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Serving the Midlands, South West and Wales

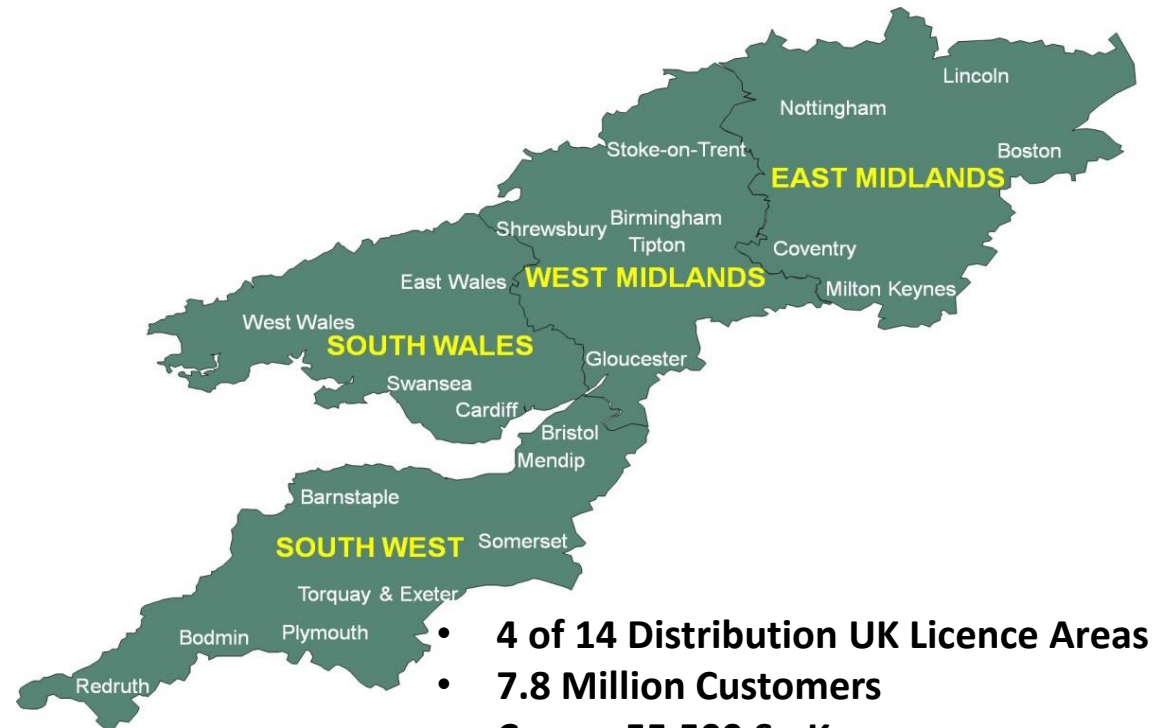
**Strategic Investment Options for
Low Carbon Economy in the
South West**

3rd February 2016

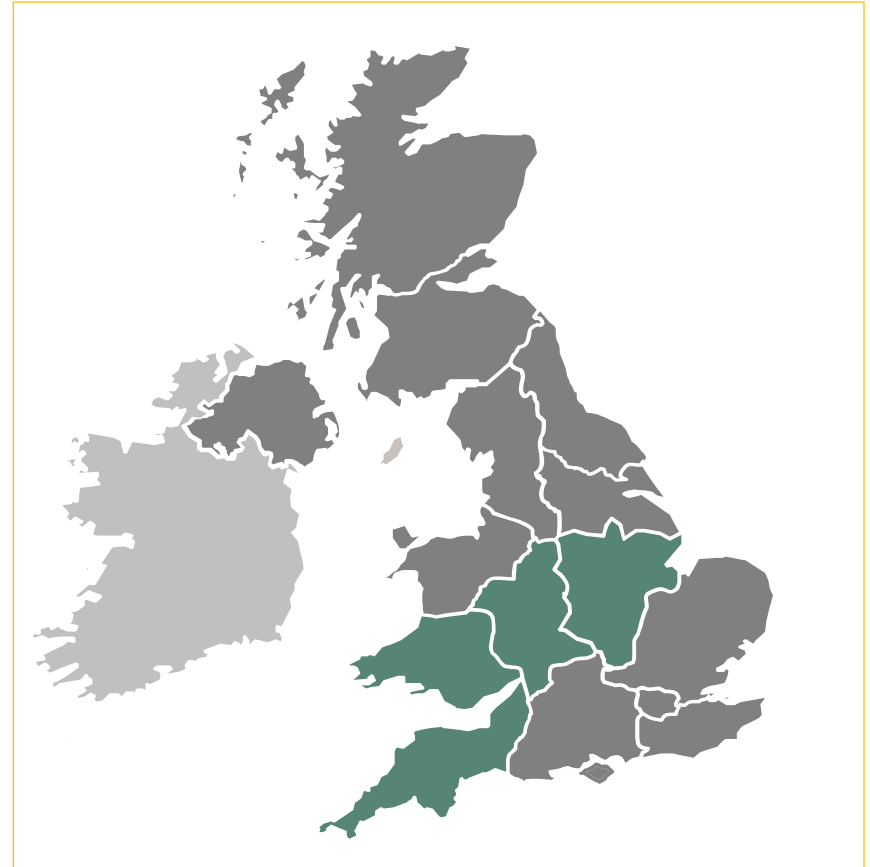
Agenda

- Welcome and Introduction
- Project Overview and Timetable
- Demand/Generation WPD South West Scenarios
- Scenario Development Case Study – Onshore Wind
- Feedback/Discussion
- Next Steps
- Lunch/Close

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 West

Generation Type	Western Power Distribution - South West Generator Connections (MVA)			Total (MVA)
	Connected	Committed	Offered	
Photovoltaic	1,144.9	900.2	226.4	2,271.5
Wind	218.7	202.7	3.0	424.4
Landfill Gas, Sewage Gas, Biogas, Waste Incineration	55.1	100.4	6.0	161.5
CHP	23.9	1.7	25.1	50.7
Biomass & Energy Crops	0.2	1.9	-	2.1
Hydro, Tidal & Wave Power	2.7	2.4	-	5.1
Other Generation	474.5	248.7	256.0	979.1
Total	1,919.9	1,458.0	516.6	3,894.5

Winter Maximum Demand (MW)	2,530
Summer Minimum Demand (MW)	980

Current WPD Network Constraints in S West

K route

Two 94km 132kV circuits
Constrains North Cornwall
and Devon from St Tudy to
Barnstaple

J route

10km 132kV circuit
Constrains North Devon

Fraddon BSP

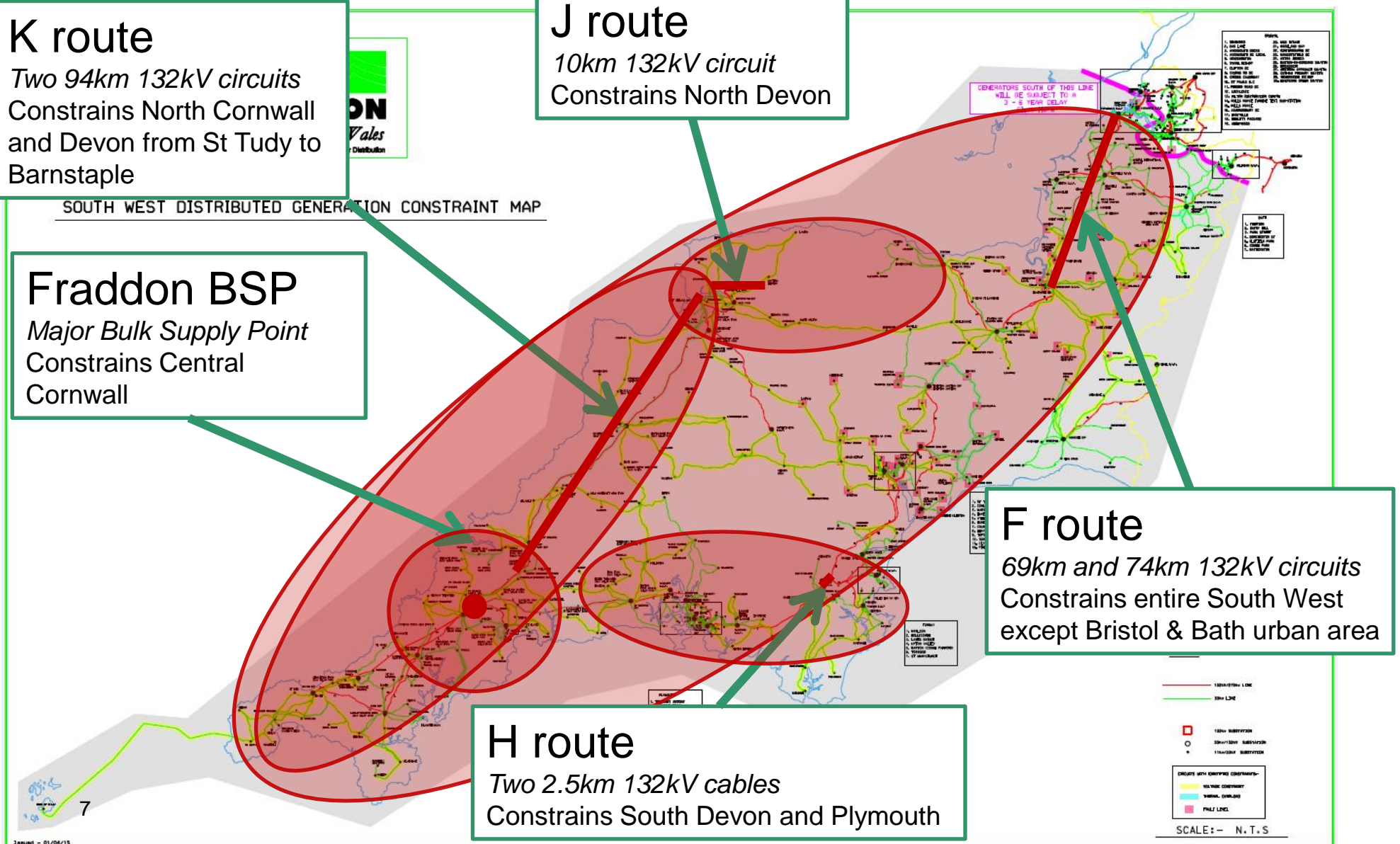
Major Bulk Supply Point
Constrains Central
Cornwall

F route

69km and 74km 132kV circuits
Constrains entire South West
except Bristol & Bath urban area

H route

Two 2.5km 132kV cables
Constrains South Devon and Plymouth



Resulting Restrictions

- All customers in the WPD South West plc region seeking the connection of new generation which contribute to flows on the F-route will presently have the following restrictions included in their connection offers:
 - A delay of 3 - 6 years, subject to planning approval and the completion of National Grid's 400kV works
 - The restrictions will apply to all generator connections requiring works at HV (i.e. 6.6kV or 11kV) or above
- In addition, there are likely to be other reinforcement works included in the connection offers (for more localised issues), plus a requirement to obtain a Statement of Works from National Grid indicating works required on the transmission system
- These other works add further costs and delay to generator connections

Current National Grid Constraints affecting S West

- 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
 - thermal capacity and fault level issues
 - 400kV circuit between Hinckley Point and Melksham requires upgrading
 - Active Management/Intertrips from National Grid are required
 - Whilst not there yet, the system is approaching dynamic voltage stability limits which will require a considerable increase in data from DG to assess with longer timescales than the Statement of Works process

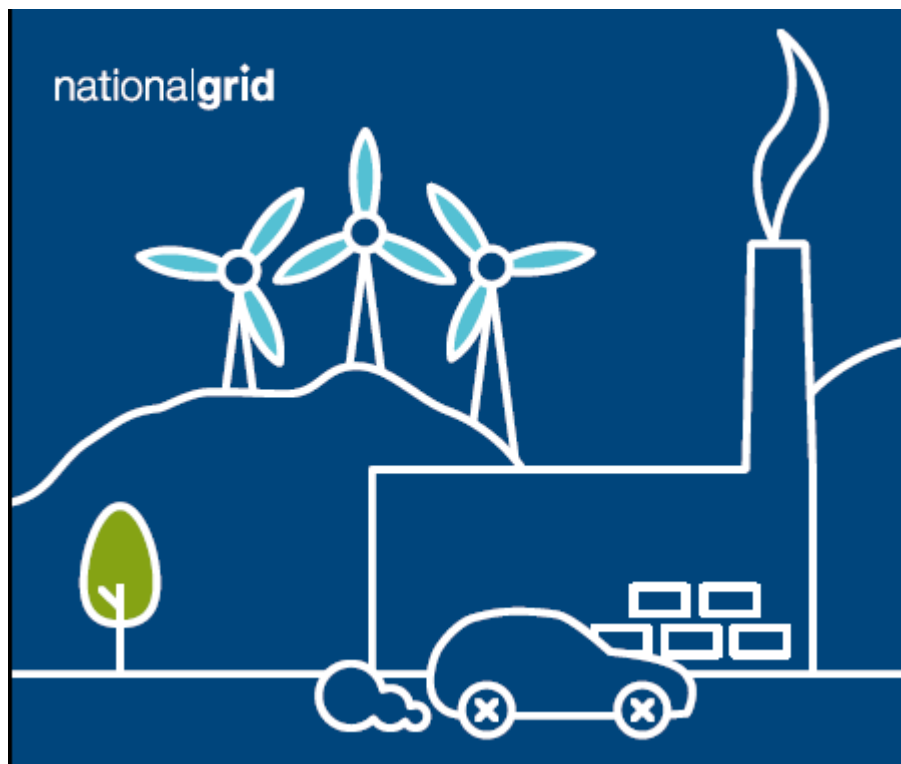
Aim of Study

- 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 West
- 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



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



Green ambition

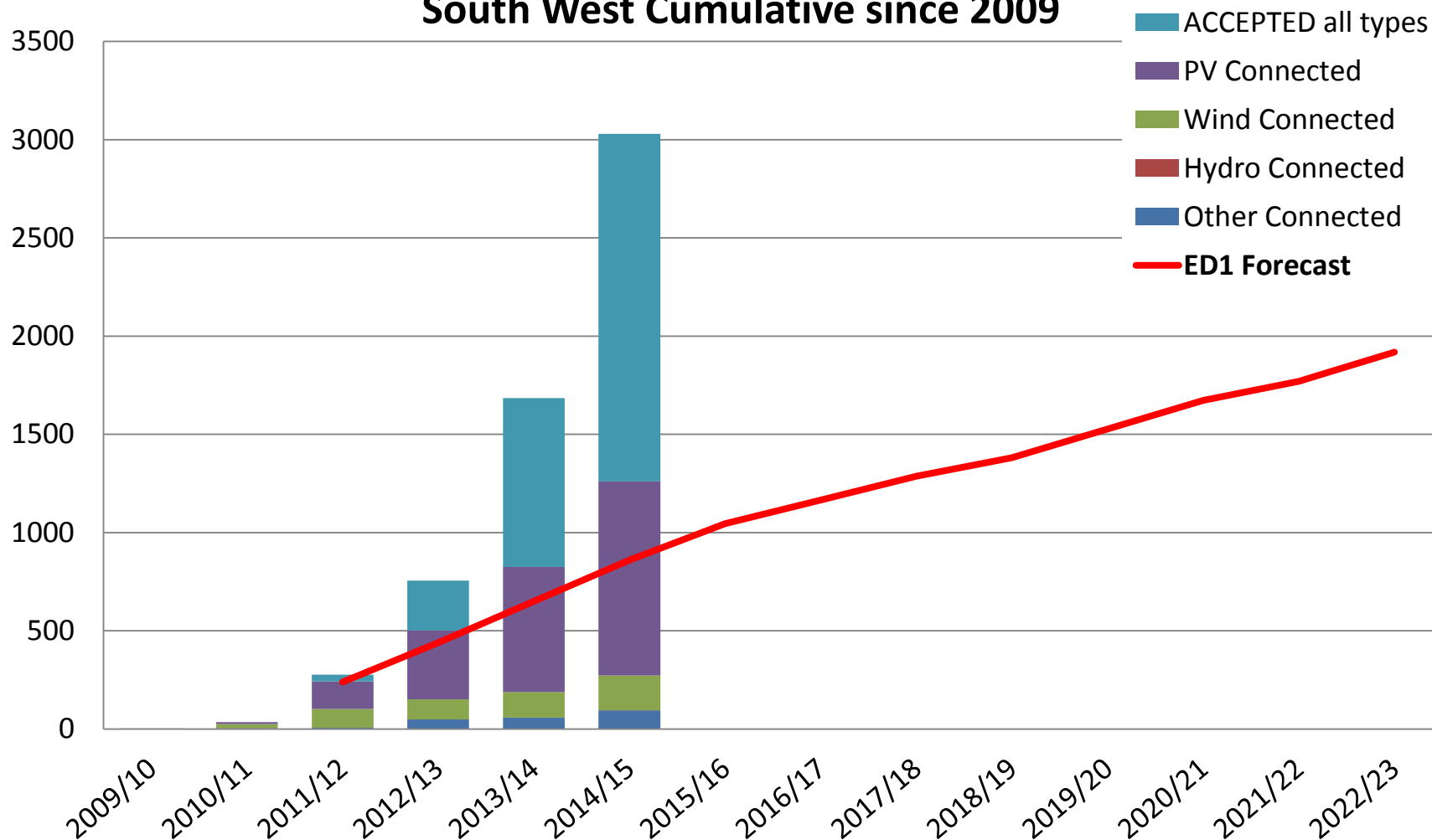


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WPD – South West Experience

DG (MW) Connected + Accepted South West Cumulative since 2009



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
- 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)

Timetable

- Initial stakeholder workshop to get stakeholder input to approach and scenarios to be considered – September 2015
- Develop detailed demand and generation scenarios – Completed in January 2016
- Undertake network studies and identify solutions with costs - February/March 2016
- Sensitivity work – i.e. how much ‘headroom’ do the potential solutions give – March 2016
- Assess potential for demand response/generation constraint – April 2016
- Complete and publish report – April 2016
- Dissemination event – late April 2016

Questions?

Next Steps

- Where possible incorporate stakeholder feedback into scenarios
- Network studies, identification of works needed and cost estimates

Thank you for your attendance and input