

RaaS - Resilience as a Service

Forecasting Innovation Conference
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Maciej Fila – SSEN

Dan Jerwood – E.ON UK



Scottish & Southern
Electricity Networks



SSEN Distribution

Over **3.8 million** homes and businesses served by our networks

Over **3,700** employees across the country

More than **770,000** customers on our Priority Services Register

130,000km of overhead lines and underground cables

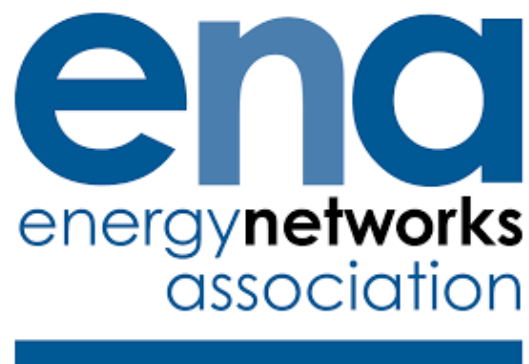
106,000 substations

100+ subsea cables powering island communities





Innovation & Collaboration



- Open Networks



RESOP –
Regional Energy System
Optimisation Planning



- Microresilience



- Value of Lost Load

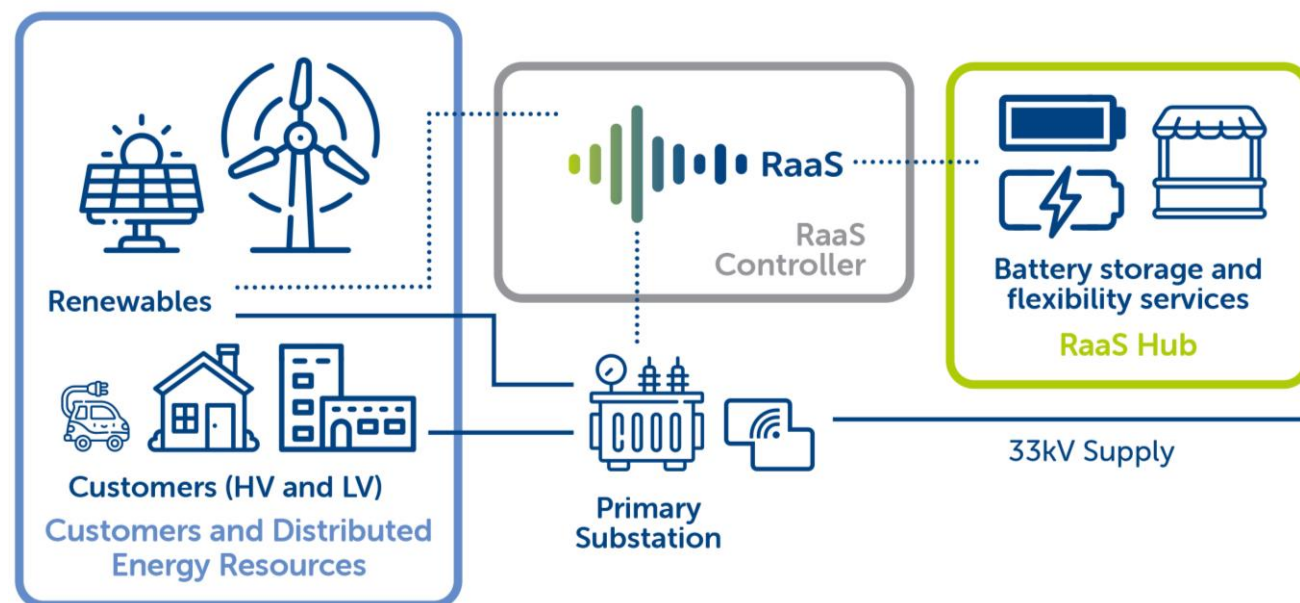


**Scottish & Southern
Electricity Networks**

- EV readiness
- Heat strategy



RaaS Technical Solution



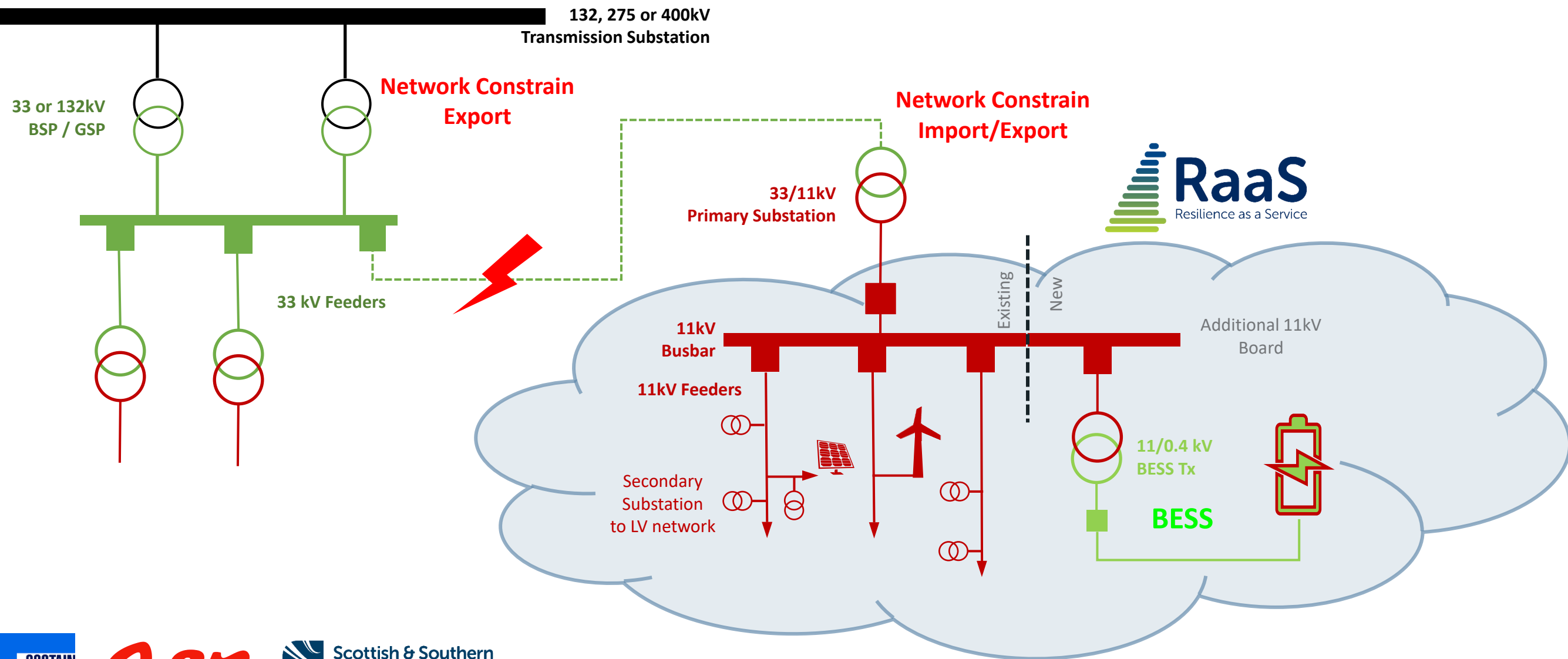


Trial Site - Drynoch, Isle of Skye





RaaS Technical Solution





Business Case Appraisal

RaaS product design

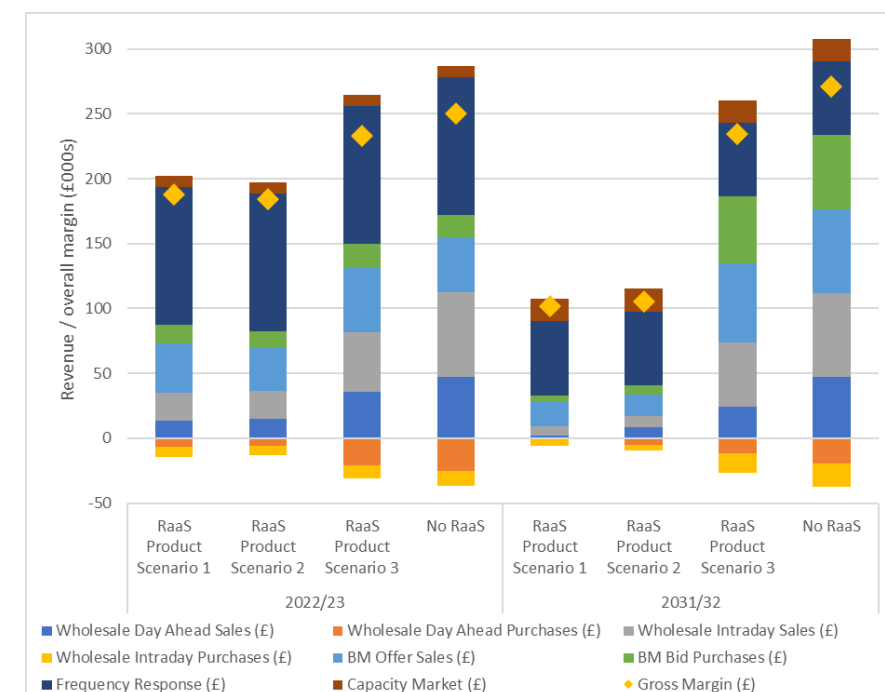
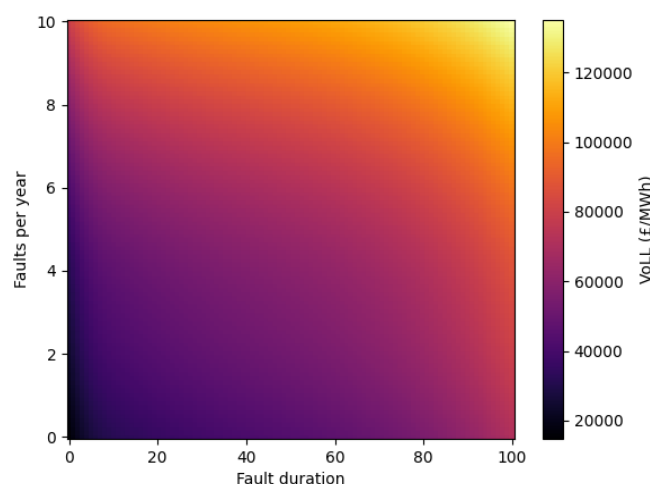
- level of granularity in requirements definition
- enhanced forecasting

DNO

- Valuation of RaaS - Willingness to Pay
 - CIs/CMLs
 - VoLL
 - other factors ?

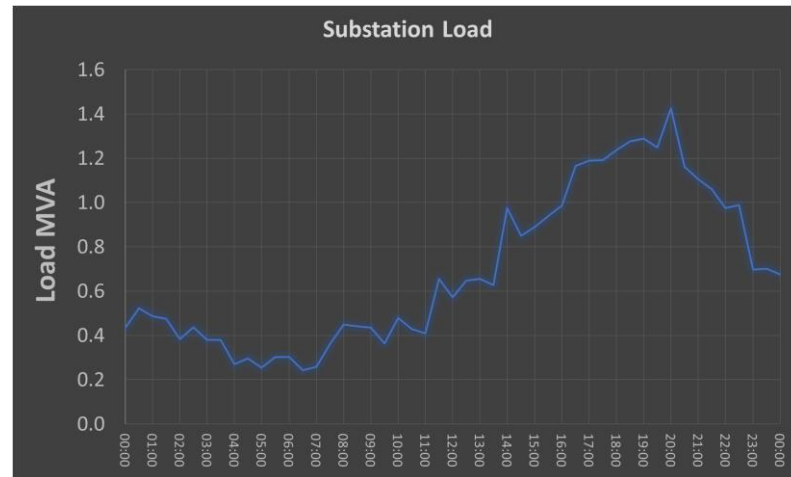
RaaS Service Provider

- Stacking revenues with other markets & flexibility services
- Valuation of RaaS - Willingness to Accept

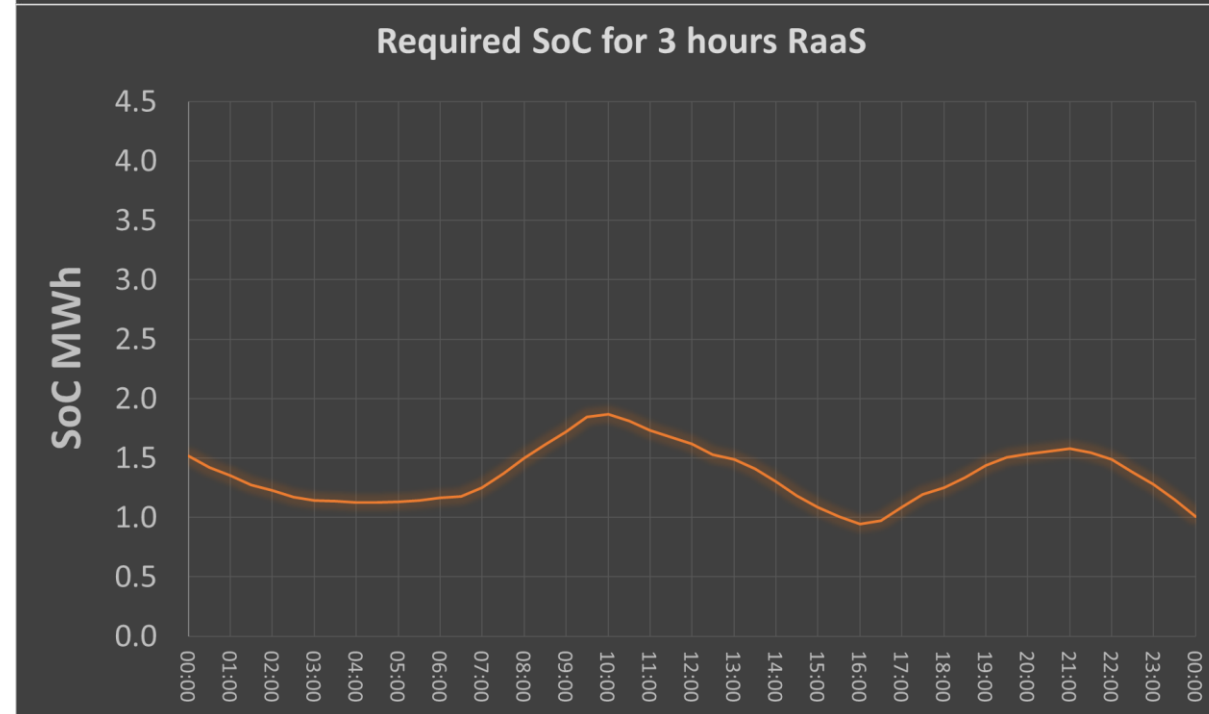
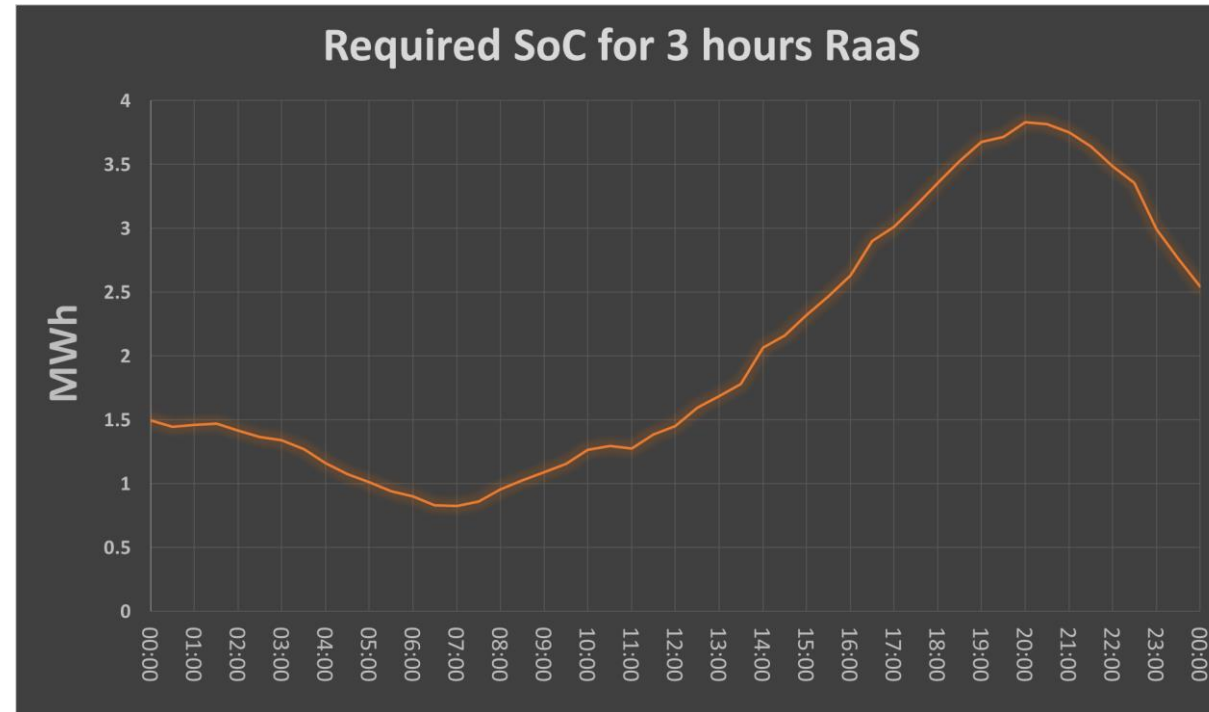
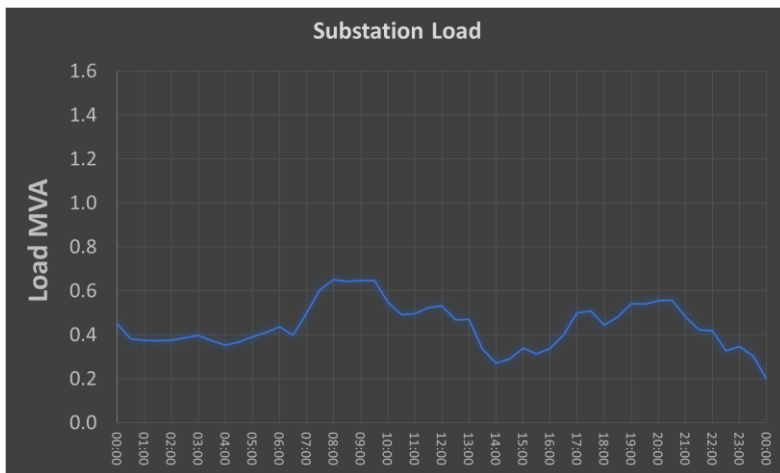




Required State of Charge Winter Day



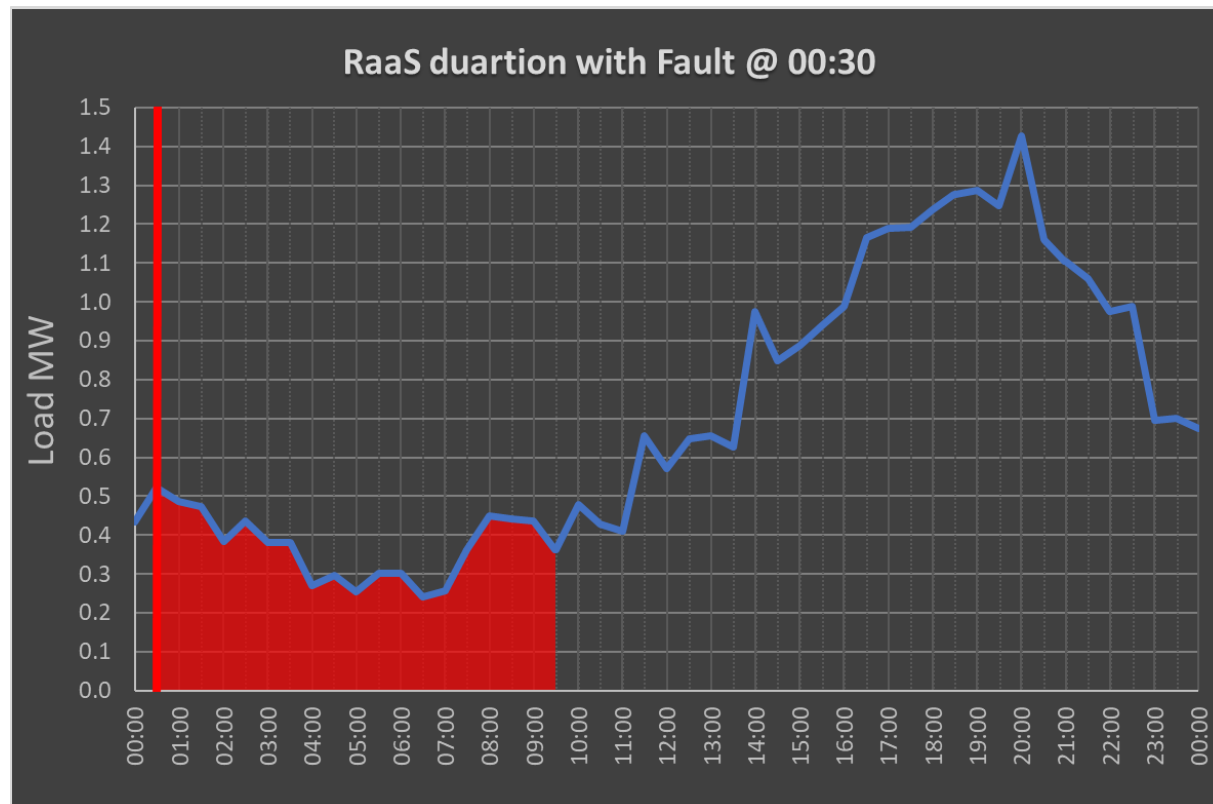
Summer Day





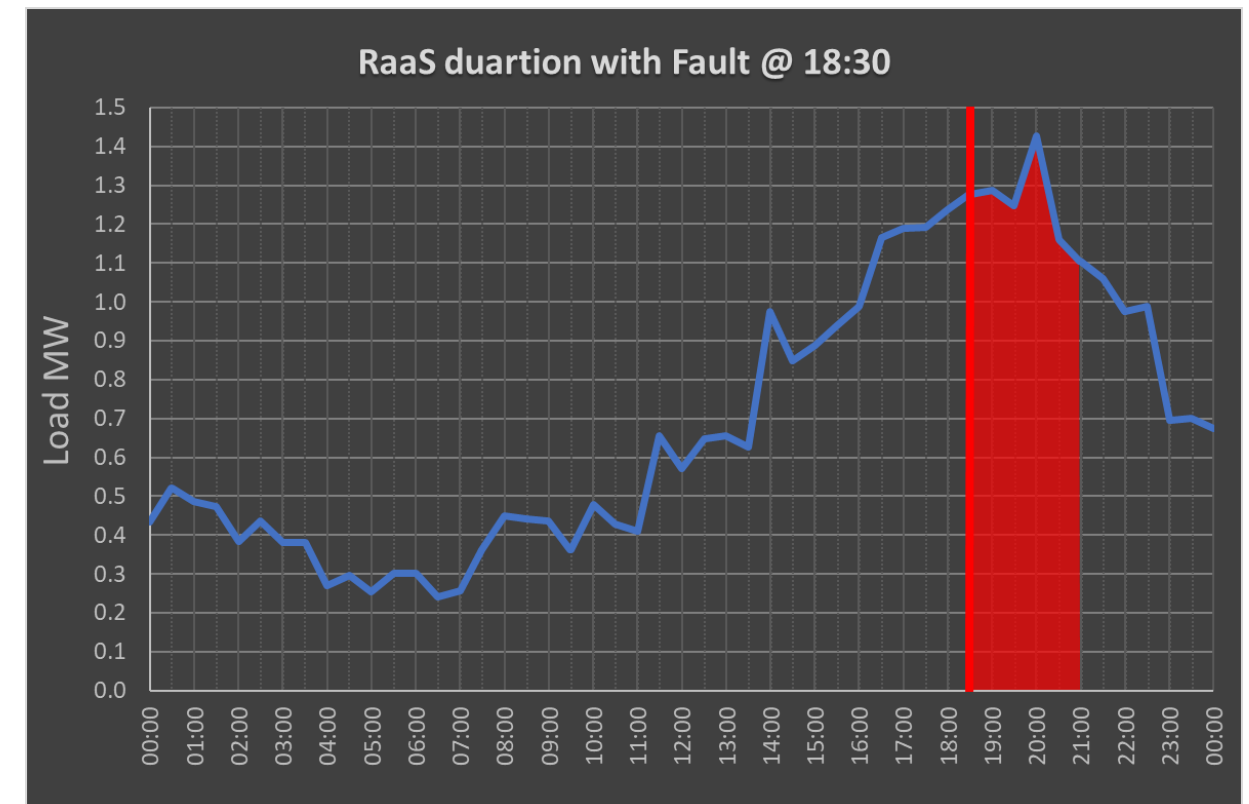
RaaS Duration with 3 MWh

Fault @ 0:30



RaaS Duration 8 h

Fault @ 16:30

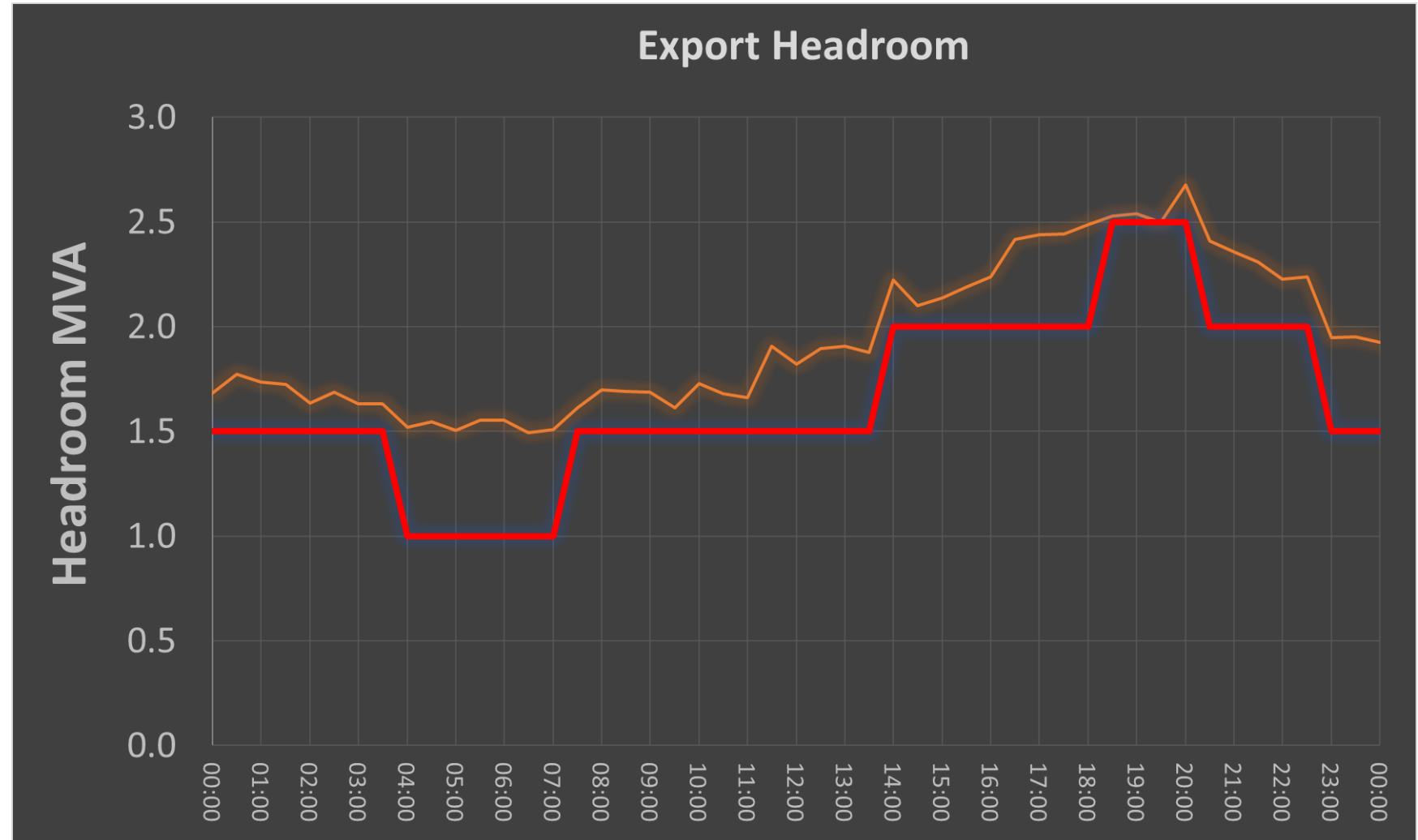


RaaS Duration 2.5 h



Available Headroom for BESS Export

Winter Day



24/48 h ahead



Probability for RaaS requirement

Risk of fault due to:

- Strong wind
- Lighting

Network constrains

- Local/Distribution/Transmission

Resources availability:

- Staff
- Diesel generators – location/availability
- Distributed Energy Resources
- Load

Importance of Forecasting in Commercial Optimisation of RaaS Asset

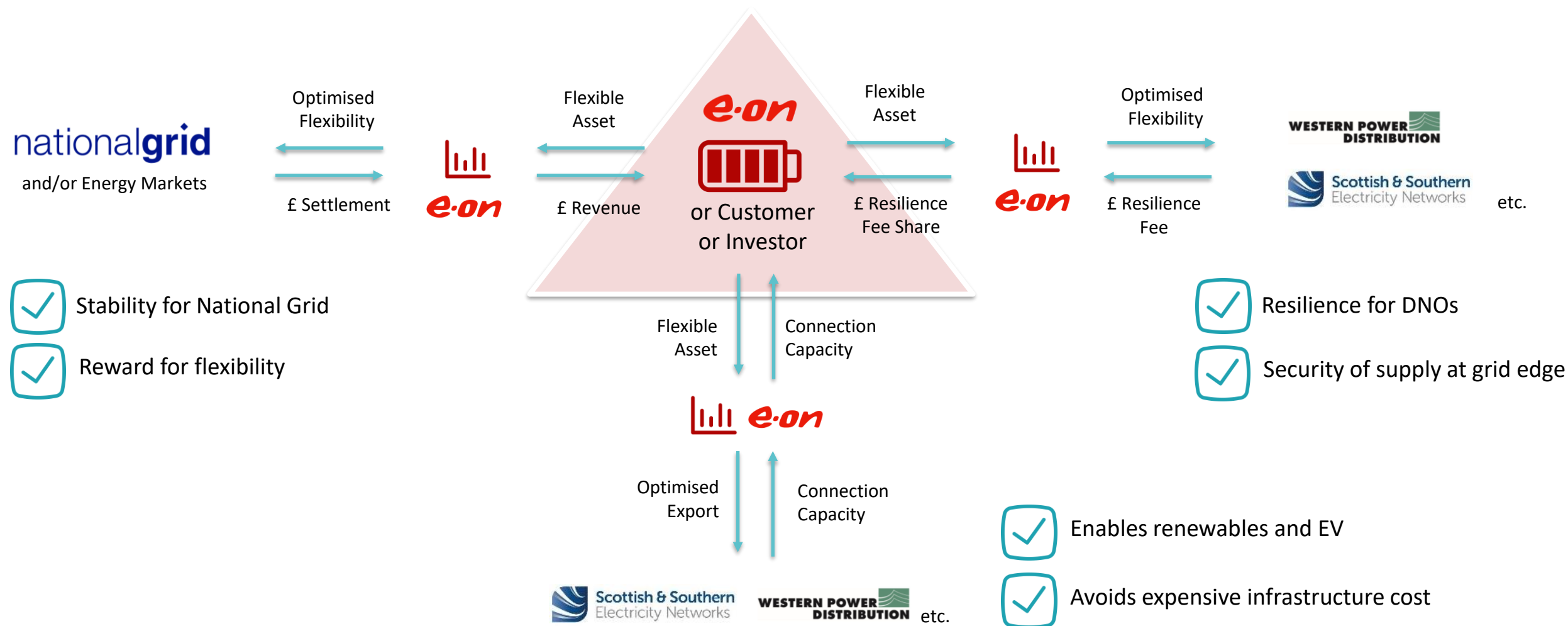
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Battery Market growth expected to be 10-20 x Current Level

- At present there is around 1.5GW of installed Battery Energy Storage System (BESS) capacity on the UK system.
- National Grid estimate that 15GW of Storage will be required to achieve Net Zero by 2035.
- Going forward, a total requirement of ~30GW is forecast for a fully renewable future proof reliable energy systems in the UK.
- National Grid need to incentivise investment into storage if we hope to achieve our challenging Net Zero targets.



Criticality of Batteries for Security of Supply, as more Renewables come Online



It is possible for a battery asset to participate in several / all of these direct and indirect revenue streams.
The role of optimiser and REVENUE AGILITY is crucial therefore to derive best value for the battery asset owner.

Basics Rules of Optimisation of Batteries in Commercial Services

- (Monetary) value is created by Batteries by following the profile required by the *Buyer of the Flexibility* (TSO, DSO, electricity supplier...)
- The amount of *MW's* made *available* which can flex is critical
 - Higher MW Availability = Higher payment
 - Meet minimum participation levels for some services
- Contracts pay for the delivery of the required profile over the duration of the contract
 - Failure to deliver can lead to financial penalties
- Revenue Stacking across multiple products (indicated opposite) is essential for optimal returns
- Forecastable revenue streams aid in construction business case for initial investment in battery assets

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Dynamic Containment

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Day Ahead Wholesale Market

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DNO Resilience Services

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Within Day Wholesale Market

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Balancing Mechanism

nationalgrid

Capacity Mechanism

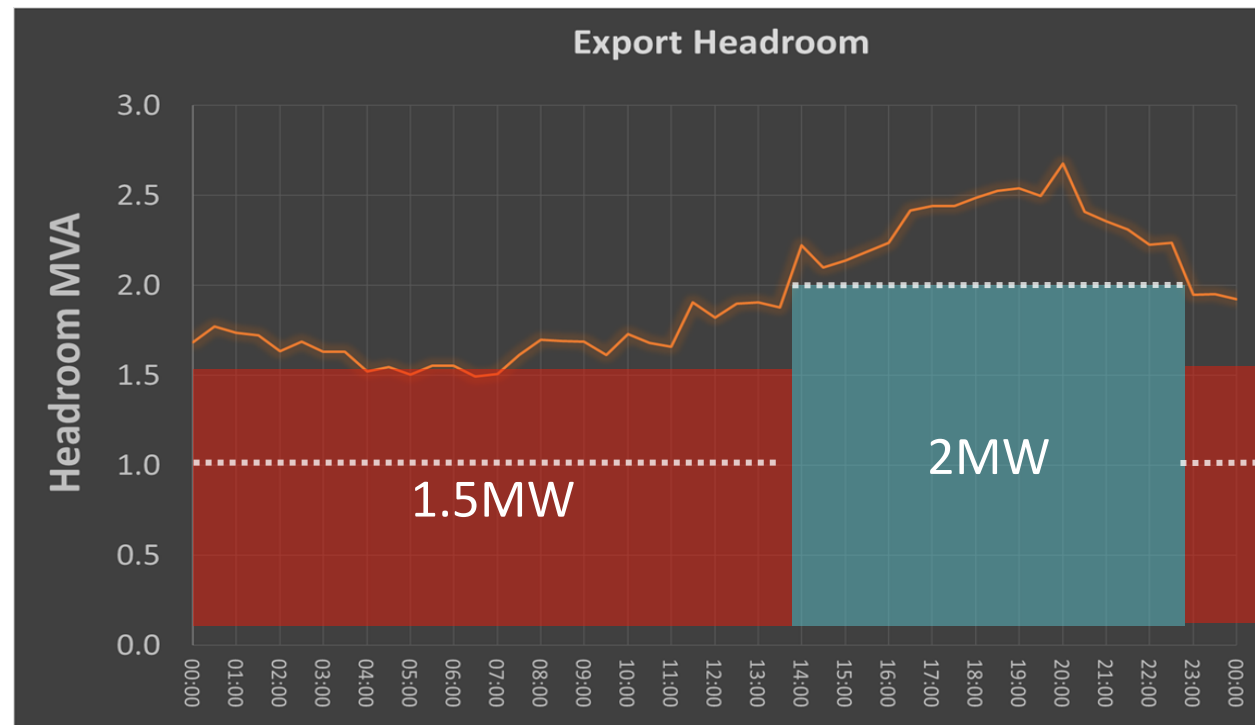
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Supplier Portfolio Balancing

The Role of Forecasting in Commercial Optimisation

Technical Forecasting (DSO/ TSO/ Asset Owner)

- Asset availability profile over the day
- Likely forecast accuracy – should include historic data and asset technical reliability
- Product characteristics e.g. deliver only whole MWs



Market(s) Price Forecasting (Commercial Optimiser)

- Near term (day-ahead or within day) price forecast of ALL markets the asset can participate in
- Market/ tender participation timelines
- Volumes required by each market
 - Fluctuation in Dynamic Containment volume forecast* by National Grid has marked impact on accepted prices
- Delivery cost forecast (varies over the day)
- Overlay of potential penalties for non-delivery
 - Is withdrawing from a previously agreed contract commercial viable? Reputational risk?
- Appetite to risk and target returns will also factor

* Can be 10-12% out at D-4

Basic 2-Step Price Optimisation Approach

Technical and Price forecasts
and delivery cost used to lock in
strategy on D-1

Day Ahead Wholesale (auction
10:50 results 11:10)

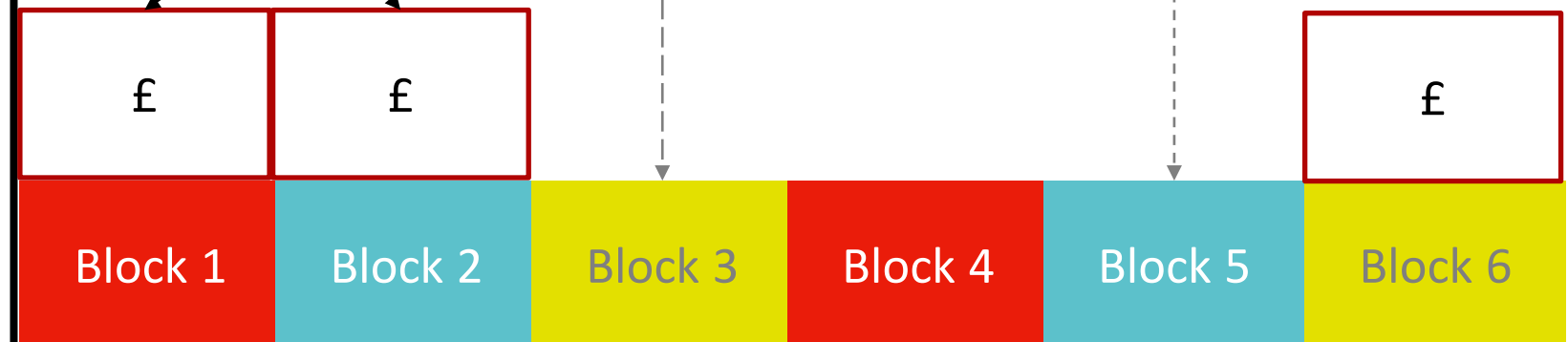
Dynamic Containment (auction
14:30, results 15:00)

Blocks awarded forego potential on-
day value

Contacts *awarded on D-1*

Block 3 and 5 free for
on day actions

Don't forget to leave
time to 'position the
battery' between
events!



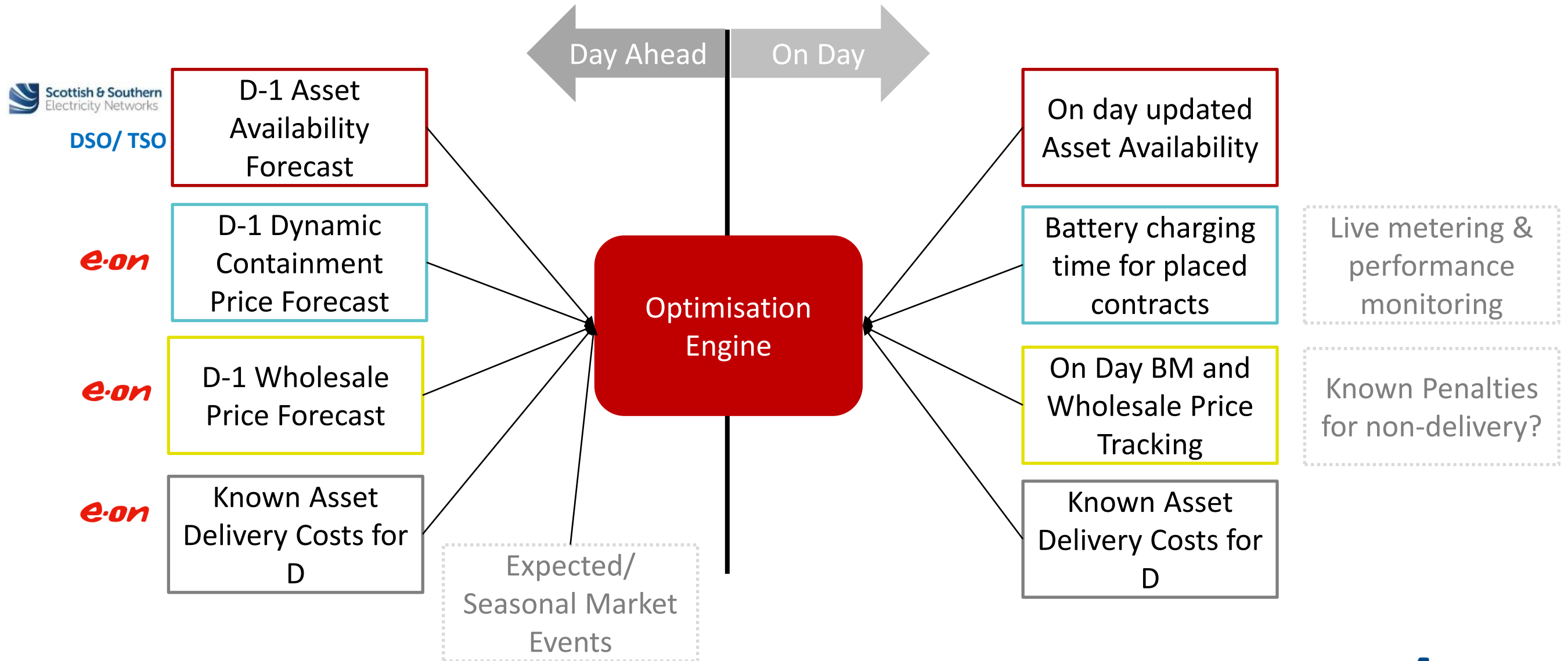
Day D-1

Day D

Target: to deliver flexibility in all time periods where market value
outweighs delivery costs (ideally 24 hours/ day)

Remember the charge and discharge ability of batteries both need to be optimised where possible. Buy and Sell
options in the Balancing Mechanism can both be optimised!

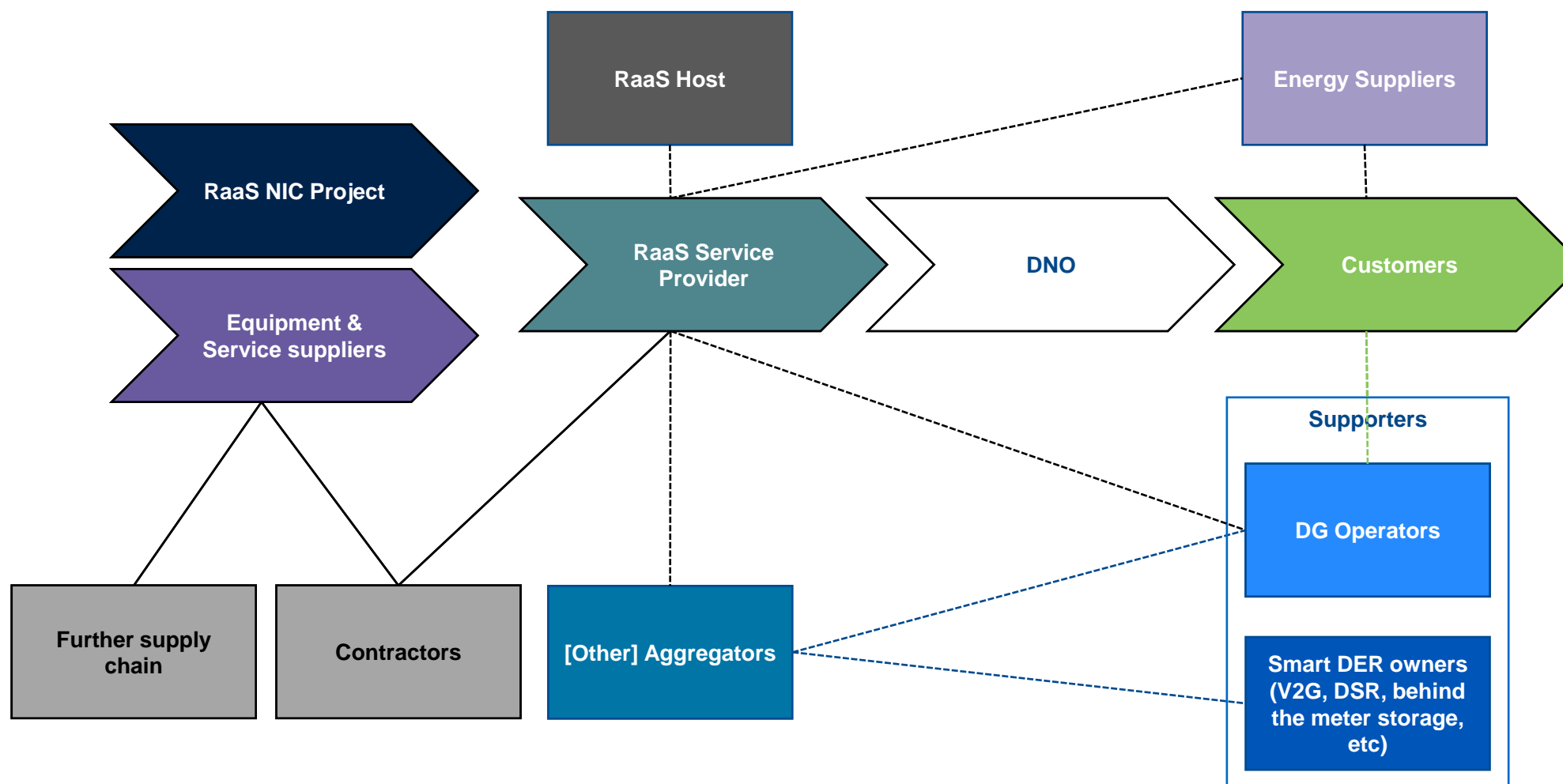
Optimisation Engine Inputs



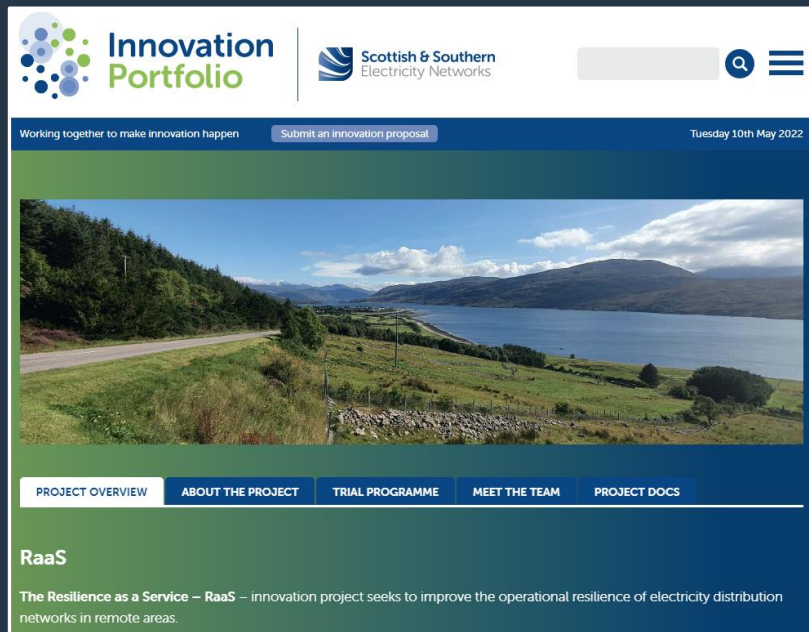
Forecasts of technical availability and capability, all relevant value streams alongside delivery costs, on-day availability forecasts and market opportunities all contribute to Optimal Returns



Market Structure



thank you



Questions & comments welcome - RaaS@costain.com
<https://ssen-innovation.co.uk/raas>



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