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Distributed Generation HV & EHV Workshop

4 March 2020

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Welcome and Introduction

Steffan Jones

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Domestic Arrangements

- Don’t forget to sign in!
- Toilets situated in main reception area
- Planned fire alarm test at 3pm
- Floor plans highlight evacuation point
- Emergency Assembly Point – Hartington Road
- Mobile Phones
- Photography will be taken during the event

What do we want from you today?

- One word – **Feedback!**
- Use the feedback forms and give us your honest opinion
- Contact the ICE team or your usual contacts in ENWL at any time to give us feedback
- **ice@enwl.co.uk**

Agenda

Welcome & Introduction

Accessing the Network & Network Information

Lunch & Networking 12 – 12:45

ICE Update & Shaping our 2020-21 Workplan

Coffee Break

Engineering Recommendation G99

Question & Answer Session

Wrap Up & Close

Meet the Team

Steffan Jones

Head of Infrastructure Solutions

Steffan joined Electricity North West in 2014 as the Infrastructure Solutions Manager, heading up both the Grid and Primary Connections team and the Asset Diversions team. During his 24 year career he has worked in both heavy industry and commercial contracting roles as well as the electrical utility sector. Steffan aims to enhance the customer journey throughout the delivery of Infrastructure Solutions projects.

Victoria Brown

Bid Engineer

Victoria joined Electricity North West in 2014 after graduating from university. As a Bid Engineer within the Grid and Primary Bid Team, Victoria is responsible for estimating and quoting Generation Connections >1MW.

Brian Hoy

Head of Market Regulation

Brian has over 30 years of experience working in the electricity industry. He has an engineering background but has worked in the regulatory aspects of new connections for a number of years. Brian represents Electricity North West on connections related matters and leads a number of national industry groups.

Gillian Williamson

HV Planning Manager

Gill's role in Strategic Planning includes managing the team responsible for HV connections, providing technical support to our customers from identification of least cost points of connection through post acceptance including protection reviews, fault level studies, power quality assessments and earthing.

Meet the Team

Hannah Sharratt

Connections Stakeholder Engagement and Regulation Manager

Hannah has 20+ years experience in the Utility industry in programme, project and change management roles. Hannah is currently focusing on our Connections stakeholder engagement activity and is committed to delivering real and lasting enhancements to our stakeholder experience.

Ami Mathieson

Incentive on Connections Engagement Manager

Ami joined Electricity North West 9 years ago; she has spent that time primarily within the Customer directorate. Her current role is to support the Connections Stakeholder Engagement and Regulation Manager in the successful delivery of the Incentive on Connections Engagement (ICE) strategy and aims.

John Carlisle

Infrastructure Solutions Programme Manager

John is the Delivery Programme Manager for our Grid and Primary Connections team. John is an Incorporated Engineer with the Institute of Engineering and Technology and a Registered member of the Association of Project Management. John and his team are responsible for the delivery of all new connections on the 33KV and 132KV networks, inclusive of all demand and generation projects.

Matt Savka

Connections Delivery Manager

Matt joined Electricity North West over 14 years ago. During this time he has worked in several different roles within Connections, from Design Engineer to Business Connections Manager. Matt's current focus is on design for demand and generation connections in the south of our region.

Meet the team

Peter Barlow

Programme Manager- Grid and Primary

Peter joined Electricity North West in 2017 as a Programme Manager for Infrastructure Solutions. He leads the Bid Team within Grid and Primary connections. His background is in Mechanical Engineering, previously working in Energy Markets as a Sales Manager in Oil & Gas, and Offshore Renewables (Wind, Wave, and Tidal Power).

Tracey Taylor

Delivery Manager- Business Connections Lakes

Tracey joined Electricity North West 31 years ago with a background in Design. She currently works within the Business Connections team as Construction and Delivery Manager responsible for delivering Generation and Demand Connections at LV and HV within the North area, with a focus on the delivery stage. Tracey ensures the team are managing the construction and energisation of connections in line with customer expectations.

Joe Davis

Project Planner

Joe joined the new connections team in Electricity North West in 2002. Joe has developed from assisting customers with small industrial connections to assisting them with larger connections, facilitating them with all aspects of the journey including generation, constrained connections, fault level studies, protection studies, earthing assessments, project management and final commissioning works.

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Accessing the Network and Network Information

Victoria Brown, Steffan Jones, Gill Williamson, Brian Hoy, Hannah Sharratt

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What will we look at today…

Getting Connected

- What We Offer
- Network Constraints
  - Distribution Constraints
  - Transmission Constraints
- Pre Application Contact
- Interactivity

Network Information

- Heat Map Tool
- Other Potential Information Sources
- GIS Update

Transition to DSO and Flexibility

- DSO Transition
- Flexible Services
- Flexible Connections

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Getting Connected

Victoria Brown

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What do we offer?

Budget

Advantages	Disadvantages
• No Cost Associated • Short timescales- max 20 working days • Gives an early indication whether a connection will be cost prohibitive	• High Level Desktop Assessment – Network Modelling is not undertaken • Cannot be accepted or progressed to a Formal Application – no ability to retain start date

Formal Offer

Advantages	Disadvantages
• Open to Acceptance – secure capacity for the requested technology and size • Network Modelling is undertaken to determine the impact on the ENWL network	• Fee of £1,000 + VAT • Maximum timescale of 65 working days to issue the Offer • No early indication of viability/cost of the requested connection

Gen Plus

Advantages	Disadvantages
• Budget letter within 30 working days, early indication whether the connection is viable • Network assessment undertaken for the budget element • Up to 6 options (export/technology) for one site • Start date is retained for the formal offer if pursued within 7 days	• Fee of £500 + VAT for the budget assessment • Then a further £1,000 + VAT if progress to a Formal Application

Distribution Constraints

There are a number of common constraints that can be encountered across the ENWL network, which can have an impact on Connection Applications, either by requiring Reinforcement or changing the Point of Connection.

Fault Level

- All generation has some FL contribution – Synchronous generation will contribute more than Asynchronous
- Can potentially be mitigated by ENWL or by the Generator
- POC will be discounted if the proposed DG causes a FL exceedance

Thermal Capacity

- Thermal constraints arise where the Network has insufficient capacity to accommodate the requested generation.
- Thermal constraints can sometimes be mitigated with network reinforcement eg overhead line restringing
- Thermal constraints can sometimes be mitigated with export limitation

Voltage Drop or Rise

- Occurs when connecting into a heavily/lightly loaded circuit or for connections with a long cable route.
- POCs that exceed acceptable levels will be discounted

Voltage Step Change

- Distribution Code / P28 highlight acceptable limits.
- If a proposed connection causes a voltage step change outside these limits, the POC will be discounted

Transmission Constraints

In addition to Distribution level constraints, Transmission constraints must also be considered.

Appendix G

All 20 GSP sites within the ENWL area are now using the Appendix G process.

This process aims to improve the Statement of Works process and provide greater clarity.

Materiality Headroom

We have assigned 3 materiality statuses to determine the materiality headroom for each GSP.

A – Latest return indicates spare capacity at this location

B – Insufficient capacity to accommodate further connections without a Modification Application

C – Insufficient capacity to accommodate further connections without completing identified transmission work

GSPs with 'A' Status

- Bredbury
- Carrington
- Macclesfield
- Padiham
- Penwortham
- South Manchester
- Washway Farm

GSPs with 'B' Status

- Bold
- Kearsley
- Kirkby
- Rochdale
- Stalybridge
- Stannah
- Whitegate

GSPs with 'C' Status

- Harker – replacement of 4 SGTs and 132kV switchboard
- Hutton - replacement of 4 SGTs and 132kV switchboard
- Heysham – HOPS scheme (to be confirmed)

Examples of Distribution & Grid Constraint Impact

Carlisle BSP

- Highly limited capability for synchronous generation due to fault level constraints
- Fed from Harker GSP which requires significant NGET works in order to connect

Hazel Grove

- Sufficient headroom for a 33kV 30MW connection of Synchronous, Inverter Connected or Battery Storage Generation
- Fed from Bredbury GSP which currently has a Materiality Status of 'A' – Sufficient headroom without a Modification Application

Lancaster BSP

- Headroom for asynchronous, synchronous and battery storage generation
- Fed from Heysham GSP, which has 'C' status and requires significant NGET works prior to the energisation of any new connection.

Carrington BSP

- No availability for Synchronous, Inverter Connected or Battery Storage Generation
- Fed from Carrington GSP, which currently has sufficient headroom to connect.

Pre Application Contact

As shown on the previous slides, there are a number of factors which can influence the viability of a new DG connection. We actively encourage you to engage with us pre-application in order to help you understand potential difficulties for proposed projects. This can be achieved through:

Get in Touch

- Operate an 'open door' policy
- Regularly offer surgery sessions – no need to wait for a DG event

Heat Map

- If you would prefer to assess the network yourself, you can use our Heat Map Tool

Other Information

- Additional information is available on our website

Interactivity Process

Brian Hoy

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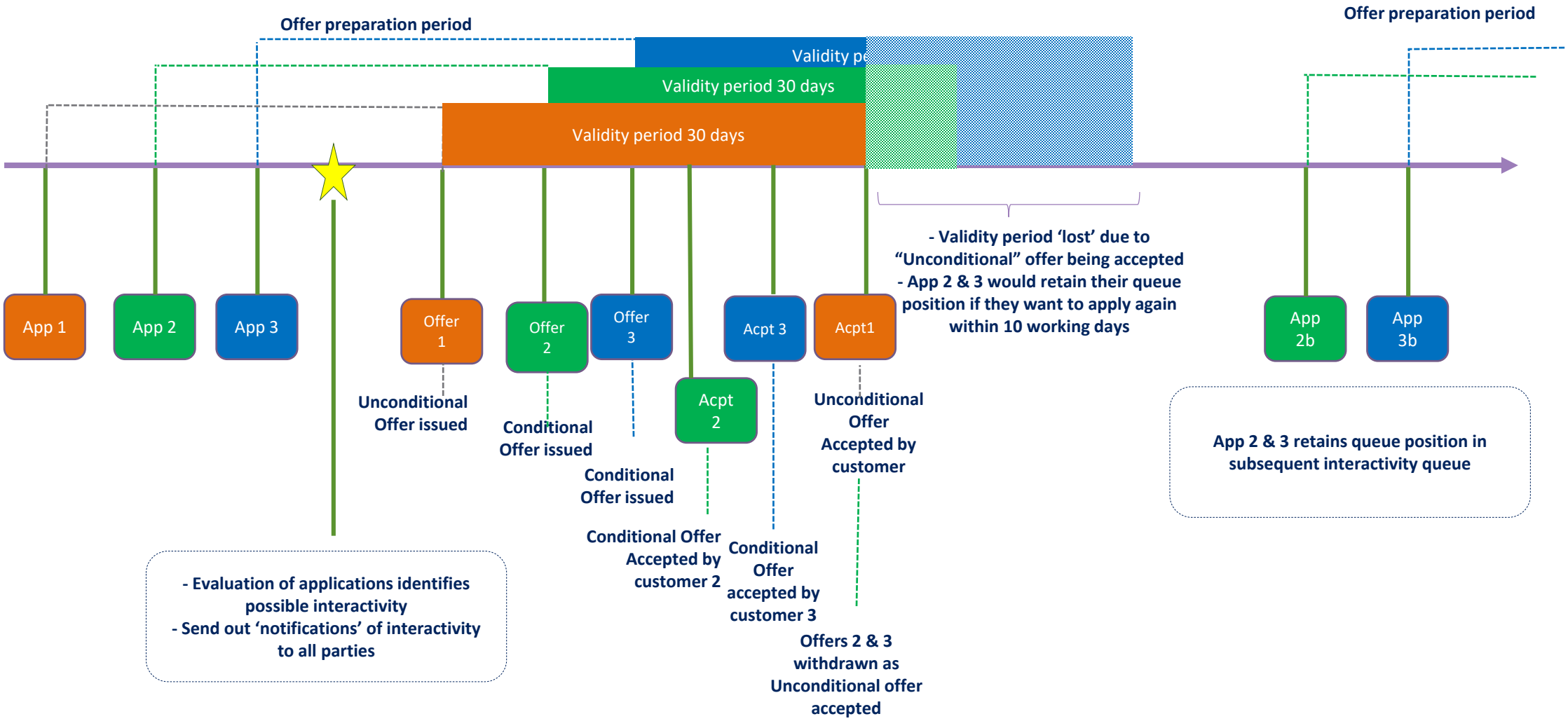
Background

- As part of Open Networks 2018 DNOs consulted on interactivity
  - Clear feedback from stakeholder on desire for consistency
  - But no clarity on which approach was preferred
- Work carried forward into Open Networks 2019
  - Three options considered:
    - Moratorium
    - Conditional approach (based on UKPN)
    - ‘Cumulative’ approach
- ENA Open Networks published a joint consultation on Application Interactivity and Queue Management
  - was open for eight weeks and closed on 25 September 2019.
- Consultation was on a ‘minded to’ consistent approach to interactivity based on the current UKPN approach
- Good level of response:
  - 19 responses received from a broad range of stakeholders
- ENA webinar held 10 Feb and DER Connections Steering Group briefed 20 Feb

Key features

- When Interactivity is triggered the applications are ‘queued’
- The application that is first in the Interactive Queue has first refusal on the connection – they are considered ‘*Unconditional*’
- Later applications depend on some or all earlier applications **not** being accepted - they are ‘*Conditional*’
- Applicants will be given early warning that they are Interactive
- Connection Offers are issued in normal timescales and will be issued as Conditional or Unconditional as appropriate
- There is no moratorium period – Interactive Offers are issued with 30 days validity period
- Conditional connection offers don’t have to pay until their acceptance has been confirmed

The ‘Conditional’ approach for interactivity



Next steps Open Networks

Application Interactivity

- Hold stakeholder briefings ~ Feb 2020
- Publish final guide ~ March 2020
- Develop an implementation timetable for network companies to roll out the new process ~ March 2020
- Prepare a process to apply the ‘conditional’ interactivity approach to connections across Transmission and Distribution where there is interactivity between customers connecting to different networks ~ 2020 work
- Extent across Distribution to Distribution and IDNOs to follow in 2020

Network Information

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- Flexible Services
- Flexible Connections

Heat Map Update

Gill Williamson

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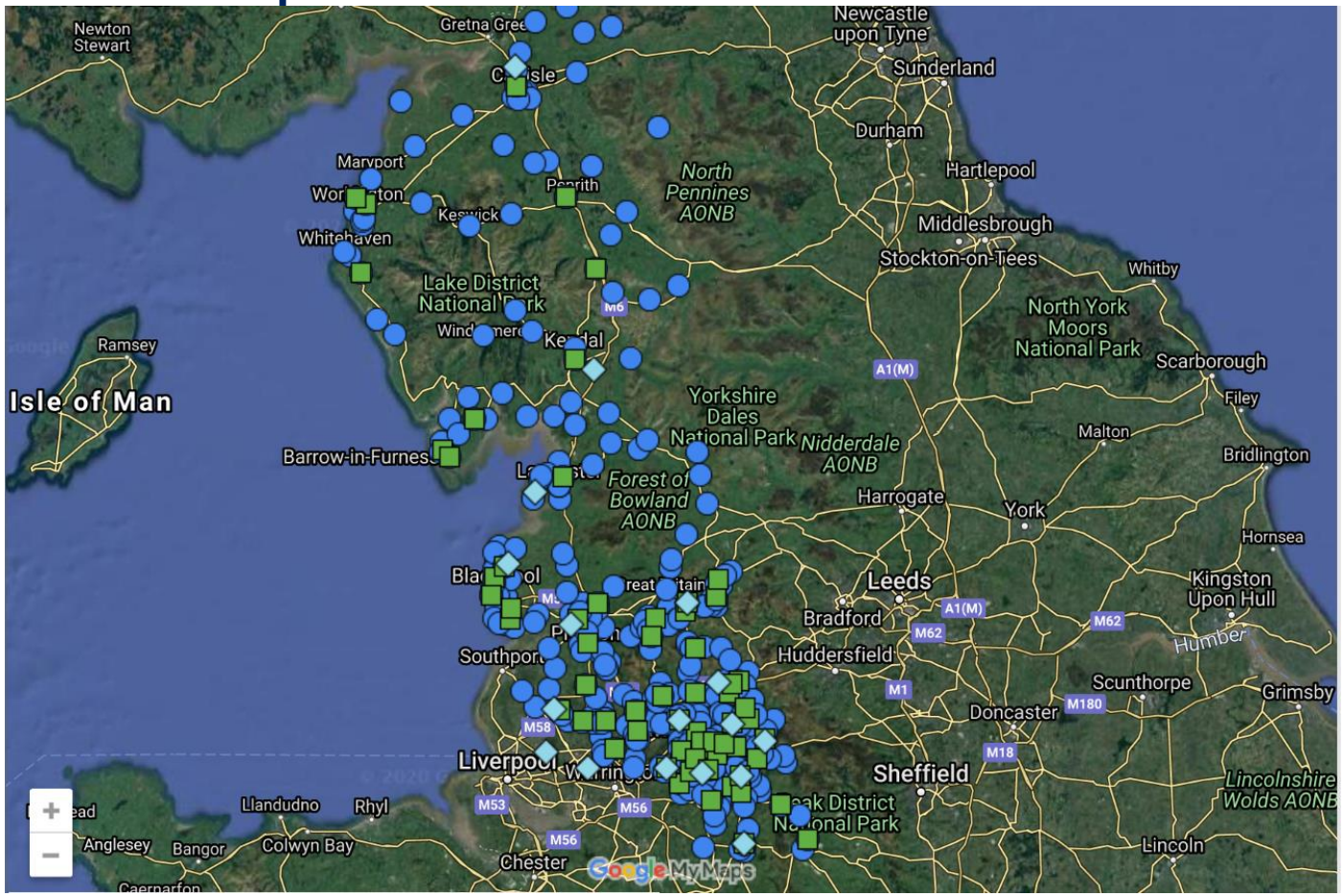
Heat Map Update

We have added a map to provide a quick view, supplementing heat map tool workbook



Download here: https:/www.enwl.co.uk/get-connected/network-information/heatmap-tool/

Heat Map Update

Embedded within the heat map webpage

Based on Google maps – familiar zoom and pan

GSP, BSP and Primary substation locations

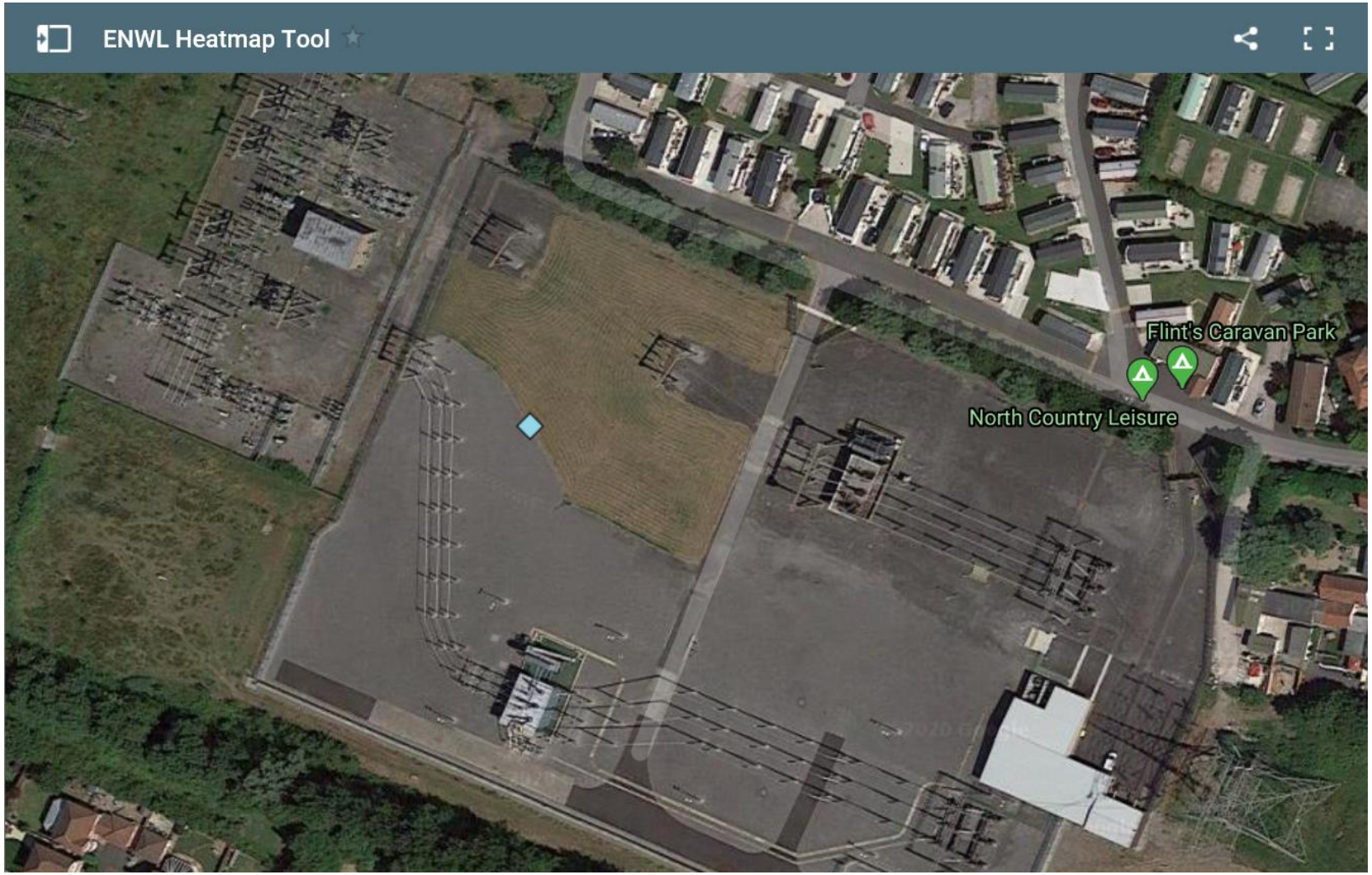
Click substation symbols for tabulated data

Heat Map Update

Grid Supply Point substation

Bulk Supply Point substation

Primary substation

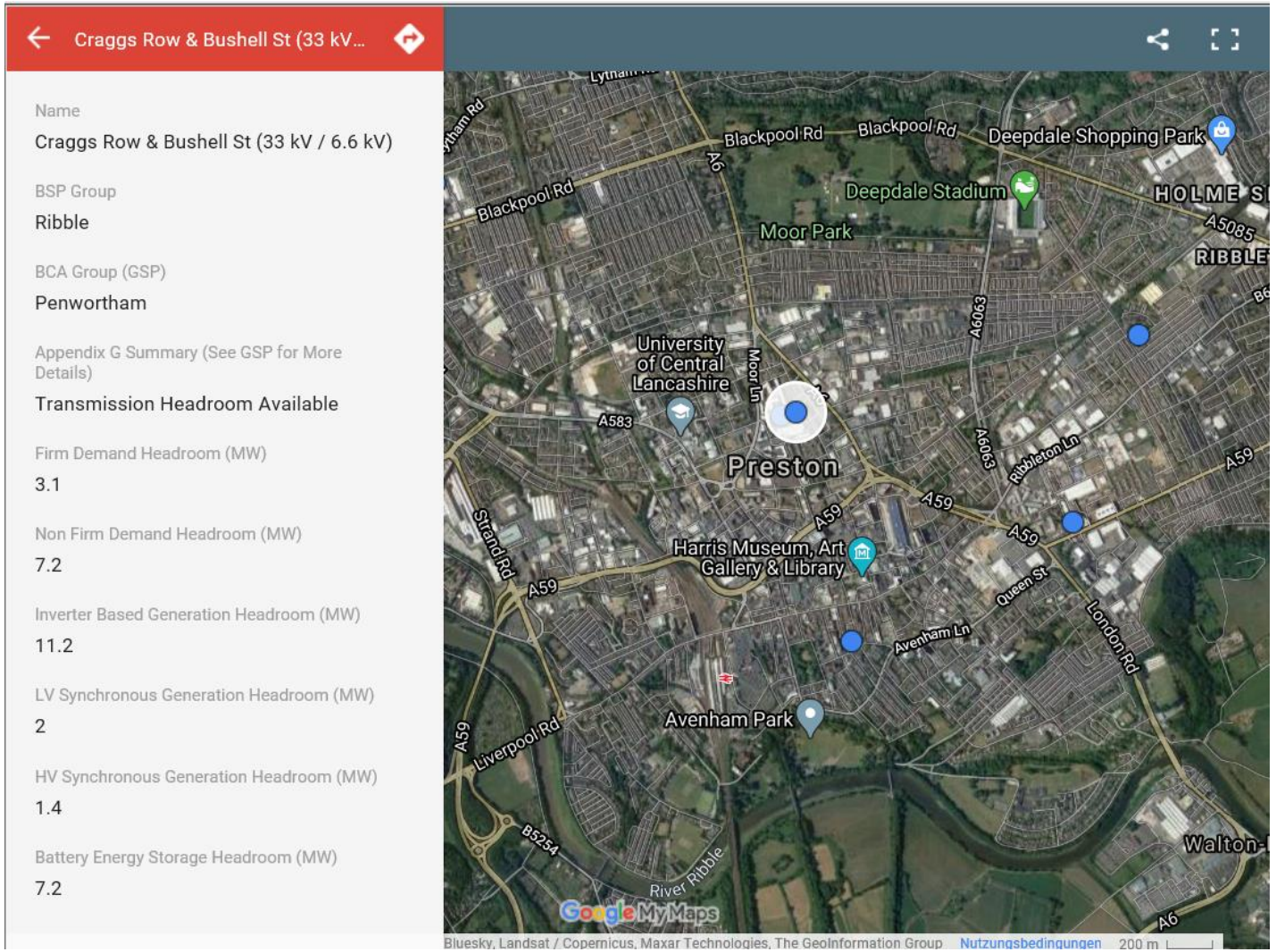


Heat Map Update

Click to the substation shape to display tabulated data

Primary data:-

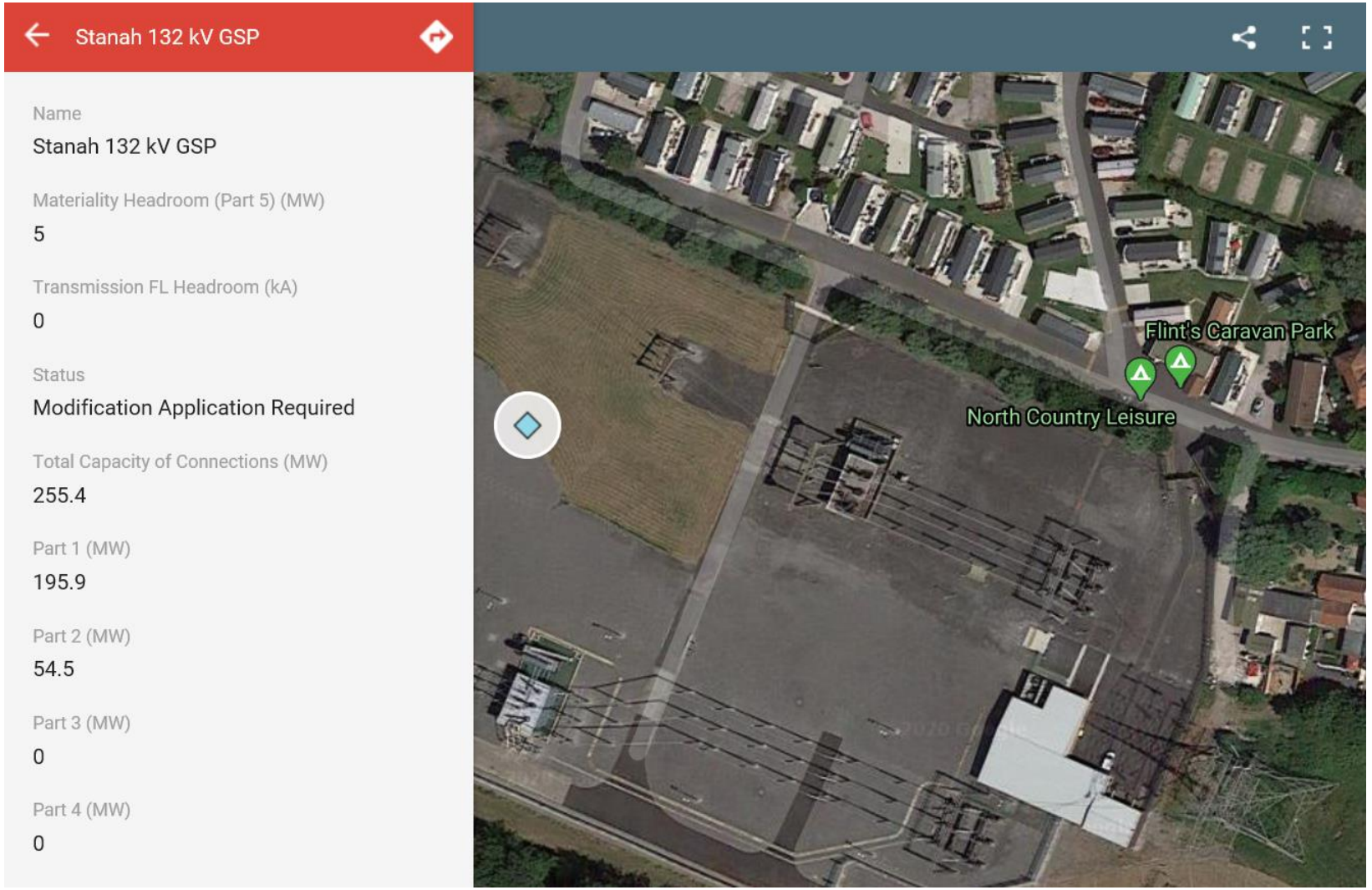
- Upstream feeding arrangement
- Appendix G info
- Firm and non-firm demand headroom
- Generation headroom inverter, LV synchronous, HV synchronous and battery types



Heat Map Update

Click to the substation shape to display tabulated data

- GSP data:-
  - Appendix G info
  - Appendix G parameters
  - Part 1 existing gen cap
  - Part 2 existing gen with specific requirements
  - Part 3 existing gen interim requirements
  - Part 4 contracted to connect pending transmission works
  - Part 5 materiality headroom
  - Transmission fault level headroom
  - Status



New way to access our network capacity data

Retain heat map tool workbook

Same information just different ways of visualising

Same monthly refresh rate

- Does not replace detailed assessments
- Indication of constraints doesn’t mean that we can’t connect you

Heat map Update

- Click on the Substation in Excel to take you to the map location

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11 kV & 6.6 kV Connections

The results given by this tool are based on high level approximations only. It should also be noted that the network may have changed since the last time the data was updated. As such, the outcome of a formal application may differ from the results given by this tool. For further information on how to interpret the data contained within this workbook please refer to the user guide embedded within the first tab.

Please note that the value of headroom quoted by this tool is based on total capacity available for new connections not the maximum size of a single connection which can be much lower. It is normally not possible to accommodate a single connection of more than 7 MW at 11 kV or 6.6 kV. This is based on the typical load rating of items of plant such as circuit breakers, current transformers and cable terminations.

Inputs

Easting	356710
Northing	431558
Capacity (MW	5
Connection Ty	Demand – Firm

Use the controls to the left to find the nearest primary substations to your site. The results will be displayed in the table below. When the desired site capacity and connection type are entered an estimate of available headroom and connection feasibility will be displayed. The results are based on both local constraints and constraints at the associated BSP.

Key

	Capacity <90% of headroom
	Capacity >90% & < 100% of headroom
	Capacity >100% of headroom

Distribution Network Capacity Capacity

No	Distance (km)	Primary Substation	BSP Group	BCA Group (GSP)	Primary Substation Location Easting	Primary Substation Location Northing	Headroom (MW)	Can Connect?
1	0.06	RIBBLETON	PRESTON EAST	PENWORTHAM	356730	431506	10.6	
2	1.37	PRESTON EAST	PRESTON EAST	PENWORTHAM	356777	432926	10.6	
3	1.91	DODGSON RD	PRESTON EAST	PENWORTHAM	355190	430397	10.6	
4	2.62	ST MARYS ST	RIBBLE	PENWORTHAM	354932	429640	6.5	
5	3.25	BUSHELL ST	RIBBLE	PENWORTHAM	353809	430094	4.8	
6	3.32	CRAGGS ROW	RIBBLE	PENWORTHAM	353740	430080	3.1	
7	3.58	AVENHAM	PRESTON EAST	PENWORTHAM	354028	429192	4.2	
8	3.94	BLACKBULL	RIBBLE	PENWORTHAM	353041	433005	7.1	
9	4.35	TULKETH	RIBBLE	PENWORTHAM	352393	431036	7.5	
10	4.48	HIGHER WALTON	LEYLAND	PENWORTHAM	358020	427270	0.0	

Transmission Constraints (App G)

Materiality Headroom	Fault Level Headroom	Transmission System Comment (see
-	-	-
-	-	-
-	-	-
-	-	-
-	-	-
-	-	-
-	-	-
-	-	-
-	-	-
-	-	-

Ribbleton (33 kV / 6.6 kV)

Name
Ribbleton (33 kV / 6.6 kV)

Easting
356730

Northing
431506

BSP Group
Preston East

BCA Group (GSP)
Penwortham

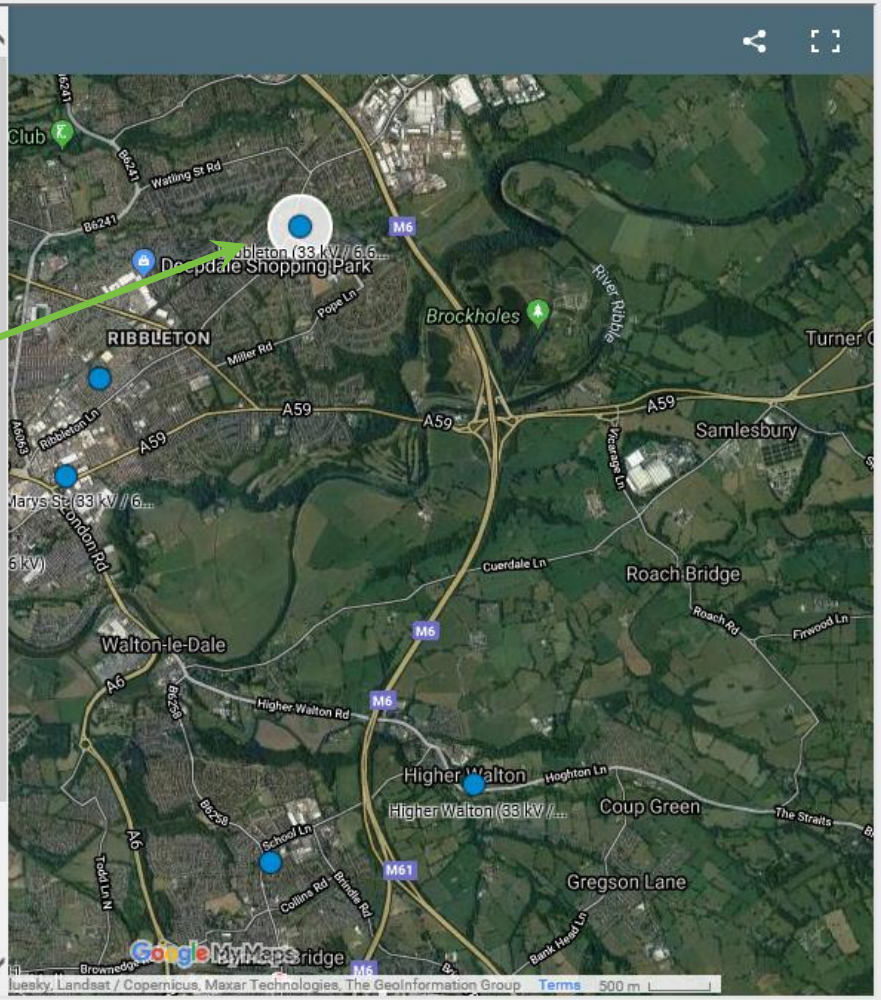
Appendix G Summary (See GSP for More Details)
Transmission Headroom Available

Firm Demand Headroom (MW)
10.6

Non Firm Demand Headroom (MW)
10.6

Inverter Based Generation Headroom (MW)
11.2

LV Synchronous Generation Headroom (MW)
2



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Other Potential Information Sources

Gill Williamson

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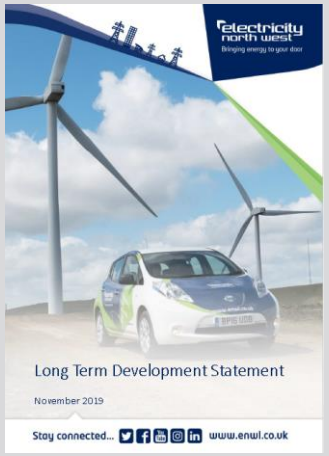
Heat Map Update – Further network information sources

LTDS
Long term Development Statement

Comprises:

- Report
- Schematic diagrams
- Network data workbook



Network data:

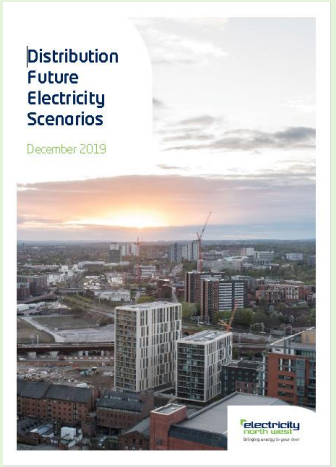
- Circuit data
- Transformer data
- Load information forecast to 2023/24
- Fault Level information
- Generation information
- Development proposals

https://www.enwl.co.uk/get-connected/network-information/long-term-development-statement/

DFES
Distribution Future Electricity Scenarios

Comprises:

- DFES Report explaining scenarios
- Forecasts data workbook
- Regional Insights analysis report



Forecasts to 2050 x 5 scenarios broken down per substation:

- Number of EVs and number of HPs
- Maximum and minimum demand
- Generation capacity per technology
- Reactive power
- Energy

https://www.enwl.co.uk/get-connected/network-information/dfes/

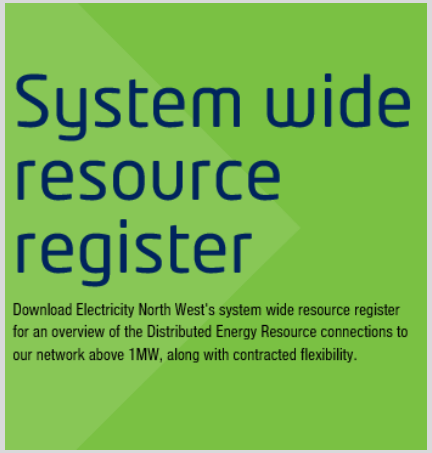
Heat Map Update – Further network information sources

System Wide Resource Register SWRR

Comprises:

- Resource workbook

Industry agreed format
Updated monthly
Some data is redacted to protect the identity of specific resources



Resource data:

- Generators, storage >1MW
- Already connected or accepted to connect, distribution and transmission service provided
- Flexibility services

https://www.enwl.co.uk/get-connected/network-information/system-wide-resource-register/

Geographical Information System (GIS) Update

Hannah Sharratt

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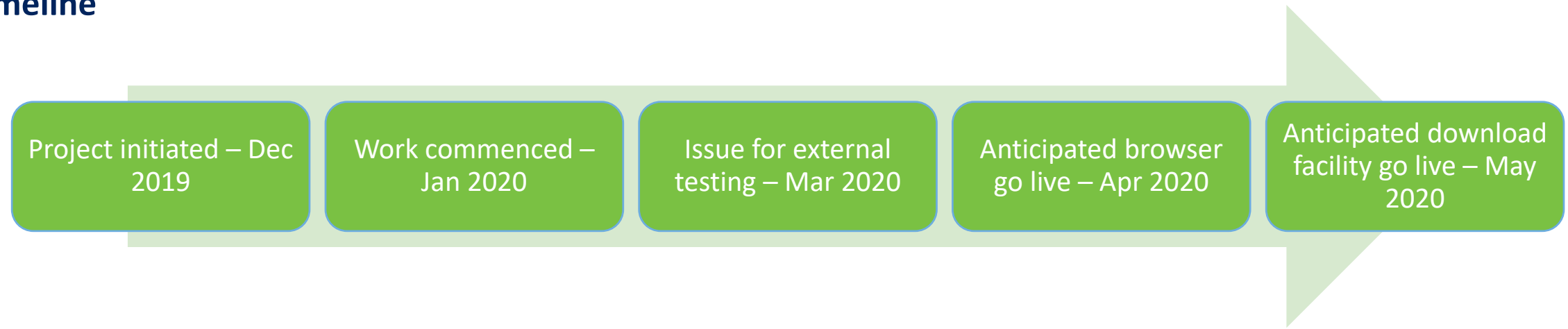
Proposed Offering

- Web based application
- Better access arrangements – 24/7
- Update period more frequent – improved time delay from site data appearing in GIS system
- Simple Browser or Download for your own GIS software
- More information displayed on asset attributes

Timeline



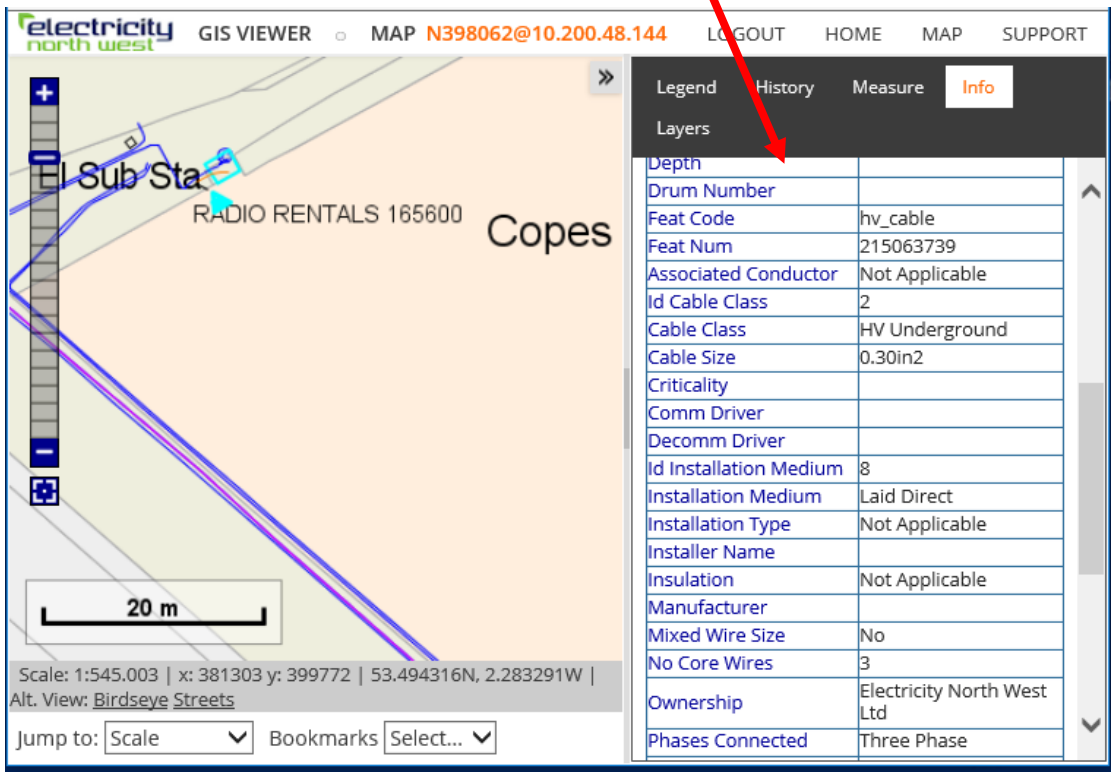
Proposed Views

- Proposed home view

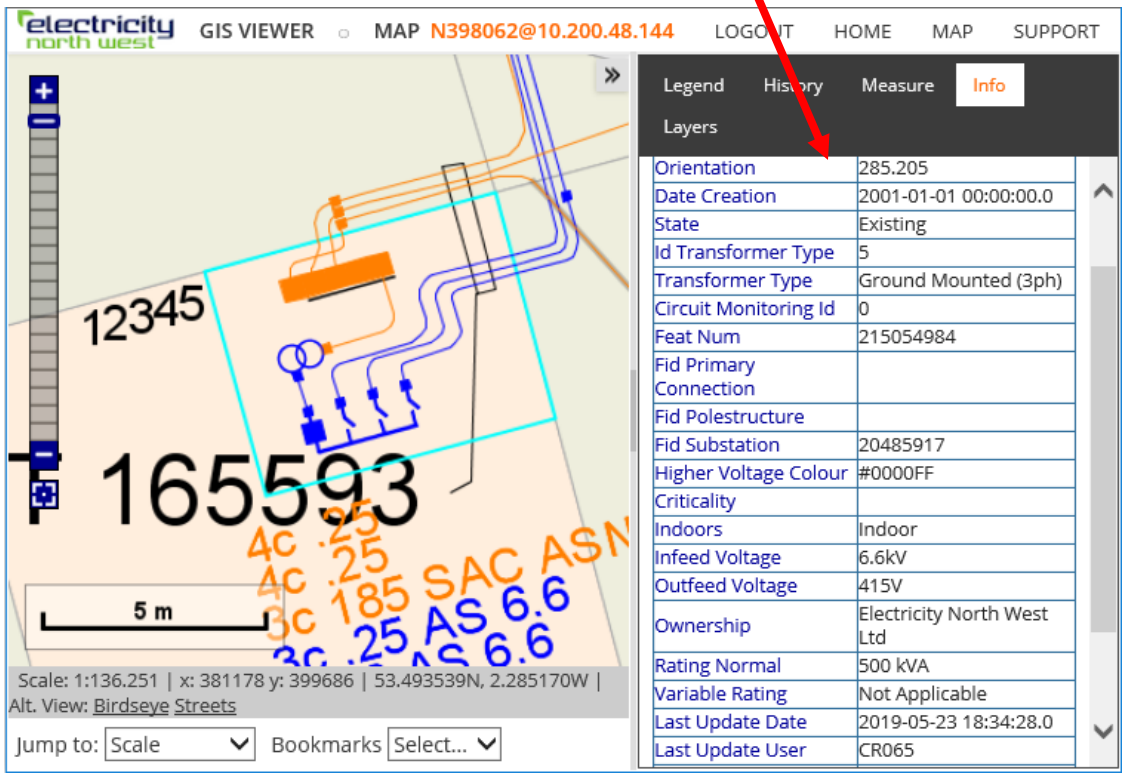
- Better definition of assets
- More detailed asset information
- Interactive map

Proposed Views

- Improved cable asset data



- Improved plant asset data



Transition to DSO and Flexibility

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Transition to DSO and Flexibility

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- Flexible Services
- Flexible Connections

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DSO Transition

Steffan Jones

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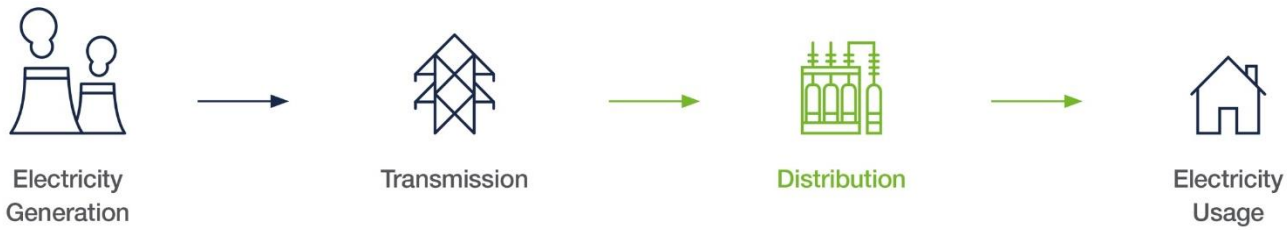
Increasing network complexity

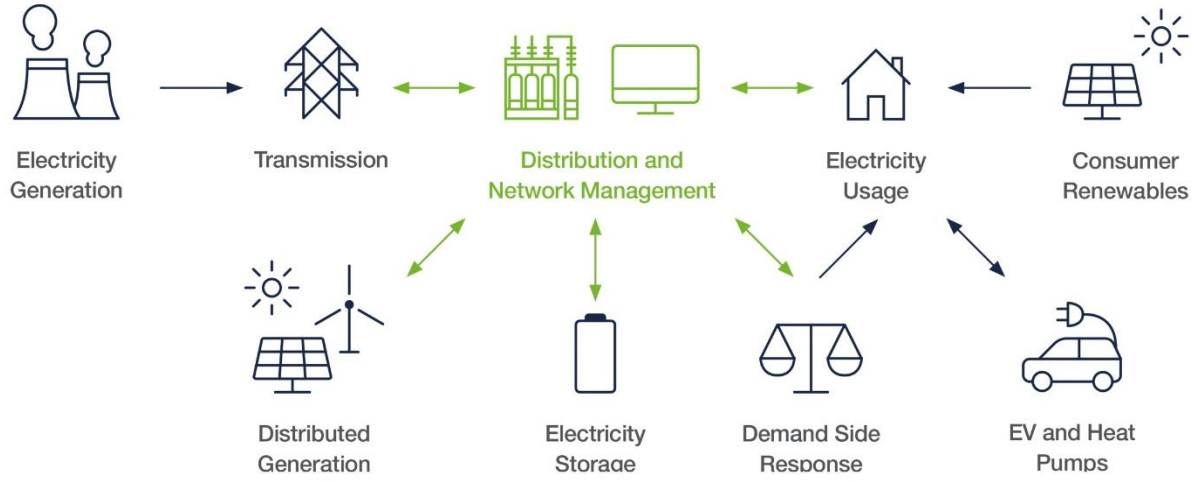
Historically controlling single directional flows

- 18 connections to National Grid transmission network.
- 6 connections to other DNOs



As a DSO controlling bi-directional flows

- 18 connections to National Grid transmission network.
- 6 connections to other DNOs
- Hundreds of connections to IDNOs
- Tens of thousands of customer connections



Distribution System Operation

- A large quantity of the ICE and business change program plans for 2018 & 2019 have been associated with the transition to enhancement of Distribution System Operation functionality within ENWL.
- Distribution System Operation can be segregated into a range of functions, some are inherently the responsibility of the DNO to deliver, however many are already widely open to competition and market participation.
- Some of the DSO functions were already part of the role of a DNO and will be enhanced, whilst some are completely new.
- We believe that DNOs should retain responsibility for all DSO functions which preserve the system security and are directly liked to the licence obligation of:

  "Permit the development, maintenance, and operation of an efficient, co-ordinated, and economical system for the distribution of electricity;" (licence condition 21)

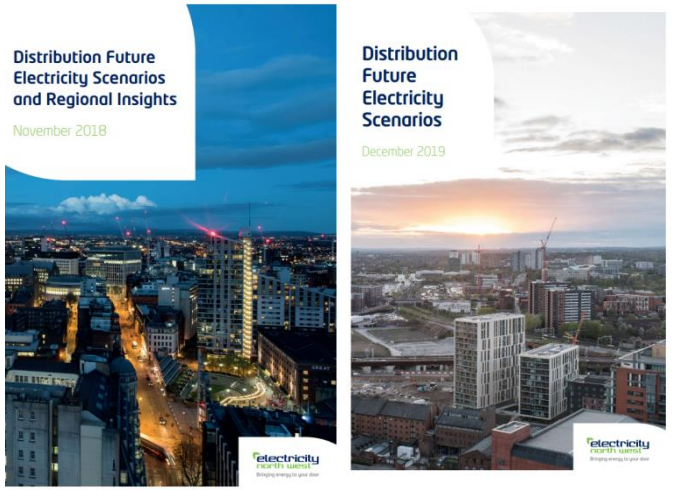
Benefits of DSO transition

Improved customer experience	• Improved customer experience though sharing of best practice within the ENA Open Networks project
Efficiency savings	• Increase utilisation of networks assets allowing for efficiency savings
Whole system investment	• Improved whole system investment decisions through closer working relationships with other network providers
Low carbon economy	• Facilitating the transition to a low carbon economy.
Increased flexibility	• Allowing all customers the ability, independent of size, to participate in energy trading and balancing
Increased productivity	• Increased productivity as a result of developing new modelling tools, implementing new systems, and improved automation

What have we done to date

Distribution Future Electricity Scenarios Documents

- 2 years of DFES publications
- 2019 FES includes data workbook
  https://www.enwl.co.uk/get-connected/network-information/dfes/



Requests of Flexible Services

- 14 Requirements published
- 5 Tenders undertaken
- 52MW asked for

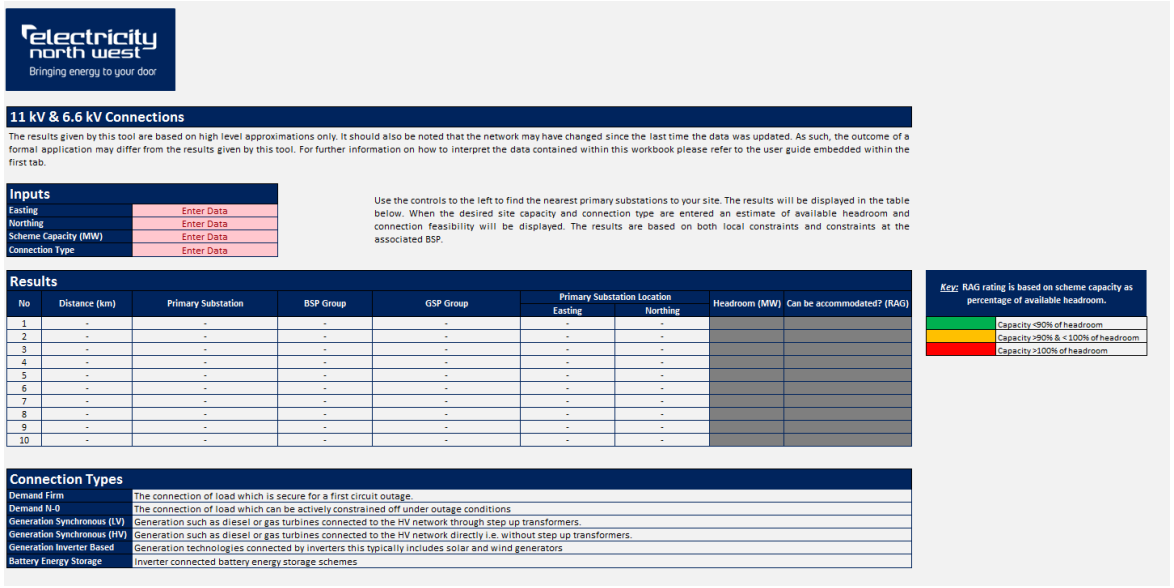
https://www.enwl.co.uk/get-connected/network-information/flexible-services/

What have we done to date

Heat Mapping Tool

- In 2018 we published the new improved heat mapping tool.
- Tool is updated monthly
- Enables developers to assess the level of capacity that might be available for new connections to our network.

https://www.enwl.co.uk/get-connected/network-information/heatmap-tool/



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11 kV & 6.6 kV Connections

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Inputs	
Easting	Enter Data
Northing	Enter Data
Scheme Capacity (MW)	Enter Data
Connection Type	Enter Data

Use the controls to the left to find the nearest primary substations to your site. The results will be displayed in the table below. When the desired site capacity and connection type are entered an estimate of available headroom and connection feasibility will be displayed. The results are based on both local constraints and constraints at the associated BSP.

Results

No	Distance (km)	Primary Substation	BSP Group	GSP Group	Primary Substation Location		Headroom (MW)	Can be accommodated? (RAG)
					Easting	Northing		
1	-	-	-	-	-	-		
2	-	-	-	-	-	-		
3	-	-	-	-	-	-		
4	-	-	-	-	-	-		
5	-	-	-	-	-	-		
6	-	-	-	-	-	-		
7	-	-	-	-	-	-		
8	-	-	-	-	-	-		
9	-	-	-	-	-	-		
10	-	-	-	-	-	-		

Key: RAG rating is based on scheme capacity as percentage of available headroom.

	Capacity <90% of headroom
	Capacity >90% & < 100% of headroom
	Capacity >100% of headroom

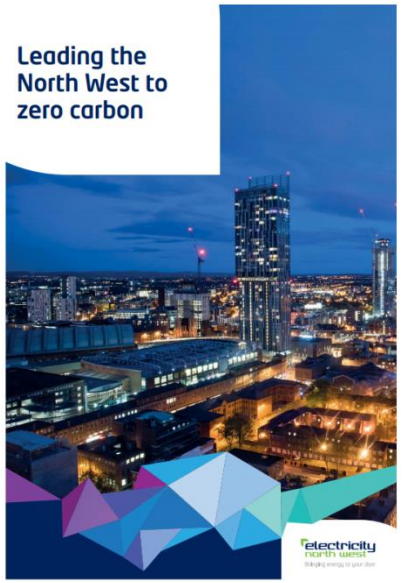
Connection Types

Demand Firm	The connection of load which is secure for a first circuit outage.
Demand N-0	The connection of load which can be actively constrained off under outage conditions
Generation Synchronous (LV)	Generation such as diesel or gas turbines connected to the HV network through step up transformers.
Generation Synchronous (HV)	Generation such as diesel or gas turbines connected to the HV network directly i.e. without step up transformers.
Generation Inverter Based	Generation technologies connected by inverters this typically includes solar and wind generators
Battery Energy Storage	Inverter connected battery energy storage schemes

Carbon Plan

- Publication of the carbon plan in 2019
- Maps out how we intend to reduce emissions 10% year on year.

https://www.enwl.co.uk/zero-carbon/leading-the-north-west-to-zero-carbon/

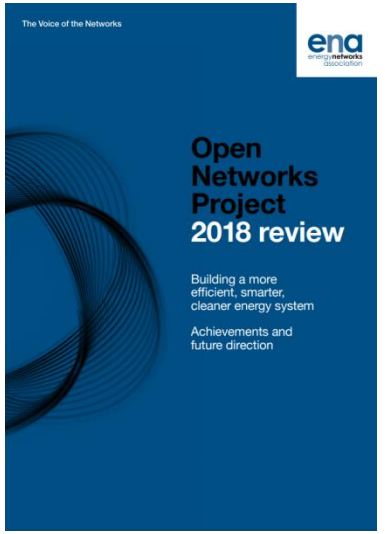


What have we done to date

Open Networks Project

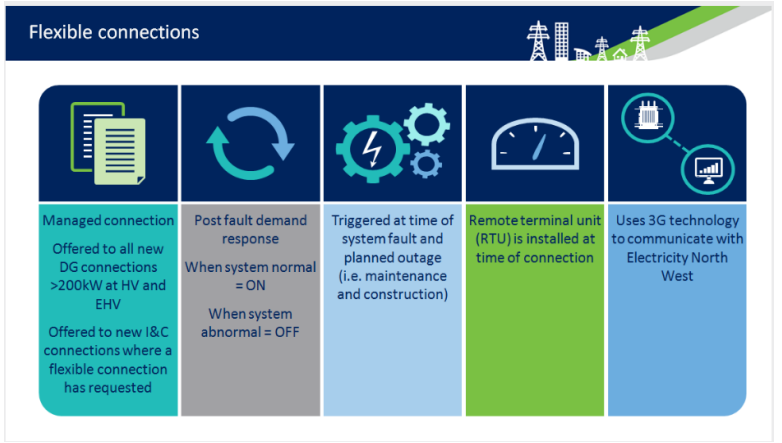
- Worked collaboratively with the other industry members to develop shared processes, identify best practices, and enhance whole system development.
- Consultations on: impact assessment, connection queues, interactivity, and flexible services.

http://www.energynetworks.org/electricity/futures/open-networks-project/



Flexible Connections

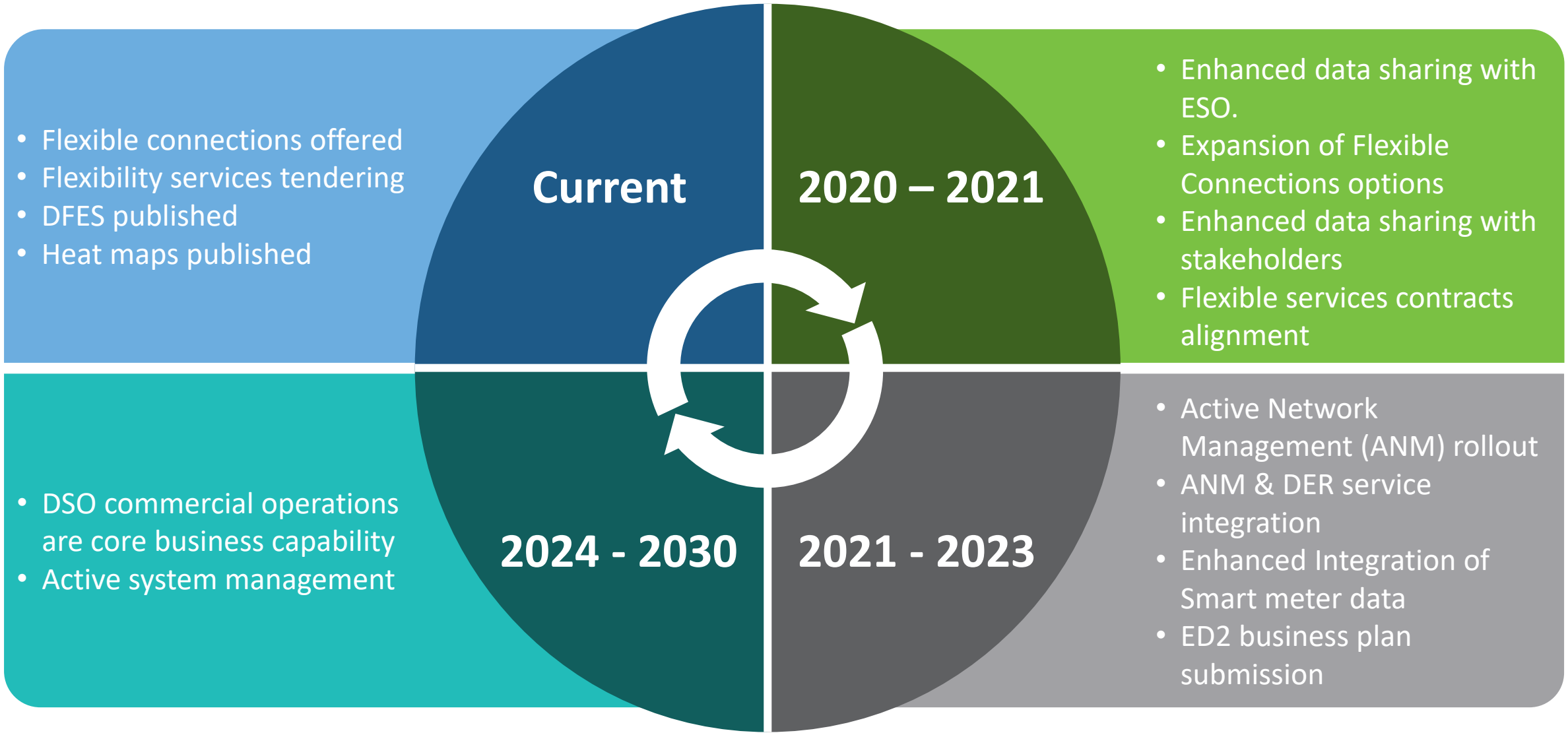
- We offer constrained or flexible connection offers as standard, which means you could benefit from avoiding reinforcement costs and associated timescales for traditional network reinforcement. https://www.enwl.co.uk/get-connected/apply-for-a-new-connection/managed-connections/



Key points for 2020

- Publication of System Wide Resource Register
- Changes to the interactivity process
- Changes to the queue management process
- Alignment of flexible services contracts with other DNOs
- Publication of Digitisation strategy

DSO transition



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Flexible Services

Steffan Jones

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Current requirements

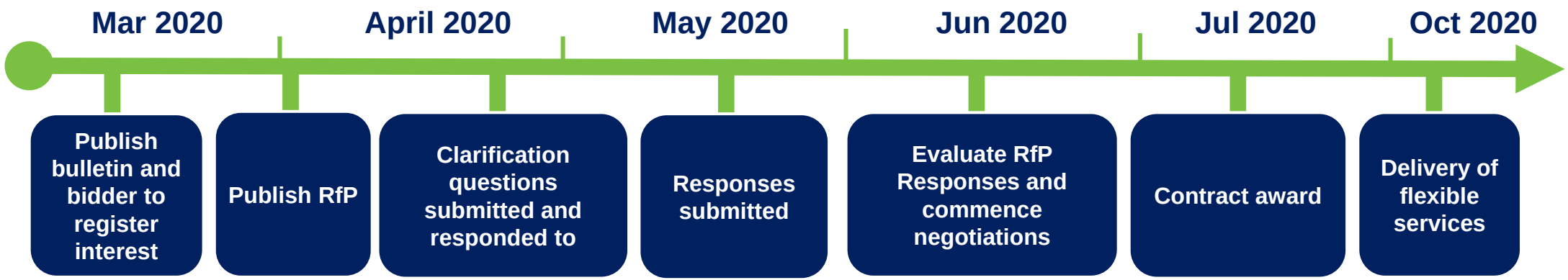
On 28 March we published 4 new requirements for flexibility

The tender opens for submissions on 17 April 2020

The tender closes to submissions on 18 May 2020

Current requirements

You can register your interest to participate in this tender on our webpage



For more information on the requirements for this tender please visit
www.enwl.co.uk/flexible-services/current-request-for-proposals

Recent improvements following feedback

We have now published the full **half hourly** requirements for our current requirements

You can now **register your asset** via an online form, and we will contact you directly when there is a requirement in your area

We are the first DNO to adopt the industry agreed **consistent branding** for flexible service products
(Sustain, Secure, Dynamic, Restore)

Flexible Connections

Steffan Jones

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Business as Usual Flexible Connection Options

Export limiting devices

Flexible Connection Solution where automated equipment at the User's site/substation ensures that the User's Agreed Export Capacity is not exceeded.

Available to all generation customers where export capacity is deemed to be an issue or where the site does not wish to export/limited export requirements. Sites should adhere to EREC G100 standards.

Remote Constraint Connection

Flexible Connection Solution where capacity is temporarily reduced (which may be zero) for system abnormal network conditions. These may be distant from the customer's site and are monitored in real-time.

Currently ENWL offers remote constrained connections to all generation sites ≥200kVA in the form of rapid and controlled shutdown procedures.

Intertripped connections

Flexible Connection Solution which will disconnect some/all of the site for a prescribed system abnormal network condition, such as another circuit breaker opening.

Applied within ENWL where a network critical disconnection is required following an abnormal running condition within protection timescales (<1s).

It is not always possible to technically or financially facilitate a flexible connection to all sites. Your designer will be able to advise on a site by site basis.

What we are working on

We are developing:

Timed Capacity Connections - a Flexible Connection Solution where the User manages their import/export level within a prescribed operating schedule agreed within their Connection Agreement.

Active Network Management - a Flexible Connection Solution where distributed control systems continually monitor network parameters and allocate capacity to customers in order that performance remains within limits.

Import Limited Connections - a Flexible Connection Solution where automated equipment at the User's site/substation ensures that the User's Agreed Import Capacity is not exceeded.

Where possible, ENWL has taken the opportunity to trial these technologies. Although these are not currently business as usual, we are happy to discuss the potential for these solutions on a trial basis.

Lunch & Networking

Incentive on Connections Engagement (ICE) 2019-20 Update

Hannah Sharratt

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ICE 2019-20 Workplan Performance

Action	Progress
➢ Communicate with our Stakeholders on **Engineering Recommendation G99** requirements for the connection of Generation Equipment.	✓ Presented at 3 workshops and 2 webinars
➢ Engage with Stakeholders on our **transition to Distribution System Operator (DSO)** Strategy.	✓ Presented at DG HV/EHV workshop and Owner Operator Forum
➢ Continuously improve how we provide information and publish requirements for **flexible services**, such as Demand Side Response.	✓ Consultation completed. ✓ 3 workshop presentations provided. ✓ New information & guidance published
➢ Clearly communicate where **flexible connection options** are available.	✓ Presentation at workshop ✓ Options discussed during quoting process, where applicable
➢ Provide briefings for stakeholders on the proposed changes to charges through **Ofgem's significant code review**.	✓ Presentation at workshop and 2 webinars.
➢ Review our **interactivity processes** in line with best practise identified through the Open Networks Project.	✓ Ongoing in line with national timelines, roll out planned for next year ✓ Presented at workshops.
➢ Lead the national engagement with stakeholders on more consistent DNO **connection charging approach** to make charging fair for all of our customers.	✓ Update provided at workshop. No changes to current approach planned.

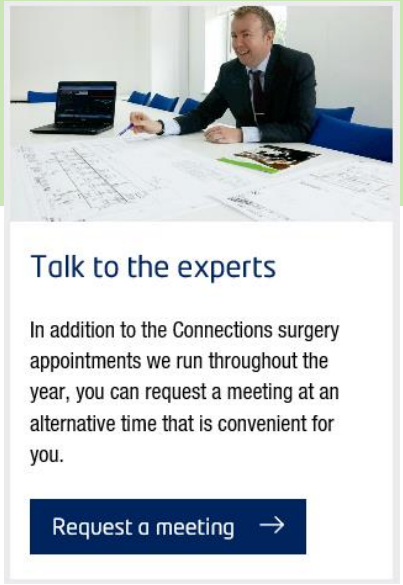
ICE 2019-20 Workplan Performance

Action	Progress
➢ Engage with our Stakeholders to improve **outage communications**, adopting the principles of the Solar Trade Association (STA) best practice guide and apply where appropriate.	✓ Best practise implemented in line with STA Guidance ✓ Presented at Owner Operator Forum
➢ Improve access and presentation of information on **available thermal capacity and fault level** on our network.	✓ Enhanced Heatmap Tool now available with improved geographical view
➢ Engage with stakeholders to review and improve the **post acceptance process**.	✓ On track
➢ Engage with our stakeholders on the impact of our new **Network Management System**.	✓ Impact of new Network Management System reviewed – no impact for DG HV/EHV customers
➢ Target improved **Time to Quote** timescales (57 working days).	✓ On track: HV 36 days; EHV 52 days
➢ Improve 3rd party access to our **Network Information** on GIS.	✓ New functionality available for stakeholder testing in March, with planned roll out from April.
➢ Improve communications on **Transmission Constraints**.	✓ On track
➢ Engage with Stakeholders to improve the ENWL **'Get Connected' website**.	✓ Website improvements implemented. Collating feedback via webinars and surveys.

ICE 2019-20 Workplan Performance TO BE UPDATED

- Business As Usual commitments

➢ We will continue to offer opportunities for stakeholders to engage with us.	✓ 2 workshops held in area ✓ 1 London workshop ✓ 9 Surgery session opportunities, now also offering request a surgery sessions ✓ Multiple webinars available, including Ofgem Charging Review, G99 & G98
➢ We will continue to communicate with our stakeholders by issuing regular updates on ICE Commitments, Policy and Health & Safety updates to registered stakeholders	✓ Quarterly updates and newsletters published for ICE ✓ All updates available on our website



ICE Workplans are available here

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Ofgem Significant Code Review

Brian Hoy

What is the Access SCR?

- **A Significant Code Review (SCR)** allows Ofgem to initiate wide ranging and holistic change and to implement reform of a code based issue.

- **Objective of Access Significant Code Review (SCR):** to ensure electricity networks are used efficiently and flexibly, reflecting users' needs and allowing consumers to benefit from new technologies and services while avoiding unnecessary costs on energy bills in general**.**
  - **Access arrangements** - the nature of users' access to the electricity networks (for example, when users can import/export electricity and how much) and how these rights are allocated:
  - **Forward-looking charges** –the type of ongoing electricity network charges which signal to users how their actions can ether increase or decrease network costs in the future

- **Scope:**
  - Review of the definition and choice of transmission and distribution access rights
  - Wide-ranging review of Distribution Use of System (DUoS) network charges
  - Review of distribution connection charging boundary
  - Focussed review of Transmission Network Use of System (TNUoS) charges

Ofgem's approach

- Ofgem's focus this year is on developing and assessing a long-list of options. They are sharing their thinking through two working papers:
  - 1st working paper – published September 2019
    - An initial overview and assessment of options for access rights, better locational DUoS signals and charge design.
    - The links between access, charging and procurement of flexibility.
  - 2nd working paper – published December 2019
    - Distribution connection charging
    - Small user treatment
    - Focused transmission charging reforms
- A shortlist of options will be assessed in further detail this year, with consultation on their draft SCR conclusions in summer 2020
- Further information on the reviews can be found at
  - http://www.chargingfutures.com/charging-reforms/access-forward-looking-charges/proposed-changes-and-potential-impacts/
  - https://www.ofgem.gov.uk/electricity/transmission-networks/charging/reform-network-access-and-forward-looking-charges

Ofgem’s Access and Forward Looking Charging SCR

2nd Working Paper December 2019

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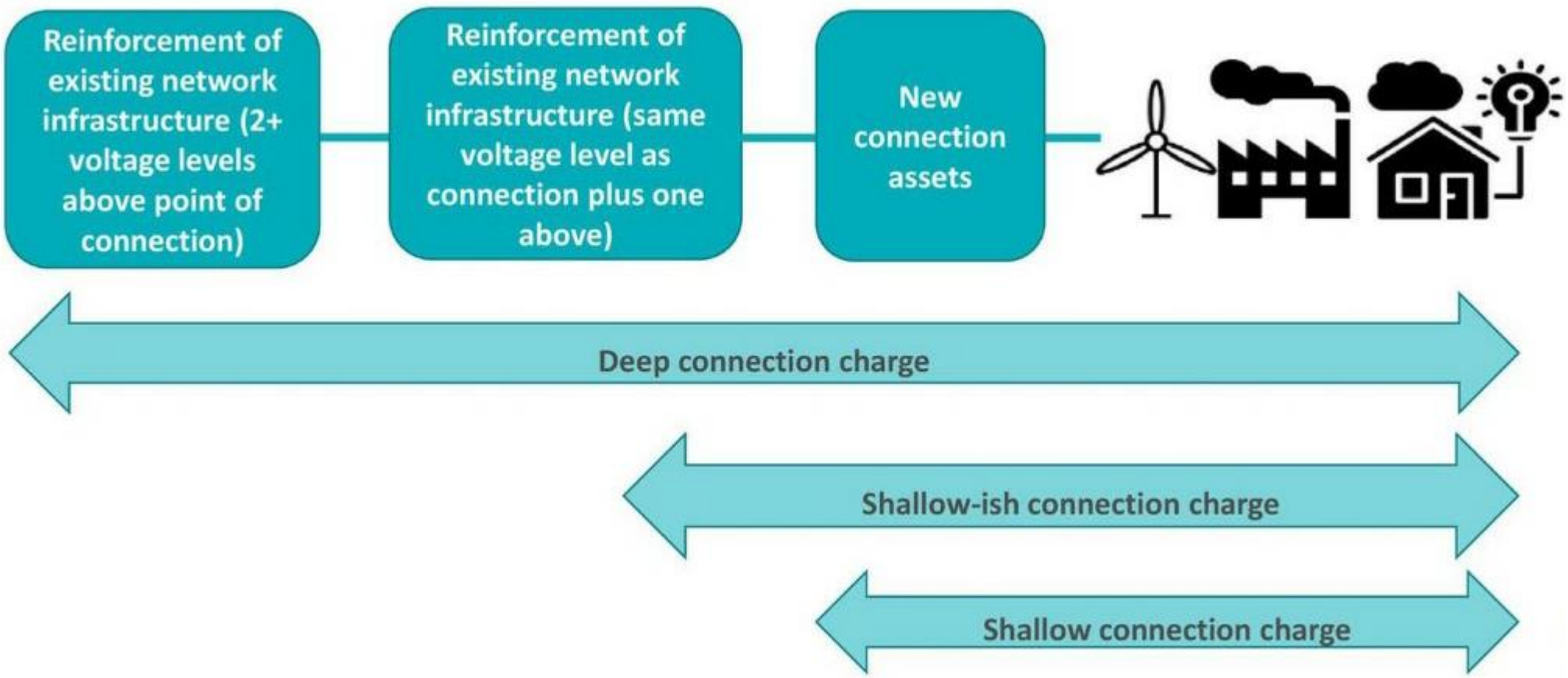
What is the ‘connections boundary’?

When connecting to the network there can be different kinds of assets required to make the connection. The ‘connections boundary’ describes the assets that the customer has to pay for.



How does it work now and what are the issues?

Transmission

- **Shallow connection boundary**
- Pay for new connecting assets up front or over time
- TOs must fund any necessary reinforcement via RIIO allowances or the ESO could actively manage the constraints through flex markets
- To protect against TOs undertaking reinforcement that is not then used, users provide securities against them cancelling their projects ('user commitment')

Distribution

- **Shallow-ish connection boundary**
- Pay upfront for new connecting assets and a share of any necessary reinforcement of the upstream network
- Can lead to high connection charges and might reduce incentives for DNOs to invest strategically, **but** provides a locational signal
- Protects wider consumers from the risk of stranded or under used infrastructure

Potential problems with these arrangements

- The difference between arrangements may be distorting investment decisions or competition between projects
- The connection arrangements could be creating barriers to entry for some users (eg upfront cost) and slow down connections of new technologies like distributed generation and EV charging infrastructure

What options are Ofgem considering?

Shallow-ish connection boundary

current arrangements

Shallower

still recovering some reinforcement costs through connection charges, but less than now

Shallow

no longer recovering any reinforcement costs through connection charges

Alternative payment arrangements

it might be possible to combine alternative payment terms such as payment over time with any of the other options

What are Ofgem's initial thoughts?

Connection boundary depth	Pros	Cons
• **Shallow-ish** (keep the existing boundary but could still implement other approaches such as alternative payment terms)	+ Delayed payment may **reduce issues associated with high upfront cost**.	- Could expose DNOs to **bad debt risk**.
• **Shallower** (still recovering some reinforcement costs through connection charges, but less than now)	+ Would reduce cost but **keep some locational signal** depending on where new level is set. + Recovering more from network charges could mean **more opportunity for innovative/ more strategic solutions** to network development.	- **Weaker locational signal** but could be mitigated by more locational DUoS charging.
• **Shallow** (no longer recovering any reinforcement costs through connection charges)	+ Increased opportunity for DNOs to consider **alternative approaches to developing their network** + **Lowest level of upfront cost** to connecting users	- **Weakest locational signal** and could create an incentive to over–request capacity required. - May be **excessively complex** and/or risk introducing cross-subsidies between users

Significant Code Review Timetable - Key Milestones

- The reviews are likely to result in major changes to the charging and access arrangements for customers
- Aim is to finalise the proposals mod 2021 in time for DNO RIIO-ED2 Business Plan Submissions
- Reviews are still at an early stage and impacts not yet clear
- Further updates will be provided as further information becomes available.

Shaping our 2020-21 ICE Workplan

Hannah Sharratt

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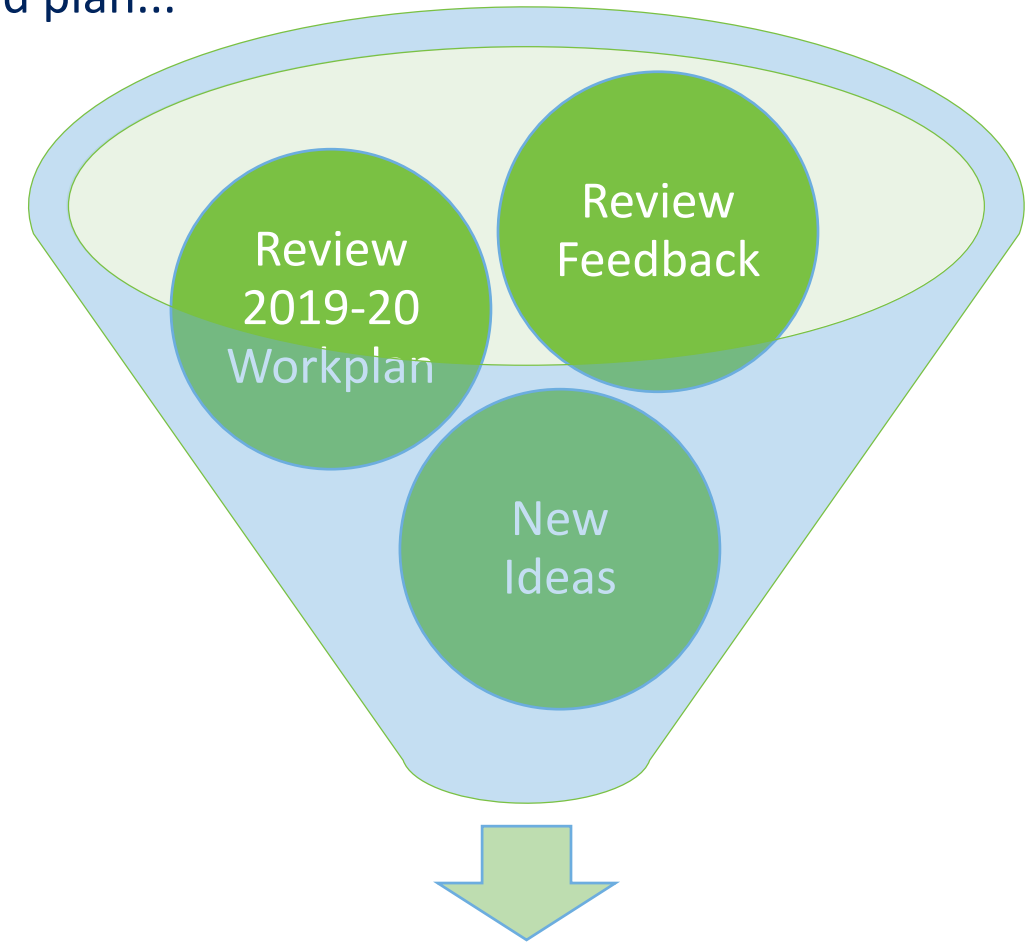
Your Priorities ?

- For each of the following topics, please indicate the level of **importance** to you
  - 1 = low importance, 5 = extremely important

Competition in Connections	Training & Guidance	Clarity of Customer Responsibilities
Process	Time To Quote	Communications
Land Rights & Consents	Time To Connect	Pre-application support / Ease of application
Cost	Interactivity	Payment Options
Local Economy	Access to Information	A&D Fees
Flexible Connection Options	Clarity of our Requirements	Other factors, eg Highways, National Rail, BEIS, Local Authorities

Proposed DG HV/EHV Workplan

How we create the proposed plan...



Draft 2020-21 ICE Workplan

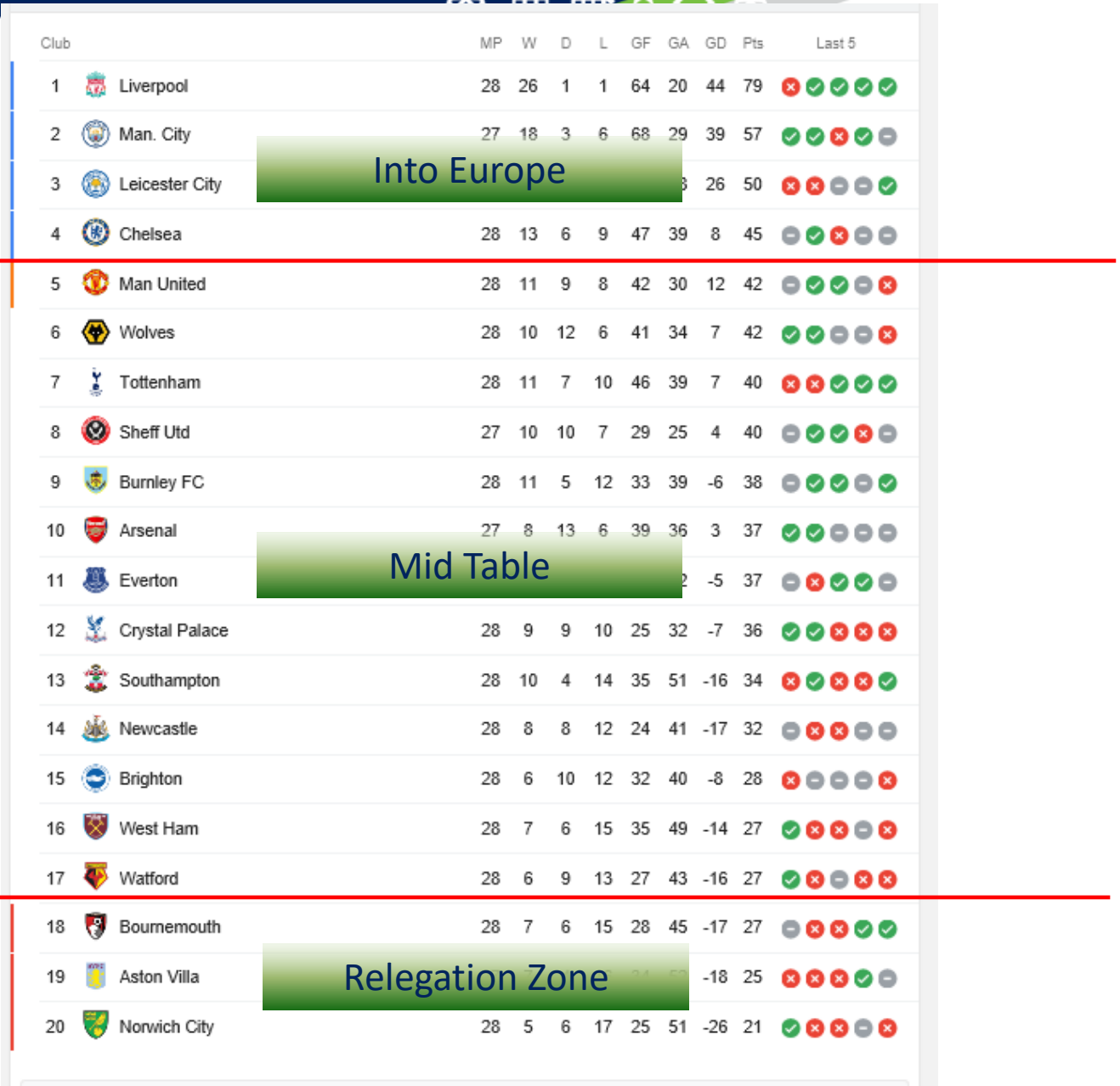
2020-21 DG HV/EHV ICE Workplan Development

Gather Ideas & Options:	Assessment & Benefits Review:	Assessment & Benefits Review:	Confirm:	Finalise
Draft ICE commitments & actions	Discuss potential ICE actions with stakeholders	Review & respond to feedback	Test updated ICE actions & KPIs / outputs with stakeholders	Publish Workplan

Internal engagement → External engagement → Act on feedback → External engagement → Finalise & Issue

ICE Commitments League – Ranking exercise

- **Individual activity:** Using the sheets provided, please categorise each proposed ICE commitment.
- **Group activity:** Using the cards provided, please categorise each proposed ICE commitment.
- Please also provide feedback on our proposed actions, and describe how this will benefit you.



Feedback & Summary

Thank you

Coffee Break

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G99 Update

Gill Williamson

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EREC G99 Update : Agenda

Recap on G99 fundamentals

Type A update

- ENA Type Test Register

Type B update

- PGMD process
- Reactive power capability evidence

Type C update

- Frequency testing
- Monitoring
- Models

Resources

Recap on G99 fundamentals

EREC G99 Update – recap on G99 fundamentals

- Generators have a legal requirement to comply with G99
- Manufacturers should assist with some of the necessary compliance information
  - Type Test
  - Manufacturer's Information
  - Test reports
- Electricity North West have a legal requirement to assure compliance

G98 & G99 are evolving, so please always check for and use the latest versions.

Latest versions from 9th March 2020 are:

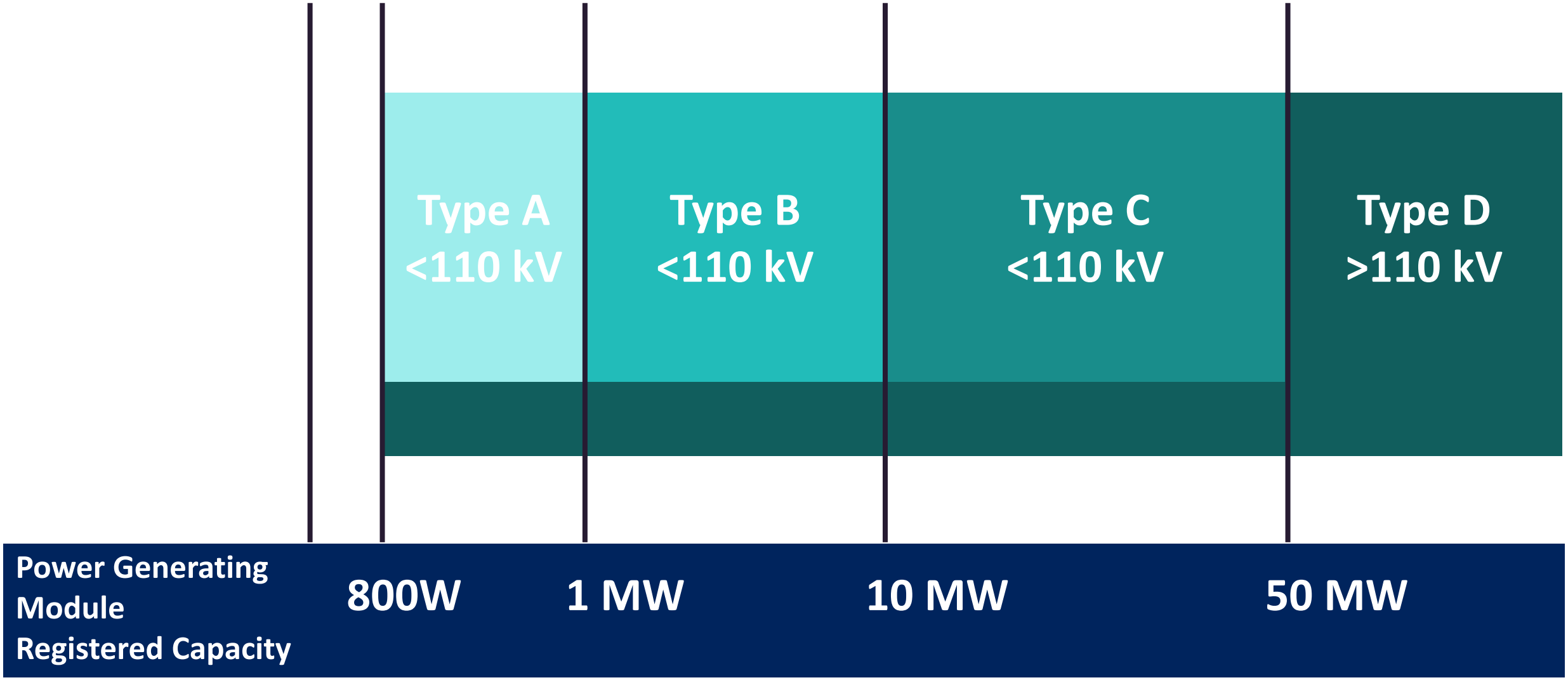
G98 Issue 1 Amendment 4

G99 Issue 1 Amendment 6

https://www.energynetworks.org/electricity/engineering/distributed-generation/engineering-recommendation-g99.html

EREC G99 Update – recap on G99 fundamentals

- Types affect technical requirements and which forms you use

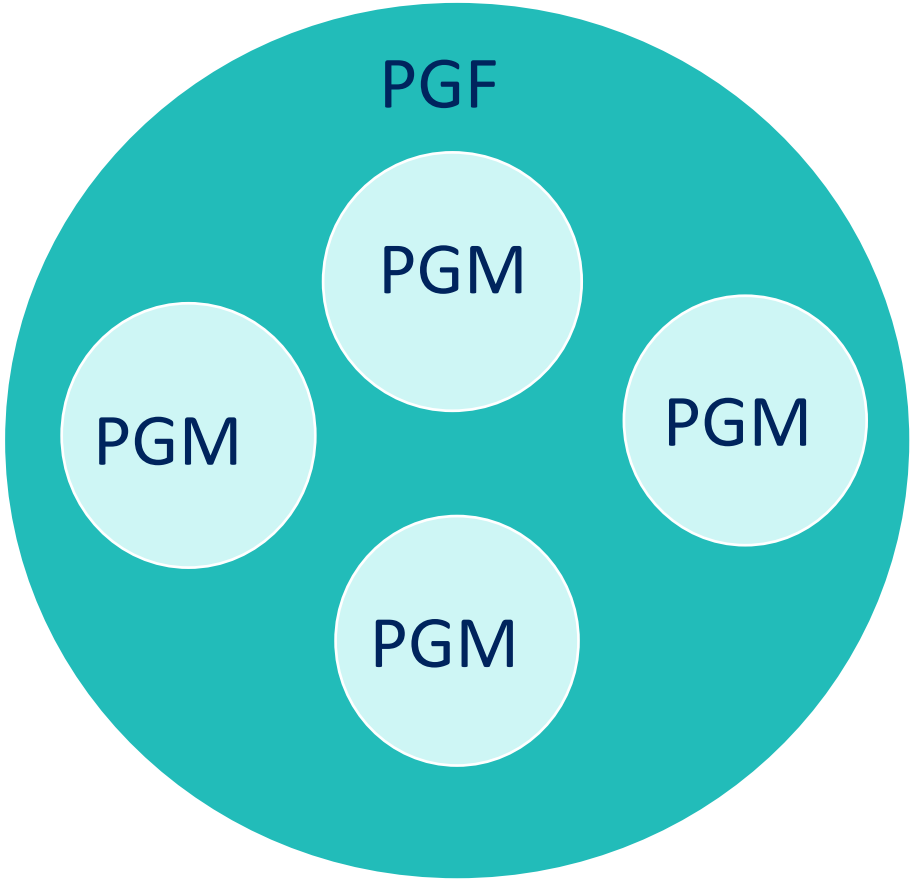


EREC G99 Update – recap on G99 fundamentals

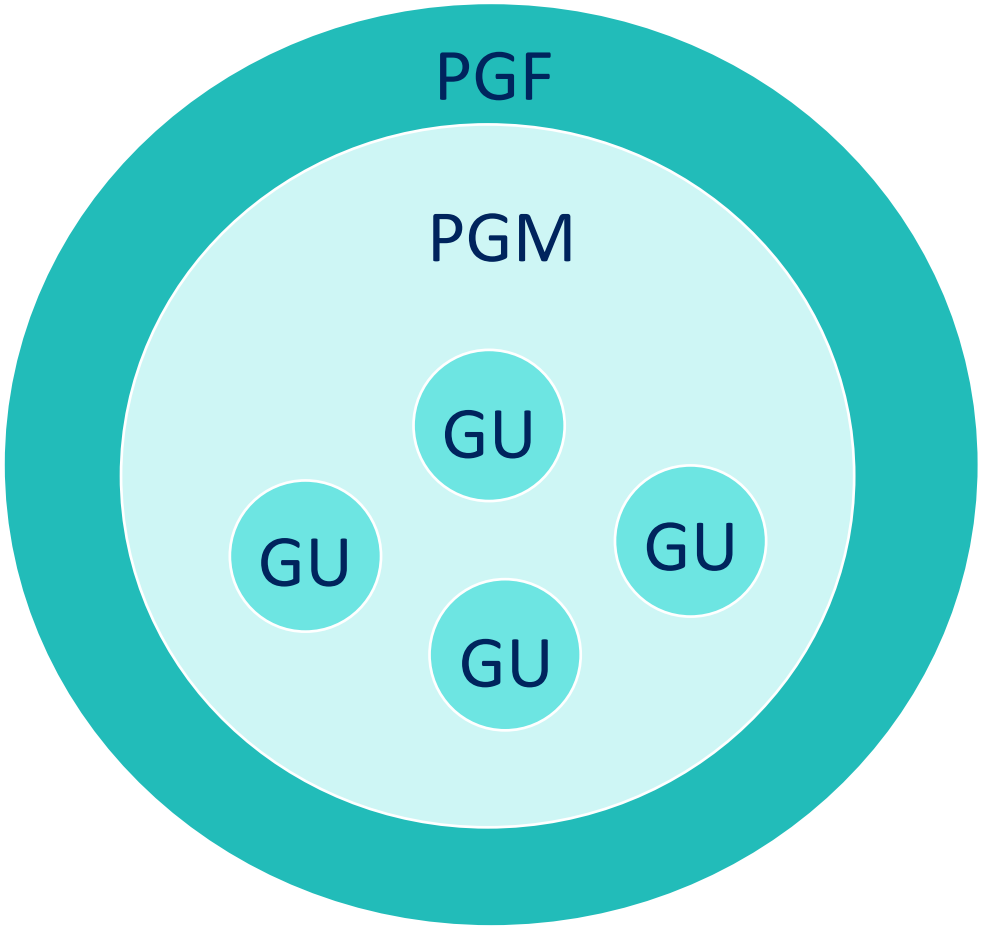
Types depend on PGM capacity

PGM definition depends on whether the technology is synchronous / asynchronous

SYNCHRONOUS SCHEME



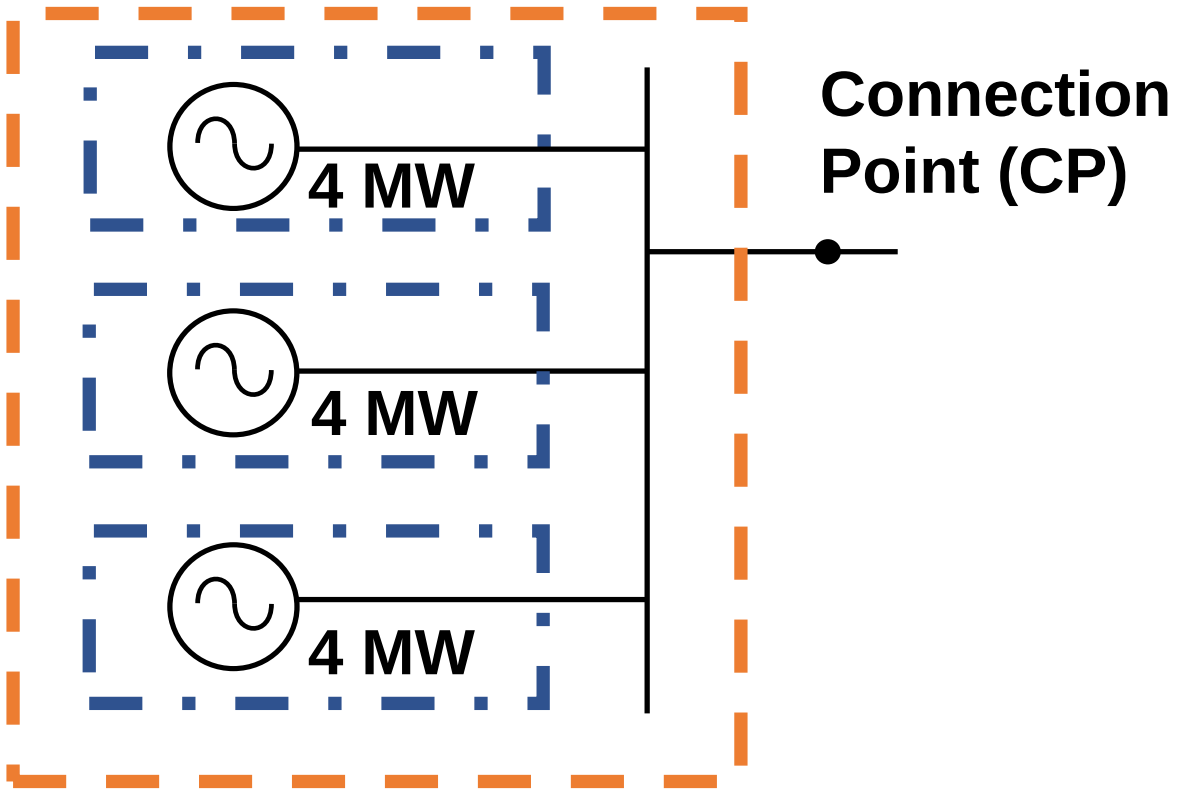
ASYNCHRONOUS SCHEME



Generating Unit, GU
Power Generating Module, PGM
Power Generating Facility, PGF

EREC G99 Update – recap on G99 fundamentals

3 x 4MW Type B Synchronous PGMs = 12 MW PGF

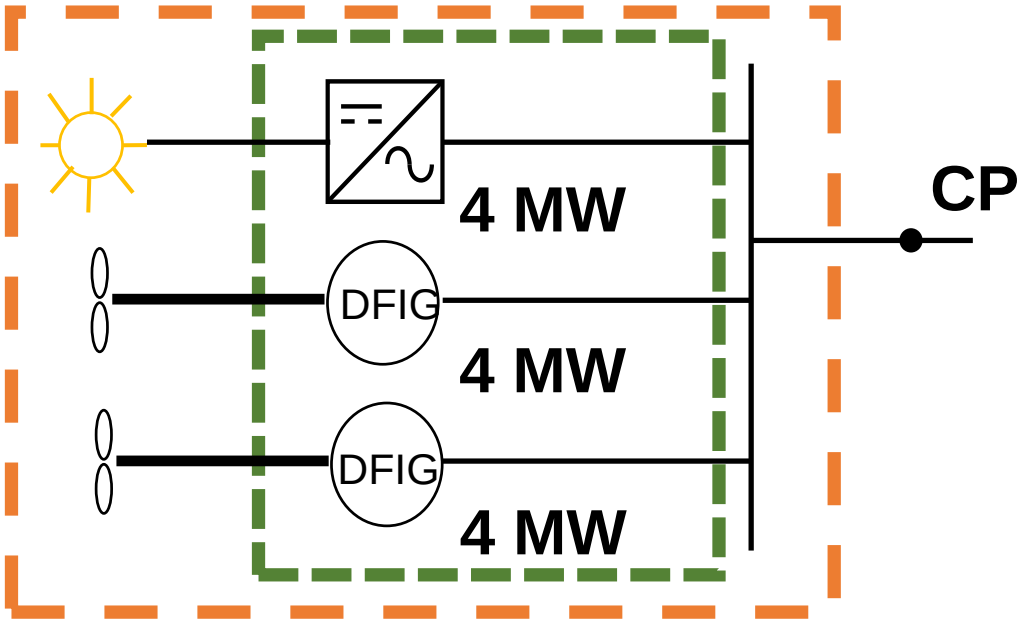


Power Generating Module (PGM) / Synchronous Power Generating Module

Power Generating Facility (PGF)

EREC G99 Update – recap on G99 fundamentals

1 x 4 MW Inverter connected plus 2 x 4 MW Asynchronous GU =
12 MW Type C PPM = 12 MW PGF



Power Generating Module (PGM) / Power Park Module (PPM)

Power Generating Facility (PGF)

Type A Update

EREC G99 update – Type A

Summary of G98 and G99 Forms

	Single premises Up to and including 16 A per phase	Multiple premises Up to and including 16 A per phase	Less than 50kW	Integrated Micro-generation & storage (each up to & including 16 A per phase)	Greater than 50kW & less than 1MW Type A	1MW to less than 10MW Type B	10MW to less than 50MW Type C	Greater than or equal to 50MW or >110kV Type D
Applicable Standard	G98	G98	G99	G99	G99	G99	G99	
Application		Form A	Form A1-1	Form A1-2	SAF*	SAF*	SAF*	
Notification	Form B	Form B	Form A3-1	Form A3-2	Form A3-1			
Evidence	If fully type tested but not registered with the ENA- Form C	If fully type tested but not registered with the ENA- Form C	If not type tested – Form A2-1 synchronous <50kW, Form A2-2 synchronous >50kW or Form A2-3 inverter connected gen	If not type tested – Form A2-1 synchronous <50kW, Form A2-2 synchronous >50kW or Form A2-3 inverter connected gen	If not type tested- Form A2-2 synchronous Form A2-3 inverter connected gen	PGMD** Form B2-1	PGMD** Form C2-1	
Site Compliance and Commissioning Checks					Form A2-4 if the Interface Protection is not Type Tested or for other site compliance tests	Form B2-2 if the Interface Protection is not Type Tested or for other site compliance tests	Form C2-2 if the Interface Protection is not Type Tested or for other site compliance tests	
Installation						Form B3	Form C3	

*Standard Application Form

**Power Generating Module Document

Consult our G99 summary sheet to quickly determine which form you need

G99 summary
https://www.enwl.co.uk/globalassets/get-connected/new-connections/generation/g99/g99-summary-guide.pdf

G98 summary
https://www.enwl.co.uk/globalassets/get-connected/new-connections/generation/micro-generation/g98-summary-guide.pdf

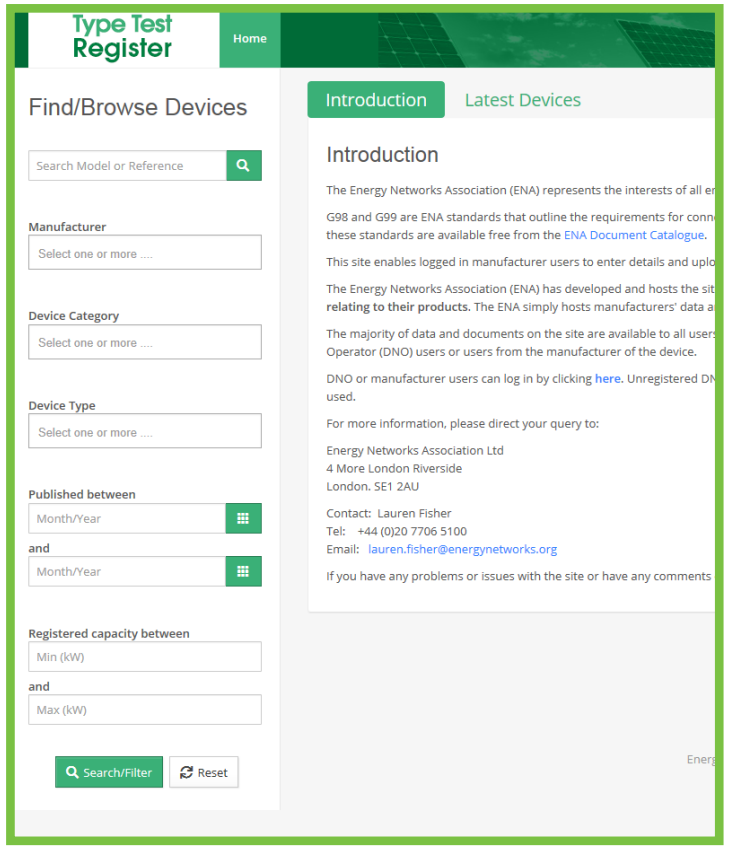
EREC G99 Update – Type A

ENA Type Test Register is available @ http://www.ena-eng.org/gen-ttr/

Product manufacturers upload data and documentation relating to their products

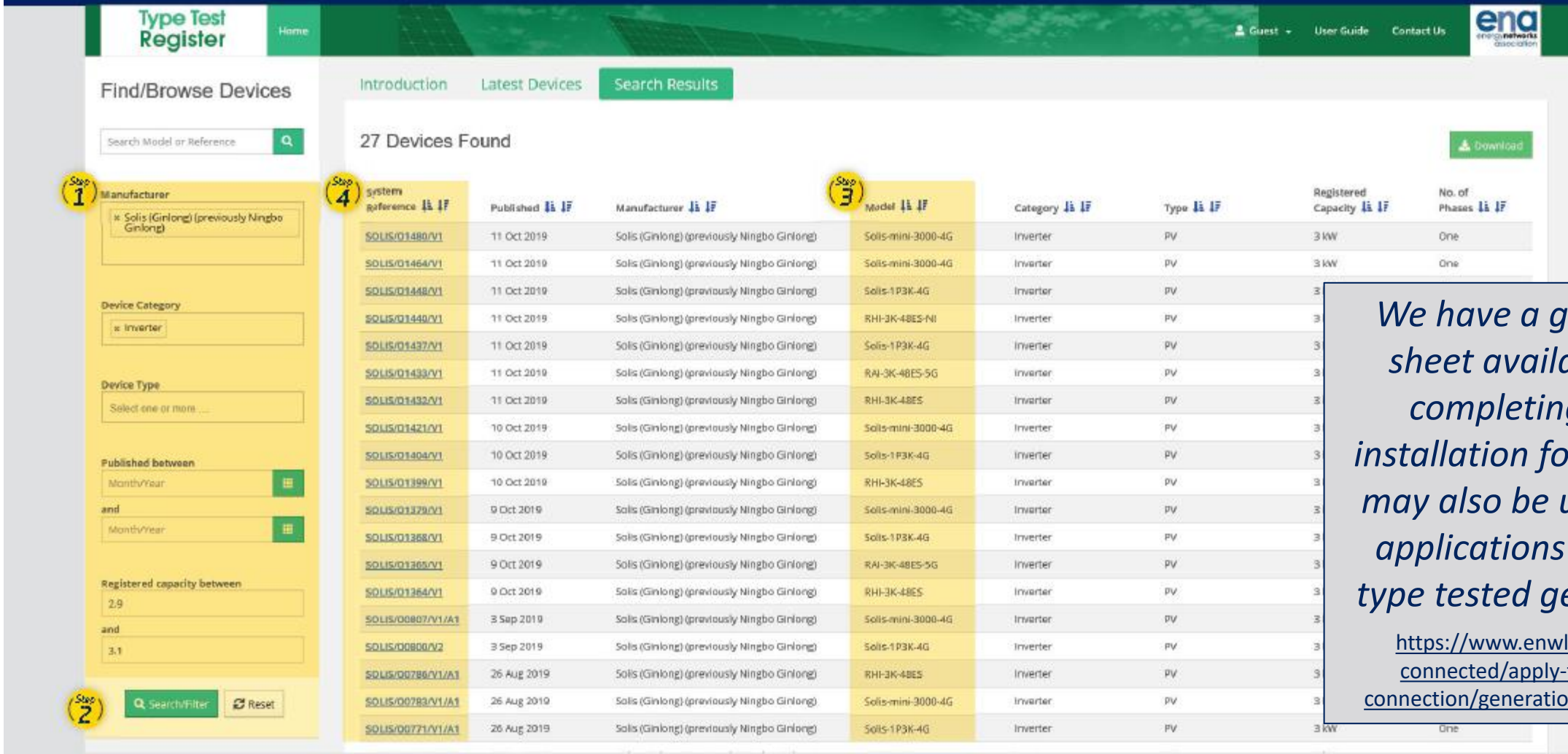
Manufacturers have been requested to resolve issues with most of the 370 entries

Manufacturers are requested to provide missing or incorrect information



EREC G99 Update – Type A

Manufacturer's Reference Number is obtained from the ENA Type Test Register website
www.ena-eng.org/gen-ttr



Step 1 Select manufacturer, device category and an appropriate registered capacity range

Step 2 Click the Search/Filter button

Step 3 Identify the micro generator model using this column

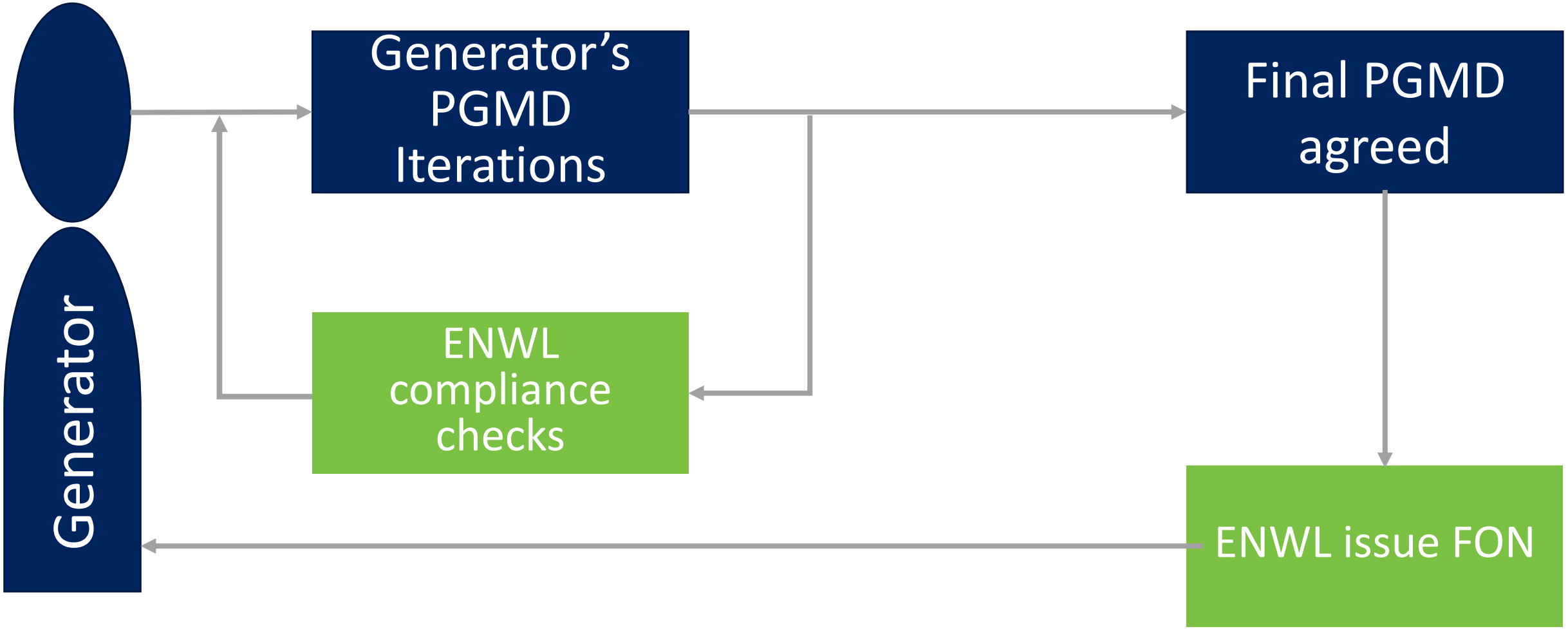
Step 4 The System Reference of the micro generator to be entered on the Form B

We have a guidance sheet available for completing G98 installation form and it may also be useful for applications for G99 type tested generators

https://www.enwl.co.uk/get-connected/apply-for-a-new-connection/generation-connection/

Type B update

EREC G99 Update – Type B



PGMD must be submitted at least 28 days prior to synchronisation

EREC G99 Update – Type B

Please use the word version of the PGMD clearly signpost evidence using filenames, report section, figure and table numbers

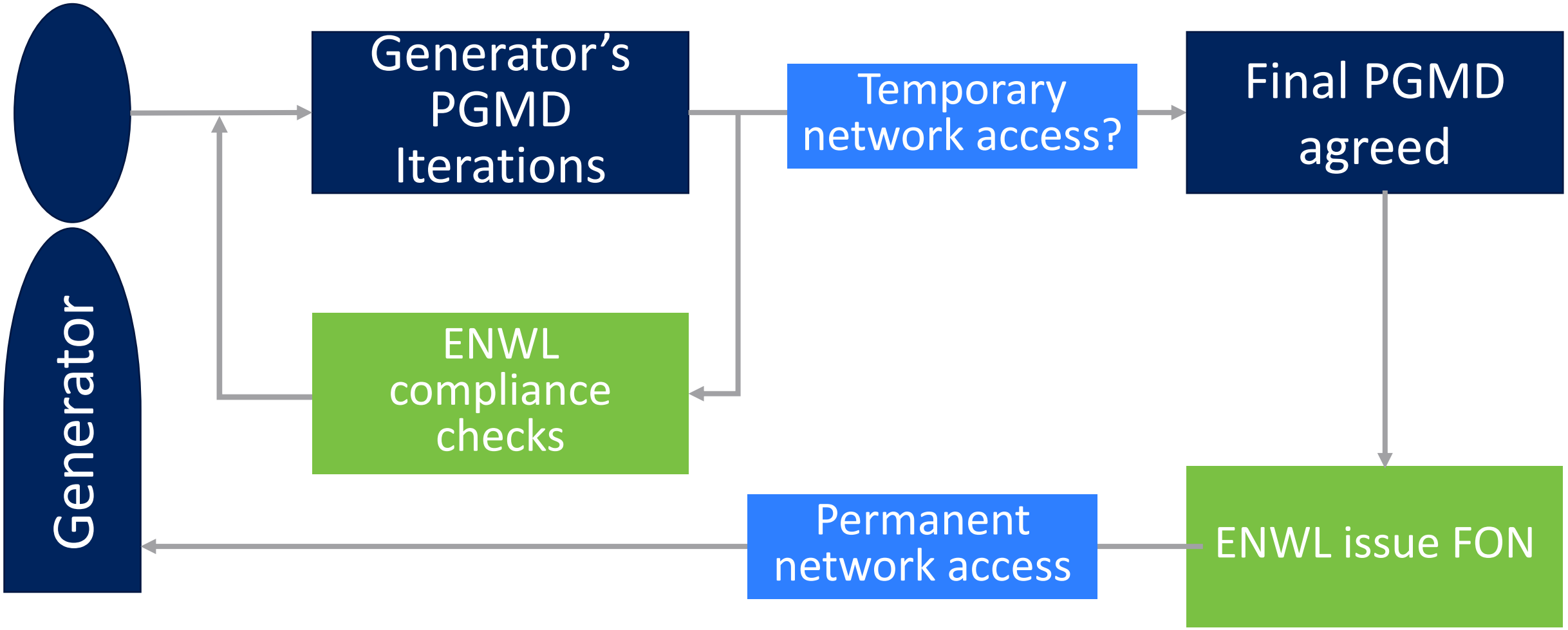
Experience is that everybody (DNOs, Generators and manufacturers) is still learning, so please consider your requirements early

Generators are free to choose method of compliance

Check detailed technical requirements, simple declaration is not acceptable

BESS and short term parallel are exempt from some technical requirements

EREC G99 Update – Type B



Temporary network access?

As endorsed by the ENA, Type B and C generators may be able to fully operate after commissioning tests and before the FON is issued if:

1) The connection is **safe**, i.e. adequate commissioning completed
2) ENWL are satisfied that the connection will **not affect the operation** of our distribution network, i.e. checked protection, flicker and harmonic impact has been confirmed to be compliant with P28 and G5 respectively
3) We are satisfied that the Generator is **taking steps to demonstrate compliance**

Operation in advance of the FON will be conditional and time limited

We may consider an ION arrangement

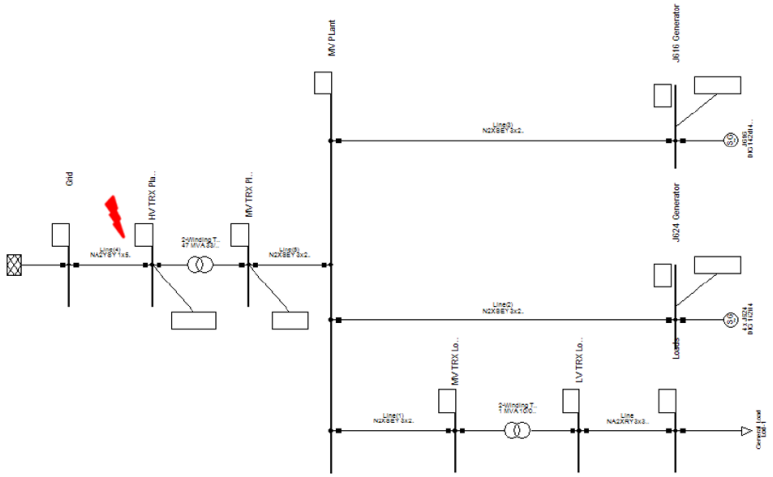
EREC G99 Update - Type B

reactive power capability

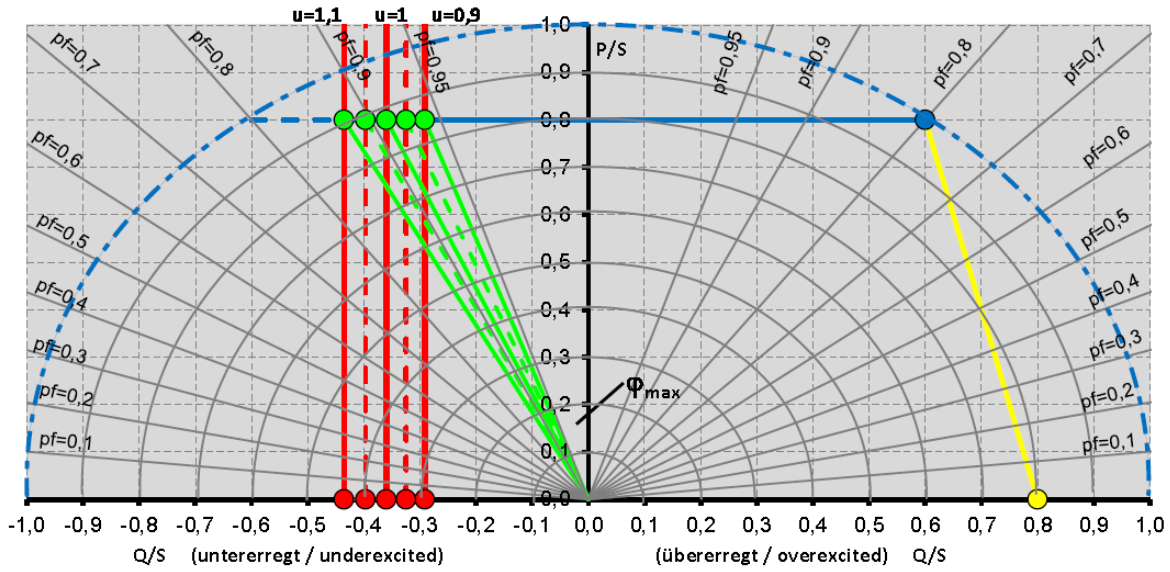
Continuous operation between 0.95 leading and 0.95 lagging Power Factor

At initial stage (IS) Options = S,MI

According to the PGMD - evidenced by carrying out simulation study in accordance with B.4.2/C.7.3/C.9.3 and by submission of a report



Load flows ✔

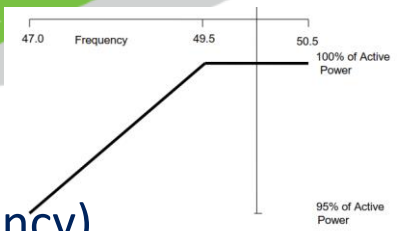


Generator Performance Chart / Capability Curve ✔

- *DNOs can accept a generator capability curve as evidence of reactive power capability compliance*

Type C Update

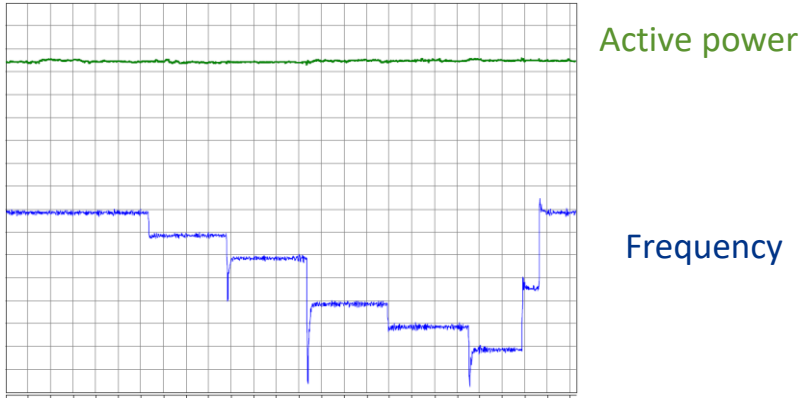
EREC G99 Update - Type C



G99 requires Type A, B, C and D PGMs to demonstrate:- **frequency capability** **frequency response** (active power output with falling frequency)

Able of continue to operate during frequency ranges At initial stage (IS) Options = MI, TV	
Frequency range	Duration
47 - 47.5 Hz	20s
47.5 – 49 Hz	90 minutes
49 -51 Hz	continuous
51 – 51.5 Hz	90 minutes
51.5 – 52 Hz	15 minutes
Evidence is normally in the form of a table listing time alongside frequency and power output	

Active power shall not drop more than shown in figure 12.1 At FON stage (FONS) Options = MI, TV, T Synchronous PGMs only	
Frequency range	Active Power output
49.5 Hz for 5 minutes	100%
49 Hz for 5 minutes	Not less than 99%
48 Hz for 5 minutes	Not less than 97%
47.6 Hz for 5 minutes	Not less than 96.2%
47.1 Hz 20 seconds	Not less than 95% without tripping
Evidence is frequently in the form of a graph	



- *Conducting these tests for Type C and D is often impractical due to the size of the load bank*
- *ENA expects some discretion*
- *G99 B5.3 states "tests can be undertaken…", not "shall"*
- ***DNOs have latitude to agree an alternative test approach for larger PGMs***

EREC G99 Update - Type C

Annex C.6 requires a Recording Device to be installed for all Type C and Type D generation projects

- Potential issues with minimum measurement requirements and definition of accuracy in Table C.6.1
- Siemens are holding discussions with ENA and National Grid to agree practical revisions
- Not on PGMD (yet)
- ***ENA have agreed that DNOs can apply leniency in the meantime***

Table C.6.1 Accuracy and resolution requirements for dynamic system monitoring

Quantity	Measurement Range	Accuracy ±% of nominal	Resolution ±% of nominal	Comment
RMS voltage	0 – 1.5 V_n	0.1	0.01	Crest factor ≤1.5
Voltage phase sequence components	0.8 V_n – 1.5 V_n	0.1	0.01	Crest factor ≤1.5
Current phase sequence components	0 – 5.0 I_n	0.5	0.01	Crest factor ≤3.0
Active Power	0 – 5 P_n	0.5	0.01	For all **Power Factors** between 0.5 and 1.0
Reactive Power	0 – 5 RP_n	0.5	0.01	For all **Power Factors** between 0.87 and 1.0
Frequency	42.5 Hz –57.5 Hz	0.005	0.001	20%<V_n<150%

The accuracy requirements for fault recording and power quality monitoring shall be in accordance with BS EN 61000-4-30 Class A; the resolution requirements shall support the required accuracy in accordance with IEC 62586-1.

EREC G99 Update – Type C

- 6.3.9.4 requires Type C and Type D Power Generation Modules to submit **simulation models**
- ENWL require the model to be in **IPSA format** (G99 allows the particular variety of power system analysis software to be specified)
- Model to be **validated by carrying out simulation studies** in accordance with C.7.8 and documented in a report to be submitted

We need models to simulate:-

1) *Future network stability as the generation mix changes*
2) *Model network disturbances such as frequency excursion of 9th August 2019*
3) *Simulate future DSO network balancing and operation*
4) *Model future innovative network controls*

Resources

EREC G99 Update – Responding to customer queries

FAQs on website

EREC G99 webinar recordings on website

Information available here

Webinar 1 Introduction to G99 Processes

Webinar 2 Technical Compliance

Question & Answer Session

electricity north west

Bringing energy to your door

Wrap up and Close

Steffan Jones

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Wrap Up & Close

- Please give us your honest feedback on the forms provided
- Presentation slides will be available via our website shortly.
- Don't forget to get in touch with us at ICE@enwl.co.uk
- Thank you for your attendance and have a safe journey home.