Extracting actionable information from asset data

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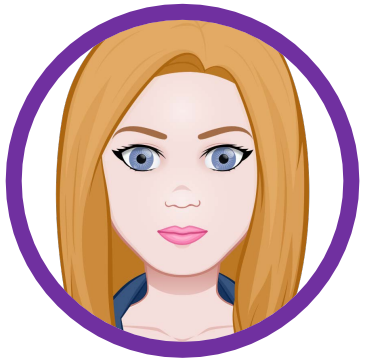
A brief introduction



Olivia Carpenter is a chartered power engineer who specialises in **power network and energy system innovation.**

I am a Senior Technical Consultant for Ricardo, and a member and volunteer for the Institution and Engineering and Technology

Ricardo is a global strategic engineering and environmental consultancy.

In the energy sector, we provide **innovative, practical and deliverable solutions** for energy network companies, innovators and developers.

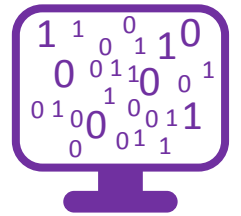
The IET is **one of the world's largest engineering institutions** with over 168,000 members in 150 countries.

The IET is working to engineer a better world by inspiring, informing and influencing our members, and wider society.

Unlocking the value of data

Data is a key enabler for a smarter, digitalised energy system, which is more connected, efficient, adaptable and robust

But data by itself does not provide the insight without significant work. Its just numbers on a screen!

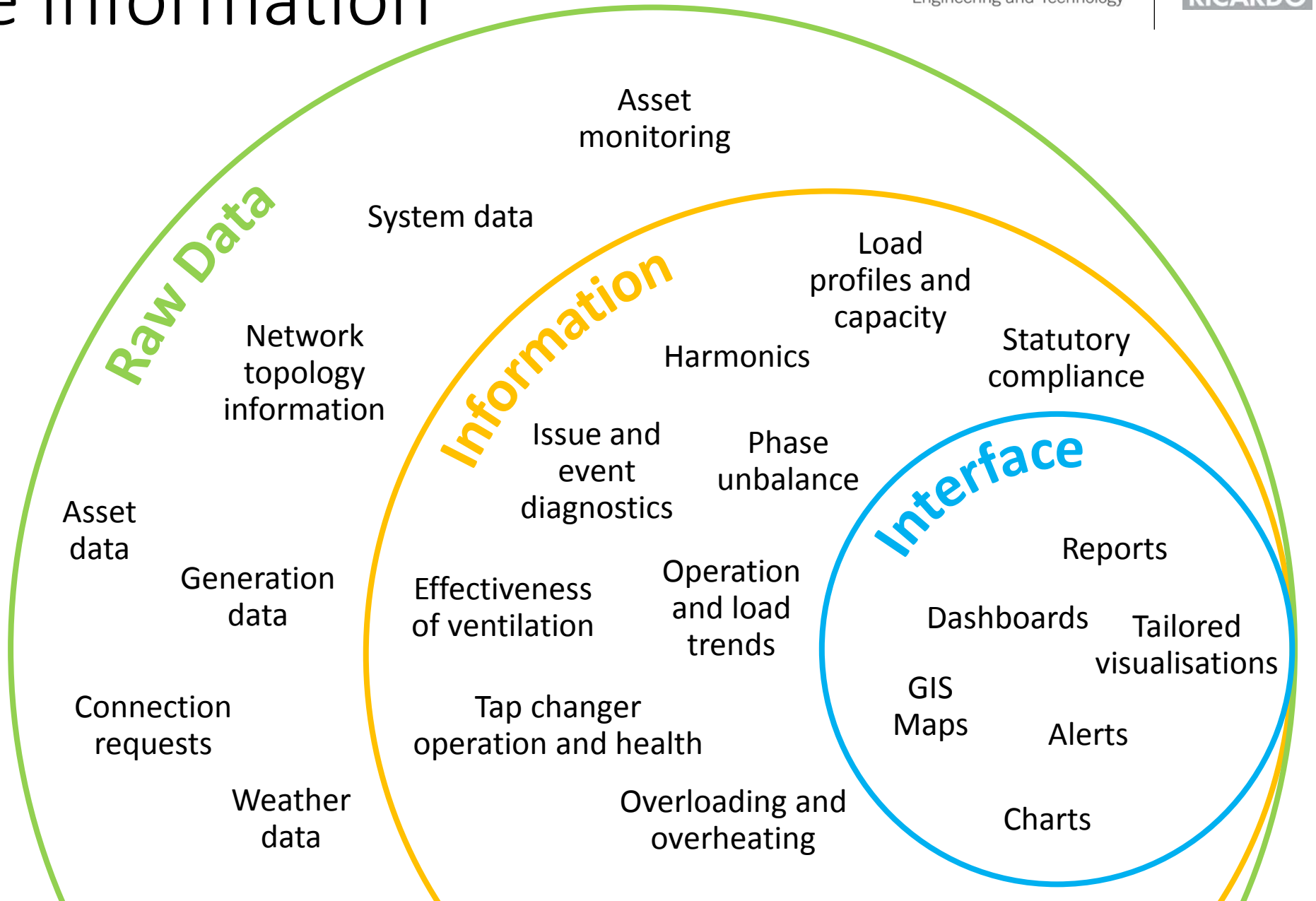


To gain the full value from data, it must be turned into **actionable information** that allows fast, informed decisions and actions

Actionable Information

Three key considerations:

- What data is available?
- What information is needed
- What is the most appropriate interface



Example Project

Distribution Network Visibility – UK Power Networks

Project Introduction

9,500 London distribution substations have monitoring installed, but this was not being used to its full potential.

This project investigated how best value can be gained from the data, by:

- Developing a number of visualisation tools
- Demonstrate the business benefits to Planning, asset management and operation

Project partners included UK Power Networks, Ricardo and Capula.

Outputs

Visualisations demonstrated include:

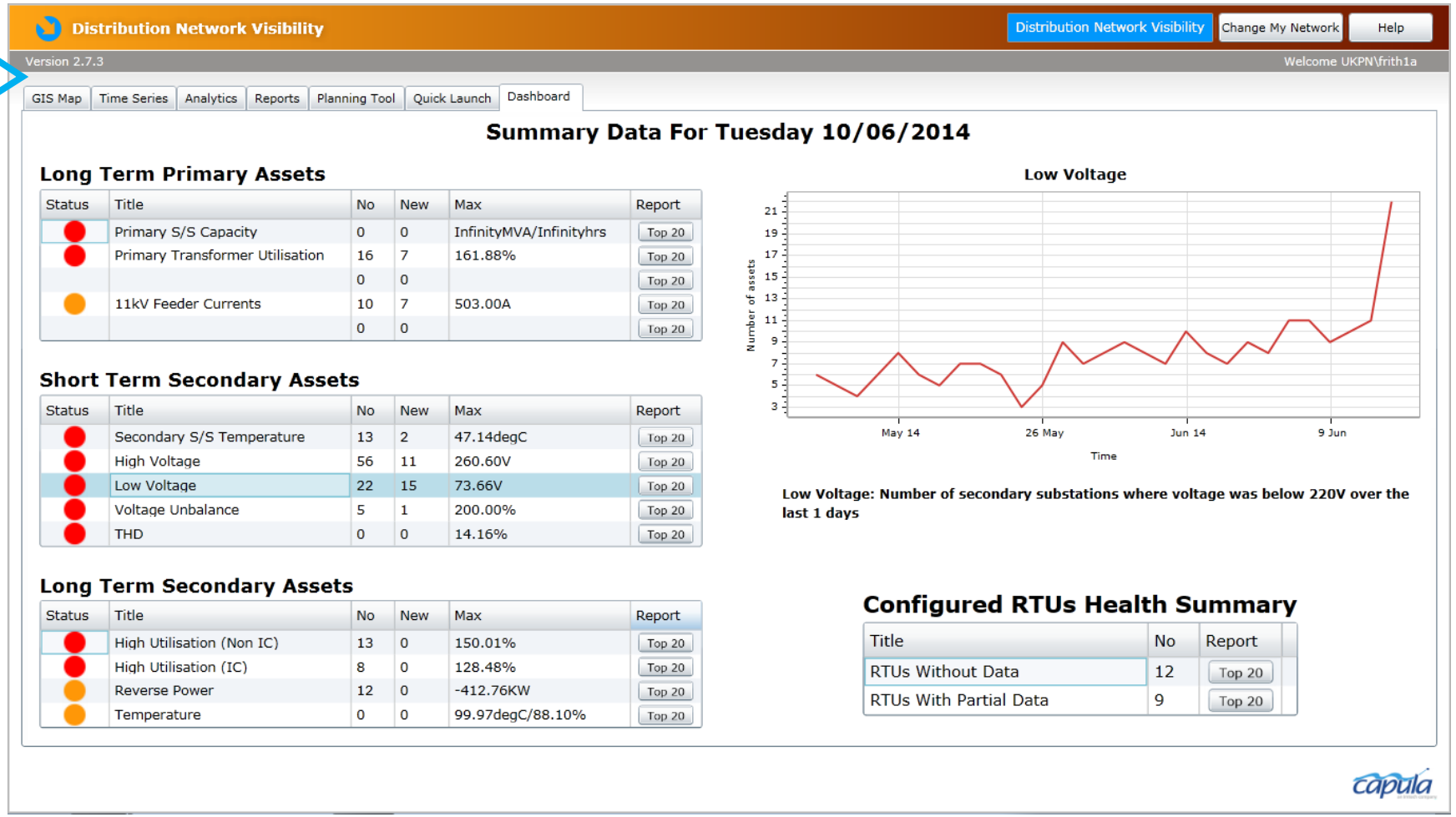
- Dashboard
- Primary Substation Tap Change Report
- Secondary Substation High Voltage clustering
- Load and Utilisation on GIS Map and reports
- Secondary substation ventilation report
- Transformer utilisation reports (new connections)
- Spare capacity report
- Load growth (1 and 5 year)
- Load profiles (planning)

Final report is available from the UK Power Networks website.

Example Project

Distribution Network Visibility – UK Power Networks

Example Visualisation: Dashboard



Example Project

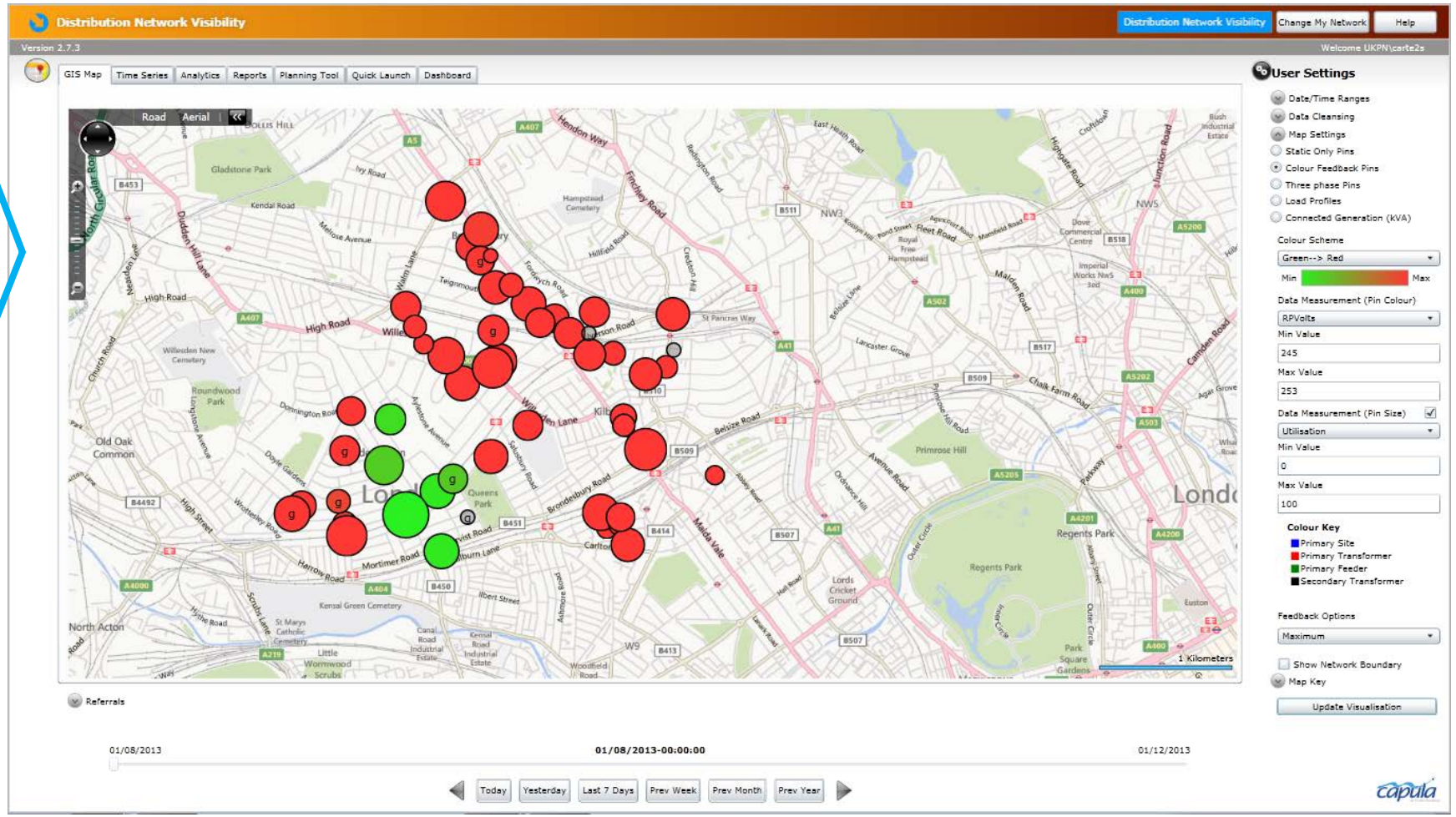
Distribution Network Visibility – UK Power Networks

Example Visualisation: Voltage and Utilisation

Here, each circle is a substation. The colour indicates voltage, and the size indicates utilisation.

It can be clearly seen that voltage issue is geographically grouped.

Simple investigation showed that they were fed by the same Primary, and that there was an issue with a tap changer.



Example Project

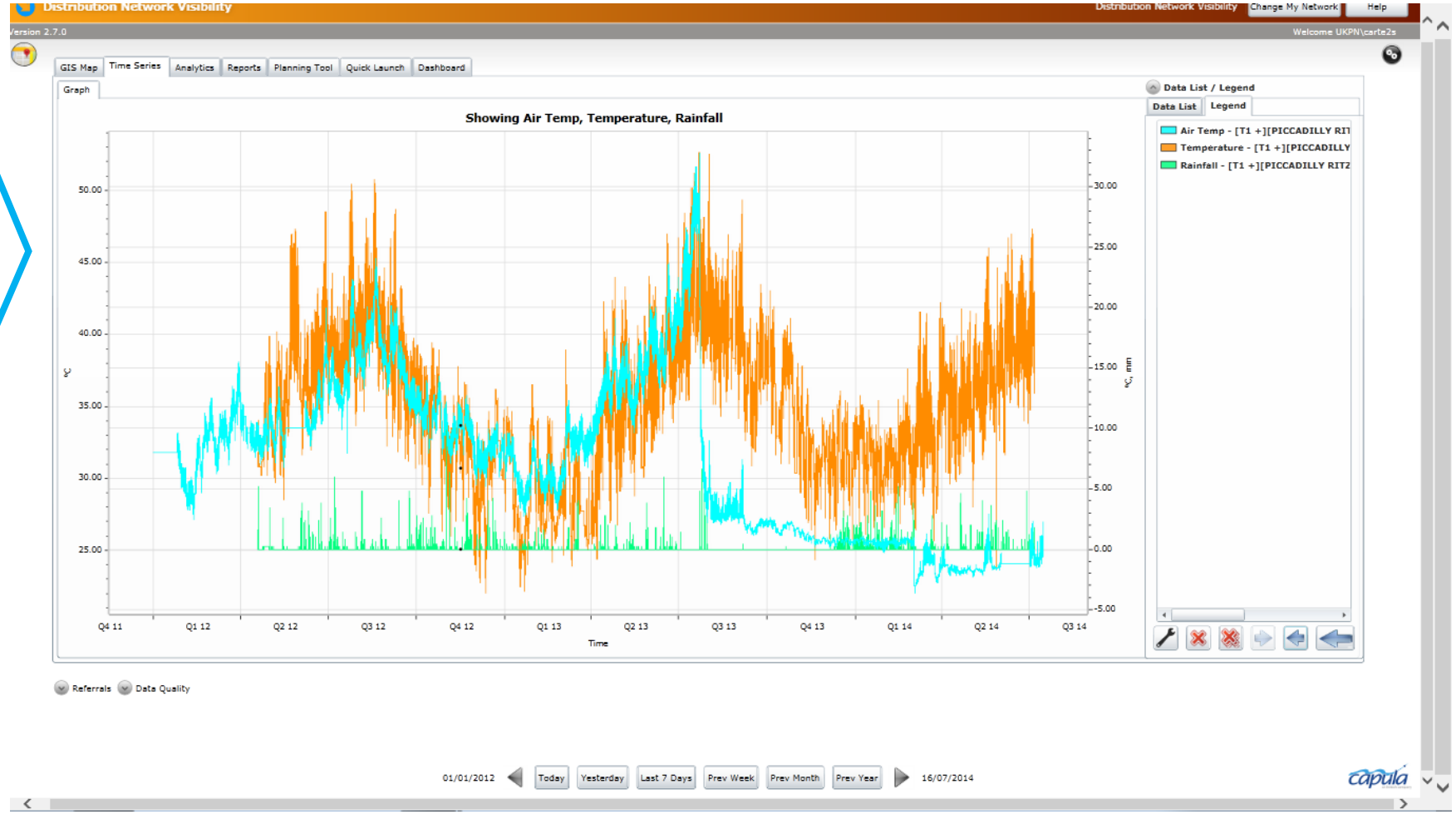
Distribution Network Visibility – UK Power Networks

Example Visualisation: Substation Ventilation

- Blue – ambient temperature
- Orange – substation temperature
- Green – precipitation

Note that the substation temperature stays high even when ambient drops.

A visit to the substation discovered that the substation ventilation had been blocked, and the transformer had been covered.



Example Project

Celsius – Electricity North West

Project Introduction

Aiming to maximise distribution substation capacity through more informed asset thermal ratings, and retrofit cooling technologies.

Includes monitoring 520 substations, including:

- KeLVN monitoring equipment that is low cost, easy to install, with a 3 year battery life
- Installation application to provide a simple and replicable installation procedure
- Data management and visualisation system

The solution was provided by a partnership between Ricardo and Ash Wireless.

Outputs

This project is ongoing. Outputs so far:

- Successfully developed monitoring solution and data dashboards, mainly focusing on data validation and processing.
- Developed methodology to estimate transformer operating temperature from surface and ambient temperatures

Work currently underway:

- Further analysis into more informed ratings
- Installing retrofit cooling technologies

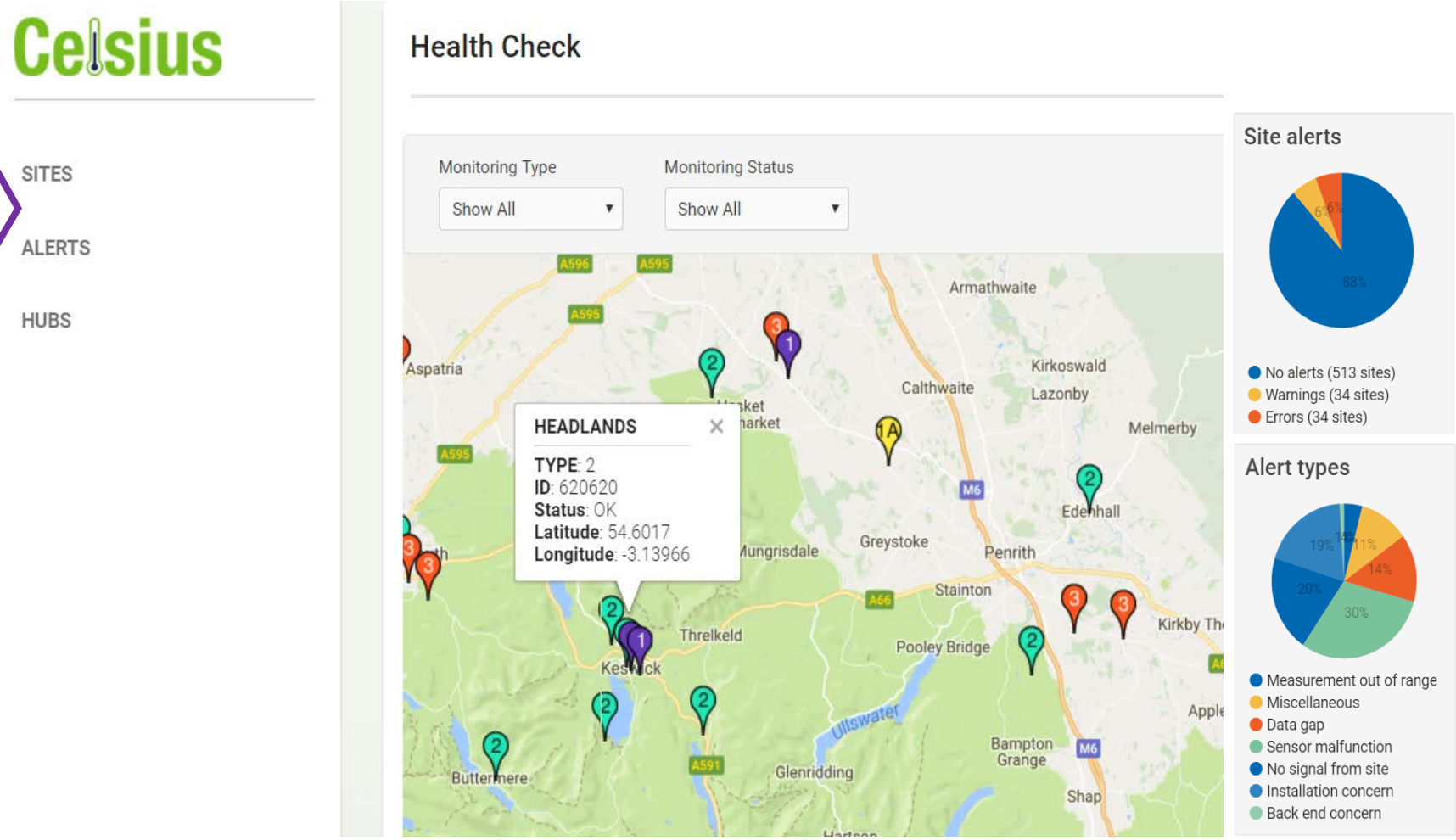
Publications are available on the Electricity North West website.

Example Project

Celsius – Electricity North West

Example Visualisation: System Health Dashboard

- Map showing trial sites, and can also show site status and monitoring configuration
- Summary of alerts raised – a mixture of alerts generated manually, and those generated by the automated data validation.



Example Project

Celsius – Electricity North West

Example Visualisation: Communications Report

- Visualisation of data completeness for each site, and each sensor.

Celsius

SITES

ALERTS

HUBS

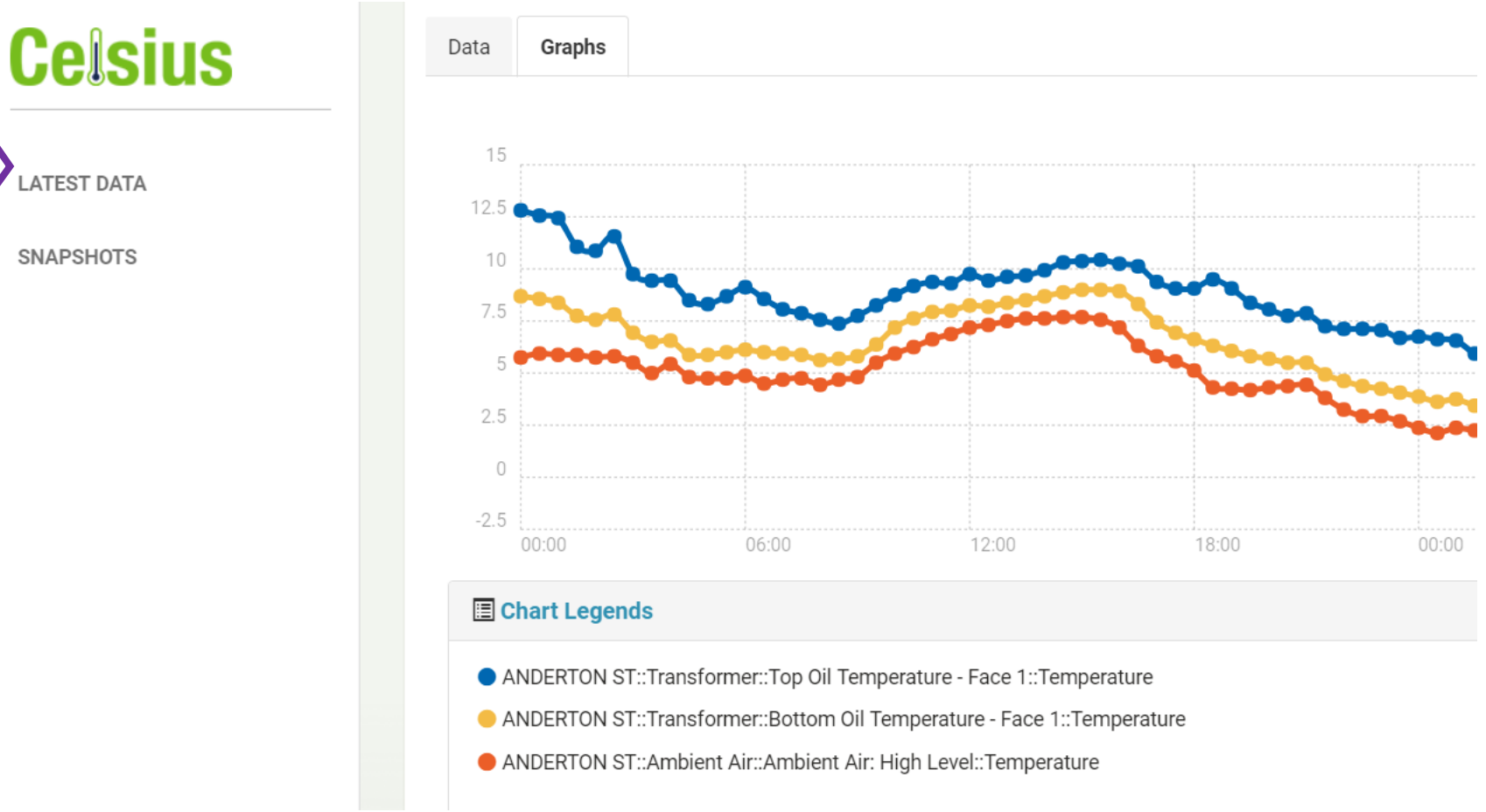
Site	Code	Type	Status	Hubs	Sensor Positions	Measurements
ALBRIGHTON EST	415402	2	OK	C3E4B5B7319		85 % coverage
ALBRIGHTON RD	415599	2	OK	2045AC6E8B60		100 % coverage
ALDER AVE	212304	2	OK	10172469DA63		100 % coverage
ALEXANDRA RD S	171051	2	OK	2218AF88E894		98 % coverage
ALLITHWAITE	618166	1	OK	1E0882561604		100 % coverage
ALTRINCHAM FOOTBALL	171011	2	OK	14165694CE3F		100 % coverage

Example Project

Celsius – Electricity North West

Example Visualisation: Data dashboard

- 130 million data measurements taken so far
- The dashboard allows selection of data from any site and any time, produces graphs, and enables data download.



Lessons and conclusions

There are key blockers to implementing data and actionable information solutions:

Issues with quality of input data are common, including asset records and system topology information as well as sensor readings

Individual buy-in can be challenging when trying to alter established processes

Technical difficulties with communications and data access can be complex, resulting in incomplete data

However, it is possible to over come these blockers.

By implementing data and actionable information solutions, it is possible to gain significant benefit to all aspects of operating power systems, including providing valuable and accessible insight to support operation, planning, and maintenance.

Thank you for listening

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