Electricity Distribution

NEAT

The Network Event and Alarm Transparency (NEAT) project

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Background & Objective

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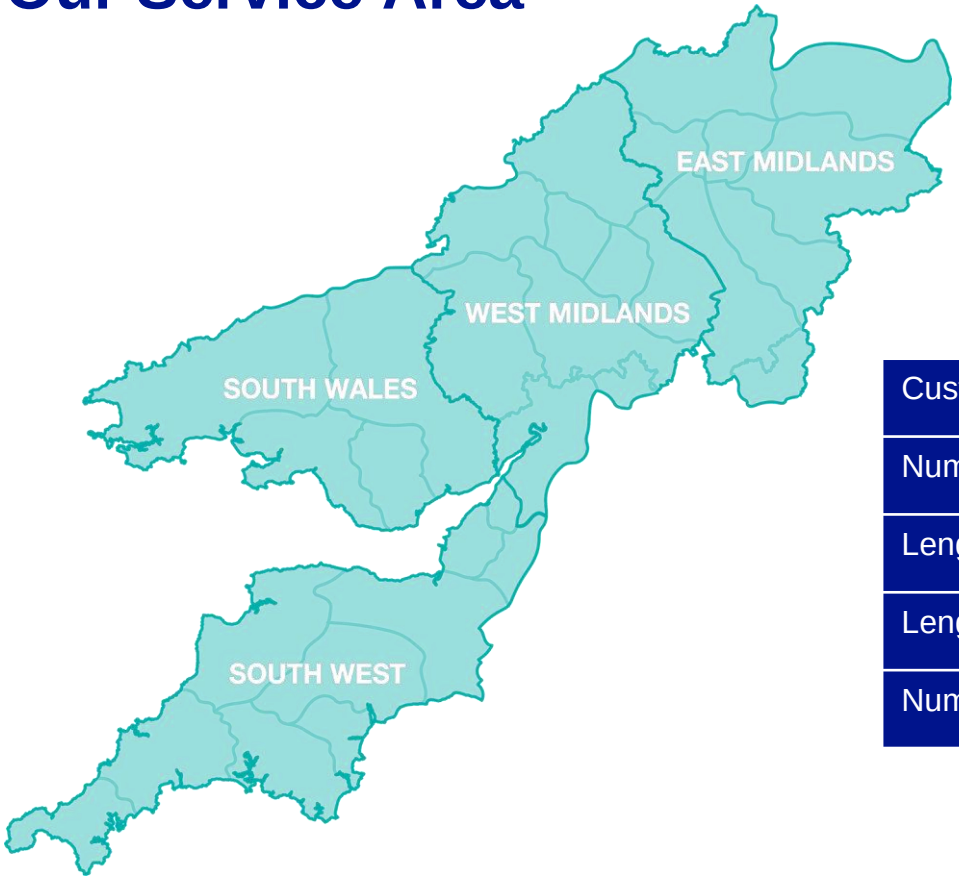
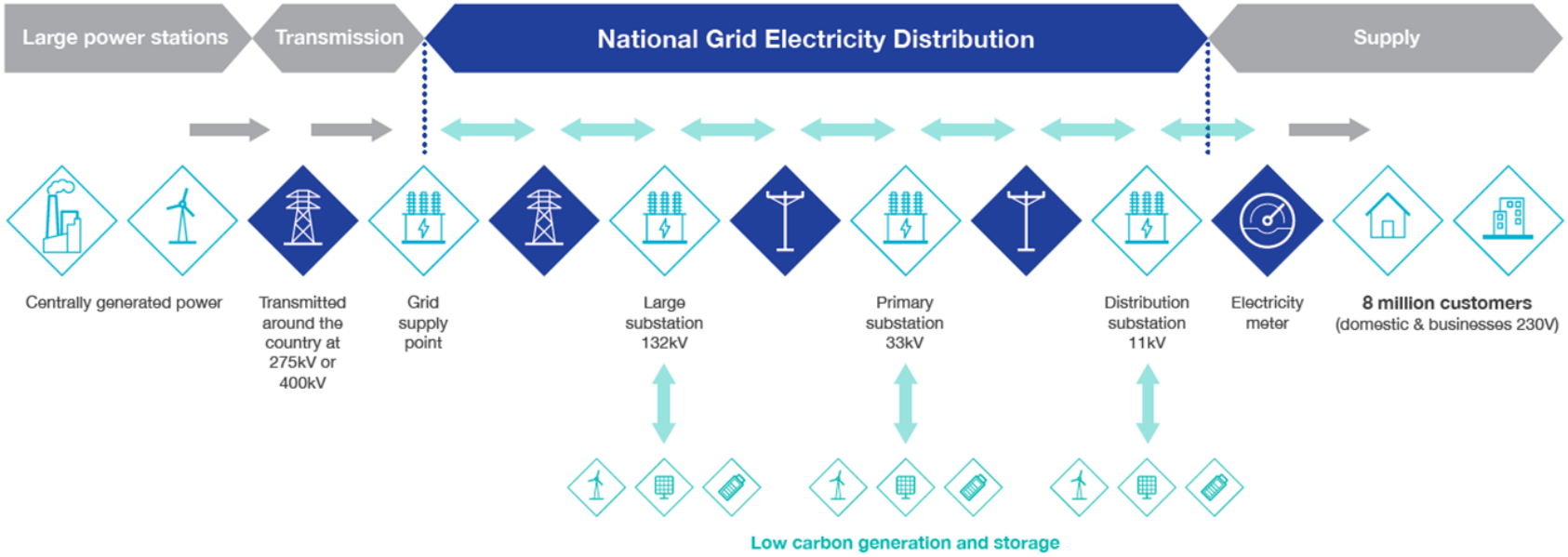
Our Service Area



Key Facts

Customers Served	8 million
Number of substations	185,000
Length of underground cables	138,000 km
Length of overhead lines	90,000 km
Number of staff	6,600

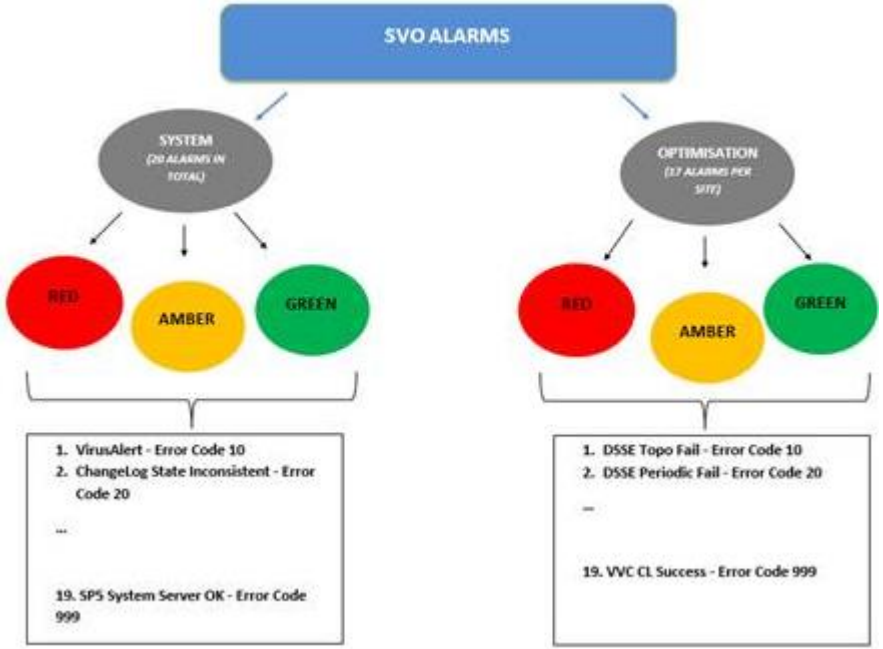
Electricity System Overview



Background

Distribution Network Operator (DNO) to Distribution System Operator (DSO)

- Differences in responsibility.
- New systems - Active Network Management (ANM) and System Voltage Optimisation (SVO).
- New alarms and events.
- More new systems are anticipated in the future.



Harmonic and PSC Introduction

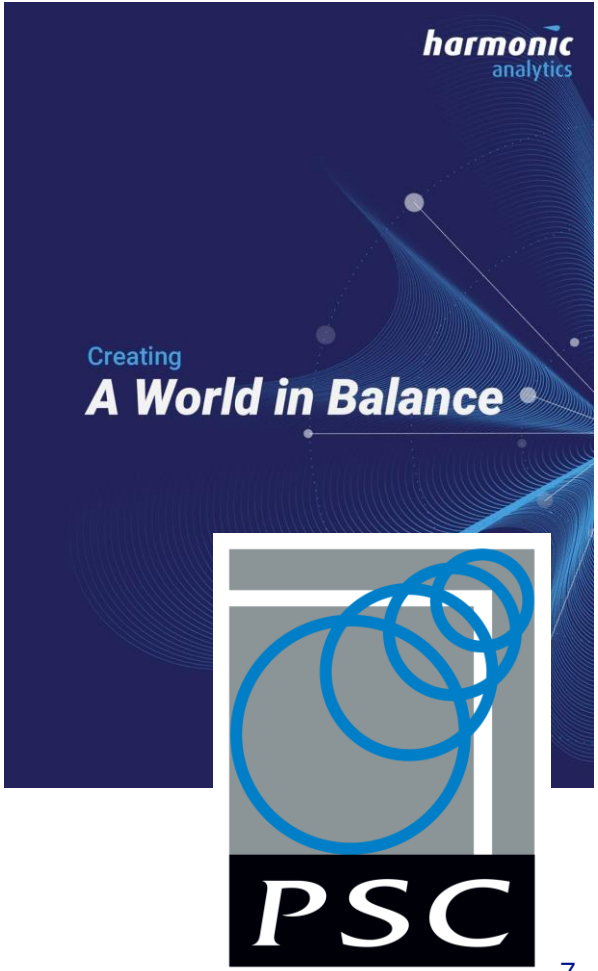
Harmonic Analytics is a Data Science Company

Operating since 2003, Harmonic is a New Zealand-based team of statisticians, operations researchers and software engineers.

- Over 20 years, we've solved complex challenges across 12 industry sectors - of which electricity is our largest.
- We've built, deployed, supported and hosted solutions in NZ and abroad.

Power Systems Consulting (PSC) Partnership

- Partnered together for 10 years to combine power systems and data science expertise.
- Focussing on addressing the clean energy transition and other important, complex electricity sector challenges.

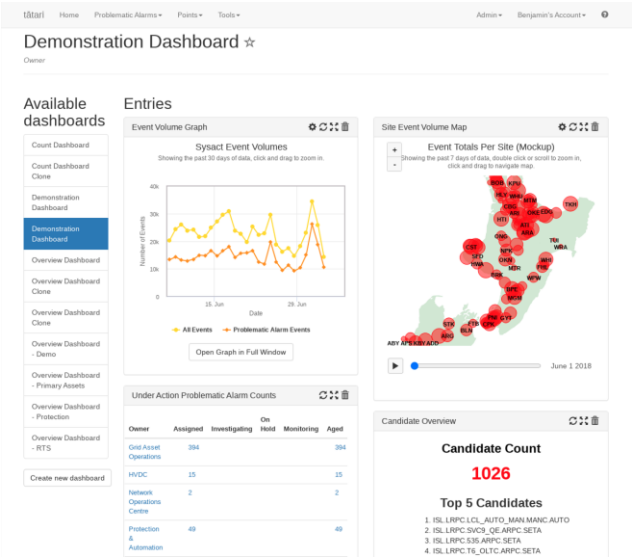


Alarm Data Science Context

2015 - Transpower asked Harmonic to build Tātari

Tātari, is a live, automated tool which supports the analysis and management of ‘problematic’, noisy alarms, focussed on:

- Supporting root cause analysis to manage alarm volumes.
- Identifying underlying asset health issues.
- Machine learning to automate alarm resolution processes.



2019 - AusNet asked Harmonic to build I:DEA

I:DEA, also supports the analysis and management of noisy alarms, focussed on alarm flooding during bushfire season.

2021 - Alarm Intelligence R&D programme

NZ Government-funded, with PSC + NZ, Australian transmission and distribution experts.

Objective

Network Event and Alarm Transparency (NEAT)

- NEAT is a National Grid led Innovation project funded by Ofgem's National Innovation Allowance (NIA) funding mechanism.
- The NEAT project aimed to streamline the identification of information which allows DSO supported systems to operate optimally.
- Minimising downtime of these systems will ensure that customers, mostly renewable generation, are not constrained more than necessary.
- This maximises the production of renewable energy in the short term and maintains the confidence to connect for new developments.

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Method & Development Stages

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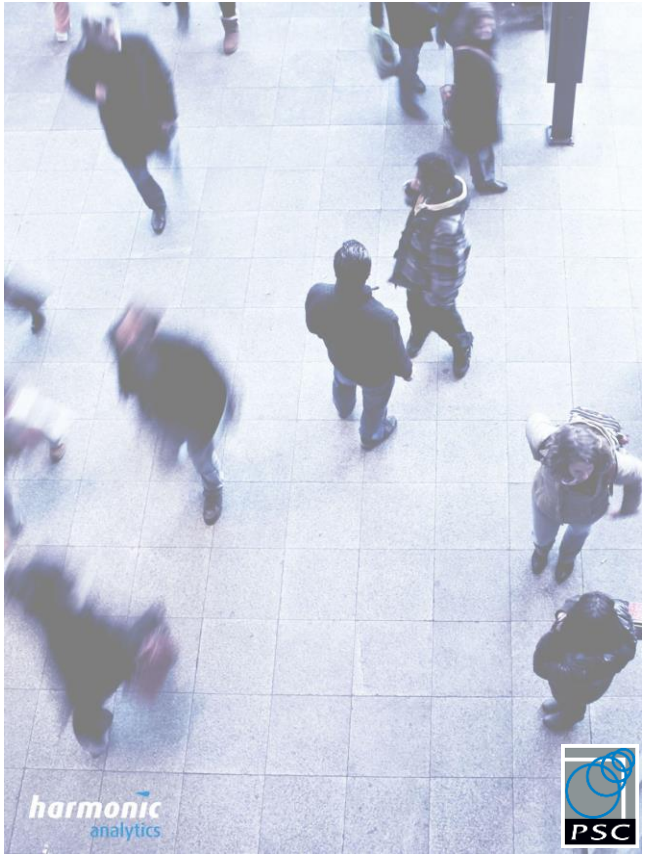
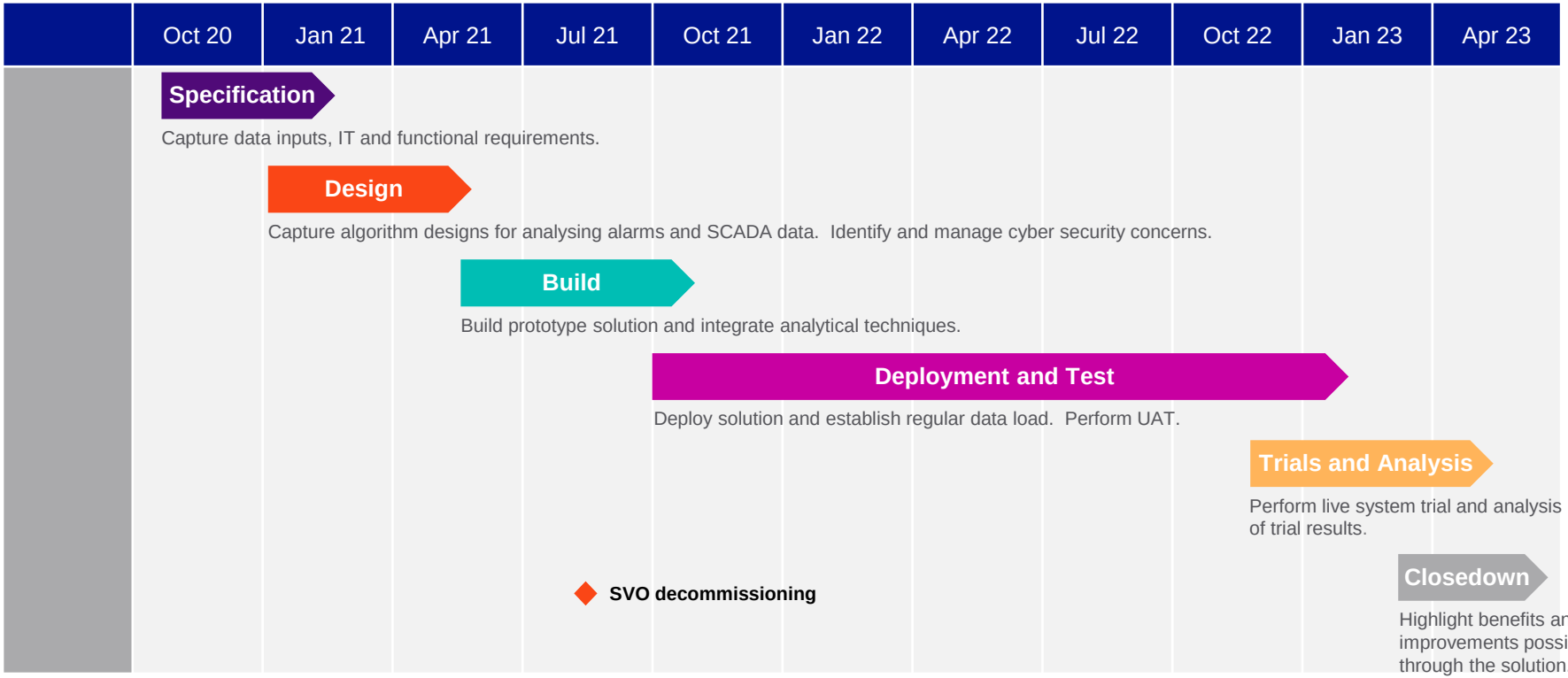
Method

Develop successful analytical techniques into prototypes

- Analyse relationships between alarms in ANM, SVO, PowerOn and other system events, including configuration changes and measurements.
- Develop generalised prototypes that could be applied to future, yet to be developed systems, or systems in use by other DNOs.
- Provide rules or information to better sort and separate alarms to help controllers improve decision making.
- Normal issues and alarms managed by the control room were filtered out from our analysis.



Development Stages



Development & Deployment Learning

- Difficulties with new deployment platform in WPD (OpenShift). Lacking experience on the new system.
- VPN (CyberArk) set-up issues.
- NGED acquisition of WPD diverting resources temporarily.
- Lack of immediate users and feedback during development.

Development & Deployment Learning

Data quality issues were made visible for the first time for NEAT used data that was not normally examined in detail

.

- Unexpected inclusion of personal data.
- 12h and 24h time formats mixed in the same report.
- An alarm flood of over 800,000 alarms on 22nd Nov 2020 that was related to a single device.
- Issues introduced during the data extraction process suggested inconsistent formats of the source data.
- Error in extracting the month rather than the minutes resulting in all switching and alarms times occurring at either 11 or 12 minutes past the hours.

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Solution Demonstration

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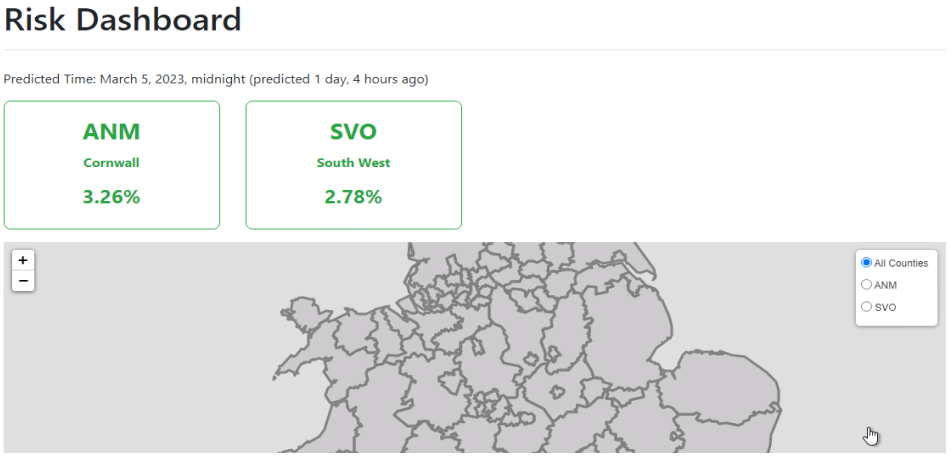
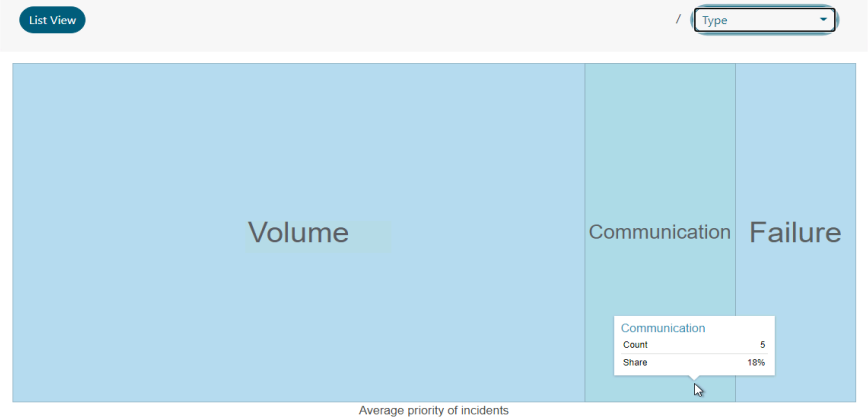
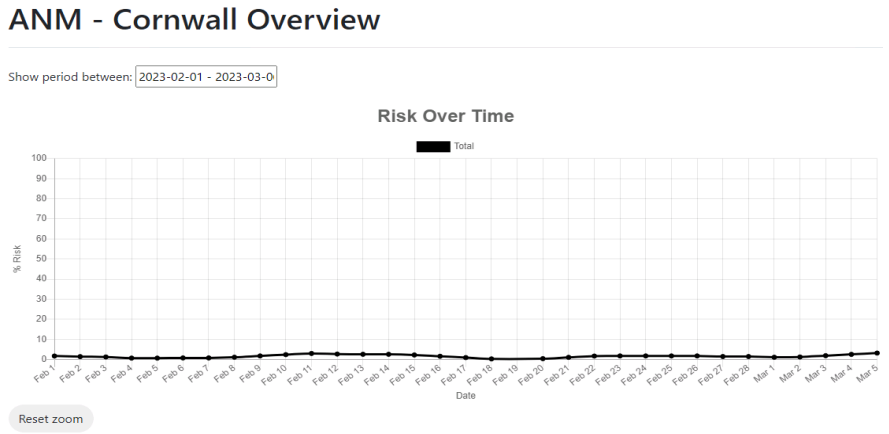
Solution Demo







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Analysis Summary

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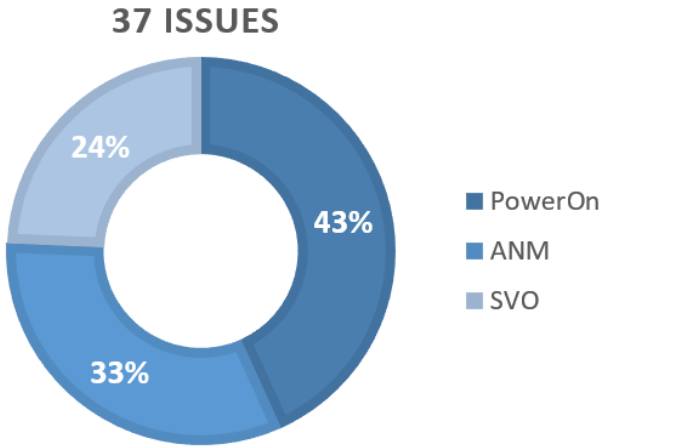
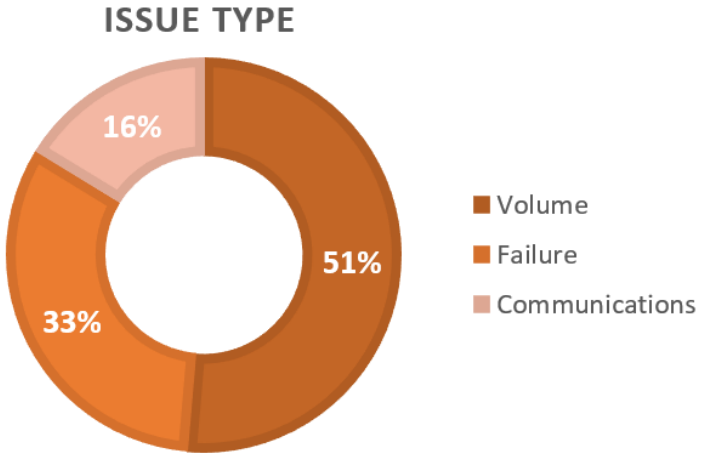
Analysis Summary

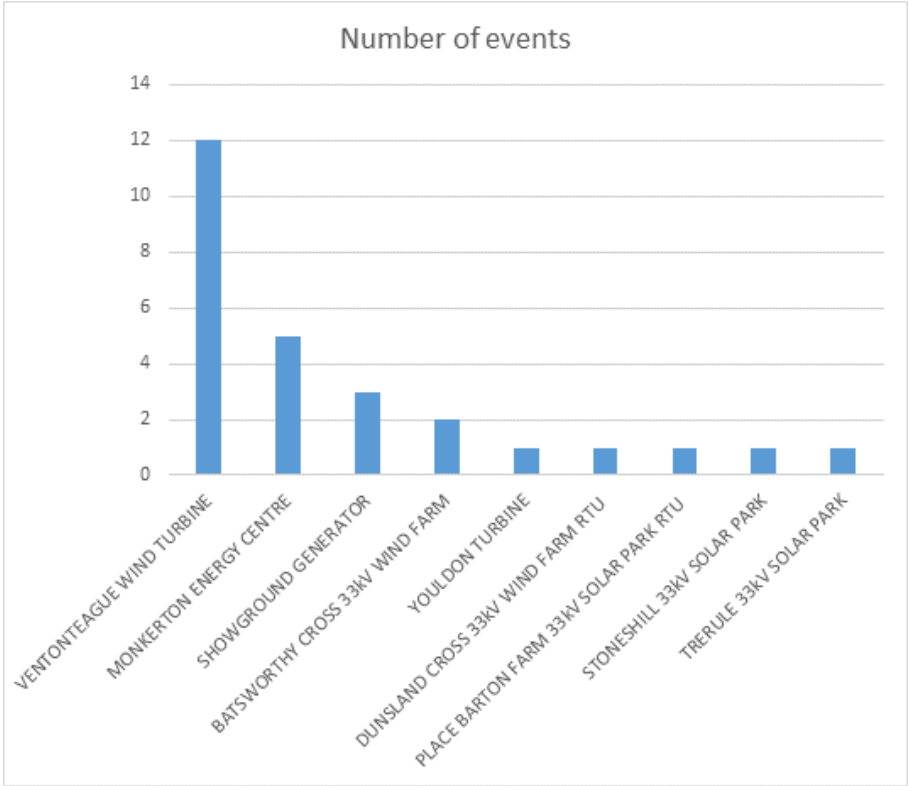
- **37 Issues identified**
  - 9 replay issues for SVO
  - 12 ANM
  - 16 PowerOn
- **Issue types**
  - 19 Volume
  - 12 Failure
  - 6 Communications
- **User feedback**
  - Some usability issues to improve
  - Interest in deploying to other areas





Analysis Summary

- Events were spread across various sites.
- A few sites were responsible for a large proportion of events.
- Fixing these sites will fix the majority of the problems and the number of events will decrease substantially.



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Next Steps

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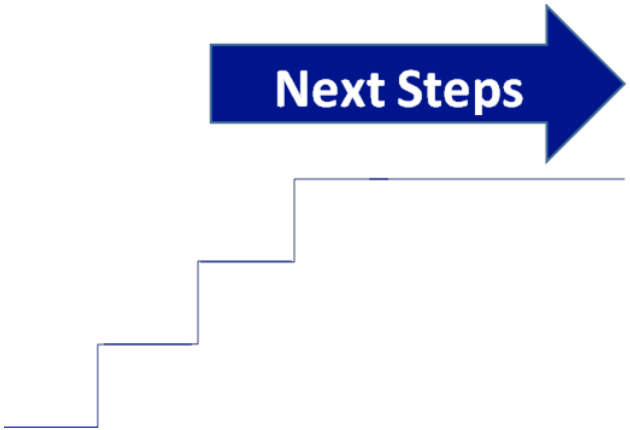
Next Steps

- Undertake an additional telecoms trial for another area to determine whether there is potential ongoing value.
- Reevaluate the role of NEAT when new SVO and ANM systems are available.
- Continue to add new data sets to NEAT and explore the breadth of the available data (e.g. ICCP data) for additional insights.
- Implement minor user interface improvements.
- Undertake trials for any other interested DSOs.
- Let NEAT continue to run over the summer which may provide more information for ANM.



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Q&A

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