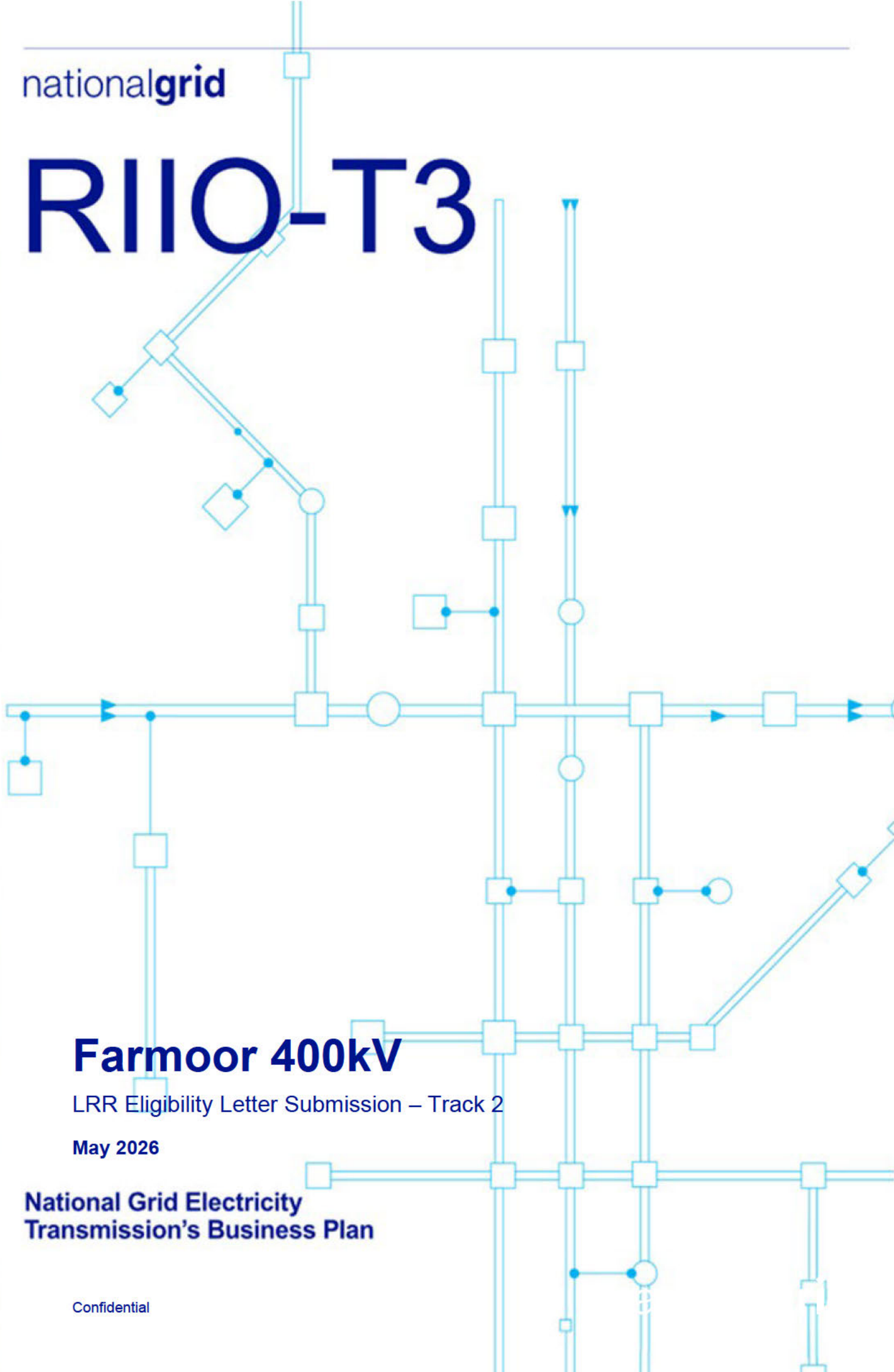


R110-T3



Farmoor 400kV

LRR Eligibility Letter Submission – Track 2

May 2026

National Grid Electricity
Transmission's Business Plan

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Reference and summary table

Field	Description		
Name of Project	Farmoor 400kV		
TO's preferred re-opener track	Track 2 Eligibility Letter (EL)		
RRP References	No OSR created to date. Will be included in RRP26 submission.		
BPDT / Project Reference Number	Not Applicable.		
Load Board Reference	Not Applicable.		
Investment Driver	Generation connections: [REDACTED]		
PASE alignment	The option is developed prior to the PASE framework.		
Outputs	Delivery of a new 11-bay ([REDACTED]) 400kV GIS substation [REDACTED]		
Short list of strategic options considered	Two main options were shortlisted for detailed analysis: <ul style="list-style-type: none"> Option E-5: New 11-bay, 400kV AIS substation. Option E-6: New 11-bay, 400kV SF₆ free GIS substation 		
Preferred solution and explanatory narrative on the rationale	The preferred option is Option E-6 (a new 11-bay SF₆ free 400kV GIS substation [REDACTED] . It provides the most deliverable route to meeting the reducing planning, land and construction risk in the Oxfordshire Green Belt. [REDACTED] Option E-6 has better economic/consumer value through lower initial cost and superior NPV, while still meeting all engineering requirements and providing [REDACTED]		
Costs	[REDACTED] (including [REDACTED] contingency in 2023/24 price base)		
Delivery Year	[REDACTED]		
Applicable Reporting Tables	No OSR created to date. Will be included in RRP26 submission.		
Historic Funding interactions	N/A - This project has not received any historic funding. There are no early asset write-offs (EAWOs) associated with this project		
Interactive Projects	[REDACTED]		
Spend Apportionment	T2 (FY 2022-2026)	T3 (FY 2027-2031)	T4+ (FY 2032- 2037+)
	[REDACTED]	[REDACTED]	[REDACTED]

1 Executive Summary

1.1 Project Summary

This investment enables connection of ‘green’ generation customers, improving system operability and resilience through a new 400kV node with future extendibility, and providing an efficient, coordinated alternative to incremental reinforcement.

1.2 Submission purpose

We are seeking Ofgem’s approval, under the Load Related Re-Opener (Special Condition 3.18 of the RIIO-ET3 licence), to progress the Farmoor 400kV project as a Track 2 EL investment and approval of Pre Construction Funding (PCF).

This submission proposes Track 2 EL Load Re-Opener process for assessment. The track proposal has been discussed with Ofgem.

1.3 Need

The Farmoor 400kV investment is load driven, with the proposed investment required to support the following:

[REDACTED]

Without this investment, we would be unable to meet statutory duties to provide connection offers. The investment enables the timely connection of significant volumes of low-carbon generation (solar PV and BESS) in this part of the network.

1.4 Optioneering and strategic direction

We have undertaken a multi factor optioneering process to identify the most efficient solution to meet the identified need. We conducted a high-level assessment of strategic options (do nothing, market-based, whole-system, reuse or extension of existing assets, and new-build) to develop a longlist of potential options. In identifying a shortlist of options for this site, we have considered:

- Connection to existing substations versus construction of a new substation.
- Single and double circuit turn in arrangements.
- AIS and GIS technologies; and
- Multiple potential sites along the Cowley–Minety–Walham 400kV overhead line for the substation in and outside of the Green Belt.

This paper uses two linked “option” labels: numbered Areas of Search (1–15) to describe *where* a new substation could be located, and lettered design options (A–E) (with sub-variants) to describe *what* could be built.

[REDACTED]

Two options involving a new 400kV substation build were shortlisted for detailed assessment (Option E-5 AIS and Option E-6 GIS).

Option E-6 is our preferred solution because it provides the most deliverable route to meeting the

Option E-6, the preferred solution, is the selected design option at the selected site, supported by the optioneering assessment and the referenced layouts/Single Line Diagrams (SLDs) in Section 4.

Table 1: Longlist Options

Option	Details	Drivers met?	New site?	AIS/GIS?	Short List?
Option A	Do nothing counterfactual option	No	No	NA	X
Option B	Market-based solution	No	No	NA	X
Option C	Non-transmission, whole systems solutions (DNO)	No	No	NA	X
Option D-1	Connection to Cowley Substation. Extension of Cowley to facilitate customers.	No	No	AIS/GIS	X
Option D-2	Connection to Didcot Substation. Extension of Didcot to facilitate customers.	No	No	AIS/GIS	X
Options E-1A to E1D	x4 sub options of a new 400kV substation, 4-bay, single circuit turn in.	No	No	AIS	X
Option E-2	New 400kV substation, 11-bay, double circuit turn in between towers	All	Yes	AIS	X
Option E-3	New 400kV substation, 11-bay, double circuit turn in at tower	All	Yes	AIS	X
Option E-4	New 400kV substation, 11-bay, double circuit turn in at tower	All	Yes	GIS	X
Option E-5	New 400kV substation, 11-bay (with allowance for) double circuit turn in at tower	All	Yes	AIS	✓
Option E-6	New 400kV substation, 11-bay (with allowance for) double circuit turn in at tower	All	Yes	GIS	✓
Option E-7	New 400kV substation, 11-bay (with allowance for), double circuit turn in between towers	All	Yes	GIS	X

1.5 Cost estimates

Based on the latest Cost Book (2023/24 prices) and early project estimates, the preferred option, Option E-6, has an estimated total cost of including risk and contingency. Pre Construction Funding of is requested to progress surveys, planning and land activities, FEED, programme management and obtain third party services.

1.6 Indicative delivery programme

The project is planned for delivery subject to planning consent and regulatory approvals. Cost apportionment and final efficiencies will be confirmed through the Project Assessment stage.

2 Introduction

2.1 Farmoor 400kV

This submission, coupled with its Annexes and Cost Benefit Analysis (CBA), is made under the Load Re-Opener and Price Control Deliverable (Special Condition 3.18 of the RIIO-ET3 Licence) for the Farmoor 400kV substation, new build project.

The application seeks the following determinations from Ofgem:

- approval of project eligibility under the Load Re-Opener and Price Control Deliverable (Special Condition 3.18)
- confirmed acceptance of the preferred solution (Option E-6)
- confirmation that the project should proceed via Track 2 EL of the re-opener process; and
- approval of Pre Construction Funding (PCF) under Special Condition 3.15 (Pre Construction Funding Reopener, Price Control Deliverable).

The investment will enable the connection of [REDACTED] confirmed customers (solar generation and battery energy storage systems), while being designed to accommodate capacity for future connections.

2.1.1 Eligibility, Project Track Statement and PASE

The project qualifies under Special Condition 3.18 as a load-driven investment scheduled for delivery within the RIIO-ET3 period. The investment has no allowances provided in the current or historic price control periods.

This submission proposes the Track 2 EL Load Re-Opener process for assessment. Track 2 EL is appropriate as a single preferred option is set out and the track proposal has been discussed with Ofgem.

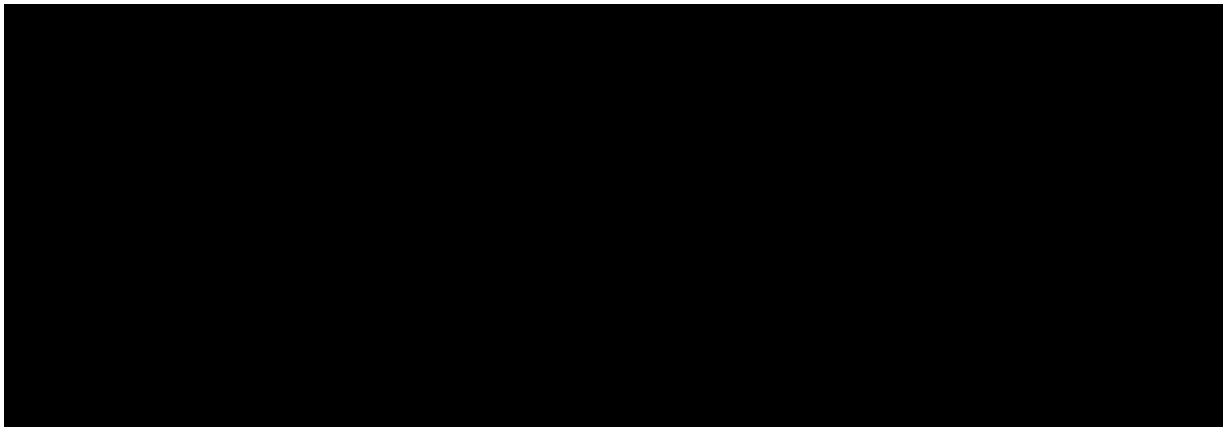
2.1.2 Pre Construction Funding Request

Under Special Condition 3.15 of the Electricity Transmission licence, this investment qualifies for allowances equal to [REDACTED] of its total forecasted cost [REDACTED] at the time of this Load Re-Opener Eligibility Letter submission).

Based on our current forecast we have provided below breakdown of costs amounting [REDACTED]

Table 2 below summarises the activities covered by the application of these PCF allowances based on our current progress of PCF and EEW spend. This position will be updated as we continue to mature this investment and ultimately reconciled at Project Assessment stage of the re-opener

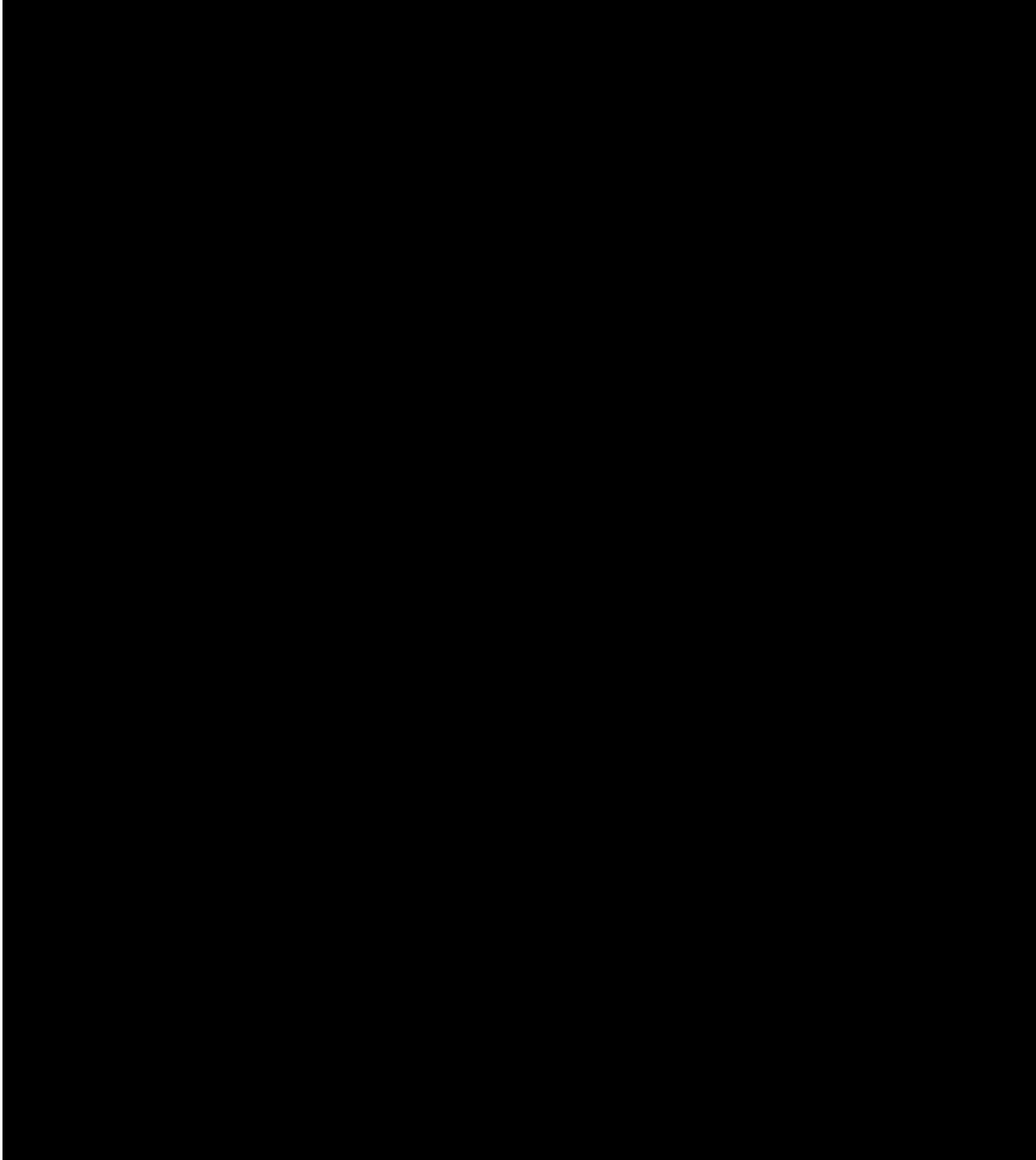
We confirm that no PCF activity included in this submission has been funded through baseline allowances, other re-openers, or alternative licence mechanisms.



2.2 Background

2.2.1 Chronology of investment

The customer connections drivers, siting study and high-level optioneering considerations are provided in **Figure 1**.



2.2.2 Regional & Network Context

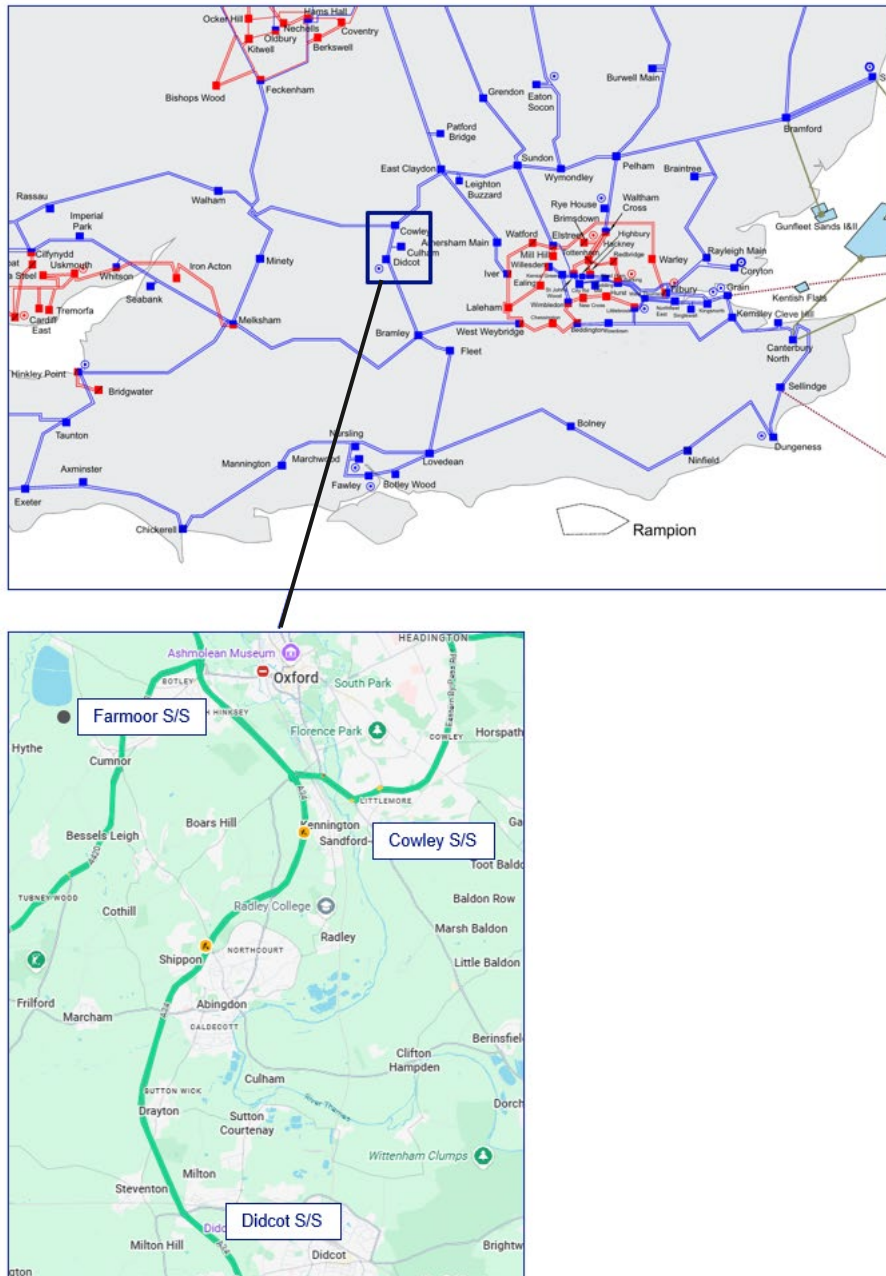
Farmoor is being progressed within the South Central network, where the Cowley–Minety–Walham 400kV corridor provides key transfer capability and the nearest practicable connection route for the contracted customers.

The project will create a new 400kV node in the Oxford area to enable the connection of material volumes of low-carbon generation and to support secure operation of power flows on the Cowley–Minety–Walham corridor.

While the South Central zone contains significant demand centres and generation sources, this submission focuses on the local Oxfordshire requirement to provide timely transmission access for the contracted Farmoor generation connections.

Farmoor also sits within a wider programme of reinforcement and connection activity in Oxfordshire. In particular, the South Hinksey 400kV cable uprating (on the Cowley–Walham and Cowley–Minety circuits) interacts with Farmoor by removing an existing corridor constraint and increasing transfer capability, supporting the export of generation once connections are made (see Section 2.2.2.1).

Figure 2: Proposed location of Farmoor on our network



2.2.2.1 Interactive projects

[Redacted]

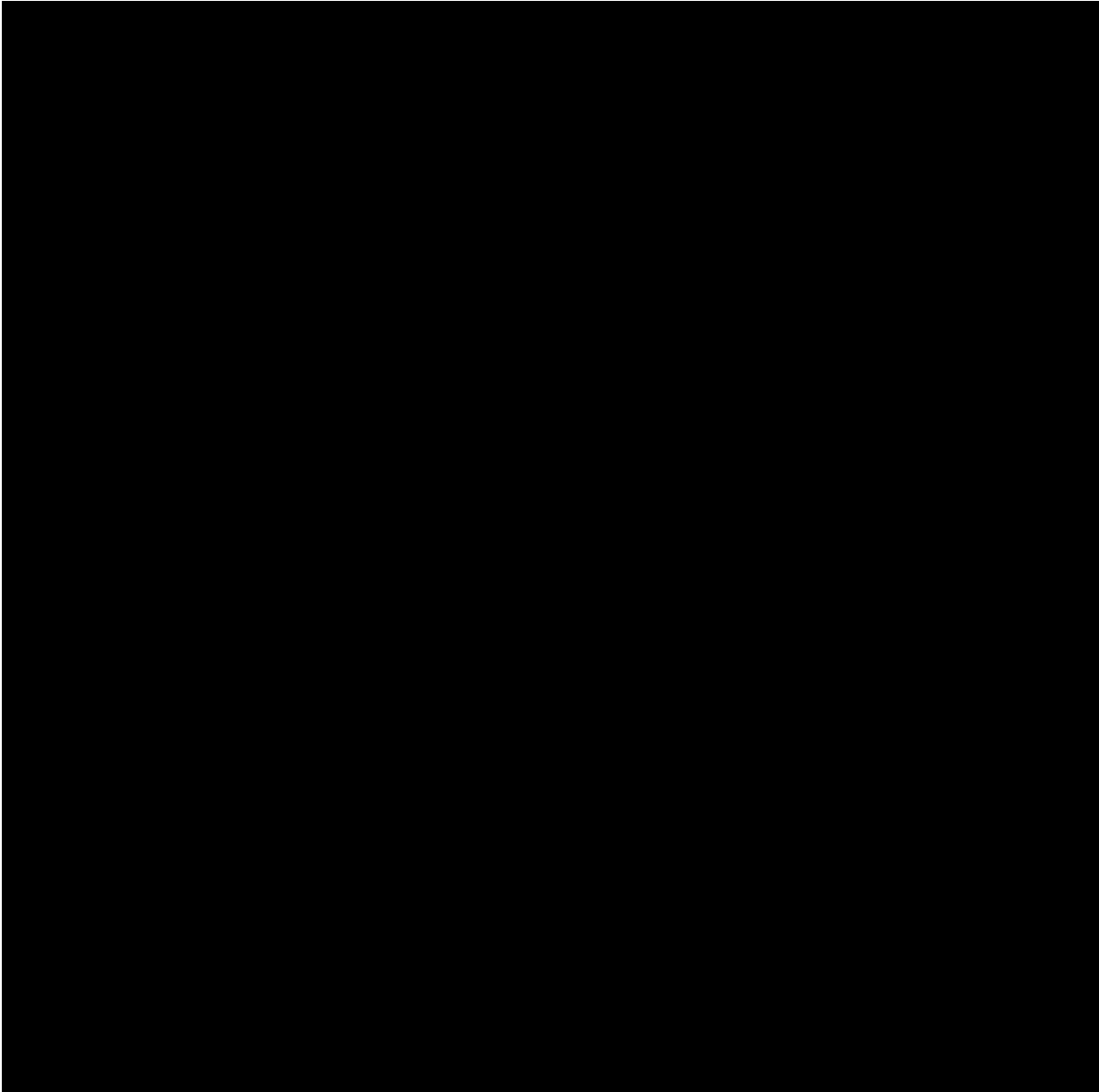
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2.2.3 Site Background

Farmoor is a proposed new build 400kV SF₆ free GIS substation. Nearby existing substations include Cowley and Didcot. Farmoor is part of a regionwide capacity buildout where both generation export and large demand growth are driving transmission investment.

Farmoor is to [Redacted] The study, including reasons for the preferred site, is summarised in section 4.2. In this regard, [Redacted]

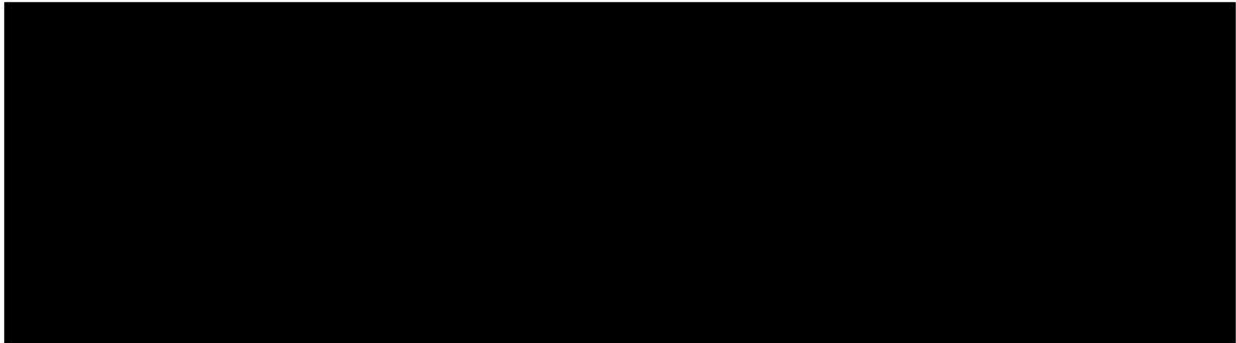


2.2.4 Historical funding

Not applicable, this project has received no historic funding.

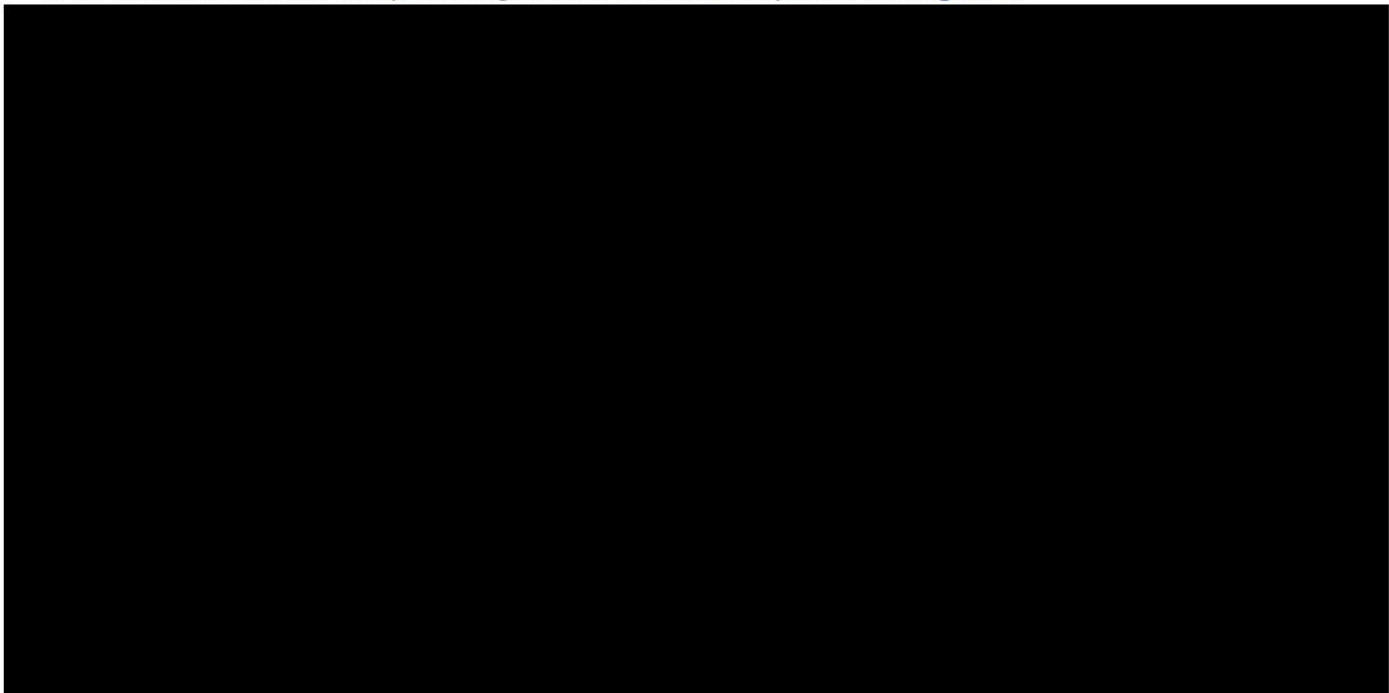
3 Drivers & Needs Case

The Farmoor 400kV investment is triggered by confirmed customer connection requirements in Oxfordshire.



3.1 Customer

Table 4 provides an overview of customer connections, relative to this investment and the impacts of Connections Reform. A map showing customer locations is provided in **Figure 5**





3.2 Asset Health

Although the selection of the preferred load-driven intervention may influence how interfacing assets are managed, there is currently no asset-health driver directly associated with the Farmoor scheme.

4 Optioneering

We follow a structured, multi-factor optioneering process to select the most economic and efficient solution, in the interest of consumers. In line with the Electricity Transmission Design Principles, our optioneering process takes into account engineering, environmental, deliverability, economic and stakeholder factors. We start by assessing the most suitable strategic options.

This paper uses two linked “option” labels: numbered Areas of Search (1–15) to describe *where* a new substation could be located, and lettered design options (A–E) (with sub-variants) to describe *what* could be built. The preferred solution is therefore the selected design option at the selected site.

4.1 Strategic Options

In line with our standard optioneering process, we considered the following broad strategic options:

Table 5: Strategic direction setting

Option	Description
Option A: Do nothing	This option involves making no changes and therefore doing nothing to facilitate the connection of customers.
Option B: Market based solution	This option involves accommodating increased customer demand through the procurement and use of ancillary services only.
Option C: Non-transmission, whole systems solution	This option involves addressing the identified need without constructing new transmission assets, instead relying on coordinated interventions across the wider electricity system.
Option D: Make use of existing assets.	This option involves making use of existing infrastructure such as substations and could include extension or upgrading.
Option E: New substation	This option involves construction of a new substation.

We discounted Options A, B and C due to the inability of these options to facilitate the connection requests and therefore fulfil our licence obligation, Transmission Licence (Licence Condition C8). We discounted existing substations due to physical constraints preventing further expansion (Option D) and therefore decided to progress with a new substation near Oxford (Option E) leading to a siting study summarised in section 4.2. A descriptive rationale for rejection or progression from the longlist is explained in Section 4.3, **Table 7**.

4.2 Siting

This section summarises how we identified and down-selected potential locations for a new 400kV substation (“siting options”). It explains:

[REDACTED]

[REDACTED] The subsequent Section 4.3 then assesses design solutions (i.e., what is built) at the preferred location.

We began studies to identify possible sites for a new substation. We employed the support of [REDACTED], with technical inputs from the [REDACTED] in conducting a detailed review of possible suitable sites. The scope of the study was bound by our statutory duties and planning policy requirements such as; the Electricity Act 1989, Transmission Standard Licence Conditions, the Natural Environment and Rural Communities Act 2006, the Horlock rules, the National Planning Policy Framework (NPPF) as well as National Policy Statements (NPS).

Figure 6 and Figure 7 show the siting study area within dotted lines, some of which lies within the [REDACTED]. The siting study area was defined to ensure the new substation could be connected efficiently to the existing 400kV network while limiting the extent of additional infrastructure required. Owing to customer power requirements and system security considerations, connection to the 400kV overhead line network is essential, with the Cowley–Walham–Minety 400kV overhead line representing the nearest practicable connection route.

Figure 6: Areas of search

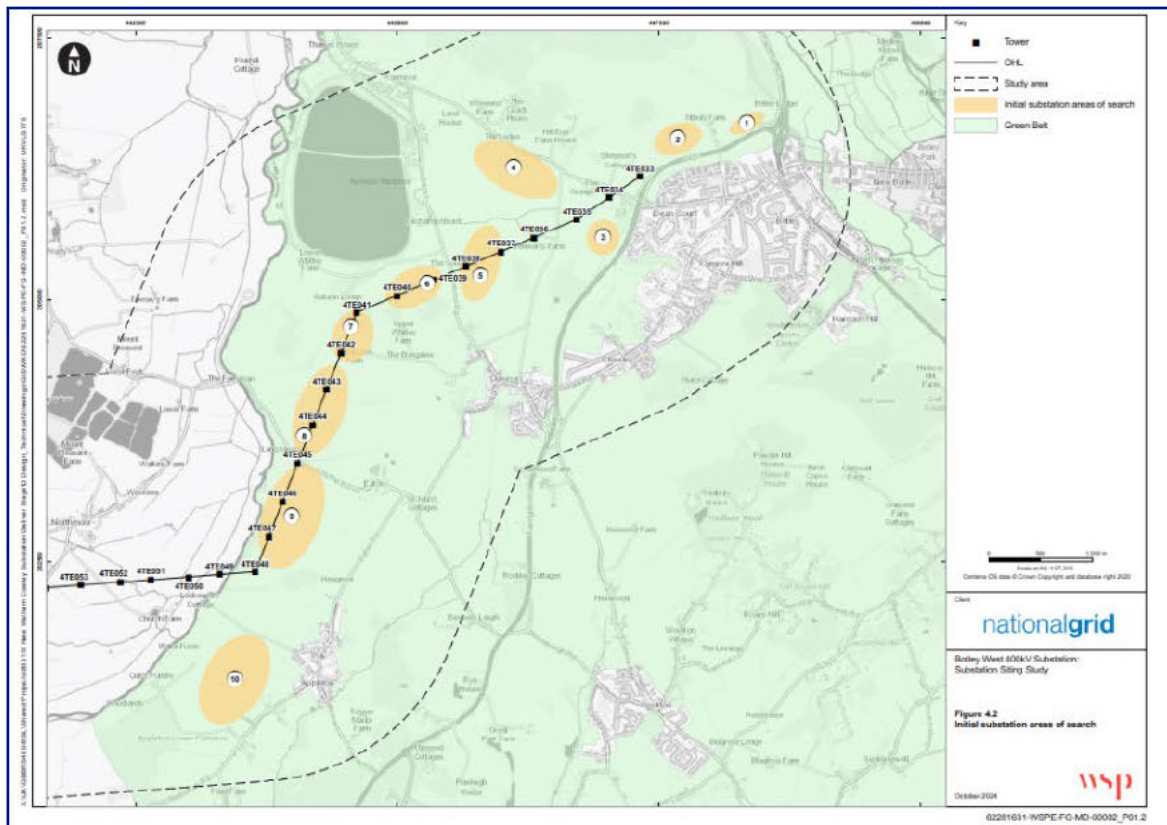
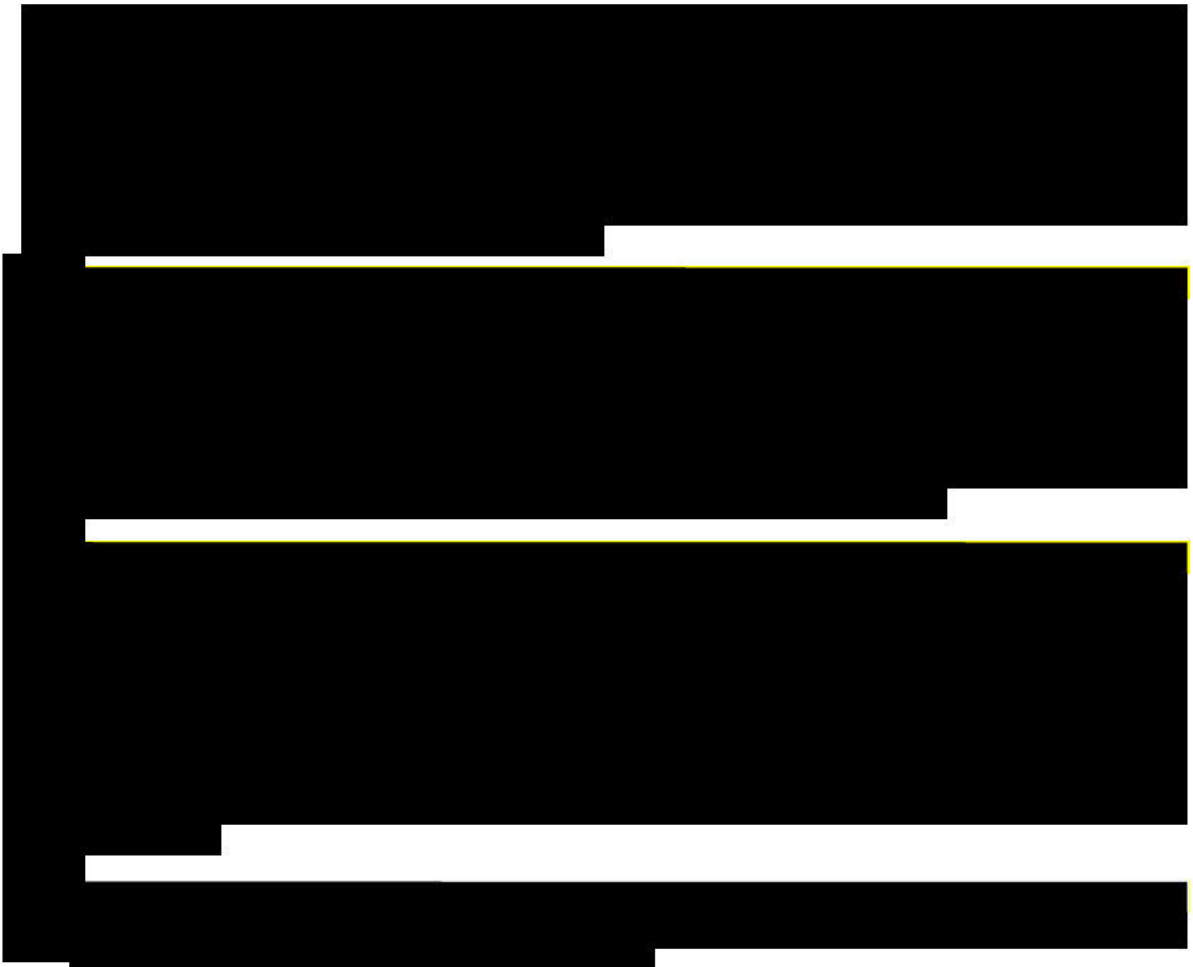


Figure 7: Areas of search beyond Green Belt



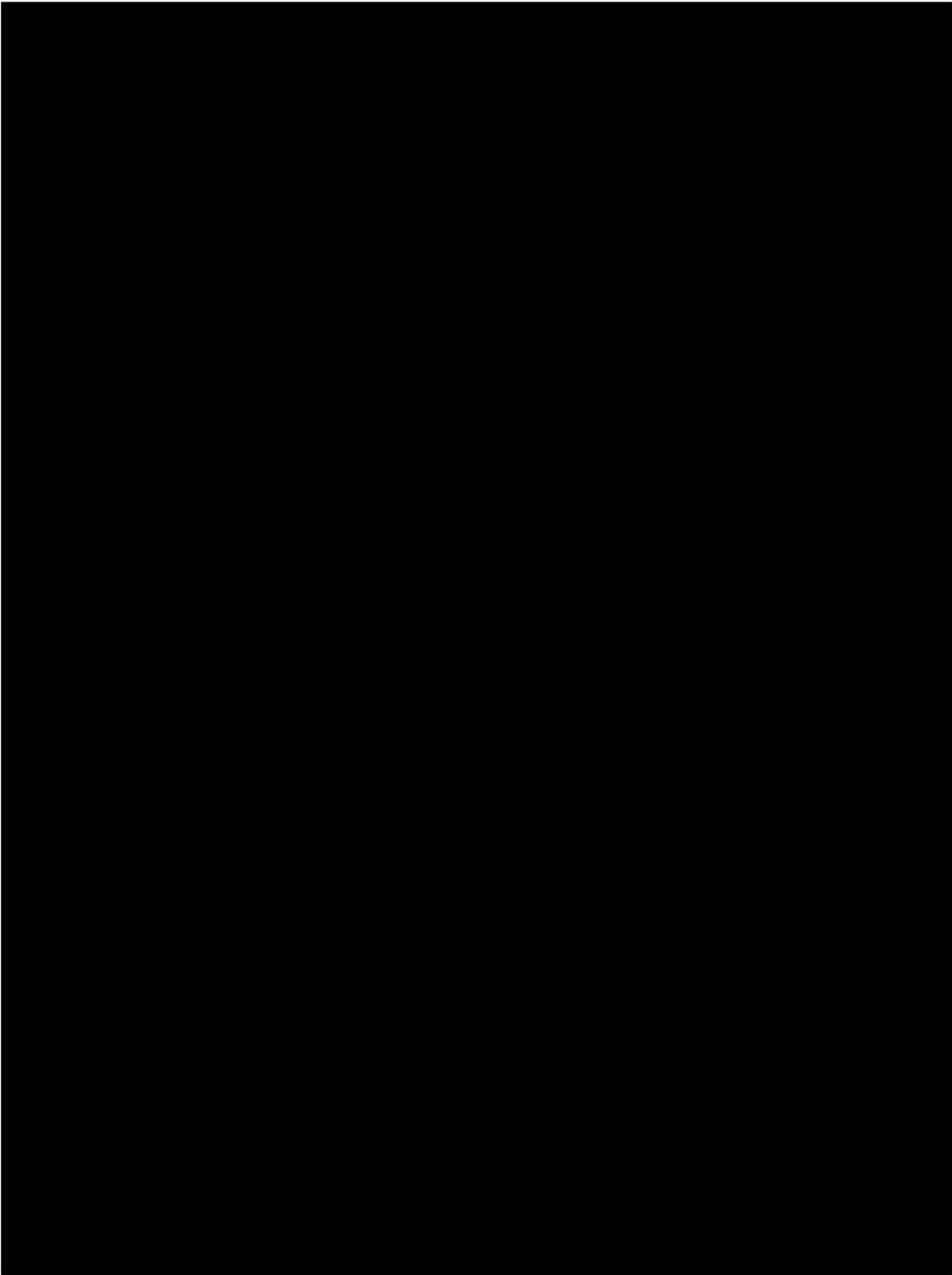
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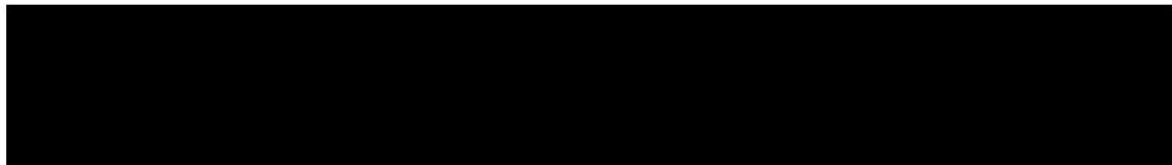
[Redacted]

[Redacted]

[Redacted]



4.2.1 Siting Conclusion



[REDACTED]

4.3 Summary of all identified design options

In line with our internal processes and Ofgem’s *Load Re-Opener Guidance*, we have undertaken a proportionate multifactorial assessment of the options to identify the option that offers the best overall outcome for consumers.

Table 7: Summary of long list options and down selection

Option	Technical Description	Relevant Diagrams or Layout References	Consenting Risks & Environmental Constraints	Rationale for rejecting or taking forward the option
Option A: Do nothing Not progressed	The network is kept in its current state, and no new connections are facilitated.	N/A	N/A	Engineering: Compliant customer connection not delivered. The Do-Nothing option was therefore discounted as it would go against NGET Licence Obligations.
Option B: Market-based solution Not progressed	Increased customer demand is accommodated through the procurement and use of ancillary services only.	N/A	N/A	Engineering: Compliant customer connection not delivered. New customer connections require physical connections to the transmission network. The market-based option was discounted as it does not enable this.
Option C: Non-transmission, whole systems solution Not progressed	The required customer connection is accommodated by a DNO instead of NGET.	N/A	N/A	Engineering: Compliant customer connection not delivered. [REDACTED] [REDACTED] The non-transmission, whole-system solution was discounted as new customer connections require a physical connection to the transmission network.
Option D-1: Connection to and extension of [REDACTED] Not progressed	Connection to [REDACTED] [REDACTED]	No drawing	Smaller footprint of the extension compared to new build, therefore has lower ecological/ environmental impact.	Engineering: The substation has a lack of physical space to extend.

Option	Technical Description	Relevant Diagrams or Layout References	Consenting Risks & Environmental Constraints	Rationale for rejecting or taking forward the option
<p>Option D-2: Connection to and/or extension of [REDACTED]</p> <p>Not progressed</p>	<p>Connection to [REDACTED]</p> <p>Extension of [REDACTED]</p>	<p>NA</p>	<p>Existing substation so minimal consenting risks compared to new substation.</p> <p>Area largely brownfield site with a lot of development already planned in the vicinity.</p>	<p>Engineering: The substation has a lack of physical space to extend.</p>
<p>Options E-1: New 400kV AIS Substation (S/S) 4-bays Single Circuit Options (There are x4 variants of this option described in the next column E-1A to E-1D)</p> <p>Not progressed</p>	<p>E-1A – Turn in at tower [REDACTED] S/S connected via 900m cable from 400kV CSE compound in existing location of tower [REDACTED]</p> <p>E-1B - Turn-in at tower [REDACTED] Cowley–Walham circuit from both sides terminate at 400kV CSE compound to new gantries from proposed tension tower 60m West of existing tower [REDACTED] (removed). S/S connected via cable from 400kV CSE compound.</p> <p>E-1C – Turn in at tower [REDACTED] Cowley–Walham circuit from both sides terminate at Farmoor 400kV to new FLT landing gantries</p>	<p>Appendix A (supplied alongside this submission)</p>	<p>Smaller footprint compared to Double Circuit turn equivalents reducing environmental impact and potentially easier to consent.</p>	<p>Engineering: The single circuit and lack of SGTs limits connectivity to only one customer, it therefore does not satisfy drivers to connect multiple customers to the National Electricity Transmission System (NETS).</p> <p>Consumer value: The designs lack adaptability and future-proofing to facilitate further potential demand or generation connections in the region.</p>

Option	Technical Description	Relevant Diagrams or Layout References	Consenting Risks & Environmental Constraints	Rationale for rejecting or taking forward the option
	<p>from proposed tension tower 60m West of existing tower [REDACTED] (removed). From FLI landing gantries, the circuit loop-in loop-out via single switch Main and Reserve busbar arrangement within Farmoor 400kV S/S.</p> <p>E-1D – Turn in at tower [REDACTED] As for Option E-1C but at tower [REDACTED]</p>			
<p>Option E-2: New 400kV AIS 11-bay Substation between towers [REDACTED]</p> <p>Not progressed</p>	<p>Cowley-Walham 400kV circuit terminated from the Walham side at Farmoor via a new landing gantry from proposed Tower [REDACTED] and Minety–Cowley 400kV circuit terminated from the Minety side via a new landing gantry from proposed Tower [REDACTED]. Both circuits loop-in/loop-out through single main and reserve busbars within the substation. No SGTs in scope. Option removes existing [REDACTED]</p>	Appendix A	<p>Larger substation footprint compared to Single Turn-in options (Option E-1) creates [REDACTED]</p>	<p>Engineering: The double circuit turn in allows for capacity to connect all three immediate customers compared to single circuit turn-in options.</p> <p>Consumer value: The lack of allowance for future SGTs and additional bays means the design lacks adaptability and sufficient future proofing.</p> <p>Environmental: The option is located [REDACTED] and requires the removal of hedgerows.</p> <p>Consents and Land: [REDACTED]</p> <p>Deliverability: Cable works underneath OHL circuits would require outage of both circuits due to impressed voltage requirement. Access to this location would be more complex as the roads to this location are narrow and not suitable for construction traffic for a project of this size. In addition, access to this location will have to cross multiple small villages.</p>

Option	Technical Description	Relevant Diagrams or Layout References	Consenting Risks & Environmental Constraints	Rationale for rejecting or taking forward the option
<p>Option E-3: New 400kV AIS 11-bay Substation at tower [REDACTED]</p> <p>Not progressed</p>	<p>Cowley-Walham 400kV circuit terminated from the Walham side at Farmoor via a new landing gantry from proposed [REDACTED], and Minety–Cowley 400kV circuit terminated from the Minety side via a new landing gantry from proposed Tower [REDACTED]. Both circuits loop-in/loop-out through single main and reserve busbars within the substation. No SGTs in scope. Option removes existing tower [REDACTED].</p>	<p>Appendix A</p>	<p>Larger substation footprint compared to Single Turn-in options (Option E-1) creates [REDACTED]</p>	<p>Engineering: The double circuit turn in allows for capacity to connect all three immediate customers compared to single circuit turn-in options and is closer to customer locations compared to E-2.</p> <p>Consumer value: The lack of allowance for future SGTs and additional bays means the design lacks adaptability and sufficient future proofing.</p> <p>Environmental: [REDACTED]</p> <p>Consents and stakeholder impact: [REDACTED]</p> <p>Land acquisition: [REDACTED]</p> <p>Deliverability: The water stream [REDACTED] mains) runs in the eastern piece of land which would require diversion during construction and cable works underneath OHL circuits would require outage of both circuits.</p>
<p>Option E-4: New 400kV GIS 11-bay Substation at tower [REDACTED]</p> <p>Not progressed</p>	<p>Similar to Option E-3 but GIS option.</p>	<p>Appendix A</p>	<p>The smaller substation footprint compared to Option E-2 and 3 reduces [REDACTED]</p>	<p>Engineering: The double circuit turn in allows for capacity to connect all three immediate customers compared to single circuit turn-in options and is closer to customer location compared to E-2.</p> <p>Consumer value: The lack of allowance for future SGTs and additional bays means the design lacks adaptability and sufficient future proofing.</p>

Option	Technical Description	Relevant Diagrams or Layout References	Consenting Risks & Environmental Constraints	Rationale for rejecting or taking forward the option
				<p>Environmental: The GIS solution would be SF₆ free. [REDACTED]</p> <p>Consents and stakeholder impact: [REDACTED]</p> <p>Land: [REDACTED]</p> <p>Deliverability: The water stream ([REDACTED] mains) runs in the eastern piece of land which would require diversion during construction.</p>
<p>Option E-5: New 400kV AIS Substation 11 [REDACTED] bay Double Circuit turn-in at [REDACTED]</p> <p>Progressed to shortlist</p>	<p>[REDACTED] SGTs for future demand . Cowley-Walham 400kV circuit terminated from the Walham side at Farmoor via a new landing gantry from proposed [REDACTED] and Minety-Cowley 400kV circuit terminated from the Minety side via a new landing gantry from proposed [REDACTED] Both circuits loop-in/loop-out through single main and reserve</p>	<p>Section 4.4.1</p>	<p>[REDACTED]</p>	<p>Engineering: Double circuit turn in allows for capacity to connect all three immediate customers.</p> <p>Consumer value: [REDACTED]</p> <p>Outputs of further analysis is contained within Table 8.</p>

Option	Technical Description	Relevant Diagrams or Layout References	Consenting Risks & Environmental Constraints	Rationale for rejecting or taking forward the option
	busbars within the substation. Option removes existing tower [REDACTED]			
Option E-6: New 400kV SF ₆ free GIS Substation 11 [REDACTED] bay Double Circuit turn-in at tower [REDACTED] Progressed to shortlist	SF ₆ free GIS alternative to Option E-5. [REDACTED] [REDACTED] Cowley-Walham 400kV circuit terminated from the Walham side at Farmoor via a new landing gantry from proposed Tower [REDACTED] and on Cowley side at Farmoor via a new landing gantry from proposed Tower [REDACTED] Minety-Cowley 400kV circuit terminated from the Minety side via a new landing gantry from proposed Tower [REDACTED] and on Cowley side at Farmoor via a new landing gantry from proposed Tower [REDACTED] Option removes existing tower [REDACTED]	Section 4.4.1	[REDACTED]	Engineering: Double circuit turn in allows for capacity to connect all three immediate customers. Consumer value: [REDACTED] Outputs of further analysis is contained within Table 8 .
Option E-7: New 400kV SF ₆ free GIS Substation 11 [REDACTED] bay Double Circuit	SF ₆ free GIS Option, includes [REDACTED] From landing gantries [REDACTED] and [REDACTED], the circuit will	Appendix A	TCPA required.	Engineering: The double circuit turn in allows for capacity to connect all three immediate customers compared to single circuit turn-in options. However, compared to Option E-6, the substation is located further away from the User's main substation, therefore 400kV and 132kV cable routes would be longer.

Option	Technical Description	Relevant Diagrams or Layout References	Consenting Risks & Environmental Constraints	Rationale for rejecting or taking forward the option
turn-in between towers 4TE040 & 4TE041 Not progressed	loop-in loop-out via single switch Main and Reserve busbar arrangement within Farmoor 400kV Substation. [Redacted] between the existing towers, [Redacted]			Consumer value: [Redacted] Environmental: SF ₆ free GIS. [Redacted] Consents and stakeholder impact: [Redacted] Land: [Redacted]

In summary, Options A-C were rejected due to their failure to deliver compliant physical connections (Options A–C). Options D-1 [REDACTED] and D-2 were rejected due to physical constraints preventing extension of the site. The four variants of Option E-1 (E-1A to E-1D) were rejected due to the inability of the substation design to accommodate all 3 generation customers and therefore cannot meet the drivers. Option E-2 to E-4 were rejected because [REDACTED]. Option E-7 was rejected due to distance from the User's main substation necessitating longer 400kV and 132kV cable routes and the requirement to [REDACTED]

4.3.1 Influence of stakeholders on shortlisting

Stakeholder views

The Botley West project has received substantial negative local opposition in Oxfordshire. The “*Stop Botley West*” group have challenged the solar farm project on grounds of visual impact and loss of [REDACTED] whilst highlighting how the project will trigger a new substation, which they view as further damaging the landscape. As a responsible infrastructure developer, we have been mindful of the impact of the substation and how it will be received by local residents. In doing so, we are aligned with draft Electricity Transmission Design Principles which suggest transmission owners ‘be cognisant of local stakeholder views.’

[REDACTED] challenging local sentiment toward a substation. Therefore, we aimed to minimise local impacts through our shortlisting as much as possible to mitigate deliverability risk and delay. We incorporated these considerations into our multi factor optioneering more fully set out below.

Consenting and [REDACTED]

We are currently in the [REDACTED] and therefore do not have final views from the Local Planning Authority (LPA) on our proposals. However, the Vale of White Horse District Council's screening report (Environmental Impact Assessment) noted there would be ‘*significant visual and character impact...is likely to significantly affect the wider landscape character...located within the Oxfordshire Green Belt... (changing the area) from one with an open character and appearance to an industrial substation*’. The assessment, [REDACTED], endorses our approach in the earlier shortlisting and subsequent multi factor optioneering exercise to exclude options that would result in disproportionate landscape and visual effects.

Furthermore, the recent planning decision¹ regarding Uxbridge Moor (a 132/400kV GIS substation, with six SGTs) by Buckinghamshire Council provides a recent example of the ability to consent GIS solutions in Green Belt. This decision supports our earlier shortlisting and subsequent multi factor optioneering exercise to, where possible, prefer options that delivered the same project benefits and satisfied the needs case, while having a reduced Green Belt impact.

[REDACTED]

[REDACTED]

[REDACTED]

¹ Planning Approval (PL/24/0449/FA)

[Redacted]

[Redacted]

[Redacted]

[Redacted]

4.4 Shortlisted Options

Option E-5: New 400kV AIS Substation 11-bay [Redacted]

Option E-6: New 400kV SF₆ free GIS Substation 11-bay [Redacted]

4.4.1 Description of short-list options considered

Option E-5: New 400kV AIS Substation 11-bay [Redacted]

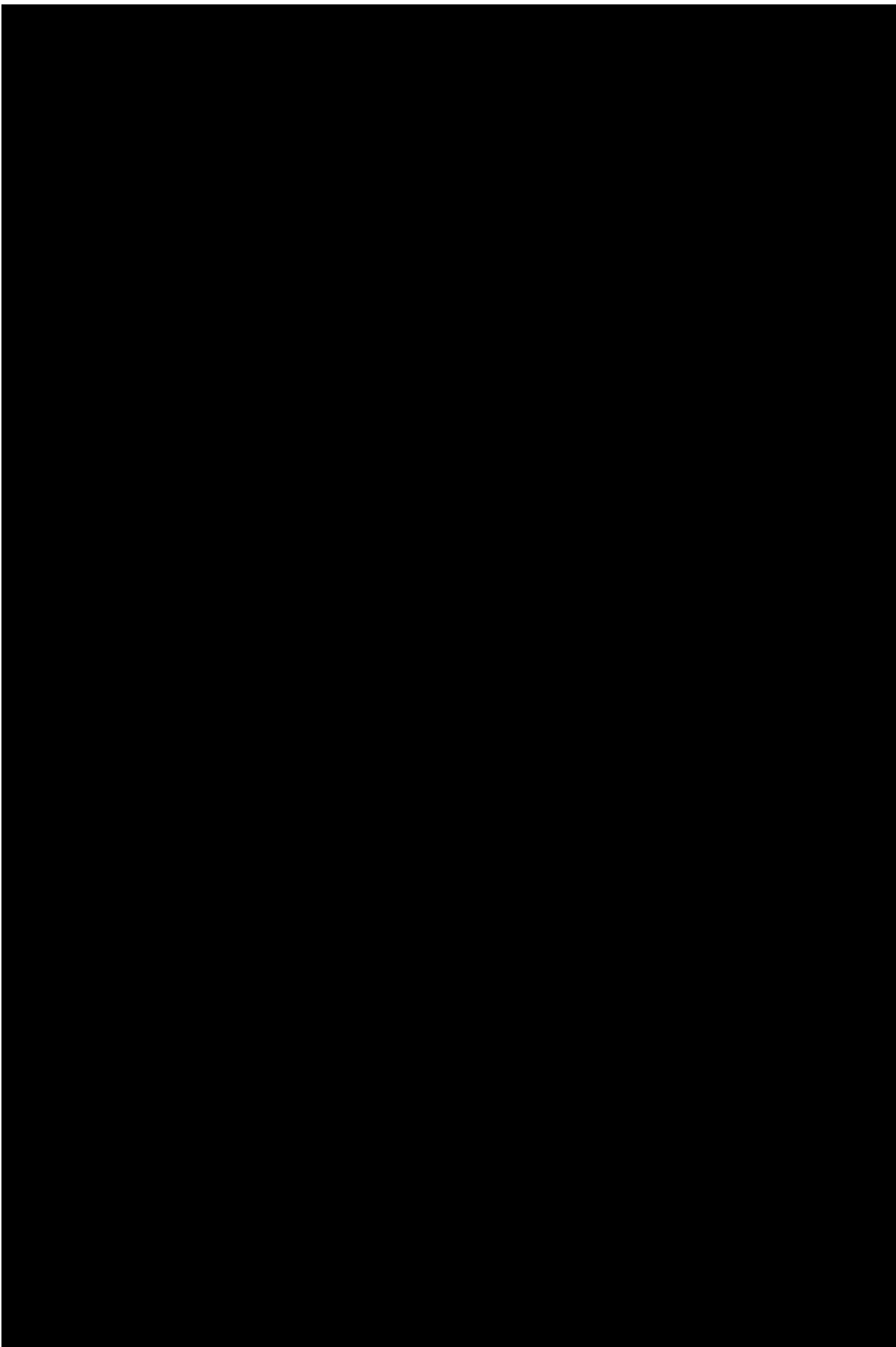
The proposed investment includes a double-circuit turn-in to ensure compliance with the Security and Quality of Supply Standard (SQSS) and National Grid Electricity Transmission’s statutory duties as Transmission Owner, by enabling compliant operation under N-1 and, where applicable, N-2 such that, following the loss of a credible circuit or item of plant, the system remains within permissible thermal, voltage and stability limits.

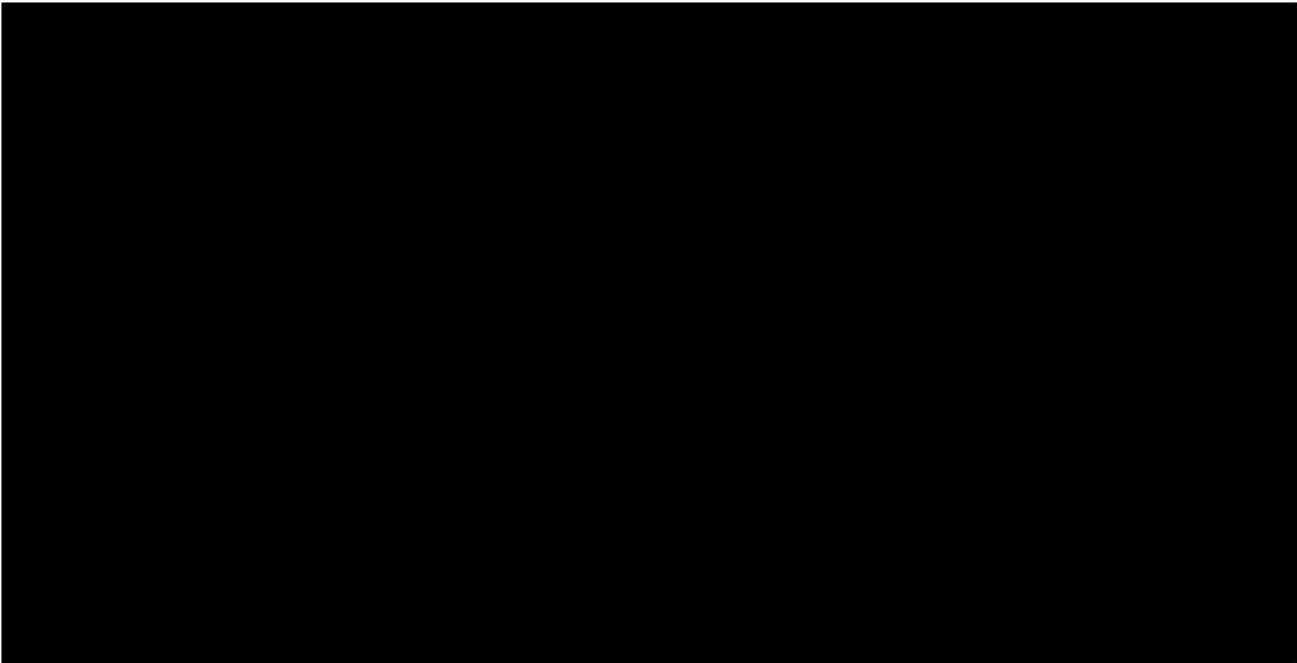
A single-circuit arrangement would give rise to pre- and post-fault constraints and would not provide a robust or enduring SQSS-compliant solution at the forecast level of demand. The double-circuit configuration improves post-fault operability, avoids reliance on operational mitigations, and represents an appropriate and proportionate solution that supports the efficient and economic development of the transmission system, thereby constituting eligible expenditure.

[Redacted]

[Redacted]

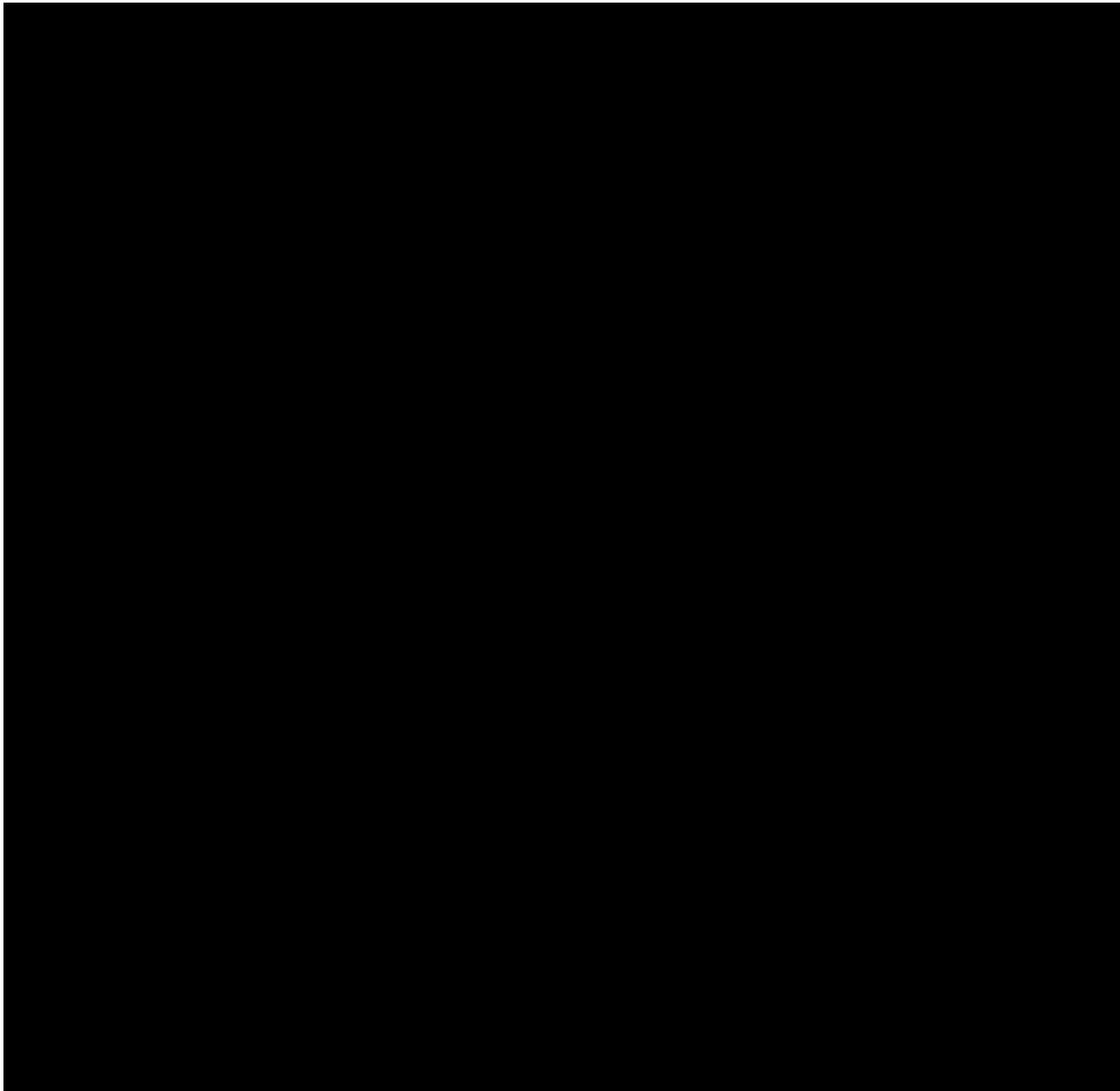
[Redacted]

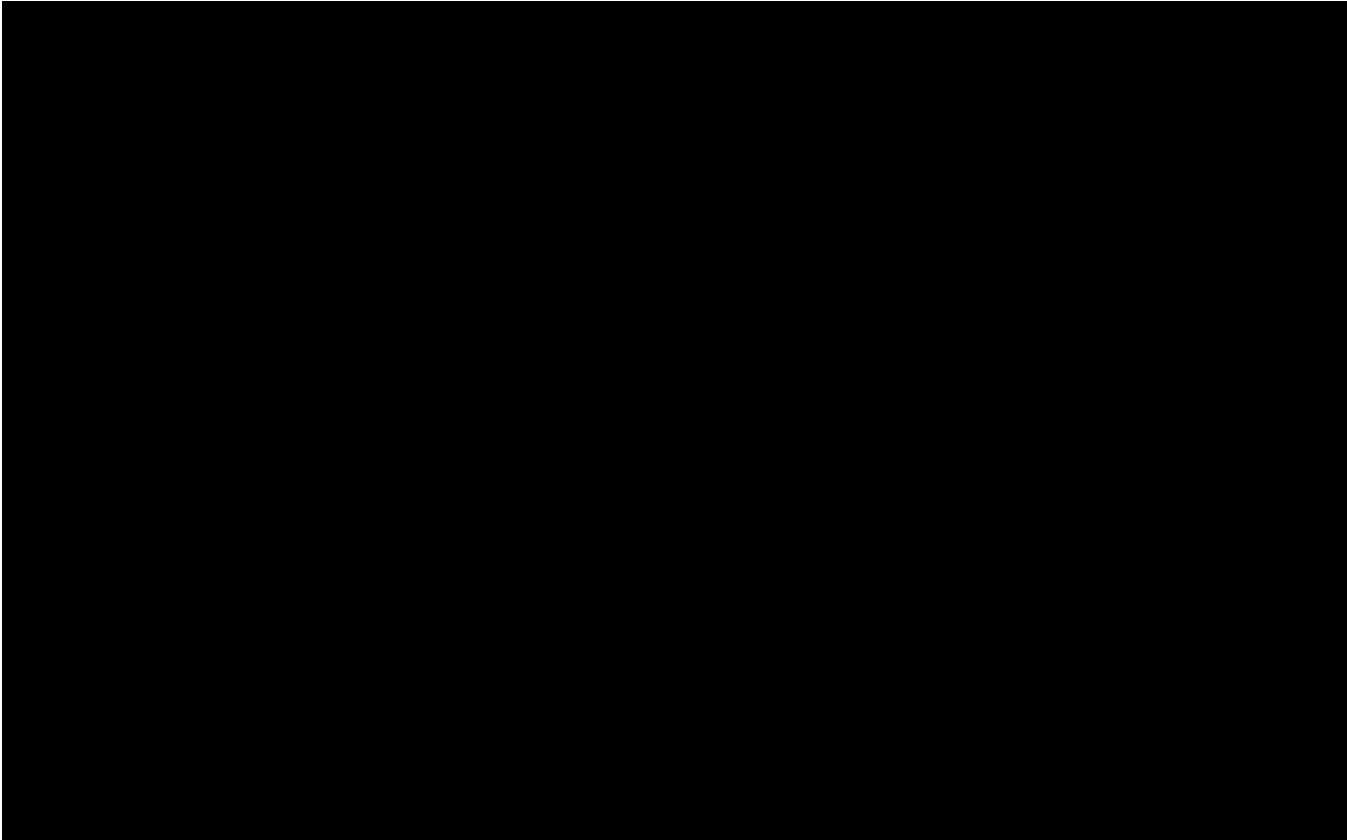




Option E-6: New 400kV SF₆ free GIS Substation 11-bay

[Redacted text block containing multiple lines of blacked-out content]





In appraising these two options, we undertook a proportionate, multi-factor qualitative assessment to determine which option delivers the best overall outcome for consumers, while meeting the investment drivers. The results are summarised in **Table 8**.

4.5 Qualitative assessment of shortlist

Table 8: Multifactorial analysis

Optioneering Categories					
Option	Engineering	Environmental	Deliverability	Economic/Consumer Value	Consenting /Stakeholder
Option E-5 New AIS Substation	<ul style="list-style-type: none"> Delivers against the project drivers. [REDACTED] Extension of 400kV busbar is feasible. 	<ul style="list-style-type: none"> AIS footprint is [REDACTED] AIS substations contain SF₆ gas in circuit breakers. 	The footprint of an [REDACTED]	<ul style="list-style-type: none"> Owing to [REDACTED], wider decarbonisation benefits of connecting renewable generation customers is delayed. 	[REDACTED]
	Strong Benefit	Neutral	Detractor	Detractor	Detractor

² National Grid RII0-3 Business Plan Submission, *NGET_NN_Atypical EJP_Early Land Purchase.pdf*

Optioneering Categories					
Option	Engineering	Environmental	Deliverability	Economic/Consumer Value	Consenting /Stakeholder
Option E-6 New GIS Substation	<ul style="list-style-type: none"> Delivers against the project drivers. Extension of 400kV busbar is feasible. 	<ul style="list-style-type: none"> GIS footprint is SF₆ free technology significantly reduces operational emissions - 		<ul style="list-style-type: none"> Lower potential earlier connection of renewable energy generation providing wider decarbonisation benefits earlier. 	
	Strong Benefit	Neutral	Neutral	Benefit	Benefit

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

4.5.1 Qualitative assessment output

Option E-6 is preferred because it reduces key delivery and [REDACTED] while still meeting the investment drivers and therefore provides the best overall solution for consumers.

The [REDACTED] Furthermore, there is recent consenting precedent ([REDACTED]) to support the ability to consent a new build GIS substation on [REDACTED]

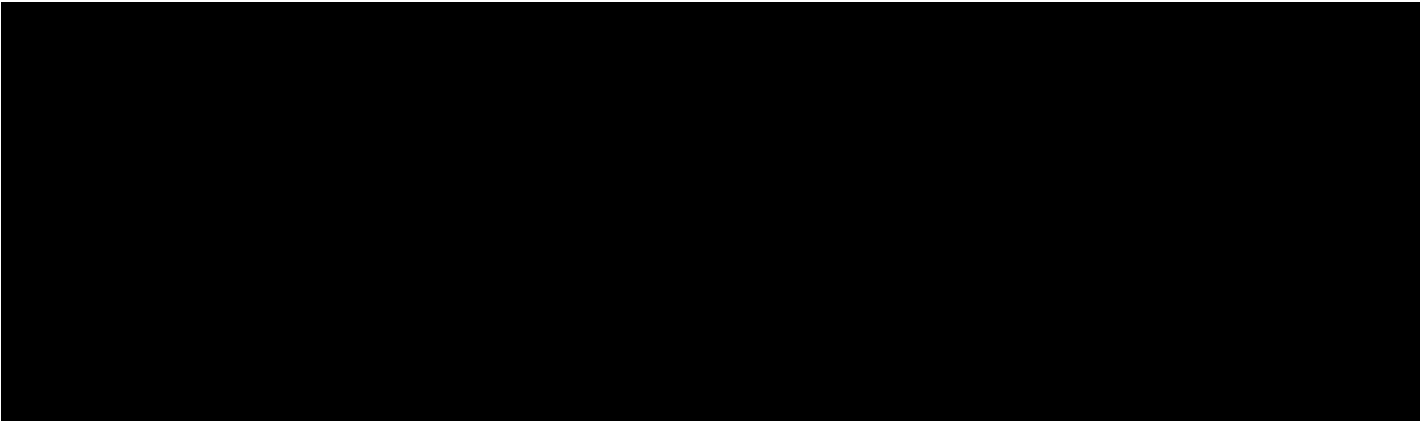
4.5.2 PASE Alignment

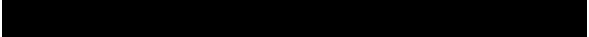
The preferred Option E-6 was established prior to the introduction of PASE. The preferred option is Track 2 EL and the track proposal has been discussed with Ofgem. Nevertheless, Option E-6 is consistent with some PASE principles, with its [REDACTED] layout [REDACTED]

4.6 Quantitative analysis of shortlist options

4.6.1 Cost estimates of shortlist options

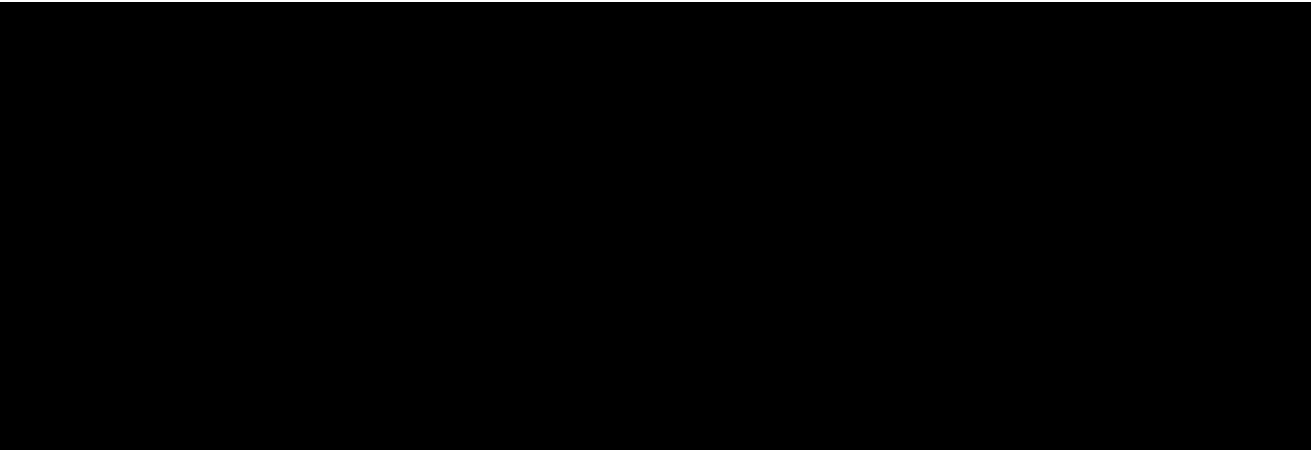
To assess the shortlisted options, cost estimates have been created for quantitative economic comparison. All capex costs are derived from NGET's latest Cost Book (23/24 prices). Estimating Units Lines (EULs) have been used to generate cost estimates based on the scope of work and the new assets to be acquired for each option. For each EUL, we have applied a [REDACTED] contingency, based on historic project analysis, to account for unforeseen circumstances and to mitigate risks during implementation.



Option E-6 is lower cost than Options E-5 because  leads to additional civil cost when constructing the substation platform, which encompass the construction of foundations, support structures, drainage systems, flood protection, security features, and access roads. Although AIS typically has lower initial equipment costs the longer construction durations drive increased project management overheads and associated security and site welfare costs, among other things, which must be in place for longer.

4.6.1.1 Cost drivers

The project's cost estimates are based on current market conditions, with ongoing work to refine requirements:



4.6.2 Cost Benefit Analysis

4.6.2.1 Purpose and Approach

Our Cost Benefit Analysis (CBA) evaluates the economic efficiency and consumer value of the proposed transmission investments. This analysis aligns with Ofgem's Load Re-Opener Guidance and Submission Requirements.

The CBA process integrates monetised benefits such as constraint cost savings, system efficiency improvements, and consumer bill impacts, alongside a comprehensive Whole-Life Cost Analysis (WLCA) that captures capital expenditure, operational and maintenance costs, replacement cycles, carbon impacts, and future extendibility. This dual approach ensures a balanced assessment of both short-term economic benefits and long-term cost efficiency, avoiding the risk of asset stranding or future inefficiencies.

Our CBA considers:

- Robust optioneering and sensitivity testing: We have evaluated credible alternatives, including 'do nothing' and 'do minimum' scenarios, to confirm that the preferred solution delivers the optimal balance of technical performance, environmental impact, and economic benefit.

- Quantification of constraint cost reductions: Using system operator modelling outputs and historical data, we quantify expected savings from reduced system constraints, which translate into direct consumer bill benefits.
- Assessment of delay impacts: The financial consequences of potential project delays on constraint costs and consumer bills are modelled through risk-adjusted scenarios, providing a clear understanding of the value of timely delivery.
- Inclusion of socio-economic benefits: Where quantification is challenging, qualitative evidence supported by stakeholder engagement and regional development plans highlights the wider economic benefits, including job creation and inward investment.
- Consideration of non-monetised benefits: We explicitly identify benefits that are qualitative or not readily monetisable, such as enhanced system operability, resilience, and environmental improvements, ensuring full transparency of the value proposition.
- Alignment with policy and government targets including Net Zero and AI Growth Zones: The CBA reflects the influence of national and local policies, including Clean Power 2030, net zero commitments, and economic growth plans demonstrating how the investment supports the broader energy transition.

We have assessed consumer value by comparing the whole-life costs and benefits of five shortlisted connection and substation delivery options using Ofgem’s RIIO-ET3 CBA template. The assessment is completed relative to a counterfactual and on a discounted basis over a 50-year appraisal period (2027–2076), consistent with the CBA methodology.

For each option considered, we have quantified:

- (i) Initial CAPEX investment required
- (ii) Future end of life replacement cost

The supporting CBA model quantifies the costs and benefits for this project. Using the Ofgem RIIO-ET3 CBA template spreadsheet, the CBA compares the discounted cost and benefits for consumers for the following two shortlisted options.

- E-5: New AIS Substation
- E-6: New GIS Substation

CBA Outcome

Lifetime Cost-Benefit Analysis: The lifetime costs and benefits refer to a 50-year period starting from 2027 until 2076

Table 10: Lifetime Cost-Benefit Analysis (2023/24 base prices, central carbon pricing, discounted values)

On the basis of the discounted lifetime CBA results (Table 10), Option E-6 delivers the highest NPV (██████████ 2023/24 base prices) and therefore represents the preferred option on consumer value grounds. Options E-5 delivers a lower NPV than E-6 (██████████ 2023/24 base prices). This recommendation analysis is subject to confirmation through deliverability, consents/land, outage and risk considerations, and any CBA sensitivities (e.g. carbon price trajectories) set out in the assumptions below.

Assumptions of the CBA analysis

The CBA results are based on the following high-level assumptions (with sensitivities used to test robustness where appropriate):

- Appraisal period of 50 years (2027–2076), with costs and benefits discounted and presented relative to the counterfactual.
- Cost base: 2023/24 prices, aligned to the Ofgem RIIO-ET3 CBA template inputs (including treatment of replacement CAPEX and maintenance).
- Carbon: central base case carbon price applied for monetising construction carbon, SF₆/alternative gas leakage and losses, with scenario testing for alternative carbon price trajectories.
- Benefits scope applied consistently across options; where option-specific benefits exist (e.g. constraints), the basis and evidence are documented and applied consistently.
- Key sensitivities considered (as applicable): timing/phasing, CAPEX uncertainty ranges, delivery/outage risk, and benefit parameter uncertainty (including losses and leakage assumptions).

4.6.2.2 Costs

Table 11: Summary of all additional Capex costs (2023/24 base prices)

	Initial works (£m)	Future replacement (40yr) (£m)	Total costs (£m)
Option E-5	██████	██████	██████
Option E-6	██████	██████	██████

4.6.2.3 Benefits

The following benefits have been included within the CBA:

- SF₆/Alternative gas leakage reduction
- Carbon cost of construction reduction
- Summary of all Benefits

Table 12 presents the summary of all (undiscounted) benefits, including environmental and non-environmental benefits, considering the central base case carbon price.

Table 12: Summary of all benefits

Option	Environmental Benefits		Total Benefits (£m)
	Carbon costs of construction (£m)	Gas leakage (£m)	
Option E-5	██████	██████	██████
Option E-6	██████	██████	██████

4.7 Preferred Solution

Based on the outputs of our multifactorial analysis and CBA, our preferred option is to deliver Option E-6. It presents a preferable NPV compared to Option E-5, it also has a lower up-front cost, and the option provides the following benefits. It has lower delivery risks as a result of the land and planning advantages.

4.7.1 Project benefits and outputs

- It provides a compliant connection node for [REDACTED] generation capacity and future-proofs the site [REDACTED]
- The new substation raises the capacity to accept and dispatch new power flow and demand, directly supporting transfer capacity through the node.

[REDACTED] he solution provides improved operational flexibility and system resilience [REDACTED]

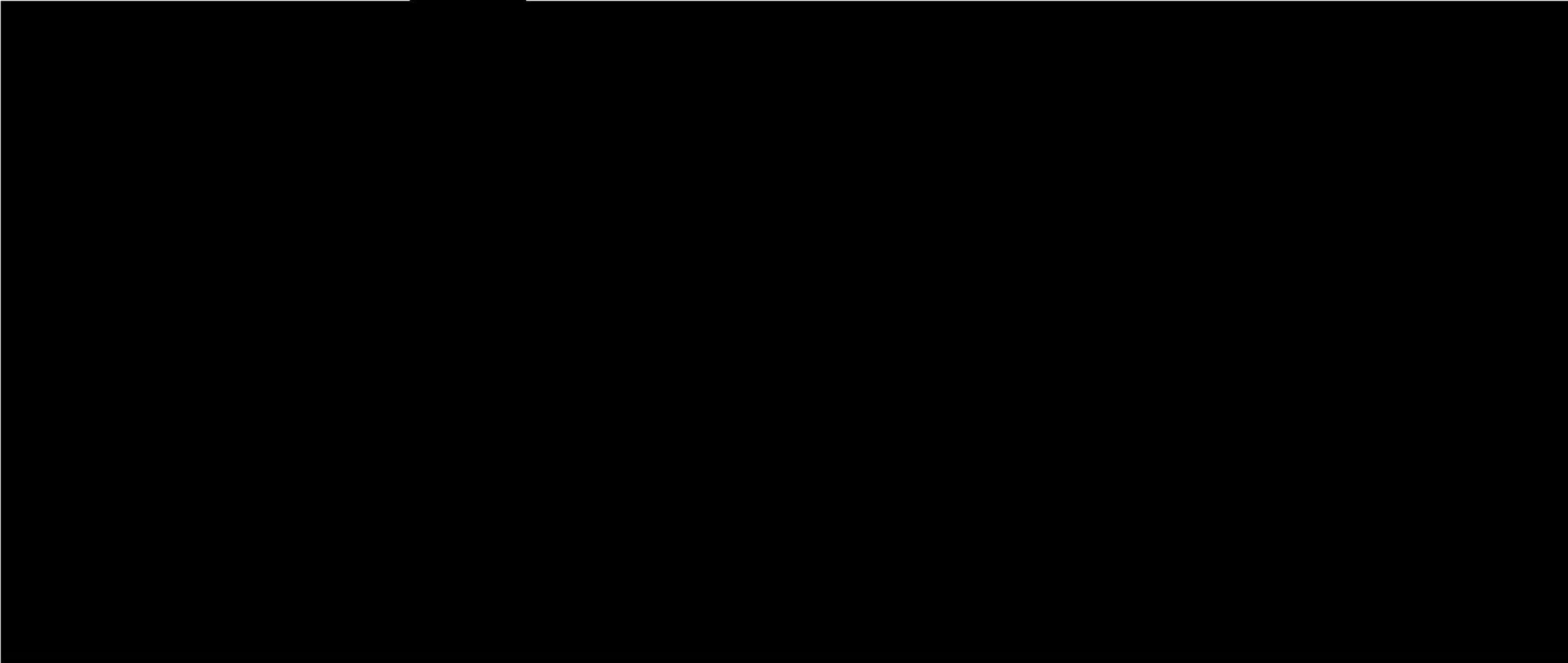
- The solution minimises the substations footprint and knock on environmental impacts and reduces the extent of visual impact [REDACTED]
- The option can be facilitated on a [REDACTED]
- By mitigating the risk of delay through [REDACTED] enables the connection of renewable generation customers sooner.

4.7.2 Future-proofing

[REDACTED]

[REDACTED]

5 Delivery



5.1 Procurement and contracting strategy

[REDACTED]

The [REDACTED]

[REDACTED] This will take advantage of utilising regional allocation where it is mutually beneficial to further enhance growth and social value. Consequently, for the Farmoor project, our aim is to appoint [REDACTED] as our regional partner.

[REDACTED]

We intend to use the [REDACTED]

Additional information regarding our procurement strategy and supplier selection will be presented in the Project Assessment.

5.2 Risk and risk management

An overview of current delivery risks are listed below along with mitigations. As risks continue to evolve, an updated detailed view of risk and mitigations will be supplied within the Project Assessment submission.

[REDACTED]

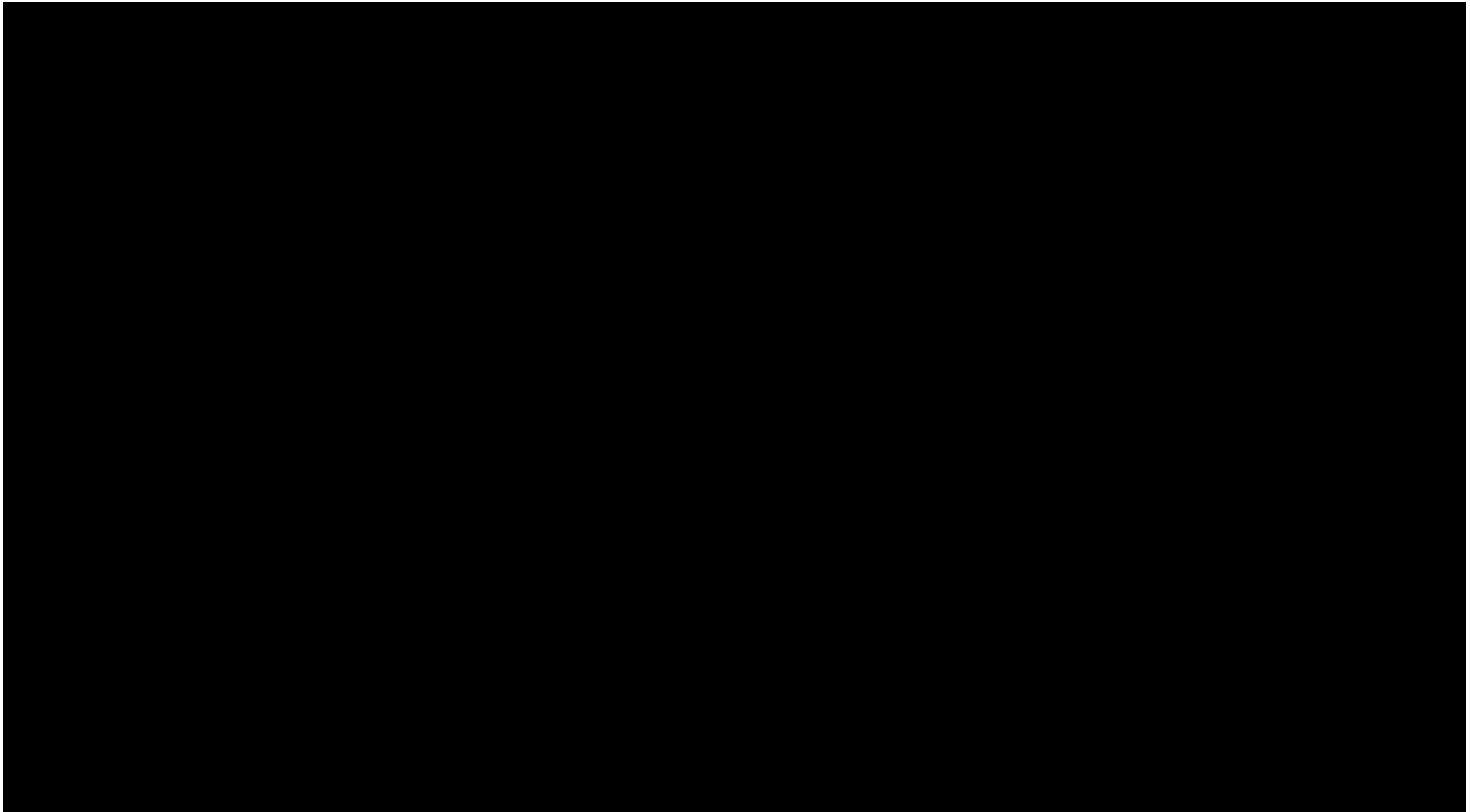
6 Conclusion

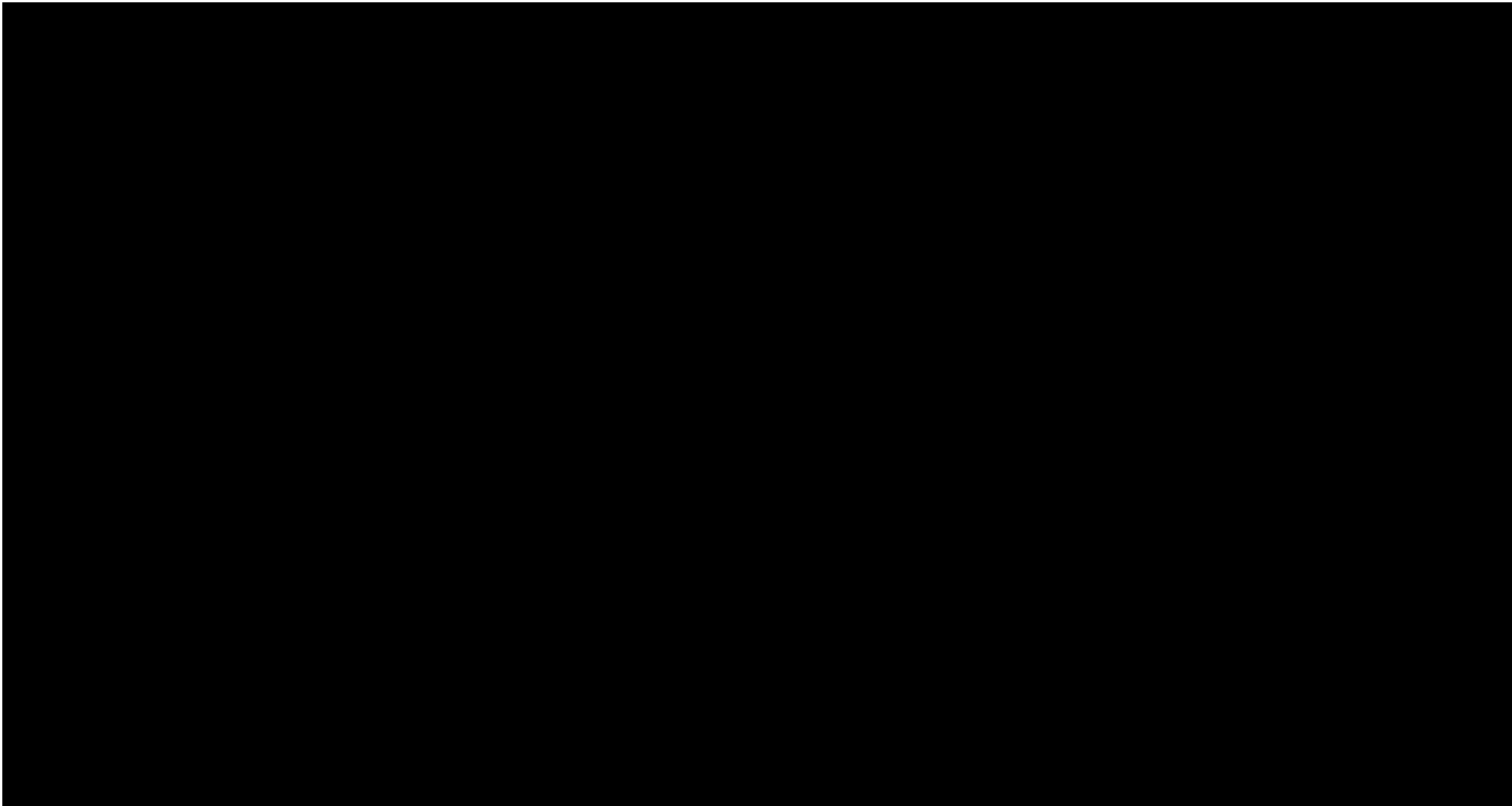
This submission outlines a preferred solution to satisfy the investment drivers. It seeks confirmation of eligibility under Special Condition 3.18, confirmation of eligibility of PCF under Special Condition 3.15, confirmation of re-opener Track 2 EL and formal approval of the Needs Case and preferred solution.

The preferred option E-6 consists of a new, 400kV GIS 11-bay substation, [REDACTED]

Main Drivers	Load – Connection of multiple contracted generation and storage customers.
Preferred Options	<p>Option E-6 – construction of a new 11-bay 400kV GIS substation, located south of Farmoor Reservoir and connected via a double circuit turn in from the Cowley–Minety–Walham 400kV overhead line.</p> <p>[REDACTED]</p>
Estimated Cost & Timing	<p>Total forecasted expenditure: [REDACTED]</p> <p>Indicative delivery timeline:</p> <ul style="list-style-type: none"> • [REDACTED]
Outputs	<p>Delivery of a new 400kV substation at Farmoor with a [REDACTED] turn in arrangement.</p> <p>Connection of three [REDACTED] customers (solar PV and BESS), with capacity to accommodate future connections.</p> <p>Improved system operability, resilience, and flexibility, [REDACTED]</p> <p>[REDACTED]</p> <p>Enabling the efficient connection of low-carbon generation customers.</p> <p>We propose a Price Control Deliverable for this investment relating to the delivery of the works and the associated outputs as follows:</p> <p>Construct a new 11-bay, 400kV SF₆ free GIS substation at Farmoor [REDACTED]</p>

Appendix 1: System Design Table





Appendix 2: Planning Legislation

[REDACTED]

[REDACTED]

[REDACTED]

Summary of NGET's Statutory Duties

Regulated by Ofgem, NGET have a legal requirement to meet its statutory duties and comply with national and local planning policy. These duties are summarised in the section below.

NGET must comply with its statutory duties to ensure it develops and maintains an efficient, economic, and coordinated energy transmission system and has due regard to the desirability of preserving amenity. The key statutory duties with relevance to the Project include:

- NGET owns and operates the electricity transmission system within England and Wales and has a statutory duty to develop and maintain an efficient, co-ordinated, and economic electricity transmission system.
- NGET has a statutory duty to provide additional capacity to meet customer demand. Upon receipt of a connection application, NGET has a legal obligation under the conditions of its transmission licence to make an offer to the customer detailing the terms (such as the work, cost, and programme) for the connections. There are very limited exceptions to NGET's obligation to make a connection offer, which do not apply to the connections considered in relation to the Project.
- Licence Condition C8 sets out obligations on NGET to make offers to provide connections to the transmission system, and related provisions.
- Licence Condition C17 requires NGET to plan, develop and operate the transmission system according to the National Electricity Transmission System Security and Quality of Supply Standard ('NETS SQSS').
- Electricity Act (1989)³ – with purpose to preserving and mitigating any impact to natural beauty, sites of special interest, buildings, or objects of historic or archaeological interest.
- Countryside and Rights of Way Act (2000)⁴ – with the purpose of conserving and enhancing areas of natural beauty. Natural Environment and Rural Communities Act (2006)⁵ – with the purpose of conserving biodiversity.

³ UK Public General Acts: Electricity Act (1989)

⁴ UK Public General Acts: Countryside and Rights of Way Act (2000)

⁵ UK Public General Acts: Natural Environment and Rural Communities Act (2006)

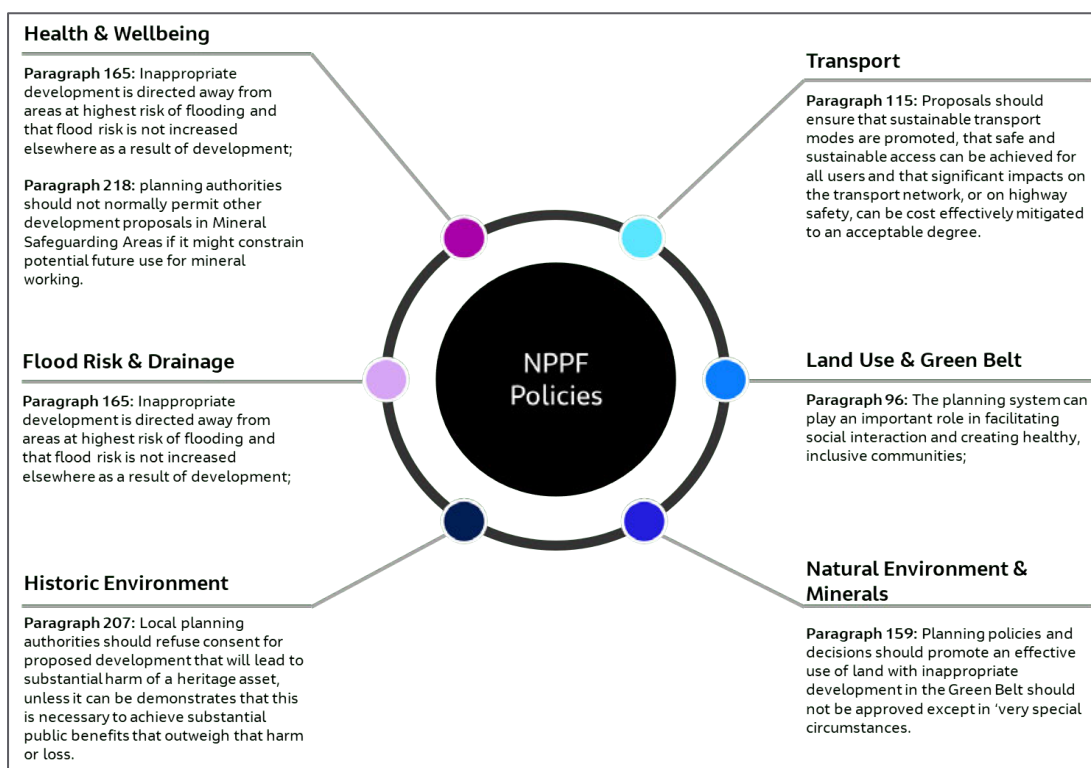
Holford Rules, Horlock Rules, National & Local Planning Policy Framework

To support the decision-making process of new energy infrastructure, NGET must comply with legislation specific to siting and designs of new substations in addition to wider consent from local and national permitting bodies. With relevance to the Project, this includes:

- Holford Rules: Provides guidance on routeing of high voltage overhead transmission lines.
- Horlock Rules: Provides guidelines for the design and siting of substations (in addition to cable sealing end compounds and line entries).
- National Planning Policy Framework (NPPF): Outlines economic, social, and environmental policies which contribute to the objective of delivering sustainable development.
- Local Planning Policy Framework: NGET must work with local authorities and their development plans when determining planning decisions on new energy infrastructure.

Whilst NPPF does not include policy specific to the siting of new substation, the Figure below outlines NPPF policies that may have relevant considerations when determining new substation locations.

Figure 15: NPPF New Substation Related Planning Policies



Appendix 3: Glossary

ACE	Advanced Commissioning Engineer
ACL	Available For Commercial Load
ACSR	Aluminium Core Steel Reinforced
AIS	Air Insulated Switchgear
APM	Advanced Procurement Mechanism
BESS	Battery Energy Storage System
BP	Business Plan
BPDT	Business Plan Data Template
CAI	Closely Associated Indirect
CBA	Cost Benefit Analysis
CPO	Compulsory Purchase Order
CSNP	Centralised Strategic Network Plan
DC	Direct Current
DCO	Development Consent Order
DC TC	Direct Current Time Constraint
DESNZ	Department for Energy Security and Net Zero
DISC	Disconnecter
DLR	Docklands Light Railway
DNO	Distribution Network Operator
ECC	Estimated Cost of Construction
EEW	Early Enabling Works
EJP	Engineering Justification Paper
EoL	End-Of-Life
ESO	Energy System Operator
ET	Electricity Transmission
EU	European Union
EUL	Estimating Units Lines
ESW	Earth Switch
FEED	Front End Engineering Design
FES	Future Energy Scenarios

FY	Financial Year
G3	Green Gas for Grid
GEC	General Electric Company
GIB	Gas Insulated Busbar
GIS	Gas Insulated Switchgear
GLA	Greater London Authority
GW	Giga Watt
HDD	Horizontal Directional Drilling
HV	High Voltage
HWUP	Hackney Waltham Cross Upgrading
IEC	International Electrotechnical Commission
kW	Kilo Watt
LLTI	Long Lead Time Items
LTDS	Long-Term Development Statement
LV	Low Voltage
LVAC	Low Voltage Ac
M&E	Mechanical And Electrical
MITs	Main Interconnected Transmission Systems
MSIP	Medium Sized Investment Project
MVA	Megavolt-Amperes
MW	Mega Watt
NESO	National Energy System Operator
NETS	National Electricity Transmission System
NG	National Grid
NGED	National Grid Electricity Distribution
NGET	National Grid Electricity Transmission
NOA	Network Options Assessment
NOMs	Network Output Measures
NPV	Net Present Value
OHL	Overhead Line
ORPS	Obligatory Reactive Power Service
PCD	Price Control Deliverables
PCF	Pre Construction Funding

SF6	Sulfur Hexafluoride
SAP	Senior Authorised Person
SGT	Super Grid Transformer
SLD	Single Line Diagram
SPV	Special Purpose Vehicle
SSMD	Sector Specific Methodology Document
SSSI	Site of Special Scientific Interest
STC	System Operator Transmission Owner Code
SuDS	Sustainable Drainage Solutions
TBC	To Be Confirmed
tCO2e	Tonnes of Carbon Dioxide Equivalent
TCPA	Town And Country Planning Association
TCSNP	Transitional Centralised Strategic Network Plan
TWB	Through-Wall Bushing
UK	United Kingdom
UKPN	UK Power Networks
UKPN EPN	Eastern Power Networks
UKPN LPN	London Power Networks
UKPNS	UK Power Networks Services
UXO	Unexploded Ordnance
VCA	Voltage Compliance Assessment
XPLE	Cross-Linked Polythene

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