nationalgrid

RIIO-T3

North West London (NWL)

Eligibility Letter Submission – Track 2

May 2026

National Grid Electricity Transmission

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Reference and summary table

Field	Description
Project Name	North West London
TO's preferred re-opener track	Track 2 Eligibility Letter (EL)
RRP Reference	[redacted]
BPDT / Scheme Reference Number	[redacted]
Load Board Reference	[redacted]
Investment driver(s)	This project was first identified as a [redacted] These projects are required to deliver the following: • to improve the balance of power flows on Sundon – Elstree circuits and increase the network's capability to import power into London; • to support [redacted] therefore reducing constraint costs on the system. [redacted] As such, this investment supports the delivery of key UK government energy policy objectives and the regulatory framework set through RIIO-3 and [redacted], by enabling a secure, affordable and resilient electricity system capable of accommodating sustained growth in demand and generation.
Project outputs	• Additional 400 kV network capacity along the Sundon-Elstree-St John's Wood route • Second 400 kV cable circuit from Elstree–St John's Wood substations via an existing tunnel •
Short list of strategic options considered	[redacted]
Preferred solution and explanatory narrative on the rationale	To deliver HND Essential Options ESC1 and SER4, the circuit between Sundon and Elstree will be reconductored [redacted] and a cable will be routed through the existing Elstree – St John's Wood tunnel. **For the connection of the ESC1 cable at Elstree** substation, our preference is **Option E-2**. Option E-2 ensures timely delivery of the programme. [redacted] Option E-2, has lower future-proofing potential and has a significantly larger environmental impact due to the need to fell a large section of trees.

Field	Description
	For the connection of the ESC1 cable at St John's Wood substation, our preference is **Option S-6**. Option S-6 is a viable option [redacted]
PASE Compliance	The two key underlying components of the investment (SER4 and ESC1) are individually below [redacted] and are primary options within the PASE framework: • ESC1 is a new circuit intervention between Elstree and St John's Wood, which is designed to be operated at 400 kV. • SER4 is a reconductoring intervention between Sundon and Elstree [redacted]
Cost (23/24 prices)	Total upfront capital cost of the project is currently estimated to be [redacted].
Delivery year	[redacted]
Delivery risks	• **Procurement:** Lead times for delivery of long lead plant items may lead to a delay in the programme. Mitigated by securing manufacturing slots early. Where possible, [redacted] • **Third-party:** Third-party infrastructure can impact the proposed substation design and lead to late design alterations for the substation. To mitigate this risk, we have a programme of ongoing stakeholder consultation. • **Internal Interfaces** [redacted] Delays to that project could create delays to our own project, creating programme risks. To mitigate this risk, we have sought to align the contracting strategy between the substation packages. • **Outages:** Non-availability of outage and double circuit outage windows could lead to possible delays in programme works. To mitigate this risk, we have placed and confirmed dates for required outage windows in advance.
Interactive projects	[redacted]

Field	Description
	[redacted]
Historical funding interaction	In RIIO-T2: • ESC1 received allowances of [redacted] ([redacted]) in the T2 baseline, which will be readjusted at the end of RIIO-T2 to reflect the actual T2 spend. • SER2 received allowances of [redacted]) through the Wider Works Price Control Deliverable (PCD) in T2. However, this was not ultimately delivered because the scope of work changed and the project became SER4, which means the funding will be superseded by the funding sought under this scheme. In RIIO-T3, no funding was requested in the Business Plan.
Details of proposed working arrangements between TO's (or DNOs) if the project is to be undertaken jointly between more than one TO	N/A
Any other analysis or information that the TO considers to be relevant to the Authority's determination of its request	N/A
Applicable Reporting Tables	[redacted]
[redacted]	[redacted]

1. Executive summary

1.1 Project summary

The investment will reinforce the North West London network by delivering the ESC1 and SER4 schemes: a second 400 kV circuit between Elstree and St John's Wood and reconductoring of the Sundon–Elstree route, increasing import capability into London. It was identified by the former ESO as an [redacted]

1.2 Submission purpose

This paper presents our Eligibility Letter under the Load Re-opener and Price Control Deliverable under Special Condition 3.18 of the Electricity Transmission Licence Conditions.

The **purpose of this submission** is to request Ofgem's approval of project eligibility against the Load Reopener criteria and seek approval of the project's needs case and preferred solution for the North West London Reinforcement (NWL) Scheme. [redacted] In January 2026, the Final Needs Case (FNC) report for Letchmore Heath was submitted to Ofgem under the Large Onshore Transmission Investment (LOTI) mechanism, which was SpC 3.13 in our T2 licence. That report should be read in parallel with the information set out in this document for NWL. [redacted]

The NWL scheme is **complex and is multidisciplinary in nature**, requiring all the typical technologies associated with HV transmission asset construction: power cables, overhead lines, substations, tunnel installation and third-party connections in both urban and rural environments.

1.3 Need

NWL is a single investment that **delivers two NESO schemes: ESC1 and SER4**. These are the Elstree to St John's Wood Cable (ESC1) project and the Sundon to Elstree Reconductoring (SER4) project. ESC1 and SER2 (which later became SER4) were recognised [redacted]

These investments, shown on the below map, are required to deliver the following:

- to improve the balance of power flows on Sundon – Elstree circuits and increase the network's capability to import power into London;
- [redacted]

[redacted]

1.4 Optioneering to date

1.4.1 SER4 Optioneering

To arrive at the scope of work defined for SER4, we coordinated with the former ESO on how best to deliver a capacity increase on the Sundon-Elstree second circuit. We undertook a multi-factor optioneering process to identify a proportionate and deliverable solution in the interests of consumers. We first considered , including non-build options (do-minimum, market-based, whole- that differed based on the We were immediately able to rule out most options on the basis that they could not deliver the driver. Of the remaining options, the use of a

Table 1: Summary of SER4 optioneering

Option	Details	Drivers met?	Preferred?
A	Do nothing counterfactual option	No	X
B	Market-based solution	No	X
C	Non-transmission, whole systems solutions (DNO)	No	X
Y-1		No	X
Y-2		Yes	✓
Y-3		No	X
Y-4		No	X
Y-5		Yes	X
Y-6		Yes	X

Our cost estimates for this option are presented below. All capex costs are derived from NGET's latest Cost Book (23/24 prices). [redacted], based on historical project analysis, to account for unforeseen circumstances and mitigate risks during implementation.

[redacted]

1.4.2 ESC1 Circuit Optioneering

A similar approach was used to arrive at the scope of work defined for ESC1. From the [redacted] we were able to rule out the non-build options on the basis that they could not deliver the driver. The [redacted] The scope of work also aligns with HND Essential Option ESC1.

Table 3: Summary of ESC1 optioneering

Option	Details	Drivers met?	Preferred?
A	Do nothing counterfactual option	No	X
B	Market-based solution	No	X
C	Non-transmission, whole systems solutions (DNO)	No	X
X-1	Use the existing cable tunnel	Yes	✓
X-2	Surface line route	Yes	X
X-3	OHL route	Yes	X
X-4	Construct a new tunnel	Yes	X

Our cost estimates for this option are presented below, [redacted] These costs are as specified in the cost book, and any updates will be shared with Ofgem in the [redacted].

[redacted]

1.4.3 ESC1 Connection Optioneering

Once it was determined that a cable would be routed through the existing Elstree – St John's Wood tunnel by delivering ESC1, we optioneered how to connect this cable at each substation. For each substation, we undertook a multifactorial options analysis to identify a solution that would deliver in the interests of consumers. For Elstree, we shortlisted three of the five considered options. For St John's Wood, we shortlisted three of the seven considered options.

Table 5: Summary of optioneering for connecting at Elstree and St John's Wood

Option	Details	Drivers met?	AIS/ GIS?	Short List?
Elstree connection options				
E-1	400 kV SF_6-free GIS extension of existing building	Yes	GIS	✓
E-2	400 kV SF_6-free GIS extension in the 132 kV AIS area	Yes	GIS	✓
E-3	400 kV SF_6-free GIS extension in Greenfield northeast of site	Yes	GIS	✓
E-4	400 kV SF_6-free GIS extension in the 275 kV AIS compound	No	GIS	X
E-5	New 400 kV AIS substation	No	AIS	X
St John's Wood connection options				
S-1	400 kV GIS busbar extension	Yes	GIS	✓
S-2	400 KV GIS Busbar [redacted]	No	GIS	X
S-3	Tee-off into 400 kV [redacted]	Yes	GIS	✓
S-4	Tee-off into 400 kV [redacted]	No	GIS	X
S-5	New 400 kV GIS into the 275 kV AIS Building	No	GIS	X
S-6	Elstree 2 connection [redacted]	Yes	GIS	✓
S-7	New 400 kV AIS substation	No	AIS	X

Our cost estimates for the shortlisted options are presented below, [redacted]

[redacted]

Our preferred options for these connections at Elstree and St John's Wood are options E-2 and S-6, respectively. Option E-2 ensures timely delivery of the programme. [redacted] has lower future-proofing potential and has a significantly larger environmental impact due to the need to fell a large section of trees. [redacted]

1.4.4 Preferred overall option

In summary, our overall preferred option for the NWL investment is as follows:

- For SER4, our preferred option is Y-2, which is to reconductor the existing OHL route between Sundon and Elstree [redacted]
- For ESC1, our preferred option is X-1, which is to route a [redacted] between Elstree and St John's Wood
- For the connection of the ESC1 cable at Elstree substation, our preferred option is E-2, which is a 400 kV New GIS Extension in the 132 kV AIS area
- For the connection of the ESC1 cable at St John's Wood substation, our preferred option is S-6, which is an Elstree 2 [redacted]

Taken together, the preferred solution enables the investment drivers and avoids constraint costs to consumers that would otherwise be incurred. It also supports the [redacted] and enables increased power transfer into London, aligned with decarbonisation and offshore wind growth. The **total cost of the investment is** [redacted]

1.5 Indicative delivery programme

The ACL [redacted] which ensures timely delivery of the investment need and prevents expensive constraint costs (see programme of works, below). Key milestones in the programme include:

[redacted]

[redacted]

2. Introduction

2.1 North West London

This paper presents our Eligibility Letter under the Load Re-opener and Price Control Deliverable under Special Condition 3.18 for the North West London (NWL) reinforcement scheme. Through this submission, we are seeking:

- approval of the investment need and our preferred option;
- confirmation of the proposed Track 2 EL; and
- Pre-Construction Funding (PCF) under Special Condition 3.15 (Pre-Construction Funding Re-opener, Price Control Deliverable).

Subject to Ofgem confirming eligibility, needs case and PCF applicability, we will continue development and intend to submit a Project Assessment in line with the re-opener process.

[redacted] In January 2026, the Final Needs Case (FNC) report for Letchmore Heath was submitted to Ofgem under the Large Onshore Transmission Investment (LOTI) mechanism, which was SpC 3.13 in our T2 licence. That report should be read in parallel with the information set out in this document for NWL. [redacted]

The NWL scheme is **complex and is multidisciplinary in nature**, requiring all the typical technologies associated with HV transmission asset construction: power cables, overhead lines, substations, tunnel installation and third-party connections in both urban and rural environments.

2.1.1. Eligibility, Track and PASE

The NWL investment should progress through Load Related Re-Opener because the investment is required to facilitate network drivers and the requirement did not form part of the baseline portfolio for the RIIO-T3 Final Determination.

The project is being submitted through the Track 2 EL pathway. The two key underlying components of our preferred option are individually [redacted] and are primary options within the PASE framework:

- the new circuit intervention between Elstree and St John's Wood is designed to be operated at 400 kV (a primary option in the PASE framework);
- the reconductoring intervention between Sundon and Elstree [redacted]

2.1.2 Pre-Construction Funding Request

Under Special Condition 3.15 of the Electricity Transmission licence, this investment qualifies for allowances [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] as part of this submission [redacted].

[redacted]

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

[redacted]

2.2 Background

2.2.1 Chronology

The Elstree to St John's Wood Cable 1 (ESC1) project and the Sundon-Elstree 2 circuit Reconductoring (SER2) projects were **confirmed as Holistic Network Design (HND) Essential Options** in the former ESO's *Network Options Assessment (NOA) 2021/22 Refresh.*[2] These projects are designated as Clean Power 2030 enabling transmission investments, reinforcing the need case established under the Beyond 2030 framework. This was in response to the coordinated offshore network proposed in the HND to connect Round 4 windfarms, which resulted in increased reinforcement requirements across boundaries in the Midlands, South and East of England due to the location of the onshore connection points.

[redacted]

Given shared drivers, constraints and outage dependencies, **ESC1 and SER4 were combined into a single integrated scheme in 2025, now referred to as the NWL project**. Following strategic confirmation, NWL progressed through structured optioneering to identify credible options to progress.

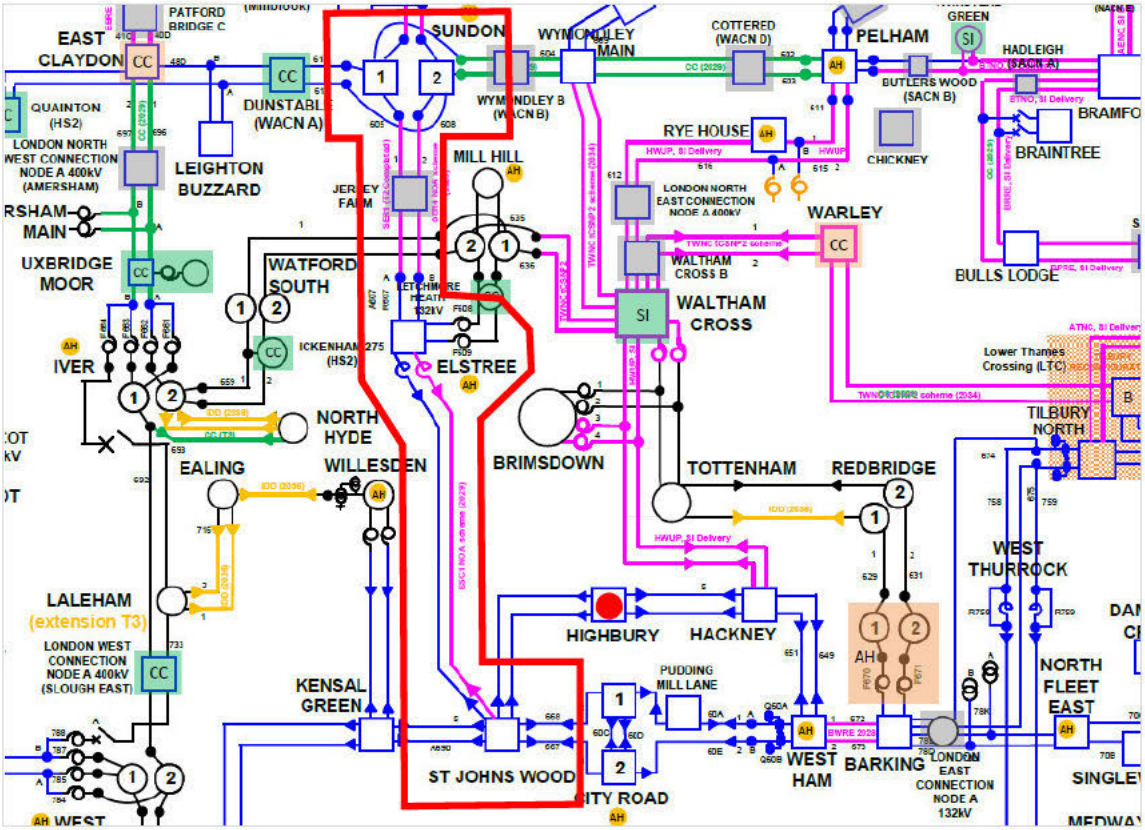
[2] National Grid ESO, 2022. Network Options Assessment 2021/22 Refresh

[3] A separate project (SER3) completed the reconductoring of the Sundon-Elstree 1 circuit and has guided the approach for the Sundon-Elstree 2 circuit. Both SER 3 & 4 (formerly SER 1 & 2) were renumbered when ESO determined a second iteration/upgrade to conductor type was needed for both Elstree-Sundon circuits (ccts 1 & 2) to meet power flows.

2.2.2. Regional and network context

The proposed **investment sites are within North West London, Bedfordshire and Hertfordshire** (see Figure 4 and Figure 5). The London and Southeast 275 kV and 400 kV transmission networks are designed to meet London's electricity needs and support the coastal interconnector power exchange capability. There are multiple interconnectors in this region which create dynamic network challenges that affect the infrastructure needed to manage large power flow in either direction.

Figure 5: NGET's network map including NWL and other network upgrades



*Key: **Red** is the investment location*

The region is predominantly a net importer, with future power flows into the capital forecast to increase significantly. As a net importer, excess power on the transmission network flows into this region and heads to the interconnectors for export in times of high wind and solar generation in the UK. In Greater London, demand is forecast to increase by more than 170% by 2050, against a backdrop of the UK's transition towards net zero and a significant increase in the number of data centres needed to support the growing telecommunications industry.[4]

[redacted]

[redacted] For this reason, reinforcement is required for the following:

- To address the single circuit dependency into St John's Wood; increasing system flexibility and operability by having a second circuit.
- To provide adequate thermal and transfer capability to support forecast peak demand.

[4] NESO, 2024. Electricity Ten Year Statement (ETYS)

[redacted]

- To ensure the network can accommodate planned renewable generation in line with national decarbonisation policy.

[redacted]

NESO has identified the need for network reinforcement. In response to the identified need to increase capacity on key import routes into the capital, ESC1 and SER2 were confirmed as HND Essential Options in the ESO's *NOA 2021/22 Refresh*.[5] NESO have identified both Sundon and St Johns Wood as strategic demand growth supply point areas as part of their Regional Energy Strategic Planning (RESP) review with [redacted] to be considered for pro-active investment by 2034.[6] Their need is to address critical constraints on the network in light of the demand growth described above.

In response to the growing demand in London and the need for reinforcement, **our regional blueprints for London and the Southeast include several circuit and substation investments**.[7] Examples of our circuit investments include three cable upgrade projects, three reconductoring projects and a new cable project. Two initiatives within that circuit investment portfolio (ESC1 and SER4, which are respectively items 8 and 9 in Figure 6, below) form the NWL investment set out in this document.

[redacted]

[5] National Grid ESO, 2022. Network Options Assessment 2021/22 Refresh

[6] NESO Strategic Energy Need - Feb 26

[7] NGET, 2024. London: Future Network Blueprint; NGET, 2024. Southeast: Regional Network Blueprint

2.2.3 Interactive projects

[redacted]

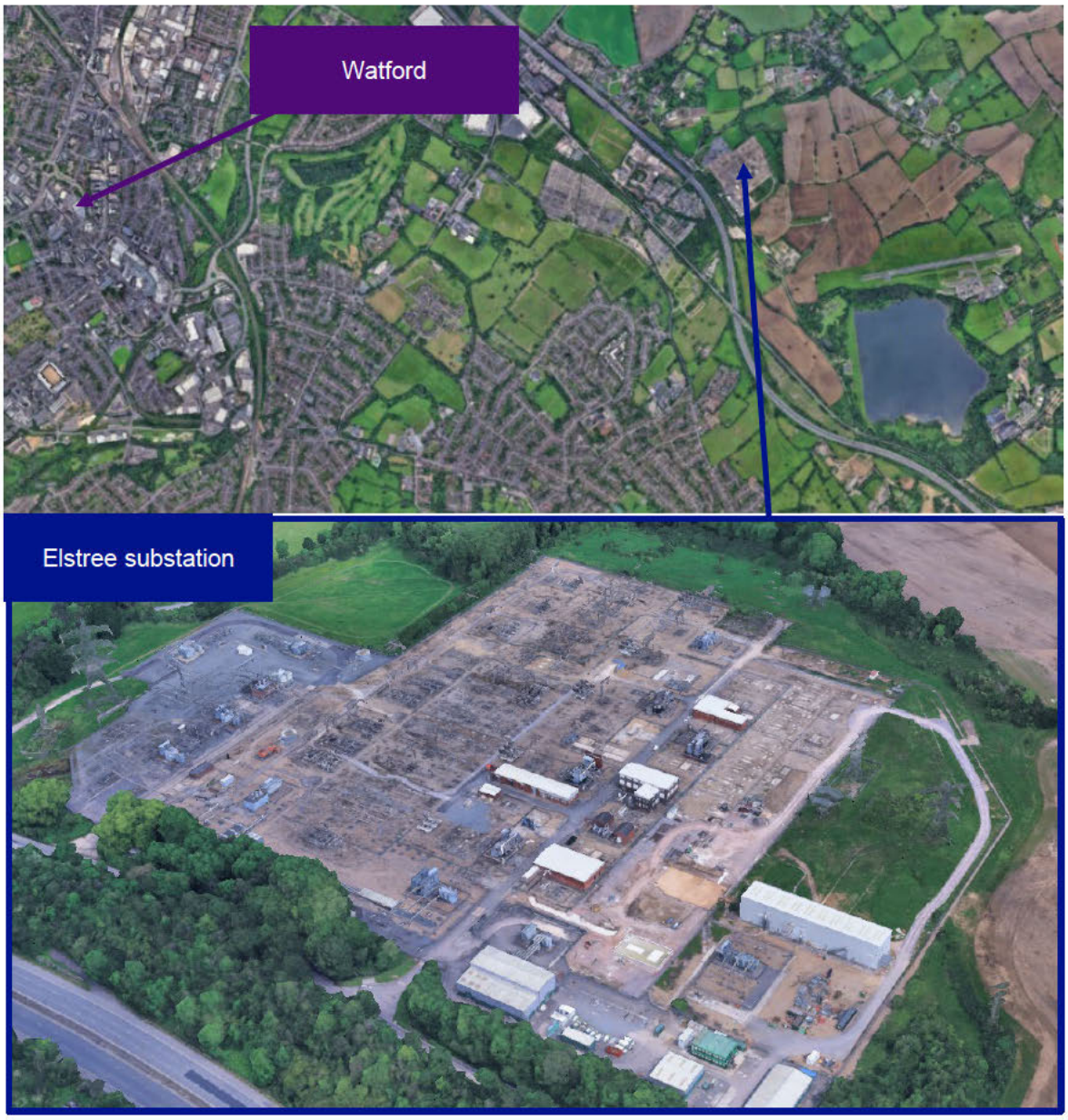
2.2.4 Site background

The proposed site of the investment includes two major National Grid substations (Elstree and St John's Wood), the existing tunnel route between Elstree and St John's Wood, and the existing OHL between Sundon and Elstree (see Figure 1 in the executive summary).

Elstree substation sits within a plot of NGET-owned land in Radlett, Watford (see Figure 7). [redacted] The substation sits within a plot of NGET-owned land, on which there is ~ [redacted] to build to the southeast of the Elstree substation, [redacted] Please see Appendix 4 for [redacted]

[8] Please refer to the Letchmore Heath LOTI FNC submission for further discussion on the green belt surrounding Elstree substation.

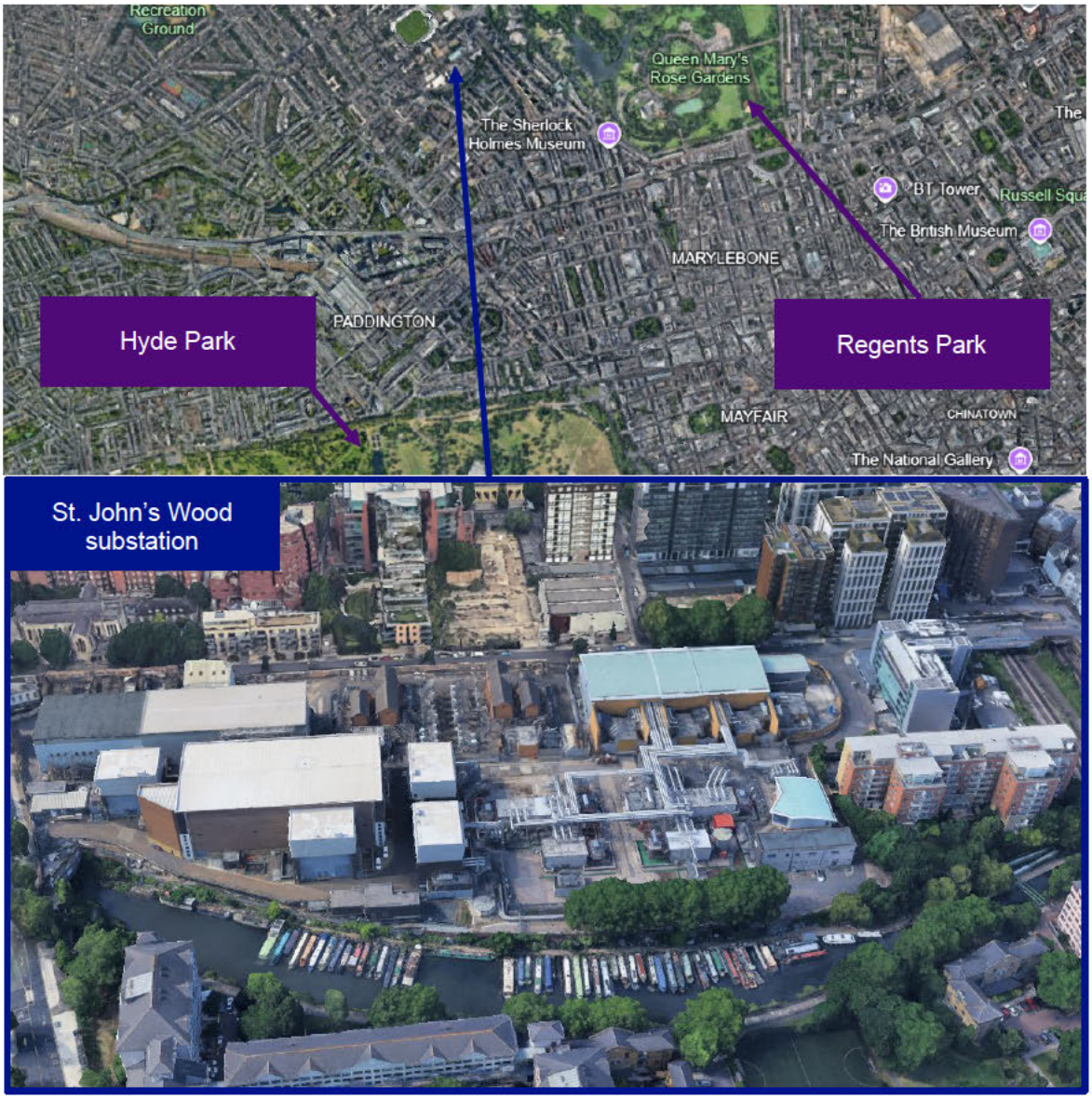
Figure 7: Location of Elstree substation outside Watford



St John's Wood Substation (SJOW) is located in inner London (see Figure 8). [redacted]

[9] In our T3 Business Plan submission, we set out the need for site rationalisation to address this asset health driver. In the T3 Final Determination, Ofgem stated that we should request allowances for this through a re-opener submission.

Figure 8: Location of St John's Wood substation on a map of North West London



The existing **Elstree to St John's Wood Cable tunnel**, built circa 2000, is approximately 21 km in length and has an internal diameter of 3m. It has some localised expansions (circa 20m in length) but is predominantly of the same construction throughout. The tunnel was constructed using pre-cast concrete sections. [redacted]

2.2.5 Historical funding

[redacted]

[redacted]

2.2.6 EAWO

There are no EAWOs expected as part of this investment.

3. Drivers & Needs Case

The investment is required to deliver against NESO drivers (see Table 8).

Table 8: Overview of investment drivers

Type	Description	Date
NESO	Deliver ESC1 and SER4, which are HND Essential Options.	[redacted]

3.1 NESO

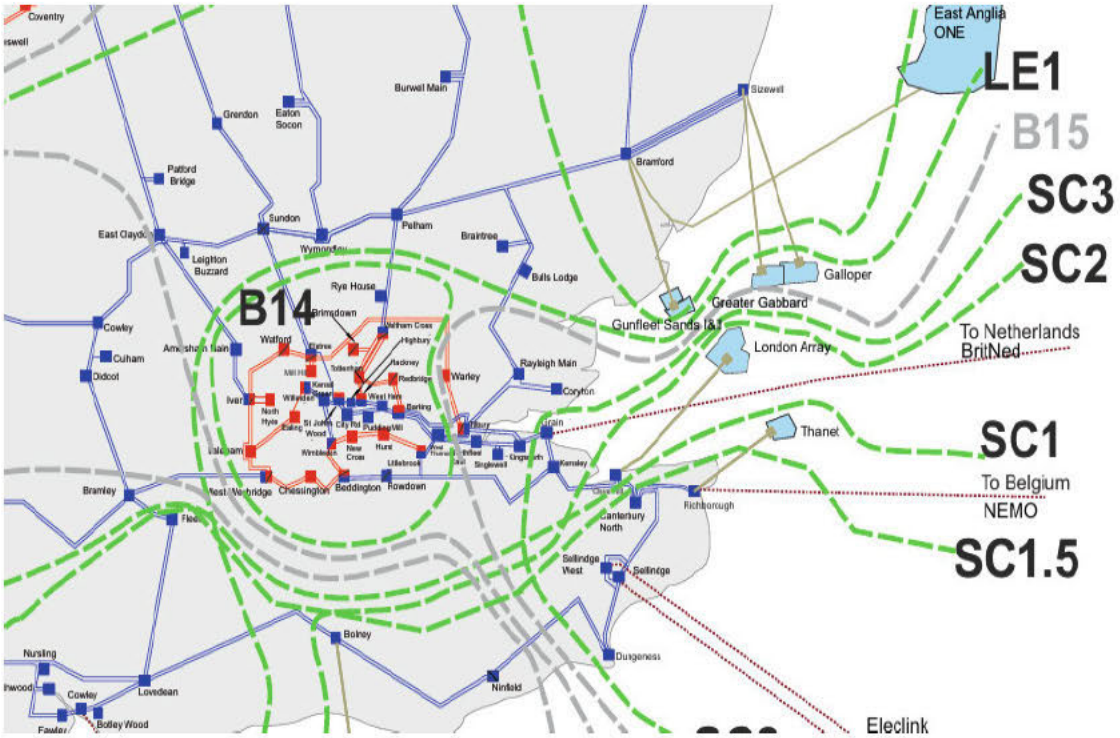
The investment is required to deliver ESC1 and SER4. ESC1 and SER2 (which later became SER4) were recognised by the former ESO as Holistic Network Design (HND) Essential Options in its *NOA 2021/22 Refresh*.[10] [redacted][11]

These investments are required to deliver the following:

- to **improve the balance of power flows on Sundon – Elstree circuits** and increase the network's capability to import power into London;

[redacted]

Figure 9: LE1 and B14 Boundary Map



[10] National Grid ESO, 2022. Network Options Assessment 2021/22 Refresh

[11] Figures provided to NGET by ESO by email on 4 August 2023.

3.2 Asset Health

Though the selection of the preferred load-driven intervention will affect how we manage the health of the assets, this scheme is fundamentally network capacity driven and so there is no asset health driver for interventions that is considered likely to affect the scope or timing of this project. There are however asset health/non-load drivers for interventions at the interfacing substations, alongside the predominant load-related scheme.

SER4 Asset Health

[redacted] This reflects NGET's most recent (2025/26) assured view of [redacted] As to be expected given the intervening period driven by [redacted]

This submission seeks funding only for the load-related scope described herein. Where load-related scope delivered through reopeners replaces previously allowed non-load-related (NLR) asset funding included within the T3 Final Determination, the corresponding NLR outputs will not be delivered and therefore the NLR PCDs will act as designed to remove associated NLR funding.

Delivery of asset health interventions will be optimised, taking account of outage availability and practical interactions between activities. Where load-related and asset health interventions coincide, delivery may be coordinated to improve efficiency and minimise disruption. Such coordination does not alter the underlying investment drivers, nor the portfolio-level governance or funding treatment of non-load asset health interventions.

Further detail on wider site-level asset health interventions is provided within the RIIO-T3 Asset Health Portfolio EJP and associated supporting documentation, which should be referenced for completeness.

3.3 Other considerations

Strategic significance of the investment

The investment directly supports the Government's Clean Power 2030 () ambition by delivering early reinforcement of corridors that are integral to the Pathway to 2030 network design. **It also supports the delivery of the Government's AI Opportunities Action Plan**.[12]

The project has also been listed as part of the Greater London Authority's (GLA) London Infrastructure Framework (LIF) as critical energy infrastructure to enable the London Growth Plan.[13] This lays out the long-term vision for London's critical economic infrastructure priorities through to 2050.

Elstree 400 kV substation extension

The two feeder reinforcements are also necessary to connect a 400 kV substation extension at Elstree with SQSS compliance, which is being delivered as part of the [redacted]

[12] DCMS & Department for Science, Innovation & Technology, 2025. AI Opportunities Action Plan

[13] Mayor of London, 2026. London Infrastructure Framework

4. SER4 Optioneering

This section sets out the optioneering for increasing capacity on the Sundon – Elstree second circuit as part of SER4.

4.1 Strategic options

We followed 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 started by assessing the most suitable strategic options (see Table 13).

Table *10*: Assessment of the strategic options for increasing capacity on the Sundon – Elstree second circuit

Option	Description	Assessment
A: Do minimum	Maintaining the network its current state and not addressing the investment drivers.	The investment driver would remain unmet, resulting in constraint costs to consumers.
B: Market-based solution	The investment drivers are met through the procurement and use of ancillary services only.	It is not possible to address the investment driver through this means.
C: Non-transmission, whole systems solution	The investment drivers are met through DNO flexibility rather than through NGET infrastructure investment.	There are limitations with DNO flexibility. ANM or curtailment is not sufficient to meet the need of managing substantial power demands. Whilst DNO flexibility markets are growing, central London demand is largely non-interruptible, with data centres and dense commercial load that have low tolerances for curtailment. Distribution-level flexibility and connection management measures are insufficient substitutes for infrastructure intervention due to the scale, firmness and criticality of London demand.
Y-1: [redacted] **Not taken forward**	[redacted]	Rejected because it cannot deliver the investment driver.
Y-2: [redacted] **Taken forward as preferred option**	[redacted]	The solution provides value to consumers through using existing infrastructure, in turn also preventing the need for new consenting. [redacted]

Option	Description	Assessment
		[redacted]
Y-3: [redacted] **Not taken forward**	[redacted]	Rejected because it cannot deliver the investment driver.
Y-4: [redacted] **Not taken forward**		Rejected because it cannot deliver the investment driver. [redacted]
Y-5: [redacted] **Not taken forward**		While this delivers against the investment driver, [redacted]
Y-6 [redacted] **Not taken forward**	[redacted]	While this delivers against the investment driver [redacted]

4.1.1 Shortlisting rationale and influence of stakeholder considerations

- The **non-build strategic options (A-C) were ruled out** because they would not deliver on the need to intervene on the network that was identified by NESO.
- Of the intervention options, we [redacted] **(option Y-1)** on the basis that it would not deliver against the driver.

[redacted] Of the different conductor types, analysis from the SER1 project found [redacted] On this basis, given that the findings could equivalently be applied to the second circuit, we **ruled out options Y-3 and Y-4** [redacted]. The letter from [redacted] On this basis, **we ruled out options Y-5 and Y-6** [redacted]

- This left option **Y-2 as the preferred option**, [redacted] for delivering against its identified driver and forms part of the scope of work that is required for HND Essential Option SER4.

4.2 Description of preferred option

Proposed works: [redacted]

How it meets the driver: Increases capacity on the corridor.

4.3 Quantitative analysis of preferred option

4.3.1 Cost estimates **of preferred option**

Cost estimates have been created for quantitative economic comparison. All capex is derived from NGET's latest Cost Book [redacted]). 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, [redacted], based on historical project analysis, to account for unforeseen circumstances and mitigate risks during implementation.

[redacted]

4.3.1.1. Cost drivers

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

Using the cost book, the main factors driving the costs for the shortlisted options are:

- Unit costs of SGTs;
- Operational cut and fill works for substation area.

4.3.2 Cost-benefit analysis

This subsection sets out the cost-benefit analysis (CBA) for the preferred option and a breakdown of the costs and benefits underpinning that analysis. This analysis is based on the latest cost book estimates.

4.3.2.1 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 costs

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 four shortlisted options.

- Option Y-2: [redacted]

4.3.3 CBA Outcome

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

[redacted]

4.3.4 Assumptions of the CBA analysis

Core assumptions and sensitivities. 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.

- [redacted] 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).

4.3.5 Costs

[redacted]

4.3.6 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 17 presents the summary of all (undiscounted) benefits, including environmental and non-environmental benefits, considering the central base case carbon price.

Table *14*: Summary of all benefits

Option	Environmental Benefits		Non-Environmental Benefits	Total Benefits (£m)
	Carbon costs of construction (£m)	Gas leakage (£m)	Transmission loss (£m)	
[redacted]				

5. ESC1 Circuit Optioneering

This section sets out the optioneering for increasing capacity on the Elstree – St John's Wood circuit as part of ESC1.

5.1 Strategic options

Replicating the approach adopted for SER4, explained in Section 4.1, we started by assessing the most suitable strategic options for increasing capacity on the circuit (see Table 18).

Table *15*: Assessment of the strategic options for increasing capacity on the Elstree – SJOW circuit

Option	Description	Assessment
A: Do minimum	Maintaining the network its current state and not addressing the investment drivers.	The investment driver would remain unmet, resulting in constraint costs to consumers.
B: Market-based solution	The investment drivers are met through the procurement and use of ancillary services only.	It is not possible to address the investment driver through this means.
C: Non-transmission, whole systems solution	The investment drivers are met through DNO flexibility rather than through NGET infrastructure investment.	There are limitations with DNO flexibility. ANM or curtailment is not sufficient to meet the need of managing substantial power demands. Whilst DNO flexibility markets are growing, central London demand is largely non-interruptible, with data centres and dense commercial load that have low tolerances for curtailment. Distribution-level flexibility and connection management measures are insufficient substitutes for infrastructure intervention due to the scale, firmness and criticality of London demand.
X-1: Use the existing cable tunnel **Taken forward as preferred option**	Feed the cable through the existing tunnel, which has been future proofed to accommodate this.	Avoids the need for a new tunnel or surface cable route. This provides significant benefits, including: reducing capital costs; drawing on permitted development rights; reducing environmental impacts of new tunnelling; reducing construction risk; reducing disruption to third parties and local communities; and reducing programme duration, in turn ensuring future constraint costs can be avoided by delivering the scope of work on time.
X-2: Surface line route **Not taken forward**	Construct a new surface line route between Elstree and St John's Wood substations.	Surface line routes would require multiple land agreements, highway closures and environmental mitigation, and would create unacceptable disruption within a constrained urban environment. These options would also present a higher risk of planning refusal and third-party objection.
X-3: OHL route **Not taken forward**	Construct a new OHL route between Elstree and St John's Wood substations.	OHL routes would require multiple land agreements, highway closures and environmental mitigation, and would create unacceptable disruption within a constrained urban environment. These options would also present a higher risk of planning refusal and third-party objection.
X-4: Construct a new tunnel	Build a new tunnel underground between Elstree and St Johns Wood. Feed the	Construction of a new bored tunnel would require extensive third-party land rights, complex planning consent, introducing

Option	Description	Assessment
Not taken forward	cable through this new tunnel. Would also require new headhouses along the route.	significant programme and cost risk without delivering any additional benefit over reuse of the existing tunnel.

5.1.1 Shortlisting rationale and influence of stakeholder considerations

- The **non-build strategic options (A-C) were ruled out** because they wouldn't deliver on the need to intervene on the network that was identified by NESO.
- Of the infrastructure options, the **preferred option is to use the existing future-proofed tunnel (Option X-1)**. The construction of new infrastructure when there is already an existing tunnel that has been future-proofed with the specific intention of providing space for this cable would lead to unjustified costs to consumers. It also has a significantly lower environmental impact than the other infrastructure interventions among our strategic options. The scope of work also aligns with HND Essential Option ESC1.

The tunnel therefore provides a proven, operational corridor that avoids the need for new surface or underground routes through densely developed urban areas. Using that available space would minimise additional interaction with third-party infrastructure and reduce the impact on the live transmission network during construction.

5.2 Description of preferred option

Proposed works: Re-use of the existing Elstree–St John's Wood cable tunnel to add second circuit within the purpose-built, strategic corridor that was built into the original design of the tunnel as part of future proofing.

How it meets the driver: Provides a second cable in the tunnel, increasing capacity.

Uncertainties and assumptions: Further surveys were undertaken during the optioneering phase to assess whether the existing tunnel is still fit for purpose, given that the existing Elstree-St John's Wood was originally designed to accommodate a second circuit. We have assessed the capacity of the existing forced ventilation (cable rating) system during optioneering but its compatibility and condition for usage for the life span of both circuits will be assessed further during development including the need for any modifications.

Drawing: Please see a profile of the option in Figure 9.

5.3 Quantitative analysis of preferred option

5.3.1 Cost estimates of preferred option

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 ([redacted]). 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, [redacted], based on historic project analysis, to account for unforeseen circumstances and to mitigate risks during implementation.

[redacted]

5.3.1.1. Cost drivers

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

Using the cost book, the main factors driving the costs for the shortlisted options are:

- Unit costs of SGTs;
- Operational cut and fill works for substation area.

5.3.2 **Cost-benefit analysis**

This subsection sets out the cost-benefit analysis (CBA) for the preferred option and a breakdown of the costs and benefits underpinning that analysis. This analysis is based on the latest cost book estimates.

5.3.2.1 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 costs

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 four shortlisted options.

Option X-1: Use the existing cable tunnel

5.3.3 CBA Outcome

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

Table 17: Lifetime Cost-Benefit Analysis [redacted], central carbon pricing, discounted values)

Option	Initial Investment £m	PV of Lifetime Costs £m	PV of Monetised Benefits £m	NPV £m
Option X-1: Use the existing cable tunnel	[redacted]	[redacted]	[redacted]	[redacted]

5.3.4 Assumptions of the CBA analysis

Core assumptions and sensitivities. 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: [redacted] 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).

5.3.4 Costs

Table 18: Summary of all additional Capex costs ([redacted])

	Capex		
	Initial works (£m)	Future replacement (40yr) (£m)	Total costs (£m)
Option X-1: Use the existing cable tunnel	[redacted]	[redacted]	[redacted]

5.3.5 Benefits

The following benefits have been included within the CBA:

- Carbon cost of construction reduction
- Summary of all Benefits

Table 22 presents the summary of all (undiscounted) benefits, including environmental and non-environmental benefits, considering the central base case carbon price.

Table 19: Summary of all benefits

Option	Environmental Benefits		Non-Environmental Benefits		Total Benefits (£m)
	Carbon costs of construction (£m)	Gas leakage (£m)	Transmission loss (£m)	Other benefits (£m)	
Option X-1: Use the existing cable tunnel	[redacted]				[redacted]

6. ESC1 Connection Optioneering

This section sets out the optioneering for connecting a new circuit in the existing Elstree – St John's Wood tunnel (selected as the preferred option in Section 5) at Elstree and St John's Wood substations as part of ESC1.

6.1 Elstree connection

6.1.1 Longlist of options considered

For the connection of the cable at Elstree substation, we considered five options and assessed them based on the balanced scorecard categories. An overview of the assessment of our longlist options is provided in the table below.

Table 20: Summary of all identified (Long List) options for connecting at Elstree substation

Option	Technical Description	Relevant Diagrams or Layout References	Consenting & Land Risks & Environmental Constraints	Rationale for rejecting or taking forward the option
E-1: [redacted] Taken forward to detailed optioneering	Extension of existing GIS to the South-East. [redacted] will be installed in vicinity along wit [redacted]	[redacted]	**Environment:** [redacted] out the site boundary and in a woodland area. [redacted] **Land:** Works within existing National Grid land.	Technically feasible and delivers scheme requirements, and the option would have close proximity to the access road and M1. However, [redacted] and it does not allow future extension of GIS limiting future expansion. This would require further investigation.
E-2: [redacted] Taken forward to detailed optioneering	Extend the existing 400 kV GIS by installing a [redacted]	[redacted]	**Environment:** [redacted] and reduced ecological impact. **Consenting:** Works are within National Grid ownership boundaries, meaning permitted development rights can be used. **Land:** Works within existing National Grid land.	Provides a new GIS platform within NGET land and connection [redacted] with increased flexibility.
E-3: [redacted] Taken forward to detailed optioneering	Extend the existing 400 kV GIS by [redacted]	[redacted]	**Environment:** [redacted] and reduced ecological impact. **Consenting:** [redacted] **Land:** [redacted]	Technically viable but require [redacted] introducing higher planning, environmental and cost risks.
E-4: [redacted] Not taken forward	Extend the existing 400 kV [redacted]	Not produced as option not viable.	**Consenting:** Hypothetically, this would be within the existing substation boundary, meaning planning application would not be needed. However, there is insufficient space. **Land:** Difficulties with acquiring land would necessitate a compulsory purchase order	Dismissed as [redacted]

	A new 400 kV Series reactor and 400 kV Shunt reactor will be installed in vicinity along with the relocation of Reactor R197.		(CPO), leading to project delays and the consequent incursion of constraint costs.	
E-5: New 400 kV AIS substation **Not taken forward**	Construction of a new 400 kV AIS substation.	Not produced as option not viable.	**Consenting:** A key insight from Letchmore Heath was that AIS options would not be viable at the Elstree site. This is because the use of AIS technology at Elstree to deliver against the investment drivers would require substation works on green belt land not presently owned by NGET, on which we would not hold permitted development rights. This means we would need to gain planning consent, which the Local Planning Authority has indicated would be "unlikely" to be approved, given that a substation intervention constitutes an "inappropriate development" on the green belt (please see the Letchmore Heath FNC for further information). **Land:** Difficulties with acquiring land would also necessitate a compulsory purchase order (CPO), leading to project delays and the consequent incursion of constraint costs.	**Planning, consent and land acquisition:** Due to the challenges discussed to the left, AIS options are not considered to be viable at the Elstree site. Please refer to the Letchmore Heath FNC for more information. **Engineering:** Furthermore, there are technical challenges with using AIS technology at the Elstree site as a result of the need to connect into existing GIS.

6.1.2 Shortlisting rationale and influence of stakeholder considerations

The rational for our identified shortlist includes:

- **Option E-4 was ruled out on engineering grounds** [redacted]
- **Option E-5 was ruled out on planning, consent and land acquisition grounds** – please refer to the Letchmore Heath FNC for further information on these constraints at the Elstree site.
- **Options E-1 to E-3 were shortlisted** because they deliver against the driver and are technically viable.

6.1.3 Shortlisted options

We have shortlisted three options, which are described in the subsections that follow:

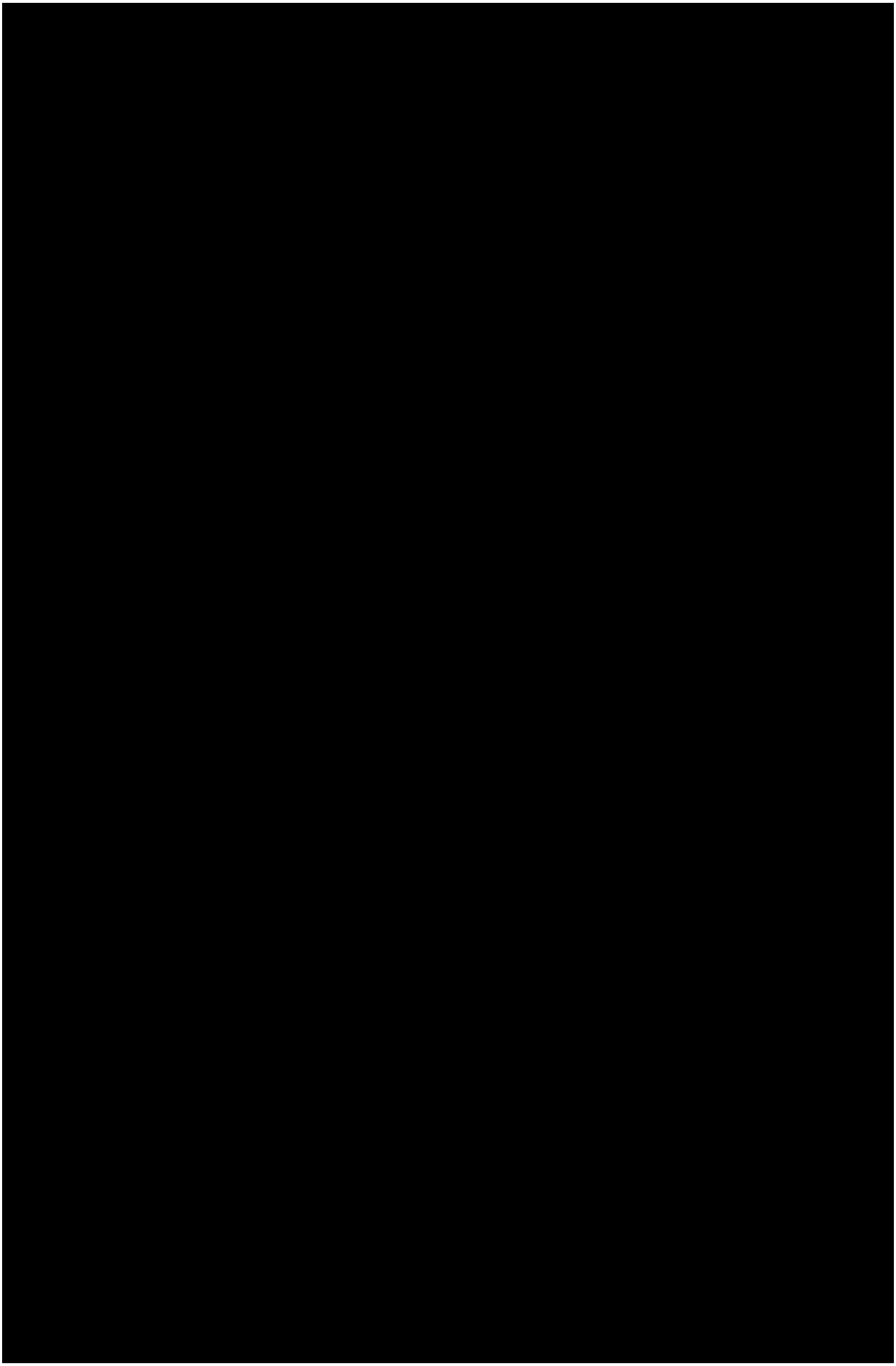
[redacted]

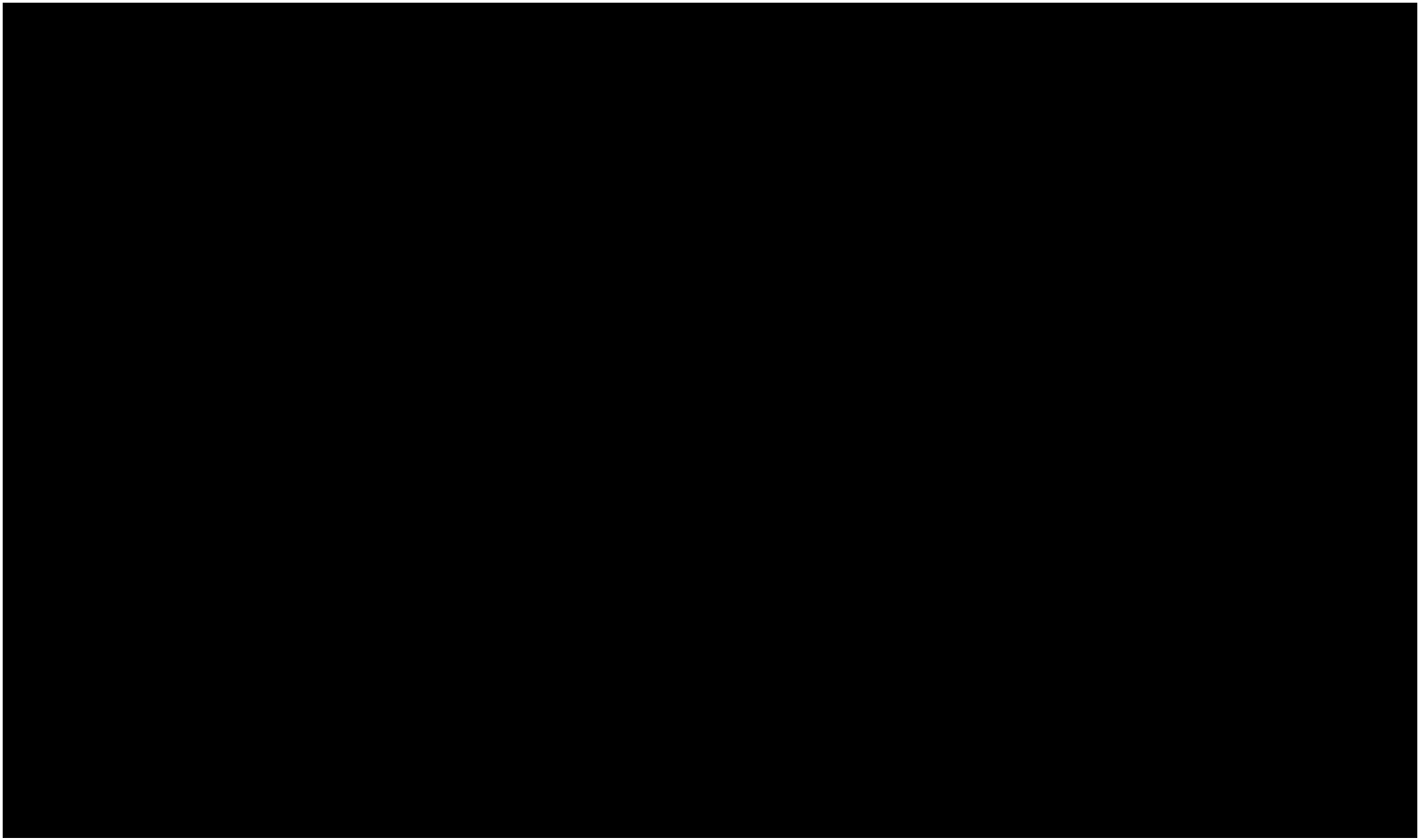
6.1.3.1 Option E-[redacted]

Proposed works: Extension of the existing GIS [redacted]

How it meets the driver: Provides a connection at Elstree substation for the second circuit in the existing Elstree-St John's Wood tunnel, facilitating an increase in capacity.

[redacted]





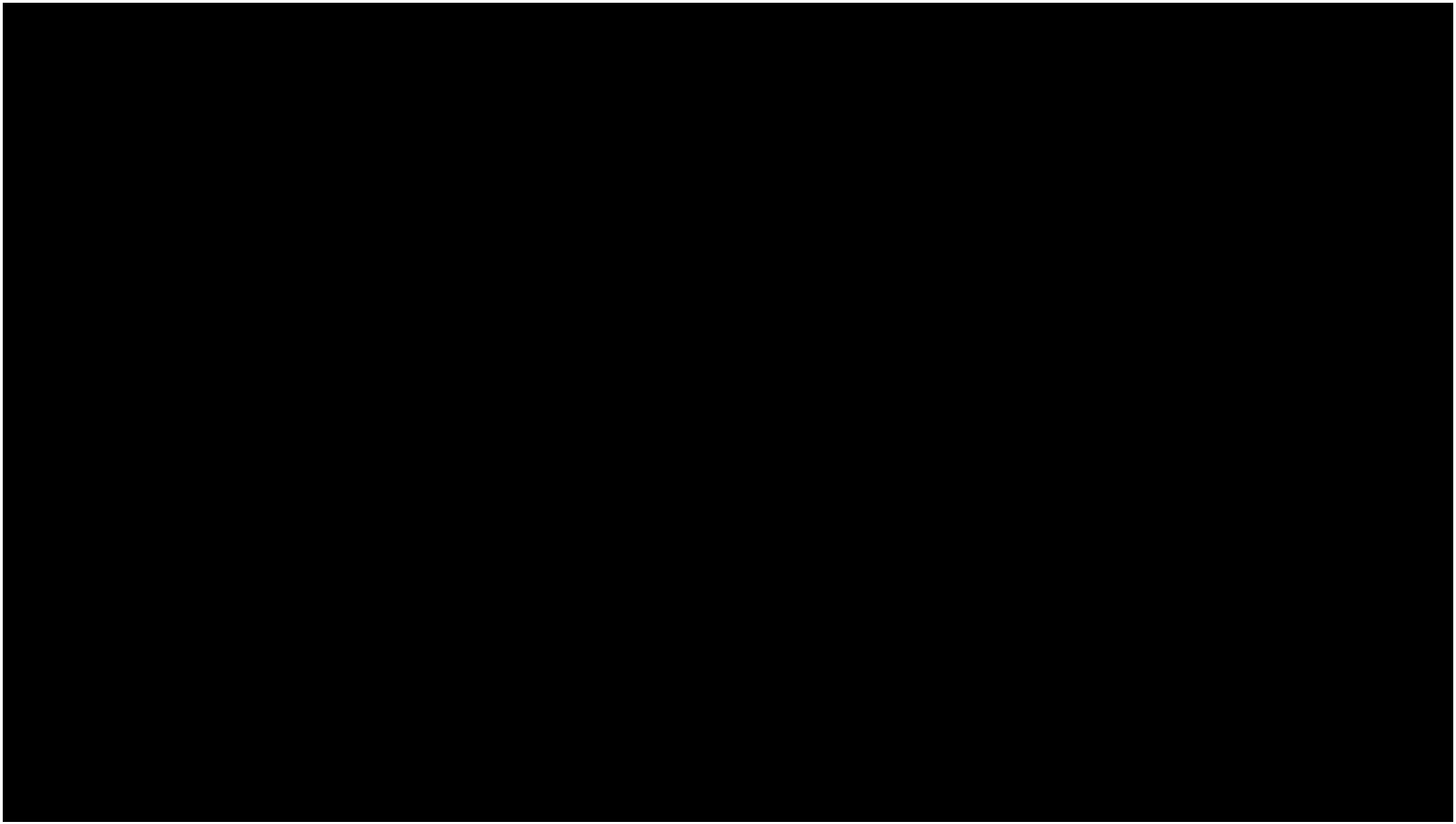
6.1.3.2 Option E-2: 400 **kV New GIS Extension in 132 kV AIS area**

Proposed works: Extension of the existing 400 kV GIS by installing a new GIS in the ex-132 kV compound. [redacted]

How it meets the driver: Provides a connection at Elstree substation for the second circuit in the existing Elstree-St John's Wood tunnel, facilitating an increase in capacity.

Drawings: [redacted]

[redacted]



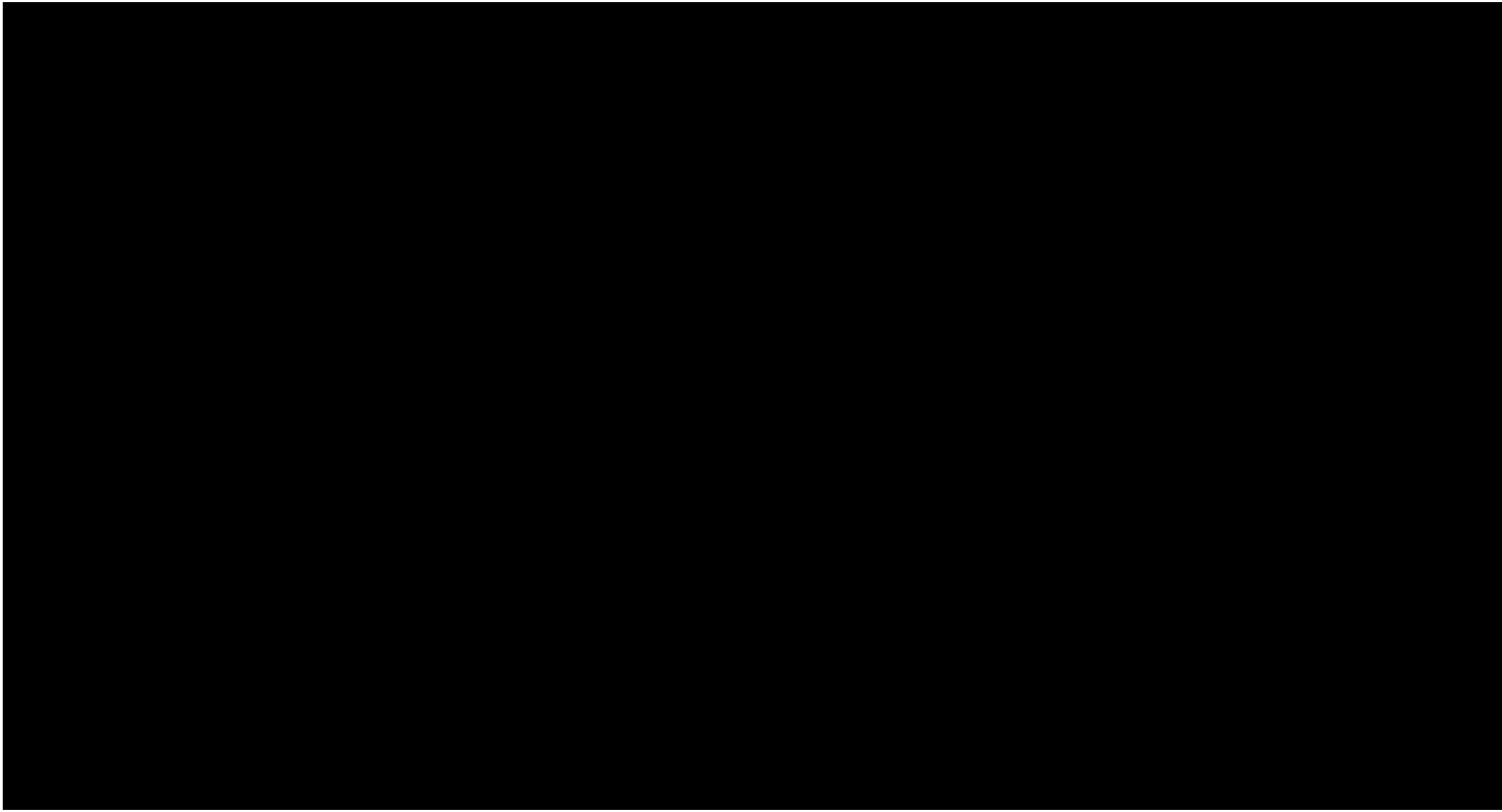
6.1.3.3 Option E-3: 400 **kV New GIS Extension in the Greenfield northeast of site**

Proposed works: Proposed works include the extension of the existing 400 kV GIS by installing a new GIS hall east of the substation. This land is within National Grid ownership [redacted]

How it meets the driver: Provides a connection at Elstree substation for the second circuit in the existing Elstree-St John's Wood tunnel, facilitating an increase in capacity.

Drawings [redacted]

[redacted]



6.1.4 Qualitative assessment of shortlisted options

Option	Optioneering Categories				
	Engineering	**Environmental**	**Deliverability**	**Economic/Consumer Value**	**Consenting /Stakeholder**
E-1: 400 kV GIS [redacted]	✓ **Technical performance:** Keeps all 400 kV infrastructure in a single contained area. All 400 kV equipment will be housed within a single building. × **Future:** Future extension limited to 3 bays only. [redacted] × **Safety (1):** [redacted] × **Safety (2):** [redacted]	✓ **Emissions (SF_6):** GIS extension to use SF_6 free / clean air solution. ✓ **Emissions (other):** Short GIB routes means less gas used. [redacted] × Nature **(2):** Existing dormice in Elstree. Surveys might be required in the greenfield to verify possible protected species, which could affect the project programme.		✓ **Capex:** Due to short cable length and GIB run, this will be a relatively cost-effective solution. ✓ Timely connection avoids constraint costs to consumers. × Land constraints would require costly resolution (see next column).	× **Planning and consent (greenfield):** [redacted] . It is possible that a [redacted] is in place to compensate previous works on site. × **Planning and consent (trees):** Requires the clearance of trees within National Grid land ownership, but outside the existing site boundary. Tree clearance will be contrary to previous planning conditions and there is a risk that the work would no longer fall under permitted development and would require a full TCPA application. This option carries reputational risk as well. × **Land:** The option would require land at Kiburn Park HH (at which there is only provision for one parking space, with no space available nearby) and Cricklewood HH (no permanent lease agreed with Network Rail). A resolution would be required by the project, [redacted]. all other HH also require third-party land agreements for scope to be complemted. × **Stakeholder impact:** New reactors close to public road (Hillfield lane). Possible noise outside the substation. Circuits are crossing the road, so the road will be blocked during construction.
	Supporting Evidence: FEED report.	**Supporting Evidence:** Environmental costs calculated as part of our CBA. FEED report.	**Supporting Evidence:**	**Supporting Evidence:** FEED report. Constraint cost estimates provided to NGET by ESO by email on 4 August 2023.	**Supporting Evidence:** Record of stakeholder engagement. FEED report. Please also refer to images of

Option	Optioneering Categories				
	Engineering	**Environmental**	**Deliverability**	**Economic/Consumer Value**	**Consenting /Stakeholder**
					trees that would require clearing on the site in Section 6.1.2.
	Detractor	Detractor	Neutral	Benefit	Strong Detractor
E-2: 400 New GI [redacted]	✓ **Technical performance:** Operations supportive of proposed design. GIS located in disused area of substation [redacted] with inherent minimal impediment to the execution of the works. × **Technical performance:** 400 kV GIS now split across two buildings. × **Safety:** Risk of smoke in M1 in case of fire.	✓ **Emissions (SF_6):** GIS extension to use SF_6 free / clean air solution. • **Emissions (other):** Longer [redacted] rom existing GIS hall to new GIS than option E-1, but shorter than E-3. Longer GIB routes use more gas.	✓ **Delivery risk (consenting & planning):** is lower within the boundary favouring this option. It utilises existing internal land within the substations.	• **Capex:** Longer [redacted] from existing GIS hall to new GIS than option E-1, but shorter than E-3. Longer GIB routes have greater capex. ✓ Timely connection avoids constraint costs to consumers.	✓ Planning and consent: No interference with [redacted] to install GIS and reactors. ✓ Land: The option utilises existing internal land within the substations, so from a visual point of view this reduces the impact on the public unlike E1 tree clearance is a huge visual impact within the highway.
	Supporting Evidence: FEED report.	**Supporting Evidence:** Environmental costs calculated as part of our CBA. FEED report.		**Supporting Evidence:** [redacted]	**Supporting Evidence:** FEED report.
	Benefit	Neutral	Strong Benefit	Neutral	Strong Benefit
E-3: 400 kV New GIS [redacted]	✓ **Technical performance:** This location has fewer existing cables in the area × **Technical performance:** 400 kV GIS now split across two buildings × **Future:** Limits future extension. Limited space to install more CB and cables. × **Safety:** Risk of smoke in M1 in case of fire.	✓ **Emissions (SF_6):** GIS extension to use SF_6 free / clean air solution. [redacted] × **Nature:** Existing dormice habitat at Elstree. Sundon circuits to be installed in area with dormice. Possible ecological issues with licences and remedial work. Risk of finding other protected species in the area.		✓ **Capex:** Longest cable length and GIB run (~500m) required back to the existing GIS hall. ✓ Timely connection avoids constraint costs to consumers.	[redacted] **Planning and consent:** GIS and [redacted] The site is on NGET land, meaning extension could potentially be permitted development if criteria are met. [redacted] × **Stakeholder impact:** New reactors close to new BESS development. Possible noise outside the substation. × **Stakeholder impact:** Likely visual impact from public rights of way

Option	Optioneering Categories				
	Engineering	**Environmental**	**Deliverability**	**Economic/Consumer Value**	**Consenting /Stakeholder**
					but probably less prominent than tree clearance for E-1.
	Supporting Evidence: FEED report.	**Supporting Evidence:** Environmental costs calculated as part of our CBA. FEED report.		**Supporting Evidence:** [redacted]	**Supporting Evidence:** FEED report.
	Detractor	Detractor	Neutral	Detractor	Detractor

Further considerations that apply to all projects on deliverability include:

- **Delivery date:** Due to multiple activities happening on the site at the same time, there is a risk of delays by third party work that could affect the main construction programme. However, delivery date is the same for each option.
- **Supply chain:** All options require a new series reactor with identical characteristics to that of the [redacted] These are rarely installed on our system, so lead times are high and the supplier pool small. We have secured pre-works funding to order the additional series reactor and are completing the order process through our procurement frameworks to mitigate this risk. We continue to monitor progress with the manufacturer.

6.1.4.1 Conclusion from detailed qualitative assessment

Based on the detailed qualitative assessment, **Option E-2 is the preferred option** because:

- **Environmental:** Avoids the felling of a large number of trees, which is a drawback of E-1
- **Engineering (future proofing):** Allows future expansion of 400 kV GIS
- **Engineering (technical performance):** Utilises [redacted] to install new GIS, [redacted]
- **Consenting and land (planning consent):** No interference with [redacted] to install GIS and reactors

6.1.5 Quantitative analysis of shortlisted options

6.1.5.1 Cost estimates of shortlisted 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 ([redacted]). 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, [redacted], based on historic project analysis, to account for unforeseen circumstances and to mitigate risks during implementation.

[redacted]

6.1.5.2 Cost drivers

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

Using the cost book, the main factors driving the costs for the shortlisted options are:

- Unit costs of SGTs;
- Operational cut and fill works for substation area.

6.1.5.3 Cost-benefit analysis

This subsection sets out the cost-benefit analysis (CBA) for the preferred option and a breakdown of the costs and benefits underpinning that analysis. This analysis is based on the latest cost book estimates.

6.1.5.4 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:

iii) Initial CAPEX investment required

iv) Future end of life replacement costs

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 four shortlisted options.

- Option E-1: [redacted]
- Option E-2: [redacted]
- Option E-3: [redacted]

6.1.5.4. CBA Outcome

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

On the basis of the discounted lifetime CBA results (Table 25), Option E-1 delivers the highest NPV and therefore represents the preferred option on consumer value grounds. While Options E-2 and E-3 delivers lower NPVs than E-1 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.

6.1.5.6 Assumptions of the CBA analysis

Core assumptions and sensitivities. 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: 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).

6.1.5.7 Costs

Table 23: Summary of all additional Capex and Opex costs [redacted]

Option	Capex		Opex	Total costs (£m)
	Initial works (£m)	Future replacement (40yr) (£m)	Maintenance costs (£m)	
[redacted]				

6.1.5.8 Benefits

The following benefits have been included within the CBA:

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

Table 27 presents the summary of all (undiscounted) benefits, including environmental and non-environmental benefits, considering the central base case carbon price.

Table 24: Summary of all benefits

Option	Environmental Benefits		Non-Environmental Benefits		Total Benefits (£m)
	Carbon costs of construction (£m)	Gas leakage (£m)	Transmission loss (£m)	Other benefits (£m)	
[redacted]					

6.1.6 Preferred option for Elstree connection

The preferred solution is **Option E-2**, which is a 400 kV [redacted]:

- **Consumer value / economic performance:** The option ensures timely delivery of the programme, avoiding expensive constraint costs.
- **Engineering:** [redacted] It has the greatest future-proofing potential among the options considered.
- **Environment:** [redacted] significantly reduces the environmental impact. Alternative Option E-1 requires the felling of a large section of trees.
- **Planning, consent and stakeholder acceptance:** Is delivered within the existing operational boundary of the [redacted] and benefits from permitted development rights, avoiding the need for planning consent for the substation works. Avoids development on green belt land and the associated consenting risk and programme uncertainty present in alternative option E-3.
- **Deliverability:** Avoiding the need for land acquisition or planning consent ensures the programme can be delivered on time.

6.2 St John's Wood connection

6.2.1 Longlist of options considered

For the connection of the cable at St John's Wood substation, we considered seven options and assessed them based on the balanced scorecard categories. An overview of the assessment of our longlist options is provided in the table below.

Table 25: Summary of all identified (Long List) options for connecting at St John's Wood substation

Option	Technical Description	Relevant Diagrams or Layout References	Consenting & Land Risks & Environmental Constraints	Rationale for rejecting or taking forward the option
S-1: [redacted] **Taken forward to detailed optioneering**	[redacted]	[redacted]	**Land and consents:** Work within substation footprint, meaning permitted development and no land take needed. Minimal stakeholder & community impact.	Feasible but requires major building modifications, live plant interfaces and complex outages
S-2: [redacted] **Not taken forward**		Not produced as option not viable.	**Land and consents:** Work within substation footprint, meaning permitted development and no land take needed. Minimal stakeholder & community impact.	Not feasible due to system constraints of additional outages. Difficulty to execute extension of GIB. Involves removal of existing rooms and outages to implement extension.
S-3: [redacted] **Taken forward to detailed optioneering**		[redacted]	**Land and consents:** Work within substation footprint, meaning permitted development and no land take needed. Minimal stakeholder & community impact.	Feasible but requires basement works and constrained cable routing
S-4: [redacted] **Not taken forward**		Not produced as option not viable.	**Land and consents:** Work within substation footprint, meaning permitted development and no land take needed. Minimal stakeholder & community impact.	Dismissed due [redacted] The [redacted]
S-5: [redacted] **Not taken forward**		Not produced as option not viable.	**Land and consents:** Work within substation footprint, meaning permitted development and no land take needed. Minimal stakeholder & community impact.	Dismissed as [redacted] making this option redundant.
S-6: Elstree 2 connection into ex-Shunt Reactor 1 bay **Taken forward to detailed optioneering**		[redacted]	**Land and consents:** Work within substation footprint, meaning permitted development and no land take needed. Minimal stakeholder & community impact.	Feasible option. Avoids major building works and provides lowest disruption and outage risks.

Option	Technical Description	Relevant Diagrams or Layout References	Consenting & Land Risks & Environmental Constraints	Rationale for rejecting or taking forward the option
S-7: New 400 kV AIS substation **Not taken forward**	Construction of a new 400 kV AIS substation.	Not produced as option not viable.	**Land:** Located in a dense urban environment in central London.	**Land:** This GIS substation is located in central London and would not be able to accommodate AIS technology due to [redacted] Please see site images in Section 2.3.

The rational for our identified shortlist includes:

- **Options S-2, S-4 and S-5 were ruled out on engineering grounds**. S-2 would not be feasible due to system constraints, while S-4 would require [redacted] S-5 would require the creation of a point of connection at the 400 kV GIS in the 275 kV building
- **Option S-7 was ruled out on land acquisition grounds** [redacted]
- **Options S-1, S-3 and S-6 were shortlisted** due to being technically feasible

6.2.1 Shortlisted options

We have shortlisted three options, which are described in the subsections that follow:

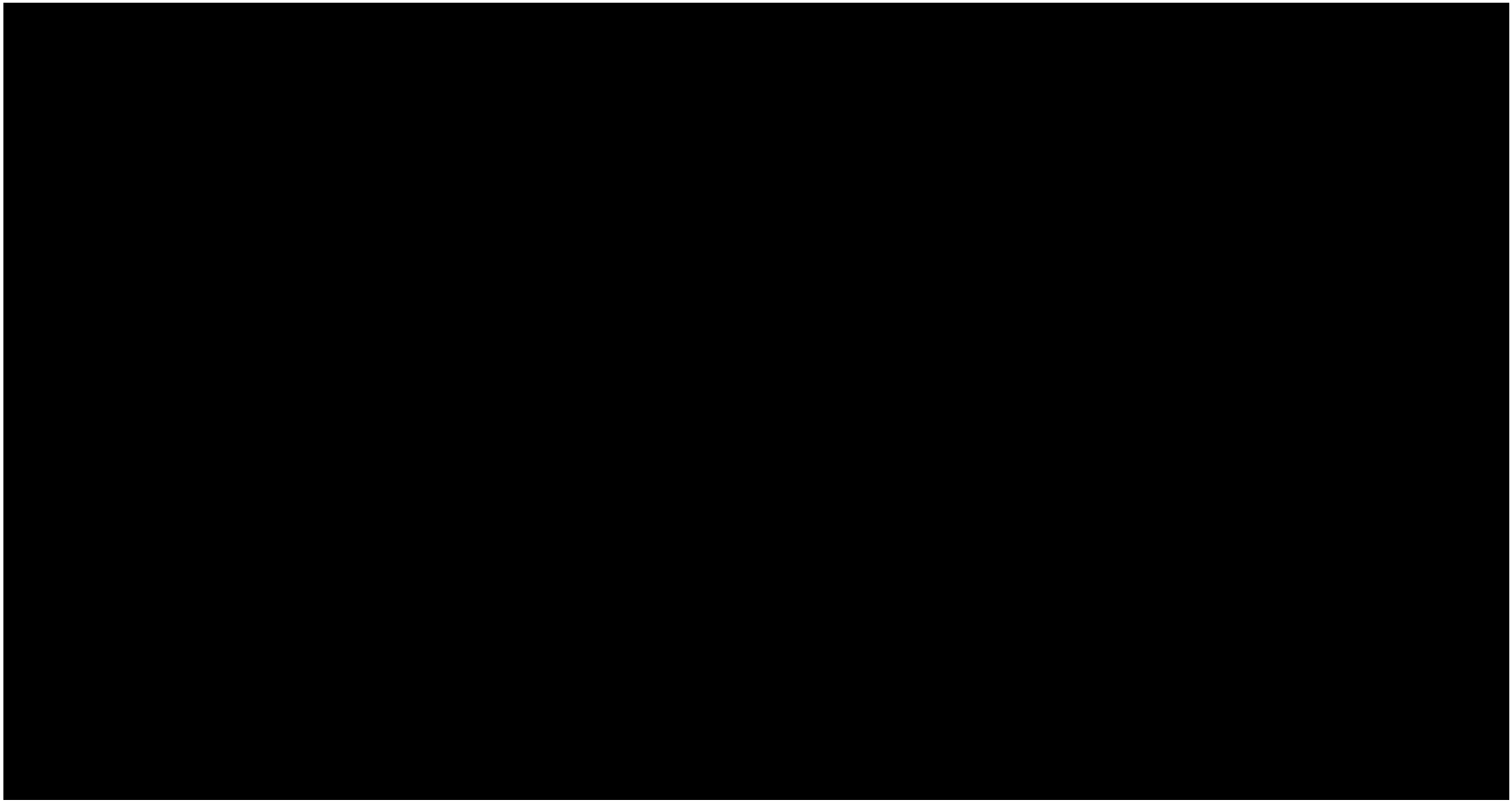
[redacted]

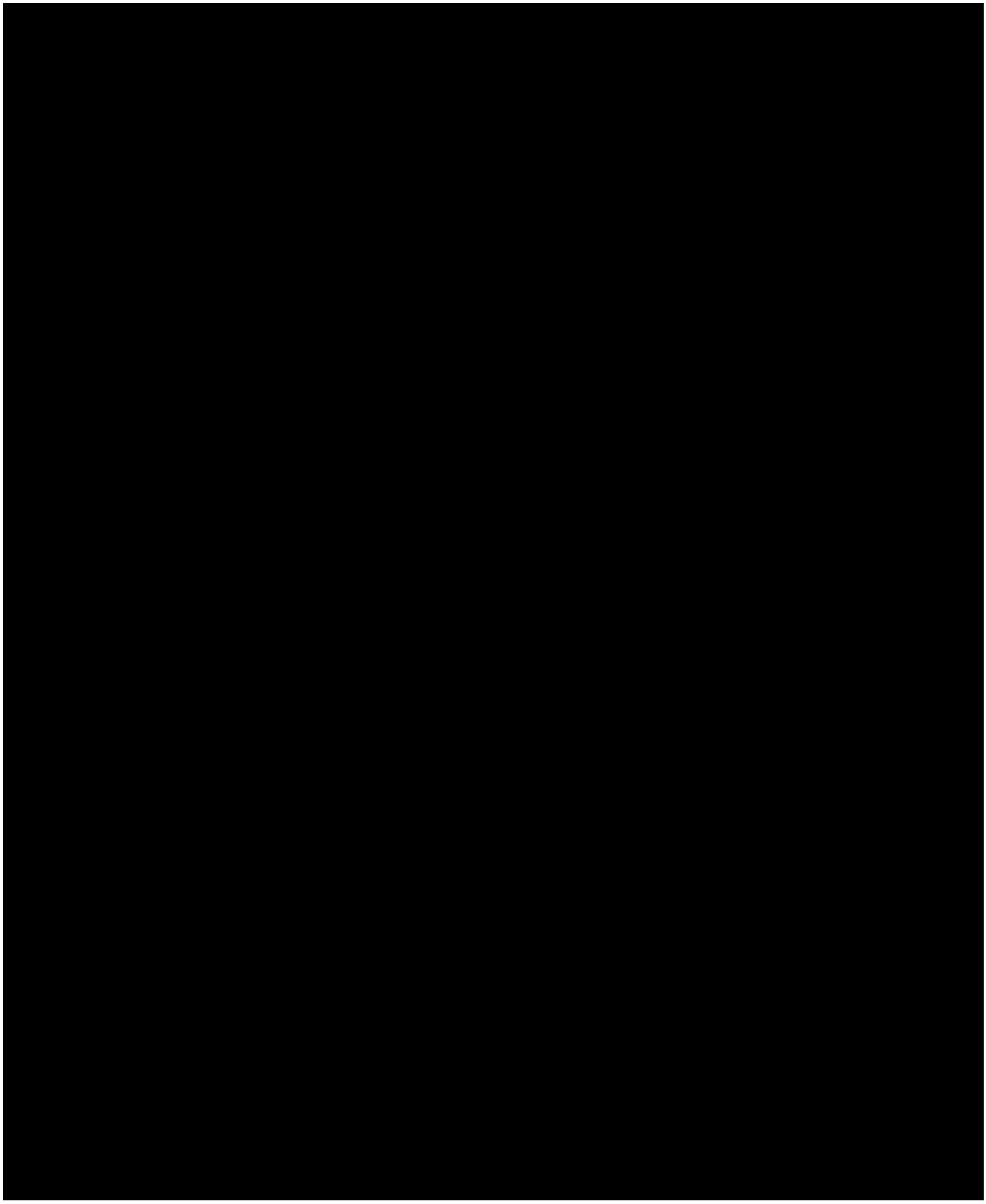
[redacted]

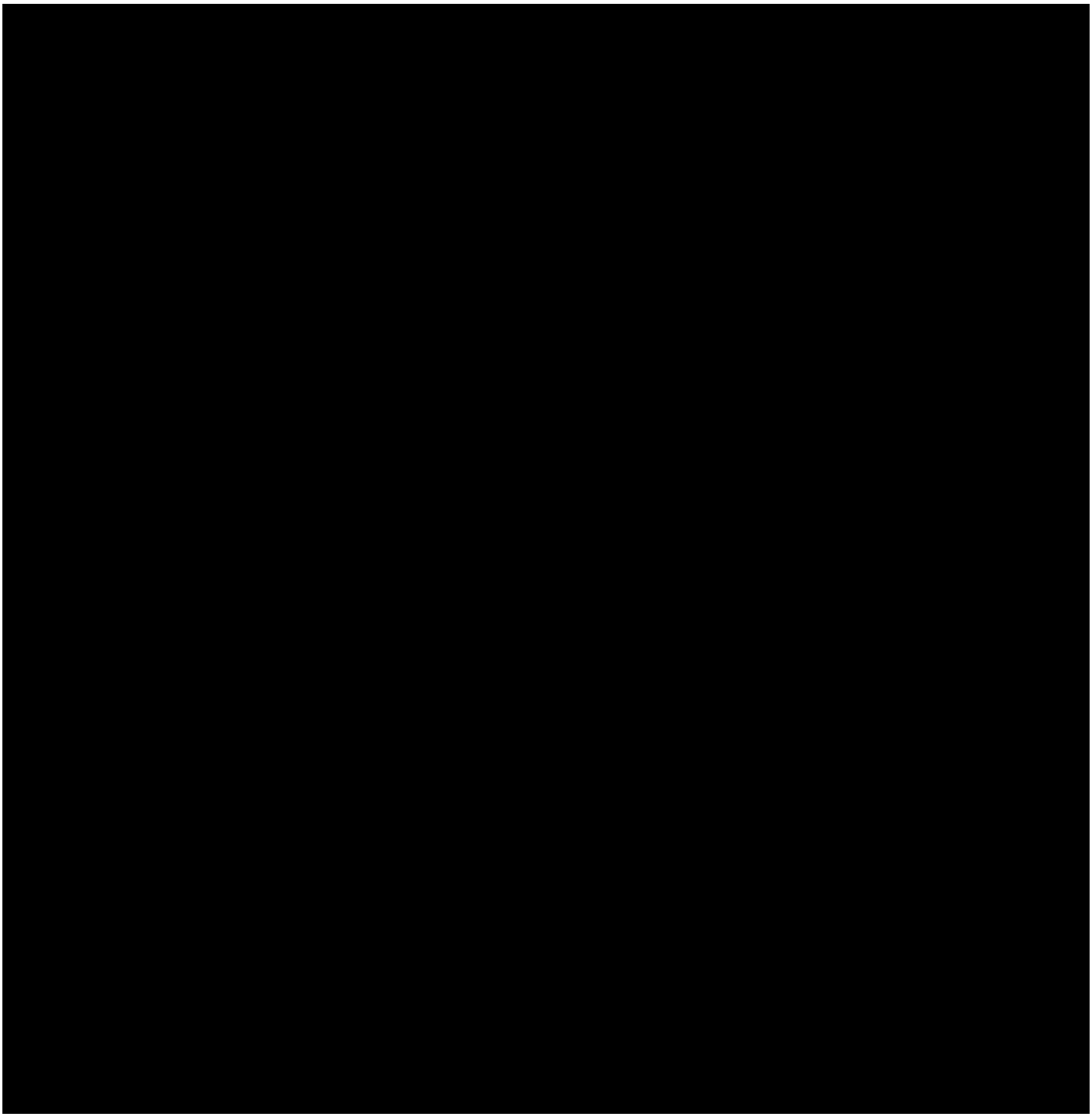
How it meets the driver: Provides a connection at St John's Wood substation for the second circuit in the existing Elstree-St John's Wood tunnel, facilitating an increase in capacity.

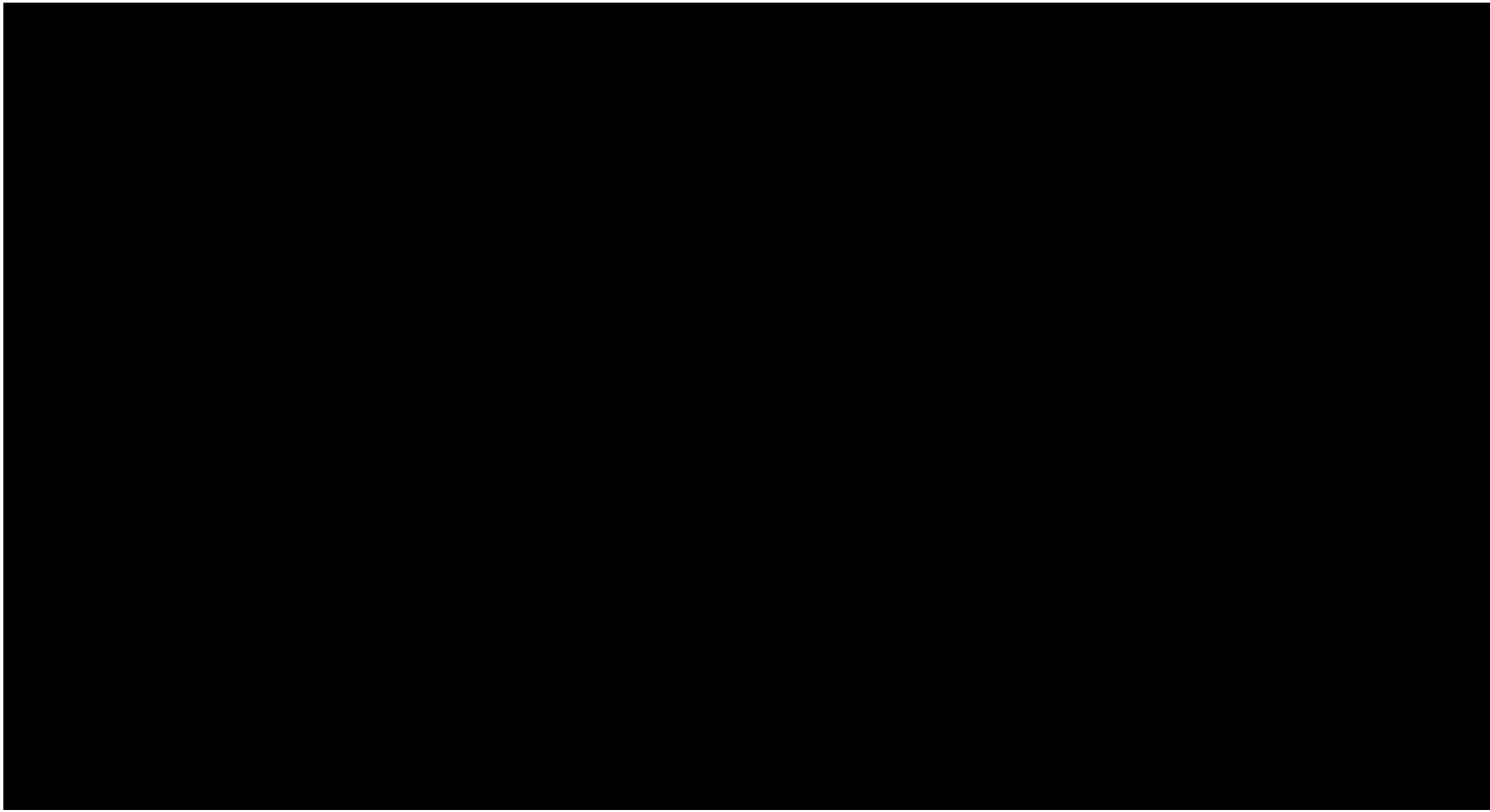
Drawings: [redacted]

[redacted]









6.2.3 Qualitative assessment of shortlisted options

Option	Optioneering Categories				
	Engineering	Environmental	Deliverability	Economic/Consumer Value	Consenting /Stakeholder
[redacted]	✓ **Future (bay extension):** Creates space for a bay for future extension, this could be used for a future 400 kV GIS hall. ✓ **Technical performance (space for operation and maintenance):** [redacted] × **Technical performance (access):** [redacted] × **Future (GIB extension):** [redacted] × **Technical performance (complexity):** [redacted] This will need to be evaluated by a structural engineer.	× **Emissions (SF_6):** New equipment for GIS extension will be insulated with SF_6. It is not possible to extend the GIS with SF_6 free [redacted]	× **Delivery date:** Option is more difficult and risks requiring a longer time to implement with a more complex programme than option S3 × **System access:** Outages required to implement the works could be difficult to be made available	× **Capex:** Due to the extents of the building modifications, this option is likely more expensive than option S-3, 6. ✓ Timely connection avoids constraint costs to consumers.	✓ **Land acquisition:** Solution is within substation's existing boundaries. Using existing NGET land mitigates land acquisition risks. • **Planning and consent:** While permitted development may be possible, the construction of the buildings within the NGET operational boundary would require a prior approval application. × **Stakeholder impact:** Noise and vibration during construction might disrupt neighbours.
	Supporting Evidence: FEED report.	**Supporting Evidence:** Environmental costs calculated as part of our CBA. FEED report.	**Supporting Evidence:** Internal delivery planning tools. FEED report.	**Supporting Evidence:** [redacted]	**Supporting Evidence:** FEED report.
	Detractor	Detractor	Neutral	Benefit	Neutral

Option	Optioneering Categories				
	Engineering	Environmental	Deliverability	Economic/Consumer Value	Consenting /Stakeholder
[redacted]	✓ **Technical performance (complexity):** Easier to implement cable route between headhouse and circuit breaker compared to option S1. Requires fewer modifications in the building than option S1. No relocating of rooms needed within building. [redacted] × **Technical performance (complexity):** However, more GIS modifications than option S9. Also requires modifications to the [redacted] ✓ **Impact to wider electrical system:** Minimal disruption to overall GIS substation. No main or reserve busbar outage required, only circuit outage. × **Technical performance (access):** [redacted]	• **Emissions (SF_6):** Requires less equipment with SF_6 compared to option S1, but more than S3.	✓ **Delivery date:** Faster implementation compared to option S1 ✓ **System access:** Onl [redacted] Minimal disruption compared to option S1	✓ **Capex:** Lower cost than Option S-1. ✓ Timely connection avoids constraint costs to consumers. ✓	✓ **Land acquisition:** Solution is within substation's existing boundaries. Using existing NGET land mitigates land acquisition risks. ✓ **Planning and consent:** Permitted development rights. • **Stakeholder impact:** Noise and vibration during construction might disrupt neighbours, but less than in option S1.
	Supporting Evidence: FEED report.	**Supporting Evidence:** Environmental costs calculated as part of our CBA. FEED report.	**Supporting Evidence:** Internal delivery planning tools. FEED report.	**Supporting Evidence:** [redacted]	**Supporting Evidence:** FEED report.
	Benefit	Neutral	Strong Benefit	Neutral	Benefit

[redacted]	✓ **Technical performance (space for operation and maintenance):** It will have easier maintenance of Bus coupler 1 than option S3 ✓ **Technical performance (complexity):** [redacted] Requires less modifications in the building than option S1. [redacted] Less GIS modifications than option S3. ✓ **Impact to wider electrical system:** Minimal disruption to overall GIS substation. No main or reserve busbar outage required, only circuit outage. **Technical performance (complexity):** Requires modifications [redacted] × **Technical performance (circuits):** [redacted]	× **Emissions (SF_6):** Requires less equipment with SF_6 compared to option S1 and S3.	× **Delivery date:** Faster implementation compared to option S1 × **System access** [redacted] disruption compared to option S1	✓ **Capex:** Lower cost than Option S-1. ✓ Timely connection avoids constraint costs to consumers.	✓ **Land acquisition:** Solution is within substation's existing boundaries. Using existing NGET land mitigates land acquisition risks. ✓ **Planning and consent:** Permitted development rights. • **Stakeholder impact:** Noise and vibration during construction might disrupt neighbours, but less than in option S1.
Supporting Evidence: FEED report.	**Supporting Evidence:** Environmental costs calculated as part of our CBA. FEED report.	**Supporting Evidence:** Internal delivery planning tools. FEED report.	**Supporting Evidence:** [redacted]	**Supporting Evidence:** FEED report.	
Detractor	Detractor	Neutral	Detractor	Benefit	

6.2.4 Conclusion from detailed qualitative assessment

Based on the detailed qualitative assessment, Option S-6 is the preferred option because:

- **Engineering (impact to wider electrical system):** Less disruptive of existing infrastructure
- **Deliverability (system access):** Less onerous outage requirement, more feasible cable entry to the existing headhouse
- **Engineering (technical performance):** Easier cable route through the basement. Fewer constraints in the maintenance of Busbar 1 compared to S-3

6.2.5 Quantitative analysis of shortlisted options

6.2.5.1 Cost estimates for shortlisted 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, [redacted] based on historic project analysis, to account for unforeseen circumstances and to mitigate risks during implementation.

[redacted]

6.2.5.2 Cost drivers

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

Using the cost book, the main factors driving the costs for the shortlisted options are:

- Unit costs of SGTs;
- Operational cut and fill works for substation area.

6.2.5.3 Cost-Benefit Analysis

6.2.5.4 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 costs

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 four shortlisted options.

- Option S-1: [redacted]

[redacted]

6.2.5.5 CBA Outcome

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

[redacted]

considerations, and any CBA sensitivities set out in the assumptions below.

6.2.5.6 Assumptions of the CBA analysis

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

[redacted]

- Cost base: [redacted], 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).

6.2.5.7 Costs

[redacted]

6.2.5.8 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 29: Summary of all benefits

Option	Environmental Benefits		Non-Environmental Benefits		Total Benefits (£m)
	Carbon costs of construction (£m)	Gas leakage (£m)	Transmission loss (£m)	Other benefits (£m)	
[redacted]					

6.2.6 Preferred option for St John's Wood connection

The preferred solution is **Option S-6**, which is an Elstree 2 connection into the [redacted]

- **Consumer value / economic performance:** The CBA shows this option to have the highest NPV relative to the baseline among shortlisted options in this category.
- **Engineering:** It provides the lowest level of disruption to the existing GIS building and the most practical and deliverable construction sequence. It requires minimal building modifications and avoids major structural alterations. It also provides the most direct and feasible cable entry route into the existing headhouse and maintains appropriate clearances for long-term operation and maintenance.
- **Planning, consent and stakeholder acceptance:** Avoids main or reserve busbar outages, requiring only short, localised circuit outages.
- **Deliverability:** Presents the lowest overall programme and outage risk of the shortlisted connection options.

7. Preferred overall option

Following the optioneering set out in Sections 4-6, our overall preferred option for the NWL investment is as follows:

- For SER4, our preferred option is Y-2, [redacted]
- For ESC1, our preferred option is X-1, [redacted]
- For the connection of the ESC1 cable at Elstree substation, our preferred option is E-2, [redacted]
- For the connection of the ESC1 cable at St John's Wood substation, [redacted]

Taken together, the preferred solution enables the investment drivers and avoids constraint costs to consumers that would otherwise be incurred. It also supports the Pathway to 2030 strategy and enables increased power transfer into London, aligned with decarbonisation and offshore wind growth. The **total cost of the investment is** [redacted]**).**

The qualitative and quantitative analysis undertaken as part of the optioneering process demonstrates that the preferred solution provides the most balanced and deliverable outcome when assessed against the balanced scorecard criteria. Information is set out for each option category, below.

7.1 Project benefits and outputs

The key outputs delivered by this option are as follows:

[redacted]

- [redacted]

ESC1 materially changes power flow optionality into Central London, which improves NESO's ability to manage constraints and reduces reliance on eastern London corridors during stress events. The reinforcement improves operational flexibility across transmission, distribution and system operation, supporting NESO's future operability requirements for a highly meshed, high-demand urban system.

Additional power capacity enabled by NWL reduces risk of development sterilisation, connection deferrals and supports spatial energy planning certainty for energy stakeholders. Timely delivery of NWL provides certainty to local authorities and developers, reducing whole-system inefficiency caused by stop-start connection planning.

7.2 Futureproofing

NWL **supports the long-term strategy to uprate the network from 275 kV to 400 kV** by connecting the Sundon-Elstree circuit directly into the 400 kV substation. The existing 275 kV network increasingly constrains future demand growth and renewable power flows into London.

The preferred option also delivers **a single strategic point of connection into London** via the Elstree 400 kV GIS extension (which is being delivered within the scope of the Letchmore Heath

project). This provides a coordinated interface between the wider system and the London network, enabling power to be distributed efficiently downstream.

More broadly, we have undertaken **co-ordinated future-proofing with interfacing projects in the region**. There are inherent challenges in future-proofing due to the highly constrained urban environment, limited land availability at Elstree and St John's Wood, and the pace of forecast demand growth across London. [redacted]

[redacted]

7.3 Influence of stakeholders on optioneering

[redacted] To provide value to consumers, we have therefore sought to prioritise timely delivery in our optioneering.

The minimal additional land and consenting required for the scheme has also influenced our optioneering.

[redacted]

8. Delivery

A programme of works for NWL Scheme is outlined below in Figure [redacted], which ensures timely delivery of the investment need and prevents expensive constraint costs.

[redacted]

8.1 Procurement and contracting strategies

[redacted]

[redacted]

[redacted]

8.2 Delivery risks

As highlighted in the multifactorial analysis (see Section 4.4), the preferred option still contains some risks. These are also listed in the CBA risk register. An overview of the high-level risk assessment and associated mitigations is provided in Table 33, below. A full risk assessment is expected to be carried out at a later stage with the output updated accordingly.

Table *30*: Risk assessment and proposed mitigations for the preferred option

Risks	Mitigation	Likelihood
Procurement: Lead times for delivery of long lead plant items may lead to a delay in the programme implementation. Procurement timescales for the delivery and manufacturing of long lead items are currently affected by demand in the [redacted]	To mitigate programme delays, the manufacturing slots are being secured to ensure delivery for construction. [redacted]	Medium

Risks	Mitigation	Likelihood
Technical Risks: There is a risk that the [redacted]	To mitigate this risk, we have [redacted]	High
[redacted]	[redacted]	Low
Internal [redacted] There is similarly a risk that the works associated with the NWL project could sterilise other plans at sites without proper coordination.	[redacted]	Medium
Outage: Non-availability of outage and double circuit outage windows could lead to possible delays in programme works.	We have placed and confirmed dates for required outage windows in advance. Interaction with other schemes and prioritisation will be monitored.	Low

9. Conclusion

This paper presents our Eligibility Letter for the NWL reinforcement scheme.

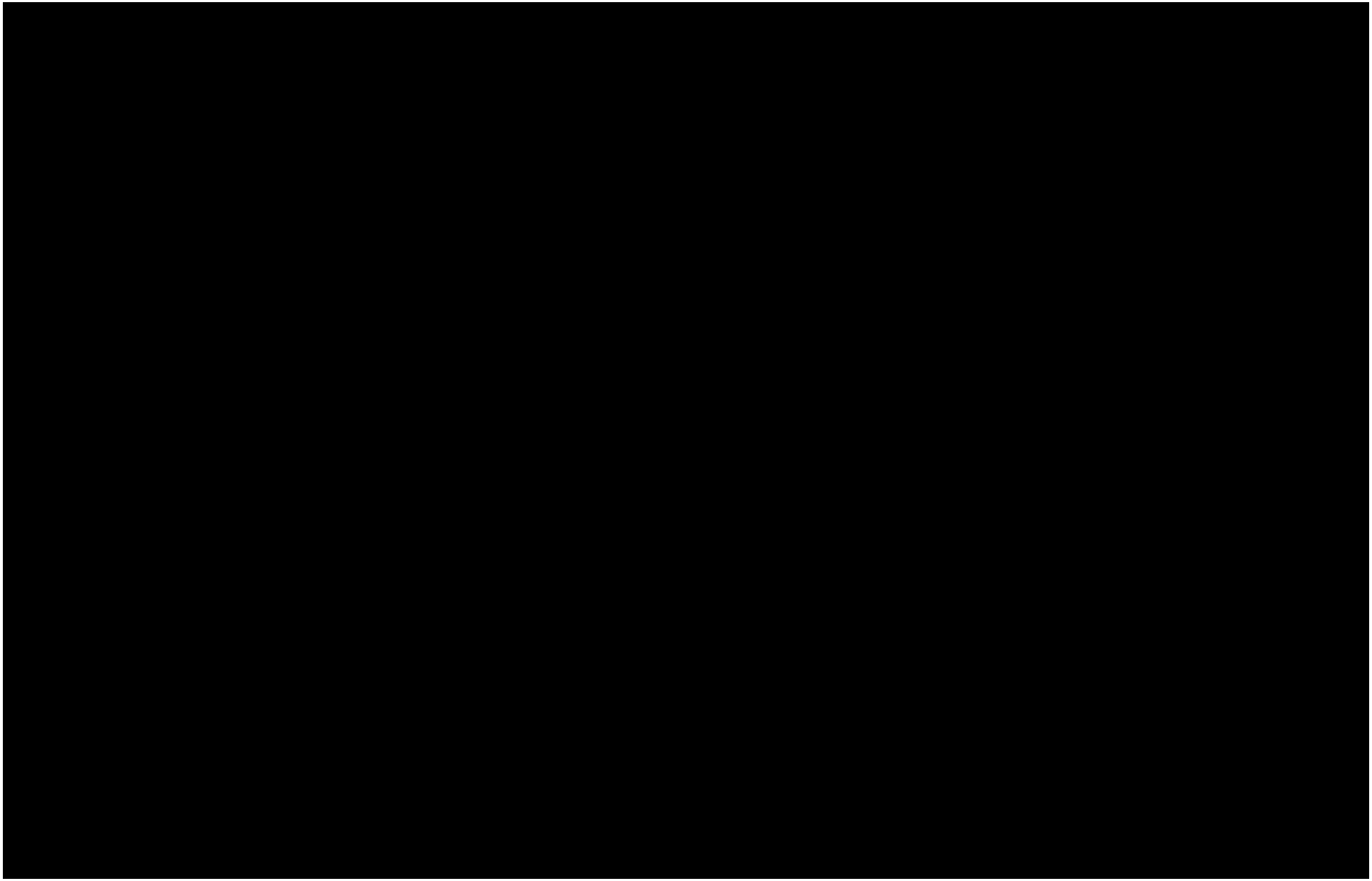
This submission outlines a preferred solution to satisfy the investment drivers. It seeks confirmation of eligibility under Special Condition 3.18, confirmation of eligibility for PCF under Special Condition 3.15, confirmation of re-opener Track 2 EL and formal approval of the preferred option.

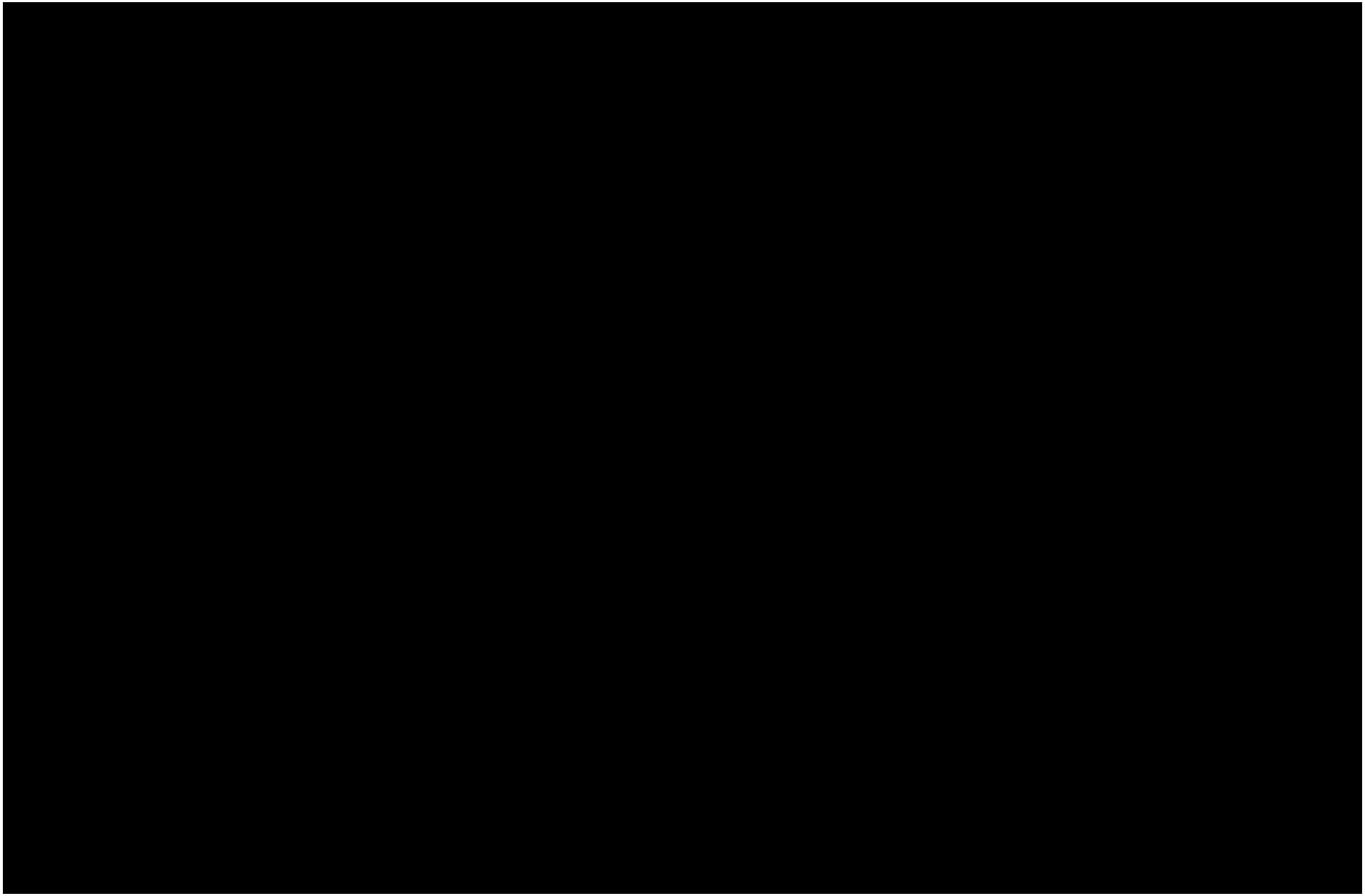
[redacted]

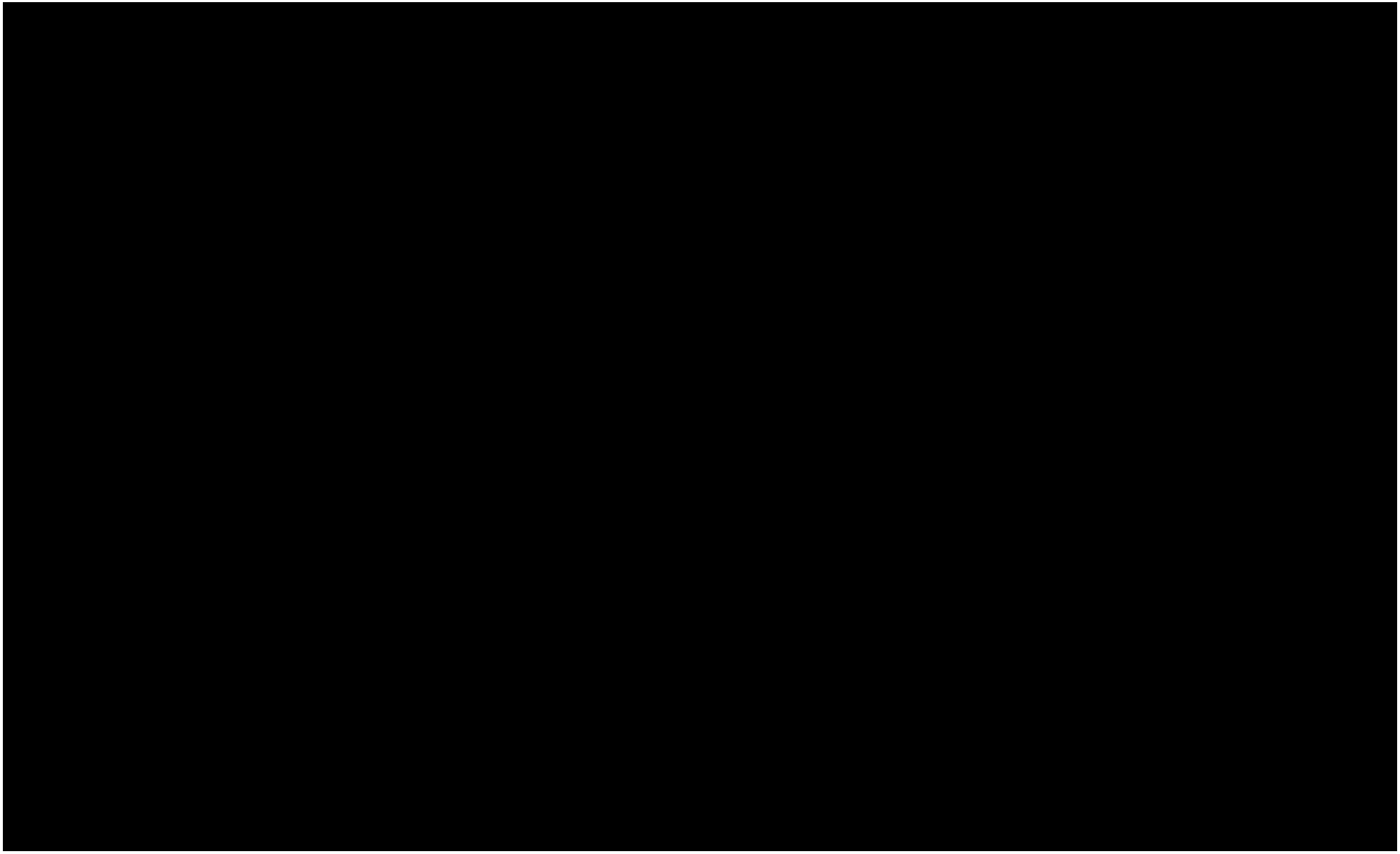
Appendix

A1. System design table

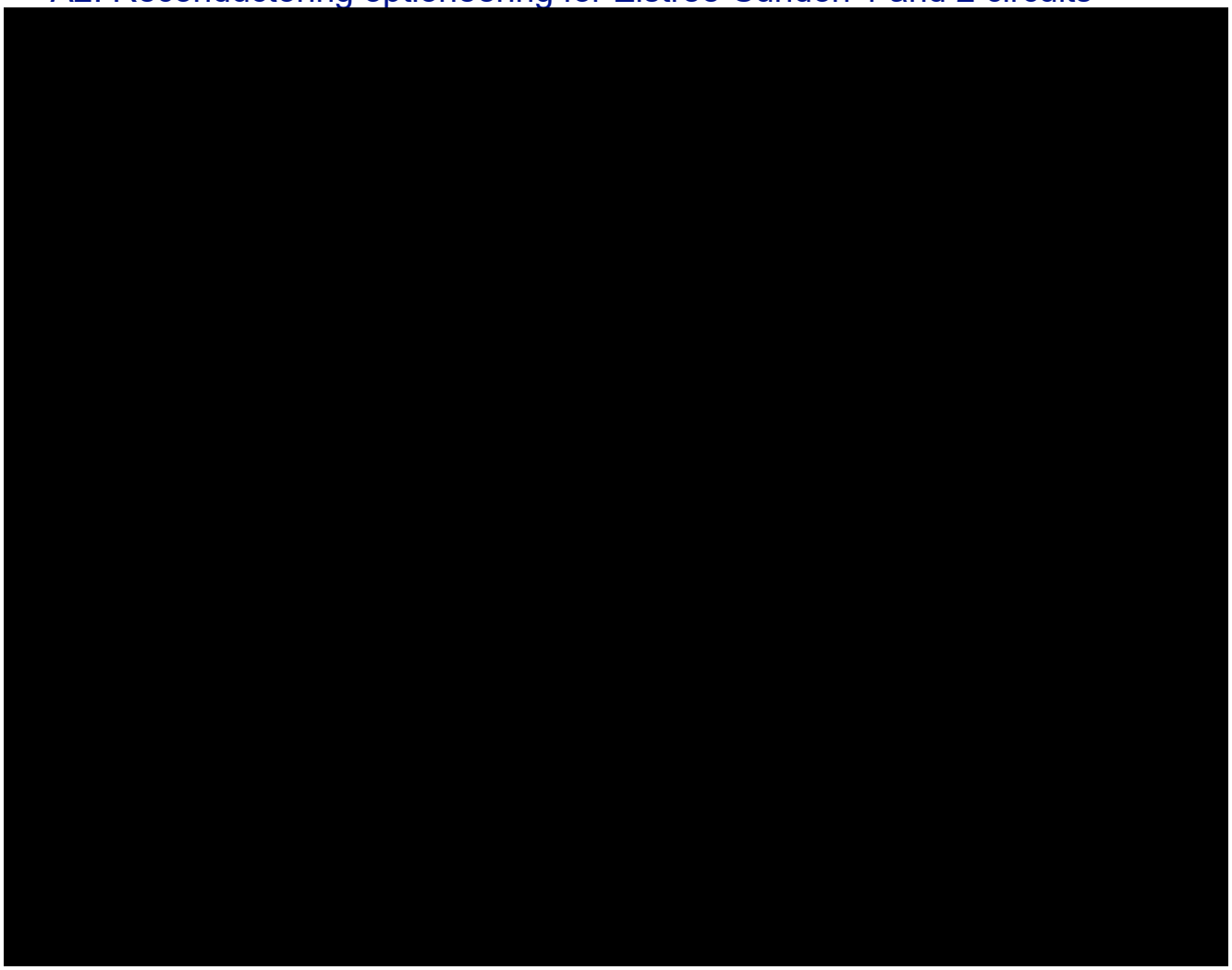
[redacted]

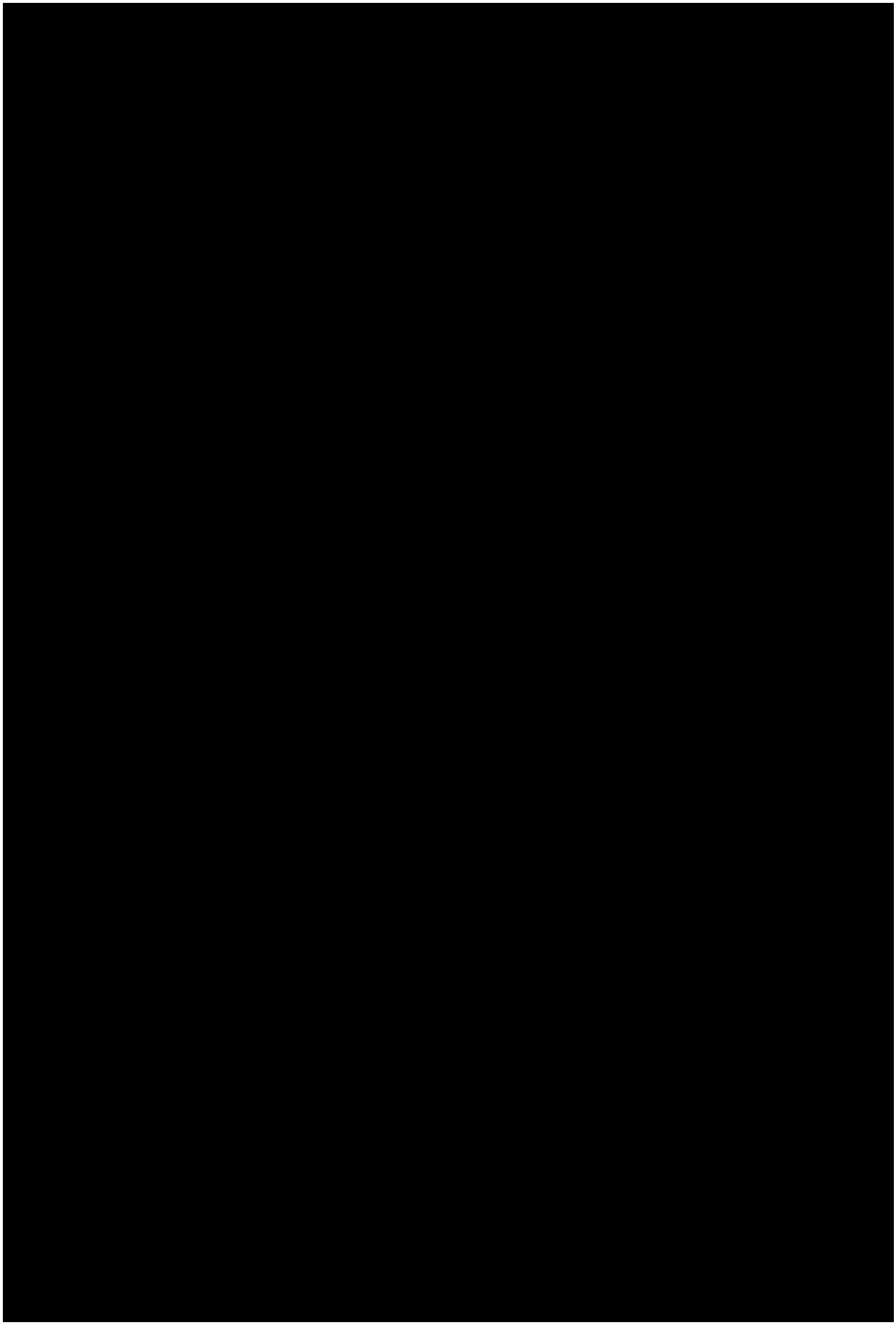






A2. Reconductoring optioneering for Elstree-Sundon 1 and 2 circuits





A3. Stakeholder engagement

Elstree connection

Comprehensive stakeholder engagement has been undertaken and continues for the works at Elstree as part of [redacted]

Other works

Stakeholder engagement for the reconductoring and cable works between Elstree and St John's Wood and Sundon to Elstree will be proportionate and activity led. It will be focused on informing affected stakeholders ahead of key works.

It will involve targeted communications with local authorities, elected members such as councillors and MPs and directly affected parties. For this there will be clear messaging, a dedicated contact point for enquiries, and close coordination with contractors to manage issues and minimise community impact.

A4. Land ownership map

A land ownership map for the Elstree site is provided in the figure below.

A5. CBA assumptions

The following assumptions have been applied:

- Forecast demand growth into London, as reflected in NOA continues to justify the need for increased capacity on the Sundon–Elstree–St John's Wood corridor.
- The existing Elstree–St John's Wood cable tunnel can accommodate a second 400 kV circuit although new surveys suggest no issues.
- New 400 kV GIS equipment at Elstree can be delivered within the existing operational boundary, specifically within the former 132 kV AIS area, following asset clearance.
- No additional permanent land acquisition outside National Grid ownership is required for the preferred Elstree and St John's Wood solutions.
- for works delivered within existing operational footprints of substations and Tunnel, with no requirement for Green Belt development.
- Required outage windows for construction and commissioning can be secured from operations.
- The overhead line reconductoring works associated with the Sundon–Elstree route will be delivered as a part of the NWL scheme, interfacing with options set out in the optioneering report.

A6. Glossary

Abbreviation	Description
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	Disconnector
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 Uprating
IEC	International Electrotechnical Commission

ISS	Integrated Security System
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
SF_6	Sulfur Hexafluoride
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

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