WESTERN POWER DISTRIBUTION

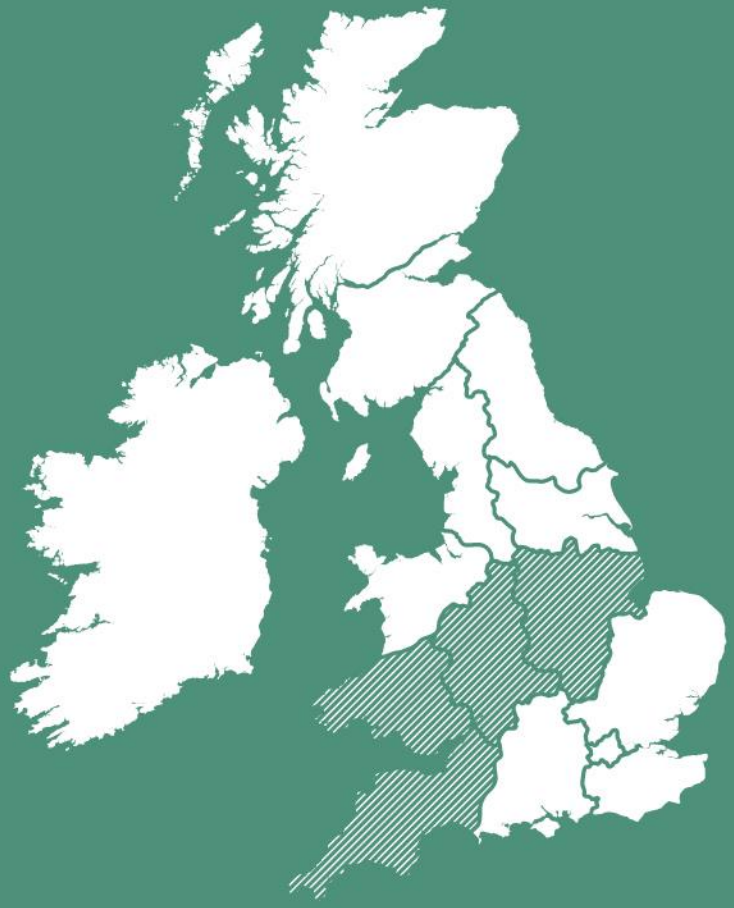
INNOVATION

NEXT GENERATION NETWORKS

Transition to DSO

1.4 DSO Transition

LCNI 2016, 12th October 2016



Steven Gough/James Bennett

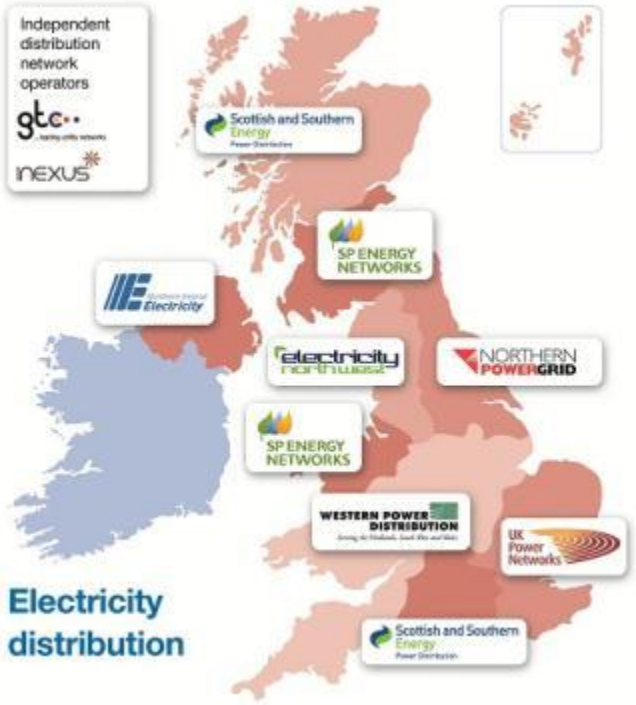
Innovation and Low Carbon Networks Engineer

Agenda

1. Western Power Distribution – Who Are We?
2. Traditional Role of the DNO
3. Distribution Network Transformations
4. Role of DSO
5. WPD Innovation

Who Are We?

- 7.8 Million customers over a 55,300 sq kms service area
- Our network consists of 220,000 kms of overhead lines and underground cables, and 185,000 substations
- LV to 132kV Network ownership



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 LV 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

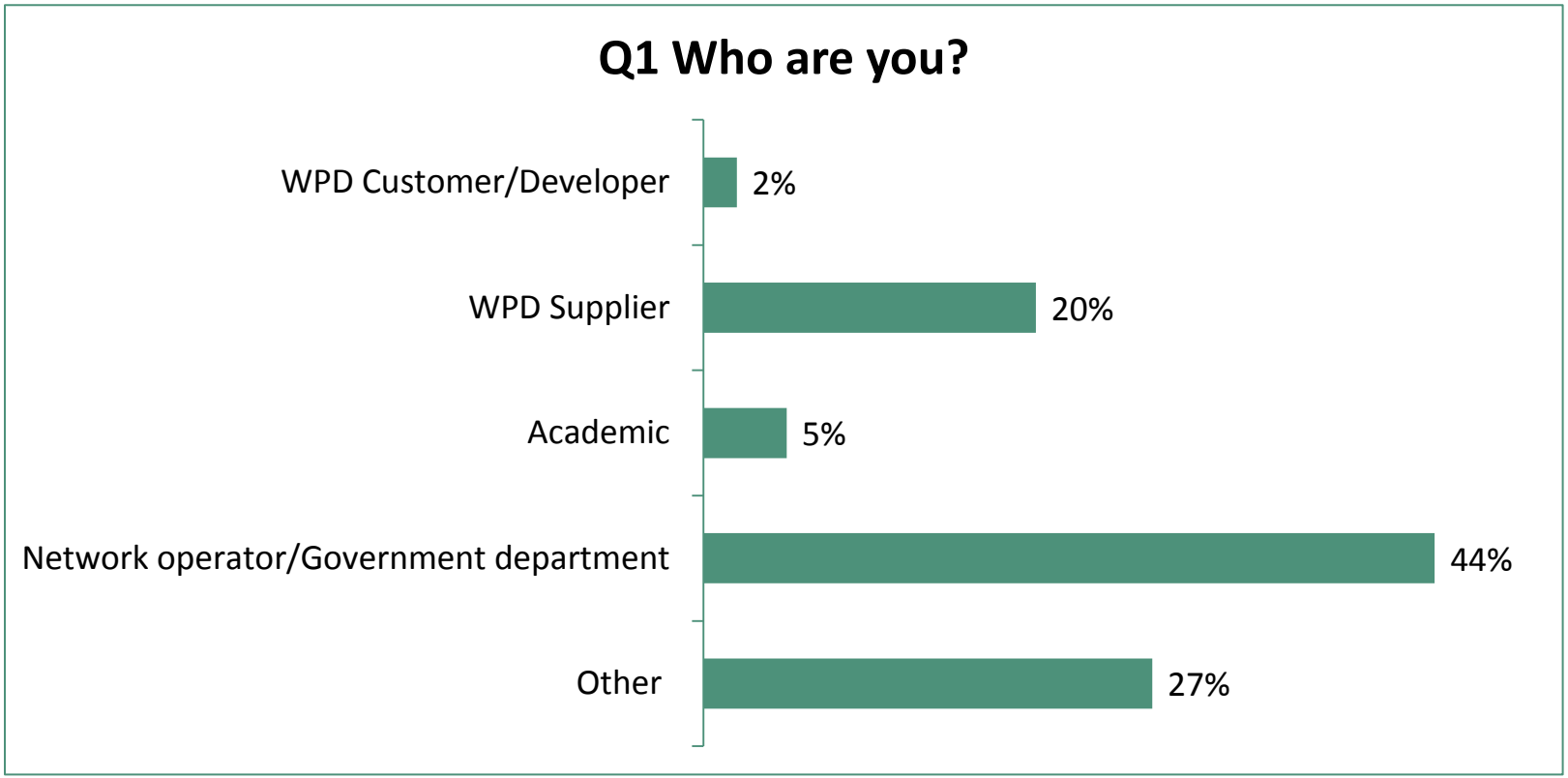
- Airborne Inspections
- AIRSTART[1]
- Telecoms Analysis
- Superconducting Cable
- SF6 Alternatives
- MVDC Test Lab
- Smart Energy Laboratory
- Statistical Ratings
- Primary Network Power Quality Analysis

- Hybrid Heat Pump Demonstration
- Hydrogen Heat & Fleet
- Carbon Tracing
- HV Voltage Control
- Solar Storage
- LV Connect and Manage
- Sunshine Tariff
- CarConnect
- Industrial & Commercial Storage

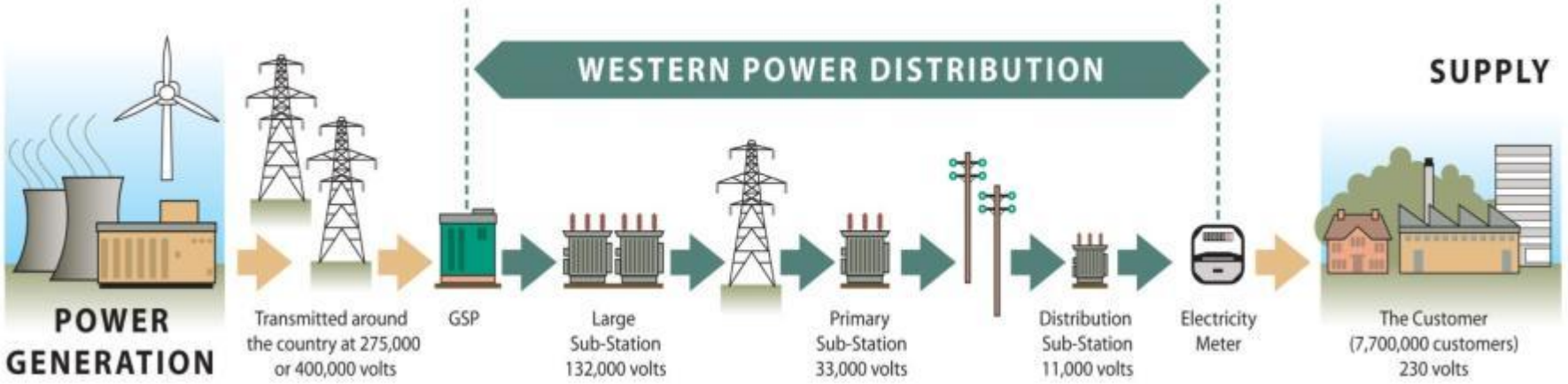
- DSO/SO Shared Services
- Project SYNC
- Project ENTIRE
- Smart Meter data for Network Operations
- Distribution Operability Framework
- Times Series Data Quality
- Voltage Reduction Analysis
- LV Connectivity
- Smart Systems and Heat[2]

As part of WPD Balancing Act Event, participants were asked a series of questions regarding DSOs across two sessions. These graphs summarises the results from those sessions.

This question establishes the demographics in the room. The next questions will be filtered by these sub-categories.

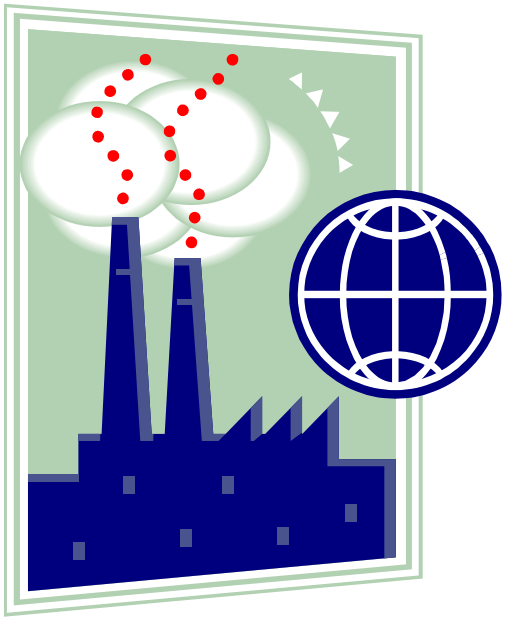


Traditional Role of the DNO



Network Changes - Drivers

- Climate change and international agreements on reducing carbon emissions
- EU and UK binding targets – delivered through renewable DG, EV, RHI
- Rapid changes in GB generation
  - Much more DG
  - Volatile market/incentives
  - Increased need for local and coincidental demand
- Consideration of whole system issues
  - Power
  - Energy
  - Also Gas, Heat and transport fuels
- Significant uncertainty over the pace of change
  - Risk of stranded assets
- Long lead time to build conventional capacity



Network Changes - Drivers

Intermittent renewable DG

- Summertime, daytime DG peaks
- Limited contribution to Winter demand peaks

Electrification of heat and transport

- Larger peaks
- Potentially volatile to external events

Storage – falling prices and mass production

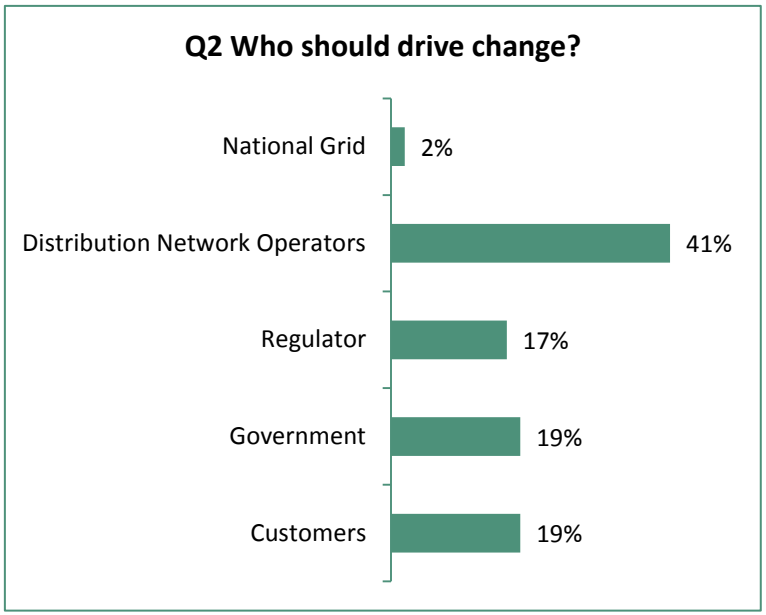
- Potentially disruptive to existing customer profiles
- …but to also be used to help

Building a passive grid to cater for unmanaged peaks is cost prohibitive

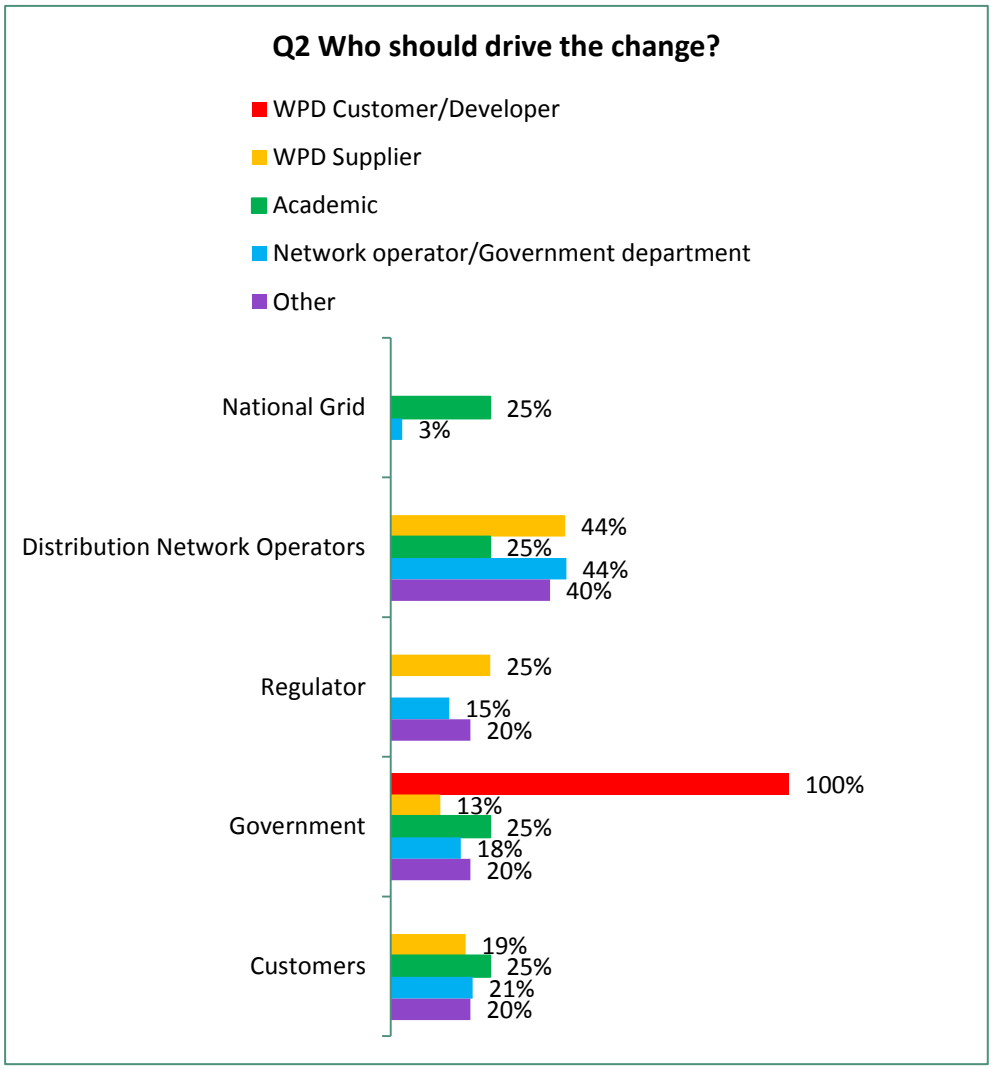
- Customer interest in managed connections (eg ANM)

Coordination with GBSO essential

- Avoid paying for conflicting services
- Distribution network compliance and customer service
- Facilitate residual balancing by the SO

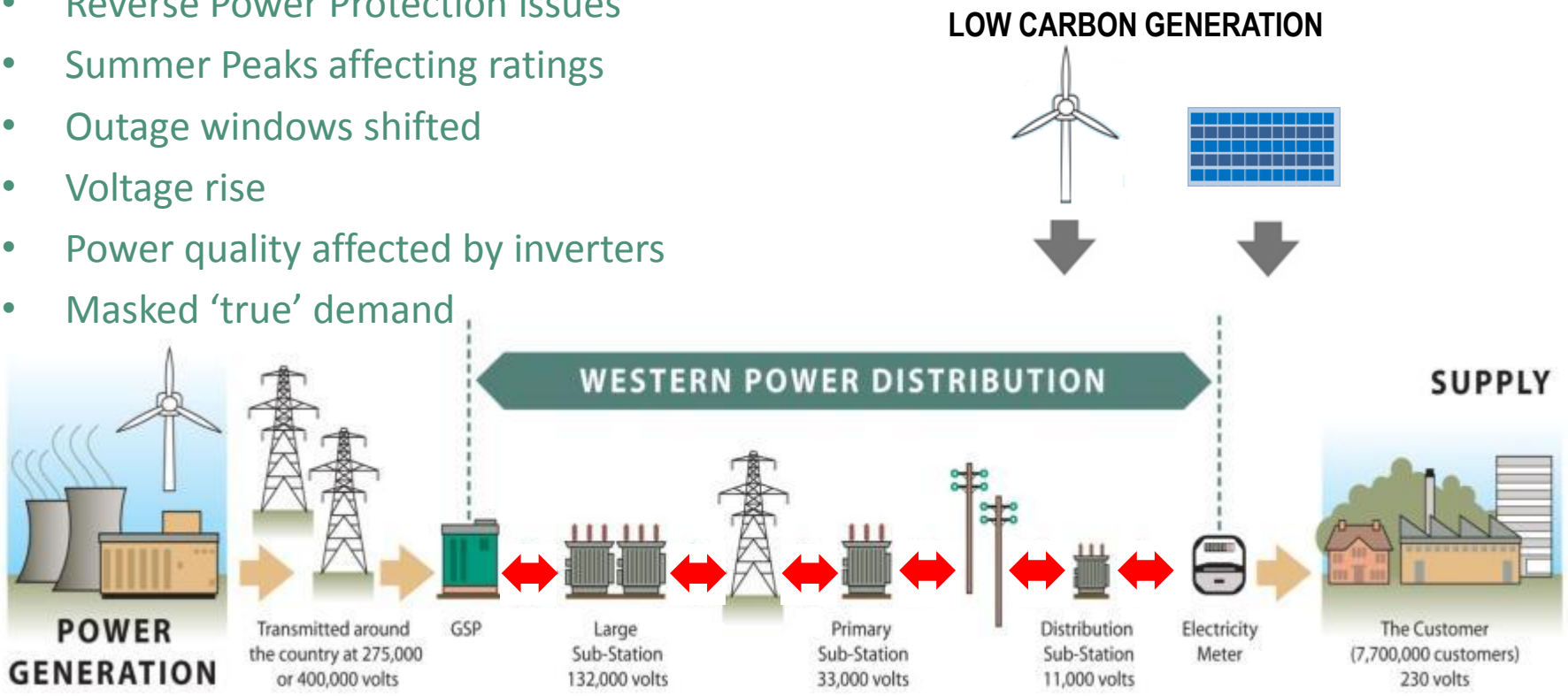


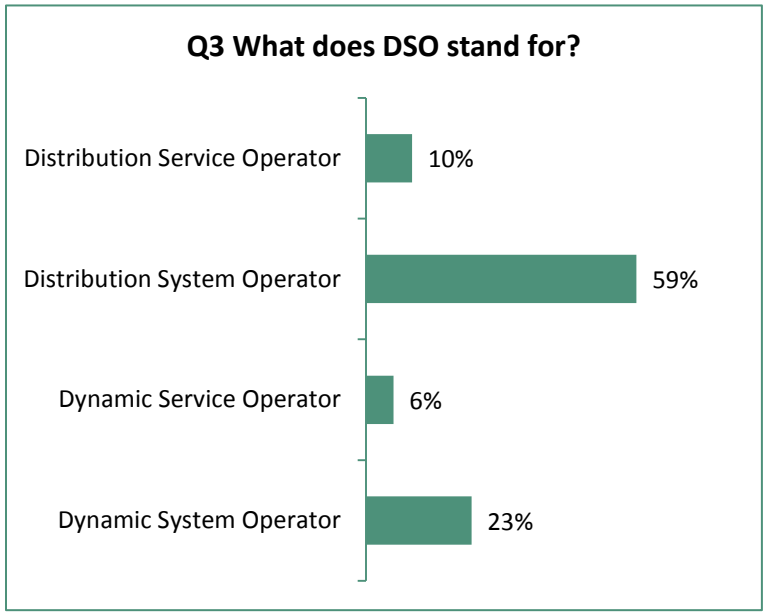
It was clear that the DNOs should be driving change as they are the key parties who have the most to gain or lose. Also they are the parties who will be required to change the most.



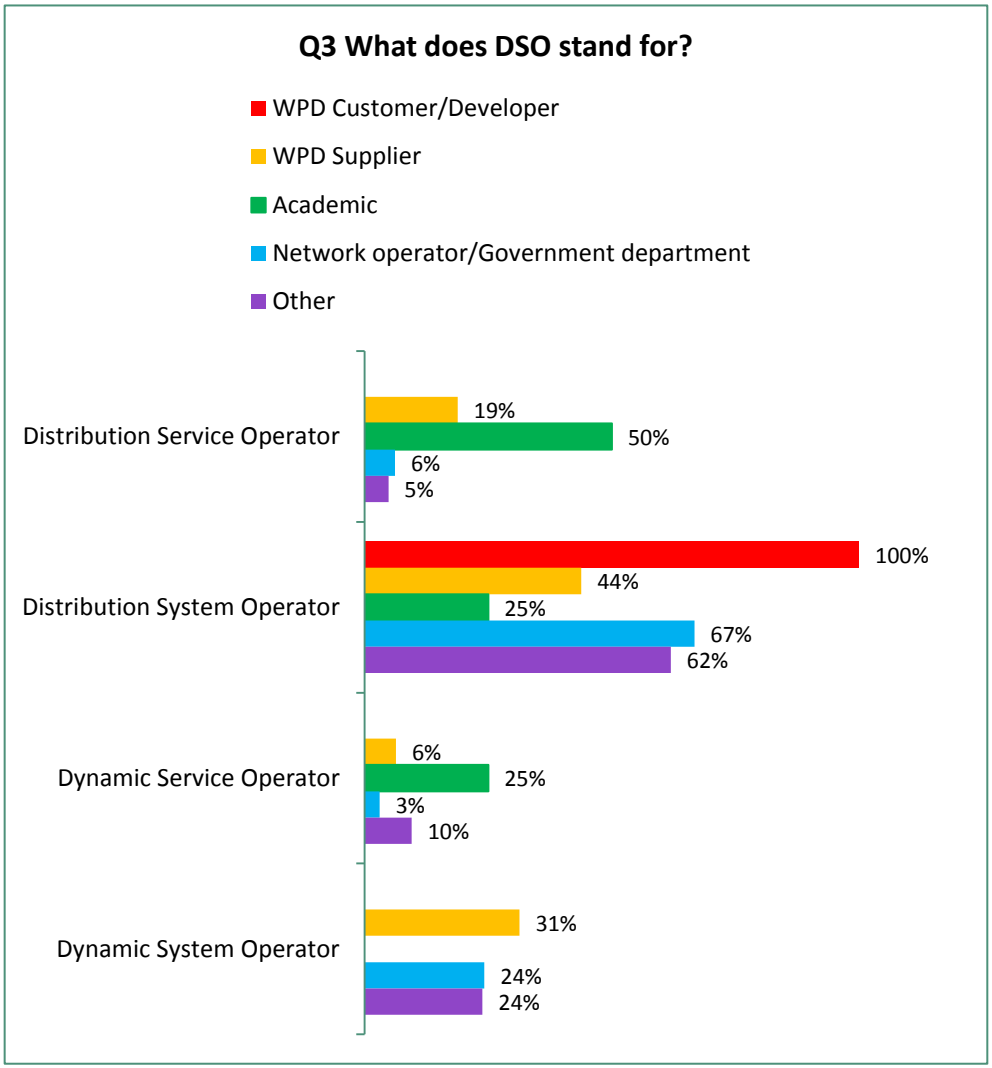
Distribution Network Transformations

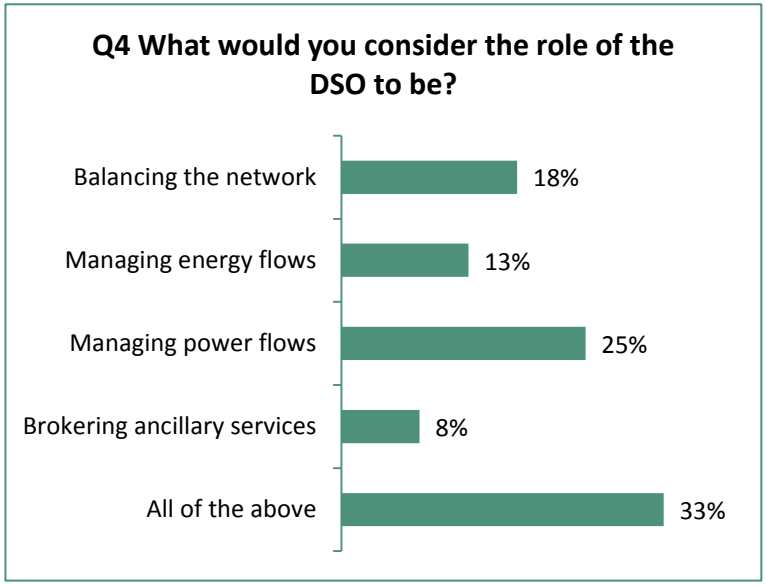
- Bi-directional power flow
- Exporting GSPs
- Potential increase in Fault Level
- Reverse Power Protection issues
- Summer Peaks affecting ratings
- Outage windows shifted
- Voltage rise
- Power quality affected by inverters
- Masked ‘true’ demand





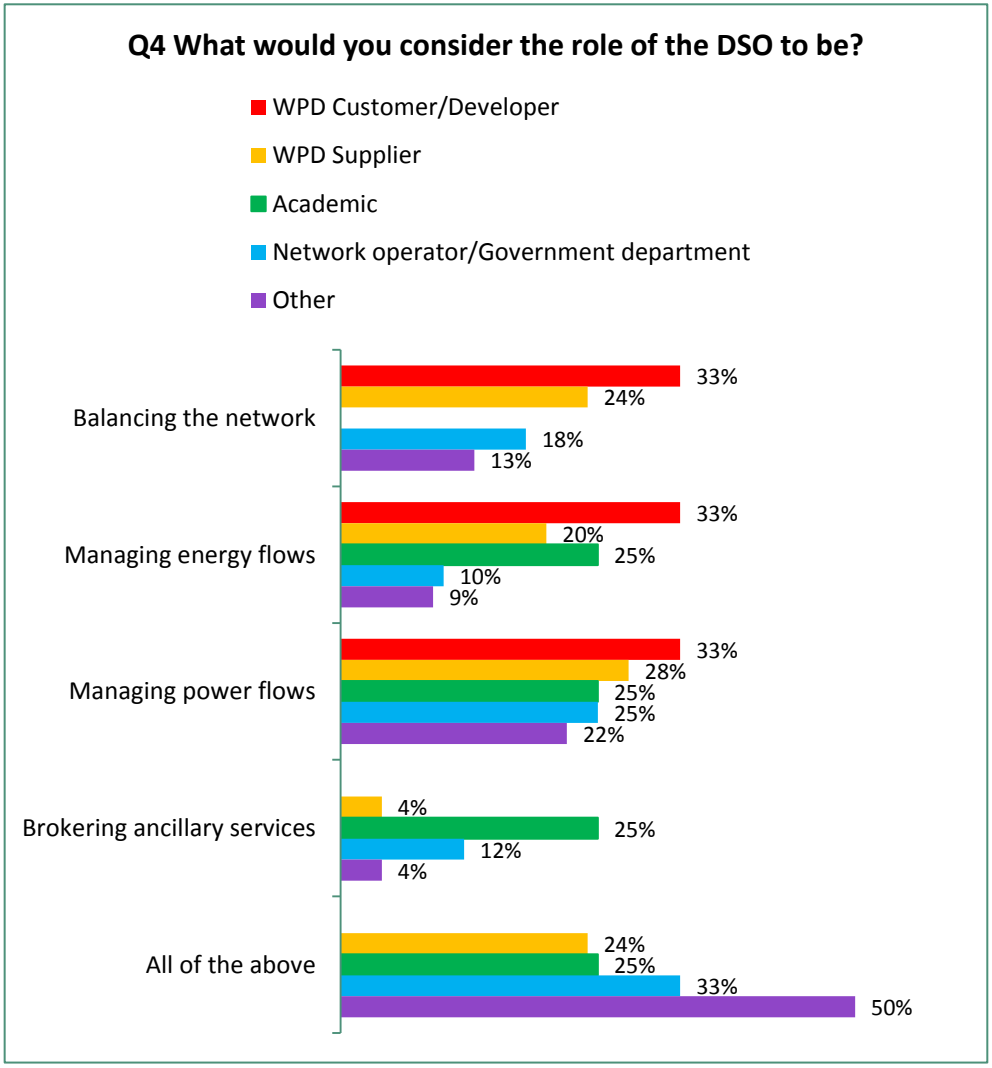
The DSO definition is reasonably well defined among stakeholders, although there is still roughly 40% of the participants who chose one of the other options. This could have been because they thought the term should stand for this option.





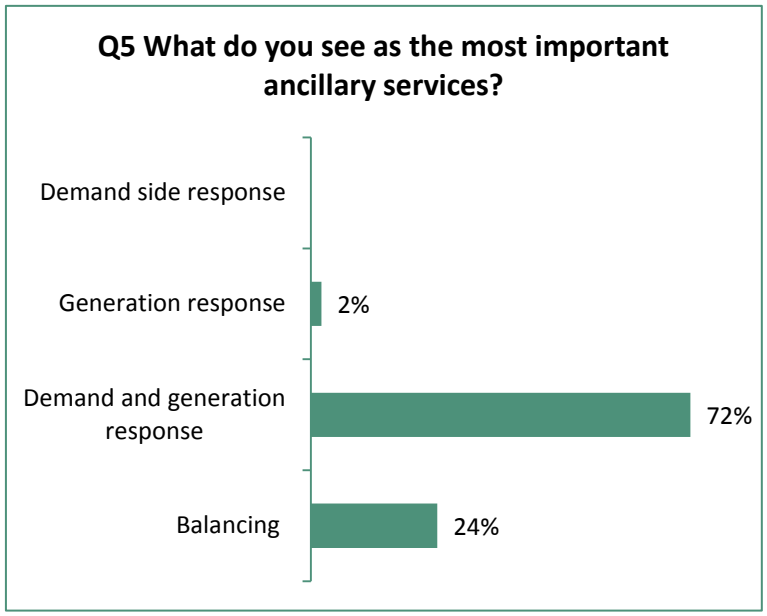
Participants expected role of the DSO is not unanimous. Although the 'All of the above' was just the both popular choice.

Potentially the question could be further refined to make it clear on the differences between Balancing, Managing Energy Flows and Managing Power Levels.

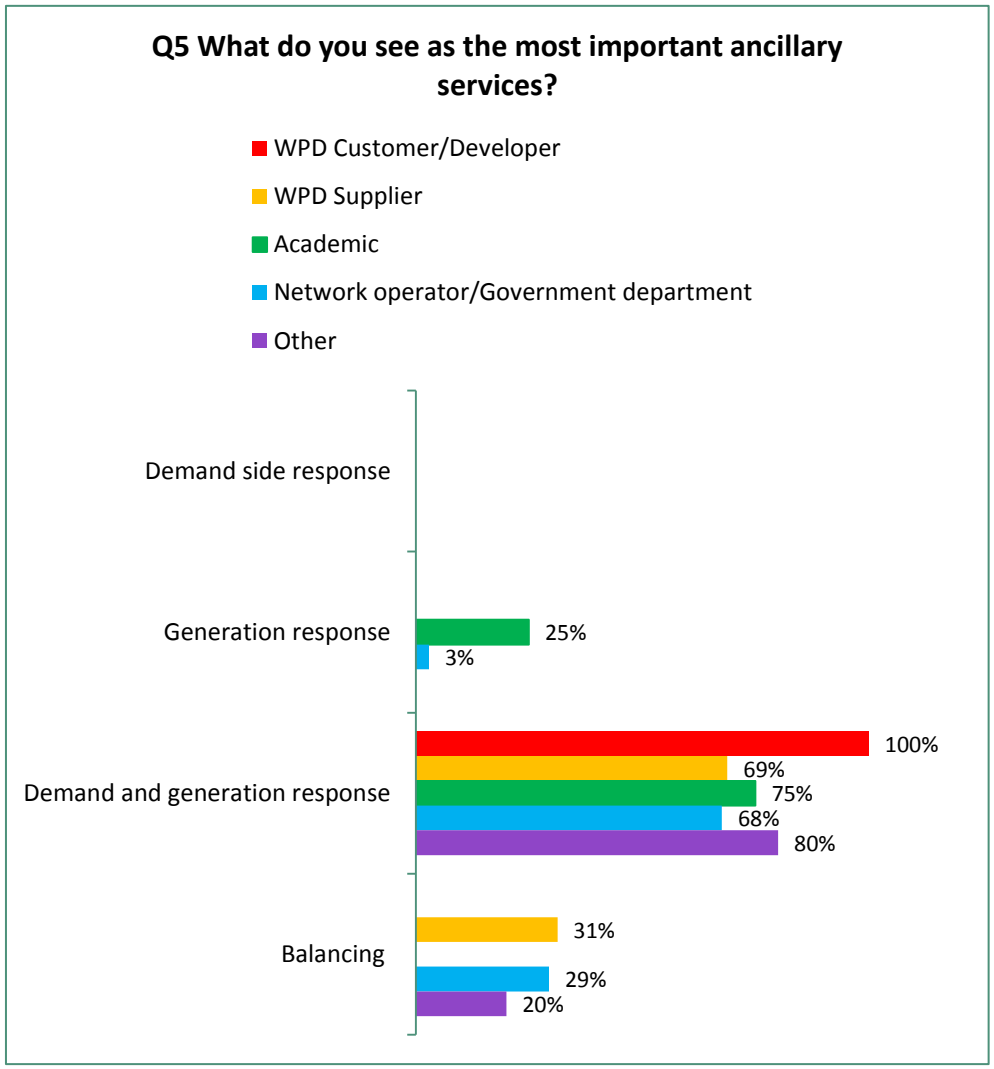


Role of the DSO

- Understanding historic and real time energy flows
- Forecasting future energy volumes across the network (under different scenarios),
- Identifying requirements for flexibility services (DSR)
- Actively reconfiguring the system dependent on need (ranging from seasonal adjustments through to fine adjustments pre gate closure)
- Contracting/despatching DER through commercial arrangements
- Operation of storage and DG where no commercial provider exists, where technically needed or when more cost effective
- Coordinating DSO operations with the GBSO (and using space capacity to provide some services to the SO)
- Maintaining a platform for energy suppliers, communities and other market participants to have visibility of network congestion (and to offer the DSO flexible demand or DG solutions)

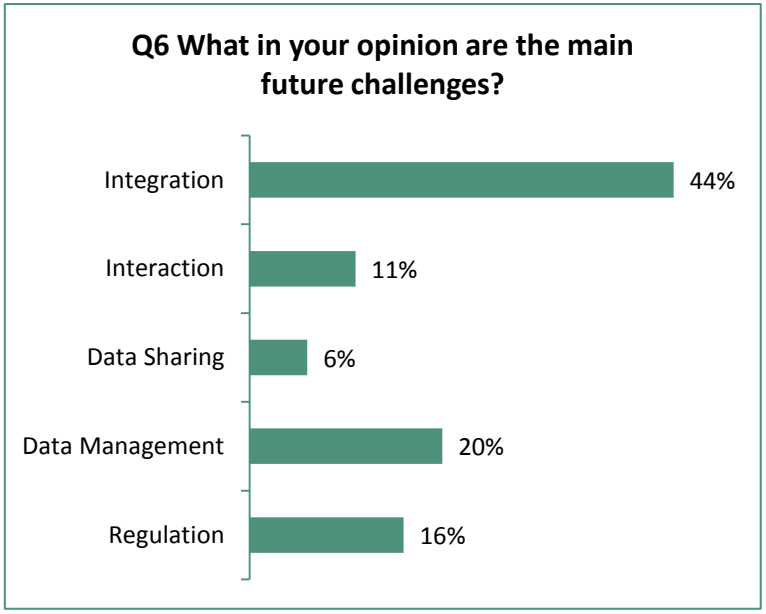


Participants are clear that there is no singular important ancillary service (i.e. Demand or Generation) and that both demand and generation response and balancing services will play an important role in the future.

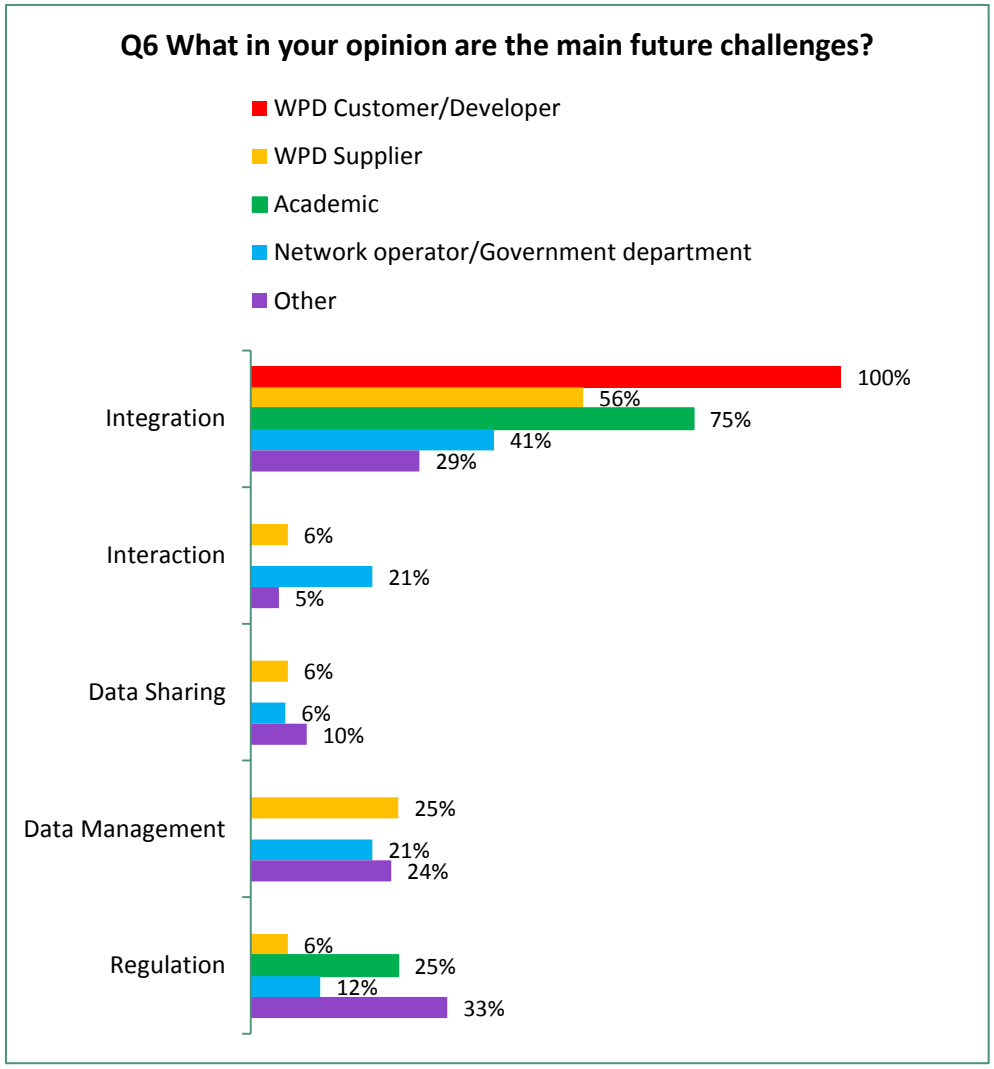


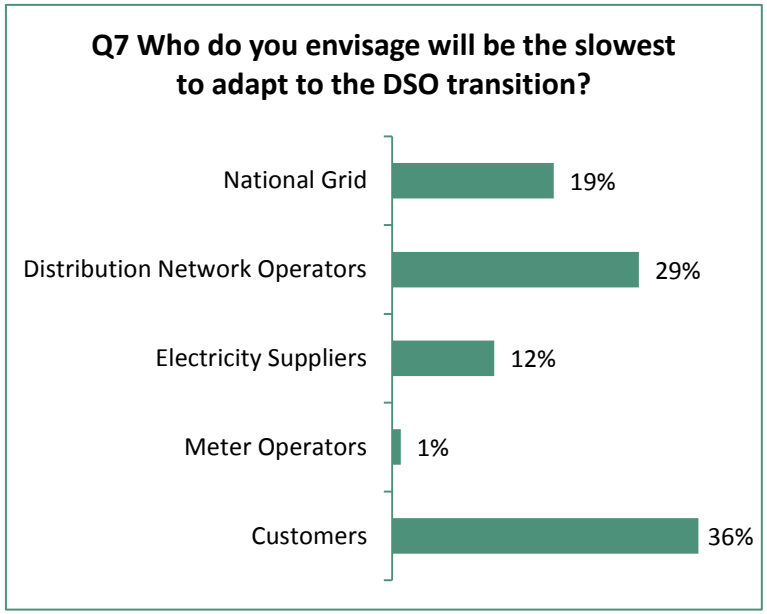
WPD Innovation Project Learning

- LV Templates – Energy profiling
- Low Carbon Hub – development of Alternative Connections/ ANM
- Low Carbon Hub – development of DG constraint panels
- FALCON – I&C DSR (with DG and Active Demand)
- FALCON – Energy Forecasting
- SoLa BRISTOL – domestic DSR and DSM (with batteries)
- Community Energy Action – Community based DSR
- ECHO – domestic DSR (smart plugs)
- Electric Boulevards – Smart EV charging
- Sunshine Tariff – Community DSR (Offsetting DG and Demand)
- SYNC – I&C DSR (demand shifting to summer DG peak)
- ENTIRE – Demand side response
- Solar Storage (DG output smoothing and ancillary services using battery storage)
- Hydrogen Heat and Fleet (demand control through electrolysis and cross vector hydrogen use)
- Plugs and Sockets – EU funded project

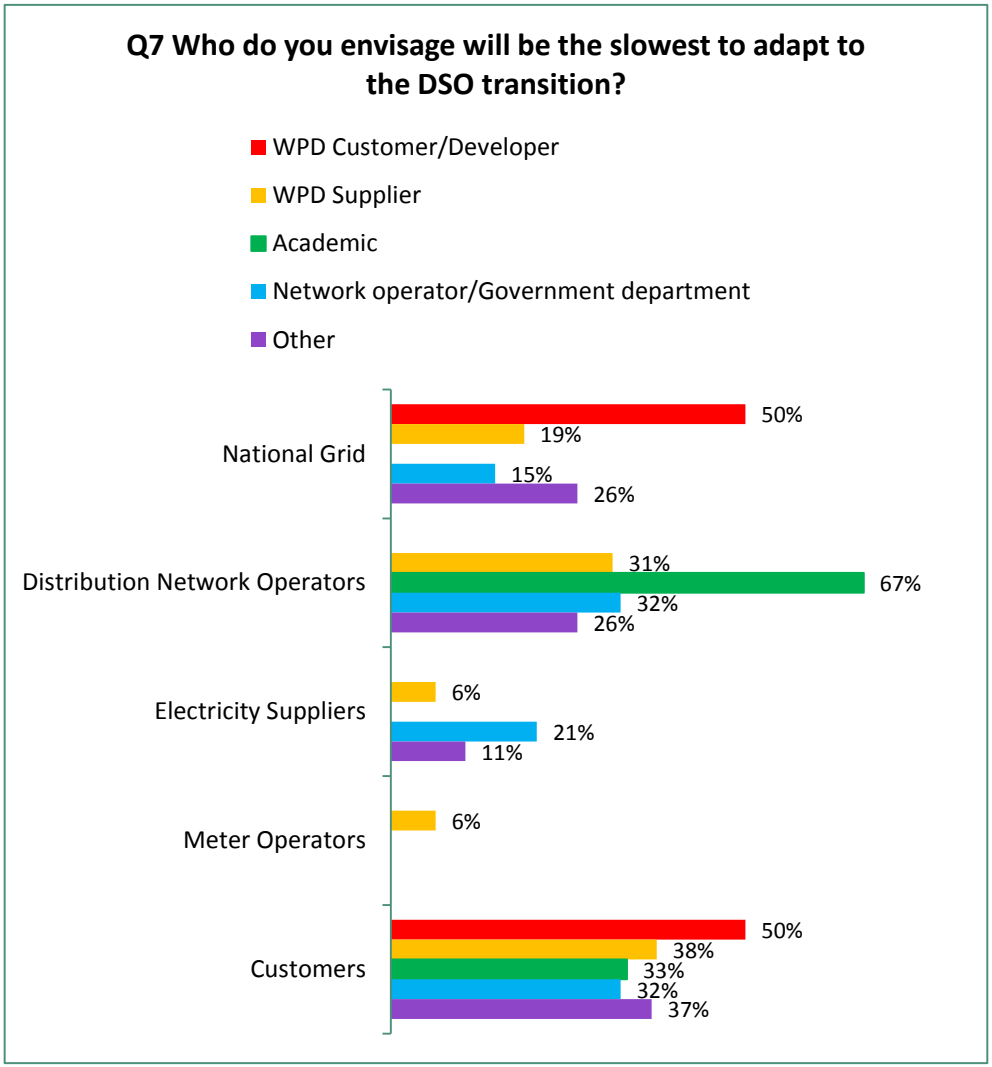


Overall integration is seen as the main future challenge. Interestingly the future challenges as anticipated by Network Operators/Government Departments representatives is reasonably evenly split across Regulation, Data Management, Interaction & Integration.





The Network Operators and Customers are seen as slowest to adapt to the DSO transition. As smart metering is set to play a key role in the DSO future it is good to see that there is confidence in Electricity Supplier and Meter Operators.

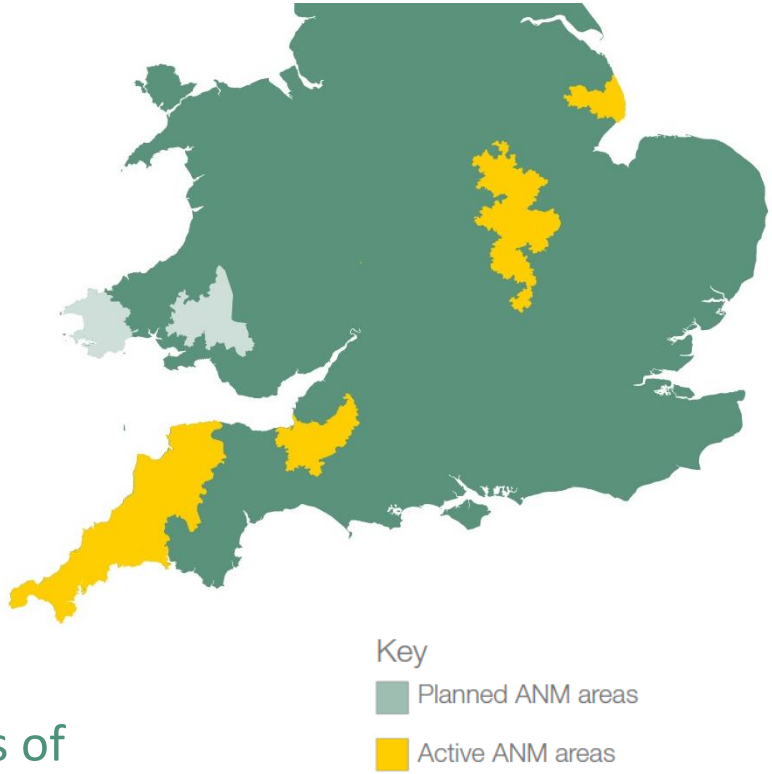


WPD DSO Readiness

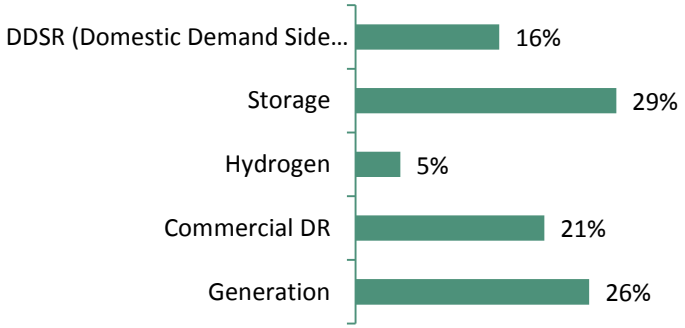
Data Integrity	Market Integration	IT Systems	Customer Propositions	Equipment
Alignment of Data – CIM	WPD regional energy scenarios	Power System Modelling	DSR products by customer segment	Telecommunications readiness
Time Series Data – MWh not MW	WPD Operability Framework	Energy Management and Settlement	DSM tariff structure	Transducers and measurement
Connectivity	DSR Shared Service	Time Series Data Stores	Alternative Connections	Settlement and metering data
	Visibility Platform	LV Connectivity / GIS	Managed Connections	Managed Connection Interface
	Charging Methodology	Settlement and Billing		Active Network Management

WPD Innovation Strategy

- ANM rollout
  - 4 active zones
  - 9 zones due to roll out
  - By 2021 the entire network will be c
- Focus on Demand Side Services
  - A number of demand projects coveri domestic and commercial
  - Projects investigating control over electrification heat and transport
- Key focus on integration of systems and data
  - Several projects looking at the readiness of internal systems
  - Verification of data and enabling greater use



Q8 What technologies are likely to be most important in the DSO transition?

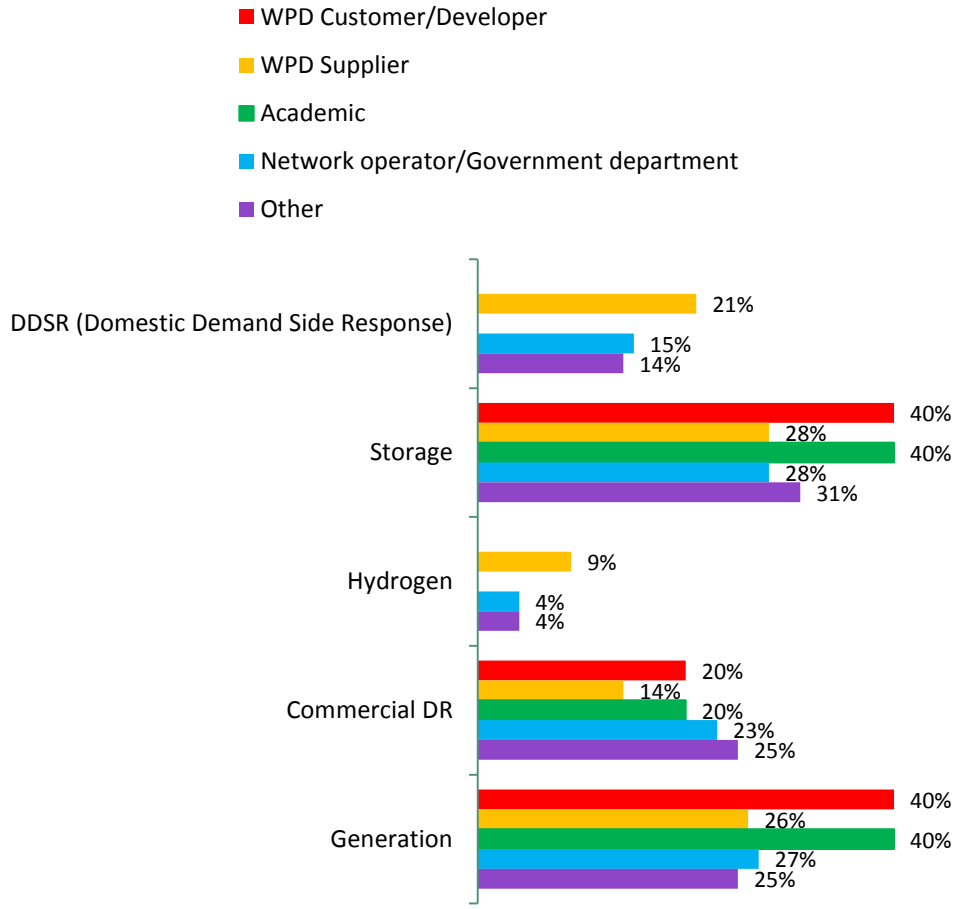


Domestic Demand Side Response (DDSR) is not seen as of prime importance in the DSO transition. Whilst singularly domestic actions are small the cumulative effects could be huge and of great use when the DSO role has matured.

Hydrogen is not seen as a particularly important either. This may be due to the current regulatory and technological barriers currently in place.

People's preference were focused on nearer term technologies.

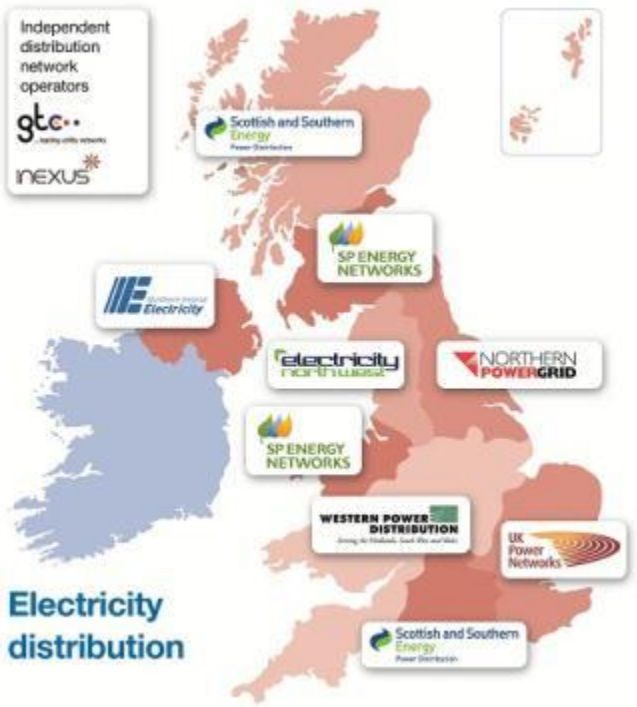
Q8 What technologies are likely to be most important in the DSO transition?

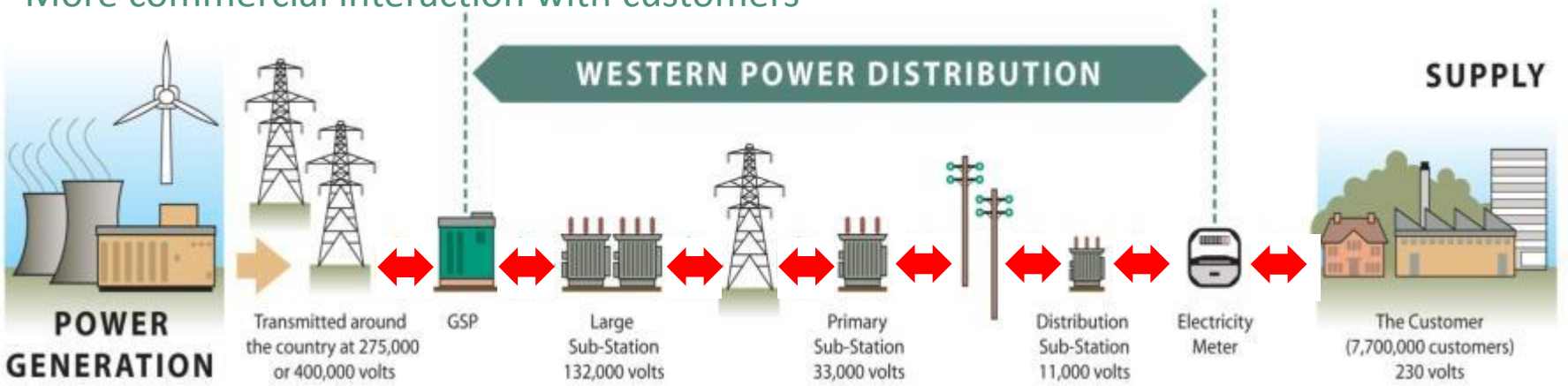


Who Are We? (Future)

- 7.8 Million customers over a 55,300 sq kms service area
- Our network consists of 220,000 kms of overhead lines and underground cables, and 185,000 substations
- LV to 132kV Network ownership

- Managing Energy not Power
- Demand response contracts
- Balancing & Settlement
- Enhanced connections
- More commercial interaction with customers





THANKS FOR LISTENING

WESTERN POWER DISTRIBUTION

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