# Re-opener Report

## MSIP Project: Melksham Operational Tripping Scheme (OTS) Phase 2

**January 2022**

nationalgrid

# Contents and structure of the reopener submission

The table below signposts the structure of the document and sets out the purposes of each of the sections. This also lists the appendices. We invite Ofgem to consider the proposals set out in this submission and raise queries against anything that may require further clarification.

# 1. Executive summary

1. This document outlines the Medium Sized Investment Project (MSIP) re-opener submission for Melksham Operational Tripping Scheme Phase 2.

2. The Melksham Operational Tripping Scheme project is driven by a range of future Generation Customers connecting into the South West region of England, including [redacted] These additional connections to the Transmission System would result in thermal, voltage and stability issues when particular double circuit unplanned outages occur during certain planned outages. The most efficient way to manage these issues is through an Operational Tripping Scheme (OTS) and this investment seeks to extend the existing Melksham Operational Tripping Scheme to mitigate these issues in the South West region.
3. An OTS monitors a number of circuits and in the event of a fault or combination of faults would then carry out automatic switching or trip generation to avoid instability or unacceptable thermal or voltage condition on the transmission system. An OTS also provides National Grid Electricity System Operator (NG ESO) with flexibility in managing constraints across the network.
4. The existing Melksham OTS initial phase was installed in 2019 to cater for the [redacted] The system provides signals and indications to the Distribution Network Operator's (DNO) Active Network Management (ANM) to manage constraints on the network. The existing system is readily reconfigurable to accommodate the above-mentioned future connections and additional circuits.

5. Alternative options were investigated and identified to be either not applicable or would have resulted in higher initial capital costs and/or whole lifetime costs for the end consumer. For example, the 'Do nothing' option indicated that the annual constraint costs from 2024 would be estimated to be between approximately **£[redacted]/annum** to **£[redacted]/annum.**

6. This submission is supported by a Cost Benefit Analysis (CBA), which shows the potential 'do nothing' constraint cost during the RIIO T2 regulatory period exceeding the cost required to extend the Melksham OTS.

7. The proposed works have been carefully sequenced and need to commence from March 2022 to avoid excessive constraints costs and facilitate timely connections. This recognises system access restrictions for the works and minimises regret through delivery programme. The sequence proposed ensures that work will only proceed when the associated customer provides adequate confidence of their connection works progressing.

8. The proposed completion date for the works is 31 October 2025 and the works are to be staged with all the delivery spend occurring within RIIO T2 period. Six percent of the total costs have already been incurred in development and 72% of the total costs have been contracted through [redacted], therefore providing high confidence in our cost forecast. The total cost for the proposed works is [redacted] (18/19 price base) and through this submission NGET are requesting only the direct element of [redacted] (18/19 price base) through this submission, assuming the opex escalator applied to MSIP allowances.

# 2. Introduction

9. This document is the formal MSIP submission to Ofgem by NGET for the Melksham OTS works during the RIIO T2. This is submitted under the MSIP re-opener provided for in Special Condition 3.14 of the NGET Transmission Licence.

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. Due to increasing levels of generation connection to the Transmission System over the next five years in the South West of England; thermal, stability and voltages issues could occur within the Transmission System. Security standards require NGET to alleviate these issues by investing in transmission assets to cover N-2[1] conditions. The security standards also allow investment in transmission assets to cover N-3[2] conditions, where there is a positive cost benefit case (i.e. where the savings associated with constraint costs are greater than the costs of investment in transmission assets).

12. An Operational Tripping Scheme can provide an effective transmission asset investment to deal with N-3 conditions. Without an Operational Tripping Scheme, during certain planned single circuit outages NG ESO would need to constrain generation to avoid the unacceptable thermal, stability or voltage issues that would occur if there was a subsequent unplanned double circuit fault outage, despite the fact that an unplanned double circuit fault outage is a rare event. An Operational Tripping Scheme can be armed during certain planned single circuit outages such that generation is automatically disconnected (or constrained) if a subsequent unplanned double circuit fault outage occurs, which significantly reduces the volume of constraints required.

13. Each generation connected user has an operational inter-tripping requirement in order to meet the GB Security and Quality Supply Standard requirements for system maintenance access, as allowed in the Connection and Use System Code (CUSC) (CAP076). This could be provided through multiple independent OTS. Due to overlapping system monitoring requirements, it is generally more efficient to provide a wider OTS that can meet the operational tripping requirements of all these connected users. Having a wide area OTS also provides the NG ESO with the opportunity to have additional flexibility in managing constraints across the network, by NG ESO having commercial arrangement with Customers,

14. The works described in this submission utilise the existing Melksham OTS to monitor circuits and trip the future transmission connected generations in certain N-3 conditions. This N-3 condition management is included within the bilateral contract agreements signed by the customers. The full requirements of an OTS is determined by the NG ESO and NGET, and are described within a Functional Requirement Specification (FRS) document completed in June 2021 and is supported by NG ESO.

15. The works within this report not included in NGET's RIIO-T2 baseline allowances.

## The strategic context

16. NGET is required by licence to provide reliable and safe connections for customers and to ensure that the transmission system is operated in a safe and reliable manner. The NGET baseline RIIO-T2 business plan included several customer connections with a high confidence of connecting at that time. It is NGET's responsibility to ensure that the Transmission System remains operational after these customers have connected. When there are multiple connections (including interconnectors) to the transmission system, the system may experience increased thermal loadings or deviation from the stipulated voltage limitations during certain scenarios, which could lead to an unreliable and unsafe network. Works to alleviate these issues could include additional transmission capacity, or in this case an OTS as the most economic option where allowed for under the GB Security and Quality Supply Standard.

17. The existing Melksham OTS has been designed to manage thermal overloads and instability. The OTS is used to secure double circuit faults which coincide with other outages on the transmission system. This ensures that

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1 An N-2 condition in the transmission network is defined as when a circuit is on planned outage followed by a single circuit fault reducing the transmission capacity by 2 circuits

2 An N-3 condition in the transmission network is defined as when a circuit is on planned outage followed by a double circuit fault reducing the transmission capacity by 3 circuit

regional demand remains secure and avoids scenarios whereby the transmission system could be overloaded/unstable under certain conditions.

## Future and forecast data

18. The investment proposed within this funding submission is driven by contracted customer connections. Therefore, the contractual positions and latest project statuses of the customers' projects underpin the Need Case for this investment.
19. NGET is seeking funding for these works via the **Medium Sized Investment Project (MSIP)** reopener mechanism under the 'Protection Equipment' category. The criteria for assessment for the category of protection equipment is as follows:
20. *Protection projects that are required (iii) following system studies by the System Operator or the licensee showing a need for an operational intertrip.*

# 3. Demonstration of the Needs Case

## The Current Position

21. There are currently eight generators/HVDC interconnectors connected to the South West England region. To operate the Transmission System effectively, existing OTS systems have been installed. These systems include the [redacted] These OTSs monitor sections of the Transmission System and generator connections ensuring that the network is safe and secure during planned and unplanned outages that may result in unacceptable conditions on the network.

22. The Melksham OTS is readily extendable to accommodate future customers and already monitors a considerable number of circuits in the region. This system currently caters for the [redacted] and provides signals/indications to Distribution Network Operator (DNO) Active Network Management (ANM) schemes.

## Needs Case

23. Due to the increasing level of future generation and interconnectors connecting to the South West region of England during the RIIO T2 period, there is a requirement to extend the Melksham OTS to ensure continued efficient operation of the Transmission System.

24. The anticipated future generation connections covered by this investment are provided in Table 1 below. Each of these future generation connections has an operational inter-tripping required which could be provided through multiple independent OTS. However this would result in overlapping of system monitoring requirements and therefore it is more efficient to provide a wider OTS (such as the Melksham OTS) that can meet the operational tripping requirement of all the generation connections. The delivery of the Melksham OTS works needs to commence from 2022 to ensure that changes to the Transmission System (including new circuits and realignment of existing circuits) are incorporated into the OTS and existing planned outages can be utilised to undertake the works. The forecast constraints costs are **£[redacted]/annum** to **£[redacted]annum.**

25. **Table 1: Generation connections in South West England**

| Connection Type | Customer | Connection site | TEC (MW) | Connection Year |
|---|---|---|---|---|
| [redacted] | | | | |

## Section Summary – Need Case

- **The Needs Case is triggered by 14 Customers connecting to the Transmission System from 2023.**
- **To operate the Transmission System economically, safely and reliably during N-3 scenarios some form of investment is to be considered.**

# 4. Options Analysis

## Option selection

26. During the development of this investment, several options were assessed to determine the most cost efficient and fit for purpose solution that would satisfy the Needs Case.

27. **Note: -** Listed below are the options that were assessed and discounted during the option selection process.

| Option | Reason |
|---|---|
| Installation of a new local OTS for each generator/interconnector | Increased costs for consumers/customers as several OTS systems will be required. The use of Portable Relay Rooms may be required at some sites due to lack to space within the existing relay rooms |
| Installation of a new regional OTS that covers all new generators/interconnectors | Increased cost for consumers/customers as a new OTS system will be required. The use of Portable Relay Rooms may be required at some sites due to lack to space within the existing relay rooms |
| Extension of the existing Sellindge OTS | This option will be more expensive as a greater number of circuits would need to be monitored and a considerable amount of overlapping with the existing Melksham OTS which will result in inefficient operation of both OTS systems. |
| Undertaking network reinforcement | Increased cost required within T2 period (>£500m), inability to complete work due to volume as there will be insufficient outages, NG resources and supply chain resources to undertake the works. |

28. The approach taken to identify the optimal solution included a Cost Benefit Analysis (provided within Appendix A) to assess the shortlisted options which include:

1. **DO NOTHING**: this option assumes that the customers will connect and no capital works will be undertaken. Under certain planned outage conditions, a further fault on the system (N-3 conditions) would lead to conditions unacceptable conditions on the network. To avoid this, generation would need to be constrained - requesting the generators to reduce their load or completely disconnect from the Transmission System. The ESO would then also have to replace any constrained generation with generation from outside the area to maintain a balanced overall system. These constraint actions by the ESO lead to constraint payments that are ultimately be borne by the end consumer through Balancing System Use of System Charges (BSUoS).
2. **EXTENSION OF THE EXISTING MELKSHAM OTS** – In order to avoid constraint costs or network reinforcement/modifications, the existing Melksham OTS can be extended to accommodate the future customer connections and additional circuits to be monitored.

## Section Summary – Options Analysis

- **The shortlisted options considered in this study were the 'Do Nothing' and 'Extension of the Existing Melksham OTS' options**
- **The constraint cost savings associated with OTS are higher than the associated cost of extending the OTS**

# 5. Methodology for option selection

## Approach

29. A Cost Benefit Analysis (CBA) was undertaken on the shortlisted options and is provided in Appendix A. The CBA assessed the costs associated with each option up to the end of life of the NGET and customer connection assets. The asset's design life has been assumed to be 20 years (from the last customer connection in 2025).

## Cost Benefit Analysis

30. The CBA considered the following:

31. **BASELINE OPTION - DO NOTHING:** This option (provided within the Baseline tab of the CBA in Appendix A) assumes that no capital works will be undertaken on the Transmission System to alleviate issues associated with the N-3 scenarios during the RIIO T2 period and the following assumptions/considerations have been incorporated into the assessment:
    - Due to the restrictions imposed on the generators, constraint costs will be incurred
    - The constraint cost figures used in the study have been obtained from high-level studies undertaken by the NG ESO, when the existing Melksham OTS was designed/installed. The assessment was undertaken based on the predicted demand and embedded generation, Future Energy Scenarios, typical circuit availability Constraint costs were estimated to be between approximately **£[redacted]/annum** to **£[redacted]annum.** depending on several different assumptions. This assessment used a small number of planned outages to determine constraints and was based on a conservative £/MWh figure
    - The constraint cost will commence when the interconnectors and transmission directly connected customers ([redacted]) connect to the Transmission System from 2024
32. The CBA indicates that by 'doing nothing', constraint costs will be incurred from 2024 when the bulk of the customers ([redacted] connect. The net present cost to consumers of these constraint costs is **£[redacted]**. This also indicates that the constraint cost in 2024, just one year, of **£[redacted]**, will be greater than the whole cost required to extend the Melksham OTS system (£[redacted]).
33. **OPTION 1 - DO NOTHING –SENSITIVITY CONSTRAINT VALUE:** This option (provided within the Option1 tab of the CBA in Appendix A) assumes the same as Baseline – Do Nothing option but reflects the lower constraint range of **£[redacted]/annum** from 2024 when customers connect.

34. **OPTION 2 - EXTENSION OF THE EXISTING MELKSHAM OTS**: This option covers extension of the existing Melksham OTS to manage constraints on the Transmission System; and the following assumptions/considerations have been incorporated into the assessment:
    - The delivery works to extend the existing Melksham OTS shall commence in 2021/22 with all the delivery works being undertaken in RIIO T2 period. This investment includes minimal cost post T2 period which is associated with closing out the project. This is evident in the cost profile provided in the Option 1 tab within the CBA (Appendix A) Extension of Melksham OTS will commence in 2021/22 and take up of work in RIIO T2 period.
    - The cost for the OTS extension works is based on contractor's submitted costs for installing and commissioning the OTS equipment and internal NGET costs (breakdown provided in 'Detailed Costs' section)
    - Due to the presence of the OTS when the customer connects, it is anticipated that no constraint costs will apply and therefore has not been included within this option
    - The analysis assumes the existing Melksham OTS has a design life of 20 years and therefore the existing Melksham OTS will be replaced with a new OTS in 2039.
    - The CBA includes costs to be incurred during and post RIIO T2 period covering the OTS extension costs and subsequent replacement (Installed 2039)

- The proposed OTS works need to commence from 2022 to ensure outages are utilised efficiently as there will be outage restrictions within the area due to the future works on the network
- The OTS works have been sequenced to utilise already planned outages to incorporate new and existing circuits into the OTS system, ensuring delivery programme and cost efficiencies. The sequence proposed ensures that work will only proceed when the associated customer provides adequate confidence of their connection works progressing.

35. The only variables in the options are the constraint costs for the Baseline Option and the cost of extending the OTS (and replacing it at its end of life) for Option 2.
36. The Cost Benefit Analysis (CBA) undertaken is provided within Appendix A with a summary of the results from the CBA presented in the below table. Refer to the 'Summary' tab of the CBA for detailed results of the assessment.
37. **Table 2 – Cost Benefit Analysis results**

| Option No. | Desc. Of Option | Preferred Option | Total Forecast Expenditure (£m) | Total NPV | Delta (Option to baseline) | NPV 10 years |
|---|---|---|---|---|---|---|
| **Baseline** | Do Nothing - Sensitivity higher constraint value assumed | N | | | | |
| **1** | Do Nothing – Sensitivity lower constraint value assumed | N | | | | |
| **2** | Extension of existing OTS | Y | | | | |

* Investment includes initial extension and replacement of OTS assets in 2039

38. The economic assessment outlined by the CBA shows that the preferred solution of extending the OTS presents the best value to consumers, taking into account all investment costs, consumer benefits, constraint costs and discounted using the Spackman method.
39. The economic assessment also identified that the investment to extend the Melksham OTS is recovered through avoided constraint costs within the RIIO T2 regulatory period.
40. Further sensitivity was considered, NGET looked at routine asset replacement impact on constraint costs and can confirm that this will have no impact.

## Section Summary – Methodology for option selection

- **A CBA was undertaken on the shortlisted options**
- **The 'Do Nothing' option included constraint costs assumed to be a maximum of £xxx and a minimum of £xxxx per annum (18/19 prices)**
- **Using the upper annual constraint cost, the CBA indicates that the constraint cost in the Do Nothing scenario in 2024 only (£xx per annum) will exceed the cost of extending the existing Melksham OTS (£xxxxxxx)**
- **The Do-Nothing option has an NPV that is £xxxxxxx less favourable to consumers than the extension of the existing Melksham OTS option. This CBA includes cost of replacing the OTS in 20 years (£xxx).**
- **Based on the above, the option to extend the existing Melksham OTS has been selected as the preferred option.**

# 6. Preferred option and detailed costs

## Preferred option

41. The Melksham OTS is a regional scheme, where the centrally located [redacted] (at Melksham 400kV substation) monitors selected circuits within the area and issues trip and/or control commands to plant and equipment across a number of sites. The preferred option will use the [redacted]

42. [redacted]

- [redacted]
- [redacted]
- [redacted]
- [redacted].

43. The below shows an illustration of the Melksham OTS system.

[redacted]

44. **Figure 3: Melksham OTS system**

45. This investment will require works to be undertaken at a total of [redacted] substation sites. These include the following 400kV substation sites:

[redacted]

46. The assets that require monitoring are provided in Table 3.

47. **Table 3: Circuits that require monitoring**

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## Detailed costs

48. The following cost breakdown represents the latest view of costs for the proposed investment.

49. **Table 4: Cost of the preferred option**

50. See Appendix E for further detail of spend profile.

## Risk & Contingency

51. The following key programme and project risks have been identified and incorporated into the analysis to produce the contingency provided within Table 5:

52. **Table 5: Key Risks**

| Cause | Description | Impact | Probability | Mitigation |
|---|---|---|---|---|
| | | | | |
| | | | | |
| | | | | |

| Cause | Description | Impact | Probability | Mitigation |
|---|---|---|---|---|
| | | | | |
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53. **Procurement Strategy**

54. A Direct Allocation was undertaken with the XXXX as the Scope of Works was an "extension to existing protection system". Any alternative strategy would require a larger scope with the removal of in-situ equipment. After several meetings, a Cost Review challenging supplier rates and hours resulted in a revised bid lower than original submitted.

55. **Cost Maturity**

56. The table below shows the assessment of cost firmness using the classification outlined in the Ofgem LOTI reopener guidance document published on 29th March 2021. This shows that 78% of the total costs are either incurred already or have been contracted, giving high confidence in our cost submission.

| Cost Firmness | Project Management | Optioneering /Develop't | Contractor Costs | Commission | Contingency | Closeout | Totals |
|---|---|---|---|---|---|---|---|
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| Total | | | | | | | |

## Total Allowance Request

57. 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.

| | FY22 | FY23 | FY24 | FY25 | FY26 | Cost (£k) |
|---|---|---|---|---|---|---|
| Direct Allowances Requested | | | | | | |

## Section Summary – Preferred Options and Detailed Costs

- **The preferred option is considered to be the extension of the existing Melksham OTS.**
- **The total costs of the project is £xxxxxxx in 18/19 price base.**
- **78% of the total costs are either incurred already or have been contracted, giving high confidence in our cost submission.**

# 7. Project delivery strategy

58. A detailed programme has been provided by the contractor which facilitates the completion of the works in stages to ensure all works associated with each customer connection is completed prior to the customer connecting.

59. The key project milestones are provided within the table below:

60. **Table 6: Key Project Milestones**

| MILESTONE | DATE |
|---|---|
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61. During the production of the proposed programme, lessons learnt from the development, design and delivery of the existing Melksham OTS have been considered and used to produce a more robust programme for the proposed works.

62. *[redacted] All other customer connection works will be awarded to the contractor as each customer investment is sanctioned ensuring there is a certain level of confidence in the customer proceeding with their connection prior to making a commitment to the OTS works delivery contractor. In the event of most of these customers terminating their contract, the need for the OTS is still the most effective option. Although there will be changes to some of the customer connection dates highlighted within Table 1, some of the OTS works would still need to commence early due to potential outage availability constraints in the future. The proposed OTS works have currently been sequenced to minimise regret ensuring the works are undertaken providing programme and cost efficiency.

63. The works identified can be achieved by connecting the circuits to be monitored over a number of years as indicated in Table 7 below. These are based on the customers' contracted connection dates.

64. **Table 7: Circuits to be monitored**

Year 2022: [redacted]

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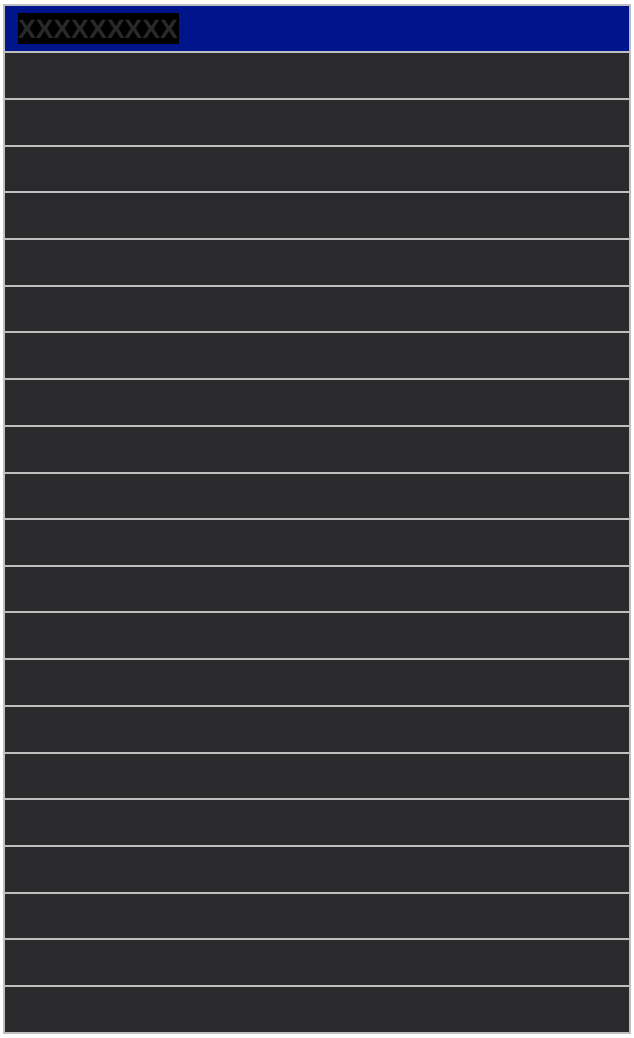
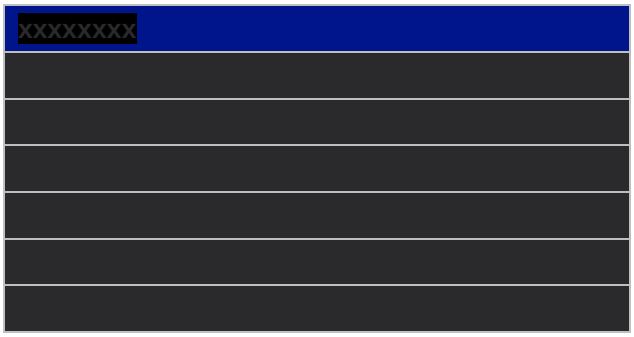
| |

Year 2023: [redacted]




Year 2024: [redacted]



Year 2025: [redacted]

| [redacted] |
| --- |
| |
| |
| |
| |
| |

65. The outages required to undertake the works on the above-mentioned circuits and SGTs are provided in Appendix B.

66. A high-level flow chart illustrating the Stages and the activities to be undertaken within each stage (Design, configuration, site installation, Factory acceptance test, Site Acceptance Test) has been provided within Appendix C.

67. Note that these dates are based on the contracted customer connection dates known at the time of project development and will change if the customer submits a modification application to make changes to their connection dates.

# 8. Price Control deliverables

68. As there is no measurable output in terms of contracted Transmission Entry Capacity or transformers to be delivered for this project, it is proposed that the following Price Control Deliverable is defined.

69. Complete extension of the Melksham OTS by 31/10/2025.

# 9.Stakeholder engagement

70. The following stakeholders have been identified and are aware of the impact of the OTS system on their proposed connection to the transmission network. A division of responsibility for the works that identifies the scope of physical works associated with each project; to ensure that individual projects understand the physical interface with the OTS and ensures that these projects complete the works required to enable the interface has been produced. The stakeholders include:

# 10.Overview of assurance and point of contact

71. Appendix F the assurance statement letter is the written confirmation in line with the assurance requirements set out in Ofgem's Re-opener Guidance[3] and Data Assurance Guidance document (currently under review).

72. 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.

73. 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.

[3] RIIO-2 Re-opener Guidance and Application Requirements Document: Version 1, 26 February 2021

# Appendices

## Appendix A: Cost Benefit Analysis

**Redacted**

## Appendix B: Outages required for the works

**Redacted**

## Appendix C: High level flow chart illustrating stages and activities

**Redacted**

## Appendix D: Assurance statement letter

APPENDIX D - Melksham OTS Assura

## Appendix E: Spend Profile of Investment

**Redacted**

## Appendix F: Ofgem ET UM submission template

**Redacted**

## Appendix G: Ofgem guidance checklist

APPENDIX G - Ofgem Document Guidance .

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