Active Network Management

SHRAVANA MUSUNURI, PH.D

ENZEN GLOBAL SOLUTIONS PVT LTD

SHRAVANA.MUSUNURI@ENZEN.COM

Agenda

- About Enzen
- Renewable Energy-Trends and Challenges
- Active Network Management – Concept, Benefits
- Relevant case studies
- Conclusion

About Enzen

“Making energy essentials accessible, affordable and sustainable”

Implemented India’s 1st Smart Grid

Smart Solutions running across 60+ countries


WATER


POWER


GAS


RENEWABLES

CAGR of 75% since inception

Revenue Growth

3,500+ Globally

Headcount

Over 115+ clients and increasing

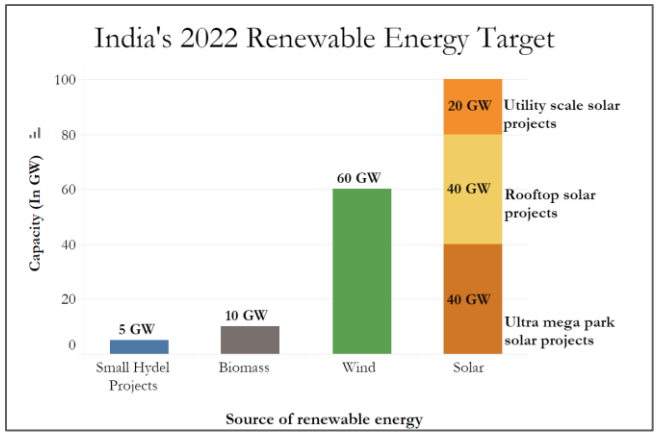
Clients

Offices in 8 countries
Operating in 12 countries

Locations

India – Emerging Trends

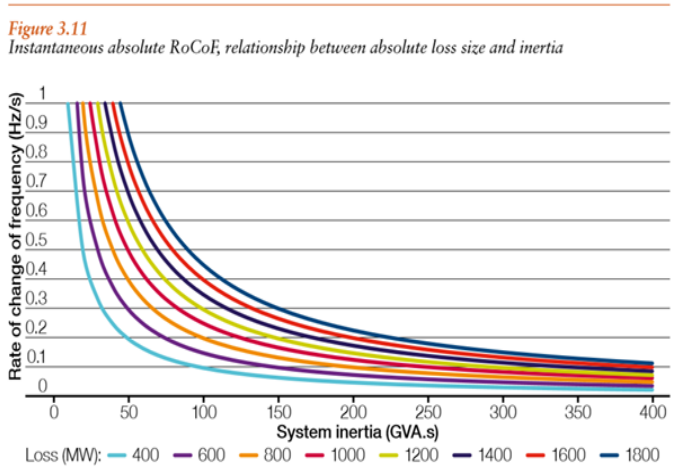
- 175GW of renewables by 2022
- Adoption of electric vehicles
- Green energy corridors and grid strengthening
- Low Wind, Solar energy prices



Associated Challenges

Technical

- High deviations from schedules due to forecast errors
- Renewable Energy Curtailments due to congestion and schedule issues
- Voltage instability and Increased Losses
- Huge Infrastructure upgrade requirements
- Reverse power flows at distribution level
- Frequency excursions and reduced inertia



Commercial

- Need for **Competitive market for Ancillary Services** e.g. reactive power and frequency response

What Becomes Important to Address These Challenges

- Fast-Acting
- Predictable
- Automated
- Secure
- Easy to integrate

Active Network Management - Concept

- Emerged mainly in the UK as a means of increasing the hosting capacity of the grid to connect low carbon technologies while avoiding grid upgrades and investment .

- ANM involves the integration and autonomous management of a range of Distributed Energy Resources

- Airline analogy: more passengers are booked on a flight than the plane can accommodate, as some may not turn up or accept payment to go on another flight.

- More resources are hosted on the grid that would traditionally be permitted, as they only cause issues in short, infrequent moments. Actively managing grid access in these moment is better than financing the building of new grid.

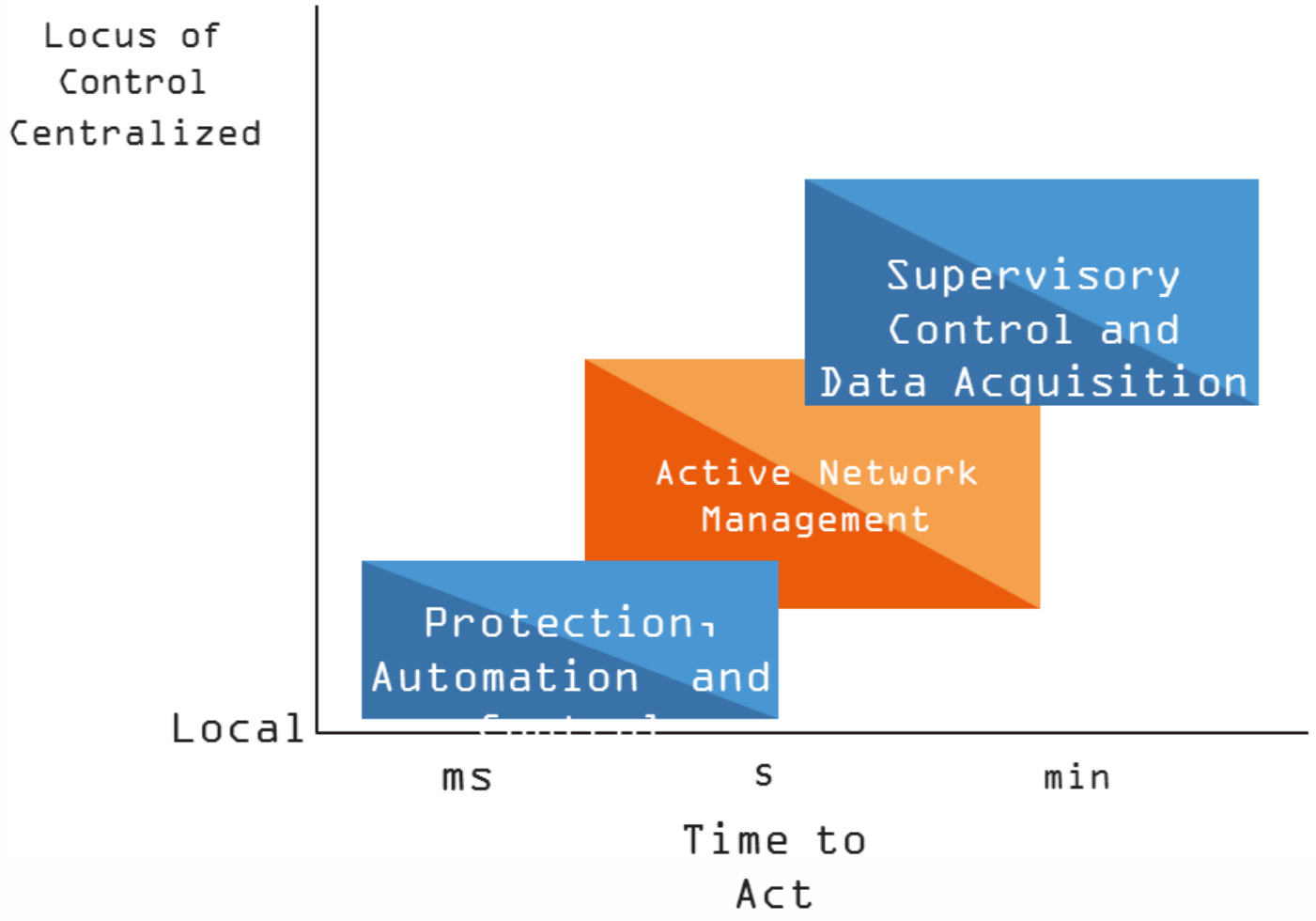
Active Network Management - Concept

- Delivery of real-time autonomous deterministic control, providing guaranteed repeatability and time-bounding of end-to-end control actions.

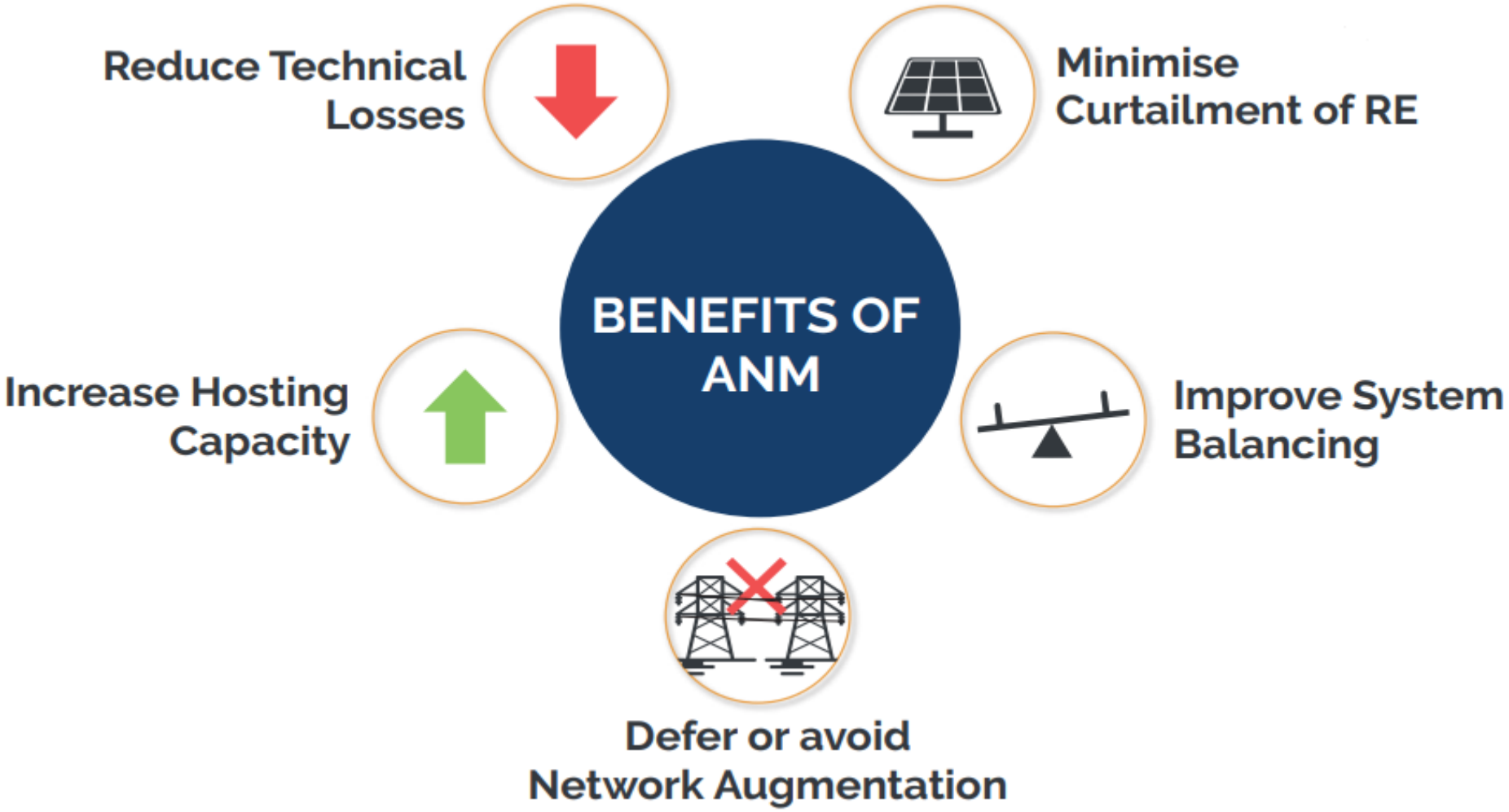
- Second-by-second control of DER and grid devices to deliver smart grid functionality. Typical applications include real and reactive power control, voltage management, and energy balancing.

- Real-time monitoring of generator export and constraint locations; detection of threshold breaches at constraints; calculation of generator set points; escalating control actions.

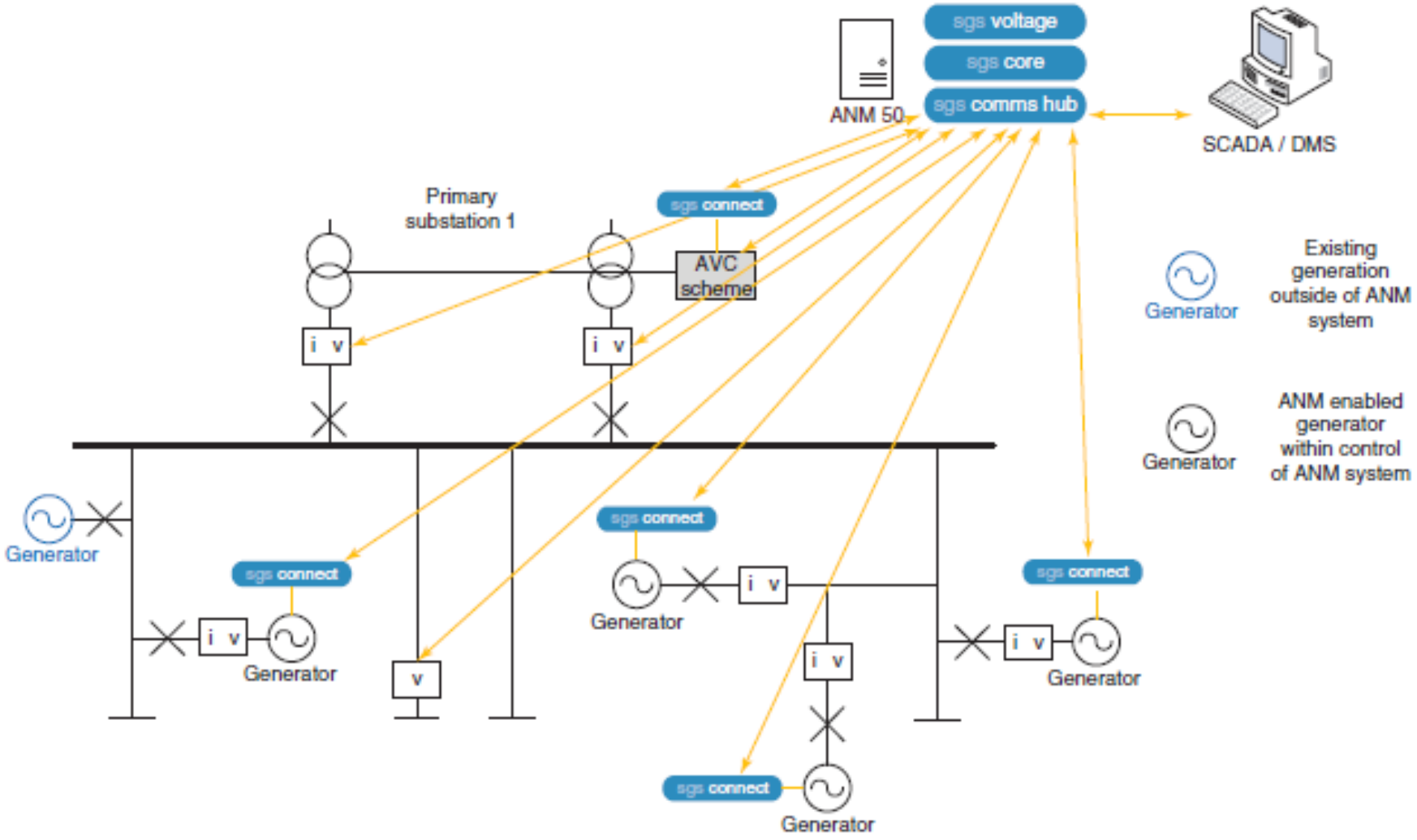
Active Network Management (Cont'd..)



Benefits of This Concept



Example ANM Implementation to Address Network Constraints



Some Example Implementation Cases

Shetland Microgrid

Client: **Scottish and Southern Energy Distribution**

Challenge

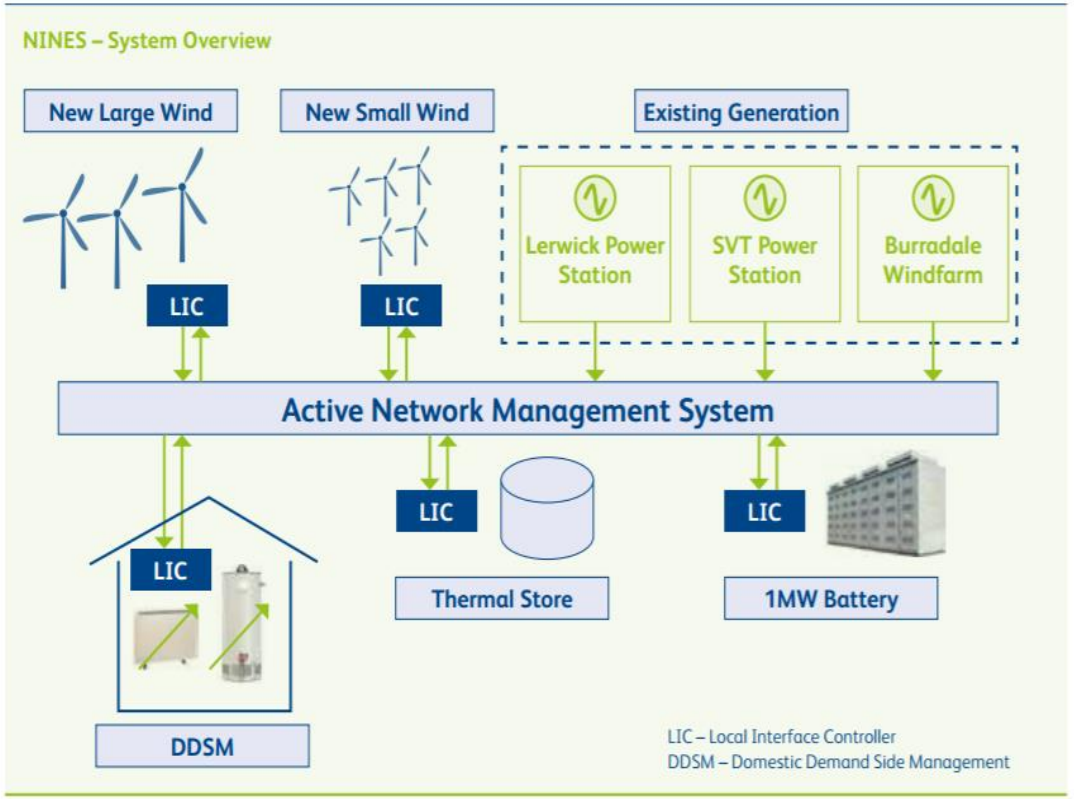
The Shetland Islands are electrically isolated from mainland UK, and have old, inefficient diesel generation. There is an existing gas terminal and 3.6 MW of wind, with no capacity for more renewable generation.

Solution

ANM smoothens demand curve, utilise available technologies, maximise RE capacity, and alleviate constraints, lop peaks, and fill troughs. The system controls: energy storage, domestic DSM, wind and tidal generation. It incorporates scheduling into the control.

Benefits

- 8.5 MW of renewable generation connected
- Extra 9.32 GWh of renewable energy generated on to the network (March 2016 – February 2017), 10% of demand and saving £1.0m per annum



Adding More Renewables to Existing Network

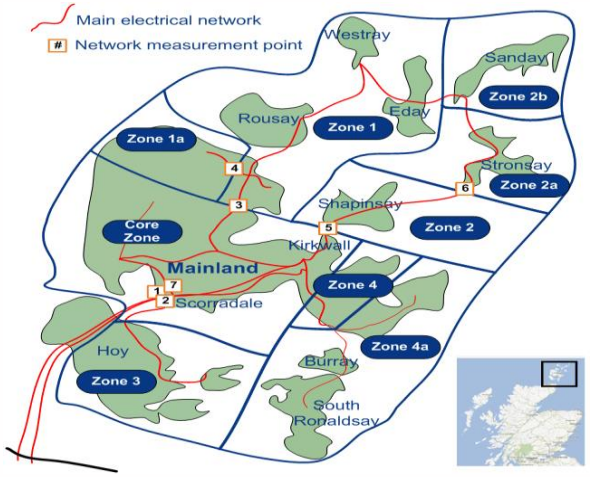
Client: Scottish and Southern Energy Distribution

Challenge

- SSEPD sought cost effective alternative to traditional grid upgrades to accommodate high demand for wind connections, despite network being at full capacity.

How It Was Achieved

- By real time control of wind to demand changes, network constraints and limiting generation in the worst cases.



Zone	ANM Operation	SHEPD Equipment	Generator Site Issues
Core Zone			
Zone 1			
Zone 1A			
Zone 2			
Zone 2A			
Zone 2B			
Zone 3			
Zone 4			
Zone 4A			

Last updated @ 09/11/2017 04:54:11

Benefits

- Allowed **additional 20 generators** (24 MW) to connect. **Enabled 2X increase**
- Project developers saved **£30 million**

Minimize Outages and RE Curtailments

Client: SP Energy Networks

Challenge

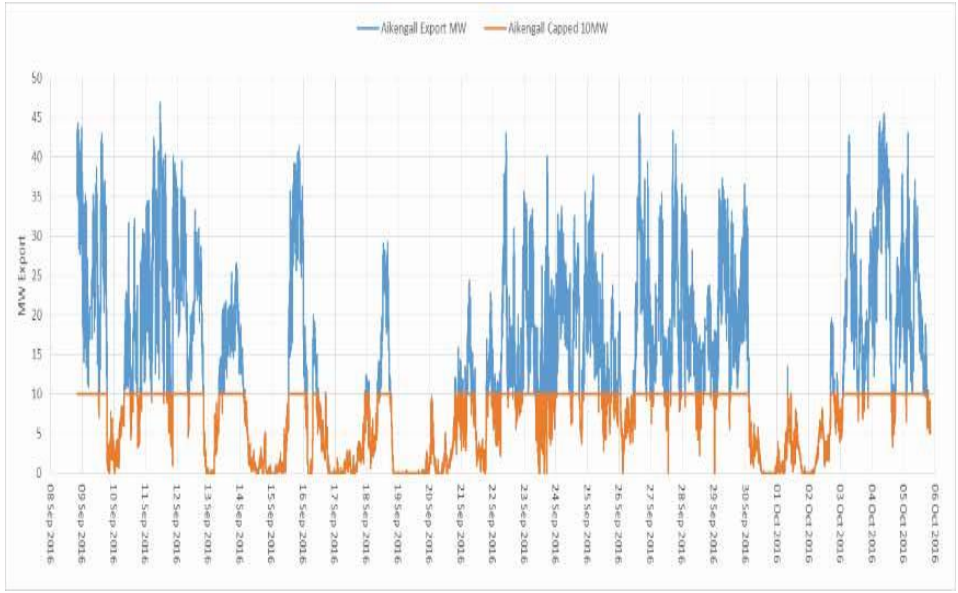
- Over curtailment during N-1 contingency conditions. Existing firm generator had 10 MW cap under N-1 conditions.

Benefits

- Increased energy yield (the energy under the blue line – the orange line is the export with a SPS)

How It Was Achieved

- ANM actively controlled the RE generation on a min-by-min scale considering the demand changes under N-1 conditions.



ANM Good Practice Guide

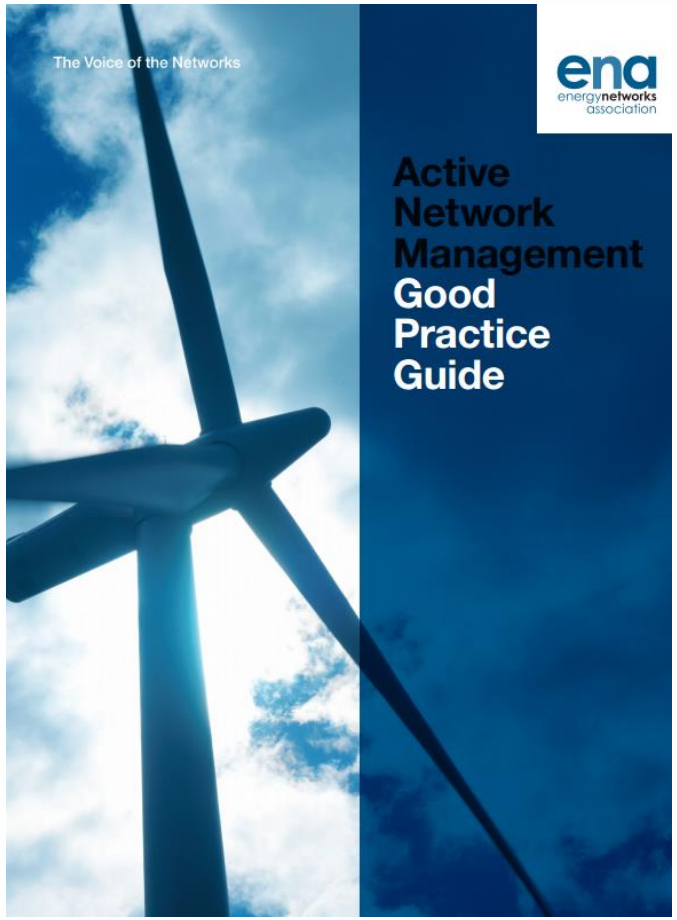
Active Network Management Good Practice Guide

All DNOs were involved

Outlines what ANM is, when and how it should be used, the deployment of ANM, etc.

Also considers future developments of the technology

http://www.energynetworks.org/news/publications/reports.html



Thank You