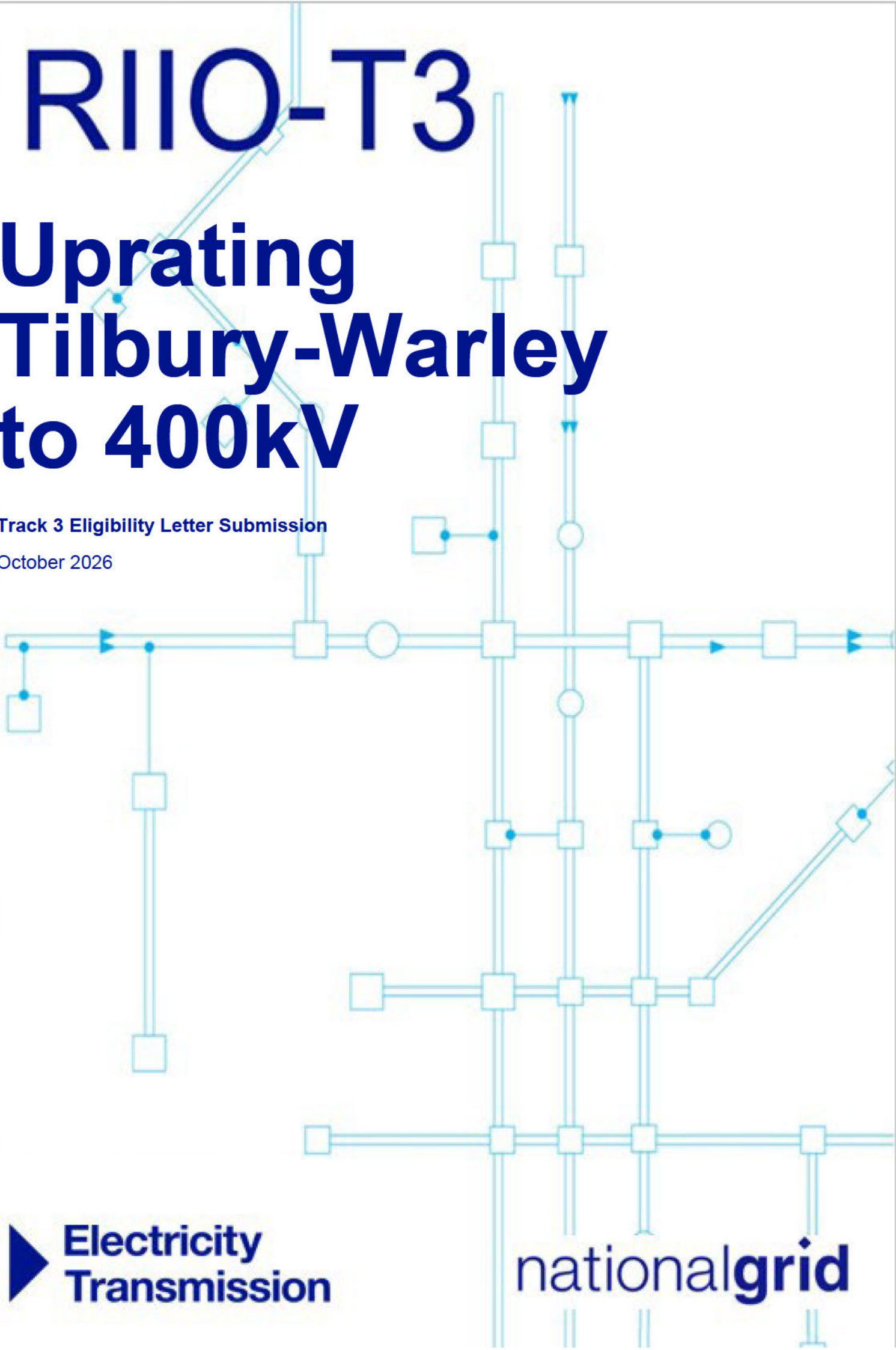
RIIO-T3

Uprating Tilbury-Warley to 400kV

Track 3 Eligibility Letter Submission

October 2026



Electricity Transmission

nationalgrid

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Reference and summary table

Field	Description
Project name	Uprating Tilbury - Warley to 400kV
TO's preferred re-opener track	Track 3 Eligibility Letter (EL)
RRP Reference	NGT500476
BPDT / Project reference number	NGT500476
Load Board Reference	August 2026, project name "Uprating Tilbury - Warley 400 kV Line"
Investment driver(s)	**Primary:** • **Customer**: c.1.5GW of new demand at Tilbury by 2034 and c.1.9GW at Warley by 2038. Warley 400kV energises in stages from 2033, so the OHL must operate at 400kV by 2033. **Secondary:** • **NESO**: required to enable the LE1 boundary increase delivered by the TWNC project by 2035. Initially within TWNC's southern section, now developed and funded separately to meet the 2033 customer date; and • **Asset Health**: [redacted]
Project outputs	Reconductoring of Tilbury-Warley 1 and 2; delivering an increased summer pre-fault continuous rating of [redacted] and an increased summer post-fault continuous rating of [redacted] improve asset health by replacing fittings on towers, associated steelwork and overhead line components.[1]
Short list of strategic options considered	Four main options were shortlisted for detailed analysis: [redacted] Option E-1: Reconductor with [redacted] Option E-3: Reconductor with [redacted] Option E-4: Reconductor with [redacted] • Option E-5: Reconductor with [redacted]
PASE alignment	Of the four shortlisted options for this project, options E-4 or E-5 are PASE aligned because they use the highest-rated conductor available to NGET at the time for the investment.

[1] Target construction by 2028. Delivery of the outputs and associated benefits is contingent on the future energisation of the Tilbury and Warley substations.

Cost (23/24 prices)	[redacted]
Delivery year	Proposed construction delivery year is 2028, contingent on several factors (See Section 4.1). Delivery of the outputs and associated benefits is contingent on the future energisation of the Tilbury 400 kV rebuild and the new Warley 400 kV substations.
Extension cost (applicable only to substations)	N/A
Applicable reporting tables	BPDT Applicable reporting table: 5.2 Scheme Output 6.1 Scheme C&V Load Actuals 6.5 T3 Baseline Load 9.4 CAI 11.10 Contractor Indirects
Interactive projects	The investment interacts with several projects in the area: • Warley 400 kV substation replacement • Rebuild of Tilbury 275 kV at 400 kV • ATNC (Norwich-Tilbury) (Southfields substation) • Lower Thames Crossing • Lower Thames Crossing OHL Diversion • TCSNP2: new transmission circuit between Wymondley and Waltham Cross (TWNC)
Historic funding interaction	Assets on the Tilbury – Warley OHL circuits have had non-load asset health driven fittings work undertaken in RIIO-ET1 which spanned into RIIO-ET2.
Spend apportionment	[redacted]

Executive summary

Project summary

The Tilbury–Warley transmission circuit is a strategically important route serving London and the South East. Customer connections at Tilbury and Warley will push power flows beyond the existing circuit rating. We propose to remove this constraint by uprating the overhead line from 275 kV to 400 kV using a new conductor. The OHL must operate at 400kV by 2033 to enable the first Warley energisation stage and keep the circuit SQSS compliant. The uprating also enables the LE1 boundary increase delivered by the separate TWNC project and will replace ageing fittings in the same programme.

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 Uprating Tilbury-Warley to 400 kV project as a Track 3 EL investment and approval of 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.

This submission provides an update to the Optioneering originally submitted within the RIIO-T3 Engineering Justification Paper (EJP) for Uprating Tilbury - Warley to 400 kV. At Final Determination, Ofgem determined that the EJP was not justified on the basis that the preferred solution relied on the [redacted] conductor, for which Type Registration was withdrawn. To ensure we deliver the best solution for consumers, we have re-evaluated our optioneering for this investment and removed the [redacted] conductor (option E-2) from our consideration. We have produced a new shortlist of options and accordingly updated the qualitative and quantitative analysis for these, which forms the basis of this submission.

Project need

The uprating of the Tilbury–Warley overhead line (OHL) to 400kV is required to meet the following drivers:

- **Customer connections:** Tilbury substation is forecast to connect c.1.5GW of new demand by 2034 and Warley c.1.9GW by 2038. The May 2026 Load Reopener submissions for Tilbury and Warley set out the related substation investments needed to accommodate this growth, including the interaction with the Tilbury-Warley OHL. Warley 400kV substation will be energised in stages from 2033, with full completion by 2038. The OHL must therefore be capable of 400kV operation by 2033 to enable the first Warley energisation stage. Our system studies confirm that, without this uprating, the circuit would overload under forecast network conditions, resulting in SQSS non-compliance.
- **NESO:** The uprating is also required to enable the LE1 boundary capacity increase delivered by the Transmission Corridor South (TWNC) project, a separate tCSNP2 investment to uprate the network between Wymondley (Hertfordshire) and Waltham Cross (Essex) to 400kV by 2035. The Tilbury-Warley OHL uprating was initially included in the scope of the southern section of TWNC but is being developed and

funded separately in order to meet the 2033 customer connections driver set out above. This is reflected in the separate regulatory submissions relating to Tilbury, Warley and TWNC, which do not have overlap in scope or requested funding.

- **Asset health:** Fittings on Tilbury–Warley circuits 1 and 2 are approaching the end of their anticipated 45-year asset life, [redacted] Delivering this work as part of the reconductoring avoids a future standalone asset health intervention and reduces future outage requirements.

Optioneering to date

We undertook an initial structured, multi-factor optioneering process to identify the most appropriate solution to meet the required need.

We conducted this high-level assessment of strategic options (do nothing, market-based, whole-system, reuse or extension of existing assets, and new-build) to develop a longlist. A number of these options were discounted due to either not meeting the Investment Driver or by creating constraints elsewhere on the system.

A preferred option was then selected during 2024 and identified in the EJP for this investment. Due to developments in 2025, the preferred conductor option from our EJP was no longer feasible (explained in more detail at section 3.3 below).

In 2026 we re-evaluated and produced a new shortlist to assess. This included option E-1 from the original optioneering and three new options. These are identified in blue highlight in the table below. This is supported by the optioneering assessments and the referenced layouts/Single Line Diagrams (SLDs) in Section 3.

Table 1: Summary of longlist options

Option	Details	Drivers met?	New site?	AIS/ GIS?	Shortlist?
Option A	Do nothing counterfactual option	No	No	N/A	No
Option B	Market-based solution	No	No	N/A	No
Option C	Non-transmission, whole systems solution	No	No	N/A	No
Option D-1	Installation of a Quadrature Booster	No	No	N/A	No
Option D-2	Installation of a Series Reactor	No	No	N/A	No
Option E-1	Reconductoring the OHL circuit [redacted]	No	No	N/A	Yes[2]
Option E-2	Reconductoring the OHL circuit [redacted]	No[3]	No	N/A	No[4]
Option E-3	Reconductoring the OHL circuit [redacted]	No	No	N/A	Yes[5]
Option E-4	Reconductoring the OHL circuit [redacted]	Yes	No	N/A	Yes
Option E-5	Reconductoring the OHL circuit [redacted]	Yes	No	N/A	Yes
Option F	This option involves construction of a new OHL circuit	Yes	N/A	N/A	No

[2] This option was progressed to shortlist as it was expected to meet the drivers. The System Design Specification was produced subsequently (July 2026) and confirmed this option would not meet the required rating.

[3] Initially assessed prior to EJP in December 2024.

[4] At the time of our EJP in 2024, this was progressed to shortlist. It was not shortlisted when re-evaluated in 2026.

[5] This option was progressed to shortlist as it was expected to meet the drivers. The System Design Specification was produced subsequently (July 2026) and confirmed this option would not meet the required rating.

Cost estimates

Based on the latest Cost Book (2023/24 prices) and early project estimates, of the shortlisted options (Options E-1, and E-3 to E-5) these have an indicative total cost range from [redacted] through to [redacted] including risk and contingency.

This project is therefore eligible dependent on the final option selected, with some options above the £40m load re-opener threshold and some below. There is a possibility that once we identify our preferred solution and subject to updated costs at the time, this investment may become ineligible and therefore be withdrawn or transferred to UIOLI. However, on the basis that a credible option is above the threshold, we are beginning to progress this investment through the Load Re-opener. We will reassess eligibility under the load re-opener framework once our preferred solution is confirmed.

Our preferred solution is still being determined and will be confirmed in our subsequent Needs Case submission. Pre Construction Funding of [redacted] is requested to progress surveys, planning (including wayleaves) and land activities, FEED, programme management and obtain third party services. In the event our preferred solution is below the £40m eligibility threshold, any PCF allowances received through the Load Re-opener process would be appropriately adjusted and deducted from subsequent funding recovery mechanisms to avoid double recovery.

Indicative delivery programme

We propose to construct in 2028, aligned to the Lower Thames Crossing diversion outage. This reduces additional outages, avoids duplicating high-risk construction and eases system access, land access and supply chain pressures.

The system is highly constrained due to numerous ongoing projects in and around this area - if the 2028 window is missed, the next opportunity for these works would be to align with system outages currently planned for Warley 400 kV energisation for 2033 and Tilbury 400 kV currently planned for 2034.

The 2028 programme depends on internal outage prioritisation, land access, constructability and stakeholder agreement. We will confirm the position for these for inclusion in the Needs Case submission. Cost apportionment and final efficiencies will be confirmed through the Project Assessment stage, following subsequent Needs Case submission.

1. Introduction

1.1 Uprating Tilbury - Warley to 400 kV

This submission, coupled with its Annexes and Cost Benefit Analysis (CBA), is made under the Load Re-Opener and Price Control Deliverable (Special Condition 3.18 of the RIIO ET3 Licence) for the Uprating Tilbury - Warley to 400kV. This application seeks the following determinations from Ofgem:

- approval of project eligibility under the Load Re-Opener and Price Control Deliverable (Special Condition 3.18)
- confirmed acceptance of our investment need, optioneering process completed to date and shortlisting of design options we will take forward to detailed analysis
- confirmation that the project should proceed via Track 3 EL of the re-opener process; and
- approval of Pre Construction Funding (PCF) under Special Condition 3.15 (Pre Construction Funding Reopener, Price Control Deliverable).

Eligibility, Project Track Statement and PASE

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

This submission proposes the Track 3 EL Load Re-Opener process for assessment. Track 3 EL is appropriate as we do not yet have a preferred solution.

Two of the shortlisted options sit above the £40m load re-opener threshold whereas two sit below. Only E-4 and E-5 meet the required rating; E-4 [redacted] is a compliant option above the threshold, E-5 [redacted] is below it. We have not yet selected the preferred solution. We are seeking eligibility while both compliant options remain open and will reassess once we select the solution and mature its costs. We will reassess eligibility under the load re-opener framework once our preferred solution is confirmed and costs are further matured. The cost estimates presented include project-specific contingency derived from the Cost Book methodology and will be updated and evidenced at Needs Case.

For this submission we have updated our optioneering since our EJP for the range of conductors, reaching a new shortlist of: [redacted]

Subject to Ofgem providing approval of this project being assessed under Track 3 EL, we will then continue development of our Needs Case Assessment for your approval in April 2027, which will confirm our preferred solution.

Pre-construction funding request

Under Special Condition 3.15 of the Electricity Transmission licence, this investment qualifies for allowances equal to 8.2% of its total forecasted cost (range of [redacted]

[redacted] from the shortlisted options, with an average of [redacted]) at the time of this Load Re-Opener Eligibility Letter submission. The activities in Table 2 total [redacted] – we request [redacted] for pre-construction funding, rounded down.

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

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

[redacted]

The projected cost to deliver our short-listed solutions for the investment range from [redacted], with an average of [redacted] (see section 3.5 below for further details). Given the range, we are requesting under Special Condition 3.15 a PCF allowance of [redacted] (based on the average of the shortlisted options).

Once selected, if our preferred solution has a total forecast expenditure that remains below the Load Re-opener threshold, we will withdraw the project from the Load Re-opener and seek an alternative funding route through an appropriate price control mechanism. If this occurs, any PCF allowances received through the Load Re-opener process would be appropriately adjusted and deducted from subsequent funding recovery mechanisms to avoid double recovery.

There is a possibility that costs (and our PCF allowance) may be exceeded given the range of options, which will be addressed at the Project Assessment stage.

1.2 Background

Chronology of investment

The background to the investment commenced in 2022 with the signing of the first customer connection at Warley 275 kV. In 2024 a review of interacting projects showed a convergence of drivers that led to a standalone investment for the Uprating of Tilbury-Warley to 400 kV. A summary of the chronology surrounding the development of the investment is provided in Figure 1.

Figure 1: Summary of chronology

2022: NESO Network Options Assessment 2021/22 Refresh First customer mod app	**2022**: NESO refreshed its NOA in July. It outlined a need for a new 400 kV transmission circuit into Waltham Cross (TWNC) by 2034 to accommodate new 6-7 GW capacity. Warley modification application triggered need to rebuild at 275 kV. Tilbury began to look at options for rebuilding 275 kV.
2023: Transmission Works Review Connecting Customer Drivers	**2023**: TWR conducted. It indicated a projected increase in load on the Tilbury-Warley circuit, [redacted] More customers seek connection (Tilbury and Warley). This includes an additional 3.5 GW by 2028 and 3 GW by 2029. These necessitate uprating to 400 kV.
2024: TWNC Convergence of drivers EJP	**2024**: TWNC project commissioned - development of a new circuit between Wymondley and Waltham Cross, along with the enhancement of the Northeast London (Tilbury to Waltham Cross via Warley) 275 kV ring to 400 kV. In 2024 we reviewed the interacting customer, network and asset health requirements and decided to progress the Tilbury–Warley uprating as a standalone investment. The works were initially part of TWNC's southern section. We separated development and funding to meet the earlier 2033 customer date and to keep scope and costs distinct. We submitted an EJP in our T3 business plan for this investment, preferring [redacted] conductor at the time.
2025: Evolving optioneering and preferred solution tCSNP2 Refresh	**2025**: NGET submits addendum to Ofgem on a range of OHL EJPs that had preferred [redacted] conductor, since Type Registration withdrawn. Ofgem did not provide funding for these projects at the time. tCSNP2 refresh in December. The driver for TWNC continues to be marked as proceed.
2026: Tilbury and Warley ELs Re-optioneering carried out Connections reform outputs	**2026**: ELs submitted in May for the Warley 400 kV Replacement and for the Tilbury 400 kV rebuild. This will require the OHL between Warley and Tilbury to run at 400 kV. NGET carries out re-optioneering to evaluate conductor options following Ofgem FD on our EJP. Revised shortlist produced to remove [redacted] conductor. Connections reform outcomes known: Warley Gate 2 customers circa 1.9 GW by 2038 and Tilbury Gate 2 customers circa 1.5 GW by 2034.

Regional and network context

The Greater London region consumes 20% of the nation's electricity, requiring substantial upgrades and reinforcements to keep pace with the region's rising demand. This growth is being driven by transport and heat electrification, major data centre developments and wider expansion across London's urban economy. As the transmission network plays a critical role in importing electricity into London and distributing it to areas of high demand, increasing consumption is placing greater pressure on the existing infrastructure. This area forms a key part of the outer transmission network supplying Greater London, with 275 kV infrastructure linking the capital to wider 400 kV sources beyond the city. National and regional decarbonisation targets are further increasing the need for additional capacity within the region.

At the same time, wider generation growth outside London, including offshore wind and other low-carbon sources, relies on the transmission network's ability to transport power efficiently into the city. Given the limited local large-scale generation in London, these trends are increasing the requirement for import capacity and reinforcing the strategic importance of the outer transmission network.

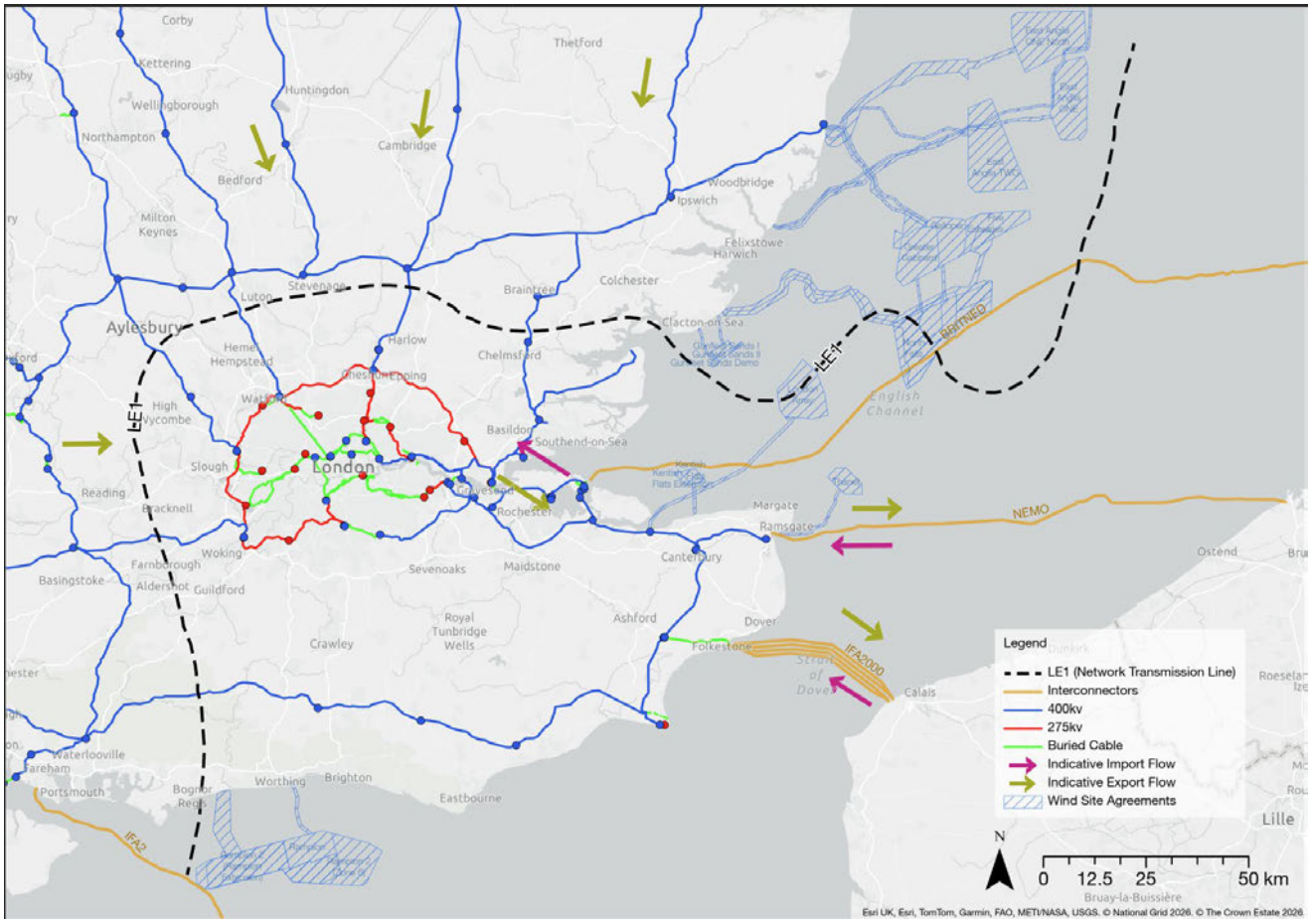
Figure 2 below illustrates the LE1 network topology. The LE1 almost exclusively imports power from the North, West and Southeast, and the purpose of the boundary is to monitor flows in this direction. As demand continues to increase, several parts of the outer network are becomingly more heavily utilised, particularly those supporting power transfers into the inner London. This drives the requirement for significant investment in network reinforcement, including substation upgrades and uprating of circuits to 400 kV capacity. This includes the TWNC tCSNP2 project, (see Section 2.2) to facilitate an additional 6-7GW of capacity in the area.

This investment is a key component of the wider reinforcement strategy for Greater London. By addressing forecast overloads and requirement for increased transfer capacity on the Tilbury-Warley corridor, it supports both anticipated demand growth and the efficient delivery of the TWNC.

Multiple network requirements are addressed through a coordinated sequence of investments by developing this investment alongside the Warley 400 kV replacement, the Tilbury 400 kV rebuild and wider reinforcement activity across the outer London transmission network. This coordinated approach avoids duplication, minimises the risk of inefficient or delayed reinforcement and reduces overall systems costs.

In addition to increasing network capability, this investment addresses underlying asset health risks, improving network resilience and helps to avoid more disruptive reinforcements in the future. Together with other planned investments it forms part of a phased strategy that delivers near-term network capacity while maintaining flexibility for further reinforcement beyond 2031 should future demand growth require it.

Figure 2: Regional Overview of Tilbury – Warley OHL circuit on the LE1 boundary



[redacted]

Interactive projects

The Tilbury – Warley OHL circuits interact with several projects in the area, as detailed in Table 3 below:

Table 3: Interactive projects

Project	Details	Status
Warley 275 kV Substation Replacement to 400 kV	Uprating of the Warley site: Enables new customer connections at Warley (detailed in our driver section) and addresses asset health.	Replacement with Staged energisation from 2033, with completion in 2038
Rebuild of Tilbury 275kV at 400kV	Enables new customer connections at Tilbury and addresses asset health.	Completion by 2034
ATNC (Norwich-Tilbury) (Southfields substation)	[redacted]	ACL of 2031
Lower Thames Crossing Diversion (OHL)	OHL diversion works (and outage) to facilitate the Lower Thames Crossing (LTC) project are also needed.	[redacted]
Lower Thames Crossing	Interaction from construction POV	Starting in 2026; completion in 2032
tCSNP2: New transmission circuit between Wymondley and Waltham Cross (TWNC) and uprating of the Northeast London ring (Tilbury to Waltham Cross via Warley) from 275kV to 400kV	Separate tCSNP2 investment to uprate the corridor between Wymondley and Waltham Cross to 400kV and deliver the LE1 boundary increase. Tilbury-Warley uprating was initially within its southern section, but as above was developed separately to meet the 2033 customer date.	Anticipated completion in 2035

Site background

The Tilbury – Warley (ZB) OHL is a key feed circuit for the Northeast London area, currently providing power to two critical sites (namely the Warley 275 kV substation and the Tilbury 400/275 kV substation). Figure 4 below provides a physical overview of the Tilbury – Warley OHL Circuit.

The existing circuit is composed of [redacted] which cross numerous third-party assets, including highways (A13 and A1089), local DNO 132 kV pole lines and Network Rail assets. The OHL is owned and operated by NGET.

NGET has existing access rights to the towers carrying the 275 kV conductors, which are built on land owned by third parties.

[redacted]

Historical funding

Assets on the Tilbury – Warley OHL circuits have had non-load asset health driven fittings work undertaken in RIIO-ET1 which spanned into RIIO-ET2, as presented in Appendix D.

No additional funding has been provided for this project to date in T3 (none awarded at EJP), with all preliminary work completed at risk.

Early Asset Write Offs (EAWO)

We anticipate an early asset write off (EAWO) value of [redacted] primarily associated with the ZB route. This reflects the remaining accounting value of the assets at the time of replacement. Further information will be provided at Project Assessment stage.

2. Drivers and need case

This investment was created in 2024 as drivers from interacting projects converged. To ensure there was no duplication of scope, costs or delivery, the uprating of Tilbury-Warley to 400kV was progressed as a standalone investment.

Customer demand at Tilbury and Warley drives this investment. Warley 400kV energises in stages from 2033, so the OHL must operate at 400kV by that date to keep the circuit SQSS compliant. The uprating also enables the LE1 boundary increase delivered by the separate TWNC project by 2035. Replacing ageing fittings in the same reconductoring adds an asset health benefit and avoids a later standalone intervention.

The customer dates reflect the latest programme. Where they remain subject to Connections Reform or contractual confirmation, we state this in the customer table and will update it at Needs Case.

Table 4: Investment drivers

Summary of drivers		ACL date
Customer connections	• Circa 1.5GW demand at Tilbury by 2034 • Circa 1.9GW demand at Warley by 2038 • Warley 400kV energises in stages from 2033. The OHL must operate at 400kV by 2033 for the first stage. Without the uprating, the circuit overloads under forecast conditions and breaches the SQSS.	2033-2038[6]
NESO	tCSNP2: TWNC • Enables the LE1 boundary increase delivered by the separate TWNC project. • Tilbury-Warley uprating was initially within TWNC's southern section, but since developed and funded separately due to customer driver.	Due to complete in 2035
Secondary: Asset Health	[redacted] Coordinated replacement avoids a later standalone intervention and further outages.	N/A

[6] The final ACL dates of contracted customers may change pending connections reform gate 2 offer outcomes.

2.1 Customer

There is substantial contracted demand growth across Tilbury and Warley. Based on latest available information from Gate 2 Phase 2 customer application, this includes: approximately 1.5 GW demand at Tilbury by 2034 and approximately 1.9 GW demand at Warley by 2038. This investment is necessary primarily to support existing customer connection commitments.

The contracted customers for this investment are, due to the interactivity of these projects, duplicative from the Tilbury and Warley substation investments[7]. These are summarised in table 5 below.

As part of this submission, NGET has assessed whether Connections Reform has materially changed the customer drivers underpinning the proposed intervention. Connections reform outcomes are not expected to affect the need, scope, cost, programme, preferred option or timing of this proposed network intervention, and the separate TWNC driver adds a further need by 2035.

Table 5 provides an overview of customer connections, relative to this investment and the impacts of Connections Reform.

[7] Eligibility Letters for both assessments were submitted to Ofgem in the May 2026 Load Re-opener window.

Table 5: Details of customers with contracted connections

Customer name	Project name	Technology type	Connection site demand capacity	TEC	Voltage (kV)	ACL / Connection date[8]	Connections Reform gate / Phase
Tilbury Substation							
[redacted]							
[redacted]							
[redacted]							
Warley Substation							
[redacted]							
[redacted]							
[redacted]							
[redacted]							
[redacted]							

[8] Gate 2 Phase 2 customers previously had ACL dates from 2033-2038. These ACL dates are listed as to be confirmed as we are yet to confirm post connection reform ACL dates.

2.2 NESO

In addition to the customer driver, the Uprating of this OHL to 400kV has also been identified as required by NESO.

TWNC and the Tilbury-Warley OHL Uprating to 400kV

Through multiple strategic network plans, NESO outlined a need to upgrade the network between Wymondley, Waltham Cross and Tilbury from 275 kV to 400 kV to deliver network benefits and meet demand growth that is expected to exceed current network capacity.[9] TWNC is a tCSNP2 investment to uprate the corridor between Wymondley and Waltham Cross to 400kV by 2035. The Tilbury–Warley uprating was initially within its southern section. We are now developing and funding it separately because the circuit must operate at 400kV by 2033 for the first Warley energisation stage, ahead of TWNC, to meet the separate customer connection drivers.

Although NESO has not provided NGET with individual constraint savings for each proposed tCSNP2 project, it has published expected total savings of £52bn to £83bn from delivering the tCSNP2 investments – this investment being one of those contributors. TWNC therefore necessitates the need for uprating to 400 kV to facilitate this investment.

Scope

The Tilbury-Warley uprating enables the wider LE1 increase but sits outside TWNC's scope and funding. TWNC assumes these works are delivered separately. Progressing them separately meets the 2033 customer date and keeps scope and funding distinct, with no overlap.

Delivery

Our proposed delivery year of 2028 is an opportunity to align with the Lower Thames Crossing (LTC) diversion outages (see section 4.1 below). This OHL will operate at 275kV until the Warley substation stage 1 commissioning in 2033, at which point it will operate at 400kV. Undertaking this work in 2028 ensures that this OHL does not become a constraining factor on the delivery year of these other schemes – which may have occurred otherwise. This approach increases outage and cost efficiencies, minimises environmental impact, and ensures that we do not duplicate high risk construction activities. It also ensures no detriment to connection customers or end consumers, by realising the uprating on a timetable best aligned to all drivers.

Funding and separation

The TWNC project itself is being funded by the 'Development Track' funding route for tCSNP2 projects as part of T3 baseline funding. As this investment is not included in the scope of TWNC, the uprating of the Tilbury-Warley OHL is not already funded and there is no risk of duplicate funding. This has therefore necessitated this EL submission through the load re-opener mechanism.[10]

[9] Network Options Assessment 2021/22 Refresh, July 2022; tCSNP2; Beyond 2030 – Electricity Transmission Update, June 2026.

[10] Equally, the substation works at Warley (which TWNC will connect into) were also excluded from TWNC funding, which led to submission of Eligibility Letters through the load re-opener in May 2026.

2.3 Asset health

The condition of the OHL infrastructure on this route presents another secondary driver for the scheme and the delivery of the preferred option will provide an asset health benefit and delivery efficiencies.

A summary of the current asset health position is provided in Table 6, which reflects our latest, assured 2025/2026 asset condition data.

[redacted]

Whilst current asset health assessments indicate that all assets remain below intervention thresholds, the Tilbury-Warley circuits were originally constructed in 1955 and forecast deterioration indicate [redacted] which would likely trigger an investment requirement in the T4 period.

Coordinating renewal activity within this reinforcement programme therefore represents the most appropriate whole-life outcome for consumers. By completing these replacement activities

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

as part of the load-related reinforcement, the project avoids future standalone asset-health interventions, reduces future outage requirements and minimises disruption to network users.

3. Optioneering

This section explains how we assessed the options for this investment.

Optioneering overview

We have applied a staged, multi-factor optioneering process to identify the preferred option.

1. We start by determining the most suitable strategic option. Strategic optioneering determines the type of investment we should develop.
2. We then consider a longlist of technical options within each investment type, down selecting to a shortlist of options.
3. We then consider a shortlist of technical options, selecting a preferred option based on a qualitative balanced scorecard of considerations: Engineering, environmental, deliverability, economic/consumer value and consenting/stakeholder.
4. We then assess quantitatively all shortlisted options in a CBA to determine which technical option provides greater Net Present Value.
5. We then consider the outputs of both step 3 and 4 to provide a final preferred option.

This paper uses a linked "option" label: lettered design options (A–F) (with sub variants) to describe what could be built. The project does not yet have a preferred solution.

3.1 Strategic options

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

Table 7: Strategic direction setting

Option	Description
Option A: Do nothing counterfactual option	This option involves making no changes and therefore doing nothing to facilitate the connection of customers.
Option B: Market-based solution	This option involves accommodating increased customer demand through the procurement and use of ancillary services only.
Option C: Non-transmission, whole systems solution	This option involves addressing the identified need without constructing new transmission assets, instead relying on coordinated interventions across the wider electricity system.
Option D: Make use of existing assets	This option involves making use of existing OHL infrastructure.
Option E: Reconductoring	This option involves reconductoring of the existing infrastructure to uprate
Option F: New line	This option involves construction of a new OHL circuit

We discounted Options A, B, C, and D primarily due to not being able to meet the investment drivers or creating constraints elsewhere on the system. Given consent timelines and delivery risk, Option F would not be expected to be delivered until 2035/36, therefore was ruled out on deliverability grounds and the cost to consumers. These collectively would be unable to facilitate the connection requests and therefore fulfil our licence obligation, Transmission Licence (Licence Condition D4A).

For Option C, we considered whether the identified capability requirement could be met through non-transmission interventions including DNO flexibility services, active network management, generation curtailment and coordinated transmission-distribution solutions. Such measures may provide operational benefits but would not provide the enduring scale of increase in transmission capability required by NESO's TWNC project nor support wider network transfer requirements across Greater London. Consequently, a transmission reinforcement remained necessary.

The preferred strategic direction is therefore to reconductor (Option E).

3.2 Longlist of options considered

In line with our internal processes and Ofgem’s Load Re-Opener Guidance, we assessed the options to identify the option that offers the best overall outcome for consumers. A descriptive rationale for rejection or progression from the longlist is explained in Table 8.

Table 8: Assessment of longlist options

Option name and status (progressed/not progressed)	Technical Description	Relevant diagrams, layout or SLD reference	Consenting risk and environmental constraints	Rationale for rejecting or taking forward the option
Option D-1: Installation of a Quadrature Booster **Not progressed**	This option involves construction of a Quadrature Booster	N/A	N/A	**Engineering**: does not provide additional capacity to the region; would result in overloads in other circuits in the region.
Option D-2: Installation of a Series Reactor **Not progressed**	This option involves construction of a Series Reactor	N/A	N/A	**Engineering:** does not provide additional capacity to the region; would result in overloads in other circuits in the region
Option E-1: Reconductoring the OHL circuit with [redacted] **Progressed to shortlist**	This option involves reconductoring of the existing infrastructure to uprate with [redacted]	N/A	Minor consenting risk related to new land access that will be required	**Engineering:** addresses investment driver by providing an increase in the circuit thermal rating. Progressed to shortlist.
Option E-2: Reconductoring the OHL circuit with [redacted]	This option involves reconductoring of the existing infrastructure to uprate with [redacted]	N/A	Minor consenting risk related to new land access that will be required	**Compliance:** Following Type Registration for the conductor being withdrawn in 2025, this option was deemed not credible.

Option name and status (progressed/not progressed)	Technical Description	Relevant diagrams, layout or SLD reference	Consenting risk and environmental constraints	Rationale for rejecting or taking forward the option
[redacted] **Not progressed**[12]				
Option E-3: Reconductoring the OHL circuit with [redacted] **Progressed to shortlist**	This option involves reconductoring of the existing infrastructure to uprate	N/A	Minor consenting risk related to new land access that will be required	**Engineering:** addresses investment driver by providing an increase in the circuit thermal rating. Progressed to shortlist.
Option E-4: Reconductoring the OHL circuit with [redacted] **Progressed to shortlist**	This option involves reconductoring of the existing infrastructure to uprate	N/A	Minor consenting risk related to new land access that will be required	**Engineering:** addresses investment driver by providing an increase in the circuit thermal rating. Progressed to shortlist.
Option E-5: Reconductoring the OHL circuit with [redacted]	This option involves reconductoring of the	N/A	Minor consenting risk related to new land access that will be required	**Engineering:** addresses investment driver by providing

[12] During initial optioneering in 2024 for our EJP, this was progressed to shortlist and was the preferred option. Due to its Type Registration being withdrawn, it was not progressed to shortlist when re-optioneered in 2026. This is explained further at section 3.3 below.

Option name and status (progressed/not progressed)	Technical Description	Relevant diagrams, layout or SLD reference	Consenting risk and environmental constraints	Rationale for rejecting or taking forward the option
[redacted] **Progressed to shortlist**	existing infrastructure to uprate			an increase in the circuit thermal rating. Progressed to shortlist.
Option F: New line **Not progressed**	This option involves construction of a new OHL circuit	N/A	DCO required to deliver a new OHL would add at least 6 years to planning and build time – not expected to be delivered until 2035/36. Highest risk option based on consenting risk.	**Deliverability:** Rejected as DCO planning process would push delivery timeline to 2035/36, preventing delivering the contracted connections, risk SQSS non-compliance, have the greatest cost, and there is a risk DCO may not be approved. **Consumer value:** Would have greatest cost to consumers.

In summary, Options A-D were rejected because they were unable to meet the investment drivers for the project, the wider consequences of which result in a highly constrained transmission network in Greater London. Option F was rejected on the grounds that a new OHL circuit would not be deliverable in the required timescales – risking significantly delaying customer connections – and the costs to consumers.

Within the preferred strategic approach of reconductoring (option E), options were rejected for the following reasons:

- **Compliance**: Option E-2 was rejected due to the type of registration being withdrawn for the conductor type.

Following completion of the long-list assessment, Options E-1 [redacted] E-3 [redacted] E-4 [redacted] and E-5 [redacted] were identified as credible options and were therefore progressed to detailed qualitative and quantitative assessment.

Stakeholder influence on shortlisting

Reconductoring the existing OHL route has a much lower impact on stakeholders and has a significantly lower consenting risk than the construction of a new OHL circuit. Among other factors, this has influenced our decision to shortlist only the reconductoring options.

Even though the project pertains to an existing OHL route, the proposed works will impact local communities, and NGET is responsible for managing these relationships. As such, NGET will seek to mitigate potential disruptions (e.g. minor road closures, access to stakeholder land, etc.) through early engagement with local stakeholders and parish councils, communicating where disruptions are likely to impact on residents and local businesses. NGET is currently proposing a delivery year of 2028 to mitigate against outage constraints, such that this delivery route will provide the least disruption to the local area.

[redacted]

3.3 Shortlisted options

Initial shortlist: 2024

The Tilbury – Warley OHL circuit is constructed with L2 tower types, which can only support certain conductor sizes and provide a sufficient MVA increase in capacity. At the time of the initial optioneering assessment for reconductoring in 2024, our assessment criteria (version 1) were:

a) Must achieve pre-fault continuous summer rating of at least [redacted] (to remain SQSS compliant).

b) Must be able to be delivered by 2028 (to improve efficiency opportunity re: outages).

c) Address any asset health concerns on the circuits to maximise the efficiency of our proposed investments, ultimately benefiting consumers.

d) Make provision to deliver additional capacity to address potential future needs, ensuring value for money for future consumers.

The options assessed as meeting these assessment criteria were limited to the [redacted] conductor types. These were the shortlisted options in our EJP:

- Option E-1: reconductoring of the OHL circuit with [redacted]; and
- Option E-2: reconductoring of the OHL circuit with [redacted]

Initially in our RIIO-T3 business plan, we recommended a number of OHL reconductoring investments to use the recently introduced [redacted] conductor as this had the highest rating amongst a range of options. Therefore, Option E-2 was our preferred option specified in this investment's EJP at the time. However, Type Registration for Option E-2 was subsequently withdrawn[redacted].

Therefore, in mid-2025, we attempted to update our EJP via an addendum to change our preferred conductor to the next highest-rated conductor at the time: [redacted] (Option E-1). Due to this change from our EJP submission, this was deemed unjustified by Ofgem at Final Determination.

Revised shortlist: 2026

Consequently, we revised our shortlist optioneering in 2026. The [redacted] conductor, Option E-2, was no longer feasible. Additional conductors were discounted based on rating, tower-compatibility or type registration grounds: [redacted]

We propose to take forward four options, which we will proceed to investigate and develop a Needs Case Assessment before indicating a preferred option. The updated shortlisted options for this investment now are:

[redacted]
- Option E-1: the reconductoring of the double circuit through a full asset refurbishment of both fittings and the new conductors with [redacted]
- Option E-3: the reconductoring of the double circuit through a full asset refurbishment of both fittings and the new conductors with [redacted]
- Option E-4: the reconductoring of the double circuit through a full asset refurbishment of both fittings and the new conductors with [redacted]
- Option E-5: the reconductoring of the double circuit through a full asset refurbishment of both fittings and the new conductors with [redacted]

Description of short-list options considered

Across all shortlisted options, these conductor types can allow for future uprating to 400 kV through the installation of appropriate insulators, fittings and line profiles. Additionally, these shortlisted options provide the opportunity to provide our network with strategic capacity and flexibility for the longer term, ensuring value for money for future consumers.

As each shortlisted option is a different variation of the same strategic solution (reconductoring) these have the same approach to implementation.

Proposed works:

- Remove the existing conductor, fittings and earth wire.

[13] The pre-fault winter rating of [redacted] would meet the initial assessment criteria of [redacted]

[14] The pre-fault winter rating of [redacted] would meet the initial assessment criteria of [redacted]

- Replace with a new 400kV capable conductor, fittings and earth wire on the overhead line circuits 1 and 2, between Tilbury and Warley Substations.
- [redacted]

How it addresses need:

- Reconductors the OHL between Tilbury and Warley substations to uprate to 400 kV.

Drawings:

- Please see Appendix C for the relevant layout drawing.

The System Design Table (SDT) for each option is provided within Appendix B - System design table.

In appraising these four options in 2026, we undertook a proportionate, multi factor qualitative assessment to understand their respective advantages and disadvantages, in addition to an indicative Cost Benefit Analysis. Following development of a revised System Design Specification in July 2026, our assessment criteria for these options evolved since the initial optioneering (carried out in 2024). The new key requirements for our shortlisted options as of July 2026 (version 2) therefore are:

a) Must achieve continuous pre-fault summer rating of [redacted] and a continuous post-fault summer rating of at least [redacted] pre-fault continuous winter rating of at least [redacted] and a new winter post-fault continuous rating of at least [redacted]

b) Must be able to be delivered between 2028-2033 (in light of outage constraints and drivers).

c) Address any asset health concerns on the circuits to maximise the efficiency of our proposed investments, ultimately benefiting consumers;

d) Make provision to deliver additional capacity to address potential future needs, ensuring value for money for future consumers.

The results of our comparison of options are summarised in Table 9.

Overall, through detailed shortlist optioneering, it is intended to compare the benefits in areas such as network operability and deliverability to establish the right solution. Selection of our preferred solution will be confirmed in due course.

3.4 Qualitative assessment of shortlist

Table 9: Multifactorial analysis

Optioneering categories					
Option	**Engineering**	**Environmental**	**Deliverability**	**Economic / consumer value**	**Consenting / stakeholder**
Option E-1 Reconductor with [redacted]	Technical performance: Does not meet the required pre-fault summer rating of [redacted], as this is rated to [redacted]. Future: addresses asset health issues.	Efficiency: lower transmission losses for [redacted] conductor comparatively to [redacted] conductor resulting in lower tCO2 emissions during operation. [redacted] There is no change to lasting visual impact post completion.	[redacted] is extensively used across the NGET network, resulting in significant experience of its installation, operation and maintenance. [redacted] Shorter supply chain journeys reduce lead time for delivery. Furthermore, the volume of upcoming NGET projects proposing [redacted], supporting improved availability and reduced lead times.	[redacted] conductor has lower capex cost and lower transmission losses versus the [redacted] alternative. Benefit: uprating benefits contracted customers and in turn consumers through timely connection and building a network for the future.	The construction impact needs to be minimised as it coincides with other works in the area such as LTC. Coordination between projects required. Land access rights: Wayleaves are currently in place for a 275kV system; [redacted] It is a reconductoring scheme; therefore no consent is required.
	Detractor	Benefit	Benefit	Benefit	Neutral

Optioneering categories					
Option	**Engineering**	**Environmental**	**Deliverability**	**Economic / consumer value**	**Consenting / stakeholder**
Option E-3 Reconductor wit [redacted]	Technical performance: Does not meet the required pre-fault summer rating of [redacted], as this is rated to [redacted] Future: addresses asset health issues.	Efficiency: [redacted] has higher transmission losses than the alternative conductor options assessed for L2 towers, also resulting in increased operational carbon emissions. [redacted] There is no change to lasting visual impact post completion.	[redacted] has limited operational precedent on the NGET network [redacted] Its installation is technically more complex than conventional conductor solutions and is supported by a limited pool of industry expertise. [redacted]	Cost: [redacted]-specific: conductor/material costs are higher than [redacted] TOTEX is higher due to increased transmission losses (MWh) when using [redacted]. Benefit: uprating benefits contracted customers and in turn consumers through timely connection and building a network for the future.	The construction impact needs to be minimised as it coincides with other works in the area such as LTC. Coordination between projects required. Land access rights: Wayleaves are currently in place for a 275kV system; [redacted] It is a reconductoring scheme; therefore no consent is required.
	Detractor	Detractor	Neutral	Detractor	Neutral
Option E-4 Reconductor wit [redacted]	Technical performance: Meets the required pre-fault summer rating of [redacted] as this is rated . Future: addresses asset health issues.	Efficiency: [redacted] has higher transmission losses than the alternative conductor options assessed for L2 towers, resulting in increased operational carbon emissions. [redacted]	[redacted] has limited operational precedent on the NGET network, [redacted] Its installation is technically more complex than conventional conductor solutions and is supported by a limited pool of industry expertise. [redacted]	Cost: [redacted]-specific: conductor/material costs are higher than [redacted]; TOTEX is higher due to increased transmission losses (MWh) when using [redacted] vs [redacted]. Benefit: uprating benefits contracted customers and in turn consumers through timely connection and building a network for the future.	The construction impact needs to be minimised as it coincides with other works in the area such as LTC. Coordination between projects required. Land access rights: Wayleaves are currently in place for a 275kV system; [redacted]

Optioneering categories					
Option	**Engineering**	**Environmental**	**Deliverability**	**Economic / consumer value**	**Consenting / stakeholder**
		There is no change to lasting visual impact post completion.	[redacted]		[redacted] It is a reconductoring scheme; therefore no consent is required.
	Benefit	Detractor	Neutral	Detractor	Neutral
Option E-5 Reconductor with [redacted]	Technical performance: Meets the required pre-fault summer rating of [redacted] as this is rated . Future: addresses asset health issues.	Efficiency: [redacted] is expected to provide lower transmission losses than [redacted], resulting in reduced operational carbon emissions over the asset life. [redacted] There is no change to lasting visual impact post completion.	[redacted] based on established technology Operational deployment is limited: [redacted]. Residual programme and delivery risk compared with Option E-1.	Cost: [redacted] conductor has lower capex cost and lower transmission losses versus the [redacted] alternative. Benefit: uprating benefits contracted customers and in turn consumers through timely connection and building a network for the future.	The construction impact needs to be minimised as it coincides with other works in the area such as LTC. Coordination between projects required. Land access rights: Wayleaves are currently in place for a 275kV system; [redacted] It is a reconductoring scheme; therefore no consent is required.

Optioneering categories					
Option	**Engineering**	**Environmental**	**Deliverability**	**Economic / consumer value**	**Consenting / stakeholder**
	Benefit	Benefit	Detractor	Benefit	Neutral

Indicative qualitative assessment output

The key differentiators between the four shortlisted options are the type of conductor ([redacted] and the maximum temperature ([redacted]). In terms of performance against the qualitative parameters of our assessment, whilst the findings of our qualitative assessment remain indicative and dependent upon further evaluation:

- Options E-3 and E-4 perform least effectively against most assessment criteria. This is due to higher transmission losses, costs, increased carbon emissions, and more complex installations.
- Option E-5 tests equally positively against environmental and economic/consumer value considerations to option E-1.
- Option E-1 indicatively performs best on deliverability.
- Options E-4 and E-5 perform equally on engineering as they both meet the required rating and the investment drivers.

E-5 meets the required rating at lower cost and losses, but its fittings are not yet Type Registered. Dependent upon the outcome of further internal review, option E-5 is therefore indicatively the preferred solution at this stage. However, there is a dependency with option E-5 on the fittings becoming Type Registered. [redacted] Option E-4 has been fully Type Registered and therefore does not have this dependency, but has higher cost, losses and supply chain risk, as described above.

If our preferred solution becomes Option E-5 and the total forecast expenditure remains below the Load Re-opener threshold, we will cease progression through the Load Re-opener and seek an alternative funding route through the relevant price control mechanism.

Selection of our preferred solution will occur over the coming months. We welcome feedback from Ofgem on this indicative qualitative assessment. Our preferred solution will be identified in our Needs Case submission.

PASE alignment

Of the options that meet the required rating, E-5 has the highest rating and is the PASE primary option if its fittings gain Type Registration in time. If not, E-4 is the highest-rated fully registered option and becomes the PASE primary option.[15]

[15] Source: optioneering report June 2026.



3.5 Quantitative analysis of shortlist options

Indicative cost estimates of shortlist options

To assess the shortlisted options, cost estimates have been determined using a parametric cost estimating methodology suitable for the stage of development and option selection for this investment. At each stage of project development, there are uncertainties associated with construction, commercial, stakeholder and supply chain activities, as well as external events, which may impact cost and schedule outcomes. Consistent with the level of project maturity at EL stage, the current estimate includes a [redacted] risk and contingency allowance. This allowance has been informed by National Grid's experience of previously delivered projects and the risk events encountered during delivery, providing a proportionate representation of project uncertainty at this stage. Detailed QSRA and QCRA assessments will be completed as part of Project Assessment to further quantify project-specific risks and update the allowance where appropriate.



Provisionally, options E-1 and E-5 have lower costs than options E-3 and E-4 based on recent contractor engagements, with differing supply chain costs according to the conductor type. These findings are based on our current estimate of costs; this will be updated at our Needs Case submission.

Cost Drivers

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

- Unit costs of OHLs (based on contractor pricing);
- Obtaining future access rights (easements);
- Enabling works (surveys, ecology, vegetation clearance, construction laydown); and
- Construction costs (scaffolding, steel work strengthening, overhead line crossings).

Cost Benefit Analysis (CBA)

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, 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 four shortlisted options using Ofgem's RIIO-ET3 CBA template. The assessment is completed relative to a counterfactual and on a discounted basis over a 50-year appraisal period (2027–2076), consistent with the CBA methodology.

For each option considered, we have quantified:

i. Initial CAPEX investment required

ii. Future end of life replacement cost

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

[redacted] Option E-1: the reconductoring of the double circuit through a full asset refurbishment of both fittings and the new conductors with [redacted]

Option E-3: the reconductoring of the double circuit through a full asset refurbishment of both fittings and the new conductors with [redacted]

- Option E-4: the reconductoring of the double circuit through a full asset refurbishment of both fittings and the new conductors with [redacted]
- Option E-5: the reconductoring of the double circuit through a full asset refurbishment of both fittings and the new conductors with [redacted]

CBA outcome

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

[redacted]

On the basis of the discounted lifetime CBA results (Table 12), Option E-1 delivers the highest NPV [redacted] closely followed by Option E-5 [redacted].[16] The difference in cost estimates between Option E-1 and E-5 is based on recent contractor engagements. Options E-3 and E-4 deliver a lower NPV than Options E-1 and E-5 with NPVs of [redacted]. This analysis is subject to confirmation through deliverability, consents/land, outage and risk considerations, and any CBA sensitivities (e.g. carbon price trajectories) set out in the assumptions below.

Assumptions of the CBA analysis

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

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

[16] Option E-1 does not meet the required rating, per our multifactorial analysis (table 9 above).

- Key sensitivities considered (as applicable): timing/phasing, CAPEX uncertainty ranges, delivery/outage risk, and benefit parameter uncertainty (including losses and leakage assumptions).

Costs



Benefits

The following benefits have been included within the CBA:

- Carbon cost of construction reduction
- Transmission Losses

Summary of all benefits

Table 14 presents the summary of all (undiscounted) benefits, including environmental and non-environmental benefits, considering the central base case carbon price.



Project benefits and outputs

Table 15: Summary of outputs and benefits

Output:	Description
Outputs and benefits	• Targeted construction date by 2028, with subsequent energisation of Warley and Tilbury substations then allowing delivery of an increased summer pre-fault continuous rating of [redacted] and an increased summer post-fault continuous rating of [redacted] • Enabling the increased boundary flow across LE1 boundary. • By enabling TWNC, this investment will help to meet demand growth that is expected to exceed current network capacity. • Across all tCSNP2 investments (of which this project is one) delivery is expected to deliver total savings of £52bn to £83bn. • By reinforcing the 14km Tilbury-Warley circuit, replacing fittings of the ZB double circuit, and [redacted] we will strengthen the reliability and resilience of our transmission infrastructure including preventing overloads during fault conditions. • This investment will contribute to the net zero energy transition, ensuring smooth integration of new generation sources and aligning with local and regional energy needs. • Carrying out a single programme of works allows for more cost- and time-efficient delivery, aligning with system access opportunities, minimising supply chain risks whilst minimising environmental and local impacts.

4. Delivery

4.1 Delivery year and indicative timeline

The proposed delivery year is 2028, driven by current outlook on system outages, land access and concurrent construction works alongside Lower Thames Crossing OHL diversion works outage. This also aligns with our approach on accelerating works before 2030 to alleviate supply chain capacity issues, land access and system access constraints, and minimise environmental impact. We consider delivery in the 2028 window is optimal for consumers and the local community to avoid realisation of these risks.

The system is highly constrained due to numerous ongoing projects in and around this area; if the 2028 window is missed, the next opportunity for these works would be to align with system outages currently planned for Warley energisation in 2033 and Tilbury planned for 2034. However, if the 2028 delivery window is missed, whilst this investment can still be achieved in the 2033 window, ultimately this risks exacerbating the supply chain capacity issues, land access and system access constraints, duplication of high risk construction activities, and environmental detriment. Ultimately this investment is required to achieve the LE1 boundary uplift required by NESO for the separate TWNC project by 2035. Therefore, the work for this investment is planned for 2028 to align with the LTC diversion outage.

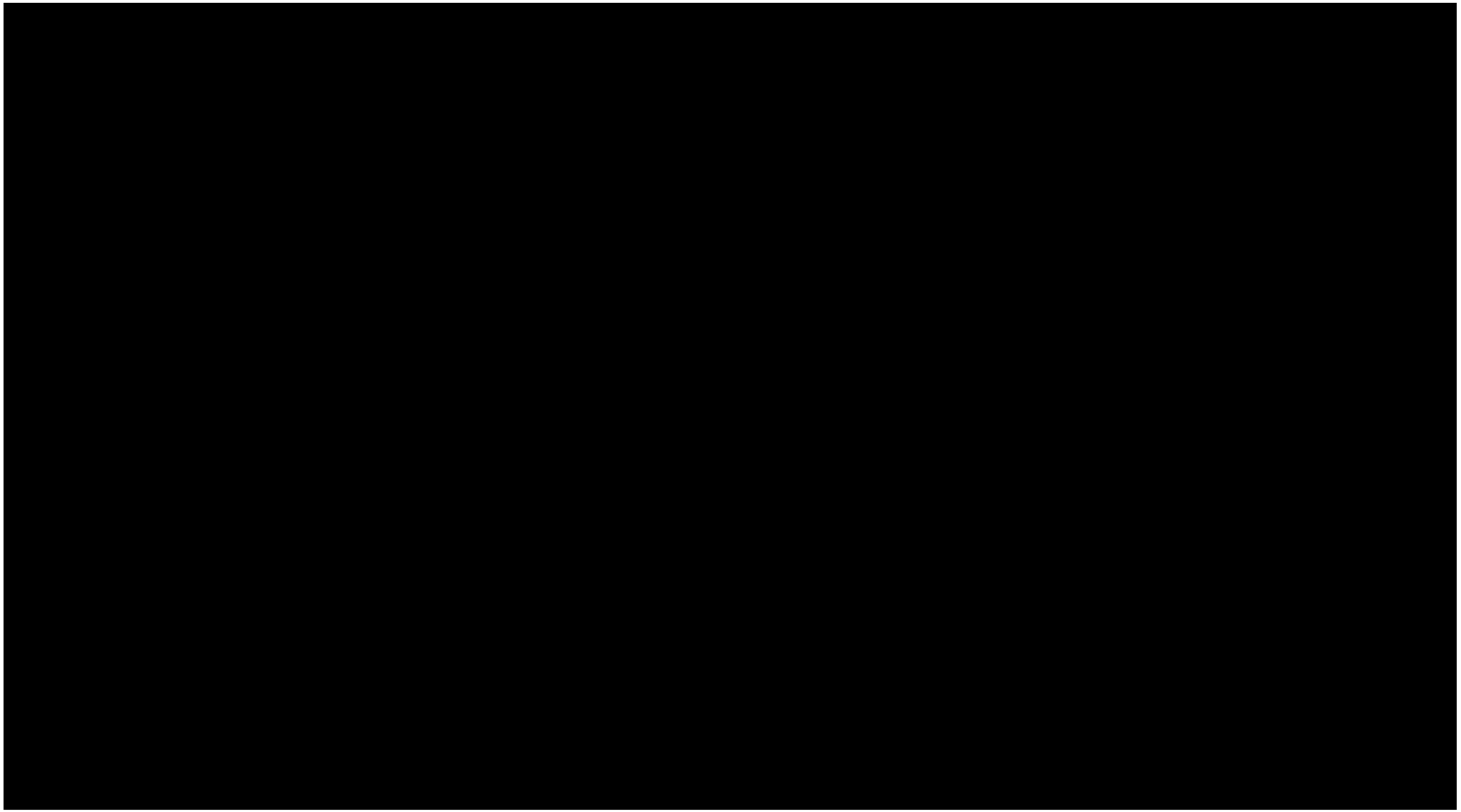
[redacted]

This delivery window is dependent upon a number of factors including: [redacted] prioritisation of projects in the region requiring outages, [redacted] and constructability strategy. Therefore, 2028 remains the proposed delivery year until these pending dependencies are addressed.

Cost apportionment and final efficiencies will be confirmed through the Project Assessment stage, following subsequent Needs Case submission.

Figure 5: Indicative programme of work for Uprating Tilbury – Warley to 400kV details the high-level program for the shortlisted options. Key assumptions with this program are:

- We are planning to deliver in 2028; this assumes integration with the LTC OHL diversion.
- Supply chain availability and long lead item OHL conductor being procured.
- System access and resource availability over the ET3 period have been assessed, allowing for indicative outage dates to be identified.



4.2 Procurement and contracting strategy

At this stage, the procurement and contracting strategy is to align construction works for this investment alongside pre-planned Lower Thames Crossing OHL diversion works outage in 2028. Additional information regarding our procurement strategy and supplier selection will be presented in our Needs Case submission and subsequent Project Assessment.

4.3 Risks and risk management

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

As highlighted in the qualitative options analysis, the various options do present some risks; these are detailed in the following table with their respective mitigation measure.

Table 16: Summary of risks and mitigations

Risk	Mitigation
Scope: Steelwork strengthening may be needed and condition steelwork on the L2 towers may be required.	Steelwork climbing surveys will be carried out to identify and grade steel degradation. If replacement is needed, steel will be ordered and fitted during the project.
Outages: Other projects outages and/or interfacing works may be rescheduled or prioritised, resulting in insufficient time or delays to the booked outages.	NGET will have coordination meetings with interfacing projects to coordinate works within outages and reduce risk.
[redacted]	[redacted]
Third party asset protection: Due to the nature of a full OHL refurbishment and more intrusive work to be carried out, there is a risk to protection of 3rd party assets.	NGET will engage early with 3rd parties to ascertain the most suitable protection or closure of each asset. OHL wiring work will be carried out under single circuit outage conditions, and an experienced OHL contractor will be selected in line with NGET safety rules.
[redacted]	[redacted]

Risk	Mitigation
Third-party impact: Third-party asset owners such as DNOs, Highways and Lower Thames Crossing (LTC) may be affected by the work (e.g., scaffold structures, outages or closures).	NGET will engage early with 3rd parties to ascertain they are aligned with the project and its timings. Our external affairs team will proactively support with this engagement.
Procurement: Delays for some long lead items (e.g., conductor) may cause an overall delay in the programme of works.	Early engagement with contractors so that the materials can be ordered in a timely manner. There is also a potential for free issues materials (i.e. spares that NGET has already procured for other projects and have not been used).

5. Conclusion

This submission outlines a shortlist of options that aim to satisfy the investment drivers; identification of a preferred solution is dependent upon further internal evaluation and governance. It therefore seeks confirmation of eligibility under Special Condition 3.18, confirmation of eligibility of PCF under Special Condition 3.15, and confirmation of re-opener Track 3 EL.

In addition to meeting the primary customer, TWNC and asset health drivers, this investment maximises the use of the existing transmission corridor and avoids the significantly greater cost, environmental impact and delivery risk associated with constructing a new overhead line. By coordinating reinforcement and asset renewal activities through a single delivery programme, the investment also reduces future intervention requirements and avoids unnecessary future outages.

The final preferred solution will consist of a reconductoring of the OHL double circuit through a full asset refurbishment of both fittings and the new conductors, to a specification to be determined at our Needs Case submission in April 2027.

Table 17: Submission summary

Submission summary	
Main drivers	**Primary:** • **Customer**: c.1.5GW of new demand at Tilbury by 2034 and c.1.9GW at Warley by 2038. Warley 400kV energises in stages from 2033, so the OHL must operate at 400kV by 2033. **Secondary:** • **NESO**: required to enable the LE1 boundary increase delivered by the separate TWNC project by 2035. Initially within TWNC's southern section, now developed and funded separately to meet the 2033 customer date; and • **Asset Health**: [redacted]
Estimated cost and timing	Range of [redacted]; proposed construction date of 2028.
Outputs	Reconductoring of Tilbury-Warley 1 and 2; delivering an increased summer pre-fault continuous rating of [redacted] and an increased summer post-fault continuous rating of [redacted]; improve asset health by replacing fittings on towers, associated steelwork and overhead line components.[17]
Proposed PCD	A Mechanistic Price Control Deliverable (PCD) for OHL uprating for this investment relating to the delivery of the outputs by the end of the RIIO-ET3 price control period.

[17] Target construction by 2028. Delivery of the outputs and associated benefits is contingent on the future energisation of the Tilbury and Warley substations.

Appendix A
Glossary

Table 18: Table of abbreviations and definitions

Abbreviation	Description
AAAC	All Aluminium Alloy Conductor
ACCC	Aluminium Conductor Composite Core
ACCR	Aluminium Conductor Composite Reinforced
ACL	Available For Commercial Load
ACSR	Aluminium Conductor Steel Reinforced
AIS	Air Insulated Switchgear
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
DCO	Development Consent Order
DNO	Distribution Network Operator
EAWO	Early Asset Write Off
ECC	Estimated Cost of Construction
EEW	Early Enabling Works
EL	Eligibility Letter
EJP	Engineering Justification Paper
EoL	End-Of-Life
ESO	Energy System Operator
EPN	Eastern Power Networks
ET	Electricity Transmission
ETP	Electricity Transmission Partnership

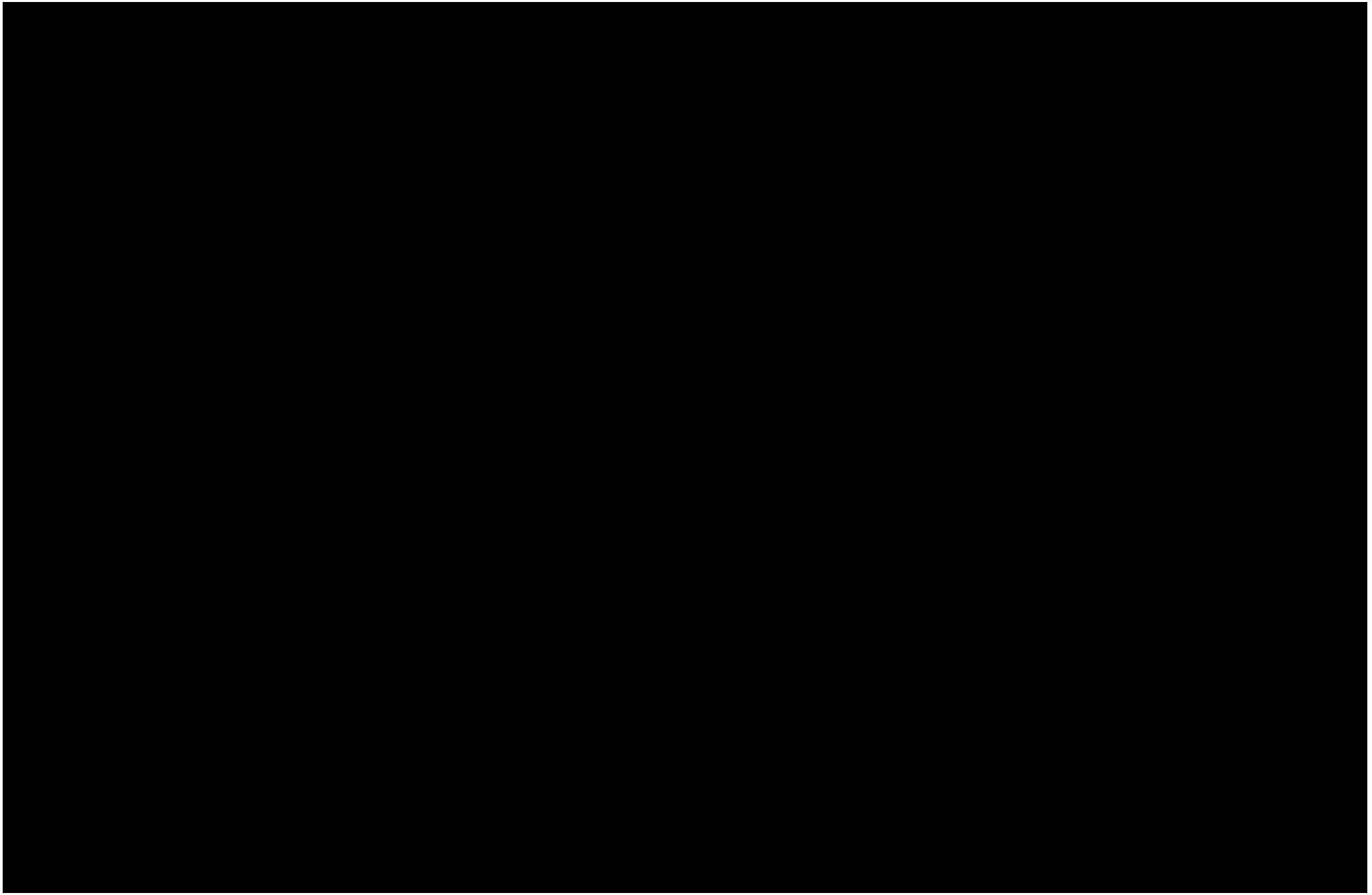
Abbreviation	Description
EUL	Estimating Units Lines
FEED	Front End Engineering Design
FES	Future Energy Scenarios
FY	Financial Year
GIS	Gas Insulated Switchgear
GLA	Greater London Authority
GW	Giga Watt
HV	High Voltage
kW	Kilo Watt
LTC	Lower Thames Crossing
LV	Low Voltage
LVAC	Low Voltage Ac
MITS	Main Interconnected Transmission Systems
MSIP	Medium Sized Investment Project
MVA	Megavolt-Amperes
MVAr	Megavolt-Ampere Reactive
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
NPV	Net Present Value
OHL	Overhead Line
OPGW	Optical Ground Wire
PASE	Pre-Approval of Solution Engineering
PCD	Price Control Deliverables
PCF	Pre Construction Funding
QCRA	Quantitative Cost Risk Analysis

Abbreviation	Description
QSRA	Quantitative Schedule Risk Analysis
R&C	Risk and Contingency
RRP	Regulatory Reporting Pack
SDS	System Design Specification
SDT	System Design Table
SF6	Sulfur Hexafluoride
SGT	Super Grid Transformer
SLD	Single Line Diagram
SQSS	Security and Quality of Supply Standard
TBC	To Be Confirmed
TEC	Transmission Entry Capacity
tCSNP2	Transitional Centralised Strategic Network Plan 2
TCPA	Town And Country Planning Association
TCSNP	Transitional Centralised Strategic Network Plan
TWR	Transmission Works Review
UIOLI	Use It or Lose It
UK	United Kingdom
UKPN	UK Power Networks
WLCA	Whole-Life Cost Analysis

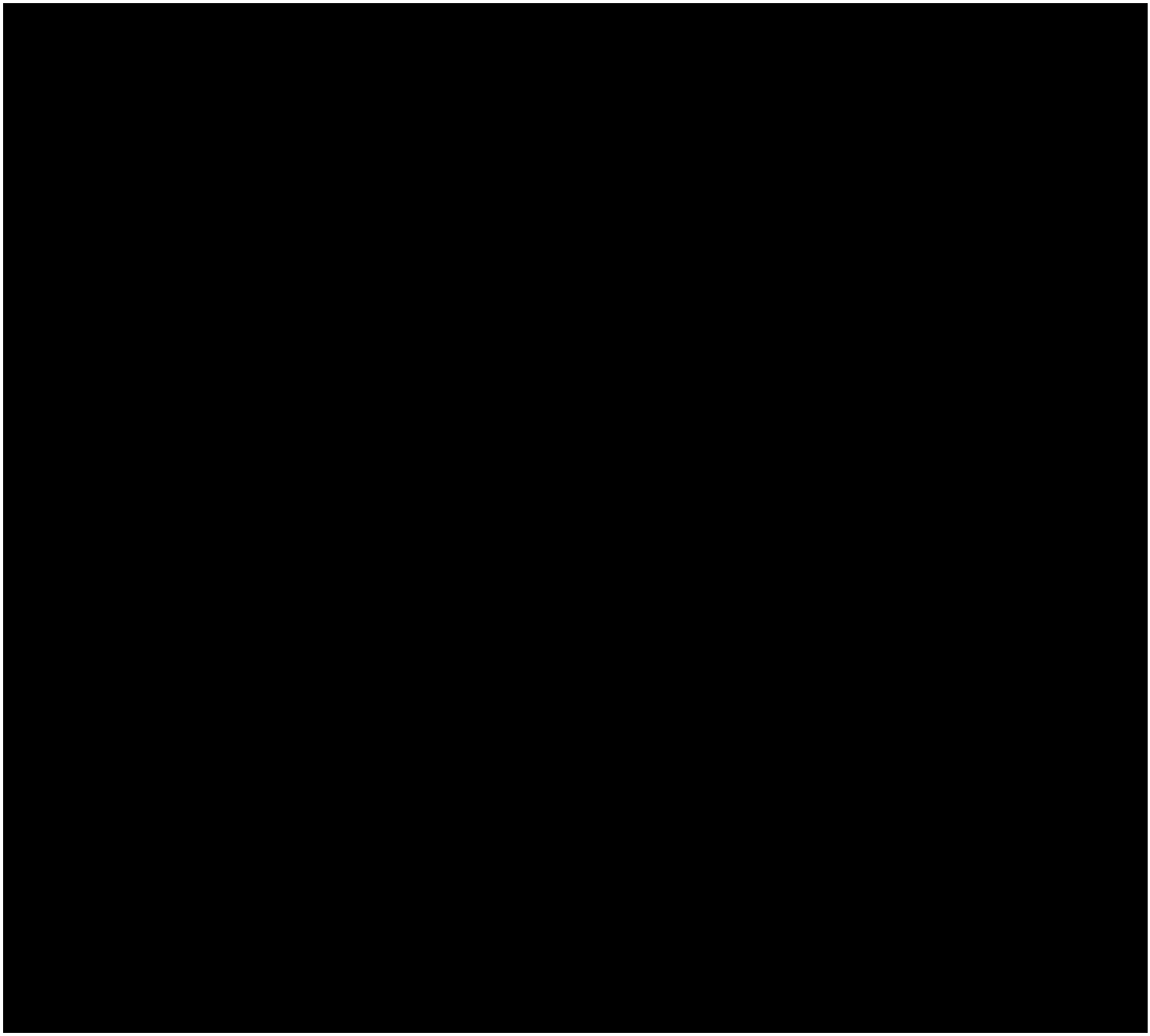


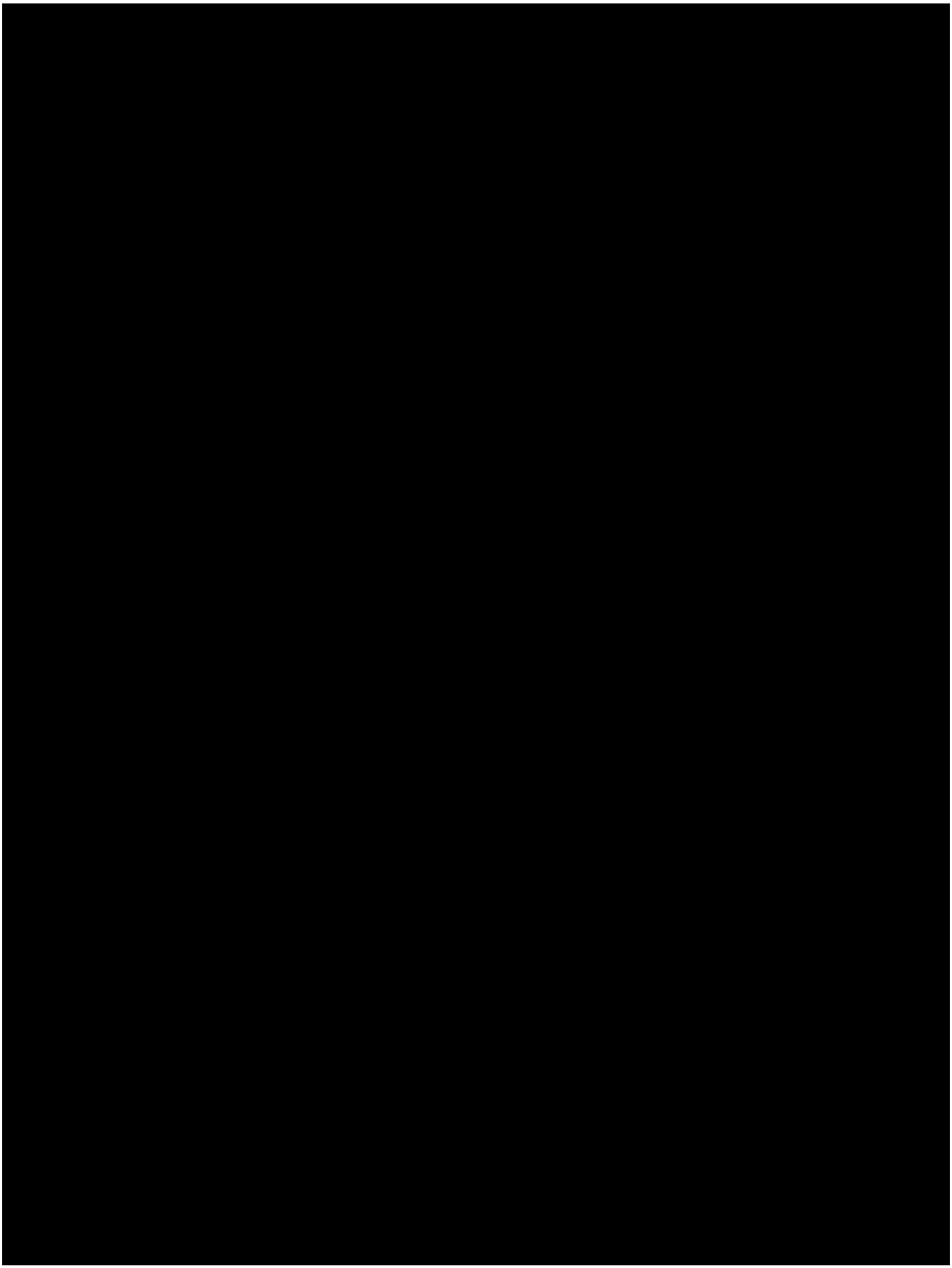
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