WESTERN POWER DISTRIBUTION

Serving the Midlands, South West and Wales

Distributed Generation

Stakeholder Workshop

November 2016

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Housekeeping

- Building Evacuation
- Facilities
- #DGWPD on the @wpduk twitter handle
- Two minutes silence

Agenda

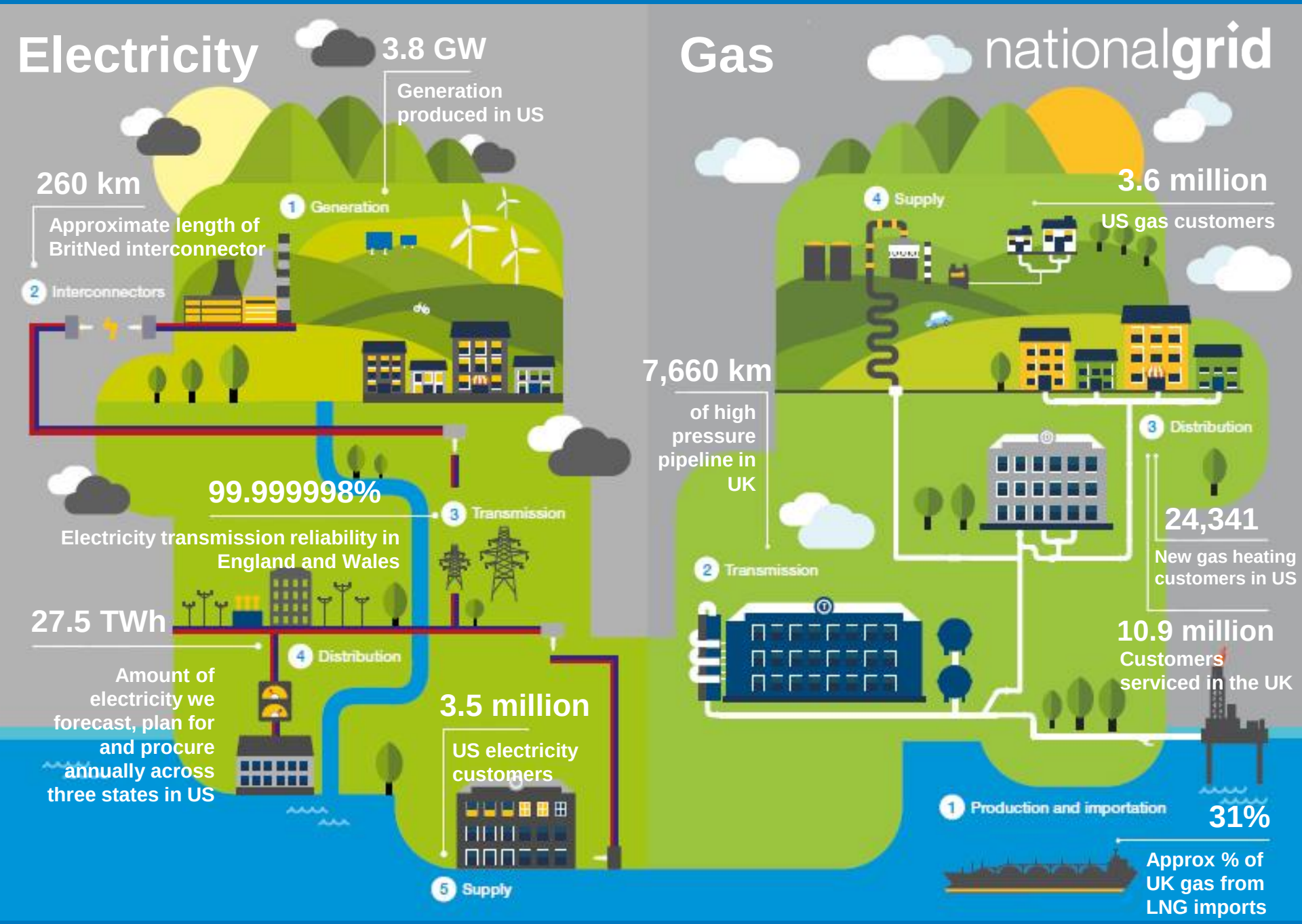
Welcome & overview	09:45 – 10:00
Connecting DG, future challenges - NGET presentation	10:00 – 10:15
Connecting DG, future challenges - WPD presentation	10:15 - 10:30
Introduction to Westbourne as facilitators	10:30 - 10:35
Workshop discussion 1	10:35 – 10:45
Coffee Break	10:45 – 11:10
Transition to DSO - WPD presentation	11:10 - 11:25
Connecting DG - A developer view	11:25 - 11:40
Workshop discussion 2	11:40 – 12:30
Lunch	12:30 - 13:15
Feedback from workshop and panel session	13:15 – 14:00
Close	

System Operation experiences and innovation

Phil Sheppard
Director of SO Operations
National Grid

Agenda

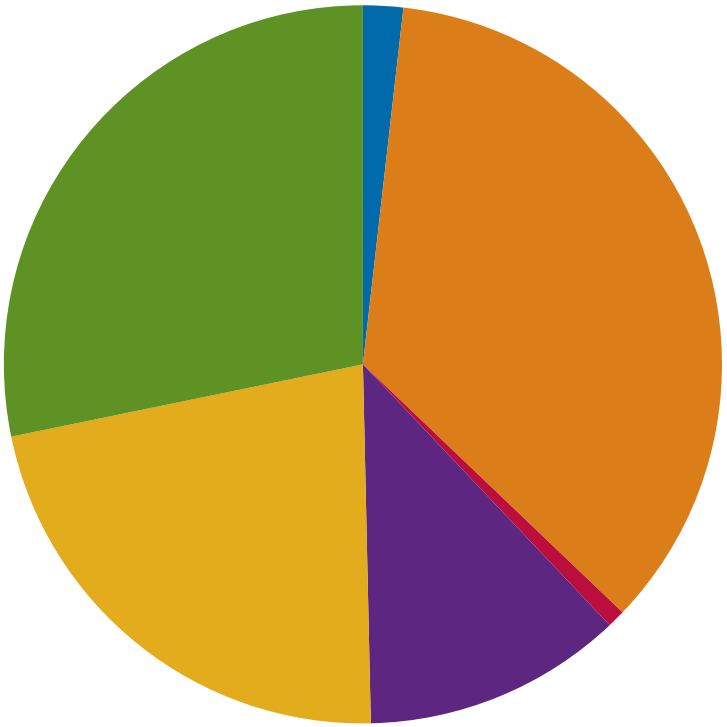
- About National Grid
- Changing generation background
- Challenges in System Operation
- Creating the future network
- Summary

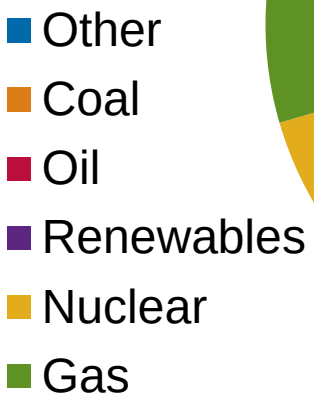

Electricity
3.8 GW
Generation produced in US
260 km
Approximate length of BritNed interconnector
1 Generation
2 Interconnectors
99.999998%
Electricity transmission reliability in England and Wales
3 Transmission
27.5 TWh
Amount of electricity we forecast, plan for and procure annually across three states in US
4 Distribution
3.5 million
US electricity customers
5 Supply
Gas
nationalgrid
4 Supply
3.6 million
US gas customers
7,660 km
of high pressure pipeline in UK
3 Distribution
24,341
New gas heating customers in US
2 Transmission
10.9 million
Customers serviced in the UK
1 Production and importation
31%
Approx % of UK gas from LNG imports

Current energy mix

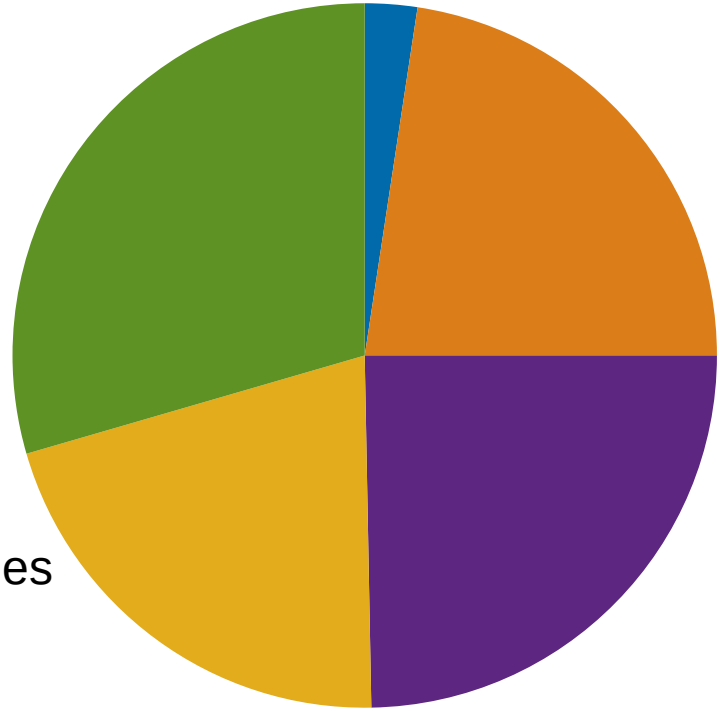
nationalgrid

Q3 2012





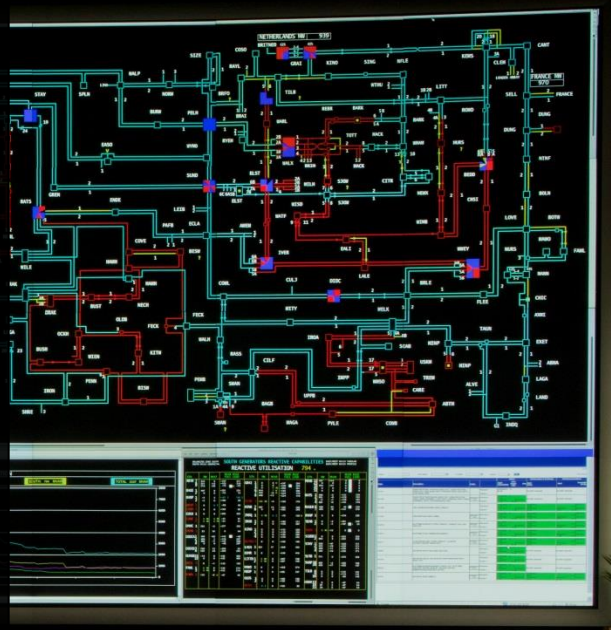
2015

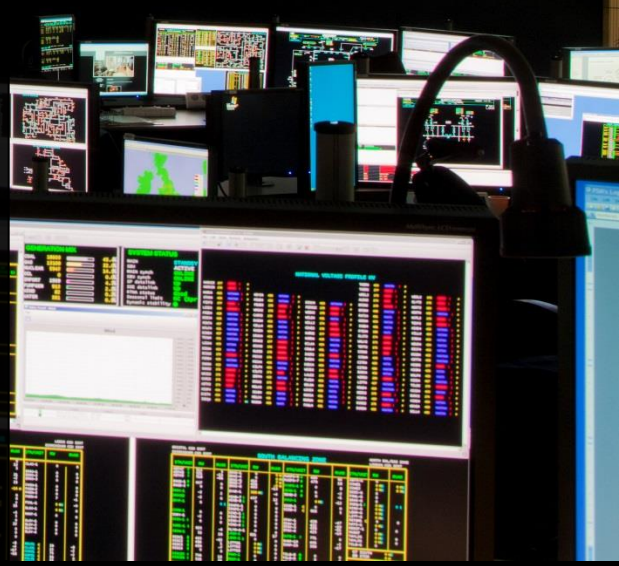


23GW of distributed generation – increase circa 8GW in 2015 mainly solar in the south of England

Challenges and approach

- **Challenges**
  - Normal approach, no further connections after April 2015
  - High voltages >420kV
  - No mechanism to control transmission flows in an emergency
- **Approach**
  - Worked with WPD to identify ways to increase ability to offer connections





Solutions

Technical

- Reduce target volts at GSPs – released 20-30MVA at multiple sites
- Interruptible contracts – allows for disconnection under system stress conditions
- New generation variable target volts +/-0.95pf

Commercial

- Bulk Statement of Works – 1GW in a single application
- Greater visibility and management of distributed generation queue
- Headroom and materiality limits provided to DNOs, allows DNOs to manage their customers more effectively

Next steps

- System Operability Framework published 30 November
- ENA – Transmission, Distribution Interface working group
- Completion of Statement of Works trail – roll out best practice across GB
- Continued collaborative and supportive working with DNOs and developers to find solutions

Summary

- Changing energy mix is now
- Through collaboration GWs of additional projects have connected
- System Operability Framework highlights issues and solutions
- Cross industry ENA working group to identify long term solutions

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Connecting DG – the challenge

Friday 11th November 2016

Graham Halladay

Network Services Manager South West

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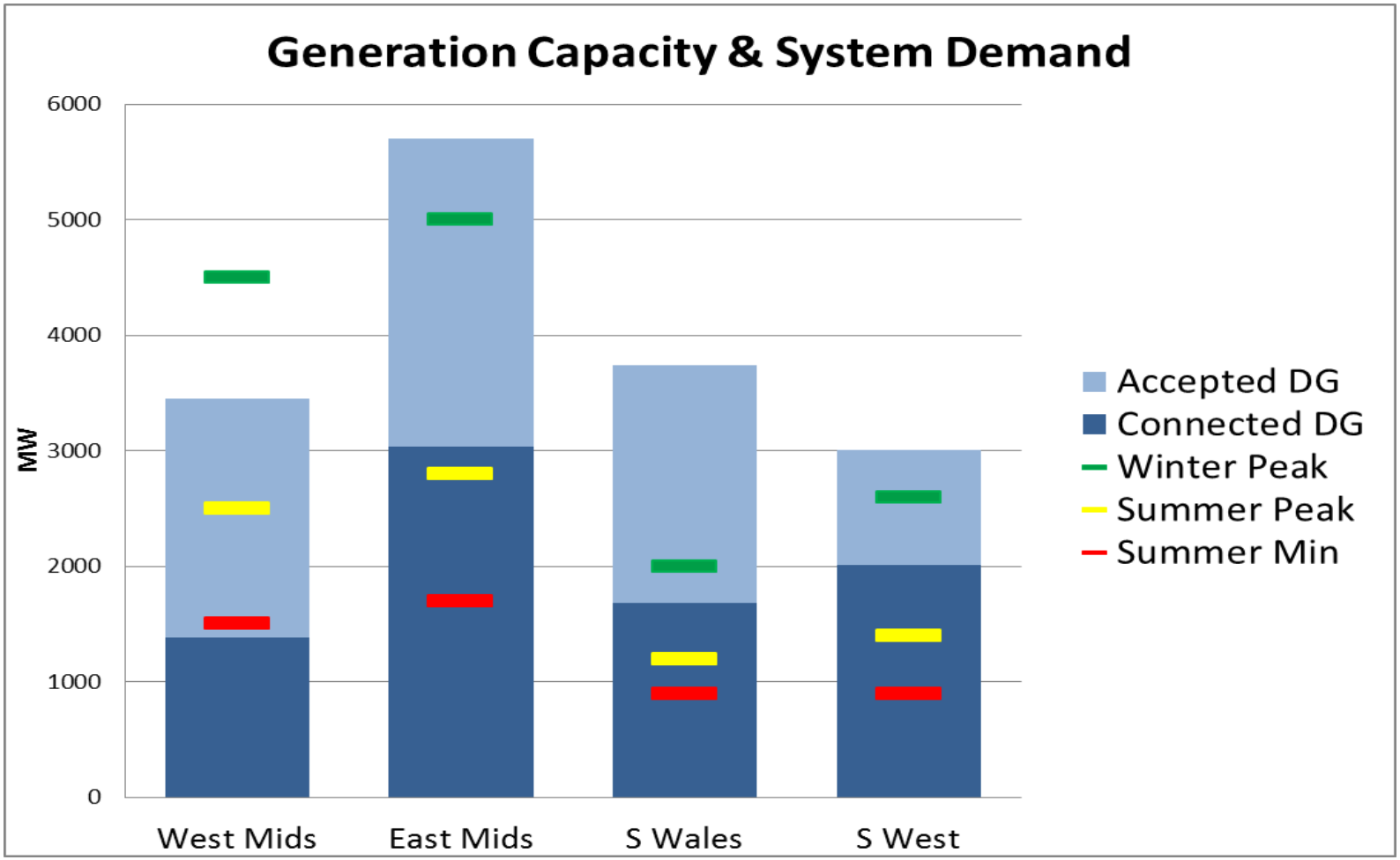
Volumes of DG on WPD network



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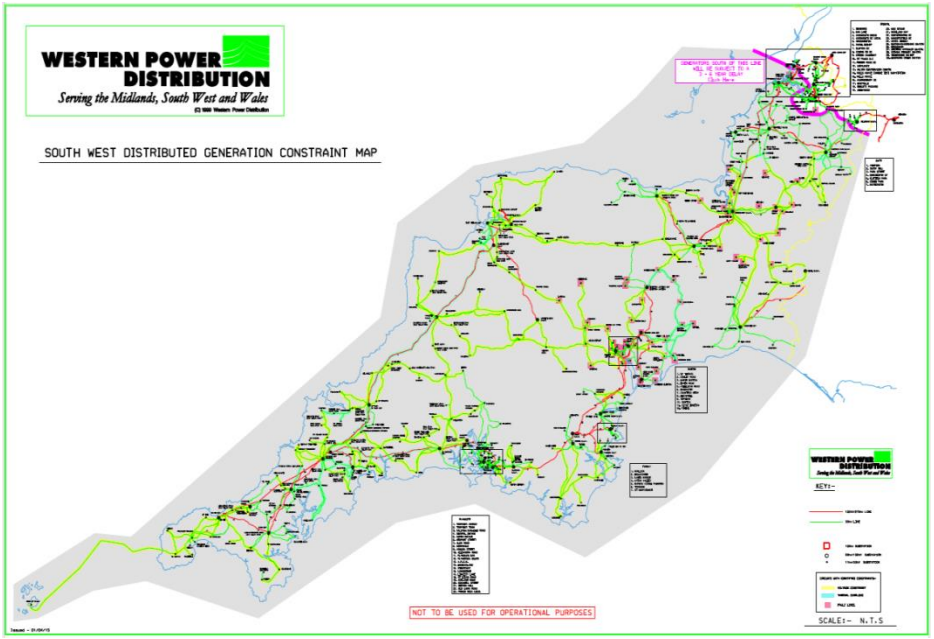
Challenges

- Network constraints
- Long connection times/high costs
- Capacity queues
- New issues affecting network planning and operation
- Consequential impact on the National Grid



Response to challenges

- WPD publish an annual connections improvement plan as part of Ofgem's ICE incentive for all customers
- The following areas have been identified as important for DG
  - Consistency of process and communication across WPD
  - Service provided post-acceptance of a connection offer
  - Statement of Works
  - DG Forecasting - scenarios for DG volumes and potential network investment
  - Queue and capacity management
  - Competition in Connection Code of Practice
  - Constraint information
  - Working with National Grid
  - Provision of mapping information

Response to challenges

- Whilst the ICE plan covers a range of actions for all customers, based on feedback from last year's workshop we are focusing on the following key areas to improve the DG connections process:
  - Improvements in the Statement of Works process and communication
  - Addressing queue and capacity management
  - Constraint Information - working with connected generators to provide better visibility of network constraints and outages
  - Working with National Grid

Focus on Statement of Works

- We have trialled a new “Appendix G” approach across South West, South Wales and parts of the Midlands where customers are allocated into four groups

Part 1	Connected. Only pre-existing constraints apply
Part 2	Customers with future connection dates allowed to connect subject to site specific requirements
Part 3	Customers with future connection dates allowed to connect subject to interim restrictions on availability
Part 4	Customers with future connection dates may only connect on completion of transmission works

- Process repeated monthly with customers included at a maximum six week interval
- Information available on our website by GSP indicating outcome /materiality headroom

Focus on queue and capacity management

Capacity Recovery

- Capacity recovery - 88 HV and 25 EHV connected DG customers contacted who had not utilised more than 75% of their maximum export capacity in a continuous 12 month period since January 2014. 4.8 MVA recovered to date

Milestones

- Applied milestones in connection offers to free up capacity (obtain planning, commence works, complete works)
- Actively reviewing milestones in existing offers – 2GW of recovered capacity subsequently re-offered
- We will revise the milestones to largely align with outcome of national work initiated by ENA

Focus on constraint information

- We have established generator owner group to establish requirements for provision of information on outages and constraints for DG
- We will provide improved outage forecasts for new connections and regular updates for connected customers
- Actions proposed;
  - Extend weekly outage notification from trial to Business as Usual
  - Publish regular outage/constraint information on WPD website for registered customers
  - Publish post-outage details

Working with National Grid

In response to the rapidly emerging need for distribution and transmission networks to work together;

- We have implemented a monthly exchange of information with NGET on connected DG and those accepting offers for connection for NGET approval or conditions to be imposed (e.g. operation at particular power factor, inclusion in tripping arrangements or active network management scheme, delay whilst transmission work completed)
- National Group established including NGET to improve the processes at the T/D interface so that issues are considered on a whole system basis
- WPD Future Energy Scenarios project and development of DSOF (Distribution System Operating Framework)

Summary

- Based on feedback from this workshop last year we are focussing on improvements to
  - Statement of Works
  - Queue and capacity management
  - Constraint information
  - Working with National Grid
- We want your views on whether we have correctly captured the feedback in this area, your views on how we monitor our progress and whether there are any additional steps that we could take to improve service further
- We commit to translating your feedback into positive action and keeping you up to date with our progress

COFFEE BREAK

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WPD transition to DSO

Friday 11th November 2016

Nigel Turvey

Network Strategy and Innovation Manager

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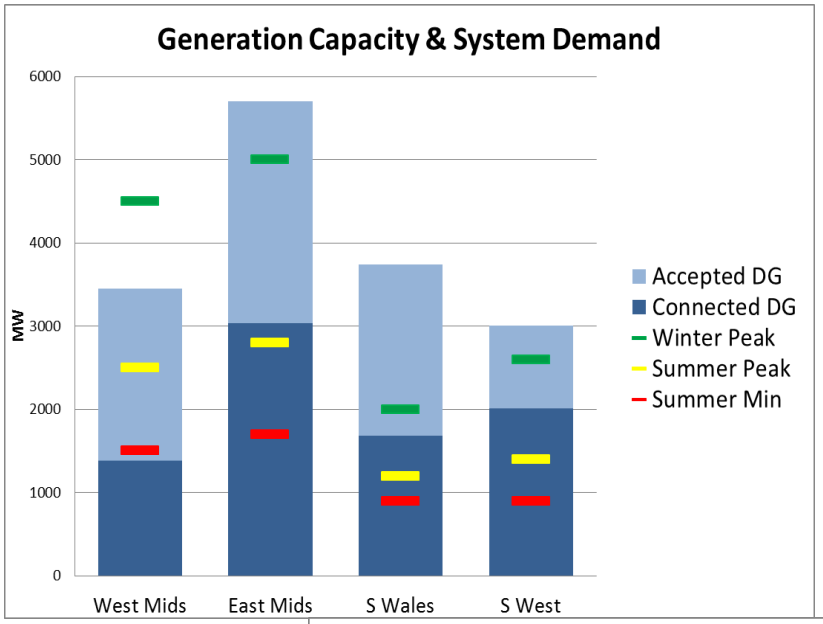
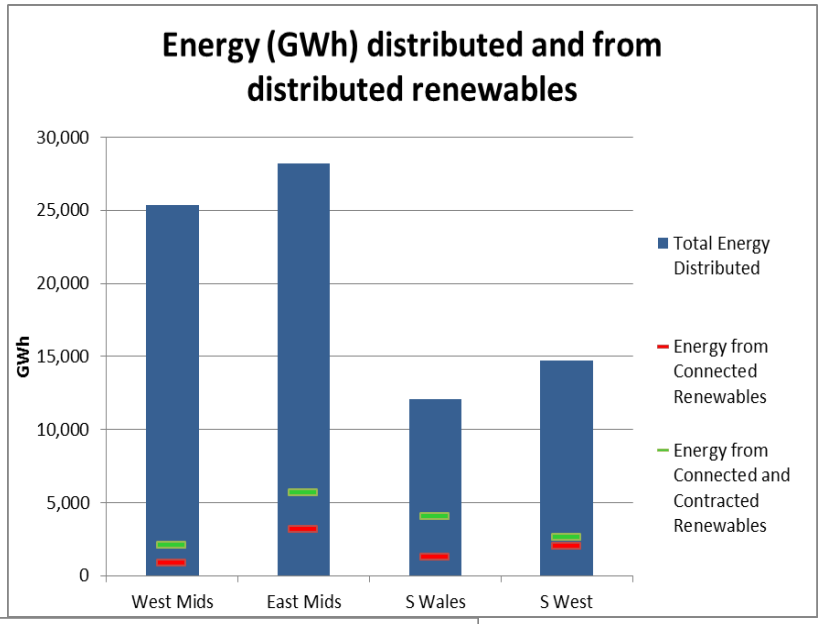
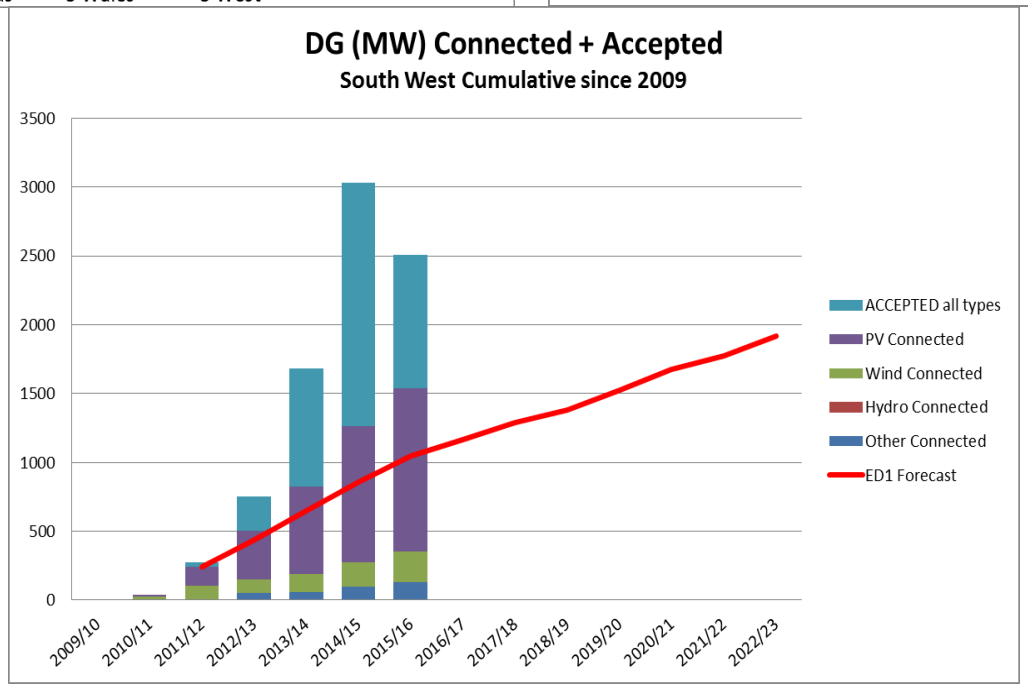
Agenda

- Drivers of need to change
- Emerging whole system issues
- What functions could a DSO perform?
- Where is WPD in this transition?

Growth in and Current DG and Demand data







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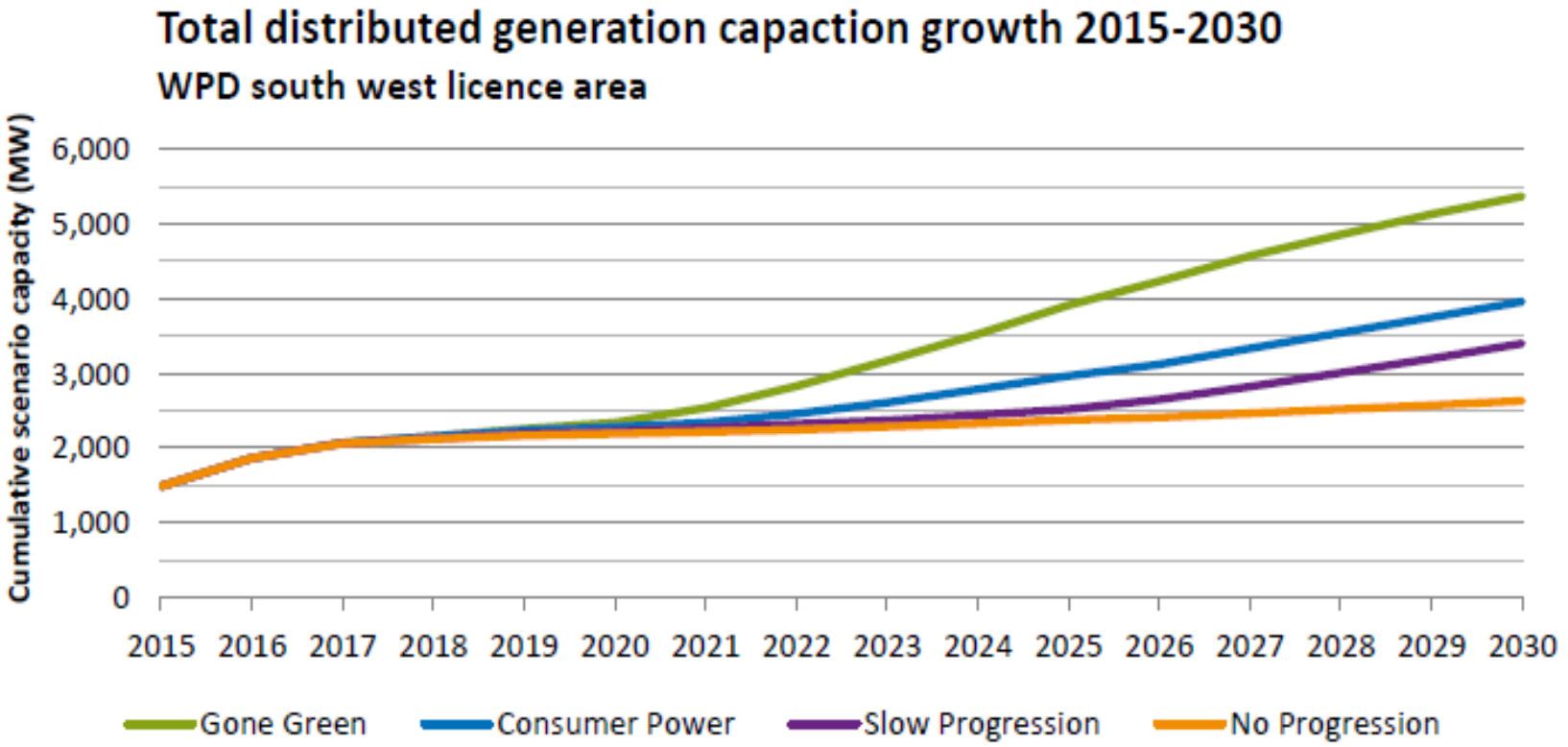
Drivers of need to change

- Support mechanisms for renewables have resulted in a significant growth in distributed generation connections
- Reinforcement in anticipation of need for network capacity strongly discouraged by regulatory mechanism due to risk of stranded assets
- Low load factors for many renewables would result in uneconomic networks for passive operation
- Both D and T networks either have or are reaching thermal and voltage limits in many areas
- Both load shape and demand/generation growth and timing uncertain due to:
  - EVs – speed of adoption?, use of rapid charging? and pattern of charging?
  - Growth in behind the meter generation
  - Storage – currently uneconomic for most applications but price dropping rapidly
  - Renewables – further cost reductions expected making projects viable without subsidy

Long term scenarios

- Given this uncertainty, to try and assess the ‘envelope’ of potential net flows on the network we are looking at long term scenarios
- We have forecast potential changes in demand and DG for the South West using 4 economic scenarios
- The purpose of these is to;
  - Understand the thermal, voltage and fault level limits of the network
  - Provide information to potential connectees on the likely issues when considering connections
  - Identify and form case for any low/no regret investments that can be made
- First version and results of network studies published
- Now working with TSO to identify impact on transmission network and likely conditions for connections or reinforcement work that would result

Example output from long term scenarios



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Other issues to address

- In addition to the thermal and voltage issues on the distribution network there are also issues at the transmission level from:
  - changes in reactive power absorption
  - reverse power capability at interface substations between T and D
  - T system boundary limit being reached and
  - concern that voltage stability limit being reached in the South West
- Increased whole system issues emerging including voltage control, frequency containment, reverse power management, changes in fault levels
- We are working with the SO on the options for planning and operation of the combined T and D networks in the South West using long term scenarios
- Methodology needed to determine when constraint is the right overall economic solution or where reinforcement of the network is justified

What could a DSO do?

- Whatever form it takes, it will require more data, increased network visibility, greater control functionality and the ability to better forecast energy volumes
- New role is likely to include:
  - managing, contracting and dispatching power and energy flows
  - brokering ancillary services
  - Network balancing (local power and demand balancing)
- Relationship with the TSO:
  - coordinate operations
  - provide services
- A platform will be needed for energy suppliers, communities and other market participants to have visibility of network congestion in order to facilitate optimal DG and DSR solutions
- Active involvement in reconfiguration of the system will also be needed

Where are we on this transition?

- Introduction of Active Network Management seen as a first step towards DSO by 2021– this is increasingly being integrated with TSO to help manage constraints on the transmission network

- Projects ongoing to develop readiness for DSO are in the areas of:
  - Data integrity
  - Market integration
  - IT systems
  - Customer propositions
  - Equipment

WPD DSO focus areas

- 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

Some longer term issues

- Outstanding question of whether our role as a DSO is management of system constraints (including where economic transmission constraints) or whether there is a longer term role of energy balancing

- Currently the TSO contracts with distribution connected demand and generation for services without notification to distributor – is this sustainable within an ANM zone or under a DSO model?

- Peer-to-peer trading – currently often results in development of private networks. Process and commercial arrangements need to be developed to enable this across distribution networks

Summary

- The speed and uncertainty in the growth in DG has made the traditional approach to connections impractical
- A range of technical and commercial development has been needed to allow connections to continue
- Historically, connections on the distribution network rarely impacted the transmission system – that impact is now frequent
- Significant increase in both frequency and detail of data exchange between DNO and TSO has resulted
- Institutional framework developing to determine whole system solutions
- Evolution to DSO has started – but final destination currently unclear

Dr Graham Pannell
Renewable Energy Systems
Vice-Chair, ENA DG-DNO Steering Group

Distributed Generator Customer Experience

and notes from the Steering Group

Agenda

1. Policy / Steering Group / Why “QMEC” is a good thing
2. DNO service 2015/16 in practice

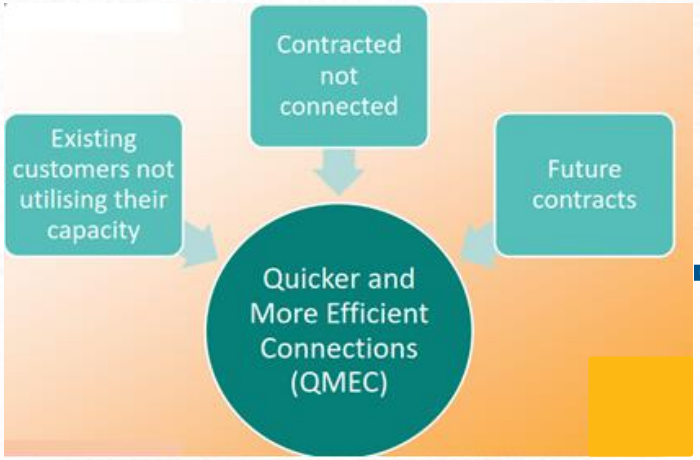
   Designer is a customer-facing role

3. Key Connections Challenges to DNOs
   1. Constraint Information
   2. Transmission / Distribution Interface
   3. Capacity Hoarding
4. Help Required from Regulator / Govt.
   1. Under-used capacity
   2. A&D Fees (still!)

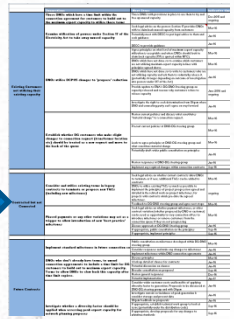
Steering Group & Why "QMEC" is a good thing

ofgem Making a positive difference for energy consumers

https://www.ofgem.gov.uk/publications-and-updates/quicker-and-more-efficient-connections-next-steps-0



DG-DNO Steering Group



Work plan

Queue Mgmt. (milestones, changes)

Unused capacity – existing and future

hot off the press

Energy Networks Association

Fair and Effective Management of DNO Connection Queues: Progression Milestones Best Practice Guide

3 November 2016

Energy Networks Association

Fair and Effective Management of DNO Connection Queues: Treatment of Changes to Connection Applications

April 2016

… QMEC is also: "strategic investment" trials

DNO Service – the reality

- "ICE" has seen some practical benefits, and some attitude benefits

- Cultural challenge across the board
  - ☆ *A Designer is a customer-facing role*

Confusion communicating transmission interaction.
Piecemeal design review.
Still some issues with outdated & unevolved T&Cs.

Pragmatic delivery ☆
Land rights processes & guidance

Incentive on Connections Engagement

Owners Forum
Land rights improvements
Aiming for timely design info
Aiming for accessible outage info

Few 'SMART' actions
Capacity Register – Updated?
Heat Map poor.

6.3 NEW	Ensure protection settings, fault current and background harmonics data available within a target date for DG connection schemes.	New action - CCSG June 2015	Complete: WPD issued a new policy document (SD1F) in Sep'15 providing the process and timescales for requesting this information from WPD within five working days where the information is available on the WPD systems, or up to six weeks where monitoring equipment needs to be fitted on site to collect data.	Q1 '16	On target

Ongoing Challenges to DNOs

key ongoing *DNO connections* challenges for 2016/17+

non-exhaustive(!)

Challenge #1 – Constraint Information

Information to inform likely constraint / curtailment

outages/constraints have increased & typically unrecorded.

some constraint may reflect optimal system operation, but…

Difficult to get useful info from DNO.

BOTH "flexible" *AND* "traditional" offers.

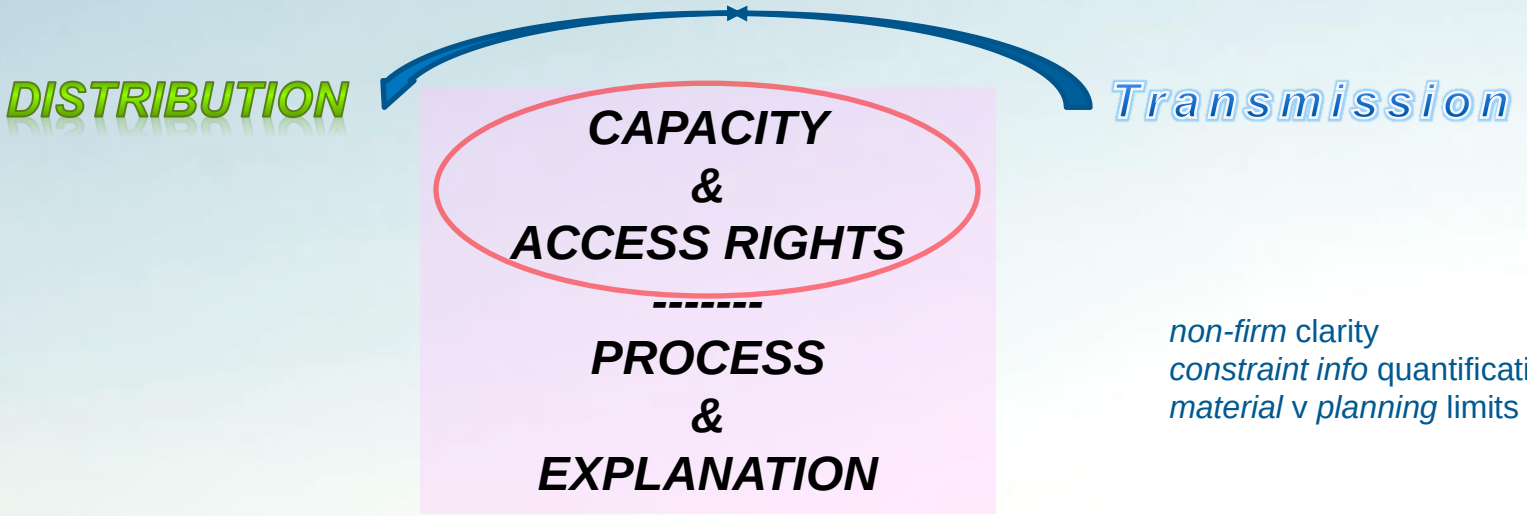
- DNO has unlimited rights for generic "abnormal network conditions"
- No reinforcement signal for DNOs to resolve already-constrained areas

consider perceptions of investors.

bankability is important

Challenge #2 – T/D Interface (MORE! BETTER!)

Distribution customers still held in the dark for too long



non-firm clarity
constraint info quantification
material v *planning* limits

SoW Trial: a good start, but not enough.

Better info up-front
Better manage 'last-straw'

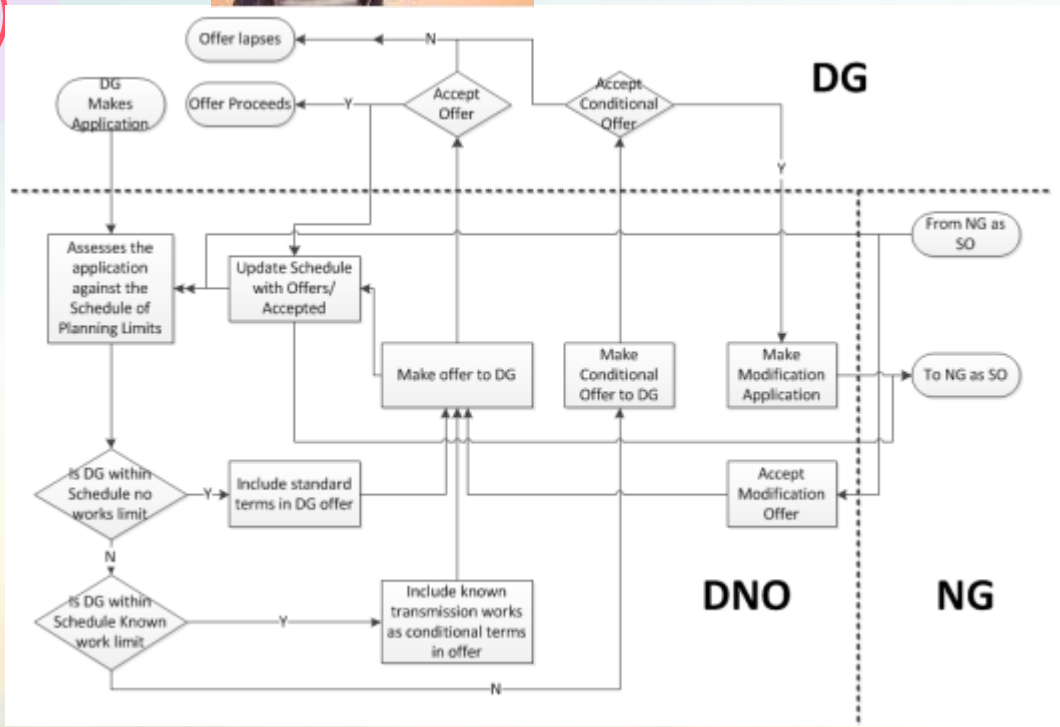
Challenge #2 – T/D Interface (MORE! BETTER!)

CAPACITY
&
ACCESS RIGHTS

PROCESS
&
EXPLANATION

"Where am I?"

WPD's Designer should know, should explain simply.



Challenge #3 – capacity farming / squatting

Capacity Farmers

= increased overall cost of electricity

Help required

Help Required! Key *Connections* Challenges for Regulator & Policy Makers

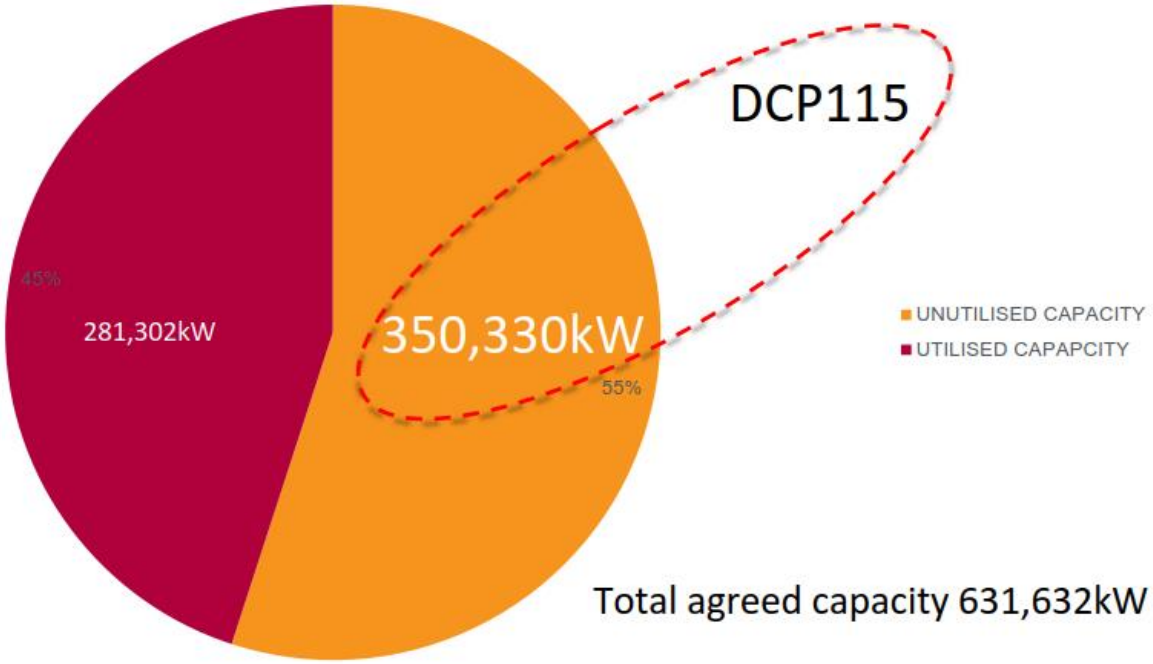
Help required #1 - *Unused Capacity*

Modification proposal:	**Distribution Connection and Use of System Agreement (DCUSA)** **DCP114 – National Terms of Connection Amendments – Capacity Management (over-utilisation) and** **DCP115 – National Terms of Connection Amendments – Capacity Management (under-utilisation)**		
Decision:	The Authority[1] directs that these modifications[2] be made[3]		
Target audience:	DCUSA Panel, Parties to the DCUSA and other interested parties		
Date of publication:	22 July 2015	Implementation date:	next DCUSA release at least three months after date of Authority approval

DCP115 = very limited. customers non-reply, or just “non”.

example – UKPN – *how much could you get back that’s not ever used?*

Analysis of generators connected not utilised
>75%* agreed capacity in 2015



Help required #2 - *A&D Fees*

Absence of these fees is unfair & wasteful

timeline

pre 2008	Fees were standard
2008-2016	no Fees, service deteriorates, laments presented to Auth.&Govt.
2014	I moaned about it at DG Forum.
2015	I moaned about it at DG Forum.
2016 Jan	DECC consultation*1 (closed May)
2016 Nov	????

Over 90% customers support it*1
All 6 DNOs support it
TSO already does it

What's the barrier?

e.g. EPN region
3% acceptance rate
…pays for all 100% design work

Help required

from 2014

A note to *Ofgem* and to *DECC*

Reinforcement signal

All DNOs (soon) offer flex connections, but DG takes 100% risk;

where reinforcement is {coordinated economic efficient™},

where is the signal to DNOs to build? ...and £200k/MW cap is questionable

Your collective failure to deal with A&D Fees

DNOs have presented evidence. We are suffering poor service, real projects get stuck, present framework encourages manipulation.

Capacity Hoarding - black market. Queue Mgmt/ Capacity Register..

DNOs must enforce milestones for progression, & fairly redistribute relinquished capacity.

A challenge... total existing 'capacity' unused?

Help Required! Key *Connections* Challenges for Regulator & Policy Makers

DNO Challenges #...506…

not time to elaborate today, but…

- ***DSO*** – please define services, consider min length
- ***DUoS* – is completely opaque** to customers
- *Behind meter* – policy?

Agenda

1. Policy / Steering Group / Why "QMEC" is a good thing
2. DNO service 2015/16 in practice

   Designer is a customer-facing role

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4. Help Required from Regulator / Govt.
   1. Under-used capacity
   2. A&D Fees (still!)

…& UoS charging

Dr Graham Pannell
Renewable Energy Systems
Vice-Chair, ENA DG-DNO Steering Group

Information for Stakeholders

Thank you for attending

- Slides and feedback will be posted on the website www.westernpower.co.uk
- Generator Owner Forum

www.westernpower.co.uk/Connections/Generation/Distribution-Generation-owner-operator-forum.aspx

- ICE plan

https://www.westernpower.co.uk/About-us/Stakeholder-information/Connection-Customer-Engagement.aspx

- Statement of Works

https://www.westernpower.co.uk/Connections/Generation/Statement-of-Works/Relevant-Embedded-Generation-Lists.aspx

- Upcoming Events
  - East Midlands Scenario event – December 7th
  - Annual workshops – January 2017

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