



The role of Distribution Networks in supporting security and restoration of supply in the future

Jack Haynes
Energy X

27 April 2023

Who we are

We own and operate two regulated distribution networks, SP Distribution plc (SPD) and SP Manweb plc (SPM). We are the only DNO group to operate across all three nations of GB – Scotland, England and Wales. We also own and operate one transmission network in Central and Southern Scotland, SP Transmission plc (SPT).

Our business is crucial to the delivery of the UK's Net Zero targets and the transition to a more sustainable future.

We are committed to making this happen at pace, and placing our customers and stakeholders at the heart of this journey.

Key facts

>7m people served

across 3.5 million homes and businesses



>2,400 employees

across our distribution business



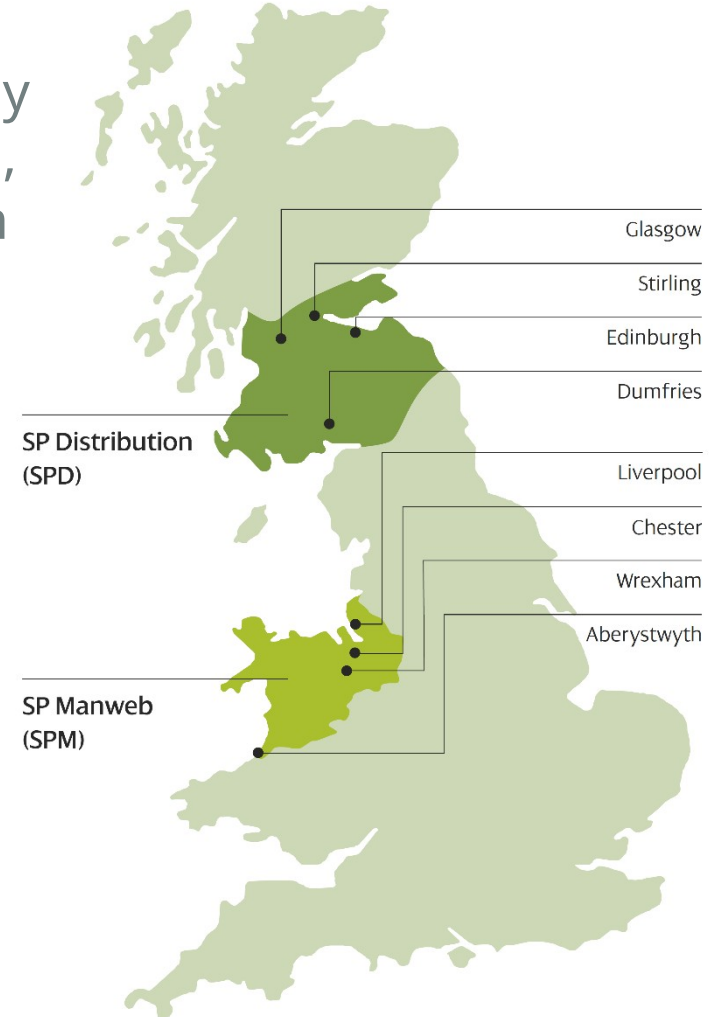
30,000

substations across our distribution network areas



>100,000km

of cables and overhead lines, enough to wrap 2.5x around the world



Distributed Restart - Project Motivation

Critical to ensuring stability in UK power networks sector and providing benchmark for worldwide utilisation

Distributed Restart



nationalgrid

Today | 5-7 days for restoration using traditional methods

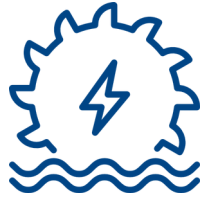
- Closing of coal/ gas stations means need to rely on renewables for restoration
- Need to tap into distributed generator resource of which there are 1000s connected in the U.K
- Reduce restoration timeframe and monetise availability

After D-Restart | <1-3 days for restoration using DRZs

- 1) Demonstrate ability of DERs such as wind, hydro, biomass or batteries to start and maintain power islands
- 2) Increase number of revenue streams for generation owners via commercialisation of restoration availability
- 3) Reduce blackstart restoration timeframe from 5-7 days to potentially hours - 3 days subject to rollout
- 4) Set global benchmark / template for distributed restoration zones (DRZs) through world first testing
- 5) Further expand the portfolio of renewable generation benefits in pursuit of Net-Zero

Work Completed to Date – Galloway and Chapelcross

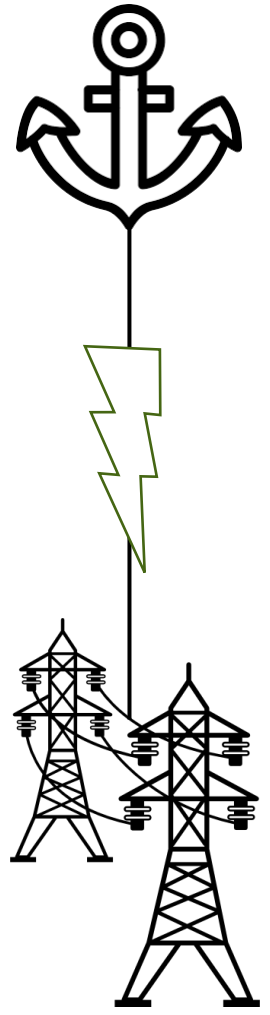
Power Engineering Trials Workstream (PET)



Kendoon Hydro – Apr 22



Energised up to 275kV from 11kV 13MVA Generator & measure BLPU of Hydro



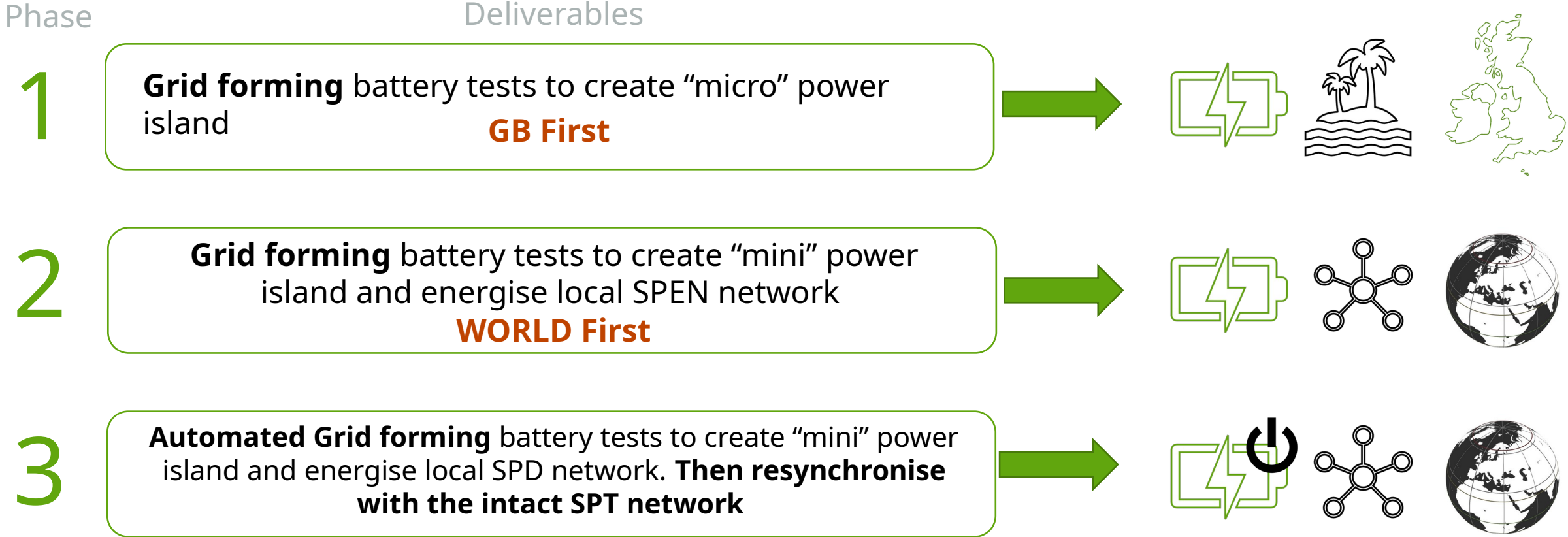
Stevenscroft Biomass – June 22



Energised up to 400kV from 33kV 53MVA Generator & measure BLPU of Biomass

Blackstart Restoration Time Reduction

Ground breaking trials led by SP Energy Networks and NGENSO

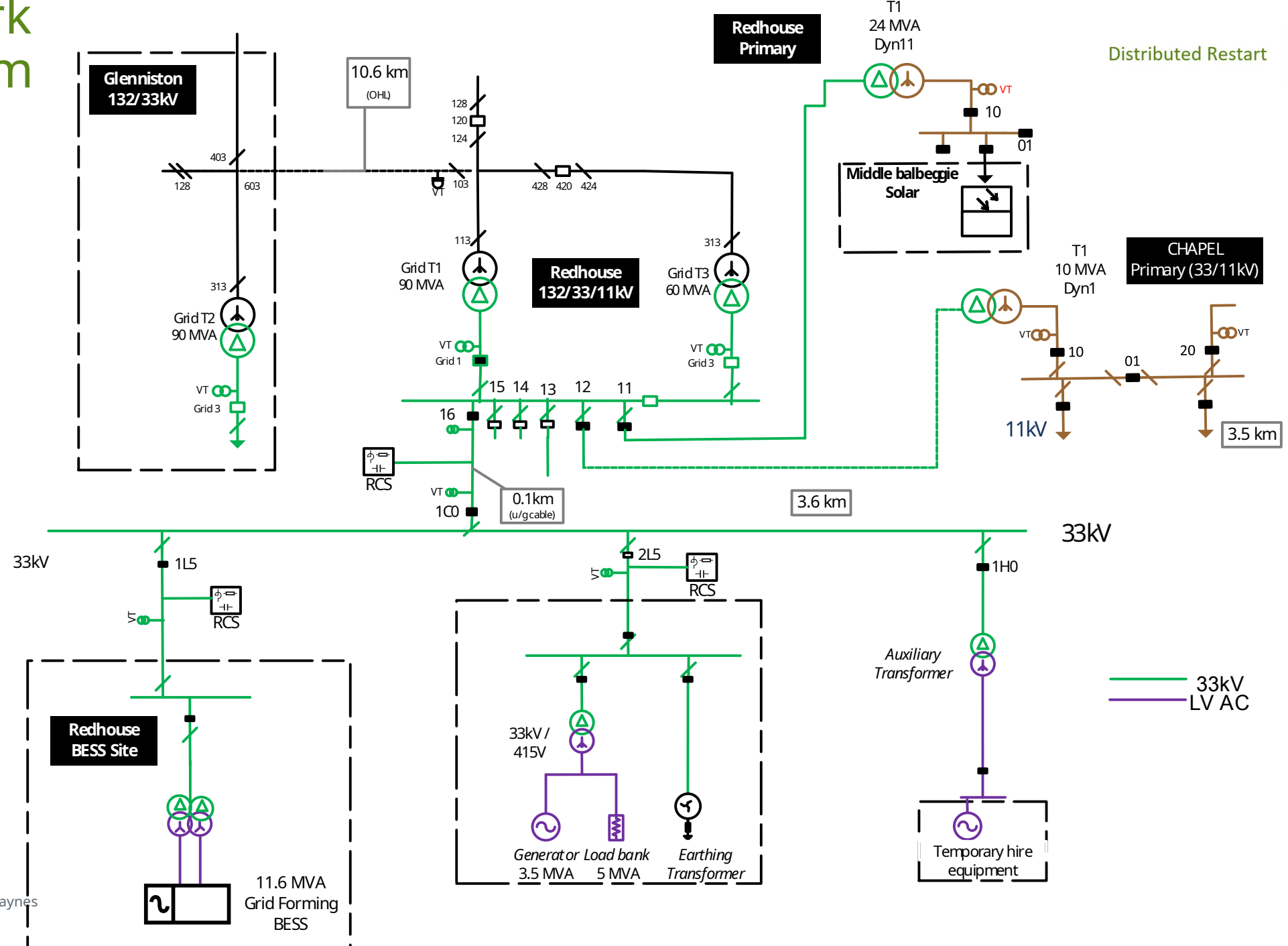


BAU Solution



Network Diagram

Distributed Restart



Simplified

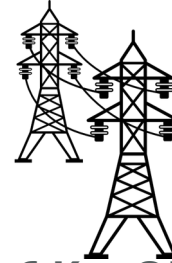
d

Main Testing Elements



SPT Network

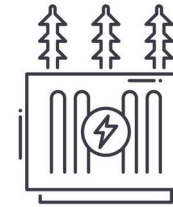
Gleniston Line



10.6 Km OHL

Redhouse Grid

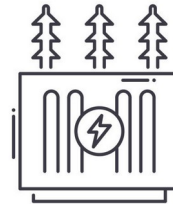
90MVA



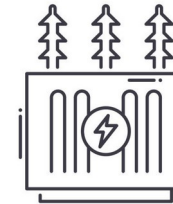
132kV

SPD Network

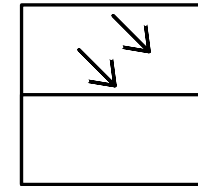
Redhouse Primary 24MVA



Chapel Primary 10MVA



Middle Balbeggie Solar 3MVA



33kV

33kV

Customer Site



Grid Forming Battery 11.6 MVA



Load Bank 5MVA



DC



Phase 1

Redhouse BESS trials May/June 2023



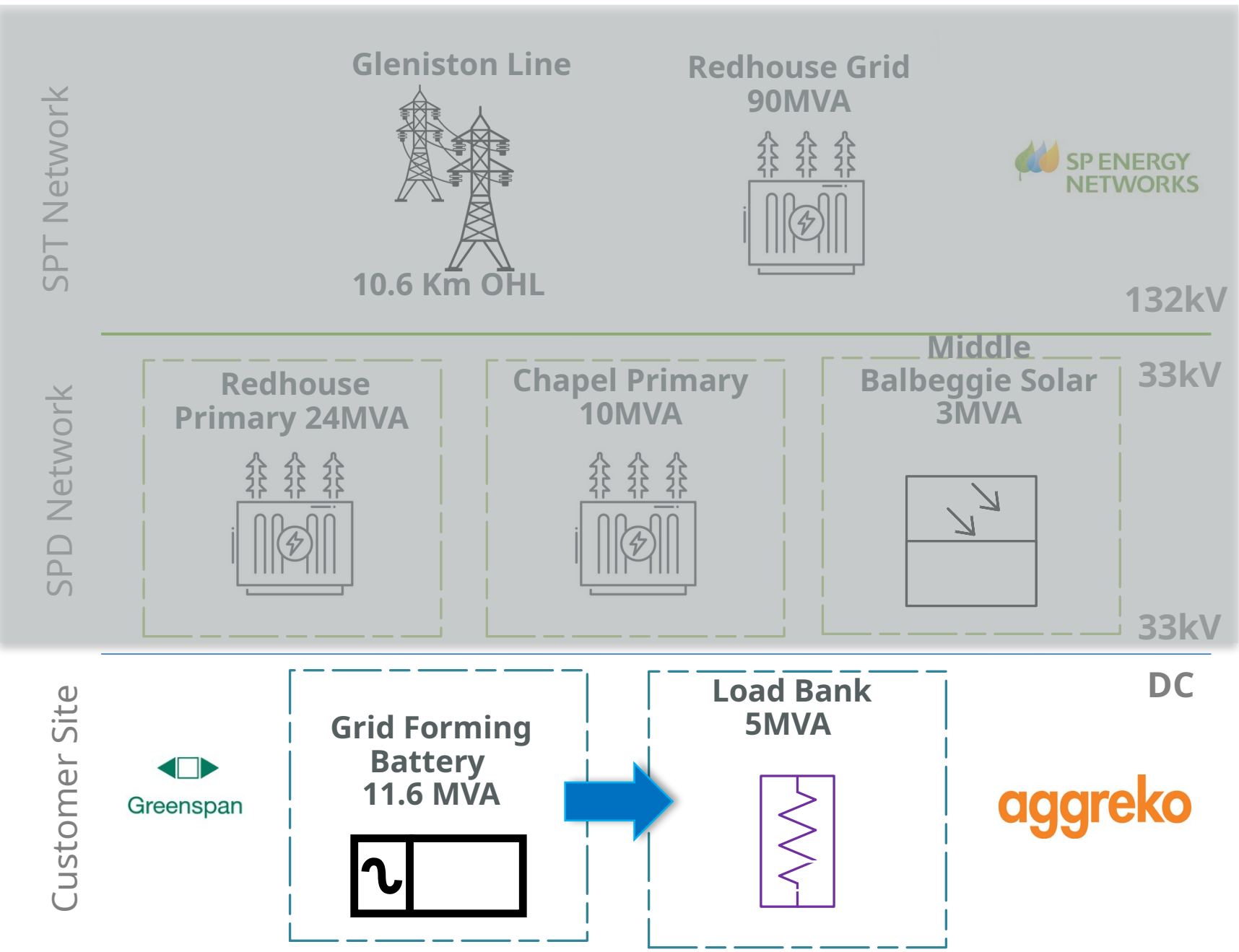
Grid Forming battery tests with **simulated** customer load



Customer Network **only**



GB first tests of this kind



Phase 2 – SPD stage

Redhouse BESS trials May/June 2023



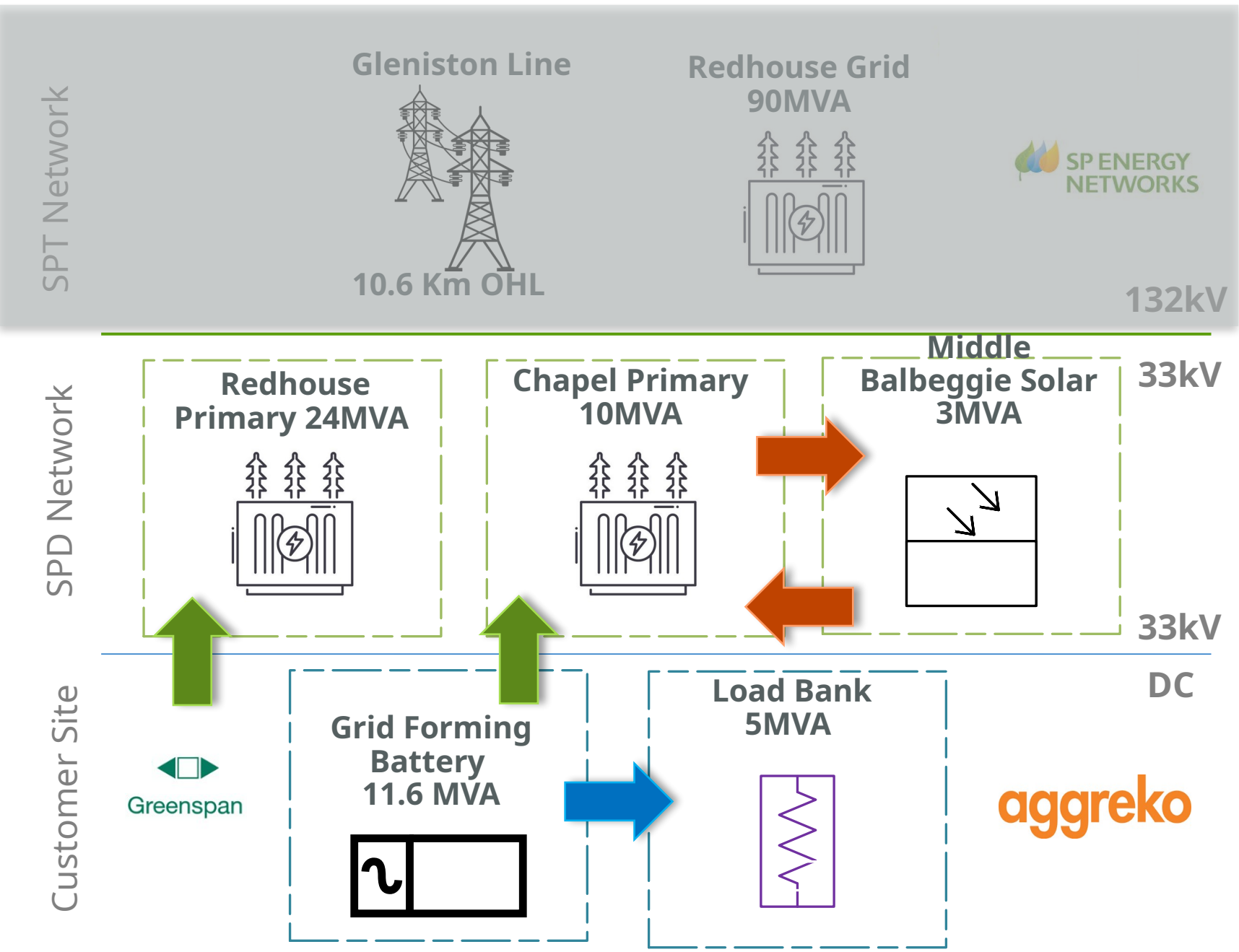
Grid Forming battery tests with **simulated** customer load



Energising SPD Primary Transformers and **additional DER**



World first tests – forefront of innovation



Phase 2 – SPT stage

Redhouse BESS trials May/June 2023



Grid Forming battery tests with **simulated** customer load



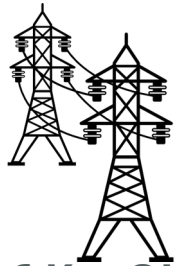
Energising SPT **grid transformer and 132kV line**



World first tests – forefront of innovation

SPT Network

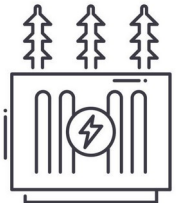
Gleniston Line



10.6 Km OHL

Redhouse Grid

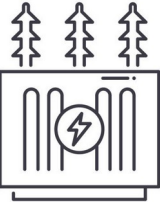
90MVA



132kV

SPD Network

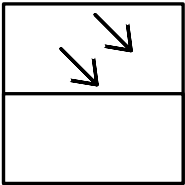
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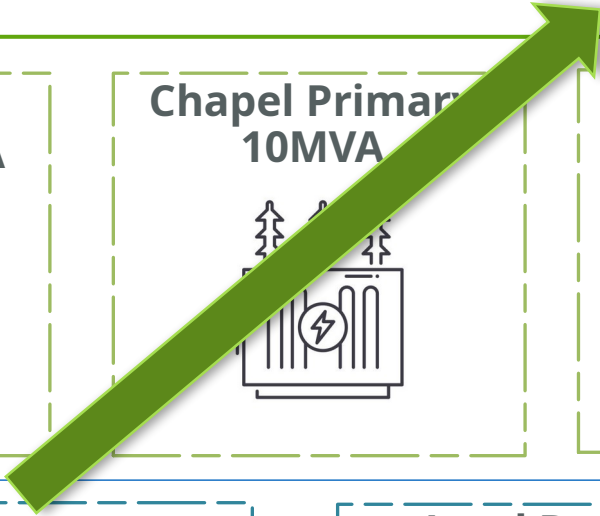
Grid Forming Battery 11.6 MVA



Load Bank 5MVA



DC



Phase 3 – DRZC

Redhouse BESS trials May/June 2023



Grid Forming battery tests with **simulated** customer load under **DRZC control**



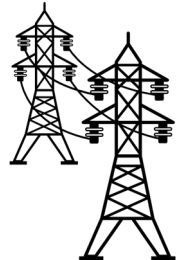
Automated start-up and **optimal** power island control



World first tests – forefront of innovation

SPT Network

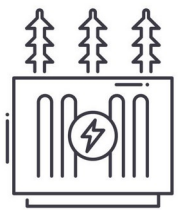
Gleniston Line



10.6 Km OHL

Redhouse Grid

90MVA



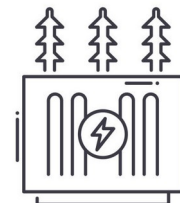
132kV

SPD Network

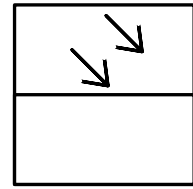
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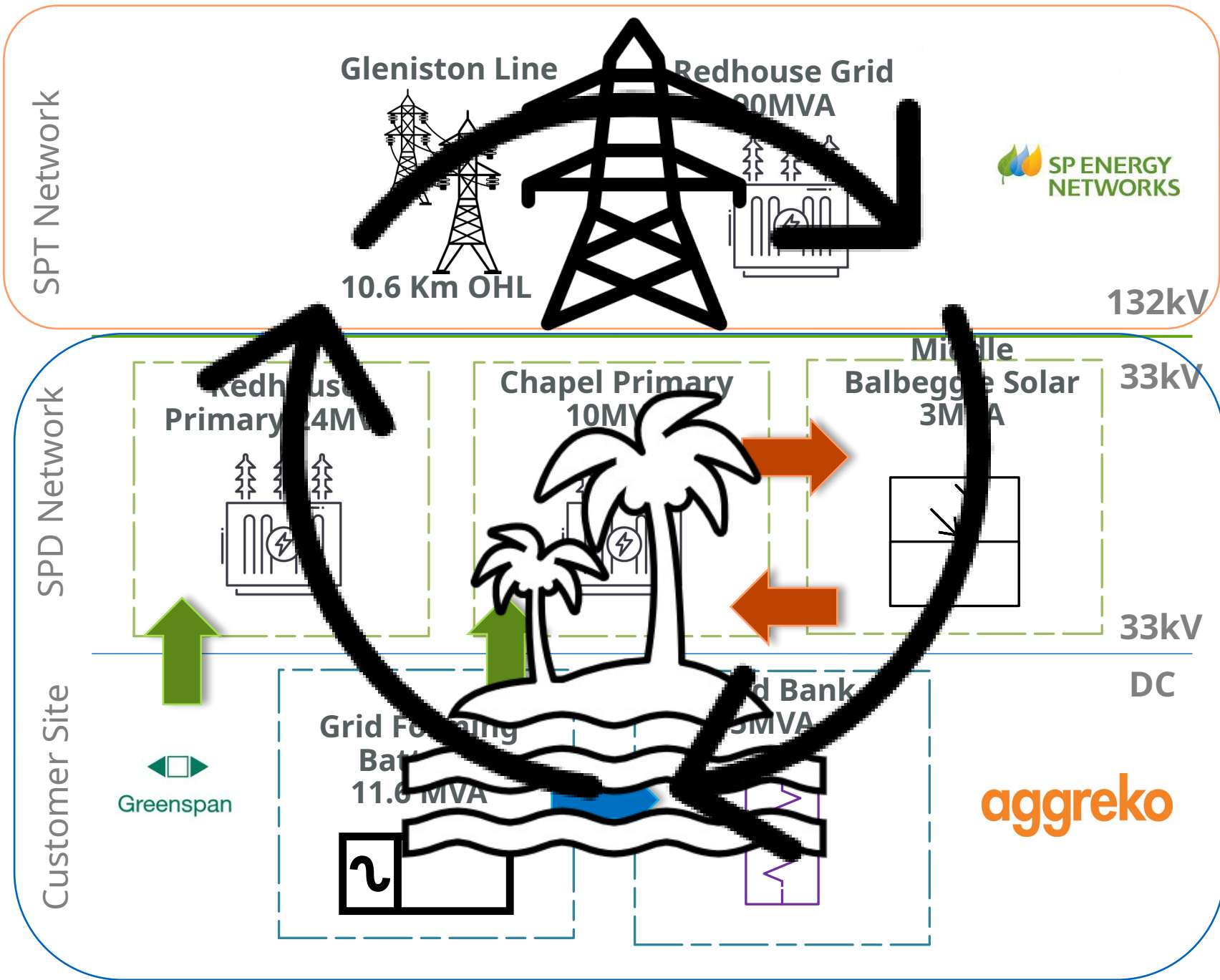
Grid Forming battery tests with **simulated** customer load under **DRZC control**



Automated start-up and **optimal** power island control



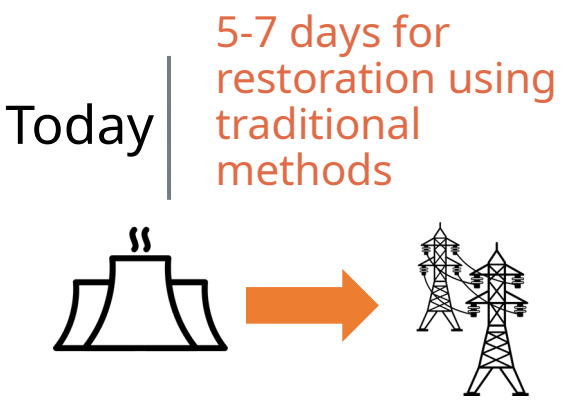
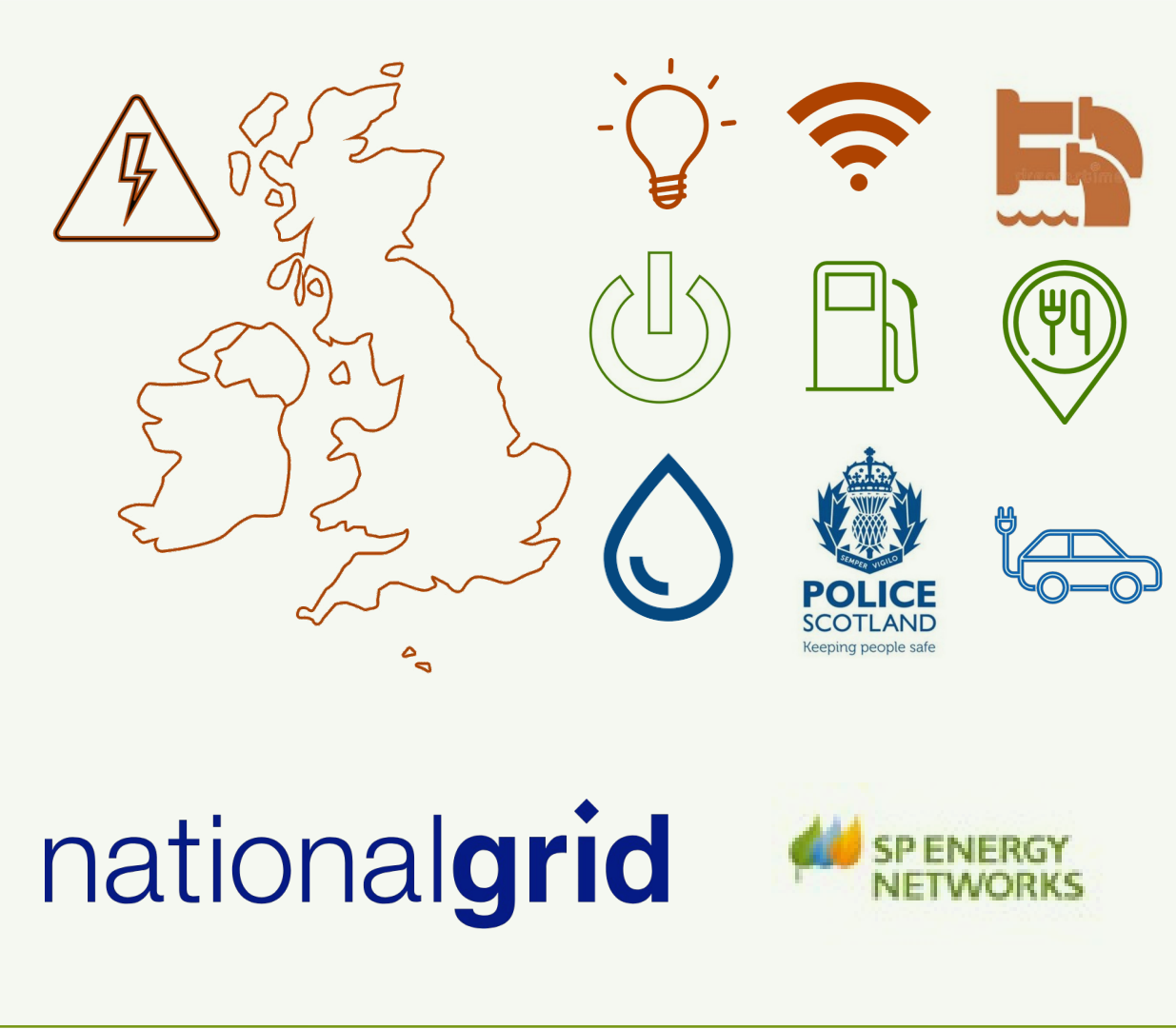
World first tests - forefront of innovation



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