SP Energy Networks

Energy Innovation Summit

Predict4Resilience

Creating a Trusted Fault Prediction Tool for the Control Room

11/2025

Contacts

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Who We Are

SP Energy Networks, part of ScottishPower, owns four regulated electricity network businesses in the UK:

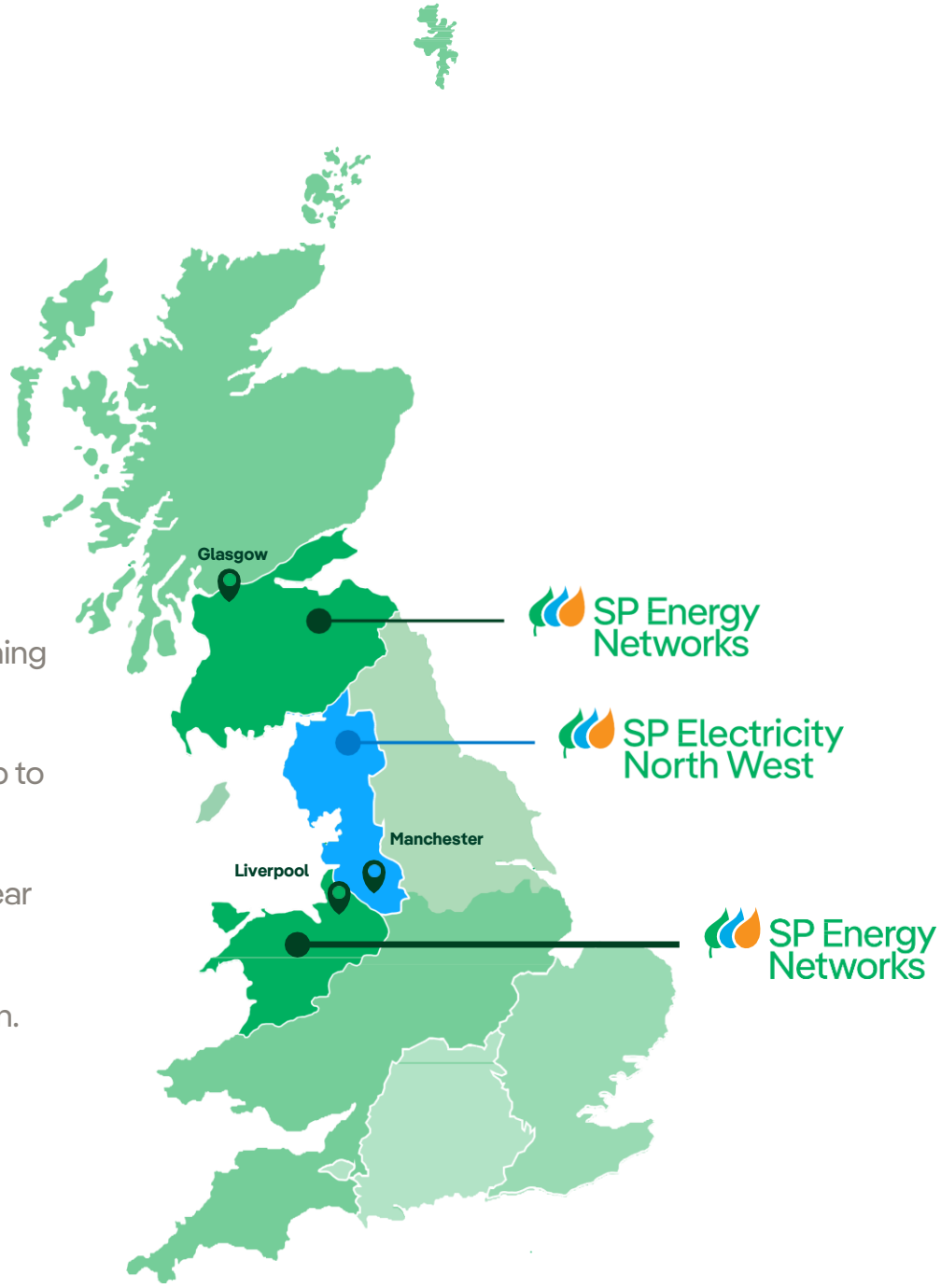
- SP Distribution plc (SPD)
- SP Transmission plc (SPT)
- SP Manweb plc (SPM)
- SP Electricity North West (SP ENW)

Together we keep electricity flowing to over **12 million** people across a network spanning more than **172,000 kilometres.**

Operating in some of the UKs largest cities as well as significant rural areas. It's our job to move electricity to and from homes and businesses over our network.

Our aim is to deliver a safe and reliable electricity supply 24 hours a day, 365 days a year whilst providing exceptional value for money.

It's a role that puts us right at the heart of the UK's Net Zero carbon emissions ambition.



Project Partners

SP Energy Networks

SIA

Scottish & Southern Electricity Networks

University of Glasgow

Project Background

Background

Storm Arwen

On November 26-27, 2021, Storm Arwen brought severe weather with 98 mph winds to the UK, causing approximately 9,700 faults and leaving over 1 million customers without power.

Public Review

Due to the widespread disruption, Distribution Network Operators (DNOs) were reviewed by Ofgem and BEIS through the Energy Emergencies Executive Committee (E3C).

DNOs' Commitment

DNOs have committed to enhancing their preparedness, resilience, and customer support to respond even more effectively to severe weather events.

Predict-4-Resilience

2022: Discovery

Initial analysis and survey of existing practice and available tools. Potential benefits identified.

2022-23: Alpha

Proof-of-concept developed, and desk-based studies verify potential skill of fault forecasts. Business case developed.

2023-27: Beta

Fault forecasting methodology has been productionised and live trials are under way. Enhancements continue to be developed and rolled out to trial participants. Commercialisation strategy under development.

Problem Statement

Severe weather events can have major impacts on the electricity network, potentially resulting in **power outages,** which cause **significant inconvenience to customers**

Reliance on Tacit Knowledge for Risk Assessment

Not backed by data, subject to human bias and limited/differing experience

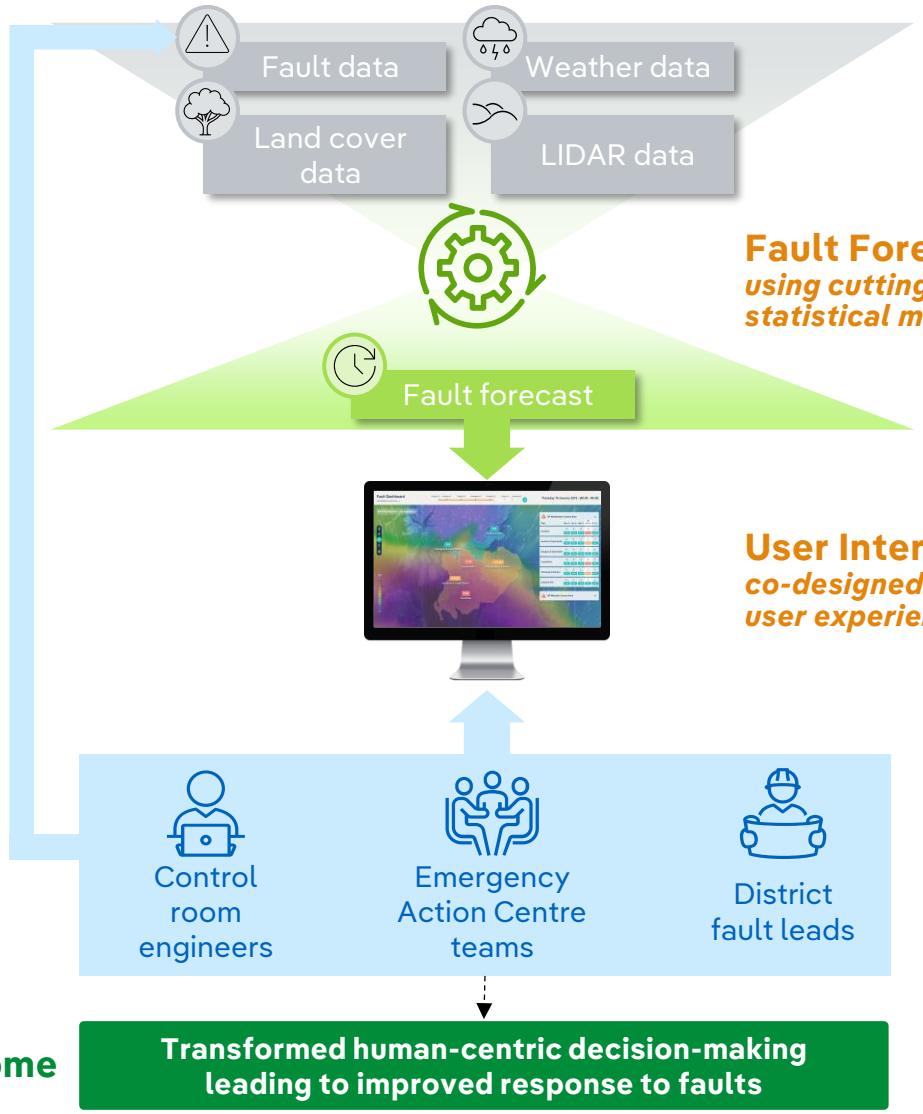
Financial Impact of Limited Fault Insights

Weather forecasts alone don't quantify range of fault impacts, potentially leading to higher costs

Reactive Management of Severe Weather Risks

Limited DNO information about the potential risks of upcoming severe weather

P4R as a Solution



Fault Forecast Engine
using cutting-edge statistical methods

User Interface
co-designed with users and user experience (UX) experts

Outcome

Transformed human-centric decision-making leading to improved response to faults

Success Stories with P4R

Better Resources Management

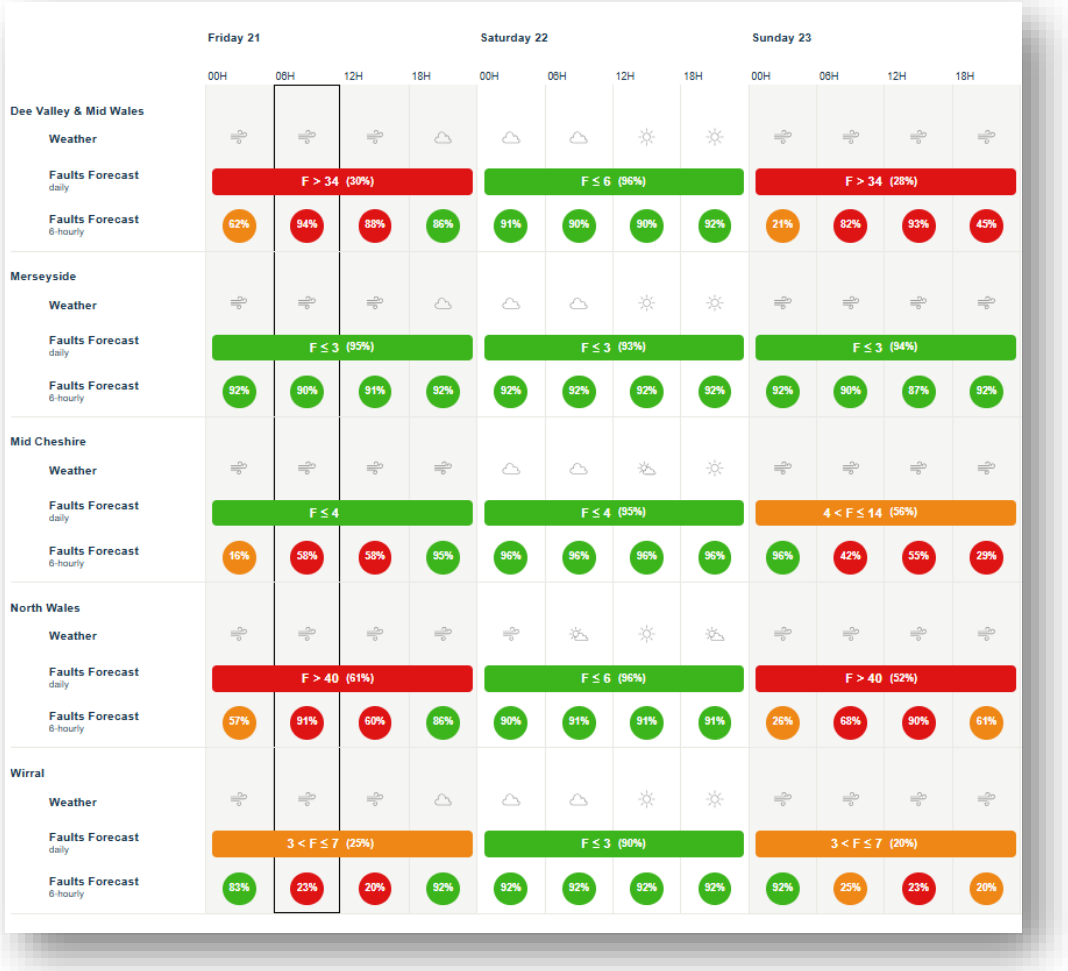
P4R enables smarter allocation of resources and strengthens cross-district collaboration, especially during amber situations.

Case Study: Unnamed Storm Feb 2025

Event
- Severe weather on Feb 21 & 23 (not a named storm)
- 81 network faults in SPD over three days

Forecast Performance
- Amber risks signaled **4 days ahead**
- Forecasts accurately showed:
  - Faults on **Feb 21 & 23**
  - No significant issues on **Feb 22**
- 6-hour forecasts pinpointed **timing of Sunday faults**

Impact
- Staff scheduling optimised (work Friday, rest Saturday, return mid-Sunday)
- Clear example of P4R's value in **busy but non-exceptional events**



From Weather Data to Fault Forecasts

By translating weather information into fault forecasts, P4R turns raw data into actionable insights, reducing reliance on individual judgment and enabling more confident decision-making.

Case Study: Unnamed Event Aug 2025

Event

- August 30/31st 2025 – routine weekend with potential weather risk flagged by traditional weather providers

Forecast Performance

- Weather providers suggested risk in 4 districts
- P4R indicated **Green** with no sign of faults expected over the weekend
- No issues occurred in those districts

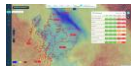
Impact

- Decision made not to put staff on call
- No issues occurred in those districts
- ~£'000s saved by avoiding unnecessary standby costs

Early and Accurate Fault Detection

In mid-level storms, P4R effectively translates weather forecasts into early insights on network impacts, enabling more efficient resource planning and coordination, and supporting faster customer restoration.

Case Study: Storm Amy – Sept 3rd-4th

P4R 

September 29th
1 Red warning in SPD, forecasted for 03/10

September 30th
3 red warnings for 03/10
4 red warnings for 04/10
All other districts showed amber alerts on both days

Storm Amy named by MetOffice and **yellow** warnings issued

October 1st
4 red warnings for 03/10
5 red warnings for 04/10
All other districts showed amber alerts on both days

Amber warnings issued north of SPDfor 03/10 5pm to 04/10 9pm

October 2nd
Impact **confirmed** for 03/10
Impact **decreased** for 04/10

Storm Recorded

October 3rd
Impact **confirmed** for 03/10
Impact **confirmed** for 04/10
(2 Red, 3 Amber, 1 Green)

Storm Recorded

October 4th
Impact **confirmed** for 04/10
(3 Red, 2 Amber, 1 Green)

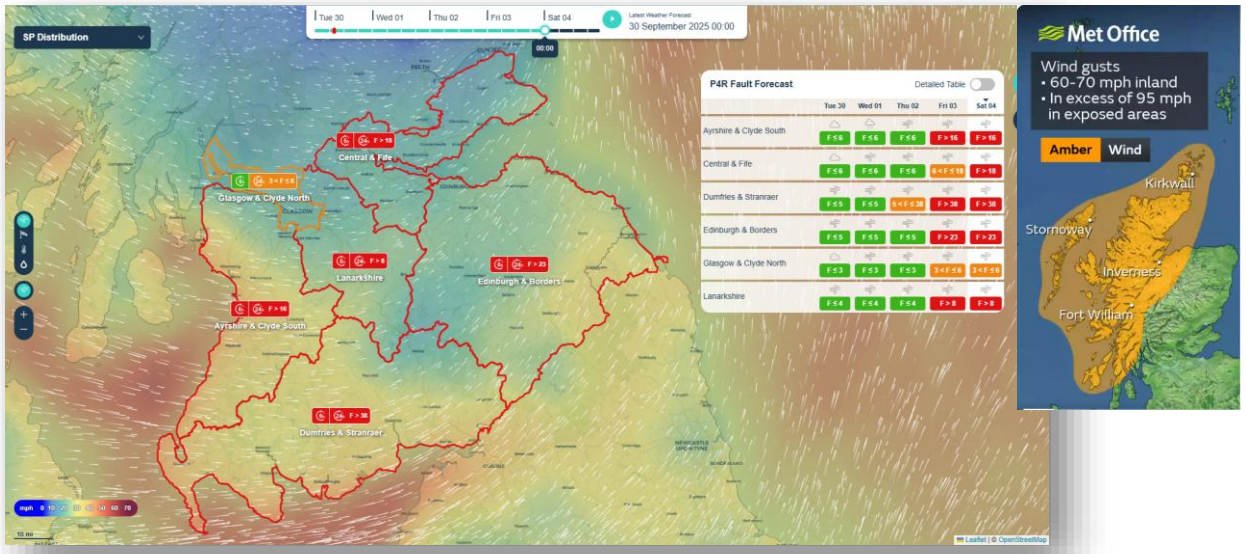
Forecast Performance

- P4R issued red warnings for most SPD districts before MetOffice issued weather warnings. **Extra days are critical for the preparation of network response.**
- The response team prepared to face an estimated total of 208 faults on October 3rd using P4R.
- All districts except Glasgow did indeed experience a significant number of faults with a total of 200 faults on October 3rd.

Impact

- P4R provided timely and accurate situational awareness, enabling more effective resource planning and coordination.
- As a result, 95% of customers were reconnected within the first 24 hours.

Existing processes would have led to under preparation based on the severity of the weather front. P4R demonstrated the importance of not relying solely on weather forecast.



Benefits

A proactive response will enable power supply to be restored sooner than is currently possible, creating a more resilient network and minimising disruption and stress for customers, particularly for the vulnerable.

It will bring about a range of significant financial, social and environmental benefits to network consumers and wider society

More resilient network

Minimising disruption to individuals and businesses, especially with working from home more prevalent.

Improved Customer Service

Better **communication of potential storm disruption** in the days leading up to an event.

Delivering planned works

Visibility of impact and location of weather events can give network operators **confidence to continue with necessary network upgrades** that would otherwise have been cancelled.

Reliable service for vulnerable

An extended loss of power supply **particularly affects the vulnerable and those medically-dependent** on electrical appliances. Places of work may be closed, causing lower-income families further stress because of lost wages

Environmental Benefits

A reduction in **CO_2 emissions** and an improvement in **air quality** through reduction in generator usage and fuel consumption. .

Better allocation of UK resources

Understanding the likely impact of an extreme weather event supports a **coordinated response among all DNOs**.

Next Steps

Next Steps

1

Phase 1: Completion of Trials

- Improving and finalising models and User Interface according to observations and feedback collected during the Trials
- Scheduled for Q3 2026

2

Phase 2: Full Deployment at SPEN and SSEN

- P4R fully integrated (BAU) at SPEN and SSEN
- Tool embedded in the control room to inform decisions.
- Tool deployed to the rest of SPEN and SSEN
- Scheduled for Q4 2026

3

Phase 3: National and International Expansion

- Expansion to GB DNOs first - scheduled Q4 2026 – Q4 2028
- Expansion to international DNOs to start in Q4 2026

Questions?

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