virtual Energy System (VES)⁹ project
- information to be provided to interested parties by the DSO
- information/evidence to be submitted by bidders / potential RSPs
- timeframes - acknowledging timeframes associated with other aspects of scheme development, and potential alignment with the evolving connections application processes
- the methodology to be used by the DSO when comparing bids for e.g. different durations of RaaS service, and/or different combinations of fixed, availability & utilisation payment, and assessing the cost effectiveness of the proposal

⁵ Open Networks '[Flexibility Service Pre-qualification Standard Template](#)', March 2024

⁶ at the time of writing SSEN-D are introducing Electron's 'ElectronConnect' platform to expand procurement of flexibility services capable of adjusting power generation or consumption in specific areas when needed, and streamline entry into the market for Flexibility Service Providers (FSPs) www.ssen.co.uk/about-ssen/dso/flexibility/flexibility-services

⁷ www.energynetworks.org/work/open-networks/market-development

⁸ Ofgem's FoDF work aims to develop a market enabling platform for co-ordinating DER assets participating in the provision of services to distribution networks (FDI previously referenced as Common Digital Energy Infrastructure (CDEI)) Ofgem [Future of Distributed Flexibility presentation](#), November 2023

⁹ the ESO's [VES](#) project aims to create the common data sharing infrastructure and governance necessary for an ecosystem of connected digital twins and models for future planning and operation of the energy system

Contract

The Open Networks Standard Agreement for Flexibility Services¹⁰ will be applied for RaaS as with other DSO flexibility products, with any necessary adaptations identified and raised with the ENA for incorporation into the standardised terms.

RaaS specific considerations related to contract details include:

- contract duration
- non-delivery/under-delivery considerations - how any breach of obligations will be addressed
- provision for over-delivery (in the event that the capacity available and utilised during a RaaS event is greater than the specified reserved capacity)

Payment Terms

The commercial strategy for RaaS must include detail on the following:

- payment structure for RaaS - mix of fixed, availability and/or utilisation payments
- how any penalty values may be calculated and applied
- how any over-delivery values may be calculated and applied
- invoicing & settlement process - as with the tendering process, this will reflect the approaches used by SSEN-D for other DSO products, with data requirements appropriate to the provision of RaaS

Operational Factors

Provisions relating to the ongoing operation of RaaS, and expectations associated with maintenance over the course of the contract, including:

- monitoring requirements - both for ongoing operation (RaaS response) and data settlement, and to identify any potential issues with the system to flag maintenance requirements
- the dispatch process for RaaS - automated in response to signals from the DSO, together with detail on any situations when a RaaS response should not be initiated
- any considerations relevant to the maintenance regime - e.g. notifying of maintenance periods, avoiding times of higher risk of a RaaS event, no penalties when a RaaS facility is unavailable due to reasonable, pre-notified maintenance

¹⁰ Open Networks '[Standard Agreement for Procuring Flexibility Services](#)', version 3, April 2024

Key Challenges

An understanding of key considerations and challenges for the introduction of RaaS is also important, to then look at how the concept can be refined to remove any perceived barriers or enhance incentives. The potential challenges identified through both prior project work and PD5 engagement are set out below. These represent RSP, BESS provider, DSO and wider market perspectives. The commercial framework proposed for RaaS incorporates factors that aim to address these, and reflects the views and preferences elicited through PD5 engagement.

■ Location

Areas that would initially be prioritised for RaaS are in more remote locations. Associated with this there may be considerations around:

- more complex logistics to deliver equipment
- additional transportation/travel costs (relevant to both construction and future maintenance)
- potential network constraints limiting export capacity (and therefore revenue generation from other markets)
 - It is recognised that at the time of writing a number of industry initiatives are working to improve new connections processes and reduce the impact of network constraints, as noted in the [Links with Wider Industry Activities](#) section of this document.
- access to other markets with regard to considerations around selection for dispatch
- proximity to areas of special designation¹¹ limiting options for siting and obtaining planning permission for a RaaS BESS

■ Recent trends in the utility scale BESS market

Over recent years the utility scale BESS market has experienced a reduction in revenues from other markets and flexibility services, eroding commercial value. If this continues, potential RSPs may require a greater proportion of income from RaaS (against other stackable market revenues) to achieve their required Return on Investment (ROI), potentially placing this outside the level of RaaS fee that would be cost effective for a DNO.

■ Battery prices

There is a clear role for batteries within the energy industry, however, significant geopolitical events over recent years, and potential moves towards trade protectionism and changes to import/export tariffs, continue to impact both the overall price and price volatility of assets such as batteries and BESS components. The conventional expectation for technology prices to reduce with time may not be experienced, and a risk of costs increasing is perceived by some within the industry.

■ Scale of scheme required for RaaS

To support the 11kV network downstream of a primary substation RaaS is more aligned to the smaller scale end of the utility BESS market. Some BESS developers/owners are currently more focused on larger scale batteries connected at higher voltage levels.

Further, smaller scale BESS scheme have the same preparation requirements as large scale sites (planning permission, land lease negotiations, obtaining a grid connection, construction planning, etc.) but with lower associated income.

¹¹ areas of special designation may include:

NSAs - National Scenic Areas - in Scotland

AONBs - Areas of Outstanding Natural Beauty - in England, Wales and Northern Ireland

SSSIs - Sites of Special Scientific Interest

SNCIs - Sites of Nature Conservation Interest / SINCs - Sites of Importance for Nature Conservation

- RaaS fee - sufficient for RSP, cost effective for DSO
- Whilst many pricing elements are common across energy schemes/BESS projects, the provision of RaaS would introduce additional requirements with associated costs. The RaaS fee must therefore align with the incremental costs to deliver the service, for example associated with:
- an enhanced technology specification - e.g. grid forming capability, provision of sufficient fault level contribution
 - opportunity cost of RaaS - e.g. reserved capacity implications for BESS optimisation
 - more remote location - e.g. additional logistics or travel costs, limitations to export capacity and/or access to other markets
- ➔ The locational consideration has a distinction between schemes where:
- an asset is/is to be installed in a location for another primary use case, with RaaS providing an additional income and local benefits over and above the primary business case (whether new build or retrofit)
 - a scheme could be located elsewhere, and the RaaS fee needs to act as a sufficient locational signal to potential RSPs
- Ensuring safety of technical operation
- This primarily relates to the interaction of the RaaS scheme with the local electricity network. Ensuring and evidencing safe operation of the RaaS scheme, including the operation of earthing and protection schemes throughout all RaaS modes of operation, is fundamentally important and requires collaboration and input from all involved in the planning and delivery of a RaaS scheme.
- ➔ The RaaS trial scheme will provide evidence and learning relating to the technical application and integration of RaaS.

Principles applied in developing the Commercial Framework for RaaS

The principles applied in developing the commercial framework for RaaS must reflect the considerations set out in the subsections above, and support the project aims to:

- open RaaS to as many potential participants as possible
- attract participants and promote market development
- ensure a fair, competitive, and transparent marketplace
- enable market participants to efficiently engage in the tendering and service delivery processes

Accordingly, the key principles underpinning the approach that will be used to bring RaaS to market following successful technical trial through the project are to:

- provide sufficient detail to allow both commercial aspects and technical requirements to be clearly understood by potential RSPs
- develop a clear, straight forward tendering process - giving consideration to the number of steps involved, and aim to avoid multiple iterations of stages
- align the RaaS approach with standardised terminology, processes, etc. developed through the Open Networks project
- recognise the role of learning and adaptation - allow the industry (including potential participants/service providers/investors and DSOs) to become familiar with RaaS through initial implementation, before then incorporating refinements which may bring additional benefits but add complexity and/or uncertainty
- ensure that all aspects incorporated into the commercial framework maintain technology neutrality

- avoid DSO requirements that constrain the ability of suppliers to offer innovative solutions
- aim to identify all areas where a DSO can offer useful support to bidders through the tendering and scheme development processes, on an impartial and non-discriminatory basis

An Enterprise Design perspective

A Mott MacDonald paper¹² on the Project 13 approach to delivering infrastructure gives the following classification:

“An enterprise can be defined as being a productive long-term relationship between the owner, integrator, advisors and suppliers. These organisations are commercially aligned and incentivised to deliver better outcomes for the end-users.”

Figure 4 depicts the potential future market structure for RaaS. The interfaces between organisations will be key to successful RaaS schemes, and an enterprise perspective reflects the above definition.

The commercial framework must work to support relationships between the DSO, asset owner, asset operator, integrator(s), supplier(s) and others, with commercial alignment to ensure that RaaS is beneficial both for DSO customers and for those involved in delivering the service.

The principles applied must promote open interaction, identify responsibilities and risks at different stages, apply rewards / penalties which reflect those, and avoid anything which may constrain collaboration.

While the Open Networks Standard Agreement for Flexibility Services will be applied for DSO procurement of RaaS, the project continues to apply enterprise design principles in developing the broader commercial framework for rollout of RaaS.

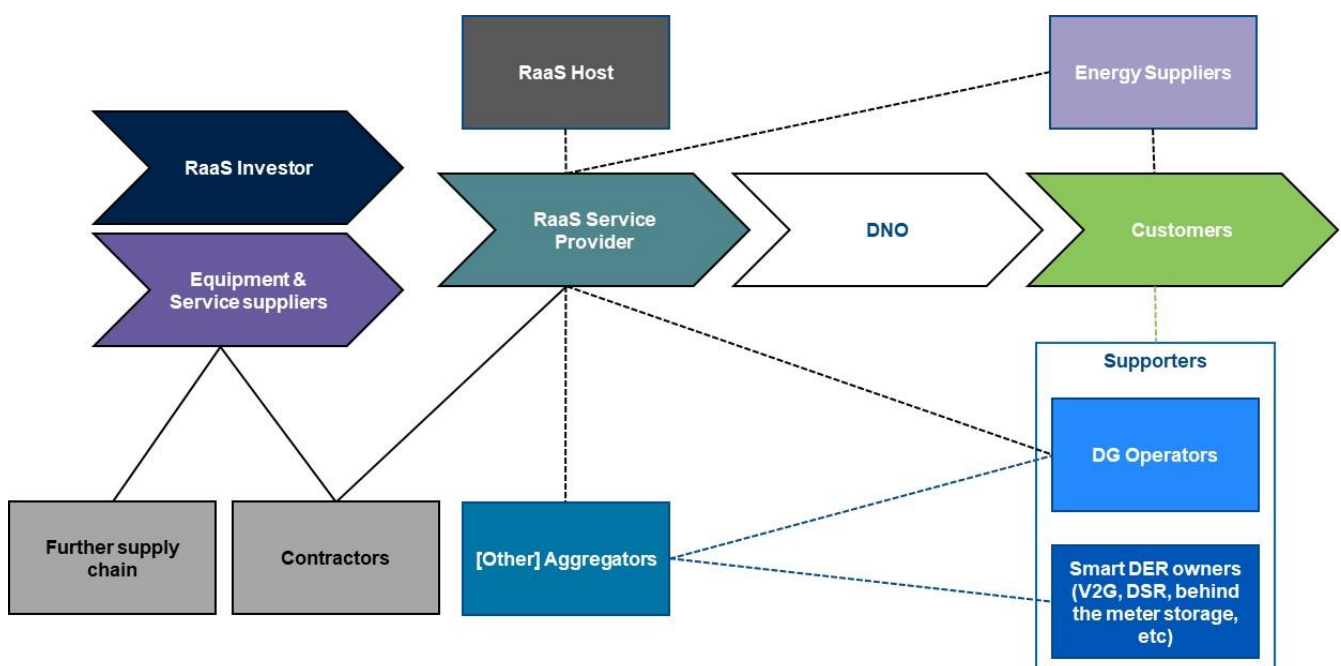


Figure 4 - Potential future market structure for RaaS

¹² Project 13 (P13) is a partnership initiative of the Institution of Civil Engineers, the World Economic Forum and the Civil Engineering Contractors Association - Mott MacDonald [Project 13 insights and guidance paper](#)

PD5 Supply Chain Engagement

Approach to PD5 Supply Chain Engagement

The purpose of PD5 'Supply Chain Engagement' is to use engagement to inform the commercial strategy applied for rollout of RaaS at scale following successful demonstration of the pilot scheme through the project trial.

By eliciting views, preferences, perceptions and other relevant insight from those who characterise potential RaaS Service Providers (RSPs), the project can aim to ensure that what would be put in place is as appealing and easy for potential service providers to engage with as possible.

The aims of engagement were to:

- introduce the RaaS - Resilience as a Service - concept as a potential new market based solution to improve security of supply for electricity customers in remote and rural areas
- invite views that will help inform development of the concept and future commercial strategy for RaaS as a new electricity distribution network 'flexibility services' product

Engagement Planning Process

How to ask

The Stage Gate consultation events previously held by the project were open industry events which worked well in raising awareness of the RaaS concept and inviting questions and comments to steer future work¹³.

In contrast, the need to allow both detailed and open discussion with regard to commercial aspects of RaaS lead to the project arranging a series of bilateral meetings with relevant organisations for this stage of engagement. This planned approach was supported by the project's Stakeholder Advisory Board.

Whilst both online and in person meetings were offered, all were held online via Teams. This allowed more individuals from to join each event, as well as being cost and time efficient for all involved.

Who to ask

Perspectives were sought from flexibility service providers, asset investors/developers, community energy groups, and industrial/large energy user organisations.

Relevant organisations were identified through a combination of:

- prior engagement where organisations had expressed an interest in future contact
- a review of speakers and exhibitors at relevant and timely conferences - All Energy¹⁴, Utility Week Live¹⁵
- a list of organisations involved in this space maintained by Modo Energy¹⁶

¹³ PD4 '[Stakeholder Engagement & Stage Gate Decision](#)'

¹⁴ All Energy, 15 & 16 May 2025, SEC, Glasgow www.all-energy.co.uk/en-gb/conference.html

¹⁵ Utility Week Live, 21 & 22 May 2024, NEC, Birmingham www.utilityweeklive.co.uk/content-programme-2024

¹⁶ Modo Energy support decision making for energy storage through a focused software platform, research, resources, and insight through media such as podcast interviews - their website holds a current and free-to-access list of organisations involved in this space <https://modoenergy.com/research/battery-energy-storage-optimizers-contact-list-gb>

Direct contact was made with 24 organisations, providing introduction and inviting people to speak with the team to learn more about the RaaS concept and project, and if happy to, give feedback on our thinking to date. Responses were received from ten organisations, with calls held in June 2024.

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

In addition to detailed discussion around factors that will provide a foundation for the future commercial rollout of RaaS, a positive response to the RaaS concept was received through this engagement, with comments including:

“Thanks again for taking the time to run through the project and for the interesting discussion. It is something that we are very passionate about as a company in supporting the networks and utilising flexible assets.”

“Thank you for the very insightful session and for sharing this.”

“Thank you very much for your time earlier today. It was very helpful and informative. We are very keen to hear more.”

“Thank you, it was a most interesting discussion. Please do keep in touch with us about the project. When you are ready to host a site visit, please let me know.”

“finding it so interesting ... thank you very much for doing this”

Information Presented

As described in the **Development of the Commercial Framework for RaaS** section of this document, prior project work and the development of discussion points for engagement shaped the information to be presented during the engagement sessions. This aimed to provide context to inform the views and perspectives of respondees.

The topics presented covered different aspects of the RaaS concept, project work, and development of the commercial framework. Areas with specific questions or options to seek perspectives on were brought out, to explore how these factors may drive thinking in the supply chain and what would attract participation in RaaS.

Whilst the slides were structured as illustrated in Figure 5, a key benefit of bilateral engagement events was the ability for conversations to follow and focus on areas of particular importance and interest to those participating in each session.

Today's session

- Welcome and introductions
- Context of PD5 engagement as a foundation for future roll out
 - seeking views that will inform development of the RaaS concept and future commercial strategy
- Overview of the RaaS innovation project, technical concept & pilot scheme
- Context for the commercial framework
 - Who could provide RaaS
 - Potential priority locations
 - RaaS Requirements Specification
- Overview of factors that form the business case for RaaS¹⁷
 - DNO valuation, inc. IIS/VoLL and other factors that will influence a DNO's decision to enhance the resilience of their electricity networks
 - Willingness to Pay (WTP)
 - RSP valuation, inc. revenue stacking - Willingness to Accept (WTA)
- Considerations around payment structure options
- Modelling to verify technical capability & network interaction for scheme assessment



Figure 5 - Topics presented

A copy of the slide pack used for engagement is provided as Appendix 2.

¹⁷ learning from work undertaken to assess the business case for RaaS, with associated stakeholder engagement, is set out in PD4 [‘Stakeholder Engagement & Stage Gate Decision’](#)

Stakeholder Feedback & Inferences for RaaS

Discussion Points and Feedback

An important aspect of the PD5 engagement was the opportunity for questions, feedback and challenge from those participating. This was strengthened by the bilateral approach taken, allowing open discussion.

The slide pack also included specific discussion points and questions associated with each topic where external views and perspectives were specifically sought. The discussion points raised are presented in Table 2, together with summaries of the feedback received to inform the commercial strategy to be applied for future rollout of RaaS.

The project team sought to elicit views on opportunities, risks and supportive DSO actions to guide development of a commercial approach designed to promote market development, enhance the attractiveness of bidding for and delivering RaaS in remote areas, and enable market participants to efficiently engage with RaaS.

Table 2 - Specific discussion points and questions raised during engagement

Context	Discussion Points / Questions	Feedback Received / Views Expressed
theme: Locations	<p>thoughts about exploring development sites in areas where RaaS would be beneficial</p> <ul style="list-style-type: none"> • views on key considerations when prospecting for sites at present 	<p>Smaller scale BESS sites need the same preparation (planning permission, land lease negotiations, construction planning, etc.) as larger scale sites, but then with proportionately lower income - anything that the DSO can do to support or take on these aspects would increase interest.</p> <ul style="list-style-type: none"> ➤ As part of the DSO tender process for RaaS, information will be provided on locations where the DSO (or other partners) have space within the associated substation compound or on adjacent land that could be offered to an RSP. <p>Connection capacity is key to revenue generation from participation in other markets/ancillary services. Connection timeframes will also govern when planned assets could commence service provision.</p> <ul style="list-style-type: none"> ➤ The DSO will review any network constraints and/or connection queue prior to tendering for RaaS for any given site, and provide relevant information (e.g. size of connection queue, expected date for resolution due to transmission network reinforcement, etc.) where applicable. <p><i>also see the Broader View Points section of this document for comments regarding colocation and onsite assets</i></p>
theme: Tendering Process / Locations	<p>which option is most likely to appeal to potential RSPs ?</p> <ul style="list-style-type: none"> - tendering for individual sites - tendering across a suite of sites with the option to bid for one or more sites - tendering for a portfolio of sites <ul style="list-style-type: none"> • views on the pros & cons of these options • how many/where might it make sense to group sites into lots ? 	<p>The opportunity to tender for a suite of sites would be welcome. Tendering for and planning & delivering individual sites may be perceived as too commercially or operationally onerous, and a suite of sites where the solution was broadly repeatable (with some ability to accommodate specific site needs) would allow framework contracts with strategic partner(s) that can provide replicability and economies of scale.</p> <p>Clustering may be more about sizing (rather than geography). Around 5-6 sites per lot may work well.</p>

		<p>➔ DSO to aim to group/categorise sites for tender based on similar service requirements. Bidders would be able to submit offers for one or more sites.</p> <p>As well as clustering RaaS sites, where other DSO services are required in a location the DSO should bundle these into one tender process (i.e. rather than tendering for RaaS, tendering separately for constraint management). If there were other DSO requirements in the local area, those could potentially still be provided during a RaaS event (e.g. demand reduction for constraint management could be utilised during a RaaS event).</p> <p>➔ DSO to identify and tender for service bundles where appropriate, with bidders able to submit offers for one or more services.</p>
<p>theme: Tendering Process / Locations</p>	<p>would asset developers make use of a DSO resource that gives visibility of all potential RaaS sites, with an open-ended opportunity to propose a RaaS scheme* ?</p> <ul style="list-style-type: none"> • would developers welcome contact re RaaS at the point of submitting a grid connection application to the DNO, or would RaaS need to be considered earlier in the scheme appraisal process ? <p>*as distinct from the DSO targeting specific sites through a point in time tender process</p>	<p>A published resource which identifies all potential current/future RaaS sites would be welcomed. Developers can then approach the DSO if they are looking to install a scheme for a customer in a relevant location (as distinct from a developer taking a RaaS tender as a locational signal for siting e.g. a BESS primarily used for ancillary/wholesale markets).</p> <p>➔ DSO to publish all potential RaaS sites on the website for visibility, in addition to specific tendering processes for initial priority RaaS sites.</p> <p>Similarly, where an application is made for a new connection in a RaaS area, contact from the DSO to invite discussion re RaaS would also be welcomed - avoid missed opportunities.</p> <p>➔ DSO to aim to incorporate this.</p>
<p>theme: Tendering Process</p>	<p>would potential RSPs have sufficient insight to respond meaningfully to an 'initial bid' stage ?</p>	<p>A mix of views were expressed here.</p> <p>Most respondents felt that an initial, non-binding, bid stage should be possible as they would likely have an idea of prices sought to make a decision on whether to bid for RaaS or not. This early evaluation would therefore be beneficial for the RSP, to</p>

		<p>avoid time on detailed technical assessment if the WTA is not at a workable level.</p> <p>However, uncertainties during the early stage of tendering (e.g. grid forming cost, earthing scheme requirements, etc.), may mean that bidders do not have sufficient clarity on costs at this stage.</p> <ul style="list-style-type: none"> ➤ The option to submit a non-binding ‘initial bid’ should form part of the tender process for RSPs to take up where they would find it useful - this would not be used to shortlist bidders, and RSPs may choose not to submit an initial bid.
<p>theme: DSO Requirements Specification</p>	<p>what views are there on both assessing and working with the options of:</p> <ul style="list-style-type: none"> - pre-defined MWh for each Service Window (set out at contract placement) - dynamic capacity requirement notification - ‘take what’s available’ (no reserved capacity for RaaS) <ul style="list-style-type: none"> • views on the pros & cons of these options • if dynamic, how much notice from the DSO would be needed - e.g. day ahead, 4 hrs ahead, other ? 	<p>Clearer service requirements will increase certainty of revenue from RaaS. This would reduce risk to attract initial participation in the service. Accordingly, there was a strong preference for pre-defined service requirements for the initial introduction of RaaS.</p> <ul style="list-style-type: none"> ➤ When tendering for RaaS the maximum service requirement sought will be specified as MWh reserved capacity figures for each EFA block on weekdays/weekends across each season, equating to an e.g. 3 hour RaaS service durations. Alignment with EFA (Electricity Forward Agreement) blocks gives more granularity in linking reserved capacity to expected demand. <p>In time, once experience is gained in the provision of RaaS, increasing dynamics in requirements specification would be welcome to open up options for trading and optimisation - this may reduce certainty of income from RaaS, but give opportunity for increased revenue from other dynamic markets.</p> <ul style="list-style-type: none"> ➤ Noted as a point for ‘future evolution’ of the commercial strategy - allowing an RSP to choose between pre-defined or dynamic capacity requirements specification. <p><i>also see the Requirements Specification and Payment Structure section of this document</i></p>

<p>theme: DSO Requirements Specification / Tendering Process</p>	<p>would developers be open to assessing a range of reserved capacity figures ?</p> <ul style="list-style-type: none"> • to what extent would this add time/resource to their appraisal process ? 	<p>Responses indicated preference for the DSO to set out the maximum requirements sought (i.e. pre-defined MWh for each Service Window), but accept offers/bids for a proportion of that full level.</p> <p>➔ The tendering process will be run on this basis.</p>
<p>theme: DSO Requirements Specification</p>	<p>views on arrangements where:</p> <ul style="list-style-type: none"> - the DSO can ‘stand down’ a RaaS service - would this be a practicable option for RSP asset optimisation ? - the RSP could ‘opt out’ of providing RaaS a number of times across a year <ul style="list-style-type: none"> • if an option to ‘opt out’ would be beneficial, how often and/or for how long would it be useful for an RSP to be able to choose to opt out ? 	<p>Little value was seen in the idea of a DSO being able to ‘stand down’ a RaaS service. This would make revenues from RaaS less certain, and there is no guarantee that the capacity made available to the RSP would generate income over the lost RaaS fee.</p> <p>➔ This will not be incorporated into the RaaS commercial strategy.</p> <p>The ability for an RSP to ‘opt out’ may be of interest, but this should be introduced as a future option, once participants have become more familiar with the RaaS product.</p> <p>➔ Option noted as a point for ‘future evolution’ of the commercial strategy.</p>
<p>theme: Payment Structure</p>	<p>views re availability vs utilisation vs fixed payments for RaaS?</p> <ul style="list-style-type: none"> • perceptions/preferences re payment structure ? • would potential RSPs accept/be interested in different payment structures for each site, or would a ‘one payment structure for all sites’ approach appeal more ? 	<p>As noted above with regard to requirements specification, revenue certainty was highlighted as important for attracting interest in a new flexibility service product, with initial participation allowing the market to gain familiarity with the service. The locational and technological challenges associated with RaaS add to this requirement.</p> <p>A firmer, more certain income stream from RaaS will lower risk of participation and help to incentivise investment - some focus on availability or fixed payments can support this.</p> <p>➔ Recognised as important for the initial rollout of RaaS.</p> <p><i>also see the Requirements Specification and Payment Structure section of this document</i></p>

theme: Contract Length	<p>preferences for e.g. 2 year, 5 year, 10 year contract ?</p> <ul style="list-style-type: none"> • what wouldn't be acceptable contract length wise ? 	<p>Longer term contracts provide more certainty of income over time, and so would be more appealing for the introduction of RaaS.</p> <p>➔ Recognised as important for the initial rollout of RaaS.</p>
theme: modelling to verify capability and network interaction	<p>views on the supplier studies sought for RaaS scheme assessment</p> <ul style="list-style-type: none"> • what would developers value or find supportive during the RaaS modelling and verification process ? 	<p>Technical modelling is recognised as necessary - provides validation of the product, as with other DSO/flexibility services products. Respondee were comfortable with this stage, both in situations where the modelling would need to be sought from the planned asset supplier, or where it could be undertaken by the RSP directly using OEM (Original Equipment Manufacturer) information.</p> <p>➔ The DSO will support this process, working closely with potential RSPs.</p> <p>It is recognised that DSO provision of site specific detail is very important, and detailed information/technical specifications up front should minimise the need for multiple iterations of modelling. This process will draw on experience during the tendering process for the RaaS trial BESS.</p>
theme: Tendering Process	<p>thoughts on the idea of tendering for RaaS, inc. alignment with current processes for participation in other markets/flexibility services ?</p> <ul style="list-style-type: none"> • what timeframes would be acceptable/unacceptable for the tender process (whether upper or lower limits) ? • would an open-ended tender process be acceptable (without defined time periods for different stages of the tendering/assessment process) ? 	<p>In addition to broader alignment with timeframes for other tender processes, it is key to take timeframes associated with the evolving connections process (i.e. application windows, and progression gates) into consideration when issuing invitations to tender for RaaS.</p> <p>➔ Recognised as important for the initial rollout of RaaS.</p>
theme: Tendering Process	<p>views on:</p> <ul style="list-style-type: none"> - key challenges - key risks <p>associated with tendering for RaaS</p>	<p>see the Key Challenges section of this document</p>
theme: Scheme Development	<p>have we understood the stages of scheme development correctly ?</p> <ul style="list-style-type: none"> • are there other key points that we should consider ? 	<p>see the Broader View Points section of this document</p>

Broader View Points

In addition to feedback on the specific discussion points raised, there was commonality in views around:

- the requirement for a clear investment signal/revenue stream when introducing this as a new flexibility services product, aiming to reduce uncertainty over the potential income from RaaS
- potential for colocation with renewables is expected to be advantageous - helping to firm revenue streams
- likewise, the potential for RaaS to be provided via 'behind the meter' BESS schemes installed to balance onsite energy use (to reduce energy costs by optimising on site load and generation, or avoid network reinforcement costs by minimising import from grid) and/or for onsite resilience was of interest with regard to both synergies of use cases and increased income certainty - this strongly recognised a whole system approach to solution planning, and the potential for sites being located in areas that would benefit from RaaS, such as rural renewable energy schemes, distilleries, supermarkets, and water or wastewater treatment works
- DSOs must provide clear information to potential bidders, and have clear routes/points of contact to raise questions and points of clarification through the tender process - this must include clarity in requirements specification, and clarity in how schemes will be assessed and selected
- while some asset owners and service providers are focussed on larger scale batteries at present, from a strategic perspective multiple RaaS locations may create interest to form new business models
- increased focus on resilience under RIIO-ED3 should further promote measures to improve security of supply - when setting out the strategic context for RIIO-3¹⁸, Ofgem specifically recognises the importance of energy systems being developed with acceptable levels of resilience against climate change and extreme weather events

All feedback provided has been used to shape the commercial framework proposed for future rollout of RaaS following successful demonstration of the pilot scheme through the project trial.

Requirements Specification and Payment Structure

This subsection provides detail on the conclusions for requirements specification and payment structure, as referenced in Table 2.

The approach taken must work towards a RaaS fee which represents a cost effective solution for the DSO and its customers, and is commercially acceptable for the RSP, recognising considerations associated with the implementation of RaaS in remote locations.

Further, the site specific nature of RaaS requirements (reflecting local demand patterns) and the specifics of schemes that may be implemented to provide RaaS in a given location (reflecting both capacity to meet demand (e.g. BESS capacity, co-located renewables, demand turndown, etc.) and other scheme use cases), each influence the overall economics of a RaaS scheme.

The paragraphs below set out the background and PD5 conclusions with regard to suitable payment structures for the introduction of RaaS as a new DSO flexibility services product.

¹⁸ Ofgem [Future Systems and Network Regulation: Framework Decision Overview](#), October 2023

"2.7 We also recognise the significance of climate change in exacerbating extreme weather events and the importance of future energy systems being developed with acceptable levels of resilience against these events."

Context

An approach for DNO valuation of a RaaS service was developed through Phase 1 of the project¹⁹, providing a means to assess the overall 'Willingness to Pay' (WTP) for a RaaS service at individual sites, based on probabilistic assessment of historic demand patterns and outages. The figures derived represent a typical amount that a DNO should aim to pay overall for a RaaS service (e.g. per year, or per contract duration), based on probabilistic assessment of two measures - firstly, average annual Customer Interruption (CI) & Customer Minutes Lost (CML) penalties, which form part of the RIIO-ED2 Interruption Incentive Scheme (IIS) applied to DNOs; and secondly, average annual Value of Lost Load (VoLL) figures, which provide a more refined view of the impact of different frequencies and durations of power outage on different customer groups.

Whilst this provides a basis for DNO valuation, other factors will also influence a DNO's decision to implement RaaS and the value to be attributed. Examples here include aspirations for improving network performance for Worst Served Customers (WSC)²⁰, Ofgem expectations for service to vulnerable consumers (beyond consideration of VoLL or CIs/CMLs), or avoiding the visual impact of a new overhead line (alternatively accepting the high cost of undergrounding).

Further, drivers for resilience introduced for RIIO-ED3 can be incorporated into this DNO valuation where RaaS is rolled out in future years.

From the RSP perspective, their business case must consider other use cases for the asset(s) forming the scheme to derive a 'Willingness to Accept' (WTA) figure for provision of RaaS. The Phase 1 work also assessed the potential capability to stack revenues through participation in other markets²¹.

The Willingness to Pay and Willingness to Accept figures must be well balanced and acceptable for both parties for a successful RaaS scheme.

Subsequent work through Phase 2 of the project has looked into the effect of payment structure on the provision of RaaS, to explore the balance of fixed, availability and/or utilisation payments and aim to understand the approach that would represent best value for both RSPs and DNO customers. This work made it clear that different potential RaaS sites have different payment structure/customer benefit ratios influenced by scheme specifics. This is in part driven by the overall capacity of the RaaS asset(s) vs demand at a site, for example:

- in some situations there may be a high level of 'natural availability' of BESS capacity for provision of RaaS, where the expected optimisation of the BESS in other markets tends to result in available capacity aligned to local demand - the 'take what's available' approach would work well in these areas, and a focus on utilisation payments would tend to represent a greater customer cost/benefit ratio
- for some local demand/BESS capacity combinations, availability price signals tend to have a 'tipping point' in influencing BESS behaviour (rather than linearly encouraging reserved capacity for RaaS) - availability payments below that point would represent little/no marginal benefit to DNO customers, and availability payment values above that point may represent overly high payments by the DNO

Alongside these findings, it is clear from PD5 engagement that a straightforward approach to site specific requirements specification and payment structure will help to attract participation in the initial introduction of RaaS by providing a firmer revenue stream which reduces uncertainty for potential RSPs.

The role of availability or fixed payments in providing locational price signals for assets that could be installed in alternative locations is also recognised.

¹⁹ RaaS '[DNO Business Case Review](#)', TNEI

²⁰ the SSEN RIIO-ED2 Business Plan final submission includes a [Reliability Strategy](#) annex to Section C 'A Safe, Resilient and Responsive Network'

²¹ RaaS PD3 '[Business Model](#)'

Recommendations

Drawing on the above context, this subsection sets out the proposal relating to RaaS service requirements specification and payment structure at this point in time.

Notably, neither a single approach to payment structure for all sites, nor fixed payment rates for RaaS across all sites, would provide an appropriate, cost effective solution for wider introduction of RaaS.

Whilst ballpark figures for RaaS fees are recognised as useful for those considering participation in RaaS and assessing the business case for their asset(s), DSO derivation of a ceiling price for RaaS is intricate for a number of key reasons:

- the customer benefit, and therefore value, of RaaS is dependent on the duration of service to be offered for maintaining supply to customers - reflective of the capacity available to meet demand during a RaaS event
- the DSO 'indicative average WTP per year (or over the contract duration)' is an overall figure, and the payment structure sought by an RSP (i.e. their preferred mix of fixed, availability & utilisation payments) will influence the ceiling price for the £/MWh rates associated with availability & utilisation payments (then combining to form the overall RaaS fees)
- the total amount issued as utilisation payments will be influenced by the number of RaaS events during any given year, which by its nature is unpredictable

Given this, during the initial rollout of RaaS SSEN-D would aim to provide indicative availability & utilisation payment figures (£/MWh) for each site equating to an example proportional split linked back to overall DSO WTP £ per year, using the example methodology set out in the callout box below.

Example methodology for deriving indicative DNO WTP figures

- 1) based on an e.g. 3 hour RaaS service duration, establish the reserved capacities associated with each EFA block on weekdays/weekends across each season
- 2) use 1) to derive a total reserved capacity MWh over the year
- 3) apply an assumption that 70% of the indicative overall average WTP per year is provided as an availability payment
- 4) divide 3) by 2) to derive a £/MWh availability payment
- 5) divide the remainder (30%) of the indicative overall average WTP per year by the mode of the frequency and duration curves derived through the DNO valuation modelling methodology to derive a £/MWh utilisation payment

Whilst not representing ceiling prices - for the reasons set out above - associated figures could be provided by the DSO as part of the tender process caveated as example information, and provided together with both historic fault data for the site, and the modelled outage frequency and duration curves^{19, 22}.

Potential RSPs would then be able to propose their own preference for availability/utilisation payments, and the reserved capacities that they are able to offer (whether the full level of reserved capacity sought by the DSO, or a proportion of that), with these being assessed by the DSO using the probabilistic assessment of outages & indicative average annual value of the proposed service. Where an RSP bids for a portfolio of RaaS sites, there may be merit in combining values across the sites to derive availability & utilisation rates applicable to all sites.

Table 3 sets out the proposed approach to payment structure and assessment of RSP WTA figures for the two planned service requirements specification options. This reflects PD5 engagement feedback as:

- a defined service requirement supports the introduction of RaaS by providing a clear and firmer basis for assessment which reduces uncertainty for the RSP, in contrast to a dynamic approach to requirements specification with requirements notified e.g. day ahead
- although a 'take what's available' approach represents less certainty for both the RSP and DSO, some schemes may be well placed to offer RaaS on this basis - examples here include batteries with capacity proportionally greater than average local demand levels, and batteries installed for another primary use case (e.g. local/onsite energy balancing, or onsite resilience) which may not be focused on participating in other flexibility services

Whilst 'take what's available' bids may not be widely offered initially by RSPs, it is appropriate to retain this as an option as something that RSPs can request for exploration, with the DSO able to accept and assess bids on both bases. An option for the DSO to specify a reserved amount a period of time ahead, e.g. in advance of expected storms/named weather events, could also be explored.

Table 3 - Proposed approaches to requirements specification and payment structures

Requirements Specification	Payment Structure	Potential Penalties	Assessment
defined reserved capacity	<ul style="list-style-type: none"> • mix of availability & utilisation payments 	<ul style="list-style-type: none"> • no availability payment during periods where specified capacity is not reserved • no payment for utilisation if not responding to an event • contractual breach penalty for continued under/non-delivery²³ 	<ul style="list-style-type: none"> • DNO provides indicative/ballpark WTP figures based on example methodology • DNO provides an indication of historic outages & modelled outage assumptions • bids assessed against probabilistic assessment of outages & annual cost with regard to WTA figures and duration of service associated with the reserved capacity offered
'take what's available'	<ul style="list-style-type: none"> • mix of fixed & utilisation payments 	<ul style="list-style-type: none"> • no payment for utilisation if not responding to an event when capacity is available • contractual breach penalty to recover an element of the fixed payment made 	<ul style="list-style-type: none"> • indicative/ballpark WTP figures of less relevance, though would have been provided as part of the tender information • DNO provides an indication of historic outages & modelled outage assumptions • bids assessed against probabilistic assessment of outages & annual cost with regard to WTA figures and modelled available capacity profile

²² these curves would be in the form of probability distributions which indicate:

- the probability that X number of faults will occur within a given year
- the probability that, once a fault occurs, customers are off supply for at least Y hours

²³ a consideration here is the need to avoid risk of an RSP having been awarded RaaS but then not providing the service, with the impact that the DNO turned down another scheme, resulting in a missed opportunity to apply RaaS in that area

Future Evolution

The commercial strategy for initial implementation and rollout of RaaS is focused on attracting engagement and participation in a new product supporting remote 11kV networks. The potential future evolution of RaaS must, however, also be considered to ensure that the approach taken allows for future adaptation and innovation in RaaS.

Stakeholder engagement through Phase 1 of the project supported the idea that beyond an initial, direct, implementation to remote 11kV networks, the RaaS concept can evolve to benefit other areas and voltage levels across the distribution network, and be delivered in a range of ways incorporating different assets and participant.

Conversations held with supply chain stakeholders through PD5 engagement provided a clear steer on what would be sought to attract early market participation in RaaS. Interest in further options over time, as experience is gained through initial rollout and drawing on other technologies and market capabilities, was also expressed.

These 'future evolution' points include:

- once industry/investors are more familiar with RaaS, service providers would welcome increasing dynamics in requirements specification as this may open up options for trading and optimisation, which may reduce certainty of RaaS income but give opportunity for increased revenue from other dynamic markets - examples here include:
 - dynamic RaaS service requirement specification - e.g. reserved capacity notified day ahead, 4 hrs ahead, etc. - greater granularity in requirements specification equates to reserved capacity more closely aligned to expected demand requirements, allowing more headroom capacity for other markets - an RSP would be able to choose between defined or dynamic capacity requirements specification
 - introduction of the option for a RSP to choose to 'opt out' of providing RaaS a given number of times across a year/contract
 - potential application of different availability and/or utilisation payments at different times of year
- where there may be more than one asset with RaaS capability within an area:
 - DSO appoints several RSPs, with associated rules about which one is called on for grid forming capability during any given RaaS event (e.g. based on merit order, rotation, etc.) potentially with assets declaring availability the week before
 - availability of a contract to provide a given proportion of a RaaS service (e.g. certain times of year, or supporting a proportion of a RaaS event)
 - ability for RSPs to flexibly bid for provision of RaaS at different points in time across a year
- application of RaaS as part of a wider microgrid incorporating e.g. local demand reduction, dynamic/direct control of local renewables, integration with V2G schemes, integration with thermal stores, integration with hydrogen schemes, incorporation of other schemes/assets that could contribute to load balancing and the duration of islanded operation, etc. - potentially supporting both a local restoration plan and Distributed ReStart (national black start)
- provision of RaaS from assets connected to the higher voltage network - as an example here, a BESS connected to the 33kV network which has an auxiliary load connection to the 11kV network may be able to use that 11kV connection to provide RaaS

Links with Wider Industry Activities

The future application of RaaS will be influenced both technically and commercially by wider industry activities.

To develop a replicable product for RaaS the project team must be mindful of ongoing initiatives and their bearing on the commercial framework and future opportunities for RaaS. Relevant proposals and consultations must be tracked to understand potential implications for RaaS and provide input such that future changes accommodate and support RaaS.

Through this PD5 engagement, too, key observations and challenges were raised by participants drawing on their experience of working to deliver flexible and low carbon solutions for the GB energy system. These comprised:

Ongoing changes to the new connections application and assessment processes, both at ESO and DNO level

Examples of the range of initiatives underway include:

- National Grid ESO's 'five-point plan'²⁴ of short term initiatives to improve the connections process and aim to speed up connections to the grid, including changes to how batteries and other energy storage technologies are assessed with regard to their impact on the electricity system
- National Grid ESO's Connections Reform project²⁵ to establish longer term changes to the connections process to address challenges
- the ENA's Strategic Connections Group's 'three-step plan'²⁶ for improving and accelerating customer connections at distribution level, including introduction of standardised 'non-firm' connections offered to battery storage operators on a 'connect and manage' basis, and the plan to roll out Grid Supply Point Technical Limits²⁷
- contribution by Regen's Electricity Storage Network (ESN) Grid Connections Working Group²⁸ on issues impacting access to the electricity grid, to reduce barriers preventing renewable generation and low carbon technologies from connecting at the speed and scale needed to meet net zero

Within the PD5 engagement events a number of participants raised considerations about grid connections, including the question as to whether changes to the connections process would better recognise grid connection applications that contribute to security of supply, address constraints, etc., with regard to how such schemes are assessed and connected.

Mechanisms to promote enhanced resilience through the RIIO-ED3 price control

RIIO-ED3 support for resilience schemes will be important for bolstering security of supply for the GB energy system.

The need for enhanced resilience is increasingly clear, in light of both climate change and increasing severe weather events²⁹, and with greater reliance on electricity through the decarbonisation and electrification of heat and transport.

²⁴ www.nationalgrideso.com/industry-information/connections/what-are-we-doing-now-our-five-point-plan

²⁵ www.nationalgrideso.com/industry-information/connections/connections-reform

²⁶ <https://cdn.prgloo.com/media/35e96278bc7040f08ed7103df86c23e4.pdf>

²⁷ <https://www.energynetworks.org/publications/grid-supply-point-technical-limits-for-accelerated-non-firm-connections>

²⁸ www.regen.co.uk/project/grid-connections-working-group

²⁹ recent considerations here include Storms Arwen (November 2021), Eunice (February 2022), Otto (February 2023), Agnes (September 2023), Babet (October 2023), with fewer storms of such impact experienced prior to bid submission and awarding of funding for the RaaS NIC project

Mechanisms or incentives to support local resilience will act to promote the wider implementation of RaaS, bringing benefits to households, businesses and communities in a great number of locations.

Development of a more focused approach to network reliability within RIIO-ED3, which better recognises the increasing impact of power outages on customers³⁰, will provide benefits to customers and support broader policy aims for the resilience of GB infrastructure.

Specific support for resilience would enhance the economic value of RaaS schemes, thereby broadening the number of sites where RaaS would be attractive to potential service providers. As noted in the **Development of the Commercial Framework for RaaS** section of this document, a key challenge recognised through this PD5 engagement is the need to meet the incremental costs to deliver the service associated with a higher technology specification (inc. grid forming capability, provision of sufficient fault level contribution) and more remote locations.

Wholesale markets and locational charging

The Government's Review of Electricity Market Arrangements (REMA)³¹ is an ongoing industry reform programme focused on balancing the supply and demand of electricity and policies to incentivise investments in assets. The scope of REMA includes the balancing mechanism, ancillary services, the Capacity Market (CM) and the Contracts for Difference (CfD) scheme.

REMA will lead to changes in how electricity wholesale market prices are derived, thereby having implications for local energy assets, including batteries. Whilst nodal pricing (Locational Marginal Pricing (LMP)) has now been ruled out, zonal pricing remains an option under detailed consideration. Shorter-duration settlement periods also remain in consideration.

Similarly, initiatives such as National Grid ESO's proposal for a Local Constraint Market³² will influence use of power by distributed energy resources, including batteries, in some locations.

As RaaS is a locationally bounded solution, changes to pricing mechanisms, charging schemes, local markets etc. bring considerations for those investing in energy assets. Whilst benefits for distributed energy schemes, batteries, etc. are likely to be realised, uncertainty over how such changes might resolve may create apprehension around investment, thereby holding back future rollout of RaaS beyond the project trial. To avoid impeding the timely rollout of RaaS, the business case for assets built under one regime must be respected, and/or incentives for localised resilience must counter these uncertainties.

³⁰ the current RIIO-ED2 price control period has three key components for network reliability:

- Interruption Incentive Scheme (IIS) - which applies generic penalty rates on DNOs for Customer Interruptions (CIs) and CMLs (Customer Minutes Lost)
- Guaranteed Standards of Performance (GSoP) - generic rates for compensation payments to customers if a DNO fails to meet the defined level of service
- Improved network performance for Worst Served Customers (WSC, defined as a "customer experiencing on average at least four higher voltage interruptions per year, over a three-year period") - no specific performance levels have been set by Ofgem in RIIO-ED2, and DNOs must establish the appropriate level of performance improvement required through engagement with stakeholders

³¹ www.whatisrema.com

³² www.nationalgrideso.com/industry-information/balancing-services/local-constraint-market - trial of a local marketplace that incentivises use of power by local assets (e.g. demand turn-up to time-shifting energy use) when the southwards transmission system is at capacity

Strategic planning activities

Strategic planning activities involving a wide range of stakeholders - such as the creation of Local Heat and Energy Efficiency Strategies (LHEESs) in Scotland and Local Area Energy Plans (LAEPs) in England and Wales³³ - provide additional input to DNO network planning activities. By bringing greater visibility and understanding of infrastructure requirements and options for delivery, all involved, including DNOs, can use these approaches to evolve their planning processes and provide whole system solutions which attract and make the most of local energy assets.

Further, the National Energy System Operator (NESO)³⁴, which is due to replace the Electricity System Operator in autumn 2024, will have responsibility for producing Regional Energy Strategic Plans (RESPs) to improve strategic energy planning and coordination across the country. NESO's regional planning capabilities are expected to be established by late 2025, with RESPs then feeding into electricity and gas distribution network investment plans for the RII0-3 price control periods³⁵.

As a market based approach to local electricity network resilience using assets that can participate in other services, RaaS is well placed to form part of optimised local area energy strategies.

Broader policy aims

The RaaS concept is also well placed to support wider policy aims. Key statements identified through prior project work and referenced through PD5 engagement included:

- Scottish Government's Local Energy Policy Statement, January 2021³⁶ - key principles and values to inform decisions of those participating in or developing local energy schemes, these support an inclusive energy transition centred on individuals and supported by strong collaboration at local community level
- Electricity Engineering Standards Review, December 2020³⁷ - an Independent Panel Report (for BEIS/Ofgem) with recommendations including introduction of a customer focused resilience standard, and a methodology to use distributed resources to supply customers in power islands under outage conditions
- National Infrastructure Commission report on infrastructure resilience, May 2020³⁸ - recommendations include using flexibility services to keep options open as energy demands change, and applying managed approaches to proactively and incrementally adapt
- Scottish Government's Energy Strategy - the strategy will draw on conclusions from the Draft Energy Strategy and Just Transition Plan consultation³⁹, which set out the policy positions and ambitions that the government seek to press for and influence

³³ Scottish Government have mandated the development of Local Heat and Energy Efficiency Strategies (LHEES), Welsh Government has mandated the development of LAEPs - SSEN are committed to supporting development of coordinated and effective delivery strategies for whole system and net zero initiatives at local level www.ssen.co.uk/about-ssn/dso/whole-system/local-area-energy-planning

³⁴ NESO will be an independent public corporation responsible for planning Britain's electricity and gas networks and operating the electricity system www.nationalgrideso.com/what-we-do/becoming-national-energy-system-operator-neso

³⁵ Ofgem [Future Systems and Network Regulation Core Document](#), October 2023

"1.22 A key area for RII0-ED3 will be the design of a new regional system planning approach and reviewing the role of the distribution network companies in allowing greater flexibility on the system. These decisions on local energy governance will be critical inputs to the future regulatory framework for distribution, and further work in developing that framework will be needed in the next year when we have greater certainty on the forward approach."

³⁶ www.gov.scot/publications/local-energy-policy-statement

³⁷ https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/943685/Electricity_Engineering_Standards_Review.pdf

³⁸ <https://nic.org.uk/app/uploads/Anticipate-React-Recover-28-May-2020.pdf>

³⁹ <https://consult.gov.scot/energy-and-climate-change-directorate/energy-strategy-and-just-transition-plan>

- Local Energy Scotland - support for community energy, and local energy schemes, including promoting community participation with developers in renewable energy projects through shared ownership⁴⁰
- The Energy Act 2023 - the Act makes provision about energy production and security, and the regulation of the energy market⁴¹
- potential future reforms along the lines of those set out in the Local Electricity Bill⁴² - a Bill with proposals to enable electricity generators to become local electricity suppliers

The benefits of RaaS in achieving these policy aims and representing the efficient use of local energy resources to bring benefits to local communities must be recognised in mechanisms and incentives implemented to achieve policy aims. Such measures may similarly provide other use cases and drivers for energy storage schemes or other assets that could also be used to deliver energy resilience.

⁴⁰ Local Energy Scotland manage the Scottish Government's Community and Renewable Energy Scheme (CARES), giving advice and funding about local renewable energy <https://localenergy.scot/resource/shared-ownership/what-are-the-benefits-of-shared-ownership>

⁴¹ www.legislation.gov.uk/ukpga/2023/52

⁴² <https://bills.parliament.uk/bills/3039>

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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Appendices

Appendix 1 - RaaS Project Deliverables

Appendix 2 - 'RaaS Concept and Commercial Strategy Development - June 2024' - slide pack for PD5 supply chain engagement

Appendix 1 - RaaS Project Deliverables

To provide the context for PD5, Table 4 presents the Project Deliverables defined in the RaaS Project Direction.

Table 4 - 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. Evidence provided to Project Steering Board to inform Stage Gate decision including technical design, stakeholder feedback, alignment with Open Networks Project, updated budget and business case.
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.