WESTERN POWER DISTRIBUTION

INNOVATION

NEXT GENERATION NETWORKS

Facilitating widespread adoption of LCTs

2.3 Enablers for Low Carbon Technologies

LCNI 2016, Wednesday 12th October 2016

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WESTERN POWER DISTRIBUTION INNOVATION

Future Networks Programme

WESTERN POWER DISTRIBUTION PROTEUS NEW

WESTERN POWER DISTRIBUTION FLEXDGRID

WESTERN POWER DISTRIBUTION PLUGS AND SOCKETS

WESTERN POWER DISTRIBUTION SOLA BRISTOL

WESTERN POWER DISTRIBUTION LOW CARBON HUB

WESTERN POWER DISTRIBUTION OPEN L\ NEW

WESTERN POWER DISTRIBUTION NETWORK EQUILIBRIUM

WESTERN POWER DISTRIBUTION SMART ENERGY ISLES

WESTERN POWER DISTRIBUTION NETWORK TEMPLATES

WESTERN POWER DISTRIBUTION FALCON

Assets

- Telemetry
- Decision support
- Improved assets
- New assets
- Flexibility
- Automation
- Incident response

Customers

- New connections
- Upgrades
- Information
- Self Serve
- Products/Service
- Tariffs
- Communities

Operations

- Reliability
- Forecasting
- DSO
- DSR
- GBSO Interface
- Efficiency
- SHE and Security

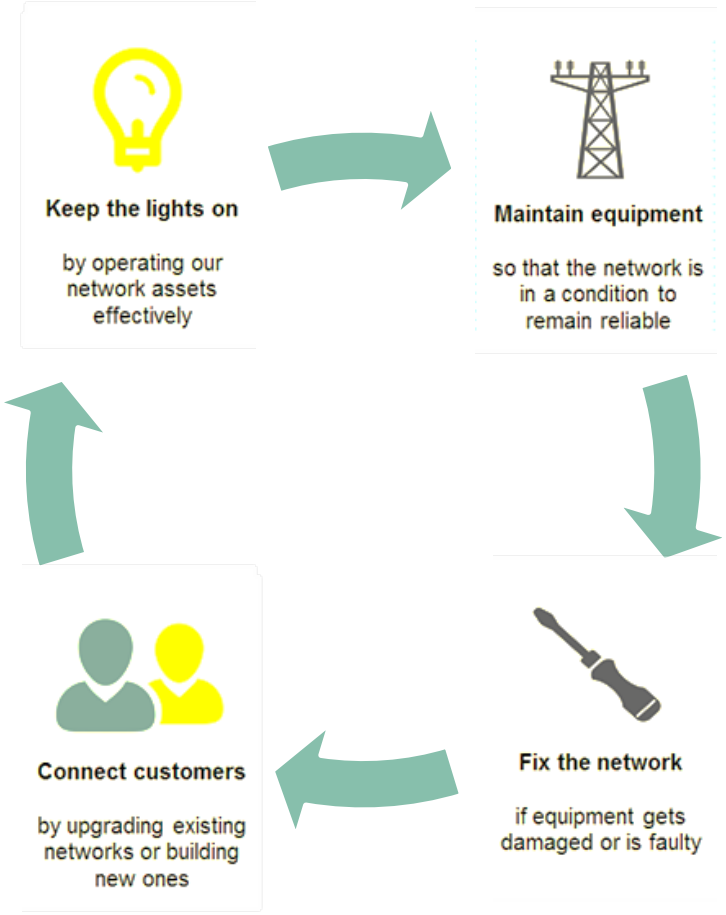
Network and Customer Data

- Airborne Inspections
- AIRSTART[1]
- Telecoms Analysis
- Superconducting Cable
- SF6 Alternatives
- MVDC Test Lab
- Smart Energy Laboratory
- Statistical Ratings
- Primary Network Power Quality Analysis
- Hybrid Heat Pump Demonstration
- Hydrogen Heat & Fleet
- Carbon Tracing
- HV Voltage Control
- Solar Storage
- LV Connect and Manage
- Sunshine Tariff
- CarConnect
- Industrial & Commercial Storage
- DSO/SO Shared Services
- Project SYNC
- Project ENTIRE
- Smart Meter data for Network Operations
- Distribution Operability Framework
- Times Series Data Quality
- Voltage Reduction Analysis
- LV Connectivity
- Smart Systems and Heat[2]

Note: 1 – Funded by Aerospace Technology Institution; Note 2 – Funded by the Energy Systems Catapult

Agenda

- Connecting Renewables
- Changing Networks
- WPD LCT projects
- Future Enablers



Renewables in Numbers (WPD)

50,00

connection enquiries

6,000

1GW

l DG connected

14.1G

maximum dema

>7GW

accepted and preparing to connect

1GW

onnected in 2015/6

5.0GW

minimum demand

EHV

Alternative Connections

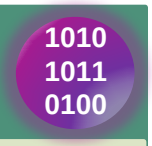
TIMED

- **Generation curtailed within specific times**
- Sub 1MVA
- Modelled seasonal capacity variations
- Localised control only
- No comms
- Non-optimised

SOFT-INTERTRIP

- **Releases pre-fault capacity with trip facility**
- 11kV and 33kV
- Real-time monitored values
- Small clusters of generation or simple pinch points
- Existing monitoring with localised control

ACTIVE NETWORK MANAGEMENT

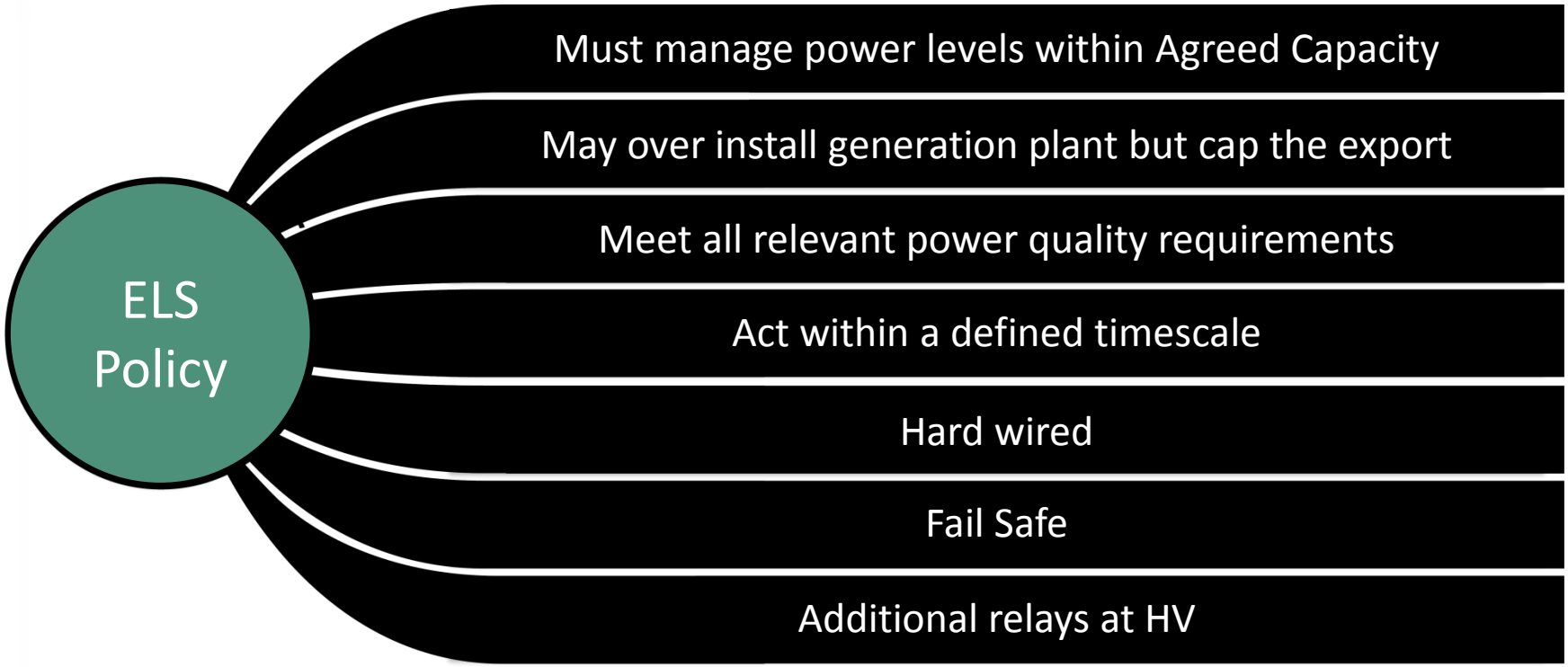


- **Fully optimises capacity based on all constraints**
- Management of generation using LIFO principles
- Real-time granular control of output
- Requires new Active Network Management control and monitoring systems

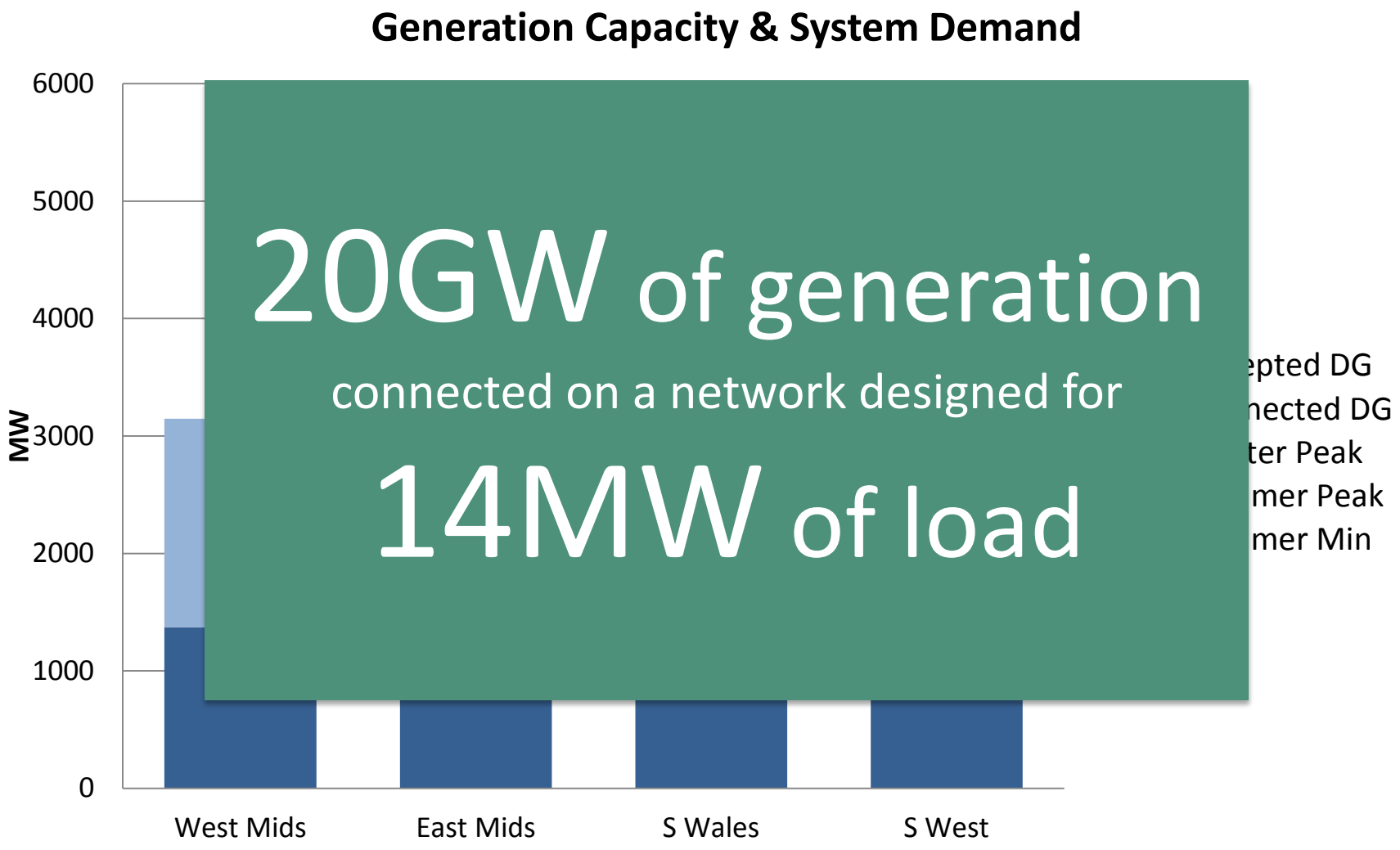
Costs, Complexity & Network Optimisation

Enabling Customer Pro-sumption

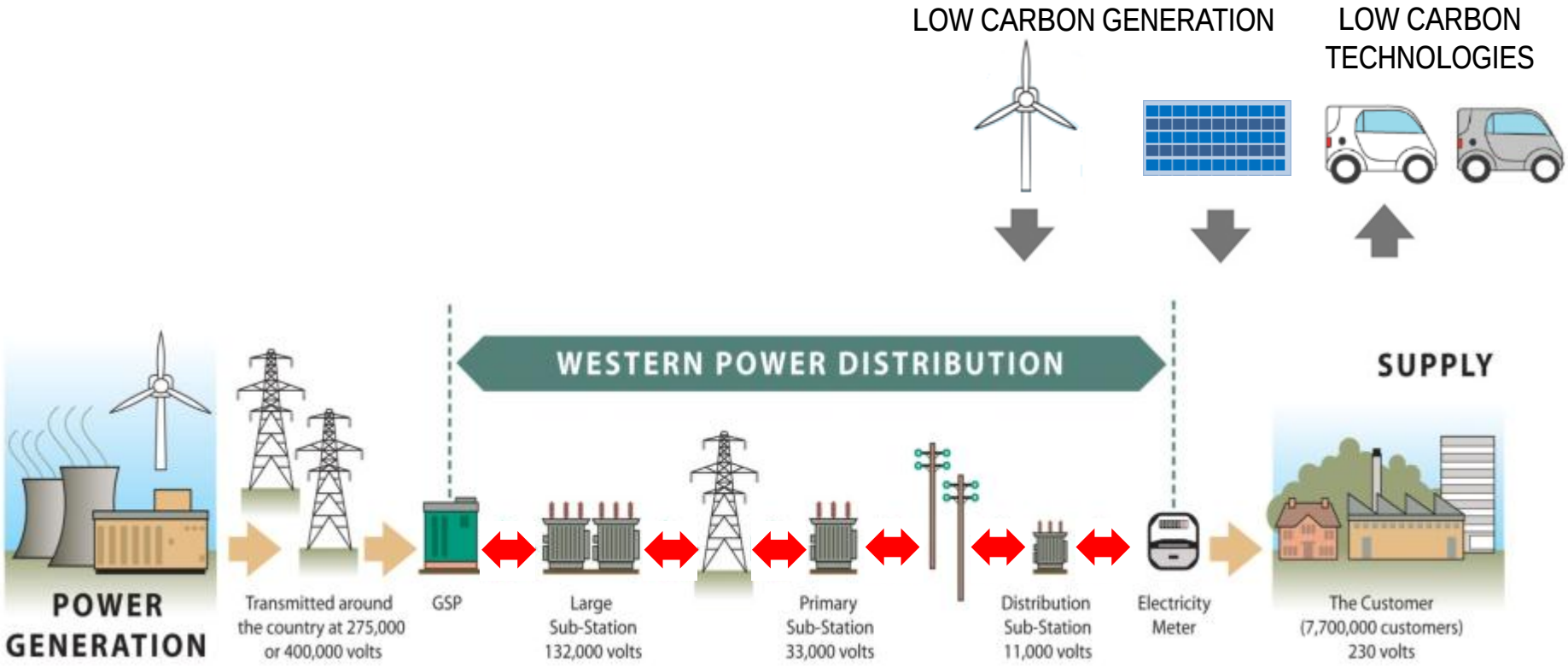
- WPD have created a policy to allow customer to connect generation behind the meter even in areas with constraints



Generation and Demand Interaction



Changing Networks



WPD LCT Projects

WESTERN POWER DISTRIBUTION CARCONNECT

- Understand & model effects of faster charging
- Monitoring of actual network effects
- EV DSR contract framework & trial

WESTERN POWER DISTRIBUTION ELECTRIC VEHICLE EMISSIONS TESTING

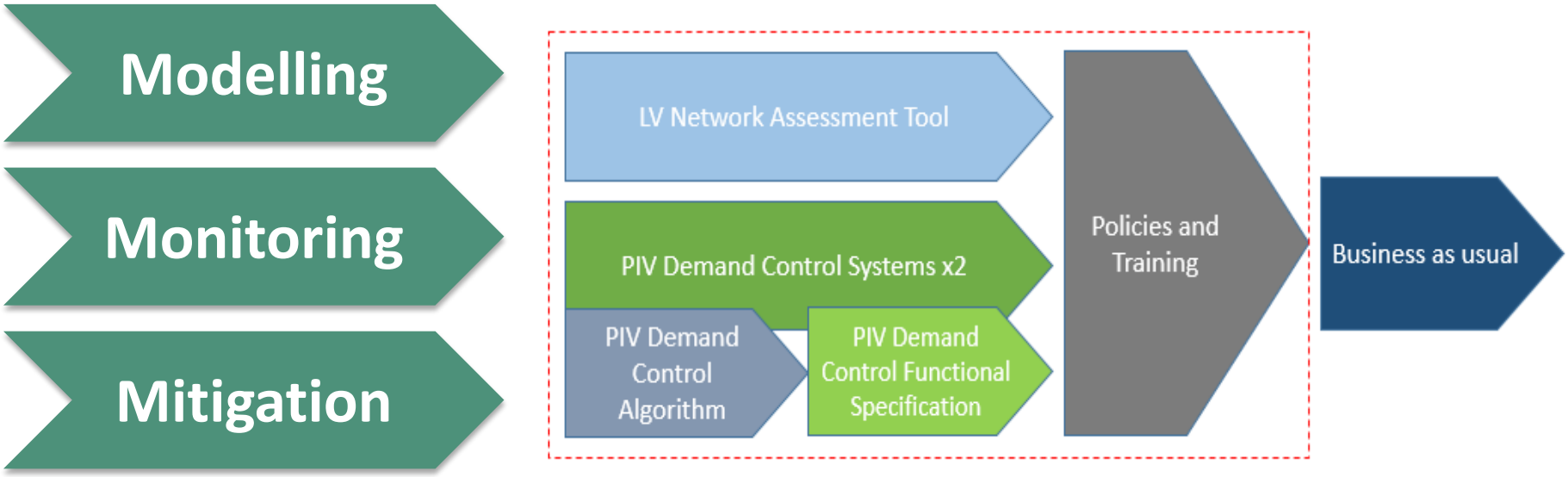
- Are EVs more disturbing than declared?
- If less disturbing can this free headroom?

WESTERN POWER DISTRIBUTION LV CONNECT & MANAGE

- Developing hardware to control charging

CarConnect NIA Project

- £5.8m project to develop all the tools required for DNOs to manage EV uptake
- World's largest Plug-in Vehicle Trial – up to 700 vehicles
- Using a market-led range of EV manufacturers and models
- Charge rates of up to 32A and test bed development of V2G



CarConnect NIA Project

Modelling | **Monitoring** | **Mitigation**

- Data from the 700 participant electric vehicle trial will inform new planning assumptions to be developed within a distribution network modelling tool
- This will build upon work from Low Carbon London and My Electric Avenue
- The tool will be trained out to WPD network planners to assess future reinforcement schemes

CarConnect NIA Project

Modelling → **Monitoring** → Mitigation

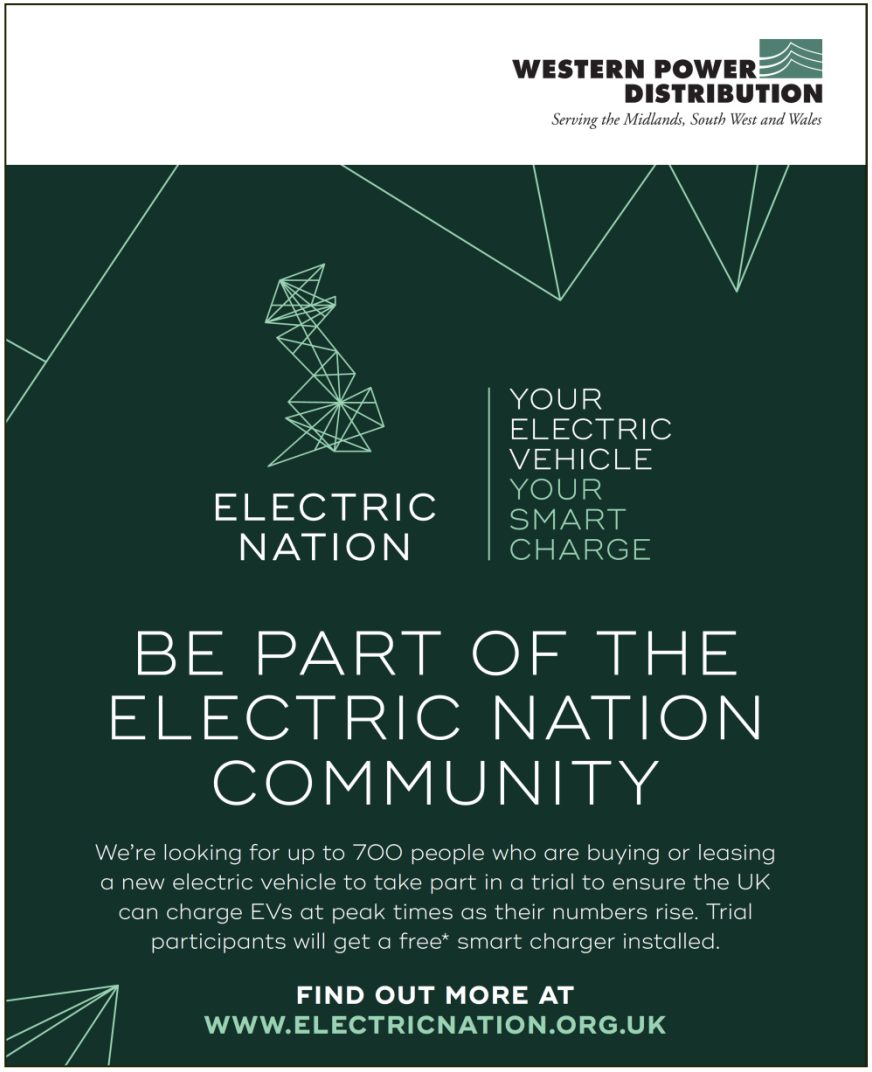
- 30 substation monitoring units will be installed at potential cluster locations around the WPD network
- An algorithm will be developed to detect electric vehicle charging signatures, allowing further visibility of electric vehicle penetration levels
- By more accurately understanding actual clustering effects at LV network pinchpoints, we can use all available headroom and potentially further defer reinforcement

CarConnect NIA Project

Modelling → Monitoring → **Mitigation**

- This project will also develop and trial the use of demand side response as a mitigation technique for load peaks caused by widespread electric vehicle charging
- Smart chargers will allow the charging level to be controlled by a third party
- WPD will contract with the third party to provide this demand flexibility and trial the effectiveness and reliability of EV DSR on a commercial basis

CarConnect – Introducing Electric Nation



- Customers in WPD regions will be recruited to the trial under the customer facing brand – Electric Nation
- Trial participants will be offered a free smart charger for their property
- Data gathered will inform future network planning
- Smart chargers will be able to throttle charging and we can pilot DSR commercial arrangements for customers

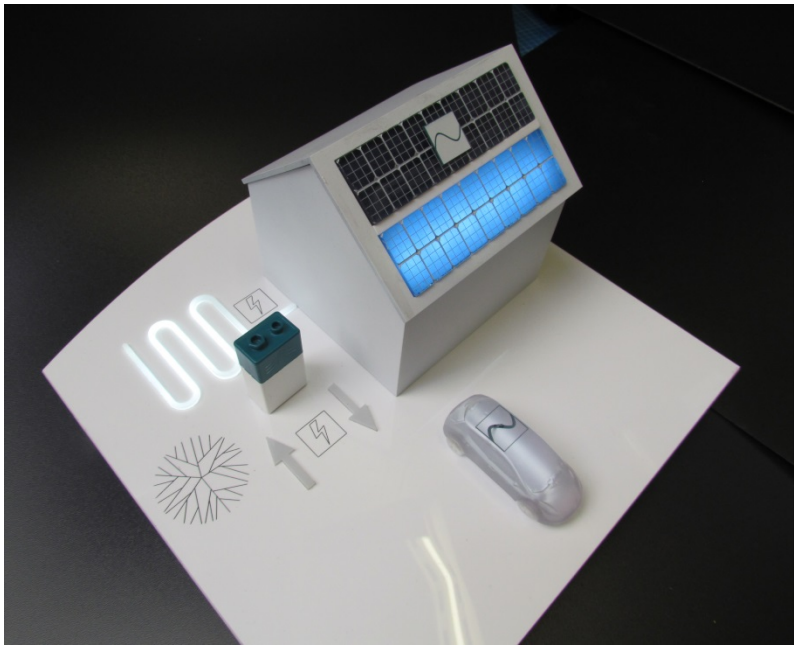
EV Emissions Testing

- Electric vehicles connected to the distribution network create harmonic disturbances that can affect power quality for other customers
- DNOs have to assess the impacts and plan reinforcement where required to comply with power quality legislation limits

- By more accurately assessing emissions, DNOs can minimise reinforcement
- 15+ Vehicles will be tested at Millbrook Proving Ground
- Potential savings UK wide of £1.8bn

LV Connect & Manage

- £1.7m project to develop the technology that would enable DNOs to directly throttle Low Carbon Technologies in the home when clusters occur rapidly
- Short-term solution can be quickly deployed by customer's own electrician
- Bi-directional devices in the home will be controlled to keep the network within limits
- Will accelerate the connection of renewables, heat pumps, energy storage and electric vehicle charging



Future Enablers

Data Integrity	Market Integration	IT Systems	Customer Propositions	Equipment
Alignment of Data – Common Information Model	WPD regional energy scenarios	Power System Modelling	DSR products by customer segment	Telecommunications readiness
Energy and Utilisation Data – MWh not MW	WPD Operability Framework	Energy Management and Forecasting	DSM tariff structure	Transducers and measurement equipment
Network Connectivity	DSR Shared Service (link to TSO)	Time Series Data Storage and Visualisation	Alternative Connection Agreements	Settlement and metering data for Network Operations
	Visibility Platform (link to aggregators / suppliers)	LV Connectivity / GIS	Managed Connection Agreements	Managed Connection Interface Devices
	Network Charging Methodology	Settlement and Billing		Active Network Management Technology

THANKS FOR LISTENING

WESTERN POWER DISTRIBUTION

Serving the Midlands, South West and Wales

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