

# NOA Voltage Pathfinder

Pennine and North England 2024 – 2034

Tender information pack v1.1



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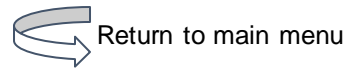
# Introduction

NGESO is seeking to procure static reactive power services in the Pennine and Northern England region from April 2024 to March 2034.

This tender information pack contains the information needed to participate in the Pennines and Northern England high voltage tender. There are accompanying tender documents which provide more detailed information on technical and commercial assessment methodologies, site connections/availability and standard contract terms.

This tender information pack aims to provide current and potential reactive power providers with clear, simple and transparent guidance on the service. It pulls together FAQs on the service and provides links to related documents.

A menu button on each page allows access back to the main menu:



Please contact [box.pennine.tender@nationalgrideso.com](mailto:box.pennine.tender@nationalgrideso.com) if you have any questions or feedback.

# Executive Summary

Procurement is considered for 2024-2034:

- Reactive capability requirement exists 1 April 2024 23:00 – 1 April 2034 07:00
- Reactive capability available 24/7 year round
- Forecast utilisation – capped at 5,500 hours (11,000 Settlement Periods (SP)) per annum per provider
- Reactive Lead (Absorption) requirement: -200MVA<sub>r</sub> in North East area and -500MVA<sub>r</sub> in West Yorkshire area
- We invite embedded and transmission connected parties to participate
- The reactive requirement is measured at the transmission system. Procured volumes quoted are minimums and depend on the exact location and size of the reactive providers
- Requirement is for static Reactive Power provision however, dynamic providers will be considered
- One contract type to cover all providers, availability payments only (£/SP)

Continued...

# Executive Summary

We are introducing a cap on the number of solutions submitted per parent company:

- We have set limits on the number of solutions per parent company. Any change in asset, MW value, MVA<sub>r</sub> value, Voltage Level or Connection type counts as a different solution.
- In West Yorkshire region, participants can provide a total of 9 solutions only, with a maximum of 3 solutions per site
- In North East region, participants can provide a total of 5 solutions only, with a maximum of 3 solutions per site

TO initial site feasibility report is available on request – We require each recipient to confirm that they shall not communicate, reproduce or disclose any part of the report, without the express written consent of National Grid Electricity Transmission plc. To receive a copy of the report please email us with the above confirmation at:

[box.pennine.tender@nationalgrideso.com](mailto:box.pennine.tender@nationalgrideso.com)

We do not require tender parties to have a connection agreement or have submitted a connection application to participate in the tender. We encourage parties to wait until the results of the tender have been published in January 2022 before submitting any connection applications.

We recognise that multiple technology types can provide this service. However, it is the responsibility of the participants to ensure they are aware of any and all charges (e.g. system charges and levies) associated with that asset and the type of connection and licence (e.g. demand or generation) it will use and hold.

# Version Control

Version	Date published	Page No.	Comments
1.0	26 March 2021	NA	NA
1.1	6 April 2021	29	To aid clarity, the slide wording has been amended, and the table has been updated with 'effective MVAR' and correctly defined effectiveness factors, to supplement the contribution factors already there.

# Main Menu

1. How to participate

2. Market information

3. Reactive overview

4. Requirements

5. Assessment principles

6. Contract

# 1. How to participate

Timeline

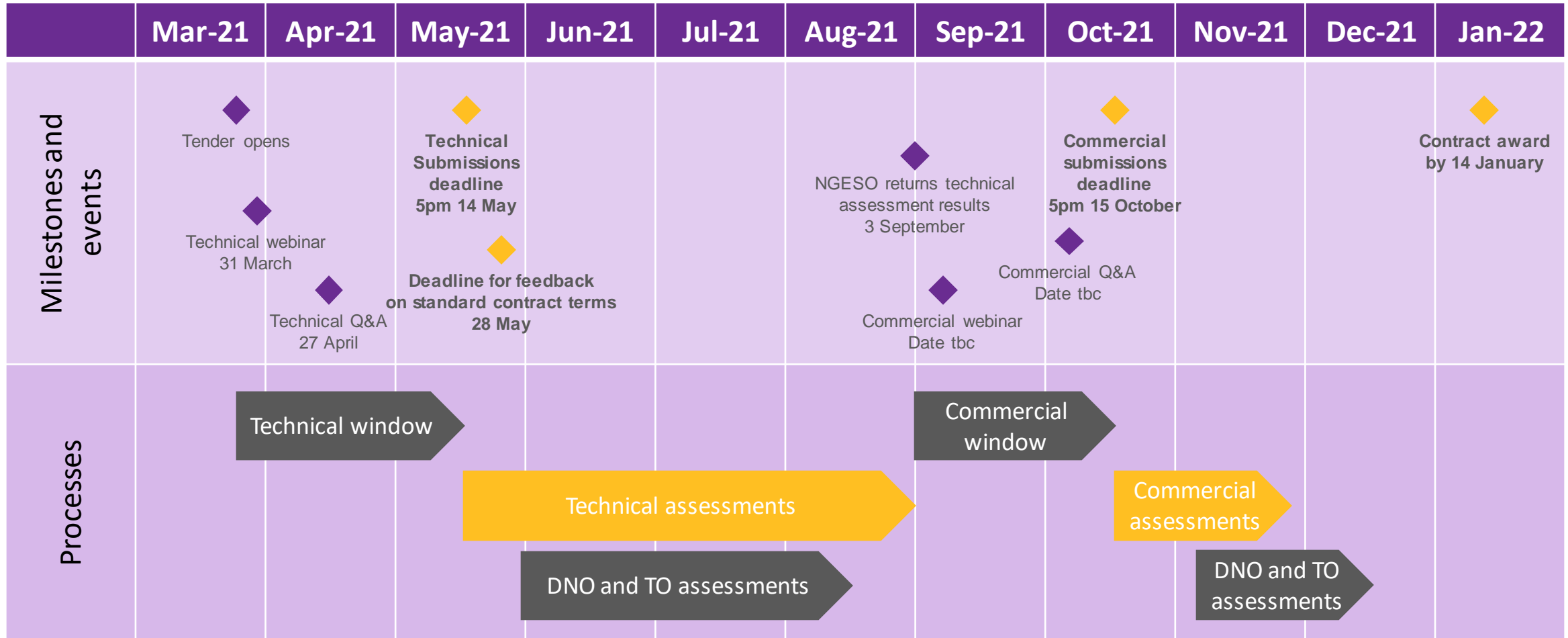
How to submit information

Tender documents

Key contacts



# Timeline



# How to submit information

- The deadline for submission of technical information (section A of the proforma) is **5pm on 14 May 2021**.
- Submissions must be emailed to [box.pennine.tender@nationalgrideso.com](mailto:box.pennine.tender@nationalgrideso.com) and consist of:
  - Pennine tender submission proforma
  - Pennine proforma appendix
  - Pennine DRC data template
- Feedback on the standard contract terms must be submitted no later than **28 May 2021** to [box.pennine.tender@nationalgrideso.com](mailto:box.pennine.tender@nationalgrideso.com)
- NGESO will work with the TO and DNOs to conduct a technical assessment and return the proforma (with a completed section B) to participants on or before **3 September 2021**.
- The deadline for submission of commercial information (section C of the proforma) is **5pm on 15 October 2021**.
- Submissions must be made on the proforma and emailed to [box.pennine.tender@nationalgrideso.com](mailto:box.pennine.tender@nationalgrideso.com) and consist of:
  - Pennine tender submission proforma
  - Pennine proforma appendix
  - Pennine appendix - Contract declaration
- NGESO will review the submissions and publish the tender outcome by **14 January 2022**.

# Tender documents

Document	Description
Pennine invitation to tender	Formal letter inviting industry to participate in the Pennine pathfinder tender
Pennine 2024 Tender information pack	This document contains the high-level information needed to participate in the Pennines and Northern England high voltage tender.
Pennine tender submission proforma	Excel file which must be used by tender participants to submit their solutions to NGENSO. All green fields must be completed for the submission to be compliant with the tender rules.
Pennine DRC data template	Excel file which must be completed by tender participants connecting to the Transmission Network. All SPD data should be submitted as a minimum.
Pennine reactive service agreement	Static Reactive Power Service Market Agreement for the Pennine region
Pennine pathfinder connections review scope	This document summarises the assessments that will be undertaken by the TO and DNOs to ensure that proposed solutions can safely connect to their networks.
Pennine effectiveness factor assessment methodology	This documents summarises the approach we use to allow a fair comparison of the reactive power that can be provided by all potential options.
Pennine commercial assessment methodology	Document which sets out the approach we intend to take in assessing options submitted to manage voltage. The aim is to ensure all the voltage requirements in the defined regions are met at the lowest cost to consumers.
Pennine FAQs	A set of anticipated questions from industry which will be updated with questions submitted by industry
Enquiry form for use of National Grid land	This form should be completed and submitted to NGENSO to request information on NGET operational land
Pennine Appendix - contract declaration	A form that providers must sign to say that they accept the Contract Terms, no later than the date of commercial submission 15 October 2021
Pennine Appendix - feedback template	Opportunity for participants to feedback on the tender process and principles, including standard contract terms, using the template provided
Pennine proforma appendix	This will be published by in due course and will include opportunity to submit additional supporting technical and commercial information. It will also include a programme capability document which must be completed by all participants

All these document are available on the tender webpage - [www.nationalgrideso.com/transmission-constraint-management?market-information](http://www.nationalgrideso.com/transmission-constraint-management?market-information)

# Key contacts

- NGESO Pennine pathfinder team – [box.pennine.tender@nationalgrideso.com](mailto:box.pennine.tender@nationalgrideso.com)
- NGESO Electricity Customer Connections - <https://www.nationalgrideso.com/connections>
- NGET connections - <https://www.nationalgrid.com/uk/electricity-transmission/connections>
- Northern Powergrid connections - <https://www.northernpowergrid.com/get-connected/>
- Electricity North West connections - <https://www.enwl.co.uk/get-connected/>

## 2. Market information

Webinars and FAQs

Context

NOA Mersey lessons learnt

# Webinars and FAQs

Technical webinar on 31 March 2021 – sign up [here](#)

Q&A session on 27 April 2021 – sign up [here](#)

Commercial webinar and Q&A sessions will be scheduled during the commercial stage. Dates to be confirmed

The FAQ document will be updated on an appropriate ad-hoc basis, dependant on the volume of queries we receive during different stages of the tender.

# Context

## What has already happened?

- In October 2019 we tendered for a one-year reactive power absorption service in the Mersey region. An embedded provider was awarded a contract from April 2020. [Reactive Power – Mersey 2020/21](#)
- In November 2019 we tendered for a nine-year reactive power absorption service in the Mersey region. This was the first time commercial parties competed against a network owner solution. Commercial parties were awarded contracts from April 2022, with the service delivered from a reactor and battery energy storage solutions. [Static Reactive Power – Mersey 2022 - 2031](#)
- In June 2020 we published our voltage screening report which highlights future areas for potential pathfinder procurement. [Download](#)
- We published a lessons learnt document for the nine-year Mersey pathfinder in November 2020. [Download](#)

Continued...

# Context

## Why are we doing this?

- The System Operability Framework (SOF) has highlighted operability risks expected due to the decline in transmission connected synchronous generation over the next decade, and an increasing need to absorb reactive power.
- As part of our Network Development Roadmap, we want to explore the benefits and practicalities of applying a Network Options Assessment (NOA)-type approach to the operability aspects of system voltage.
- NOA Voltage Pathfinder for Pennine and Northern England is the next step in expanding the opportunity for varied technologies and providers to participate in the assessment of market-based solutions against Network Owner options. It will seek solutions which absorb reactive power to manage high volts downwards.
- The outcome of this NOA Voltage Pathfinder procurement process will be a recommendation of the most economic & efficient solution for securing voltage in the Pennine and Northern England region over the contracted period.
- The recommended solution could consist of market-based options, Network Owner options or a mix of market based and Network Owner options.
- For the avoidance of doubt, an outcome could be that we accept no market tender and/or no Network Owner options if none of the solutions considered provide economic benefits against our forecast Balancing Mechanism (BM) alternative cost of controlling high voltage.

Continued...



# Context

## What approach are we using?

The pathfinders are using a 'learn by doing' approach. This means:

- We are developing the pathfinders within the existing industry framework. Where we see areas which could be improved in the framework these will be flagged. This approach enables us to continue moving forward but recommendations may not be implemented before the pathfinder is completed given the timescales to make changes to the framework.
- We will learn lessons from other pathfinders which will influence how the process develops.
- We are buying new services from new technologies and will learn new information about these during the process.
- Participants are invited to feedback on the contract terms, assessment methodologies or other elements of the tender pack or process using the feedback template provided.

# NOA Mersey lessons learnt

We are implementing these lessons from the NOA Mersey pathfinder into this tender. More information can be found in the published [lessons learnt](#)

## Pre-qualification and compliant bids

We have improved the proforma and are allowing for free text to be submitted in a word document or pdf format

There will be opportunity to discuss submitted bids after the deadline which will be used to clarify assumptions, amongst other things

We are providing more information earlier in the tender process following discussions with the TO and DNOs. An initial site feasibility report for available transmission sites is available on request.

## Assessment (including transparency)

There will be no cost associated with outages in the assessment for the Pennines area. Due to the complexities of the region redundancy has been considered in defining the requirement rather than in the commercial assessment.

Generic connection costs and outage information is provided in the tender pack but assessment will be site-specific

We will not account for Final Consumption Levies (FCLs) or losses for any commercial provider. Any TO option will still have a notional losses volume applied.

The approach that TOs should use when submitting the costs of their options, and if this should or should not consider any residual value after the tender period, is currently under discussion with Ofgem. Appreciating the importance of this information for informing the pricing strategies of other participants, we will provide an update on this as soon as possible and no later than three weeks prior to the deadline to receive commercial bids.

## Participation and level playing field

We have included liquidated damages in the contractual terms that providers would be liable in case of any delays to the service delivery date

The penalties for non-availability due to a TO or DNO outage will only be applicable for the first 14 days, thereafter full availability payment will be due (assuming the facility is still available)

Participants will be expected to submit 'full and final' bids which will be valid for three months post contract award and sign a Contract Declaration Form.

There will be a deadline for contract signatures of two months post contract award.

The signatures will be conditional on all successful parties signing within the deadline, otherwise the ESO will reserve the right to revisit the tender stack per region.

Providers will be expected to submit a Programme Capability and Project Plan with their commercial submission.

It is our understanding that any solution submitted by a DNO to this tender will be funded through BSUoS, and any TO solution would be funded through TNUoS.

## Timeline

Overall timeline extended to reflect feedback and complexity of region

## Communication

We have introduced a deadline for sharing information with tender participants – this will be three weeks prior to the commercial submission date

We will publish updates to the FAQ document throughout the tender.

# 3. Reactive overview

Voltage and Reactive Power

Voltage Constraint Services

Tender Outline

# Voltage and reactive power

Why is there a need?

## System Operator obligation

- NGENSO has a statutory obligation to maintain the National Electricity Transmission System (NETS) voltages within limits. This obligation also applies to voltage step change limits. These limits are defined within the NETS Security and Quality of Supply Standards (SQSS).

## System voltage

- System voltage is continuously changing and is variable across the system.
- Voltage is a localised property of the system.
- There are differing requirements across areas of the system due to this variability.

## Reactive power

- NGENSO maintains voltages by managing the Reactive Power flows across the system.
- Voltage constraint contracts have been used historically to procure additional reactive capability paid at ORPS rate.

# Voltage constraint services

## What do we do now?

### General

- The Electricity System Operator uses reactive capability provided by generators and assets.
- Services have typically been limited to BM providers.
- Dispatch of Reactive Power completed through electronic instruction.
- Instruction is either via Reactive Power or Voltage Set point instruction.

### Availability

- Where required, additional reactive power is accessed through purchasing Active Power via Trading and BM Actions.
- Constraint Management contracts, such as the Optional Voltage Contracts, also allow NGE SO to access reactive power.
- Availability reported through 'Constraint' part of [Monthly Balancing Services Summary](#).

### Utilisation

- After the reactive capability has been procured – Reactive Power dispatch is paid at ORPS rate as outlined in the CUSC.
- Reactive Utilisation is reported through 'Reactive' part of the MBSS.

# Tender outline

## What are we doing next?

### Providers

- We are expanding on the new approach used for the Mersey 2020 tender, to enable transmission and distribution connected providers to participate in this long-term Reactive Power service tender.
- The service is open to BM and non-BM providers, with or without an MSA, and do not need to be a CUSC or BSC party.
- The service is open to any provider who can meet the requirements ([see section 4](#)).
- Providers can offer other balancing services in conjunction with Reactive Power services, as long as this does not impact delivery of the contracted reactive power volume. The benefits of the additional services provided will not be considered as part of this tender. We remind participants that availability of the service may not be withdrawn to provide other balancing services, in accordance with paragraph 4.2.2 of the standard contract terms.
- We are offering a single contract type with availability payments only (£/SP).

#### Embedded Providers

- Technical restrictions may require embedded providers to have an active power element at the same time as providing reactive power i.e. cannot provide reactive power at 0MW, and/or limit the achievable operating power factor.
- The DNO feasibility assessment will confirm where limitations exist and determine if reinforcements would enable operation at lower power factors.

# 4. Requirements

Technical Requirements

Locational Requirements

# Technical Requirements

What are the minimum requirements to participate?

<p>Minimum size</p>	<ul style="list-style-type: none"><li>• The minimum reactive power absorption for new* transmission connected solutions is 40MVAR.</li><li>• The minimum reactive power absorption for new and existing distribution connections and aggregated solutions, and existing transmission connections is 15MVAR.</li><li>• Distribution connected solutions will have to operate at a specific leading power factor identified by the DNO, unless network reinforcements are agreed with the DNO, and connected at 33kV or above.</li><li>• Aggregated solutions must be no less than 15MVAR with sub-units being a minimum of 5MVAR.</li></ul>
<p>Maximum size</p>	<ul style="list-style-type: none"><li>• Maximum size of a reactive power solution is often limited by the voltage step change limits and is dependent on the voltage level. The usual maximum sizes used for a solution that can be switched by a single circuit breaker are: 200MVAR for 400kV connections, 100MVAR for 275kV connections, 60MVAR for 132kV connections, 30MVAR for 66kV connections and 15MVAR for 33kV connections. Technical assessments will be carried out to verify whether solutions are compliant with voltage step limits.</li><li>• Please note: the Mersey voltage pathfinder received viable solutions greater than these maximum values.</li><li>• See also the 'Power Quality' remarks regarding larger sized solutions</li></ul>
<p>Location</p>	<ul style="list-style-type: none"><li>• All providers must be within the location described in <a href="#">slide 29</a> or <a href="#">slide 31</a>. Where providers are connected at distribution level, you may wish to confirm where you are connected on the transmission network.</li></ul>

These are the minimum requirements needed to participate in the tender.  
\*any asset not on the TEC register as at 29 January 2021

Continued...



# Technical Requirements

What are the minimum requirements to participate?

## Dispatch

- There must be a single point of dispatch.
- Providers to be dispatched via EDL/EDT or signals over a VPN via IEC104 server connection.
- Providers must acknowledge receipt of instruction within 2 minutes.
- The minimum notice period required to deliver reactive power must not exceed 30 minutes.
- Providers must have capability of receiving and responding to instructions 24/7 for the duration of the contract period.
- Providers must inform NGENSO of planned outages / periods of unavailability.

## Voltage control

- All providers must be in a control mode which enables constant reactive power absorption (for embedded providers this will likely need to be at a constant power factor).
- All technologies should be in correct control mode for duration of instruction, and if operating in a different mode, move to the correct mode without instruction.

These are the minimum requirements needed to participate in the tender.

Continued...

# Technical Requirements

What are the minimum requirements to participate?

## Metering

- Providers must provide, at the point of connection, operational and settlement metering for real-time visibility and service settlement purposes.

## Protection settings for embedded solutions

- All Embedded solutions must comply with G99 regarding loss of mains protection.
- All Embedded solutions must be able to remain connected and stable for faults on the transmission system, by **demonstrating** compliance with Engineering Recommendation G99.

## Aggregators

- A tendered / contracted unit can be made up of multiple sub-units. Technical details of each sub-unit must be shared at the point of tender (stage 1) to facilitate assessment of the impact and effectiveness of each.
- Aggregated units must be within the same sub-region (North East, West Yorkshire 1 or West Yorkshire 2).
- Sub-units must be no smaller than 5MVA<sub>r</sub>. Tendered units must be no smaller than 15MVA<sub>r</sub>.
- Sub-units can be reallocated across aggregated sites. The total effective MVA<sub>r</sub> of the aggregated unit must remain at least the same after reallocation. Sub-unit size must be the same as tendered.
- New sub-units can be allocated to an aggregated site where the aggregator has worked with the DNO to determine the unit level effectiveness and impact to the network.

These are the minimum requirements needed to participate in the tender.

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# Technical Requirements

What are the minimum requirements to participate?

## Power Quality

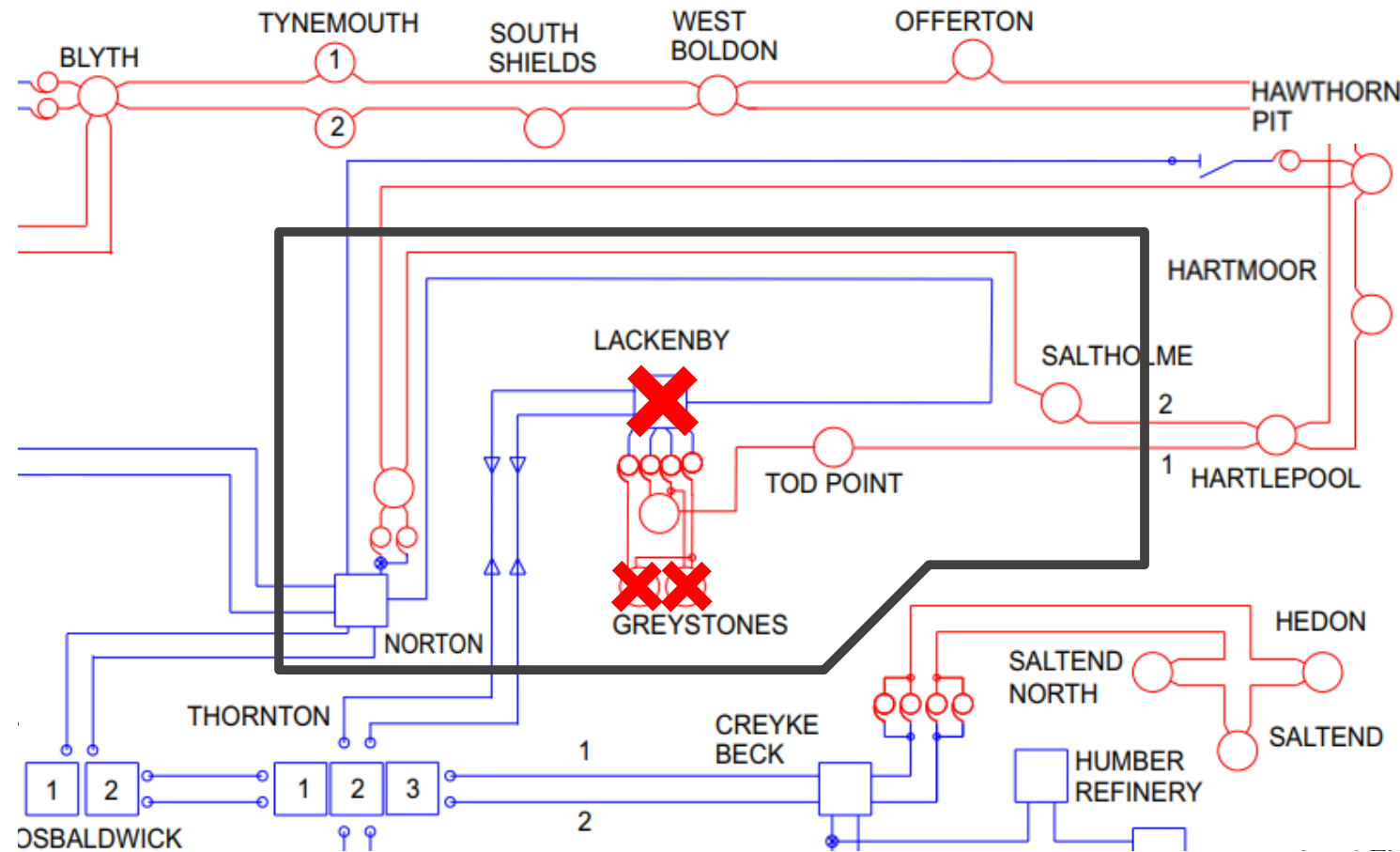
- Participants should be aware that through steady state analysis we have determined that installation of static shunt reactors at Stocksbridge 400kV site must be 200MVAR minimum size, as lower values may give rise to onerous resonance conditions that could require mitigation measures in order to satisfy connection conditions.
- Tenderers are required to consider and account for transient and temporary voltage issues for any installation at all sites. For further details please refer to the 'Pennine Pathfinder Connections Review Scope' document.

These are the minimum requirements needed to participate in the tender.

# Locational Requirements

## North East

- The requirement is for 200MVA of 'effective' absorption.
- Potential reactive providers must be within the black boundary.
- Compensation at sites enclosed by the black boundary contributes to alleviating high voltage in the entire area shown in the diagram. Technical assessment determined that similar volumes procured at other sites, being skewed towards either the North or South of the area, have limited effect on the opposite extremity.
- As part of the lessons learnt from Mersey, transmission sites that are unavailable for **new** connections within required timescales have been identified and removed. These are shown with red crosses. For avoidance of doubt, this does not affect DNO connections.



Continued...

# Locational Requirements

## North East

- Reference point for effectiveness calculation is at Norton 400kV busbar (100% effective).
- The ‘counterfactual’ option represents the default investment that would be adopted without the pathfinder approach. For high voltage this would be by the installation of reactors, and hence installation of a 200MVAR reactor at Norton represents the North East counterfactual.
- A similar approach to Mersey is used for the effectiveness calculation. The methodology is detailed in the “*Pennine effectiveness factor assessment methodology*” document, which is in the tender pack.
- The table shows, for all sites in scope:
  - Modelled MVAR size at each site; this is the assumed maximum reactive power absorption for the relevant voltage level.
  - Indicative effective MVAR for the given modelled size. Note actual effectiveness of tendered options will be calculated during the technical assessment stage (tender stage 1).
  - The Effectiveness Factor, as per the methodology
  - The percentage contribution to the 200MVAR requirement of the modelled solution (“Contribution to meeting requirement”)
- Site information for some of the available transmission sites is available on request from the ESO, as noted in the table opposite. Request a copy by emailing us at: [box.pennine.tender@nationalgrideso.com](mailto:box.pennine.tender@nationalgrideso.com)

Indicative effectiveness (connecting to busbar)

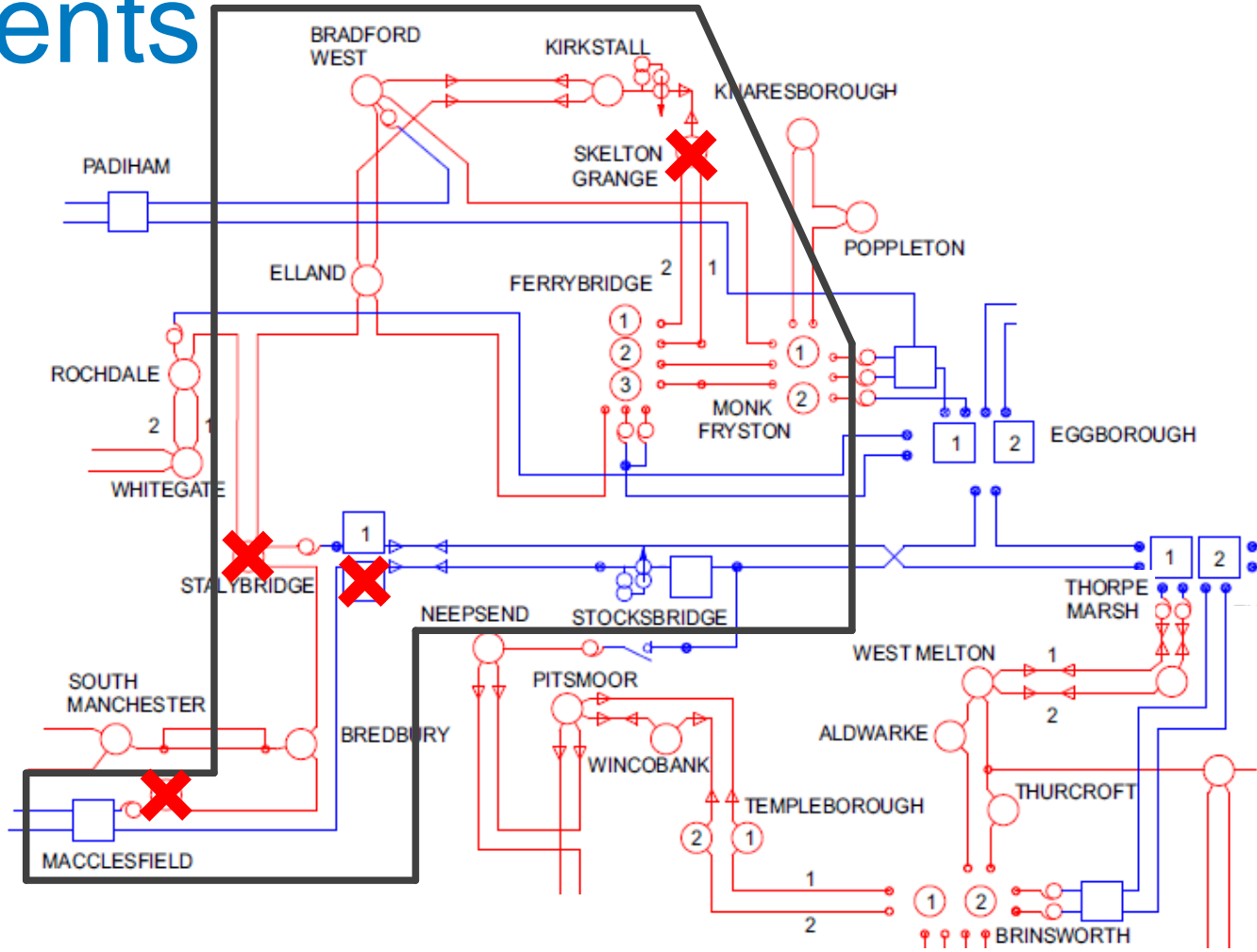
	Modelled Size (MVAR)	Effective MVAR	Effectiveness Factor	Contribution to meeting requirement	NGET Site Information Available?
Norton 400kV	200	200	100%	100%	Yes
Lackenby 400kV*	200	190	95%	95%	N/A*
Norton 275kV	100	90	90%	45%	Yes
Saltholme 275kV	100	85	85%	42.5%	No
Lackenby 275kV	100	80	80%	40%	No
Tod Point 275kV	100	80	80%	40%	No
Norton 132kV	60	56	93%	28%	-
Saltholme 132kV	60	56	93%	28%	-
Greystones 66kV	30	30	100%	15%	-
Lackenby 66kV	30	26	87%	13%	-
Tod Point 66kV	30	26	87%	13%	-
Grangetown 66kV	30	26	87%	13%	-

\*Existing connected parties only – substation is full

# Locational Requirements

## West Yorkshire

- Potential reactive providers must be within the black boundary.
- This boundary has been defined based on our technical studies, to focus on the most beneficial sites to ensure the entire region is compliant when considering contingencies across a wider network area.
- As part of the lessons learnt from Mersey, transmission sites that are unavailable for **new** connections within required timescales have been identified and removed. These are shown with red crosses. For avoidance of doubt, this does not affect DNO connections.
- Site information for all available transmission sites in this area is available on request from the ESO. Request a copy by emailing us at: [box.pennine.tender@nationalgrideso.com](mailto:box.pennine.tender@nationalgrideso.com)



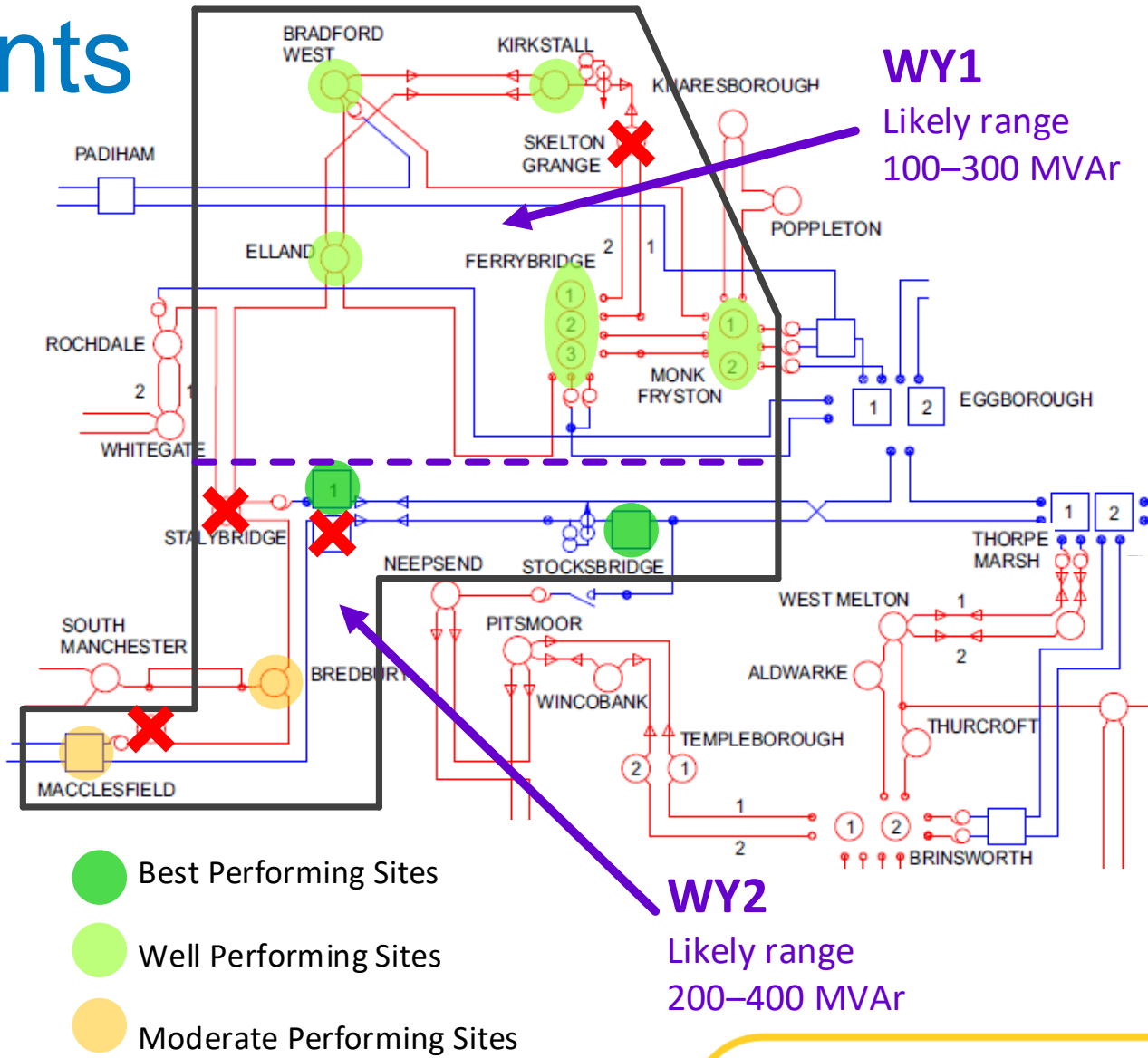
**X** Denotes sites within tender area but unavailable for new connections

Continued...

# Locational Requirements

## West Yorkshire

- This is a highly interconnected and electrically complex area of network containing long cable lengths, and thus is subject to high voltage rise.
- The region has been subdivided into two. Minimum requirements are:
  - 100MVA<sub>r</sub> in WY1 region
  - 200MVA<sub>r</sub> in WY2 region
  - Total combined minimum of 500MVA<sub>r</sub>.
- The previously described 'Effectiveness' measure works well when there is a single worst case contingency, and a single electrically optimal site, as was true for Mersey and in the North East. Here, the several critical contingencies and higher total volume required, mean solutions are needed across multiple sites.
- Assuming standard sizes of 100MVA<sub>r</sub> at 275kV sites and 200MVA<sub>r</sub> at 400kV sites, we have analysed all combinations at transmission level giving 500MVA<sub>r</sub> and 600MVA<sub>r</sub> in total. Based on this analysis, we have colour coded the sites to indicate which performed best.

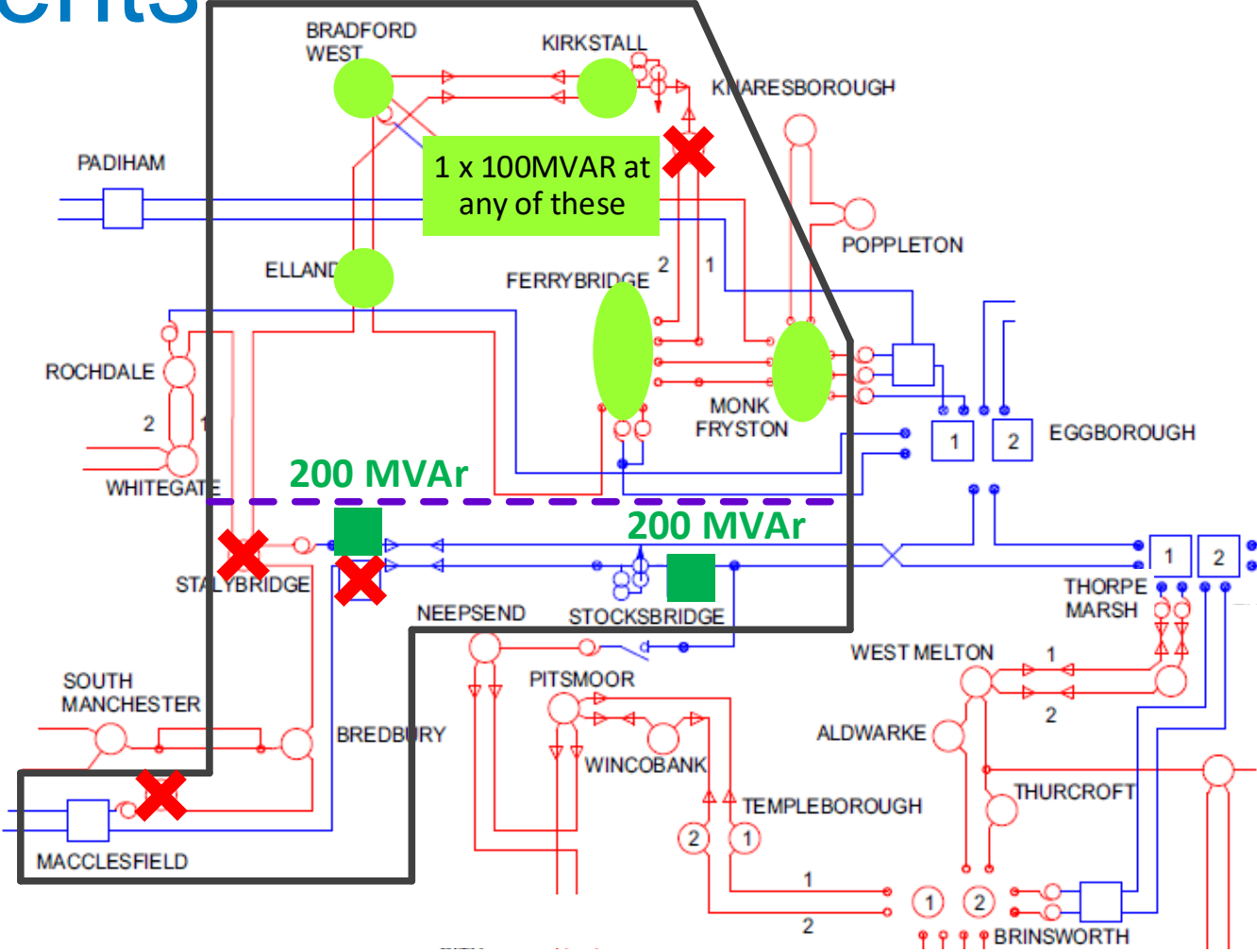


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# Locational Requirements

## West Yorkshire

- The counterfactual for this region has been designed to minimise the total theoretical investment cost by:
  - Using standard sized reactors
  - Utilising the minimum number of reactors and sites.
- Aside from the basic tenets above, it is an 'electrical-only' analysis, so assumes equal costs and availability at all non-excluded sites
- The counterfactual case is:
  - 200MVA<sub>r</sub> reactor at Stocksbridge 400kV
  - 200MVA<sub>r</sub> reactor at Stalybridge 400kV
  - 100MVA<sub>r</sub> reactor at any of the sites in WY1.





# 5. Assessment principles

General Assessment Information

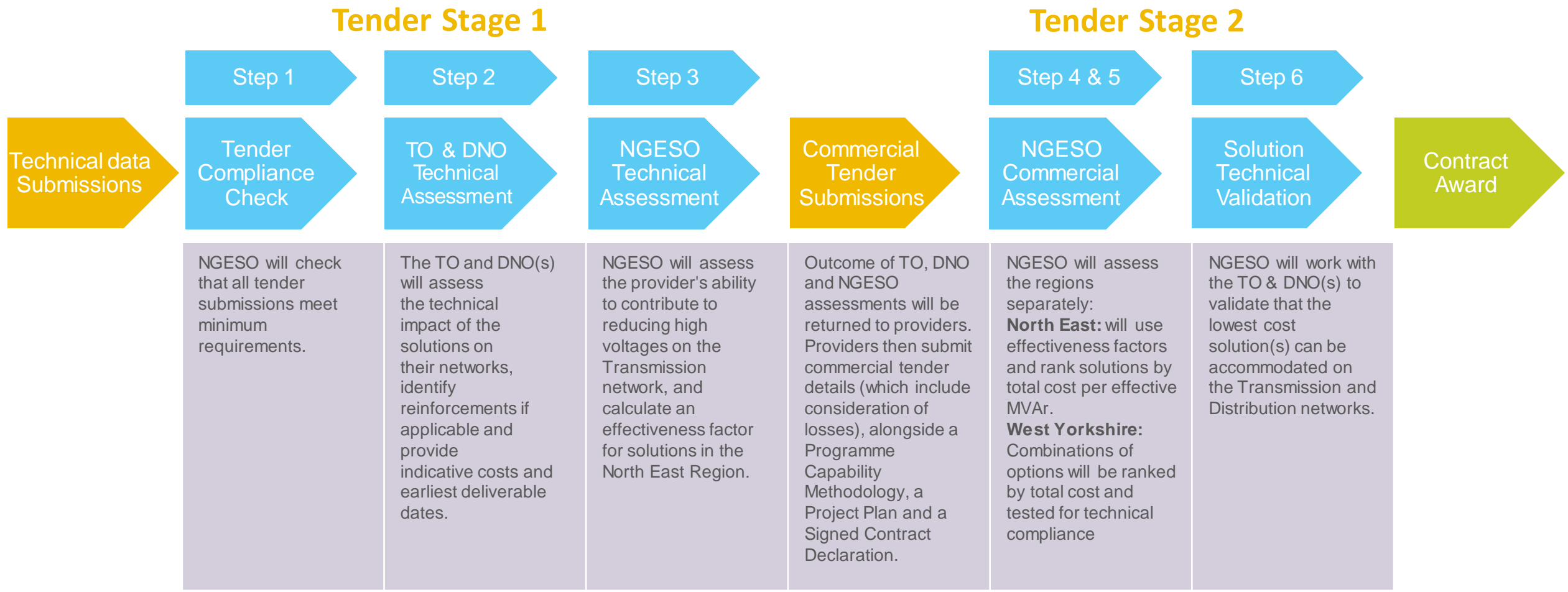
Reactive Tender Assessment  
Process

# General assessment information

The criteria for selection include but are not limited to:

- The proposed service must meet the minimum requirements
- Location of asset and connection point
- Provider effectiveness (where applicable)
- Total cost
- MVA<sub>r</sub>
- SEL if applicable
- Whether the cap on submissions has been exceeded (if you are unsure, please contact us well in advance of submission deadlines)
- Viability of service provider's proposals

# Reactive tender assessment process



# Reactive tender assessment process

## Step 1: Tender compliance check

All submissions will be assessed against the requirements. As part of the submission, providers will have to complete the following:

- Section A of the proforma – all fields highlighted green must be complete with a valid entry for the submission to be tender compliant
- The relevant Pennine DRC schedule template
- Where applicable, an Enquiry form for use of National Grid land (for review of non-operational land on transmission sites)

Providers will need to confirm that their options will meet all the minimum technical requirements. These include:

- Being ready to provide the reactive power service no later than 1 April 2024.
- Must be able to provide the service for the whole contract period until 1 April 2034.
- Connected at 33kV or higher.
- Connected within the indicated regions (refer to [Locational requirements](#)).
- Minimum absorption capability (aggregated sub-units must be minimum of 5MVar).
- Ability to meet the 24/7 service period requirement.
- Where applicable, the minimum notice period for NGENSO to enact the reactive power service must be no more than 30 minutes.
- Meet required protection settings.

Continued...

Any submissions which do not meet the minimum technical requirements will not be progressed further in the assessment.

# Reactive tender assessment process

## Step 2: TO and DNO technical assessment

- For the purpose of this tender, NGESO will work with the TO and DNOs to ensure the impact of any proposed options on their networks is considered in the assessment.
- For distribution-connected options, network studies will be carried out by Electricity North West (ENWL) and Northern Powergrid (NPG) to identify the impact of the reactive power flows on the distribution network and to evaluate the effectiveness of each solution at their corresponding Grid Supply Point(s). They will also provide indicative costs and lead-times to connect solutions to their network.
- For transmission-connected options, network studies will be carried out by National Grid Electricity Transmission (NGET) to determine the network impact of each solution and the level of reinforcements required to enable a connection to their networks. They will also provide indicative costs and lead-times to connect solutions to their network. NGET will also provide a review of non-operational land where available.
- NGET has undertaken an initial site feasibility on most sites within the tender region. This report is available on request as it contains information which is strictly private, confidential and commercially sensitive to National Grid Electricity Transmission plc. We require each recipient to confirm that they shall not communicate, reproduce or disclose any part of this document, without the express written consent of National Grid Electricity Transmission plc. To receive a copy of the report please email us with the above confirmation at: [box.pennine.tender@nationalgrideso.com](mailto:box.pennine.tender@nationalgrideso.com)
- For further details on the TO and DNO assessments see the 'Pennine Pathfinder Connections Review Scope' document included separately as part of the tender documents.

Continued...

# Reactive tender assessment process

## Step 3: NGESO technical assessment (for the North East only)

- The next step in the assessment process is to establish through system studies the effectiveness of each option.
- The effectiveness of any proposed options varies according to their points of connection. It will impact the total volume of Reactive Power procured. Options in different locations, connected at different voltage levels or of different sizes have different impacts on the transmission system voltage. Therefore an effectiveness factor needs to be established for each option.
- The ESO will work with DNOs to calculate the effectiveness factors when all bids are received.
- Please refer to Pennine effectiveness factor assessment methodology for details on how effectiveness factors are calculated.
- Using the effectiveness factor, the Effective MVA<sub>r</sub> provided by each option will be calculated:
- $\text{Effective MVA}_r \text{ provided} = \text{MVA}_r \text{ provided at point of connection} \times \text{effectiveness factor}$
- If an option is not effective, it will not be considered for further assessment.

Please note that for the West Yorkshire region, we will undertake the technical assessment as part of the Commercial Assessment Step 4 as explained on the next slide. Further details are included in the Pennine Commercial Assessment Methodology.

Continued...

# Reactive tender assessment process

## Step 4: Cost Assessment – Contract assessment and selection

- Once commercial submissions have been received, we will assess the viability of service provider's solutions against the criteria within the Programme capability document.
- We will then assess the options to determine the lowest overall cost to the consumer. The two regions will have different assessment methodologies;
  - North East Region: the assessment will calculate the total cost per effective MVA<sub>r</sub> of each contract over the ten-year contract length using the parameters provided to create a price stack. Contracts will then be awarded until our requirement has been fulfilled. Due to the granularity of the product and location of providers this may result in some overholding.
  - West Yorkshire Region: We will rank combinations of solutions in the region from lowest cost solution. We will then technically assess the options starting with the lowest cost solution and continuing until a technically compliant solution is found. The preferred solution will be the most cost-effective combination of options which solves the voltage issues in the region.
- The awarding of contracts will be at the lowest overall cost to the consumer to meet the volume requirement.
- If, following the connection feasibility studies, an option cannot meet a connection date of 1st April 2024, it may still be included in the assessment with additional costs added to represent the cost to the ESO of managing the voltage up until the option's connection.

Continued...



# Reactive tender assessment process

## Step 5: Cost Assessment – Comparison against other options

- All solutions are compared against the BM counterfactuals although at times there may be no alternative BM actions to take due to generator outages and unavailability. NGENSO is licensed to manage the system in an economic and efficient manner and the cost of the solutions will be compared to the historic cost of managing voltages in the Pennine region and other voltage areas. If the total costs of the solutions required to obtain the total requirement is excessively high compared to these costs, NGENSO may reject solutions with effective £/MVA<sub>r</sub> costs that show significant deviation from the average accepted tender price. Providers are expected to be price reflective in line with the market.
- The costs of energy losses are included for TO solutions and should be included with the tender bid for commercial solutions.
- Costs for managing volts on the Transmission system are available in the Monthly Balancing Services Summary, on the National Grid website.

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# Reactive tender assessment process

## Step 6: Validation of the combined solution

- If the lowest cost solution is a combination of options, NGENSO will collaborate with the TO and relevant DNO(s) to perform a validation. This is to validate that when all the selected options are working together to provide the reactive power services, no system limits will be exceeded inadvertently as a result. Shall the lowest cost solution prove to cause other system issues, the next-lowest cost solution will be selected instead. Step 6 will be repeated until the best whole system solution and economic outcome is found to clear the validation process.

Continued...

# Contract

Contract summary

Penalties

# Contract summary

## Payment structure

- Provider paid a fixed fee for periods of availability (£/SP) to cover all costs of providing the service throughout the service term.
- The tender submission will be valid for a minimum period of three months post contract award and providers shall be required to sign the Pennine appendix - Contract Declaration

## Contract structure

- Provider contracted reactive capability to be available for every SP for the duration of the contract with the exception of technical outages.
- Availability payment is £/SP against an agreed reactive volume.
- For sites with multiple units; unit's contracted reactive capability can be delivered from any unit, as long as the contracted reactive capability is maintained.
- Reactive capability must always be delivered from the agreed contract location.
- Aggregators may reallocate between their contracted locations, but the total effective MVAr delivered must not reduce

# Penalties

## Liquidated damages

- Providers will be liable for liquidated damages in the event of late service commencement. These are capped at 180 days x availability x 2

## Availability

- Providers are considered available in a settlement period when available capability or metered delivery is  $\geq 90\%$  of contracted volume, and will be paid their availability fee (£/SP).
- There will be an annual assessment to calculate annual availability. Where annual availability falls below 90%, providers will be subjected to a penalty equal to their availability fee for the unavailable settlement periods which take them below an annual availability of 90%.
- Annual payment collared at £0 – this is reached at 45% annual availability
- NGENSO reserve the right to re-test a provider, and potentially reduce contracted capability / payments, where the performance expectation of 90% is not met in more than 20% of instructed SPs within a calendar month

