RIIO-T3

Connahs Quay-Legacy-Trawsfynydd 1 and 2, Ironbridge-Legacy-Shrewsbury, Ironbridge-Legacy 2 OHL

Track 2 Eligibility Letter Submission

October 2026

Electricity Transmission

nationalgrid

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Reference and summary table

Field	Description
Project name	Connah's Quay (previously Deeside) - Legacy - Trawsfynydd 1 and 2, Ironbridge - Legacy - Shrewsbury, Ironbridge - Legacy 2 OHL Reconductoring The submission comprises two distinct but interrelated route reinforcements projects: • **Route 1 (ZK/ZKA)** Connah's Quay - Legacy - Trawsfynydd 1 & 2 circuits • **Route 2 (ZZJ/ZZK)** Ironbridge - Shrewsbury - Legacy and Ironbridge - Legacy 2
TO's preferred re-opener track	Track 2 Eligibility Letter (EL)
RRP reference	NGT500472 Deeside - Legacy - Trawsfynydd 1 and 2, Ironbridge - Legacy - Shrewsbury, Ironbridge - Legacy 2 OHL
BPDT / Scheme reference number	For total project cost: NGT500472
Load Board reference	NGT500472
Investment driver(s)	**Customer:** Aggregated customer connection and demand growth of approximately [redacted] by 2030 and a further [redacted] by 2035 is forecast to increase power transfers across North Wales. System studies identified resulting [redacted] on the affected routes, requiring additional transmission capability to accommodate the Connections Reform-aligned customer connection portfolio and to maintain alignment with wider regional network development across the North Wales transmission corridor.
Project outputs	• Uprating of the ZK/ZKA and ZZJ/ZZK OHL circuits to approximately deliver [redacted] • Facilitation of aggregated customer connection portfolios by 2035.

Short list of strategic options considered	2 options per route were shortlisted for further consideration:
	• ZK/ZKA (L2 and L6 tower sections)
	  • Option E-4: Reconductor with [redacted] on L2 tower sections and [redacted] on L6 sections.
	  • Option E-11: Reconductor with [redacted] on L2 sections and [redacted] on L6 sections
	• ZZJ/ZZK (all L2 towers)
	  • Option E-4: Reconductor with [redacted]
	  • Option E-11: Reconductor with [redacted]

Preferred solution and explanatory narrative on the rationale	Our preferred Option is E-11 across both routes (Reconductoring using [redacted] conductor solutions.) • **Engineering:** delivers the highest capability of the credible conductor solutions assessed and available to NGET. • **Consumer Value:** provides the strongest consumer value outcome of the shortlisted options through the lower costs and the highest NPV.
PASE alignment	PASE Primary Option, as the preferred solution utilises [redacted] which represent the highest-rated approved conductor solutions available to NGET for the relevant L2 and L6 towers.

Cost (23/24 price bases)	The total estimated investment cost is [redacted] (including risk and contingency), comprising: • [redacted] for the ZK/ZKA route • [redacted] for the ZZJ/ZZK route.		
Delivery year	ZZJ/ZZK: [redacted] ZK/ZKA: [redacted]		
Applicable reporting tables	Load C&V Table 6.1 and CAI 9.4		
Interactive projects	The ZK/ZKA and ZZJ/ZZK reinforcements are directly linked and identified as enabling works across multiple customer connection contracts. The projects are assumed within the planning background used for NESO's strategic network assessments and provide a proportionate increase in network capability ahead of further strategic reinforcements, including UWNC, MWNC/MWN1 and the Lower Frankton-Ironbridge Quad Boosters.		
Historic funding interactions	The Fixed Asset Register indicates no major interventions (excluding inspection and maintenance) during RIIO-ET1 and RIIO-ET2 on the ZKA, ZZJ and ZZK circuits.		
Spend apportionment	**T2 (FY 2022-2026):**	**T3 (FY 2027-2031):**	**T4+ (FY 2032-2037+):**
	[redacted]	[redacted]	[redacted]

Executive summary

Project summary

The investment will reconductor the Connah's Quay[1] - Legacy - Trawsfynydd (ZK/ZKA) and Ironbridge - Legacy - Shrewsbury / Ironbridge - Legacy 2 (ZZJ/ZZK) 400 kV circuits in North Wales. This is required to address [redacted] identified through system studies and increase transmission network capability to accommodate aggregated customer connections and demand growth. [redacted]

The project was originally submitted as part of NGET's RIIO-ET3 Business Plan within the portfolio of OHL reconductoring schemes. Consistent with other reconductoring investments proposed, the project was subsequently assigned to Ofgem's Track 2 Load Re-opener pathway as part of the RIIO-ET3 Final Determinations. [redacted]

Submission purpose

We are seeking Ofgem's approval, under the Load Related Re-opener (Special Condition 3.18 of the RIIO-ET3 Licence), to progress proposed reconductoring investments on the Connah's Quay - Legacy - Trawsfynydd and Ironbridge - Shrewsbury - Legacy overhead line circuits to increase transmission network capability and facilitate aggregated customer connections and demand growth.

Project need

The investments are driven by the need to provide sufficient transmission network capability to accommodate the aggregated portfolio of customer connections. This includes a pipeline of [redacted] by 2030 and a further [redacted] by 2035, whose connection requirements are directly dependent or enabled by the delivery of reinforcements on this circuit.

NESO establishes the relevant regional customer connection and system planning background, which NGET has used to assess the impact on its transmission network. Using NESO's post-Connections Reform customer connection background and planning assumptions, NGET network studies identified increased power flows [redacted] on the relevant circuits arising from the anticipated connections, establishing a minimum requirement for at least [redacted] summer pre-fault capability (or approximately [redacted] winter post-fault capability).

The proposed uprating also ensures these routes remain aligned with the wider North Wales reinforcement pathway, including associated developments around Lower Frankton, by increasing capability on existing infrastructure in line with the assessed customer background and regional network requirements.

[1] Note: The project was originally referred to as *Deeside* in the RIIO-T3 EJP submitted in December 2024 Business Plan. The asset is now known as **Connah's Quay** following a historic site redevelopment and renaming.

Optioneering

A proportionate optioneering assessment was undertaken to identify the most appropriate solution to address the identified network requirement. Strategic options considered included do nothing (A), market-based solutions (B), whole system solutions (C), use of existing assets (D), reconductoring (E) and construction of a new overhead line (F).

The strategic options were discounted where they were unable to provide the required increase in transmission capability, were not technically feasible, or could not be delivered within the required timescales. Reconductoring was identified as the preferred strategic approach and a range of conductor solutions were subsequently assessed against the key factors influencing shortlisting, including capability, tower compatibility, compliance, deliverability, operability and consumer value.

For both routes, [redacted]-based options were identified as the only credible shortlisted conductor solutions that meet the required rating. [redacted]-based options were retained as the closest comparator for value assessment purposes. For ZK/ZKA, this compares [redacted] (Option E-4) with [redacted] (Option E-11); for ZZJ/ZZK, this [redacted] (Option E-4) with [redacted] (Option E-11).

These options were progressed to detailed assessment, with Option E-11 subsequently identified as the preferred solution for both routes as it delivers the highest capability of the credible conductor solutions assessed, met the identified minimum capability requirement, and provided the strongest consumer value outcome.

Tables 1 and 2 summarise the reconductoring longlist assessments for each route. Further detail is provided in Section 3.

Table 1: Summary of ZK/ZKA Reconductoring Assessment

Option	Details	Meets Capability Requirement	Shortlisted	Preferred solution
Option E-1	Reconductor with [redacted] (L2) and [redacted] (L6)	x	x	x
Option E-2	Reconductor with [redacted]	✓	x	x
Option E-3	Reconductor with TS [redacted]	✓	x	x
Option E-4	Reconductor with [redacted] (L2) & [redacted] (L6)	x	✓	x
Option E-5	Reconductor with [redacted]	x	x	x
Option E-6	Reconductor with [redacted]	x	x	x
Option E-7	Reconductor with [redacted]	x	x	x
Option E-8	Reconductor with [redacted]	x	x	x
Option E-9	Reconductor with [redacted]	x	x	x
Option E-10	Reconductor with [redacted]	x	x	x
Option E-11	Reconductor with [redacted] (L2) and [redacted] (L6)	✓	✓	✓

Table 2: Summary of ZZJ/ZZK Reconductoring Assessment

Option	Details	Meets Capability Requirement	Shortlisted	Preferred solution
Option E-1	Reconductor with [redacted]	x	x	x
Option E-2	Reconductor with [redacted]	✓	x	x
Option E-3	Reconductor with [redacted]	✓	x	x
Option E-4	Reconductor with [redacted]	x	✓	x
Option E-5	Reconductor with [redacted]	x	x	x
Option E-6	Reconductor with [redacted]	x	x	x
Option E-7	Reconductor with [redacted]	x	x	x
Option E-8	Reconductor with [redacted]	x	x	x
Option E-9	Reconductor with [redacted]	x	x	x
Option E-10	Reconductor with [redacted]	x	x	x
Option E-11	Reconductor with [redacted]	✓	✓	✓

Cost estimates

Based on the latest Cost Book (2023/24 price base) and early project estimates, the estimated total project cost is [redacted] for the ZK/ZKA route and [redacted] for the ZZJ/ZZK route, resulting in a combined project cost of [redacted], inclusive of risk, contingency and the Pre-Construction Funding (PCF) allowance provided through the RIIO-ET3 Licence.

[redacted]

Indicative delivery programme

The target completion date is [redacted] (ZZJ/ZZK) and [redacted] (ZK/ZKA).

Key dependencies at the time of writing include:

- **Outages:** The possibility of other project outages and interfacing works slipping, is mitigated through coordination meetings with interfacing projects.
- **Materials:** Procurement of long lead-time materials.
- **Land access:** The possibility of disagreement with landowners on temporary access, routes and timing for OHL refurbishment is mitigated through engaging early with landowners to ascertain suitable access routes and timing.
- **Adverse weather:** Effects of adverse weather are mitigated through planning the work during the spring and summer months, and monitoring weather conditions and assigning additional resources where appropriate to prevent any programme delays.
- **Vandalism and theft:** The risk of National Grid or contractor assets being stolen or vandalised on site is mitigated through a security plan tailored to each location.

1. Introduction

1.1 Connah's Quay (Deeside) - Legacy - Trawsfynydd 1 and 2, Ironbridge - Legacy - Shrewsbury, Ironbridge - Legacy 2 OHL

This submission, together with its supporting Annexes and Cost Benefit Analysis (CBA), is submitted under the Load Re-opener and Price Control Deliverable mechanisms (Special Condition 3.18 of the RIIO-ET3 Licence) for investment to reconductor the Connah's Quay[2] - Legacy - Trawsfynydd and Ironbridge - Shrewsbury - Legacy circuits in order to increase transmission network capability and facilitate contracted customer connections.

The application seeks the following determinations from Ofgem:

- approval of project eligibility under the Load Re-Opener and Price Control Deliverable (Special Condition 3.18)
- approval of the preferred solutions (Option E-11 for both the ZK/ZKA and ZZJ/ZZK route option sets) to address the identified network need
- confirmation that the project should proceed via Track 2 EL of the re-opener process.

Note: The proposed reconductoring investments were originally submitted as *Deeside – Legacy – Trawsfynydd 1 and 2, Ironbridge – Legacy – Shrewsbury, Ironbridge – Legacy 2 OHL* within NGET's RIIO-ET3 Business Plan, the project formed part of a wider portfolio of overhead line reconductoring schemes that were subsequently assigned to Ofgem's Track 2 Load Re-opener pathway at Final Determinations.

Eligibility, Project Track Statement and PASE

The project qualifies under Special Condition 3.18 as a load-driven investment scheduled for delivery within the RIIO-ET3 period. No allowances have been provided for the delivery of the investment in the current or previous price control periods, other than the £13.83 million Pre-Construction Funding allowance provided under RIIO-ET3.

In line with the RIIO-ET3 FD, this submission proposes the Track 2 Eligibility Letter (EL) Load Re-Opener process for assessment. The Track 2 EL route was considered appropriate as the project was understood to form part of the Ofgem Final Determinations grouping "Various OHL Reconductoring (Includes ACCC impacted NLRE and LRE)", which was assigned to the Track 2 Load Re-Opener process.

The preferred solution is PASE Primary aligned, as it involves reconductoring both overhead line routes using the highest rated conductors that are technically feasible and compatible with the existing tower configurations.

[2] The project is referred to as "Deeside" within the original EJP and associated regulatory documentation. However, the transmission asset is now known as Connah's Quay, following a historic site redevelopment and renaming.

Preconstruction funding allowance

[redacted]

Table 3: Pre-Construction Funding Price Control Deliverable Allowance (2023/24 price base)

EJP Reference	Output	Delivery Date	2026/27 (£m)	2027/28 (£m)	2028/29 (£m)	2029/30 (£m)	2030/31 (£m)	Total Allowance (£m)
NGT500472	DEESIDE - LEGACY - TRAWSFYNYDD 1, DEESIDE - LEGACY - TRAWSFYNYDD 2, IRONBRIDGE - LEGACY - SHREWSBURY, IRONBRIDGE - LEGACY 2	31 March 2031	2.82	2.79	2.77	2.74	2.71	**13.83**

The project was originally submitted as a baseline RIIO-ET3 investment and subsequently transferred to the Load Related Re-opener pathway. Although the project would not typically have been expected to receive a separate PCF allowance in these circumstances, a PCF allowance was included within Appendix 2 of the RIIO-ET3 Licence and has not subsequently been amended. NGET therefore recognises the allowance as part of the current licence arrangements and is not seeking any additional pre-construction funding through this submission.

1.2 Background

Chronology of Investment

2023: Transmission Works Review (TWR)

As part of NESO's Transmission Works Review (TWR), revised Construction Planning Assumptions (CPAs) were applied to the contracted customer connection background to reflect more realistic assumptions regarding customer progression.

2023 – 2024: Detailed Studies and RIIO-T3 Business Plan Submission

NGET subsequently undertook network studies using this revised planning background, which identified thermal constraints within the North Wales transmission corridor associated with the aggregated customer connection portfolio and the need for additional transmission capability on the Connah's Quay-Legacy-Trawsfynydd (ZK/ZKA) and Ironbridge-Legacy-Shrewsbury / Ironbridge-Legacy 2 (ZZJ/ZZK) routes.

Based on the outputs of these studies, the projects were submitted to Ofgem in December 2024 as part of NGET's RIIO-ET3 Business Plan. The submission proposed reconductoring of the identified routes as a proportionate reinforcement. The preferred conductor solutions at the time comprised [redacted] conductors for ZK/ZKA, and [redacted] conductors for ZZJ/ZZK.

Owing to the need for further assessment of [redacted] overhead line conductor solutions, the project was included in the wider portfolio of [redacted] reconductoring schemes subject to additional review during the RIIO-ET3 determination process. Whilst the preferred solution did not utilise an [redacted] conductor, the proposed application of [redacted] required further consideration alongside the wider assessment of type-registered conductor technologies and reconductoring strategies.

2025: RIIO-T3 Final Determination

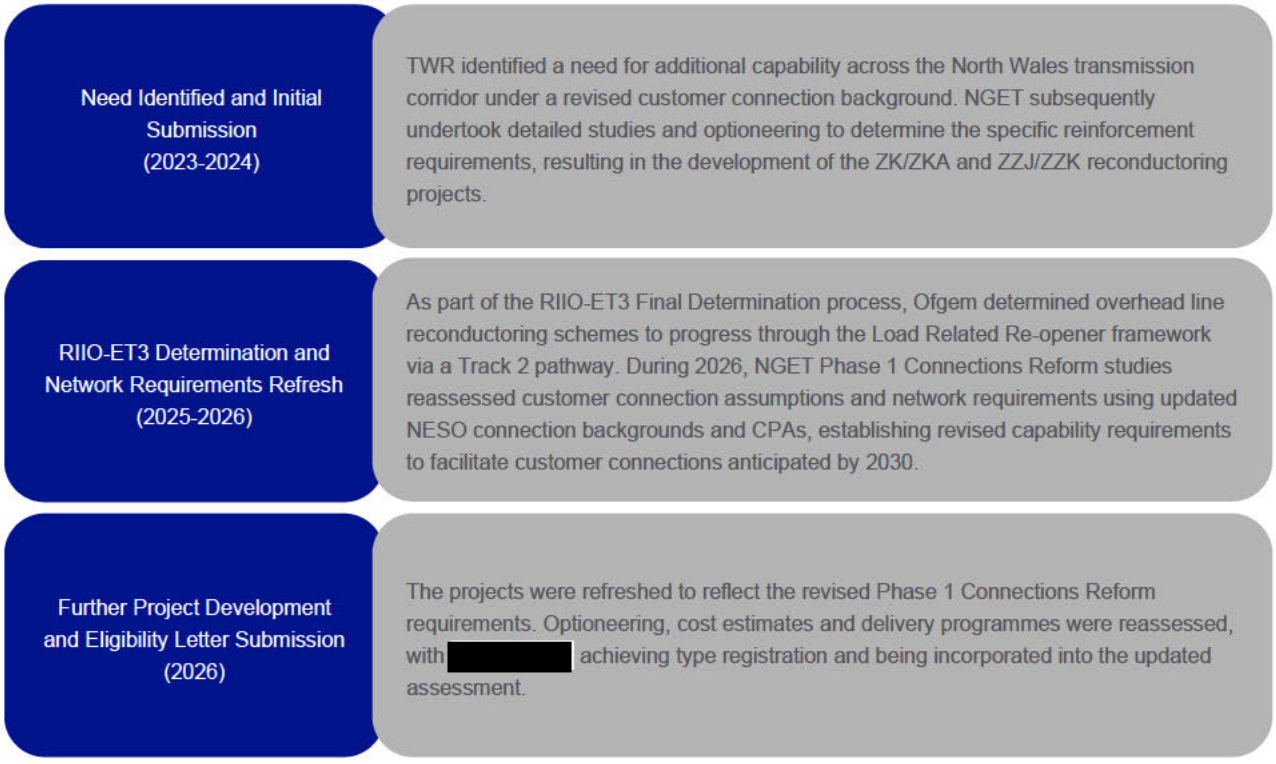
As part of the RIIO-ET3 Final Determination process, Ofgem concluded that further assessment of overhead line reconductoring schemes was required through the Load Related Re-opener framework. Consequently, the projects were assigned to the Track 2 Load Reopener and PCF allowance was granted in the NGET licence.

2026: Connections Reform Studies

As part of Connections Reform, NESO developed a revised customer connection background aligned to the Government's Clean Power 2030 pathway, supported by updated Construction Planning Assumptions (CPAs). This represented a refresh to the planning background used in the 2023 Transmission Works Review. NGET subsequently undertook updated network studies to assess the impact of the revised assumptions, customer background and associated power transfers. These studies reconfirmed the need for reinforcement of the associated routes and established the revised capability requirements that underpin this submission.

Whilst the underlying need for reinforcement remained unchanged, the updated studies superseded the network capability requirements derived from the 2023 TWR planning background. The projects were subsequently developed against these updated requirements, including refreshed optioneering, cost and programme assessments. Developments also reflected the successful type of registration of [redacted] conductor, enabling it to be fully considered within the updated optioneering process.

Figure 1: Summary of chronology



Regional and network context

North Wales is served by a strategic 400 kV transmission network extending from Wylfa through Pentir, Trawsfynydd and Connah's Quay into England. This corridor forms a critical part of the wider North West transmission system and plays an important role in transferring power between generation sources located in North Wales, the North West and Scotland, and demand centres in the Midlands and further south.

The region is experiencing significant change driven by industrial decarbonisation, renewable generation growth, increasing electrification and wider economic development. Existing and contracted customer connections, together with future growth across North Wales and the wider North West, are increasing demands on the transmission system and driving higher power transfers across the network. Maintaining sufficient transmission capability is therefore essential to facilitate customer connections, support regional economic growth and ensure the continued secure operation of the electricity system.

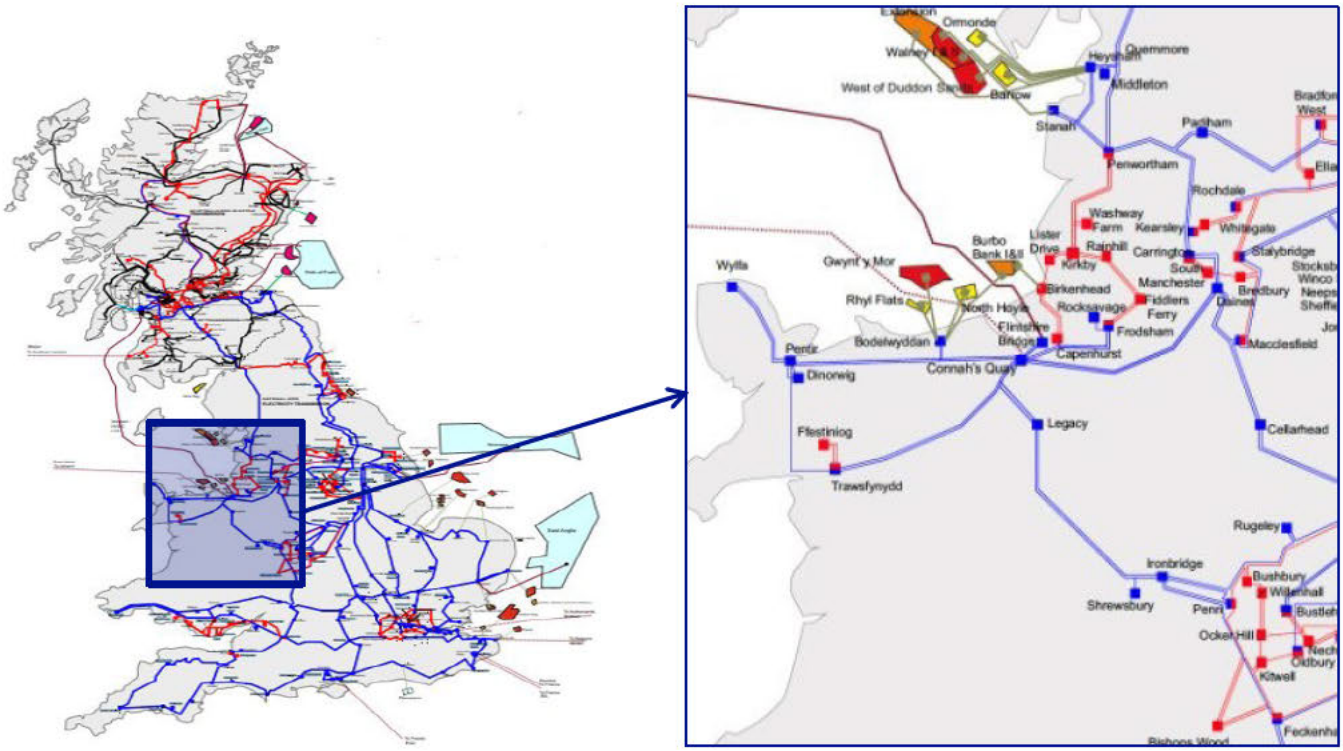
Within this wider network, the Connah's Quay - Legacy - Trawsfynydd (ZK/ZKA) and Ironbridge - Legacy - Shrewsbury / Ironbridge - Legacy 2 (ZZJ/ZZK) routes form part of the critical north-to-south transfer path linking North Wales with the wider transmission system. These circuits play an important role in transporting power from generation-rich areas in North Wales and the North West to demand centres elsewhere in Great Britain and are increasingly relied upon as regional power transfers grow.

The proposed investments increase capability on existing transmission routes, providing a proportionate reinforcement to accommodate aggregated customer connections up to 2035 and increasing power transfers across North Wales. By maximising capability from existing infrastructure, the projects provide an efficient means of delivering the network capability identified through recent system studies.

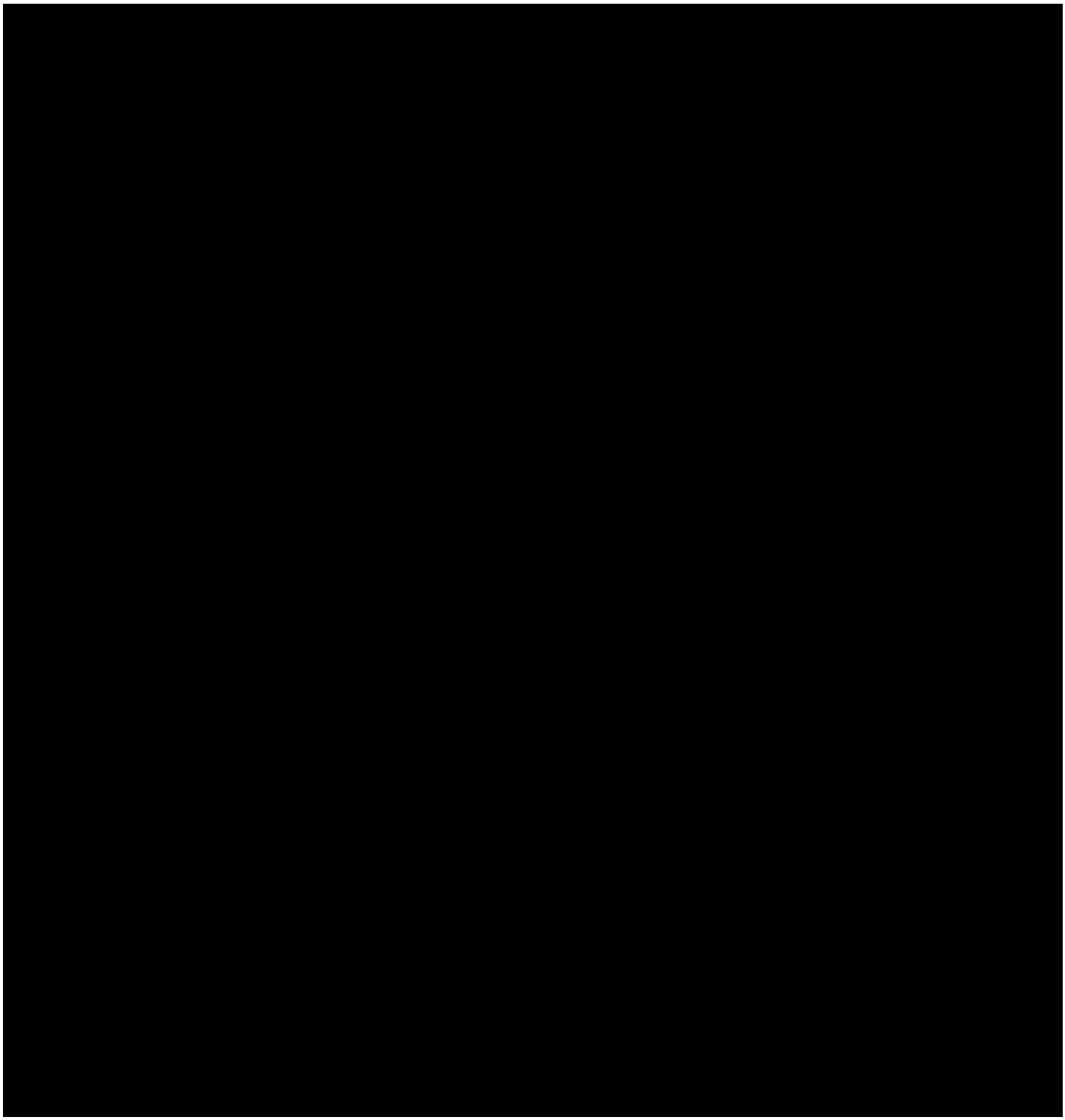
The projects are aligned with wider strategic network planning across North Wales and the wider transmission system. The reinforcements are assumed within the planning background used for NESO's strategic network assessments and therefore do not represent additional reinforcement requirements identified through tCSNP2. Rather, they form part of the assumed network capability upon which wider strategic reinforcements are developed.

Longer-term network requirements are expected to be delivered through a combination of strategic reinforcements identified through NESO planning processes, including PSNC North (UWNC), PSNC Mid (MWNC/MWN1) and the installation of Quad Boosters on the Lower Frankton-Ironbridge circuits. Collectively, these investments support increasing customer demand, facilitate future customer connections and enable increasing power transfers within North Wales and across the wider transmission system.

Figure 2: Regional overview of the Connah's Quay, Legacy, Trawsfynydd, and Ironbridge substations and OHL circuits on our network



Key: ***Red*** *= 275 kV assets,* ***Blue*** *= 400 kV assets.*



Existing Circuit Configuration

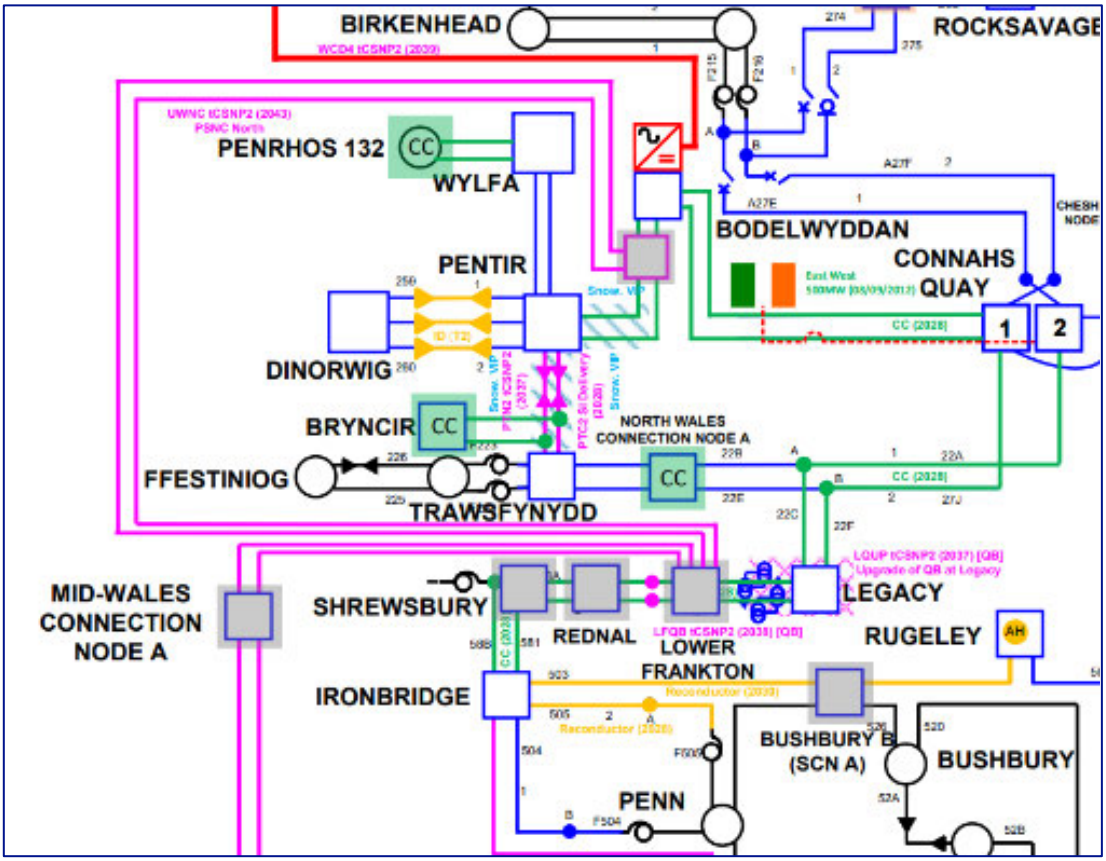
The ZK/ZKA route comprises a combination of L2 and L6 tower sections, whilst the ZZJ/ZZK route is wholly constructed on L2 towers. The proposed works involve reconductoring existing circuits to increase transmission capability whilst retaining the existing route alignments and tower infrastructure. The differing tower configurations influence the conductor solutions that can be deployed across each section of route.

Figure 4: Map of investment locations



The figure above shows the principal locations associated with the proposed reinforcements: (1) Connah's Quay, (2) Legacy, (3) Shrewsbury and (4) Ironbridge.

Figure 5: Future network configuration relevant to the proposed investments



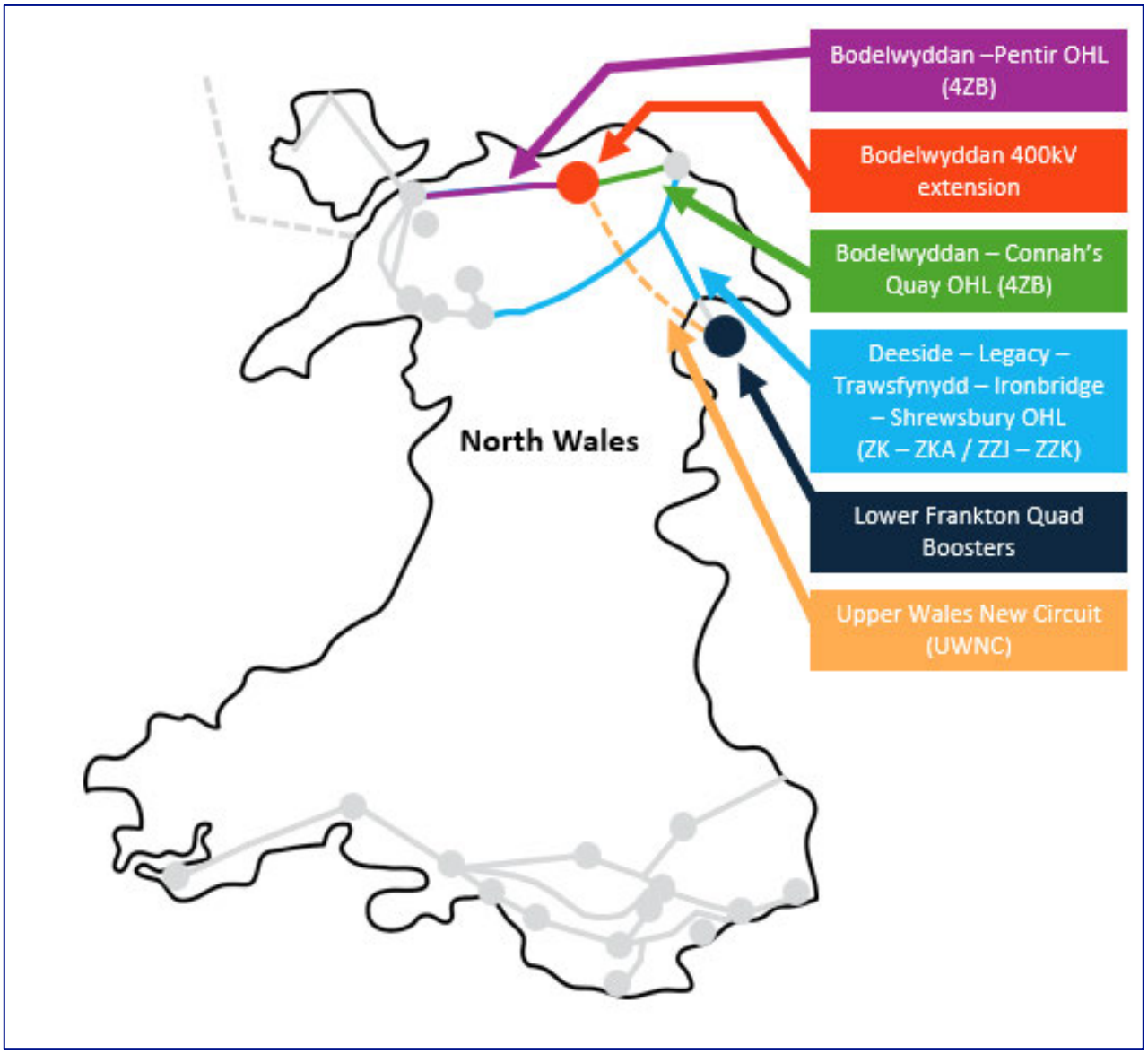
Interactive projects

The ZK/ZKA and ZZJ/ZZK reconductoring projects form part of a wider North Wales reinforcement strategy. The capability delivered by these projects is reflected in the planning background for relevant NESO strategic network assessments, including tCSNP2-related studies where applicable. They therefore provide an increase in capability on existing routes that supports, and is considered alongside, wider regional reinforcements required to accommodate future customer connections and regional power transfers. The following projects interact with the proposed investment and contribute to the wider network capability required across North Wales.

Table 4: Interactive projects

Project	Details	Status
Pentir to Swansea New Circuit in 2037 (PSNC) *(Split into Mid Wales New Circuit (MWNC) and Upper Wales New Circuit (UWNC))*	The original PSNC concept has evolved into the separate UWNC and MWNC strategic reinforcement projects. UWNC represents the primary strategic reinforcement for North Wales and provides a new Bodelwyddan-Lower Frankton connection to support increasing power transfers and future customer growth across North Wales and the wider North West. The project is expected to provide regional capability to complement that delivered through the ZK/ZKA and ZZJ/ZZK reconductoring works.	Proceed signal confirmed through tCSNP2 Refresh and June 2026 Beyond 2030 Electricity Transmission Update,
Bodelwyddan – Connah's Quay OHL (4ZB)	Reconductoring of the Bodelwyddan-Connah's Quay section of the 4ZB route to facilitate customer connections across North Wales. The project interacts with ZK/ZKA and ZZJ/ZZK through shared customer dependencies and the wider regional reinforcement pathway.	In Delivery [redacted]
Bodelwyddan - Pentir OHL (also 4ZB)	Reconductoring of the Pentir–Bodelwyddan section of the 4ZB route (49.9 km; [redacted] to increase network capability across North Wales.	The EJP was submitted in the T3 Business Plan for delivery in the T3 period.
Lower Frankton Quad Boosters (LFQB)	Installation of two [redacted] Quad Boosters to provide operational control of power flows and support management of increasing transfers across the North Wales and Midlands transmission network. NESO's assessment of the Quad Boosters assumes the capability delivered through the ZK/ZKA and ZZJ/ZZK reconductoring works is available, demonstrating the complementary role of both investments in addressing wider regional network requirements	Included within tCSNP2 Refresh; ongoing assessment to determine future scope and delivery requirements.
PTC1 and PTNO Reinforcement — North West Wales Transmission Upgrade	North West Wales electricity transmission reinforcement project, which upgrades the high-voltage grid between Pentir and Trawsfynydd. The works are part of The Great Grid Upgrade.	Planning applications submitted; one consent granted and remaining applications under determination.

Figure 6: Location of interactive works relative to the investment



Site background

The Connah's Quay - Legacy - Trawsfynydd 1 & 2 and Ironbridge - Legacy - Shrewsbury / Ironbridge - Legacy 2 400 kV overhead line circuits are key north-south transmission circuits supplying North Wales and the West Midlands. The circuits connect four substations at Connah's Quay, Legacy, Shrewsbury and Ironbridge. Figure 7 provides an overview of these substations and their location within the transmission network. Whilst the ZK/ZKA circuits form part of a wider three-ended arrangement connected to Trawsfynydd, the Trawsfynydd leg was not identified by the system studies as requiring reinforcement and is therefore outside the scope of this investment.

The ZK/ZKA circuits extend between Connah's Quay, Legacy and Trawsfynydd across North Wales. The route traverses a combination of industrial and agricultural landscapes and includes several significant crossings, including the A548, A55 and the River Dee. The ZZJ/ZZK circuits extend between Legacy, Shrewsbury and Ironbridge through predominantly agricultural and semi-rural areas. The route includes several major infrastructure and environmental crossings, including the A483, A53 and A5 road network, the Shrewsbury-Telford railway line and the River Severn. In places, the route also passes in close proximity to residential communities and local infrastructure around Shrewsbury.

The existing overhead lines consist of [redacted] conductors installed on L2 towers, and [redacted] on the L6 towers, [redacted]

Figure 7: The relevant substations and their point of connection to the OHL circuits



Historical funding

[redacted]

Early Asset Write Offs (EAWO)

We anticipate an Early Asset Write-Off (EAWO) value of [redacted] (2023/24 prices), primarily associated with sections of the ZK/ZKA route that were last reconductored in [redacted] Further information will be provided at Project Assessment stage.

2. Drivers and need case

The proposed investment is driven by the need to facilitate planned and contracted customer connections across North Wales and the wider North West region. As part of a wider programme of reinforcements across North Wales, the project addresses increasing circuit loadings and power transfers arising from customer connection growth. Without reinforcement, forecast loadings would exceed the capability of the existing network.

Table 5: Investment drivers overview

Summary of drivers		ACL
Aggregated regional customer connections	• The projects are required to provide additional transmission network capability to accommodate the aggregated regional customer connections and demand background, comprising approximately [redacted] by 2030 and [redacted] by 2035. • NESO establishes the relevant customer connection and system planning background against which the transmission network is assessed, including the updated assumptions arising from Connections Reform. • Using this NESO-defined planning background, NGET undertook detailed network studies to assess the impact of the aggregated connections and demand on power flows and circuit capability requirements. • These studies identified increased loading [redacted] on the relevant transmission routes, establishing the need for additional network capability and reinforcing the case for maximising capability from existing transmission infrastructure. • The proposed uprating also ensures these routes remain aligned with the wider North Wales reinforcement pathway by reducing the risk of the existing circuits becoming a limiting element as regional capability is developed.	**Various** Gate 2 Phase 1 portfolio: By 2030 Gate 2 Phase 2 Portfolio: By 2035
Asset health	• Asset health is not a primary investment driver for the proposed reinforcement, however, the projects will deliver associated asset renewal benefits through the replacement of overhead line components required as part of the reconductoring works.	N/A

2.1 Customer Connections

The proposed investments are driven by the need to provide additional transmission network capability to accommodate portfolios of aggregated customer connections totalling approximately [redacted] by 2030 and [redacted] by 2035. These connections form the planning background underpinning the investment, with associated increases in power transfers and circuit loadings identified across the affected routes. The proposed reinforcements support the connection pathway for this portfolio and, for some customers, form part of the enabling network infrastructure required to facilitate their connection.

The customer connection background comprises the Gate 2 portfolio established through Connections Reform, together with DNO demand at relevant Grid Supply Points. This includes customers aligned to the Clean Power 2030 pathway, referred to as Phase 1, and a broader portfolio of customer connections anticipated beyond 2030, referred to as Phase 2.

Table 6 and 7 summarise the Gate 2 customer connections directly affected or enabled by the proposed ZK/ZKA and ZZJ/ZZK reconductoring works. Table 6 presents the Phase 1 customer portfolio anticipated by 2030, while Table 7 presents the broader Phase 2 portfolio anticipated by 2035. [redacted]

Table 6: Gate 2 Phase 1 aggregated customer connections (connections up to 2030) directly affected or enabled by the ZK-ZKA and ZZJ-ZZK reconductoring

Customer Category	Number of Connections	Capacity (MW)	Connection Assumptions
Generation	[redacted]	[redacted]	2030
Transmission Demand	[redacted]	[redacted]	
DNO (Embedded Generation)	[redacted]	[redacted]	
DNO Demand	[redacted]	[redacted]	
Total	[redacted]	[redacted]	

Table 7: Gate 2 Phase 2 aggregated customer connections (connections up to 2035) directly affected or enabled by the ZK-ZKA and ZZJ-ZZK reconductoring

Customer Category	Number of Connections	Capacity (MW)	Connection Assumptions
Generation	[redacted]	[redacted]	2035
Transmission Demand	[redacted]	[redacted]	
DNO (Embedded Generation)	[redacted]	[redacted]	
DNO Demand	[redacted]	[redacted]	
Total	[redacted]	[redacted]	

***Note:** DNO Demand is included in the total capacity totals as it contributes to the overall network capacity requirement. However, it is not included in the number of connections totals, as DNO demand relates to GSP-level demand rather than discrete customer connection projects.

Determining System Requirements to connect the customers

NESO Transmission Works Review (TWR)

The need for reinforcement on both routes was originally identified through the 2023 Transmission Works Review (TWR), undertaken by NESO as part of its Five-Point Plan to accelerate customer connections at the time. The TWR process established an updated customer connection background and planning assumptions, against which NGET subsequently assessed future network performance and capability requirements.

NGET's studies identified increasing power transfers across the North Wales transmission corridor and confirmed the need for additional capability on both circuits to facilitate forecast customer connections associated with the routes. These studies formed the basis of the original RIIO-ET3 submission.

Following the implementation of Connections Reform, the customer connection assumptions underpinning the TWR studies were superseded by an updated planning background and the associated capability requirements were subsequently reassessed. Historical TWR loading forecasts from NGET are provided in Appendix E for reference.

Phase 1 Connections Reform Studies

Following the implementation of Connections Reform, NESO developed an updated customer connection background aligned to the Clean Power 2030 pathway and associated Gate 2 customer portfolio. NGET subsequently undertook updated network studies using this revised planning background to assess future power transfers and determine the network capability required to facilitate customers anticipated to connect by 2030 (Connections Reform Gate 2 Phase 1 Studies).

The studies reconfirmed the continuing need for reinforcement of the two routes. The resulting loading forecasts and capability requirements are summarised in Table 8 and Table 9.

The highest predicted pre-fault summer loading identified through the Phase 1 studies was approximately [redacted] pre-fault summer loading[3], and a corresponding [redacted] post-fault winter loading, establishing the capability requirements across both routes. As the most onerous loading condition identified, this represents the governing capability requirement for the reinforcement.

Customer Portfolio Sensitivity and Low-Regret Investment

The planning assumptions and customer backgrounds do not assume that all projects within the connections pipeline will ultimately connect. Instead, they incorporate assumptions regarding the expected progression of projects, recognising that some schemes may be delayed, withdrawn or otherwise not proceed to connection.

In accordance with Connections Reform and the Connections Network Design Methodology (CNDM), transmission reinforcements are assessed against the agreed Gate 2 portfolio. This provides a consistent and transparent planning background for network assessment and avoids the need to speculate on the future progression of individual customer projects.

The identified need is therefore driven by the assessed customer connection and demand background as a whole, rather than any individual customer connection. As the planning background already incorporates assumptions regarding project non-progression, the

[3] The capability requirements and circuit loadings presented throughout this submission are based on pre-fault summer conditions. This reflects the basis of the network assessments used to identify the need for reinforcement and the associated customer connection requirements.

reinforcement requirement is not dependent on all Gate 2 projects ultimately connecting. The investment therefore represents a low-regret investment.

Table 8: Gate 2 Phase 1 Connections Reform Predicted Circuit MVA loading[4]

Circuit	Predicted pre-fault summer Loading (MVA) 2030
Connah's Quay - Legacy - Trawsfynydd 1 (Connah's Quay leg)	[redacted]
Connah's Quay - Legacy - Trawsfynydd 2 (Connah's Quay leg)	
Connah's Quay - Legacy - Trawsfynydd 1 (Legacy leg)	
Connah's Quay - Legacy - Trawsfynydd 2 (Legacy leg)	
Ironbridge - Legacy 2	
Ironbridge - Legacy - Shrewsbury	

Table 9: Capability Requirements for the circuits

Circuit	Existing Conductor Configuration	Existing Summer Pre-Fault Rating (MVA)	Required Summer Pre-Fault Rating (MVA) by 2030	Required Winter Post-Fault Rating (MVA)
Connah's Quay - Legacy - Trawsfynydd (ZK/ZKA)	[redacted]	[redacted]	[redacted]	[redacted]
Ironbridge - Legacy - Shrewsbury / Ironbridge - Legacy 2 (ZZJ/ZZK)	[redacted]	[redacted]	[redacted]	[redacted]

The proposed reconductoring will maximise capability on the existing ZK/ZKA and ZZJ/ZZK routes in accordance with PASE principles for overhead line reconductoring. As such, the reinforcement supports both the Phase 1 customer portfolio and the broader customer growth anticipated through Phase 2 by increasing capability on the routes to accommodate increasing power transfers.

The projects will form part of a wider regional reinforcement and complement the interacting projects described in Section 1.2. Collectively, these reinforcements increase regional network capability, support the accommodation of anticipated customer connections and demand growth, and facilitate power transfers across the region.

[4] Derived using the latest Future Energy Scenario (FES) backgrounds and NESO Construction Planning Assumptions (CPAs) reflecting the portfolio of customers anticipated to connect by 2030. NGET assessed future network loading conditions using these inputs to establish the capability requirements for the affected routes

2.2 Asset health

This project is primarily driven by the need to facilitate customer connections and increase network capability. Asset health considerations provide an additional benefit and efficiency opportunity but are not a key driver for this investment. A summary of the current asset health position is provided in Table 10 and Table 11 which reflects our latest, assured 2025/2026 asset condition data.

[redacted]







3. Optioneering

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

The proposed investments comprise two distinct reconductoring schemes, ZZJ/ZZK and ZK/ZKA. Both are driven by the same underlying need and were initially assessed against a common set of strategic direction-setting options. Route-specific optioneering was then undertaken to reflect differences in tower configurations, conductor constraints and feasible reinforcement solutions.

3.1 Strategic Options

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

Table 12: Strategic direction setting

Option	Description
Option A: Do nothing	This option involves making no changes to the existing network and therefore doing nothing to facilitate the connection of customers.
Option B: Market based solution	The use commercial mechanisms, such as constraint management or flexibility services, to reduce network loading and manage power transfers without undertaking physical network reinforcement.
Option C: Non-transmission, whole systems solution	Address the identified need through alternative solutions outside traditional transmission reinforcement, including demand-side response, flexibility services, storage, generation dispatch or coordinated whole-system interventions.
Option D: Make use of existing assets	Increase network capability through asset optimisation that make more effective use of the existing OHL infrastructure.
Option E: Reconductoring	Increase transmission capability by replacing the existing conductors with higher-capacity conductors on the existing overhead line routes, whilst retaining existing towers.
Option F: New line	Construct a new transmission circuit to provide additional network capacity to facilitate connections.

Options A and B were discounted as they would not provide the additional transmission capability required to accommodate the aggregated customer connections and demand background and therefore would not meet the identified investment need.

Option C was discounted as non-transmission and whole-system solutions could not provide the enduring increase in transmission capability required to accommodate the aggregated customer portfolio and associated power transfers.

Option D was discounted as optimisation of existing assets alone was unable to provide the required increase in network capability. Option F was discounted due to its significantly higher cost and longer delivery timescales relative to the identified need.

The preferred strategic direction is therefore Option E, reconductoring, which seeks to maximise capability on both routes to support connections.

3.2 Siting

As the works comprise the replacement and uprating of existing conductors on established overhead line routes, the preferred solutions are expected to be delivered under existing permitted development rights associated with transmission infrastructure.

Although the works are confined to existing transmission corridors, temporary access to third-party land will still be required to facilitate surveys, construction activities, access routes and associated OHL refurbishment works.

3.3 Longlist of options considered

In line with our internal processes and Ofgem's Load Re-opener Guidance, we undertook a proportionate multi-factor assessment to identify the option that provides the best overall outcome for consumers.

A descriptive rationale for rejection or progression from the longlist is explained further in Tables 13 and 14.

A total of 19 long-list options were developed for each project route, of which 11 options related to reconductoring. Only conductor solutions that were considered credible for deployment were taken forward for detailed assessment, based on compatibility with the existing tower configurations, [redacted]

- For ZK/ZKA, conductor solutions compatible with both L2 and L6 tower types were considered;
- For ZZJ/ZZK only solutions compatible with the existing L2 tower type were assessed.

Table 13: ZK/ZKA Assessment of longlist options

Option name and status	Technical Description	Relevant diagrams	Consenting risk and environmental constraints	Rationale for rejecting or taking forward the option
Option A: Do minimum **Not progressed**	Continue operating the existing network without intervention.	N/A	N/A	**Engineering:** Rejected as the option would not provide the additional transmission capability required to address the identified network constraints and accommodate the aggregated customer connections and demand growth.
Option B: Market-based solution **Not progressed**	Use commercial and operational market mechanisms, such as flexibility services and constraint management, to manage network loading without undertaking physical network reinforcement.	N/A	N/A	**Engineering:** Rejected as market-based solutions manage network constraints but do not provide the additional transmission capability required to meet the identified investment need.
Option C: Non-transmission, whole-systems solution **Not progressed**	Address the identified need through non-transmission interventions, including flexibility services, active network management, demand-side response, generation curtailment and coordinated transmission-distribution solutions.	N/A	N/A	**Engineering:** Rejected as non-transmission and whole-system solutions may provide operational benefits but would not deliver the enduring transmission capability required to address the identified network constraints and facilitate aggregated customer growth.
Option D-1: Hotwiring **Not progressed**	Increase route capability by operating the existing conductors at higher temperatures.	N/A	N/A	**Engineering:** Rejected as the existing [redacted] conductors are [redacted] and therefore cannot be further thermally uprated. Whilst the [redacted] sections could be uprated to [redacted], this would only increase route capability to approximately [redacted], which remains below the identified capability requirement

Option name and status	Technical Description	Relevant diagrams	Consenting risk and environmental constraints	Rationale for rejecting or taking forward the option
Option D-2: Dynamic line rating **Not progressed**	Installation of dynamic line rating equipment to monitor real-time environmental conditions and calculate dynamic circuit ratings.	N/A	N/A	**Engineering:** Rejected as Dynamic Line Rating would provide only a limited operational uplift in circuit rating, which is insufficient to meet the identified capability requirement. In addition, the uplift is dependent on prevailing environmental conditions and cannot be relied upon as a continuous network capability.
Option D-3: Quad booster **Not progressed**	Installation of Quad Boosters to control and redistribute power flows across the transmission network, improving utilisation of existing network capacity.	N/A	Low consenting and environmental risk, as the works would be confined to existing operational substation infrastructure.	**Engineering:** Rejected as Quad Boosters redistribute power flows rather than increase circuit thermal capability. Whilst capable of influencing flow patterns, they would not address the underlying capability requirement identified by the studies and could increase loading on adjacent circuits. The introduction of series impedance would also adversely affect voltage stability, particularly under certain fault conditions.
Option D-4: Series reactors **Not progressed**	Installation of series reactors to increase circuit impedance and influence power flow distribution across the network.	N/A	Limited consenting and environmental impacts associated with installation within existing substation infrastructure.	**Engineering**: Rejected as series reactors influence power flows but do not increase circuit thermal capability. Whilst they may reduce loading on specific circuits, they would not address the underlying capability requirement identified by the studies and could increase loading elsewhere on the network. **Consumer Value:** May require additional reinforcement works elsewhere on the system, resulting in higher overall costs.
Option E-1: Reconductor with [redacted] **Not progressed**	Replacement of the existing conductor system with [redacted] (L2) and [redacted] (L6), including associated fittings and auxiliary equipment.	Common route layout for all reconductoring options (Figure 3).	Minor consenting requirements, limited to any clearance or associated ground works required to accommodate the replacement conductor system.	**Engineering:** Rejected as reconductoring the OHL with [redacted] conductors at the [redacted] would provide approximately [redacted] which is below the identified minimum network capability requirement of [redacted] MVA and therefore does not meet the investment need identified by the Phase 1 study.

Option name and status	Technical Description	Relevant diagrams	Consenting risk and environmental constraints	Rationale for rejecting or taking forward the option
Option E-2: Reconductor with [redacted] **Not progressed**	Replacement of the existing conductor system with [redacted] conductors, including associated fittings and auxiliary equipment.	Common route layout for all reconductoring options (Figure 3).	Minor consenting requirements, limited to any clearance or associated ground works required to accommodate the replacement conductor system. Additional surveys and FEED studies may be required due to conductor-specific loading characteristics and land-take requirements.	**Compliance:** [redacted]
Option E-3: Reconductor with [redacted] **Not progressed**	Replacement of the existing conductor system with [redacted] conductors, including associated fittings and auxiliary equipment.	Common route layout for all reconductoring options (Figure 3).	As Option E-1	[redacted]
Option E-4: Reconductor with [redacted] **Taken Forward**	Replacement of the existing conductor system with [redacted] conductors on L2 tower sections and [redacted] conductors on L6 tower sections, including associated fittings and auxiliary equipment.	Common route layout for all reconductoring options (Figure 3).	As Option E-1	**Engineering:** [redacted] configuration provides approximately [redacted], which falls marginally short of the identified minimum capability requirement. It has been retained as the closest credible comparator to [redacted] for value assessment. **Operability:** [redacted]
Option E-5: Reconductor with [redacted] **Not progressed**	Replacement of the existing conductor system with [redacted] conductors on L2 tower sections and [redacted] conductors on L6 tower sections, including associated fittings and auxiliary equipment.	Common route layout for all reconductoring options (Figure 3).	As Option E-1	**Engineering:** Rejected as [redacted] conductor on the L6 tower sections would remain the limiting factor, restricting overall route capability to approximately [redacted] below the identified minimum network capability requirement of [redacted]

Option name and status	Technical Description	Relevant diagrams	Consenting risk and environmental constraints	Rationale for rejecting or taking forward the option
Option E-6: Reconductor with [redacted] **Not progressed**	Replacement of the existing conductor system with [redacted] conductors on L2 tower sections and [redacted] conductors on L6 tower sections, including associated fittings and auxiliary equipment.	Common route layout for all reconductoring options (Figure 3).	As Option E-1	**Engineering:** Rejected as the [redacted] conductor on the L6 tower sections would remain the limiting factor, constraining overall route capability to approximately [redacted] Whilst [redacted] conductor on the L2 sections is capable of achieving a higher rating (approximately [redacted] the option remains below the identified minimum network capability requirement of [redacted].
Option E-7: Reconductor with [redacted] **Not progressed**	Replacement of the existing conductor system with [redacted] conductors, including associated fittings and auxiliary equipment.	Common route layout for all reconductoring options (Figure 3).	As Option E-1	**Engineering:** Rejected as the [redacted] conductor configuration would provide approximately [redacted], below the existing route capability and therefore incapable of meeting the investment need.
Option E-8: Reconductor with [redacted] **Not progressed**	Replacement of the existing conductor system with [redacted] conductors, including associated fittings and auxiliary equipment.	Common route layout for all reconductoring options (Figure 3).	As Option E-1	**Engineering:** Rejected as the [redacted] conductor is already installed on sections of the existing route and would not provide a sufficient increase in route capability. Whilst higher-rated than the existing [redacted] sections, the resulting route capability would remain below the identified capability requirement and therefore does not represent a credible reinforcement option.
Option E-9: Reconductor with [redacted] **Not progressed**	Replacement of the existing conductor system with [redacted] conductors, including associated fittings and auxiliary equipment.	Common route layout for all reconductoring options (Figure 3).	As Option E-1	**Compliance:** Rejected as [redacted] conductor is no longer an approved solution for deployment on the NGET network. [redacted]
Option E-10: Reconductor with [redacted] **Not progressed**	Replacement of the existing conductor system with [redacted] conductors, including associated fittings and auxiliary equipment	Common route layout for all reconductoring options (Figure 3).	As Option E-1	**Engineering:** Rejected as the proposed [redacted] conductor configuration would provide approximately [redacted] below the existing route capability and therefore incapable of meeting the investment need.

Option name and status	Technical Description	Relevant diagrams	Consenting risk and environmental constraints	Rationale for rejecting or taking forward the option
Option E-11: Reconductor with [redacted] **Taken Forward**	Replacement of the existing conductor system [redacted] conductors on L2 tower sections and [redacted] on L6 tower sections, including associated fittings and auxiliary equipment.	Common route layout for all reconductoring options (Figure 3).	As Option E-1	**Engineering:** Taken forward as the proposed conductor configuration provides approximately [redacted], meeting the identified minimum network capability requirement. It maximises capability from the existing tower infrastructure. [redacted] **Deliverability:** [redacted]. This provides scope for cost reduction and ensures supply can be met.
Option F: New Overhead Line Circuit **Not progressed**	Construction of a new overhead line circuit to provide additional transmission capability between the affected substations.	Conceptual new overhead line solution. Detailed route alignment was not developed at longlist stage.	High consenting and environmental risk associated with the construction of a new overhead line, including potential impacts on landscape, ecology, land use and local communities. A new route would also be subject to a complex and potentially lengthy consenting process.	**Deliverability, Economic Value and Consenting/Stakeholder:** Rejected as a new overhead line would provide a substantially more interventionist solution than required to address the identified need. The option would be significantly more expensive, have greater environmental and stakeholder impacts, and would not be deliverable within the required timeframe.

Table 14: ZZJ/ZZK Assessment of longlist options

Option name and status	Technical Description	Relevant diagrams	Consenting risk and environmental constraints	Rationale for rejecting or taking forward the option
Option A: Do minimum **Not progressed**	Continue operating the existing network without intervention.	N/A	N/A	**Engineering:** Rejected as the option would not provide the additional transmission capability required to address the identified network constraints and accommodate aggregated customer connections and demand growth.
Option B: Market-based solution **Not progressed**	Use commercial and operational market mechanisms, such as flexibility services and constraint management, to manage network loading without undertaking physical network reinforcement.	N/A	N/A	**Engineering:** Rejected as market-based solutions manage network constraints but do not provide the additional transmission capability required to meet the identified investment need.
Option C: Non-transmission, whole-systems solution **Not progressed**	Address the identified need through non-transmission interventions, including flexibility services, active network management, demand-side response, generation curtailment and coordinated transmission-distribution solutions.	N/A	N/A	**Engineering:** Rejected as non-transmission and whole-system solutions may provide operational benefits but would not deliver the enduring transmission capability required to address the identified network constraints and facilitate the aggregated customer growth.
Option D-1: Hotwiring **Not progressed**	Increase route capability by operating the existing conductors at higher temperatures.	N/A	N/A	**Engineering:** Rejected as the existing [redacted] conductors are already operated at their maximum permissible temperature of [redacted] and therefore cannot be further thermally uprated. The option would not provide a material increase in route capability and therefore does not meet the identified capability requirement.

Option name and status	Technical Description	Relevant diagrams	Consenting risk and environmental constraints	Rationale for rejecting or taking forward the option
Option D-2: Dynamic line rating **Not progressed**	Installation of dynamic line rating equipment to monitor real-time environmental conditions and calculate dynamic circuit ratings.	N/A	N/A	**Engineering:** Rejected as Dynamic Line Rating would provide only a limited operational uplift in circuit rating, which is insufficient to meet the identified capability requirement. In addition, the uplift is dependent on prevailing environmental conditions and cannot be relied upon as a continuous network capability.
Option D-3: Quad booster **Not progressed**	Installation of Quad Boosters to control and redistribute power flows across the transmission network, improving utilisation of existing network capacity.	N/A	Low consenting and environmental risk, as the works would be confined to existing operational substation infrastructure.	**Engineering:** Rejected as Quad Boosters redistribute power flows rather than increase circuit thermal capability. Whilst capable of influencing flow patterns, they would not address the underlying capability requirement identified by the studies and could increase loading on adjacent circuits. The introduction of series impedance would also adversely affect voltage stability, particularly under certain fault conditions.
Option D-4: Series reactors **Not progressed**	Installation of series reactors to increase circuit impedance and influence power flow distribution across the network.	N/A	Limited consenting and environmental impacts associated with installation within existing substation infrastructure.	**Engineering**: Rejected as series reactors influence power flows but do not increase circuit thermal capability. Whilst they may reduce loading on specific circuits, they would not address the underlying capability requirement identified by the studies and could increase loading elsewhere on the network. **Consumer Value:** May require additional reinforcement works elsewhere on the system, resulting in higher overall costs.
Option E-1: Reconductor with [redacted] **Rejected**	Replacement of the existing conductor system with [redacted] conductors, including associated fittings and auxiliary equipment	Common route layout for all reconductoring options (Figure 3).	Minor consenting requirements, only if additional ground works are needed to achieve clearance.	**Engineering:** Rejected as the proposed [redacted] configuration would provide approximately [redacted] which is below the identified minimum network capability requirement of [redacted] and provides less capability than the alternative conductor solutions taken forward for further assessment.

Option name and status	Technical Description	Relevant diagrams	Consenting risk and environmental constraints	Rationale for rejecting or taking forward the option
Option E-2: Reconductor with [redacted] **Rejected**	Replacement of the existing conductor system with [redacted] conductors, including associated fittings and auxiliary equipment.	Common route layout for all reconductoring options (Figure 3).	Minor consenting requirements, only if additional ground works are needed to achieve clearance. Additional surveys and FEED studies may be required due to conductor-specific loading characteristics, land take requirements and increased tension and ice loading.	[redacted]
Option E-3: Reconductor with [redacted] **Rejected**	Replacement of the existing conductor system with [redacted] conductors, including associated fittings and auxiliary equipment.	Common route layout for all reconductoring options (Figure 3).	As Option E-1	[redacted]
Option E-4: Reconductor with [redacted] **Taken Forward**	Replacement of the existing conductor system with [redacted] conductors, including associated fittings and auxiliary equipment.	Common route layout for all reconductoring options (Figure 3).	As Option E-1	**Engineering:** [redacted] configuration provides approximately [redacted] which falls marginally short of the identified minimum capability requirement. It has been retained as the closest credible comparator to [redacted] for value assessment. [redacted]
Option E-5: Reconductor with [redacted]	Replacement of the existing conductor system with [redacted] conductors, including associated fittings and auxiliary equipment.	Common route layout for all reconductoring options (Figure 3).	As Option E-1	**Engineering:** Rejected as the existing L2 towers cannot support the proposed [redacted] conductor configuration and therefore the option is not technically feasible on this route.

Option name and status	Technical Description	Relevant diagrams	Consenting risk and environmental constraints	Rationale for rejecting or taking forward the option
Rejected				
Option E-6: Reconductor with [redacted] **Rejected**	Replacement of the existing conductor system with [redacted] conductors, including associated fittings and auxiliary equipment.	Common route layout for all reconductoring options (Figure 3).	As Option E-1	**Engineering:** Rejected as the existing L2 towers cannot support the proposed [redacted] conductor configuration and therefore the option is not technically feasible on this route.
Option E-7: Reconductor with [redacted] **Rejected**	Replacement of the existing conductor system with [redacted] conductors, including associated fittings and auxiliary equipment.	Common route layout for all reconductoring options (Figure 3).	As Option E-1	**Engineering:** Rejected as the proposed [redacted] conductor configuration would provide approximately [redacted], which is below the existing route capability and therefore does not represent a credible reinforcement option.
Option E-8: Reconductor with [redacted] **Rejected**	Replacement of the existing conductor system with [redacted] conductors, including associated fittings and auxiliary equipment.	Common route layout for all reconductoring options (Figure 3).	As Option E-1	**Engineering:** Rejected as the existing route is already strung with [redacted] conductors throughout and therefore replacement with [redacted] conductor would not provide any increase in route capability.
Option E-9: Reconductor with [redacted] **Rejected**	Replacement of the existing conductor system with [redacted] conductors, including associated fittings and auxiliary equipment.	Common route layout for all reconductoring options (Figure 3).	As Option E-1	**Compliance:** Rejected as [redacted]
Option E-10: Reconductor with [redacted] **Rejected**	Replacement of the existing conductor system with [redacted] conductors, including associated fittings and auxiliary equipment.	Common route layout for all reconductoring options (Figure 3).	As Option E-1	**Engineering:** Rejected as a proposed [redacted] conductor configuration would provide approximately [redacted] which is below the existing route capability and therefore does not represent a credible reinforcement option

Option name and status	Technical Description	Relevant diagrams	Consenting risk and environmental constraints	Rationale for rejecting or taking forward the option
Option E-11: Reconductor with [redacted] **Taken Forward**	Replacement of the existing conductor system with [redacted] conductors, including associated fittings and auxiliary equipment.	Common route layout for all reconductoring options (Figure 3).	As Option E-1	**Engineering:** Taken forward as the proposed conductor configuration provides approximately [redacted], meeting the identified minimum network capability requirement. It maximises capability from the existing tower infrastructure. **Compliance:** [redacted] conductor [redacted] **Deliverability:** [redacted] This provides scope for cost reduction and ensures supply can be met.
Option F: New Overhead Line Circuit **Not progressed**	Construction of a new overhead line circuit to provide additional transmission capability between the affected substations.	Conceptual new overhead line solution. Detailed route alignment was not developed at longlist stage.	High consenting and environmental risk associated with the construction of a new overhead line, including potential impacts on landscape, ecology, land use and local communities. A new route would also be subject to a complex and potentially lengthy consenting process.	**Deliverability, Economic Value and Consenting/Stakeholder:** Rejected as a new overhead line would provide a substantially more interventionist solution than required to address the identified need. The option would be significantly more expensive, have greater environmental and stakeholder impacts, and would not be deliverable within the required timeframe.

In summary, Options A-D were rejected across both projects as they were unable to provide a technically feasible solution capable of accommodating the forecast increase in circuit loading and customer connection growth. Option F was rejected as a new 400 kV overhead line could not be delivered within the required timescales and would result in significantly higher consenting, environmental and consumer cost impacts.

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

- **Capability:** [redacted] were rejected as they did not provide sufficient route capability to meet the identified network requirement or delivered materially less capability than the credible alternatives assessed.
- **Tower compatibility:** [redacted] were rejected on ZZJ/ZZK as the existing L2 towers could not support the proposed conductor configurations. [redacted] were rejected on ZK/ZKA as the [redacted] sections would remain the limiting factor, constraining overall route capability below the identified requirement.

[redacted]

[redacted] **Maturity, compliance and deliverability:** [redacted] was not progressed at this stage because it is not currently available as a complete conductor-fitting system [redacted]

Following completion of the longlist assessment, Option E-4 and Option E-11 were identified as the only credible conductor solutions for further assessment. For ZK/ZKA, these comprised [redacted] and [redacted], whilst for ZZJ/ZZK they comprised [redacted] was retained as the closest credible comparator for value assessment purposes, although it falls marginally short of the identified minimum capability requirement. These options were therefore progressed to detailed qualitative and quantitative assessment.

Stakeholder influence on shortlisting

As the proposed works are confined to an existing overhead line corridor, stakeholder considerations primarily relate to temporary construction impacts rather than permanent environmental effects. Key considerations include access across third-party land, traffic management, road and rail crossings, and potential disruption to local communities during construction.

Upon FEED completion, NGET will engage early with affected landowners, local authorities and other relevant stakeholders to develop access arrangements, communicate planned works and identify mitigation measures where required. NGET will also undertake land rights reviews and seek to secure any additional rights required to support delivery of the works and minimise programme risk.

As proposed options utilise the existing route alignment, stakeholder and environmental impacts are expected to be significantly lower than alternative options involving new transmission infrastructure.

3.4 Shortlisted options

Following completion of the long-list assessment, two reconductoring options were identified as sufficiently credible to progress for both the ZK/ZKA and ZZJ/ZZK projects. For both routes, [redacted] options were retained for further assessment as the closest alternative, although they fall marginally short of the required rating. [redacted]

For **ZK/ZKA**, the shortlisted options comprise:

- Option E-4: Reconductoring of the Connah's Quay - Legacy - Trawsfynydd 1 and 2 circuits through a full refurbishment of fittings and replacement of conductors.
    - The L2 tower sections would be reconductored with [redacted] C, delivering a summer pre-fault rating of [redacted]; and
    - The L6 tower sections would be reconductored with [redacted] delivering a summer pre-fault rating of [redacted] up to this point.
- Option E-11: Reconductoring of the Connah's Quay - Legacy - Trawsfynydd 1 and 2 circuits through a full refurbishment of fittings and replacement of conductors.
    - The L2 tower sections would be reconductored with [redacted], delivering a summer pre-fault rating of [redacted]; and
    - The L6 tower sections would be reconductored with [redacted], delivering a summer pre-fault rating of [redacted]

For **ZZJ/ZZK**, the shortlisted options comprise:

- Option E-4: Reconductoring of the Ironbridge - Legacy - Shrewsbury and Ironbridge - Legacy 2 circuits through a full refurbishment of fittings and replacement of conductors. All existing sections are comprised of L2 tower types and would therefore be reconductored solely with [redacted], delivering a summer pre-fault rating of [redacted].
- Option E-11: Reconductoring of the Ironbridge - Legacy - Shrewsbury and Ironbridge - Legacy 2 circuits through a full refurbishment of fittings and replacement of conductors. All existing sections are comprised of L2 tower types and would therefore be reconductored solely with [redacted] delivering a summer pre-fault rating of [redacted].

For all shortlisted options, the existing tower infrastructure would be retained. The works would comprise replacement of the conductor system, refurbishment of associated fittings, replacement of the Optical Ground Wire (OPGW), and strengthening of foundations and steelwork where required to accommodate the new conductor arrangements. The proposed reconductoring works are expected to extend the operational life of the affected circuits by approximately 40 years, providing asset health asset health benefits.

As part of our assessment, wider network limitations and associated substation equipment were reviewed to determine whether any additional reinforcement would be required elsewhere on the system to support the current minimum requirement of a [redacted] summer pre-fault rating on the affected routes. This review concluded that no further substation reinforcement works are required on either route. Consequently, no additional substation scope has been included.

3.5 Qualitative assessment of shortlist

Table 15: ZK/ZKA Multifactorial analysis[9]

Option	Optioneering categories: Engineering	Environmental	Deliverability	Economic / consumer value	Consenting / stakeholder
Option E-4 : Reconductor with [redacted]	**Rating:** [redacted] delivers a summer pre-fault rating of [redacted] which is below the required [redacted] rating. It has been retained for further assessment as the closest alternative to [redacted] but does not meet the minimum capability requirement. **Constructability:** [redacted] is an [redacted] and therefore requires specialist tension-stringing methodologies during installation.	**Losses:** [redacted] conductor is expected to result in electrical losses approximately 10% higher than the [redacted] reference case. Higher electrical losses increase lifetime energy losses and associated network carbon emissions. .	[redacted] As a result, there is less operational, installation and maintenance experience available when compared with more established conductor systems, increasing delivery and lifecycle risk. **Supply chain:** [redacted]	**Conductor cost:** Higher capital conductor cost option. **Asset Life:** [redacted] is assumed to have an asset life of approximately 40 years, consistent with the [redacted] alternative.	**Consenting/Stakeholder:** Throughout the route all options would require the same consenting and stakeholder engagement. **Laydown Areas:** [redacted] may require additional temporary laydown areas and handling arrangements, increasing the temporary construction footprint during installation.
	Detractor	Detractor	Neutral	Detractor	Detractor
Option E-11: Reconductor [redacted]	**Rating:** [redacted] delivers a summer pre-fault rating of [redacted], exceeding the required 2,730 MVA rating. It is the only credible shortlisted L2 conductor solution that meets the required rating. **Construction:** [redacted] can be installed using established overhead line construction techniques and does not require	**Losses:** [redacted] conductor is expected to result in electrical losses approximately 10% higher than the [redacted] reference case.	**Installation:** [redacted] has similar installation and operating characteristics to [redacted], which is used extensively across the network, supporting confidence in installation, operation and maintenance. **Supply Chain:** [redacted]	**Conductor cost:** Lower capital conductor cost option against the [redacted] alternative, representing a more moderate cost differential. **Asset Life:** [redacted] is assumed to have an asset life of approximately 40 years, consistent with the [redacted] alternative.	**Consenting/Stakeholder:** No material difference in stakeholder or consenting requirements relative to Option E-4. **Laydown Areas:** [redacted] requires standard pulling zones and laydown areas during installation and does not require the additional temporary laydown and handling arrangements.

[9] For ZK/ZKA, the assessment is driven by the conductor selection on the L2 tower sections, as the [redacted] on the L6 tower sections is common to both shortlisted options.

Option	Optioneering categories				
	Engineering	Environmental	Deliverability	Economic / consumer value	Consenting / stakeholder
	the specialist handling and stringing methodologies associated with [redacted] conductors.		[redacted]		
	Benefit	Detractor	Neutral	Benefit	Benefit

Table 16: ZZJ/ZZK Multifactorial analysis

Option	Optioneering categories				
	Engineering	**Environmental**	**Deliverability**	**Economic / consumer value**	**Consenting / stakeholder**
Option E-4: Reconductor wit [redacted] 2)	**Rating:** [redacted] delivers a summer pre-fault rating of [redacted], which is below the required [redacted] rating. It has been retained for further assessment as the closest alternative to [redacted] but does not meet the minimum capability requirement. **Constructability:** [redacted] and therefore requires specialist tension-stringing methodologies during installation.	**Losses:** [redacted] is expected to result in electrical losses approximately 10% higher than the [redacted] reference case. Higher electrical losses increase lifetime energy losses and associated network carbon emissions.	**Installation** [redacted] As a result, there is less operational, installation and maintenance experience available when compared with more established conductor systems, increasing delivery and lifecycle risk. **Supply chain:** [redacted]	**Conductor cost:** Higher capital conductor cost option. **Asset Life:** [redacted] is assumed to have an asset life of approximately 40 years, consistent with the [redacted] alternative.	**Consenting/Stakeholder:** Throughout the route all options would require the same consenting and stakeholder engagement. **Laydown Areas:** Bend radius limitations [redacted] ay require additional temporary laydown areas and handling arrangements, increasing the temporary construction footprint during installation.
	Detractor	Detractor	Neutral	Detractor	Detractor
Option E-11: Reconductor wit [redacted] (L2)	**Rating:** [redacted] delivers a summer pre-fault rating of [redacted], exceeding the required [redacted] rating. It is the only credible shortlisted L2 conductor solution that meets the required rating. **Construction:** [redacted] can be installed using	**Losses:** [redacted] conductor has less electrical losses per year than the [redacted] alternative	**Installation:** [redacted] has similar installation and operating characteristics to [redacted], which is used extensively across the network, supporting confidence in installation, operation and maintenance.	**Conductor cost:** Lower capital conductor cost option, against the [redacted] alternative, representing a materially larger cost differential and stronger consumer value benefit. **Asset Life:** [redacted] is assumed to have an asset life of approximately 40	**Consenting/Stakeholder:** No material difference in stakeholder or consenting requirements relative to Option E-4. **Laydown Areas:** [redacted] requires standard pulling zones and laydown areas during installation and does not require the

Option	Optioneering categories				
	Engineering	Environmental	Deliverability	Economic / consumer value	Consenting / stakeholder
	established overhead line construction techniques and does not require the specialist handling and stringing methodologies [redacted]		**Supply Chain:** [redacted]	years, consistent with the [redacted] alternative.	additional temporary laydown and handling arrangements.
	Strong Benefit	Detractor	Neutral	Strong Benefit	Benefit

Qualitative assessment output

Based on the qualitative assessment:

Based on the qualitative assessment, the preferred option is **Option E-11** (reconductoring the ZK/ZKA circuits with [redacted] on the L2 tower sections and [redacted] on the L6 tower sections, and reconductoring the ZZJ/ZZK circuits with [redacted] because:

- **Capability:** It is capable of meeting the identified minimum capability requirements of [redacted]
- **Consumer value:** It delivers a lower capital cost than the [redacted] alternative. This is more significant in the case of ZZJ/ZZK.
- **Operability and deliverability:** [redacted] is functionally equivalent to [redacted] and therefore provides greater operational familiarity and maintenance/delivery confidence. [redacted]

PASE alignment

Option E-11 is the preferred option and is aligned with the PASE principle of maximising capability from existing infrastructure through deployment of the highest-rated conductor solution available to NGET for the existing tower configurations. Option E-4 is not fully aligned with PASE, as it does not utilise the highest-rated conductor available for the existing tower types.

3.6 Quantitative analysis of shortlist options

Cost estimates of shortlist options

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

Table 17: ZK/ZKA Cost estimate breakdown (23/24 price base)

Options	OHL (£m)	Cables (£m)	Substation (£m)	Total (exc. risk (£m))	Biodiversity (	Total (incl. risk (£m))
Option E-4: Reconductor with		-	-			
Option E-11: Reconductor with		-	-			

Table 18: ZZJ/ZZK Cost estimate breakdown (23/24 price base)

Options	OHL (£m)	Cables (£m)	Substation (£m)	Total (exc. risk (£m))	Biodiversity (	Total (incl. risk (£m))
Option E-4: Reconductor with						
Option E-11: Reconductor with						

Cost Drivers

For both ZK/ZKA and ZZJ/ZZK, Option E-11 is lower cost than Option E-4 because conductor is significantly more expensive than from a materials and installation cost perspective.

As well as having a high material cost, and requires specific tension-stringing methodologies, resulting in increased land take during conductor stringing activities. also requires additional laydown areas due to the bend radius requirements associated with its . These requirements do not apply to .

For ZK/ZKA, the sections are common to both shortlisted options and therefore do not contribute to the cost difference between them. The cost differential is therefore driven by the choice of conductor on the L2 tower sections. Similarly, for ZZJ/ZZK, the cost differential is driven by the choice between the conductor systems.

As a result, Option E-11 provides the lower-cost solution for both projects and achieves the higher NPV identified within the quantitative assessment.

Cost Benefit Analysis (CBA)

Purpose and approach

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

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

Our CBA considers:

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

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

For each option considered, we have quantified:

i. Initial CAPEX investment required

ii. Future end of life replacement cost

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

- **Option E-4**: the reconductoring of the ZK/ZKA circuits with [redacted] on the L2 tower sections and [redacted] on the L6 tower sections, and the reconductoring of the ZZJ/ZZK circuits with [redacted]; and
- **Option E-11**: the reconductoring of the ZK/ZKA circuits with [redacted] on the L2 tower sections and [redacted] on the L6 tower sections, and the reconductoring of the ZZJ/ZZK circuits with [redacted]

CBA outcome

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

Table 19: ZK/ZKA Lifetime CBA (2023/24 prices, central carbon pricing, discounted values)

Option	Initial investment (£m)	PV of lifetime costs (£m)	PV of monetised benefits (£m)	NPV (£m)
Option E-4: Reconductor with [redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Option E-11: Reconductor with [redacted]	[redacted]	[redacted]	[redacted]	[redacted]

Table 20: ZZJ/ZZK Lifetime CBA (2023/24 prices, central carbon pricing, discounted values)

Option	Initial investment (£m)	PV of lifetime costs (£m)	PV of monetised benefits (£m)	NPV (£m)
Option E-4: Reconductor with [redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Option E-11: Reconductor with [redacted]	[redacted]	[redacted]	[redacted]	[redacted]

ZK/ZKA: On the basis of the discounted lifetime CBA results (Table 19), Option E-11 delivers the highest NPV ([redacted] 2023/24 base prices) and therefore represents the preferred option on consumer value grounds. Option E-4 delivers a lower NPV than E-11 ([redacted] 2023/24 base prices). This recommendation analysis is subject to confirmation through deliverability, consents/land, outage and risk considerations, and any CBA sensitivities (e.g. carbon price trajectories) set out in the assumptions below.

ZZJ/ZZK: On the basis of the discounted lifetime CBA results (Table 20), Option E-11 delivers the highest NPV ([redacted] 2023/24 base prices) and therefore represents the preferred option on consumer value grounds. Option E-4 delivers a lower NPV than E-11 ([redacted] 2023/24 base prices). This recommendation analysis is subject to confirmation through deliverability, consents/land, outage and risk considerations, and any CBA sensitivities (e.g. carbon price trajectories) set out in the assumptions below.

Assumptions of the CBA analysis

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

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

Costs

Table 21: ZK/ZKA Summary of all additional Capex costs (2023/24 base prices)

Option	Initial works (£m)	Future replacement (40yr (£m))	Total costs (£m)
Option E-4	[redacted]		
Option E-11			

Table 22: ZZJ/ZZK Summary of all additional Capex costs (2023/24 base prices)

Option	Initial works (£m)	Future replacement (40yr (£m))	Total costs (£m)
Option E-4	[redacted]		
Option E-11			

Benefits

The following benefits have been included within the CBA:

- OHL Transmission Losses
- Carbon cost of construction reduction
- Summary of all Benefits

Table 23 and 24 present the summary of all (undiscounted) benefits, including environmental and non-environmental benefits, considering the central base case carbon price.

Table 23: ZK/ZKA Summary of all benefits

Option	Environmental benefits		Total benefits (£m)
	Carbon costs of construction (£m)	Transmission loss (£m)	
Option E-4	[redacted]		
Option E-11			

Table 24: ZZJ/ZZK Summary of all benefits

Option	Environmental benefits		Total benefits (£m)
	Carbon costs of construction (£m)	Transmission loss (£m)	
Option E-4	[redacted]		
Option E-11			

3.7 Preferred solution

Based on the outputs of the multifactorial assessment and CBA, the preferred option is Option E-11 (reconductoring the ZK/ZKA circuits with [redacted] on the L2 tower sections and [redacted] on the L6 tower sections, and reconductoring the ZZJ/ZZK circuits with [redacted] as it has been determined to represent the best overall outcome for consumers.

This option is preferred across both route because capable of meeting the identified minimum capability requirements of [redacted]. Across both routes it delivers a lower capital cost, lower whole-life cost and higher NPV than the [redacted] alternative, whilst maintaining a comparable asset life and electrical loss profile. [redacted] is functionally equivalent to [redacted] and therefore benefits from established installation, operation and maintenance practices.

The [redacted] conductor itself has been successfully type-registered and [redacted] Compatibility between [redacted] and the existing [redacted] fittings has been confirmed, [redacted]

Taken together, these factors provide the strongest overall consumer outcome whilst maximising capability from existing infrastructure through a proportionate, low-regret reinforcement. The preferred option also remains aligned with wider strategic network planning across North Wales and the wider transmission system.

Project benefits and outputs

Table 25: Summary of outputs and benefits

Output and proposed PCD:	Description
Outputs and benefits	• Reconductoring of the ZK/ZKA circuits using [redacted] and the ZZJ/ZZK circuits using [redacted]. • Increase route capability to approximately [redacted] winter post-fault. • Facilitate delivery of the Connections Reform-aligned customer connection and demand portfolio across North Wales by 2035 • Provide a proportionate, low-regret reinforcement aligned with wider strategic network planning across North Wales and the wider transmission system. • Deliver inherent asset health benefits through the replacement of ageing conductors, fittings and associated line components

4. Delivery

4.1 Delivery year and indicative timeline

The delivery programmes for both projects are provided in Figures 8 and 9 respectively. The programmes have been developed taking account of system access requirements, procurement lead times, resource availability, and construction sequencing.

ZZJ/ZZK is currently forecast to achieve ACL by [redacted], whilst ZK/ZKA is forecast to achieve ACL by [redacted], subject to the successful progression of outage acquisition activities. The programmes assume delivery over multiple outage seasons and will continue to be refined as the projects progress and outage certainty increases.





The ZZJ/ZZK and ZK/ZKA routes are both required to deliver the network capability identified through Connections Reform studies and support the wider customer connection portfolio underpinning the investment need. The projects are therefore being progressed in parallel, although they are at different stages of outage maturity.



Outages

The outage requirements for the projects have been developed through National Grid's established outage planning and governance processes. Outage needs are identified during project development and captured within the OHL Workbook. These requirements are subsequently reviewed through the portfolio governance process and coordinated with Outage Planning, Power System Engineers (PSE) and System Planning teams to assess feasibility and delivery confidence, before ultimately submitting the request to NESO.

For outages within the Long-Term Planning timescales (typically 3–6 years ahead), outage requests are submitted to NESO through the established Week 12 and Week 44 Long-Term Planning submission windows. Following submission, NESO undertakes its assessment and typically provides feedback within 1–2 months. The outage position is continually reviewed and challenged through portfolio governance activities, outage coordination forums and planning reviews as delivery assumptions mature.

Table 26: Outage positions

Circuit	Current Position
[redacted]	[redacted]
[redacted]	[redacted]
[redacted]	[redacted]
[redacted]	[redacted]

[redacted]

4.2 Risks and risk management

The principal risks identified at this stage are mostly common to both the ZK/ZKA and ZZJ/ZZK routes and reflect the current level of OHL project maturity. Table 27 summarises the key delivery risks and mitigations associated with the proposed reconductoring works. As the projects progress through FEED and detailed design, route-specific risks and mitigation measures will be further refined and presented within the Project Assessment submission.

Table 27: Summary of risks and mitigations (ZK/ZKA and ZZJ/ZZK)

Category	Risk	Mitigation
Design and Technical	OHL foundations upgrades may be needed due to loadings of the new [redacted] conductor.	A full round of surveys will be undertaken at FEED, such as ground investigations and intrusive foundation inspections, to assess the current ground and soil conditions and the condition of the L2 tower foundations. This will inform whether foundation upgrading/strengthening is needed.
	[redacted]	[redacted]
	[redacted]	
Operation and Maintenance	[redacted]	
Safety, Health and Security	Given the nature of a full OHL refurbishment and more intrusive work to be carried out, [redacted]	[redacted] OHL wiring work will be carried out under single circuit outage conditions, and an experienced OHL contractor will be selected in line with NGET safety rules.
Planning, Land and Consent	[redacted]	
	Ecological consenting and licenses may be needed for SSSI and habitat/species such as Dormouse or Great Crested Newts, which could lead to programme delays.	NGET when planning the job will develop a plan that limits habitat and species displacement. Full ecological surveys on the potential work areas and access routes will be carried out to then engage relevant authorities/agencies to obtain ecological consents/licenses and to develop a plan of works that limits habitat/species displacement.

Category	Risk	Mitigation
		Any Biodiversity Net Gain needed will be identified as part of the environmental surveys however due to this being existing infrastructure and access/enabling works being temporary no habitat should be permanently lost therefore BNG will be low.
Third Party Impact and Network Coordination	[redacted]	
Environmental and Sustainability	Some of the works might fall within a Site of Special Scientific Interest (SSSI), which may increase the potential for loss of habitat.	A comprehensive ecological survey of all work sites and access routes allows early engagement of environmental agencies to agree on plan of works that limits habitat/species displacement. Any Biodiversity Net Gain needed will be identified as part of the environmental surveys however due to this being existing infrastructure and access/enabling works being temporary no habitat should be permanently lost therefore BNG will be low.
Timing of Programme and Resources	The long programme of works will require more resources and a more skilled workforce in an already constrained market. [redacted]	Early engagement with the market will allow to plan, establish and secure the resources needed for the project.
Cost	An increase in prices of metal would increase the £-cost of the preferred solution. Early phase development – no project-specific risk register	We assume that OFGEM will introduce an appropriate mechanism to address the impact of Real Price Effect inflation. We have applied a [redacted] risk and contingency uplift to reflect typical project risk and contingency costs. This project is currently in an early phase of development (between stages 4.0 to 4.2) and consequently has less detailed scope definition and no project-specific risk register. The [redacted] risk and contingency uplift reflect unaccounted project risks including material deviation from the original scope assumption and unforeseen delays. Derivation of the [redacted] is explained in the NGET Cost Assessment and Benchmarking Approach Annex of our submission



5. Conclusion

This submission sets out the preferred solutions to address the identified investment drivers and seeks confirmation of eligibility under the Load Related Re-opener (Special Condition 3.18 of the RIIO-ET3 Licence), together with approval of the needs case and preferred solutions.

The **preferred solution is E-11**. For the Connah's Quay-Legacy-Trawsfynydd (ZK/ZKA) route this consists of reconductoring the existing circuits with [redacted] on the L2 tower sections and [redacted] on the L6 tower sections.

For the Ironbridge-Legacy-Shrewsbury / Ironbridge-Legacy 2 (ZZJ/ZZK) route this consists of reconductoring the existing circuits [redacted]

They represent a proportionate, low-regret investment to address forecast thermal constraints associated with aggregated customer demand and connection growth. The projects are aligned with wider strategic network planning across North Wales and the wider transmission system.

Table 28: Submission summary

Submission summary	
Main drivers	**Customer:** Aggregated customer connection and demand growth of approximately [redacted] by 2030 and a further [redacted] by 2035 is forecast to increase power transfers across North Wales. System studies identified [redacted], requiring additional transmission capability to accommodate the Connections Reform-aligned customer connection portfolio.
Preferred option	Option E-11: Reconductor with [redacted] (L2) and [redacted] (L6) for ZK/ZKA, and [redacted] (L2) for ZZJ/ZZK.
Estimated cost	ZK/ZKA: [redacted] (including contingency). ZZJ/ZZK: [redacted] (including contingency).
Outputs	• Uprating of the ZK/ZKA and ZZJ/ZZK OHL circuits to approximately deliver a winter post-fault rating of [redacted] • Facilitation of aggregated customer connection portfolios by 2035.
Proposed PCD	Delivery of the outputs is proposed by [redacted]

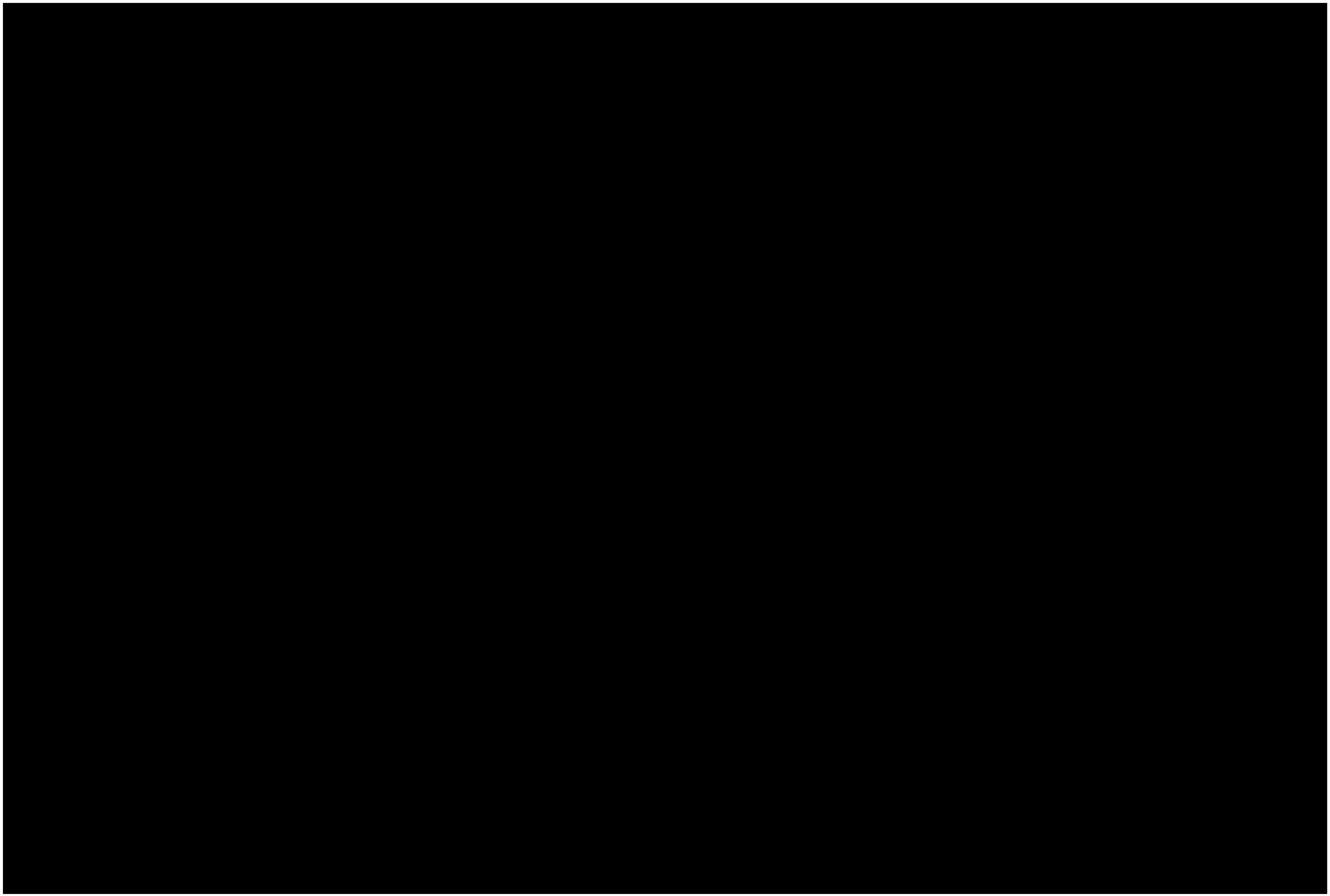
Appendix A
Glossary

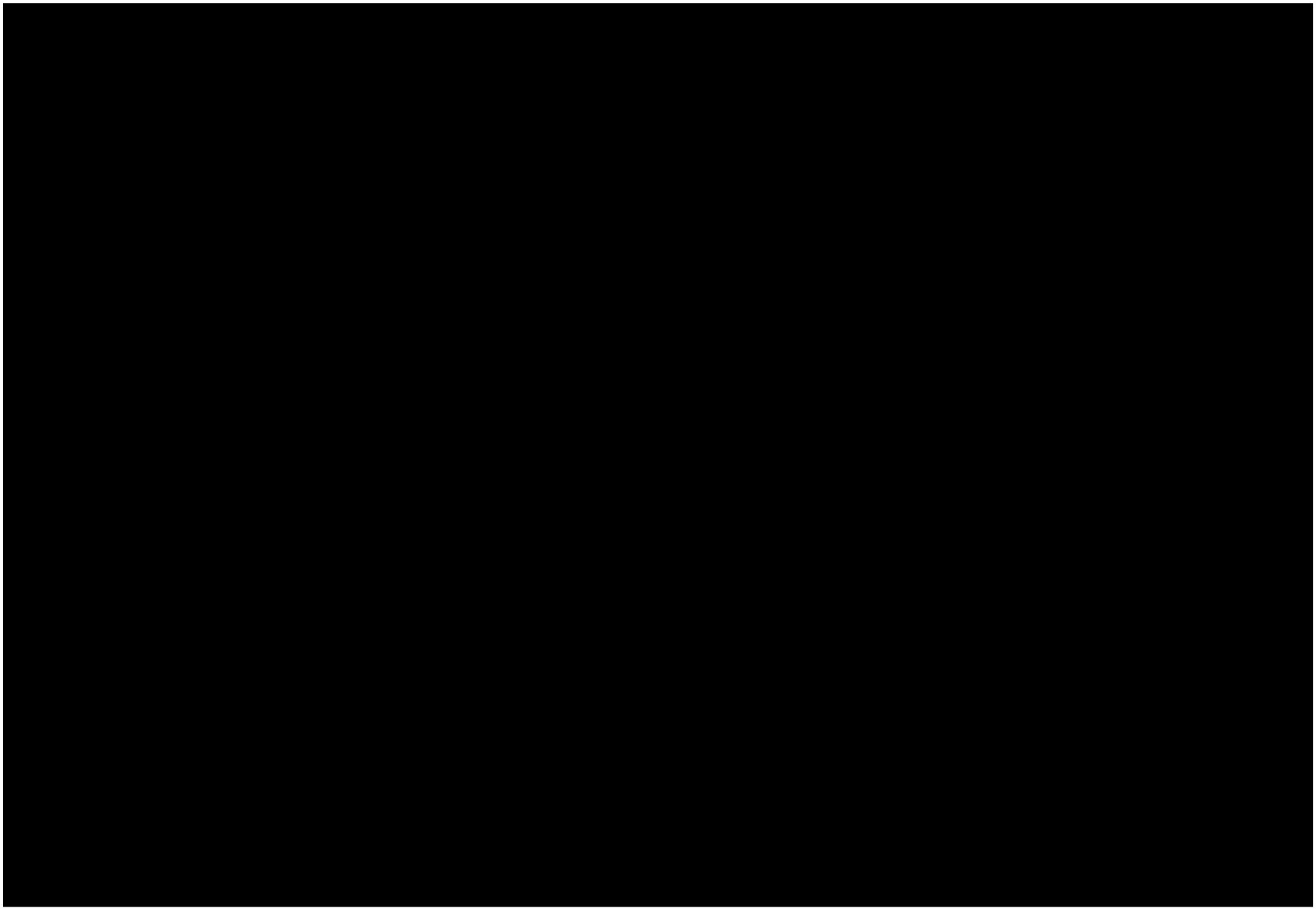
Table 29: Table of abbreviations and definitions

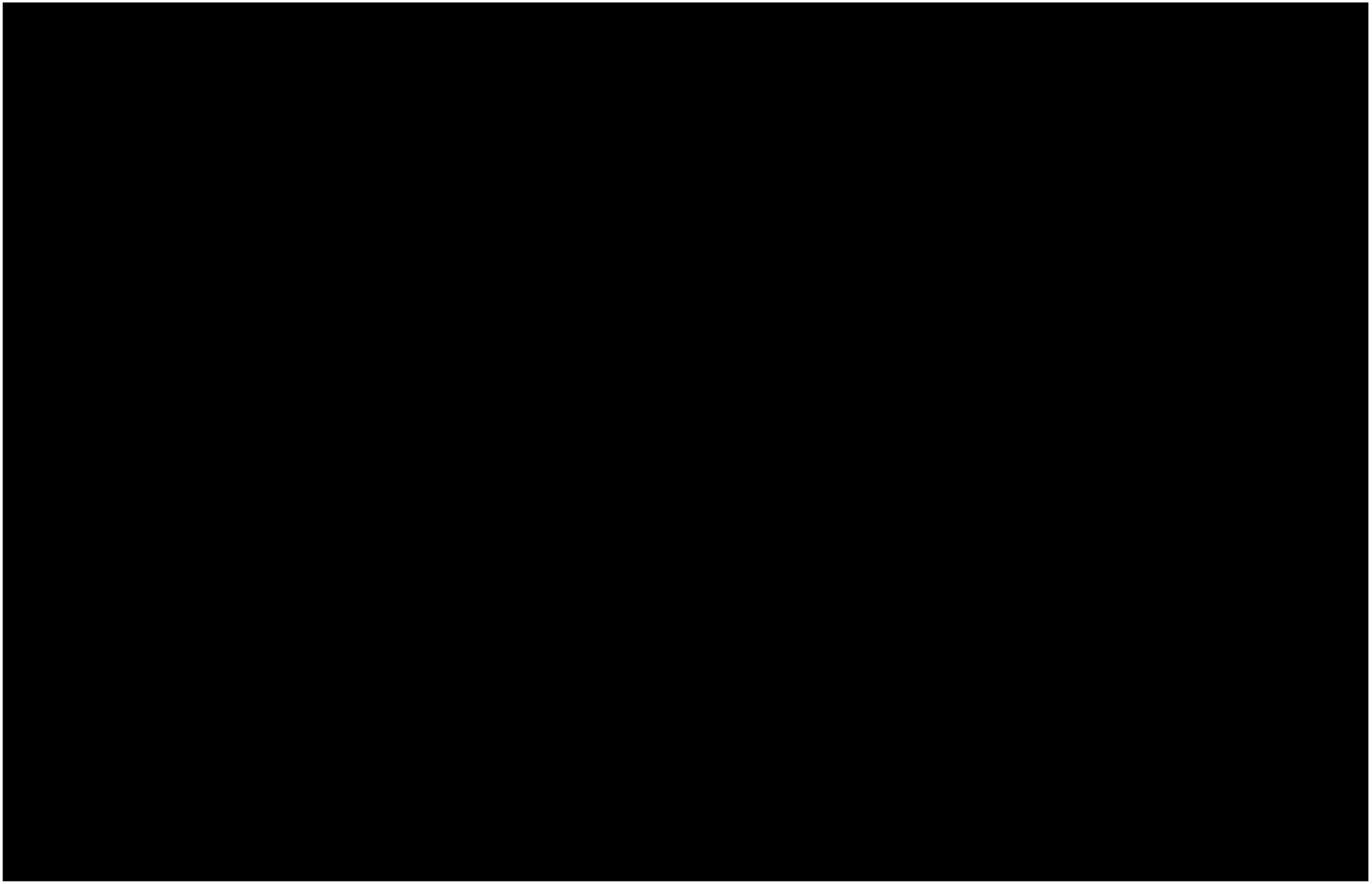
Abbreviation	Description
[redacted]	[redacted]
ACL	Available for Commercial Load
BPDT	Business Plan Data Template; the regulatory reporting template used to identify and track project references and allowances.
C&V	Costs and Volumes; reporting category used for load-related investment tables.
CAI	Closely Associated Indirects; indirect costs associated with delivery of capital investment.
CBA	Cost Benefit Analysis; assessment used to compare options and test the value delivered by the preferred solution.
CNDM	Connections Network Design Methodology; methodology used to support network assessment under Connections Reform.
CPA	Construction Planning Assumption; planning assumption used by NESO to establish the customer and system background for studies.
DNO	Distribution Network Operator; an operator of a regional electricity distribution network connected to the transmission system through Grid Supply Points.
EAWO	Early Asset Write Off; residual value of assets expected to be decommissioned before the end of their regulatory asset life.
EJP	Engineering Justification Paper; technical justification document supporting a proposed investment.
EL	Eligibility Letter; Stage 1 submission under the Load Re-opener process to confirm eligibility and proposed assessment track.
EoL	End of Life; asset condition measure used to assess remaining asset life and risk.
ESO	Electricity System Operator; predecessor terminology for the system operator role now undertaken by NESO.
ET1 / ET2 / ET3	RIIO Electricity Transmission price control periods: RIIO-ET1, RIIO-ET2 and RIIO-ET3.

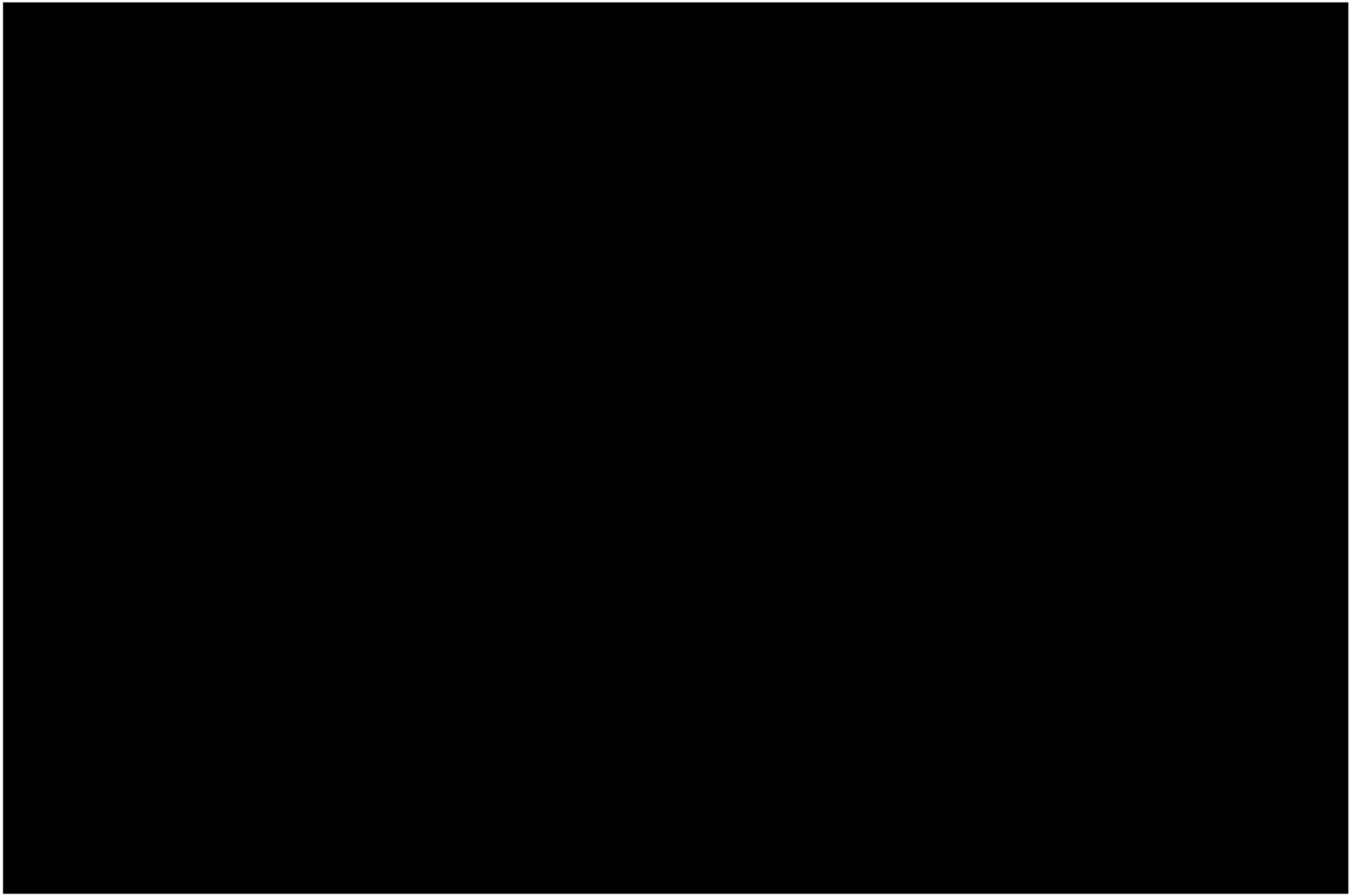
Abbreviation	Description
[redacted]	[redacted]
Gate 2	Connections Reform gate used to identify projects with sufficient maturity to be included in the planning background.
GB	Great Britain.
GSP	Grid Supply Point; point at which the transmission network supplies a distribution network.
kV	Kilovolt; unit of electrical voltage.
L2 / L6 towers	Overhead line tower types used on the relevant circuit sections, influencing conductor compatibility and feasible reconductoring options.
LFQB	Lower Frankton Quad Boosters; proposed power flow control devices interacting with the wider North Wales reinforcement strategy.
Load Re-opener	RIIO-ET3 regulatory mechanism allowing Transmission Owners to request funding for load-related reinforcement where need, scope, timing or costs require further assessment.
MW	Megawatt; unit of electrical power.
MVA	Megavolt ampere; unit of apparent power used for circuit ratings and loading.
MWNC	Mid Wales New Circuit; strategic reinforcement referenced as part of the wider North Wales reinforcement pathway.
NESO	National Energy System Operator; body responsible for developing system planning backgrounds and strategic network assessments.
NGET	National Grid Electricity Transmission; Transmission Owner responsible for the relevant transmission assets in England and Wales.
NLRE	Non-Load Related Expenditure; expenditure associated with asset health and non-load investment drivers.
NPV	Net Present Value; discounted value measure used to compare the economic outcome of investment options.
Ofgem	Office of Gas and Electricity Markets; the GB energy regulator responsible for determining RIIO price controls and re-opener submissions.
OHL	Overhead Line; electricity transmission line supported by towers or poles.

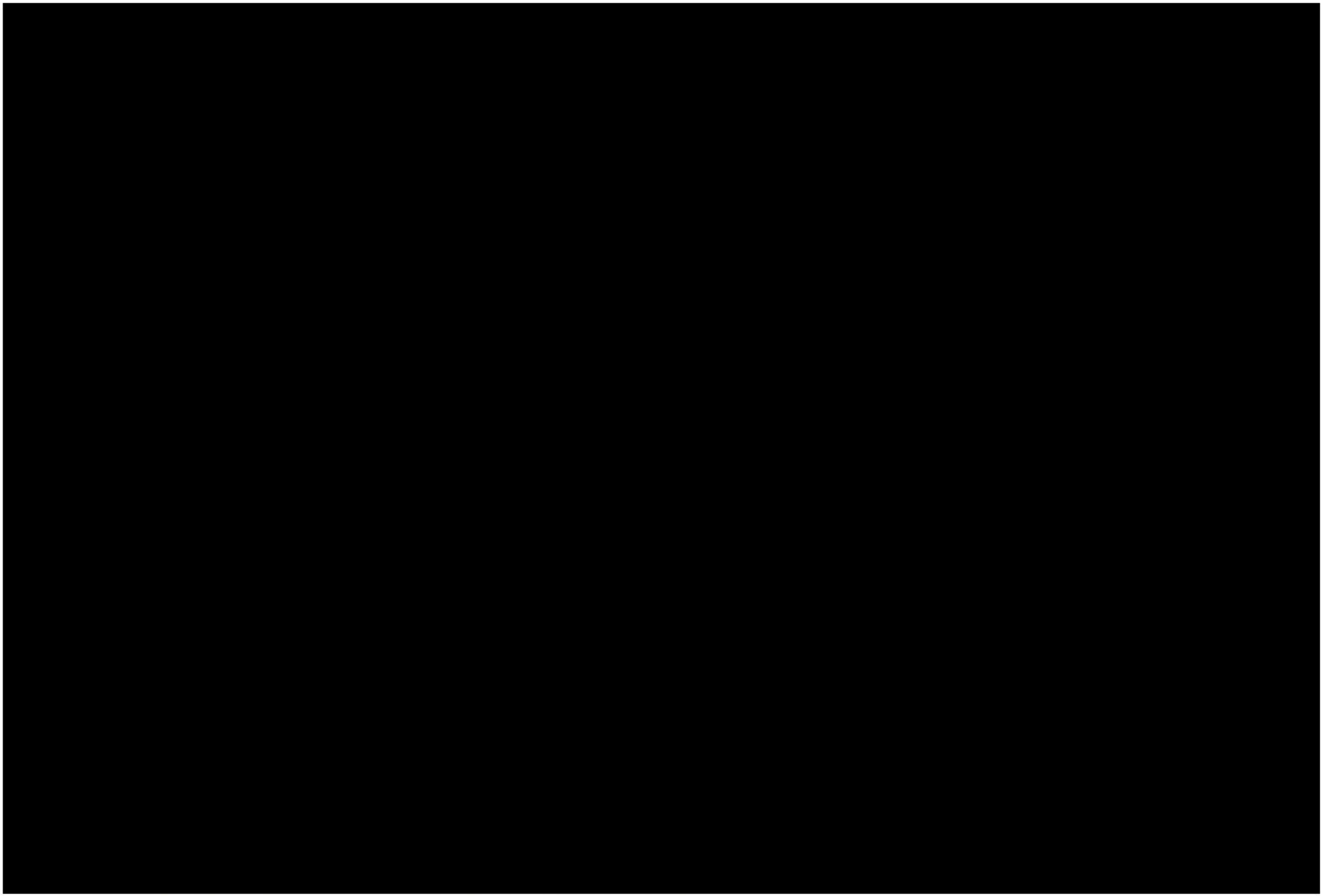
Abbreviation	Description
PA	Project Assessment; later-stage re-opener assessment following eligibility confirmation.
PASE	Pre-Approval of Solutions by Engineering; process used to identify engineering-aligned preferred solutions for load-related projects.
PCF	Pre-Construction Funding; allowance provided to support project development activities before full project funding is determined.
PSNC	Pentir to Swansea New Circuit; strategic reinforcement concept evolved into UWNC and MWNC.
QB	Quad Booster; power flow control equipment used to manage flows across transmission circuits.
RIIO	Revenue = Incentives + Innovation + Outputs; Ofgem's regulatory framework for energy network price controls.
RRP	Regulatory Reporting Pack / regulatory reference used to identify the project in reporting tables.
SQ	Supplementary Question; follow-up question raised by Ofgem during assessment of a submission.
tCSNP2	Transitional Centralised Strategic Network Plan 2; NESO strategic network planning process referenced in relation to wider reinforcements.
TO	Transmission Owner; licensed owner of electricity transmission assets.
TWR	Transmission Works Review; NESO-led review that informed the customer connection and system planning background.
UWNC	Upper Wales New Circuit; strategic reinforcement forming part of the wider North Wales reinforcement pathway.
ZK/ZKA	Circuit route between Connah's Quay, Legacy and Trawsfynydd forming one of the proposed reconductoring routes.
ZZJ/ZZK	Circuit route between Ironbridge, Legacy and Shrewsbury / Ironbridge and Legacy 2 forming one of the proposed reconductoring routes.

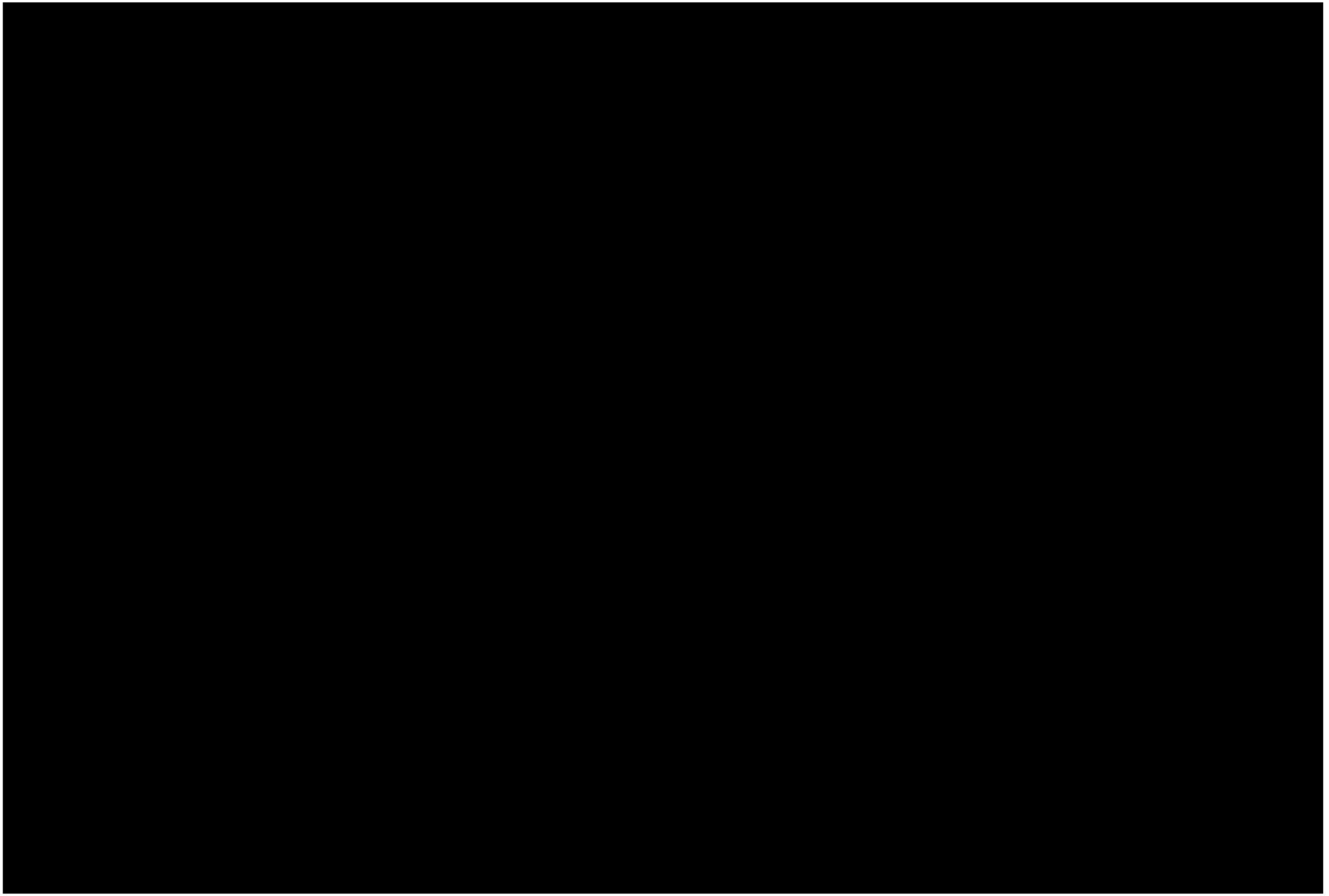


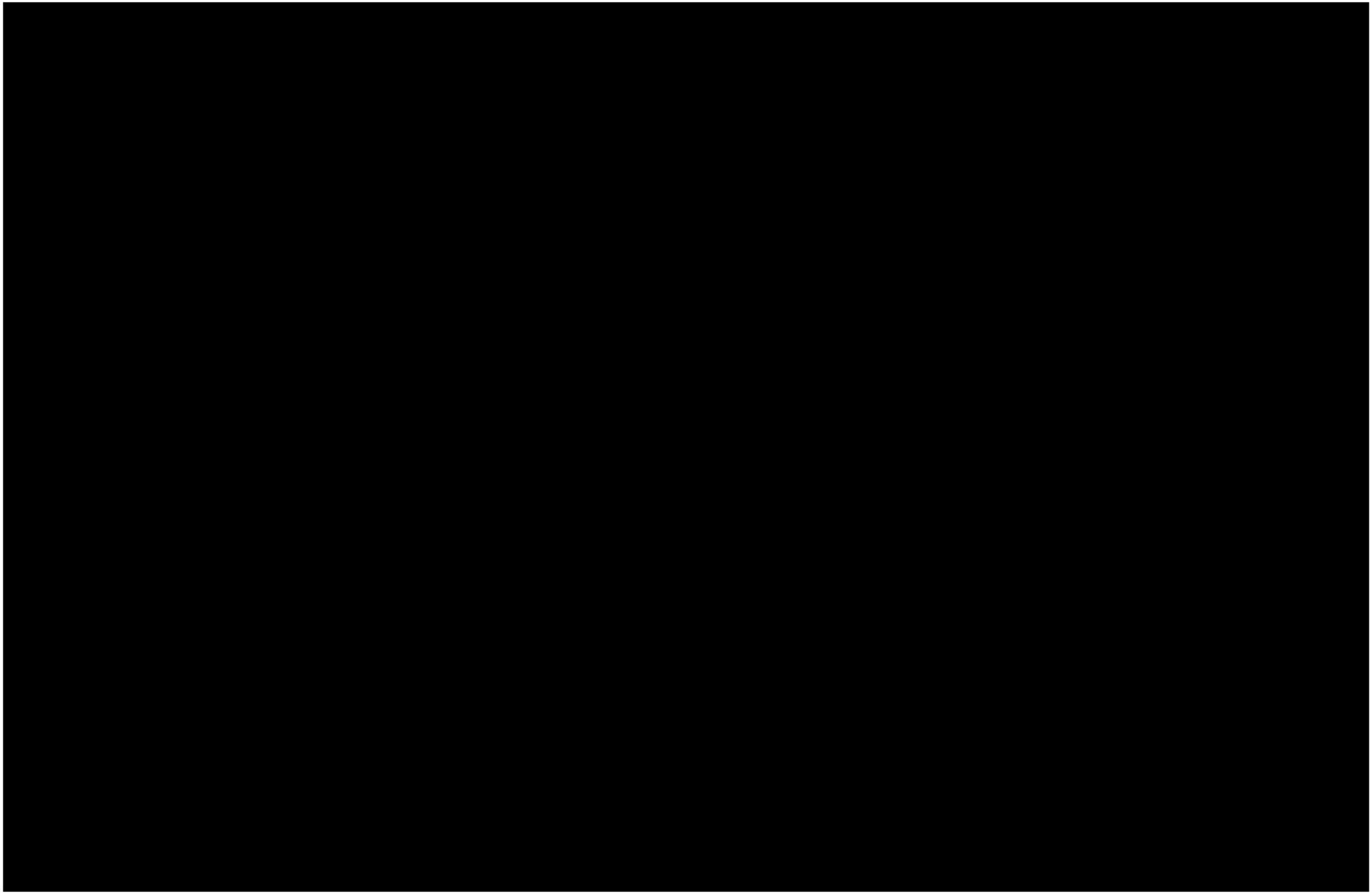














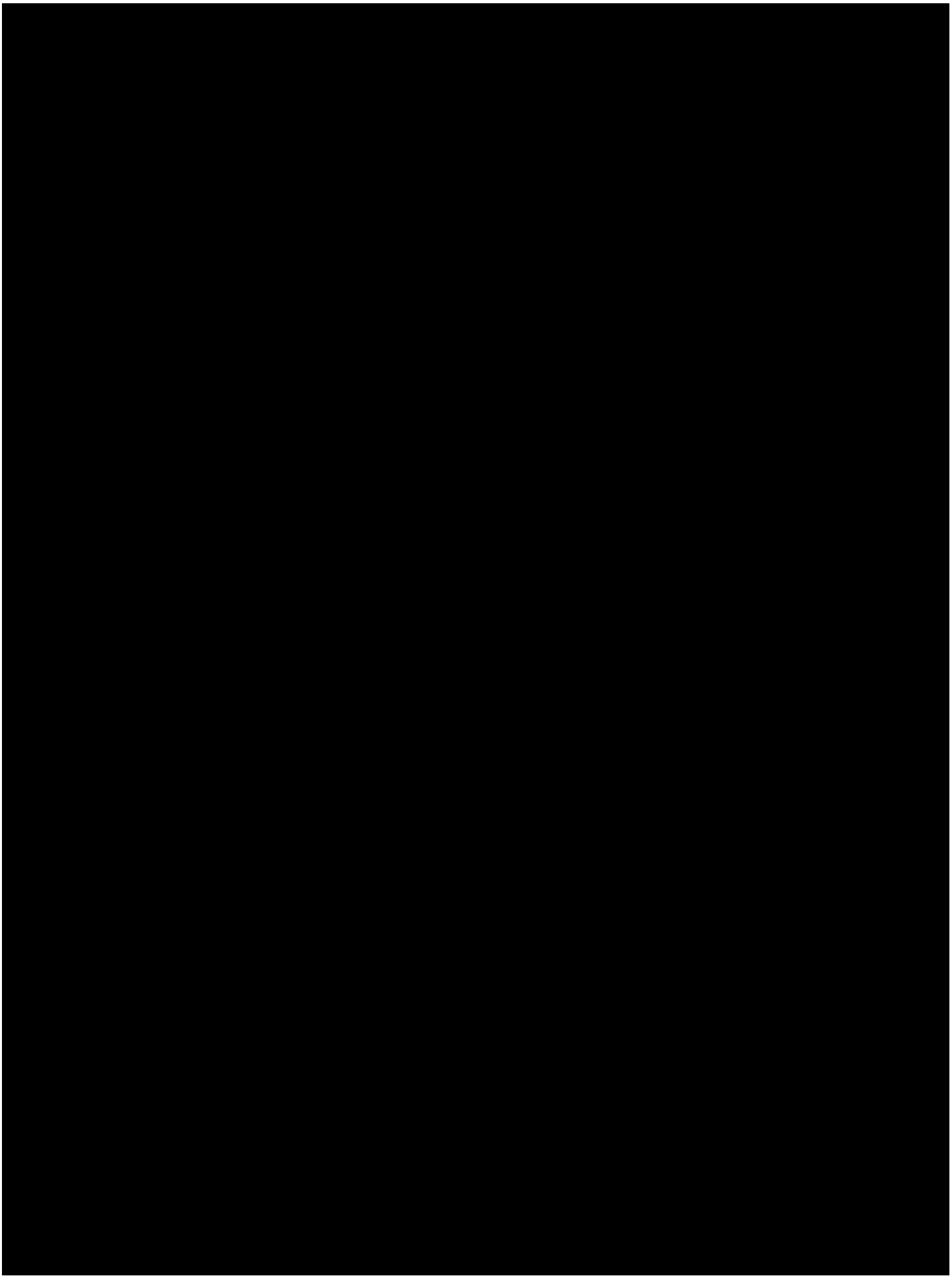
Appendix C
T1 and T2 asset interventions

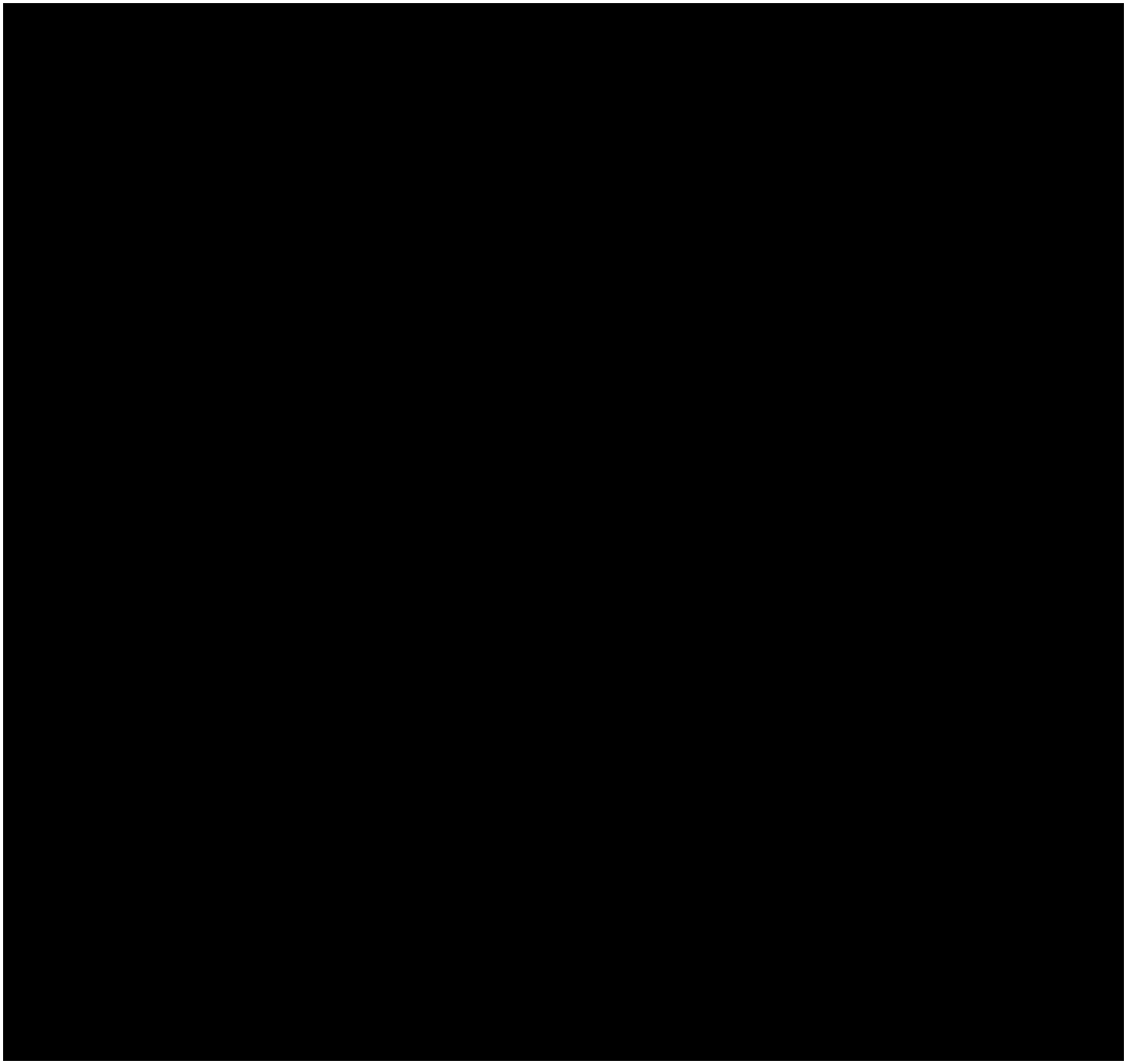
Table 32: T1 and T2 asset interventions

Asset group	FP with phase	T1 intervention	T2 intervention
[redacted]			

Appendix D
Detailed customer driver information

[redacted]





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