nationalgrid

January 2025 MSIP Reopener

MSIP Marston Vale

National Grid Electricity Transmission
Medium Sized Investment Project

January 2025

Contents

Investment Summary

Project Name	Marston Vale (Millbrook)	**Delivery year**	[redacted]
Drivers for the Investment	**Generation: To build a new 4-bay 400kV GIS substation for a contracted customer (Millbrook Power Ltd).** Millbrook Power Ltd. (a Drax company) are constructing a new open-cycle gas turbine (OCGT) in Millbrook, Bedfordshire. The OCGT power station will have the capacity to generate up to 299MW.		
Key considerations & challenges	**Historic nature of the connection**: Drax submitted a Development Consent Order (DCO) for this project in 2017, and NGET assigned an ECI stage 1 contract for design in 2018. Optioneering subsequently reflects our perception of the right thing to do for consumers at the time, with the primary decision-making criterion being cost minimisation for consumers. **Technology choice**: While NGET's current preference is to favour Air Insulated Switchgear (AIS) over Gas Insulated Switchgear (GIS) technology where possible, optioneering occurred in 2018 and the technology choice reflects the decision-making process and constraints at that time, including limited land and that no SF_6-free solutions were available. In 2020, the Secretary of State for Business, Energy and Industrial Strategy (BEIS) authorised a non-material change to the DCO to allow for the construction of a GIS substation instead of an AIS substation, noting this was necessary in order for the customer to construct and operate the power station efficiently and effectively. **Time**[redacted] **Land**: While the land needed for this project was purchased by the customer based on the requirements known at the time, additional land must be purchased to finalise the project.		
Optioneering	NGET considered several options for delivering this customer connection, including three option categories (**do nothing**, **market** and **whole system solutions**) which would not provide a physical connection. NGET considered **utilising an existing substation**, however, this option was discounted as there were no suitable substations where both gas and electricity transmission systems are proximate. NGET then considered several options to **develop a new substation**, of which three were shortlisted: • E-3: AIS substation inside the Rookery Pit and using the existing overhead line (OHL) tower. • E-5: GIS substation next to the OHL tower and using the existing OHL tower. • E-6: GIS substation next to the OHL and installing a new OHL tower.		
Proposed Solution	**Construct a new 4-bay 400kV GIS substation at Millbrook to connect 299MW of OCGT generation to the grid.** The preferred option is to build the substation next to the existing OHL tower and to use the existing tower. The substation will connect to the 400kV Grendon to Sundon double circuit at Tower ZA378 via a double-tee arrangement. This is our preferred option having considered all relevant factors to determine the best overall solution for consumers. This option best supports a timely connection, while accommodating the restrictive location requirements arising from the gas generation connection, as well as managing the technical and land ownership challenges driven by the historic development of the customer's project.		
Outputs of the Investment	**Network capacity**: Building a new 4-bay 400kV GIS substation will enable the supply of 299MW of OCGT generation to the network and enable the customer to deliver its provisional capacity market obligation. This supply will assist in meeting electricity demand throughout the winter period when demand is high. At the time of developing and sanctioning this project, Millbrook Power was the only known connecting customer in the region. However, NGET has seen an increase in demand across all substations, including Marston Vale substation over recent years. Since original optioneering, additional customers have shown interest in connecting in the area. Investigations and option assessments are ongoing to evaluate the feasibility of securing additional land to expand the substation to accommodate additional customers.		
PCD Primary Output	Construct a new 400kV 4-bay substation at Millbrook, Bedfordshire to connect Millbrook Power Ltd. OCGT [redacted]		
Estimated Cost (18/19 prices)	The current total cost of the project is [redacted] The funding allowance being sought is: [redacted]		
Spend profile (18/19 prices)	**T2 (FY2022 – FY2026) and prior:** [redacted]	**T3 (FY 2027 – FY2031):** [redacted]	**T4+ (FY 2032+):** [redacted]
Reporting table	Annual RRP – PCD Table	**PCD Modification Process**	Special Condition 3.14, Appendix 1
Historic funding interactions	No existing funding in RIIO-T1 or RIIO-T2.		

1. Executive summary

1.1 Context

This paper, together with the associated Cost-Benefit Analysis (CBA), summarises NGET's proposed investment to connect a new 400kV Gas Insulated Switchgear (GIS) substation (Marston Vale) at Millbrook, near Bedford, and seeks to demonstrate the consumer interest in the associated investment.

The substation will connect a 299MW open-cycle gas turbine (OCGT) known as 'Millbrook Power' to the network. This will deliver strong consumer benefit by enabling the connection of a significant on-demand source of power to the grid, helping to increase domestic energy security.

This Medium Sized Investment Project (MSIP) paper seeks approval of the need for the investment, as well as approval of the proposed solution and requested funding allowances for efficient spend on the project.

1.2 What is the background to this Investment?

This project is an example of where there is significant elapsed time from the initial development of the solution [redacted] and the submission of a request for allowances. The design decisions reflect the perceived priorities at the time [redacted]

Millbrook Power is a Drax Group project to build and operate a rapid response gas-fired power station on land located near the village of Millbrook in Bedfordshire. The power station will provide back-up to other sources of electricity, including variable renewable energy sources like wind and solar energy, and is the subject of a provisional capacity market agreement for the delivery period of October 2024 to September 2039.[1]

The Millbrook power station will have the capacity to generate up to 299MW – enough instant electricity to power 150,000 households.[2] It will operate as a 'peaking plant', generating electricity at times when need is greatest. The electricity provided through this project will benefit consumers by providing an on-demand electricity source, which will be particularly important during the winter period when demand is high.

Optioneering for this investment occurred in 2018, and key optioneering choices for this project reflect the perceived priorities and preferences at that time, i.e. to meet the need of the customer whilst minimising costs to consumers. These decisions were then reflected in the authorisation of the non-material change to the DCO to allow for the construction of a GIS substation. In the Non Material Change Decision Letter, the Secretary of State for BEIS noted that in order for Millbrook Power Ltd. to construct and operate the power station efficiently and effectively, it was necessary to construct a GIS substation instead of an AIS substation.[3]

This investment was designed to enable the connection of a single customer (Drax), to support the timely connection of a significant source of peaking power to the grid. As a result, our progress was matched to the customer progress.

The Millbrook power station and associated network requirements have been under development for more than ten years (a full timeline is at Section 2, Table 1 below):

- [redacted] While originally contracted by a developer in 2014, Drax announced that it acquired Millbrook Power in December 2016.[4] [redacted]
- Drax submitted a DCO application in October 2017 with an assumed substation location within the Rookery Pit, and we awarded [redacted] Early Contractor Involvement (ECI) stage 1 design contract in 2018. DCO was granted in March 2019. However, our design and optioneering process indicated that the substation should instead be positioned outside the pit. This is because options that considered the new substation within the pit proved significantly

[1] Drax, "Capacity Market Agreements: T-4 auction – provisional results", 11 March 2021.
[2] Drax, "Millbrook Power: About Millbrook Power".
[3] Department for Business, Energy and Industrial Strategy, "Non Material Change Decision Letter", 14 April 2020.
[4] Drax, "Drax acquires Millbrook Power", 6 December 2016.

more expensive for consumers having required extra works – including extended cable run, site preparation within steep ground, and potentially additional drainage works due to the substation being located within an area that already requires flood mitigation.

- As a result, in September 2019 Drax applied for a 'non-material change' to their DCO to change the location of the substation and to allow for the construction of a GIS substation.
- This DCO change was authorised in April 2020 by the Secretary of State for BEIS. In authorising the change, the Secretary of State noted that in order for Millbrook Power Ltd. to construct and operate the power plant efficiently and effectively, it was necessary to construct a GIS substation instead of an AIS substation.[5] At the time, the Secretary of State also noted that the proposed change would not result in any further environmental impacts.[6]
- Once the non-material change was authorised in April 2020, Drax obtained a DCO, which secured the site for the substation. [redacted]

[redacted]n March 2021, Drax provisionally secured a T-4 capacity market agreement (for the delivery period October 2024 to September 2025)[redacted]

- At the time of contracting, a full non- SF_6 400kV GIS substation was not available, leaving us with the choice to either delay the customer or proceed with the GIS substation. As a result, we proceeded with the development and incorporated non SF_6 to parts of the design where the technology was commercially available to do so.

The project history for this investment therefore led us to prioritise options that minimised costs to the consumer and enabled us to connect the customer as quickly as possible. This approach was in line with our perception of the right thing to do for consumers at the time of design, even if the complex chronology of the customer has resulted in us only being able to submit an MSIP application now.

1.3 What have we considered in developing options for this investment?

NGET assessed a range of solutions to meet the investment drivers in a way that best serves the interests of consumers.

Optioneering

The optioneering process highlights several key trade-offs, particularly between the available space on site and the use of AIS or GIS technology. Optioneering was also closely linked to the needs of this customer specifically, given the history and context of development outlined in Section 1.2.

Ultimately, particularly considering the provisional capacity market agreement, we prioritised ensuring a timely delivery and minimising cost to the consumer, in line with NGET's priorities at the time.

NGET considered the following options:

- **Do nothing (Option A), market based (Option B),** and **whole system solution** (**Option C**) – all of which were discounted as they would not deliver the customer connection.
- **Utilise an existing substation (Option D)** – which was discounted as there were no suitable substations within the vicinity of the power station where both the gas and electricity transmission networks are proximate. Additionally, the two closest substations – Sundon and Grendon – were located at a significant distance away (circa 20km and 35km away respectively).
- **Develop a new substation (Option E)** – which was selected, with a range of options considered (Options E-1 to E-8, outlined in Section 4.1 Table 5).

As outlined in Section 1.2, in 2018 we evaluated several options for delivering a new substation. These varied in terms of location, switchgear, and tower connection. We considered three shortlisted

[5] Department for Business, Energy and Industrial Strategy, "Non Material Change Decision Letter", 14 April 2020.
[6] Ibid.

options to develop a new substation, which differed in terms of the substation location, technology type, and whether a new OHL tower was required.

These options were:

- **E-3:** AIS substation inside the Rookery Pit and using the existing OHL tower.
- **E-5:** GIS substation next to the OHL tower and using the existing tower.
- **E-6:** GIS substation next to the OHL and installing a new tower.

Siting

We determined that locating the substation within the Rookery Pit would require significant extra works and would incur significant additional costs for the consumer, particularly due to the need for additional cable run and site preparation [redacted] The low-lying site available within the pit also exposed the infrastructure to heightened flood risk. We therefore decided that the most appropriate location for the substation build was next to the OHL tower [redacted]

We determined that locating the substation outside the pit would significantly reduce the cost of the project and thereby the cost to consumers.

Land availability and technology type

As outlined in Section 1.2, due to the history of the project, the customer DCO secured the land available which ultimately rendered a GIS solution the most viable option due to reduced land availability. A GIS solution has a smaller footprint than an AIS substation and presented advantages in terms of site preparation and planning.

At the time of contracting, a full non- SF_6 400kV GIS substation was not available. While enquiries were made to understand how much non-SF_6 equipment could be utilised on passive components of the GIS structure, and to understand whether the switchgear was capable of being retrofitted with non-SF_6 gas, we determined that this would likely cause a significant programme delay, and that this length of delay could not be mitigated in the programme due to customer and consumer importance of enabling a timely connection. [redacted]

[redacted]

Delivery contract

[redacted]

1.4 What is the preferred option and what outputs does it deliver?

The preferred option is to construct a new 4-bay 400kV SF_6 GIS substation (Marston Vale), connected to the 400kV Grendon to Sundon double circuit at the existing Tower ZA378 via a double-tee arrangement. [redacted]

We determined a GIS substation would be more efficient, economical, and smaller than an AIS substation. The GIS substation will result in a much smaller footprint, [redacted] removing the need for a temporary transmission tower and additional land purchase, which would have otherwise resulted in higher costs to the consumer. Additionally, utilising GIS technology reduces project costs by avoiding the need to purchase extensive additional amounts of land at a premium.

For these reasons – cost, land availability, and time – it was determined that the preferred option would involve the substation utilising SF_6 GIS technology and being built next to, and utilising, the existing OHL tower. In line with our prioritisation at the time of enabling a prompt connection, minimising the project scope and cost to the consumer, we determined this was the best option.

Funding allowances are sought as part of this MSIP submission. The direct costs for this investment are [redacted] (18/19 prices). Further details related to the makeup of these requested allowances are detailed within the cost model available alongside this submission.

1.5 How has future proofing been considered in the proposed investment?

Delivering a four-bay substation met the requirements for this investment at the time key decisions were made [redacted] At the time, there was no indication of additional demand that would necessitate a larger substation.

While the design and construction processes have been aligned, several adjustments have since been made to allow for future expansion, such as relocating the control building. Since original optioneering, additional customers have shown interest in connecting in the area. [redacted] Investigations and option assessments are ongoing to evaluate the feasibility of securing additional land to expand the substation to accommodate additional customers. [redacted]

While there are a number of additional prospective customers to connect to this node, we recognise that the implementation of Connections Reform, in tandem with the Government's Clean Power 2030 Action plan, will impact the connections landscape at both a national and regional level. This will, in turn, help us to refine the number, type and location of investments in this region moving forward.

1.6 What are the uncertainties and how have they been accounted for?

Several risks and uncertainties have been considered in relation to the preferred option selected.

Outage conformation and commissioning programme: Due to changes in the project's programme and site access delays, we were unable to meet the initial outage dates. However, a request has now been made to the National Energy System Operator (NESO) for [redacted] alternative outage windows.

OTS (Operational tripping scheme): This project has OTS requirements [redacted] NGET is currently exploring alternative options.

Land purchase progression: [redacted]

Following an investment driver to connect the new Millbrook Power Ltd. OCGT in Millbrook, Bedfordshire, NGET conducted an optioneering process using a combination of quantitative and qualitative assessment methods to identify the best option for consumers. This sought to balance key project considerations – cost, land availability, and time. This project has a long history, and optioneering originally occurred in 2018 and is reflective of NGET's priorities at the time – which focused on reducing costs to consumers and enabling a swift and compliant customer connection. The conclusion of our analysis is the decision to construct a new 4-bay 400kV GIS substation to connect 299 MW of OCGT for Millbrook Power Ltd.

2. Introduction

2.1 Project background

This paper presents the investment case and associated efficient costs for our preferred solution for the new 4-bay 400kV GIS substation at Millbrook, Bedfordshire. The project aims to connect a contracted customer, Millbrook Power Ltd.

2.1.1 MSIP Eligibility

The Marston Vale 400kV substation project is eligible as an atypical MSIP reopener. The project is connecting generation load to the Electricity Transmission network. However, current total direct costs for delivering the investment exceed the allowances available via the Generation Connection Volume Drivers by circa [redacted]

The comparative funding to expenditure ratio triggers an a-typical generation connection MSIP (SpC 3.14.6 category a). A breakdown of eligible volume driver allowances is provided in Appendix A.

2.1.2 Chronology to the request

The Millbrook power station has a long and complex history. Initially contracted by a developer in 2014, Drax announced that it acquired Millbrook Power in December 2016.[7] [redacted]

Optioneering for this investment took place in 2018, and subsequently reflects preferences at that time. The key driver was to facilitate the connection of a single customer (Drax), supporting the timely connection of a peaking power source with a provisional capacity market agreement. Consequently, our optioneering process was closely aligned with the development of the customer's needs.

Drax submitted a DCO in 2017, assuming an initial substation location within the Rookery Pit, and we awarded an ECI stage 1 design contract in 2018. However, our design and optioneering process determined that the substation should be located outside the Rookery Pit due to the high costs and additional works required for an in-pit location—such as extended cable runs, site preparation on steep ground, and potential drainage issues due to flood mitigation needs.

As a result, Drax submitted an application to amend their DCO in 2019 to change the substation's location and to allow for the construction of a GIS substation. In 2020, the Secretary of State for BEIS authorised this 'non-material change' to the DCO, and noted that in order for Millbrook Power Ltd. to construct and operate the power plant efficiently and effectively, it was necessary to construct a GIS substation instead of an AIS substation.[8]

[redacted]

At the time of contracting, a full non- SF_6 400kV GIS substation was not available, necessitating a choice between indefinite delay or proceeding with the available GIS substation. We proceeded with development, incorporating non- SF_6 technology where commercially feasible.

The project's historical context led us to prioritise options that minimised consumer costs and would enable us to connect the customer as quickly as possible. These decisions aligned with our perception of the right thing to do for consumers at the time.

Table 1: Timeline of the Millbrook Power OCGT and Marston Vale substation

Time	Action
[redacted]	
October 2017	Customer DCO application submitted – with an assumed AIS substation location in the Rookery Pit
November 2018	ECI Stage 1 optioneering and option development

[7] Drax, "Drax acquires Millbrook Power", 6 December 2016.
[8] Department for Business, Energy and Industrial Strategy, "Non Material Change Decision Letter", 14 April 2020.

March 2019	Customer DCO granted
September 2019	Customer submits application to amend DCO
April 2020	Non-material change to DCO authorised – for a GIS substation adjacent to the electricity transmission line
March 2021	Customer provisionally secures agreement in Capacity Market Auction
[redacted]	[redacted]
[redacted]	[redacted]
[redacted]	[redacted]
[redacted]	[redacted]

2.1.3 Importance of the investment

The new substation is required to accommodate the contracted customer connection for Millbrook Power Ltd., a subsidiary of the Drax group, to connect a new 299MW OCGT to the 400kV Grendon to Sundon circuit.

The Millbrook power station OCGT is designed to operate for short periods of time to meet specific system support needs. As the UK transitions towards a net zero economy, it will become increasingly dependent on renewable energy sources like solar and wind. Fast response system support technologies like OCGTs will subsequently play a role in providing the firming generation capacity needed to support the secure operation of a clean power grid.

The Government's Clean Power 2030 Action Plan, published in December 2024, notes that while the UK's power system is transitioning rapidly to clean power sources, gas will continue to play a back-up role to ensure security of supply.[9] It reports there will be a fundamental shift in the role and frequency of unabated gas generation, moving from generating almost every day of the year, to an important backup to be used only when essential. This is consistent with NESO's view and aligns with the Climate Change Committee's advice that maintaining gas capacity to use as backup is consistent with a fully decarbonised power system.[10]

Drax secured a 15-year provisional agreement in the March 2021 capacity market auction, for the delivery period of October 2024 to September 2039.[11] Winning a provisional agreement in a T-4 capacity market auction means a participant is in line to receive a capacity contract, subject to final confirmation, which can provide revenue certainty for the participant. In NESO's Mid-Term (Y-1) Market tender round, for which contract awards were announced in November 2024, Millbrook Power Ltd was selected as one of 5 provides to deliver 5 GVAs of inertia for the Mid-Term's inaugural delivery year between October 2025 and September 2026.[12]

2.2 Regional and strategic context

The new substation will be located in Millbrook, Bedfordshire, England, part of the broader East Anglia transmission network. Historically, East Anglia has been a site for natural gas production, and while the focus in this region is shifting towards renewables, the region still has infrastructure related to gas, including pipelines and processing facilities, which was a key factor when considering siting for this investment.

The East Anglian electricity transmission network has historically been a net importer of power and is developing into a net exporting region. The general pattern of power flow in the East Anglia transmission network will be north-south flows carrying power to London and Southeast England. The existing network can also be influenced by future development outside of the region such as wind generation in the North and flows on the interconnectors to Europe on the South Coast. Looking forward, about a third of today's UK energy demand could be met by the energy that will be coming into East Anglia in the next decade or so.

[9] Department for Energy Security and Net Zero, "Clean Power 2030 Action Plan", 13 December 2024.
[10] Ibid.
[11] Drax, "Capacity Market Agreements: T-4 auction – provisional results", 11 March 2021.
[12] NESO, "NESO awards first contracts under the Mid-Term (Y-1) Stability Market", 22 November 2024; NESO, "Mid-term (Y-1) Stability Market: Tender Results", 22 November 2024.

2.4 T3 interactions

While this MSIP is being submitted under the RIIO-T2 price control period, it links to initiatives outlined in our RIIO-T3 Business Plan. The Millbrook Marston Vale substation will be connected to the 400kV Grendon to Sundon double circuit. As outlined in our RIIO-T3 Regional Report *East Anglia: Future Network Blueprint*, we are enhancing existing networks to ensure adequate capacity for electricity transmission in the region.[13] This includes work to reconductor the existing OHL circuit between Grendon and Sundon to increase transmission capacity and enable the transmission of new electricity sources, like that being delivered through this investment.

Table 2 - Alignment with Ofgem T3 consumer outcomes

Infrastructure fit for a low-cost transition to net zero	As the UK transitions towards a net zero economy, it will become increasingly dependent on renewable energy sources like solar and wind. Fast response system support technologies like the Millbrook Power OCGT will play a role in providing the firming generation capacity needed to support the secure operation of a clean power grid.
System efficiency and long-term value for money	The optioneering choices selected throughout this project prioritised minimising costs to consumers, while enabling the timely connection of a significant on-demand source of power to the grid, helping to increase domestic energy security.

2.5 Customer drivers

Our contracted connections pipeline is growing at an unprecedented rate. To help develop the network in a way which delivers value for consumers, we have developed a consistent and repeatable methodology for assessing our confidence in each contracted customer connection project proceeding to connect. This methodology is outlined in our T3 Business Plan submission. This methodology results in a score and associated RAG rating that demonstrates the relative likelihood that a contracted project will proceed to connect to our network based on its technology, characteristics, and progress against key milestones. Projects scoring:

- ≥7 are rated green and are most likely to connect.
- ≥ 5 but < 7 are rated amber and have some chance of proceeding.
- <5 are rated red and are less likely to proceed.

It is important to recognise that because the scores are relative, a customer assessed as 'most likely to connect' is not guaranteed to connect and a customer that is 'less likely' to proceed could proceed to connect.

Given the long gestation period for this project, at the time of optioneering, we only had one customer driver, [redacted] As outlined in Section 1.5, since original optioneering, while there are other additional prospective customers to connect to this node, we recognise that the implementation of Connections Reform, in tandem with the Government's Clean Power 2030 Action plan, will impact the connections landscape at both a national and regional level.

[redacted]

Table 3: Customer confidence assessment

Customer Name	Project Name	Project Type	MW	ACL Date[14]	RAG confidence
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

[13] National Grid Electricity Transmission, "East Anglia: Future Network Blueprint", January 2025.
[14] The Available for Commercial Load (ACL) date refers to the date that a customer requests in its connection request to NGET. This date remains a proposed ACL date.

3. Establishing need

3.1 Overview

Table 4: Summary of Investment Driver

Summary of Primary Driver		Date
Customer connection	NGET has a signed agreement with Millbrook Power to connect 299MW of OCGT to the 400kV Grendon to Sundon double circuit. NGET is to connect the customer to the transmission network [redacted]	[redacted]

3.2 Load related drivers

NGET has a signed connection agreement with Millbrook Power Ltd., a Drax company. The customer is developing an OCGT peaking plant.

Table 5: Details of customer connection

Customer Name	Project Name	Project Type	MW	ACL[15] Date	[redacted]
Millbrook Power Ltd.	Millbrook Power Station	Generation	299	[redacted]	[redacted]

We have a high degree of confidence that the Millbrook power plant will progress. [redacted]

[redacted]

16 [redacted]

17 Drax, "Capacity Market Agreements: T-4 auction – provisional results", 11 March 2021.

3.3 Existing and planned future network

The Millbrook substation will connect to the 400kV Grendon-Sundon Circuit. NGET's Sundon and Grendon substations are the closest existing connection points to the Millbrook Power OCGT, located circa 20km and 35km away respectively. While NGET considered the possibility of connecting the customer at these sites during optioneering, it was determined that a new site was required as no existing substations were suitable due to the need for a site where both the gas and electricity sites are proximate.

4. Optioneering

This section summarises the options we considered to address the needs case established in the previous section, in a way that best serves the interest of current and future consumers.

In line with our optioneering process, we identified the following high level-options:

A. Do nothing;
B. A market-based solution;
C. A non-transmission, whole system solution;
D. Make use of existing NGET substations; and
E. A new substation.

In summary:

- **Options A-C** were discounted because they would not deliver a compliant connection.
- **Option D** was discounted as it was determined that there were no appropriate existing substations in the region where the gas and electricity transmission networks are proximate.
- 8 configurations of **Option E** (building a new substation) were considered, differing in terms of location (inside the Rookery Pit on site or beside the OHL), switchgear (AIS or GIS) and tower connection.

The optioneering process identified several key trade-offs, including the choice between the available space on site and the use of AIS or GIS technology. The process was also closely aligned with the specific needs of the customer, based on the development history and context detailed in Section 1.2. Additionally, as the customer later secured a 'non material change' to the DCO which secured a specific parcel of land and GIS solution (as outlined in Section 2.1.2), space on site was restricted, and any options considered later to purchase additional land was determined to be costly and would risk delaying the delivery of this investment.

The 2018 optioneering process assessed multiple options for delivering this connection, outlined in Section 4.1, Table 6 below – Options E-1 to E-8. These options differed primarily based on location (such as inside the Rookery Pit or beside the OHL), switchgear type (AIS or GIS), and whether to utilise the existing OHL tower or build a new one. Each option was evaluated using various criteria to determine the most suitable choice for consumers. Following this initial assessment, three options were taken forward to detailed assessment – one AIS and two GIS options.

4.1 Assessment of high-level options

As above, a summary of our assessment of the high-level options identified to meet the customer need is set out below. Each of these is assessed against the following criteria:

- Capacity and future development potential
- Design and technical complexities
- Operation and maintenance
- Safety, health and security
- Planning, land and consent
- Third party impact and network coordination
- Environment and Sustainability
- Timing of programme and resources
- Cost

A summary of our initial options assessment is in Table 6 below.

Table 6: Summary of initial options assessment

Option	Option title	Option description	Taken Forward to Detailed Optioneering?	Rationale
A	Do nothing	NGET does not undertake any activity.	**Not taken forward** – the option does not comply with NGET licence obligations to provide customer connections.	Would not deliver a compliant customer connection.
B	Market-based solution	Customer connection is accommodated through the procurement and use of ancillary services only.	**Not taken forward** – the option does not comply with NGET licence obligations to provide customer connections.	Would not deliver a compliant customer connection.

Option	Option title	Option description	Taken Forward to Detailed Optioneering?	Rationale
C	Whole systems solution	Customer connection is accommodated by a Distribution Network Operator (DNO) instead of NGET.	**Not taken forward** – the option does not comply with NGET licence obligations to provide customer connections.	[redacted]
D-1	Use existing assets	The required customer connection is accommodated at an existing substation.	**Not taken forward** – no appropriate existing connection points.	**Location requirements** • We determined that there were no substations within the vicinity of the customer that would enable a compliant connection as the substation needed to be located at a point where the gas and electricity transmission networks are proximate. • For this reason, this option was not taken forward to detailed options assessment.
E-1	Build new	AIS substation near OHL, existing tower	**Not taken forward**	**Land space requirements and technical complexity** • There is a small forest next to the OHL tower and an AIS substation build would likely encroach on this more than a GIS option due to the AIS' larger footprint. • The Millbrook watercourse is located near the OHL tower. Locating the substation in this area would require diversion of the watercourse, which would likely be more challenging for an AIS solution than a GIS solution as the land space requirement is larger. • For these reasons, this option was not taken forward to detailed options assessment.
E-2	Build new	AIS substation near OHL, new tower	**Not taken forward**	**Land space requirements and technical complexity** • As for E-1, this option would likely encroach on the small forest and require diversion of the watercourse, which would likely be more challenging for an AIS solution than a GIS solution as the land space requirement is larger. • This option would involve the construction of a new tower and therefore require two supplementary towers to be built to divert the existing circuits, whilst the new permanent tower would be built.

Option	Option title	Option description	Taken Forward to Detailed Optioneering?	Rationale
				• For these reasons, this option was not taken forward to detailed options assessment.
E-3	Build new	AIS substation inside Rookery Pit, existing tower	**Taken forward to detailed assessment**	• This option was originally proposed as part of the customer's DCO proposal. • This option was subsequently taken forward to detailed options assessment to determine whether it was the most appropriate option for delivering this customer connection.
E-4	Build new	AIS substation inside Rookery Pit, new tower	**Not taken forward**	**Land space requirements** • This option is the same as E-3 but would involve the construction of a new tower. • As with option E-2, this would require two supplementary towers to be built to divert the existing circuits, whilst the new permanent tower would be built. • For this reason, this option was not taken forwarded to detailed options assessment.
E-5	Build new	GIS substation near OHL, existing tower	**Taken forward to detailed assessment**	• This option would enable a compliant customer connection. • It makes use of the existing OHL tower.
E-6	Build new	GIS substation near OHL, new tower	**Taken forward to detailed assessment**	• This option would enable a compliant customer connection. • While this option would require the construction of a new OHL tower (as with Option E-2 and E-4), it was taken forward to detailed options assessment to contrast against the other options and evaluate the benefits and disadvantages of installing a new OHL tower.
E-7	Build new	GIS substation inside Rookery Pit, existing tower	**Not taken forward**	**Additional works required** • This option would require additional works and likely result in higher costs to consumers due to its location in the Rookery Pit. • Building the substation in the Rookery Pit would require extended cable run, site preparation within steep ground, and potentially necessitate additional drainage works, without a material consumer benefit.

Option	Option title	Option description	Taken Forward to Detailed Optioneering?	Rationale
				• For this reason, this option was not taken forwarded to detailed options assessment.
E-8	Build new	GIS substation inside Rookery Pit, new tower	**Not taken forward**	**Additional works required** • As for E-7, this option would require additional works and likely result in higher costs due to its location in the Rookery Pit. • For this reason, this option was not taken forwarded to detailed options assessment.

Following the optioneering assessment, three options were identified to be taken forward to the detailed options assessment, which is set out in Section 5. The shortlisted options were:

- Option E-3: AIS substation inside Rookery Pit; utilise existing OHL tower.
- Option E-5: GIS substation near OHL; utilise existing OHL tower.
- Option E-6: GIS substation near OHL; deliver and utilise a new OHL tower.

5. Detailed options analysis

5.1 Description of the options

In Section 4, three options (E-3, E-5 and E-6) were identified to be taken forward to detailed option assessment. The shortlisted options differed predominantly in terms of technology type (AIS or GIS), substation location (in the Rookery pit or near the OHL tower), and whether the existing OHL tower will be used or a new OHL tower installed.

This section provides a qualitative and quantitative (CBA) assessment of the alternative options and sets out the key considerations underpinning our preferred solution, namely the development of a new 4-bay GIS substation near the existing OHL tower and utilising the existing OHL tower.

[redacted]

In this option, the AIS substation would be situated within the Rookery Pit. It also includes the double tee connection on the existing OHL tower, [redacted] The new AIS substation would be constructed adjacent to the customer's power station [redacted]

[redacted]

A new GIS substation would be constructed adjacent to the Rookery Pit, near OHL tower ZA378, incorporating a double tee on the existing OHL Tower. Under this option, the new GIS substation would be built offline next to the OHL tower on the side closest to the Rookery Pit. The existing OHL tower ZA378 would require modification to turn this into a double tee, [redacted] This option would not require an outage for diversion as it would utilise the existing tower.

[redacted]

A GIS substation would be constructed outside the Rookery Pit near OHL tower ZA378 with a single turn in on a new tower. The new GIS substation would be built offline next to the OHL tower ZA378, on the side closest to the Rookery Pit. This option would necessitate the construction of a new tower, [redacted]

5.2 Qualitative options analysis

Table 7 below provides a summary of our detailed qualitative assessment of the relevant technical, environmental, planning, and socio-economic considerations pertaining to the three options.

Table 7: Summary of qualitative analysis of shortlisted options

Option #	Option 1: E-3	Option 2: E-5	Option 3: E-6
Option title	**AIS substation inside Rookery Pit, existing tower**	**GIS substation near OHL, existing tower**	**GIS substation near OHL, new tower**
Capacity & future development potential Preferred option: E-5 and E-6	Ability to extend if required, however, this would require additional land purchase. [redacted] While AIS is generally easier to extend than GIS, the lack of available land presents a challenge, particularly noting the high cost of acquiring additional land.	Option to extend the GIS hall for future bays if required, which will require additional land purchase [redacted]	As with Option E-5, ability to extend if required.
Design & technical complexities Preferred option: E-5	Long cable route required for the AIS location in the Rookery Pit. Flood risk in low-lying areas available south of new power station requiring extensive civils works.	Space constraints at the location near the OHL tower with vegetation clearance required.	Building a new tower requires sequenced outages to divert the existing OHL, increasing risk and costs.
Operations & maintenance Preferred option: E-5	AIS substations require more maintenance compared to GIS substation, as moving AIS equipment is exposed and therefore more susceptible to corrosion than GIS equipment.	Maintenance access to the existing tower is limited due to the design, meaning a new access is required. [redacted]	Crane access for tower maintenance would be very difficult due to proximity to roadside and land boundaries.
Safety, health & security	The reuse of the existing tower imposes some risks during installation. Because the modifications to the tower involve installing new support arms at height, at a relatively close distance to the adjacent circuit, this	The reuse of the existing tower imposes some risks during installation. Because the modifications to the tower involve installing new support arms at height, at a relatively close distance to the adjacent circuit, this	Installing a new OHL tower would have to be carried out whilst the OHL circuits are live to be able to complete the new tower build offline. This is a safety concern due to distances from the existing towers, and

Option #	Option 1: E-3	Option 2: E-5	Option 3: E-6
Option title	**AIS substation inside Rookery Pit, existing tower**	**GIS substation near OHL, existing tower**	**GIS substation near OHL, new tower**
Preferred option: E-6	option imposes a larger risk than installing a new tower. Building a new substation within Rookery Pit would require a long length of cable connecting the substation to cable sealing end compound near the OHL tower. The construction of the cable trench would require deep excavations along the entire length of the cable route, which poses a higher safety, health and security risk.	option imposes a larger risk than installing a new tower.	there would need to be consideration for crane access and lifting equipment.
Planning, land & consent Preferred option: E-5	Additional requirement for cable routes from the OHL tower to the AIS substation. This would require further land agreements for cable rights.	Existing wayleaves in place for the current tower. Limited land space required for the construction of the substation.	Additional wayleaves would be required if a new tower was to be installed for rights of access to the tower. We would also require additional land space to build the tower.
Third party impact & network coordination Preferred option: E-3	Access to the proposed AIS substation would be shared with Millbrook Power and [redacted] Construction deliveries would have an effect on both parties. The installation of the substation in the rookery pit is less susceptible to resistance from surrounding stakeholder (public, communities, planning) due to comparatively lower visual impact.	[redacted] There would also be construction traffic on [redacted] where the substation access road would be joined to the existing [redacted] The required substation services (e.g. water, DNO, fibre) routes to the substation site would be required to be installed in the existing roadway so would have an impact on the council and traffic management.	Analogous issues to E-5.
Environment & sustainability	Larger footprint would mean more carbon-intensive construction. More plant would be required for an AIS substation and more support structures and foundations – resulting in more material usage.	Smaller footprint meaning less material requirement for site finishing and fewer materials required for structural support and foundations. More SF6 gas used than AIS solution.	Smaller footprint meaning less material requirement for site finishing and fewer materials required for structural support and foundations. More SF6 gas used than AIS solution.

Option #	Option 1: E-3	Option 2: E-5	Option 3: E-6
Option title	**AIS substation inside Rookery Pit, existing tower**	**GIS substation near OHL, existing tower**	**GIS substation near OHL, new tower**
Preferred option: E-3			
Timing of programme & resources Preferred option: E-5	Would entail a longer civils programme, due to longer cable installation, and the requirement for construction at two sites. The commissioning resource constraints and outage restraints would be consistent across the three shortlisted options	Space constraints extend the construction programme due to restricted site access preventing simultaneous work. Shorter civils programme compared to AIS (Option E-3) as less space required and less equipment.	Analogous to E-5, however, additional time requirements of installing new tower.

Based on the qualitative analysis of shortlisted options summarised detailed in the table above, Option E-5 is the preferred option, offering what we consider to be the most advantageous option for consumers, considering the broad range of factors:

- Planning, land & consent: The GIS options (Option E-5 and Option E-6) required limited land space compared to option E-3, an AIS solution. Additionally, as option E-5 utilises the existing OHL tower, existing wayleaves are in place and new wayleaves would not be required (noting they would be required for Option E-6).
- Timing of programme & resource: All GIS options have a smaller site construction area than the AIS option. For this reason, the construction works should be lesser, particularly for E-5 which utilises the existing OHL tower and does not require the installation of a new OHL tower.

The next section sets out our quantitative assessment of the three options which we have considered alongside the qualitative assessment in making our final decision.

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5.3 Quantitative options analysis

5.3.1 Lifetime Cost-Benefit analysis (CBA)

The CBA was carried out using the NGET CBA/NPV (net present value) tool which is based on Ofgem RIIO-T2 CBA template spreadsheet, assuming a capitalisation rate of 85% and a pre-tax (weighted average cost of capital) WACC of 3.19%, in line with Ofgem's guidelines.

A summary of the lifetime CBA results is presented in the table below. The full CBA is appended alongside this submission in Appendix B. Costs and benefits are discounted at a rate of 3.5% for the first thirty years, and at 3% after that, in line with Ofgem guidance. Costs and benefits are presented relative to a 'do minimum' counterfactual.

The results shown in the table below demonstrate that option E-5 has a more favourable NPV in comparison to option E-3 and E-6, due to a lower discounted cost than both the other options.

Table 8: Lifetime Cost-Benefit analysis (discounted 2018/19 prices)

Options	Total (£m)			
	Costs (discounted)	Benefits (discounted)	NPV	Difference to baseline
Option E-3	[redacted]	[redacted]	[redacted]	[redacted]
Option E-5	[redacted]	[redacted]	[redacted]	[redacted]
Option E-6	[redacted]	[redacted]	[redacted]	[redacted]

5.3.2 Costs

5.3.2.1 Capex costs

All CAPEX cost estimates are derived from the NGET Project Development Cost Book (August 2024 with 2018/19 prices), which is based on historical tender returns and project data. The cost estimations are based on pre-tender award estimates and are subject to change based on actual tendered solutions. The illustrated options are assessed against a "do minimum" counterfactual.

We have used Estimating Units Lines (EULs) to generate cost estimates based on the scope of work and the new assets to be constructed for each option, including risk contingency.

Table 9: Summary of costs (undiscounted 2018/19 prices)

Option	Total CAPEX (£m)	Carbon cost of construction (£m)	Total (£m)
Option E-3	[redacted]	[redacted]	[redacted]
Option E-5	[redacted]	[redacted]	[redacted]
Option E-6	[redacted]	[redacted]	[redacted]

The difference within the CAPEX cost can be accounted for by the difference in scope between the three options. Option E-3 proposes the construction of a new AIS substation, while option E-5 and E-6 propose a new GIS substation. The difference between option E-5 and E-6 is that the former propose to build a new OHL tower, the latter to use the existing one.

Future replacements cost of new assets

To assess the costs of the investment, future replacement costs of the new assets were included within the CBA. It has been assumed that the assets on average would have a lifespan of 40 years after the first year of construction. With initial construction commencing in 2023, the replacement costs will commence in 2043. It has also been assumed that the replacement cost would mirror the absolute cost and timespan occurred in the initial construction. The replacement costs will also impact the carbon cost of construction. In line with Ofgem guidance, the CBA spans 50 years commencing 2023. As both the construction and replacement occur within the 50-year appraisal, the replacement cost has been taken into account within the assessment.

Table 10: Summary of replacement costs (undiscounted 2018/19 prices)

Option	Replacement Spend Profile (£m)	Carbon cost of construction (£m)	Total (£m)
Option E-3	[redacted]	[redacted]	[redacted]
Option E-5	[redacted]	[redacted]	[redacted]
Option E-6	[redacted]	[redacted]	[redacted]

5.3.2.2 OPEX costs

Annual maintenance costs [applies to no option]

Given that the maintenance costs do not differ amongst options, and that estimation of these costs would be heavily assumption-driven, annual maintenance costs have been excluded from the CBA.

Constraint costs

No data has been investigated and produced for the current stage within the proposal and therefore constraint costs have been excluded from the assessment for all options.

5.3.2.3 Summary of costs

A summary of the costs within the assessment is illustrated within the following table:

Table 11: Cost Summary £m (undiscounted 2018/19 prices)

Option	Initial cost (£m)	Replacement cost (£m)	Total cost (£m)
Option E-3	[redacted]	[redacted]	[redacted]
Option E-5	[redacted]	[redacted]	[redacted]
Option E-6	[redacted]	[redacted]	[redacted]

5.3.3 Benefits

Avoided carbon cost of generation

The generation of electricity comes from gas combustion which will generate CO2. Therefore, the values for the benefit will be a negative (i.e., disbenefit) to signify a cost to society. The value is estimated using the NGET CBA tool based on cost of carbon for displaced generation (assumes CCGT – combined- cycle gas turbine), for type of connection, year, load factor and annual output.

The table below illustrates the benefit for each option:

Table 12: Avoided carbon cost of generation (undiscounted 2018/19 prices)

Option	Avoided carbon cost of generation (£m)
Option E-3	[redacted]
Option E-5	[redacted]
Option E-6	[redacted]

SF_6 – leakages

Upon operation gas leaks will be unavoidable. The disbenefit of these leaks is accounted for by the monetisation of the economic value of 1kg of CO_2 emissions. The disbenefit was quantified by the multiplication of the total SF_6 weight by 0.1% which captures the leakage and disbenefit to society. The value was divided by a thousand and multiplied by the 23,500 which represents the equivalent of G^3 weight into CO_2. The equivalent CO_2 weight is multiplied by the carbon price to calculate the disbenefit. Table 13 illustrates the non-SF_6 disbenefits for the analysis.

As Option E-3 proposes to use AIS technology, SF_6 leakages are expected.

G^3 leakages

Upon operation gas leaks will be unavoidable. The disbenefit of these leaks is accounted for by the monetisation of the economic value of 1kg of CO_2 emissions. The disbenefit was quantified by the multiplication of the total G^3 leakages weight by 0.5% which captures the leakage and disbenefit to society. The value was divided by a thousand and multiplied by the 326 which represents the equivalent of G^3 weight into CO_2. The equivalent CO_2 weight is multiplied by the carbon price to calculate the disbenefit. Table 12 below illustrates the G^3 disbenefits for the analysis.

[redacted]

Table 13: Gas leak disbenefit (undiscounted 2018/19 prices)

Option	SF_6 emissions (kg)	G3 leakages (kg)	SF6/G3 emissions (tCO_2e)	Economic value of the benefit (£m)
Option E-3	[redacted]	[redacted]	[redacted]	[redacted]
Option E-5	[redacted]	[redacted]	[redacted]	[redacted]
Option E-6	[redacted]	[redacted]	[redacted]	[redacted]

Transmission losses

No transmission losses are expected, so they are not assessed.

5.3.3.2 Summary of benefits

A summary of benefits included in the analysis is illustrated in the following table:

Table 14: Benefits summary (undiscounted 2018/19 prices)

Option	Environmental benefits			Total benefits (£m)
	Carbon cost of construction (£m)	Gas leak (£m)	Transmission losses (£m)	
Option E-3	[redacted]	[redacted]	[redacted]	[redacted]
Option E-5	[redacted]	[redacted]	[redacted]	[redacted]
Option E-6	[redacted]	[redacted]	[redacted]	[redacted]

5.4 Preferred solution

The preferred solution is Option E-5: to deliver a new 4-bay GIS substation. This substation will be constructed adjacent to the Rookery Pit, near OHL tower ZA378, incorporating a double tee on the existing OHL Tower.

The new GIS substation will be built offline next to the OHL tower on the side closest to the Rookery Pit. The existing OHL tower ZA378 requires modification to turn this into a double tee, [redacted] This will allow for down leads to be installed into the new substation to the air insulated switchgear to the outdoor cable ceiling ends, which is connected to the indoor-GIS via cable for both circuits. This option does not require an outage for diversion as it utilises the existing tower.

The optioneering that informed this decision occurred in 2018 and was based on the fact that a GIS solution would require less land and construction works – thereby delivering the project at a lower cost to consumers and with less impact on the surrounding environment.

The decision to utilise GIS technology was made prior to current preference of prioritising AIS over GIS solutions, where possible, and reflected NGET priorities at the time, which considered reducing costs to the consumer to be the primary decision-making criterion.

While we have since explored options to utilise SF_6-free gas in the GIS system for this project, it was determined that this would cause a significant programme delay which could not be absorbed into the programme due to outage restrictions [redacted] for this connection.

Additionally, there is limited equipment rated at 400kV that could feasibly use non-SF_6 gas. [redacted]

The selected option for a new SF_6 GIS substation has therefore been retained as the preferred option through the construction period.

The scope of work for the preferred solution, Option E-5, is as follows:

[redacted]

6. Detailed cost for preferred solution

6.1 Introduction

This section provides a breakdown of the overall costs for the Marston Vale 400kV substation, including an expenditure profile for all Regulatory Years of delivery.

The following cost estimate breakdown represents our latest view of costs for the proposed investment and all costs are presented in 2018/19 price base, unless otherwise stated.

Appendix C Cost Model submitted alongside this document provides a breakdown of the costs in more detail and should be reviewed alongside this chapter.

This section is broken down into the following sections:

- Total Allowance Request
- Cost Summary
- Cost Firmness.

6.2 Total Allowance Request

Total project costs are [redacted]. NGET requests [redacted] 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 15 - Allowance request – Cost Model tab reference 1.0

	2018/19 price base (£)						
	T1 & Prior Costs	2021/22	2022/23	2023/24	2024/25	2025/26	Total
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

6.3 Cost Summary

The total cost to develop and deliver the Ironbridge shunt reactor project is [redacted] including indirect costs and costs incurred to date.

Table 16 below shows a summary of total project costs.

Table 16 – Cost Summary – Cost Model tab reference 1.1

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

[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	
[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	

6.4 Cost Firmness

Table 17 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 [redacted] of the total costs (firmness 1 and 2) are either incurred or have been contracted, giving high confidence in our cost submission.

Table 17 - Cost Firmness – Cost Model Tab reference 1.9

Cost Firmness	Total	Notes
[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	

Estimated costs relate to National Grid resource costs, calculated based on forecast days and standard rates, as well as risk for the remainder of the project.

7. Deliverability and risk

6.1 Deliverability

This section sets out a summary of the key activities pertaining to the delivery of the project, including the current high-level programme plan, procurement strategy and anticipated risks.

6.1.1 Delivery Programme

As outlined in this paper, this project has a long history. The key milestones of the delivery programme for this project are outlined in Section 2.1.2 Table 1 and include the initial customer DCO submission in 2017 and authorisation in 2019, the authorisation of the non-material change to DCO in April 2020, the provisional capacity market agreement in 2021 [redacted]

6.1.2. Stakeholder engagement

As this project is developed, designed and built under the customer's DCO, the customer (Drax) has been responsible for liaising with the community and local stakeholders. This has been done via quarterly meetings held with the local community and council where information is presented showing progress on both the NGET scheme [redacted]

6.1.3 Procurement and Contracting Strategy

In 2018, we assigned an Early Contractor Involvement (ECI) stage 1 contract for design. [redacted] n 2021, Drax secured the capacity revenue contract [redacted]

[redacted]

[redacted] The procurement process throughout this project demonstrates our efforts to drive value for money for consumers, utilising competitive tender processes to ensure this investment is delivered efficiently.

6.1.3 Risk and Risk Management

A risk management process has been used for managing reasonably foreseeable risks. The process employed is in line with ISO 31000:2009, Risk Management – Principles and Guidelines.

Table 18 below lists the key risks identified for the project. The full Risk Register is included in tab 4.1 of the Cost Model appended to this submission.

Table 18: Delivery risks

Risks	Mitigation
Amendment to planned outage: Potential for delay to current outage start and finish. [redacted]	In depth reviews of the construction / commissioning programme to ensure activities are being completed in a timely manner to achieve the agreed outage dates with the outage and resource team.
Protection control panel – Factory Acceptance Test (FAT) delay: [redacted]	This is being mitigated through regular communication and mitigation meetings with the supplier.

Risks	Mitigation
Tower modifications: Additional modifications of the OHL tower required to meet technical requirements.	This is being mitigated through detailed design and hazard reviews.
Extension of ground deployed cable: Due to the type of fibre connection, a ground deployed cable will be required to ensure minimal outage on the fibre network while making the new fibre connection at the site.	This is being mitigated through route impact reviews.
OTS (Operational tripping scheme): This project has OTS requirements and there is currently a long lead time on this equipment, which may cause delays to the scheme.	NGET is currently exploring alternative options.
Land purchase progression: [redacted]	We are in discussions with the landowner, [redacted]

8. Conclusion

This document is NGET's formal MSIP re-opener submission to Ofgem for construction of a new 4-bay GIS substation (Marston Vale) near Millbrook, Bedfordshire, England. It is submitted with reference to Special Condition 3.14 (a) of NGET's Transmission Licence.

Table 19 below summarises the main investment driver, the selected option, estimated costs and expected outputs.

Table 19: Project Investment Summary

Main drivers	**Customer connection**: To connect Millbrook Power Ltd., an OCGT with the capacity to generate up to 299MW.		
Selected Option	Construct a new 4-bay 400kV GIS substation at Millbrook, next to the existing OHL tower and utilising the existing OHL tower, to connect 299MW of OCGT generation to the grid. The substation will be connected to the 400kV Grendon to Sundon double circuit.		
Estimated Cost	The current total cost of the project is [redacted] The funding allowance being sought is: [redacted]		
	T2 (FY2022 – FY2026) and prior: [redacted]	T3 (FY 2027 – FY2031): [redacted]	T4+ (FY 2032+): [redacted]
Outputs	**Network capacity**: Building a new 4-bay 400kV GIS substation will enable the supply of 299MW of generation to the network. This supply will play an important role in helping to ensure we can meet peak demand in times of tight margins, particularly in the winter period when demand is high.		
PCD Primary Output	Construct a new 400kV 4-bay substation at Millbrook, Bedfordshire to connect Millbrook Power Ltd. [redacted]		

Following an investment driver to connect the new Millbrook Power Ltd. OCGT in Millbrook, Bedfordshire, NGET conducted an optioneering process using a combination of quantitative and qualitative assessment methods to identify the best option for consumers. This sought to balance key project considerations – cost, land availability, and time. This project has a long history, and optioneering originally occurred in 2018 and is reflective of NGET's priorities at the time – which focused on reducing costs to consumers and enabling a swift and compliant customer connection. The conclusion of our analysis is the decision to construct a new 4-bay 400kV GIS substation to connect 299 MW of OCGT for Millbrook Power Ltd.

9. RIIO-T1 and RIIO-T2 allowances

There were no investments proposed for this project during either RIIO-T1 or RIIO-T2 business plans submissions. The Project does not have funding through any other price control mechanism.

10. Assurance and Point of Contact

Attached to this submission is 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. This confirmation is provided by the Head of Future Price Controls, Electricity Transmission.

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:

a. It is accurate and robust, and that the proposed outcomes of the MSIP submission are financeable and represent best value for consumers.

b. There are 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.

c. The application has been subject to internal governance arrangements and received sign off at an appropriate level within the licensee. NGET's designated point of contact for this MSIP application is Leo Michelmore, Strategic Upgrade Regulatory Manager (leo.michelmore@nationalgrid.com).

Appendix A: Volume Driver

Please see the accompanying Volume Driver calculation submitted alongside this MSIP: ‘Marston Vale – MSIP Jan 25 – Volume Driver’.

Appendix B: Cost Benefit Analysis

Please see the accompanying Cost Benefit Analysis submitted alongside this MSIP: 'Marston Vale – MSIP Jan 25 – CBA'.

Appendix C: Cost Model

Please see the accompanying Cost Model submitted alongside this MSIP: ‘Marston Vale – MSIP Jan 25 – Cost Model’.

Appendix D: Glossary

Acronym	Definition
ACL	Available for Commercial Load
AIS	Air Insulated Switchgear
BNG	Biodiversity Net Gain
CBA	Cost-Benefit Analysis
DNO	Distribution Network Operator
DCO	Development Consent Order
EA	Eligibility Assessment
ECI	Early Contractor Involvement
EIA	Environmental Impact Assessment
EPC	Engineering, Procurement and Construction
ESO	Electricity System Operator
FID	Final Investment Decision
FNC	Final Needs Case
GIS	Gas Insulated Switchgear
GVA	Gross Value Added
kV	Kilovolt
LDO	Local Development Order
MSIP	Medium Sized Investment Project
MVA	Megavolt Amperes
NESO	National Energy System Operator
NDP	Network Development Process
NG	National Grid
NGET	National Grid Electricity Transmission
OCGT	Open-Cycle Gas Turbine
OEM	Original Equipment Manufacturer
OHL	Overhead Lines
SDS	System Design Specification
SF_6	Sulphur Hexafluoride
SGT	Super Grid Transformer
SQSS	Security and Quality of Supply Standard
SWOT	Strengths, Weaknesses, Opportunities and Threats
tCO2e	Carbon Dioxide Equivalent

National Grid plc
National Grid House,
Warwick Technology Park,
Gallows Hill, Warwick.
CV34 6DA United Kingdom
Registered in England and Wales
No. 4031152

nationalgrid.com

National Grid plc
National Grid House,
Warwick Technology Park,
Gallows Hill, Warwick.