Network Event & Alarm Transparency (NEAT)

Client	National Grid Electricity Distribution (formerly Western Power Distribution)
Country	UK
Year	2020 - 2023

National Grid Electricity Distribution (formerly Western Power Distribution) in the United Kingdom engaged PSC to deliver an innovation project known as the Network Event and Alarm Transparency (NEAT) project. The project was run by National Grid and funded under the Ofgem Network Innovation Allowance (NIA).

National Grid operates the UK's largest electricity distribution network serving nearly eight million customers in the East and West Midlands, South West and South Wales, across a distribution area of approximately 550,000 square kilometres.

Challenge

Distribution Network Operators (DNOs) are experiencing an increasing number of new and unfamiliar types of alarms in their control rooms as new functions for real-time dynamic network management and optimisation schemes are introduced. In this particular case, new functions are required to support Active Network Management (ANM) or System Voltage Optimisation (SVO) and are expected to be followed by other new systems and functions as part of the Distribution System Operator (DSO) transition.

The processing of these requires a different approach and a significant level of analysis to rationalize and resolve. It also makes the management of the network more complex.

The project's goal was to develop a robust tool for analysing alarms and events, so that by understanding the root causes and interactions, they can be managed efficiently and effectively.

Project solution

In partnership with Harmonic Analytics[1], PSC addressed the issues by developing a software tool that analysed the relationship(s) between alarms and other system events[2] to provide clear conclusions as to the root cause of the various issues raised by the alarms.

The project approach contained six distinct work packages:

- **Develop a Specification:** Production of a system specification outlining the tool's functionality to be delivered and accessible via a browser interface from the distributor's systems.
- **Design Phase:** The models and datasets to be used in delivering the functionality outlined in the specification were determined in this phase. This included an assessment of the available data to assess whether it was complete and whole. Initial tests of the various model types informed preliminary selection for further development during the build phase. The design phase set out the tool's overall process along with the user interaction and thoughts on the data analysis methodologies.
- **Build Phase:** The build phase developed the software tools that included sprints (focussed productivity technique created by a group of individuals working on the same software development) for model refinement and the creation of a dashboard for user evaluation.

1 Harmonic Analytics are a leading data science company based in New Zealand.
2 System events relate to system assets, configuration and measurements available from the WPD SCADA system.

The build phase used clustering analysis, network association analysis, spatial analysis where geographical information was present, time series analysis, and predictive forecasts.

- **Deploy and Test Phase:** This phase included the selection and integration of the project requirements into the NEAT dashboard.
- **System Trial and Findings Analysis Phase:** The prototype dashboard was developed further during a live system trial to extract insights from the alarm and event analysis. During the trial period, analysis was carried out to review trends and look for results improvement and learnings.
- **Dissemination and Project Closedown Phase:** This phase covered the findings in terms of alarm relationships as well as trends from the ANM and SVO alarm systems. This phase highlighted the benefits and improvements possible through a better understanding of the interactions between different events.

The Network Event and Alarm Transparency project (NEAT) applied a variety of analytical techniques to the available data, developing the most successful techniques into a prototype dashboard and carrying out a trial of the system. This trial involved data transfer from National Grid systems into the prototype dashboard and support analytics but did not include live interfaces to the systems.

The trial showed that the users found the system easy to use and that it was easy to navigate between the various screens and apply filters.

PSC advantage

Our global footprint enables PSC to bring extensive experience working on innovative new schemes to facilitate the connection of low carbon technologies to the power system and support the transition to net zero. The PSC UK team has extensive experience working across all DNOs and supporting the transition to operating more active networks as they transition to become Distribution System Operators. PSC also has an established partnership with Harmonic Analytics who bring leading data analysis experience relating to alarm and event management from Australia and New Zealand to ensure maximum benefit for National Grid and the UK industry.

The project has been welcomed by Jenny Woodruff, Innovation and Low Carbon Network Engineer at National Grid, who said: "Distribution Network Operators are taking on new roles to become Distribution System Operators. These new roles often require new software systems to support them which increases the number of alarms but also introduces new types of alarms that can be difficult to manage. NEAT will help us streamline the process to resolve these new alarms ensuring the optimal operation of our network."