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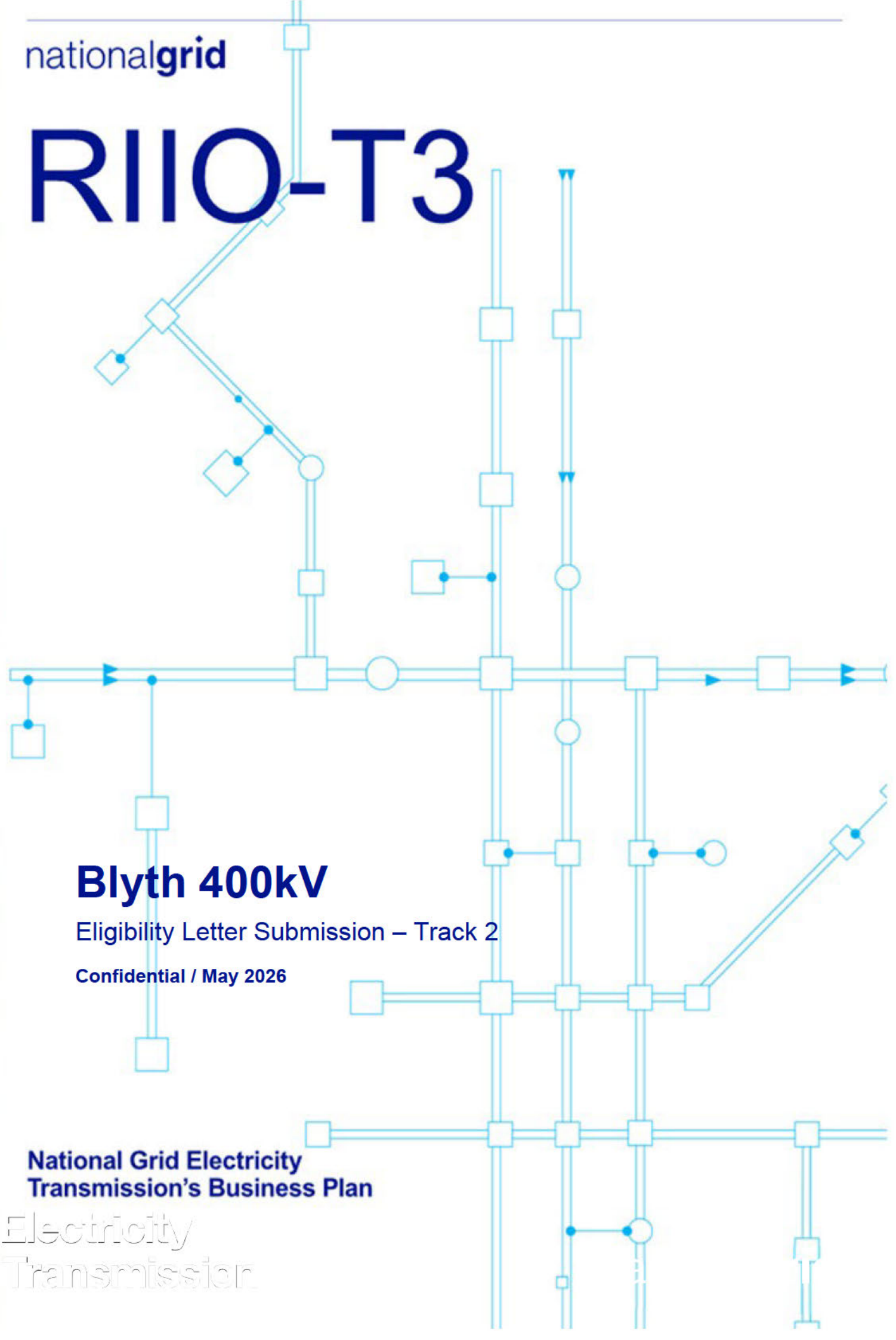

Blyth 400kV

Eligibility Letter Submission – Track 2

Confidential / May 2026

National Grid Electricity Transmission's Business Plan

Electricity Transmission

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Reference and summary table

Field	Description
Project name	Blyth 400kV
TO's preferred re-opener track	Track 2 Eligibility Letter (EL). The proposed track allocation has been discussed with Ofgem and is supported by the Connections Accelerator Service (CAS) assessment.
RRP References	Not Applicable
BPDT / Project Reference Number	NGT500557
Investment drivers	**Customer connections** • **Strategic demand** [redacted] connection underpins one of the UK's first AI Growth Zones, identified by government through the Office for Investment and Connections Accelerator Service (CAS), with a requirement for: [redacted] • **Offshore generation**: [redacted] **Site Strategy Considerations:** Not a formal driver, however, future-proofing of the Blyth site requires optioneering to accommodate potential 275 kV rationalisation and a foreseeable future 66 kV rebuild, ensuring near-term 400 kV connections do not constrain efficient long-term site reconfiguration.
PASE Compliance	The preferred enduring solution (new 400 kV GIS substation) represents a PASE variant, reflecting coastal location and proximity.
Project outputs	• Up to [redacted] demand capacity, [redacted] supporting delivery of one of the UK Government's [redacted] AI Growth Zones • [redacted] offshore wind generation capacity [redacted] supporting UK Net Zero and offshore wind objectives. • Enablement of an optimised layout for the Blyth site in future, in best interests of consumers.
Short list of options considered.	A total of five options shortlisted. Three options are based on permanent GIS solutions utilising NEP1 land adjacent to the existing Blyth substation (*Northumberland Energy Park 1* [redacted] • One option delivers a single-stage permanent 400kV GIS solution, without a temporary connection to meet [redacted] connection date. • Two options adopt a phased approach, incorporating an initial temporary connection [redacted] followed by construction of a permanent 400kV GIS substation as the enduring/permanent solution.

	Two further options are based on permanent 400kV AIS solutions located on an identified land parcel approximately 2km away from the existing Blyth substation: • One option includes a phased approach, with an initial temporary connection arrangement [redacted] ahead of a permanent 400kV AIS substation assumed deliverable on the land parcel. • The second option represents a single-stage permanent 400kV AIS solution assumed deliverable on the land parcel, and without a prior temporary connection.		
Preferred solution and rationale	The preferred solution is Option X1A, comprising a phased approach: • Stage 1:Temporary AIS extension to the existing Blyth 400 kV substation [redacted] • Stage 2: An enduring solution of a new 400kV SF6 free GIS substation adjacent to the existing Blyth 400kV substation, which is justified given the coastal location, siting constraints and delivery timescales. This provides capacity for the subsequent demand and generation connection requirements. • Design intent to ensure that the associated enduring layout preserves space and optionality for potential future 275 kV uplift and 66 kV rebuild, should those needs materialise.		
Expected Forecast Costs	Total cost of the project is currently estimated to be [redacted] (2023/24 prices, including contingency). Total LR funding request [redacted]		
[redacted]	[redacted]		
Applicable Reporting Tables	BPDT 10.5 ET Pipeline log and RRP 2024-25 E1.11_ET Pipeline Log.		
Historic funding interactions	There have been no historic funding allowances awarded to date relevant to this proposed Blyth 400kV investment.		
Interactive projects	• Blyth Stella New Circuit (BSNC) – interface with regional 400 kV circuit reinforcement works. • FSU1 (Fourstones–Harker–Stella West 400 kV OHL Route) – interface with wider 400 kV overhead line reinforcement programme.		
Spend Apportionment	T2 (FY 2022- 2026) [redacted]	T3 (FY 2027 – FY 2031) [redacted]	T4+ (FY 2032 – FY 2037+) [redacted]

1. Executive Summary

1.1. Project Summary

The Blyth 400kV investment brings several important benefits. It enables strategic demand by supporting the development of a UK-designated AI Growth Zone, allowing [redacted] demand to be met within timelines aligned with government goals. This contributes to regional capability, skill enhancement, productivity growth, and long-term consumer advantages through increased economic capacity.

Additionally, the project supports low-carbon generation, making it possible to connect [redacted] This connection offers clear benefits to consumers, such as improved supply security, access to low-carbon energy, and further advancement towards Net Zero targets.

1.2. Purpose of the Submission

This Eligibility Letter and associated Cost Benefit Analysis (CBA) are being submitted as part of the RIIO ET3 Load Re opener (LR) mechanism under Special Condition 3.18 (Load Re opener and Price Control Deliverable) of the Electricity Transmission Licence Conditions. [redacted]

This submission is requesting Ofgem's approval of project eligibility against the Load Re-opener criteria and seeks early-stage views on the project's needs case and optioneering solution for the Blyth 400 kV Substation. The submission further requests Ofgem's determination on the appropriate re-opener track for the project and seeks Pre-Construction Funding (PCF) under Special Condition 3.15 (Pre-Construction Funding Re-opener, Price Control Deliverable).

1.3. Needs Case

Strategic investment at Blyth is required to meet the needs of two nationally significant contracted connection applications:

- [redacted] demand, delivered in stages:

  [redacted] of generation, [redacted]. This investment supports the UK Government's Clean Power 2030 strategy by enabling large-scale offshore wind farm connections by 2030.
- Site Strategy Considerations: Although not a formal driver, the approach to site strategy seeks to maximise the use of the existing Blyth transmission estate by accommodating near-term connection requirements, while avoiding decisions that would constrain the site's long-term layout or limit future rationalisation or reconfiguration of lower-voltage assets.

1.4. Optioneering Overview

Strategic option categories

In line with National Grid's standard optioneering process, options were considered across the following five strategic categories:

1. **A:** Do minimum
2. **B:** Market-based solution
3. **C:** Non-transmission, whole system solution
4. **D:** Making use of existing substations

5. **E:** Building new substations

The strategic assessment identified that a combined approach, making targeted use of the existing Blyth substation to enable early delivery, alongside the development of a separate new enduring substation at Blyth, would be required to deliver an appropriate solution for both contracted demand and generation.

Project Siting

Optioneering was initially undertaken through desktop studies, focusing on land in the immediate vicinity of Blyth 400kV Substation, reflecting both the need to deliver a timely connection in line with contracted ACLs, particularly for contracted demand requirements, and the clear benefits of proximity to connecting customers in reducing delivery risk.

Blyth is, however, a highly constrained site, characterised by a coastal and estuarial setting, with environmental sensitivities and the presence of strategic existing assets (including [redacted] cables and the Blyth–Stella–Eccles 400 kV OHL), and a limited availability of undeveloped land. Within these constraints, assessments identified:

- Limited space within existing NGET-owned operational land capable of accommodating targeted early works
- A small parcel of land immediately adjacent to the existing substation (NEP1 land) that could accommodate a new substation with a restricted footprint.

Ongoing siting study work has identified a potential parcel of land approximately 2km from the existing Blyth 400kV substation that may be capable of accommodating a larger infrastructure footprint; however, at time of submission this remains subject to further assessment and completion of the study. However, sites located further afield from Blyth substation would not support delivery of the contract demand connection within the required timescales at this stage and would not meet the contracted [redacted] connection date.

As a result, the preferred siting solution focuses is a combined use of NGET-owned land and adjacent NEP1 land, supporting a delivery programme better aligned to meeting contracted demand requirements at Blyth.

Technical optioneering

Across the five strategic categories, a comprehensive longlist of options was developed and assessed. At a high level:

- Do minimum, market-based and non-transmission options (A–C) were ruled out on engineering grounds, as they could not deliver compliant transmission-level connections.
- Options relying solely on extensions or rebuilds of the existing Blyth substation (Category D) were ruled out due to insufficient footprint, site constraints, and inability to accommodate both early delivery and long-term capacity requirements.

This process resulted in a shortlist of options, including:

- Option E-2: New Standalone 400 kV GIS Substation with [redacted] Diversion and 400 kV Layout Rationalisation (NEP1 Land)
- Option X1A: Phased Connection Approach – Temporary AIS Extension followed by New 400 kV GIS Substation (NEP1 Land)
- Option X2: Phased Connection Approach – Permanent GIS Extension and Build New 400 kV GIS Substation (NEP1 Land)
- Two further AIS options based on permanent 400 kV AIS solutions located on the alternative parcel of land identified approximately 2km from the existing Blyth substation, along the Blyth–Stella–Eccles OHL route. These options assume that a larger infrastructure footprint could be accommodated on this parcel and that an AIS configuration could be feasible; however, this has not been confirmed through the ongoing siting study yet. As such, these options are presented for indicative comparison only and function as counterfactuals to benchmark alternative siting and technology choices for a permanent solution.

Option X1A is selected as the preferred solution following a detailed qualitative assessment:

- It is the only option that meets the project's contracted delivery requirements, outperforming other technically feasible solutions.

- Decouples early delivery of the initial non-firm connection from the land acquisition, full planning consent, and construction activities necessary for an enduring or permanent solution.
- Ensuring the consumer only funds infrastructure elements of the investment with a appropriate split between customer and consumer funding regarding the temporary works.
- Supports a coherent long-term site strategy, including rationalisation of 400 kV assets and offers optionality for potential future 275 kV uplift and 66 kV rebuild.
- Adopts a GIS solution, justified due to the harsh saline coastal environment at Blyth.

1.5. Costs

The total cost book estimate of the preferred option for investment at Blyth (Option X1A) is [redacted] (2023/24 price base, including contingencies), comprising [redacted] for Stage 1 (accelerated works) and [redacted] for Stage 2 (the enduring 400 kV GIS solution).

Of the [redacted] attributed to Stage 1, [redacted] These costs are excluded from the Load Re-opener funding request [redacted]

On this basis, the net Load Reopener funding request is [redacted] (2023/24 price base, including contingencies), presented on a cost book estimate basis for consistency with the comparative assessment and CBA.

Note: For the purposes of the Load Re-opener submission, Stage 1 costs are presented at [redacted] on a cost book estimate basis to maintain consistency with the level of cost maturity reflected in Stage 2 and across the alternative shortlisted options. However, the Stage 1 solution has subsequently progressed to a more advanced stage of design, and a more developed E-Hub cost estimate of [redacted] is now available, reflecting this increased level of design and cost maturity and providing a more representative view of likely delivery costs.

Further detail on the matured Stage 1 cost estimate, including the cost breakdown and funding treatment, is set out in Section 4.8.3.

1.6. Indicate Delivery Programme

[redacted] These milestones are indicative and remain subject to refinement as the programme develops.

It is recognised that the programme remains challenging and subject to several external dependencies, including land acquisition, planning consent, outages, and third-party agreements. As such, while the preferred option presents the strongest delivery pathway, programme risk remains for this investment.

2. Introduction

2.1 Blyth 400kV Investment Submission

This Eligibility Letter and associated CBA are being submitted as part of the RIIO-ET3 Load Reopener (LR) mechanism under Special Condition 3.18 (Load Re-opener and Price Control Deliverable) of the Electricity Transmission Licence Conditions.

This submission seeks:

- Approval of the investment need to connect strategic demand and offshore generation, and of the proposed optioneering solution, comprising a phased approach of a temporary AIS extension to the existing Blyth 400 kV substation (Stage 1), followed by a new enduring 400 kV GIS substation on adjacent land (Stage 2).
- Confirmation that this investment will be determined as a Track 2 EL Load Reopener investment, reflecting its strategic importance and alignment with in-flight investment arrangements agreed with Ofgem, including consideration of the preferred solution as a PASE variant.
- Approval of Pre-Construction Funding (PCF) under Special Condition 3.15 (Pre-Construction Funding Re-opener and Price Control Deliverable) to support the continued development of the investment.

Subject to Ofgem's determination of the above, NGET will continue development of the project and intends to submit a subsequent Project Assessment, in line with the Load Re-opener process for Track 2 EL investments.

2.1.1 Eligibility, Project Track & PASE

The Blyth 400kV investment submission is eligible for assessment through Load Re-Opener (SpC 3.18) because the investment is required to facilitate a large new contracted strategic demand and generation connection in line with the Licence Condition. This investment in Blyth did not form part of the baseline portfolio for RIIO-T3 Final Determinations.

We request that the project is progressed through the Track 2 EL assessment pathway for the following reasons:

- The project has been identified as suitable for the Track 2 EL pathway, and this approach has been discussed with Ofgem.
- The preferred option is a PASE variant solution comprising a 400 kV GIS substation located in proximity to the coast and therefore aligns with the types of solutions considered under Track 2 EL.
- The Connections Accelerator Service (CAS) assessment in Appendix A1 confirms this investment as being strategically important and therefore suited to a fast-track determination.

2.1.2 Pre-Construction Funding Request

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

Based on our current forecast we have provided below breakdown of costs amounting [redacted] as part of this submission. This equates to [redacted] of the latest total forecast costs project costs.

Table 1 outlines activities covered by PCF allowances based on current PCF and EEW spend. This information will be updated as the investment matures and reconciled at Project Assessment during 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]

2.2 Project Background

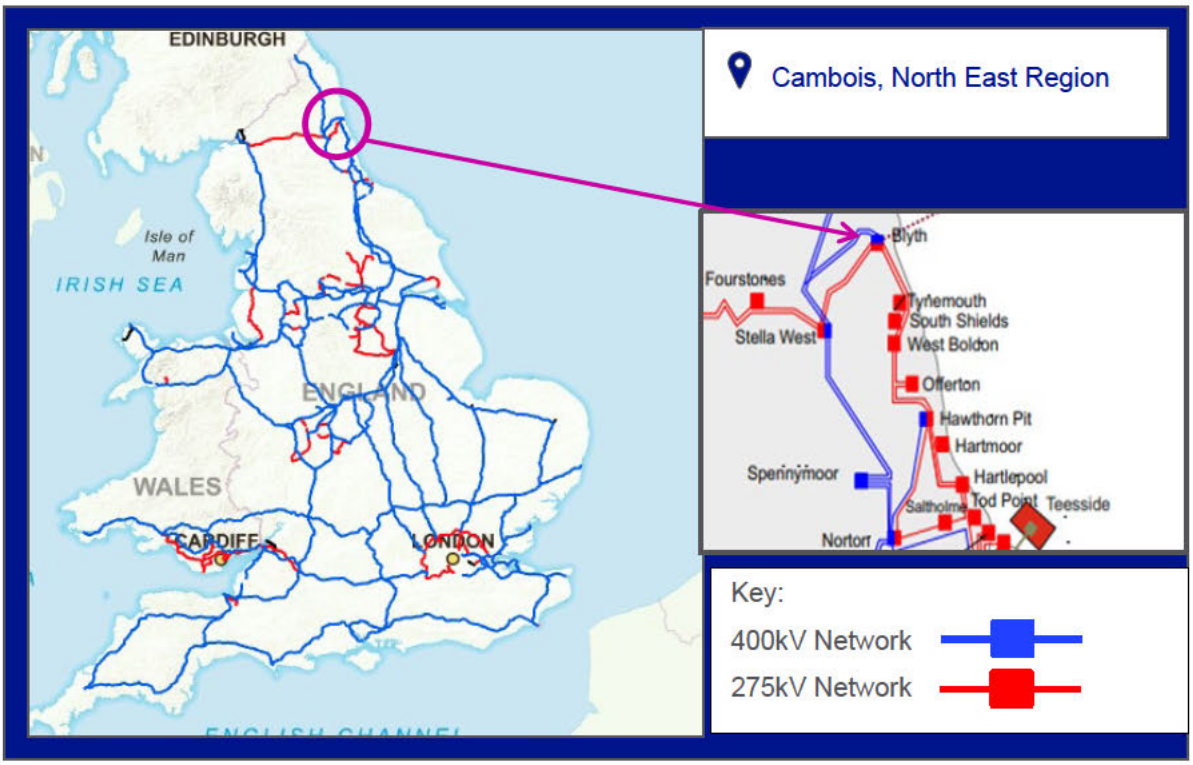
[redacted]

2.2.2 Regional and network context

The proposed investment site is located at Blyth substation in Northumberland, within the North East region of the National Grid Electricity Transmission (NGET) network (see **Figure 1**). The 400kV transmission network in the region has historically been designed to facilitate bulk North-to-South power transfers, supporting the movement of generation from Scotland and the North East into the Midlands and South of England.

Figure 1: Network map highlighting the location of Blyth in the North East region

[1] https://www.gov.uk/government/news/north-east-england-set-for-billions-in-investment-and-thousands-of-jobs-as-uk-and-us-ink-tech-partnership

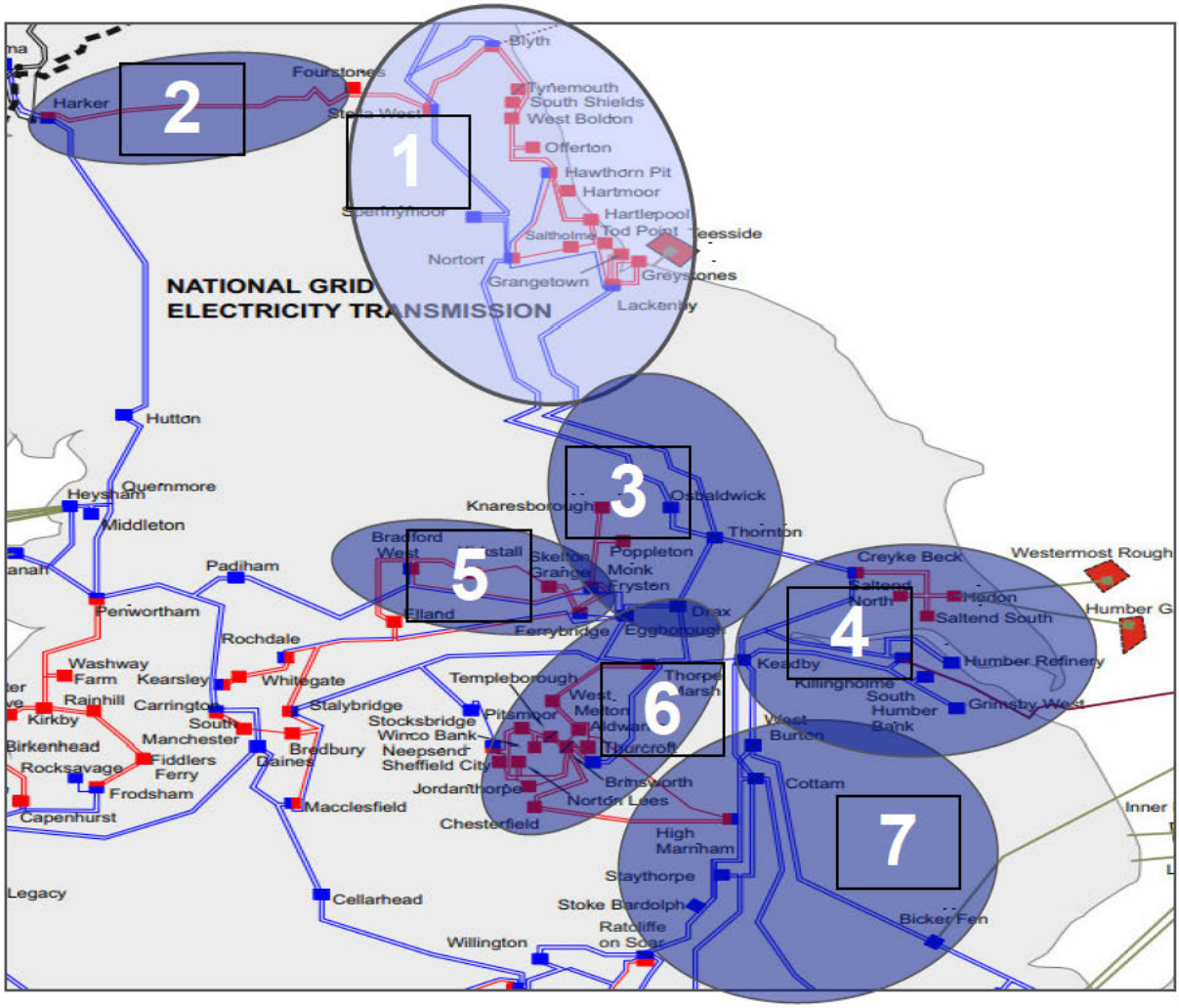


The North East transmission network is sub-divided into several distinct network groupings, reflecting different power flow characteristics and operational roles across the region. Blyth is located on the North East Ring, a strategically important coastal network grouping that plays a critical role in exporting power from the North of England and Scotland into the wider GB transmission system.

The North East Ring is characterised by high through-flows driven by increasing renewable generation, particularly from Scotland, and by its limited number of export routes out of the ring. Power typically exits the ring via key 400kV corridors towards Yorkshire and the Midlands, meaning the ring operates as a constrained exporting system under certain conditions. As a result, faults or outages on critical circuits can quickly lead to system constraints without appropriate reinforcement.

Blyth is in a key location on the North East Ring due to its coastal location and strong integration with the 400kV network. It connects into the Blyth-Stella-Eccles OHL circuit that straddles the B6 boundary between Scotland and England, and is one of a small number of substations on the ring that are highly attractive for both generation and demand customers, given their proximity to the coast and ability to interface directly with strategic transmission infrastructure.

Figure 2: North East ring within the North East Region



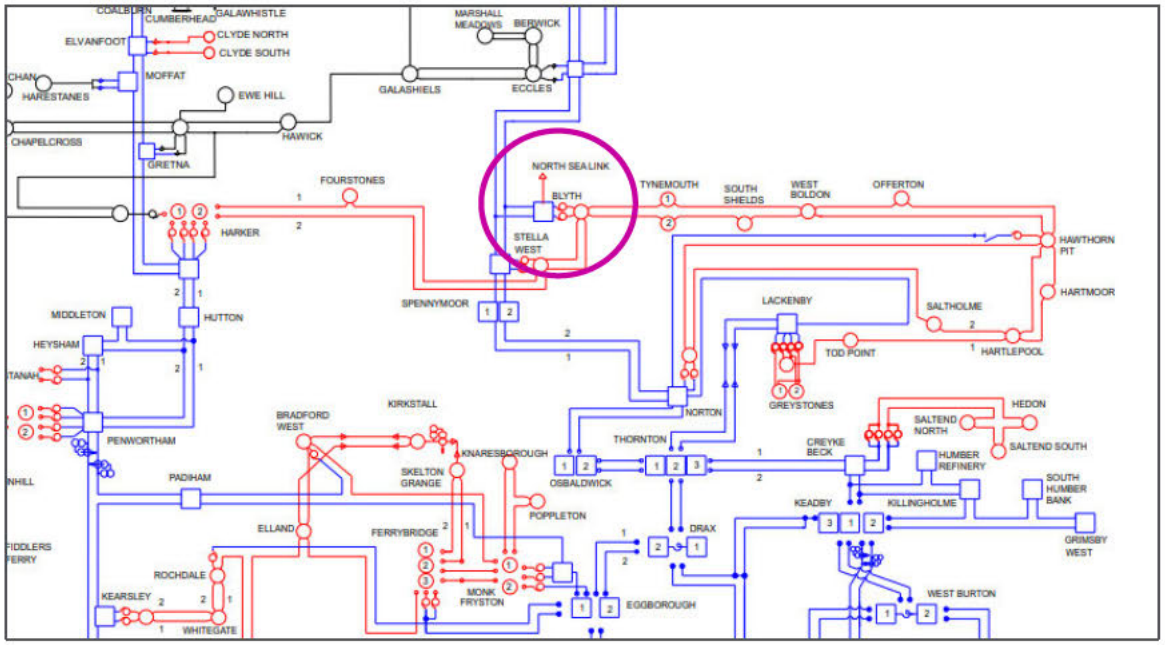
Key: 1. Northeast ring, 2. East – West route, 3. Aire Valley, 4. Humber region, 5. East & West Yorkshire, 6. South Yorkshire, 7.Trent Valley/Lincolnshire region

A defining feature of the North East Ring is the presence of the North Sea Link (NSL) interconnector, which connects at Blyth substation to Kvilldal in Norway. This interconnector enables the export of surplus renewable generation and the import of Norwegian hydroelectric power, providing both energy balancing and voltage support to the regional network. The operation of NSL further reinforces Blyth's role as a strategic interface between domestic transmission flows and international power exchange.

The combination of interconnector operation, offshore wind integration, and increasing north-to-south power flows creates dynamic and bidirectional operating conditions. During periods of high wind generation, the ring can experience elevated power flows and heightened constraint risk, requiring coordinated management across transmission assets.

Electricity demand within the North East is also expected to increase over the coming decades, driven by electrification of industry, transport and heating, alongside the emergence of large strategic demand users. This is evidenced by the scale of developments across Teesside and the wider region, including multiple low-carbon generation, hydrogen and industrial schemes, as well as proposals for large-scale data centre campuses, collectively representing several gigawatts of potential new demand on the electricity system.

Figure 3: Blyth's position within Regional Network Map



2.2.3 Site and Substation Overview

Blyth substation is located immediately adjacent to the Blyth estuary and close to the Port of Blyth. The site occupies a strategically constrained coastal location, bounded by the estuary and North Sea to the east and south, a major A road 1km to the west, and the [redacted] interconnector station, the North Sea Link interconnector station, [redacted], and JDR Cables' new cable manufacturing facility all bordering the site (See **Figure 7**: Site Constraints at Blyth).

The Blyth substation operates at three different voltage levels across the site.:

Blyth 400KV Substation:

The existing 400kV substation was commissioned in 2020 as part of wider reinforcement and connection activity in the North East. The 400kV installation was delivered as a compact outdoor GIS "lean build" substation as part of an innovation exercise with market leaders & suppliers. [redacted]

[redacted]

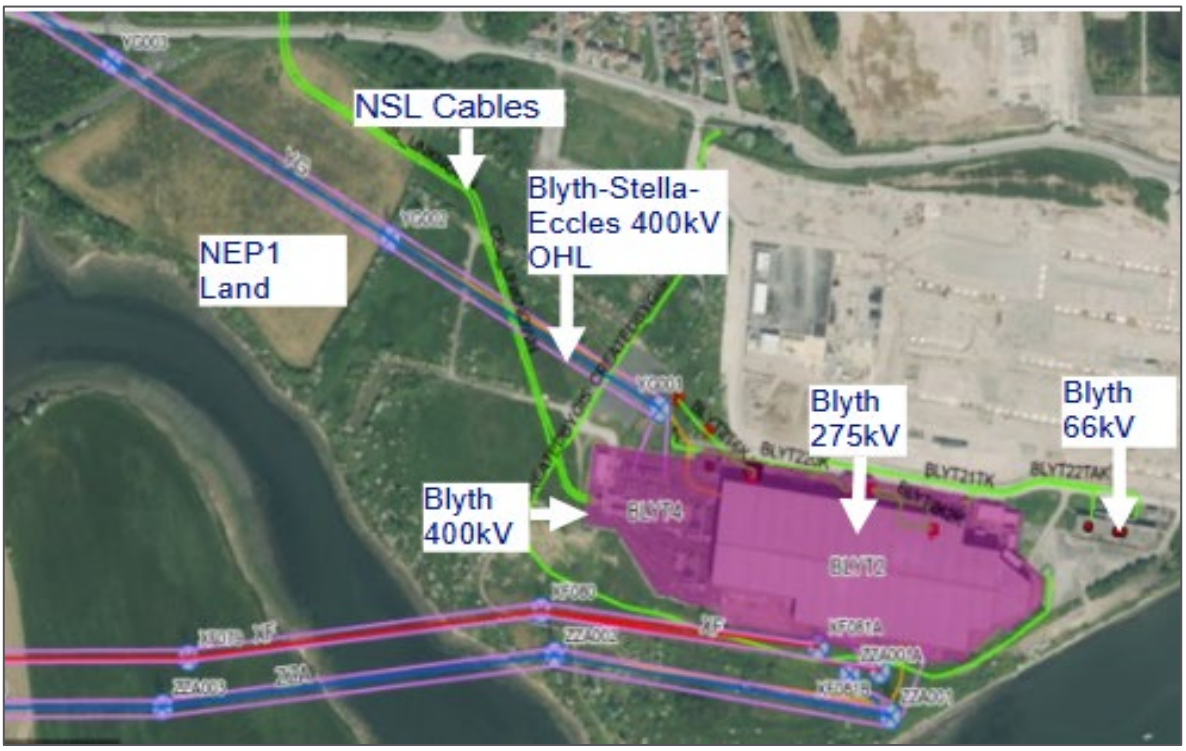
Blyth 275kV Substation

Blyth 275kV substation was originally built as an outdoor AIS substation, however due to its coastal location and historical position adjacent to a coal fired power station, pollution issues early in its life led to an outdoor building being retrofitted over the entire substation in the 1960s.

Blyth 66kV Substation

The Blyth 66 kV Substation was constructed in the 1950s and is one of only a small number of 66 kV substations still owned by NGET. The condition and constraints of the 66kV described below are provided for context only and do not form part of the scope of works or funding request within this submission.

Figure 4: Blyth Substation



2.2.4 Historical Funding

There is no historical funding allowances associated with the proposed Blyth 400 kV investment.

2.2.5 Early Asset Write Offs (EAWO)

The preferred solution for this project includes for diversion the existing North Sea Link cables into the new proposed substation, substation. This is still to be agreed between National Grid Ventures and NESO, however, should the diversion commence, it will likely result in the EAWO of the existing Blyth 400kV outdoor GIS substation.

The estimated remaining Regulated Asset Value (RAV), using our statutory Fixed Asset Register for these works, is [redacted]

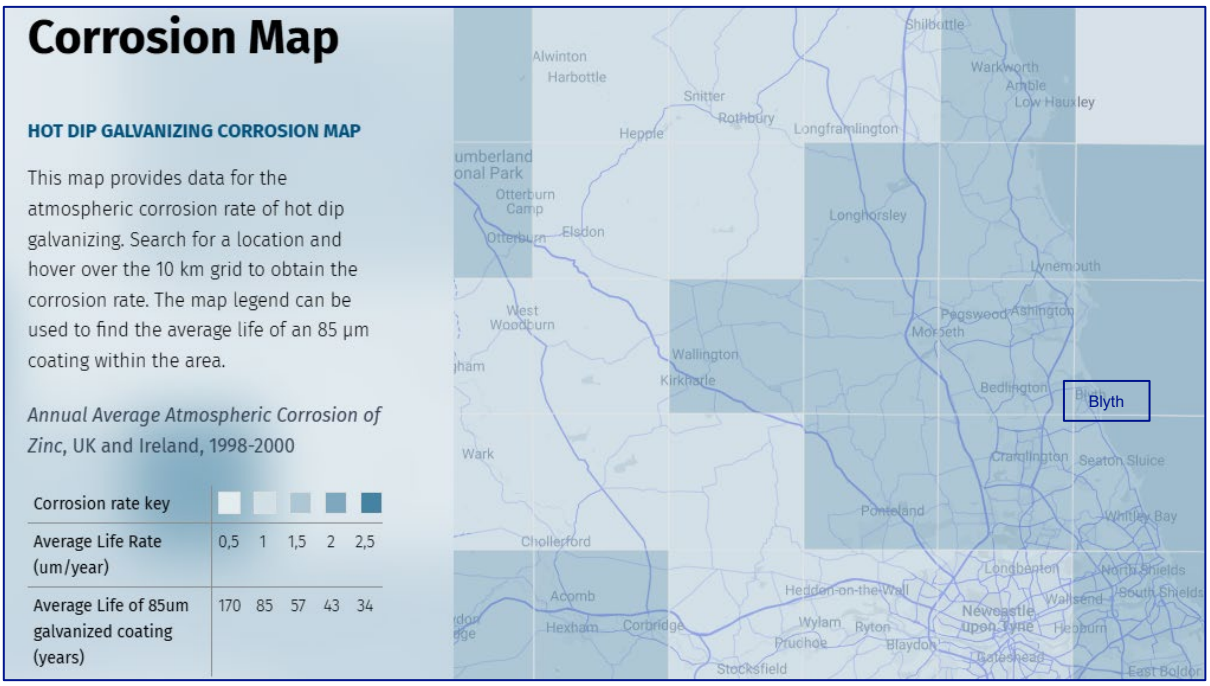
2.2.6 Coastal Proximity

Blyth is located immediately adjacent to the North Sea, with the coastline and Blyth estuary tightly bounding the site to the east and south, and this proximity to the marine environment introduces material considerations for the selection of switchgear technology. The exposed coastal setting results in increased salt-laden air and atmospheric moisture, which elevates corrosion risk and directly influences asset durability and whole-life performance.

In this context, the Galvanizers Association UK corrosion map provides an appropriate and widely used proxy for indicating relative atmospheric corrosivity, showing higher corrosion rates in coastal zones compared to inland locations. The map below is intended to illustrate spatial variation in the

atmospheric corrosion of zinc across the UK based on measured exposure data, and its classification of coastal areas such as Blyth as higher-corrosivity environments supports the need to carefully consider technology choices and protection measures when specifying substation equipment at this location.

Table 2: Galvanizers Association Corrosion Map2



2.2.7 Interactive Projects

[redacted] is dependent on completion of wider strategic infrastructure (SI) reinforcements, which sit outside the scope and costs of this eligibility submission. These reinforcements currently include, but are not limited to:

- FSU1: a new 400 kV overhead line route between Carlisle and Stella, providing additional west–east transfer capability; and
- BSNC: a proposed 400 kV overhead line route between Stella and Blyth, noting that the requirement for this reinforcement remains subject to confirmation.

The need, form, and timing of these wider reinforcements are subject to ongoing Connections Reform–led power system studies and may evolve as system planning assumptions are refined. Where these reinforcements proceed, they are expected to be progressed through separate SI funding routes.

Accordingly, the Blyth scheme is designed on the basis that:

- all temporary and permanent substation works required to accommodate [redacted] demand and generation connections are delivered within the scheme scope; and
- firm capacity is enabled through coordination with wider SI delivery, rather than through an additional staged expansion within this project.

[2] Corrosion Rates in UK & Ireland - Corrosion Map

3. Project Drivers and Needs Case

Table 3: Blyth 400kV investment drivers and offered ACL(s)

Driver	Description	Capacity	ACL(s)	Connection Reform
Strategic Demand Customer connection	[redacted]	[redacted]	[redacted]	[redacted]
Generation Customer connection	[redacted]	[redacted]	[redacted]	[redacted]
Site strategy Considerations *Not within scope of this submission; any proposed design should be developed with a view to preserve the ability to accommodate future site rationalisation, which would be progressed separately under an alternative funding route, if and when required.*	Future Blyth 275 kV / 66 kV substation rationalisation and rebuild	N/A- Enabling infrastructure	N/A – may materialise in future	N/A

*Note: [redacted]

3.1 Customers

There are two primary customer drivers for this investment as summarised below.

[redacted]

Demand Requirement

[redacted]

[redacted]

[redacted]

[redacted] Through the Holistic Network Design (HND) process led by NESO, Blyth was confirmed as the connection location for [redacted], aligning with the UK Government's ambition to deliver 50 GW of offshore wind as part of Clean Power 2030. [redacted]

[redacted]

[redacted]

Overview of customers with contracted connections at Blyth

The customer ACL dates presented in this submission reflect the existing customer 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 Project Assessment.

[redacted]

Following the implementation of Connections Reform, customers associated with the Blyth node have been reclassified through the NESO process as Gate 1 or Gate 2.

In developing the Blyth investment case, these revised connections landscape has been taken into account to ensure appropriate alignment with the gating framework and to provide clarity on which customers are relied upon to justify the investment.

Gate 1 customers have been considered in the development of the investment case to ensure the post-reform connections landscape is appropriately understood. However, Gate 1 customers do not form part of the needs case, cost justification, or scope definition for the Blyth investment.

While some Gate 1 customers may, subject to future progression, ultimately connect at the Blyth node, the proposed investment has not been developed on the assumption of their advancement, and no element of the proposed works is contingent on Gate 1 progression.

Any provision of spare bays or physical capacity within the proposed Blyth design reflects prudent network planning and design flexibility only. It does not anticipate or pre-empt Gate 1 customer progression

3.2 Site Strategy Considerations

Although not an explicit driver to this submission, the existing configuration and condition of the 275 kV and 66 kV assets impose practical constraints on how the Blyth 400 kV solution can be efficiently configured and delivered. Their potential future role has therefore been actively considered within the optioneering to ensure that any proposed solution to meet the near-term connection drivers does not constrain or preclude subsequent site rationalisation in the best interests of consumers.

Any potential reconfiguration or rationalisation of the 275 kV and 66 kV substations is explicitly outside the scope of this submission. However, optioneering has been undertaken with a view and intent to enable and accommodate such works in future, should they be required, with the expectation that these would be progressed under a separate funding route in near future.

275 kV Site Strategy and future considerations

The 275kV substation currently performs an essential functional role at the Blyth site. However, its long-term role is expected to change as supply arrangements are progressively reconfigured, which may reduce the need for a dedicated 275kV installation at Blyth.

Subject to future system studies and the outcomes of wider network development, the site strategy allows for the 275kV infrastructure to be reduced over time, uplifted to 400kV, or for the existing 275kV footprint to be repurposed either to support alternative infrastructure arrangements or to release space to enable a more efficient overall site layout.

Optioneering for the Blyth project must therefore avoid preferred options that lock the site into layouts which constrain future reconfiguration, consolidation, or more effective use of land. Layouts should retain sufficient flexibility to accommodate potential changes in the 275kV system including provision for future 275kV and 66kV SGTs and associated cable routes.

A key constraint is the requirement to divert the NSL cables into the proposed 400kV substation to preserve space for future plant and infrastructure. Preferred options must therefore manage NSL cable routing in a way that avoids sterilising land and prevents long term layout inefficiencies.

This principle is reflected in the Option X1A layouts, which demonstrate how potential future 275kV and 66kV works could be accommodated within the proposed site compound. The layouts are arranged to reduce future delivery risk including minimising cable crossings and avoiding space pinch points thereby reducing the likelihood of abortive works or rework should these future drivers materialise.

66kV Site Strategy and Future Considerations

While this proposed investment as part of this submission does not propose immediate intervention at 66 kV, the Blyth site strategy recognises there is an anticipated requirement for the future replacement or reconfiguration of the 66 kV substation and this will necessitate recabling and associated works.

[redacted] As Blyth's role expands to support large-scale transmission interfaces and strategic customer connections, a future 66 kV rebuild supplied from higher-voltage infrastructure is therefore a foreseeable requirement rather than a speculative one.

This anticipated rebuild acts as a key consideration for the current connection driven project by requiring optioneering to explicitly account for the need to deliver a 66 kV replacement in due course. Credible options for Blyth should avoid layouts, land take or interface arrangements that would constrain a future rebuild or lead to inefficient sequencing, abortive works or additional land pressure. Optioneering is therefore informed not only by near-term connection delivery, but by the requirement to maintain a clear and deliverable pathway for a future 66 kV solution that responds to known asset condition issues and supports the long-term configuration of the Blyth site.

3.3 Asset Health

Though the selection of the preferred load-driven intervention will affect how we manage the health of the assets at this substation, there is currently no fundamental asset health driver for interventions at Blyth 400kV that is considered likely to affect the scope or timing of this project.

4. Optioneering

This section presents our optioneering assessment for accommodating the investment drivers at Blyth. It presents an overview of our design proposals and the optioneering process, including considerations regarding siting as appropriate to the project drivers, and outlines the process of refining an initial long list of options, to a subsequent short list, and the rationale behind the selection of our final preferred solution.

4.1 Strategic Options

Considering the investment drivers at Blyth, a strategic direction-setting exercise was undertaken to establish the appropriate investment approach capable of required demand and generation connections.

As part of this, a set of assessment considerations were established to guide the optioneering process and define credible solutions. These included that solutions should:

- produce economic, consumer efficient, co-ordinated and enduring national infrastructure.
- support the timely provision of additional transmission capacity required to meet the customer drivers.

[redacted]

Table 5: Strategic Option Assessment

Category	Description	Assessment
A: Do minimum	Maintaining the network its current state and not facilitating the new connections.	Not viable. This option would fail to accommodate contracted customer demand and strategic generation.
B: Market-based solution	Accommodating customer demand through the procurement and use of ancillary services only.	Not appropriate. Market-based measures would not provide sufficient or enduring capacity to meet the scale, duration, and certainty of the forecast contracted demand and generation connections.
C: Non-transmission, whole systems solution	The required customer connection is accommodated by a DNO instead of NGET.	Not feasible. The scale of demand and generation exceeds the capability and statutory role of the distribution network. A DNO-led solution would be inconsistent with network planning responsibilities and would not deliver the required transmission-level capacity.
D: Making use of existing substations	Extensions or rebuilds of the substation at Blyth to facilitate the new connections.	Partially feasible at Blyth substation, reflecting proximity to contracted demand and generation customers and the potential to support early delivery requirements. Utilising

		existing substations offer opportunities to defer or reduce new infrastructure; however, site-specific constraints, limited footprint, and the scale of future firm demand and generation significantly limit the extent to which existing sites can accommodate all contracted connections.
E: Building new substations	Facilitating the requested connection by building a new substation.	Feasible in the Blyth area, reflecting the proximity to the contracted demand and generation customers and the ability to accommodate capacity beyond the limitations of existing infrastructure at Blyth.

Outcome of Strategic Options Assessment

Our strategic assessment indicated that, in light of the staged nature of customer connection requirements and the need to meet early delivery milestones, there be merit in considering the use of more than one category of intervention to support the timely delivery of contractual obligations, in the best interest of consumers.

In this context, consideration was given to taking forward a combination of targeted use of the existing Blyth substation to support early requirements, alongside the potential development of a new substation solution to accommodate future firm demand and generation connection. This approach would require appropriate consideration of charging arrangements, to ensure that costs are allocated in a manner consistent with the best interests of consumers (see section 4.8.4).

4.2 Siting Optioneering

In light of the strategic assessment above, National Grid undertook desktop siting in the vicinity of Blyth 400kV substation. This assessed the extent to which existing infrastructure and surrounding sites could be utilised or developed, taking account of the delivery requirements arising from the connection drivers. The assessment considered land availability, site-specific constraints and footprint requirements,

Site constraints at Blyth

Blyth is a highly constrained and congested coastal site, and this materially shaped the siting outcome. Land availability is limited by a combination of physical, environmental and third-party constraints:

- The site is bounded by the North Sea and Blyth estuary to the east and south, limiting outward expansion.
- The A189 borders the site to the west.
- Adjacent customer landholdings surround the site to the north.
- Existing NGET land to the south is limited and insufficient on its own to meet the delivery requirements.
- Land to the west is crossed by existing strategic assets, including a 400 kV overhead line and the North Sea Link (NSL) interconnector cables, which constrain layout and construction sequencing.

These constraints significantly restrict the number of locations capable of accommodating new transmission infrastructure within reasonable proximity to the existing Blyth substation.

Siting Considerations – Existing Substation Proximity

To support the potential opportunities to accommodate the initial demand requirements, the siting assessment identified that NGET-owned land immediately adjacent to the existing Blyth 400 kV substation could support an initial extension making use of existing infrastructure.

This would involve utilisation of the current 400 kV AIS busbar arrangements to enable connection into new transformer infrastructure located on the adjacent land. A small additional parcel of land would also be required to accommodate the full footprint of the works, which is expected to require minor planning consent.

Siting Considerations – New Substation Development

[redacted] NEP1) was identified as capable of accommodating a new 400 kV substation and associated infrastructure.

It was considered that sites located further afield would introduce significant delivery challenges, including materially longer cable routes, increased environmental and consenting complexity, and potential misalignment with required delivery timeframes.

On this basis, NEP1 represents the only location within reasonable proximity that is capable of accommodating required infrastructure within the relevant constraints.

Benefits of Using Adjacent Land (NEP1)

Focusing the permanent solution on land adjacent to the existing substation provides a number of material benefits:

- Minimises cable routing requirements, reducing the distance and complexity of connections for both demand and generation.
- Reduces construction and interface risk by limiting the extent of new corridors.
- Facilitates future site strategy, including potential rebuild of the 66 kV substation and uplift of the 275 kV substation.
- Enables efficient transfer into the enduring configuration, reducing the need for reconfiguration as the delivery solution moves from initial connection arrangements to the final solution.
- Provides a logistical advantage, due to close proximity to the Port of Blyth (approximately 500 m), enabling direct delivery of large equipment such as Super Grid Transformers and reducing reliance on complex overland transport.

Siting Study and Parallel Progression

For completeness, a siting study has been commissioned to examine whether alternative, larger parcels of land could accommodate an alternative AIS technology solution. Ongoing siting study work has identified a potential parcel of land approximately 2 km from the existing Blyth 400 kV substation that may be capable of accommodating a larger infrastructure footprint; however, this remains subject to further assessment and completion of the study. This includes confirmation of land availability and current use, as well as planning, environmental and consenting considerations. The land parcel remains in relevant proximity (3kms from the North Sea and 2km for Blyth Estuary) to the coast.

At this stage, locations further afield from the existing Blyth substation would not support delivery within the required timeframes and would not align with the initial 2028 demand connection requirements. Accordingly, the project continues to be progressed on the basis of a combined use of NGET-owned land and adjacent NEP1 land, supporting a delivery programme aligned to meeting initial demand requirements.

Notwithstanding this, Options E-5 and E-6 in the subsequent sections of this Chapter present counterfactual options of building an AIS substation on this parcel of land for the purposes of indicative

comparison. These options demonstrate NGET's best endeavours to explore and develop AIS alternatives within the constraints of the current siting assessment.

Figure 9 - Identified land 2km from the existing Blyth substation

4.3 Optioneering Considerations: Diversion of Existing NSL Cables and 400kV OHL

The optioneering process outlined in the subsequent section has taken account of the existing North Sea Link interconnector (NSL) cables and the Blyth–Stella–Eccles 400 kV overhead line, as their presence has influenced the development and configuration of the options considered.

North Sea Link Diversion

The Blyth site strategy has been developed in the consideration of the existing NSL cables, which run directly through the centre of the NEP1 land parcel proposed for development. These cables connect into the existing Blyth 400 kV outdoor GIS substation, commissioned in 2020. All options presented in the subsequent sections have been developed with explicit consideration of the NSL cables; however, their presence represents a significant technical and spatial constraint common to all credible options.

[redacted] ll optioneering scenarios involve multiple crossings of the NSL cables, increasing the technical complexity and overall option viability. Retaining the cables in situ would also constrain the available developable area, limiting the ability to accommodate future strategic requirements at the site, specifically the potential need for the 66 kV substation rebuild and the 275 kV substation uplift.

Against this context, the credible approaches have been developed on the basis of diverting the existing NSL cables into the new substation:

- Diverting the NSL cables into the new substation limits the total number of required cable circuit crossings to four 400 kV crossings: two associated with the initial demand connection requirements and two associated with the interconnection between the existing and new

substations. This derisks the overall build programme and security of supply for the North Sea Link cables.

- Diversion of the NSL cables releases space on the northern portion of the NEP1 land, enabling the future 66 kV rationalisation and 275 kV uplift to be accommodated, while maintaining sufficient space for customer connections.

[redacted]

NSL cables results in higher upfront costs and early asset write-off charges, it ensures a more resilient long-term connection of the NSL interconnector to the National Grid.

- The diversion of the NSL cables into the new substation removes the need for the existing Blyth 400kV GIS substation, which could then be decommissioned, removing SF6 from the grid.

[redacted] In the absence of agreement, the current design intent would need to be materially revised to avoid the existing NSL cable easement, which would likely constrain the overall site layout and limit the extent to which wider site strategy objectives can be realised, although the full impact would only be confirmed as those future schemes progress and their requirements become more defined.

Blyth-Stella-Eccles 400kV OHL Diversion

The Blyth-Stella-Eccles 400kV OHL route (YG route) runs directly through the NEP1 parcel of land, creating a potential electrical hazard during construction and operation. All identified/credible options have therefore considered diverting this existing OHL route to the West hand edge of the NEP1 land, before cabling into the new Blyth 400kV GIS substation. This thereby eliminates the risk of oversailing of the OHL. The current preferred solution is for a new temporary tower to be constructed to the north of the NEP1 land, enabling the construction of the terminal tower in line with the existing YG route.

This will require a temporary tower to be installed to the north of the Brock Lane road. The exact placement of this temporary tower and new terminal tower and gantries is subject to change as surveys are carried out to identify underground services .

4.4 Summary of All Identified Options

In line with our internal processes and Ofgem's *Load Re-opener Guidance*, we have undertaken a proportionate multifactorial assessment of the options to identify the option that offers the best overall outcome for consumers. The assessment considered: Consumer Value, Engineering, Environmental, Consenting and Land, and Deliverability. Each option has been assessed against the relevant factors within these categories.

An overview of the assessment of our longlist options is provided in the table below. **Layout drawings and SLDs are provided in Supporting information Document 'Appendix A3 – Blyth 400kV SLDs and Layout Drawings' to this document.**

[redacted]

Table 6: Longlist of Options considered to accommodate the project drivers at Blyth

Option	Technical Description	Relevant Diagrams or Layout References	Consenting Risks & Environmental Constraints	Rationale for rejecting or taking forward the option
Option A: Do minimum **Not progressed**	The network is kept in its current state, and no new connections are facilitated.	N/A	N/A	**Engineering:** Compliant customer connection not delivered.
Option B: Market-based solution **Not progressed**	Increased customer demand is accommodated through the procurement and use of ancillary services only.	N/A	N/A	**Engineering:** Compliant customer connection not delivered.
Option C: Non-transmission, whole systems solution **Not progressed**	The required customer connection is accommodated by a DNO instead of NGET.	N/A	N/A	**Engineering:** Compliant customer connection not delivered.
Option D: Extension or rebuild of Blyth substation **Not progressed**	Extension or rebuild of the existing Blyth substation.	N/A	N/A – not explored	**Rationale for discounting** Engineering: A simple extension or rebuild of the existing Blyth 400 kV substation was not appropriate because it could not accommodate the combined requirements of [redacted]

Option	Technical Description	Relevant Diagrams or Layout References	Consenting Risks & Environmental Constraints	Rationale for rejecting or taking forward the option
				demand and [redacted] generation. An extension to Blyth was considered when the driver was initially more limited.
Option E-1: : New permanent 400kV GIS substation at Blyth (NEP1 Land) **Not Progressed**	Construction of a new 400 kV GIS substation on adjacent NEP1 land to accommodate all connections, without preceding temporary works to enable initial demand connection requirements. The existing Blyth 400 kV substation and the North Sea Link (NSL) cables remain in situ, with no cable diversion required prior to commencement of construction.	Appendix A3	• Requires agreement for use and acquisition of additional NEP1 land. • No upfront NSL cable diversion, reducing early construction risk. • Retains the majority of existing SF_6-based 400 kV equipment on site.	**Rationale for discounting** Engineering, Delivery & Environment: • While superficially simpler, the option would lock in inefficiencies by not creating space/optionality for future strategic works relating to the 275kV and 66kV substations, increasing the likelihood of future re-work should drivers materialise. • Retains SF6 equipment • Delays all customer ACL dates.
Option E-2: New permanent 400kV GIS substation at Blyth (NEP1 Land) with rationalisation[5] of the existing 400kV substation (Same as Option E-1, but with 400kV rationalisation	Construction of a new 400 kV GIS substation on adjacent NEP1 land to accommodate all connections, combined with diversion of the North Sea Link (NSL) cables into the new substation and rationalise the 400kV substation to create space/optionality for future rebuild of the 275kV and 66kV, This approach does not rely on preceding works to enable initial demand connection capability.	Figure 10	• Requires agreement from NG Ventures and NESO to divert the NSL cables. If this cannot be achieved option reverts to E-1. • [redacted]	**Rationale for shortlisting** Engineering, Deliverability and Environment: • A feasible technical solution for accommodating both connection requirements at the cost of a delay to customer ACL dates. • Taken forward as an enduring GIS solution in the absence of acceleration requirements . • The option enables a layout that does not preclude potential future rationalisation or rebuild of the 275 kV and 66 kV substations, should asset-health or network-strategy requirements materialise.

[5] At Blyth, 400 kV rationalisation refers to consolidating and re-configuring 400 kV assets into a single GIS layout to reduce complexity and preserve space for potential future 275 kV and 66 kV works.

Option	Technical Description	Relevant Diagrams or Layout References	Consenting Risks & Environmental Constraints	Rationale for rejecting or taking forward the option
considered + NSL cable diversion) **Progressed to shortlist**				• Enables the removal of all existing 400 kV SF_6 equipment from the site.
Option E-3: Permanent 400kV DBB Indoor AIS Substation (NEP1 Land) **Not Progressed**	Construction of a new 400 kV AIS Double Busbar substation on adjacent NEP1 land to accommodate all connections, with no temporary works for acceleration.	Appendix A3	• No suitable land identified that could accommodate a 400 kV AIS substation within or adjacent to NEP1 land. • AIS footprint requirements exceed available NEP1 land, even when considering wrap-around or compact layouts.	**Rationale for discounting** Engineering, Land and Deliverability: • Rejected because a 400 kV AIS substation cannot be physically accommodated within the NEP1 land parcel, even under the most compact configuration. As a result,, the option was assessed as undeliverable from a land and layout perspective.
Option E-4: Permanent 400kV Wrap around AIS Substation (NEP1 Land) **Not Progressed**	Construction of a new 400 kV wraparound AIS substation on adjacent NEP1 land to accommodate all connections. A wraparound arrangement to optimise layout. This approach would not include preceding works to enable initial demand connection capability.	Appendix A3	• No suitable land identified that could accommodate a 400 kV AIS substation within or adjacent to NEP1 land. • AIS footprint requirements exceed available land, even when considering wrap-around or compact layouts.	**Rationale for discounting** Engineering, Land & Deliverability: Rejected because a 400 kV AIS substation footprint cannot be physically accommodated within the NEP1 land parcel, even under the most compact configuration. As a result, the option was assessed as undeliverable from a land and layout perspective.
Option E-5 Phased Connection Approach - Temporary AIS Extension followed by a New Permanent Indoor 400 kV	A temporary AIS extension to the existing Blyth 400 kV substation to enable initial demand connection capability, followed by construction of a new 400 kV AIS substation on the land identified ~2kms to the west of the existing Blyth substation to provide the enduring solution for all	Figure 13 & 14	• The siting study undertaken to identify the suitable parcel of land is yet to be complete, so the selected site may still be proven to be unsuitable subject to further investigation.	**Rationale for shortlisting** Engineering & Initial Deliverability: • Retained as a credible AIS counterfactual, demonstrating that alternatives to GIS have been considered. • Enables for delivery of initial demand connection requirements in line with contracted timeline.

Option	Technical Description	Relevant Diagrams or Layout References	Consenting Risks & Environmental Constraints	Rationale for rejecting or taking forward the option
AIS Substation (Off-Site) **Progressed to shortlist**	connections. Once the new AIS substation is commissioned, elements (SGTs) of the temporary AIS arrangement is removed and transported over to the permanent new AIS substation. The North Sea Link (NSL) cables and existing 400kV GIS substation would be remain in situ. No consideration would be made for the existing 275kV substation and potential uplift to 400kV. Should the driver for the 66kV substation rebuild materialise it would be located within the NEP1 land and would require extended lengths of 66kV cabling from the new 400kV AIS substation to feed it.		• Due to the proximity to the coast and historic issues with the existing Blyth 275kV substation the new substation would need to be an indoor AIS substation to protect it from the harsh environment. • At this stage it is assumed that CPO will be required to acquire the land, adding significant timescales onto the ACL dates. • The extent of environmental surveys required as part of EIA screening has still to be identified.	• A technically credible approach to providing initial connection capability and has therefore been progressed to shortlist. • The delivery of a new permanent 400 kV AIS substation is subject to significant delivery uncertainty due to ongoing siting, land acquisition and consenting activities. • Does not support coordinated development of the Blyth site and introduces additional system inefficiencies (e.g. 66 kV routing). • Additional inefficiencies as temporary works are not retained within the enduring solution. • Requires indoor AIS due to coastal conditions, increasing complexity and cost.
Option E-6 Permanent New Indoor 400kV AIS substation (Off-site) **Progressed to shortlist**	A new 400 kV AIS substation on the land identified ~2kms to the west of the existing Blyth substation to provide the enduring solution for all connections. The North Sea Link (NSL) cables and existing 400kV GIS substation would be left in situ. No consideration would be made for the existing 275kV substation and potential uplift to 400kV. Should the driver for the 66kV substation rebuild materialise it would be located within the NEP1 land and would require extended lengths of 66kV cabling from the new 400kV AIS substation to feed it.	Figure 15	• The siting study undertaken to identify the suitable parcel of land is yet to be complete, so the selected site may still be proven to be unsuitable subject to further investigation. • Due to the proximity to the coast the substation would need to be an indoor AIS substation to protect it from the harsh environment. [redacted]	**Rationale for shortlisting** Engineering: • Taken forward as a pure AIS comparator, representing a non-phased alternative independent of the existing site. • While this option would add significant time onto the customer ACL dates and cost onto the consumer, it is a technically feasible engineering solution in theory. • Does not integrate with Blyth site strategy and increases future system inefficiencies. • Requires indoor AIS with associated cost and environmental impacts due to coastal conditions. • Delays would materially impact delivery of strategic demand and associated benefits. • Highly uncertain due to incomplete siting study, land acquisition, consenting and construction requirements.

Option	Technical Description	Relevant Diagrams or Layout References	Consenting Risks & Environmental Constraints	Rationale for rejecting or taking forward the option
			[redacted] • The extent of environmental surveys required as part of EIA screening has still to be identified.	
Option X1A: Phased Connection Approach - Temporary AIS Extension followed by New 400 kV GIS Substation (NEP1 Land), with NSL Diversion. **Progressed to shortlist**	A temporary AIS extension to the existing Blyth 400 kV substation to enable initial demand capability, followed by construction of a new 400 kV GIS substation on adjacent NEP1 land to provide the enduring solution for all connections. Following commissioning of the new GIS substation, the temporary AIS arrangement would be removed, with associated assets reconfigured within the new substation for permanent operation. The North Sea Link (NSL) cables would be diverted into the new substation, and the overall site layout configured to preserve space and optionality for potential future 275 kV network uplift and 66 kV substation redevelopment, should those requirements materialise.	Figure 11	• NGET benefits from permitted development rights on existing operational land; however, the Stage1 temporary extension marginally exceeds this boundary, requiring minor planning permission. • It is necessary to demonstrate that Stage1 is a standalone temporary project, distinct from the NEP1 new substation in stage 2, to avoid triggering EIA-related delays. • The site is adjacent to several designated environmental areas, and Natural England has advised that up to 12 months of surveys are required for the first phase. • [redacted]	**Rationale for shortlisting** Engineering, Deliverability, Consumer Value & Environment: • Supports delivery of initial demand connection requirements within contracted timelines, while enabling development of the enduring solution in parallel. • Some assets delivered as part of the initial connection arrangements would not be retained within the enduring solution and would be decommissioned; [redacted] • The permanent solution enables the removal of all 400 kV SF_6 equipment from the site, delivering a clear environmental benefit relative to other options. • Delivers a 400 kV layout that does not constrain future site evolution, deliberately preserving space to enable potential future rationalisation or rebuild of the 275 kV and 66 kV substations, should asset-health or network-strategy requirements arise.

Option	Technical Description	Relevant Diagrams or Layout References	Consenting Risks & Environmental Constraints	Rationale for rejecting or taking forward the option
			[redacted] If this cannot be achieved the second Stage of the Option reverts to an option similar to E-1.	
Option X1B: Phased Connection Approach - Temporary AIS Extension followed by New 400 kV GIS Substation (NEP1 Land), without NSL Diversion **Not Progressed**	A temporary AIS extension to the existing Blyth 400 kV substation to enable initial demand connection capability, followed by construction of a new permanent 400 kV GIS substation on NEP1 land to provide the enduring solution for all required connections. Under this option, the North Sea Link remains connected to the existing Blyth 400 kV substation and is not diverted into the new GIS. Indicative layouts also tested the potential uplift of the 275 kV substation into the new 400 kV site and the inclusion of a new 66 kV substation with associated connections.	Appendix A3	• Retaining NSL within the existing Blyth 400 kV substation significantly constrains the available land for new infrastructure. The resulting site arrangement is highly congested and requires extensive cable routing and crossings, increasing planning, environmental, and constructability risk.	**Rationale for discounting** Engineering: • This option represents a less efficient variant of Option X1A, failing to deliver the same level of site optimisation, constructability, and future optionality. • Retaining NSL within the existing Blyth 400 kV substation leads to a constrained and congested site layout with a high number of cable crossings and complex routing requirements. This introduces increased delivery, constructability, and programme risk.
Option X2: Phased Connection Approach – Permanent GIS Extension and Build New 400kV GIS substation (NEP1 Land)	A permanent GIS extension to the existing Blyth 400 kV substation (i.e. initial connection infrastructure is not temporary and is retained as part of the enduring solution), accommodating both demand and generation connection requirements, followed by construction of a new 400 kV GIS substation on adjacent NEP1 land to support future connections.	Figure 12	• Spacing considered to be a risk to fitting GIS solution into the extension parcel of land, considering the need for a building around the GIS switchgear. • Retains the majority of existing SF_6-based 400 kV equipment on site.	**Rationale for shortlisting** Engineering: • Progressed on the basis of technical feasibility, as a GIS-based phased alternative without temporary AIS, allowing comparison of different staged approaches. • However, the combination of bespoke GIS interfaces, extended equipment lead times, operational complexity and ACL delivery risk meant it was not considered the most deliverable staged solution particularly with regards to initial demand requirements.

Option	Technical Description	Relevant Diagrams or Layout References	Consenting Risks & Environmental Constraints	Rationale for rejecting or taking forward the option
Progressed to shortlist	This option relies on non-SF_6 GIS technology, requiring development of a bespoke interface between the existing SF_6 equipment and the new clean-gas GIS.		• Transition from SF_6 to clean-gas GIS may not be feasible, potentially requiring an SF_6-based interim solution, reducing environmental benefit.	• Retains existing GIS, limiting full site rationalisation opportunities. • Higher delivery risk due to bespoke GIS interfaces and equipment lead times. Less certain to meet [redacted] connection requirements compared to X1A.

Influence of Stakeholders on Optioneering

In assessing the longlisted options, stakeholder considerations have been taken into account where third-party assets or interfaces are present, recognising the need to work with stakeholders to ensure options can be developed and delivered.

The most material influence arises from the presence of the [redacted] cables within the NEP1 site. The ability to divert or accommodate these cables directly affects the feasibility and layout of options that can be progressed for the enduring solution on the site, [redacted]

In addition, coordination with [redacted], is required where their assets interface with the proposed works. This is particularly relevant to enabling any initial temporary connection arrangements, where diversion of existing distribution cables is necessary to facilitate construction. [redacted]

4.5 Shortlist of options considered

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

- E-2: New Standalone 400 kV GIS Substation with NSL Diversion and 400kV Layout Rationalisation (NEP1 Land)
- X1A: Phased Connection Approach - Temporary AIS Extension followed by New 400 kV GIS Substation (NEP1 Land)
- X2: Phased Connection Approach – Permanent GIS Extension and Build New 400kV GIS substation (NEP1 Land)
- E-5: Phased Connection Approach – Temporary AIS Extension followed by New Indoor 400kV AIS Substation (Off-site)
- E-6: New Indoor Standalone 400kV AIS Substation (Off-Site)

For clarity: references to *Stage 1* denote the [redacted] solution delivered to facilitate early connection capability, while references to *Stage 2* denote the subsequent construction of the enduring 400 kV substation solution.

4.5.1 Shortlist Option E-2: New Standalone 400 kV GIS Substation with NSL Diversion and 400kV Layout Rationalisation (NEP1 Land)

Description

Option E-2 is delivered as a single-phase, standalone solution, providing the full enduring configuration at Blyth without reliance on preceding works to enable initial demand connection capability.

It delivers a full new 400 kV GIS standalone substation on adjacent NEP1 land, designed to accommodate all existing and future connections at Blyth. The solution utilises non-SF_6 GIS technology and considers a complete re-configuration of how 400 kV assets are arranged on the site.

The scope includes construction of a new 400 kV GIS substation incorporating all customer and system connections, alongside the diversion of the North Sea Link (NSL) 400 kV cables into the new 400kV substation. Once the new 400kV GIS substation is operational, the existing Blyth 400 kV switchgear is decommissioned, allowing the 400 kV network at Blyth to be consolidated into a single, coherent layout.

This option builds on the benefits of a new-build GIS solution (as identified under Option E-1) [redacted] diversion offers tangible benefits, including a reduction in cable crossings, the opportunity for dedicated bays for each circuit, and improved long-term system resilience. Where feasible, operating arrangements such as single-pole running could be explored to reduce total outage duration during the diversion works.

From a site-strategy perspective, Option E-2 offers significant advantages. By diverting both the NSL cables and associated 400 kV overhead line circuits into the new GIS substation, a substantial portion of the existing easement and constrained land is released. This creates a larger area of usable land within the Blyth site, which can support future site development, improved layout [redacted]

A further benefit of this option is the removal of all existing SF_6 based 400 kV equipment from the site. This delivers a clear environmental benefit while also addressing known site condition challenges associated with the existing Mitsubishi compact outdoor GIS, which operates in a harsh coastal environment. The resulting land release and simplified layout also preserve flexibility for potential future works at 275 kV and 66 kV, should asset health or network strategy requirements materialise.

[redacted]

[redacted]

4.5.2 Shortlist Option X1A: Phased Connection Approach - Temporary AIS Extension followed by New 400 kV GIS Substation (NEP1 Land)

Description

Option X1A adopts a phased delivery approach, comprising an initial AIS extension to the existing Blyth 400 kV substation to enable early demand connection capability, followed by construction of a new non-SF_6 400 kV GIS substation on adjacent NEP1 land to provide the enduring network solution for all required connections at Blyth (i.e. consistent with the enduring configuration delivered under Option E-2).

Stage 1 Initial Temporary AIS extension:

The initial connection arrangement is delivered through a temporary AIS extension to the existing Blyth 400 kV substation, supporting delivery of initial demand connection requirements in line with contracted delivery timeline:

- This is achieved by establishing a banked tee-off connection from the 400/275 kV interbus transformers (SGT5 and SGT6), with targeted modifications to the existing AIS busbars, including installation of isolators and cable sealing ends. From these tee-off points, temporary 400 kV cable circuits connect to two new Stage 1 SGTs, enabling early energisation while preserving the ability to transition to the enduring solution.
- This is considered to be a temporary solution as there is insufficient space within the banking arrangement to enable a disconnector to be installed at the Tee off the busbar for the Blyth 400/275 interbus transformers. Without this disconnector an outage would be required on

the interbus transformers themselves should a fault occur on the 400kV cables and equipment up to the HV side of the new Stage 1 SGTs, putting the whole of the Blyth 400kV substation on single bar fault risk. While this risk can be tolerated for a short period of time, the enduring strategy must be to reconnect the new Stage 1 SGTs into the new substation once built.

Stage 2 Enduring GIS Substation:

The enduring solution is delivered through construction of a new 400 kV GIS substation on adjacent NEP1 land, consistent with the configuration described under Option E-2. This substation is designed to accommodate full demand and generation connection requirements at Blyth.

- Once commissioned, the temporary Stage 1 arrangements are removed, and the Stage 1 transformers are re-cabled into their permanent 400 kV GIS bays. Assets installed during Stage 1, including cable sealing ends, are recovered and re-used where possible, including for integration of the existing 275 kV transformers into the new substation, minimising abortive work.
- As part of the enduring configuration, the design provides for diversion of the North Sea Link (NSL) cables into the new GIS substation. This enables consolidation of all 400 kV infrastructure into a single, coherent layout and supports a more efficient overall site configuration. The arrangement also preserves space and optionality for potential future rationalisation or rebuild of the 275 kV and 66 kV substations.
- [redacted] hen this option would revert to an option similar to Option E-1, with a corresponding reduction in the extent to which wider site strategy objectives can be realised.

While Option X1A includes limited initial works to support early demand connection capability, these are restricted to what is necessary to meet contracted delivery timelines. Any associated write-off costs are treated as one-off, customer-funded expenditure, ensuring that consumers are not exposed to inefficient or avoidable costs.

[redacted]

4.5.3 Shortlist Option X2: Phased Connection Approach – Permanent GIS Extension and Build New 400kV GIS substation (NEP1 Land)

Description

The option seeks to accommodate early connection capability through a permanent GIS extension to the existing Blyth 400 kV substation, rather than a temporary AIS arrangement, followed by construction of a new 400 kV GIS substation on adjacent NEP1 land to support future connection requirements.

This option does not provide the scope for 400 kV consolidation, as the existing 400 kV substation is retained. As a result, Blyth would continue to operate with multiple 400 kV substations alongside separate 275 kV and 66 kV substations across several compounds, leading to a more fragmented and less efficient overall site configuration.

Stage 1 Permanent GIS Extension:

- A permanent GIS extension is constructed within the footprint of the existing Blyth substation to accommodate initial demand and generation connection requirements. This approach makes use of existing National Grid-owned land, which benefits from established planning consent, and seeks to minimise early land acquisition.
- However, this configuration requires integration between existing SF_6 GIS based equipment and new non-SF_6 GIS via a bespoke, non-type-registered busbar interface prior to the stage 1 connections being completed. This introduces additional technical complexity relative to standardised designs, alongside increased delivery and manufacturing risk.
- From a spatial perspective, the initial extension compound has insufficient space within the extension parcel of land compared with a temporary AIS banking arrangement in Option X1A due to the existing 275kV OHL oversailing transformers to the south of the compound. This would necessitate a diversion of that OHL to enable construction to proceed.

Stage 2 Enduring GIS substation:

The scheme transitions to an enduring 400 kV GIS substation, constructed on adjacent NEP1 land. This accommodates [redacted] end-state demand, [redacted], additional circuits, mechanically switched compensation, and provision for potential future transformer requirements associated with a potential 66 kV substation replacement.

4.5.4 Shortlist Option E-5: Phased Connection Approach - Temporary AIS Extension followed by New 400 kV AIS Substation (Off-Site)

Description:

Option E-5 follows the same initial approach as Option X1A. providing early demand connection capability through a temporary AIS extension to the existing Blyth substation.

However, unlike Option X1A, which transitions to the enduring GIS solution on NEP1, this option replaces the permanent solution with a technology and siting deviation, comprising a new off-site 400 kV AIS substation at a site identified 2kms to the west of the existing Blyth substations. It reflects the conclusion that a permanent AIS solution cannot be accommodated within the existing NEP1 land boundary.

Costs developed for this option in the CBA are based on a substation being built within this identified land, with the existing Blyth-Stella Eccles OHL being diverted into this substation. As this is still only an emerging option to present the counterfactual argument, there are no site-specific layouts that have been developed for this site and costs are based on an assumed configuration.

The timescales required to site, develop, consent and construct a new AIS substation off-site will not align with the contracted connection timelines for demand and generation connections. Therefore, this option includes the temporary AIS banking arrangement, consistent with Option X1A, to enable initial demand connection capability ahead of completion of the new substation.

Stage 1 Initial Temporary AIS Extension:

- Consistent with Option X1A, a temporary AIS banking arrangement is implemented at the existing Blyth substation to support initial demand connection capability within contracted timelines

Stage 2 Enduring Off-site 400kV AIS:

The scheme transitions to a new indoor 400 kV AIS substation at the off-site location. Due to the coastal environment, an indoor configuration is required, resulting in a material cost increase relative to a conventional outdoor AIS solution.

- As with Option X1A, this temporary banked connection would not constitute an enduring solution. The scheme transitions to a new indoor 400 kV AIS substation at the off-site location. Due to the coastal environment, an indoor configuration is required, resulting in a material cost increase relative to a conventional outdoor AIS solution.
- Following commissioning of the new substation, associated assets would require relocation and reinstallation, resulting in material asset write-off costs associated with temporary works, including land, civils and electrical infrastructure.
- Locating a new 400 kV AIS substation away from the existing Blyth site also prevents alignment with longer-term strategies for the existing Blyth 400 kV and 275 kV substations. Any future rebuild of the 66 kV substation would be expected to remain adjacent to the existing Blyth site but would instead need to be supplied from the remote AIS substation to ensure longevity of its supply. This would require extensive additional 66 kV cable routes, materially increasing cost and complexity when considered against a holistic site-wide strategy.

The site that has been identified a potentially suitable for an AIS substation has an existing DNO OHL passing through. This would require diversion prior to any construction works commencing, and at initial assessment this may require some significant modifications by the DNO to avoid the proposed site.

4.5.5 Shortlist Option E-6: New 400 kV AIS Substation (Off-Site)

Description:

As with Option E-5, this option considers a new off-site 400 kV AIS substation, at a site identified 2kms to the west of the existing Blyth substations.

Unlike Option E-5, this option does not include an initial temporary connection and instead considers only the permanent, enduring AIS solution. As the proposed site is still yet to be fully proven as suitable through the siting study, and given the timescales required to site, develop, consent and construct a new AIS substation in a process that is assumed to require [redacted] and OHL diversions from the DNO, the option performs poorly from a deliverability perspective. Taken together, these factors would result in material delay to the ACL dates for both [redacted].

4.6 Qualitative Assessment of Shortlisted Options

Table 7: Evaluation of shortlisted options

	Optioneering Categories				
Option	Engineering	Environmental	Deliverability	Economic/Consumer Value	Consenting /Stakeholder
Option E-2: New Enduring 400 kV GIS substation on adjacent NEP1 Land (incl. for potential NSL cable diversion + 400kV rationalisation)	• Subject to diversion of the North Sea Link (NSL) cables, Option E delivers full rationalisation of the Blyth 400 kV site by design for consolidation of all 400 kV assets into a single new GIS substation located on NEP1 land, enabling decommissioning of the existing 400 kV substation. • Avoids the need for SF_6-to- SF_6 free transition bays that would otherwise be required to interface between retained legacy 400 kV GIS equipment and new GIS plant where full rationalisation is not achievable. • [redacted] equipment is removed, simplifying long-term asset management. • The design intends for diversion of NSL cables, reduces cable crossings and releases constrained land, leaving space for future rebuild of the existing 66 kV substation and uplift of the 275 kV substation, supporting a coherent long-term site strategy. • Consolidation into a single GIS substation also improves layout efficiency, though cable congestion within one	• Removes all 400 kV SF_6-filled equipment from site and replaces it with clean-gas GIS technology, delivering a clear environmental benefit aligned with National Grid's SF_6 reduction strategy. • Indoor GIS substation avoids issues with saline environmental exposure to NGET owned outdoor AIS equipment. [redacted] nd the Blyth 275kV AIS substation that was originally built as an outdoor substation and subsequently had a hanger retrofitted around it. Building an indoor GIS substation avoids these issues for this build. • NEP1 land sits within an ecologically sensitive context, adjacent to designated sites including the Northumberland Marine SPA, Ramsar sites, and SSSIs. A solution within this land has the potential to disrupt natural habitats, although environmental surveys are still ongoing to quantify and mitigate this.	• Relies on delivery of a single, permanent GIS solution and does not include transitional arrangements to enable earlier connection capability. • As a result, delivery of connection requirements would be dependent on completion of land acquisition, planning consent and agreement for NSL diversion prior to construction. • First energisation is expected to occur beyond contracted connection timelines, resulting in misalignment with required delivery milestones for demand and generation connections. • The indicative delivery [redacted] ilestones are: [redacted] • Benefits from the fact that no DNO cable diversion is required, avoiding prolonged outages and coordination risks for the DNO. However, this advantage is	• Least cost option, with costs driven by NSL diversion into new substation & use of SF6 free GIS equipment. • Does not provide early connection capability and therefore defers the realisation of associated system and consumer benefits linked to timely demand and generation connections. • While not considered as part of these project costs, siting the new substation adjacent to the existing Blyth 66kV substation will significantly reduce future costs should the 66kV rebuild substation driver materialise. This would need to be fed from the new 400KV GIS substation, and siting the new substation adjacent to the likely rebuild site will greatly reduce future costs.	• Leaves the land currently occupied by the existing 400 kV substation, as well as land to the south, available for future development, which is a positive outcome from a longer-term site-use perspective. • New substation works would be located on NEP1 land, requiring full planning permission to be secured prior to construction, with no scope to rely on permitted development for early works. • NEP1 land sits within an ecologically sensitive context, adjacent to designated sites including the Northumberland Marine SPA, Ramsar sites, and SSSIs. As a result, planning determination may require detailed ecological assessment and mitigation, increasing consenting complexity and risk of challenge. • [redacted]

Option	Optioneering Categories				
	Engineering	Environmental	Deliverability	Economic/Consumer Value	Consenting /Stakeholder
	compound, however this could present challenges for maintenance access and fault repair. • Existing DNO cables remain in place, avoiding the need for early diversions and reducing engineering interfaces with the DNO during construction. • Designed with spare bays to accommodate future connection requests. As well as space to extend the building further if required. • Proximity to the customer connection points, enabling shorter cable routes between the substation and customer assets, reducing construction complexity and connection times.		outweighed by other material delivery constraints. • [redacted]		
	Strong Benefit	Benefit	Detractor	Neutral	Benefit
Option X1A Phased connection approach- Initial AIS extension + Enduring new 400kV GIS substation on adjacent NEP1 land (Incl. potential	• Subject to NSL cable diversion, the option has been designed with intention to deliver rationalisation of the Blyth 400 kV site, consolidating a new 400 kV solution into a single new GIS substation configuration. • Diversion of the NSL cables reduces the number of HV cable crossings and creates additional usable space within the site, supporting a more efficient layout. • Provision is retained for future rebuilds of the 66 kV substation and uplift of the 275 kV	• Removes all 400 kV SF_6-filled equipment from site and replaces it with clean-gas GIS technology, delivering a clear environmental benefit aligned with National Grid's SF_6 reduction strategy. • Indoor GIS substation avoids issues with saline environmental exposure to NGET owned outdoor AIS equipment. Significant corrosion has already been experienced with the outdoor GIS equipment at Blyth 400kV, and the Blyth 275kV AIS substation that was originally built as an outdoor substation	• Provides an initial connection arrangement that enables delivery of demand connection requirements in line with contracted timelines, without reliance on prior land acquisition or full planning consent for the enduring solution. • Enables parallel progression of land acquisition and consenting activities for the GIS substation, reducing overall programme risk compared to single-phase delivery options. • The indicative delivery milestones are:	• Third highest cost option driven by NSL diversion, temporary solution with increased land take footprint due to increased layout area. • Consumer exposure is mitigated by treating non-enduring elements associated with initial works as one-off, customer-funded expenditure, ensuring only enduring infrastructure is socialised. • Supports earlier realisation of system and consumer benefits by enabling timely connection of demand and generation	• Initial temporary works are largely located within existing NGET-owned land and can utilise permitted development rights, reducing early consenting risk and enabling accelerated demand delivery. • By using existing land around the current Blyth 400 kV substation for the initial temporary extension, development is steered away from nearby ecological receptors. • The enduring GIS substation will require land acquisition within NEP1. Land availability in this

	Optioneering Categories				
Option	Engineering	Environmental	Deliverability	Economic/Consumer Value	Consenting /Stakeholder
NSL Cable Diversion)	substation, supporting wider network reinforcement requirements. • DNO cable diversion required prior to implementation of the initial connection arrangement due to DNO wanting their cable outside of the operational compound and the installation of PRRs to manage protection and control transfers. • Designed with spare bays to accommodate future connection requests. As well as space to extend the building further if required. • Proximity to the customer connection point, enabling shorter cable routes between the substation and customer assets, reducing construction complexity.	and subsequently had a hanger retrofitted around it. Building an indoor GIS substation avoids these issues for this build. • NEP1 land sits within an ecologically sensitive context, adjacent to designated sites including the Northumberland Marine SPA, Ramsar sites, and SSSIs. A solution within this land has the potential to disrupt natural habitats, although environmental surveys are still ongoing to quantify and mitigate this.	[redacted] • Key delivery dependencies remain around securing agreement for the DNO cable diversion or crossing prior to commencement of the stage 1 works. • [redacted]	compared to single-phase solutions. • While not considered as part of these project costs, siting the new substation adjacent to the existing Blyth 66kV substation will significantly reduce future costs should the 66kV rebuild substation driver materialise. This would need to be fed from the new 400KV GIS substation, and siting the new substation adjacent to the likely rebuild site will greatly reduce future costs.	area has been partially de-risked through existing option arrangements, improving confidence. • Consenting and land acquisition associated with the enduring GIS substation do not constrain delivery of the initial connection arrangement. The solution has been configured to enable initial delivery to proceed independently, while land acquisition and planning for the enduring solution progress in parallel. • NEP1 land sits within an ecologically sensitive context, adjacent to designated sites including the Northumberland Marine SPA, Ramsar sites, and SSSIs. As a result, planning determination may require detailed ecological assessment and mitigation, increasing consenting complexity and risk of challenge.
	Strong Benefit	Benefit	Benefit	Neutral	Benefit

	Optioneering Categories				
Option	Engineering	Environmental	Deliverability	Economic/Consumer Value	Consenting /Stakeholder
Option X2 Phased connection approach - Permanent GIS extension + Enduring new 400kV GIS substation on adjacent NEP1 land (does not include NSL cable diversion or rationalisation)	• Provides a permanent GIS extension to the existing Blyth 400 kV substation to enable early demand connection capability. • The option does not offer the scope to deliver 400 kV rationalisation, as the existing 400 kV substation is retained. • Proximity to the customer connection point, enabling shorter cable routes between the substation and customer assets, reducing construction complexity. • Blyth would operate with three 400 kV substations, a 275kV substation and a 66kV substation across three compounds, leading to undesirable operational conditions. • Partial siting of a transformer bund beneath a 275 kV overhead line, potentially necessitating OHL diversion. • Multiple GIS manufacturers' equipment being present on site as [redacted] don't make SF6 free equipment and a transition between their existing equipment and the new SF6 free equipment would be required.. • Requires diversion or reconfiguration of DNO cables prior to implementation of the initial connection arrangement,	• Retaining the existing 400kV Substation leaves the existing SF_6-filled equipment on site in situ. Should SF6 need to be removed from the network by 2050 this option would require another site revisit within the next 20 years. • Option includes use of clean-gas GIS equipment for new assets, however, the interface between SF_6-based and clean-gas GIS may not be technically feasible, meaning an SF_6-based solution may need to be considered for the stage 1 extension, addition additional SF_6 to the network. • NEP1 land sits within an ecologically sensitive context, adjacent to designated sites including the Northumberland Marine SPA, Ramsar sites, and SSSIs. A solution within this land has the potential to disrupt natural habitats, although environmental surveys are still ongoing to quantify and mitigate this.	• Offers a potential to deliver connection requirements, however upon further option development it was forecast that delivery remains subject to key risks, including the need to develop and validate a bespoke interface between existing and new GIS technologies and potential diversion of existing 275 kV overhead lines. • Initial works can commence without full dependency on NEP1 land acquisition, allowing earlier mobilisation compared to single-phase options. However, initial demand requirement would not be achieved. • The configuration also allows remaining circuits to be built and commissioned progressively, providing flexibility to meet individual connection dates. [redacted]	• Second lowest cost option, driven by smaller land take, and no NSL cable diversion. • Shorter cable routes driven by proximity to the customer reduce cabling costs • Would make developing solutions for wider site drivers, including 66kV rebuild and 275kV uplift, significantly more challenging.	• The Stage 1 GIS extension would occupy approximately [redacted] NGET owned land and is largely capable of being delivered under existing permitted development rights, reducing initial consenting burden. • Potential overhead line diversion associated with the temporary works would require additional consenting, introducing delivery risks at Stage 1. • The permanent Stage 2 GIS substation would require development of site on NEP1 land, including full land acquisition and planning consent.

	Optioneering Categories				
Option	Engineering	Environmental	Deliverability	Economic/Consumer Value	Consenting /Stakeholder
	introducing early engineering dependencies.				
	Neutral	Detractor	Neutral	Neutral	Neutral

Option E-5 Phased Connection approach - Initial Temporary AIS Extension + Enduring new 400kV AIS substation Off Site (does not include NSL cable diversion or rationalisation)	• Off-site AIS substation would still be 2kms from the coast, and with the history of corrosion and pollution issues on both the existing Blyth 275kV and Blyth 400kV substations the new substation would need to be an indoor AIS substation. • Initial AIS banking arrangement at the existing site could not be retained permanently. With the new AIS substation being located away from the existing site these SGTs would need to be relocated to the new substation once build, making the majority of the material and cost required for the stage 1 connection obsolete within 4-5 years of installation. • The off-site location increases distance to connection points, requiring longer cable routes and adding complexity to connection delivery. • Identified land parcel has an existing DNO OHL running through it which would need to be diverted prior to any construction works commencing.	• Option would seek to avoid use of SF- free GIS equipment, and instead use AIS equipment for works. • Existing Blyth 400kV SF6 substation would be retained. • Embodied carbon still contained within the building required to surround the AIS equipment. • Larger footprint hence potentially larger environmental impact.	• The siting study has provisionally identified a site 2kms away from the existing Blyth site. Development of the off-site substation remains at an early stage, with further work required to confirm suitability of the identified location. • The construction of a temporary banked connection, which would be written off in 4-5 years, would enable the initial demand requirements to be met, however it would not provide longer term benefits for the enduring solution i.e. this solution would not re-use elements of the temporary works as part of the enduring solution as with Option X1A. • The location of an AIS substation away from the existing site adds considerable distance for the transportation of the SGTs from the Port of Blyth. It has not been proven through SWEPT analysis that the delivery can be achieved without road alterations. • The existing DNO OHL would need to be diverted prior to construction commencing, with the DNO managing this diversion. Initial examination suggests the diversion may not be straight forward however this would need to be developed further by the DNO to confirm how they wish to divert it.	• Most expensive Option, even if one-off works are charged to the customer. Price driven by indoor AIS substation, initial temporary connection & assumed length of OHL diversion to new substation site. • Due to it's proximity to the coast, this AIS option would need to be considered as an indoor AIS substation, adding considerable costs to the overall scheme. • Siting a new substation away from the existing substation would result in increased costs and complications when considering wider network drivers such as the potential rebuild of the 66kV substation. This would need to be fed from the new 400KV AIS substation, adding considerable costs for cabling across from the new site to the existing Blyth site where the 66kV rebuild would likely take place. • The cost for diverting the DNO OHL remains to be determined, however initial examination indicates this may be a complicated diversion and carry significant cost.	[redacted] As the potential site that has been identified is yet to be fully confirmed as a preferred site for AIS, there is uncertainty around the consenting and stakeholder challenges that may be presented. [redacted] would be considerable challenge from the customers looking to connect into the site, with their connection point moving from adjacent to their current development areas to 2kms away from their sites. This would add considerable time, cost and redesign onto their works, resulting in ACL dates not being achieved. • The need to make the new AIS substation an indoor AIS substation would necessitate building a large hanger type structure over the whole substation. This would increase impact on local stakeholders surrounding the proposed site.
	Supporting Evidence:	Supporting Evidence:	Supporting Evidence:	Supporting Evidence:	Supporting Evidence:
	Detractor	Benefit	Detractor	Detractor	Detractor

	Optioneering Categories				
Option	Engineering	Environmental	Deliverability	Economic/Consumer Value	Consenting /Stakeholder
Option E-6 Permanent new 400kV AIS substation Off Site (does not include NSL cable diversion or rationalisation)	• Offsite AIS substation would still be 2kms from the coast, and with the history of corrosion and pollution issues on both the existing Blyth 275kV and Blyth 400kV substations the new substation would need to be an indoor AIS substation. • The new substation would be located away from the customers that this investment aims to connect to NGETs network. This would add considerable cost and time onto [redacted] onnections. • Identified land parcel has an existing DNO OHL running through it which would need to be diverted prior to any construction works commencing.	• Option would seek to avoid use of SF6-free GIS equipment and instead use AIS equipment for works. • Existing Blyth 400kV SF6 substation would be retained. • Embodied carbon still contained within the building required to surround the AIS equipment. • Larger footprint hence likely larger impact on the environment.	• The siting study has provisionally identified a site 2kms away from the existing Blyth site, however further stages is required to confirm this site is suitable for an AIS development. • The location of an AIS substation away from the existing site adds considerable distance for the transportation of the SGTs from the Port of Blyth. Without knowledge of the site's location it has not been proven through SWEPT analysis, but the minor roads around the area suggest delivery may prove challenging. • The existing DNO OHL would need to be diverted prior to construction commencing, with the DNO managing this diversion. Initial examination suggests the diversion may not be straight forward however this would need to be developed further by the DNO to confirm how they wish to divert it. • The absence of any interim connection arrangement introduces misalignment with contracted connection timelines.	• Second highest cost option. Costs driven by indoor AIS substation & assumed length of OHL diversion to new substation site. • Due to proximity to the coast, this AIS option would need to be considered as an indoor AIS substation, adding considerable costs to the overall scheme. • Siting a new substation away from the existing substation would result in increased costs and complications when considering wider network drivers such as the potential rebuild of the 66kV substation. This would need to be fed from the new 400KV AIS substation, adding considerable costs for cabling across from the new site to the existing Blyth site where the 66kV rebuild would likely take place. • The cost for diverting the DNO OHL remains to be determined, however initial examination indicates this may be a complicated diversion and carry significant cost. • Option E-6 introduces cost drivers with an inefficient outcome as it delivers delay to connection dates, hence does not present value for money.	[redacted] As the potential site that has been identified is yet to be fully confirmed as a preferred site for AIS, there is uncertainty around the consenting and stakeholder challenges that may be presented. [redacted] • There would be considerable challenge from the customers looking to connect into the site, with their connection point moving from adjacent to their current development areas to 2kms away from their sites. This would add considerable time, cost and redesign onto their works, resulting in ACL dates not being achieved. • The need to make the new AIS substation an indoor AIS substation would necessitate building a large hanger type structure over the whole substation. This would increase impact on local stakeholders
	Supporting Evidence:	Supporting Evidence:	Supporting Evidence:	Supporting Evidence:	Supporting Evidence:
	Detractor	Benefit	Detractor	Detractor	Detractor

4.6.1 Conclusion from detailed qualitative assessment

Based on the detailed qualitative assessment, Option X1A is the preferred option because:

- It provides the most effective approach for supporting delivery of initial demand connection requirements within contracted timelines, by reducing reliance on land acquisition and full planning consent for the enduring GIS substation and thereby minimising delivery risk.
- The phased approach enables initial connection capability to be delivered predominantly on existing NGET-owned land, while land acquisition and consenting for the enduring solution progress in parallel, improving programme certainty.
- it supports a coherent long-term asset strategy, providing a pathway to a permanent GIS substation and potential rationalisation of the existing Blyth 400 kV site, avoiding long-term reliance on constrained or legacy infrastructure
- the enduring GIS solution delivers environmental benefits, including removal of 400 kV SF_6-filled equipment and improved resilience to the saline coastal environment through an indoor GIS configuration
- It provides the strongest overall system and consumer value, balancing timely delivery with long-term efficiency and coordination of the Blyth site

4.6.2 PASE Compliance

Within the PASE framework, the emerging preferred option is a variant option. It is a GIS substation at 400kV that is in proximity to the coast (in this case both the North Sea and a saline estuary).

4.7 Quantitative assessment of Shortlisted Options

4.7.1 Cost estimates of shortlisted options

To assess the shortlisted options, cost estimates have been created for quantitative economic comparison. All capex costs are derived from NGET's latest Cost Book (23/24 prices). Estimating Units Lines (EULs) have been used to generate cost estimates based on the scope of work and the new assets to be acquired for each option. [redacted]

[redacted]

Option E-2 is the lowest-cost option as it delivers a single-stage permanent GIS solution without the need for temporary works; however, it does not achieve the contracted demand delivery requirements in timescales required. Option E-5 is the highest-cost option due to the requirement for both a temporary AIS connection and a separate off-site indoor AIS substation, resulting in additional land acquisition, longer cable connections, and increased infrastructure scope. See section 4.7.2 for Cost Drivers.

Option E-6 introduces cost drivers associated with off-site development, indoor AIS construction and diversion works; however, these costs are incurred without delivering alignment to the required connection dates. The option therefore results in a materially less efficient outcome and does not present value for money, as it absorbs a broadly comparable level of capital expenditure to the Option X1A without meeting contractual delivery requirements, does not support coordinated development of the Blyth site, and is likely to lead to further future costs (see Table 10).

4.7.2 Cost Drivers

The project's cost estimates are based on current market conditions, with ongoing work to refine requirements. The baseline funding request is supported by high-cost confidence and robust EUL (Estimating Units Lines) assessments.

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

- Unit costs of SGTs
- Siting strategies (on-site vs off-site delivery)
- Substation technology and coastal environment requirements
- Phasing approach
- Level of network reconfiguration and interface works
- Extent to which wider site constraints are addressed as part of the solution

Appendix A4 provides an illustrative breakdown of the key cost drivers for each shortlisted option.

4.7.3 Purpose and Approach

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

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

Our CBA considers:

- Robust optioneering and sensitivity testing: We have evaluated credible alternatives, including 'do nothing' and 'do minimum' scenarios, to confirm that the preferred solution delivers the optimal balance of technical performance, environmental impact, and economic benefit.
- Quantification of constraint cost reductions: Using system operator modelling outputs and historical data, we quantify expected savings from reduced system constraints, which translate into direct consumer bill benefits.
- Assessment of delay impacts: The financial consequences of potential project delays on constraint costs and consumer bills are modelled through risk-adjusted scenarios, providing a clear understanding of the value of timely delivery.
- Inclusion of socio-economic benefits: Where quantification is challenging, qualitative evidence supported by stakeholder engagement and regional development plans highlights the wider economic benefits, including job creation and inward investment.
- Consideration of non-monetised benefits: We explicitly identify benefits that are qualitative or not readily monetisable, such as enhanced system operability, resilience, and environmental improvements, ensuring full transparency of the value proposition.
- Alignment with policy and government targets including Net Zero and AI Growth Zones: The CBA reflects the influence of national and local policies, including Clean Power 2030, net zero commitments, and economic growth plans demonstrating how the investment supports the broader energy transition.

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

For each option considered, we have quantified:

(i) Initial CAPEX investment required

(ii) Future end of life replacement costs

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

- Option X1A: Phased Connection Approach – Temporary AIS Extension followed by New 400 kV GIS Substation (NEP1 Land)
- Option X2: Phased Connection Approach – Permanent GIS Extension and Build New 400 kV GIS Substation (NEP1 Land)

- Option E2: 2: New Standalone 400 kV GIS Substation with [redacted] Diversion and 400 kV Layout Rationalisation (NEP1 Land)
- Option E5: Phased Connection Approach – Temporary AIS Extension followed by New 400 kV AIS Substation (Off-Site)
- Option E-6 New Standalone400 kV AIS Substation (Off-Site) (DBB/Wraparound)

4.7.4 CBA Outcome

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

On the basis of the discounted lifetime CBA results, Option E-2 delivers the highest (i.e. least negative) NPV [redacted] while Option E5 results in the lowest NPV at [redacted], driven by higher lifetime costs and additional siting and delivery requirements.

Option X1A delivers an NPV of [redacted], within the range of other staged solutions. This reflects the additional costs associated with the initial temporary connection arrangements and subsequent transition to the enduring solution. Option X1A remains the preferred solution as it provides the best overall balance between timely delivery and development of the enduring network.

In particular, X1A enables delivery of the initial demand connection within contracted timeframes, while progressing the enduring solution on a coordinated basis. The additional costs reflected in the CBA are associated with this phased approach, and do not fully capture the system and strategic benefits of accelerated delivery and preserved site flexibility.

This analysis is subject to confirmation through deliverability, consents/land, outage and risk considerations, and any CBA sensitivities set out in the assumptions below.

4.7.5 Assumptions of the CBA analysis

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

- Appraisal period of 50 years (2027–2076), with costs and benefits discounted and presented relative to the counterfactual.
- Cost base: 2023/2024 prices, aligned to the Ofgem RIIO-ET3 CBA template inputs (including treatment of replacement CAPEX and maintenance).

- Carbon: central base case carbon price applied for monetising construction carbon, SF6/alternative gas leakage and losses, with scenario testing for alternative carbon price trajectories.
- Benefits scope applied consistently across options; where option-specific benefits exist (e.g. constraints), the basis and evidence are documented and applied consistently.
- Key sensitivities considered (as applicable): timing/phasing, CAPEX uncertainty ranges, delivery/outage risk, and benefit parameter uncertainty (including losses and leakage assumptions).

4.7.5.1 Costs

Option E-2 is the lowest capex cost, making it the most cost-effective option. Option E-5 is the most expensive option due the off-site build of the new substation away from the existing site and the additional connections cable length required.

Future costs include the provision of replacement SGTs and associated cabling required to connect into the 66 kV network, should a future rebuild and transfer of supply materialise. These costs reflect the expected consequence of optioneering decisions now on transferring supply from the existing 275 kV system (future uplift) to a new 400 kV configuration. For clarity, these costs include SGTs and cabling only and exclude the 66 kV substation itself. Including these elements ensures the assessment captures whole-life system impacts, rather than favouring options that appear lower cost for this project but would result in higher costs in future.

These future costs are estimated at approximately [redacted] for Options X1A, X2 and E-2, increasing to approximately [redacted] for Options E-5 and E-6 .

4.7.5.2 Benefits

The following benefits have been included within the CBA:

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

Table 11 presents the summary of all (undiscounted) benefits, including environmental and non-environmental benefits, considering the central base case carbon price.

4.8 Preferred Solution

The preferred solution is Option X1A, which adopts a phased delivery approach to meet [redacted] demand requirements and [redacted] generation connection requirements.

Scope of Stage1 Initial connection arrangement:

The initial connection arrangement provides a [redacted] demand connection [redacted] This is delivered via a temporary AIS tee and banked connection from the existing Blyth 400/275 kV inter-bus transformers.

- The scope includes targeted modifications to the existing Blyth 400 kV AIS busbars
- Installation of isolators and cable sealing ends to tee off the busbar, with associated protection and control changes to the existing Blyth SCS to enable the tee off connection
- Temporary 400 kV cabling routed to two new 460 MVA 400/132 kV SSGTs
- Supporting works include installation of the transformers and associated HV and LV switchgear, PRRs, and security-hardened fencing.

[redacted]

Scope of Stage 2 Enduring Solution

This involves construction of a new 400 kV GIS substation across three bus sections on adjacent NEP1 land, providing capacity for the [redacted] generation connection [redacted] and the subsequent increase [redacted] capacity [redacted] This stage includes:

- Modification of the Blyth–Stella–Eccles overhead line route to connect into the new substation.

- Interconnection between the existing and new substations.
- Diversion of North Sea Link cables into the new substation (subject to agreement from NGV and NESO).
- Installation of 2no. MSCs.
- Installation of new 400 kV cables to connect the Stage 1 SGTs into dedicated GIS bays.
- Removal and rationalisation of the temporary Stage 1 arrangements, including associated P&C modifications and AIS busbar changes.

This staged approach provides the best opportunity to meet contractual connection dates. Reliance on a single-stage, permanent substation solution without the interim Stage 1 connection would miss these requirements and delay [redacted], risking the overall investment viability.

[redacted]

Provision of firm connection capability (outside scheme scope)

Following completion of the Stage 2 enduring substation by [redacted] will be enabled subject to the delivery of wider system reinforcement schemes. These reinforcements are required to accommodate the additional power transfer across the wider transmission and are currently expected to include FSU1 (Carlisle–Stella 400 kV OHL) and, if confirmed, BSNC (Stella–Blyth 400 kV OHL). The requirement, form, and timing of these schemes remain subject to Connections Reform-led power system restudies.

4.8.1 Project Benefits, Outputs & Deliverables

The proposed investment at Blyth will deliver several benefits to the network, stakeholders and consumers. A summary of the indicative outputs for the preferred investment and associated benefits is set out below.

Table 12: Summary of Outputs and Benefits

Output & Proposed PCD	[redacted]
	• Establishes a new 400 kV GIS substation at Blyth to accommodate both large-scale generation and strategic demand, strengthening transmission capability in the North East. • Supports nationally significant investment in digital infrastructure, enabling the timely development of a [redacted] and associated economic activity in line with Government supported timelines. • Supports regional economic growth, supporting employment opportunities, skills development and wider supply chain activity in North East England. • Facilitates connection of large-scale low-carbon generation, contributing to national decarbonisation objectives and contributing to national energy security. • Supports long-term network efficient use of the existing network, including designing for optimal arrangements at the Blyth site in future, accounting for potential future layouts of 275 kV and 66 kV infrastructure and therefore avoiding likelihood of asset rework in the best interests of consumers.

4.8.2 Futureproofing

Appropriate consideration has been given to ensure Blyth is capable of adapting efficiently to future network development at Blyth without undue rework or constraint.

- The preferred layout and staging of the works deliberately preserve sufficient space to enable future infrastructure activity, including the potential rebuild of the 66 kV substation and the uplift of the existing 275 kV substation should this be required as part of the longer-term site strategy. While this strategy would still need to be fully developed as part of those future projects, considerations have been given including leaving sufficient space for the siting of 4no. 400/66kV transformers, a new 66kV substation, the BSNC 400kV OHL gantry, and any additional SGTs that would be required to connect Lynemouth Power Station should the existing Blyth 275kV substation be uplifted to 400kV. These works all require further development should the future scheme come along, however space and consideration has been provided at this stage.
- The design also allows flexibility in how connections are routed across the site, including the option to convert some cable routes to gas-insulated bus (GIB) or gas-insulated line (GIL) to reduce congestion, minimise complex cable crossings, and improve constructability and operability as the site evolves.
- The new GIS substation is designed with four spare bays to facilitate future connection requests. The layout has been arranged to retain flexibility for onward expansion, with

space available on either side of the site to facilitate additional bays and associated connections. While integrating further plant would require careful coordination alongside potential 66 kV and 275 kV works, the design provides a clear pathway to accommodate future requirements within the site.

Additionally, the North Sea Link cables are preferred to be diverted into the new GIS substation, subject to freeing up additional land for the future rebuild/ uplift works and minimise disruption to the existing NG Ventures connection while the other site works are undertaken. Space is available to the south of first stage build should cable routes and spacings be required to be expanded. Diverting these [redacted] cables also removes the need for the existing Blyth 400KV substation, enabling it's rationalisation and freeing up space for future connections.

4.8.3 SQSS Compliance

The proposed connection arrangements are compliant with the NETS SQSS through application of a design variation under Clause 3.17[6].

While the initial connection arrangement for [redacted], the connection is progressed under a design variation in accordance with Clause 3.17, which permits alternative arrangements where a user accepts a defined reduction in supply security in return for an agreed outcome.

The approach is defined and assessed in line with SQSS requirements, with full SQSS-compliant capability delivered through the enduring connection solution.

4.8.4 Cost Breakdown of Preferred Solution X1A

The cost book estimate for the preferred solution (Option X1A) comprises Stage 1 and Stage 2 costs. Customer-funded elements within Stage 1 are excluded in deriving the net Load Re-opener funding request, as set out below.

[redacted]

[6] Clause 3.17 of the NETS SQSS Demand Connection Criteria

4.8.5 Cost maturity and Indicative Funding Treatment of Option X1A

Table 13 above presents high-level cost book estimates for the initial connection arrangement of [redacted] which have been used for comparative optioneering and assessment purposes across all shortlisted options. These estimates provide a consistent basis for comparison, reflecting a comparable level of cost maturity across the option set at the time of assessment.

As the project has progressed, the scope of the initial connection arrangement for the preferred option has been developed further, resulting in a more detailed, bottom-up cost estimate. This reflects increased design maturity and a more granular definition of assets, quantities, and interfaces, consistent with normal project progression. This results in an updated cost estimate of [redacted] providing a more complete view of the cost of delivering the accelerated connection arrangement.

Notwithstanding this further development, the [redacted] cost book estimate has been retained in earlier sections for assessment and comparative purposes. This ensures consistency with the treatment of other options, where costs remain at a comparable level of maturity, and avoids distortions arising from applying differing levels of cost definition across the option set.

Funding Treatment of Stage 1 Costs[7]

In applying the more developed Stage 1 cost position [redacted] for the purposes of determining funding treatment, a clear cost-allocation principle has been applied: consumers should not fund costs that arise solely as a consequence of this acceleration. Cost allocation has been assessed by reference to the Transmission Charging framework and the extent to which Stage 1 assets contribute to the enduring Blyth network

Within this framework, costs are distinguished between one-off, connection and infrastructure charges.

- **One-off charges** relate to assets delivered solely to facilitate the accelerated connection and which become redundant following delivery of the permanent Stage 2 GIS substation. These costs represent inefficiencies arising purely from acceleration and would not be incurred under a single-stage permanent solution. As such, they have been classified as one-off charges and are recovered from the connecting customer, [redacted] rather than being included in the Stage 1 funding request.

By contrast, the majority of Stage 1 works will remain in service as part of the enduring Blyth network and continue to deliver benefit beyond the acceleration period. These elements have been assessed and classified as either connection assets or infrastructure assets.

- **Connection assets and charges** – the connection assets will be those that are required exclusively to facilitate the [redacted] connection and do not form part of the shared transmission network; the costs associated are therefore recovered from the customer over the life of the assets through connection charges, reflecting the principle that customers fund assets that are solely attributable to their connection request.

- **Infrastructure assets and charges** - infrastructure assets form part of the shared transmission system and will continue to deliver wider system benefit once the permanent Stage 2 solution is in place. These asset costs are therefore appropriately recovered from consumers, as they form part of the efficient, enduring network.

[7] This represents an indicative assessment of funding treatment at this stage. The final position will be confirmed as part of the subsequent Project Assessment submission.

The table below summarises National Grid's assessment of costs associated with the initial temporary Stage 1 acceleration works and sets out the resulting cost apportionment and indicative funding treatment. The majority of these works, including the SGTs and associated civils, are expected to be retained as part of the Stage 2 enduring solution.

While the detailed design of the enduring Stage solution is still being finalised, the current design intent is to maximise retention of these assets. A limited number of elements are expected to become redundant, including modifications to the existing Blyth 400 kV AIS busbars (disconnectors and cable sealing ends), temporary 400 kV cabling associated with the tee-off arrangement, and related protection and control modifications. These will be customer funded one-off costs .All other works are expected to be retained within the final configuration.

The table demonstrates that consumer funding is limited to efficient, enduring infrastructure forming part of the final solution at Blyth. Detailed scope, asset retention assumptions, and funding treatment will be confirmed as part of the subsequent Project Assessment submission.

5. Project Delivery

5.1 Delivery Programme

The current delivery programme is being developed to align as closely as possible to contracted connection timelines.

The programme comprises:

- **Stage 1 initial connection arrangement**.

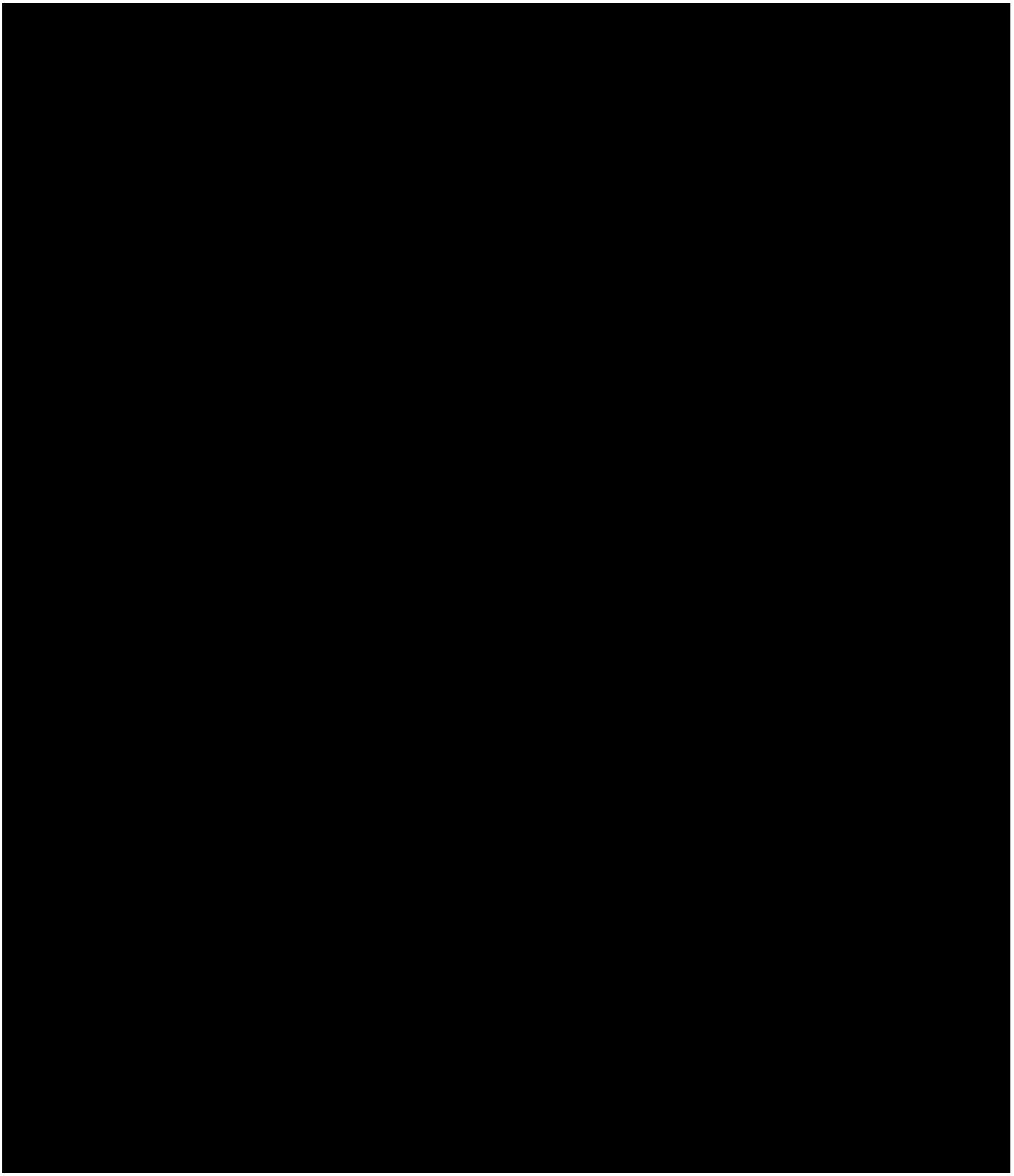
  This provides early, non-firm connection capability through a temporary AIS extension to the existing Blyth 400 kV substation, supporting delivery of initial demand requirements in line with contracted timelines [redacted]

  Delivery remains subject to dependencies including procurement lead times, and third-party interfaces (including DNO coordination and potential [redacted] cable diversion).

- **Stage 2 Enduring Solution**
  This element delivers the permanent 400 kV GIS substation, supporting full demand [redacted] and generation [redacted] connection requirements.

Stage 1 activities are largely delivered on existing NGET owned land and can rely on permitted development, allowing early works to proceed while Stage 2 land acquisition and consenting activities for NEP1 land progress in parallel.

Internal programme assessments indicate that the delivery milestones are challenging but achievable, subject to effective management of dependencies and risk and issue management. As a result, the programme is being actively reviewed and refined through the development phase, including early engagement with delivery partners, to mitigate the risk of delay and maintain alignment with contractual commitments.



5.3 Delivery risks

Table 15: Key Delivery Risk and Mitigations

Risk	Mitigation
Land acquisition and CPO risk, Planning and environmental Land acquisition constraints (including NEP1), planning delays, and ecological and ground investigation survey timelines (including HRA agreement with Natural England) impacting programme and design development	• Mitigated through existing option arrangements on NEP1 south parcel of land to de-risk the CPO process. • EIA screening for the stage 1 works has determined that the Stage 1 works are not EIA Development. Stage 2 will require screening under EIA regulations.
Requirement for outages and major works (including OHL diversion)	• Outages have already been planned in and accepted for the Stage 1 works. • Outages for the Stage 2 works, including the OHL diversion, have been submitted and are awaiting comment.
Engineering and technical constraints Including capacity limitations at existing substations, rebuilding of ageing 66 kV assets, uplift of 275 kV assets, and reliance on complex two-stage temporary-to-permanent connection arrangements	• Inclusion of the diversion of the NSL cables and Blyth Stella Eccles 400kV OHLs into the new substation de-risks the construction buildability and enables space for the future 66kV and 275kV works.
Dependency on third-party agreements and coordination Including delays to diversion of Northern Powergrid's 20 kV site supply cable and the outcome of the NSL cable diversion agreement with NGV	• [redacted] with ground investigations (GI) being undertaken in the coming months to identify the location of their underground services. • The stage 2 strategy is dependent on an agreement being made with NGV regarding the NSL Cable diversion; however work is underway to de-risk elements of the programme, including completion of consenting surveys and GI work across the breadth of the NEP1 land that is being looked to be developed.
Uncertainty around NSL cable crossing design Due to unresolved FEED proposals and space constraints, with potential cost and schedule impacts for Stage 1 works	• Stage 1 cable crossings of NSL cable are User works, however NGET have been in discussions with the customer on how they could cross the cables without jeopardising the future stage 2 works. • The number of NSL cable crossings in stage 2 is dependent on whether NGV and NESO will agree to divert the NSL Cables.

6. Proposed working arrangements

Details of proposed working arrangements between TO's

There are no formal joint working arrangements with other Transmission Owners (TOs) for this scheme. However, operational coordination with neighbouring TO infrastructure is expected where relevant, specifically in relation to:

Outage planning on the Stella West – Blyth circuits, where close coordination with the NESO and neighbouring TO boundaries will be required to secure the necessary outages.

Details of proposed working arrangements between DNO's

Engagement with [redacted] required as part of the enabling works for the Blyth substation development. At this stage, the primary interaction involves:

Facilitating the diversion and relocation of LV supply cables located within the footprint of the new substation build. Coordination with [redacted] will ensure these assets can be safely moved to enable construction activities to proceed without impacting local distribution customers.

Looking ahead, further engagement with [redacted] will be required if subsequent phases of work progress, particularly in relation to:

A potential rebuild of the existing 66 kV substation, which is DNO-owned.

Any future uplift or reconfiguration of the 275 kV substation, where interactions with NPG infrastructure or shared boundaries may arise.

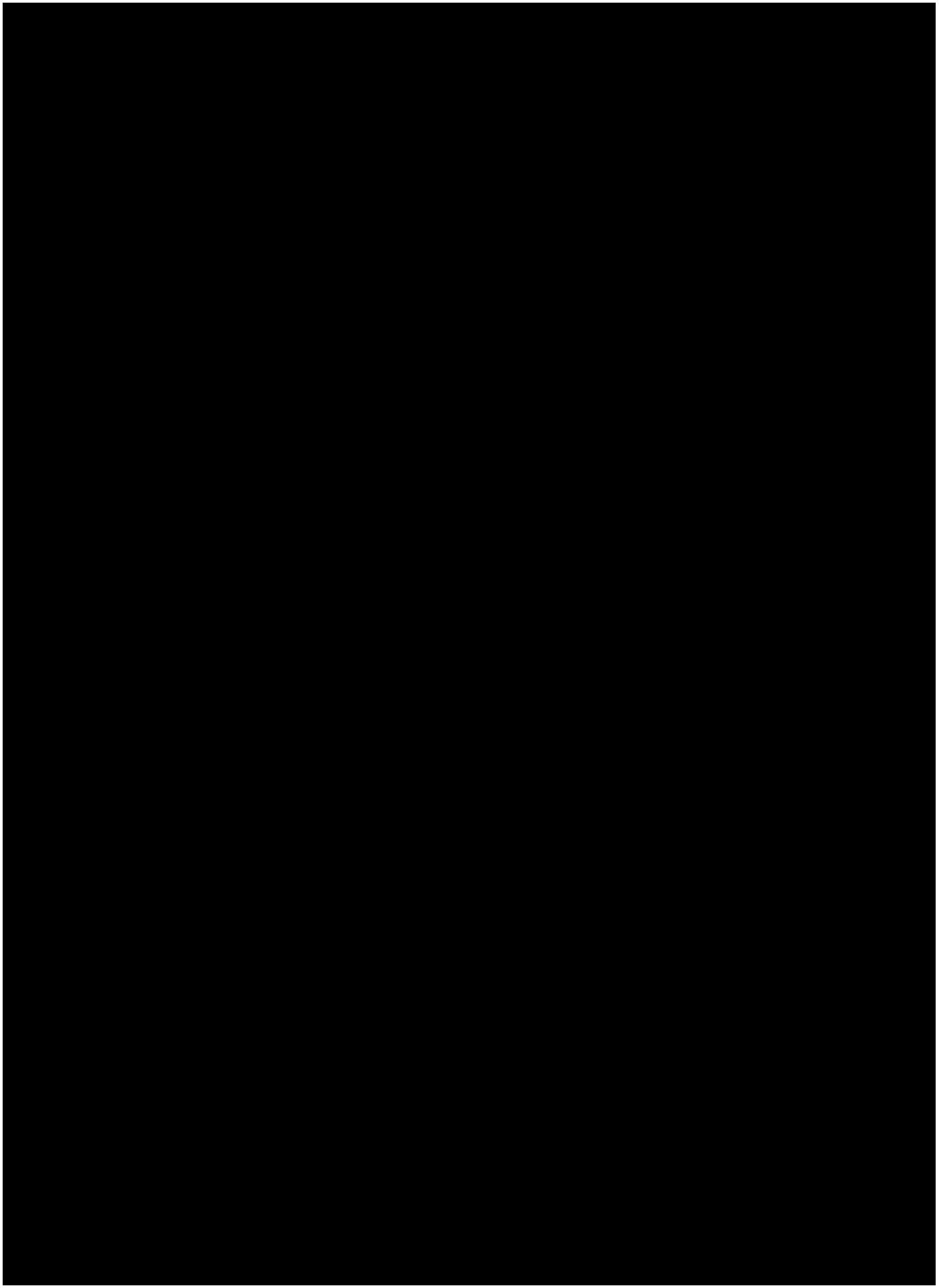
7. Conclusion

This submission sets out the preferred solution to address the investment drivers at Blyth 400 kV Substation and seeks confirmation of eligibility under Special Condition 3.18, approval of Pre-Construction Funding (PCF) under Special Condition 3.15, confirmation of the Track 2 EL re-opener assessment pathway, and formal endorsement of the Needs Case and preferred solution.

The proposed track allocation has been discussed with Ofgem, and this submission therefore seeks to secure formal recognition of Blyth's eligibility and progression pathway in advance of a future Project Assessment submission.

The preferred solution is Option X1A, a phased connection strategy comprising a temporary AIS extension to enable demand delivery requirements in alignment with contracted timelines, followed by a new, enduring 400 kV GIS substation on adjacent land to meet subsequent demand and generation requirements. This approach provides the most effective pathway of the options considered to meet contracted connection timelines while delivering a coordinated and enduring network solution in the best interests of consumers.

8. Appendix



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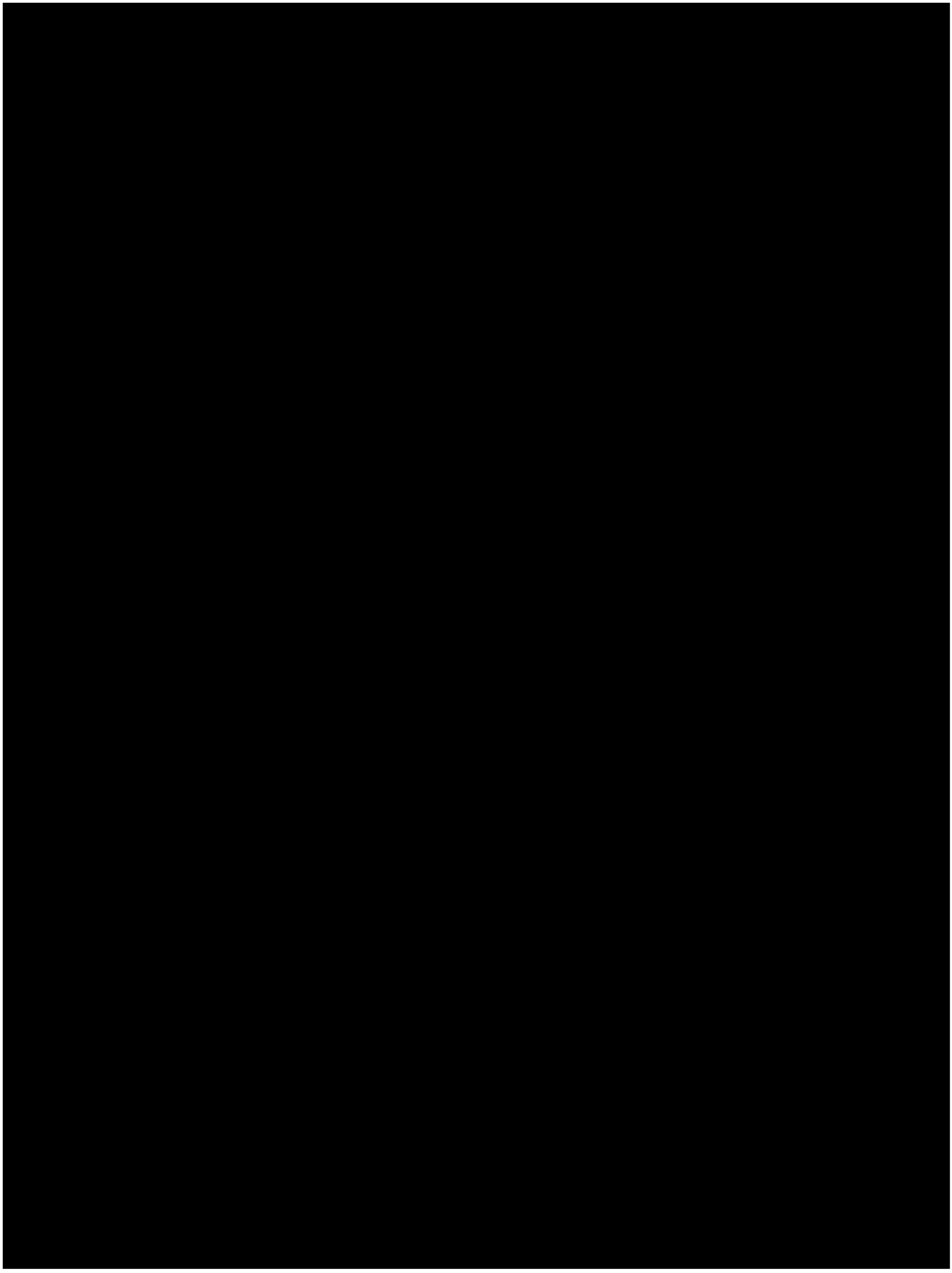
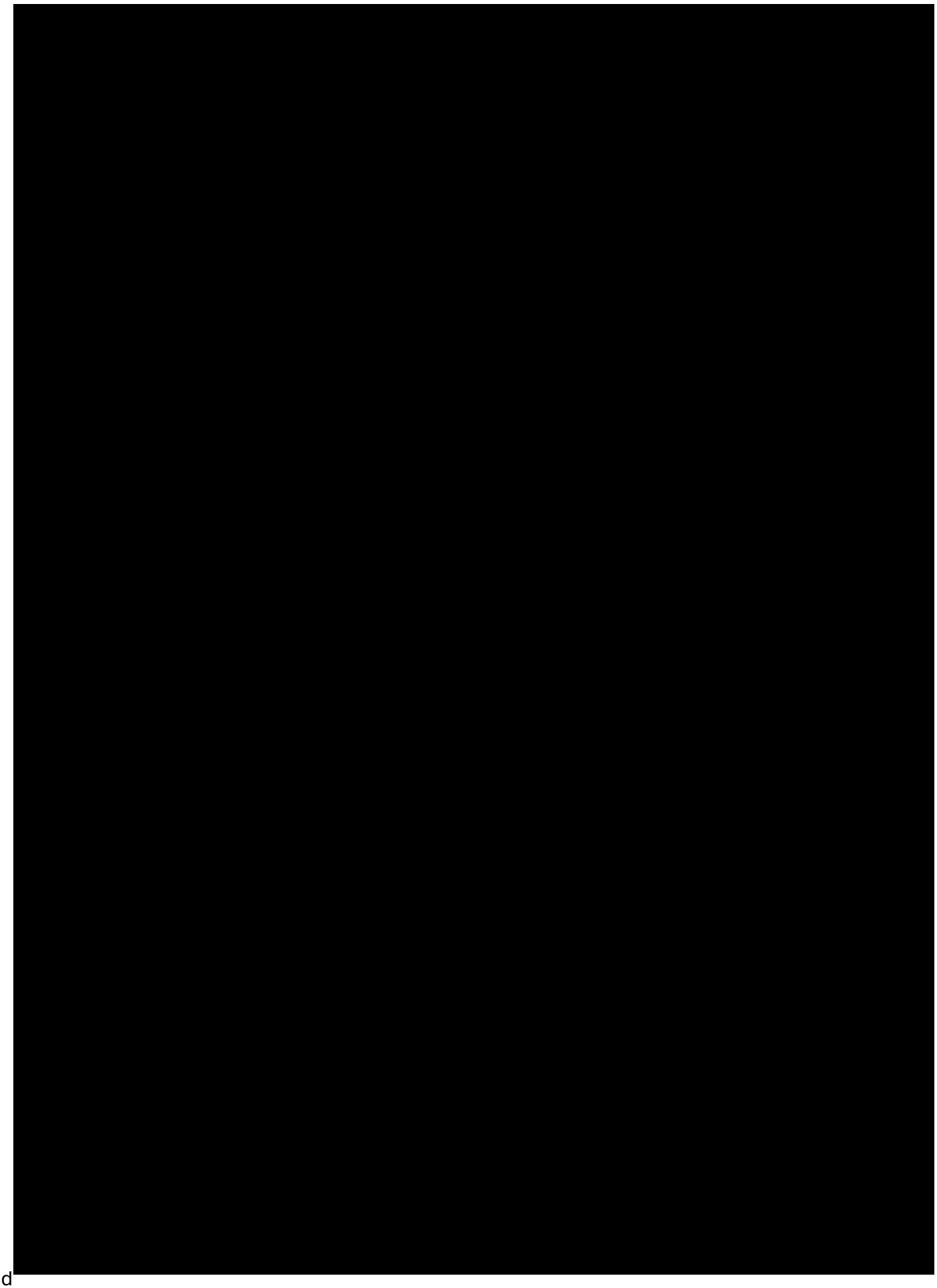
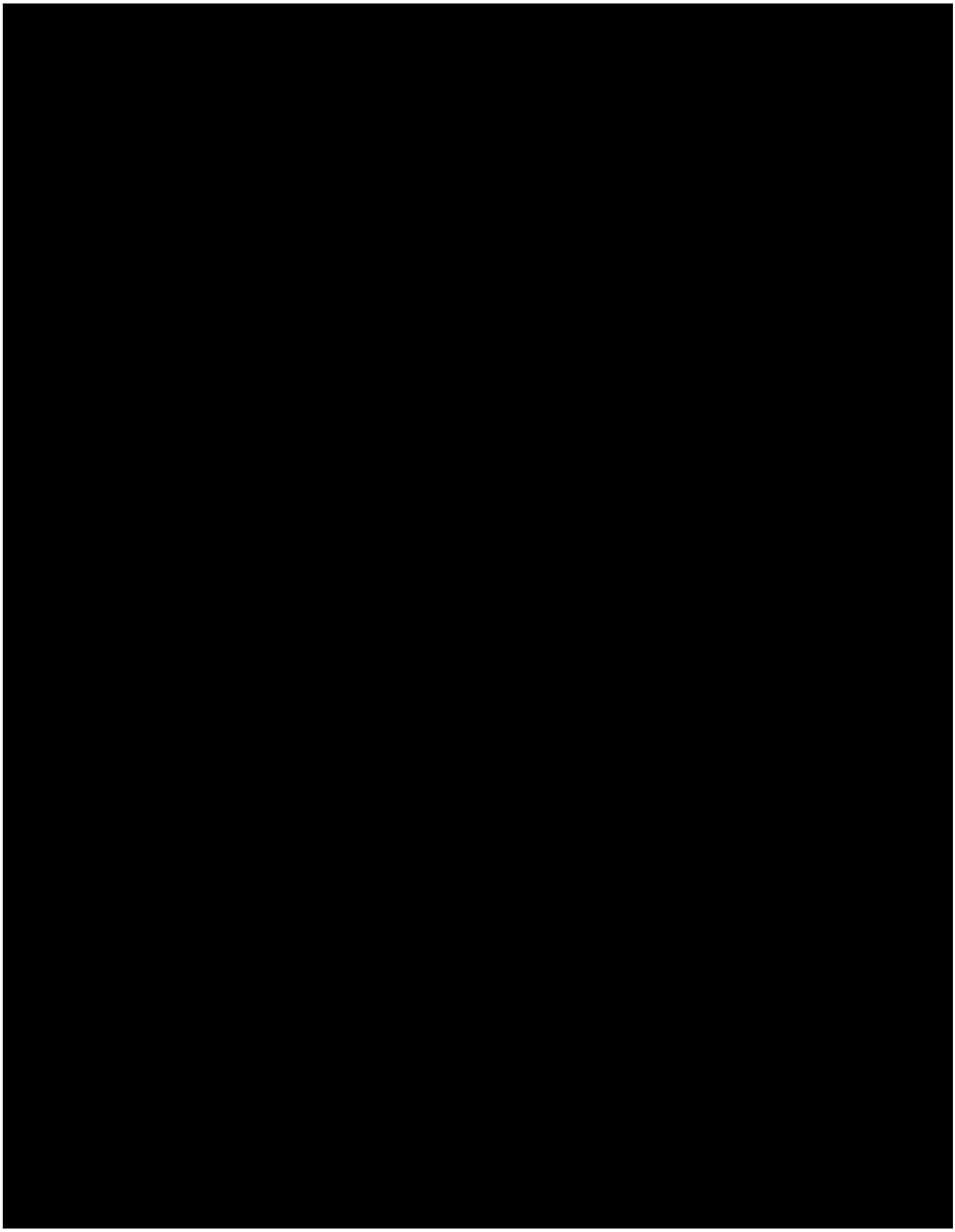
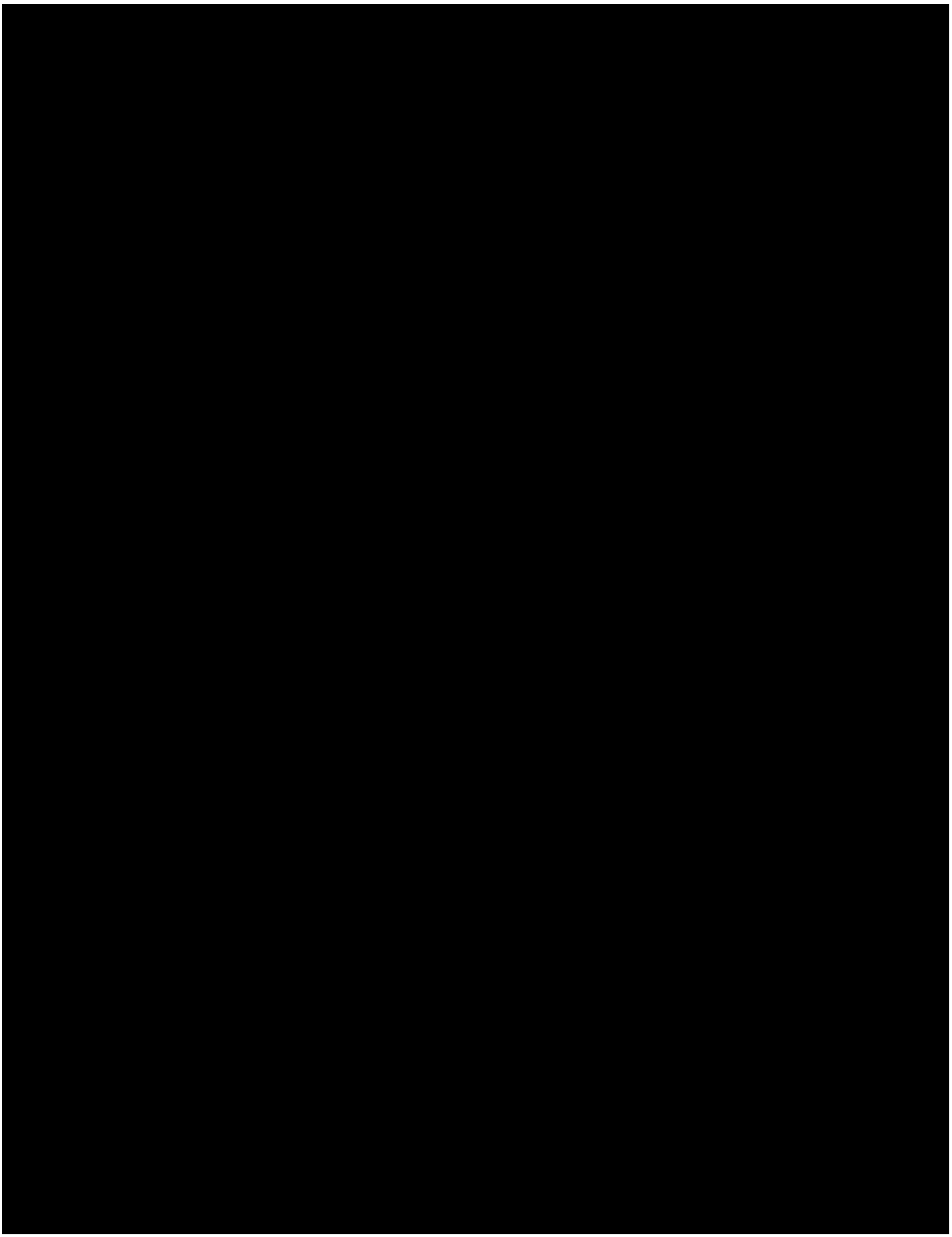








[redacted]

The cost differences across the five shortlisted options are driven primarily by siting strategy, technology choice, phasing approach, and the extent to which wider site constraints are addressed as part of the solution, rather than by differences in core connection requirements.

The principal cost drivers are summarised below:

Substation technology and coastal environment

Blyth's coastal location introduces additional design and build requirements. Where AIS solutions are considered, these must be delivered as indoor AIS substations to manage environmental exposure and asset resilience. This materially increases civil, building and enabling costs relative to GIS based solutions, which offer a more compact footprint and reduced environmental interfaces.

Phased versus single stage delivery

Options that adopt a phased delivery strategy introduce additional cost and complexity associated with temporary works, transitional arrangements and the subsequent integration of Stage 1 assets into the enduring solution.

Where a permanent GIS extension is used at Stage 1, this can provide a firm connection point for [redacted] initial demand and reduce the scale of the subsequent Stage 2 build. By contrast, options reliant on temporary AIS arrangements incur additional transition and rationalisation costs when progressing to the permanent solution.

Extent of network rationalisation and accommodation of wider site drivers

A key differentiator between options is whether they explicitly enable the wider Blyth site strategy, including future connection capability and long-term operability, or whether they primarily address near term demand.

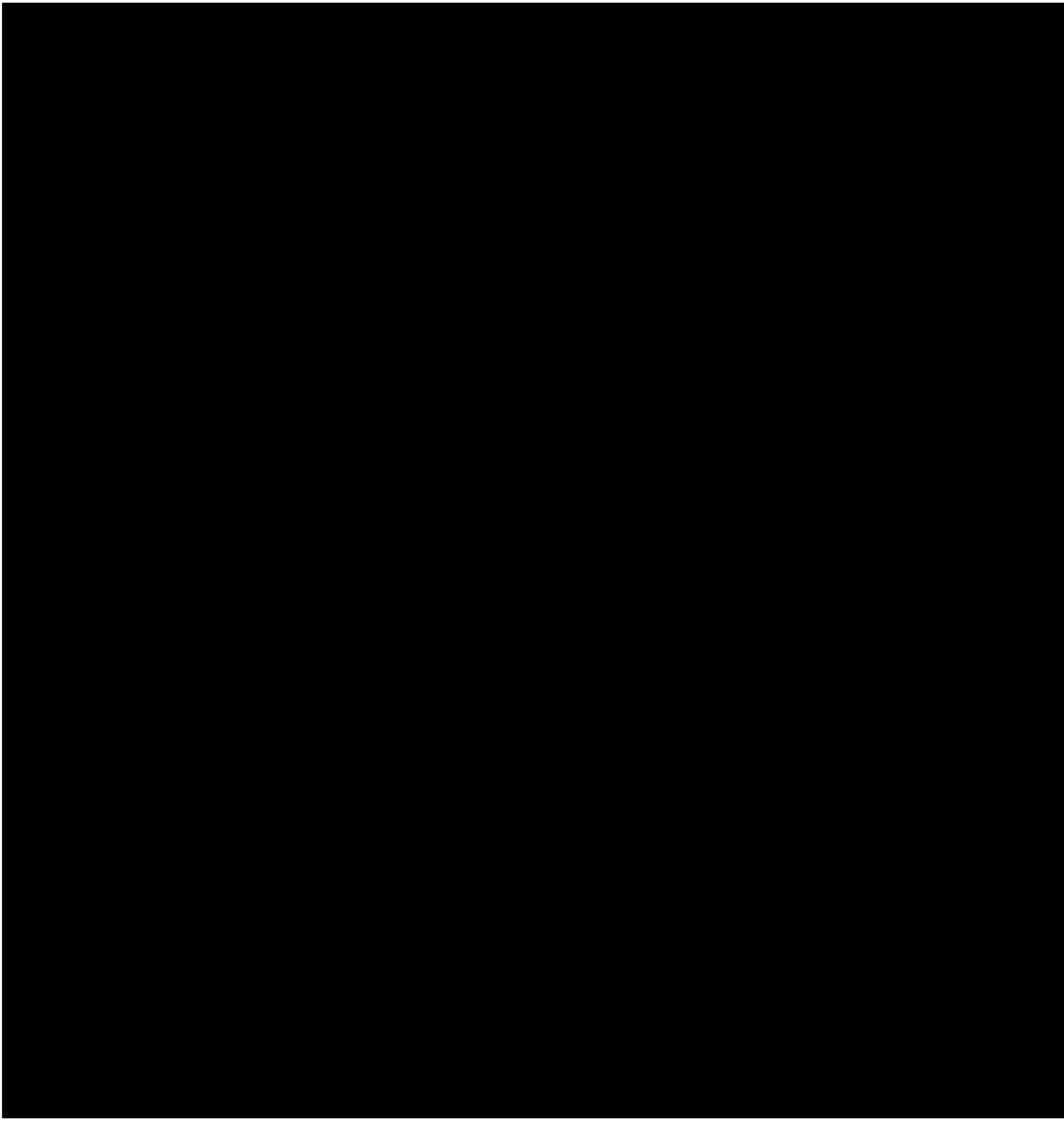
Options X1A and E2 include the diversion of the [redacted] cables into the new substation, along with associated layout rationalisation. While this increases cost relative to other options, it is the only means by which the broader site constraints can be resolved without creating significant long-term limitations. Although funding responsibility for these diversions is still subject to agreement, the costs have been included within the option totals to reflect the full scope required to deliver a coherent and future proof solution.

On site versus off site substation delivery

Options that require a new off site 400 kV substation introduce substantially higher costs associated with land acquisition, environmental mitigation, planning risk, additional overhead line works, and extended transition arrangements. These options also incur increased mobilisation, commissioning and potential early asset write off costs where temporary Stage 1 assets must later be relocated or replaced.

Interface works and system impacts

All options include costs associated with system integration, including security, intertrip schemes and overhead line diversions. However, the scale of these costs varies depending on the degree of reconfiguration required and the extent to which solutions disturb or rationalise existing network infrastructure.



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