WESTERN POWER DISTRIBUTION

FALCON

DEVELOPING FUTURE POWER NETWORKS

Energy Storage for Distribution Networks

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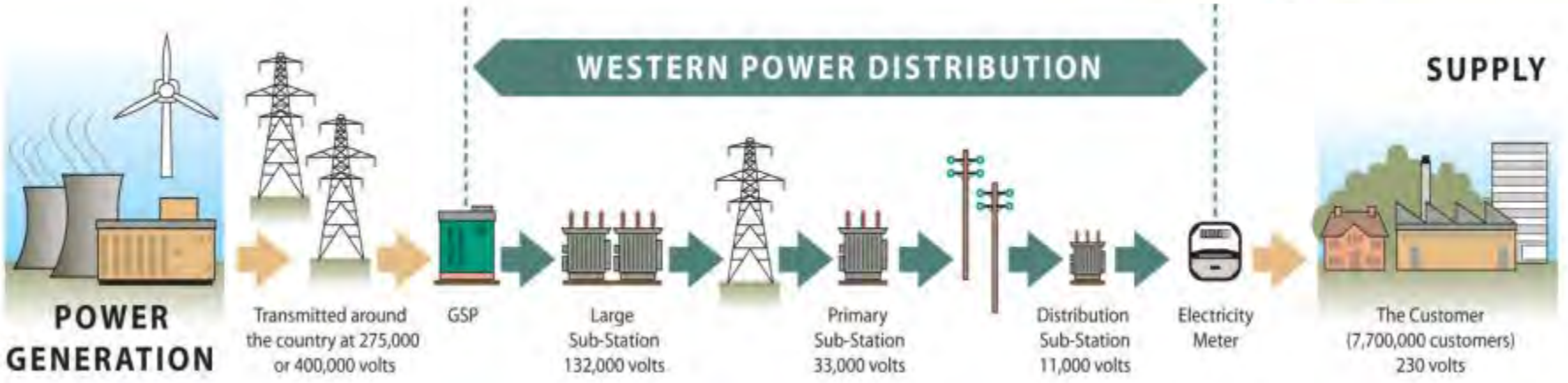
Who Are We?

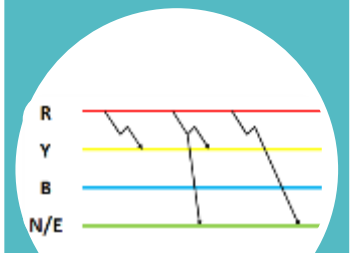
- 7.7 Million customers over a 55,500 sq kms service area
- Our network consists of 221,000 kms of overhead lines and underground cables, and 185,000 substations
- LV to 132kV Network ownership



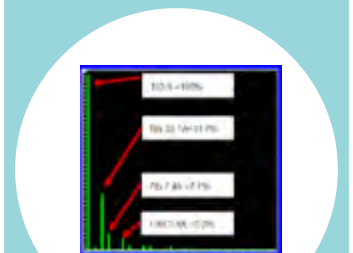
Distribution Network Challenges

Voltage

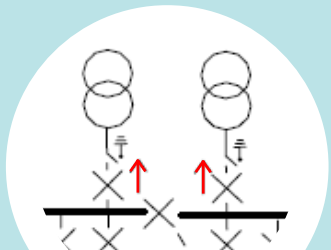
Thermal



Fault Level



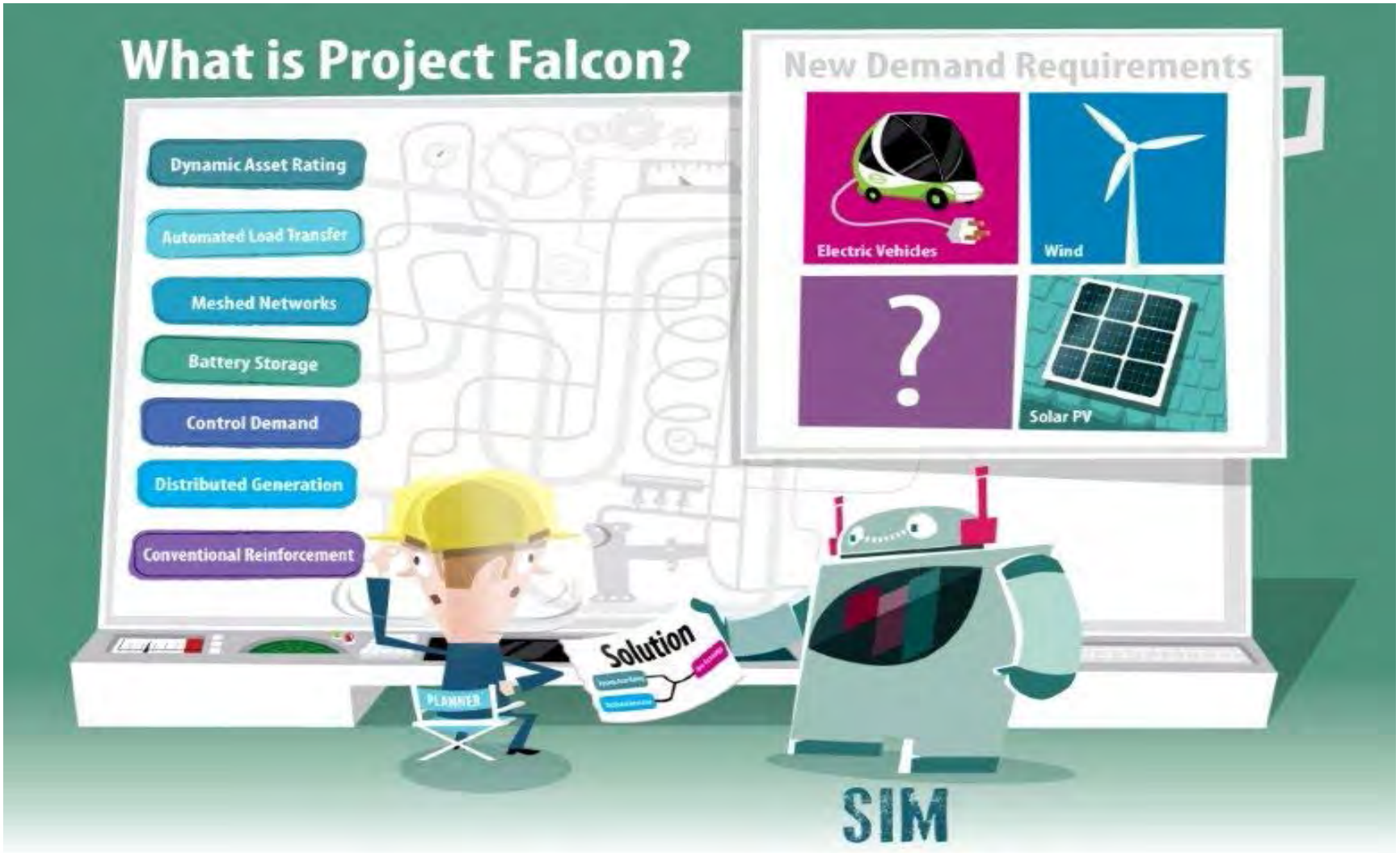
Harmonic



Reverse Power Flow

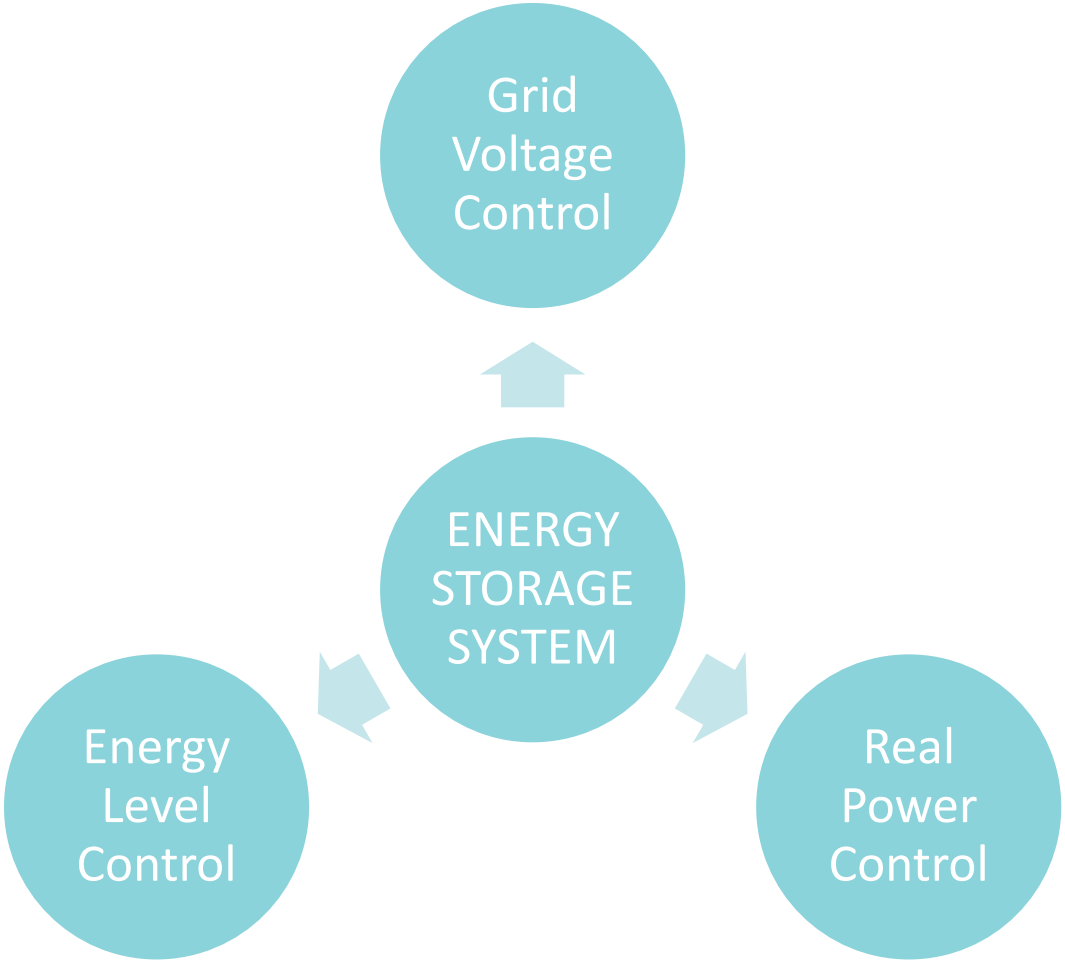
Changing Load and Generation Mix

Flexible Approaches to Low Carbon Optimised Networks

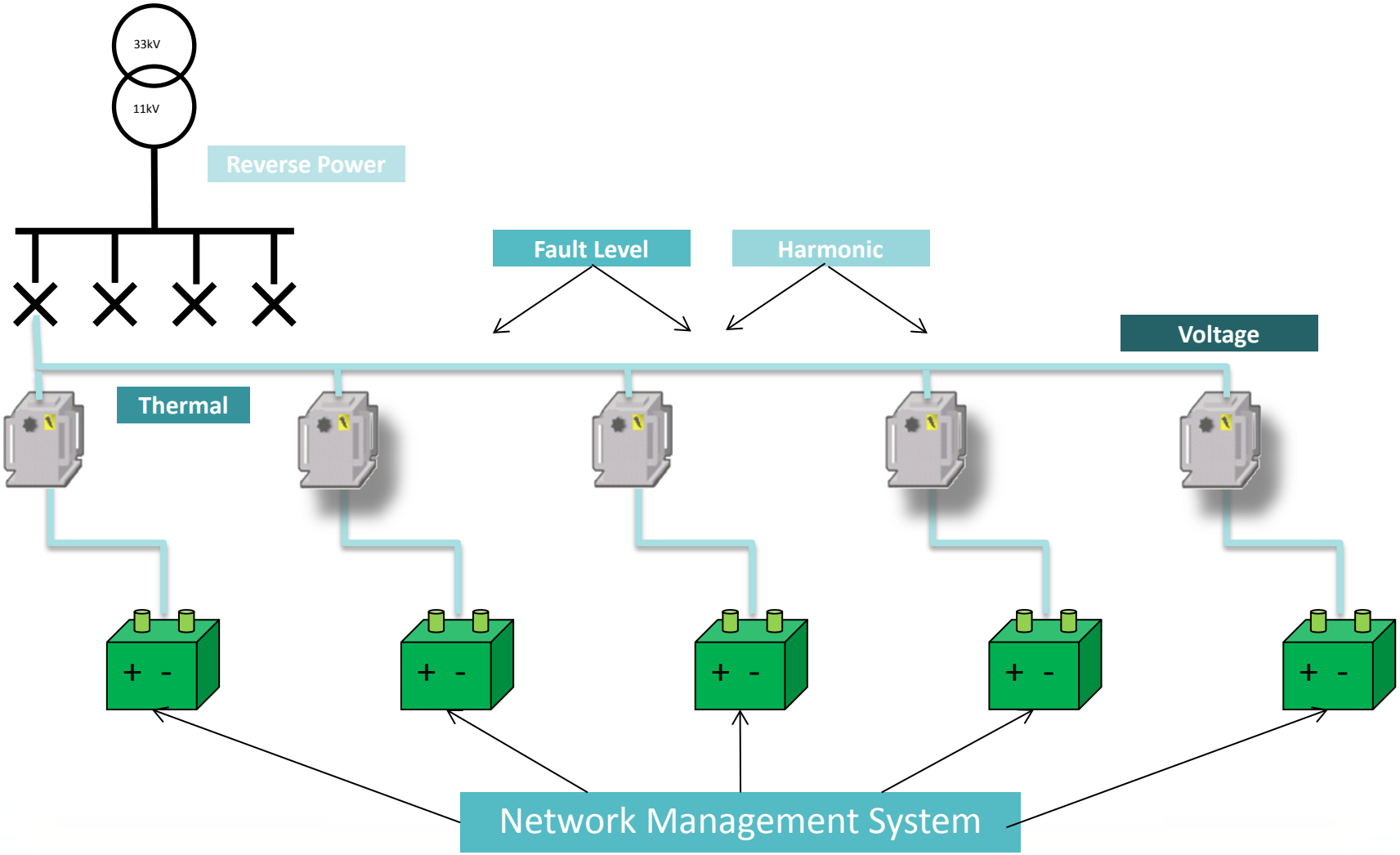


Benefits of Energy Storage Systems

- Voltage
- Thermal
- Fault Level
- Harmonic
- Reverse Power



Collaborative Energy Storage Systems



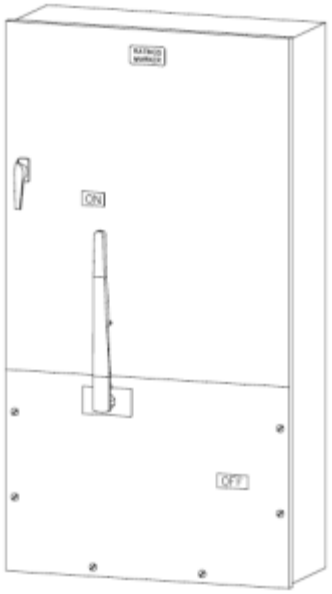
Equipment Deployed

100 kWh
Base Unit

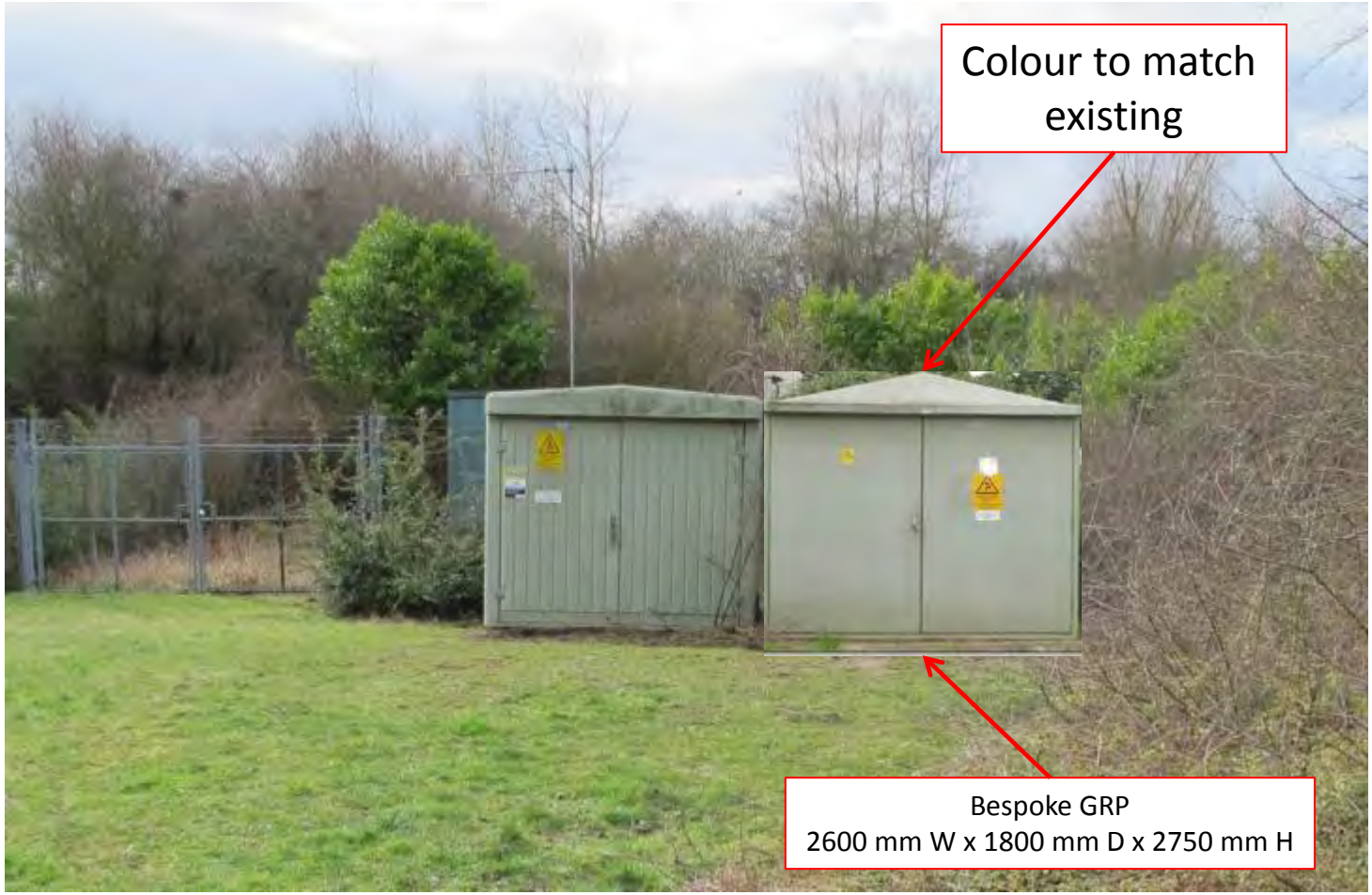
50(100) kW
Inverter

Site Controller

DC Switchgear



Existing Distribution Sites



Installed Layout

Installed Layout

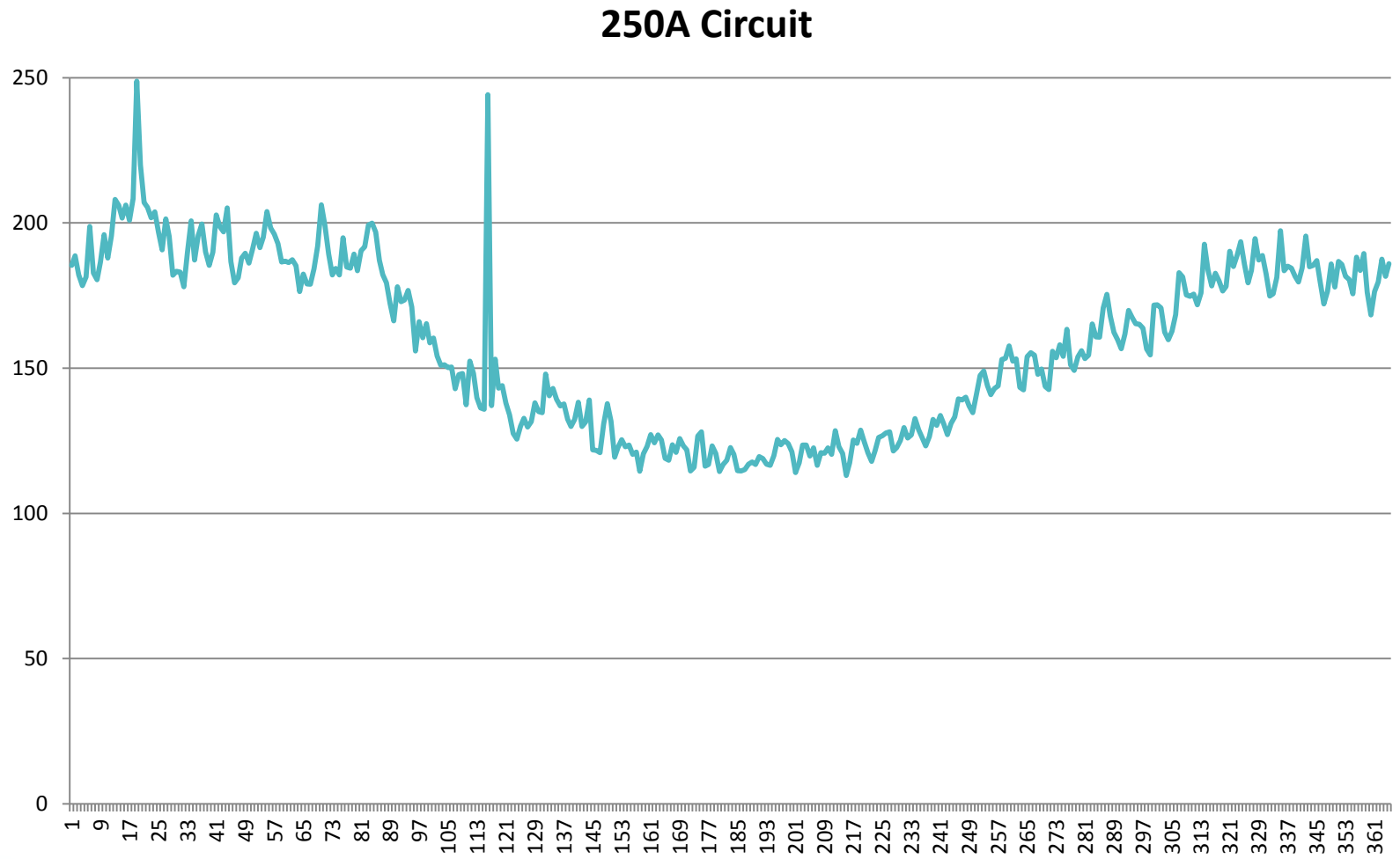
Installed Layout

Physical Installation Challenges

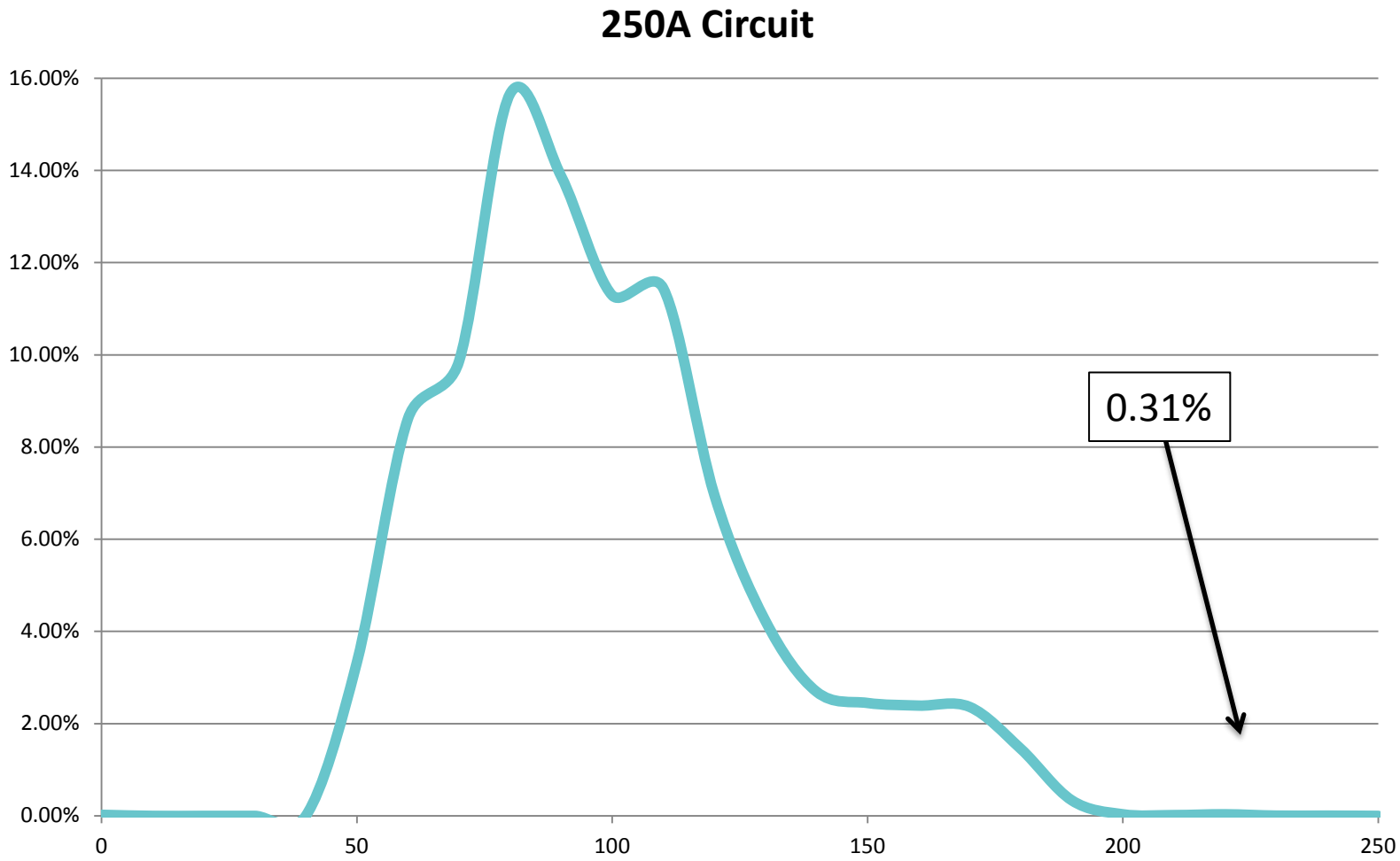
- Large Form Factor
- Difficult to manoeuvre
- DC wiring knowledge gaps
- Fan Noise
- Switching Frequency Noise
- Environmental Conditions
- Heat Dissipation
- Electrical Protection (G59)
- Modes of Failure
- Harmonic Content

Replication

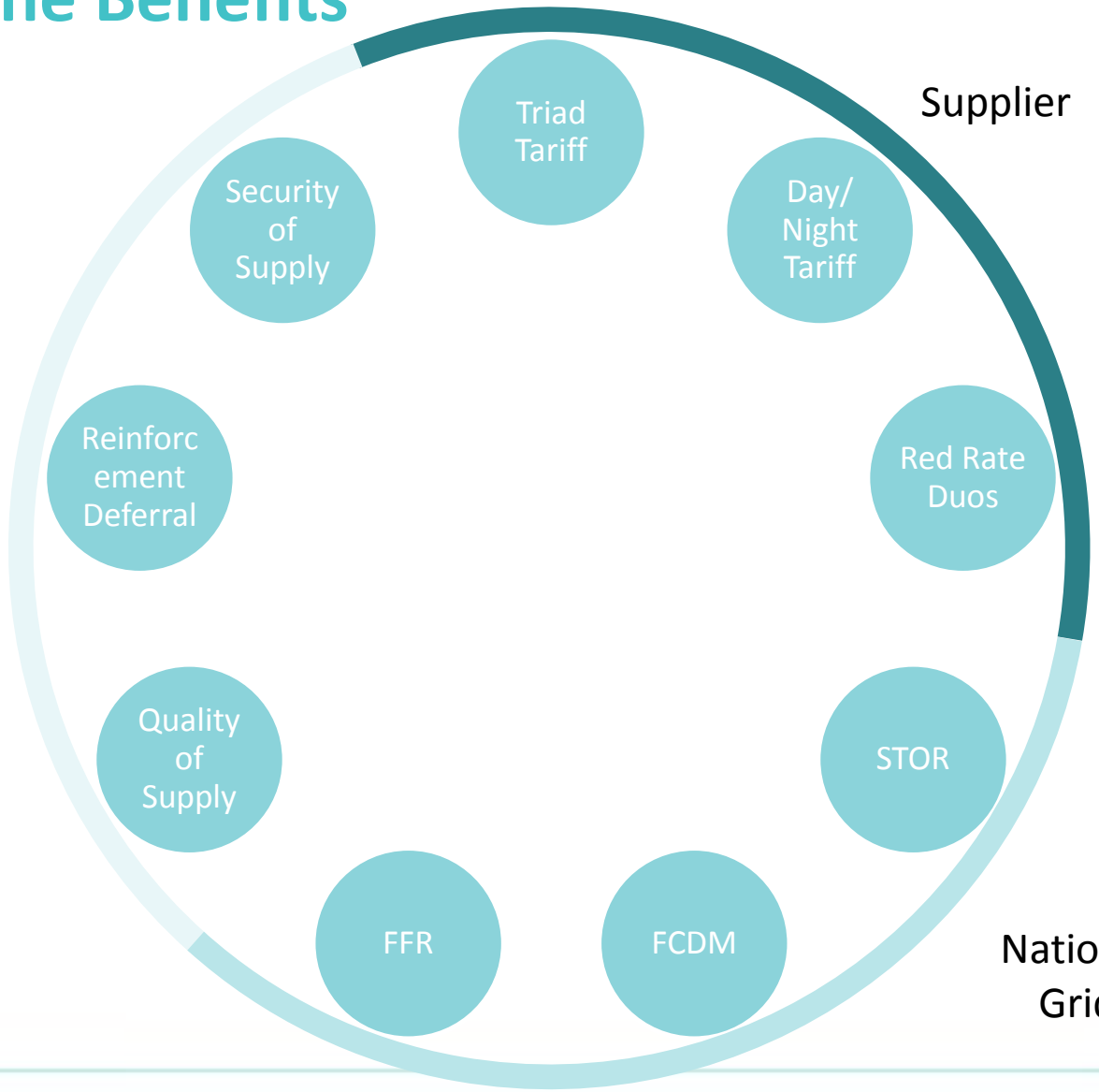
DNO Usage Profile



DNO Usage Profile



Sharing the Benefits



Project Learning

- Optimum charge and discharge windows
- Available triggers for charging regime
- DNO connection requirements for ancillary grid service operation
- Multiple set collaboration across an HV feeder or network
- Best placement of storage on the system
- How power electronic devices can be used to address power quality issues
- Lifespan of battery versus running operation
- Integration of ESSs with existing control environments
- Improvements for equipment specifications

Project Benefits

- Carbon offsetting through storage systems
- Reduction in I^2R system losses
- Improvement in system efficiency
- Voltage support
- Reinforcement deferral
- Reduced risks of stranded assets as deployment of battery storage gives options to delay reinforcement investment until demand trends are established
- Power quality improvements
- Facilitation of more Low Carbon Technologies

Dissemination Channels

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THANKS FOR LISTENING