Risk and Resilience Day 2026

Resilire: A framework for resilience modelling in electricity networks

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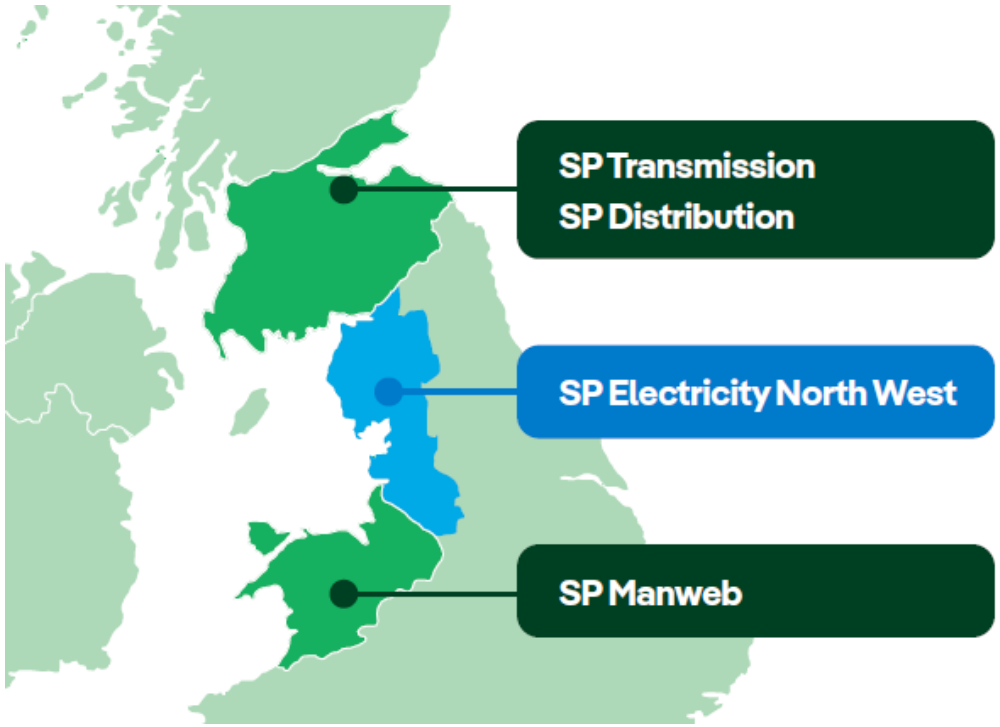
07/04/2026

Overview



£2.6bn
Investment from 2023-2028

£20bn
Cost to replace our entire network in the North West

2,287
Employees

48,000km
Underground electricity cables

13,000km
Overhead power lines

5m
Number of people we supply power to across 2.4 million homes & businesses.

Storm Arwen

Storm Arwen hit the North West of England on the 26 November 2021

We saw winds of up to 74 mph (120 km/h) with sustained winds above 60 mph (95 km/h) combined with drifting snow and icing

313 separate HV faults and 500 LV faults (about 2 months worth in 24 hours)

Over 90,000 customers were affected with some customers off supply for over five days

Impact on customers

SP Electricity North West

"When the electricity goes down, as it did, we couldn't have water to drink or to cook with. Not only does it get pumped into the house, but it has to also go through a filter and ultraviolet light. All of those are down. So, you're reduced to going to a stream to get a bucket of water to flush the toilet"

"The financial effects can be huge too. If a cow can't be milked then a vet will have to be called in to provide support for the animal's welfare. This could be needed for a couple of weeks during which time any milk that the cow produces will have to be disposed of correctly as it can be toxic if it gets into the water supply. For some farmers they are not insured for lost milk yields and the financial consequences can be catastrophic."

"I think we're beyond the point now of people saying 'oh this is a once in a generation storm, …we know with climate change… that's going to be become the norm and I think there needs to be significant investment in more kind of worst-case scenario planning, and that being on a bigger scale because we can't have the excuse that we didn't see this coming."

A change in approach

- We need to determine the most effective ways to minimise the impact of severe weather on our customers

- Hard to justify through traditional CBA — benefits affect relatively few customers and are difficult to evidence.

- Outage impact doesn't scale with duration:
  - Long interruptions cause major disruption.
  - Large-scale outages affect communications, water, payment systems, etc.

- Much of the network was built to older, less-resilient standards — full rebuild isn't feasible.

- We need to identify the most effective ways to reduce severe-weather impacts for customers.

Resilire *(reh-si-LEE-reh)*

"A Framework for Resilience Modelling in Electricity Networks"

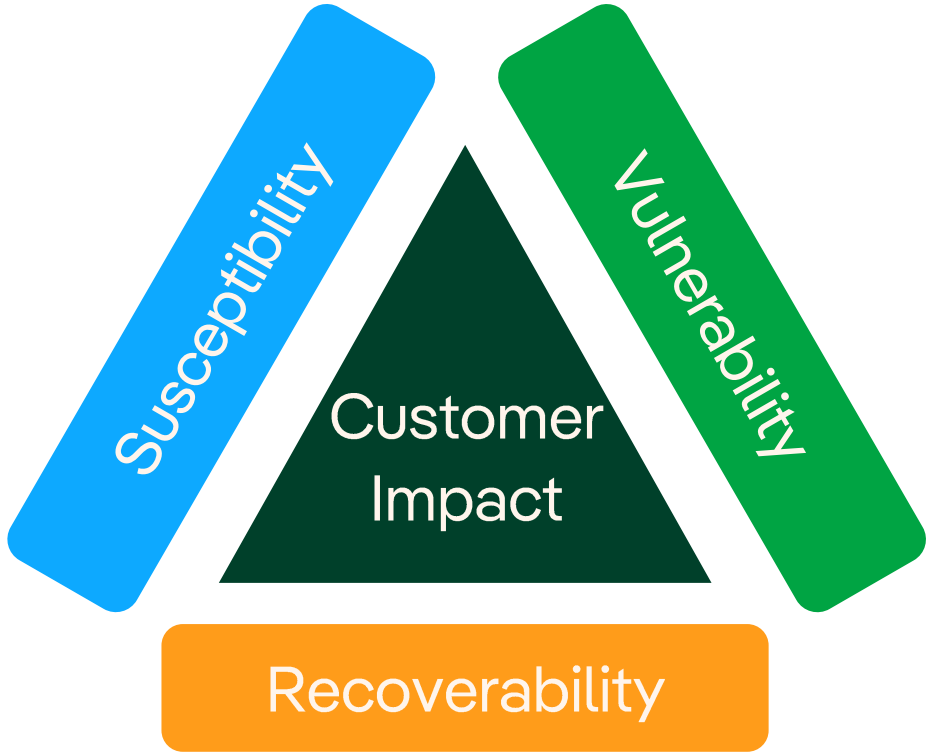
- Proposed as part of the Storm Arwen Re-opener
  - Development funded as a PCD in the final determination

- Assesses the whole system resilience risk of long-duration outages due to severe weather
  - Currently focussed on the risk of the windstorms to the HV network, but could be extended to other networks and risks

- Enables the targeting and justification of investment in network resilience

Conceptual Background

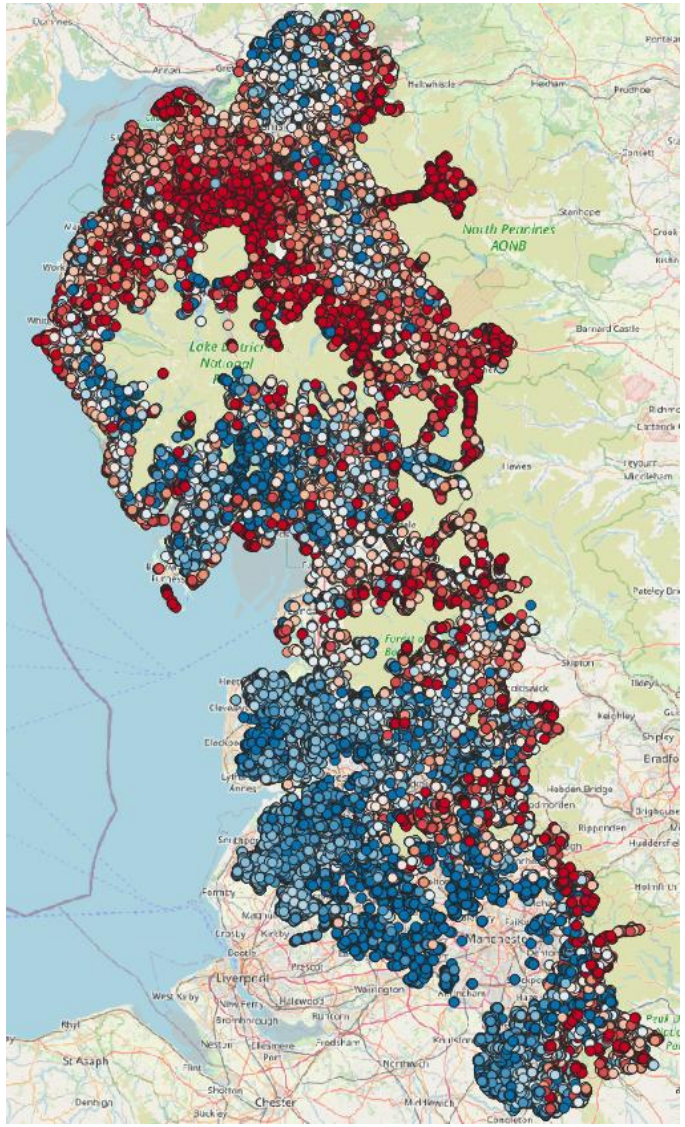
How likely is an asset to fail due to severe weather?



If the asset does fail what is the impact on customers?

How long will it take to restore supplies?

Susceptibility



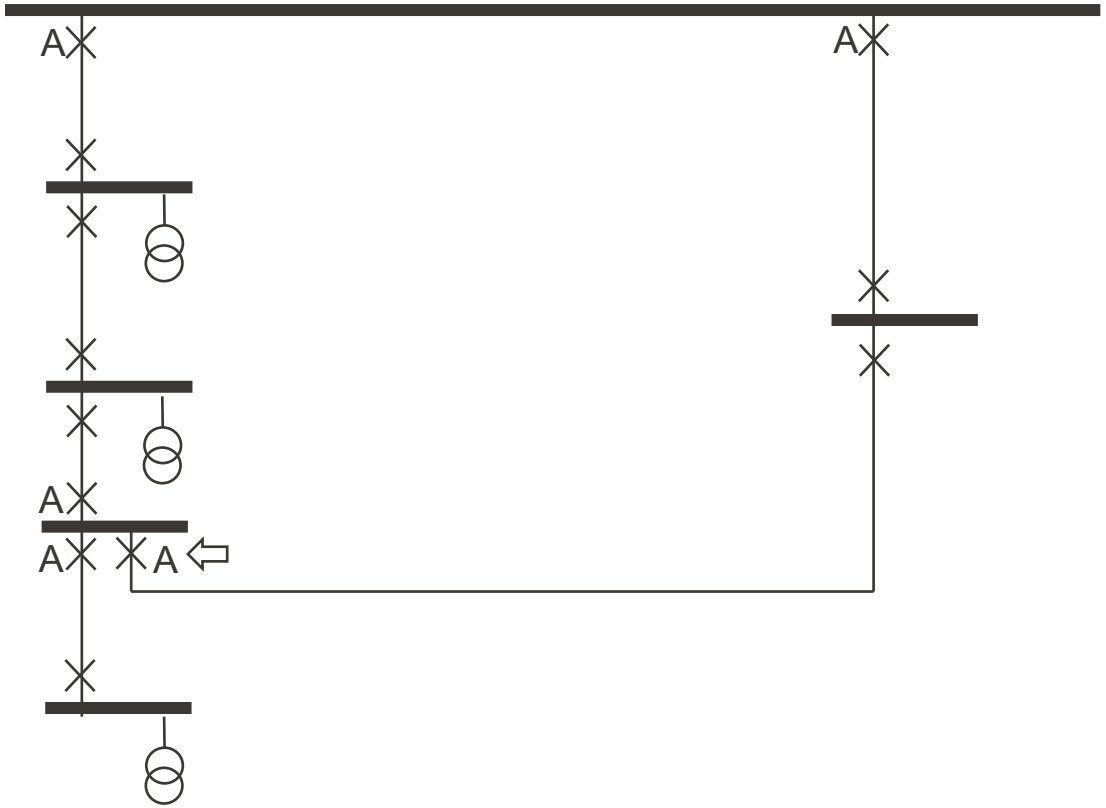
Assess the maximum expected windspeed at each pole location

Assess the installed strength of each pole

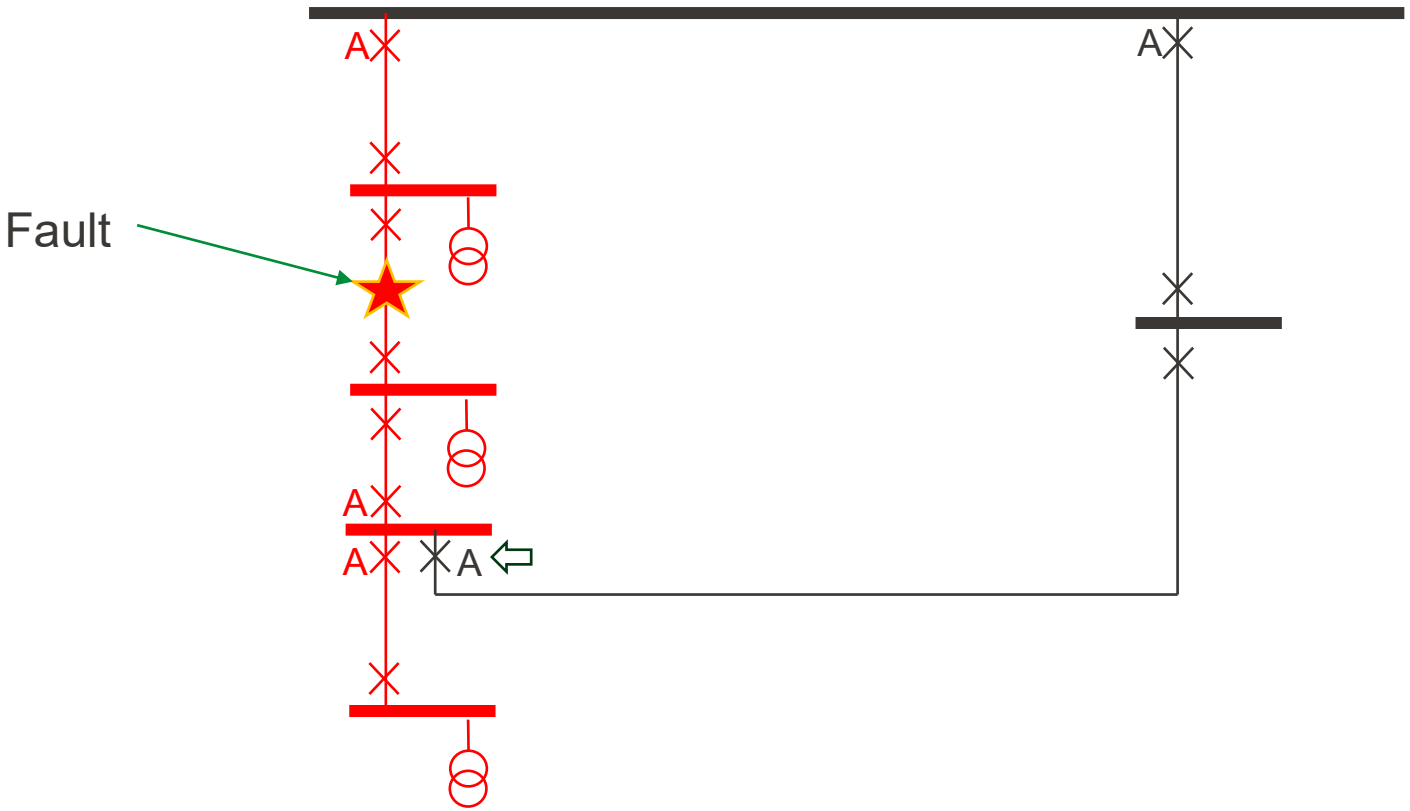
Assess the risk of tree fall at each location

Determine which assets exceed a failure probability threshold

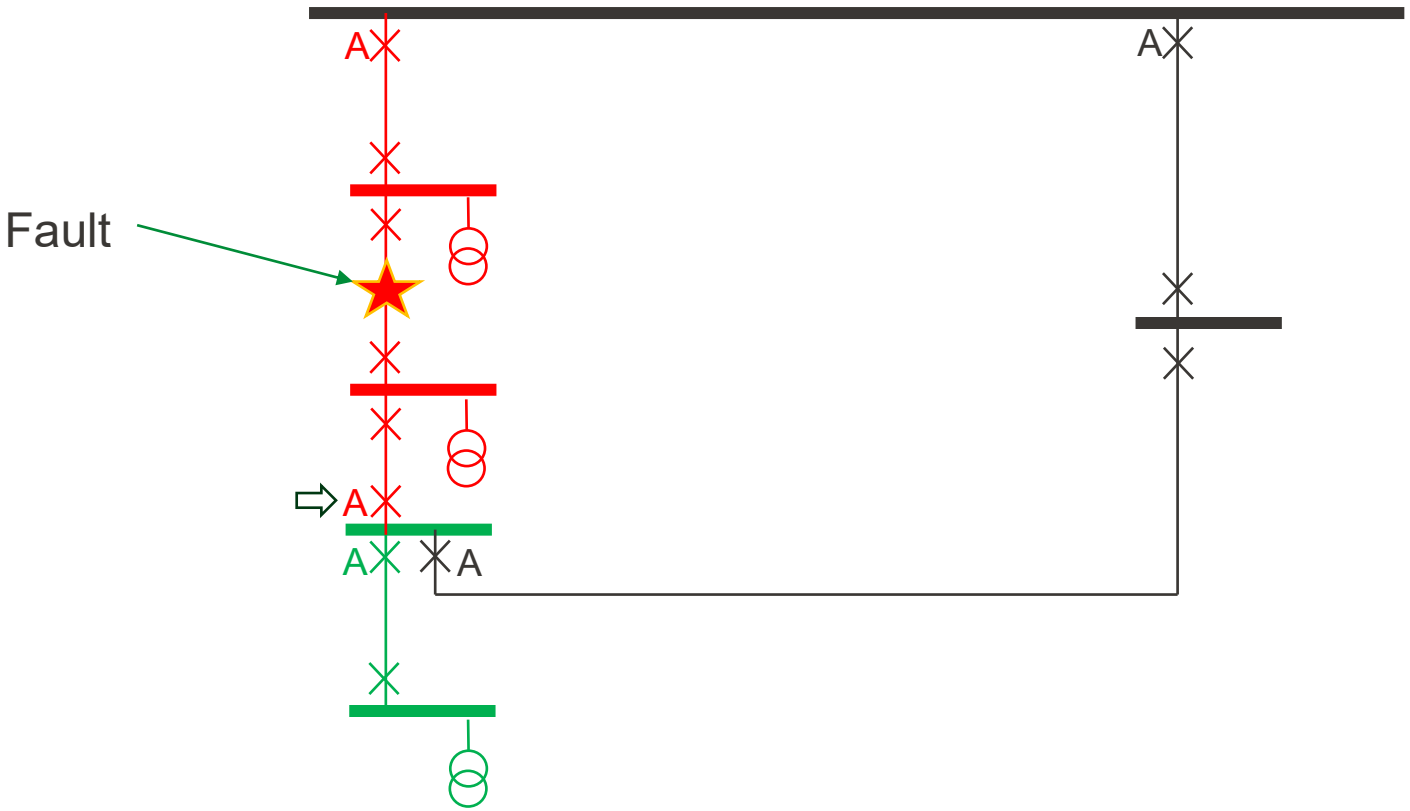
Network Restoration



Initial Fault Outage



Remote Switching

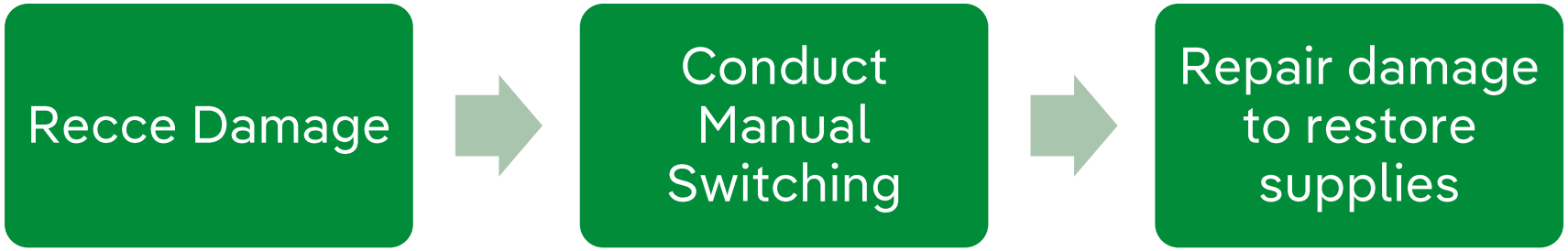


Recoverability

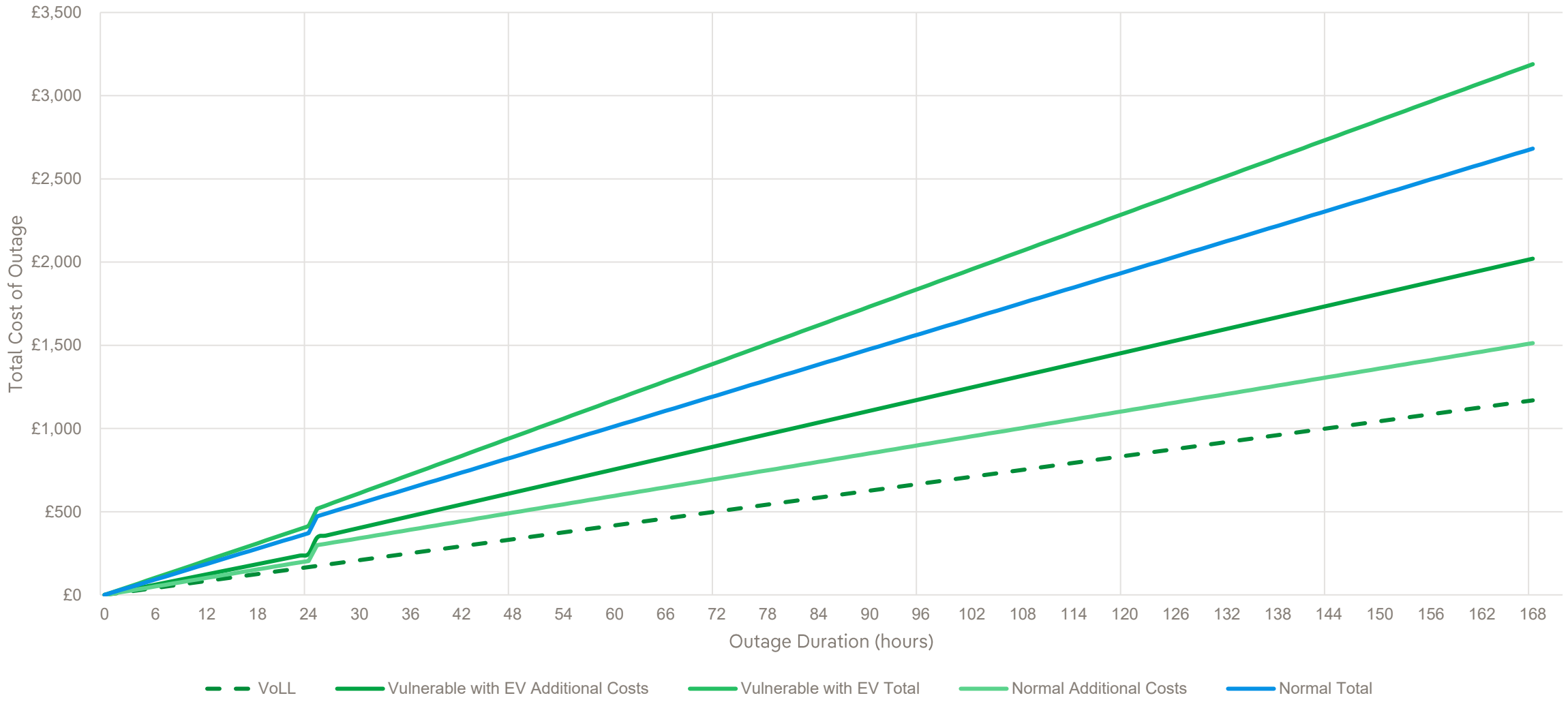
- Simulates the operational response to a major incident

- Uses an Agent Based Model to simulate:
  - Prioritisation and dispatch of appropriate resources based on current knowledge
  - Discovery of damage locations from recce
  - Travel time and on-task time
  - Re-dispatch to next task

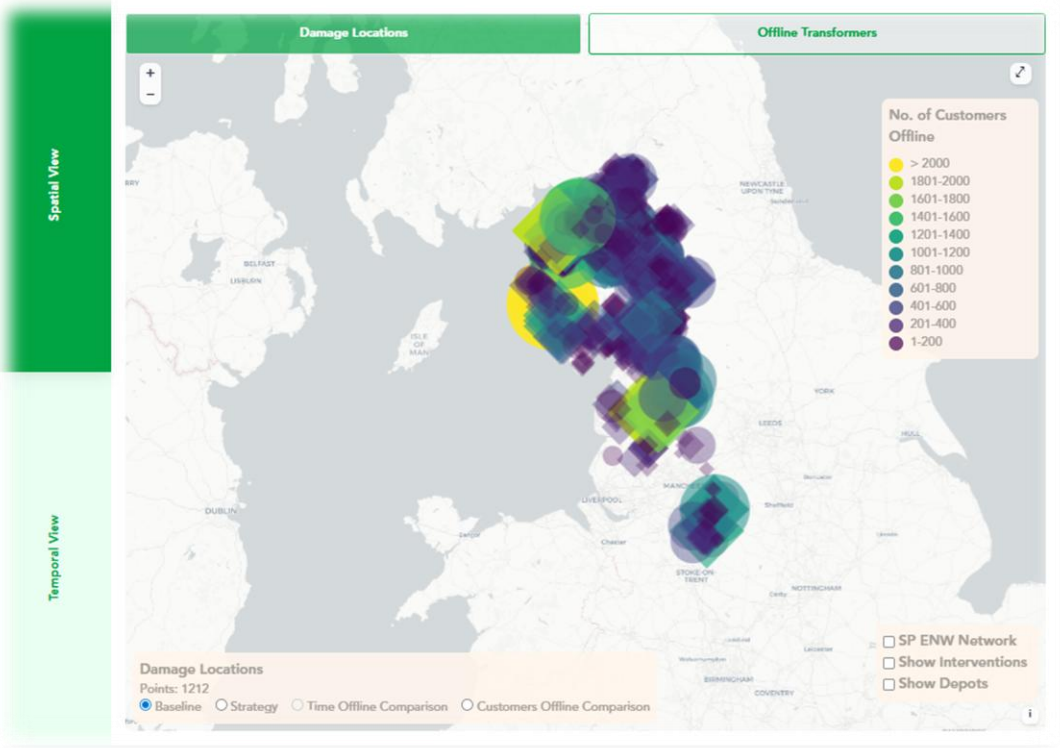
- Determines the time taken to restore each customer in the scenario

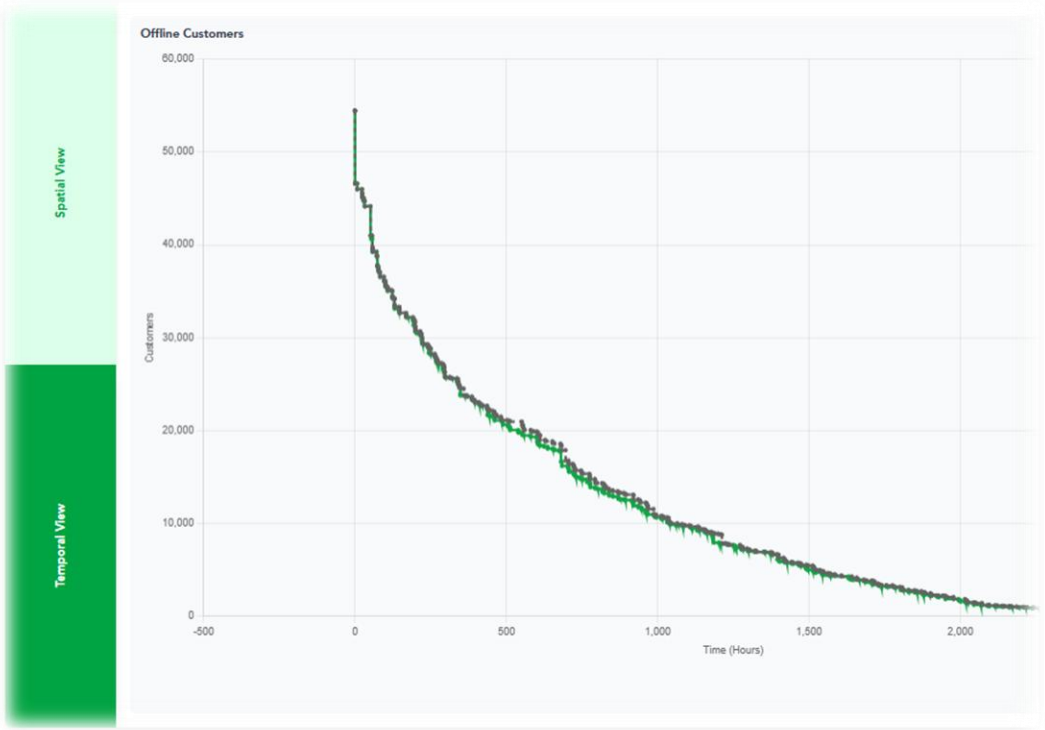


Customer Impact



Results


Spatial View
Temporal View
Damage Locations
Offline Transformers
No. of Customers Offline
> 2000
1801-2000
1601-1800
1401-1600
1201-1400
1001-1200
801-1000
601-800
401-600
201-400
1-200
SP ENW Network
Show Interventions
Show Depots
Damage Locations
Points: 1212
Baseline
Strategy
Time Offline Comparison
Customers Offline Comparison


Spatial View
Temporal View
Offline Customers
60,000
50,000
40,000
30,000
20,000
10,000
0
Customers
-500
0
500
1,000
1,500
2,000
Time (Hours)

Key Learnings

Modelling the network enables targeted investment

This whole system approach allows dissimilar intervention types to be compared

Avoiding high impact faults benefits both those directly affected and the wider area by freeing up repair resource

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For more information: