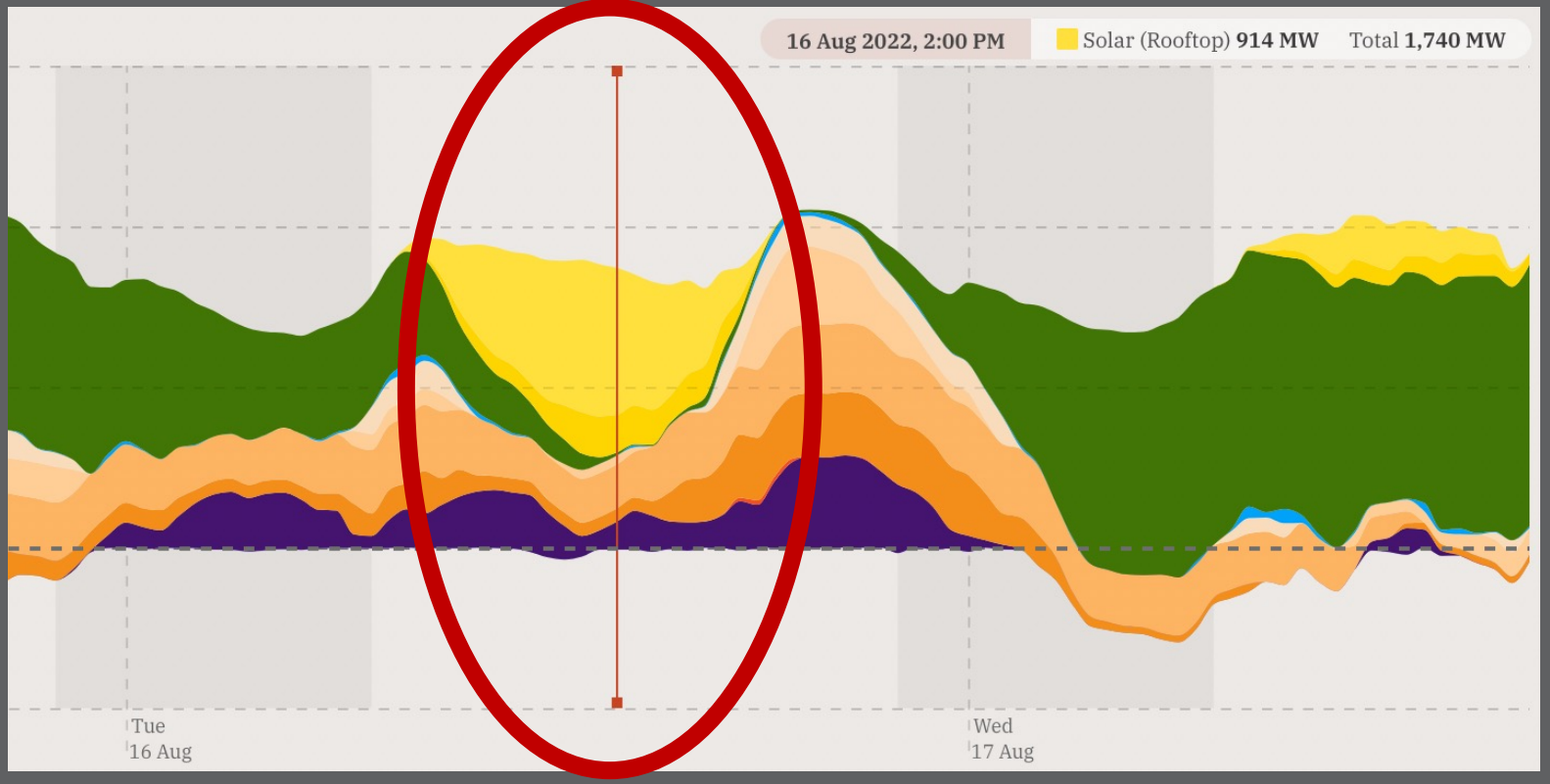
PQSynergy™ 2022

Future Grid

Managing Power Quality with AMI in high penetration DER distribution networks

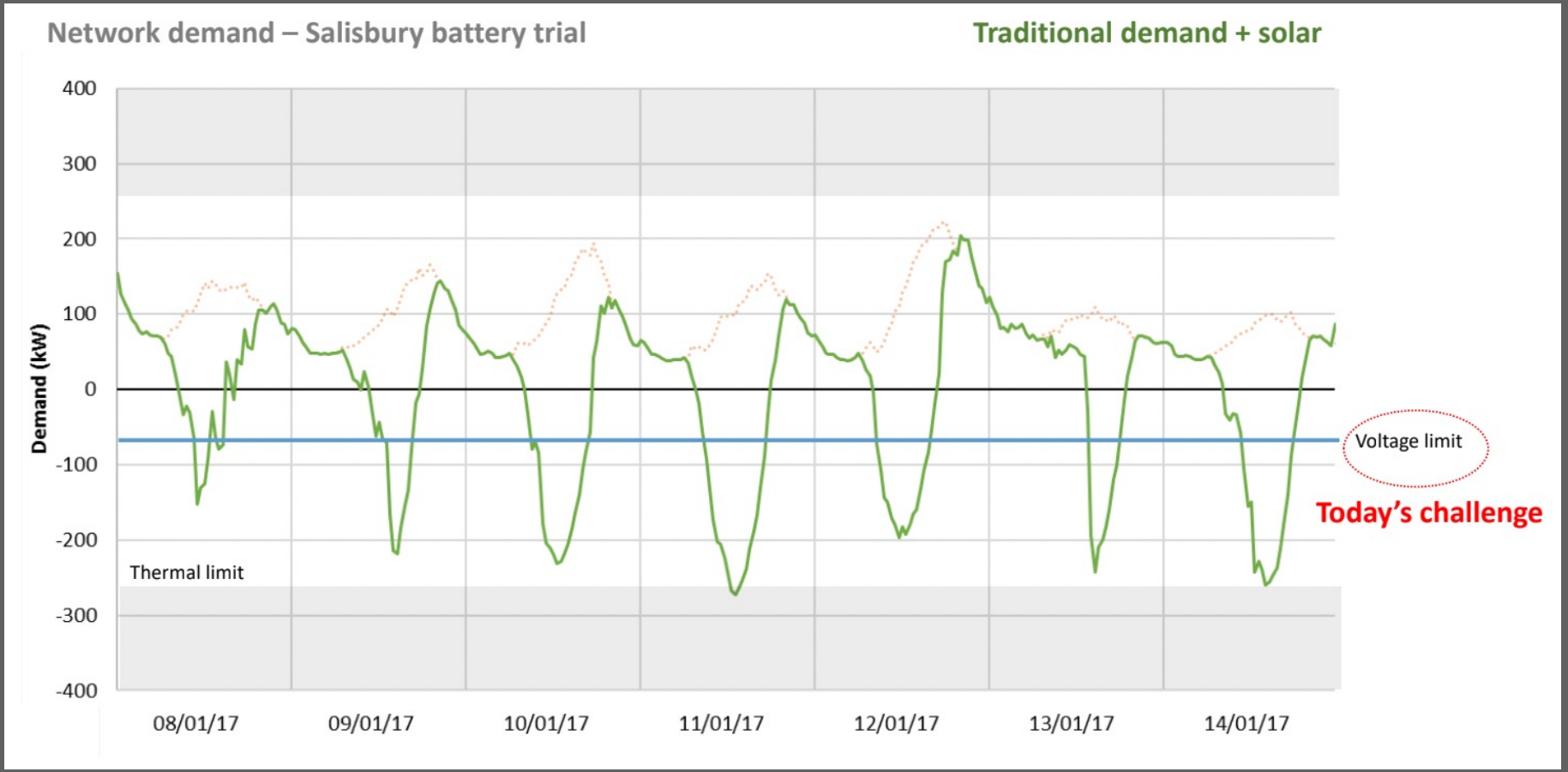
Chris J Law
CEO, Future Grid
Australia

A high penetration DER network

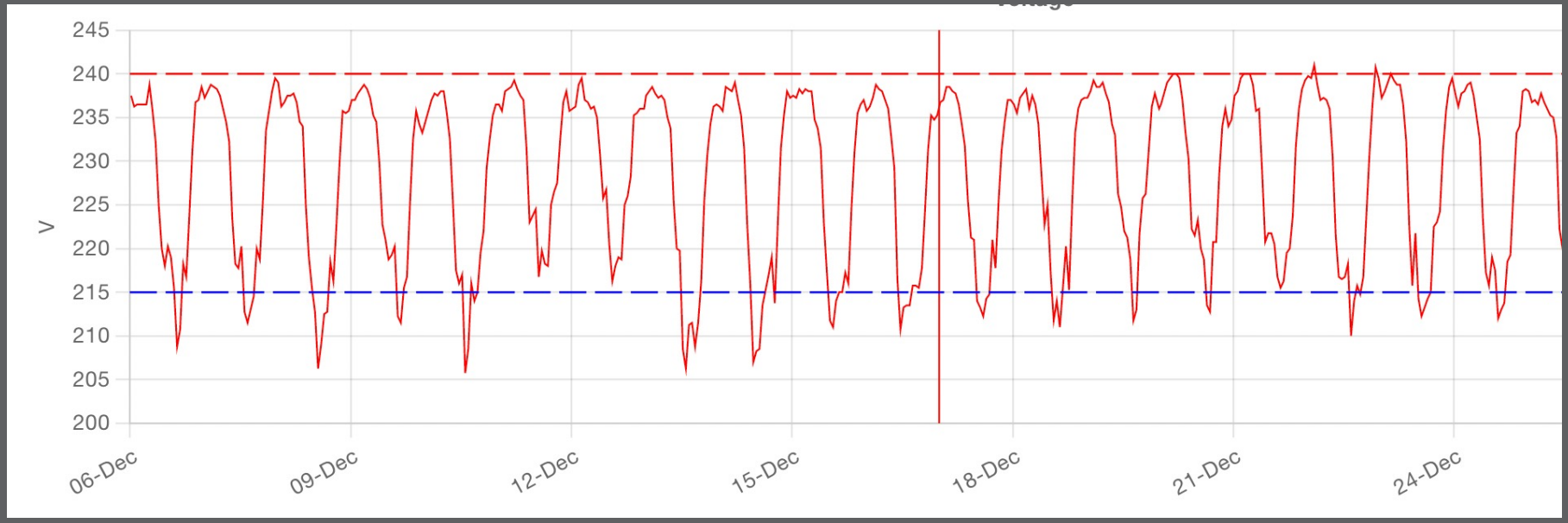


Sources	1,753
Solar (Rooftop)	914
Solar (Utility)	234
Wind	18.5
Battery (Discharging)	0.3

Now to need to manage generation and demand!

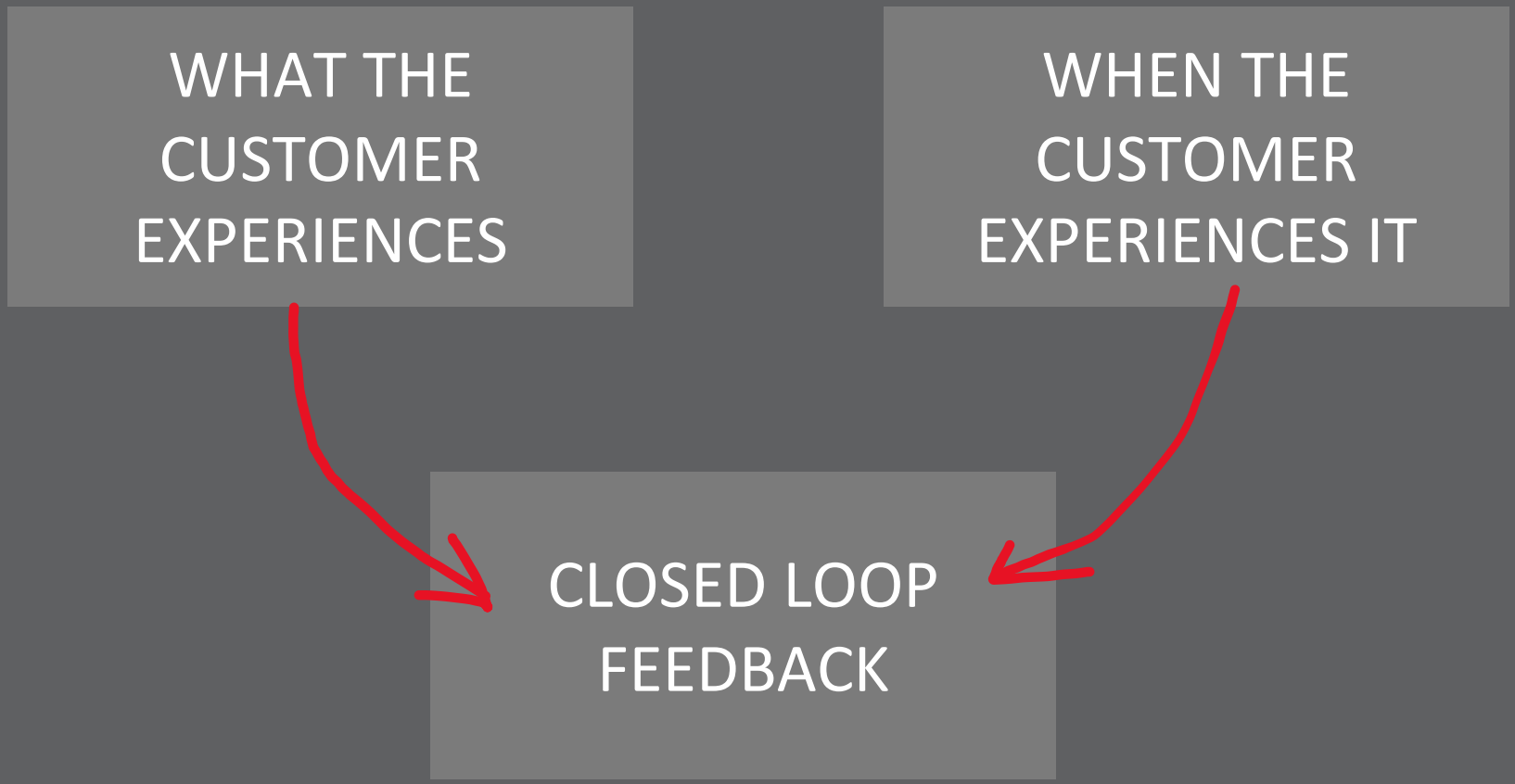


… with increasing Voltage rise and voltage spread during the day



Smart Meters (AMI) to the rescue!

Why Smart Meters?



The most important thing for using AMI for PQ management is ensuring you setup the Smart Meter with the right data to deliver the most value and here it is!

PQ Data (preferred)
Time of sample (hh:mm:ss)
Meter Id
Element / Phase
Voltage (volt)
Active Power (watt)
Reactive Power (var)

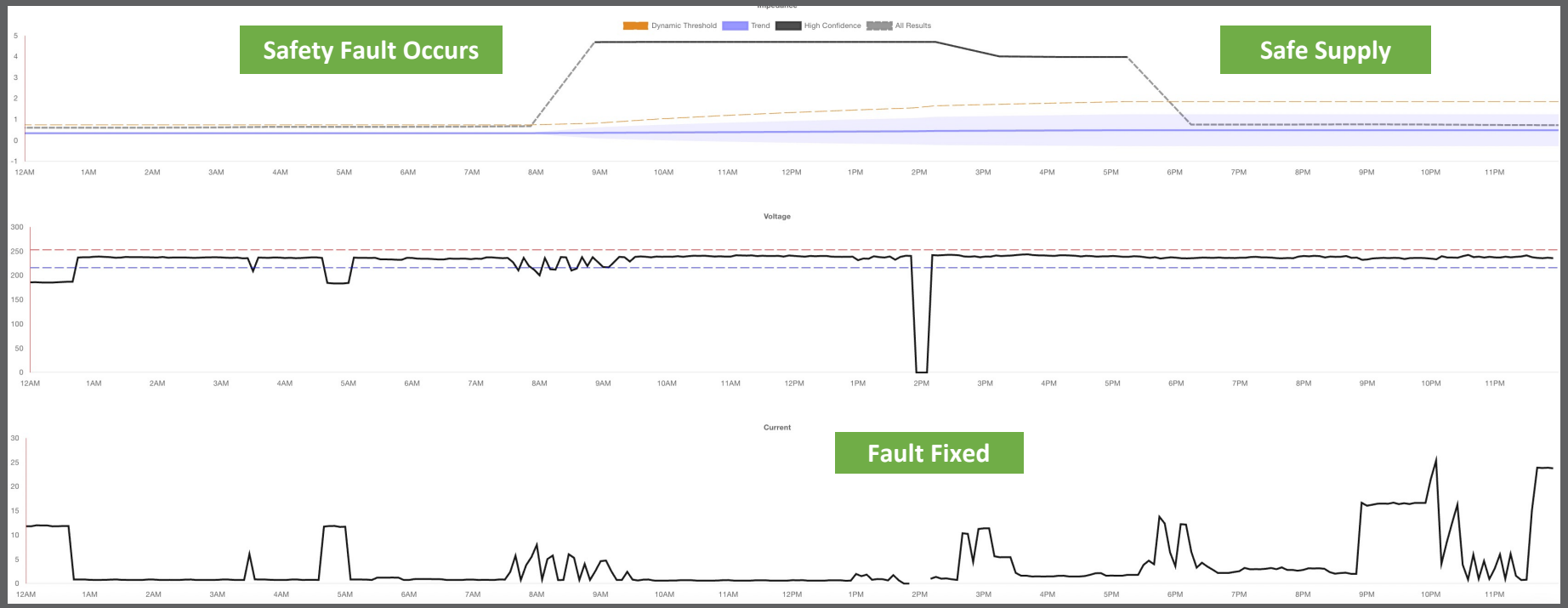
OR

PQ Data (alternate)
Time of sample (hh:mm:ss)
Meter Id
Element / Phase
Voltage (volt)
Current (amps)
Phase Angle (4 quadrant)

Key things to note:

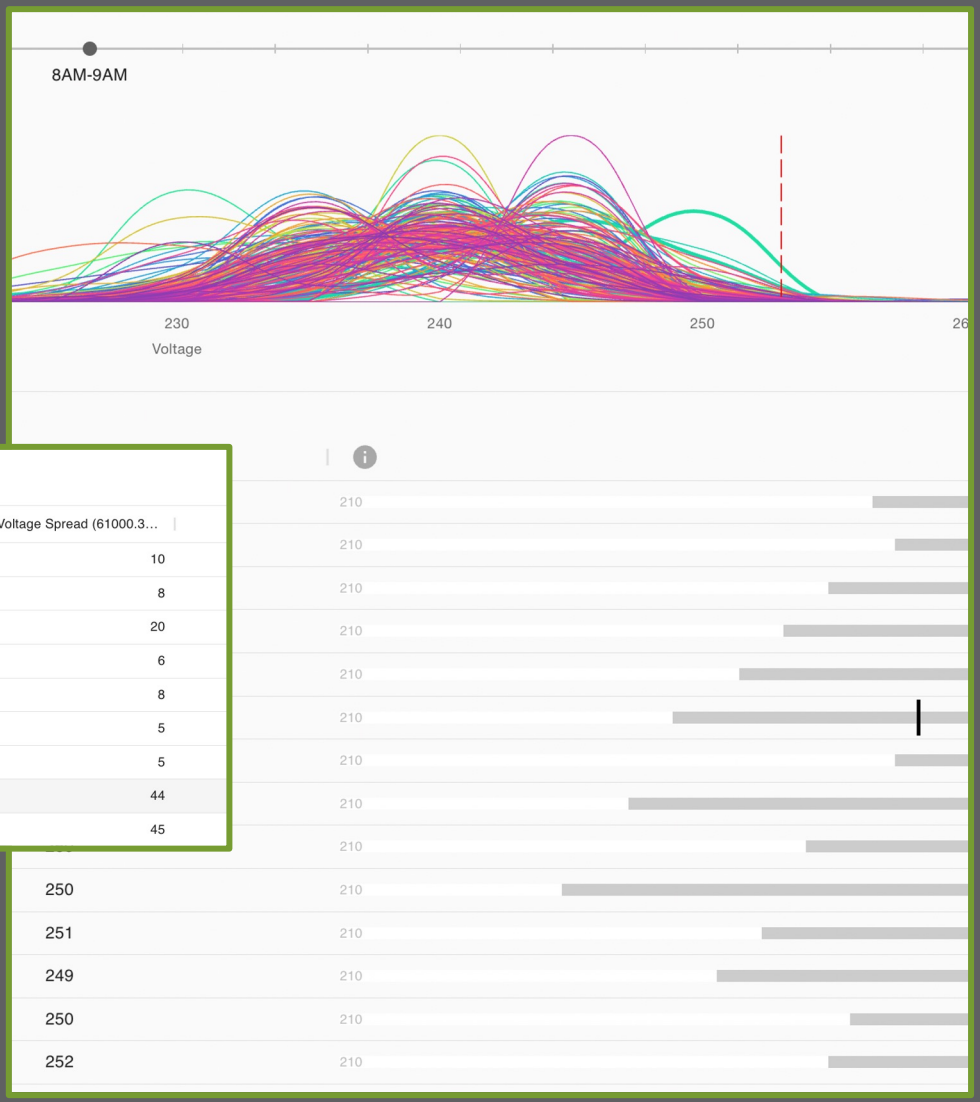
1. Instantaneous sampling forms the **power triangle**
2. Average readings (e.g. kWh, kVARh) work for a few use cases, but instantaneous readings work for all use cases

With the right PQ data you can build network impedance views e.g. Loop Impedance for customer safety and fault detection in the LV



Voltage Compliance Management

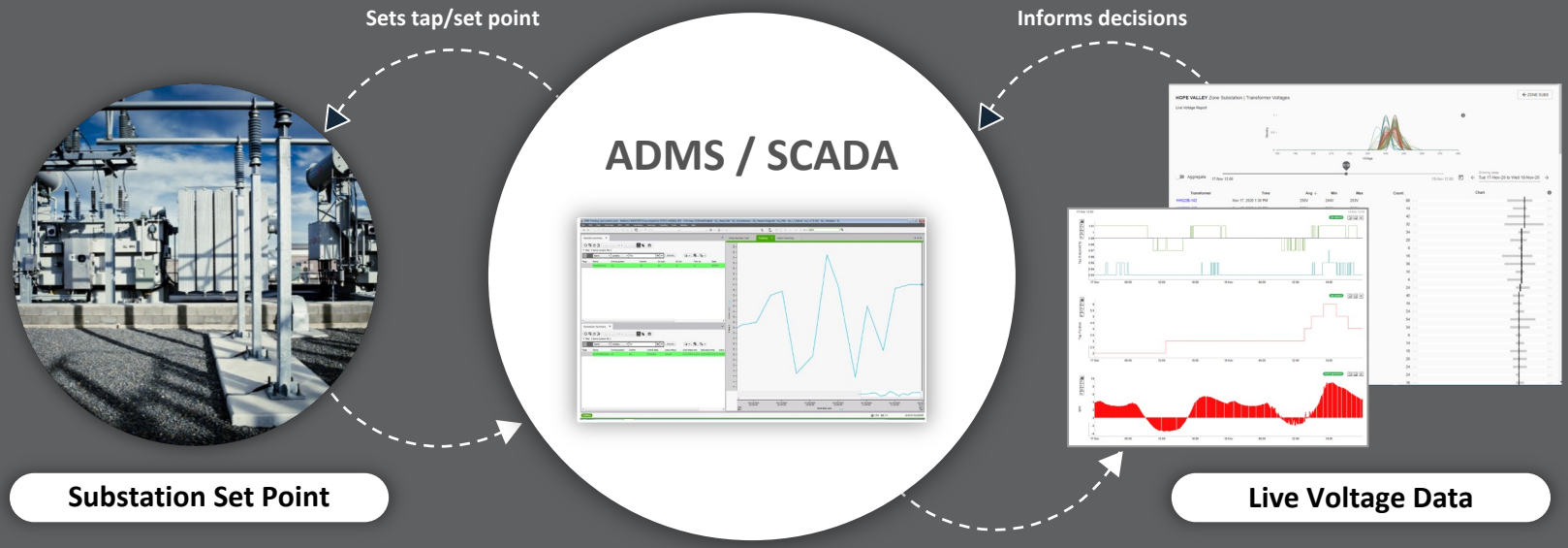
- Investigate voltage spread & compliance in real-time by asset
- View at the Zone Substation level and drill down into Network
- Top 20 by Asset Type and Region based on customer impact



Top 20

Zone Sub	Issues	High Voltage (61000.3.1…	Low Voltage (61000.3.100)	Voltage Spread (61000.3…
MUD Mudgee 132	1,536	1,508	18	10
DBW Dubbo West	1,194	1,175	11	8
MWN Murwillumbah	1,114	1,021	73	20
DBS Dubbo South	1,085	1,073	6	6
AVE Alstonville	1,080	1,062	10	8
GFH Griffith	996	983	8	5
SWR South West Rocks	928	911	12	5
YAM Yamba	928	840	44	44
PKT Parkes Town	866	638	183	45

Example : Dynamic Substation Voltage Control to manage voltage spread during the day due to Rooftop Solar



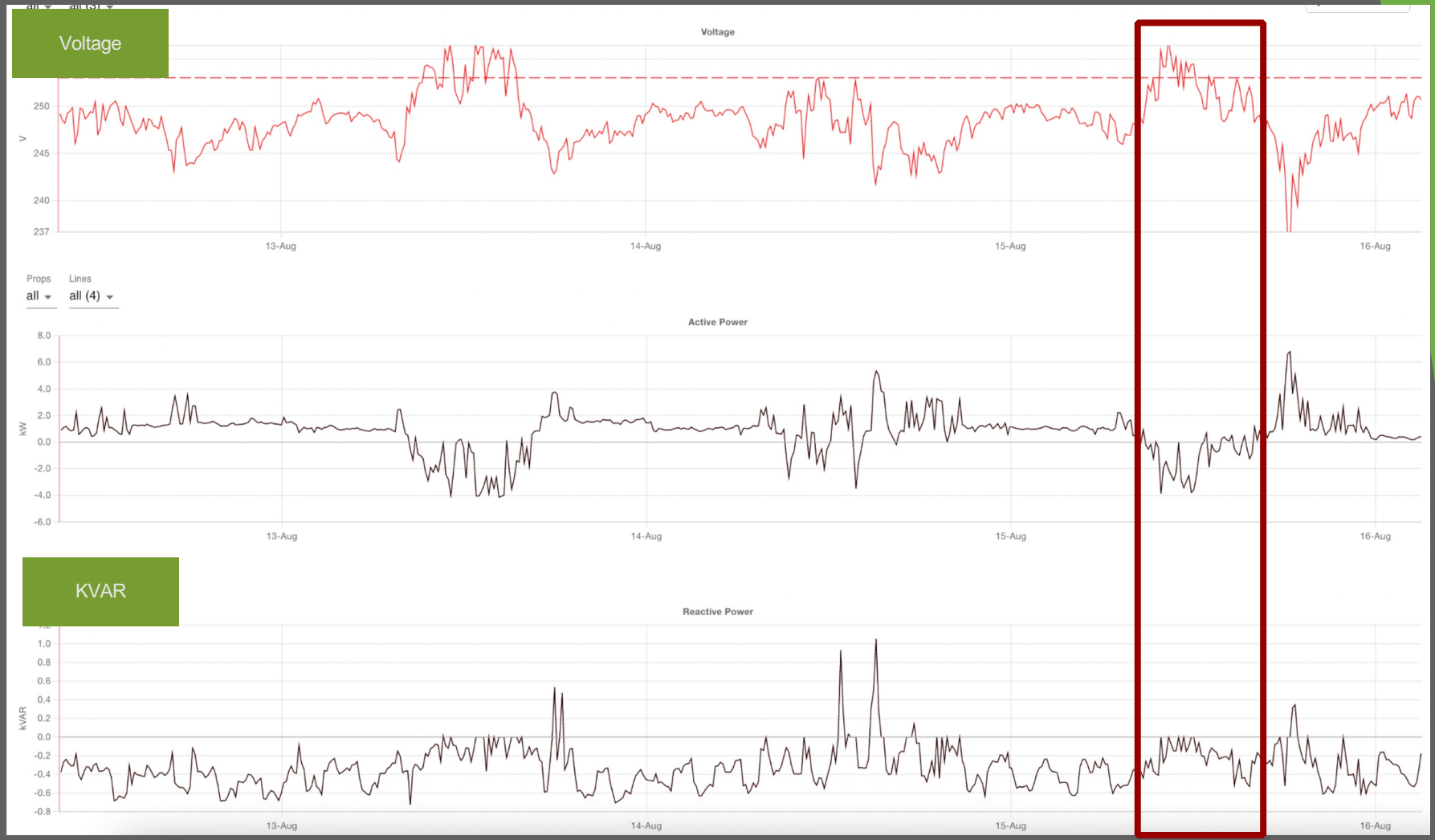
GE
Schneider Electric
ABB

Compass

DER Compliance - over 50% of DER installations are non-compliant. Knowing what is installed improves planning decisions

- Unregistered DER Detected
- Export Limit Exceeded
- Inverter Did Not Trp
- Volt/Var Not Enabled
- Inverter Size Compliance

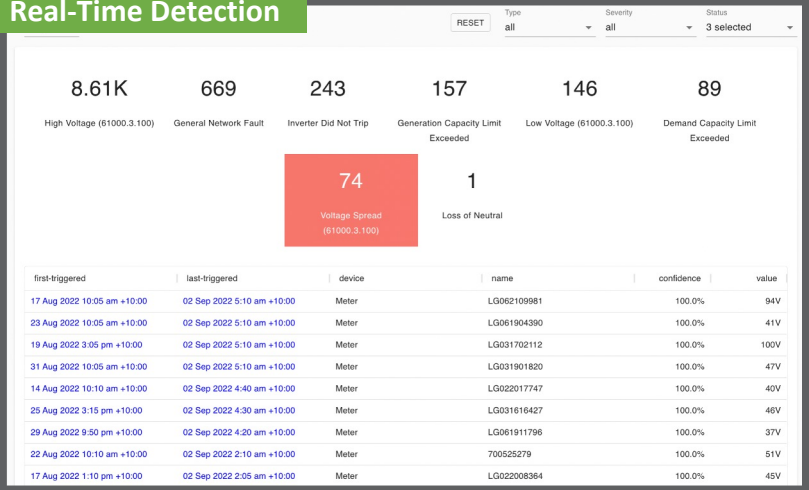
Example : Non-compliant Inverter Volt/Var Settings



Example : Review Voltage Spread caused by DER in 3 steps

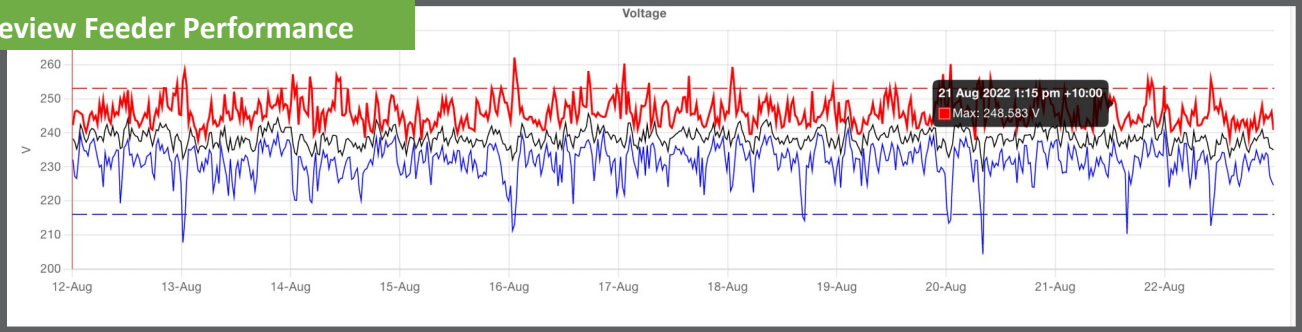
Future Grid

Real-Time Detection



Review Meter Performance

Review Feeder Performance



The min max being pretty consistent likely a phase to phase spread issue

This is borderline > 20v separation would be bad

Contact Info

+61 427 434 463

chris@future-grid.com

www.future-grid.com

Future Grid®