Thank you for your patience

We will begin the presentation shortly…

This webinar is going to be recorded and uploaded to our website. The link to slides and recording will be circulated.

Please post any questions in the Q&A and will answer these at the end of the presentation.

Electricity Distribution

Accelerating your connection

Ben Godfrey
Director of Distribution System Operator

30th October 10:30-11:30

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Agenda

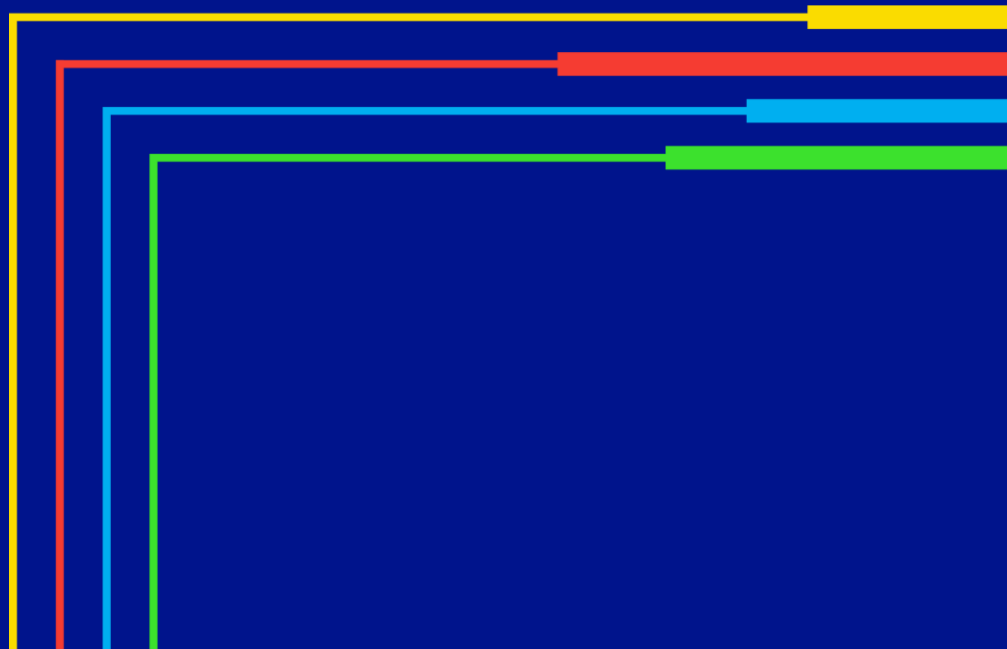
30th October 2023

10:30-11:30

1.	Technical Limit Background
2.	Phase 1A Update
3.	Expression on Interest
4.	Phase 1B Launch
5.	Curtailment Reporting
6.	Q&A

1

Technical Limit Background



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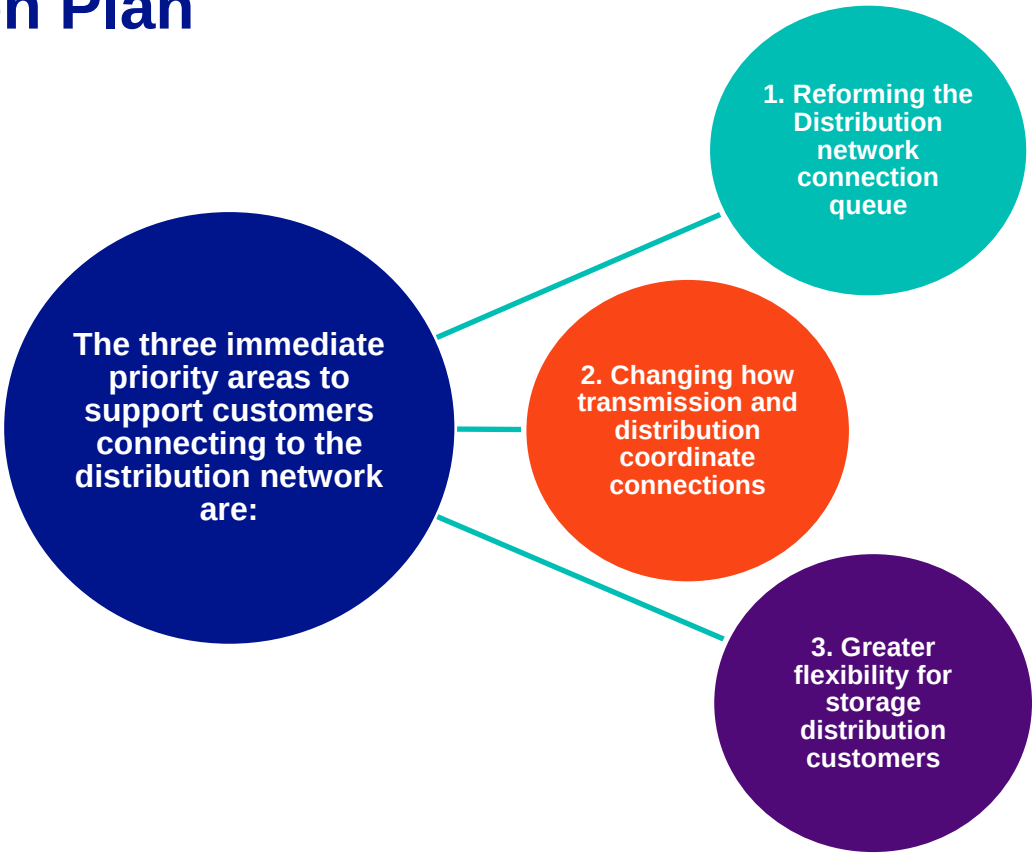
The ENA 3-Point Action Plan

The existing connections model was designed for old technology. Using the same model today is not fit for purpose.

As a result, the Energy Networks Association published a three-step plan to speed up connections to the grid.



The 3-step Action Plan to improve and accelerate connections

ACTION 1

Reforming the distribution network connection queue

- **Spring clean. Migrate pre** 2017 offers to milestones contracts
- **First ready, first connected.** Prioritise ‘shovel ready’ connections

ACTION 2

Changing how Transmission and Distribution coordinate connections

- **Clear & consistent boundaries. Create technical boundaries.**
- **Co-ordinating the queue. Reallocate capacity.**

ACTION 3

Greater flexibility for storage distribution customers

- **Flex capacity.** Connect battery customers more quickly and improve the network’s ability to manage capacity

Today’s webinar is focused on Action 2

Why do we need to change how Transmission and Distribution coordinate connections?

DNOs are required to seek permission from the ESO ahead of connecting any Distributed Energy Resource above 1MW

Nationally there are constraints on the transmission system with reinforcement connection dates out to 2038

We have 9.8GW of Distributed Energy Resource (above 1MW) already connected to our network

We have 40GW of Accepted-not-yet connected schemes

The transmission queue is now over 500 GW

What are Technical Limits?

Will give DNOs the ability to accelerate the connection of generators subject to wider Transmission Reinforcement Works

They will provide distribution customers with the option of an interim non-firm connection arrangement

The interim non-firm arrangement will be curtailable and uncompensated

Will enable more agile and shovel ready customers lower in the connection queue at GSPs to connect earlier

Releasing capacity that is not currently being utilised

How are Technical Limits Calculated?

The Technical Limit is calculated using:

- Existing GSP demand
- Unrestricted (firm) capacity that has been through a Transmission Impact Assessment
- Agreed scaling factors

- They don't replace existing Connection Asset Reverse Powerflow (CARPL) limits
- Technical Limits are reassessed on a yearly basis
- Recorded in the Bilateral Connection Agreements (BCA) between ESO and NGED

There are multiple Technical Limits at each GSP:

- ❑ A single export Technical Limit across the entire year
- ❑ A seasonal import Technical Limit (for BESS only)

$$\boldsymbol{GSP\ Export\ Technical\ Limit} = \sum \begin{matrix} Unrestricted\ Registered \\ Capacity\ scaling\ factors \end{matrix} - demand\ at\ defined\ cardinal\ points$$

Technical Limit Example

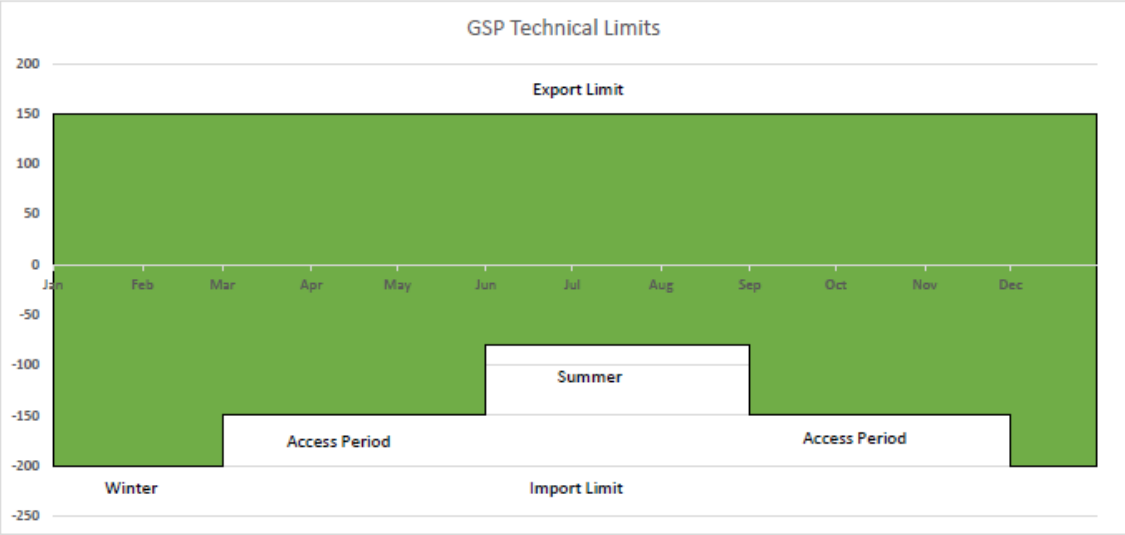


Figure 1: Technical Limits applied through the year (green areas represent compliance against limit)

Note: the above Figure is for illustrative purposes only and may not be specific to each site.

	Winter (01 Dec – 28 Feb)	Access Period (01 Mar – 31 May and 01 Sep – 30 Nov)	Summer (01 Jun – 31 Aug)
Export Technical Limit	150 MW (export)		
Import Technical Limit	200 MW (import)	150 MW (import)	80 MW (import)

Securities and Liabilities

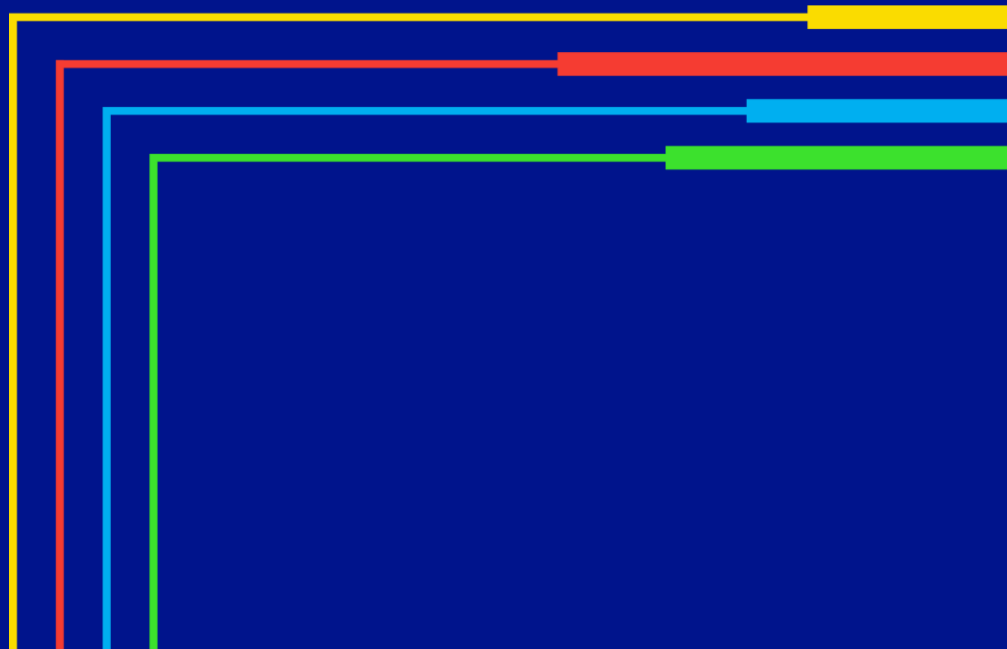
- Securities and liabilities will assigned by the ESO through the outcome of issued mod-offers as they have done previously
- Securities will fall away upon energisation
- One-off attributable costs will still be applicable
- Under Transmission Works Review (TWR) securities, liabilities and pass-through costs may change
- DNOs will be informed of the 2-step outcome by 29th February 2024

Technical Limit Clarification

- This is only offered as interim arrangement prior to transmission firm works been completed
- Schemes must have signed onto firm transmission works before they can be accelerated under Technical Limits
- Meaning schemes pending a 2-step outcome will need to wait until their 2-step offer before they can be accelerated
- Distribution constraints and delivery will need assessing before a scheme is able progress on a transmission non-firm arrangement

2

Phase 1A Technical Limits



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Phase 1a

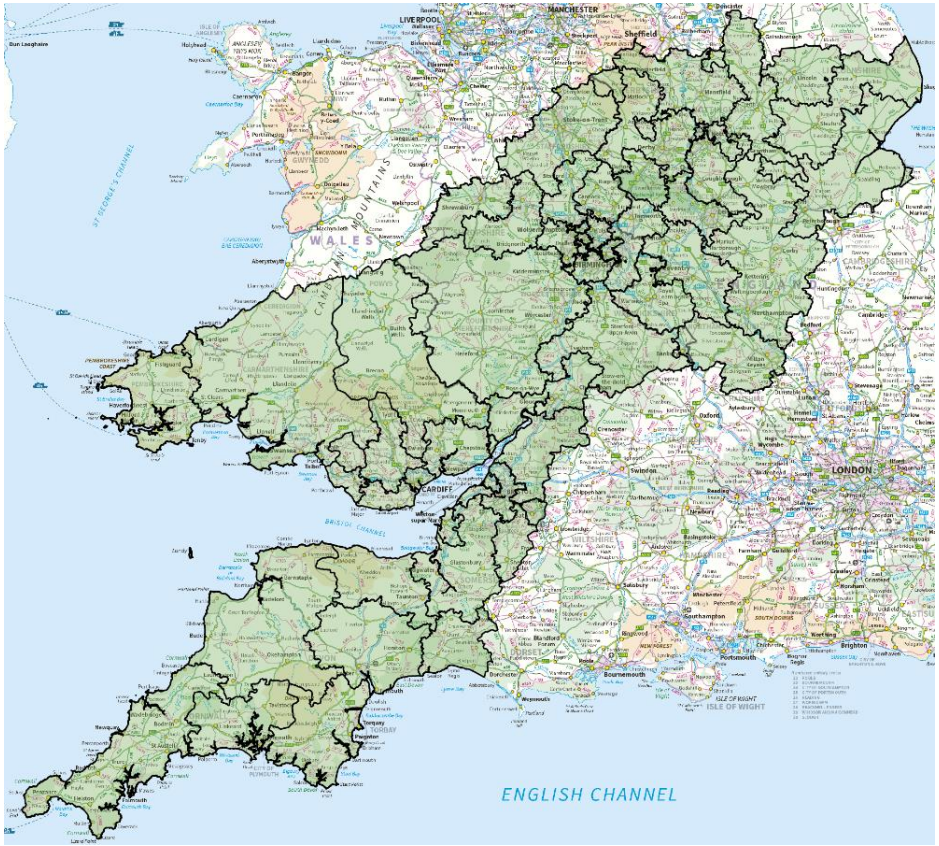
- Phase 1a has 22 of the 55 NGED GSPs:

South Wales	West Midlands	East Midlands	South West
Cardiff East 132kV	Bustleholm 132kV	Berkswell 132kV	Alverdiscott 132kV
Grange 66kV	Feckenham 66kV	Bicker Fen 132kV	Bridgwater 132kV
Pyle 132kV	Kitwell 132kV	Staythorpe 132kV	Exeter 132kV
Rassau 132kV	Nechells East 132kV	Stoke Bardolph 132kV	Indian Queens 132kV
Upper Boat 132kV	Penn 132kV		Taunton 132kV
Upper Boat 33kV	Port Ham 132kV		
	Willenhall 132kV		

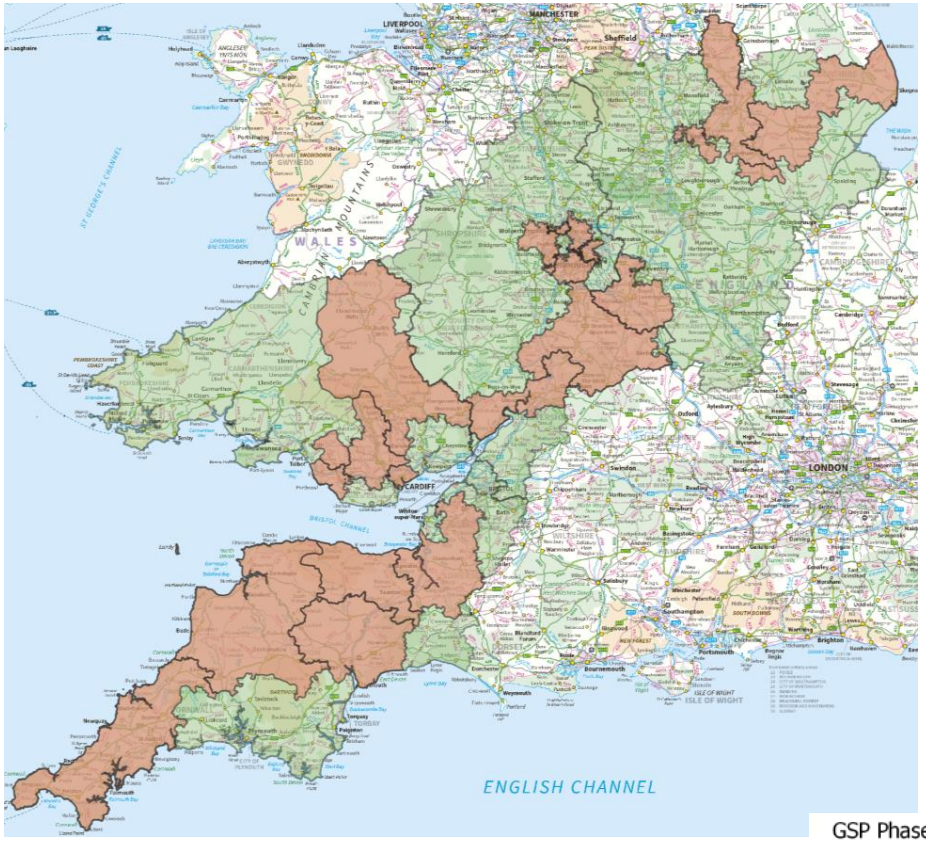
Requirements for inclusion in Phase 1A:

- Transmission Thermal Enabling Works are identified before any more DER can connect
- No works are required for eligible DER to resolve fault level (headroom >1kA)
- Single User or a single User and contracted/ connected tertiary
- GSP has a volume of unconnected unrestricted customers/capacity

NGED Licence Area



Phase 1A Coverage



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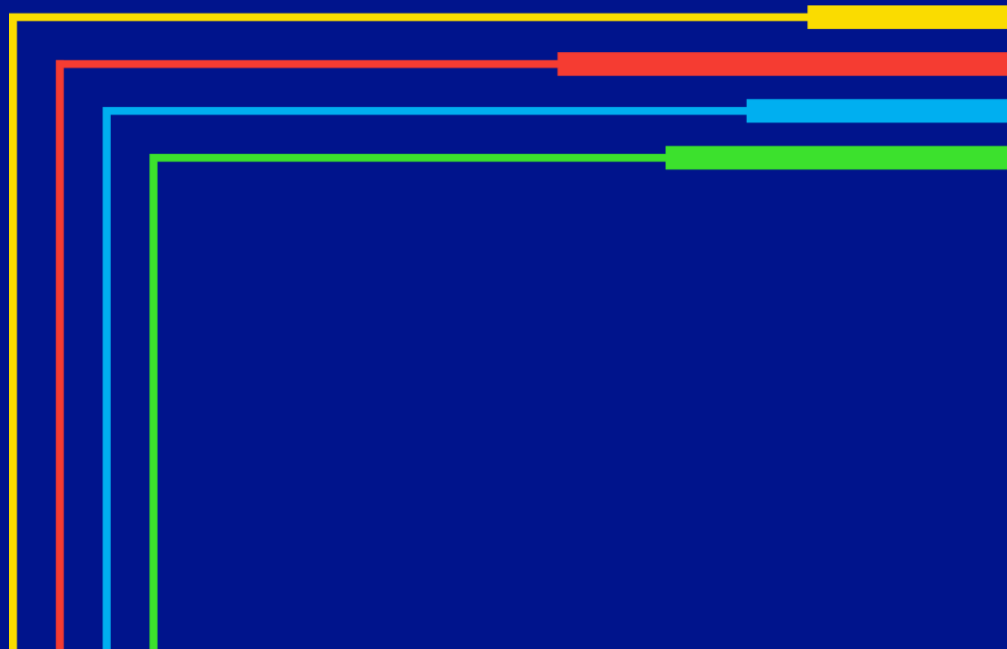
Phase 1A Expression of Interest



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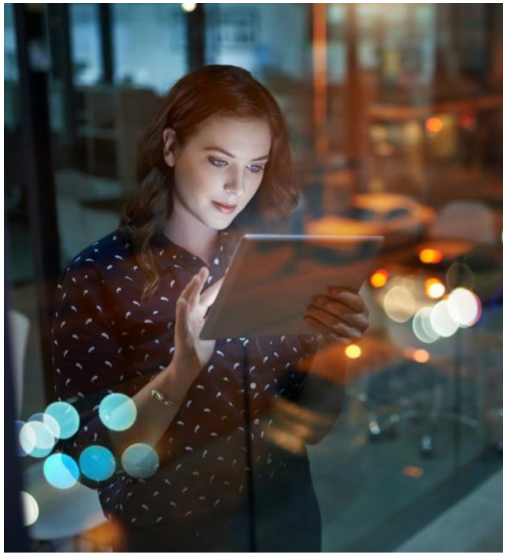
Expression of Interest Background

- Initially invited customers on the 22 phase 1A GSPs
- Targeted at customers that have transmission delays or are pending a transmission outcome – including ESO 2-step offers
- The purpose of EOI was to:
  - To understand which customers would like to accelerate their connection date on a non-firm basis
  - Help NGED understand the short-term need for acceleration
  - Informing future phases for other GSPs as they become applicable
- Phase 1A EOI issued on 8th September and closed on the 30th September
- First tranche will initially focus on customers looking to connect by October 2024, but will expand to consider the subsequent pipeline



EOI Analysis

22 NGED GSPs

included in Phase 1a – 212 customers contacted

70%

of customers submitted EOIs

9%

requested later connection than current offer

68%

requested earlier connection with curtailment

31%

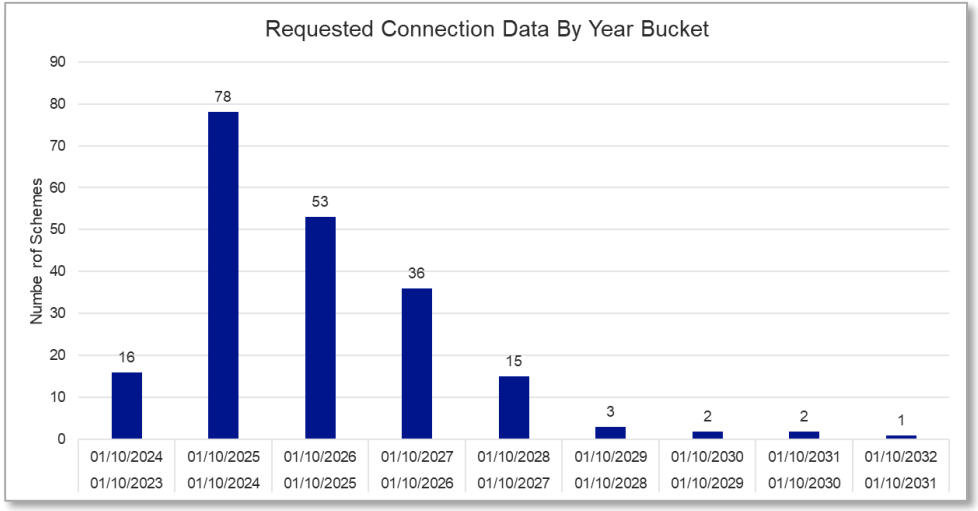
requested earlier connection but no curtailment

1 customer

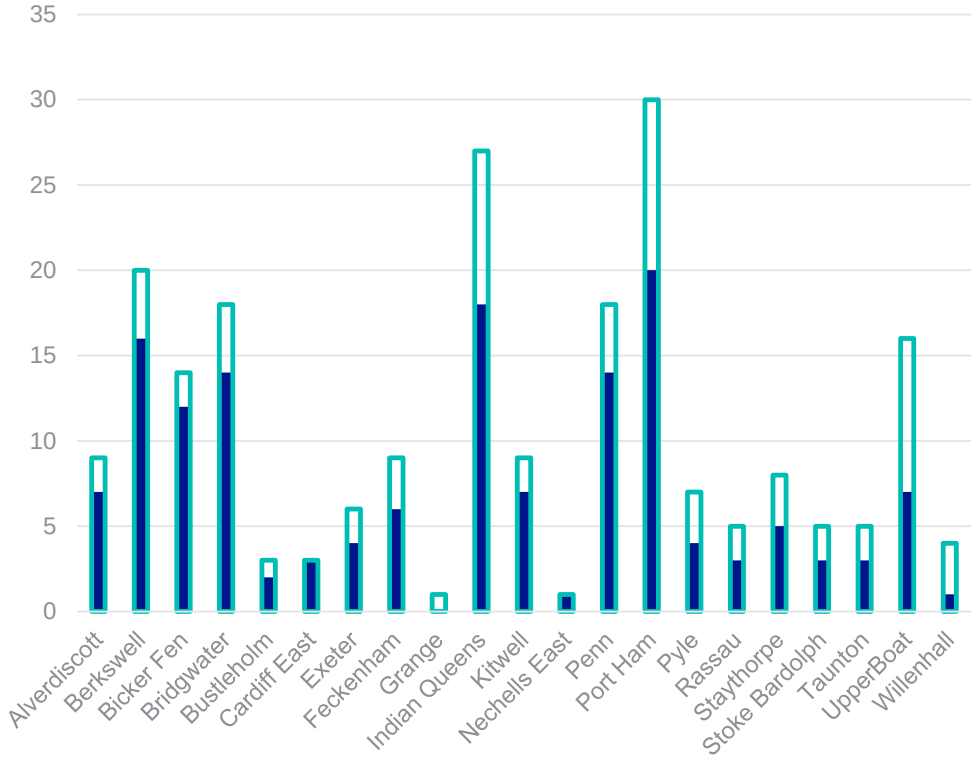
requested connection for existing energisation date

12m-24m

Most popular energisation date and peak of requests



EOI Response Analysis



Over a **70%** response rate to requested EOIs at Phase 1A GSPs

8th September	EOI Opened	• Customers within the scope of the 22 GSPs contacted via email and directed to the EOI
15th September	Phase 1A Webinar	• Webinar to explain concept of Technical Limits and EOI process
30th September	EOI Closed	• EOI closed to Phase 1A
1-12th October	Eligible Schemes Identified	• Initial assessment of EOI submission eligibility
13th October	Eligible schemes Informed	• Confirmed via email all schemes eligible to be taken to next stage assessing distribution impact

13th October – 30th November	Distribution assessment	• Connections teams assessing distribution impact of accelerating connection
30th October	Webinar update	• Webinar to explain concept of Technical Limits and EOI process
30th October	Expansion	• EOI will be maintained open for all new connections in Phase 1A areas
30th November	Start issuing variations	• Start issuing variations for any scheme that can accelerate without waiting for 2-step outcome
1st March	Embed into BAU	• Enable connections coming out of 2-step outcome process to benefit from Technical Limits

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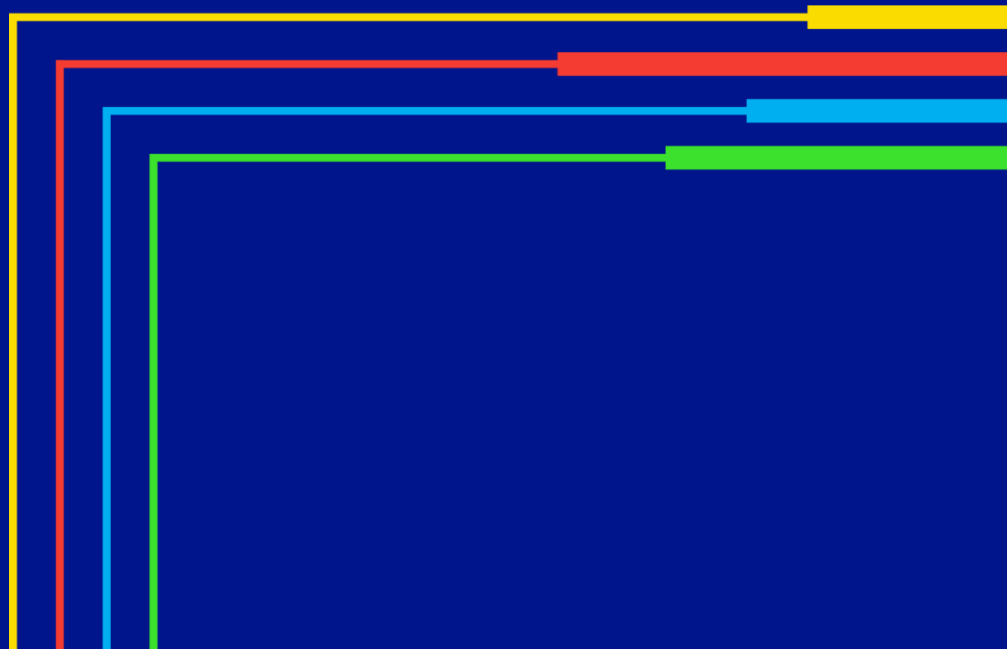
Phase 1B Technical Limits



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Phase 1B

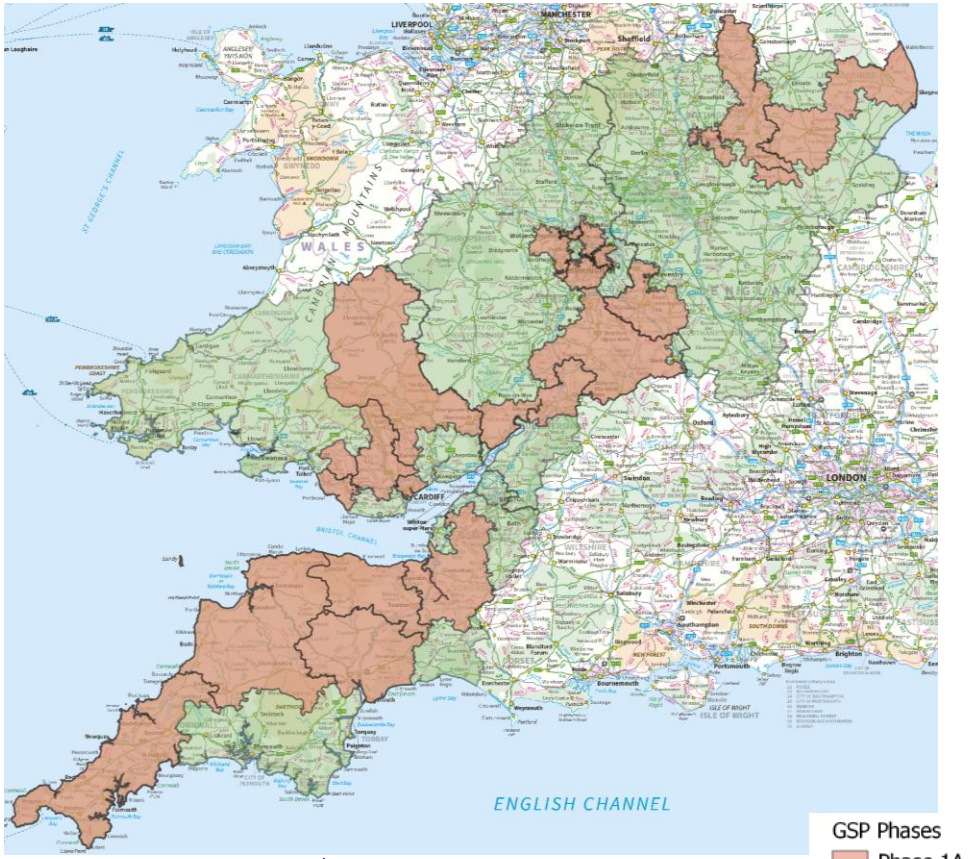
These 7 GSPs have been now been approved by the ESO:

GSP	Site Classification
Bishops Wood 132kV	Connection
Bushbury 132kV	Connection
Chesterfield 132kV	Connection
Coventry 132KV	Connection
Enderby 132kV	Connection
Abham 132kV	Connection
Landulph 132kV	Connection

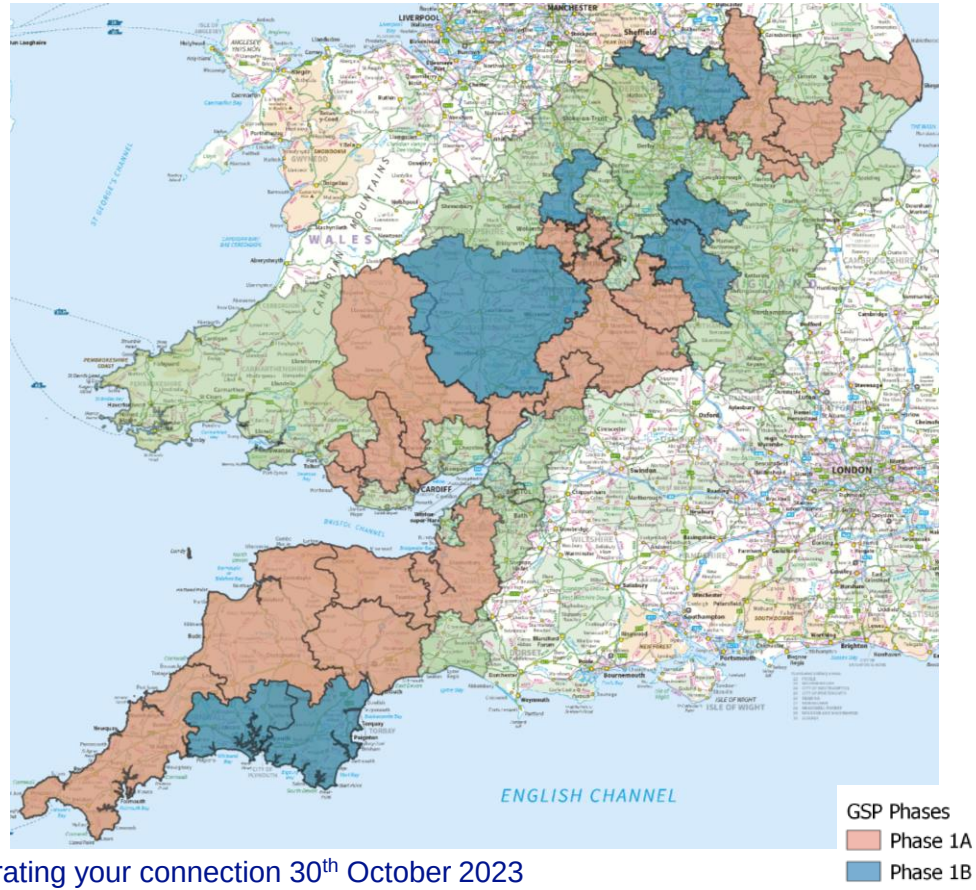
Requirements for inclusion in Phase 1B:

- Transmission Enabling Works are identified before any more DER can connect
- Fault level headroom <1kA are applicable
- single User or a single User and contracted/ connected tertiary
- GSP has a volume of unconnected unrestricted customers/capacity

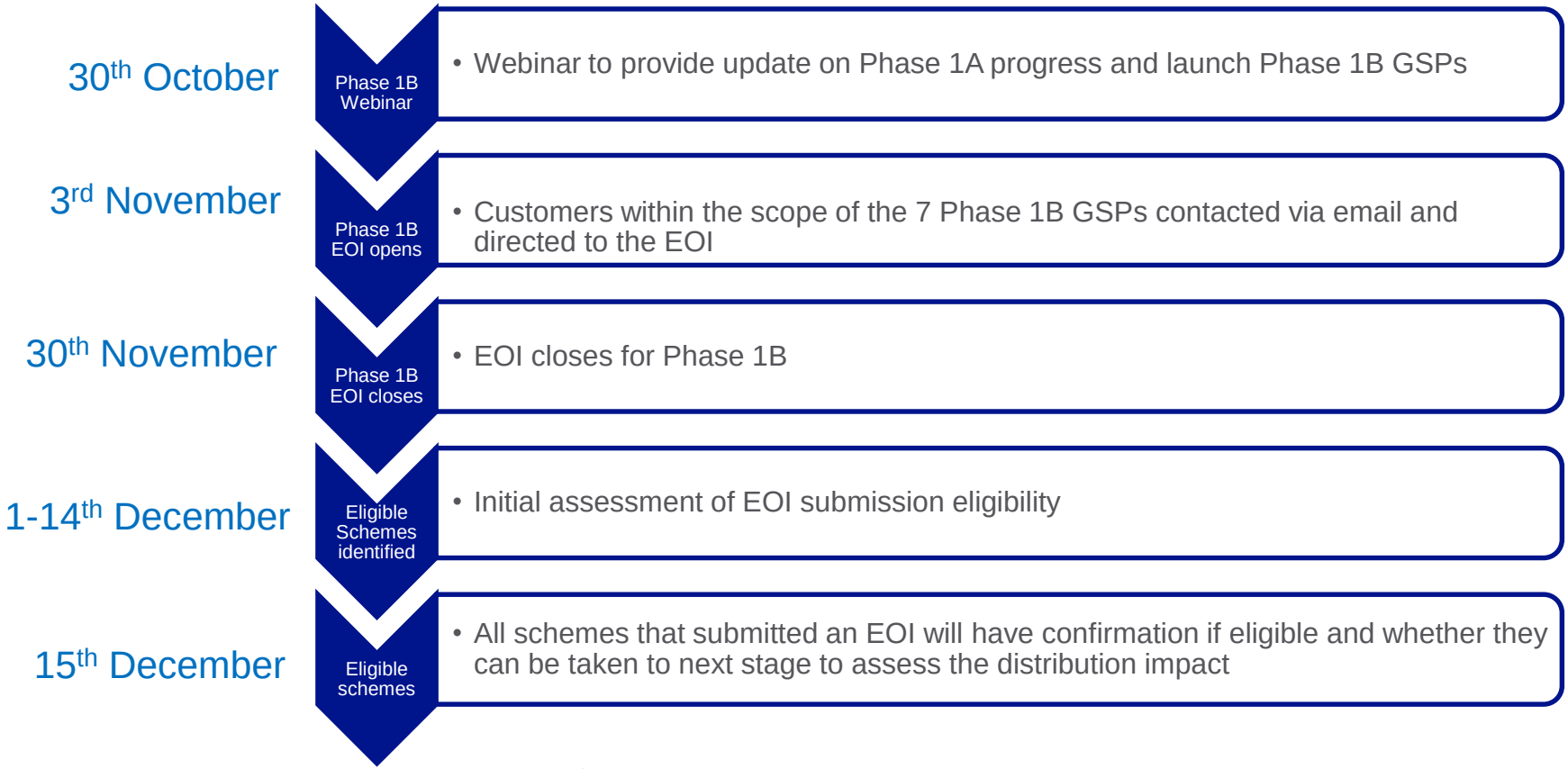
Phase 1A Coverage



Phase 1B Coverage



Phase 1B Next Steps



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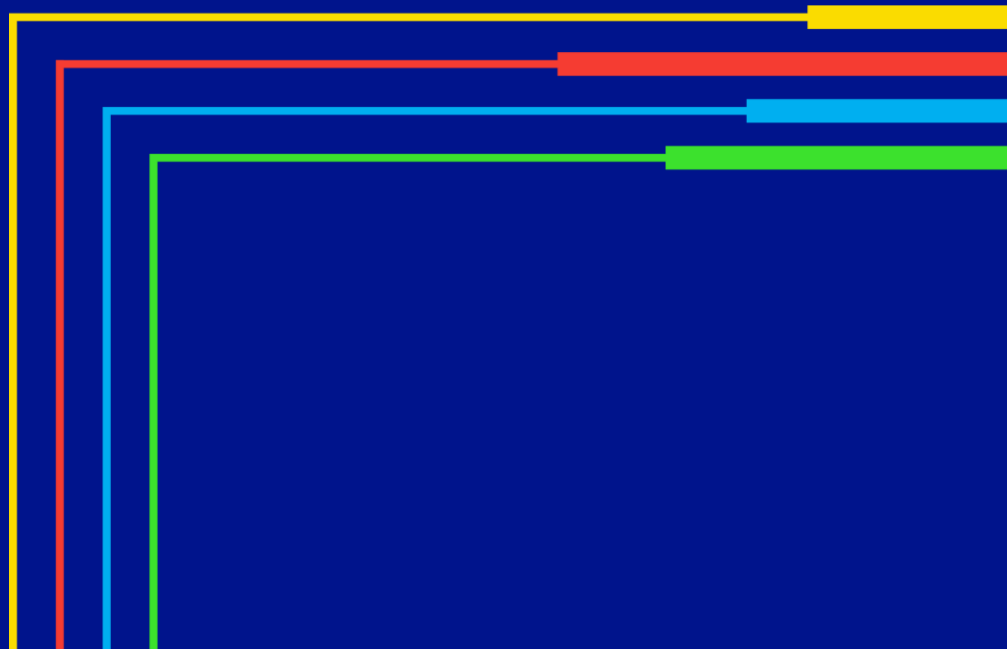
Curtailment Reports



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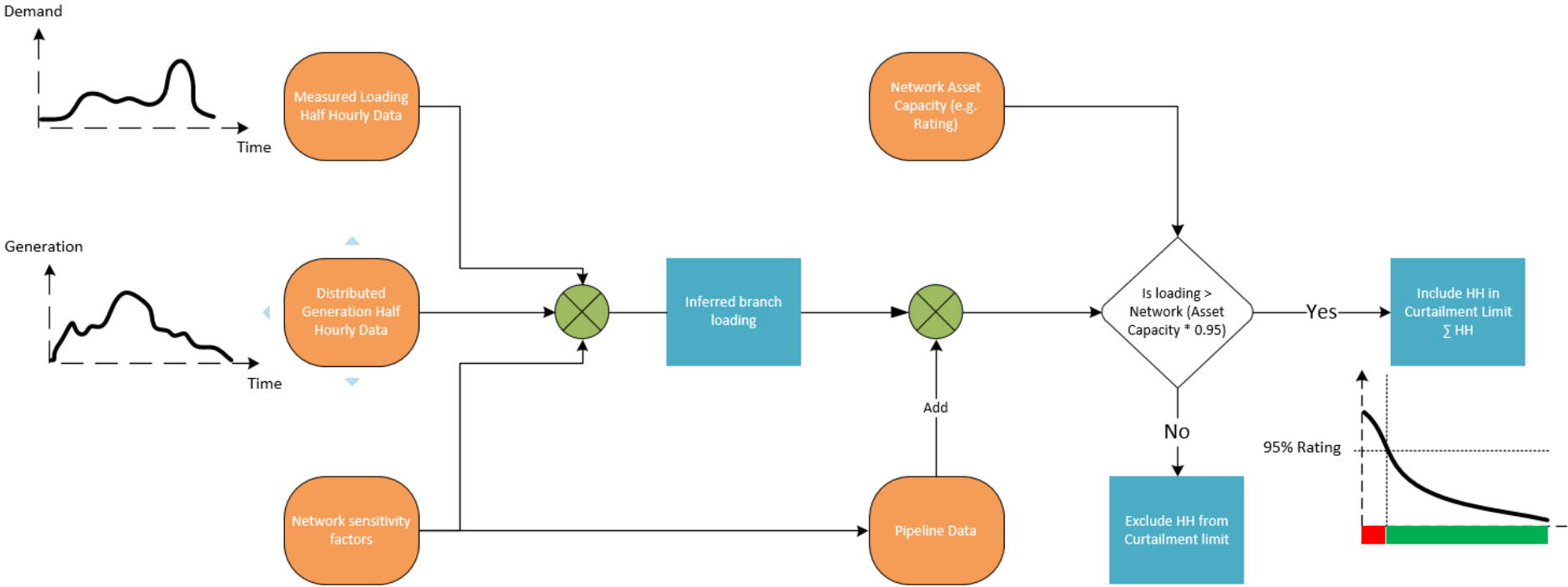
Overview

- The emphasis in the design of the DCUSA Curtailment Limit calculation has been on consistency and simplicity
- It is acknowledged that there is a trade-off against accurate and detailed representation of Load Management Schemes and network conditions and capability
- Data required to undertake the analysis:
  - Measured and Latent DG Contribution
  - Pipeline Data Requirements
  - Network Asset Capacity

Methodology Process Diagram



Accepted Queue Input

- Has pipeline data on all schemes (demand or gen) in GSP queue
- Schemes broken down by non-ANM and ANM with LIFO position
- Sensitivity Factor of each scheme to each constraint – derived from power system analysis
- Sensitivity Factor is normally ~1 for T-D interface

LIFO Stack

Enquiry number	Scheme Name	LIFO Position	MW	Fuel Type	BSP	Constraint 1 Sensitivity Factor
111111	Example 1	1	7.4	Solar	Checkerh	1
111112	Example 2	2	7.5	Wind	Hawton	1
111113	Example 3	3	20	Other	132kV	1
111114	Example 4	4	49.9	Solar	132kV	1
111115	Example 5	5	42	Solar	132kV	1
111116	Example 6	6	32	Solar	132kV	1
111117	Example 7	7	49.9	Solar	132kV	1
111118	Example 8	8	7	Other	Awton	1
111119	Example 9	9	49.9	Solar	132kV	1
111120	Example 10	10	50	Solar	132kV	1
111121	Example 11	11	50	Solar	132kV	0.97
111122	Example 12	12	40	Solar	132kV	1
111123	Example 13	13	38	Solar	132kV	0.97
111124	Example 14	14	50	Solar	132kV	1

Non-ANM Queue

CROWN Enquiry number	Scheme Name	Position	MW	Fuel Type	BSP	Constraint 1 Sensitivity Factor
3254441	Battery 1		6	Battery	Warwick	1
3425894	Solar 1		40	Solar	Harbury	1
3643653	Solar 2		49.9	Solar	132kV	1
3646405	Solar 3		40	Solar	132kV	1
3650511	Solar 4		20	Solar	Harbury	1
3654784	Solar 5		25	Solar	Harbury	1
3687828	Wind 1		20	Wind	Harbury	1
4211332	Solar 7		25	Solar	Warwick	1
3788728	Solar 8		40.65	Solar	132kV	1
3834992	Solar 9		16	Solar	Warwick	1
3899778	Solar 10		20	Solar	Warwick	1
3975314	Solar 11		16.8	Solar	Harbury	1
4018766	Battery 2		49.9	Battery	132kV	1
4015656	Battery 3		49.9	Battery	132kV	1

Methodology

- Can apply yearly profiles for any technology type
- Able to apply variable (seasonal ratings) – as required for TL

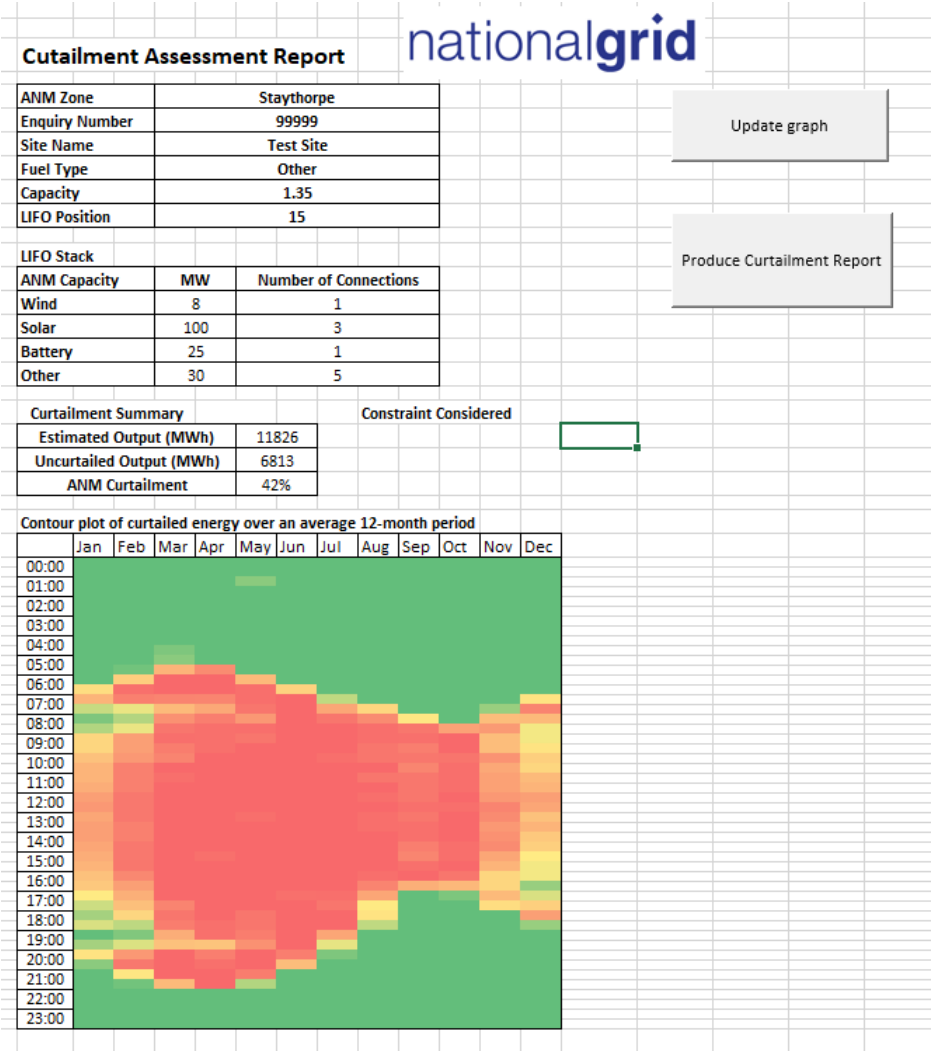
Logic applied to calculate curtailment:

1. Take constraint base half-hourly loading (data anomalies corrected)
2. Add on change in loading from non-ANM and non-ANM, accounting for sensitivity to constraint and technology yearly profile
3. Compare constraint loading against rating (e.g. Technical Limit)

Unlike DCP404 methodology, this tool can account for the compound of multiple constraints and can be used for transmission constraints.

Output and Report

- Produces curtailment report/plot
- Excel generated pdf report giving:
  - Scheme summary
  - LIFO position
  - LIFO stack technology/MW breakdown
  - Curtailment summary (MWh)
  - Heatmap/graph



Cutailment Assessment Report

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ANM Zone	Staythorpe
Enquiry Number	99999
Site Name	Test Site
Fuel Type	Other
Capacity	1.35
LIFO Position	15

Update graph

Produce Curtailment Report

LIFO Stack

ANM Capacity	MW	Number of Connections
Wind	8	1
Solar	100	3
Battery	25	1
Other	30	5

Curtailment Summary	
Estimated Output (MWh)	11826
Uncurtailed Output (MWh)	6813
ANM Curtailment	42%

Constraint Considered

Contour plot of curtailed energy over an average 12-month period

Key Points

- Spreadsheet based curtailment calculator with power system analysis inputs where required to give representative curtailment
- Suited to simpler boundary constraints such as Technical Limits
- Able to produce representative curtailment without extensive
- For Technical Limits basing on all schemes ahead in queue connecting
- Will provide calculation methodology with report

Automated Power System Analysis (DSO)

- Run by DSO Using the switch-level power system model for each condition:
  - Peak generation, minimum demand
  - Peak demand, no generation
- For each edge case undertake the following analysis:
  - Record sensitivity of every bus to every branch (above threshold for intact condition)
  - Run a full N-1 secured next fault contingency analysis
  - Record intact loading of every branch
  - Record worst FCO loading of each branch and fault cause

Curtailment Reports

- **Transmission forecast curtailment based on assumptions similar to DCP404**
  - DCP404 tooling available publically
  - Data to inform the tool to be made public
  - Customer can replace the analysis or appoint consultants to review
- **DSO diversified curtailment forecast**
  - Uses same data made publically available
  - Based on tooling developed by DSO
  - More accurate representation of actual running arrangements and expected behaviour

We will be making data open across the key inputs for curtailment forecasting

We're looking to innovate across this space with DER developers eligible for acceleration through technical limits

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Q&A

Please post any questions in the Q&A

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