MSIP Re-opener Report

Pennine Pathfinder Shunt Reactors

- Stocksbridge 400kV substation
- Bradford West 275kV substation
- Stalybridge 400kV substation

January 2024

Follow on from the January 2023 MSIP Needs Case Submission

nationalgrid

Contents

Abbreviations

Table of Abbreviations

Abbreviation	Term
CAI	Closely Associated Indirect
CB	Circuit Breaker
CBA	Cost Benefit Analysis
HV	High Voltage
kV	Kilovolt
MSIP	Medium Sized Investment Project
MVAr	Mega Volt*Amps Reactive
MW	Megawatt
NGESO	National Grid Electricity System Operator
NGET	National Grid Electricity Transmission
NOA	Network Option Assessment
PoW	Point on wave
SGT	Super Grid Transformer
SOF	System Operability Framework
WY1	West Yorkshire 1
WY2	West Yorkshire 2

Executive summary

1. This is an update on the Pennine Pathfinder project, in the context of the Medium Sized Investment Project (MSIP) submission process - provided for in Special Condition 3.14 (paragraph f) of the National Grid Electricity Transmission (NGET) Transmission Licence - since the previous re-opener MSIP Need Case submission, which identified the preferred option, originally submitted in January 2023 and acknowledged in writing by Ofgem on 24th July 2023. Ofgem approved in principle the Needs Case and requested resubmission in the January 2024 window with the detailed cost information.

2. The paper demonstrates the need for a total of XXXX of investment (the 'Investment') with XXXX direct cost allowance to provide new shunt reactors connected to the following NGET sites in the North of England:

   - Stocksbridge 400kV substation – 200 MVAr Unit
   - Bradford West 275kV substation – 100 MVAr Unit
   - Stalybridge 400kV substation – 200 MVAr Unit

3. This is a statutory requirement arising from a connection application made by National Grid Electricity System Operator (NGESO). A viable option is available, and NGET are confident in the demand and its associated timeline, based on the strategic need being aligned to government goals and progress made on customer plants (which will generate the new demand) to date.

4. The paper is divided into seven main sections. This update provides the additional requirements to the needs case submitted in 2023, to allow final approval by Ofgem. This includes an update on the preferred option (Section 3 & 4), new content for the detailed costs and risk (Section 4) as well as delivery, procurement and stakeholder engagement (Section 5).

5. Section 1 – the **Introduction** - positions the Investment within the context of NGET's investment plan. It confirms the methodology and regional context relevant to this submission. The strategic context remains as per that stated in the previous re-opener MSIP Need Case. These investments were sought as part of the NGESO's "Pathfinder" project which seeks to develop new markets to help transition to a Net Zero network. The goal remains to provide a solution capable of absorbing reactive power.

6. Section 2 – **Establishing need** – establishes the investment drivers for the project, noting the strategic context and specific load drivers for this site specifically. In this case, the requirement for the Investment came out of the System Operability Framework (SOF) with a minimum of 500MVAr being required for voltage control across three sites in the Pennines area.

7. Section 3 – **Optioneering** – summarises the options considered for addressing the established need and summarises the reasons for progressing the selected options to detailed analysis. The solution to the Needs Case, as originally presented, remains fundamentally

unchanged, seeing only minor refinements as the project evolved during detailed design and delivery stages. For the Investment, 8 options were identified, 3 of which were taken forward for detailed analysis:

- **Stocksbridge 400kV** - Build a new plinth and bunded area connection at Mesh Corner 2 of Stocksbridge 400kV substation. This option was chosen as that site has more available space and thus can mitigate any delivery and safety concerns.
- **Bradford West 275kV** - Build a new plinth and bunded area connection at Mesh Corner 1 of Bradford West 275kV substation. This option was chosen as that site has more available space and thus can mitigate any delivery and safety concerns.
- **Stalybridge 400kV** - Build a new plinth and bunded area connection at Mesh Corner 1 of Stalybridge 400kV substation. This option was chosen as it is expected to be the cheapest and also provides consumers with the most value in terms of earliest connection date and lowest project risk.

8. Section 4 – **Detailed options analysis** – outlines the detailed analysis undertaken in relation to each shortlisted option and a detailed cost analysis. Total project costs are XXXX and NGET requests a XXXX allowance (18/19 price base) is provided through the MSIP reopener mechanism to recover the direct portion of costs and deliver works described above.

9. Section 5 – **Deliverability, risk and regulatory outcome** – identifies the delivery plan, any key stakeholder input, and associated risks and mitigations, and the proposed regulatory mechanism to be attached to the Investment. It was originally agreed with NGESO that the shunt reactors would need to be in service by April 2024 at all three sites. The programme is largely unchanged with planned commissioning of the units by 30th of April 2024 at Stalybridge 400kV and Bradford West 275kV substations. Commissioning at Stocksbridge 400kV substation is planned for 12th May 2024, which is later than originally proposed. However, this later date is still within acceptable timescales for NGESO who informally communicated later required start dates in August 2024 as per their response to NGET's counterfactual submission (Appendix A). Despite this, NGET continue to recognise and work with towards its originally committed dates of April 2024.

10. Engagement with internal and external stakeholders is now concluding as the site works are coming to completion. The project has been seen as a success by both internal stakeholders delivering the project and also by the NGESO customer. There have been no stakeholder engagement issues since the options were originally selected.

11. Section 5 – **Conclusion** – confirms the proposed solution, including its key outputs and cost.

12. Section 6 – **Overview of Assurance and Point of Contact** – confirms NGET's alignment of this submission with assurance requirements and the designated point of contact for this MSIP application.

Summary Table

MSIP Re-opener Update – NOA High Voltage Pathfinder – Pennines	
Ofgem Scheme Reference/ Name of Scheme	NOA High Voltage Pathfinder Pennines
Primary Investment Driver	Voltage Control - Pennines
Licence Mechanism/ Activity	Special Condition 3.14 Medium Sized Investment Projects Re-opener and Price Control Deliverable/ Clause 3.14.6
PCD Primary Output	Deliver 500MVAr reactive power in the Pennines area across the following 3 sites by the proposed dates: 200 MVAr at Stalybridge 400kV by 30th April 2024, 100MVAr at Bradford West 275kV substation by 30th April 2024, 200MVAr at Stocksbridge 400kV substation by 12th May 2024.
Total Project Cost (£m)	XXXX
Funding Allowance Requested (£m)	XXXX
Output Delivery Year	2024
Reporting Table	Annual RRP – PCD Table
PCD Modification Process	Special Condition 3.14, 1

Issue Date	Issue No	Amendment Details
31st January 2024	1	First Update of Report

Summary Spend Phasing Table, 2018/19 price base (£)					
Site	**Regulatory Year**	**2022/23**	**2023/24**	**2024/25**	**Total**
Stalybridge	Project Costs	XXXX	XXXX	XXXX	XXXX
Stockbridge	Project Costs	XXXX	XXXX	XXXX	XXXX
Bradford west	Project Costs	XXXX	XXXX	XXXX	XXXX
Spend £m	**Total Costs**	XXXX	XXXX	XXXX	XXXX

1. Introduction

1.1 Project overview

13. This document provides an update on the Pennine Pathfinder project's progression, in the context of the Medium Sized Investment Project (MSIP) submission process, since the previously submitted re-opener MSIP Need Case submission (see Appendix B) for the Network Option Assessment (NOA) High Voltage Pathfinder – Pennines which was originally submitted to Ofgem in January 2023 and approved on 24-07-2023.

14. Each section of this document gives a brief summary of the corresponding section within the previously submitted re-opener MSIP Need Case submission. Supplementary information is provided where updates are available such as minor updates to the preferred option and needs case, as well as previously unsubmitted sections such as detailed cost information, risk, delivery, procurement and stakeholder engagement required for MSIP approval.

15. The original submission was made under the MSIP re-opener provided for in Special Condition 3.14.6 (f) of the National Grid Electricity Transmission (NGET) Transmission Licence. This update is being submitted to confirm the status of the project and is made in accordance with the 'RIIO-2 Re-opener Guidance and Applications Requirements' published by Ofgem in February 2021. No further funding requests will be required for this project.

16. The Needs Case for the project emerged from the System Operability Framework (SOF) highlighting operability risks due to the decline in transmission-connected synchronous generation over the next decade and an increasing need to absorb reactive power. The National Grid Electricity System Operator (NGESO) NOA High Voltage Pathfinder sought to find the most cost-effective way to address high voltage issues on the transmission system. NGESO concluded that the most economic and efficient solution was the connection of shunt reactors at each of three sites, known as the "counterfactual" submission.

17. NGET have evidenced that the proposed investment represents the lowest cost and best value option for consumers, in terms of being the lowest technical risk and is the only feasible connection option that can facilitate the customer's desired connection date. The original re-opener Need Case submission approved by Ofgem provided a comparison of options but did not include a detailed Cost Benefit Analysis (CBA), as it was not deemed to be proportionate to make an informed investment decision.

1.2 Geographical context

18. The "counterfactual" case for the West Yorkshire region indicated that the optimum solution would involve 200MVAr shunt reactors in the West Yorkshire 2 (WY2) area at both of Stocksbridge 400kV and Stalybridge 400 kV sites. A further 100MVAr shunt reactor would need to be sited in the West Yorkshire 1 (WY1) region, five sites were considered suitable and the Bradford West 275kV site was chosen.

19. The works described in the original re-opener Need Case submission are nearing completion and will provide connections totalling 500 MVAr reactive power across the three sites. The three reactor solutions are listed below along with a map showing the site locations:

- Stocksbridge 400kV substation – 200 MVAr Unit
- Bradford West 275kV substation – 100 MVAr Unit
- Stalybridge 400kV substation – 200 MVAr Unit

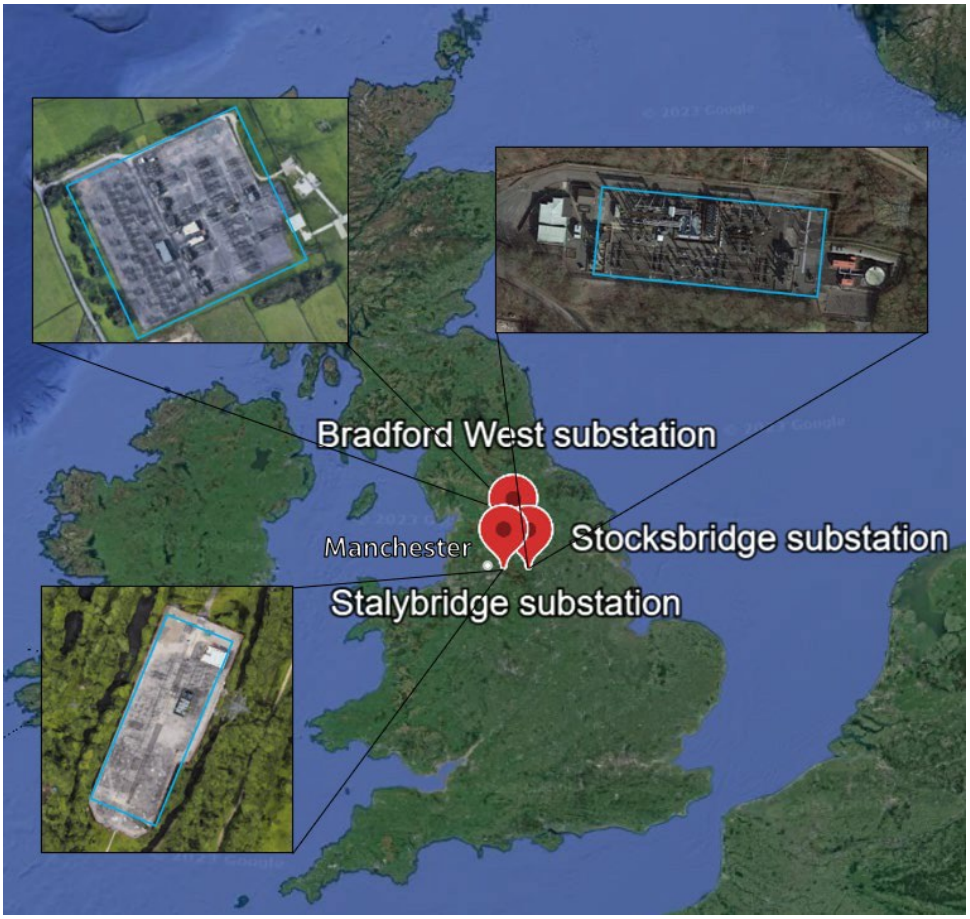

Figure 1 – Shunt reactor site locations

20. The project is progressing towards completion as follows:

- Stalybridge 400kV – 30th April 2024
- Stocksbridge 400kV – 12th May 2024
- Bradford West 275kV – 30th April 2024

1.3 MSIP Eligibility

21. This investment was not included in NGET's RIIO-T2 baseline plan because the NOA High Voltage Pathfinder – Pennines was not concluded until February 2022 and hence there was insufficient certainty around the investment requirements to allow the project to be included in the baseline RIIO-T2 investment plan. NGESO requested NGET to change its Transmission Investment Plans to provide for, and proceed with, the delivery of the three successful

"counterfactual" options in the West Yorkshire region in accordance with the planning request and programmes set out in the Tender Outcomes from NGESO which can be found at Pennines Pathfinder updates[1].

22. The needs case submitted in January 2023 highlighted the investment as requiring MSIP funding based on not being eligible for the demand or generation uncertainty mechanism volume drivers. 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. Hence, neither the demand nor generation Uncertainty Mechanism can be applied as there is no output upon which to calculate the allowance based on. The ability to absorb reactive power will provide voltage control, as required by NGESO.

23. NGET are seeking allowance for this connection under clause 3.14.6 (f) of the Medium Sized Investment Project (MSIP) reopener mechanism. The below table demonstrates how this proposal meets the remaining MSIP eligibility criteria.

Table 1 – MSIP Eligibility Assessment

Criteria	Criteria has been met
Investment is not eligible for funding via the generation or demand Volume Driver Uncertainty Mechanism.	Yes
Investment sum < £100m not included in baseline funding.	Yes
Transmission investment	Yes

1.4 The strategic context

24. NGET is required by its licence to provide connection offers for customers, and it aligns to our overall strategy which, is centred around serving our customers and providing them with an efficient, effective and timely connection. The baseline RIIO-T2 business plan included the investments where there was sufficient understanding of and certainty about at that time. Over the course of a price control period, it is expected that existing customers may change their plans or new customer may apply for connections that can require investment within the price control period. These changes are managed through the agreed uncertainty and reopener mechanisms.

25. The strategic context remains as per that stated in the previous re-opener MSIP Need Case submission (see Appendix B). These investments were sought as part of the NGESO's "Pathfinder" project which seeks to develop new markets to help transition to a Net Zero network. The goal remains to provide a solution capable of absorbing reactive power. The driver, which was highlighted through the SOF, remains unchanged and the solutions offered by NGET, are still the most economic and efficient solution for the consumer.

[1] https://www.nationalgrideso.com/future-energy/projects/pathfinders/high-voltage/Pennines

26. The scope of works remains essentially unchanged against this requirement with the solution based upon the “counterfactual” baseline and does not include any wider system works.

27. The investment proposed in this submission is driven by NGESO as part of the NOA High Voltage Pathfinder – Pennines process. As outlined in the previous submission, these works are not dependent on any wider scenario forecasts or outcomes. 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.

2. Establishing the need

28. In the January 2023 re-opener MSIP Need Case submission (see Appendix B) we explained the requirement for the project which came out of the SOF with a minimum of 500MVAr being required for voltage control across three sites in the Pennines area. We showed how the three preferred locations had been selected and how we selected the best solutions to site new shunt reactors to give the requisite capacity. Ofgem approved, in principle, the Needs Case submission and identification of the preferred option but awaited submission of full Contractor costs to finalise full approval of the Investment.

29. The network in the Pennines area is highly interconnected and electrically complex, containing long cable lengths, and thus is subject to high voltage rise. The requirement to control the voltage was defined based on NGESO technical studies, to focus on the most beneficial sites and ensure the entire region is compliant when considering contingencies across a wider network area.

30. The region was subdivided into two by NGESO, with the minimum requirements across multiple sites defined as below and as summarised in the following diagram:

- 1 x 100 MVAr in WY1 region
- 2 x 200 MVAr in WY2 region
- Total combined minimum of 500 MVAr.

Figure 2 – NGESO network diagram summarising the output from system studies.

31. The two “best performing sites” were chosen as Stalybridge 400kV substation and Stocksbridge 400kV substation. Also, one of the “well performing sites” was chosen as Bradford West 275kV substation. A new shunt reactor at each of these sites will satisfy the needs of NGESO and this solution has been agreed by Ofgem in the previous submission.

3. Optioneering

3.1 Approach to optioneering

32. The solution to the Needs Case, as originally presented, remains fundamentally unchanged since the January 2023 submission. New shunt reactor locations at the three affected sites are as per the original re-opener MSIP Need Case submission (see Appendix B). Options were chosen based on relative costs, technical complexity, ability to meet programme and health and safety performance. The preferred options were generally clear and self-evident when compared with alternatives.

33. The one key refinement since the Needs Case that was submitted in January 2023 relates to the optioneering around the Circuit Breakers (CBs). The fundamental reason for these changes is that as the project evolved during detailed design and delivery stages, NGET obtained a clearer picture of the requirements for CBs related to each shunt reactor. These requirements were explored with Ofgem during the responses to supplementary questions in March 2023 (Appendix C). Further detail on these changes is summarised in section 3.2.

3.2 Options considered

34. A summary of the options selection outputs is tabulated below. For more information, please see Section 6 of the previous re-opener MSIP Need Case submission (Appendix B) and subsequent supplementary questions (SQs) between Ofgem and NGET in relation to the Jan 23 Needs Case submission (Appendix C).

35. A “do nothing” option was also considered but this approach was discounted on the basis that it would not satisfy the needs case driver set out by NGESO.

36. Table 2 provides a summary of the options considered within the Jan 23 needs case submitted by NGET and contrasts the changes relevant to each option since this submission.

37. Operationally a shunt reactor requires a dedicated circuit breaker to facilitate Auto-Reactive Switching (ARS). This enables the reactor to be automatically switched in and out as the loading on the system dictates. and removes the restriction on switching the additional circuits out on the respective mesh corners when taking the reactors off-line. In addition, dedicated breakers add an extra level of protection to the System and all connected Plant should any faults materialise.

Stocksbridge

38. At Stocksbridge, the two options originally considered by NGET were cost neutral and considered equal in terms of technical complexity and programme. Therefore, the option physically furthest from the site office and with more available space was chosen to mitigate any delivery and safety concerns. This solution was to connect the new 200MVAr shunt reactor onto Mesh Corner 2.

39. Further design work since the previous Jan 23 Need Case document showed a need to include a dedicated circuit breaker rather than replace with Point on Wave. This is due to system configuration, operational restrictions, and site-specific requirements for PoW (point on wave) switching capability which was outlined to Ofgem in the supplementary questions shared between both parties (Appendix C).

40. However, where NGET previously planned to reuse the existing bunded area at Mesh Corner 2, further detailed assessment identified the need to build a new plinth and bund. The proximity of the existing bund to the existing busbars didn't have space to fit a circuit breaker in. The requirement for the circuit breaker meant the reactor had to be moved to a position away from the place initially agreed, hence the existing bund was not in a suitable place and a decision was taken for a new plinth and bund to be constructed.

Bradford West

41. At Bradford West the two options were also cost neutral and considered equal in terms of programme. Therefore, the option with the larger available working space was chosen to mitigate any delivery/complexity/safety concerns. This solution is to connect the new 100MVAr shunt reactor onto Mesh Corner 1. As identified in the original Needs Case submission, the scope still includes a new dedicated circuit breaker and remains unchanged.

Stalybridge

42. At Stalybridge the four options had obvious scope differences and therefore would have clear differences in expected capital costs. The preferred option is expected to be the cheapest and provides consumers with the most value in terms of earliest connection date and lowest project risk. The solution is to connect the new 200MVAr shunt reactor onto Mesh Corner 1.

43. Further design work since the previous Need Case document showed the need to include a new dedicated circuit breaker also, rather than just replacing the existing CB with Point on Wave. This is due to system configuration, operational restrictions and site-specific requirements for PoW switching capability which was outlined to Ofgem in the supplementary questions shared between both parties (Appendix C).

44. Once the concept options were chosen, they were further developed to form deliverable solutions. There were no issues that arose during detailed engineering that fundamentally changed any of the preferred options. The delivery of the new proposed units has so far proceeded as planned.

Table 2 – Summary of option selection/ Change in Circuit Breaker Requirement

Site	No. options considered	Factors Considered	Deciding Factors	Selected Option at Start of Development (Identified in Jan 23 Needs Case)	Option Post Development - now required
Stocksbridge 400kV	2	Two locations with existing bunded areas suitable for reuse focused upon. This would reduce project costs – similar capital cost for each option.	Space around the bunded area and proximity to buildings meant one location was more flexible/lower risk.	Re-use existing plinth and bunded area connection at Mesh Corner 2 of Stocksbridge 400kV substation Replace existing Circuit Breaker with Point on Wave.	Build a new plinth and bunded area connection at Mesh Corner 2 of Stocksbridge 400kV substation. Provide new dedicated Point on Wave Circuit Breaker as efficient design allowed bay to be built without extension to existing substation fenceline.
Bradford West 275kV	2	Two Mesh Corners were already allocated, and another option had challenging access with no additional benefits - leaving two options around MC1	The location selected was one of two viable positions near to MC1 chosen for its extra working space while both had similar costs.	Build a new plinth and bunded area connection at Mesh Corner 1 of Bradford West 275kV substation	Build a new plinth and bunded area connection at Mesh Corner 1 of Bradford West 275kV substation
Stalybridge 400kV	4	Space was found inside and outside the Stalybridge 400kV site fenceline and in an adjacent 275kV substation. Cost and complexity were considered	An option within the existing fenceline was preferred closest to existing busbars and with reduced cost/consent risk.	Build a new plinth and bunded area connection at Mesh Corner 1 of Stalybridge 400kV substation. Replace existing Circuit Breaker with Point on Wave	Build a new plinth and bunded area connection at Mesh Corner 1 of Stalybridge 400kV substation. Provide new Point on Wave Circuit Breaker due to system constraints in relation to Ferroresonance due to long double circuit. Due to space constraints between the existing ex-SGT bund and the busbar section, a new plinth and bund (for the reactor) was required to facilitate the circuit breaker. It was not possible to fit the Circuit Breaker between the existing plinth and the bus section.

3.3 Lifetime Cost Benefit Analysis

45. The process by which options were selected for the location and connection of shunt reactors at each site did not require a detailed cost benefit analysis. Our assessment of the options has shown that the preferred option offers the best value option for consumers, the earliest connection date for the customer, and an appropriate level of technical and project risk.

46. The purpose of the ESO's Pathfinder requirements, was explored in the previous Jan 23 needs case submission. Within which NGET detailed how the ESO are exploring new ways to manage variability in voltages through Reactive Power flows across the system. Where historically voltage constraint contracts have been used and paid for to procure additional reactive capability by the ESO adding to its Balancing Services costs. As part of its tender event, the ESO assessed NGET's proposed solution against the historic cost of managing voltages in the Pennine region and other voltage areas to ensure they represented value for money in respect of consumers.

47. 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 efficiently beneficial to undertake a CBA process as part of this submission. The reasoning behind the selection of the preferred option is clear based on the information presented in this and previous January 2023 needs case submission. Furthermore, the underpinning purpose of the scheme has been planned and tendered by the ESO as a solution to drive long term consumer value through reduction in balancing services costs.

4. Detailed Option Analysis

4.1.1 Preferred option

48. The preferred shunt reactor location selected for each site has not changed since the previous re-opener MSIP Need Case submission.

49. This section provides detailed cost information for each site. An overall aggregated summary of the total project costs is provided in the table below as an introduction.

Table 3 – Detailed Costs Overview

		2018/19 price base (£)			
		2022/23	2023/24	2024/25	Total
Stalybridge	Project Costs	XXXX	XXXX	XXXX	XXXX
	Allowance Request	XXXX	XXXX	XXXX	XXXX
Stockbridge	Project Costs	XXXX	XXXX	XXXX	XXXX
	Allowance Request	XXXX	XXXX	XXXX	XXXX
Bradford west	Project Costs	XXXX	XXXX	XXXX	XXXX
	Allowance Request	XXXX	XXXX	XXXX	XXXX
	Total Project Costs	XXXX	XXXX	XXXX	XXXX
	Total Allowance Request	XXXX	XXXX	XXXX	XXXX

4.2 Detailed costs - Stalybridge

4.2.1 Introduction

50. This section provides a breakdown of the overall costs for Stalybridge 400kV Substation – 200 MVAr Unit including an expenditure profile for all Regulatory Years of delivery.

51. The following cost breakdown represents our latest view of costs for the proposed investment in 2018/19 price base. Due to the project being underway in delivery, this forecasts in this breakdown are primarily on actuals rather than estimates.

52. Appendix D Reopener Cost Model - Stalybridge submitted alongside this document provides a breakdown of the costs in more detail and should be reviewed alongside this chapter.

53. This Chapter is broken down into the following sections:

4.2.2. Total Allowance Request

4.2.3. Cost Estimate

4.2.4. Cost Firmness

4.2.5. Direct & CAI

4.2.6. Detailed breakdown of Direct costs

4.2.2 Total Allowance Request

54. Total project costs are XXXX, NGET requests XXXX allowance is provided through the MSIP reopener mechanism to recover the direct portion of costs and deliver works described above. The MSIP reopener mechanism is subject to the Opex escalator and therefore indirect costs will be funded under this route.

Table 4 – Allowance request – Cost Model tab reference 1.0

	2018/19 price base (£)			
	2022/23	2023/24	2024/25	Total
Total Project Costs	XXXX	XXXX	XXXX	XXXX
Allowance Request (Direct Only)	XXXX	XXXX	XXXX	XXXX

4.2.3 Cost Estimate

55. The total cost to develop and deliver Stalybridge 400kV Substation – 200 MVAr Unit is XXXX as detailed in Table 5. This table and figure include both direct, indirect and costs incurred to date.

56. The tables below show a summary of costs including annual phasing.

Table 5 – Cost Summary – Cost Model tab reference 1.1

Element	Total (£)	CAI/Direct	Source
Contractor Costs			
Third Party Costs	XXXX	Direct/CAI	Majority based on contracts and quotes
National Grid Costs			
Direct Procurement	XXXX	Direct	Majority based on contracts and quotes
NG AO Works Delivery	XXXX	Direct/CAI	Estimated based on number of days and rates for resource required
ET Ops	XXXX	Direct	Estimated based on number of days and rates for resource required
Project Management	XXXX	CAI	Estimated based on number of days and rates for resource required
Project Services	XXXX	CAI	Estimated based on number of days and rates for resource required
Support Functions	XXXX	CAI	Estimated based on number of days and rates for resource required
NGET Portfolio Costs	XXXX	CAI	NGET internal estimates
Other			
Contract Inflation	XXXX	Direct	XXXXXXXXXXXXXX
Risk	XXXX	Direct	Risk register
Total	XXXX		

Table 6 – Annual Phasing – Cost Model tab reference 1.1

Element	2022/23	2023/24	2024/25	Total (£)
Contractor Costs				
Third Party Costs	XXXX	XXXX	XXXX	XXXX
National Grid Costs				
Direct Procurement	XXXX	XXXX	XXXX	XXXX
NG AO Works Delivery	XXXX	XXXX	XXXX	XXXX
ET Ops	-	XXXX	XXXX	XXXX
Project Management	XXXX	XXXX	XXXX	XXXX
Project Services	-	XXXX	XXXX	XXXX
Support Functions	XXXX	-	-	XXXX
NGET Portfolio Costs		XXXX	XXXX	XXXX
Other				
Contract Inflation		XXXX		XXXX
Risk	-	XXXX	XXXX	XXXX
Total	XXXX	XXXX	XXXX	XXXX

4.2.4 Cost Firmness

57. 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 88% of the total costs are either incurred or have been contracted/quoted, giving high confidence in our cost submission. This value was calculated by taking cost firmness levels 1-3 and dividing by the total costs.

Table 7 – Cost Firmness – Cost Model Tab reference 1.9

Cost Firmness	Total (£)	Notes
1 - Fixed	XXXX	22/23 and 2023/24 Timesheets and invoices.
2 - Agreed remeasurable	XXXX	Procurement and third-party costs where contract/quote is available (less actuals), XXXXXXXXXXX
3 - Agreed remeasurable future information	XXXX	Procurement and third-party costs where contract/quote is available (less actuals) but subject to change.
4 - Estimated	XXXX	Risks, NG costs (less actuals).
5 - Early Estimate	0	
Total	XXXX	

58. Most estimated costs relate to NG staff costs which have been estimated based on the resources required to complete the works. This is calculated using forecast days multiplied by daily rates.

4.2.5 Direct & CAI Split

59. Table 8 below provides the split between direct and indirect costs related to this project.

60. The costs of the Closely Associated Indirect (CAI) activities are incremental to the funding we received as part of our T2 baseline allowances. The T2 Baseline allowances for CAI were determined through Ofgem's regression (econometric) model, one of the key inputs being the baseline load and non-load capital allowances and as such no funding has been provided for this MSIP project. The costs are therefore in addition to the CAI allowances provided in T2 Final Determinations and should there be funded via the Opex Escalator mechanism.

61. The following table represents the split of Direct and CAI spend within this MSIP submission. The split is based on NGET's understanding of the definition of the scope of Closely Associated Indirects at the time of preparation (January 2024), and in particular the classification of those activities undertaken by contractors in the course of delivering assets.

62. NGET notes that work is ongoing between the TOs and Ofgem regarding application of the Opex Escalator mechanism and the definition of Indirect activities, and therefore this interpretation of CAI may be is subject to change. It is worth nothing that, should the Opex Escalator be applied by Ofgem to the January 2024 MSIPs in the same manner as it was applied by Ofgem to NGET's January 2022 MSIPs (in its decision of 6 October 2023) , it is unlikely that incurred CAI spend will be fully funded on all projects; we therefore believe that such under-funding should fall within the scope of the Opex Escalator True-up Mechanism currently being discussed with Ofgem.

Table 8 – CAI/Direct split – Cost Model Tab reference 1.9

Cost Firmness	Total (£)	% of Total
CAI	XXXX	XXXX
Direct	XXXX	XXXX
Total	XXXX	XXXX

4.2.6 Detailed Breakdown of Direct costs

63. The following sections discuss the component parts of the project's Direct costs. These figures differ to those within Table 5 (Summary Table) due to not including for any indirect costs.

4.2.6.1 Third Party Costs XXXX

64. The tables below show a summary of the main direct third-party costs required to deliver Stalybridge 400kV Substation – 200 MVAr Unit. Further detail can be found in the Cost Model, tab reference 1.3.

65. Of the main costs in the table below the [redacted] and [redacted] contracts are being managed by NGET Asset Operations who are taking the role of principal contractor.

66. Using industry standard procurement processes under the requirements of Utilities Contract Regulations (UCR), NGET ensured services were efficiently procured. For details on work completed, please see chapter 8 - Project Delivery.

67. [redacted] – This relates to protection and control of substation plant to provide protection of installation e.g., against surges. [redacted]

68. [redacted] – [redacted] were awarded a contract for civils work including construction of the plinth and bund. [redacted]

69. [redacted] – Design and installation of a noise enclosure. [redacted]

70. [redacted] – Detailed design and development support for the project development and delivery phases. [redacted]

Table 9 – Summary of key Third party costs – Cost Model tab reference 1.3

Activity	Provider	2022/23	2023/24	2025/26	Total (£)
P&C contractor	[redacted]	-	[redacted]	-	[redacted]
Civil works including plinth & bund construction	[redacted]	-	[redacted]	-	[redacted]
Noise enclosure	[redacted]	-	[redacted]	-	[redacted]
Detailed design	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

4.2.6.2 Direct Procurement [redacted]

71. The tables below show the main directs items required to be procured for Stalybridge 400kV Substation – 200 MVAr Unit.

72. When reviewing the main costs in the table below, it is important to note that NGET Asset Operations managed the [redacted] contract whilst enacting the role of principal contractor.

73. Using industry standard procurement processes under the requirements of Utilities Contract Regulations (UCR), NGET ensured services were efficiently procured. For details on work completed, please see chapter 8 - Project Delivery.

74. [redacted] – The majority of the spend to-date is in relation to the manufacturing and delivery of the 400kV Shunt Reactor by [redacted]. This has been successfully delivered and installed onto a plinth where it's currently being commissioned. [redacted]

75. [redacted] – Circuit breaker procurement. This contract was tendered using market standard processes.

Table 10 – Direct procurement – Cost Model tab reference 1.7

Element	Provider	2022/23	2023/24	2024/25	Total (£)
Primary equipment	[redacted]	-	[redacted]	-	[redacted]
Shunt reactor	[redacted]	[redacted]	[redacted]	-	[redacted]

4.2.6.3 NG AO Works Delivery, [redacted]

76. NGET Asset Operations are directly undertaking the contract and delivery management of the Pennine Pathfinder's projects, including enacting the role of principal contractor under CDM to deliver the Stalybridge 400 kV Substation – 200 MVAr Unit. These costs relate to NGET staff who are delivering the work; however, these would normally appear as contractor costs where a Main Works Contractor has undertaken this role. As such, these NGET staff costs related to undertaking the contract and delivery management of the scheme, including acting as principal contractor, have not been funded by an existing allowance.

77. NGET Asset Operations undertaking this direct delivery role was elected as the most suitable approach to ensure NGET could meet the customer's challenging timelines.

78. The total works delivery cost is [redacted] of which [redacted] is direct and [redacted] is indirect.

79. The table below shows the roles required by NG Asset Operations to complete Stalybridge 400 kV Substation – 200 MVAr Unit as per their role as Principal Contractor under CDM.

80. The days and rates used to calculate these costs are shown in the Cost Model tab reference 1.4.

Table 11 – NGET AO works delivery cost summary - Cost Model tab reference 1.4.

Description	2018/19 price base (£)	Direct/CAI
[redacted]	[redacted]	CAI
[redacted]	[redacted]	Direct

Description	2018/19 price base (£)	Direct/CAI
[redacted]	[redacted]	Direct
[redacted]	[redacted]	CAI
[redacted]	[redacted]	CAI
[redacted]	[redacted]	Direct
[redacted]	[redacted]	Direct
[redacted]	[redacted]	Direct
[redacted]	[redacted]	Direct
[redacted]	[redacted]	Direct
[redacted]	[redacted]	Direct
[redacted]	[redacted]	Direct
Total		

4.2.6.4 ET Operations, [redacted]

81. This cost category relates to other NGET resource supporting the project's delivery as TO.

82. It is important to note that this table only shows additional ET operation costs that are required to be conducted by NGET in a business-as-usual manner on all projects. These costs are outside of the scope of the role being taken by NGET Asset Operations acting as principal contractor under Works Delivery.

Table 12 – ET operations cost summary - Cost Model tab reference 1.4.

Description	2018/19 price base (£)
[redacted]	[redacted]
[redacted]	[redacted]
Total	[redacted]

83. The days and rates used to calculate these costs are shown in the cost model, tab reference 1.4.

4.2.6.5 Contract Inflation [redacted]

84. [redacted]

85. [redacted]

4.2.7 Risk & Contingency

86. A risk management process has been adopted to set out a framework for managing reasonably foreseeable risks in a proactive, efficient approach that will not impede delivery of this project. This process is an iterative process and is reviewed on a regular basis to capture any new risks, update any existing risks and remove any risks that have materialised.

87. The following key programme and project risks have been identified and incorporated into the analysis to produce the contingency provided within the table below. The table takes an extract of all risks with a value above [redacted]. The full risk assessment including contingency values is available within the Stalybridge cost model (Appendix D).

Table 13 – Risk Register, Cost Model tab reference 4.1.

Cause	Impact	Mitigation	Contingency Value (2018/19 price base)
[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]

4.3 Detailed costs - Stocksbridge

4.3.1 Introduction

88. This section provides a breakdown of the overall costs for Stocksbridge 400 kV Substation – 200 MVAr Unit including an expenditure profile for all Regulatory Years of delivery.

89. The following cost breakdown represents our latest view of costs for the proposed investment in 2018/19 price base. Due to the project being underway in delivery, the forecasts in this breakdown are primarily on actuals rather than estimates.

90. Appendix E Reopener Cost Model - Stocksbridge submitted alongside this document provides a breakdown of the costs in more detail and should be reviewed alongside this chapter.

91. This Chapter is broken down into the following sections.

4.3.2. Total Allowance Request
4.3.3 Cost Estimate
4.3.4 Cost Firmness
4.3.5 Direct & CAI
4.3.6 Detailed breakdown of Direct costs

4.3.2 Total Allowance Request

92. Total project costs are XXXX, NGET requests XXXX allowance is provided through the MSIP reopener mechanism to recover the direct portion of costs and deliver works described above. The MSIP reopener mechanism is subject to the Opex escalator and therefore indirect costs will be funded under this route.

Table 14 – Allowance request – Cost Model tab reference 1.0

	2018/19 price base (£)			
	2022/23	2023/24	2024/25	Total
Total Project Costs	XXXX	XXXX	XXXX	XXXX
Allowance Request (Direct Only)	XXXX	XXXX	XXXX	XXXX

4.3.3 Cost Estimate

93. The total cost to develop and deliver Stocksbridge 400 kV Substation – 200 MVAr Unit is £5.7m. This table and figure include both direct, indirect and costs incurred to date.

94. The tables below show a summary of costs including annual phasing.

Table 15 – Cost Summary – Cost Model tab reference 1.1

Element	Total (£)	CAI/Direct	Source
Contractor Costs			
Third Party Costs	XXXX	Direct/CAI	Majority based on contracts and quotes

Element	Total (£)	CAI/Direct	Source
National Grid Costs			
Direct Procurement	XXXX	Direct	Majority based on contracts and quotes
NG AO Works Delivery	XXXX	Direct/CAI	Estimated based on number of days and rates for resource required
ET Ops	XXXX	Direct	Estimated based on number of days and rates for resource required
Project Management	XXXX	CAI	Estimated based on number of days and rates for resource required
Project Services	XXXX	CAI	Estimated based on number of days and rates for resource required
Support Functions	XXXX	CAI	Estimated based on number of days and rates for resource required
NGET Portfolio Costs	XXXX	CAI	NGET internal estimates
Other			
Contract Inflation	XXXX	Direct	XXXXXXXXX
Risk	XXXX	Direct	Risk register
Total	XXXX		

Table 16 – Annual Phasing – Cost Model tab reference 1.1

Element	2022/23	2023/24	2024/25	Total (£)
Contractor Costs				
Third Party Costs	XXXX	XXXX	XXXX	XXXX
National Grid Costs				
Direct Procurement	XXXX	XXXX	XXXX	XXXX
NG AO Works Delivery	XXXX	XXXX	XXXX	XXXX
ET Ops	-	XXXX	XXXX	XXXX
Project Management	XXXX	XXXX	XXXX	XXXX
Project Services	-	XXXX	XXXX	XXXX
Support Functions	XXXX	-	-	XXXX
NGET Portfolio Costs		XXXX	XXXX	XXXX
Other				
Contract Inflation		XXXX		XXXX
Risk	-	XXXX	XXXX	XXXX
Total	XXXX	XXXX	XXXX	XXXX

4.3.4 Cost Firmness

95. 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 XXX of the total costs are either incurred or have been contracted, giving high confidence in our cost submission. This value was calculated by taking cost firmness levels 1-3 and dividing by the total costs.

Table 17 – Cost Firmness – Cost Model Tab reference 1.10

Cost Firmness	Total (£)	Notes
1 - Fixed	XXXX	22/23 and 2023/24 timesheets and invoices
2 - Agreed remeasurable	XXXX	Procurement and third-party costs where contract/quote is available (less actuals), XXXXXXXXX
3 - Agreed remeasurable future information	XXXX	Procurement and third-party costs where contract/quote is available (less actuals) but subject to change.
4 - Estimated	XXXX	Risks, NG costs (less actuals).
5 - Early Estimate	0	
Total	XXXX	

96. Most estimated costs relate to NG staff costs which have been estimated based on the resources required to complete the works. This is calculated using forecast days multiplied by daily rates.

4.3.5 Direct & CAI Split

97. Table 18 below provides the split between direct and indirect costs related to this project.

98. The costs of the Closely Associated Indirect (CAI) activities are incremental to the funding we received as part of our T2 baseline allowances. The T2 Baseline allowances for CAI were determined through Ofgem's regression (econometric) model, one of the key inputs being the baseline load and non-load capital allowances and as such no funding has been provided for this MSIP project. The costs are therefore in addition to the CAI allowances provided in T2 Final Determinations and should there be funded via the Opex Escalator mechanism.

99. The following table represents the split of Direct and CAI spend within this MSIP submission. The split is based on NGET's understanding of the definition of the scope of Closely Associated Indirects at the time of preparation (January 2024), and in particular the classification of those activities undertaken by contractors in the course of delivering assets.

100. NGET notes that work is ongoing between the TOs and Ofgem regarding application of the Opex Escalator mechanism and the definition of Indirect activities, and therefore this interpretation of CAI may be is subject to change. It is worth nothing that, should the Opex Escalator be applied by Ofgem to the January 2024 MSIPs in the same manner as it was

applied by Ofgem to NGET's January 2022 MSIPs (in its decision of 6 October 2023) , it is unlikely that incurred CAI spend will be fully funded on all projects; we therefore believe that such under-funding should fall within the scope of the Opex Escalator True-up Mechanism currently being discussed with Ofgem.

Table 18 – CAI/Direct split – Cost Model Tab reference 1.10

Cost Firmness	Total (£)	% of Total
CAI	[redacted]	[redacted]
Direct	[redacted]	[redacted]
Total	[redacted]	[redacted]

4.3.6 Detailed Breakdown of Direct costs

101. The following sections discuss the component parts of the project's Direct costs. These figures differ to those within Table 15 (Summary Table) due to not including for any indirect costs.

4.3.6.1 Third Party Costs [redacted]

102. The table below shows a summary of the main direct third-party costs required to deliver Stocksbridge 400 kV Substation – 200 MVAr Unit.

103. Of the main costs in the table below the [redacted] and [redacted] contracts are being managed by NGET Asset Operations who are taking the role of principal contractor.

104. Using industry standard procurement processes under the requirements of Utilities Contract Regulations (UCR), NGET ensured services were efficiently procured. For details on work completed, please see chapter 8 - Project Delivery.

105. [redacted] - This relates to protection and control of substation plant to provide protection of installation e.g., against surges. [redacted]

106. [redacted] – [redacted] awarded a contract for civils work including construction of the plinth and bund. [redacted]

107. [redacted] – Software and hardware upgrades for control system. This contractor was used as they were the original suppliers.

108. [redacted] – Detailed design and development support for project development and delivery phases. [redacted]

Table 19 – Summary of key third party costs – Cost Model tab reference 1.3

Activity	Provider	2022/23	2023/24	2024/25	Total (£)
Protection Equipment, Design & installation	[redacted]	-	[redacted]	[redacted]	[redacted]
Civil works including plinth and bund construction	[redacted]	-	[redacted]	-	[redacted]
DSS - Software and Hardware modification inc cubicles	[redacted]	-	[redacted]	[redacted]	[redacted]
Detailed design	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

4.3.6.2 Direct Procurement [redacted]

109. The tables below show the main directs items required to be procured for Stocksbridge 400kV Substation – 200 MVAr Unit.

110. When reviewing the main costs in the table below, it is important to note that NGET Asset Operations managed the [redacted] contract whilst enacting the role of principal contractor.

111. Using industry standard procurement processes under the requirements of Utilities Contract Regulations (UCR), NGET ensured services were efficiently procured. For details on work completed, please see chapter 8 - Project Delivery.

112. [redacted] - The majority of the spend to-date is in relation the manufacturing and delivery of the 400kV Shunt Reactor by [redacted]. This has been successfully delivered and installed onto a plinth where it's currently being commissioned. [redacted]

113. [redacted] – Circuit breaker procurement. This contract was tendered using market standard processes.

Table 20 – Summary of main Direct procurement – Cost Model tab reference 1.7

Element	Provider	2022/23	2023/24	2024/25	Total (£)
Primary equipment - circuit breaker & surge arrestors	XXXXXXXXX	-	[redacted]	-	[redacted]
Shunt Reactor	XXXXXX	[redacted]	[redacted]	-	[redacted]

4.3.6.3 NG AO Works Delivery XXXX

114. NGET Asset Operations are directly undertaking the contract and delivery management of the Pennine Pathfinder's projects, including enacting the role of principal contractor under CDM to deliver the Stocksbridge 400kV Substation – 200 MVAr Unit. These costs relate to NGET staff who are delivering the work; however, these would normally appear as contractor costs where a Main Works Contractor has undertaken this role. As such, these NGET staff costs related to undertaking the contract and delivery management of the scheme, including acting as principal contractor, have not been funded by an existing allowance.

115. NGET Asset Operations undertaking this direct delivery role was elected as the most suitable approach to ensure NGET could meet the customer's challenging timelines.

116. The total works delivery cost is XXXX of which XXXX is direct and £0.1m is indirect.

117. The table below shows the roles required by NG Asset Operations to complete Stocksbridge 400kV Substation – 200 MVAr Unit as per their role as Principal Contractor under CDM.

Table 21 – NGET works delivery cost summary - Cost Model tab reference 1.4.

Description	2018/19 price base (£)	Direct/CAI
XXXXXXXXXXXXX	XXXX	CAI
XXXXXX	XXXX	Direct
XXXXXXXXXX	XXXX	CAI
XXXXXXXXXX	XXXX	CAI
XXXXXXXXXX	XXXX	Direct
XXXXXXXXXXXXXX	XXXX	Direct
XXXXXXXXXXXX	XXXX	Direct
XXXXXXXX	XXXX	Direct
XXXXXXX	XXXX	Direct
XXXXXXXXXXXXXXX	XXXX	Direct
XXXXXXXX	XXXX	Direct
XXXXXXXXXXXX	XXXX	Direct
Total	XXXX	

118. The days and rates used to calculate these costs are shown in the cost model tab reference 1.4.

4.3.6.4 ET Operations, XXXX

119. This cost category relates to other NGET resource supporting the project's delivery as TO.

120. It is important to note that this table only shows additional ET operation costs that are required to be conducted by NGET in a business-as-usual manner on all projects. These costs are

outside of the scope of the role being taken by NGET Asset Operations acting as principal contractor under Works Delivery.

Table 22 – ET operations cost summary - Cost Model tab reference 1.4.

Description	2018/19 price base (£)
[redacted]	[redacted]
[redacted]	[redacted]
Total	[redacted]

121. The days and rates used to calculate these costs are shown in the cost model, tab reference 1.4.

4.3.6.5 Contract Inflation [redacted]

122. [redacted]

123. [redacted]

4.3.7 Risk & Contingency

124. A risk management process has been adopted to set out a framework for managing reasonably foreseeable risks in a proactive, efficient approach that will not impede delivery of this project. This process is an iterative process and is reviewed on a regular basis to capture any new risks, update any existing risks and remove any risks that have materialised.

125. The following key programme and project risks have been identified and incorporated into the analysis to produce the contingency provided within the table below. The table takes an extract of all risks with a value above 40%. The full risk assessment including contingency values is available within the Stocksbridge cost model (Appendix E).

Table 23 – Risk Register, Cost Model tab reference 4.1

Cause	Impact	Mitigation	Contingency Value (2018/19 Prices)
[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]

4.4 Detailed Costs – Bradford West

4.4.1 Introduction

126. This section provides a breakdown of the overall costs for Bradford West 275kV Substation – 100 MVAr Unit including an expenditure profile for all Regulatory Years of delivery.

127. The following cost breakdown represents our latest view of costs for the proposed investment in 2018/19 price base. Due to the project being underway in delivery, the forecasts in this breakdown are primarily on actuals rather than estimates.

128. Appendix F Reopener Cost Model - Bradford West submitted alongside this document provides a breakdown of the costs in more detail and should be reviewed alongside this chapter.

129. This Chapter is broken down into the following sections:

4.4.2 Total Allowance Request

4.4.3 Cost Estimate

4.4.4 Cost Firmness

4.4.5 Direct & CAI

4.4.6 Detailed breakdown of Direct costs

4.4.2 Total Allowance Request

130. Total project costs are XXXX, NGET requests XXXX allowance is provided through the MSIP reopener mechanism to recover the direct portion of costs and deliver works described above. The MSIP reopener mechanism is subject to the Opex escalator and therefore indirect costs will be funded under this route.

Table 24 – Allowance request – Cost Model tab reference 1.0

	2018/19 price base (£)			
	2022/23	**2023/24**	**2024/25**	**Total**
Total Project Costs	XXXX	XXXX	XXXX	XXXX
Allowance Request (Direct Only)	XXXX	XXXX	XXXX	XXXX

4.4.3 Cost Estimate

131. The total cost to develop and deliver Bradford West 275kV Substation – 100 MVAr Unit is XXXX This table and figures include both direct, indirect and costs incurred to date.

132. The tables below show a summary of costs including annual phasing.

Table 25 – Cost Summary – Cost Model tab reference 1.1

Element	Total (£)	CAI/ Direct	Source
Contractor Costs			
Third Party Costs	XXXX	Direct/CAI	Majority based on contracts and quotes
National Grid Costs			
Direct Procurement	XXXX	Direct	Majority based on contracts and quotes
NG AO Works Delivery	XXXX	Direct/CAI	Estimated based on number of days and rates for resource required
ET Ops	XXXX	Direct	Estimated based on number of days and rates for resource required
Project Management	XXXX	CAI	Estimated based on number of days and rates for resource required
Project Services	XXXX	CAI	Estimated based on number of days and rates for resource required
Support Functions	XXXX	CAI	Estimated based on number of days and rates for resource required
NGET Portfolio Costs	XXXX	CAI	NGET internal estimates
Other			
Contract Inflation	XXXX	Direct	XXXXXXXXXXXXXXXX
Risk	XXXX	Direct	Risk register
Total	XXXX		

Table 26 – Annual Phasing – Cost Model tab reference 1.1

Element	2022/23	2023/24	2024/25	Total (£)
Contractor Costs				
Third Party Costs	XXXX	XXXX	XXXX	XXXX
National Grid Costs				
Direct Procurement	XXXX	XXXX	XXXX	XXXX
NG AO Works Delivery	XXXX	XXXX	XXXX	XXXX
ET Ops	-	XXXX	XXXX	XXXX
Project Management	XXXX	XXXX	XXXX	XXXX
Project Services	-	XXXX	XXXX	XXXX
Support Functions	XXXX	-	-	XXXX
NGET Portfolio Costs		XXXX	XXXX	XXXX
Other				
Contract Inflation		XXXX		XXXX
Risk	-	XXXX	XXXX	XXXX
Total	XXXX	XXXX	XXXX	XXXX

4.4.4 Cost Firmness

133. 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 XXX of the total costs are either incurred or have been contracted, giving high confidence in our cost submission. This value was calculated by taking cost firmness levels 1-3 and dividing by the total costs.

Table 27 – Cost Firmness – Cost Model Tab reference 1.9

Cost Firmness	Total	Notes
1 - Fixed	XXXX	22/23 and 2023/24 Timesheets and invoices
2 - Agreed remeasurable	XXXX	Procurement and third-party costs where contract/quote is available (less actuals), contract inflation.
3 - Agreed remeasurable future information	XXXX	Procurement and third-party costs where contract/quote is available (less actuals) but subject to change.
4 - Estimated	XXXX	Risks, NG costs (less actuals).
5 - Early Estimate	0	
Total	XXXX	

134. Most estimated costs relate to NG staff costs which have been estimated based on the resources required to complete the works. This is calculated using forecast days multiplied by daily rates.

4.4.5 Direct & CAI Split

135. Table 28 below provides the split between direct and indirect costs related to this project.

136. The costs of the Closely Associated Indirect (CAI) activities are incremental to the funding we received as part of our T2 baseline allowances. The T2 Baseline allowances for CAI were determined through Ofgem's regression (econometric) model, one of the key inputs being the baseline load and non-load capital allowances and as such no funding has been provided for this MSIP project. The costs are therefore in addition to the CAI allowances provided in T2 Final Determinations and should there be funded via the Opex Escalator mechanism.

137. The following table represents the split of Direct and CAI spend within this MSIP submission. The split is based on NGET's understanding of the definition of the scope of Closely Associated Indirects at the time of preparation (January 2024), and in particular the classification of those activities undertaken by contractors in the course of delivering assets.

138. NGET notes that work is ongoing between the TOs and Ofgem regarding application of the Opex Escalator mechanism and the definition of Indirect activities, and therefore this interpretation of CAI may be is subject to change. It is worth nothing that, should the Opex Escalator be applied by Ofgem to the January 2024 MSIPs in the same manner as it was applied by Ofgem to NGET's January 2022 MSIPs (in its decision of 6 October 2023) , it is unlikely that incurred CAI spend will be fully funded on all projects; we therefore believe that such under-funding should fall within the scope of the Opex Escalator True-up Mechanism currently being discussed with Ofgem.

Table 28 – CAI/Direct split – Cost Model Tab reference 1.9

Cost Firmness	Total (£)	% of Total
CAI	XXXX	XXXX
Direct	XXXX	XXXX
Total	XXXX	XXXX

4.4.6 Detailed Breakdown of Direct costs

139. The following sections discuss the component parts of the project's Direct costs. These figures differ to those within Table 25 (Summary Table) due to not including for any indirect costs.

4.4.6.1 Third Party Costs XXXX

140. The tables below show a summary of the main direct third-party costs required to deliver Bradford West 275kV Substation – 100 MVAr Unit.

141. Of the main costs in the table below the XXXXXXXX, XXXXXXXXXXX, XXXX, XX XXXXXXX and XXXXX contracts are being managed by NGET Asset Operations who are taking the role of principal contractor.

142. Using industry standard procurement processes under the requirements of Utilities Contract Regulations (UCR), NGET ensured services were efficiently procured. For details on work completed, please see chapter 8 - Project Delivery.

143. [redacted] - This relates to protection and control of substation plant to provide protection of installation e.g., against surges. [redacted]

144. [redacted]– [redacted] were awarded a contract for civils work including construction of the plinth and bund. [redacted] The key factor behind why civils costs for Bradford West appear relatively higher than for Stockbridge and Stalybridge is due to the larger footprint of the site. This increase in size involves more cabling work, longer installation time and increased wiring volumes to be procured and laid.

145. [redacted] – Software and hardware upgrades for control system. [redacted]

146. [redacted] – Design and installation of a noise enclosure. [redacted]

147. [redacted] – site manager and safety advisor were compliantly procured through the Professional Services framework [redacted]

148. [redacted] – Detailed design and development support for the project development and delivery phases. [redacted]

Table 29 – Third party costs – Cost Model tab reference 1.3

Activity	Provider	2022/23	2023/24	2024/25	Total (£)
P&C contractor and equipment installation	[redacted]	-	[redacted]	[redacted]	[redacted]
Civils work including plinth and bund construction	[redacted]	-	[redacted]	-	[redacted]
DSS - Software and hardware upgrades inc cubicles	[redacted]	-	[redacted]	-	[redacted]
Noise enclosure	[redacted]	-	[redacted]	-	[redacted]
Site manager and safety advisor	[redacted]	-	[redacted]	[redacted]	[redacted]
Detailed Design	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

4.4.6.2 Direct Procurement [redacted]

149. The tables below show the main directs items required to be procured Bradford West 275kV Substation – 100 MVAr Unit.

150. When reviewing the main costs in the table below, it is important to note that NGET Asset Operations managed the [redacted] contract whilst enacting the role of principal contractor.

151. Using industry standard procurement processes under the requirements of Utilities Contract Regulations (UCR), NGET ensured services were efficiently procured. For details on work completed, please see chapter 8 - Project Delivery.

152. [redacted] - The majority of the spend to-date is in relation the manufacturing and delivery of the 275kV Shunt Reactor by [redacted]. This has been successfully delivered and installed onto a plinth where it's currently being commissioned. [redacted]

153. [redacted] – Circuit breaker procurement. This contract was tendered using market standard processes.

Table 30 – Summary of key Direct procurement – Cost Model tab reference 1.7

Element	Provider	2022/23	2023/24	2024/25	Total (£)
Primary equipment	[redacted]	-	[redacted]	-	[redacted]
Shunt Reactor	[redacted]	[redacted]	[redacted]	-	[redacted]

4.4.6.3 NG AO Works Delivery, [redacted]

154. NGET Asset Operations are directly undertaking the contract and delivery management of the Pennine Pathfinder's projects, including enacting the role of principal contractor under CDM to deliver the Bradford West 275kV Substation – 100 MVAr Unit. These costs relate to NGET staff who are delivering the work; however, these would normally appear as contractor costs where a Main Works Contractor has undertaken this role. As such, these NGET staff costs related to undertaking the contract and delivery management of the scheme, including acting as principal contractor, have not been funded by an existing allowance.

155. NGET Asset Operations undertaking this direct delivery role was elected as the most suitable approach to ensure NGET could meet the customer's challenging timelines.

156. The total works delivery cost is [redacted] of which [redacted] is direct and [redacted] is indirect.

157. The table below shows the roles required by NG Asset Operations to complete Bradford West 275kV Substation – 100MVAr Unit as per their role as Principal Contractor under CDM.

Table 31 – NGET works delivery cost summary - Cost Model tab reference 1.4.

Description	2018/19 price base (£)	Direct/CAI
[redacted]	[redacted]	CAI
[redacted]	[redacted]	CAI
[redacted]	[redacted]	CAI
[redacted]	[redacted]	Direct
[redacted]	[redacted]	CAI
[redacted]	[redacted]	Direct
[redacted]	[redacted]	Direct
[redacted]	[redacted]	Direct
[redacted]	[redacted]	Direct
[redacted]	[redacted]	Direct
[redacted]	[redacted]	Direct
[redacted]	[redacted]	Direct
[redacted]	[redacted]	Direct
Total	[redacted]	

158. The days and rates used to calculate these costs are shown in the cost model tab reference 1.4.

4.4.6.4 ET Operations, [redacted]

159. This cost category relates to other NGET resource supporting the project's delivery as TO.

160. It is important to note that this table only shows additional ET operation costs that are required to be conducted by NGET in a business-as-usual manner on all projects. These costs are outside of the scope of the role being taken by NGET Asset Operations acting as principal contractor under Works Delivery.

Table 32 – ET operations cost summary - Cost Model tab reference 1.4.

Description	2018/19 price base (£)
[redacted]	[redacted]
[redacted]	[redacted]
Total	[redacted]

161. The days and rates used to calculate these costs are shown in the cost model, tab reference 1.4.

4.4.6.5 Contract Inflation [redacted]

162. [redacted]

[redacted]

163. [redacted]

4.4.7 Risk & Contingency

164. A risk management process has been adopted to set out a framework for managing reasonably foreseeable risks in a proactive, efficient approach that will not impede delivery of this project. This process is an iterative process and is reviewed on a regular basis to capture any new risks, update any existing risks and remove any risks that have materialised.

165. The following key programme and project risks have been identified and incorporated into the analysis to produce the contingency provided within the table below. The table takes an extract of all risks with a value above 40%. The full risk assessment including contingency values is available within the Bradford West cost model (Appendix F).

Table 33 – Extract of Risks from Cost Model Bradford West. Cost Model tab reference 4.1

Description & Cause	Impact	Mitigation	Contingency Value (2018/19 Prices)
[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]

5. Deliverability, Risk & Regulatory Outcome

166. This section will document the approach to delivery, list any potential deliverability constraints and associated mitigation strategies that will need to be implemented to minimise the risk.

167. Throughout the build phase, construction progress has been monitored and managed carefully against milestones between NGET and our Contractors. One example of this includes decisions made at Bradford West, where during the build phase the NGET PM team assessed and dealt successfully with some detailed changes to the civils works. A decision was made to adapt some new infrastructure now to bring efficiency for the consumers due to a later planned mesh to a double bus bar arrangement scheme configuration change.

5.1 Procurement Strategy

168. NGET opted to utilise its own Asset Operations department to deliver the works for the Pennine Pathfinders project. NGET recognises that this delivery approach was not originally identified within NGET's January 2023 Needs Case submission, however this delivery approach was later identified as being the most appropriate and available solution to meet the challenging timescales required by the customer. This delivery strategy has continued throughout the project.

169. In this model, Asset Operations undertook the Principal Contractor role, including project management, and administered the works using externally contracted resources, XXXXXXXX XXXXXXXXXXXXXXXXXX. The key benefits this approach enables is mitigating the lead times associated with tendering contracts through NGET's EPC framework, thereby supporting efficient programme delivery in the interest of the customer and consumers. In line with Utilities Contract Regulations and industry standard procurement processes, the individual external contractors have all been appointed via existing frameworks to ensure cost effectiveness and prequalified technical competence.

5.2 Project Plan

170. At the time of writing this funding submission, commissioning start is on target in early 2024 for the reactors at Bradford West and Stalybridge. All the required materials are on site, commissioning resource secured, and outages booked for testing of HV wound plant as well as its protection and control functions to enable energisation and integration onto the transmission system by 30th April 2024 for Stalybridge and Bradford West and 12th May 2024 for Stocksbridge.

171. The unit delivered to Stocksbridge met some delays in shipping and transportation which put the delivery date back slightly, however the unit has been safely positioned on its foundations and component testing is progressing well. We can report that the forecast completion and energisation date is 12th May 2024.

172. Below is the key progress across the 3 sites to provide context of the level of monitoring being conducted by NGET to assess project delivery:

- **Stalybridge**
  - FEED Contract – completed.
  - Detailed Design Contract – completed.
  - Site Establishment and Welfare – completed.
  - Civil Works, bund, plinth, bases, ducting and drainage – completed.
  - 200MVAr Shunt Reactor and installation – ongoing (reactor on site)
  - 400kV Point on Wave Circuit Breaker and installation – completed.
  - 400kV Disconnector and installation – completed.
  - Shunt Reactor Bay Protection and Control Solution and installation – ongoing
  - Relocation of existing diesel generator for facilitate reactor bay footprint – completed.
- **Stocksbridge**
  - FEED Contract – completed.
  - Detailed Design Contract – completed.
  - Site Establishment and Welfare – completed.
  - Removal of existing SGTs – completed.
  - Removal of decommissioned fire deluge system – efficiencies to increase space and laydown area and reduce costs for “off-site” storage and/or additional security – completed.
  - Civil Works, bund, plinth, bases, ducting and drainage. – completed
  - Civil Scope changed due to need for dedicated Circuit Breaker, previously agreed in submissions and Q&A – completed.
  - 200MVAr Shunt Reactor and installation – ongoing
  - 400kV Point on Wave Circuit Breaker and installation.
  - 400kV Disconnector and installation – ongoing
  - Shunt Reactor Bay Protection and Control Solution and installation – ongoing
  - Access road – completed.
- **Bradford West**
  - FEED Contract – completed.
  - Detailed Design Contract – completed.

- Site Establishment and Welfare – completed.
- Civil Works, bund, plinth, bases, ducting and drainage – completed.
- Civil Scope changed to include relocation of existing site interceptor following need to relocate the bay to future proof substation conversion from MESH to Double Bus – completed.
- 100MVAr Shunt Reactor and installation – ongoing.
- 275kV Point on Wave Circuit Breaker and installation – ongoing.
- 275kV Disconnector and installation – ongoing.

5.3 Stakeholder engagement

173. The stakeholder engagement strategy has included the following elements:

- Internal engagement and governance approvals with senior managers/stakeholders from NGET Asset Operations who have been acting as principal contract under CDM, coordinating and managing effective project delivery.
- Customer engagement with NGESO via bi-monthly project meetings to review the project status, programme, progress and resolve any issues arising to ensure it met expectations.
- External stakeholder engagement has centred on a few specific items:
  - For Stocksbridge, 3rd party land was utilised. This was previously unadopted but became adopted at the start of the project, so appropriate coordination and liaison was required with Stocksbridge Town and Sheffield City Councils. (Similar engagement was not required at the other locations as all project activity was within existing boundaries and did not require the involvement of 3rd parties).
  - Additional statutory consultees such as National Highways and local councils were also engaged for the delivery of abnormal heavy loads, as required.
  - Given formal noise assessments undertaken at the sites recognised a need for the inclusion of noise enclosures at Stalybridge and Bradford West, NGET proceeded to include for these within the project scope. Given these noise enclosures were in the interest of keeping noise levels within suitable limits of these rural locations, NGET did not deem external stakeholder engagement necessary to make a decision for noise enclosure inclusion.

174. Engagement with internal and external stakeholders is now drawing to a conclusion as the site works are coming to completion. The project has been seen as a success. There have been no stakeholder engagement issues since the options were originally selected.

5.4 Price control deliverables

175. As there are no Output Measures which could be used to fund the projects against the requirements, it is proposed that an evaluative Price Control Deliverable is defined.

176. Deliver 500MVAr reactive power in the Pennines area across the following 3 sites by the proposed dates:

- 200 MVAr at Stalybridge 400kV by 30th April 2024,
- 100MVAr at Bradford West 275kV substation by 30th April 2024,
- 200MVAr at Stocksbridge 400kV substation by 12th May 2024.

6. Conclusion

177. This document is an update on the previous MSIP submission to Ofgem in January 2023 by NGET for the Pennine Pathfinder project during the RIIO-T2 Price Control period. This is submitted under the MSIP re-opener provided for in Special Condition 3.14, paragraph (f) of the NGET Transmission Licence. Ofgem approved in principle the Needs Case from 2023 and requested resubmission in the January 2024 window with the detailed cost information.

178. This paper has demonstrated the need for investment (the 'Investment') to provide new shunt reactors connected to the following NGET sites in the North of England:

- Stocksbridge 400kV substation – 200 MVAr Unit
- Bradford West 275kV substation – 100 MVAr Unit
- Stalybridge 400kV substation – 200 MVAr Unit

179. The paper summarised the optioneering analysis that led us to our proposed solution. The following table summarises the main drivers for this Investment, the selected option, estimated costs and forecasted outputs.

Table 34 – Conclusion Summary

Main drivers	A minimum of 500MVAr are required for voltage control across three sites in the Pennines area. The requirement to control the voltage was defined based on NGESO technical studies, to focus on the most beneficial sites and ensure the entire region is compliant when considering contingencies across a wider network area.
Selected Option	• **Stocksbridge 400kV –** Build a new plinth and bunded area connection at Mesh Corner 2 of Stocksbridge 400kV substation. This option was chosen as that site has more available space and thus can mitigate any delivery and safety concerns. • **Bradford West 275kV** – Build a new plinth and bunded area connection at Mesh Corner 1 of Bradford West 275kV substation. This option was chosen as that site has more available space and thus can mitigate any delivery and safety concerns. • **Stalybridge 400kV** – Build a new plinth and bunded area connection at Mesh Corner 1 of Stalybridge 400kV substation. This option was chosen as it is expected to be the cheapest and also provides consumers with the most value in terms of earliest connection date and lowest project risk.
Estimated Cost	• **Stocksbridge 400kV** – [redacted] • **Bradford West 275kV** – [redacted] • **Stalybridge 400kV** – [redacted]
Outputs	• 200MVAr at **Stocksbridge 400kV** substation by 12th May 2024. • 100MVAr at **Bradford West 275kV** substation by 30th April 2024 • 200 MVAr at **Stalybridge 400kV** by 30th April 2024

7. Overview of assurance and point of contact.

180. Appendix G, contains the assurance statement letter, providing written confirmation in line with the assurance requirements set out in Ofgem's Re-opener Guidance and Application Requirements Document, dated 17th February 2023.

181. This confirmation is provided by the Head of Future Price Controls, Electricity Transmission, accountable for re-opener submission 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 best value for consumers.
- Quality assurance processes are in place to ensure NGET 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 NGET.

182. NGET's designated point of contact for this MSIP application is XXXXXXX, Regulatory Development Manager, email XXXXXXXXXXXXXXXXXX, telephone XXXXXXXXXXXXX

Appendixes

Appendix A ESO Response to NGET Counterfactual Submission	National Grid Electricity Transmissio
Appendix B Previously submitted re-opener MSIP Need Case submission	Jan 23_MSIP_Pathfinder_N
Appendix C Pennine Pathfinders MSIP Jan 23 Needs Case previous Supplementary Questions (SQs)	Pennine Pathdinders MSIP - Jan 23 Needs
Appendix D Reopener Cost Model - Stalybridge	Reopener%20Cost%20Model%20-%20Staly
Appendix E Reopener Cost Model - Stocksbridge	Reopener%20Cost%20Model%20-%20Stoc
Appendix F Reopener Cost Model - Bradford West	Reopener%20Cost%20Model%20-%20Brad
Appendix G Assurance Statement Letter	APPENDIX G - Assurance Statement
Appendix H Reopener Guidance Checklist	APPENDIX H - Reopener Guidance -
Appendix I Direct Costs/ Asset Table	MSIPs%20Jan%2024%20Direct%20Costs%

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