

Re-opener Report

MSIP – ESO Driven Works

**Project: Lister Drive Customer
Connection**

January 2022

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1. Executive summary

1. This submission requests additional funding to provide a connection for assets that are to be owned, constructed, and operated by Statkraft UK connecting to NGET's Lister Drive 275kV substation.
2. Statkraft have submitted a connection application which is an output from NGENSO's Stability Pathfinder – Phase 1. The customer asset being connected will be providing ancillary services only and hence do not align with typical demand or generation connections. As such the established uncertainty mechanisms for these investment categories do not apply. Funding is therefore requested under the ESO Driven Requirements category of the MSIP reopener.
3. An unconventional connection solution to provide a tee connection to an existing circuit using a Disconnecting Circuit Breaker has been identified and selected as the preferred option.
4. Other options such as do nothing, market, and whole system solutions did not satisfy the need. Options to provide the customer a connection via construction of a new bay at Lister Drive 275kV or through connection to the tertiary windings of existing SGTs were considered and it was concluded these options would increase costs and result in a later connection date.
5. The option to provide a tee connection to the Lister Drive – Birkenhead circuit was identified as offering the lowest cost and earliest connection date. The chosen connection option satisfies the technical requirements of the customer.
6. NGET are therefore seeking funding for these works via the Medium Sized Investment Project (MSIP) reopener mechanism under the 'ESO Driven Requirements' category.
7. The proposed completion date for the works is 28/06/2022 and all spend will be within the RIIO-T2 period. The funding requested is ██████ in 18/19 price base and 80% of the total costs are either incurred or have been contracted, giving high confidence in our cost submission.

2. Introduction

8. This document is the formal MSIP submission to Ofgem by NGET for the Lister Drive Customer Connection during RIIO T2. This is submitted under the MSIP re-opener provided for in Special Condition 3.14 of the NGET Transmission Licence.
9. The MSIP re-opener was introduced by Ofgem to allow Transmission Owners (TO) to apply for funding for investments under £100m in the network not included in baseline funding. TOs MSIP submissions allow for Ofgem to carry out an assessment of the need and cost of the proposed investment.
10. This submission is made in accordance with the 'RIIO-2 Re-opener Guidance and Applications Requirements' published by Ofgem in February 2021. The contents of the submission have also been informed by engagement between NGET and Ofgem with the aim of ensuring that this submission enables the Authority to make a positive timely decision on funding.
11. NGET has demonstrated that the proposed investment represents that lowest cost option for consumers and is the only feasible connection option that can facilitate the customer's desired connection date. The submission provides a comparison of capital costs of options but does not include a detailed cost benefit analysis (CBA). It is our view that a CBA is not required to make an informed investment decision and as such one has not been provided.
12. The works described in this submission are required to provide a connection for a customer (Statkraft) who is seeking to connect two 65MVA synchronous compensators (synch comps) at the existing 275kV Lister Drive substation. The synch comps will be banked and hence only a single connection to the transmission system is required.

13.



14. This customer's connection is effectively an output of the National Grid Electricity System Operator (NGESO) Stability Pathfinder Phase 1 process. The stability pathfinder sought to find the most cost-effective way to address stability issues in the electricity system created by the decline in transmission connected synchronous generation. The stability solution tendered by this customer was selected as being beneficial for consumers and hence the customer subsequently submitted a formal application to connect.
15. This connection was not included in NGET's RIIO-T2 baseline plan because the initial approach from the customer did not take place until December 2019 and hence there was insufficient certainty around the investment requirements to allow the project to be included in the baseline RIIO-T2 investment plan.
16. Connections of this type do not provide output against the typical metrics of Mega Watts (MW) or Megavolt Amperes (MVA). They will not export power in the form of MW as a generator would or import power which is measured in MVA via a super grid transformer (SGT) like a typical demand customer. In this connection, the customer will be owning and installing their own transformer. Hence, neither the demand nor generation uncertainty mechanism can be applied as there is no output upon which to calculate the allowance. The primary function of this customer connection is to support system stability through providing reactive power (Megavolt amperes of reactive power, MVA_r) as required by NGESO.
17. NGET are therefore seeking funding for this connection via the Medium Sized Investment Project (MSIP) reopener mechanism under the 'ESO Driven Requirements' category.

3. Structure of the reopener submission

18. This submission clearly evidences that the proposed investment represents that lowest cost option for consumers and is the only feasible connection option that can facilitate the customer’s desired connection date. As such, the submission does not include a detailed cost benefit analysis as there are no alternative options that would offer benefits in either cost or connection date.

19. The table below signposts the structure of the document and sets out the purposes of each of the sections. This also lists the appendices. -

Chapter	Description
1. Executive Summary	A high-level summary of the submission
2. Introduction	High level overview of the project
3. Document structure	Navigation tool
4. Alignment with overall business strategy and commitments	The strategic context and overview
5. Demonstration of the needs case	Sets out the drivers for the project
6. Options analysis	Describes the range of options considered and shortlisted options
7. Preferred option and detailed costs	Summarises the scope of works and benefits the efficient costs of the project, setting out the assumptions and methodology used and the evidence to support cost confidence including risks and contingency
8. Project delivery	Details the proposed pathway to completion
9. Stakeholder engagement	Details the engagements with stakeholders
10. Price control deliverable	Obligation to deliver the works detailed
11. Overview of assurance and point of contact.	Assurance statement

Appendices	
Ref.	Title
Appendix A	Assurance statement letter
Appendix B	Ofgem ET UM submission template
Appendix C	Ofgem document guidance

4. Alignment with overall business strategy and commitments

The strategic context

20. As part of the transition towards a Net Zero network, National Grid Electricity System Operator (NGESO) is seeking to develop new markets to procure the services required to ensure the GB Transmission System can continue to be operated securely and economically. The decline in synchronous generation is leading to a decline in system stability. Stability service providers are therefore vital to meeting future system needs and supporting the transition to a carbon-free network.
21. These new markets are being developed through “pathfinder” projects, run by NGESO, which identify service requirements in specific areas of the network and invite existing and new providers to submit commercial bids to provide these services. NGESO carries out cost benefit analysis and recommends solutions to move forward either via commercial contracts or regulated arrangements.
22. If those commercial solutions are not already connected, or do not already have a connection agreement or offer, then they will be required to apply for a new connection. This leads to a situation where new customers apply for a connection seeking very specific connection dates to comply with the terms of the contract offered by NGESO through the pathfinder process. NGET licence includes obligation to offer terms of connection; and a duty under the Act to facilitate competition in generation and supply. This connection did not have sufficient certainty to be included in the T2 baseline when the price control was agreed.
23. The closure of transmission connected large synchronous power stations, the increase in embedded generation (i.e., connected to distribution networks), the reduction in reactive power demand, and periodic low loading levels on the transmission system can result in system conditions where voltages may exceed the upper limits specified in the National Electricity Transmission System Security and Quality of Supply Standard (NETS SQSS). System voltages must be managed within these limits to avoid safety risks and damage to assets. High system voltages can be managed by increasing the levels of reactive power absorption on the network.
24. In 2019, NGESO undertook a pathfinder tender process for long-term reactive power absorption services (to manage high voltage conditions) in the Mersey region. This pathfinder project was referred to as the NOA High Voltage Pathfinder - Mersey. The pathfinder tender sought to find the most cost-effective way to manage high voltage issues in the electricity system.
25. The relevant TO will then seek to determine an economic and efficient connection option for these customers that balances the desire for connection by a specific date (normally as quickly as possible) with the costs that would be borne by consumers of different connection options.
26. The customer connection described in this submission is an output of NGESO’s Stability Pathfinder - Phase 1¹ process.

Future and forecast data

27. The investment proposed in this submission is driven by a single customer connection. That customer has a contracted connection agreement and was awarded a contract to provide stability services to NGESO as part of the Stability Pathfinder – Phase 1 process.
28. These works are not dependent on any wider scenario forecasts or outcomes. The Stakeholder Engagement section details the status of the customer’s project, evidencing that there is a high degree of certainty that this customer will connect regardless of any other wider system developments.
29. Therefore, this submission does not present any analysis of wider scenario forecasting or outcomes as the contractual position and latest project status are the primary measures of need case certainty for this investment.

¹ [NOA Stability Pathfinder – Phase 1 updates | National Grid ESO](#)
National Grid | January 2022 | Re-opener Report

5. Demonstration of the Needs Case

Needs Case

30. In November 2019 NGENSO invited tenders for the provision of stability services through the Stability Pathfinder Phase 1 project. Participants submitting tenders, who did not already have existing connections or connection agreements, were not required to engage with NGET to define the expected connection timescales and costs ahead of the submitting a tender to the pathfinder process. Instead, NGET worked with NGENSO to provide connection cost and lead-time information ahead of the process for all potential tenderers to utilise.
31. A start date for providing stability services of 01/04/2021 was assumed by NGENSO for all participants.
32. The outcome of the Stability Pathfinder – Phase 1 tender assessment process was published by NGENSO in January 2020². Statkraft were successful in their tender to provide stability services to NGENSO. Table 1 summarises the results spreadsheet³ published by NGENSO showing the outcome for Statkraft’s proposed projects at Lister Drive.

Company Name	Voltage	Connection Point	Rating (MVA)	Start Date	Contract End Date	Accept/Reject	Reason
Statkraft UK Ltd.	275	LISD	65	01/04/2021	31/03/2026	Accept	Beneficial
Statkraft UK Ltd.	275	LISD	65	01/04/2021	31/03/2026	Accept	Beneficial

Table 1 – NGENSO Stability Pathfinder – Phase 1 results for Statkraft solutions at Lister Drive

33. As a result of Statkraft’s success in the pathfinder process they were awarded a contract by NGENSO to provide stability services.
34. NGET is obligated by our licence to provide a connection for this customer. Therefore, the results of the NGENSO Stability Pathfinder - Phase 1 tender assessment, which identified Statkraft’s solution of two 65MVA synchronous compensators at Lister Drive as offering benefit for the consumer, and the subsequent formal application to connect these assets are the basis of the need case for the investment works proposed in this submission.
35. The primary criteria for success in this connection project was to provide the customer the earliest possible connection date to facilitate delivery of the stability services required by NGENSO to ensure secure and economic operation of the transmission system.

Section Summary – Need Case

- The need case is driven by the NGENSO Pathfinder project Stability – Phase 1.
- The customer’s proposed connection was identified as being beneficial for consumers in the pathfinder assessment.
- The customer has a contract in place to deliver stability services to NGENSO.

² [NGESO Stability Pathfinder Phase 1 Results Letter - Jan 2020](#)

³ <https://www.nationalgrideso.com/document/162081/download>

6. Options Analysis

Lister Drive Substation

- 36. Lister Drive substation is in the North West of England close to Liverpool. The 275kV substation forms part of an area of the transmission system known as the Mersey 275kV ring.
- 37. The 275kV substation was constructed in the early 1960s and uses Air Insulated Switchgear (AIS) technology. The substation is indoor, split across two levels with a wrap-around reserve bus bar arrangement. A generic section through the building can be seen in Figure 1 below.

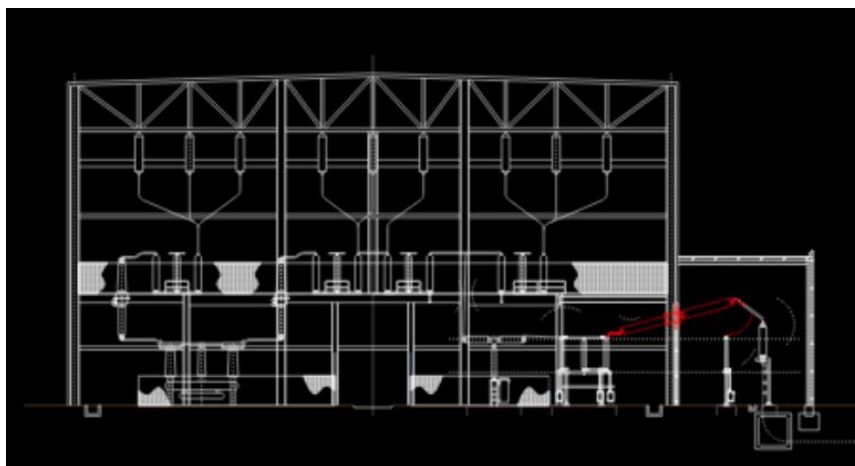


Figure 1 – Section through Lister Drive substation building

- 38. The substation is connected to the nearby substations at Birkenhead and Kirkby via a 275kV single circuit and 275kV double circuit respectively. The connections to both Birkenhead and Kirkby are predominately via 275kV underground cables.
- 39. Figure 2 shows the location of Lister Drive on the transmission system schematic.

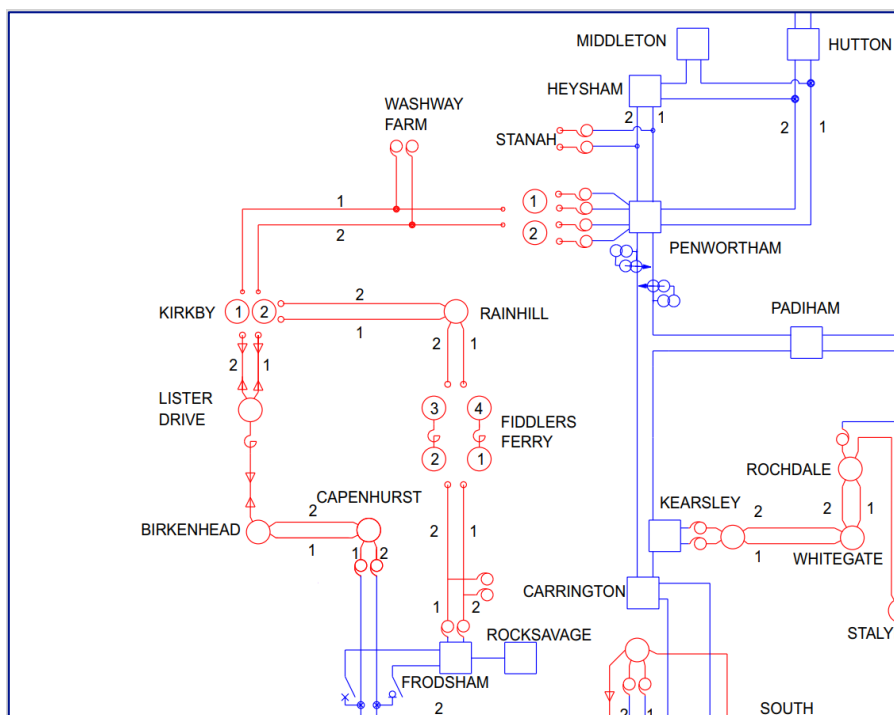


Figure 2 – Location of Lister Drive substation

40. Figure 3 shows an aerial view of the Lister Drive site with the NGET fence boundary marked in blue. The assets located outside of the building are Super Grid Transformers 1,2,3 and 4, a shunt reactor, a series reactor and associated equipment.

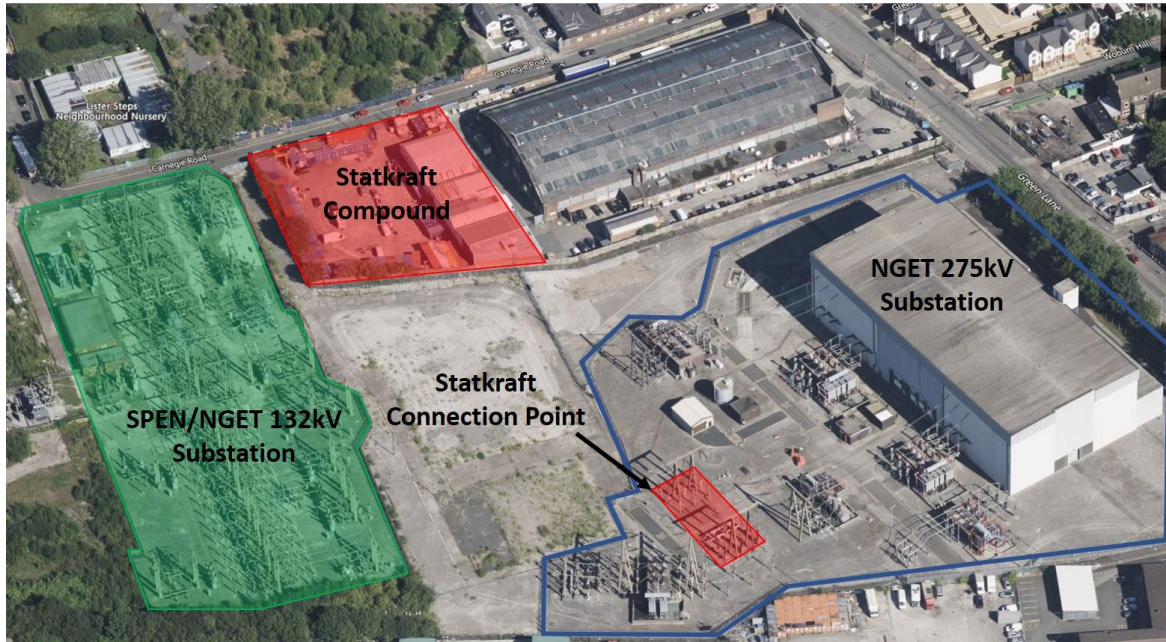


Figure 3 – Aerial view of Lister Drive 275kV site.

41. Figure 4 shows the existing internal equipment overlaid with the substation building. There are currently no spare bays within the substation and no space available to construct additional bays within the footprint of the existing building.



Figure 4 – Indoor plant layout of Lister Drive 275kV site.

Minimum Technical Requirements

42. The level of security to which connections that solely provide stability or voltage services (i.e., without exporting or importing real power (MW's) to/from the transmission system) must be designed to, is not defined in the National Electricity Transmission System Security of Supply Standard (NETS SQSS). Therefore, there is not a definable minimum level of compliant connection that can be prescribed for these customers.
43. As such, NGET has applied the same connection design requirements to these customers as would be applied to a TO owned reactive compensation asset (e.g., an SVC or reactor).
44. In lieu of a defined compliant connection requirement from the SQSS, the following connection options are considered to represent minimum technically sufficient connections for these customers:
- a direct connection to a single bay
 - a connection to the tertiary winding of an existing Super Grid Transformer (SGT)
 - a tee'd connection onto an existing circuit
45. None of these connection options provide N-1 security at the point of connection, a fault on any transmission asset to which the customer is connected i.e., a single bar, transformer, or circuit fault would result in the customer being disconnected. This level of security and the corresponding limitations on availability have been agreed with the customer and the NGENSO within the connection agreement.
46. The specific terms of the contracts for providing network services that NGENSO may award as part of future pathfinder projects could require higher levels of connection design security to be provided.

Long list of options

47. Generally, NGET will assess the following categories of option when assessing how to facilitate connections for new customers.
- Do nothing
 - Whole system / market-based solution
 - Use / enhancement of existing assets
 - Construction of new assets

Do nothing

48. This option is not applicable to this need case as NGET is obligated to provide a connection for this customer. There is no way to facilitate the customers application without providing some form of direct access to the transmission system. This option is referred to as No. 1 in Table 2.

Whole system / market-based solution

49. In this case Statkraft's proposed connection is already a market-based solution to the stability problem identified by NGENSO and the solution was identified as offering benefit for the consumer through a market-based tender exercise run by NGENSO (Stability Pathfinder - Phase 1). Therefore, as a connection to the transmission network must be provided for this customer, in order for them to supply their contracted service to NGENSO, there is no whole system or market-based alternative to providing a physical connection to the transmission network. The connection of the Statkraft synchronous compensators do not trigger any other works in the local transmission network (e.g., there is no requirement to replace circuit breakers due to increased fault levels or to increase circuit ratings to manage higher loadings. Therefore, no whole system or market-based solutions need to be investigated as alternative to any infrastructure works required beyond the customer connection point.
50. There is a SP Manweb 132kV substation located close to the Lister Drive 275kV substation (please see figure 3 above). A connection at this site could be considered as an alternative option. However, a connection at the 132kV site would introduce additional impedance between Statkraft's stability assets and the wider transmission system and would therefore reduce the effectiveness of the service provided. Statkraft's bid into the Stability Pathfinder process was based on a direct connection to the Lister Drive 275kV site and the effectiveness of the solution and value delivered

was assessed on that basis. Therefore, a connection to the 132kV site does not represent an alternative to a connection at Lister Drive 275kV and hence this option was not investigated further.

51. This option is referred to as No. 2 in Table 2.

Use / enhancement of existing assets

52. NGET has investigated options to utilise existing assets at the Lister Drive substation to reduce the cost and timescales for Statkraft's connection. As there are no spare bays available at Lister Drive, the options available were:

- tee'd connection into the Lister Drive – Birkenhead circuit. This option is referred to as No.3 in Table 2.
- connection to tertiary winding of existing SGTs. This option is referred to as No.4 in Table 2.

53. The circuit connecting between Lister Drive and Birkenhead substation consists mainly of underground cable. However, there is a small section where this circuit transitions to overhead line that is located within the Lister Drive substation compound (not within the substation building).

54. A tee'd connection to this circuit would provide the customer the same access to the network, in terms of capacity, as a direct connection to the Lister Drive 275kV busbars but does place the customer at risk of being disconnected for a single fault of the Lister Drive – Birkenhead circuit. The customer was consulted about this connection design and they confirm that this was acceptable and would be compatible with the terms of their contract to provide stability services to NGESO.

55. [REDACTED]

56. [REDACTED]

57.x [REDACTED]

58. As a result of the expected high cost and the complex deliverability challenges that would be faced, it was considered by both the customer and NGET that the tertiary connection option does not offer a credible alternative solution. Hence the tertiary option was discounted, and the tee'd connection option taken forward for further development.

Construction of new assets

59. For completeness, NGET has considered the option of constructing new assets to provide a connection for Statkraft. As described earlier, Lister Drive substation is housed within a building. There is currently no spare bay in this substation and there is insufficient room within the building to allow for an additional bay to be constructed (see Figure 3).

60. Therefore, construction of a new bay would require extension of the building. A high-level assessment was carried out and it is expected that costs for this solution would likely be in the range of [REDACTED] with a delivery timescale of approximately 18 - 24 months. The building and bay extension would be extremely complex however given the substation is a multilevel, wrap around bus bar design. The programme would require extensive proximity outages in order to construct it safely.

61. Due to the extensive scope of works associated with either extending the substation, the high expected cost, and the late connection date that could be achieved, it was concluded that the construction of a new bay was not a credible alternative to the other feasible connection options. The NGET scheme team therefore concluded that this option offered no benefit to either the

customer or the consumer and it was therefore discounted and no further development or assessment of it was carried out.

62. This option is referred to as No. 5 in Table 2.

Selection of the preferred option

63. We initially identified a range of options that could potentially fulfil the needs of Statkraft and provide a connection in the timescales required to facilitate the provision of stability services to NGENSO in a timely manner.

No.	Option	Cost (£m) in 18/19 price base	Timescale	Selected (Y/N)
1	Do Nothing	n/a	n/a	N
2	Whole System / Market-Based	n/a	n/a	N
3	Existing Assets – Tee'd Connection	██████	12-14 months	Y
4	Existing Assets – Tertiary Winding	████	18-24 months	N
5	New Assets – New Bay	██████	18-24 months	N

Table 2 – Option summary

64. Investigation of the long list of options quickly identified that whole system and market-based options were not applicable in this case due to the need for the customer to have direct access to the transmission system in order to provide the contracted stability services. Options to construct a new bay or to provide connections to the tertiary windings of existing transformers were ruled out at an early stage due to the expected costs (based on experience with scheme of similar scope) and the expected delivery timescales of those connections which would not have provided the customer with the earliest possible connection.

65. The option to provide a connection via a tee'd connection to the Lister Drive – Birkenhead circuit was identified as being expected to offer the quickest and lowest cost connection option and hence it was selected as the preferred option and taken forward for further development.

Section Summary – Options and Option Costs

- Do Nothing, Market, and Whole System solutions were considered and ruled out as being inappropriate to satisfy this need case.
- Options to provide the customer a connection via construction of a new bay at Lister Drive 275kV or through connection to the tertiary windings of existing SGTs were considered and it was concluded these options would increase costs and result in a later connection date.
- The option to provide a connection to the Lister Drive – Birkenhead circuit was identified as offering the lowest cost and earliest connection date.
- The chosen connection option satisfies the technical requirements of the customer.

7. Preferred option and detailed costs

Tee'd connection to Lister Drive – Birkenhead circuit

66. The circuit connecting between Lister Drive and Birkenhead substation consists mainly of underground cable. However, there is a small section where this circuit transitions to overhead busbar that is located within the Lister Drive substation compound (not within the substation building). This section of overhead busbar is identified within the green dashed circle in Figure 5 and shown in close up in Figure 6.



Figure 5 – Location of Lister Drive – Birkenhead circuit overhead busbar section



Figure 6 – Lister Drive – Birkenhead circuit overhead busbar section

67. Due to space restrictions around the overhead bus bar section the NGET scheme team determined that it would not be possible to utilise a standard arrangement of having a separate disconnector and circuit breaker providing the connection between the customer's assets and the NGET circuit.

68. [REDACTED]

Detailed Scope

69. [REDACTED]

[Redacted]

[Redacted]

[Redacted]

[Redacted]

77.

[Redacted]

Procurement Strategy

[Redacted]

79.

[Redacted]

Cost benefit analysis

80. Our assessment of options has shown that the preferred option (the tee'd connection) offers the lowest cost option for consumers, the earliest connection date for the customer, and the lowest level of technical and project risk.

81. As such, in line with Ofgem's guidance to develop MSIP submissions that are proportional to scale and cost of the investments proposed, it is not considered necessary or efficient to undertake a CBA process as part of this submission. The reasoning behind the selection of the preferred option are considered to be clear based on the information presented in previous sections.

Total Allowance Request

82. NGET requests that the following allowance is provided through the MSIP reopener mechanism to deliver the works described above. These allowances will be subject to the Opex Escalator mechanism

	Prev. Yrs	FY22	FY23	Cost (£k)
Direct Allowances Requested				

Section Summary – Preferred Options and Detailed Costs

- The preferred option consists of a tee'd connection into the existing Lister Drive – Birkenhead circuit.
- The connection will be achieved via a [Redacted] due to space constraints.
- The total cost of the connection is [Redacted] in 18/19 price base.
- 80% of the total costs are either incurred or have been contracted, giving high confidence in our cost submission.

8. Project delivery and monitoring

83. A detailed project delivery plan has been prepared by the NGET scheme team. This plan facilitates the customer's planned connection date of 28/06/2022.

84. The key project milestones are summarised below:

MILESTONE	DATE

9. Stakeholder engagement

85. The key stakeholders identified by NGET during this project are: Statkraft (the customer) and NGESO.

Statkraft

86. NGET has worked closely with the customer to develop options and agree a programme that meets the customer's need to achieve as early as possible a connection date. To ensure our investment is efficient, we have closely tracked the progress of the customer in developing their aspects of the connection to ensure that NGET does not invest ahead of need.

87. [REDACTED]

88. The progress of the customer indicates that they will be ready to connect by the planned date and hence NGET investment should continue as planned to meet this agreed date.

NGESO

89. Communication and coordination with NGESO has been carried out via standard procedures.

10. Price Control deliverables

90. As there is no measurable output in terms of contracted Transmission Entry Capacity or transformer capacity to be delivered for this project, it is proposed that an evaluative Price Control Deliverable is defined.

91. Provide a 275kV connection for Statkraft's stability solution to the transmission network at Lister Drive by 28/06/2022

11. Overview of assurance and point of contact

92. Appendix A the assurance statement letter is the written confirmation in line with the assurance requirements set out in Ofgem's Re-opener Guidance⁴ and Data Assurance Guidance document (currently under review).

93. This confirmation is provided by the Director of Regulation, Electricity Transmission where they are accountable for the RIIO-2 regulatory allowances for National Grid Electricity Transmission (NGET) including any changes to these allowances. They provide the following statements below regarding how this MSIP application has been prepared and submitted in relation to each of the three assurance points requested by Ofgem:

- It is accurate and robust, and that the proposed outcomes of the MSIP submission are financeable and represent good value for consumers.
- There were quality assurance processes in place to ensure the licensee has provided high-quality information to enable Ofgem to make decisions which are in the interests of consumers.
- The application has been subject to internal governance arrangements and received sign off at an appropriate level within the licensee.

94. NGET's designated point of contact for this MSIP application is Mohammed Farooq, Regulatory Development Manager, email mohammed.farooq@nationalgrid.com, telephone 07973 979 536.

⁴ [RIIO-2 Re-opener Guidance and Application Requirements Document: Version 1, 26 February 2021](#)

Appendices

Appendix A – Assurance statement letter



APPENDIX A - Lister
Drive Assurance Stat

Appendix B – Ofgem ET UM submission template

Redacted

Appendix C – Ofgem document guidance



APPENDIX C -
Ofgem Document G

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