

Mersey Voltage 2022 – 2031 Tender Interactive Guidance Document



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Version Control

Version	Date published	Page No.	Comments
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How to use this guide

This document 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 commercial.operation@nationalgrideso.com if you have any questions or feedback.

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1. Market information

3. Requirements

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Key Documents

1. Context and Market Information

1.1 Context

1.2 Wider Activities Impacting
Reactive Power

1.3 How information will be used

1.4 Market information for 2022

1.1. Context

Why are we doing this?

- We have been running a case study through the ENA Open Networks project to expand the Network Options Assessment (NOA) approach to consider transmission voltage needs and assess options to meet those needs.
- We are focusing on system needs to control high voltage as we have seen an increasing need to absorb MVARs in recent years resulting in increased costs to voltage management overall.
- This market tender is the next step in expanding the NOA process for voltage solutions to include the assessment of market-based options against Network Owner options.
- The outcome of the expanded process will be a recommendation of the most economic and efficient whole system solution which should be taken forward.
- The recommended solution could consist of only market-based options, only 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 options considered in the process provides benefits against forecast Balancing Mechanism (BM) cost to control high voltage.

1.1. Context

Aims

The aim of this tender is to:

- Formally invite tender submissions from potential providers of reactive power
- Assess these tenders against a Network Owner option
- Identify the most economic solution to meet a nine year reactive power requirement

We will also:

- Test a further procurement exercise with DNO involvement where embedded providers participate
- Use lessons learned to inform how we may approach the significant hurdles to meeting voltage challenges on a whole system basis.

1.2. Wider Activities Impacting Reactive Power

There are a significant number of activities on-going which impact the Reactive Power ancillary service. This is part of the Electricity System Operator's review of Balancing Services, aiming to create balancing service markets that meet our changing system needs.

The Product Roadmap for Reactive Power provides detailed information on the developments within the ancillary service. Developments that directly impact this tender are:

Product Roadmap for
Reactive Power

Applying a 'Network
Options Assessment' to
Voltage

Power Potential

Greater Transparency of
Reactive Spend

Stability Pathfinder
Phase One – GB 2020

1.3. How information will be used

Use of information submitted within the tender includes:

- Calculate provider effectiveness of delivering reactive power at the relevant location on the transmission system
- Pass necessary technical information onto the relevant DNO for technical assessment purposes
- Conduct economic assessment of provider solutions
- For non-connected parties, the evaluation of milestones
- Understand how losses associated with commercial offers have been derived

The results of the tender will be published alongside reasons for rejection, if relevant, and details of tender submissions. Published details will include:

- Reactive capability
- Calculated effectiveness
- Relevant submitted price (availability) and calculated Total cost per effective MVar

For information on the two stage tender process, technical and then commercial, please refer to the [Timeline](#).

1.4. Market information for 2022

What are we tendering for?

Procurement is considered for 2022-2031:

- Reactive Capability Requirement exists 1st April 2022 23:00 – 1st April 2031 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: -230MVAR (subject to potential interaction with potential Stability contracts in the area)
- The Reactive requirement is measured at the transmission system, and procured volume depends on the exact location of the reactive providers
- Requirement is for static Reactive Power provision however, dynamic providers that can operate in Constant Reactive Power mode will be considered
- We invite embedded and transmission connected parties to participate
- One contract type to cover all providers, availability payments only (£/SP)

1.4. Market information for 2022

How does this differ to the Reactive Mersey 2020/21 tender published on 14th October 2019?

This is high level and not an exhaustive list, further details provided later in the information pack:

- Reactive Capability Requirement exists 1st April 2022 23:00 – 1st April 2031 07:00
- Require reactive capability available 24/7 year round
- Forecast utilisation – utilisation capped at 5,500 hours per annum per provider
- Tender submission is split into two parts (technical and commercial)
- Minimum dispatchable unit size is 15MVA_r (aggregator sub-units minimum of 5MVA_r)
- One contract type to cover all providers, availability payments only (£/SP)
 - No utilisation payments
 - Consideration of losses to be included within availability price
- Penalty clauses for under-delivery or unavailability below a threshold
- Maximum notice period for reactive power delivery is 30 minutes
- Economic assessment will be against a network owner asset
- Aggregators are able to participate fully, not only as an agent
- Additional protection setting requirements need to be met (see [Technical Requirements section – 3.2](#))

2. Reactive overview

2. Reactive
overview

2.1 Voltage and Reactive Power

2.2 Voltage Constraint Services

2.3 Tender Outline

2.1. 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.

2.2. 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.

Key documents for
more information

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 NGENSO to access reactive power.
- Availability reported through 'Constraint' part of MBSS.

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.

2.3. 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 [\(see section 3\)](#).
- Providers can offer other balancing services in conjunction with Reactive Power services, as long as this does not impact the reactive range tendered. The benefits of the additional services provided will not be considered as part of this tender.
- We are offering a single contract type with availability payments only
- 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.
 - Providers should liaise with the DNO to understand if reinforcements would enable operation at lower power factors

3. Requirements

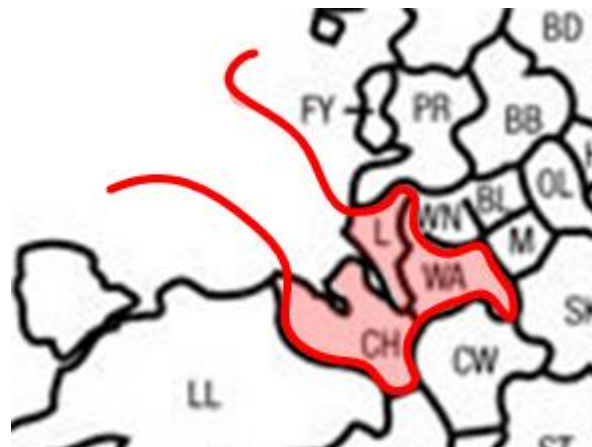
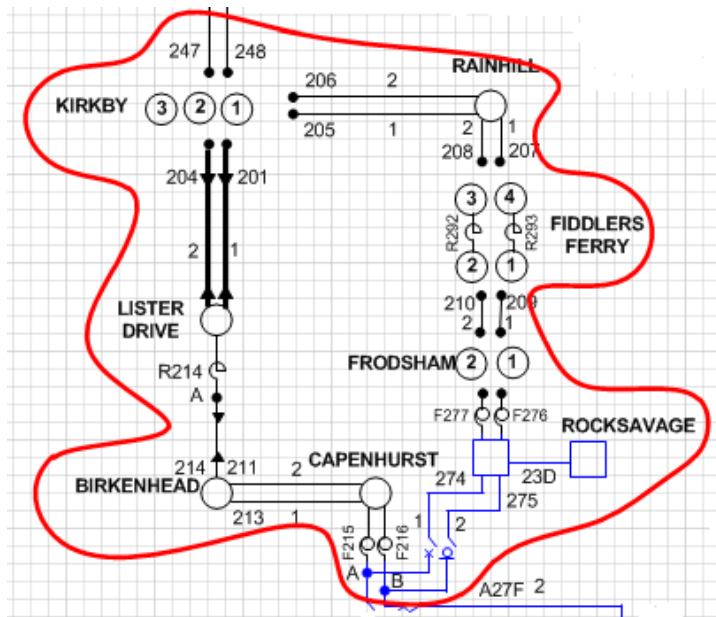
3. Requirements

3.1 Location Requirements

3.2 Technical Requirements

3.1. Location requirements

Potential Reactive Providers must be within the red boundary:



Continued...

The technical diagram is seen as the authority when determining a provider's location

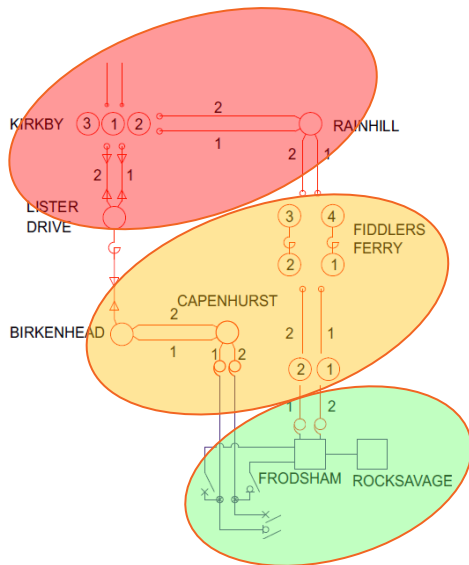
3.1. Location requirements

Indicative Site Effectiveness

Least Effective



Most Effective



Typical Effectiveness at various voltage levels*

Least Effective

Most Effective



33 kV
66 kV

132 kV
275 kV
400 kV

* Actual effectiveness depends on site by site assessment

Continued...

Indication of reactive effectiveness e.g. greater at 400kV at Frodsham; less at 33kV at Kirkby

3.1. Location requirements

Indicative effectiveness (connecting to busbars)

	100MVA absorption	50MVA absorption
Frodsham 400kV (all bars)	100%	100%
Rocksavage 400kV	100%	100%
Birkenhead 275kV (all bars)	87%	82%
Capenhurst 275kV (all bars)	88%	84%
Fiddlers Ferry 275kV MB1 RB1	86%	80%
Fiddlers Ferry 275kV MB2	86%	80%
Fiddlers Ferry 275kV MB3	79%	76%
Fiddlers Ferry 275kV MB4 RB2	79%	78%
Frodsham 275kV MC3	88%	86%
Frodsham 275kV MC1	90%	88%
Kirkby 275kV RB1 RB2	67%	62%
Kirkby 275kV MB1 MB2	78%	74%
Lister Drive 275kV (all bars)	79%	74%
Rainhill 275kV (all bars)	75%	74%

- Reference point for effectiveness calculation is at Frodsham 400kV busbar (100% effective)
- The table shows indicative effectiveness calculated for various transmission sites by modelling selected sizes of reactive power absorption.
- Actual effectiveness of tendered options will be calculated during the technical assessment stage (tender stage 1).
- The table is not an indication of available connection points. Potential participants are expected to enquire/secure available connection points via the standard connection process.

Continued...

Indicative only. Actual effectiveness will be calculated during the technical assessment stage.

3.1. Location requirements

Indicative effectiveness (connecting to tertiary of SGT)

	30MVA _r absorption	15MVA _r absorption
Birkenhead 275/132kV SGT2A	77%	73%
Capenhurst 275/132kV SGT1A	80%	73%
Fiddlers Ferry 275/132kV SGT3	87%	87%
Fiddlers Ferry 275/132kV SGT4	87%	87%
Frodsham 275/132kV SGT2	87%	80%
Frodsham 275/132kV SGT3	80%	80%
Frodsham 400/275kV SGT5	80%	67%
Frodsham 400/275kV SGT7	83%	67%
Kirkby 275/132kV SGT1A	57%	47%
Kirkby 275/132kV SGT2A	57%	47%
Lister Drive 275/132kV SGT1	70%	60%

- Reference point for effectiveness calculation is at Frodsham 400kV busbar (100% effective)
- The table shows indicative effectiveness calculated for various transmission sites by modelling selected sizes of reactive power absorption
- Actual effectiveness of tendered options will be calculated during the technical assessment stage (tender stage 1)
- The table is not an indication of available connection points. Potential participants are expected to enquire/secure available connection points via the standard connection process.

Indicative only. Actual effectiveness will be calculated during the technical assessment stage.

3.2. Technical Requirements

What are the minimum requirements to participate?

Minimum size

- Minimum Reactive Power absorption is 15MVAR at the point of connection (embedded providers 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. This can be from a single unit or aggregated from several smaller units (minimum 5MVAR)

Maximum size

- Maximum size of a reactive power solution is limited by the voltage step change limits and is dependent on the voltage level. The typical maximum size for a solution that can be switched by a single circuit breaker is: 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.

Location

- All providers must be within the location described in [slide 19](#). Where providers are connected at distribution level, you may wish to confirm where you are connected on the transmission network.
- Where postcode and technical drawings differ the technical diagram is seen as the authority.

These are the minimum requirements needed to participate in the tender

Continued...

3.2. 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 to inform NGESO 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...

3.2. 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

- Solutions implementing loss of mains protection based on RoCoF should have a setting of $\geq 1\text{Hz/s}$ with a time delay of 500ms.
- Solutions should not be implementing loss of mains protection based on Vector shift.
- Solutions must be able to remain connected and stable for faults where the voltage at the Grid Entry Point or User System Entry point could fall to 0 pu for up to 140 ms.

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 to assessment of the impact and effectiveness of each.
- Sub-units must be no smaller than 5MVar. Tendered units must be no smaller than 15MVar
- Sub-units can be reallocated across aggregated sites. The total effective MVar 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

4. Assessment Criteria and Principles

4.1 General Assessment Information

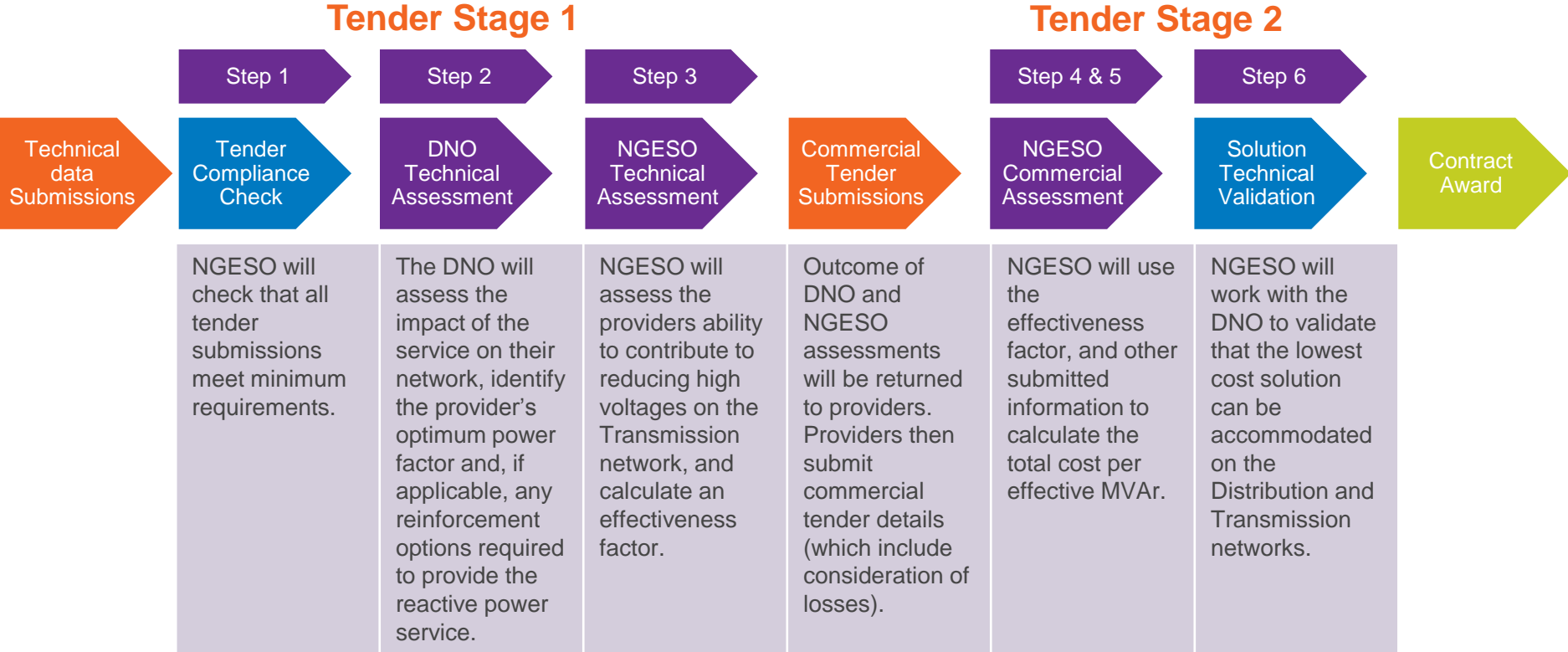
4.2 Reactive Tender Assessment Process

4.1. 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
- Total Cost
- MVA range
- SEL if applicable

4.2. Reactive Tender Assessment Process



4.2. Reactive Tender Assessment Process

Step 1: Ensure tender compliance

All submissions will be assessed against the requirements. As part of the submission, providers will have to complete section A of the proforma and confirm that their options will meet all the minimum technical requirements. These include:

- Being connected and ready to provide the reactive power service no later than 1 April 2022.
- Must be able to provide the service for the whole contract period until 1 April 2031.
- Connected at 33kV or higher.
- Connected within the Mersey region (refer to [Section 3.1](#)).
- Minimum 15MVA_r absorption capability (aggregated sub-units must be minimum of 5MVA_r).
- 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.

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

Continued...

4.2. Reactive Tender Assessment Process

Step 2: Assessment of impact on transmission/distribution network

For the purpose of this tender, NGENSO will work with the DNO and TO 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 SP Energy Networks (SPEN) 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).

As part of the assessment, SPEN will also identify the most optimum power factor for each distribution-connected solution to operate at. If a specific request is made in the tender proforma, SPEN will look into network reinforcements that will enable operation at a different power factor.

Providers will then be given a choice of either operating at the power factor set by SPEN or fund any reinforcements that will enable the operation at a different power factor. The MVar capability at the agreed power factor will be taken as the contracted MVar volume for the cost assessment (Step 4).

Continued...

4.2. Reactive Tender Assessment Process

Step 3: Technical Assessment - Effectiveness

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.

NGESO work with SPEN to calculate the effectiveness factors when all bids are received.

Please refer to [Effectiveness Factor assessment methodology](#) for details on how effectiveness factors are calculated.

Using the effectiveness factor, the Effective MVAR provided by each option will be calculated:

- *Effective MVAR provided = MVAR provided at point of connection x effectiveness factor*

If an option is not effective, it will not be considered for further assessment.

Following the DNO and NGESO assessments the tender proforma will be returned to providers with additional information provided in Section B. This will allow providers to finalise the commercial aspects of the tender in Section C of the proforma (which include consideration of losses).

Continued...

4.2. Reactive Tender Assessment Process

Step 4: Cost Assessment – Contract assessment and selection

Once commercial submissions have been received, the assessment will calculate the total cost per effective MVAR of each contract over the nine-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.

The awarding of contracts will be at the lowest overall cost to the consumer to meet the volume requirement.

Step 5: Cost Assessment – Comparison against other options

All tenders 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 contracts will be compared to the historic cost of managing voltages in the Mersey region and other voltage areas. If the total costs of the contracts required to obtain 230MVARs absorption is excessively high compared to these costs, NG may reject tenders with Effective £/MVAR 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 losses for all potential solutions, including network build, will be accounted for in the Effective £/MVAR cost.

Costs for managing volts on the Transmission system are available in the MBSS reports, on the National Grid website.

Continued...

4.2. 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 SPEN 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.

5. Contract

5. Contract

5.1 Contract Summary

5.2 Penalties

5.1. Contract – Firm Static Reactive Power Service

Payment Structure

- Provider paid a fixed fee for periods of availability (£/SP).

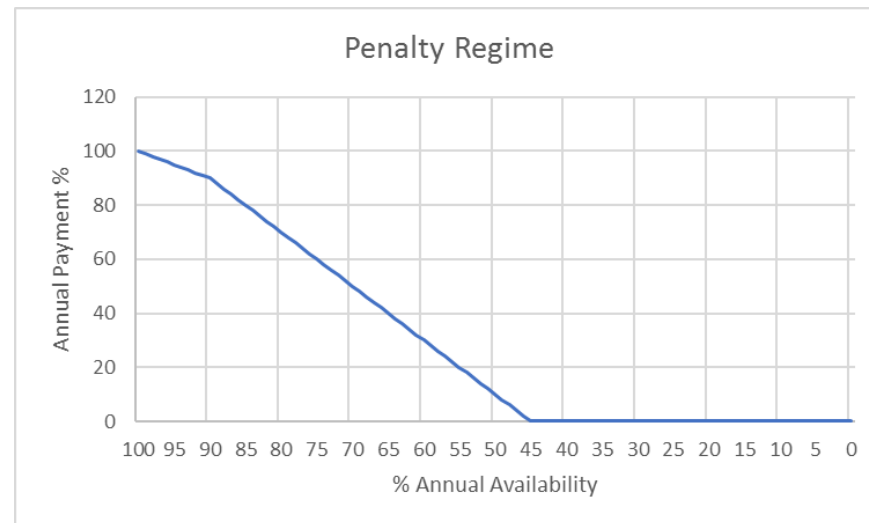
Contract Structure

- 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

5.2. Contract – Penalties for Unavailability

Penalty Structure

- Provider paid a fixed fee for periods of availability (£/SP) where capability / metered delivery is $\geq 90\%$ of contracted volume.
- Annual assessment to calculate annual availability.
- Where annual availability falls below 90%, providers will not be paid their availability fee for the periods they are not available and will be subjected to a further penalty equal to the same amount in accordance with the chart to the right
- Annual payment collared at £0 – reached at 45% annual availability
- Delivery performance below 90% in an SP will be classed as unavailable
- 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



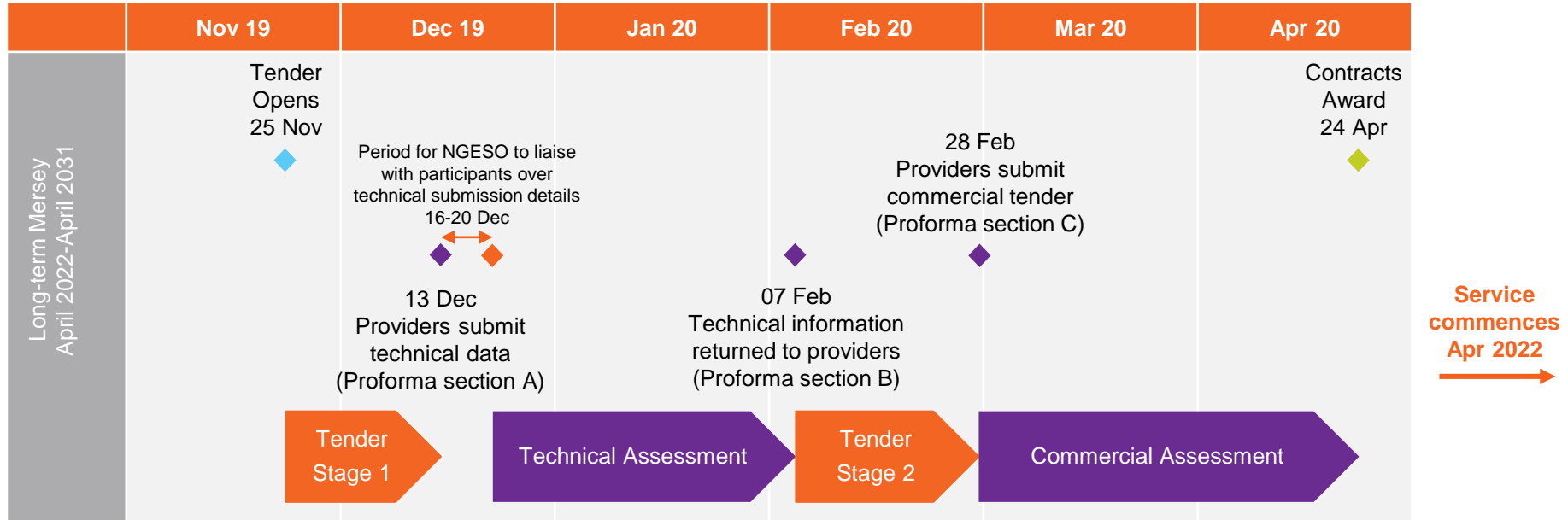
6. How to Participate

6. How to participate

6.1 Timeline

6.2 How to submit information

6.1. Timeline



6.2. How to submit information

Please use the below proforma when responding to the tender.



Tender Proforma

The deadline for submission of technical information (section A of the proforma) is 5pm on 13th December 2019.

Submissions may only include one tender per unit/asset.

NGESO will conduct a technical assessment and return the proforma (with a completed section B) to participants on or before 7th February 2020

The deadline for submission of commercial information (section C of the proforma) is 5pm on 28th February 2020

NGESO will consider the submissions and publish the tender outcome by 24th April 2020.

Please send your responses via email to commercial.operation@nationalgrideso.com

If you have any questions, please contact commercial.operation@nationalgrideso.com or call 01926 654611.

Key documents

Current and Short Term information

Constraint
Management
Contracts

Balancing
Service Reports

ORPS
Information

nationalgrideso.com

National Grid ESO, Faraday House, Warwick Technology Park,
Gallows Hill, Warwick, CV346DA

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