

WESTERN POWER
DISTRIBUTION

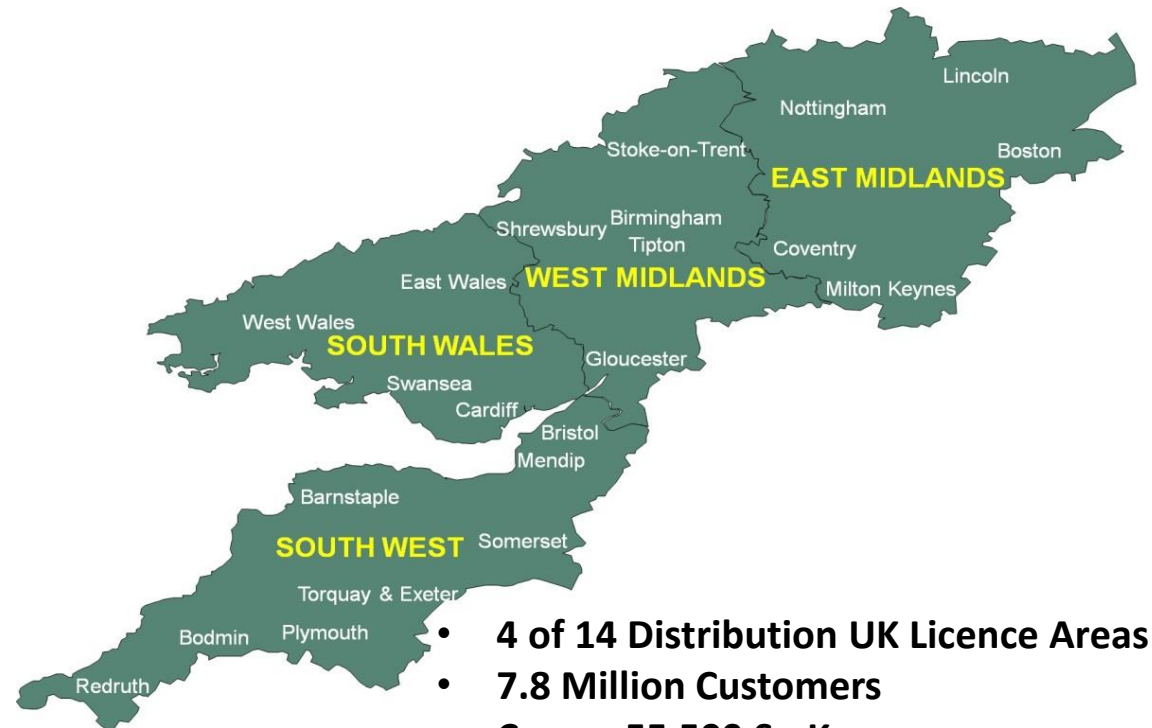


Serving the Midlands, South West and Wales

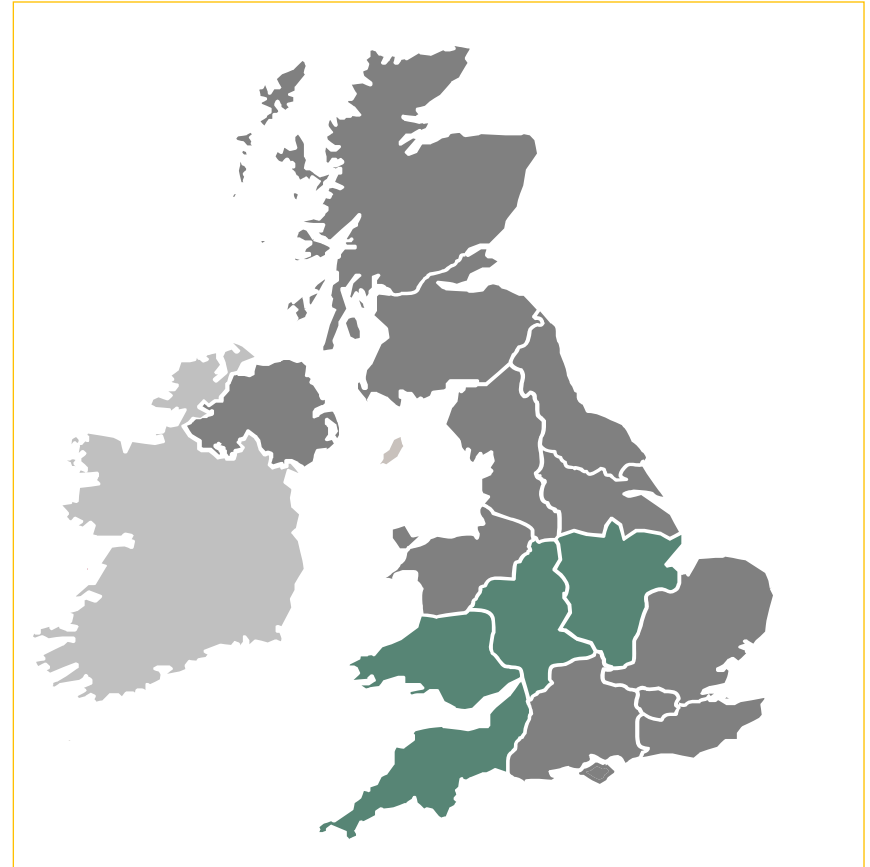
**Strategic Investment Options for
Low Carbon Economy in the
South Wales**

15th June 2016

WPD – Our Area



- 4 of 14 Distribution UK Licence Areas
- 7.8 Million Customers
- Covers 55,500 Sq Km
- 220,000km of Network
- 185,000 Substations



Drivers of the need for this project

- Significant and rapid growth in distributed generation leading to long delays and high costs for further connections
- Uncertainty in future path of both the growth in DG and demand usage
- Ofgem consultation on 'quicker and more efficient connections' raises questions on the role of strategic reinforcement funded by the wider customer base
- Need to understand whether there are 'no/low regret' investment options
- Given the last IPCC report and the Paris Agreement on Climate change it's partly a question of when rather than if there will be further growth in renewable DG and changes in customers usage of electricity

Significant uncertainty of future growth in renewable DG and electricity demand

- Significant uncertainty in the UK growth of renewable generation
- Extracts from Amber Rudd's speech on a new direction for UK energy policy:
 -*'Our most important task is providing a compelling example to the rest of the world of how to cut carbon while controlling costs.'*.....
 -*'We need to get the right balance between supporting new technologies and being tough on subsidies to keep bills as low as possible.'*.....
 -*'We need to work towards a market where success is driven by your ability to compete in a market. Not by your ability to lobby Government.'*.....
 -*'Only when different technologies face their full costs can we achieve a more competitive market.'*.....

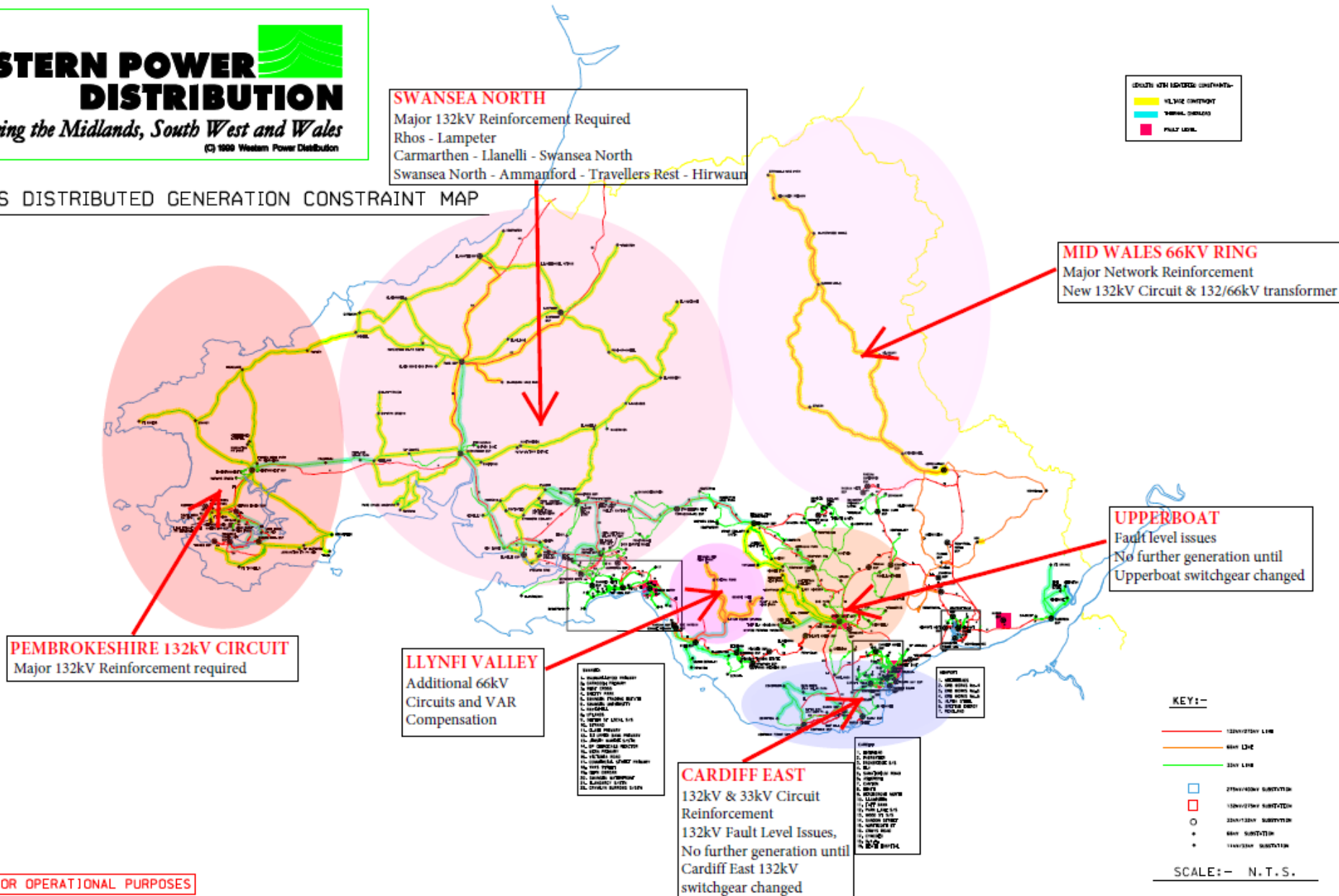
Current DG data for South Wales

Generation Type	Western Power Distribution - South Wales Generator Connections (MVA)			Total (MVA)
	Connected	Committed	Offered	
Photovoltaic	486	678	51	1215
Wind	281	373	22	675
landfill gas, sewage gas, biogas and waste incineration	51	2	0	54
CHP	6	14	7	27
Biomass & energy crops	2	84	30	116
Hydro, tidal & wave power	11	3	0	14
Storage	0	0	30	30
Other generation	803	510	202	1516
Total	1640	1664	341	3645

Current WPD Network Constraints in S Wales

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SOUTH WALES DISTRIBUTED GENERATION CONSTRAINT MAP



Current National Grid Constraints affecting S Wales

- Latest National Grid response to Modification Applications highlights the following issues:
 - Need for generators to have reactive capability between 0.95 Power Factor Lead to 0.95 power Factor Lag at Rated MW Output for voltage regulation control on the National Grid
 - Emergency disconnection arrangements
 - thermal capacity issues
 - Further connection of 'Thermal Generation' restricted without a modification application to NGET to assess the extent of NGET works required to enhance the transmission capacity out of S Wales
 - Reverse power control via an ANM scheme at GSPs at Pyle, Swansea North and Upper Boat 33kV. These will involve pre outage constraint

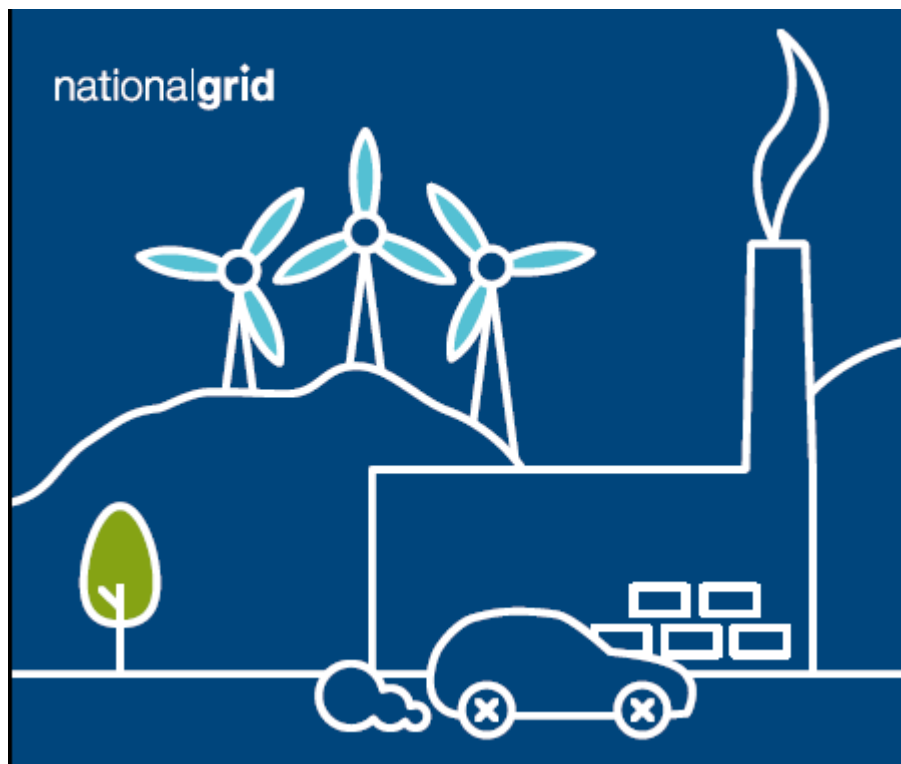
Aim of Study

- Assessing the potential growth in DG by type, general location and year against potential demand changes
- Identifying thermal, voltage and fault level constraints that result
- Assessing options for reinforcement
- Providing recommendations for 'low regret' investment and identifying the cost and timescale of these
- Use this to understand the economic potential for demand side response and/or generation constraint to avoid reinforcement
- Whilst not part of this project the scenarios will also be used to develop a Distribution Operability Framework to help identify issues in addition to capacity that will need to be addressed e.g. harmonics, system protection performance etc.

Approach

- Background Energy Scenarios (decision to use the 4 developed by National Grid to assess GB)
- Resulting Generation and Demand Scenarios for S Wales
- Identification of potential solutions (included those on National Grid)
- Estimation of capacity provided by those solutions
- Cost/timescales of those solutions
- Potential for demand or generation response given the cost of network solutions

National Grid – Future Energy Scenarios



- Annual Publication
- FES 2015
- Considers GB Wide Future Energy Landscape
- Four future scenarios
- From now to 2050
- Electricity Demand & Generation
- Gas Demand and Supply

National Grid – Future Energy Scenarios

nationalgrid

FES 2015



Prosperity



Green ambition

Consumer Power

Economic – moderate economic growth

Political – government policies focus on indigenous security of supply and carbon reduction

Technological – high innovation focused on market and consumer needs. High levels of local generation and a mixture of generation types at national level

Social – consumerism and quality of life drives behaviour and desire for 'going green', not a conscious decision

Environmental – Long-term UK carbon and renewable ambition becomes more relaxed

Gone Green

Economic – moderate economic growth

Political – European harmonisation and long-term environmental energy policy certainty

Technological – renewable and low carbon generation is high. Increased focus on green innovation

Social – society actively engaged in 'going green'

Environmental – new policy intervention ensuring all carbon and renewable targets are achieved

No Progression

Economic – slower economic growth

Political – inconsistent political statements and a lack of focus on environmental energy policies

Technological – little innovation occurs in the energy sector with gas as the preferred choice for generation over low carbon

Social – society is cost conscious and focused on the here and now

Environmental – reduced low carbon policy support and limited new interventions

Slow Progression

Economic – slower economic growth

Political – European harmonisation, focus on low cost environmental energy policies

Technological – medium levels of innovation lead to a focus on a mixture of renewable and low carbon technologies

Social – society is engaged in 'going green' but choices are limited by cost

Environmental – new policy interventions are constrained by affordability

Distribution System Operator

- Generation is becoming more distributed and variable, and new ways for consumers to monitor and manage energy are being introduced
- To make the most of the opportunities offered by these changes, and to deliver against our carbon commitments, while providing reliable and secure supply at minimum cost, we need to encourage customers to consume and produce electricity more flexibly
- Flexibility can offer alternative solutions which avoid or defer the need for reinforcement and support cheaper and timelier connections
- DNOs engaging with consumers to procure flexibility and having a greater involvement in local balancing will become Distribution System Operators (DSO)

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
- 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)

Timetable

- Stakeholder workshop to get stakeholder input to approach and scenarios to be considered – June 2016
- Complete development of detailed demand and generation scenarios – July 2016
- Undertake network studies and identify solutions with costs - August - October 2016
- Sensitivity work – i.e. how much ‘headroom’ do the potential solutions give – October/November 2016
- Assess potential for demand response/generation constraint – November 2016
- Complete report – December 2016
- Dissemination event – January 2017

Questions?