

# Powering through

Enhancing network resilience and operational response for a future-ready network.

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Northern Powergrid



# MultiResilience

Building network resilience for at risk locations

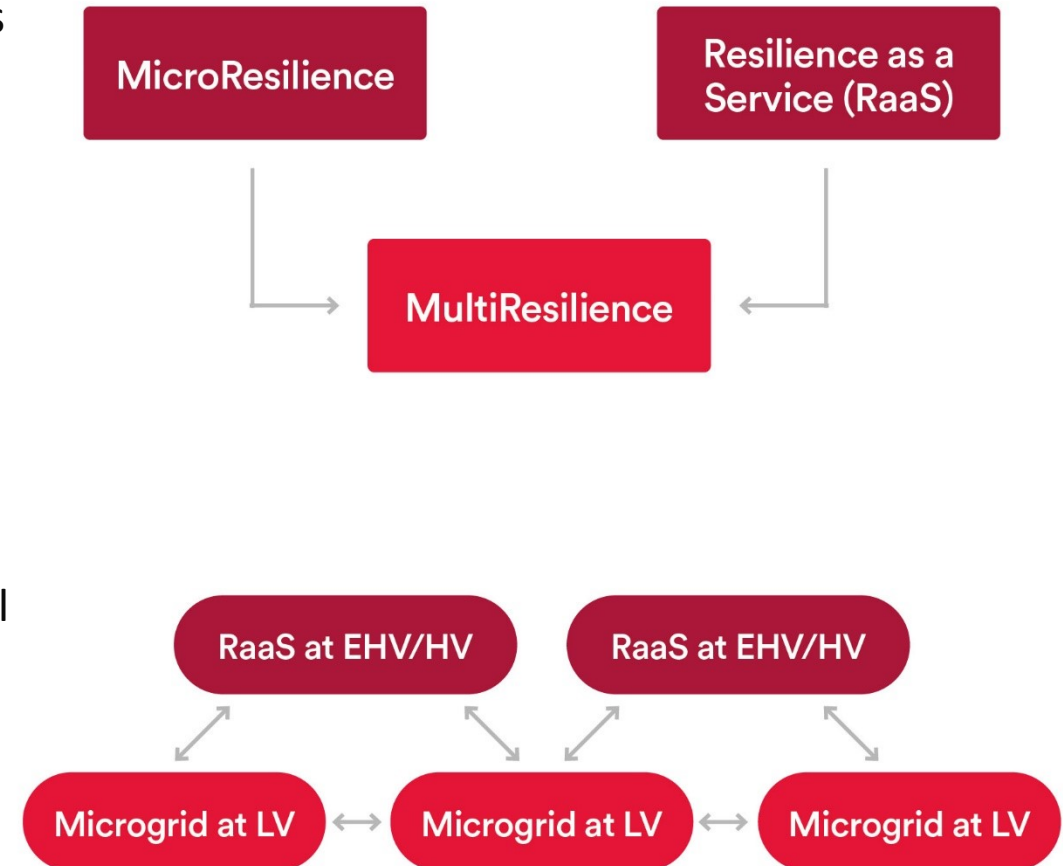


- MultiResilience builds on the learning from our ground-breaking MicroResilience innovation project.
- An energy storage battery is installed in the village of Byrness in Northumberland, a remote rural community with only 50 homes, many of which generate their own electricity.
- The community experiences frequent power cuts, due to its remote location and the characteristics of the power network in that area, the village is served by our longest OHL at 37 miles long.
- MicroResilience created the blueprint for how community microgrids can be deployed to protect customers power supplies and improve the resilience and reliability of vital local electricity networks.
- MultiResilience applies the concept to 'at risk' areas of our HV and EHV networks.



# The Challenge

- The need to reduce the impact of outages in vulnerable areas (i.e. rural networks) and minimise the impact for customers in an increasingly electrically-dominated energy system.
- Demonstrate the deployment and coordination of multiple MicroResilience solutions (LV) and RaaS solutions (EHV/HV), combining the benefits and enhancing value of both.
- Compare and contrast technologies and how to optimise hybrid application of the two approaches, to deliver enhanced and cost-effective resilience for customers.
- Establish the standard designs, technology interfaces, operational control principles and commercial arrangements that facilitate coordinated resilience from DER assets on the network.
- Demonstrate the inclusion of distributed, smaller-scale, third-party owned energy resources alongside HV resilience solutions.



# The Solution

## MultiResilience Microgrid Controller

Co-ordinating energy sources and islanded/resynch actions.

## Network Switches / Breakers

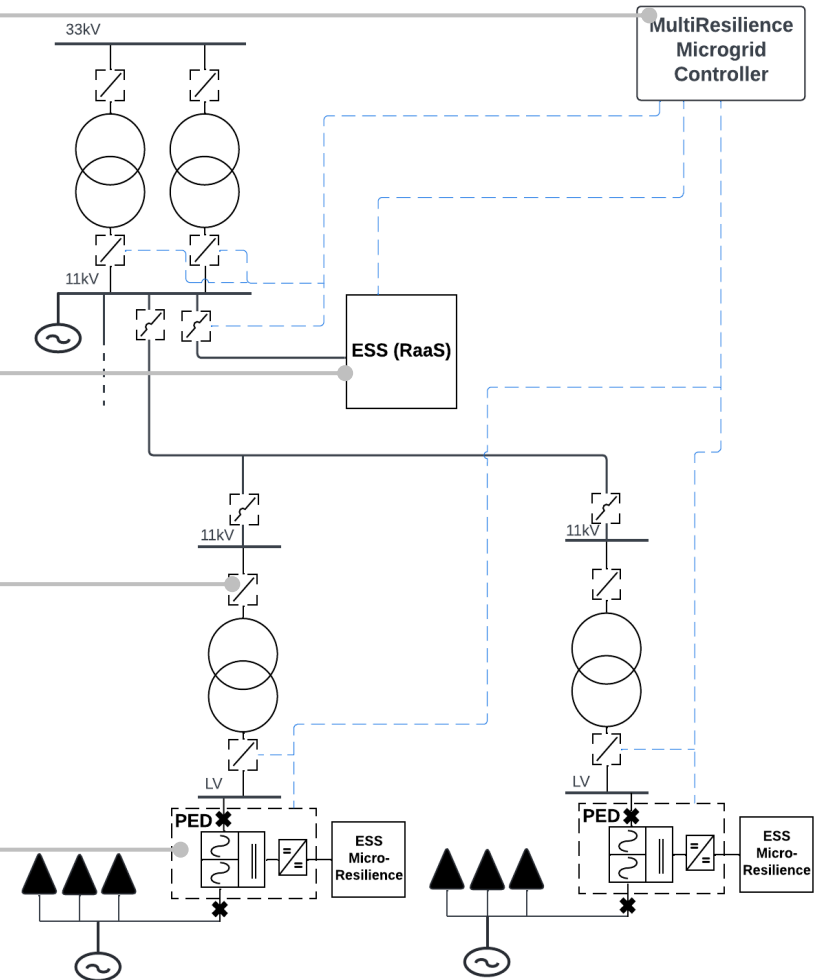
Isolation of network areas following a fault or outage and re-energisation once moved to grid connected mode.

## Power Electronics Devices (PED)

Grid-forming microgrid functions: black start, islanded operation, re-synch to grid.

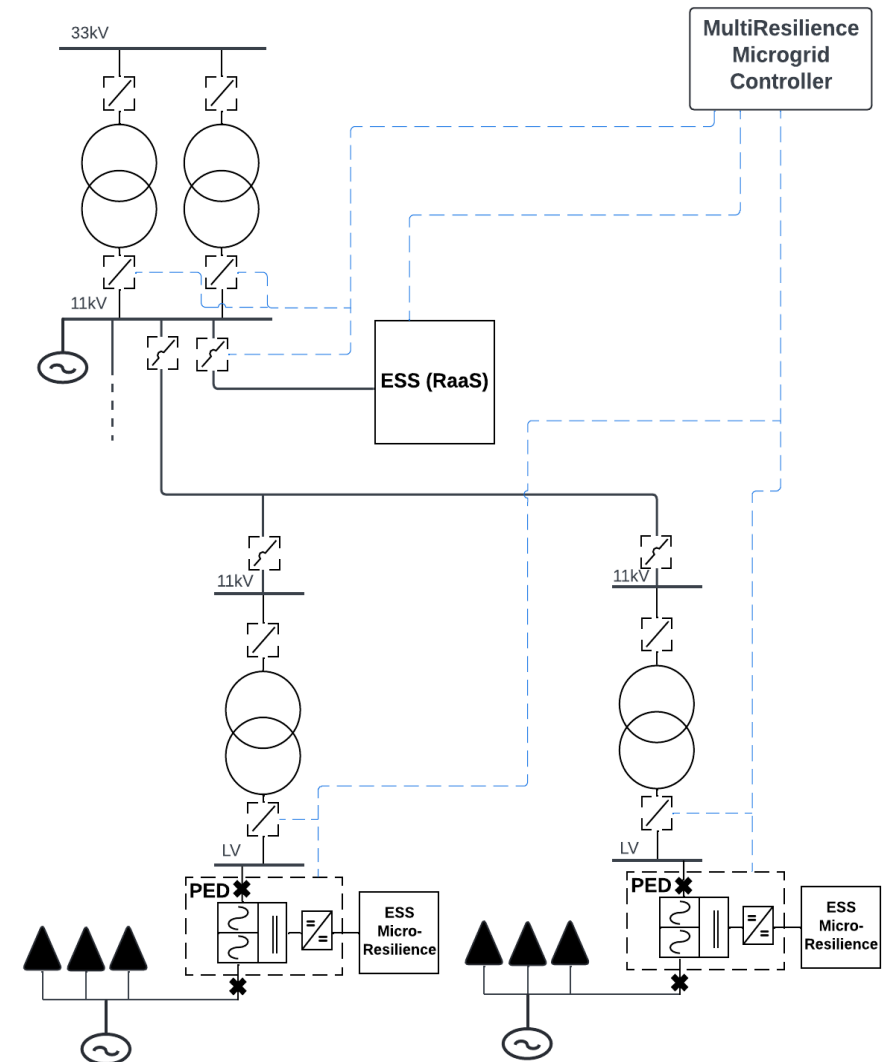
## RaaS Battery ESS (>1MVA) EHV/HV grid-forming energy source

## MicroResilience Battery ESS (<0.5MVA) LV grid-forming energy source



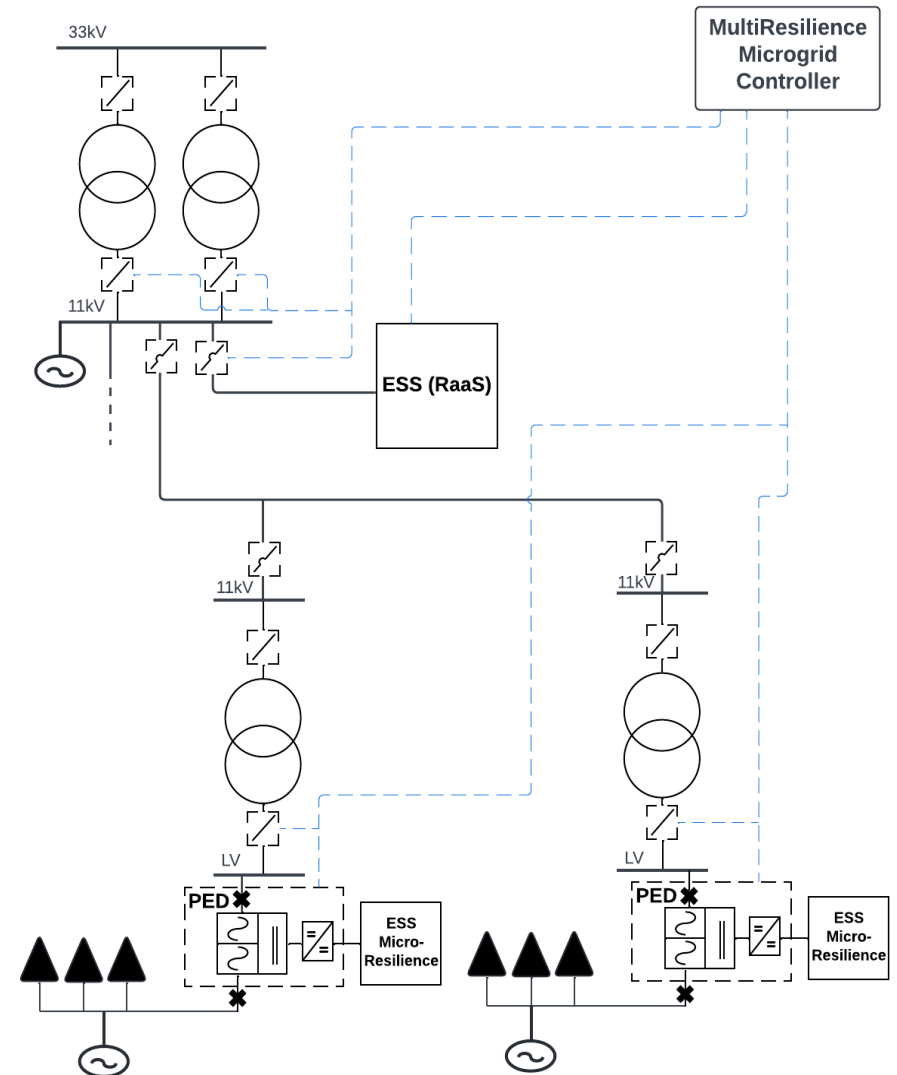
# The Solution

- Resilience is delivered by:
  - MicroResilience LV-ESS and PED in cases of localised outage affecting a distinct LV network.
  - RaaS EHV/HV ESS under HV or EHV outages affecting a wider network area.
  - Co-ordinated groups of LV-ESS and EHV-HV ESS to extend reach and expand the duration of the microgrid operation, avoiding any conflict between systems and enhancing the value case for deployment.



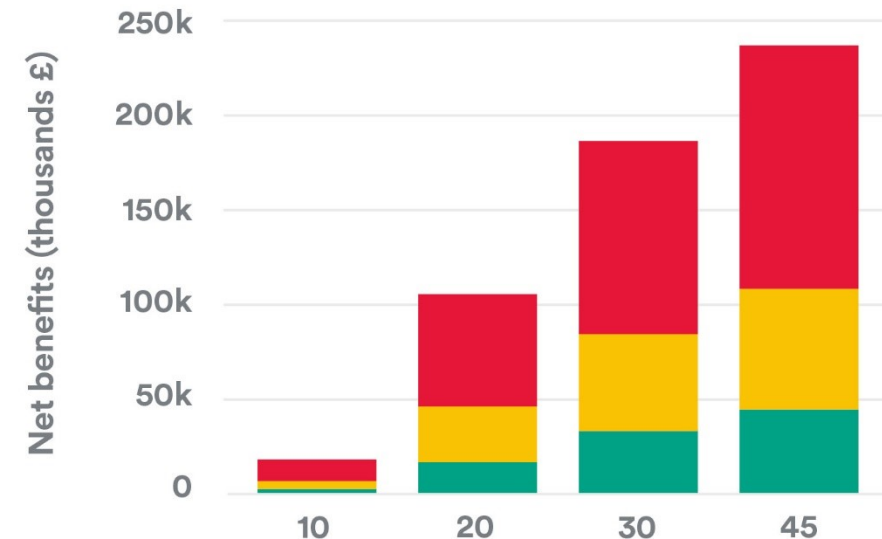
# The Solution

- Interaction with existing network assets and systems to ensure safe network operation:
  - SCADA / ADMS - providing control room access for manual interventions and approvals and critical visibility of operation for safety purpose i.e. control-room aware grid energisations and isolations.
  - Switches / Isolators - implementing control-room approved switching as part of a microgrid state transition.
  - Protection / Earthing – enabling, disabling, adapting protection configuration and modes to reflect the operational situation on the network - islanded vs. grid-connected.
  - Existing network DER - visibility of DER status (and control where appropriate) to ensure stability when co-ordinating microgrid state transitions and extend the operating window.



- Overall impact - reduces the impact of grid outages in the most vulnerable network areas.
- Assume third-party resilience is needed on 65 of the most rural primaries on Northern Powergrid's network, (~10% of the network).
- RaaS-like service, sized to supply 2/3 of peak demand, receiving £10,000 / MW / year.
- MultiResilience allows 20% reduction in the volume of this service, due to LV DERs and ESS.
- £13.9m benefit for Northern Powergrid customers.
- £27.8m for Northern Powergrid and SSEN customers combined.
- £106.9m (central estimate) for all DNOs.

## Net benefits by confidence level





# Storm Triage

Improving storm restoration response through enhanced data and informed decision-making.



# The Challenge

## Regularity of Storms

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- Increasing frequency of Winter storms.
- Direct impact of the jet stream on the UK.
- ‘Storm Season’ is evolving and expanding.
- Mitigation and resource measures are critical.

## Severity of Storms

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- Disproportionally severe UK storms.
- Increase in Winter wind speeds.
- As climate warms, heavier storms hit.
- Energy release = rapid intensification.

## Impact of Storms

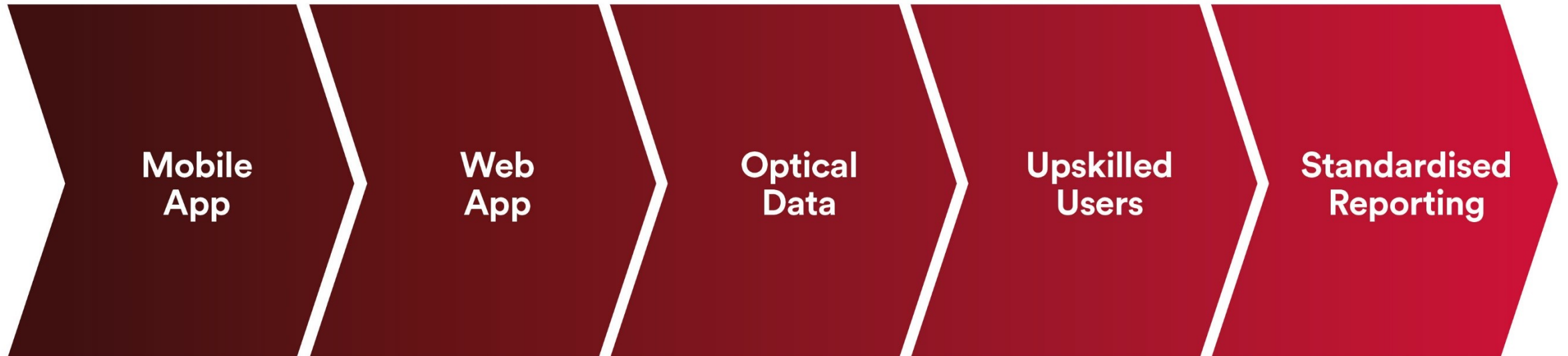
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- Multi-day storms are becoming common.
- More significant impact and cost.
- Greater impact felt in the North of England.
- Disruption to way of life – plus loss of life.

# The Solution



- The StormTriage App utilises a range of ground-breaking digital technologies including AI, Machine Learning and XR.
- It delivers a market-ready solution designed in collaboration with its intended users, Northern Powergrid's front runners and response co-ordinators.
- It provides quality optical data and situational awareness enabling real-time reconnaissance.





**STORM TRIAGE™**

## Field Test

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- 10 Front Runners, one Co-ordinator, one Remote Expert.
- 25 scenes, 567 photos, 20 videos, 22 models, four Remote Expert Calls.
- 100% of participants 'Very Likely' to recommend further development.

## Traction

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- Northern Powergrid appetite for BAU adoption and rollout.
- Positive feature recommendations.
- DNO and non-utility interest in project.

## Post-adoption

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- "Potential game-changer"
- EEC2 – 5-day, >85mph, 70k customers – 10% GSOP = £49k saving
- EEC3 – 10-day, >70mph, >75% ice, >20cm snow, 300k customers – 10% GSOP = £1.6m saving.

## StormTriage™ Release Candidate

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Deployable BAU  
Tool Stable, Robust,  
Reliable, Scalable.

## Expansion of User Base

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StormTriage™ in the  
hands of third parties.

## Expansion of Applications

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Tech stack repurposed  
for asset management  
BAU use cases.

# Experience **Storm Triage** in Virtual Reality



Circe