SP ENERGY NETWORKS

Smart Grid Applications

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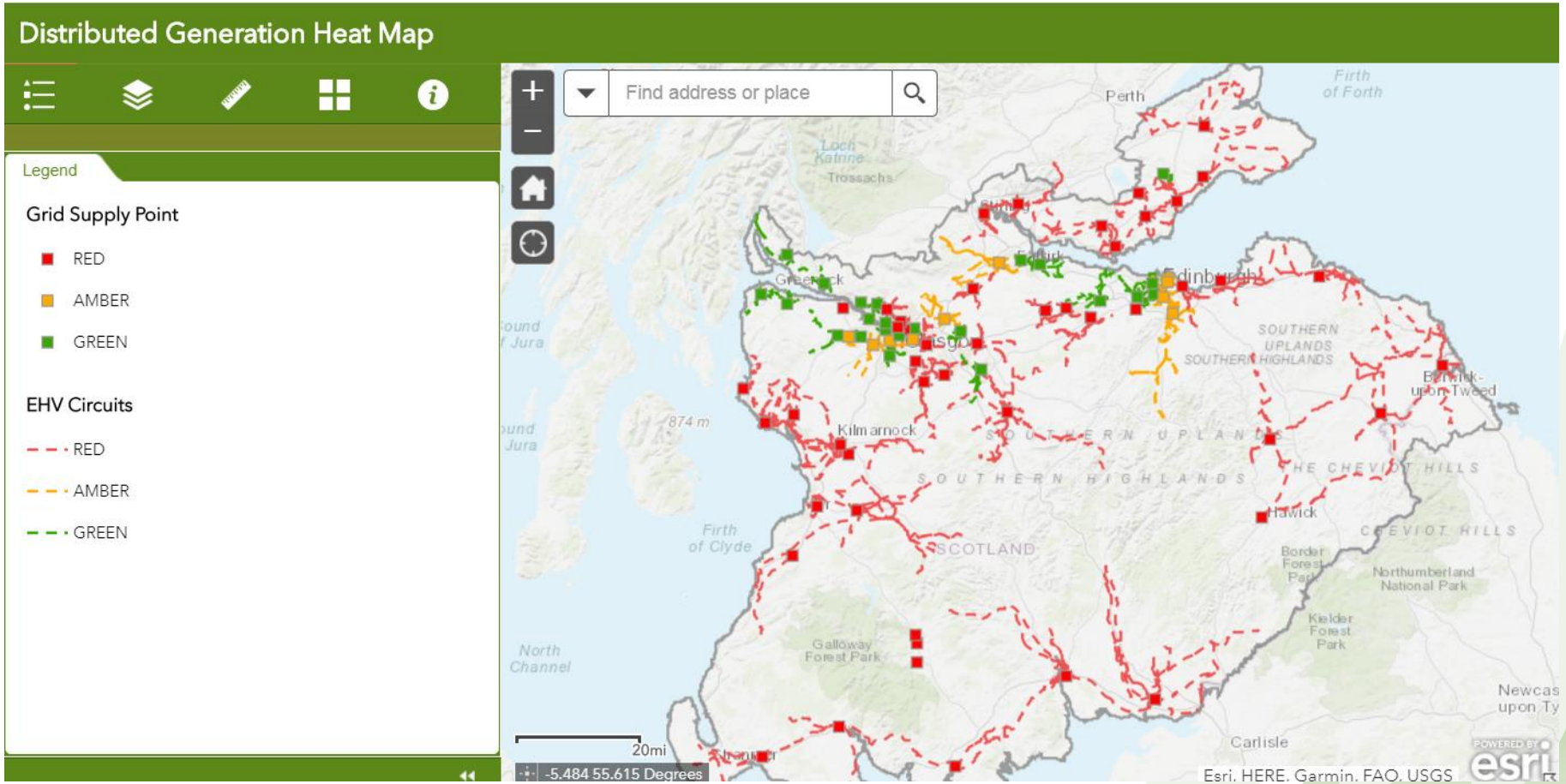
Introduction

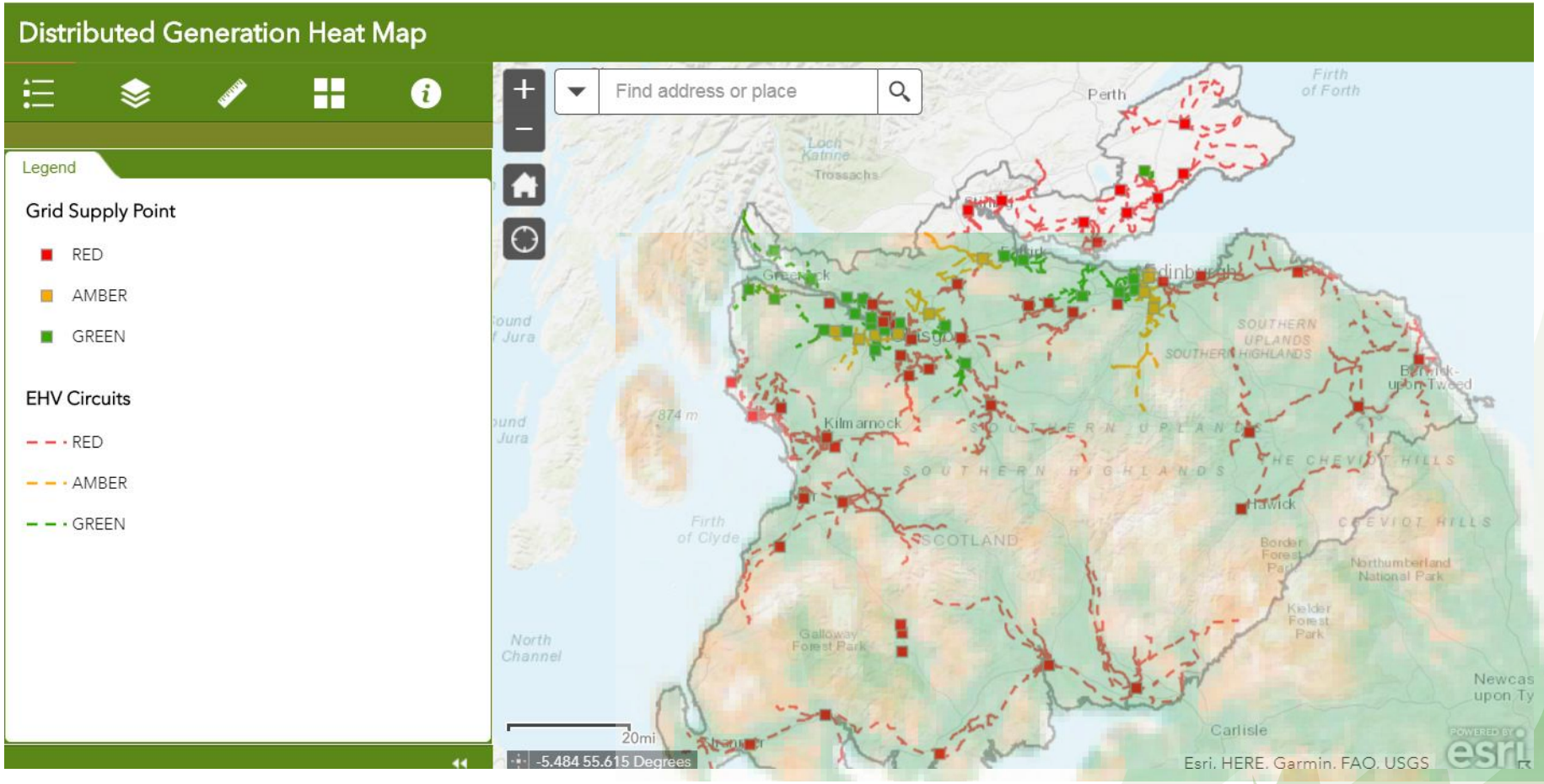
- Advanced Network Management
- Proactive and Predictive Analytics
- New Plant Technologies
- Workforce Enablement and Cyber Security
- Low Voltage

Active Network Management



Heat Map of where capacity limits SPEN connecting de-carbonising generation

Active Network Management

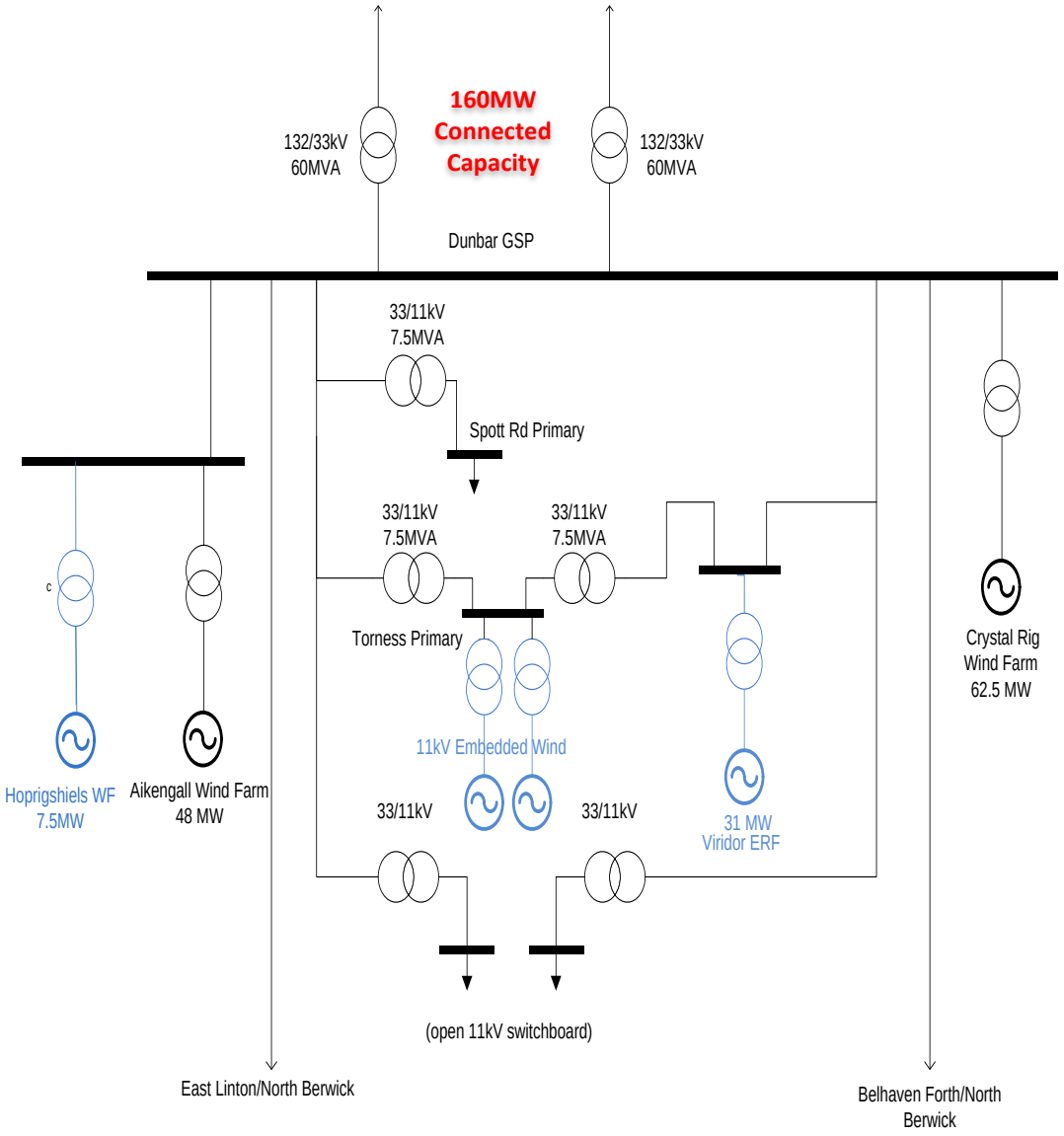


Overlay of Ofcom "Connected Nations" Mobile Network Coverage

Active Network Management

Overlay of Scottish Government Current/ Proposed Windfarm Data- Dumfries and Galloway

Project Objective - Facilitating growth in DER connecting to existing network



Project Scope:
Connect 50MW of generation across 4 new generation sites to manage load flows across GSP

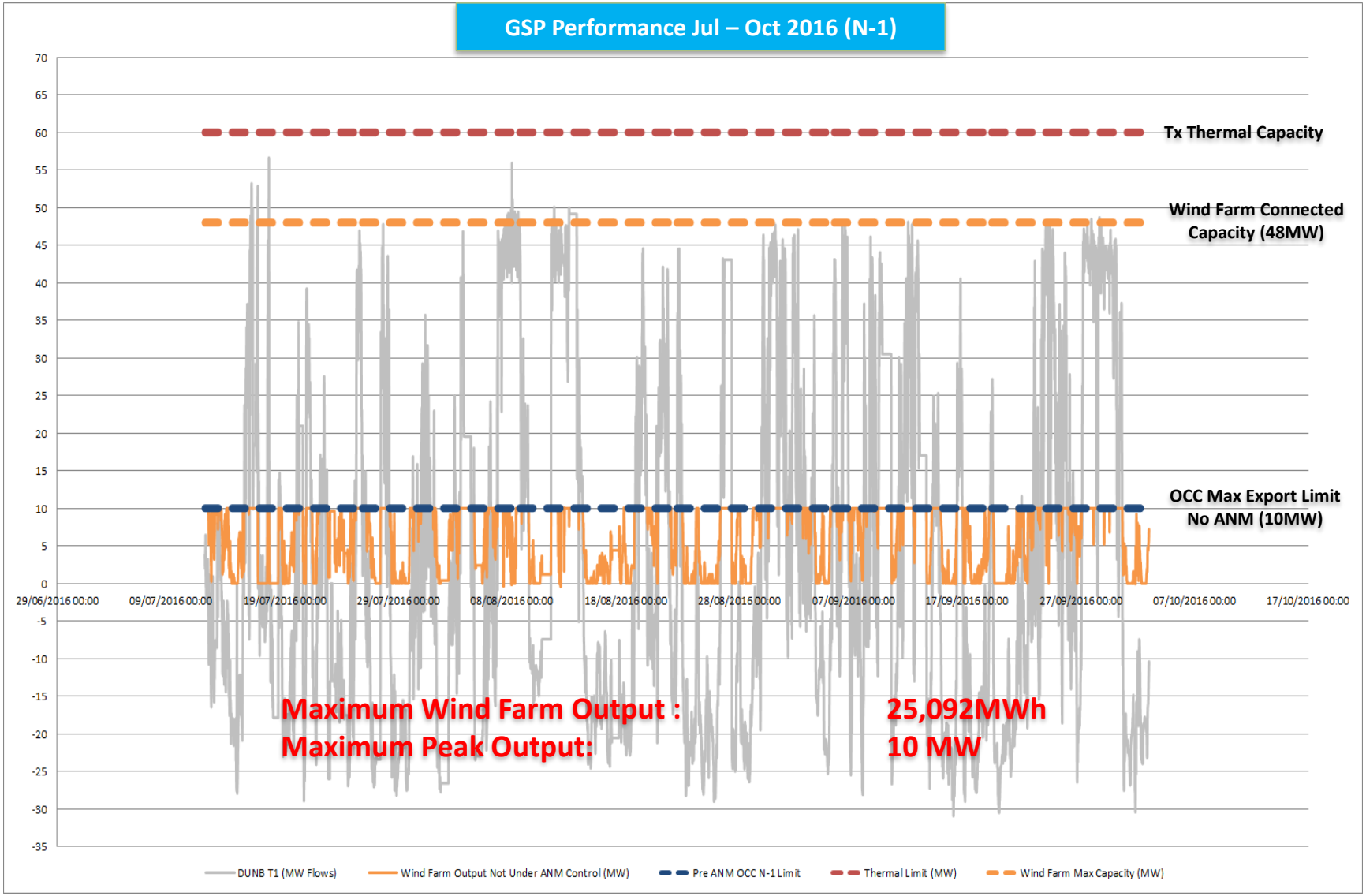
Network Constraint:
Transmission Access

Original Offer
Transmission reinforcement required, connection date advised 2021, total costs £30M

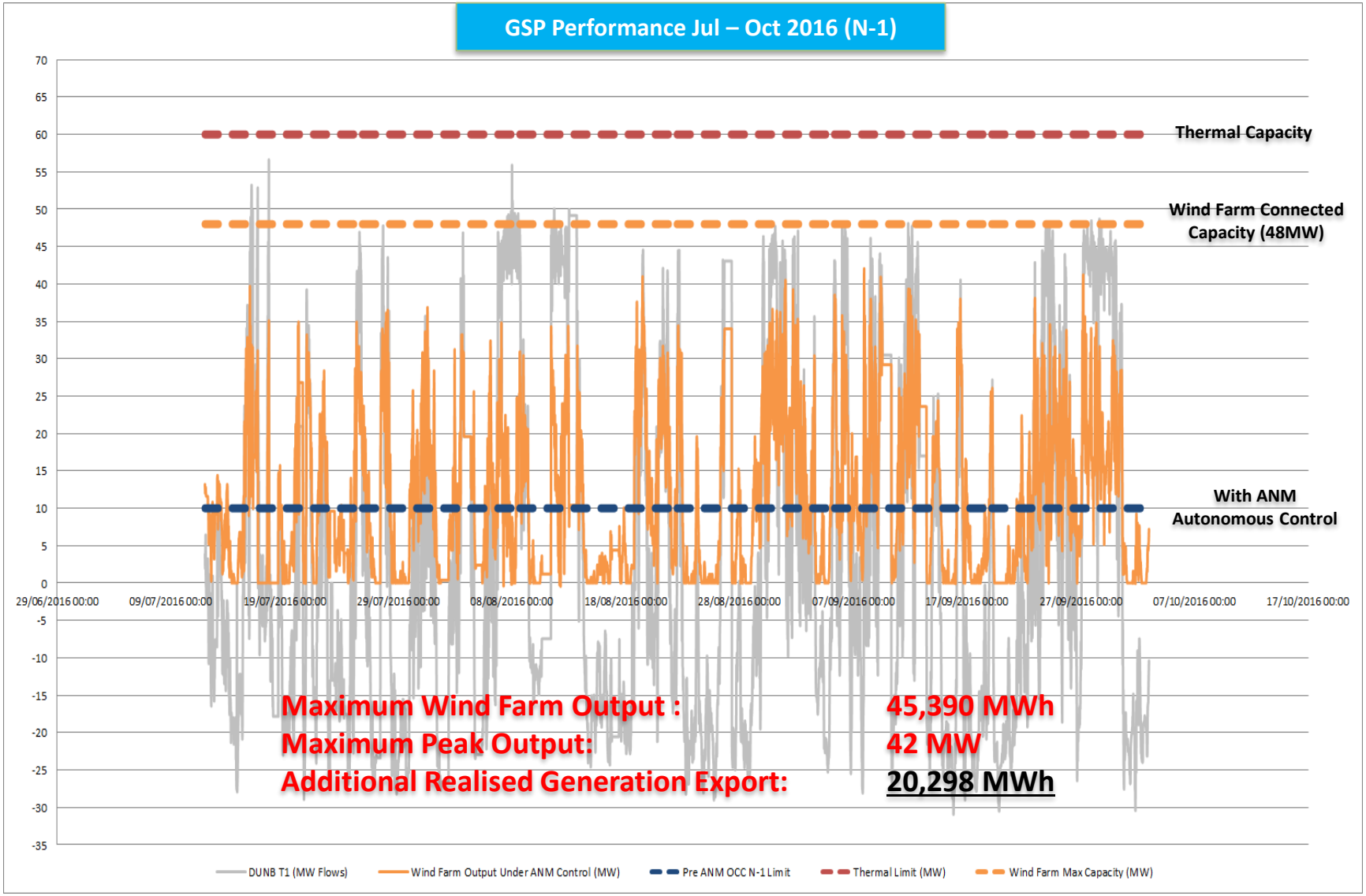
Flexible Connection Solution

- Wide area ANM scheme deployed at Dunbar GSP
- Principles of Access – LIFO
- Total ANM scheme capital costs**:£0.5M**
- All generators who requested a connection now connected
- ANM accelerated connection to network by average of **4-years**
- ANM supported by generation investors, SPT, NGET and but most of all customers

Active Network Management – Releasing Greater Network Capacity for Customers



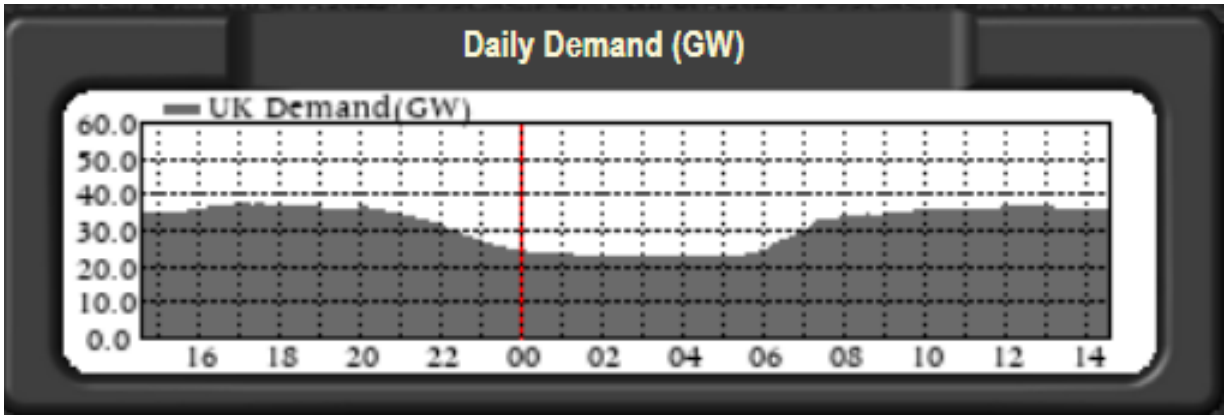
Active Network Management – Releasing Greater Network Capacity for Customers



Demand Side Management

Over £20 million to support electric vehicles across Scotland

Tesla Model 3 overtakes Ford Focus to be UK's third best-selling car



- The network is impacted, not Retail who may have data
- Much of challenge is on LV with very limited monitoring currently in place

Secondary Substation Communications

ZDNet

The hottest gadgets of 1985

Hayes Smartmodem 2400

Introduced in in 1985 for the cool price of $549.00 by Hayes Microcomputer Products --which was the market leader in PC modem peripherals -- the Smartmodem 2400 was lightning fast compared to the 1200 and 300 bits-per-second devices available at the time. Because telephone line use was billed per minute and even more expensive when dialing long distance. CompuServe, Delphi and BIX users, not to mention BBSers could download their emails and files at blazing speeds while conserving telco charges.

- 1200 baud to <u>each</u> home arrived 1982
- Adopted for power grid 15 – 20 years later- but 1200 baud <u>shared</u>
- Some countries now releasing 3-5MHz or more of spectrum for CNI

Geographic Density of Substations

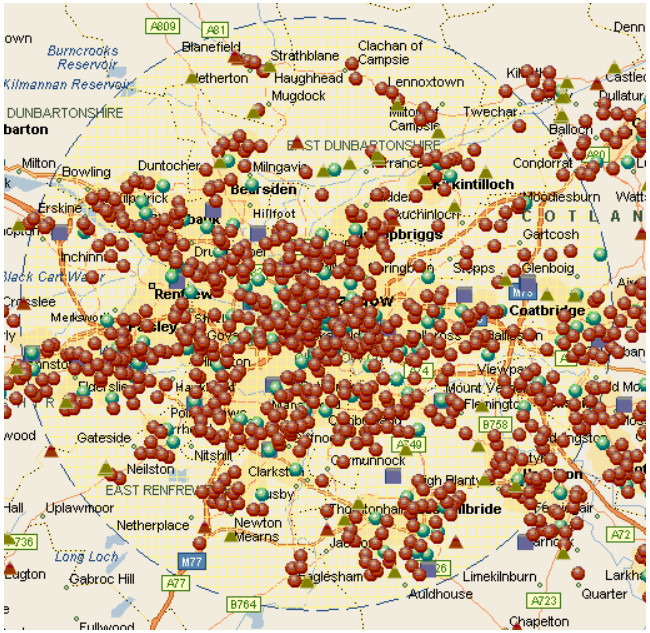
Urban

- 1,000 Substations within 10 mile sharing 1200 baud

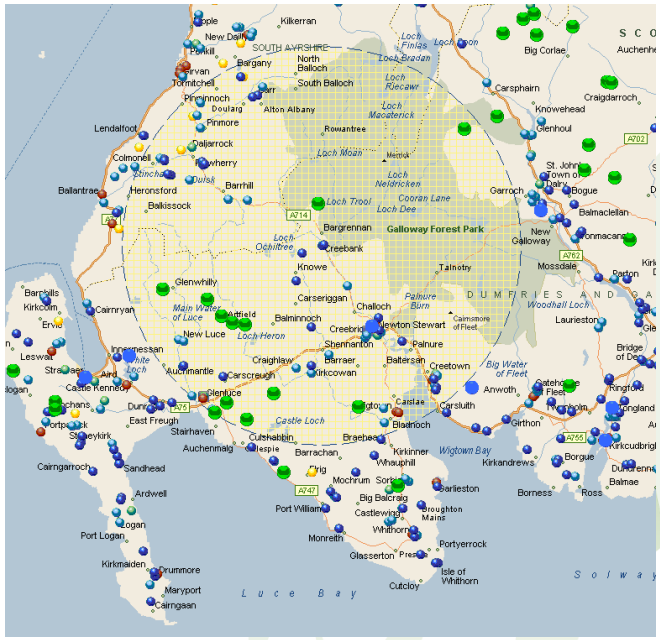
Rural

- 50 Substations
- 12 Windfarms

Future sites x 10 – 100 per cell



Urban- Cumbernauld



Rural- Dumfries and Galloway

Predictive Analytics

Use sensitive earth fault data/ signatures to predict tree incursion

Fault Location

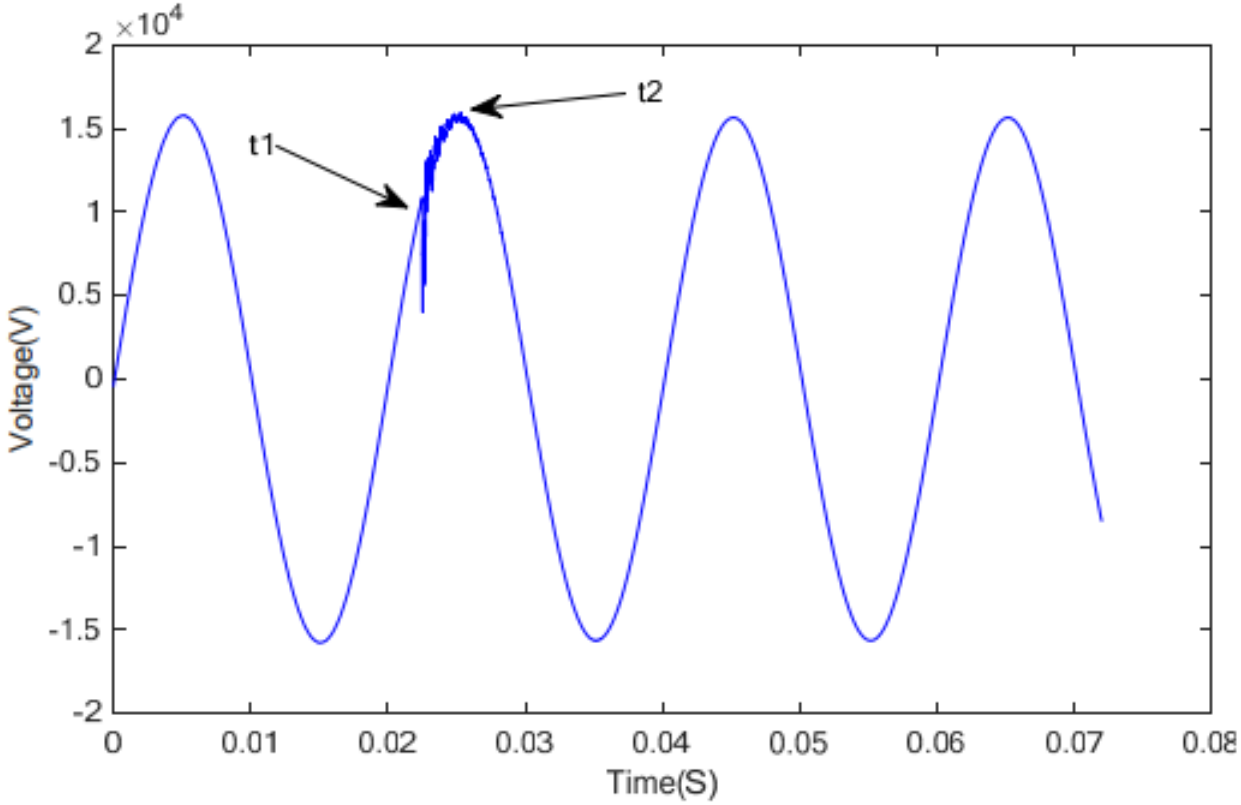
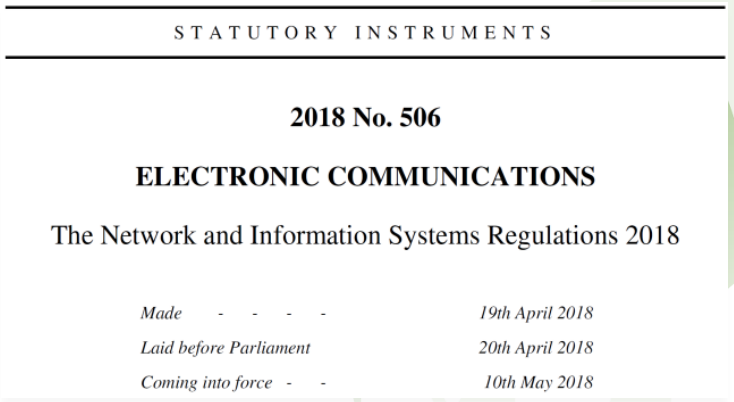


Figure 7. Voltage waveform of phase *a*, when a fault occurs.

NIS Regulations in the Electricity Industry

- *Appropriate and proportionate technical and organisational measures to manage risks*
- *"State of the art" security appropriate to the risk*
- *"Must have regard to guidance issued by competent auth"*
- *Penalties to £17 million*
- *Not the GDPR, but statutory…*
- *Audits start Q4*



STATUTORY INSTRUMENTS

2018 No. 506

ELECTRONIC COMMUNICATIONS

The Network and Information Systems Regulations 2018

Made - - - -	*19th April 2018*
Laid before Parliament	*20th April 2018*
Coming into force - -	*10th May 2018*

National Cyber Security Centre
a part of GCHQ

May 2018 report:-

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Advisory: Russian State-Sponsored Cyber Actors Targeting Network Infrastructure Devices

Highlights the threat to "UK critical infrastructure that supports the health and safety of the US and UK populations."

Legacy, unencrypted protocols easy for these actors.

Highlights SCADA sensors and controllers in the Energy Sector exposed to creating dangerous configurations that could lead to loss of service or physical destruction

New Honeywell Cybersecurity Research Reveals that USB Devices Pose a Significant Threat to Industrial Facilities

-Of 50 industrial locations studied, nearly half faced threats from removable USB media devices

-More than 25 percent of the threats detected had the potential to cause a major disruption to plant operations

-A wide variety of facilities - not just critical infrastructure - were actively targeted

Ireland's state-owned electricity provider EirGrid hit by 'state-sponsored' hackers

National Cyber Security Centre (NCSC) claims communications hijacked by hackers.

By Jason Murdock

August 7, 2017 17:13 BST

Irish power grid operator EirGrid was allegedly infiltrated by 'state-sponsored' hackers (Justin Sullivan/Getty Images)

EirGrid, an electricity provider that manages power across Ireland and Northern Ireland, was allegedly compromised by 'state-sponsored' hackers in April 2017.

The culprits hacked the state-owned operator after infiltrating a Vodafone network used by the company. They installed malicious software to intercept all unencrypted communications flowing through its web routers in Wales and Northern Ireland, Independent.ie reported.

Summary

- Funded issues growing from de-carbonisation incentives
- Power and geography a challenge with public options
- Distributed generation, Smart Grid and Cyber all increase data requirements
- Indications are around 5kbps per site
- New Power and Cyber Legislation needs support from Communication Legislators

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Thank You!