



# RaaS - Resilience as a Service

local energy resources to improve security of supply

Maciej Fila - SSEN Distribution

November 2023



Scottish & Southern  
Electricity Networks



# OUR NETWORK AT A GLANCE

Our electricity distribution network delivers power to over 3.9 million homes and businesses across the diverse and unique geographies of the north of Scotland and central southern England.

## OUR DISTRIBUTION NETWORK AT A GLANCE

Over **3.9million** homes and businesses

More than **888,000** customers on our Priority Services Register

Over **128,000km** of overhead lines and underground cables

Over **460km** of subsea cables powering our island communities

Over **4,100** employees across the country

Figures as at October 2023





## RaaS Concept

Improved resilience of the electricity system using local energy storage and generation to restore supply in the event of a power outage

### Benefits

- Security of Supply - customers experience fewer and/or shorter interruptions
- Increased uptime - renewables continue to generate and export to grid at times when that energy would otherwise have been lost
- Reduced use of temporary diesel generation
- Additional income stream for storage / flexibility market assets

### Why now?

To harness the growing number of third party owned assets and emerging markets for flexibility in addressing network challenges

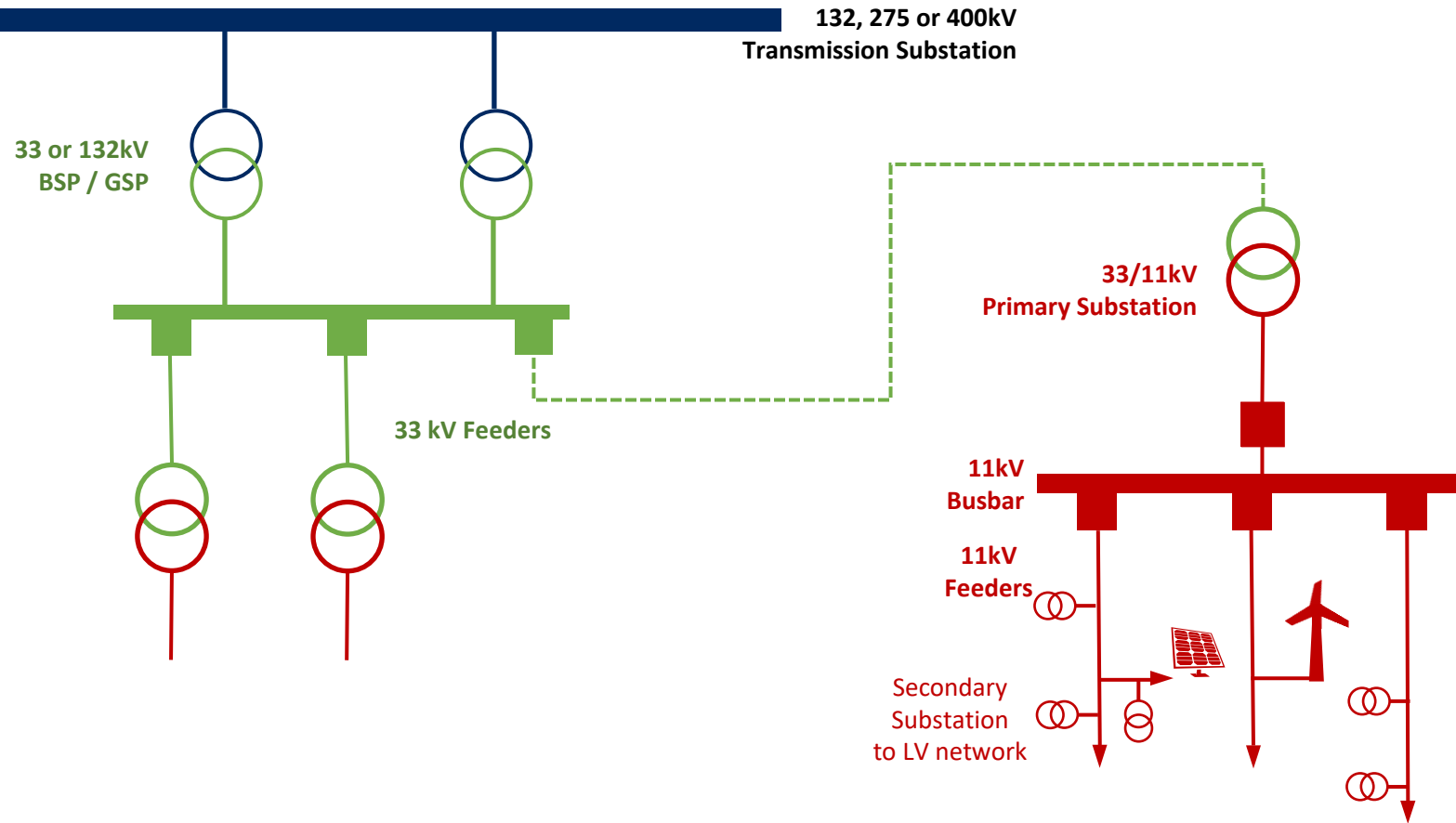
### Project Objective

Develop and demonstrate a new market-based solution to improve network resilience using local energy resources

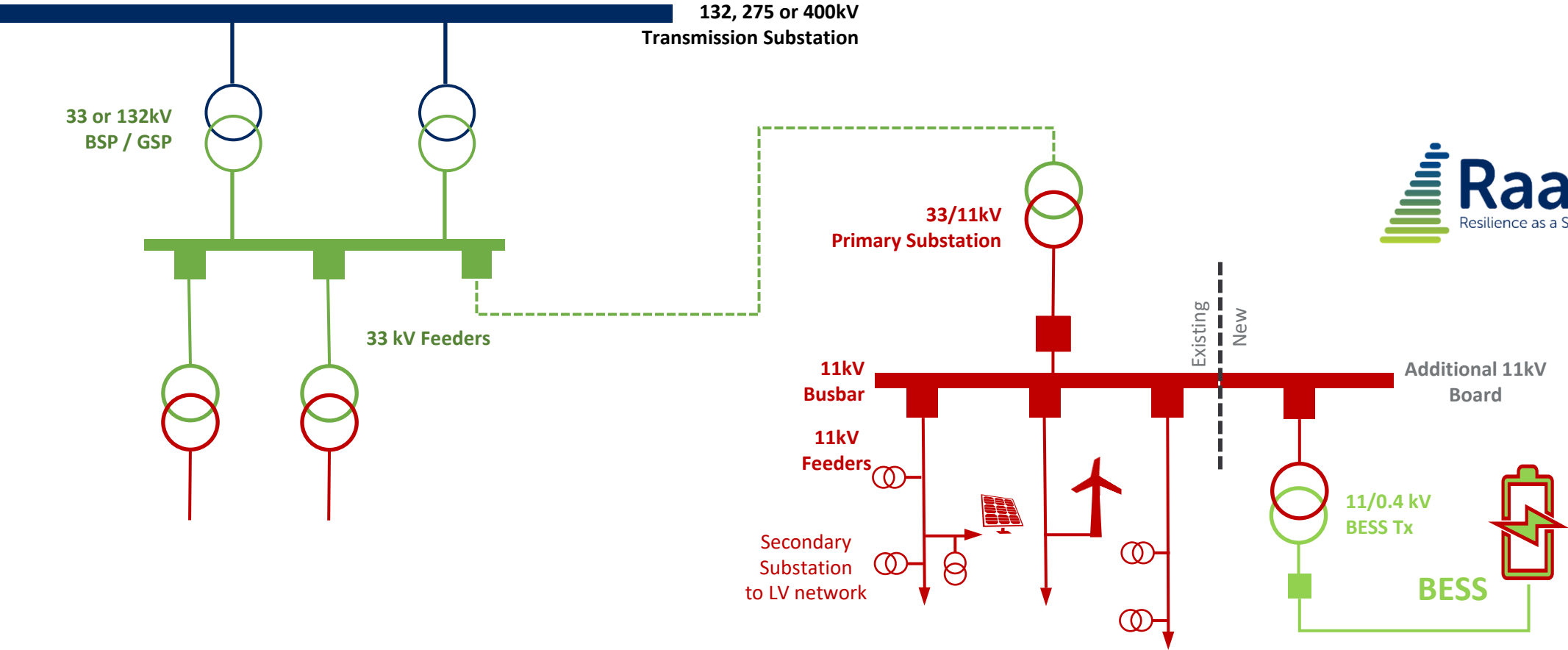
£10.9m Network Innovation Competition funded project



# RaaS Technical Solution

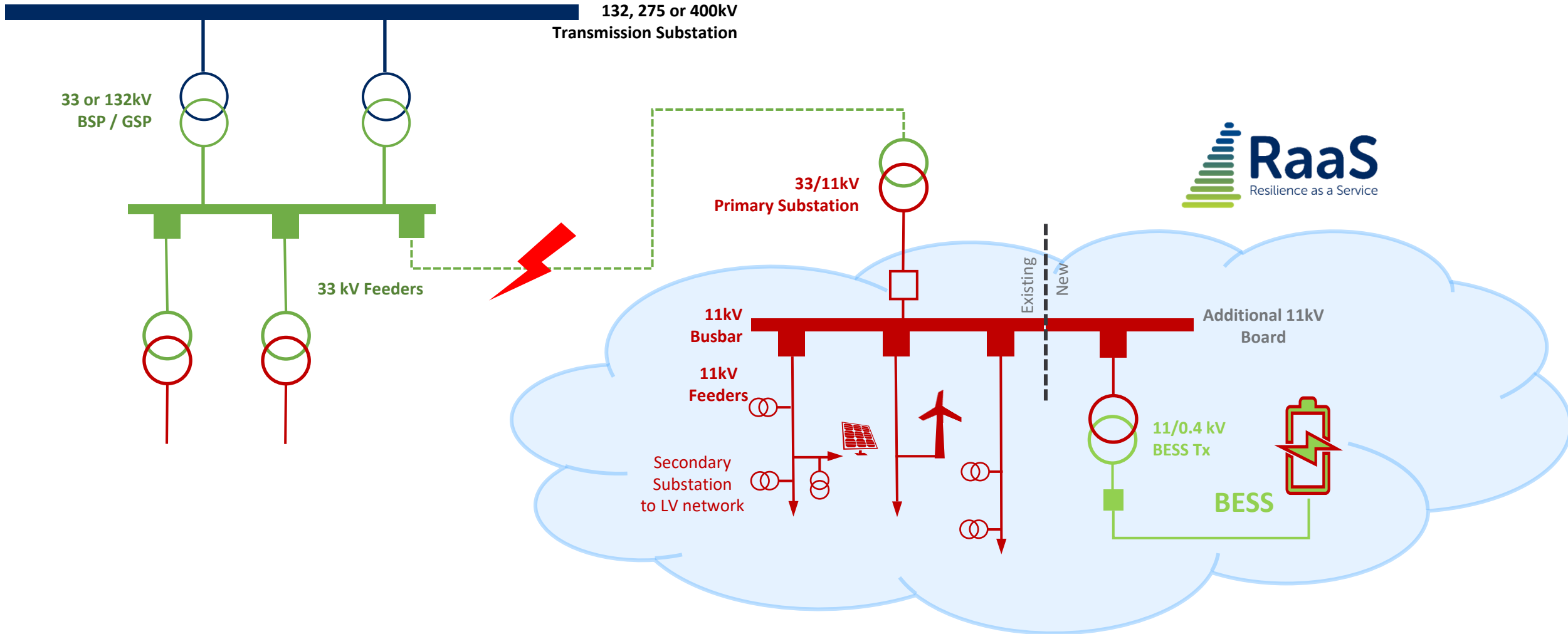


# RaaS Technical Solution



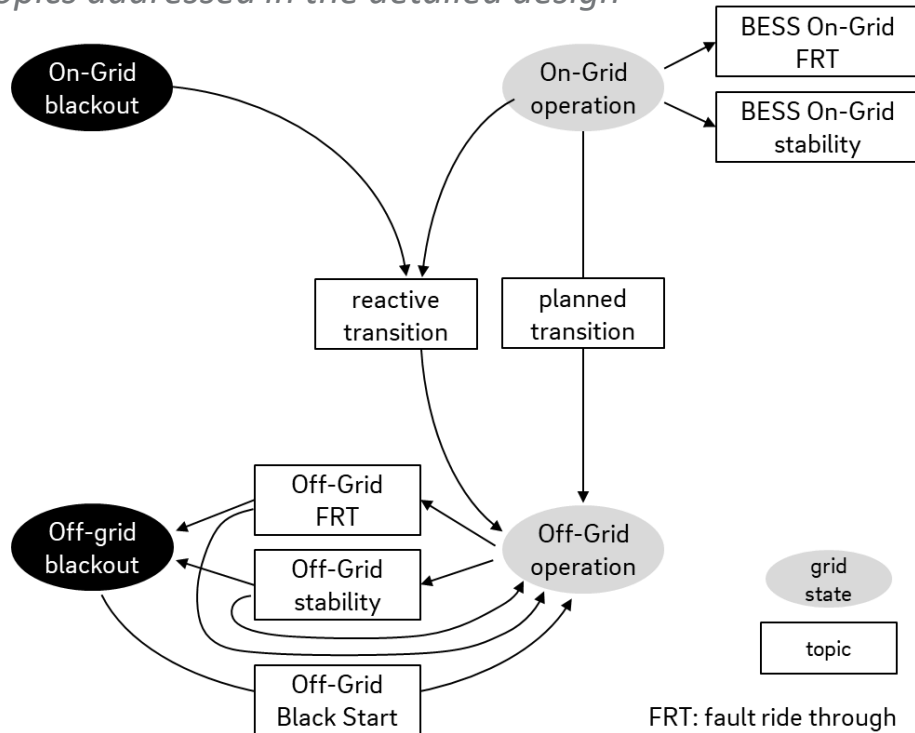


# RaaS Technical Solution



# Detailed Design

*topics addressed in the detailed design*



## SSEN

- Modelling & Feasibility Studies - RaaS at primary substation level - [WSP](#)
- Modelling of Inrush Currents During a RaaS Black Start Scenario - [WSP](#)
- Protection & Control Settings Study - [WSP](#)
- PoW Switching Studies - [Enspec](#)
- Detailed DNO Control Scheme Design - [SGS](#)

## E.ON

- Request for Information & Request for Proposals stages
  - identification and qualification of potential suppliers for BESS components & functionalities
- RaaS BESS Detailed Engineering Design

<https://ssen-innovation.co.uk/raas>



# Trial Site - Drynoch, Isle of Skye





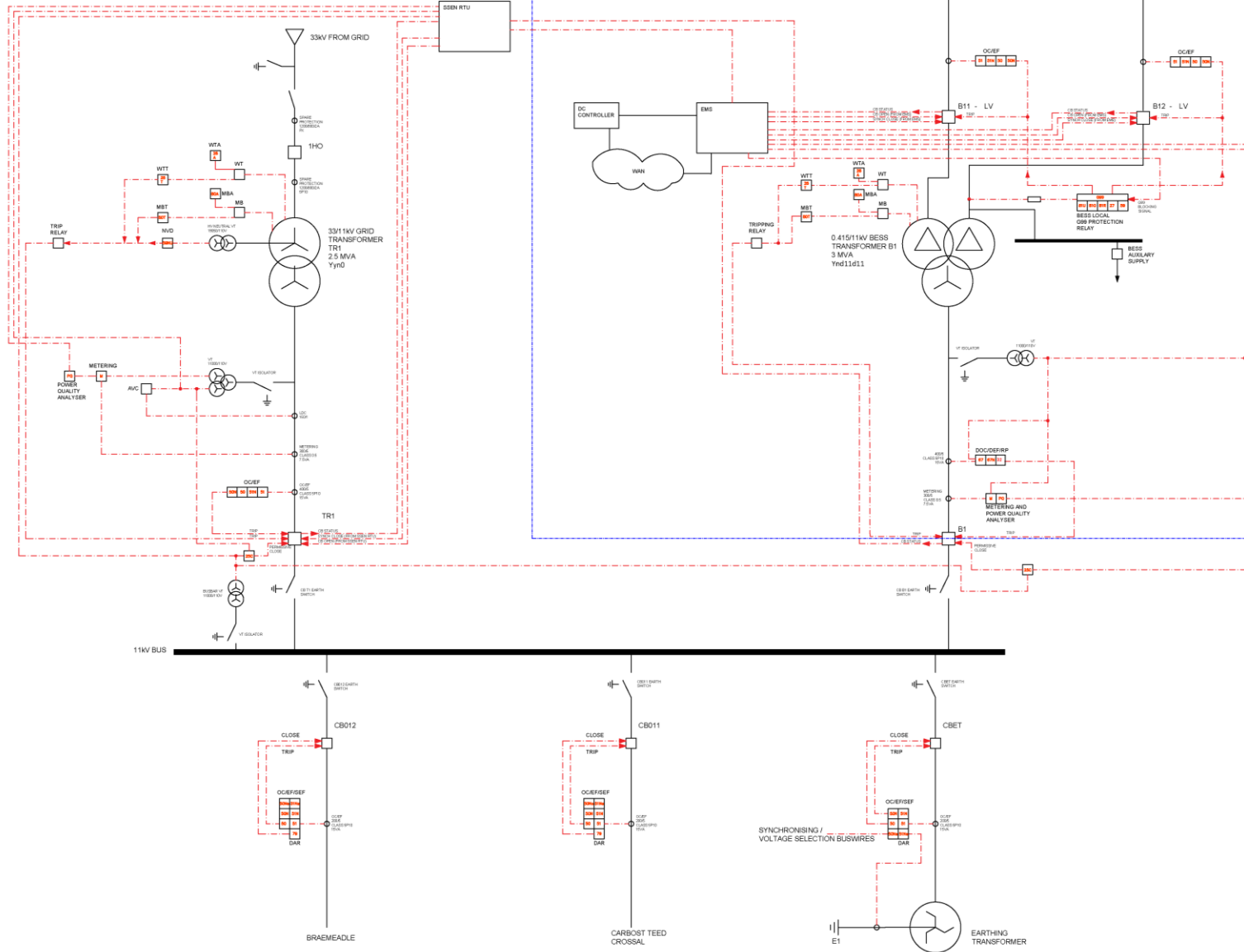
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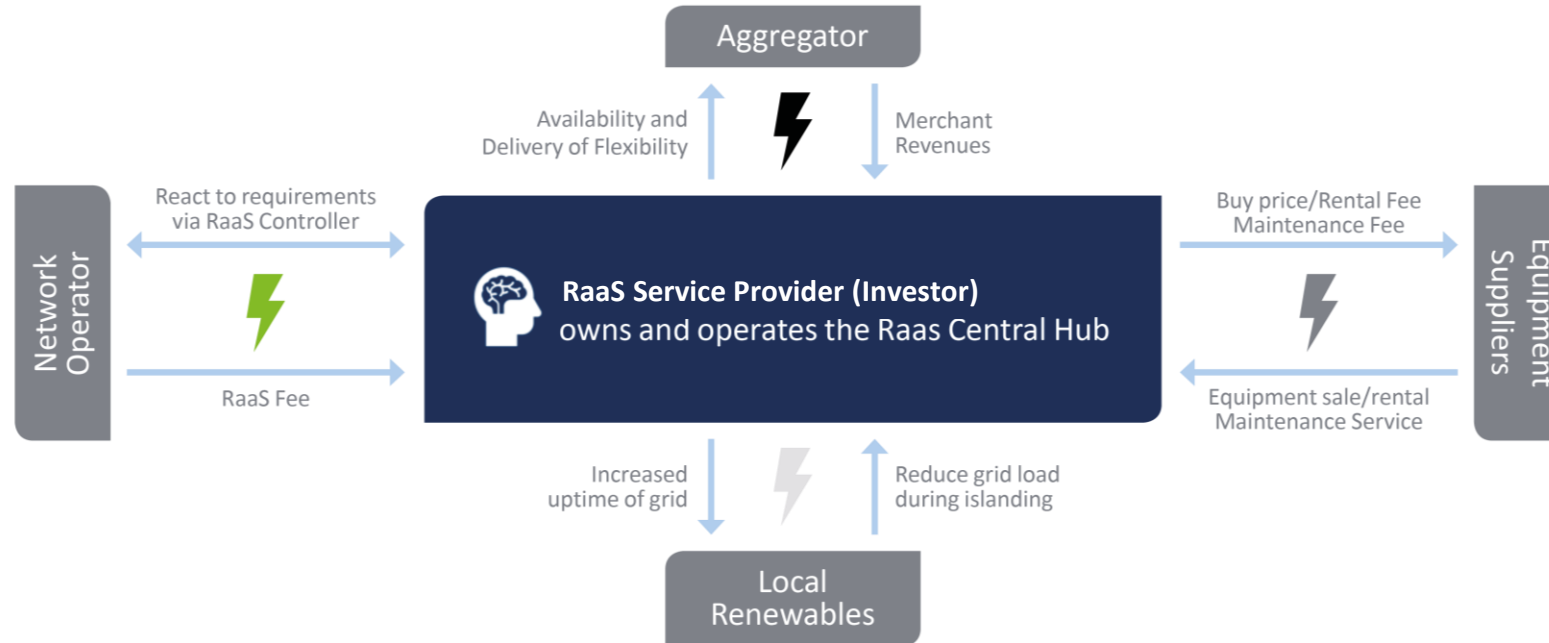


REFER TO SPECIFICATION

LINK TO SSEN RaaS  
CONTROLLER VIA DNP3  
PROTOCOL ON RS485 LINK

- 25 SYNCHRONISING DEVICE (A=AUTO SYNC, C=CHECK SYNC)
- 26 A TEMPERATURE ALARM
- 26 T TEMPERATURE TRIP
- 27 UNDER VOLTAGE RELAY
- 30A ANNUNCIATOR RELAY
- 32 DIRECTIONAL OR REVERSE POWER RELAY
- 50 INSTANTANEOUS OVERCURRENT RELAY
- 50N RESIDUAL INSTANTANEOUS OVERCURRENT RELAY
- 50 NS SENSITIVE GROUND FAULT PROTECTION RELAY
- 51 A.C. TIME DELAY OVERCURRENT RELAY
- 51 NS SENSITIVE GROUND FAULT PROTECTION RELAY
- 51N SBY BACK UP EARTH FAULT PROTECTION RELAY
- 52a CIRCUIT BREAKER FOLLOWER
- 52b CIRCUIT BREAKER INVERSE FOLLOWER
- 52c CIRCUIT BREAKER SERVICE POSITION FOLLOWER
- 52d CIRCUIT BREAKER SERVICE POSITION INVERSE FOLLOWER
- 52T CIRCUIT BREAKER TRIP COIL
- 59 OVER VOLTAGE RELAY
- 61 DENSITY SWITCH OR SENSOR
- 64 REF RESTRICTED EARTH FAULT RELAY
- 67 AC DIRECTIONAL OVERCURRENT RELAY
- 67N AC DIRECTIONAL EARTH FAULT PROTECTION RELAY
- 79 AC RECLOSING RELAY
- 80A BUCHHOLZ RELAY ALARM
- 80T BUCHHOLZ RELAY TRIP
- 81O OVERVOLTAGE RELAY
- 81R RATE-OF-CHANGE-OF-FREQUENCY RELAY
- 81U UNDERFREQUENCY RELAY
- 85 TRIP/LOCKOUT RELAY
- 94 TRIP OR TRIP FREE RELAY
- kwh kWh METER
- M MULTI-FUNCTION METER
- VPS VOLTAGE PRESENCE INDICATION SYSTEM
- VT VOLTAGE TRANSFORMER (2W)
- TRANSFORMER (3W)
- ET EARTHING TRANSFORMER
- A AMMETER
- CT CURRENT TRANSFORMER
- CIRCUIT BREAKER
- BATTERY STORAGE CLUSTER
- PCS POWER CONVERSION SYSTEM
- PQS POWER QUALITY SYSTEM

# RaaS Commercial Solution



## Challenges to solve to mitigate risk of RaaS provider:

- ⚡ Standardisation of requirements
- ⚡ Operational optimisation
- ⚡ Inclusion of local renewables
- ⚡ Equipment Supply Chain



## RaaS Supply Chain:

- RaaS Provider as single contractor to DNO
- Technology agnostic and cost optimized procurement structure



# Business Case

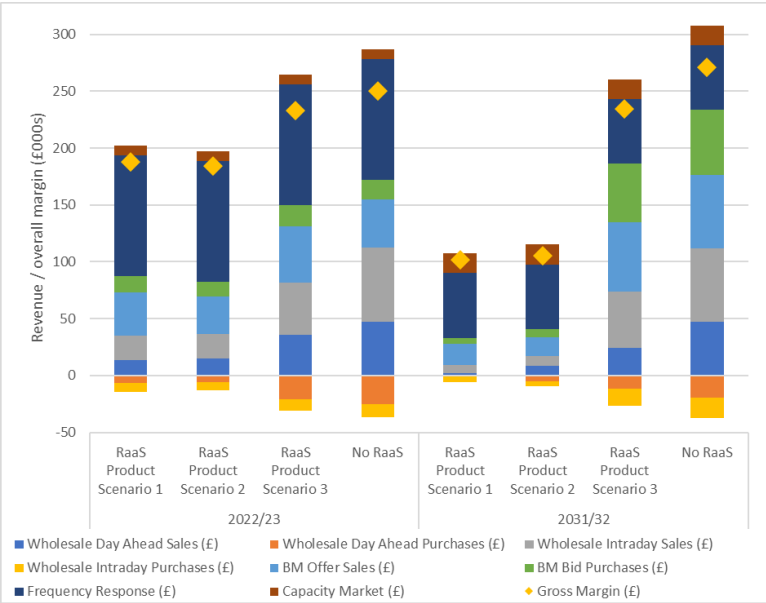
RSP valuation - *Willingness to Accept*



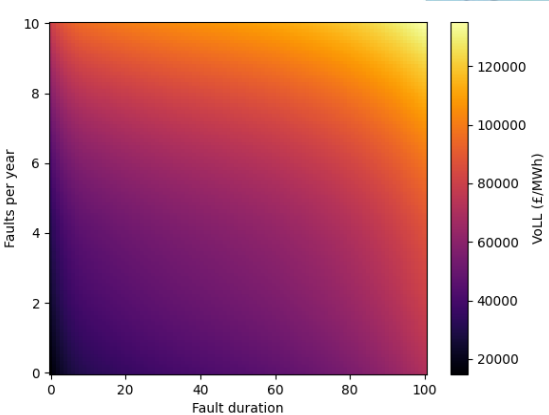
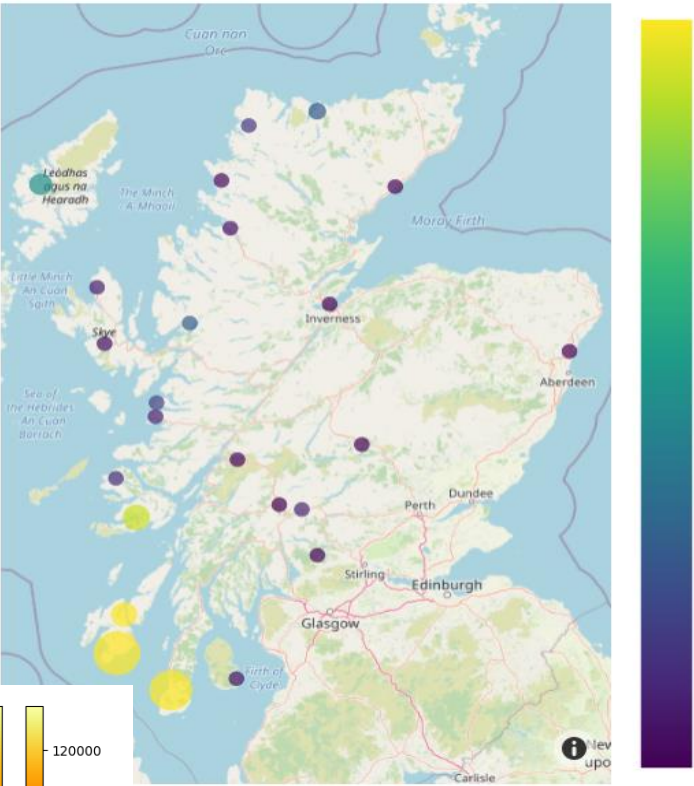
DNO valuation - *Willingness to Pay*

nationalgrid	Dynamic Containment
Wholesale market	Day Ahead Wholesale Market
Wholesale market	Within Day Wholesale Market
nationalgrid	Balancing Mechanism
nationalgrid	Capacity Mechanism
Scottish & Southern Electricity Networks	RaaS Service

report:  
Optimisation Assessment  
for RaaS Battery Operation



- CIs / CMLs
- VoLL
  - figures drawn from Electricity North West's detailed Value of Lost Load to Customers studies





# Next steps...

- Drynoch trial - proving the technical solution for fault response and local resilience
- approach to DNO requirements specification for procurement/tendering
  - level of granularity in requirements definition
  - duration of service - relative costs & benefits
  - specified reserved capacity vs 'use available capacity' approach
- the role of forecasting
  - demand - to inform the DNO requirements specification and reserved capacity at different points in time
  - interruptions - to inform DNO decisions re 'standing down' a RaaS service at certain points in time
- implications of different RaaS fee structures
  - e.g. fixed / availability / utilisation payments
  - contract vs incentives - rewards / penalties
  - impact of 'opt out' option



# Wider industry activities

## Flexibility Markets

- ENA's Open Networks activities to bring standardisation which supports participation in local flexibility market - in line with actions from BEIS' and Ofgem's Smart Systems and Flexibility plan (2021)
- Ofgem's work looking at creation of a System-Wide Flexibility Exchange / Common Digital Energy Infrastructure (CDEI) for flexibility markets
  - 'Consultation: Future of local energy institutions and governance' and 'Call for Input: The Future of Distributed Flexibility' (March 2023)

## Network constraints & new connections - recognised as a key issue for network development and the net zero transition

- National Grid ESO's Connections Reform project - ESO 5 Point Plan
- ENA's Strategic Connections Group - Three-Step Action Plan
- Accelerated Strategic Transmission Investment (ASTI)
- Large Onshore Transmission Investments (LOTI) reopener
- Access SCR (Significant Code Review) - implemented for RIIO-ED2





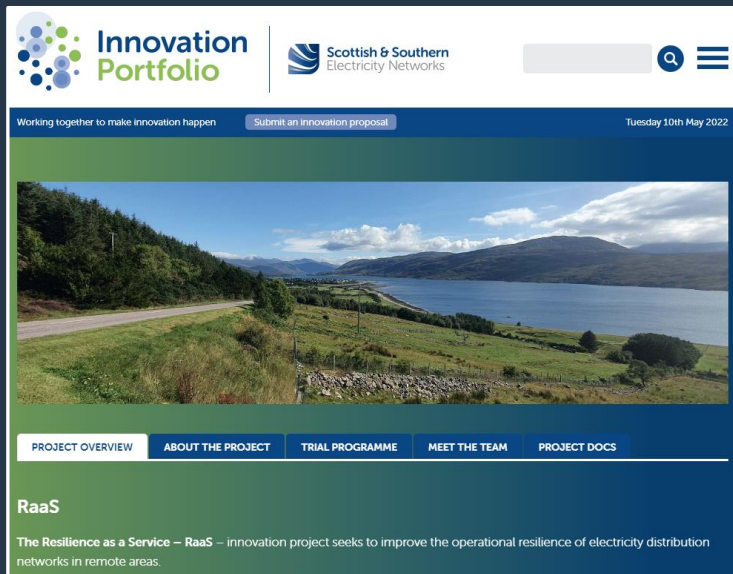


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thank you



Questions & comments welcome - [RaaS@costain.com](mailto:RaaS@costain.com)

<https://ssen-innovation.co.uk/raas>

Stand M7



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