Connections Approach for the NOA Pathfinder Stability Phase 3 Tender

February 2022 - Version 4

nationalgridESO

Contents

Version Control

Version	Description	Date
V1	Initial publication at pre-tender consultation	10 September 2021
V2	Updated document at invitation to tender (ITT) launch. Section 1 added providing updates following pre-tender consultation.	20 December 2021
V3	Section 1 updated. The assumed SCL (MVA) for the reserved bay at Offerton 275kV updated to 1625 MVA (it was previously 1675 MVA).	05 January 2022
V4	Section 1 updated with additional clarifications – identified by '**Version 4 Clarification**' in red text next to the update.	25 February 2022

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1. Invitation to Tender Update

Final bays reserved

Following the completion of the TO feasibility studies, NGESO can confirm that the below table contains the final list the substations where bays have been reserved.

Site	Region	Final No. of connection points (bays) secured	Bay Identifier(s)	Assumed SCL (MVA)	Risk / Contingency Associated
Hartmoor 275kV	North East	2	MC1 and MC2	2 x 1650	None
Offerton 275kV	North East	1	Studies have identified MC2 extension	1 x 1625	EISD at risk due to SCS equipment potentially requiring upgrade. This will not be confirmed until January/February 2022.
Walpole 400kV	East England	1	MBB1 adjacent to SGT5	1 x 7000	None
Yaxley 400kV	East England	2	2 x Additional bay at new GIS substation	2 x 2555	Achieving planning permissions for the substation design. This will be confirmed early next year.
Necton 400kV	East England	1	Bay vacated by OHL transposition Bay X305	1 x 2640	Contingent on all three connections in queue proceeding and delivering on time.
Canterbury North AIS 400kV	South Coast	1	MC1	1 x 1110	None
Canterbury North GIS 400kV	South Coast	1	MBB5/RBB5	1 x 1110	None
Richborough 400kV	South Coast	1	1 new bay next to GIS hall	1 x 2220	None
Langage 400kV	South West	2	2 x New bay within GIS building at each end of busbar	2 x 715	None
Landulph 400kV	South West	1	Busbar 3, adjacent to Langage 2 circuit	1 x 770	None
Cilfynydd 400kV	South Wales	1	MBB1 AIS BB extension (west)	1 x 1900	None
Upper Boat 275kV	South Wales	2	MC1 and MC4	2 x 1900	None
Rassau 400kV	South Wales	1	MBB2 GIS extension (east)	1 x 2950	None

- Assumed SCL (in MVA) has been based on the effectiveness of the substation to contribute to the regional requirements, considering N-1 criterion.
    - Note: NGESO have provided separate MVA sizing guidance in the Detailed Site Data Tool with Sizing Guidance document.
    - The Assumed SCL per bay (in MVA) in the table refers to the transient SCL i.e. transient fault current x substation voltage x $\sqrt{3}$. The sub-transient SCL is assumed to be 1.5x the transient SCL and an X"/R ratio of 10 is assumed.

- ± 100MW and ± 100MVAr has been assumed per bay.
- Tenderers should refer to the Connection Feasibility Report for an indicative view of the connection date, transmission infrastructure costs and site details associated with connecting to the electricity network at each of the connection points (bays) that have been reserved.
- The Connection Feasibility Report includes details about substations which do not have any reserved bays. This is because NGESO requested that some additional sites were studied.
- Within the Connection Feasibility Report the indicative EISD connection dates are provided in Month/Year format. NGESO guidance for Tenderers would be to assume this means the end of the month for planning purposes.
- The Connection Feasibility Report is supported by National Grid Electricity Transmission (NGET) Non-Operational Land Estate Reviews and redacted NGET Environmental Studies for the substations with reserved bays where there is non-operational land available.
    - *Note: Estate Reviews are not available for Yaxley or Richborough, as there is no non-operational land at these sites.*
    - *Note: Redacted Environmental Studies are not available for Yaxley, Richborough, Necton or Langage because there is no non-operational land at these sites.*

For the avoidance of doubt:

- **For the avoidance of doubt only the substations listed in the table above have reserved bays (subject to the risks/ contingencies noted within the Stability Phase 3 tender documents)**.
- Intention to use a reserved connection point (bay) in tender proposals does not convey or guarantee success in the Stability Phase 3 tender. All Tender submissions will be assessed in the same way in accordance with the Contract Award Criteria.
- **Tenderers who wish to use reserved bays should not submit any connection applications for these bays until the completion of the tender.**
- Within the Connection Feasibility Report the 'System Design Review' section confirms that for some of the reserved bays in some of the regions a staged fault-level connection will be facilitated. This means that the indicative EISD is achievable such that the connection agreement is staged with delayed fault-level enabling works planned for future years (e.g. 2029).
    - Such connections will carry a risk that should any delayed enabling works not occur as planned (e.g. due to Force Majeure, or unforeseen, events) NGET will reserve the right to 'switch off' the Pathfinder connections.
    - Please note NGESO plan to share proposed drafting of the delayed fault-level enabling works clause during the tender window.
    - **Note that delayed fault-level enabling works will only be applicable to the specific reserved bays that are impacted.**

Pre-tender consultation results

NGESO would like to thank those market participants who took the time to provide feedback on the connections approach. This feedback has been reviewed and it has been identified that most of the responses were simply clarification questions. Below NGESO have provided clarification responses to the generic queries received.

Where direct feedback was received this has been passed on for use in the ongoing codes work to identify how the reservation of bays can become an enduring solution for future Pathfinders or similar tenders. For the avoidance of doubt, no changes have been made to how this connections approach will be facilitated for Stability Phase 3, save for the clarifications and updates provided in Section 1 of this document.

Connection Approach Clarifications

Version 4 clarification: Do we need to have an accepted Grid Application by tender due date (for a non-reserved substation bay) or just an offer? Does the grid application need to be signed or just at offer stage at the tender due date?

Version 4 clarification: Tenderers who wish to connect at a substation bay that is not reserved will need to go through the normal connections process and will be required to demonstrate they have a connection offer as part of their tender submission. At the point of tender submission (16 May 2022) it does not need to be a signed/accepted agreement, only an offer.

For the avoidance of doubt: if this tenderer is then successful in Stability Phase 3, the connection offer relied on must still be valid for use, i.e., it cannot have expired. Due to how the Stability Phase 3 tender timeline compares to the duration of the connection process timeline for some tenderers this might mean that tenderers accept connection offers prior to the publication of tender results. How this is managed is at the tenderer's discretion such that the connection offer is still valid upon signature of the Stability Phase 3 contract.

Is the Connection Feasibility Report only dealing with the reserved bays and a separate document of substation effectiveness being produced? This information will be critical for those tenderers looking to provide additional capability at existing connection points.

Correct. The Connection Feasibility Report will provide details for a defined list of substations only, where bays have been reserved and have been studied. A separate document (Stability Phase 3 Detailed Site Data Tool) has been provided which confirms the effectiveness of all substations within each region of need, not just for those with reserved bays. The intention of providing this information is so that participants can consider all substations within each region, in addition to the substations where bays will be reserved.

If connecting at one of the listed substations, who has responsibility for the connection route, developer or TO / ESO?

The definition of connection route will be the responsibility of the tender participant/ project developer up to the point of entering the TO non-operational land. Please note that the connection route through/across TO non-operational land would need to be agreed with the TO lands team to ensure it avoids any constraints and does not prevent any future development, but the tenderer will still be ultimately responsible.

The reserved bays should not dictate the security requirements against largest loss as this assumes only reserved bays are the solution.

The methodology to calculate the largest loss will follow the N-1 criterion, considering all solutions that are proposed, not just solutions proposed at reserved bays. The aim will be to ensure that the SCL requirement can still be met even if the largest chosen solution is not available.

What NGESO actually procure will depend on a number of factors, e.g. the sizes of solutions that are put forward by Tenderers, the prices of solutions, the number of connections that can be facilitated in each region and the effectiveness of the substations at which the solutions are intending to connect.

For example, if the requirement in a region is 500MVA and the largest solution is 200MVA, NGESO will need to ensure that for the outage of the 200MVA solution, the requirement of 500MVA can still be met.

If four solutions are put forward and each substation associated with each solution had an effectiveness factor of 100%; and if three solutions put forward were sized at 200MVA and the

remaining one solution sized at 100MVA, NGESO may need to procure 700 MVA (3x200 + 1x100) if it is economic and efficient to do so. However, if only 200MVA solutions were put forward, NGESO may need to procure 800MVA (4x200) if it is economic and efficient to do so such that the requirement of 500MVA can still be met.

At pre-tender consultation NGESO initially provided the following guidance:

"Is there a risk that the ESO reserved connection points cannot facilitate the size of the successful solutions?

If following the tender assessment NGESO require more capacity at a site than originally assumed to facilitate the successful solution(s), NGESO reserve the right to work with the successful solution(s) at said connection point to increase the capacity of the solution to cover any gaps exposed during the tender assessment."

"What if a successful tendered solution and its connection application is fundamentally different to what has been reserved?

The assumptions that will be considered and associated with the TO feasibility studies and reservation of each connection point are detailed in Table 1 above. These assumptions will be confirmed at the launch of the tender.

Should a solution exceed or be fundamentally different to these assumptions, tender participants should anticipate variations to the indicated costs and connection timescales included in the Report. For example, if a solution is submitted as 1000MVA for a connection point where 500MVA has been assumed, this could trigger additional works within the connection, impacting the indicative cost and connection timescale in the Report.

Please note that if a tender participant initiates a substantial increase in the size of their solution post-tender award, any increase in the cost of connection resulting from such change would be borne by the tender participant i.e. the tendered price for the service will not be adjusted. Furthermore, tender participants will also need to ensure that the service start date, stated as part of the tender return, is not impacted by the increase in size."

Please note that following the completion of the feasibility studies it has been decided that the Stability Phase 3 tender will not consider solutions proposed at reserved bays if their SCL contribution exceeds the assumed MVA at a reserved bay. This has now been written into the tender assessment within the technical questions.

Version 4 clarification regarding reserved bays: For the avoidance of doubt, for tenderers that choose to rely on a reserved bay:

- The tendered solution at a reserved bay (whether the solution is one machine, or a group of banked machines) cannot exceed the SCL size at the reserved bay. This is written into the tender assessment process through Q34 in the Technical Submission Document. The Detailed Site Data Tool with Sizing Guidance provides a tool that allows tenderers to check whether their solution would exceed the SCL size or not.

- If tenderers want to export/import MW using the reserved bay, they are encouraged to size solutions within the +/- 100MW allocated to the reserved bay.
    - Tenderers who bid solutions in excess of +/- 100MW for a reserved bay will be rejected and the solution removed from the tender.
    - However, tenderers could propose a solution within the +/-100MW for the Stability Phase 3 tender, and then choose to initiate an increase to the MW size of their connection post contract award whilst going through the connections process for the reserved bay.
        - Where this is done, any MW in excess of the +/-100MW may be staged such that the +/-100MW reserved bay allocation can be exported initially, and then any MW in excess of the +/-100MW could be exported afterwards. This would be subject to the status of TEC queue and the current contracted generation background at the time the tenderer was going through the connection process. This provides fairness to those developers with existing contracts already in the TEC queue.
    - Note: any increase in the cost of the connection would be borne by the tenderer i.e. the tendered Availability Fee will not be adjusted. Furthermore, tenderers will also need to ensure that the service start date, stated as part of the tender return, is not impacted by the increase in size.
    - Reminder: There are currently MW constraints on the NETS. Tenderers should refer to the NGET Connection Feasibility Report for details of when +/-100MW could be exported for the reserved bays.
    - Reminder: Change in MW capacity of the reserved bay later in the connections process must not decrease the contracted inertia and SCL as highlighted in the Technical Specification V2 Part A, clause 2.3.

- If tenderers want to import/export MVAr, they are encouraged to size solutions within the +/- 100MVAr associated with the reserved bay.
    - Tenderers who bid solutions in excess of +/- 100MVAr for a reserved bay will be rejected and the solution removed from the tender.
    - However, a tenderer could propose a solution within the +/-100MVAr for the Stability Phase 3 tender, and then choose to initiate an increase to the MVAr size of their connection post contract award whilst going through the connections process for the reserved bay.
        - Where this is done, any MVAr in excess of the +/-100MVAr may be staged such that the +/-100MVAr allocation can be exported initially, and then any MVAr in excess of the +/-100MVAr could be exported afterwards.
    - Note: any increase in the cost of the connection would be borne by the tenderer i.e. the tendered Availability Fee will not be adjusted. Furthermore, tenderers will also need to ensure that the service start date, stated as part of the tender return, is not impacted by the increase in size.
    - Reminder: Change in MVAr capacity of the reserved bay later in the connections process must not decrease the contracted inertia and SCL as highlighted in the Technical Specification V2 Part A, clause 2.3.

At pre-tender consultation NGESO also provided the following guidance:

What if a tender participant is already connected to one of the sites reserved in the Report?

In the event a tender participant is already connected (or will be connected) at one of the sites listed in the Report but requires an update to their connection, the reserved position in the queue could be allocated if the tender participant is successful.

Therefore, a modification application would be required, and this can be submitted post-contract award. The modification process would be based on the held connection point.

NOTE: Existing connections will also need to satisfy the additionality criteria to meet the requirements for this tender.

Following the completion of the feasibility studies we now understand this may be possible depending on the running arrangements of the substation in question. If Tenderers are already connected to one of the substations with a reserved bay and wish to use the capacity associated with the reservation for their existing connection at that same substation, please notify NGESO through the Ariba Message Board prior to tender submission to allow NGESO to explore and confirm that the capacity can be allocated in this way.

What will the connection cost information included in the Connection Feasibility Report for reserved/studied bays include?

The Connection Feasibility Report will provide:

- Indicative infrastructure costs per connection point (bay)
- Indicative infrastructure costs in terms of Final Sums securities liabilities
- Indicative one-off works that could be incurred per connection point (bay)

Refer to the table below for more information about these types of costs in relation to the Connection Process.

Cost Name	Definition	Impact on Tenderer
Connection Site Infrastructure costs (also known as attributable costs)	Network reinforcement works between the point of connection and the nearest MITS substation. This cost is stated in the “Indicative Cost Estimate for works section” of the Connection Feasibility Report.	For the tender assessment, NGESO will apply infrastructure costs in accordance with the Contract Award Criteria. Tenderers would need to securitise these works from acceptance of an offer to completion. Indicative security

		costs are provided in the "Indicative NGET Costs" section of the Connection Feasibility Report. More information on securities is on the NGESO website under the "Connection and use of System code (CUSC) Customer Guides" section.
Infrastructure costs beyond the MITS substation (also known as non-attributable costs)	Network reinforcement works required that are beyond the nearest MITS substation. These are identified in the "System Design Review" section of the Connection Feasibility Report. These *may* affect the achievable connection date, as in some cases the works will need to be completed to facilitate the tenderer connecting to the system. Where such cases have been identified, they are noted in the report.	These have no monetary costs to the Tenderer, but they can affect the achievable connection date.
Connection asset costs	Connection assets or works at the point of connection to enable the connection. Depending on the location of the CUSC ownership boundary these sometimes are payable by the User.	Depending on the ownership boundary these can be payable by the Tenderer. For the purpose of the reserved bays, this only applies to Yaxley, and indicative connection costs have been provided in the Connection Feasibility Report.
One-off costs	Defined under CUSC Section 14, Part 1, paragraph 14.4.2, the following activities have been classified as One-Off Works triggered by the User's works: • Works on the transmission system that, although directly attributable to the connection, may not result in additional connection assets. • Modifications to 'in-delivery' NGET schemes, e.g. flood defence schemes. • Commissioning Support, in the form of a Commissioning Engineer and Senior Authorised Person. • NGET Technical Assurance, in the form of a Transmission Engineer (Primary and/or Secondary, as required).	Tenderer would pay for these costs. This cost is stated in the "Indicative Cost Estimate for works section" where applicable to a substation, and the "One-Off Works Cost" section of the Connection Feasibility Report.
Other costs	This can include but not limited to the following costs: connection application fee, consenting, permits, build, land and access rights. This	Tenderer would pay for these costs. These costs are not included in the Connection Feasibility

	includes cable access routes, if there is NGET non-operational land. Consideration for ongoing charges: such as TNUoS and BSUoS.	Report as they are classified as 'User Connection Assets'.

How did NGESO choose which sites to reserve/study?

Prior to publishing the pre-tender consultation, NGESO requested NGET to complete a high-level analysis to confirm which substations within each region of need would be feasible for a connection. The result of this analysis is detailed below. This was the information the was used to identify the substations where bays would be reserved.

Note: the information provided below was correct at the time it was shared to NGESO in September 2021. This information may change as the connected background changes.

Region: North East

Substation	Bay Availability	Non-Operational Land Availability	Notes
Hawthorn Pit 400kV	Red	Amber	• Current 400kV compound is a solo interbus transformer - no common busbar to connect to within existing 400kV compound. • Strategic wider works triggering new 400kV substation which will use vacant non-ops land • Potential connection point for a few of offshore windfarm projects - application has clock started. • There are physical constraints around the new GIS substation being built for the first Eastern Link
Norton 400kV	Red	Red	• No spare bays available
Lackenby 400kV	Red	Green	• No space at Lackenby (400&275) to extend the substation. • Land adjacent also constrained. • Spare bay being constructed at Lackenby for another customer connection.
Hawthorn Pit 275kV	Amber	Amber	• AIS 4-switch mesh arranged as Double Bus Bar • Possible one bay extension - will require extension of substation compound and fence into non-ops land to the West. • No plans to decommission/rationalise 275kV sub with the building of the new 400kV sub.
Norton 275kV	Red	Red	• No spare bays available
Hartmoor 275kV	Green	Green	• AIS 3-switch mesh - possibility to connect into MC1 and MC2; • Will require HV disconnectors to be installed; • User owned cable connection to User's bay located off site.
Saltholme 275kV	Red	Green	• AIS single switch mesh - mesh bay connection possible subject to any additional infra works (i.e. mesh sections)
Hartlepool 275kV	Red	N/A	• Indoor AIS DDB located inside power station land - no spare bays available and no option to extend
Offerton 275kV	Amber	Green	• AIS single switch mesh • No existing spare bays available, space available to connect to existing mesh corners, without extending beyond landownership boundary.

West Boldon 275kV	Red	Green	• AIS 4-switch mesh • No spare bays available - currently the remaining three spare bays in the mesh corners have been offered to another User. • Non-operational land to east of the substation has been reserved for three SGTs associated with this User's connection offer.

Region: South Coast

Substation	Bay Availability	Non-Operational Land Availability	Notes
Sellindge 400kV Compound A	Red	Green	• Compound A - Indoor GIS DBB - no existing spare bays available; no options to extend MBB1/RBB1 (north end of building) or MBB2/RBB2 (south end of building). • Compound B - Indoor GIS DBB - no existing spare bays available; no options to extend MBB3/RBB3 (east end of building) nor MBB4/RBB4 (west end of building). • Note potentially limited headroom until South Coast OHL built in 2029.
Canterbury North AIS 400kV	Amber	Red	• AIS 4-switch mesh - possible 1 bay connection onto MC3, between would require cabling of Cleve Hill feeder cct busbar section. • Possible connection onto MC1 adjacent to SGT 1 would require cabling of Sellindge 2 feeder cct busbar section. • Tertiary connection on SGT2 • Aware of planning constraints
Canterbury 400kV GIS	Green	Red	• Indoor GIS DBB - Busbar being extended for Interconnector bay, assumed to be MBB6/RBB6; ACL Oct 2027. • ACL driven by interconnector- could be done before if required. • Aware of planning constraints
Richborough 400kV	Green	N/A	• Indoor GIS DBB - spare bay capacity within building adjacent to SGT3 bay possibility to extend to west for additional bays. • NOA works: SCD1 - new off shore HVDC link between Sizewell and Richborough (2 bays) - ACL 2029 • Tertiary connection on SGT1 and SGT2; ACL = June 22 & Oct 22 • Potential for additional bay after taking into account the new bays required for the NOA works • No non-operational land at Richborough.
Dungeness 400kV	Red	N/A	• 400kV is an indoor AIS sub, no generation headroom, no spare bays. • 275kV substation is located in Nuclear security zone but no spare bays or space to extend the substation.

Ninfield 400kV	Red	Green	• Consider that there is no/limited capacity in this area until South Coast Line is complete. • AIS wrap around DBB; • No spare bays and no options to extend the bars due to site being constrained by MSC2 compound and Stat Comp 6 compound to the South West; and DRC5 compound to the North-East
Little Horsted 400kV*	Red	N/A	• Little Horsted is a single switch mesh site to feed the new GSP for a DNO, it is not built yet. • Current assumption is stage one will be completed for 2024/25. • The timescale for phase 2 is not confirmed • The location of the site is not suitable for any further beyond the future capacity plans, as the land boundary is extremely constrained physically or by neighbouring landowners.

Region: South Wales

Substation	Bay Availability	Non-Operational Land Availability	Notes
Upper Boat 275kV MC2/3	Green	Green	• AIS - two independent single switch mesh arrangements. • Spare bay available on MC2 and MC3 respectively • Flood defence scheme at site.
Rhigos 400KV	Amber	Amber	• AIS DBB - no spare bays currently exist. • Signed connection triggering busbar extension to West for one Generation User bay - FSA = May 2022; ACL = Sept 2023. Offer currently made to generation user; • Proposed connection GIS extension of busbar to the East for 2 User bay connections - FSA = April 2023; ACL - Oct 2028
Upper Boat 275kV MC1/4	Green	Green	• AIS - two independent single switch mesh arrangements. • No spare bays on MC1 and MC4 - signed demand connection took spare bays locations - ACL Oct 2022. But these bays could be extended • 1 spare bay available on MC2 and MC3 respectively • Flood defence scheme at site.
Cilfynydd 400kV	Amber	Green	• AIS DBB - no existing spare bays available but options available on extending busbars. • Offer current made to windfarm generator to extend MBB2/RBB2 and substation by one bay to facilitate the connection - FSA = Oct 2024; ACL = Jun 2025.

Swansea North 400kV	Red	Amber	• AIS Single switch mesh: Due to the enabling works triggered at Swansea North as part of the connection of an OFWF connection at Pembroke, when Pembroke 3 is transferred to the GIS, the mesh will be removed - ACL Oct 2027 • Indoor GIS DBB: No spare bays currently exist. Signed generator connection has triggered the extension of MBB3/RBB3 and GIS hall for one User's bay - FSA = May 2022; ACL = Sept 2023. • Enabling works for OFWF at PEMB - total of 4 OHL bays in GIS triggered - FSA = Jan 2025; ACL = Oct 2027: - turn in remaining two circuits from Pembroke into 400kV GIS, creating Pembroke-Swansea North 1-4 - 2 new OHL feeder bays triggered.
Aberthaw 275kV M/R	Green	N/A	• Indoor AIS substation located in power station land. • One populated 'spare bay' on MBB4. 3 ex generator bays are in the process of being disconnected but are yet to be fully decommissioned. • Onshore generation offer in process; possibly 'spare bay' on MBB4 is being used for this offer.
Pembroke 400kV	Red	N/A	• AIS indoor DBB - External west side of the substation is reserved for MBB2 extension (in GIS) for four bays for existing applications • Possibility to extend externally on East to provide 2-3 bays but requires extensive works to build extension through building walls. • Need to confirm if any site issues would prevent extension to East.
Rassau 400kV	Amber	Green	• Indoor GIS - configured as DBB but operated as a single switch mesh; potential for major works to develop physical assets required to operate as DBB - requires System Design Studies to confirm enduring configuration. • Possibly space within switch hall for 2-4 additional bays; need to confirm there is no NOA driven works or future expansion planned for the substation.
Pyle 275kV	Red	N/A	• AR - AIS 2-switch mesh. No spare bays and no space to extend for a spare bay

Region: South West

Substation	Bay Availability	Non-Operational Land Availability	Notes
Exeter Main 400kV	Red	Red	• AIS DBB - No options to extend MBB2/RBB2; constrained by SVCs. • Extension of MBB1/RBB1 possible; • Bars currently being extend for two Interconnector User bays - ACL April 2025. • Note will need to be studied due to potential system constraints.
Abham 400kV	Amber	Green	• AIS - no DBB or mesh in existence; an SGT circuit "teed" onto the Exeter-Langage 1 & 2 circuits each respectively. • Major works for the creation of 'single switch mesh' required to allow connection on HV side of either SGT feed; • Some space available to allow this reconfiguration of the HV connection.
Langage 400kV	Green	N/A	• GIS DBB Indoor sub located in power station land. • Space of one circuit bay at either end of busbar, within GIS building. • No non-operational land at Langage
Landulph 400kV	Green	Red	• Previous DBB arrangement reduced to single busbar and separate single-switch mesh arrangement. • No spare options on single-switch mesh. • Possible spare bay connection on Busbar 3, adjacent to Langage 2 cct, however concern on proximity and enduring maintenance access to OHL cct and 13kV RSVC compound.
Axminster 400kV	Amber	Green	• AIS single switch mesh. • Two spare bay options (opposite SGT bays) available that does not compromise ability to convert to full mesh.
Taunton 400kV	Green	Red	• AIS - two independent single busbar arrangements. • Spare bay available (ex SGT1) on MBB1 - HV disc in place; is assigned as future MSC bay - need to query if this will ever be required. • Possible spare bays (1-2) available on MBB2; removal of overhead bridge in place; disconnectors will need to be installed. • Possible interactions with Hinkley.

Region: East of England

Substation	Bay Availability	Non-Operational Land Availability	Notes
Bicker Fen 400kV	Red	Red	• No spare bays available. • Various customer connections at this site. • NGET not confident any non-operational land is available to extend the substation further.
Bramford 400kV	Red	Red	• Rebuild of AIS mesh substation to new GIS substation - still in process of transferring circuits. • Interactions with new generation connection and NOA schemes. Bramford is significantly space constrained.
Burwell Main 400kV	Red	Amber	• Substation being converted from mesh to double bus bar as a result of new generation connection and DNO additional SGT. • Not possible to extend further due to oversailing of overhead lines and lack of non-operational land.
Yaxley 400kV	Amber	N/A	• Build is expected to be delivered for 2024. • Potential to provide an additional bay on the substation • Limited footprint available to accommodate extension due to DCO constraints. • Tender for delivery is out now for contract award. • Potential issues with obtaining cable access rights across third-party owned land. • NGET lease the substation area. No non-operational land owned by NGET.
Kings Lynn 400kV	Amber	N/A	• New GIS substation estimated to be built by Oct 2024 for Kings Lynn B power station. • Outages are shared with another project in 2024 and a delay to either project will impact the other. • GIS hall has one future bay capacity though there is concern that the size of the non-SF6 GIS switchgear solution may be such that the future bay is lost. • The overall GIS hall is constrained by its location within the Power Station owned land. The substation site is being consented by another customer as part of their overall consenting for the Power Station so any increase in size of the GIS hall will impact on their approved consenting strategy/conditions.
Leiston 400kV	Red	Red	• This is an Interconnector owned site. NGET own only 132kV. • Only a SGT compound exists with no options to create a common HV busbar.
Necton 400kV	Amber	N/A	• No existing spare bays in AIS double busbar substation. • Substation extension driven by another customer for November 2025, subject to confirmation in April 2022 • Possible spare bay as a result of OHL transposition on west side extension but could

			only be offered in 2026 on the basis that the existing connection goes ahead. • Highly contested DCO associated with all works above, which is yet to be approved. No non-operational land at Necton.
Norwich Main 400kV	Red	Amber	• Hornsea P3 OFTO claiming last existing spare bay; - ACL Oct 2025. • Busbar extension for OFTO bay ACL June 2025. • Hornsea P3 currently have 2, making indications for a further two bays, potentially connect to East. • NOA: AENC - Two new OHL lines in-between BRFO-NORW; two OHL Bays on west side - ACL Nov 2030. • Large number of offshore applications and NOA schemes, may be no capacity available.
Sizewell 400kV	Red	N/A	• Indoor GIS substation located within PowerStation land - no NGET owned spare bays in current GIS sub; EDF own all spare bays. • New 26-bay GIS DBB to replace existing 16-bay GIS sub and connect 6 bays for new Sizewell C PowerStation - FSA: 01/04/2024 - ACL 31/10/2027 • NOA works: SCD1 - new offshore HVDC link between Sizewell and Richborough - ACL = 2029
Spading North 400kV	Red	N/A	• AIS DDB - no existing spare bays and no options for busbar expansion due to site being surround by PowerStation land and physical constraints of road and river.
Sutton Bridge 400kV	Red	N/A	• Single main busbar and all circuits owned by Power Station.
Walpole 400kV	Amber	Amber	• Potential opportunity for a bay next to SGT5 but significant complexity to populate bay. • No room to extend substation

The substations put forward for the high-level RAG analysis were identified based on their effectiveness at meeting the Stability Phase 3 requirements within each region of need.

The final list of substations where bays have been reserved is based on the cumulative information from the above high-level RAG analysis and the results of the Connection Feasibility Report, which has the most up-to-date land information for the reserved bays.

2. Purpose of this document

This information is the same as what was published on 10th September 2021. Section 1 contains the updates following the pre-tender consultation.

This document outlines the connections approach that will be followed for the NOA Pathfinder Stability Phase 3 (Stability Phase 3) tender and the reasons for adopting this approach.

This document will:

- Review the lessons learned from connection approaches adopted for other Pathfinders
- Explain the approach that will be followed for Stability Phase 3
- Explain why this approach has been selected
- Provide details on the connection approach and what tender participants can expect

Please note that the connections approach outlined in this document is **only** being used to facilitate the Stability Phase 3 tender at this stage.

National Grid Electricity System Operator (NGESO) has collaborated with the relevant TO, and held discussions with OFGEM, to enable this process for Stability Phase 3.

At this point in time NGESO is considering whether this approach could become an enduring solution and what amendments would be required, if any, to existing industry codes. The learnings from Stability Phase 3 and prior Pathfinders will feed into this review. **NGESO invite market participants to provide their feedback on this connection approach through the 'Technical and Connection Consultation Form', or alternatively by email to** box.ESO.StabilityP3@nationalgrideso.com

3. Lessons learnt from previous Pathfinders

This information is the same as what was published on 10th September 2021. Section 1 contains the updates following the pre-tender consultation.

To date NGESO has observed that Pathfinder requirements can be met by solutions that are either:

- Already connected to the network, and can offer additional capability, or,
- New solutions which are yet to be connected to the network.

The time and cost to connect these solution types to the network is a critical factor for the delivery of Pathfinders and creates an interaction between the connection process and the Pathfinder tenders.

Recognising the importance of this interaction and its complexities, previous Pathfinders have typically stated that having a connection offer is not a requirement of the tender process. Instead, a Connection Review has been completed in collaboration with the TOs and/or DNOs to get a view of the connection costs and delivery timescales. The Connection Review acted as a form of proxy for the standard connection process. Typically, the connection application would then be made by the successful bidder(s) upon completion of the tender.

NGESO has received feedback on the experiences with the connection approach on prior Pathfinders from both market participants and network owners. NGESO has reflected on this feedback and has identified some of the following lessons:

- The Connection Review can quickly become outdated due to the time between the Connection Review and the winning bidder(s) submitting connection applications
- Despite connections not being a requirement, some market participants elected to apply for connections
  - This increased the complexity of the TO and NGESO Connection Team assessments and workload
  - This created an artificial TEC (Transmission Entry Capacity) queue at sites of interest to Pathfinders, impacting the interactivity and cost of connections for customer connections that are both involved and not involved in Pathfinders
- The previous approach led to an influx of Connection Reviews/ connection applications to TOs and was one of the factors that led to delays in Pathfinder timetables
  - These delays impacted business planning of market participants
- The multi-stage tender process to support the Connection Reviews was not as time efficient as possible
- Information about TO-owned non-operational land was released to market later in the tender process

NGESO has reflected on the lessons and has used it to identify a new connection approach for Stability Phase 3.

4. What is the new connections approach and why was it selected?

This information is the same as what was published on 10th September 2021. Section 1 contains the updates following the pre-tender consultation.

For the purpose of the Stability Phase 3 tender, a number of connection points (bays) on the network have been pre-emptively reserved for the successful Stability Phase 3 tender participant(s).

This avoids the want/need for individual participants to submit their own connection application/modifications until the outcome of the tender is known. In reviewing this approach compared to the lessons learnt detailed in the previous section, the following benefits have been identified.

Benefits of the new approach

- Minimises barriers to entry for tender participants that a) are not already connected, or b) have not already submitted a connection application.
  - This provides for all participants to have access to network connections without the need to submit and pay for connection applications prior to certainty of success on the Pathfinder tender, making the tender process more equitable.
  - This also results in a more economic and efficient Pathfinder procurement process by avoiding the creation of an artificial TEC queue.
- Provides the market with information about feasibility of connections earlier in the tender process by publishing a Connection Feasibility Report before technical and commercial submissions are due. This enables a more efficient use of bidder time and resources, and more accurate tender submissions.
- Reduces the risk for bidders and NGESO associated with waiting until contract award of the Pathfinder to secure connections. This better enables the network stability requirement to be met on time.
- Improves connection queue and interactivity issues for market participants looking to connect to the network who are not involved in the Pathfinder process, by avoiding the creation of an artificial TEC queue at sites of interest to Pathfinders
- Reduces TO and ESO Connection Team workload and dependency on TO reviews in the tender process, making the tender process more efficient for tender participants, the TO and the ESO.

While this new connection approach brings the above benefits within the tender, it could have an impact on new connection customers external to Pathfinders.

Holding back connection points will mean Pathfinder solutions are considered as part of the contracted background for any subsequent connection offer. This impacts any subsequent offers for connection customers external to the Pathfinder.

NGESO recognise the impact of this approach, but on balance believe that this new approach is an appropriate step to support the decarbonisation of the electricity network, considering the benefits of this approach for Pathfinder participants and non-Pathfinder participants.

5. Details of the Stability Phase 3 Connection Approach

This information is the same as what was published on 10th September 2021. Section 1 contains the updates following the pre-tender consultation.

For the purpose of Stability Phase 3 Pathfinder, the Transmission Owner (TO) will conduct feasibility studies and produce a Connection Feasibility Report (henceforth referred to as 'the Report'). The Report will be produced for the reserved connection points at substations that have been identified based on a balance of the following criteria:

1. Technical effectiveness at meeting the Stability Phase 3 requirements within the specific area of need
2. Substation site has a more credible connection opportunity than other sites within the specific area of need, given the current connection background. This will be further refined through system studies and collaboration between NGESO and the relevant TO before release of the Report.

The Report will be published to Stability Phase 3 tender participants during the tender, well-prior to the tender submission deadline. The Report will provide an indicative view of the connection date, transmission infrastructure costs and site details associated with connecting to the electricity network at the connection points that have been reserved. Tenderers should note that this information will be based on desktop assessments and that the TO will not conduct any site-based investigations to inform the Report.

Tender participants should use the Report to inform tender submissions. The Report will also be used by NGESO in the tender assessment. Detailed information about the Stability Phase 3 assessment criteria and methodology will be published with the Invitation to Tender later this year.

The bays already reserved by the NGESO and being studied by the TO are listed below in Table 1.

Please note that as the detailed TO feasibility studies are yet to take place Table 1 is subject to change prior to the publication of the Report, i.e., the number of substations could be expanded, or some of the substations listed below may not be included in the final Report, should they not be feasible as a result of the TO feasibility studies. Furthermore, the MVA/ MW/ MVAr assumptions are also subject to change. NGESO assume no liability for any future change to this table.

*Table 1**

Now out of date. Section 1 contains the updates following the pre-tender consultation.					
Site	Region	No. of connection points secured	Assumed SCL (MVA) Category**	Assumed MW	Assumed MVAr
Hartmoor 275kV	North East	2	Small-Med	± 100 per bay	± 100 per bay
Offerton 275kV	North East	1	Small-Med		
Walpole 400kV	East England	1	Extra Large		
Yaxley 400kV* **	East England	1-2	Med-Large		
Necton 400kV** **	East England	1	Med-Large		
Canterbury 400kV	South Coast	2	Large		
Richborough 400kV*** **	South Coast	1-2	Large		
Langage 400kV	South West	2	Small		
Landulph 400kV	South West	1	Small		
Cilfynydd 400kV	South Wales	1	Medium		
Upper Boat 275kV	South Wales	2	Medium		
Rassau 400kV	South Wales	1	Medium		

Please note Table 1 is subject to change and the final list of substations where connection points are reserved, and associated assumptions, will be contained in the Report that will be published during the tender.* ***The final list of sites where bays have been reserved will be confirmed in the Report.*

*** ~~Small = in the region of 500MVA, Medium = in the region of 1200MVA, Large = in the region of 2000MVA, Extra Large = region of 3000MVA. The assumed solution size will depend on the final number of connection points reserved following TO feasibility studies. This will be confirmed at the time of launching the tender.~~*
Please refer to Section 1

****NGESO understands that Yaxley is a new build substation where there is potential for new bays. The detailed studies conducted by the TO will explore the feasibility of this. The Report that will be published with the invitation to tender will confirm this.*

*****Please note that this connection point available at Necton is contingent on a generation connection proceeding.*

******There may be potential for 2 bays at Richborough. This is contingent on another connection proceeding. The detailed studies conducted by the TO will confirm the feasibility of this reservation and this will be confirmed to participants with the full tender.*

NGESO are aware that the bays listed overlap with regions where there are currently MW constraints. Market participants should be aware that this may impact the cost and time for delivery in those areas where participants wish to have MW capability.

For each substation included within the Report, a connection point has been reserved in anticipation of the connection(s) of the successful tender solution(s). These connection points will be treated as unavailable and therefore in the contracted background for any subsequent connection application, until the successful tender participants make their connection application.

What does this mean for tender participants who wish to participate in Stability Phase 3?

This means that where tender participants plan to connect their solutions to the network using one of the substations in the Report, having a connection agreement in place **is not a pre-requisite for participating in the tender.**

Following contract award, successful tender participants that plan to connect their solution(s) to the network through one of the reserved connection points in the Report will be asked to apply for their connection using the formal connection process. Assuming there are no issues with the bidder's application (e.g. see the final question of this section), they will receive a connection offer based on the connection point that has been reserved by NGESO.

Please note that tender participants will be asked to identify which of the connection points would be utilised for the solution in their tender submission.

Can tender participants submit proposals for more than one of the substations where a connection point as been held?

Yes, tender participants will have the opportunity to provide proposals for multiple connection points reserved across each of the regions of need.

Similar to the NOA Pathfinder Voltage Pennine tender, Stability Phase 3 will cap the number of solutions that tender participants can submit. This cap may be by region of need, in accordance with how many connection points have been secured. Details of this cap will be confirmed with the tender information.

Where one substation has two connection points (bays) reserved, NGESO are also exploring whether proposals can be bundled where one solution proposal is a two-bay solution. Details of this will be confirmed with the tender information later this year.

What if a tender participant wishes to connect at a substation not reserved within the Report?

Should tender participants wish to connect within a SCL location of need but at a substation that is not reserved in the Report, and therefore does not have a secured connection point, these tender participants will be required to go through the standard connection process to receive a connection offer for that substation.

Such applications will follow the normal process such that system studies and assessments of the application will consider what is in the contracted background and earlier offers made, including what has already been held back for the Stability Phase 3 tender.

Should tender participants choose to connect their solution in this way, proof of a connection offer will be required as part of the tender submission. Please note that any tender participants who wish to take this approach do so at their own risk and cost. Neither NGESO nor any company within the National Grid Group will be liable for any result of doing so.

What if a tender participant wishes to seek their own connection at a substation that is included in the Report?

If a tender participant wishes to submit a connection application at a site where a connection point has been reserved, but not use the specific bay that has been reserved at that substation, that connection application should follow the normal process. The system studies and assessments of the connection application will consider what is in the contracted background and previous offers made, including what has already been held back for Stability Phase 3.

This means that if a tender participant applies for a connection, their application will be treated as being behind what has already been held for the successful Stability Phase 3 tender participants.

Should tender participants choose to connect their solution in this way, proof of a connection offer will be required as part of the tender submission. Please note that any tender participants who wish to take this approach do so at their own risk and cost. Neither NGESO nor any company within the National Grid Group will be liable for any result of doing so.

What if a tender participant is already connected to one of the sites reserved in the Report?

~~In the event a tender participant is already connected (or will be connected) at one of the sites listed in the Report but requires an update to their connection, the reserved position in the queue could be allocated if the tender participant is successful.~~

~~Therefore, a modification application would be required, and this can be submitted post-contract award. The modification process would be based on the held connection point.~~

~~NOTE: Existing connections will also need to satisfy the additionality criteria to meet the requirements for this tender.~~

Please refer to Section 1 as there has been an update to this position.

What if a tender participant is already connected, but at a site not listed in the Report?

If a tender participant is already connected at a site within a SCL location of need, but not at a site reserved in the Report, this participant would be required to go through the modification application process for any updates to their connection.

Proof of a modification application offer will be required as part of the tender submission criteria, should tender participants need to update their existing connection. This is because a queue position is not secured for these sites.

NOTE: Existing connections will also need to satisfy the additionality criteria to meet the requirements for this tender.

What if a tender participant wants to connect or is already connected at a site outside of the SCL location of need?

NGESO is not accepting any submissions for the Stability Phase 3 tender that would connect at sites outside of the SCL locations of need.

What does this mean for connection customers who are not interested in Stability Phase 3 but wish to connect at a site where ESO have a position held for Pathfinders?

Such customer connections will follow the normal connection process where system studies of the applications will consider what is in the contracted background; this will include the positions that have been held for Stability Phase 3. The impact will be that these connections offers might see an increase in cost and/ or a longer connection date if that customer chooses to connect in the same area as one of the sites considered in this Pathfinder.

NGESO recommend that these customers engage with NGESO and NGET connections teams for a pre-application call to understand the feasible connection options available.

Is there a risk that the positions have been held and then might not be used by Stability Phase 3 solutions?

NGESO have identified the number of connection points to reserve by considering the SCL and inertia requirement and the average solution size from previous Pathfinders to calculate the likely portfolio of solutions that will meet the Stability Phase 3 requirement in each location of need. However, this is only a forecast and will only be verified as result of the tender process.

NGESO have not reserved more (or less) connection points than the NGESO feel is needed to fulfil the Stability Phase 3 requirement.

There is a potential that not all the connection points held for Stability Phase 3 are required for the number of solutions that are successful at the end of the Stability Phase 3 tender. For example, this could occur where multiple already-connected solutions are successful (having met the additionality criteria).

If this is the case, the connection points reserved but not used will be released and where possible any offers made based on this being in the background will be reviewed in accordance with the normal connection process.

Is there a risk that the ESO reserved connection points cannot facilitate the size of the successful solutions?

~~If following the tender assessment NGESO require more capacity at a site than originally assumed to facilitate the successful solution(s), NGESO reserve the right to work with the successful solution(s) at said connection point to increase the capacity of the solution to cover any gaps exposed during the tender assessment.~~ Please see the relevant update within Section 1.

What if a successful tendered solution and its connection application is fundamentally different to what has been reserved?

~~The assumptions that will be considered and associated with the TO feasibility studies and reservation of each connection point are detailed in Table 1 above. These assumptions will be confirmed at the launch of the tender.~~

~~Should a solution exceed or be fundamentally different to these assumptions, tender participants should anticipate variations to the indicated costs and connection timescales included in the Report. For example, if a solution is submitted as 1000MVA for a connection point where 500MVA has been assumed, this could trigger additional works within the connection, impacting the indicative cost and connection timescale in the Report.~~

~~Please note that if a tender participant initiates a substantial increase in the size of their solution post-tender award, any increase in the cost of connection resulting from such change would be borne by the tender participant i.e. the tendered price for the service will not be adjusted. Furthermore, tender participants will also need to ensure that the service start date, stated as part of the tender return, is not impacted by the increase in size.~~
Please see the relevant update within Section 1

6. Details of the Connection Feasibility Report

This information is the same as what was published on 10th September 2021. Section 1 contains the updates following the pre-tender consultation.

The next section describes what is expected to be included within the Connection Feasibility Report (the Report) that will be produced by the TO.

The Report is expected to include:

- The final list of substations where connection points are being held
- Identification of available bays at these substations
- What, if any, substation TO reinforcement works are required to extend the substation
    - These works will be categorised into infrastructure assets only and the standard CUSC ownership boundaries will apply. User assets will be the responsibility of the tender participants.
    - A single line diagram will be provided to identify the infrastructure assets, and user assets.
- Available Fault Level headroom, MW and MVAr headroom at the time the Report is issued
- Identification of any available TO non-operational land including substation layout diagrams to demonstrate where this land is located and access information to the land
    - Please note that NGESO has not and will not be reserving any land for tender participants
    - Please also note that NGESO is attempting to organise site walks for bidders at the substations with reserved connection points
- High-level assessment of lead time and earliest in-service delivery date (EISD) for the TO works or reinforcements. This will be indicative.
- Estimation of infrastructure costs involved in connecting a solution to the network for each site within the Report. This will be indicative and may not consider site-specific risks at this stage.
- More complex studies assessing the impact on system stability, power quality, sub-synchronous interaction, protection, etc. **will not** form part of the scope of the connections review process.

7. Additional Notes

This information is the same as what was published on 10th September 2021. Section 1 contains the updates following the pre-tender consultation.

- The list of substations, connection points and assumptions identified in Table 1 is subject to change during the duration of the study work prior to the publication of the Report.
- Tender participants are to recognise that any indicative costs and indicative dates provided in the Report are subject to variation in the connection process, should tender participants be successful in Stability Phase 3 and required to go through the connection process.
- The TO will assume that all connections will be SQSS (Security and Quality of Supply Standard) compliant.
- The studies will be based on assumptions agreed between NGESO and the TO. These assumptions will be stated in the Report that will be issued to tender participants.
- Categorisation of infrastructure and connection assets (if applicable) will follow the principles laid out in the CUSC (Connection and Use of System Code), Section 14 - Charging Methodologies.
- Infrastructure costs are not directly borne by the tender participant but will need to be secured for by the tender participant in the formal connections process. The infrastructure costs will be accounted for in the assessment stage by NGESO and do not need to be included in the commercial bid of the tender participant. The tender participant will need to account for any costs for the provision of security in their commercial submission.
- Connection charges (where applicable) and costs of user assets will need to be accounted for by the tender participant in their commercial submission.
- While the Report will provide information on whether there is any available TO non-operational land near substations, tender participants are responsible for gathering and using information about land availability, planning permission or similar rights within any tender submissions or project planning. NGESO, or any other company within the National Grid plc group, shall not be held liable for this information and how it is used within tender submissions or project planning.
    - https://www.nationalgrid.com/uk/electricity-transmission/network-and-infrastructure/working-near-our-assets
    - https://nationalgridlive.e-permits.co.uk/banners/nationalgrid/banner1.htm
- The outcome of the connections approach is not binding and is the best indicative view that can be provided at the point of issue. Any successful tender participant that does not already have a connection agreement will still require a formal connection offer following the announcement of the tender results.
- Successful tender participants who are required to go through the connection process post-contract award should plan to submit a connection application no later than 1 week after the announcement of the tender results and application clock started no later than 1 week after submission of the application, thereby allowing 2 weeks between tender results and connection clock-start. This timing requirement will be confirmed within the Invitation to Tender.

- The duration of the formal connection application process should be assumed by tender participants when developing programmes. For more information on this process please visit:
    - https://www.nationalgrideso.com/industry-information/connections
    - https://www.nationalgrid.com/uk/electricity-transmission/connections

- All requirements and obligations from Grid Code, CUSC, NETS SQSS will apply. Any specific requirements will be reflected in the Bilateral Connection Agreement (BCA) when a connection offer is issued.
- All user assets and works will be delivered by the tender participant who will seek and ensure that they have all necessary consenting rights, permits, land rights and access.
- The tender participant needs to ensure that they have the appropriate licenses to deliver the service.
- If tender participants choose to commence any commercial planning or make any commercial decisions prior to the publication of the Report, **NGESO, or any other company within the National Grid plc group, shall not be held liable for these plans or decisions, and does not accept any responsibility for plans or decisions made.**