WESTERN POWER DISTRIBUTION

Serving the Midlands, South West and Wales

Transition from DNO (Distribution Network Operator) to DSO (Distribution System Operator)

Stakeholder Workshops - Afternoon Surgery

January 2016

Need for DSO Functions

- Intermittent renewable DG
  - Summertime, daytime DG peaks
  - Limited contribution to Winter demand peaks
- Electrification of demand
  - Larger peaks
  - Potentially volatile to external events
- Storage – falling prices and mass production
  - Potentially disruptive to existing customer profiles
- 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

DSO Capabilities

- Understanding historic and real time energy flows
- Forecasting future energy volumes across the network (under different scenarios),
- 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 potentially providing 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)

WPD DSO Readiness

- Increasing focus on Network Strategy, Innovation and transition to DSO
- Five areas of focus:

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

- Continuing role for innovation funding
  - NIA/NIC – Trials continue to provide new learning
  - IRM – developing future DSO capabilities

Data Integrity

- Integrated Network Models to a common standard to allow data sharing with other parties
- Improvements to existing time series data through state estimation, meter data aggregation or supplementary network transducers
- As local networks become more active LV connectivity will also be needed for modelling purposes - innovative techniques to infer connectivity should be researched for the WPD regions where data is not available

Market Integration

- WPD scenarios (regional or sub regional) are being developed taking into account local factors for DG and demand based on the National Grid scenarios but adjusted for local factors
- National Grid's "System Operability Framework" (SOF) focuses almost exclusively on an assessment of transmission issues (with limited consideration of things at distribution level that impact transmission). It is proposed to use the WPD scenarios to develop a distribution focused version of the SOF to highlight future issues and inform market participants of future restrictions or to highlight a need for ancillary services.
- Links between DSO and GBSO systems to give visibility of real time conditions
- Further trailing of coordinated GBSO/DSO services

Technologies being considered in scenarios

Key Distributed Generation , Storage and Demand Technologies Assessed	
Solar PV - Ground Mounted	**Conventional and STOR DG Capacity**
Solar PV – Roof Mounted	Gas, diesel and gas CHP
Onshore wind – Large Scale	**Demand technologies types**
Onshore wind – Small Scale	Electric vehicles
Anaerobic digestion – Electricity production	Heat pumps (domestic)
CHP	Heat pumps (communal/commercial)
Hydro	**Energy Storage**
Emerging and new DG technologies	Energy storage “Own Use”
Geothermal	Energy storage “Network Support”
Tidal stream	Energy Storage “Generation Support”
Wave energy	
Note - Tidal range and large scale offshore wind have not been included as these projects will most likely connect at the transmission network level	

Scenario development

- Started in S West – S Wales, E Midlands and W Midlands to follow
- Using the same 4 future economic scenarios as NGET but focus on local factors e.g. for onshore wind

FES Scenarios - Implications for Onshore Wind in the South West

Consumer Power

- Medium growth scenario
- Higher proportion of smaller single turbine projects – individual landowners, farmers and community groups
- Wind cost parity reached circa 2023 2025
- SW growth slightly less than national FES growth scenario
- Higher proportion of small wind projects
- Projects focused in high resources areas but relatively distributed across BSP areas

Gone Green

- Highest overall growth scenario
- Both larger and small scale wind projects
- Positive planning environment
- Economic and finance
- Wind cost parity reached 2020
- High carbon price
- SW growth slightly above UK FES growth scenario and SW historic trend

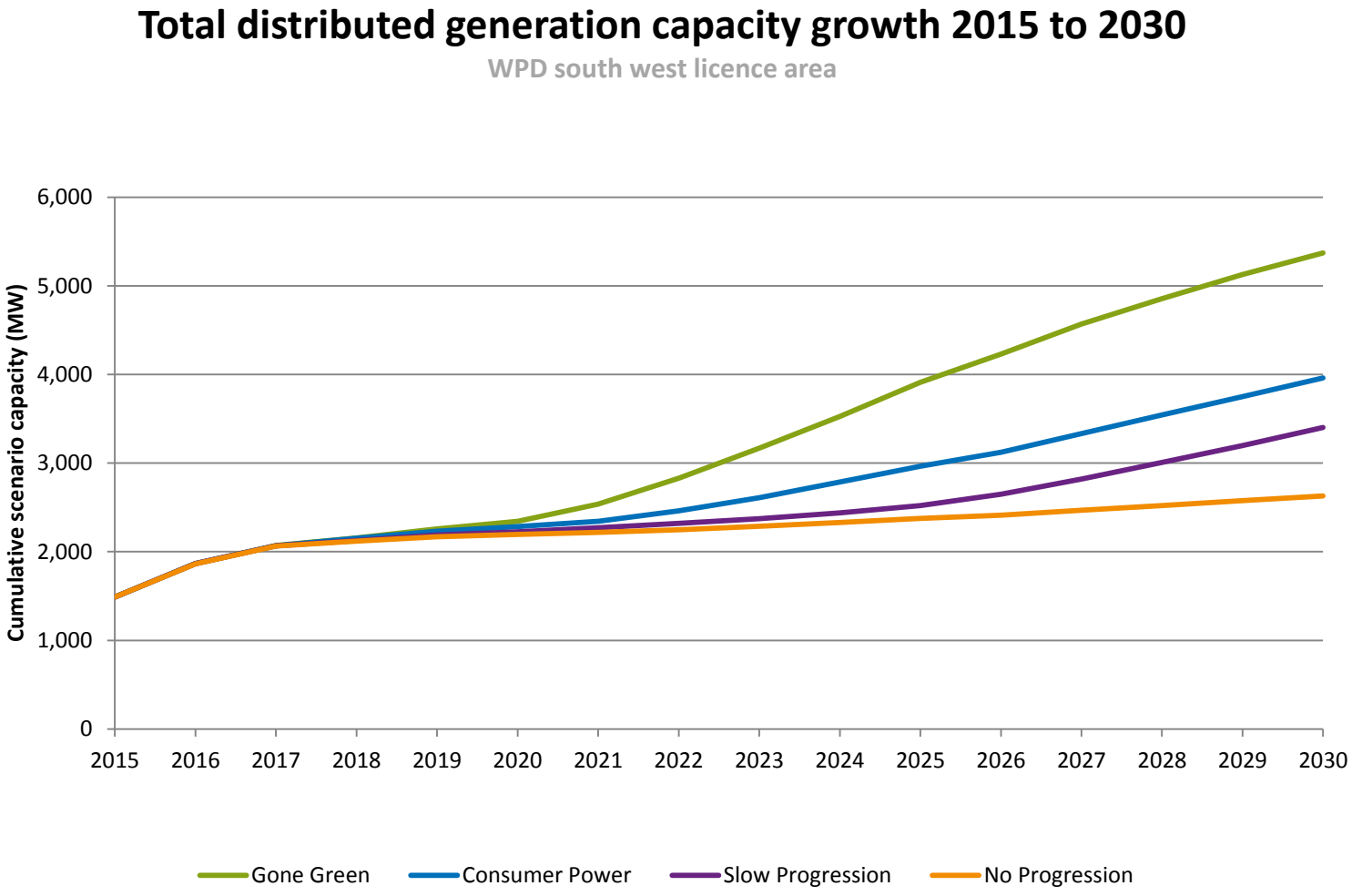
No Progression

- Lowest growth scenario
- Poor planning and economic environment
- Growth would be very slow 2020-25 with a slight increase post 2025 as price parity met
- Lead time in planning becomes a significant factor for any new projects to enter pipeline in the period to 2030
- Growth would be more weighted to economically viable (ie larger in prime resource areas) projects, though limited by planning

Slow Progression

- Medium growth scenario
- Positive planning environment
- But poor economic and finance outlook
- Wind cost parity reached 2022
- Higher proportion of larger wind farms
- Wind cost parity reached mid 2025
- SW growth slightly less than UK FES
- Higher proportion of small wind projects
- Projects focused in high resources areas but relatively distributed across BSP areas

Initial results for DG in S West



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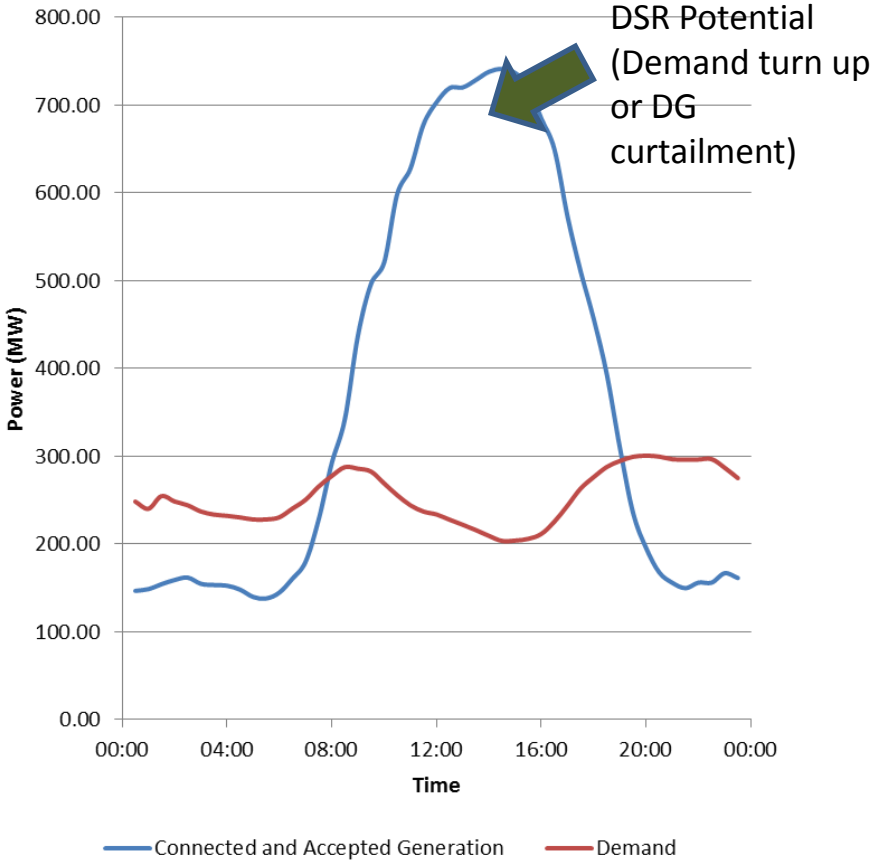
DSR Purpose and Definitions

- DSR can be used to reduce network stress at summer (DG) and winter (Load) peaks
- DSR is delivered through active control of Distributed Energy Resources (DER – DG, Storage or Active Demand). It can add/remove volume or time shift energy.
- Demand Side Management (DSM) is a subset of DSR and is more passive in nature. DSM can be based on time of use tariffs or time dependent connection agreements.
- Active Network Management (ANM) is a form of DSR. It automatically controls DER to optimise network use in line with customer connection agreements. Soft or hard intertrip solutions are simpler variants.
- DSR can be used pre and post fault. Non-firm connections (post fault or planned outages) are also a form of DSR.

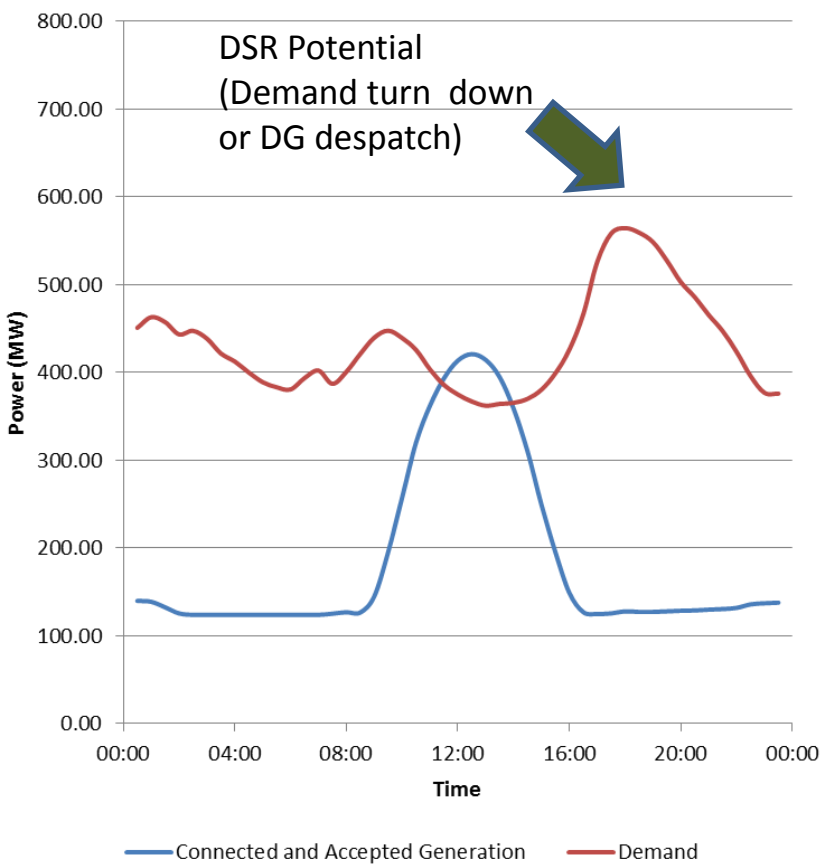
DSR Requirements

Cornwall Demand & Generation Profiles

Typical Summer Day



Typical Winter Peak Demand Day



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DSR Principles

- DSR services will mainly delivered by commercial operators (including suppliers, aggregators, ESCOs and community groups)
- Some DSR may also be provided directly by the DSO (where this is necessary – ie: where no commercial provider exists; when it is technically justified; or lower cost)
- DSR must be coordinated with National Grid requirements/schemes
  - to ensure GBSO actions have the impact expected
  - to ensure the cost of DSR services is minimised across the whole system (coordination not networks competing will deliver best value for customers)
- All customers should have access to DSR on an opt-in basis. Customers may benefit from:
  - Lower cost or quicker connections
  - Direct payments for adjusting network usage (for DSO, GBSO or both)
  - Reduced DUOS charges (for half hourly metered customers)
  - Innovative energy services

WPD DSR Innovation

- ECHO – domestic DSR (smart plugs)
- SoLa BRISTOL – domestic DSR and DSM (with batteries)
- Sunshine Tariff – Community DSR (Offsetting DG and Demand)
- FALCON – I&C DSR (with DG and Active Demand)
- SYNC – I&C DSR (demand shifting to summer DG peak)
- Solar Storage (DG output smoothing and ancillary services using battery storage)
- Clean Energy Balance (demand control through electrolysis and cross vector hydrogen use)

So Bristol La
Solar energy when you need it

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Equipment

- It is important we develop and test technology to support future DSO operations
- Further work is planned in the areas of:
  - Telecommunication links for collection of time series data and control of DER
  - Intelligent switchgear and control equipment
  - Metering solutions for billing and settlement purposes
  - Active Network Management and system control equipment

Policy Areas that need coordination between DNOs, NGET and Ofgem/DECC

- Charging methodologies
- Connection agreements
- Energy data gaps (and access to smart meter data)
- Grid Codes
- Availability of energy management and trading software
- Ownership / operation of DG and storage