

UK
Power
Networks
Delivering your electricity



Project Constellation

Creating the UK's First Smart Substation!



cigre

For power system expertise



About UK Power Networks

We distribute electricity across our Eastern, South-Eastern and London networks and we deliver the electricity to homes & businesses safely and reliably.



8.3m

Homes and Businesses – 29% of GB's population

13 GW

Peak demand – 28% of GB's electrical demand

9.5 GW

Distributed generation on our network

Situation and Complication

Keeping generation connected in a Net Zero future

We would like to achieve:

Increased reliance on DSO services, such as Flexibility

Increased penetration of low carbon generation and load

Innovation roll out throughout the network

But what about:

Unnecessary disconnection of DERs

Availability of network capacity

Scalability of hardware installations

Constellation Overview

The aim is set

Release capacity for more low carbon generation

Increase resilience of operation

Enable scalable deployment of smart functionality

We will achieve this by

Enhancing our substations by making them digital, interoperable, future-proof and enabling secure communication between them

FUNDING
NIC
ROUTE

South
SPN
East

PROJECT
£17.8m
BUDGET

GB'50
£1.1b
BENEFITS

T OF CO2
1.9m
REDUCED



Constellation Solutions

Constellation Partners



GE VERNOVA

SIEMENS



UNIVERSITY of STRATHCLYDE

PNDC

Constellation Solutions

Digital Substation

Following successful de-risking, Constellation will be trialed in seven UK Power Networks sites, 2 Grids and 5 Distributed Energy Resources



Local Active Network Management

Optimise network operation and DER output when communication links to Central ANM are unavailable



GE VERNOVA

Wide Area Protection

Dynamic management of Loss of Mains (LoM) protection settings leveraging local intelligence obtained through site-to-site communication



Adaptive Protection

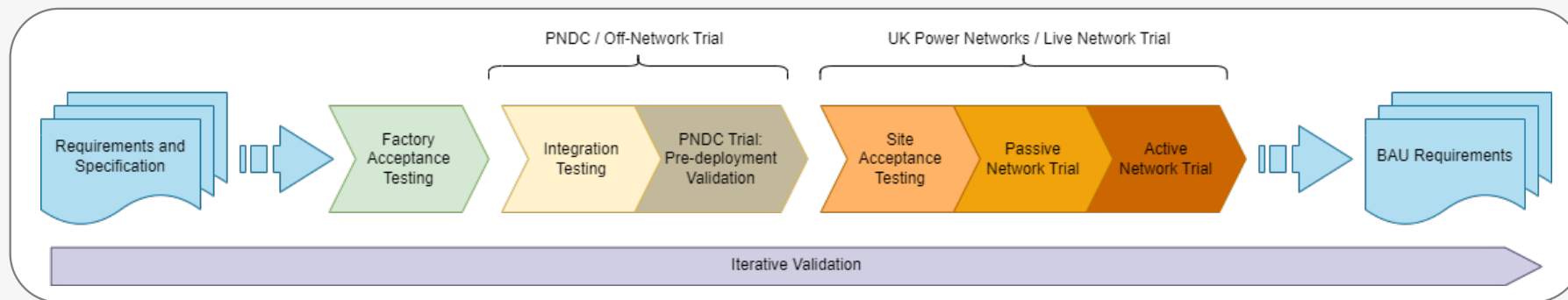
Increase network capacity through the application of adaptive protection that appropriately respond to dynamic changes in the network

SIEMENS

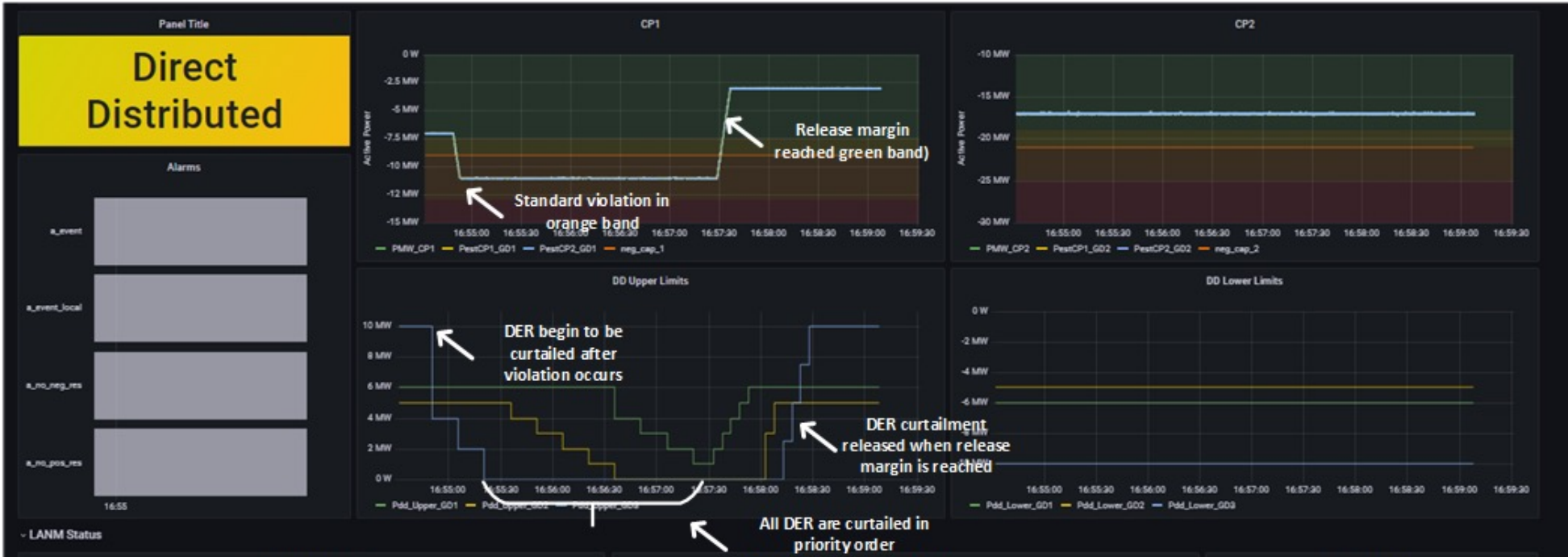


Constellation Trial Progress

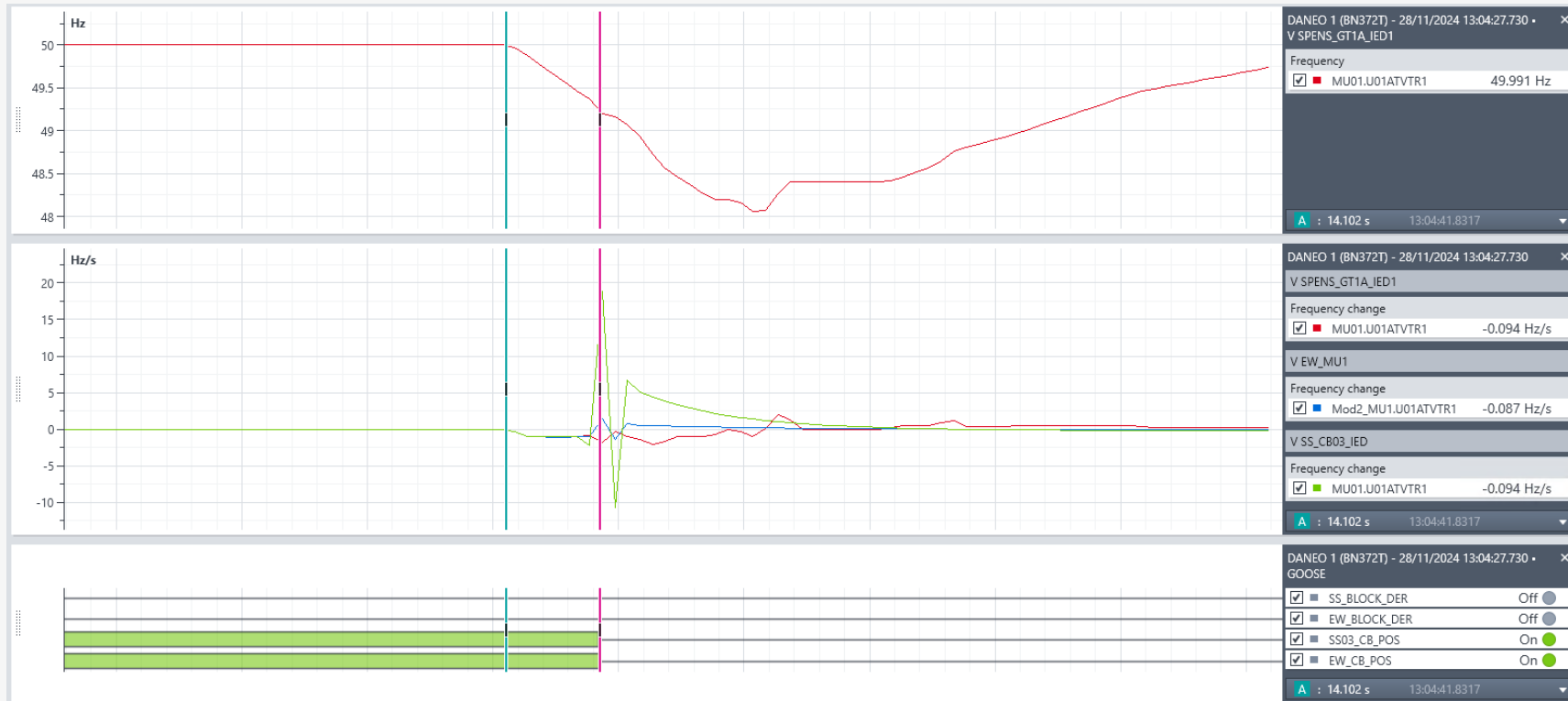
- ❖ Successful Factory Acceptance Testing for all solutions
- ❖ Successful Lab Integration Testing of all solutions
- ❖ Concluded PNDC testing in the first trial area and second area nearing completion; tests include:
 - Agile iterative testing with project partners
 - Communication testing and 5G validation
 - Virtualisation and cyber security evaluation
 - Evaluation against base case for each of the solutions



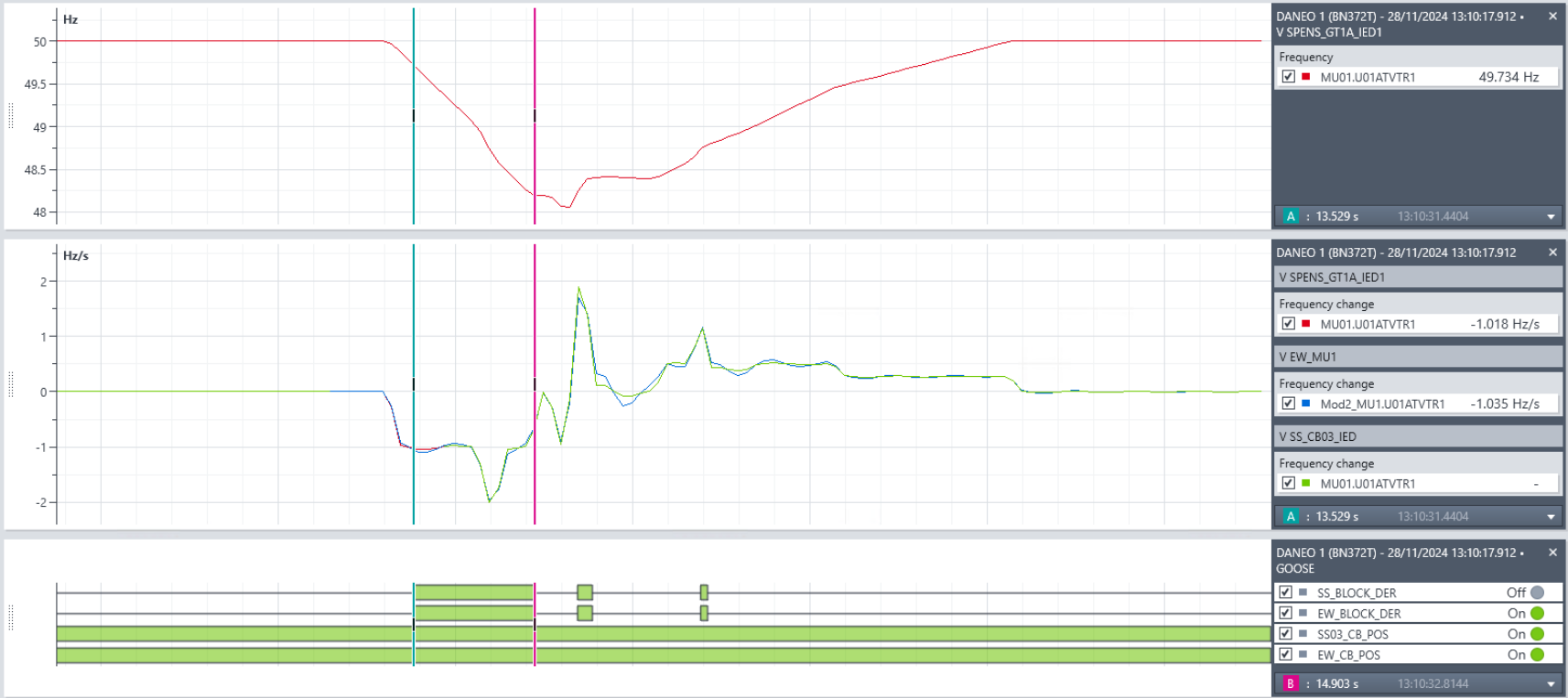
Test Scenario – Local Active Network Management



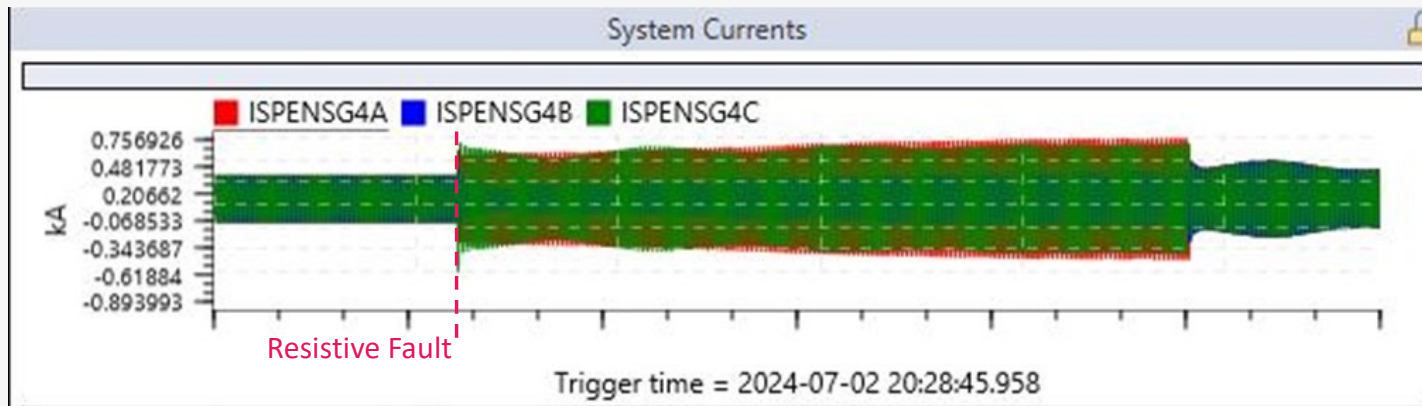
Test Scenario – Without Wide Area Protection



Test Scenario – Wide Area Protection

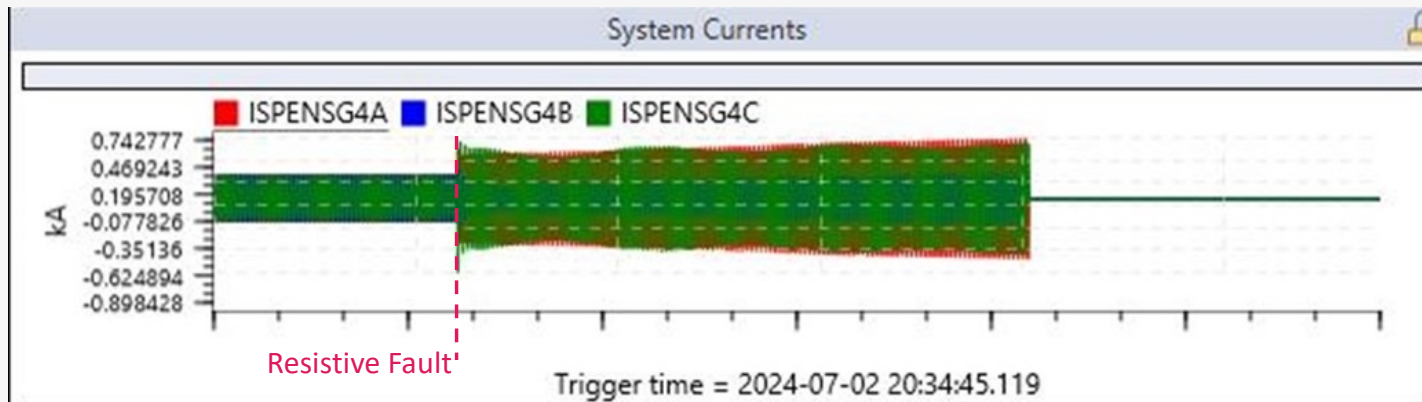


Test Scenario – Adaptive Protection (Directional Overcurrent)

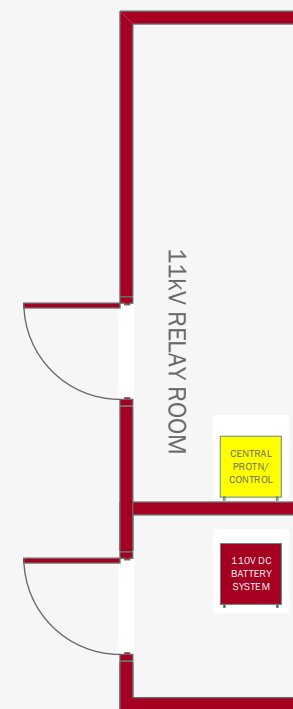
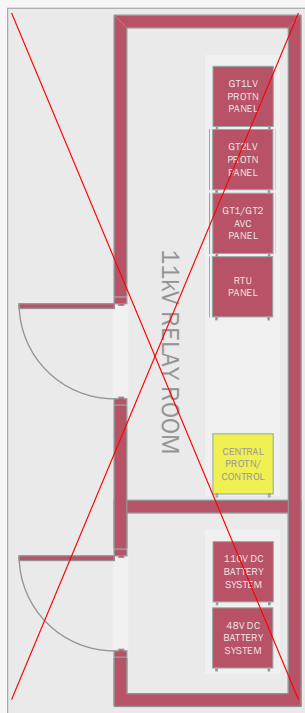


Without
APS

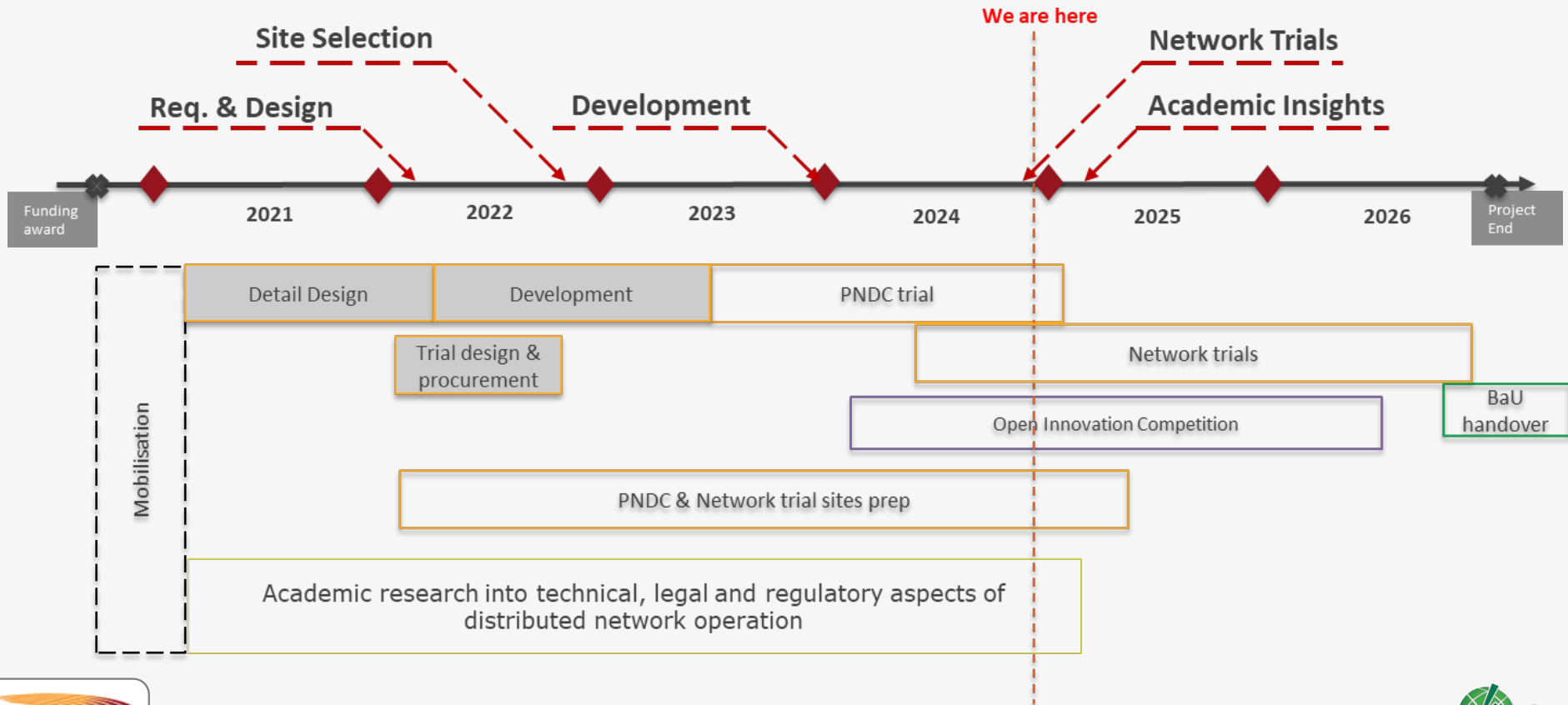
With APS



The Future Substation



Constellation Timeline





More
About
Constellation



Thank You

- Questions -



cigre

For power system expertise

Contact
Me

