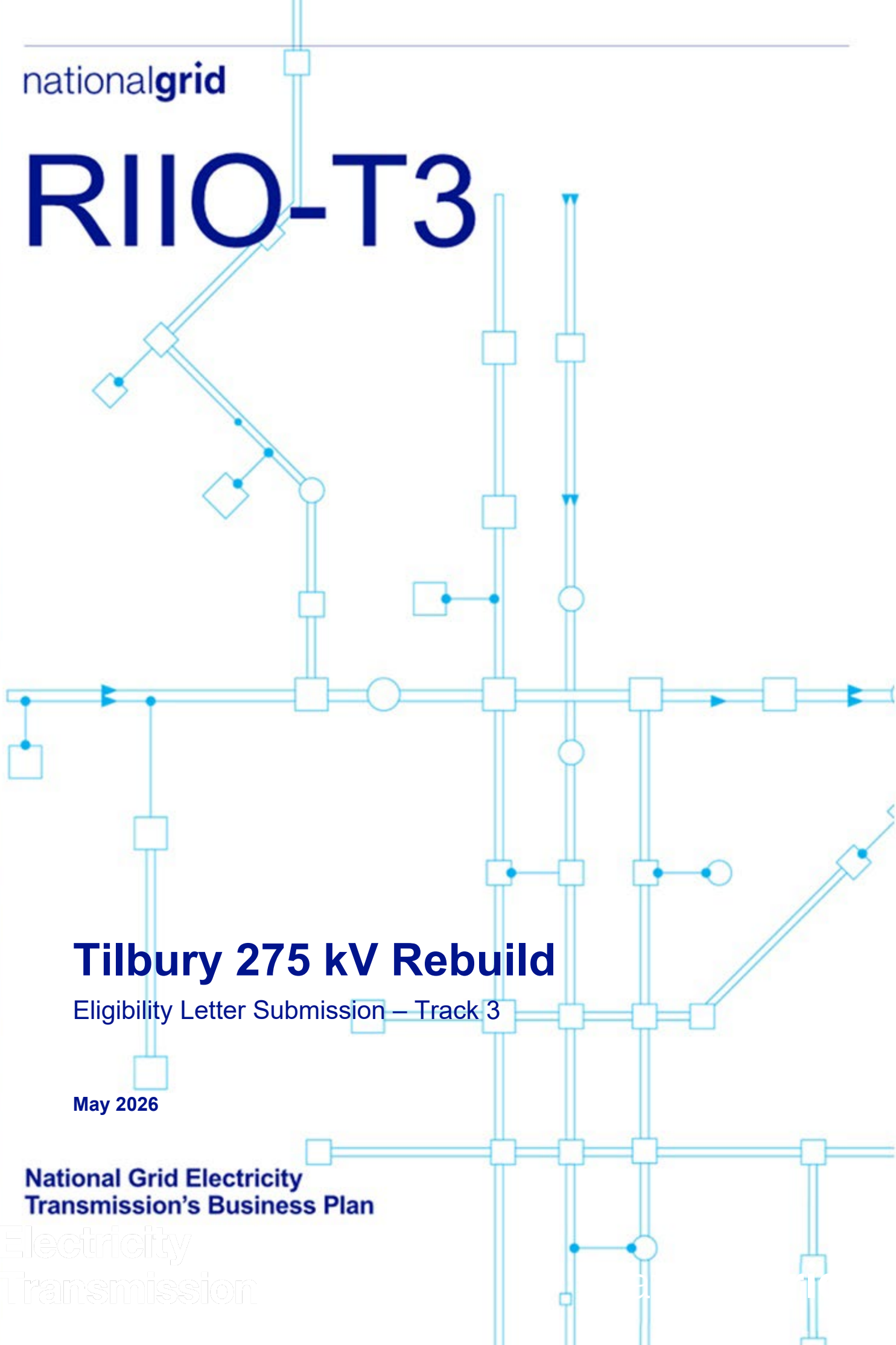


nationalgrid

R110-T3



Tilbury 275 kV Rebuild

Eligibility Letter Submission – Track 3

May 2026

National Grid Electricity
Transmission's Business Plan

Electricity
Transmission

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Reference and summary table

Field	Description
Name of Scheme	Tilbury 275 kV Rebuild
TO's preferred re-opener track	Track 3 Eligibility Letter (EL)
RRP References	NGT500441
BPDT / Project Reference Number	NGT500441
Load Board Reference	NGT500441
Investment Driver	Multiple: <ul style="list-style-type: none"> Customer Connections, [REDACTED] NOA 2022/tCSNP2 <ul style="list-style-type: none"> LE1 Boundary uplift. n [REDACTED]
PASE alignment	Of the four short-listed options: <ul style="list-style-type: none"> Three are 'Variant Option' aligned (option D3, D5b, E7b) One is 'Primary Option' aligned (option E7a)
Outputs	<ul style="list-style-type: none"> Supports TWNC (a tCSNP2 project) LE1 boundary uplift, required [REDACTED] Enables customer projects within the network, from [REDACTED] (This upgrade required for connections at Tilbury and Warley) Addresses Asset Health civil and high-risk plant assets – T3/T4.
Costs	Indicative total cost of the short-listed option(s) [REDACTED]
Delivery Year	The year the project will be completed: [REDACTED] depending on the option. There is however a regional staged requirement to have Warley 1 or 2 OHL feeder circuit ready to energise at 400 kV by [REDACTED]
Extension cost (applicable only to substations)	Not applicable at this stage.
Applicable Reporting Tables	BPDT 10.5 ET Pipeline log and RRP 2024-25 E1.11_ET Pipeline Log.

Field	Description						
Historic Funding interactions	<p>There has been no direct funding to support the Tilbury 275 kV rebuild project, with PCF funding not provided at T3 final determination.</p> <p>Any interaction with historical funding for assets impacted will be provided in our needs case submission once we have a preferred solution.</p>						
Interactive Projects	<p>Two projects are directly interactive with this investment.</p> <ul style="list-style-type: none"> • tCSNP2 – New circuit between Wymondley Main and Waltham Cross (TWNC) • Warley 275 kV Rebuild 						
Solution (s)	<p>Short list of options considered – too early for a preferred solution at this stage, which will be provided in our needs case submission</p> <p>Our short-listed options for Tilbury 275 kV are listed below. These options all need the drivers and accommodate the planned uprating of the Warley circuits to 400 kV and provide the following bays capacities – associated indicative costs as above:</p> <ul style="list-style-type: none"> • Option D3: AIS DBB refurb/reconfigure – 14 bays + 0 spare bays • Option D5b: GIS DBB rebuild on site – 14 bays + 4 spare bays • Option E7a: AIS DBB (wrap-around) rebuild offsite – 24 bays + 3 spare bays • Option E7b: GIS DBB rebuild offsite – 21 bays + 4 spare bays 						
Spend Apportionment	<table border="1" data-bbox="438 1019 1364 1153"> <tr> <td style="background-color: black; width: 33%; height: 20px;"></td> <td style="background-color: black; width: 33%; height: 20px;"></td> <td style="background-color: black; width: 33%; height: 20px;"></td> </tr> <tr> <td style="background-color: black; width: 33%; height: 20px;"></td> <td style="background-color: black; width: 33%; height: 20px;"></td> <td style="background-color: black; width: 33%; height: 20px;"></td> </tr> </table> <p>As a preferred option has not been selected, the spend apportionment is based on the average for all short-listed options.</p>						

1. Executive Summary

1.1 Project summary

Tilbury is a strategically critical transmission node supporting London and the Southeast. The project will enable contracted low carbon generation connections aligned to CP2030 and Net Zero at Warley; improves system operability and resilience in the London region via upgrades at Tilbury providing LE1 boundary uplift, and address asset health issues.

1.2 Submission purpose

We are seeking Ofgem's approval, under the Load Related Re-Opener (Special Condition 3.18 of the RIIO-ET3 licence), to progress the **Tilbury 275 kV Rebuild** as a Track 3 EL investment and to secure Pre-Construction Funding (PCF) (under Special Condition 3.15 of the RIIO-ET3 licence) to complete the remaining optioneering, design development, and stakeholder engagement required to select a preferred solution.

Specifically, this submission requests approval of the short-listed options presented and Pre-Construction Funding (PCF) of [REDACTED] representing [REDACTED] of the average of the estimated cost of these options. A Needs Case Assessment will follow in April 2027 indicating our preferred solution for Ofgem's approval.

1.3 Needs

1.3.1 Customer Connections:

- Provision of four substation bays for contracted Gate 2 connections at Tilbury (three populated bays for [REDACTED] demand connection and one spare bay for [REDACTED] voltage control connection).
- Reconfiguration of the Warley 1 and 2 feeder circuit bays at Tilbury substation to enable the uprating of the Tilbury–Warley (ZB) OHL corridor to achieve an increased winter pre-fault continuous rating¹ of [REDACTED] and an increased winter post-fault continuous rating² of [REDACTED]. This defined enabling infrastructure works is to support multiple Gate 2 contracted connections at Warley substation ([REDACTED] customers and new 132 kV DNO substation facilitating connection of an embedded [REDACTED] data centre).

1.3.2 NESO Network Operability and tCSNP2:

- Power flow control devices noted with 'Proceed' signal within the Networks Option Assessment (NOA) 2021/22:
 - NTP1: Coryton South-Tilbury and Rayleigh Main-Tilbury (specifically at the OHL teed connections to the interbus SGTs located at Tilbury 275 kV)
- Repositioning of the Warley 1 and 2 feeder circuits within the Tilbury substations to enable the ZB OHL circuits (Elstree to Tilbury) to operate at 400 kV, as part of the scope of works to deliver the **tCSNP2** strategic network reinforcement project TWNC (involving a new circuit between Wymondley Main and Waltham Cross), which is providing **LE1 boundary uplift**.

1.3.3 Asset Health:

- Managing asset health and subsidence-related risks at the existing 275 kV compound [REDACTED]

¹ This is the maximum electrical load that the line can carry continuously during winter conditions before any fault occurs in the system.

² This is the maximum electrical load that the line can carry continuously during winter conditions after any fault occurs in the system.

This requires a holistic plan to ensure coordination and timing is optimised to minimise potential customer impact.

Without this investment, NGET would be unable to meet statutory duties to provide efficient connection offers, support TWNC delivery, or maintain system operability in the London region.

1.4 Optioneering to date

We have undertaken a structured, multi-factor optioneering process to identify deliverable solutions in the interests of consumers. We conducted a high level assessment of strategic options (do-minimum, market-based, whole-system, reuse or extension of existing assets, and new-build) to develop a longlist of seven potential options for the site. In identifying a shortlist of options for this site, we have balanced:

- Refurbishment versus construction of a new substation;
- AIS vs GIS technologies;
- System access availability and customer access impact;
- Future growth potential; and
- Timings to align with end-of-life assets.

Table 1 - Summary of optioneering longlist

Option	Details	New site	AIS/ GIS	PASE	Short List
Option D1	(Do Minimum) targeted replacement of 'critical risk' 275 kV to meet asset health issues	No	AIS	Var	x
Option D2	Refurbishment of the existing 275 kV substation (only)	No	AIS	Var	x
Option D3	Refurbishment of the existing 275 kV substation and moving the Warley circuits to the existing 400 kV substation.	No	AIS	Var	✓
Option D4	Refurbishment of the existing 275 kV substation and installation of interbus SGTs on the Warley circuits.	No	AIS	Var	x
Option D5	Full in-situ rebuild and rationalisation of Tilbury 275 kV substation to a 400 kV substation within the existing site boundary.	No	a. AIS b. GIS	Var Var	X ✓
Option D6	Staging rationalisation of the 275 kV substation to an upgraded 400 kV substation in line with assets reaching their End of Life.	No	a. AIS b. GIS	Var Var	x x
Option E7	Full off-site rebuild of Tilbury 275 kV and Tilbury 400 kV substations.	Yes	a. AIS b. GIS	Yes Var	✓ ✓

Four design options (two at the existing site and two for a new site) have been shortlisted and will be taken forward for detailed analysis:

These options have been shortlisted as they can meet contracted customer demand and support regional operability requirements but require further optioneering work to review the benefits against the material trade-offs that are present across the options, such as planning risk, delivery timescales, whole-life cost, future expandability, and interaction with existing assets.

1.5 Cost estimates

Option E7b is the most expensive option on comparison of the short-listed options. The other short-listed options explore trade-offs between using GIS, rebuilding within the existing site footprint, upgrading to 400 kV, future expansion and delivery.

Indicative cost estimates, based on the cost book using 2023/24 prices, provide an indicative range from [REDACTED] reflecting differences in:

- substation configuration (AIS versus GIS);
- extent of rebuild versus refurbishment;
- land take and associated overhead line works; and
- delivery complexity and future expandability.

1.6 Indicative delivery programme

Delivery of the short-listed options varies, with refurbishment and new build taking longer to execute than an in-situ rebuild, increasing the risk of delays to the delivery of the Warley rebuild and TWNC.

Indicative dates are noted below and will be revised if needed in the needs case.

- Option D3: Early Ground works commence Q1 2030, completion [REDACTED]
- Option D5b: Early Ground works commence Q1 2030, completion [REDACTED]
- Option E7a/b: Early Ground works commence Q3 2032, completion [REDACTED]

2. Introduction

2.1 Tilbury 275 kV Rebuild

This paper presents an Eligibility Letter application under the 'Load Re-opener and Price Control Deliverable' Special Condition (3.18 of the RIIO-ET3 Licence) for an investment to rebuild Tilbury 275 kV substation. It seeks the following approvals from Ofgem³:

- Eligibility for submission under the Load Re-opener and Price Control Deliverable under Special Condition 3.18,
- Confirmation the project follows **Track 3 EL** of the re-opener process, because it is not fully compliant with Ofgem's Pre-Approved Standards of Engineering (PASE),
- Pre-Construction Funding (PCF) under Special Condition 3.15 (Pre-Construction Funding Re-opener, Price Control Deliverable), and
- Agreement on our indicative designs, needs case, optioneering process completed to date and shortlisting of design options we will take forward to detailed analysis.

The investment is to rebuild the Tilbury 275 kV substation to deliver capacity for critical NOA / tCSNP2 investments, resolve several non-load asset health drivers on the existing site and create capacity in the region as part of future-proofing the investment.

2.1.1 Eligibility & Project Track Statement

This investment qualifies for the Special Condition 3.18 as it is classified as a shared driver project scheduled to commence within the T3 price control period. No allowances were provided for this investment within the T2 price control framework, and at present no funding has been provided through the T3 price control period.

We propose the Tilbury 275 kV rebuild follows **Track 3 EL** of the Load Re-opener process. This is because not all short-listed options are fully PASE compliant, and there are significant differences in cost and delivery dates.

This paper lists our short-listed options and provides preliminary cost estimates. A full cost benefit analysis identifying our preferred solution will be provided in our Needs Case Assessment - based on further assessment of the agreed short-listed options presented in this document. We expect to submit our Needs Case Assessment for your approval in April 2027.

2.1.2 Pre-Construction Funding Request

Under Special Condition 3.15 of the Electricity Transmission licence, this investment qualifies for allowances equal to █████ of its total forecasted cost (an allowance of █████ at the time of this Load Re-opener Eligibility Letter submission).

Based on our current forecast, we have provided below a breakdown of costs amounting █████ as part of this submission.

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

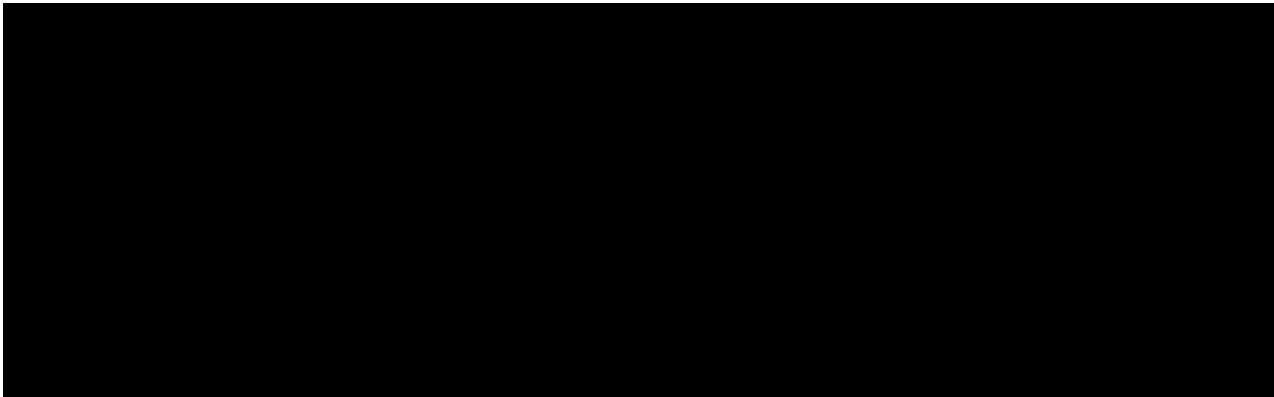
We confirm that no PCF activity included in this submission has been funded through baseline allowances, other re openers, or alternative licence mechanisms.

The projected cost to deliver our short-listed solutions for the Tilbury 275 kV investment range from █████ with an average of █████ (see Section 4 for further details). Given the range, we are requesting under Special Condition 3.15 a PCF

³ As per section 1.20 of the Load Re-opener Guidance and Submission Document (16 Dec 2025).
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allowance of [REDACTED] (based on the average of the short-listed options).⁴ There is a possibility that costs (and our PCF allowance) may be exceeded given the range of options, which we expect will be addressed at the Project Assessment stage.

[REDACTED]



2.2 Background

2.2.1 Chronology of investment

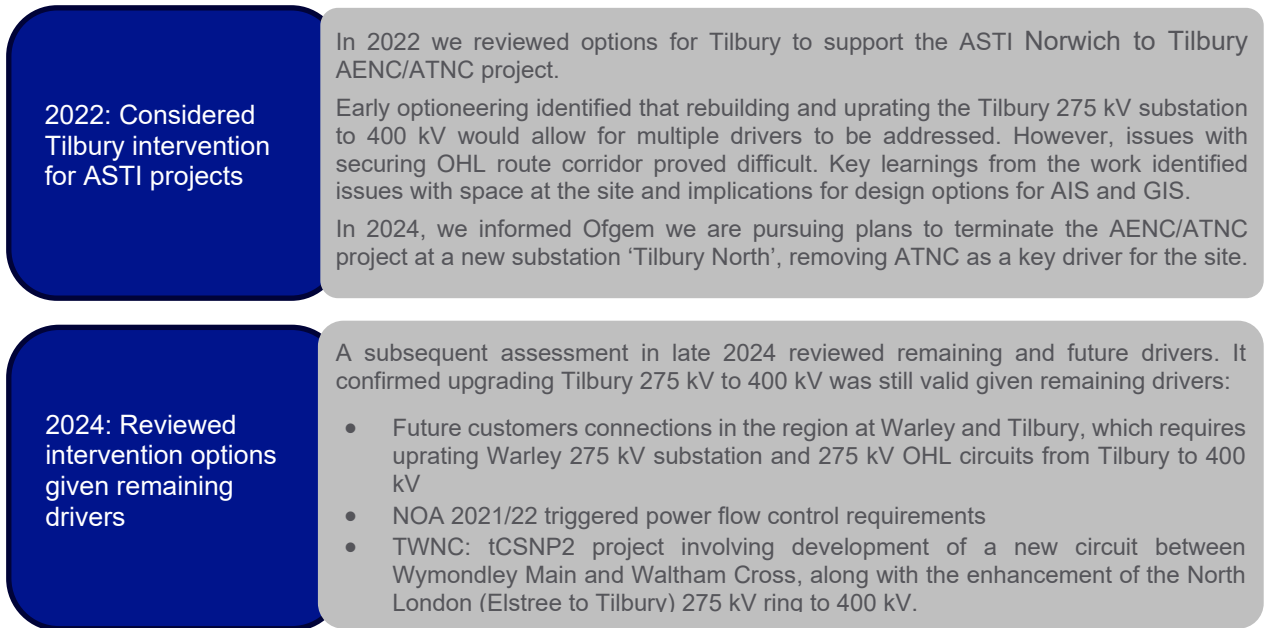
We have been in discussion with Ofgem on redeveloping Tilbury given its strategic position in the southeast and implications and relation to ensuring adequate supply to London.

Multiple considerations have emerged over time and have fed into design options. We have also been able to use the early optioneering work related to the ASTI – AENC/ATNC (Norwich to Tilbury) project, that was originally exploring a connection into Tilbury, to inform our selection of shortlisted options⁵. Figure 1 provides the summary of chronology to the investment.

⁴ [REDACTED]

⁵ A more detailed extract on the work conducted for ASTI AENC ATNC optioneering is provided in Appendix B

Figure 1: Summary of chronology



2.2.2 Regional & Network Context

The transmission system in the Central and Greater London area includes an outer 400 kV route that supplies power to the region, and two inner routes (275 kV and 400 kV). The outer 400 kV route is currently in the process of being upgrading as part of the ASTI BTNO and HWUP projects due for completions in T3. The inner 275 kV route from Elstree through to Iver is current under review on the benefits of uprating to 400 kV. The 275 kV route from Elstree to Tilbury is scoped for uprating as part of the tCSNP2 TWNC project.

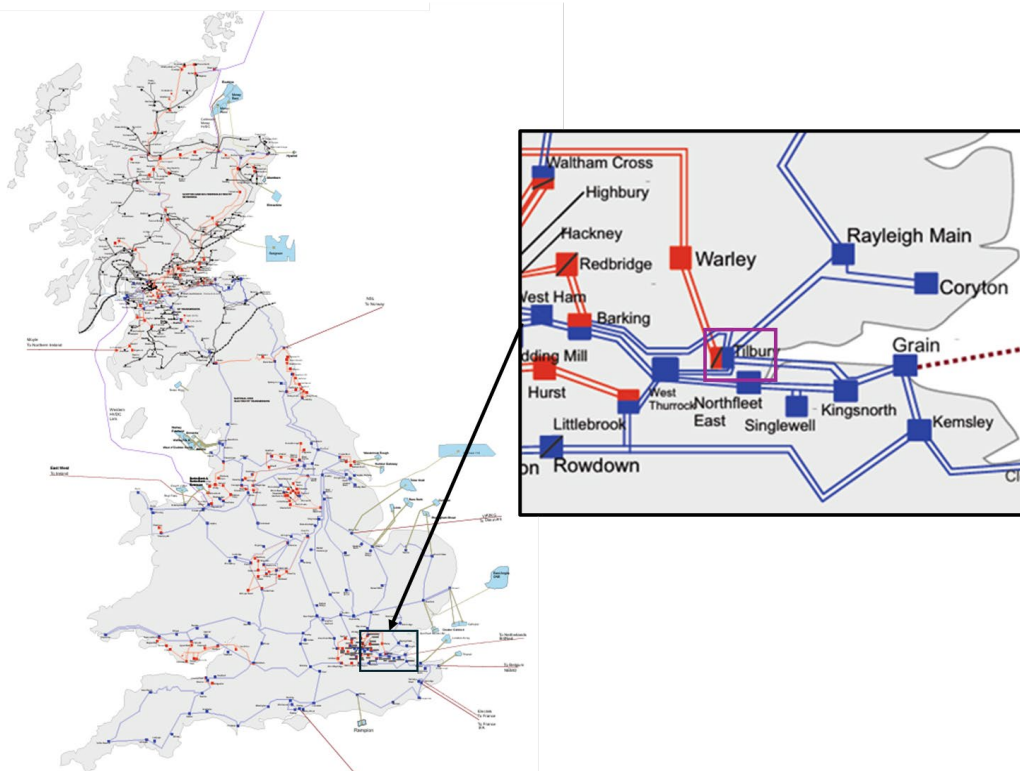
The region consumes 20% of the nation's electricity, requiring substantial upgrades and reinforcements to keep pace with the region's rising demand for power. National and regional decarbonisation targets are increasing this need. For example, London's aim to achieve net zero emissions by 2040, via the electrification of both transport and heat networks. Furthermore, the Governments Modern Industrial Strategy, which is encouraging growth in AI Data Centres near the capital, are increasing capacity requirements on both NGET and DNO networks in the area.

We are therefore exploring options to upgrade the current circuits and substations along the Elstree–Tilbury–Warley corridor, thereby enhancing power flows and overall capacity. We are also considering the potential extension of this reinforced 400 kV route into North London, reaching up to Iver. All planning for future initiatives will ensure alignment with supplementary works so as not to hinder future development proposals.

Tilbury substation manages the transmission and coordination of power from North London and East Anglia to Central and South London, as well as the Thames Estuary. Rebuilding Tilbury 275 kV substation is therefore important for supporting several critical reinforcement and upgrade projects in the area, as well as aligning with the strategy for the region. Given these are interconnected initiatives, the design and scheduling of the 275 kV rebuild is complex with the interaction of various projects and drivers, needed to be assessed when undertaking design optioneering.

From a regional perspective, the rebuilding of the 275 kV substation offers the chance to facilitate future customer connections across multiple sites, prepare for and enable LE1 boundary uplifts as part of the TWNC project and enhance the network capacity and operability of the substation.

Figure 3: Location of Tilbury site on our network



⁶ 'Tilbury North' and 'Clacton' are new future 400 kV substations associated with AENC/ATNC. Tilbury A = existing 400 kV substation; Tilbury B = existing 275 kV substation updated to 400 kV.
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Key: **red** = 275 kV assets, **blue** = 400 kV assets. Investment location shown in **purple** area.

2.2.3 Interacting projects

Whilst Tilbury is in an early stage of development, and Warley has a separate submission for consideration under the LRR, it has been identified during regional strategic workshops that there is a dependency between the two projects.

Tilbury 275 kV substation will need to be completed in such a way that enables Warley 1 or 2 circuit to be energised at 400 kV by 2033, in time to enable new customers to connect at the new Warley 400 kV substation. Any issues relating to this dependency not being met, are noted in the optioneering analysis section.

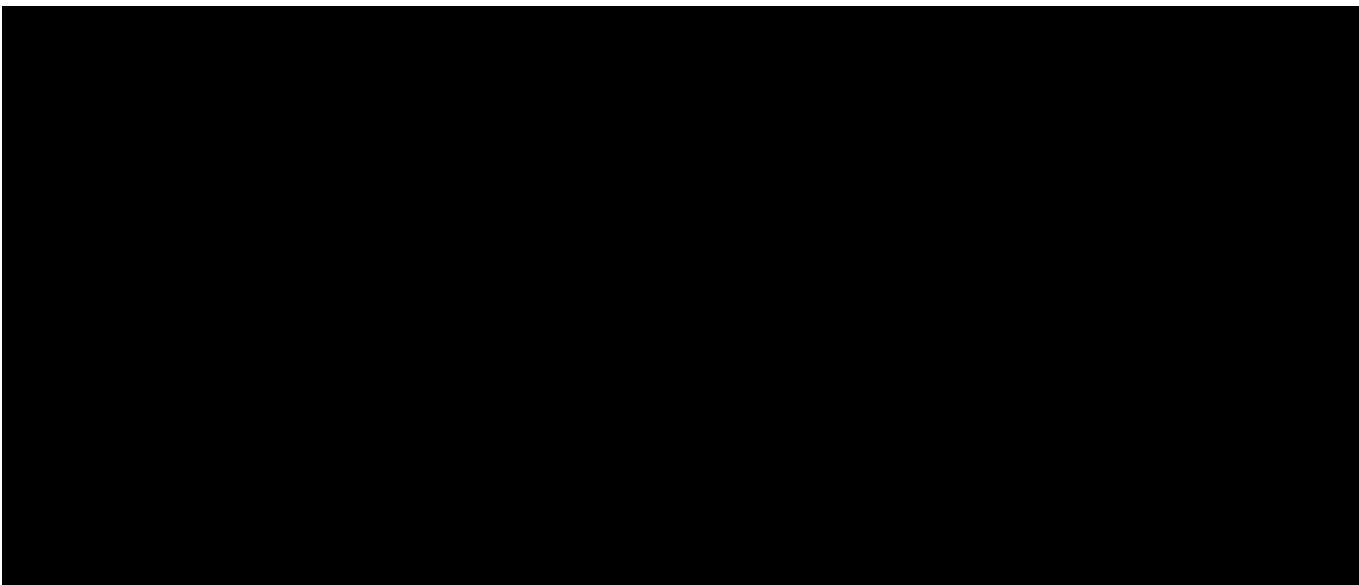
Other projects in the region that interact and may impact our short list of options and timelines for Tilbury - given potential interaction with access roads and need to system access outages – are listed below in Table 3.

Table 3 - Interacting projects

Project	Details	Status
Warley 275 kV Substation Replacement	Upgrading of the Warley site Facilitate new customer connections at Warley (detailed in our driver section)	[REDACTED]
Wider Works	Thames cable tunnel Upgrade of the Thames cable tunnel and circuits on the Tilbury-Grain route linking Kent and Essex which are currently constrained	[REDACTED]
Highways England	Lower Thames Crossing OHL diversion works to facilitate the Lower Thames Crossing (LTC) project are also needed.	[REDACTED]
Port of Tilbury expansion	Port of Tilbury (Stage 3 expansion) – construction logistics within the area may restrict access	[REDACTED]

2.2.4 Site Background

The Tilbury substation complex in Essex, north of the River Thames, includes a 400 kV SF6 Gas Insulated Switchgear (GIS) double busbar substation, a 275 kV Air Insulated Switchgear (AIS) double busbar substation, and a 132 kV AIS banked compound. Figure 4 shows an arial layout of



- The 275 kV substation was built in the 1950s for the Tilbury A coal fired power station and expanded in the 1960s for Tilbury B. Originally four 275/132 kV SGTs serviced the local DNO network. Several bays were decommissioned after the coal plants closed in 2013 (in part due to subsidence issues).
- In the early 2010s the site was expanded, with the addition of a 400 kV substation to facilitate the power flow from assets such as the London Array Offshore Windfarm, Grain CCG, Britned Interconnector, and Grain LNG. It was driven as part of the 'Thames Estuary Portfolio' which sought to enable power transfer from the estuary to the then-new Tilbury-Littlebrook-West Thurrock 400 kV double circuit.
- In addition to this expansion, a 132 kV compound linking the local DNO network (UKPN) was built. This connects through two 400/132 kV SGTs to the two-storey, floodproof 400 kV GIS substation also constructed during this period, and two of the original 275/132 kV SGTs circuits.
- An additional GIS switch hall was added to the complex to support Tilbury C PowerStation; however, it remains empty and unused given plans for the station were shelved in 2013.
- In 2024 a new gas peaking generator with BESS was connected to the 275 kV substation.

When looking at the makeup of the 275 kV site today, most equipment remains AIS with original assets remaining in place from the 1950s. However, all operating circuit breakers have been replaced and are now SF6 filled types. Due to its age, the 275 kV substation persists to have a lower fault rating (31.5kA), which limits network capacity in the area.

2.2.5 Historic Funding

There is no existing funding allowance included within the previous or current price controls to cater for the scope of rebuilding the 275 kV substation as detailed in this paper, with no PCF funding provided at T3 final determination.

An overview of historic T1 and T2 asset health interventions for the Tilbury 275kV substation is presented in Appendix A.

Any interaction with historical funding for assets impacted will be provided in our needs case submission once we have a preferred solution.

2.2.6 Aligning with our Non-Load Plan

The commencement of the new RIIO-T3 price control has set in licence our agreed Non-Load plan for the period and the PCD mechanisms which underpin it. We recognise that in the delivery of 'site strategy' investments under the Load Re-opener process, there will be circumstances where investments incorporate both load and non-load asset health drivers which overlap with the Non-Load plan and separate PCDs written into the NGET licence. Tilbury 275 kV Rebuild is a prime example of this kind of project.

In the delivery of any non-load deliverables, we can confirm that the application of any appropriate funding will only be captured in one place under only one mechanism – ensuring that double counting between the Load Re-opener and Non-Load PCDs does not occur and neither mechanism is compromised.

2.2.7 Early Asset Write Offs (EAWO)

Whilst we are at an early stage of development, there are likely to be some historic TOTEX incurred that has not been fully recovered from consumers, especially if a new site be selected.

Whilst we are not able to state the value of our RAV balance attributable to a particular asset since the RAV represents the value of TOTEX incurred yet to be recovered rather than a specific asset register, we will produce a proxy estimate for Ofgem of the value of RAV that would have been attributed to investments based on the proportion of the expenditure added to the RAV, updated for depreciation and inflation indexation.

Further details on this will be provided in our needs case submission, where we will also identify where assets being removed or replaced could be reused in other investments.

3. Project Drivers & Needs Case

3.1 Drivers

Multiple drivers relating to this proposed project are listed below. The rebuild of Tilbury 275 kV provides the opportunity to collectively address the drivers.

Table 4 – Summary of Drivers

Summary of Drivers		Date
Customer Connections (for new customer connections at Tilbury)	The following contracted customer connections are conditional on upgrade of Tilbury 275 kV to 400 kV <ul style="list-style-type: none"> [Redacted] [Redacted] 	[Redacted]
Customer Connections (for new customer connections at Warley)	The following contracted customer connections at Warley require upgrades at Tilbury as described in this paper, and upgrades at Warley as described in a separate submission ⁷ . <ul style="list-style-type: none"> [Redacted] [Redacted] [Redacted] [Redacted] 	[Redacted]
Network Operability (NOA)	NOA 2021/22 triggered power flow devices: <ul style="list-style-type: none"> NTP1: Coryton South-Tilbury and Rayleigh Main-Tilbury (As part of a reconfiguration of Tilbury 275 kV, the need for the NTP1 power flow devices, whose effective location is the short section of OHL between the 400 kV substation and the interbus SGTs, could be avoided / negated.) 	[Redacted]
Network Operability (tCSNP2)	TWNC proposes the following: <ul style="list-style-type: none"> Constructing a new double circuit between Wymondley Main and Waltham Cross Upgrading the North London 275 kV ring to 400 kV along the ZB OHL route - connecting Elstree, Waltham Cross, Warley, and Tilbury	Due to complete in [Redacted], with construction starting [Redacted]
Asset Health	[Redacted]	[Redacted]


⁷ Warley 275 kV Substation Replacement Eligibility Letter
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Summary of Drivers	Date
[REDACTED]	

3.2 Customers

The following existing/future customers in Table 5 are impacted by or dependent on Tilbury 275 kV rebuild. The customer ACL dates presented in this submission reflect the existing contracts. The testing and setting of ACL dates for customer contracts within scope of connections reform is ongoing throughout 2026. Confirmation of agreed ACL dates will therefore be presented in the next stage of submission which is Needs Case.

There was one contract previously looking to connect at Tilbury, have now received a Gate 1 offer as a result of the latest Connections Reform outcome. Consequently, this customer no longer holds an active contract with NESO for site connection. They were previously considered during the investment optioneering process. However, although the driver is now on hold, we have ensured that our proposed preferred solution continues to be the most appropriate and efficient approach to meet the confirmed Gate 2 customers and any other relevant drivers.



Existing connections will be maintained and managed during the rebuild process, with existing commercial/ownership boundary definitions, modified as required, to suit the selected option.

3.3 Asset Health

There are asset health/non-load drivers for interventions at this substation alongside the predominant load-related drivers for investment. These asset health drivers are considered likely to affect the scope and timing of the preferred load-related intervention.

[Redacted]

[Redacted]

[Redacted]

[Redacted]

⁸ In accordance with the decision-making framework set out in 'NGET_RII03_NGETQ10_Asset Health Decision Making', submitted as part of our RII0-T3 Draft Determination response.

⁹ Please note that the asset health scoring is based on data that has been updated to reflect asset deterioration since the RII0-T3 submission, which was based on 2023/24 asset condition data.

These assets were excluded from our RIIO-T3 non-load submission on the basis that they would be addressed by this substation rebuild scheme. We therefore do not have specific RIIO-T3 funding for any non-load related interventions at this substation.

Therefore, as this project develops, opportunities to economically replace these assets will be considered. If the final preferred option is to rebuild the site, either at the existing location or at a new site, this would allow the subsidence issue and all asset health drivers to be addressed.

In the interim, where there are higher-risk assets at the site, we will continue to assess and manage the risks until the project is delivered. Depending on the project scope and timeline, it may be necessary to undertake some asset interventions and ad hoc civil and building repairs ahead of the site scheme to maintain asset integrity and safety.

3.4 NESO

NESO recommended the TWNC project as part of the tCSNP2 portfolio of works that supports the required investment needed for offshore and onshore network upgrades. TWNC involves establishing a new 400 kV double circuit between Wymondley Main and Waltham Cross, and the upgrade of the North London 275 kV ring to 400 kV, connecting Waltham Cross, Warley, and Tilbury substations.

These upgrades will result in a reduction of constraints around the critical LE1 boundary which sees flows from offshore wind generation and interconnectors coming into London and the Southeast. TWNC therefore necessitates the need for upgrading of the Tilbury 275 kV substation to 400 kV to facilitate this investment.

Table 7 - Forecasted TWNC Boundary Uplifts

Boundary	TWNC Boundary uplift (FES 2025, Year 9 Model) - MW	TWNC Boundary uplift (FES 2025, year 12 model) - MW
LE1	█	█

Note: At the time of study, the FES25 optimum path was not finalised (given this, the final study path and boundary uplift are subject to change and will be updated for the Needs Case Assessment if required).

4. Optioneering

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

The project is still in its early stages, with the optioneering process ongoing; further analysis is needed before a final preferred option is chosen.

4.1 Submission purpose

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

Table 8 – Strategic Options

Option Number	Option Name	Option Description
A	Do nothing	The network is kept in its current state, and no new connections are facilitated.
B	Market based solution	Increased customer demand is accommodated through the procurement and use of ancillary services only.
C	Whole systems solution	The required customer connection is accommodated by a DNO, or at another transmission site.
D	Make use of existing assets	Facilitating the requested connection by utilising the existing substation (extension, uprating, etc.)
E	New build	Facilitating the requested connection by building a new substation.

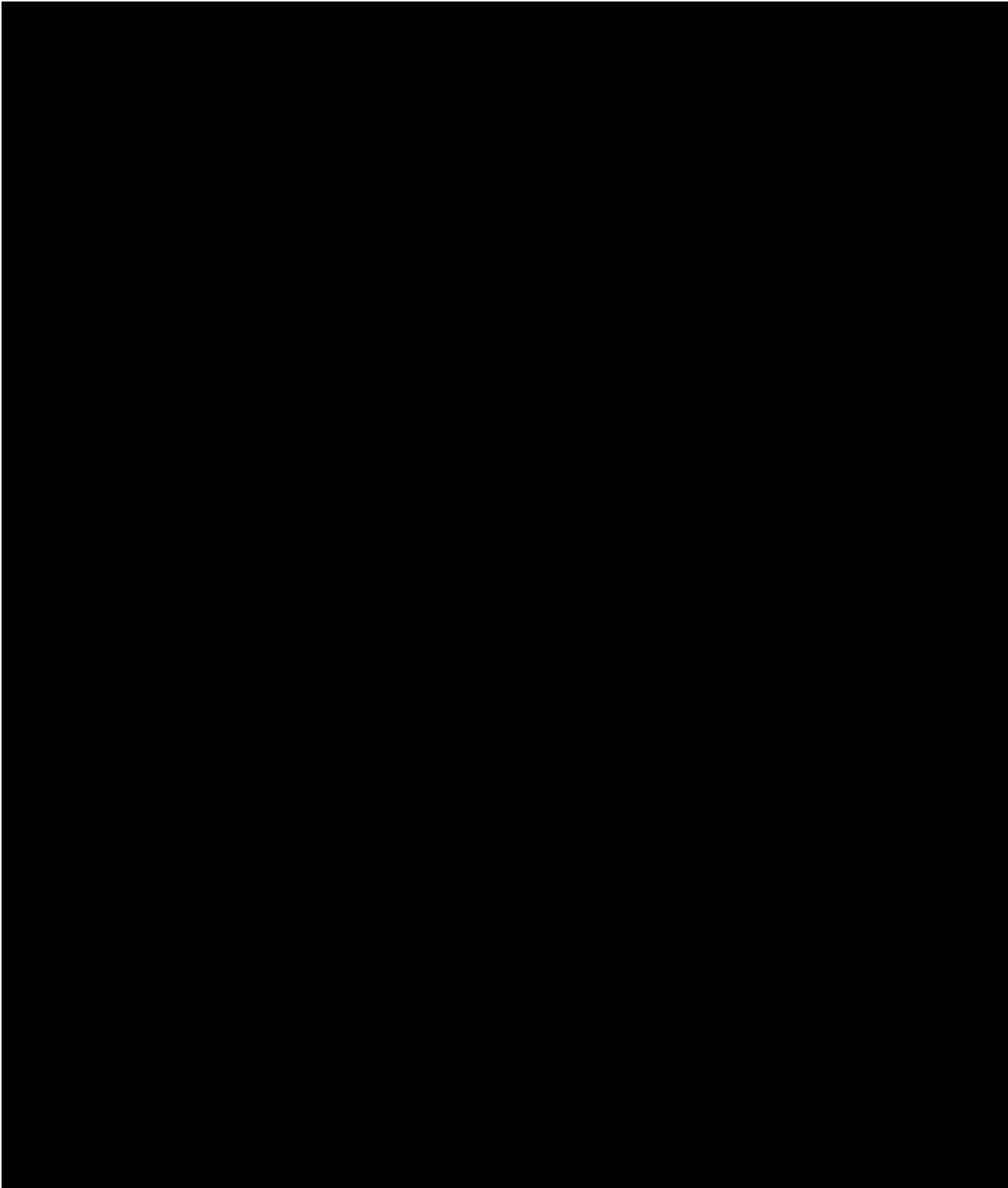
Due to licence and contractual obligations, and the inability to facilitate connection requests, Options A, B and C were discounted early in our optioneering process. In assessing Options D and E, we considered three potential approaches:

- Limited redevelopment of site within existing boundary (do minimum to ensure asset health and required enabling works for committed connections) – involves variations of Option D;
- More extensive redevelopment of the site to meet future needs, exploring timing and testing various options to accommodate AIS / GIS designs – also Option D, albeit more extensive intervention; and
- Re-location of existing facility to a new location, allowing potential for GIS / AIS designs dependent on space – requiring consideration under Option E.

4.2 Siting

As Option E would require a new site, we conducted a siting study. We employed the support of Jacobs in conducting a detailed review of possible suitable sites, based on both AIS and GIS substation configurations. The scope of the study focused on possible sites within a 2-kilometre radius of the existing Tilbury 275 kV substation compounded, to limit the required modifications to both NGET and existing connected user circuits. Figure 5 provides an aerial view of the varying sites considered as part of this study, summarised below.

Though the siting study was completed with design Option E in mind, the findings are applicable to more extensive variations of Option D, because they would require additional land to be acquired. The sites considered are detailed below:



Each of the four sites were assessed against five criteria, including impact on Environment, ease of Planning and Consenting requirements, the technical deliverability of the site for construction, availability of land and proximity and ease to an OHL connection. A high-level RAG comparative study of each of the four sites against this criterion was conducted through a “RAG” (Red, Amber, Green) score to each. A summary of the results for each site and key reasons is included in Table 10 below.

Table 10 - Summary of RAG Analysis of Initial Sites.

Site Option	Site TIL1 (new)	Site TIL2 (new)	Site TIL3 (new)	Site TIL4 (existing)
Environment	Loss of priority habitat	Both sites have open views towards West Tilbury to the north – meaning the substation and OHL connections are expected to be visible from heritage assets situated on elevated ground potentially impacting their setting.		When within the existing boundary, prioritises development on brownfield land.
Planning	Historic landfill area and soil contamination risk	Site is within existing green belt – additional justification for building required.	Site is within existing green belt – additional justification for building required.	Existing boundary and upgrade developments can factor in new customer connections.
Technical	Limited access routes: new access road required. Large amount of earth works and site is known for historic PowerStation contamination	Within a designated water storage area, which may limit potential development or necessitate compensatory storage measures.		Makes use of existing network infrastructure connections but would have technical challenges during build due to limited space.
Lands	Land owned by Port of Tilbury, who have proposed development plans that lie immediately south of the site.	The site has common land to the north, west and east which may be impacted by the proposals.	Proximity to residential development and properties.	Makes use of existing available land and supports our obligation under the Electricity Act 1989 to limit new lines and substations to only where current infrastructure cannot be updated to meet current security standards.
OHL Connection	New pylon foundations likely needed within the landfill zone for OHL connections	Proposed OHL route modifications over railway line, near scheduled monument, and would cross common land		Conveniently placed for connections to the existing overhead network and nearby customers.
Overall	Not taken forward	Taken forward	Taken forward	Front runner

The initial siting study concluded that site TIL4, which would involve rebuilding within the current substation footprint, is likely the best option from a siting perspective.

Site constraints around the historic landfill usage, proximity of the PoT, nearby Thames Estuary, which is earmarked for potential development, proximity to common land - all add limitations to the other potential sites. These findings were incorporated into our optioneering review and informed our longlist of technical options, summarised below.

4.3 Longlist of options considered

Table 11 – Assessment of option longlist.

Option	Technical Description	Relevant Diagrams or Layout References	Consenting Risks & Environmental Constraints	Rationale for rejecting or taking forward the option
<p>Option D1: (Do Minimum) targeted replacement of 'critical risk' 275 kV to meet asset health issues</p> <p>Not progressed</p>	<p>PASE Variant</p> <p>Replacement of plant assets within the 275 kV substation, identified as having a "Very High" or "High" asset risk failure score within the Asset Failure Risk report – 31 assets currently fall into these categories.</p>	<p>Layout: N/A – no change to existing operational layout</p>	<p>No impact – all proposed works within established operational boundary.</p>	<p>Engineering: Does not enable future TWNC project and does not ease current system constraints of fault level issues in 275 kV or the OHL tee'd connections for existing interbus SGTs. Not all asset health drivers met.</p> <p>Consumer Value/Economic Performance: No future customer connection capacity beyond contracted users; customers connected at 275 kV, not 400 kV as per CUSC contract.</p>
<p>Option D2: Refurbishment of the existing 275 kV substation (only)</p> <p>Not progressed</p>	<p>PASE Variant</p> <p>Refurbishment and/or replacement of all plant assets identified as having a "Medium Low" up to "Very High" asset risk failure score within the Asset Failure Risk report, as well addressing weakening civil structures and ground defects.</p>	<p>Layout: N/A – no change to existing operational layout</p>	<p>No impact – all proposed works within established operational boundary.</p>	<p>Engineering: Will not support future TWNC project or resolve site subsidence issues. Fails to meet future regional plans for upgrading North London's 275 kV system and does not alleviate current 275 kV fault level or OHL tee'd connection constraints (unless interbus circuits move to 400 kV).</p> <p>Consumer Value/Economic Performance: No extra customer capacity beyond existing contracts; customers remain on 275 kV, not 400 kV as per CUSC.</p> <p>Deliverability: Multiple, complex outages and high commissioning resource support for site works in live substation, increasing risk of safety issues and delays.</p> <p>Environmental Impact: low, as scope remains within existing site boundary</p>
<p>Option D3: Refurbishment of the existing 275 kV substation and moving the Warley circuits to the existing 400 kV substation.</p> <p>Progressed to shortlist</p>	<p>PASE Variant</p> <p>Same as Option 2, but additional scope included to transfer the 400 kV Warley circuits to existing Tilbury 400 kV substation. A 3rd interbus SGT would also need to be installed to support the 275 kV substation.</p>	<p>Layout: See Figure 6</p>	<p>No consenting requirements or environmental impacts as all works can be delivered within the existing boundary of the lease area.</p> <p>However, up to 3 additional GIS bays would need to be delivered within the existing footprint of 400 kV GIS hall – possible increase in SF6 volumes, if non-SF6 model interface is not possible.</p> <p>Additional civils associated with SGTs.</p>	<p>Engineering: Enables opportunity to meet the needs for TWNC requirements at Tilbury using space created from removal of the unutilised empty GIS hall for long term replacement of 400 kV GIS substation. Opportunity to address existing 275 kV fault level issues or the OHL tee'd connections for interbus SGTs.</p> <p>Consumer Value/Economic Performance: Contract customer connections accommodated but limited futureproofing capacity.</p> <p>Consenting and Stakeholder: Limited impact to existing users (no voltage change).</p>

Option	Technical Description	Relevant Diagrams or Layout References	Consenting Risks & Environmental Constraints	Rationale for rejecting or taking forward the option
<p>Option D4: Refurbishment of the existing 275 kV substation and installation of interbus SGTs on the Warley circuits.</p> <p>Not progressed</p>	<p>PASE Variant Same as Option 2, however the 400 kV Warley circuits are supported through the 275 kV substation via interbus SGTs sited at Tilbury.</p>	<p>Available on request</p>	<p>Likely to cause environmental impact and consenting/planning implications as the operational boundary would be crossed outside of the existing leased area into shrub land to enable the interbus SGTs.</p> <p>Interaction with generator HV cable easement.</p>	<p>Engineering: Higher impedance introduced into the network from additional interbus connections directly on incoming feeder circuits, compounding the constraints of 275 kV fault level issues and the OHL tee'd connections for the existing interbus SGT.</p> <p>Consenting and Stakeholder: additional land would be required to install interbus SGTs on Warley feeder circuits; triggers full planning application and land negotiations with PoT and connected generator.</p> <p>Deliverability: constrained access to north side where the Warley circuits approach site and longer duration than Option D2 to factor in site boundary extension.</p> <p>Consumer Value/Economic Performance: Contract customer connections accommodated but limited futureproofing capacity</p>
<p>Option D5: Full rebuild and rationalisation of the Tilbury 275 kV substation as a 400 kV substation, within existing site boundary.</p> <p>Progressed to shortlist</p>	<p>PASE Variant (AIS / GIS) Full rationalisation and uprating of the 275 kV substation to 400 kV, interconnecting it with the existing 400 kV substation, within existing site boundary – both (a) AIS and (b) GIS variations have been considered at this stage.</p>	<p>Layout: See Figure 8</p>	<p>Environmental impact and consenting implications would be limited if the rebuild is maintained within the existing boundaries.</p>	<p>Engineering: meets requirement of TWNC and addresses asset health drivers, achieves a single transmission voltage level at Tilbury, provides future proofing through addressing fault level issues and providing additional connection capacity, for DNO and generation growth in area.</p> <p>Deliverability: for GIS option, opportunity to utilise space within existing site boundary from an offline construction outside.</p> <p>Consenting and Stakeholder: Existing generator would be impacted with the change of voltage, however through moving the commercial boundary from the HV busbar to the LV side of the interbus SGT, majority of cost impact would be borne by NGET.</p>
<p>Option D6: Staging rationalisation of the 275 kV substation to an upgraded 400 kV substation in line with assets reaching their End of Life.</p> <p>Not progressed</p>	<p>PASE Variant (AIS / GIS) Same as Option 5, however works are staged works over several years to align with existing asset end of life, rather than all delivered upfront.</p>	<p>Available on request</p>	<p>Environmental impact and consenting implications would be limited if the rebuild is maintained within the existing site boundaries.</p>	<p>Engineering: Complex staged rebuild that would have interim stages present for a long time, making operation of the site and network convoluted.</p> <p>Deliverability: extends build period beyond 10 years and does not meet TWNC delivery and customer connections dates – major commitment on commissioning resources, and costly stop/start of</p>

Option	Technical Description	Relevant Diagrams or Layout References	Consenting Risks & Environmental Constraints	Rationale for rejecting or taking forward the option
				construction work when the various stages are triggered.
<p>Option E7: Full off-site rebuild of the 275 kV and 400 kV Tilbury substations.</p> <p>Progressed to shortlist</p>	<p>PASE (AIS) / PASE Variant (GIS)</p> <p>Full rationalisation of 400 kV and 275 kV substations into one 400 kV DBB substation located at a new site near to existing Tilbury – (a) AIS and (b) GIS variations to be considered against TIL2 and TIL3 sites as defined in siting study.</p>	<p>Layout:</p> <p>See Figure 10 and Figure 12</p>	<p>Full Development Consent Order (DCO) application would be required for the modification of the OHL routes.</p> <p>Major consenting impact: projects in the area such as Lower Thames Crossing will influence available sites.</p> <p>Impact on existing connected users, who would need to re-route their circuits to the new location.</p> <p>Greatest environmental impact of all options – building new would incur loss of habitat and utilise more materials compared to rebuilding on existing land.</p>	<p>Engineering: achieves a single transmission voltage level at Tilbury; futureproofing the network in the region and removing interbus SGTs (apart from for existing generator) and addressing legacy SHES and maintenance issues, including ground subsidence impact.</p> <p>Consumer Value/Economic Performance: new substation built the latest technical standards with increased customer connection capacity as land may be available to extend the substation.</p> <p>Deliverability: Offline build would have minimal system outage and commissioning resource requirement</p>

4.4 Influence of Stakeholder on shortlisting

Customer and stakeholder engagement to support the Tilbury development plans has been limited to date. The proposed plan is for this to occur, against the short-listed options, during the next phase of development and the feedback to be reported within the Needs Case.

The development of a customer and stakeholder engagement strategy will ensure that all relevant parties who will be impacted by the rebuild plans will be consulted. Following an initial review of interacting projects, key stakeholders identified are:

- Port of Tilbury
- Lower Thames Crossing

4.5 Shortlisted options

We have proposed to take forward three options, which we will proceed to investigate and develop a Needs Case Assessment before indicating a preferred option for the site. The shortlisted options for this investment are:

- Option D3 – refurbishment of the existing 275 kV substation and moving the Warley circuits to the existing 400 kV substation
- Option D5 – full in-situ rebuild and rationalisation of Tilbury 275 kV substation to 400 kV substation; AIS/GIS configurations
- Option E7 – full off-site rebuild of Tilbury 275 kV and Tilbury 400 kV substations; AIS/GIS configurations.

These options were selected for further review as they were established to be the most feasible of the long list options, that addressed the drivers identified at the site. Through detailed short-list optioneering, it is intended to compare the benefits in areas such as consenting and third-party impact against network operability and deliverability to establish the right solution for Tilbury 275 kV substation. Although both AIS and GIS variations were considered for options D5 and E7, the AIS variant for D5 was deemed not feasible as detailed below.

PASE Compliance

Both the potential new sites (and the existing site) for Tilbury are designated as coastal location given their proximity to the Thames estuary (i.e within 5km of the coast or a saline estuary, where there is no protection from onshore winds from hills or structures).

Our assessment of the PASE compliance for each shortlisted option is noted below:

- Option D3 (AIS) – Variant PASE option (substation extension / atypical extension)
- Option D5 (GIS) – Variant PASE option (rebuild of substation / Indoor double Bus at 400kV) at a coastal location
- Option E7 (AIS) – PASE primary option (new site / Outdoor double Bus AIS 400kV)
- Option E7 (GIS) – Variant PASE option (Indoor double Bus at 400kV) at a coastal location

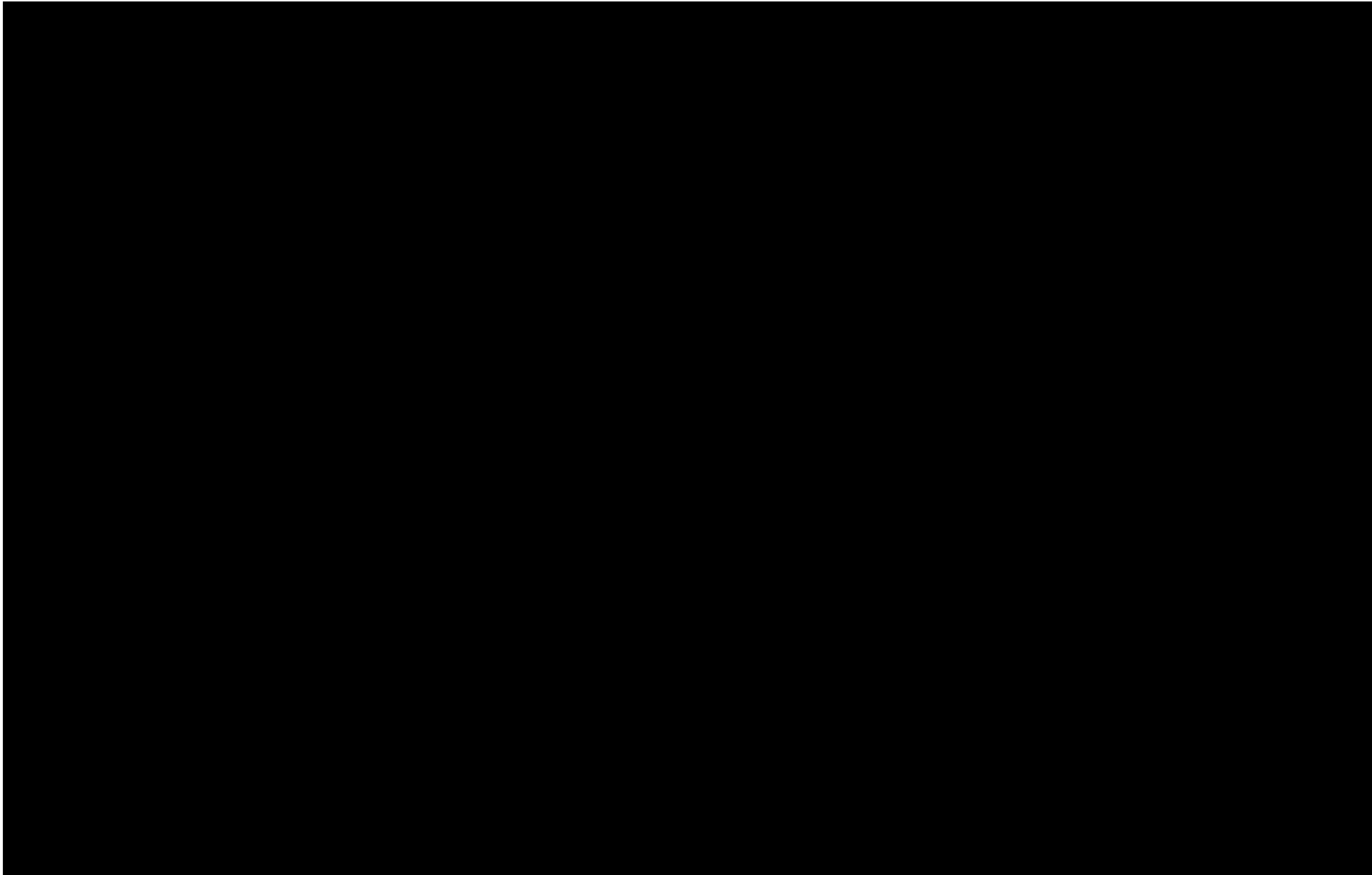
4.6 Description of shortlist options

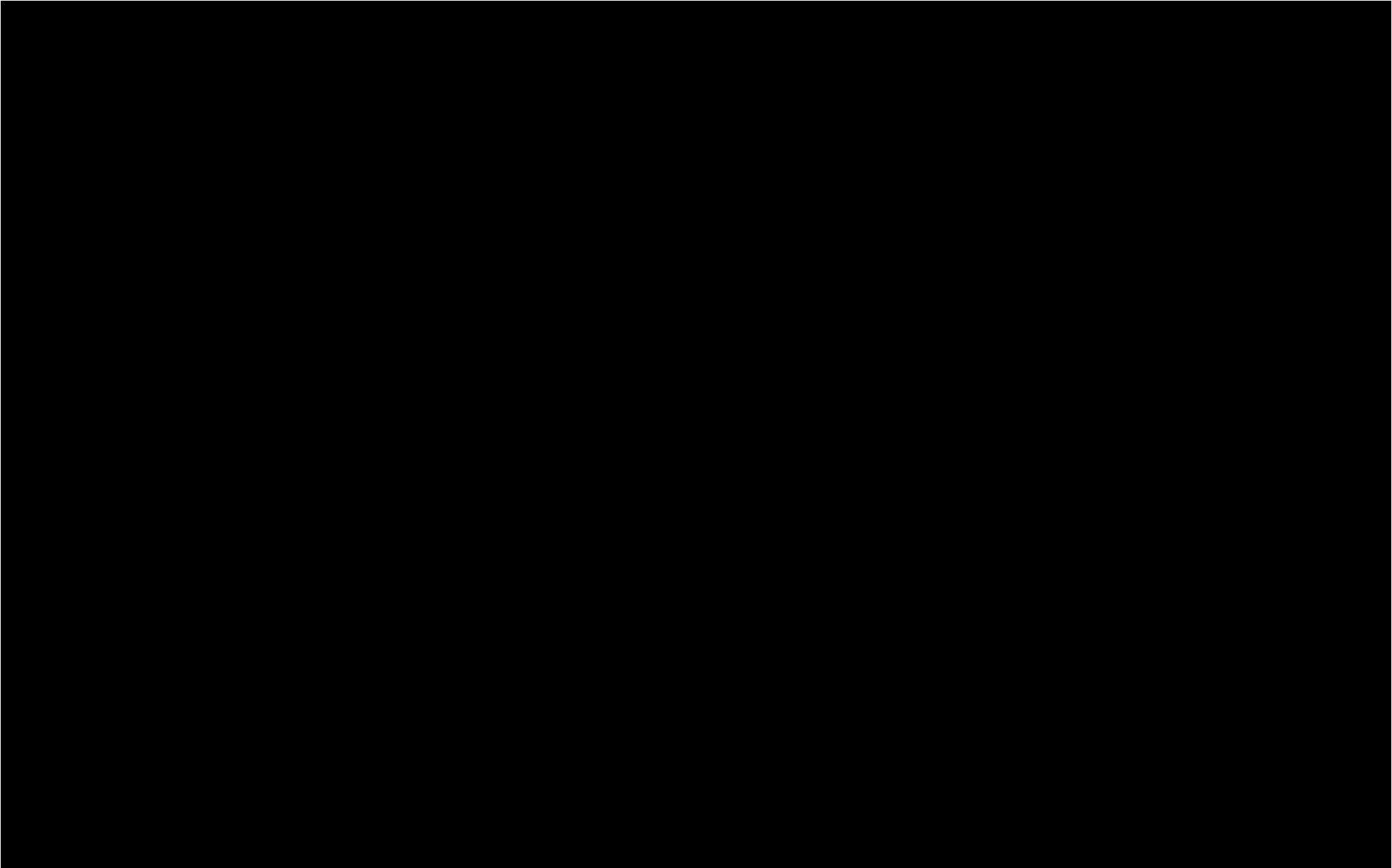
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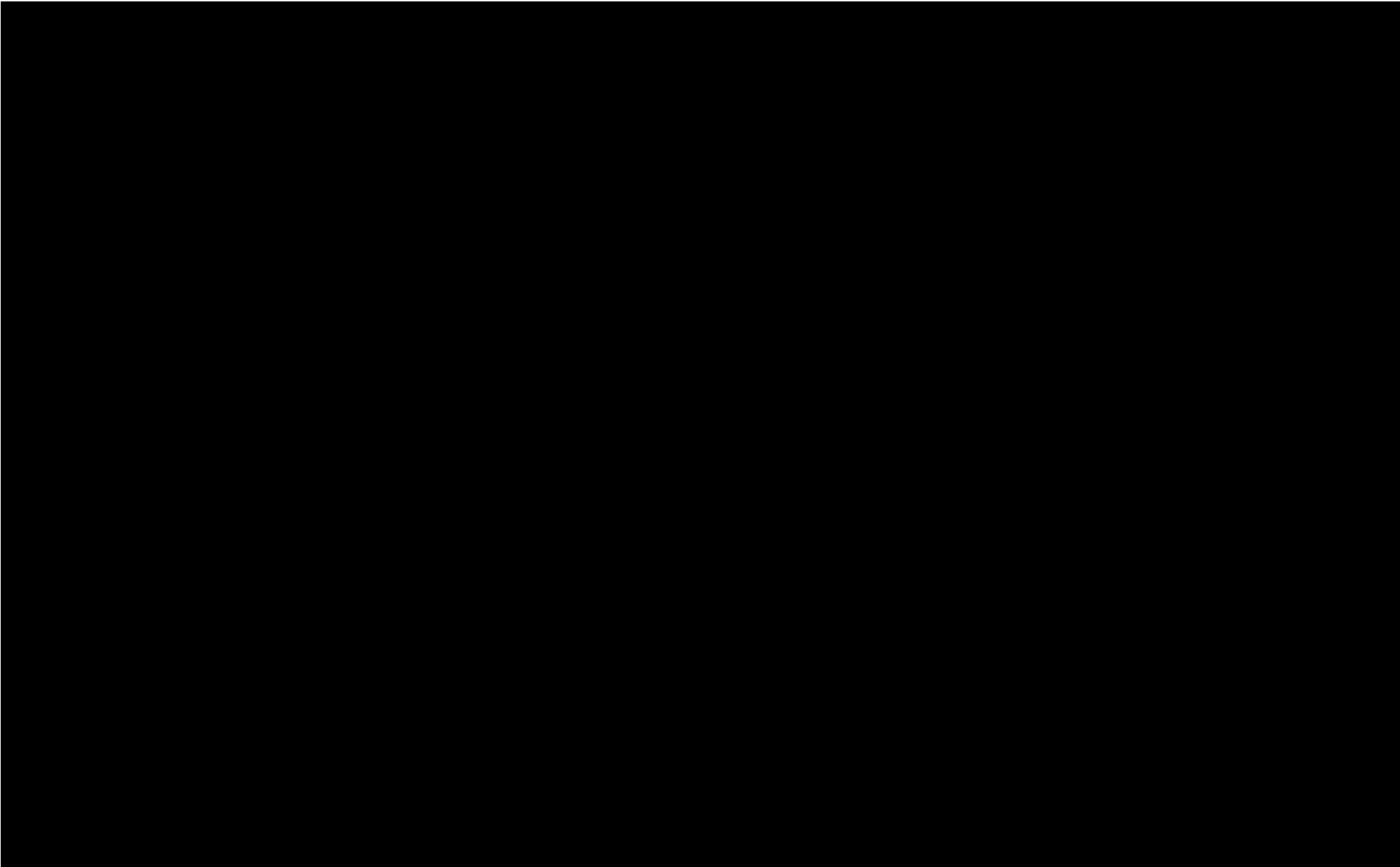




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4.6.2 Option D5 – Preliminary design

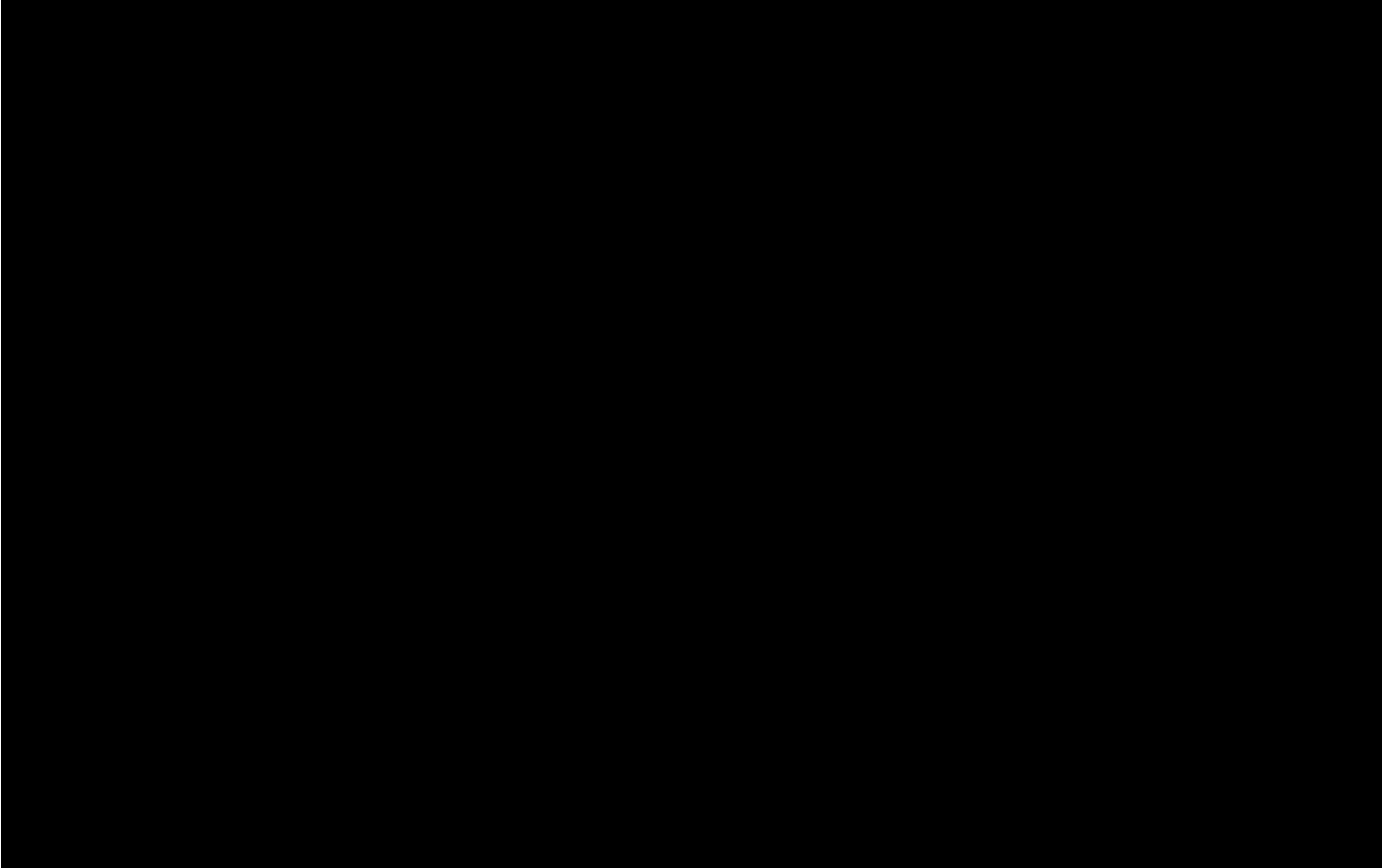
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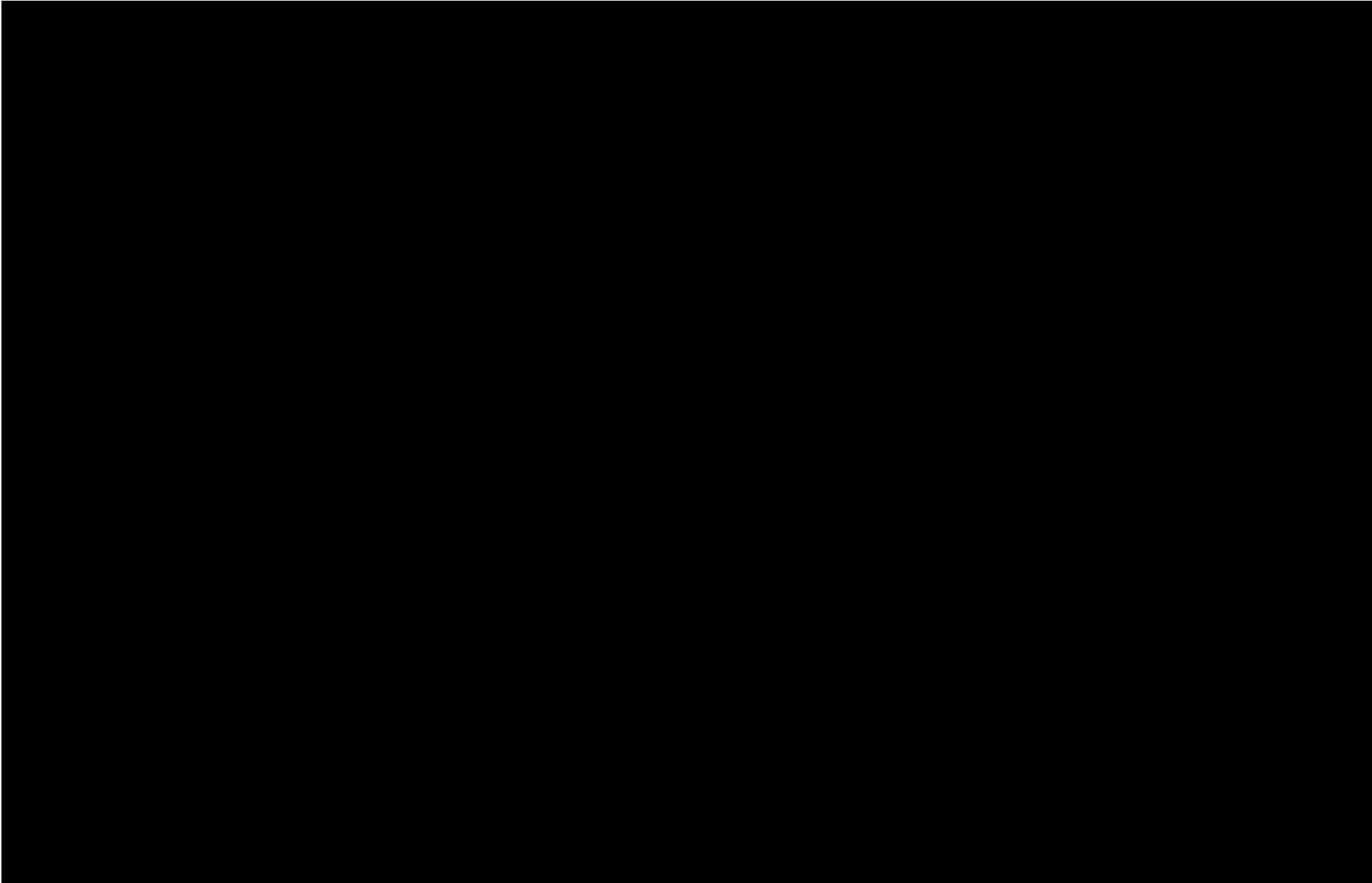
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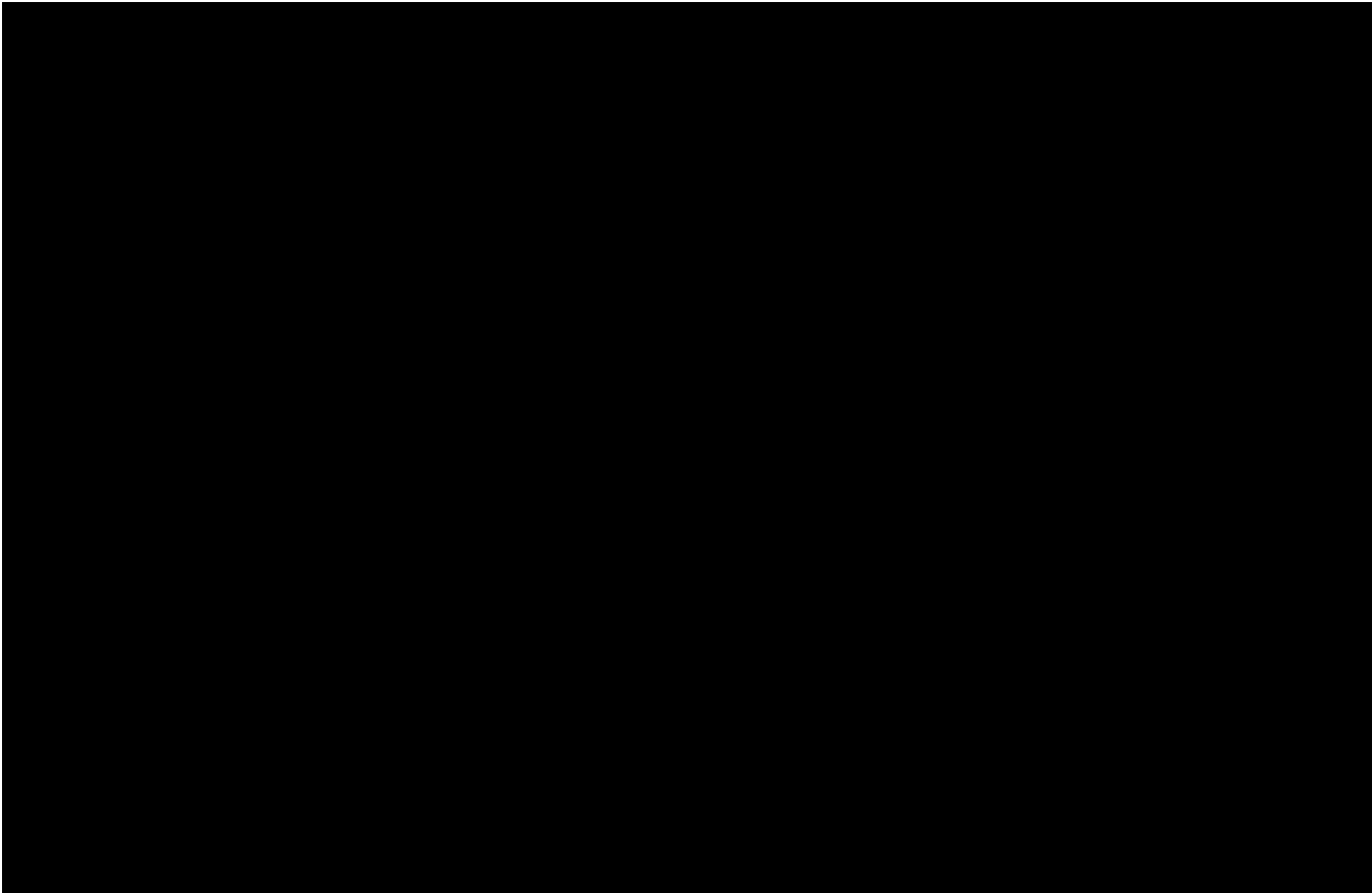
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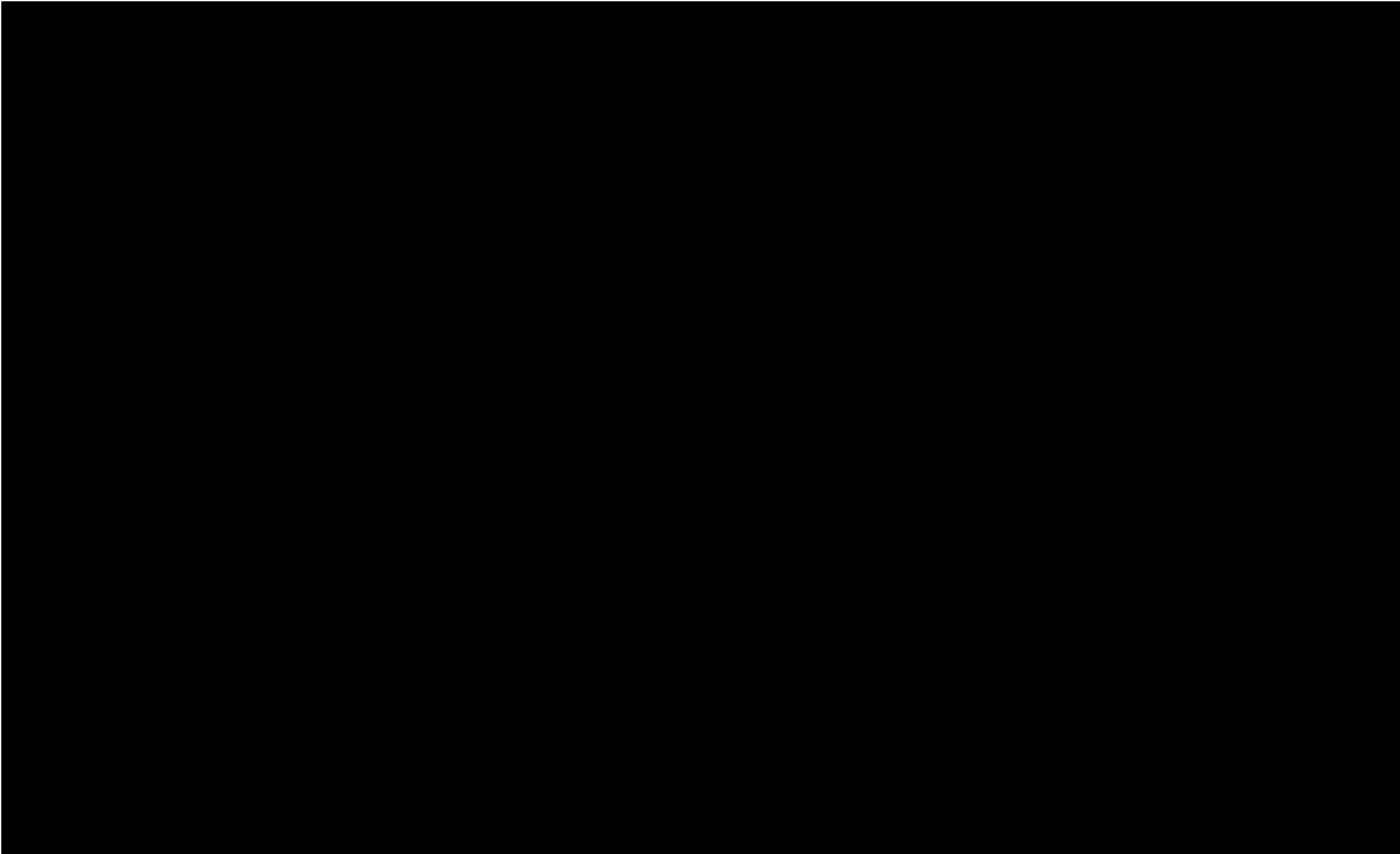
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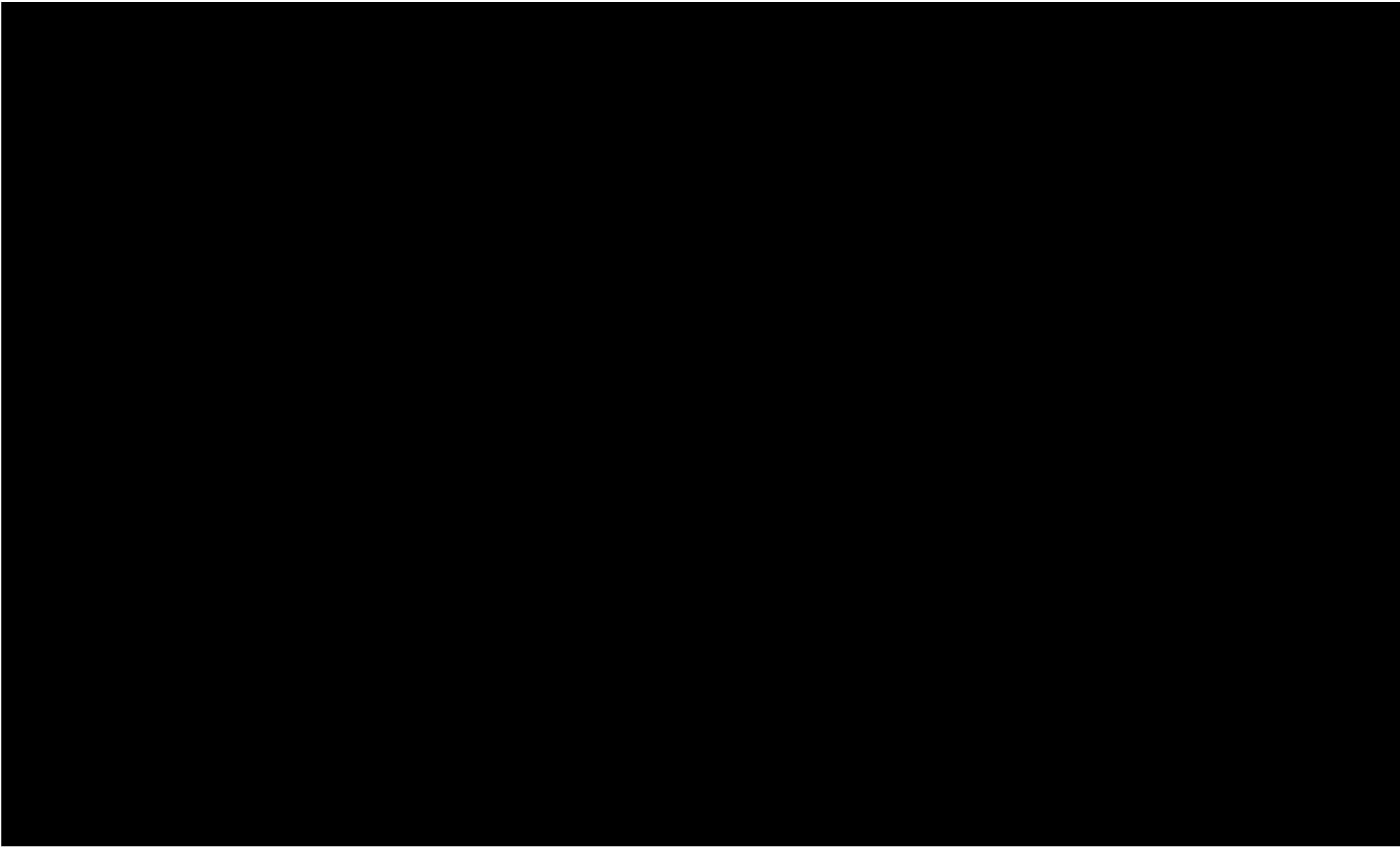


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4.7 Quantitate analysis

4.7.1 Detailed quantitative analysis of shortlisted options

Given this project is on Track 3 EL, we will provide a full quantitative assessment in our Needs Case Assessment submission across the agreed short-listed.

4.7.2 Cost estimates of shortlisted options

When assessing the emerging options for delivering the Tilbury 275 kV rebuild, indicative capex cost estimates have been determined using a parametric cost estimating methodology suitable for the outline stage of development and option comparison and selection.

This parametric method uses estimating units that compromise typical assets and services as determined by the outline scope. These units are based on typical historic costs experienced in other projects, combined with external commercial insight and current market data. They do not take into account project specific cost drivers such as the specific site, project, consenting and ground condition considerations.

All options have had an uplift of [redacted] applied to reflect both project risk and unforeseen circumstances through contingency. This uplift is evidence-based using a historic project analysis across a range of completed projects of a similar nature and content.

Table 12 and Table 13 provide a breakdown of the costs estimates for each short-listed option under consideration.

Table 12 - Shortlist Options Cost

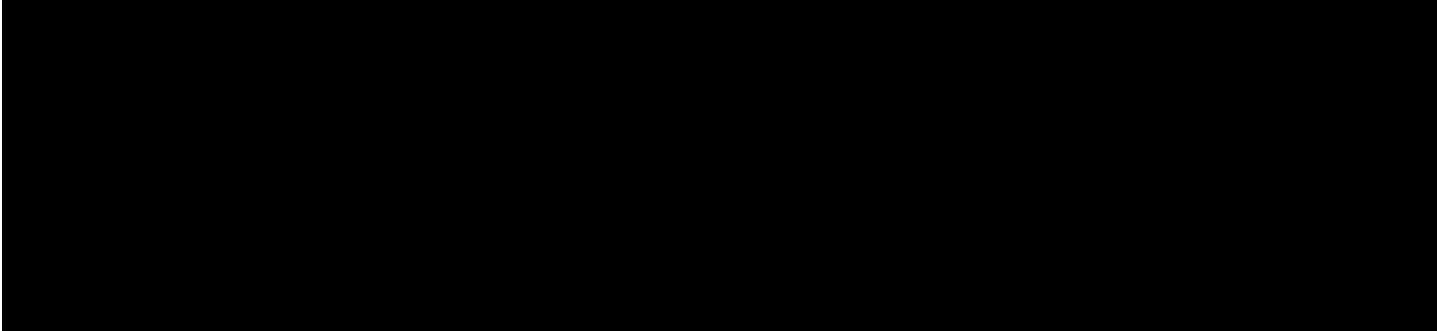
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Table 13 - Detailed Cost Breakdown for Shortlisted Options

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4.8 Cost Drivers

Within the cost breakdowns detailed above, there are number of items that are influencing the cost variations between each option. Typically, this related the scope and physical arrangement variations between the options. Below are high-level details of the items that make up most of the relevant option.

- Enabling works that consist of:
 - Ground remediation works to address the subsidence, site releveling and chippings
 - Cable installation works, including troughs, ducting and direct buried.
 - Pilling to support structure foundations, new replacement structures, drainage replacement and SGT foundation works.
 - Variation driven by large land footprint and OHL works associated with option E7 when compared to either options D3-AIS or D5b-GIS.
- 'Other' items consist of:
 - Contractor site establishment, security and detailed design activities.
 - Variations driven by the extensive OHL design scope that is associated with option E7a/E7b when compared to either options D3 or D5b
- Wound Plant that consists of:
 - New super grid transformer units – various voltage ratios
 - SGT miscellaneous installation and auxiliary systems such as dump tanks etc.

- Number of wound units proposed under each option:

Table 14: Number of wound units for each shortlisted option



Within the cost estimates defined for each option, the following items/activities, listed below, have not been considered, as further development work and stakeholder engagement is required to support their definition and understand their financial impact. We know that these items will influence the overall cost benefit analysis and we will provide further details as part of our Needs Case submission.

- Existing User Asset Impacts – depending on the preferred option selected could include wound equipment and bay switchgear.
- Temporary laydown areas – space is constrained within the areas that is being considered with the short list options, and it certain that some form of negotiated short term lease will be required to secure any temporary laydown areas to support construction of the site.

4.8.1 Cost-Benefit Analysis

Given this project is on Track 3 EL, we will provide a full cost assessment in our Needs Case Assessment submission across the agreed short-listed options, which will include a full assessment of any benefits from carbon and SF₆ abatements.

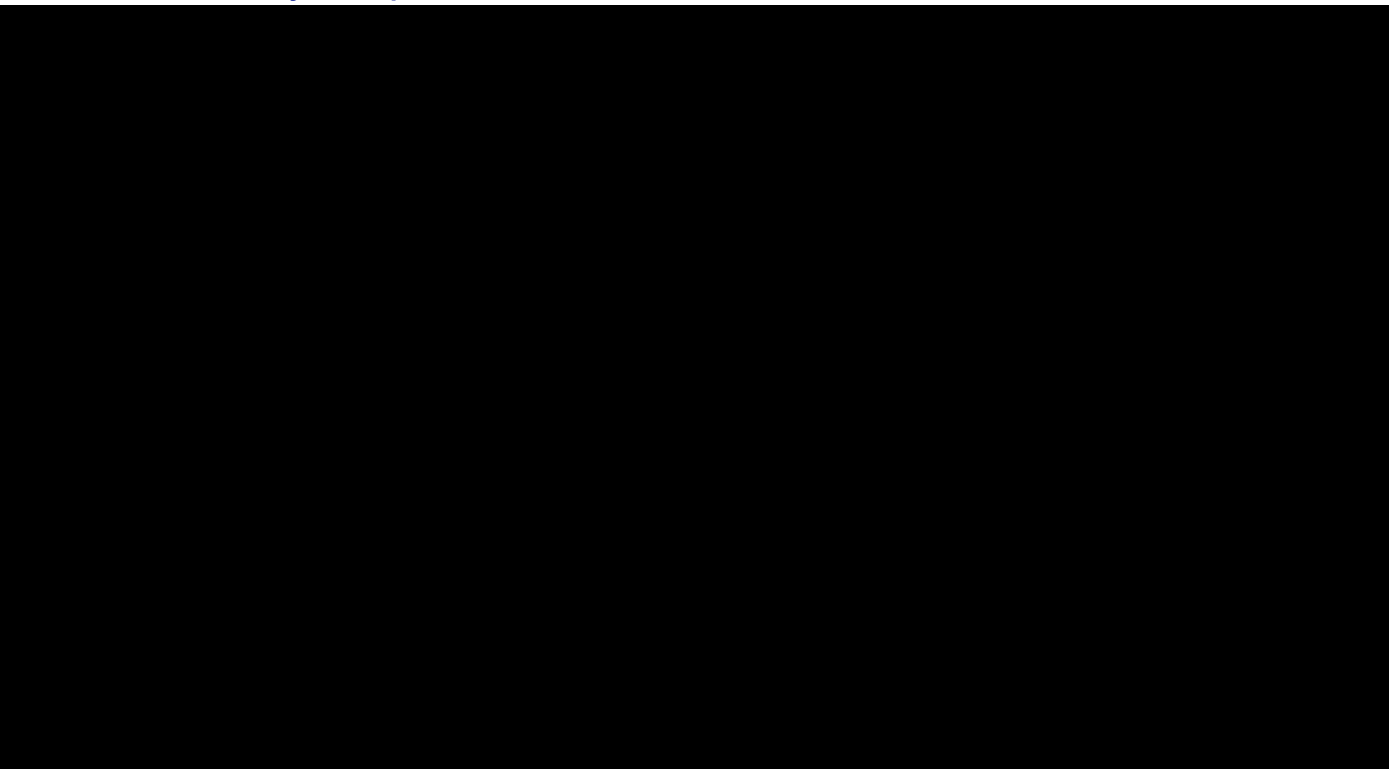
4.8.2 Preferred solution

We do not have a preferred solution at this stage. There are also trade-offs between our short-listed options, which given we are on Track 3 EL, will be provided in our Needs Case Assessment.

4.8.3 Project Benefits, Outputs & Deliverables

The proposed investment at Tilbury will deliver several benefits to the network, stakeholders and consumers. A summary of the indicative output for the developing investment and foreseen benefits is summarised in Table 15 below.

Table 15 - Summary of Outputs and Benefits



5. Project Delivery

5.1 Delivery year and indicative timeline

Whilst the project is still in an early stage of development, emerging optioneering solutions and the development programme support forecasted completion of the rebuild to occur by [REDACTED] in time to support the EISD connection for the uprating of the Warley circuits to 400 kV and the TWNC project in [REDACTED].

Whilst a more detailed programme and phasing of works is to be developed later in the project development process, a high-level indicative mapping of the project under each option is provided below¹⁰.

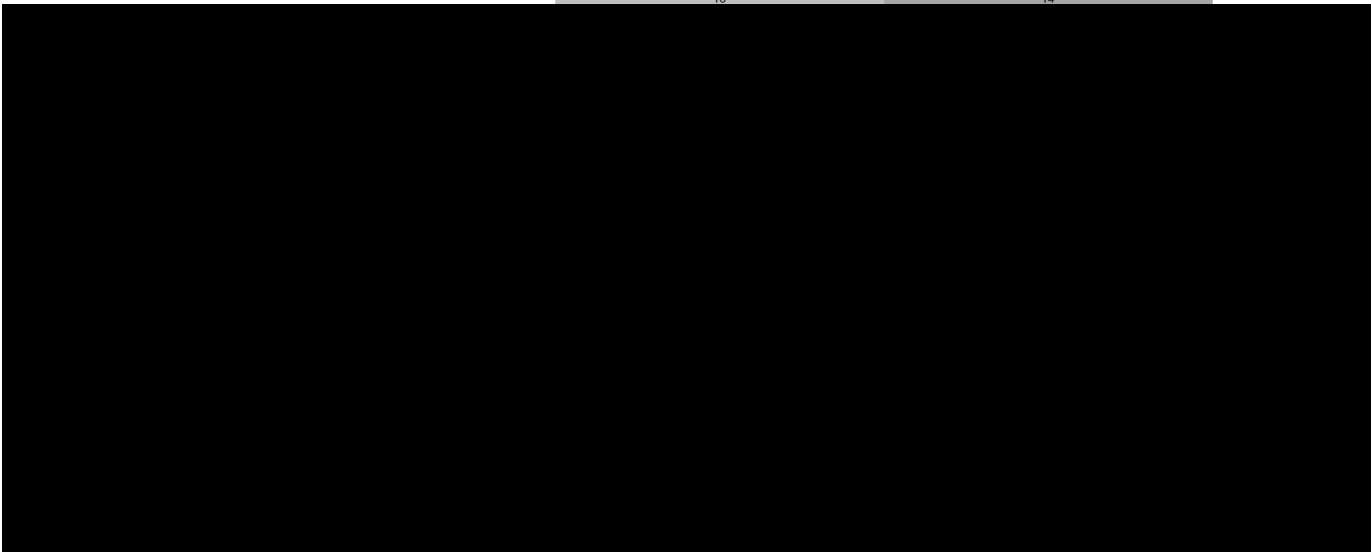


Figure 14 details the high-level program for option D3, the refurbishment of the 275 kV substation. The construction strategy for this option would be a rolling bay-by-bay rebuild/replacement of primary and civil assets. Key assumptions with this program are:

- That the works can be carried out under 'permitted development' rights that NGET hold over existing operational land.
- Current manufacturing and deliver times for lead plant items such as SGTs, primary switchgear is at a 24-month lead time and will be delivered to site in staggered steps, that will follow the construction stage by stage build within the confined space of the existing site. Currently no pre-sanction procurement of equipment is forecasted.
- System outages would be available for both the circuit bay that is being refurbished and any bay required for proximity/safety reasons – this is one of the biggest programme risks foreseen in this option and is the driving force for such a long construction period.
- Commissioning resources will be available to support the complex build and commissioning activities.

¹⁰ Note: All Charts are based on calendar years, with Q1 starting Jan 1st.

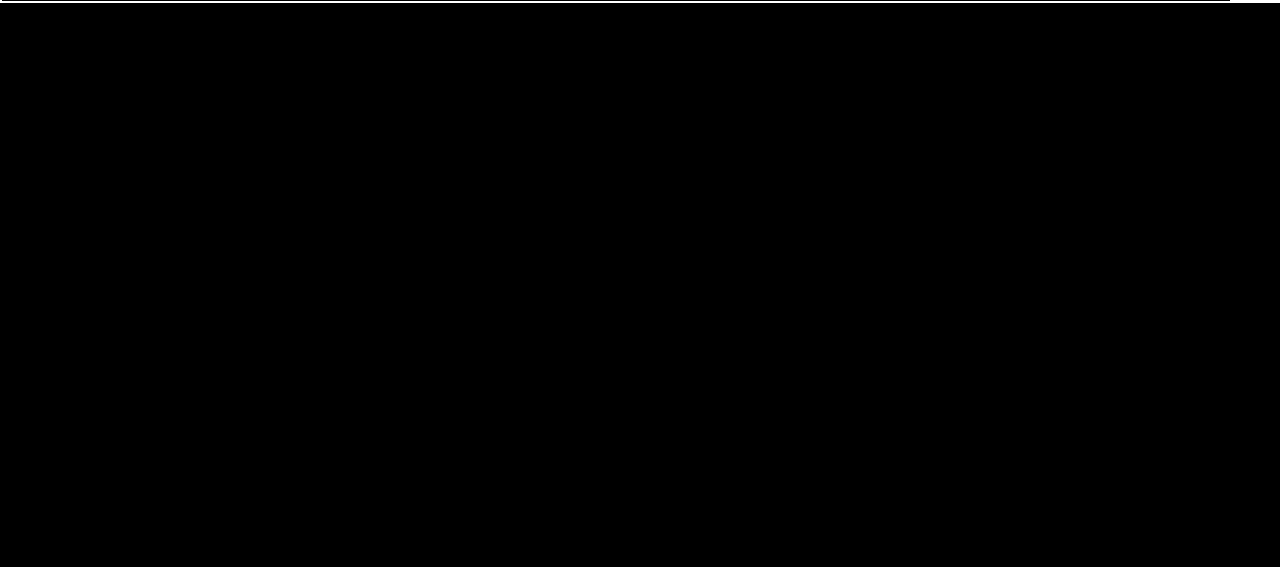
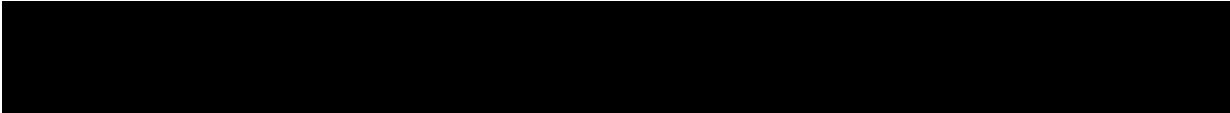


Figure 15 details the high-level program for option D5b, the uprating and rebuild of the 275 kV AIS substation to a 400 kV GIS substation. The initial construction strategy is for an offline build of the new 400 kV substation in the western end of the site and circuits within the 275 kV substation transferred over. The key assumptions are:

- That the works can be carried out under ‘permitted development’ rights that NGET hold over existing operational land.
- Current manufacturing and deliver times for lead plant items such as SGTs, primary switchgear is at a 24-month lead time and will be delivered to site in staggered steps, that will follow the construction stage by stage build within the confined space of the existing site. Currently no pre-sanction procurement of equipment is forecasted.
- A suitable laydown area to support construction will be found within the vicinity of the main site.
- System outages and commissioning resources will be available to support the project delivery.

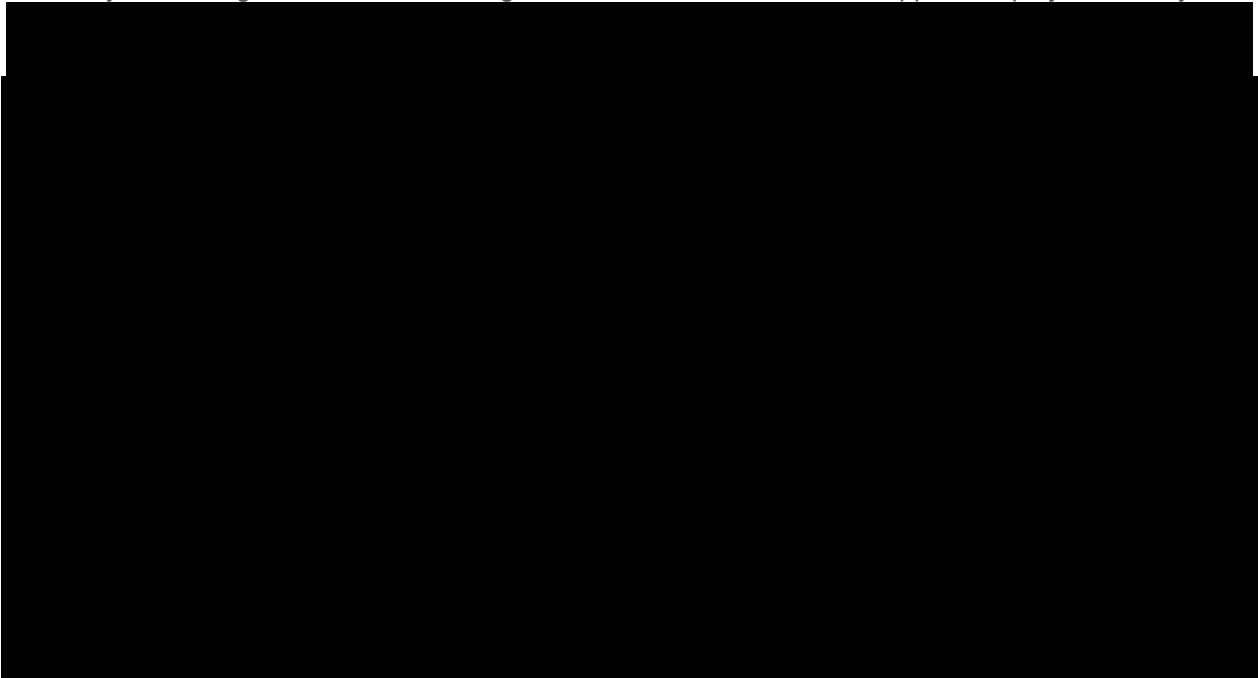


Figure 16 details the high-level program for option E7a/E7b, the offsite rebuild and rationalisation of both the 275 kV AIS substation and existing 400 kV GIS substation. The initial construction strategy

is for an offline build of the new 400 kV substation at either location TIL2 or TIL3, with OHL modifications occurring in parallel. The key assumptions are:

- Full DCO consenting application would be required to support the modification of the four OHL routes, which would be beyond the 2km rule of Section 34 that covers the permitted development rights of NGET’s OHL transmission assets. This is the primary influence of the overall duration of program, resulting in a completion date of [REDACTED].
- Current manufacturing and deliver times for lead plant items such as SGTs, primary switchgear is at a 24-month lead time and will be delivered to site in staggered steps, that will follow the construction stage by stage build within the confined space of the existing site. Currently no pre-sanction procurement of equipment is forecasted.
- A suitable laydown area to support construction will be found within the vicinity of the main site.
- System outages and commissioning resources will be available to support the project delivery – with this being an offline build, it is seen as being less onerous/contingent on system access and commissioning resources.

5.2 Procurement & Contracting Strategies

[REDACTED]

[REDACTED]

[REDACTED]

5.3 Risks & Risk Management

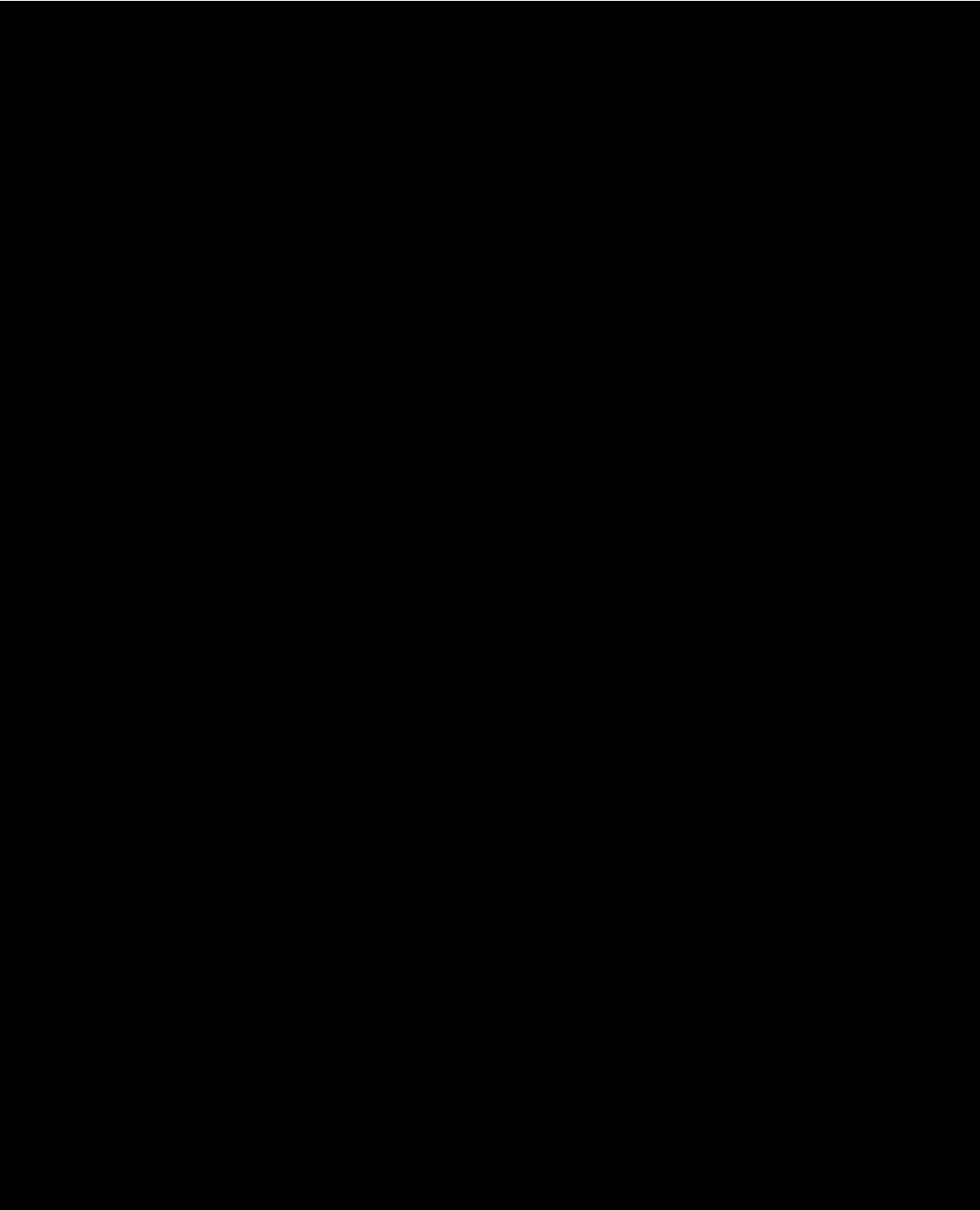
Table 16: Summary of risk and mitigations

Risk Type	Risk	Mitigation Measure
Design development & programme	Potential delays in completing detailed design work, which may impact procurement and construction sequencing.	Early design freeze, prioritisation of critical-path packages, and strong design coordination and change control.
Planning consents	Risk of the Local Authority refusing Permitted Development rights, potentially requiring a full planning process and extending timescales.	Early engagement with the Local Planning Authority, maximising use of permitted development within existing boundaries.
Procurement & supply chain	Long manufacturing lead times for switchgear and wound plant procurement. Average of 24 months between purchase order to delivery.	Advance procurement or slot reservation for long-lead items.
System access & outages	Limited access to required outages on the existing network may prevent works from being delivered to the planned schedule.	Early coordination with System Operations, maximising offline construction, and sequencing works to minimise outage dependency.
Third party dependency	LTC OHL diversion works, should complete before works start at TILB, but if late, likely to have impact on outages.	Maintaining close interface management.
Third party dependency	Further delays to HWUP & BTNO which delay ATNC.	Maintaining close interface management.
Third party dependency	Regional stage-by-staging for the delivery of ATNC, Warley Rebuild and Tilbury Rebuild.	Maintaining close interface management.
Logistics	[REDACTED]	[REDACTED]
Logistics	LTC is building in the same period; possible housing development to the North near East Tilbury/Linford.	Maintain discussions and interface meetings with LTC.
Construction laydown area	[REDACTED]	[REDACTED]

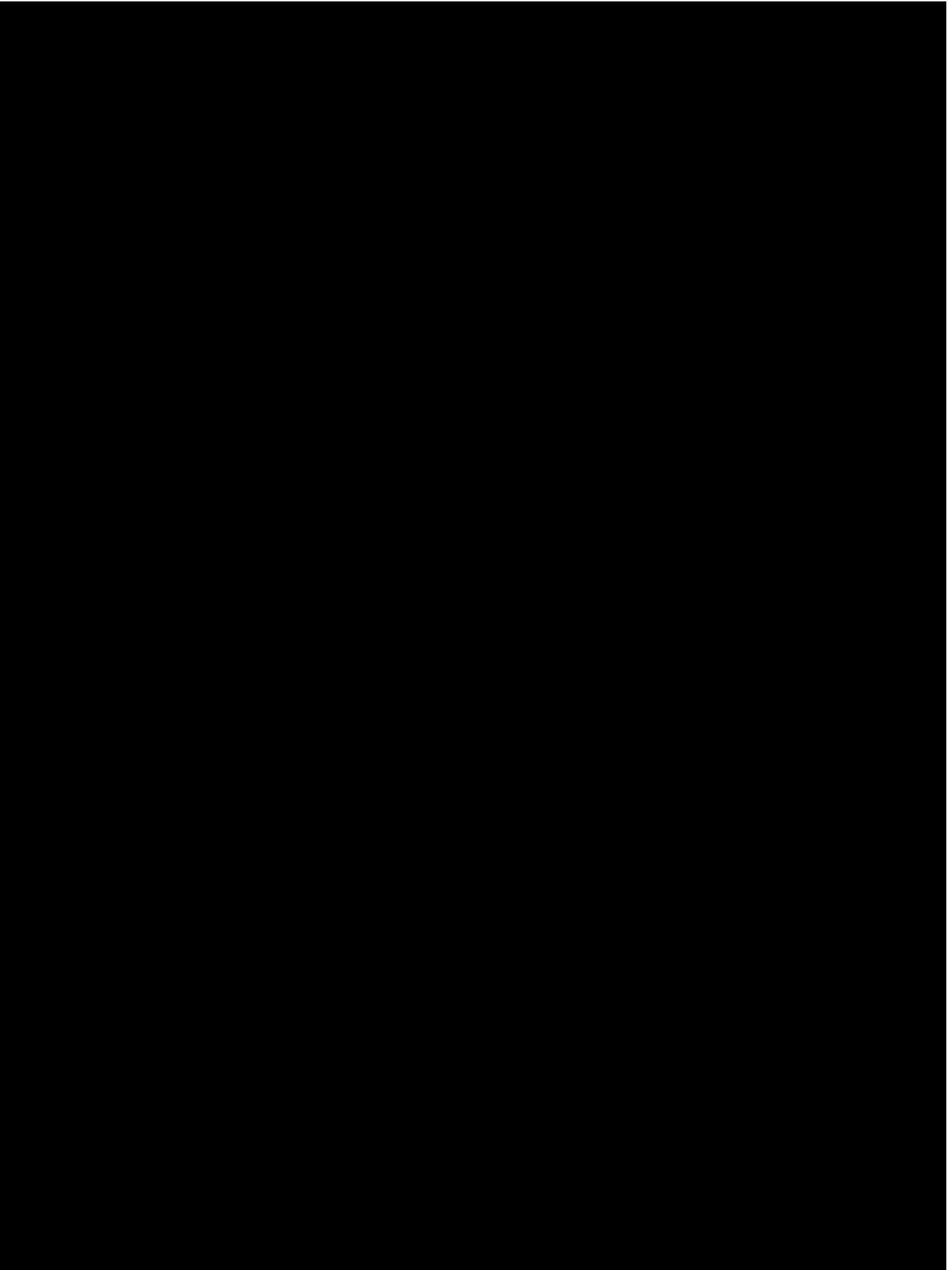
6. Conclusion

On approval by Ofgem of our shortlisted options for Tilbury 275 kV Rebuild. It seeks confirmation of eligibility under Special Condition 3.18, and confirmation of eligibility for PCF under Special Condition 3.15. A Needs Case Assessment will be prepared and submitted in April 2027, indicating our preferred option based on further development work.

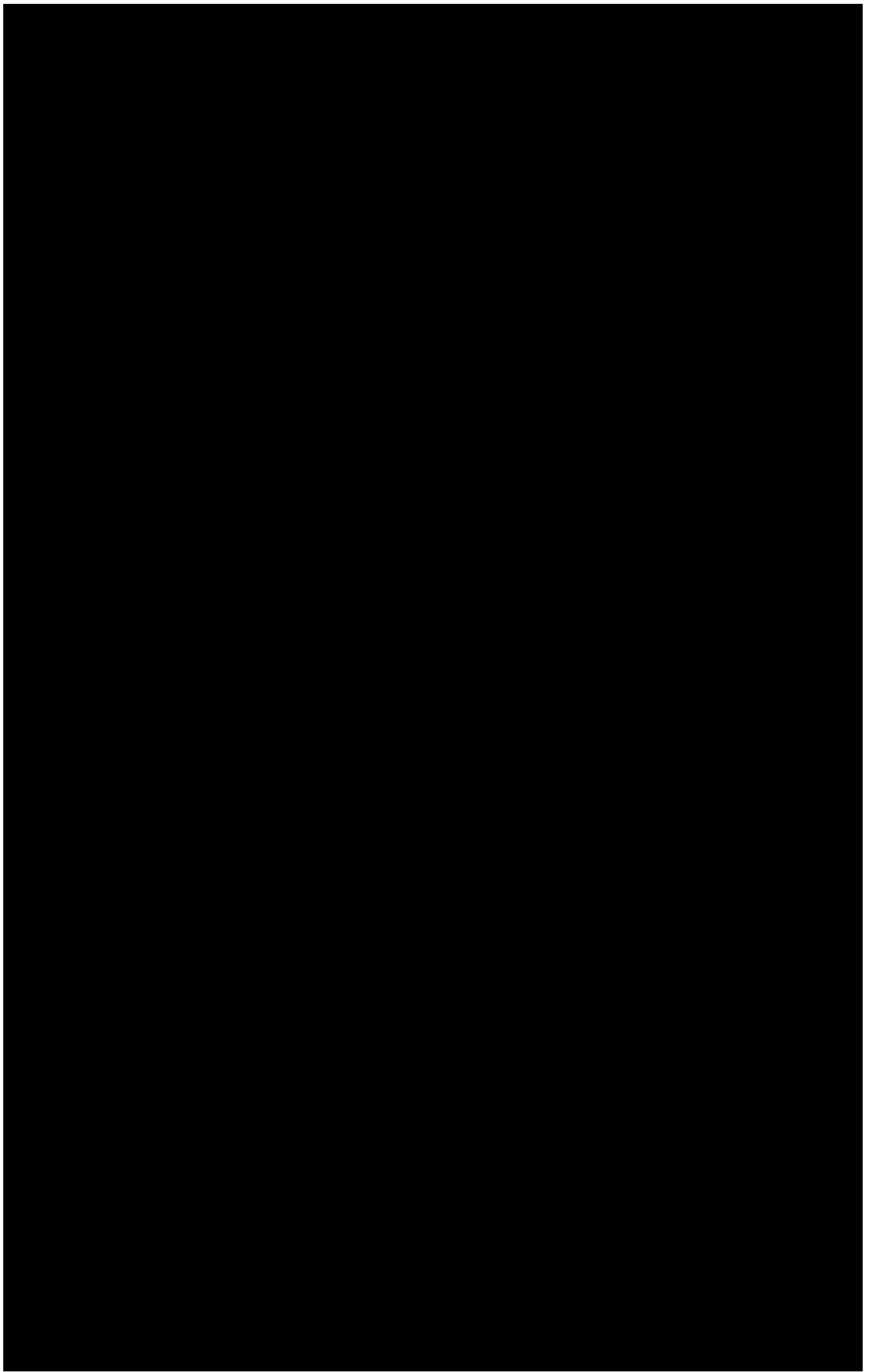
7. Appendices

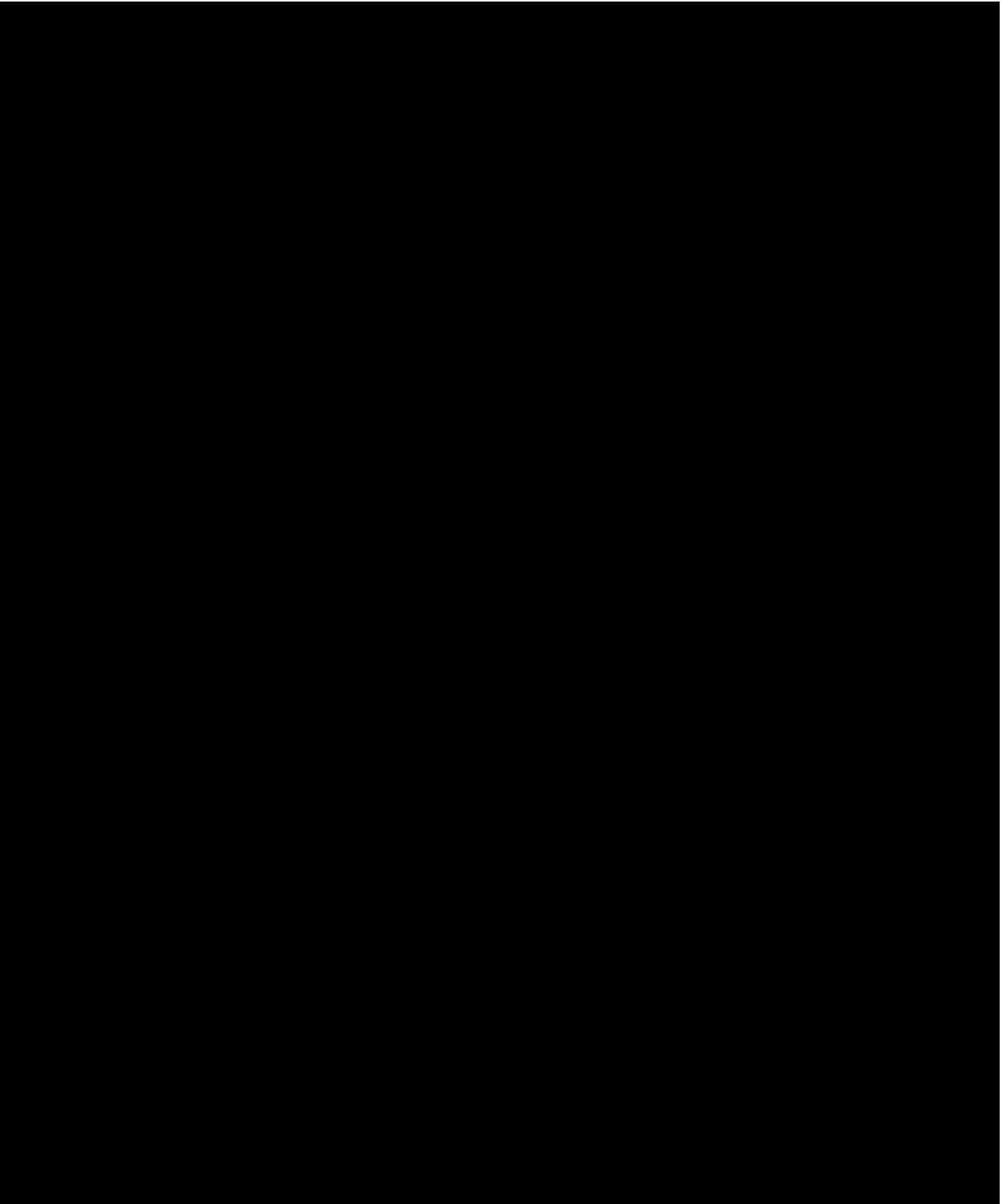


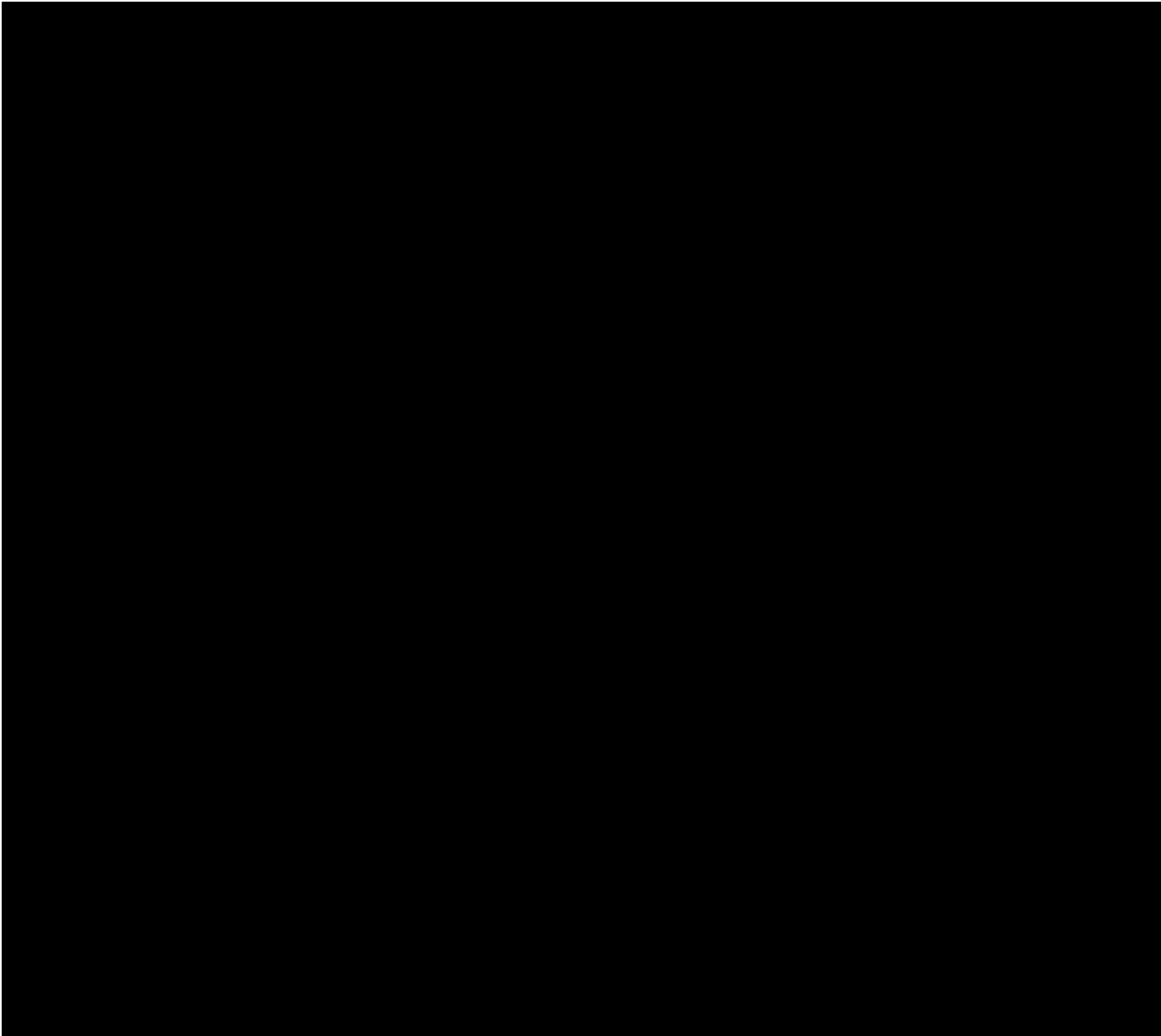
7.2 Appendix B: Historic Option Review



¹¹ Engagement on the challenge around the optioneering through this period was discussed with Ofgem during 2024

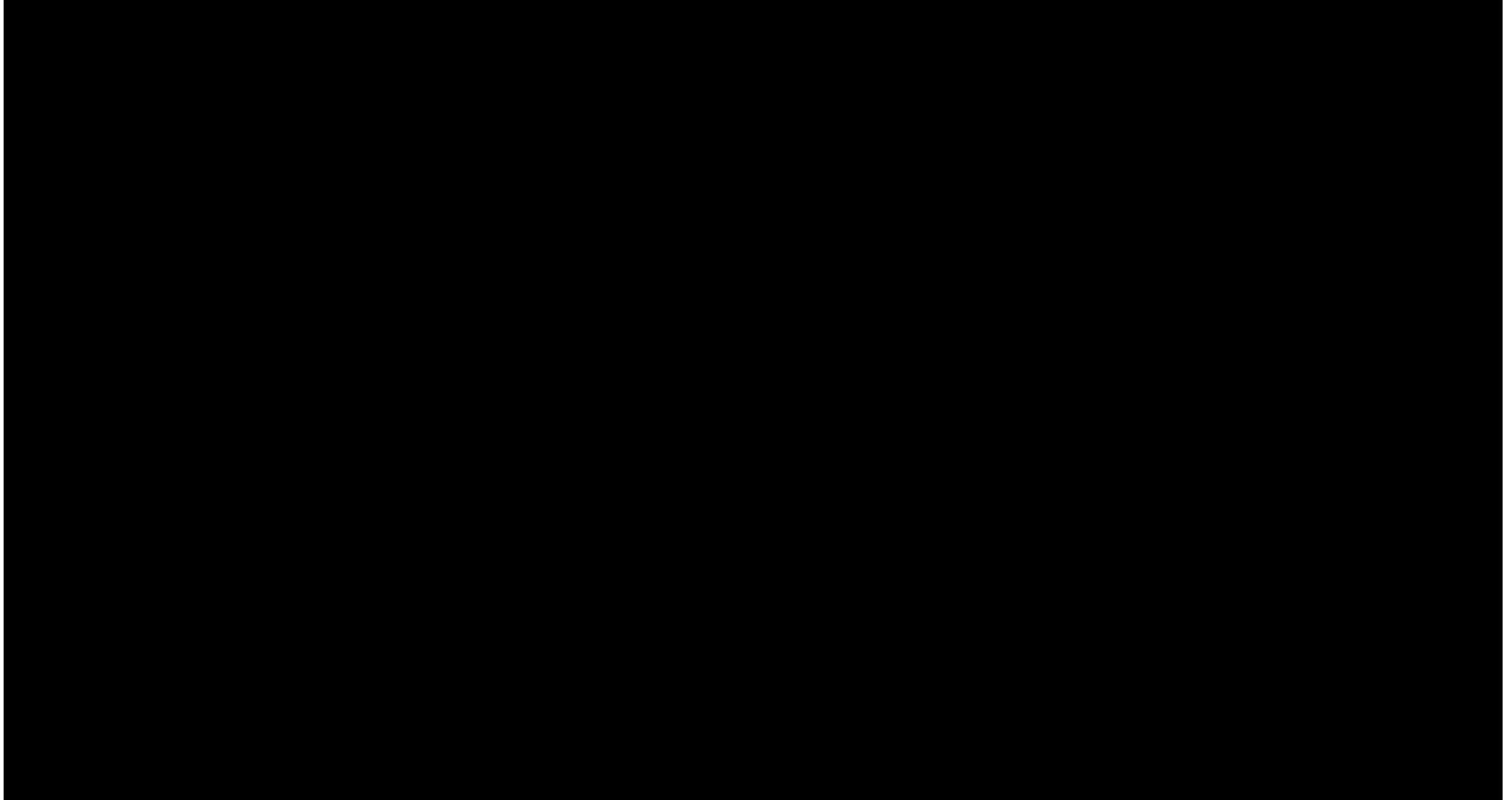


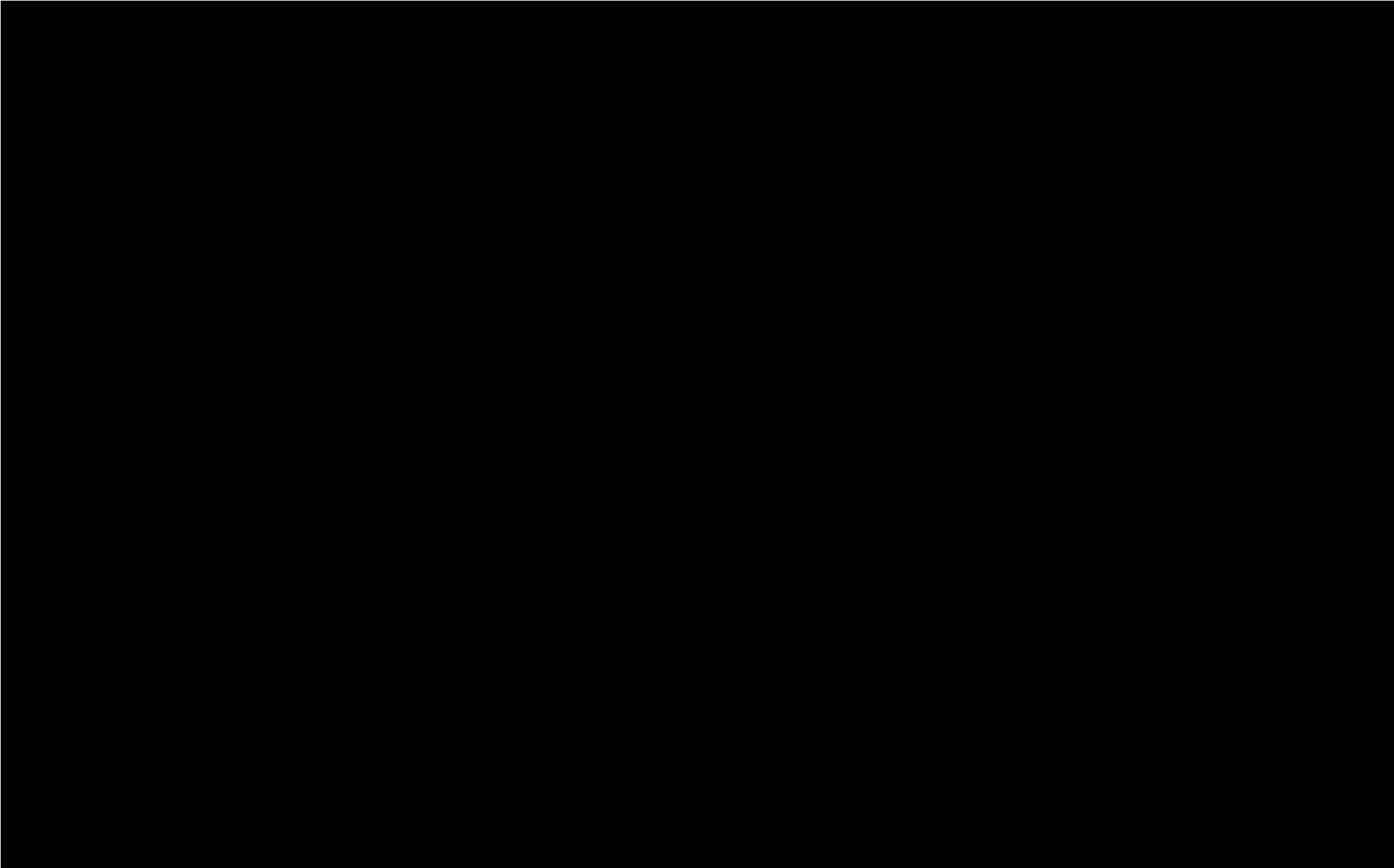


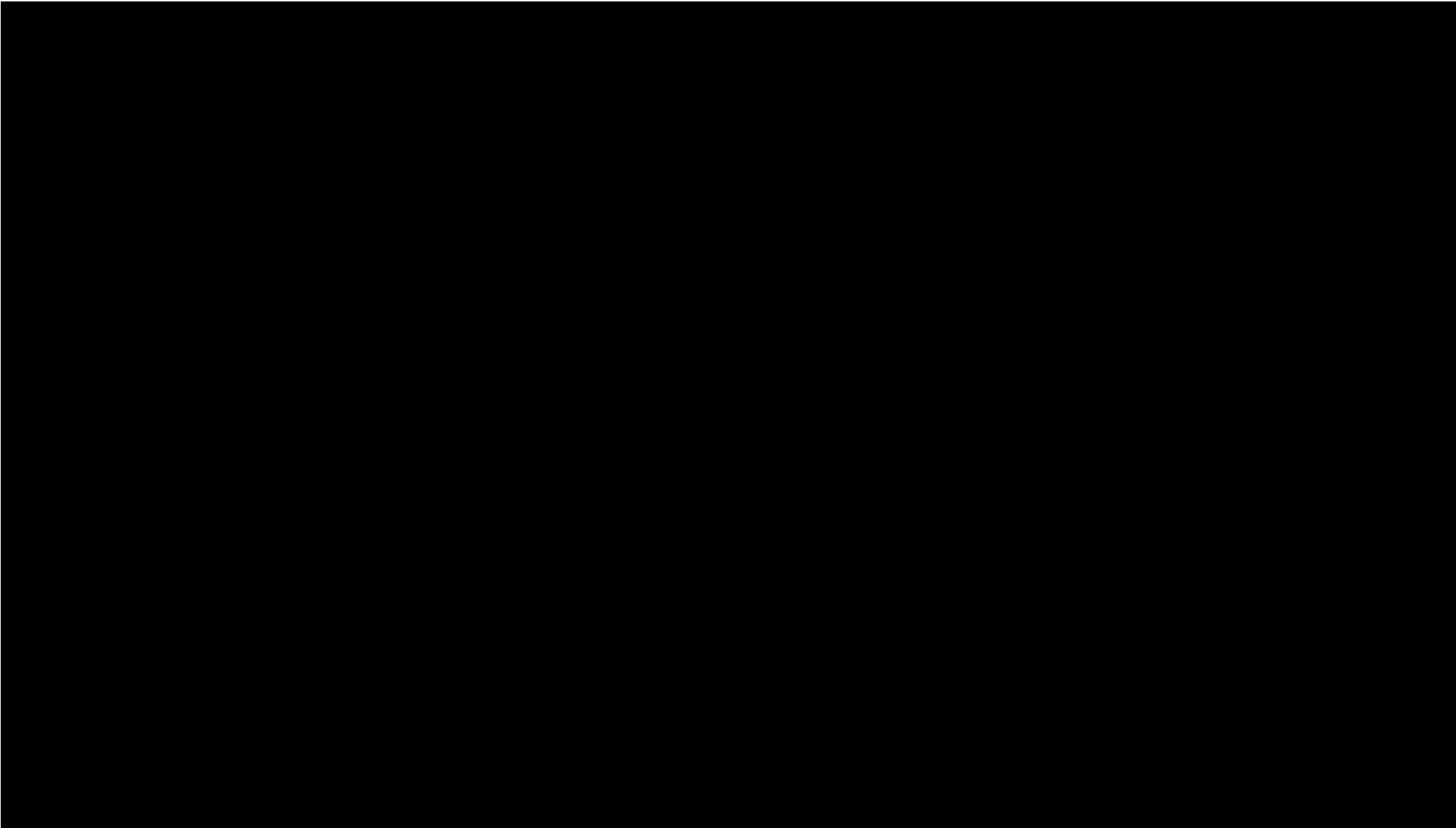


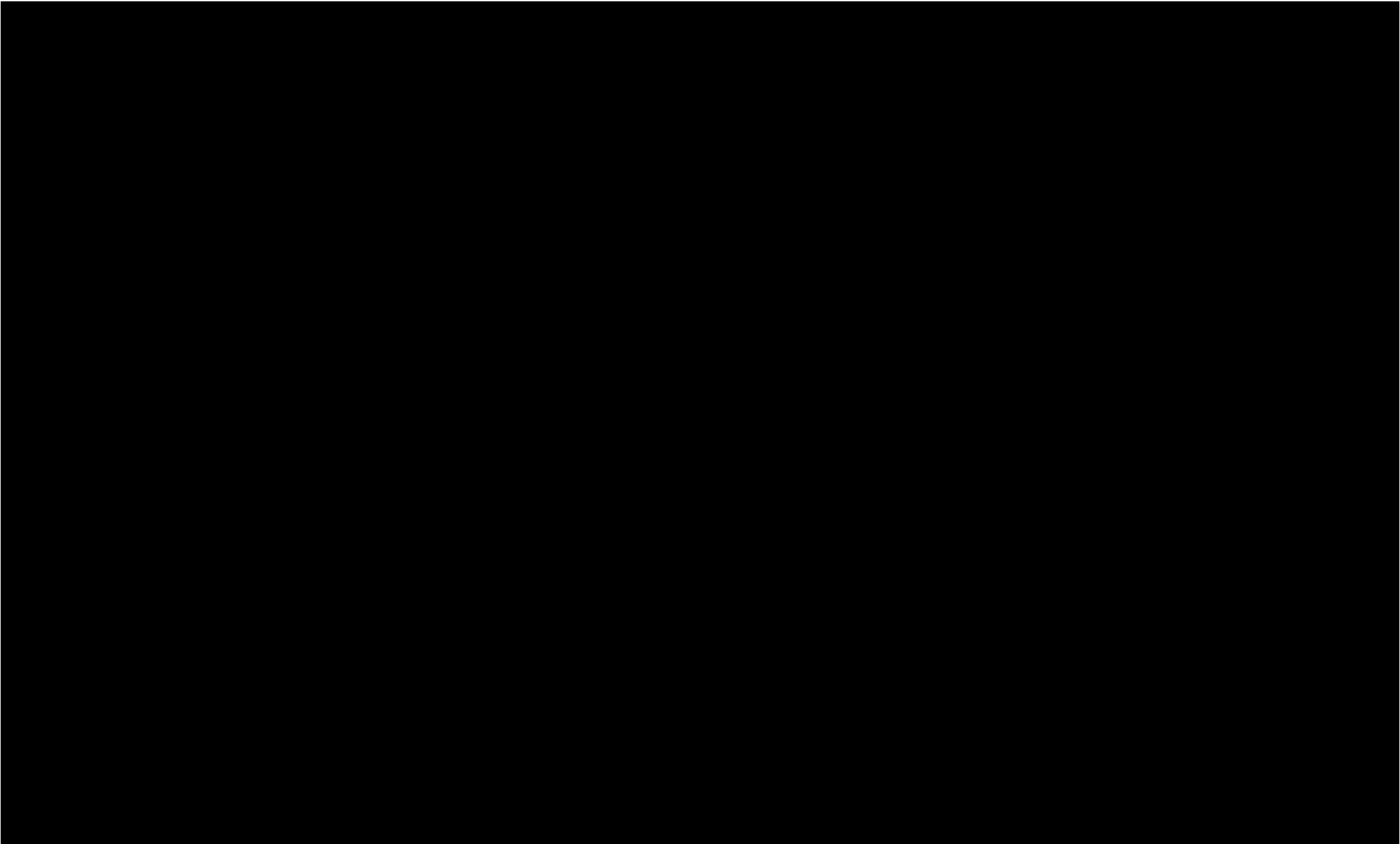
7.3 Appendix C: System Design Table

The System Design Table for each for short listed design options is presented below (note: information for Option D5 and E7 applies to both AIS and GIS variations).









National Grid plc
National Grid House,
Warwick Technology Park,
Gallows Hill, Warwick.
CV34 6DA United Kingdom

Registered in England and Wales
No. 4031152
nationalgrid.com