nationalgrid

# RIIO-T3

# SCRE (COTT4 – STAY4) and WRRE (WBUR4 – RATS4) OHL

## Eligibility Letter and Needs Case Submission – Track 3

**May 2026**

**National Grid Electricity Transmission's Business Plan**

Confidential

# Table of Contents

## Summary table

| Topic | Description |
|---|---|
| **Name of Project** | SCRE (COTT4 – STAY4) and WRRE (WBUR4 – RATS4) OHL<br>Throughout this paper the schemes are referred to as:<br>WRRE – Uprating existing 400 kV West Burton to High Marnham (A403), High Marnham to Stoke Bardolph (A41E) and Ratcliffe-on-Soar to Stoke Bardolph (A41F) single circuits.<br>SCRE – Uprating existing 400 kV Cottam to Staythorpe 1 (A408) single circuit. |
| **TO's preferred re-opener track** | Track 3 Eligibility Letter (EL) and Needs Case (NC) |
| **RRP References** | [redacted] |
| **BPDT / Project Reference Number** | [redacted] |
| **Load Board Reference** | **Discussed at load board (Feb 2026)**<br>• NGET can submit a portfolio Project Assessment for the five near term OHL schemes that were proposed to be approved in DD with ACCC which has now had type registration removed (Warwick).<br>Given maturity on costs and new optioneering, we have elected to submit an Eligibility Letter and Needs Case Submission. |
| **Investment Driver** | • This project was first identified as a NESO driven project under NOA7. It received a "essential" signal under HND and is designated as Clean Power 2030.<br>As such, this investment supports the delivery of key UK government energy policy objectives and the regulatory framework set through RIIO-3 and the CP2030 pathway, by enabling a secure, affordable and resilient electricity system capable of accommodating sustained growth in demand and generation.<br>• There is a customer driver with a number of signed customer offers counting SCRE and WRRE as "non-attributable" enabling works.<br>• This project will also address the asset health considerations for the existing fittings and insulation on the [redacted] routes |
| **PASE alignment** | The preferred option is not PASE compliant (as it does not select the highest rated conductor available for the existing tower type).<br>However, the quantitative and qualitative analysis shows it provides the best overall outcome when considering cost, transmission losses and network operability. |

<table>
<tr><td>Outputs</td><td>The key driver for uprating SCRE and WRRE 400 kV single circuits is to:<br><ul><li>provide system B8 and B7a boundary uplift to relieve the network constraint due to the forecast volume of new generation.</li><li>SCRE and WRRE facilitate EDEU (Brinsworth to Chesterfield, Chesterfield to High Marnham Uprating project) by providing power flow routes out of the High Marnham area.</li><li>In combination with EDEU, WRRE and SCRE help reinforce the B8 system boundary delivering 1075MW of uplift (see Table below- Summary boundary benefits delivered by SCRE, WRRE and EDEU).</li><li>WRRE also provides 1739 MW of uplift to the B7a system boundary.</li></ul>Summary boundary benefits delivered by SCRE, WRRE and EDEU<br><table><tr><th></th><th>SCRE, WRRE and EDEU</th><th>WRRE</th></tr><tr><td>Boundary</td><td>B8</td><td>B7a</td></tr><tr><td>MW</td><td>1075</td><td>1739</td></tr></table><br>There is also a customer driver with a number of signed customer offers counting SCRE and WRRE as “non-attributable” enabling works.</td></tr>
<tr><td>Costs</td><td>Total forecasted expenditure: WRRE: [redacted], SCRE: [redacted]<br><br>Price base year: 2023/2024<br><br>Cost drivers -<br><br>Indicative total cost of the short-listed option(s)<ul><li>Option D-1: (Selected): WRRE (£116.0m), SCRE (£41.8m)</li><li>Option D-4: WRRE (£147.0m), SCRE (£65.6m)</li></ul></td></tr>
<tr><td>Delivery Year</td><td>The year the project will be completed: SCRE ACL November is 2027 & WRRE ACL is August 2028.</td></tr>
<tr><td>Extension cost (applicable only to substations)</td><td>N/A</td></tr>
<tr><td>Applicable Reporting Tables</td><td>[redacted]</td></tr>
<tr><td>Historic Funding interactions</td><td>This Investment constitutes of [redacted] OHL routes: [redacted]. Our Fixed Asset Register indicates that we’ve carried out interventions (excluding maintenance and inspections) on various assets on these routes during RIIO-ET1 and RIIO-ET2.</td></tr>
</table>

| Route | Estimate of spend using our statutory Fixed Asset Register | Estimate of remaining Regulated Asset Value (RAV) |
| --- | --- | --- |
| [redacted] | [redacted] | [redacted] |

We've not carried out any interventions (excluding inspections and maintenance) on [redacted] OHL route during RIIO-ET1 and RIIO-ET2.

**Interactive Projects**

| Dependency | Importance |
| --- | --- |
| EDEU (Brinsworth to Chesterfield, Chesterfield to High Marnham) | It is important that WRRE (Uprating the 400 kV route between West Burton and Ratcliffe-on-Soar via High Marnham and Stoke Bardolph) and SCRE (Reconductoring 400 kV route between Cottam and Staythorpe) are considered in combination with EDEU and completed to ensure the full benefit is achieved. |
| CGNC (North Humber to High Marnham) | If SCRE & WRRE were not delivered in [redacted] delivery of the CGNC investment by [redacted] and the associated ASTI Output Delivery Incentive (ODI) date will be at risk. |
| EDN2 (Chesterfield to Willington) | If SCRE & WRRE were not delivered in [redacted] completion of EDEU could be delayed which would affect EDN2 investment to deliver by [redacted] and the associated ASTI Output Delivery Incentive (ODI) date will be at risk. |
| Customer Connections | As per the results of Connections Reform phase 1 studies which cover customers pre-2030, WRRE project has been identified as the key enabler for the following customer [redacted] |

# 1. Executive Summary

## 1.1 Project Summary

The project is a critical enabler for the ASTI project EDEU, which in turn is critical to two further ASTI projects: EDN2 and CGNC. This paper also includes additional technical scope from the original EJP submission, originally planned under the ASTI project (EDEU); however, earlier this year the technical uprating scope was transferred back into the SCRE & WRRE project to deliver the boundary uplift.

The WRRE and SCRE project consists of uprating the following circuits:

**WRRE**

- 400 kV West Burton to High Marnham (A403),
- High Marnham to Stoke Bardolph (A41E)
- Ratcliffe-on-Soar to Stoke Bardolph (A41F) single circuits and

**SCRE**

- Uprating existing 400 kV Cottam to Staythorpe 1 (A408) single circuit).

WRRE received a HND Essential recommendation in NOA 21/22 refresh. On [redacted] This project has been designated as essential to Clean Power 2030.

## 1.2 Submission Purpose

This submission provides an update to the Optioneering and Needs Case originally submitted under the RIIO-ET Engineering Justification Process (EJP). It sets out the detail and rationale for additional technical scope identified since the original EJP submission. The paper is submitted as a combined Eligibility Letter and updated Needs Case, in accordance with the RIIO-ET3 (T3) Load Re-Opener mechanism under Special Condition 3.18

We are seeking Ofgem's confirmation that Track 3 EL and NC is the appropriate route for this project, and approval for our optioneering, preferred solution and request for Pre-Construction Funding for WRRE & SCRE.

At Final Determination, this investment was deemed not justified on the basis that the preferred solution relied on the [redacted] for which Type Registration was withdrawn.

Since then, we have re-evaluated the investment and removed reliance on non-Type Registered conductors. For robustness, optioneering has been reviewed for this investment, and a clearly defined preferred solution has been identified, consistent with established engineering practice and currently available Type Registered conductors. Consequently, we have updated the qualitative and quantitively analysis accordingly for the short-listed options.

## 1.3 Need

The investment drivers have not changed since the submission of the EJP. This can be found in the Appendix D. In summary, the key driver is to reinforce the B8 and B7a system boundaries to relieve network constraints due to the forecast volume of new generation. SCRE and WRRE will also enable EDEU (Brinsworth to Chesterfield, Chesterfield to High Marnham Uprating project) by providing power flow routes out of the High Marnham area. In combination with EDEU, WRRE and SCRE help reinforce the B8 system boundary delivering [redacted] of uplift. WRRE project itself also provides B7a uplift of [redacted], as well as enable 2 other ASTI project EDN2 and CGNC.

## 1.4 Optioneering

Since the Final Determination, we have re-evaluated optioneering for SCRE and WRRE investment and removed reliance on conductors that lack Type Registration. In accordance with our ACCC EJP

Addendum, we now propose to use [redacted] conductor at [redacted], which will achieve the required [redacted]. [redacted] conductor, offering a [redacted], was considered but discounted due to greater capital expense, increased transmission losses, limited supplier availability (being Type Registered with only one supplier), and reduced bulk procurement efficiency, as it is not planned for use in other NGET T3 OHL projects.

Optioneering for SCRE and WRRE investment has been undertaken proportionately and in line with the maturity of the projects. A clearly defined preferred solution has been identified in each case, consistent with established engineering practice and currently available Type Registered conductors.

We have also updated our cost and economic assessment to reflect the change from the previously assumed [redacted] conductor to the [redacted] conductor at [redacted]

The revised Net Present Value (NPV) assessment indicates that our preferred solution continues to deliver strong consumer value and remains the most economically efficient means of meeting the identified system need when compared with both the 'do-nothing' baseline and alternative reinforcement options.

We first considered a range of strategic options, being (Option A) do-nothing, (Option B) hotwiring, (Option C) Use power control devices, (Option D) reconductoring, (Option E) upgrading, build new and (Option F) dynamic line rating. From these, we built a long list of 16 options. Of these:

- Only four options met the drivers (D1, D-4, D-11, E), which are in bold.
- Only two were shortlisted as credible and taken forward for detailed analysis (D-1, D-4). Both these options meet the SCRE and WRRE need in the required timeframe and are conductors currently available in the market
- The other two did not meet the need by [redacted] and is not a conductor currently available (D-11, E).

Option D-1 is our preferred option because it meets the need, has lower transmission losses than the alternative [redacted] lower for WRRE and [redacted] lower for SCRE) and which supports its higher NPV and is extensively used on the network meaning we have wide-ranging operational and maintenance data.

**Table 1: Summary of optioneering longlist**

| Option | Details | Drivers met | Short List |
|---|---|---|---|
| Option A | Do nothing | X | X |
| Option B | Hotwire the existing circuit | X | X |
| Option C | Installing Power Control Devices | X | X |
| **Option D-1** | Reconductor with Matthew conductor | ✓ | ✓ |
| Option D-2 | Reconductor with Warwick conductor | X | X |
| Option D-3 | Reconductor with TS conductor | X | X |
| **Option D-4** | Reconductor with [redacted] conductor | ✓ | ✓ |
| Option D-5 | Reconductor with [redacted] conductor | X | X |
| Option D-6 | Reconductor with [redacted] conductor | X | X |
| Option D-7 | Reconductor with [redacted] conductor | X | X |
| Option D-8 | Reconductor with [redacted] conductor | X | X |
| Option D-9 | Reconductor with [redacted] conductor | X | X |
| Option D-10 | Reconductor with [redacted] conductor | X | X |
| **Option D-11** | Reconductor with [redacted] conductor | ✓ | X |
| **Option E** | Build a new 400 kV circuit | ✓ | X |
| Option F | Dynamic Line Rating | X | X |

### 1.5 Cost Estimates

Based on the latest contractor cost forecast (2023/24 prices) the preferred option, Option D-1, has an estimated total cost of [redacted] for WRRE and an estimated total cost of [redacted] for SCRE ([redacted]).

The cost for other shortlisted options ([redacted]) are:

- Option D-4: [redacted] for WRRE
- [redacted] for SCRE

### 1.6 Indicative delivery program

The WRRE and SCRE projects are currently planned for delivery across the [redacted] outage seasons, due to outage and supply chain availability. The commissioning date for SCRE is [redacted] and for WRRE it's [redacted]. The design, surveys and procurement activities for 2026 works have already been undertaken. For [redacted] these activities will progress in advance. Delivery remains dependent on system access, long-lead equipment procurement and supply chain readiness.

# 2. Introduction

## 2.1 SCRE & WRRE Transmission Circuits

This paper presents our combined Eligibility Letter and Needs Case review under the Load Re-opener and Price Control Deliverable under Special Condition 3.18 for investment to upgrade the existing SCRE & WRRE transmission circuits. The driver has not changed since the submission of the EJP in December 2024. Through this submission, we are seeking:

- Approval of the investment need and our preferred option;
- Confirmation of the proposed Track 3 EL and NC; and
- Pre-Construction Funding (PCF) under Special Condition 3.15 (Pre-Construction Funding Re-opener, Price Control Deliverable).

The investment is load-driven, with customer details explained in Section 3.

### 2.1.1. Eligibility, Project Track Statement & PASE

The project is being submitted under Assessment Track 3 EL and NC as the development is at an advanced stage, with a clearly defined need, and optioneering has identified a clear preferred intervention

The preferred option is not PASE compliant (as it does not select the highest rated conductor available for the existing tower type). However, the quantitative and qualitative analysis shows it provides the best overall outcome when considering cost, transmission losses and network operability.

### 2.1.2 Pre-Construction Funding Request

Under Special Condition 3.15 of the Electricity Transmission licence, this investment qualifies for allowances equal to [redacted]

Based on our current forecast we have provided below breakdown of costs amounting £12.9m as part of this submission. We are requesting a PCF allowance of:

[redacted]

The forecasted PCF spend for SCRE & WRRE will be updated against actual spend as part of the Load Re-Opener Project Assessment submission, where any possibility of costs exceeding will also be addressed.

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

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

**Table 2: Estimated costs for WRRE pre-construction activities (£m, 23/24 prices)**

| No | Description | Total Forecast Costs |
| --- | --- | --- |
| [redacted] | | |

**Table 3: Estimated costs for SCRE pre-construction activities (£m, 23/24 prices)**

| No | Description | Total Forecast Costs £m |
| --- | --- | --- |
| [redacted] | | |

## 2.2 Background

[redacted]

### 2.2.2 Regional & Network Context

NGET is required under its licence and regulatory obligations to deliver ASTI projects in support of Net Zero; while SCRE and WRRE are not themselves classed as ASTI, they are required alongside the ASTI project EDEU to unlock the full boundary uplift and associated constraint-reduction benefits. SCRE, WRRE and EDEU are therefore progressed as an integrated package (with SCRE and WRRE delivered via the Great Grid Partnership to seek accelerated opportunities), and the wider Northeast/Midlands context reflects increasing transfer requirements driven by renewable growth, new connections and demand changes. The regional and network context remains the same as set out in the December 2024 SCRE & WRRE EJP submission and can be found in appendix D.

#### 2.2.2.1 Interactive Projects

We consider that upgrade of these existing transmission system circuits to relieve forecast north-south power flow constraints is essential to enable NGET's wider, ASTI upgrade scheme proposals. SCRE and WRRE are enablers to the EDEU (Brinsworth to Chesterfield, Chesterfield to High Marnham) ASTI project and need to be considered in combination with EDEU and completed to ensure the full EDEU benefit is achieved. SCRE and WRRE facilitate EDEU (Brinsworth to High Marnham Uprating project) by providing power flow routes out of the High Marnham area. In combination with EDEU, WRRE and SCRE help reinforce the B8 system boundary delivering [redacted] of uplift. WRRE also provides [redacted] of uplift to the B7a boundary. Without these works, the new overhead line connection between North Humber to High Marnham (CGNC) ASTI project would create system constraint at High Marnham substation. If SCRE & WRRE were not delivered in 2028, the delivery of the North Humber to High Marnham investment by 2031 and the associated ASTI Output Delivery Incentive (ODI) date will be at risk.

#### 2.2.2.2 Technical scope change for SCRE & WRRE

At High Marnham, the SCRE and WRRE projects interface with the EDEU project (Brinsworth–Chesterfield and Chesterfield–High Marnham). To realise efficiency opportunities, it was agreed in [redacted] between the SCRE, WRRE and EDEU project teams that certain overhead line sections around High Marnham would be removed from the SCRE and WRRE scope. As, at the time these sections were due to be dismantled by EDEU project in similar timeframe. As a result, SCRE and WRRE uprating would run up to existing tower [redacted] to the north of High Marnham substation and will restart from existing tower [redacted] to the south.

[redacted]

[redacted]

The above decision was reviewed [redacted] as part of the EDEU optioneering, programme and outage planning work. With an updated view on EDEUs programme it was confirmed that the previously removed scope was still required to deliver the WRRE and SCRE needs case (the EDEU ACL [redacted]). Therefore, by reverting to WRRE's original design of reconductoring into High Marnham, it would deliver an output for the B8 boundary in [redacted]. In conclusion, once EDEU becomes energised, it will lead to a further greater boundary uplift and WRRE would still achieve an uplift regardless of EDEU.

Based on the above, we decided to reverse the [redacted] and include the following for WRRE:

West Burton to High Marnham (A403) single circuit:

- Refurbish the steelwork on towers [redacted] through to the gantry at High Marnham, covering [redacted] towers and [redacted] gantry
- Replace the existing AAAC Rubus downleads between tower [redacted] and the High Marnham gantry (short section approximately 50 metres)
- Replace [redacted] disconnectors at High Marnham [redacted]

High Marnham to Stoke Bardolph (A41F) single circuit:

- Replace existing AAAC Rubus conductor with [redacted] conductor
- Replace existing earthwire with [redacted] between gantry at High Marnham and existing tower [redacted] (route length approx. 5.2km)
- Refurbishment of additional [redacted] towers and [redacted] gantry (condition and load related steelwork replacement).

The following scope has been included in the SCRE works:

Cottam to Staythorpe (A408) single circuit:

- Replace existing AAAC Rubus conductor with [redacted] conductor (route length approx. 4.6km)
- Replace existing earthwire with [redacted] between [redacted] and [redacted] (length approx. 0.5km)
- Refurbishment of additional [redacted] towers (condition and load related steelwork replacement).

The scope change described above, provides the background for this Eligibility Letter & Needs Case submission. This has resulted in a request for an increased cost allowance for the SCRE and WRRE projects.

### 2.2.3 Site Background

**SCRE**

The 400 kV route runs on one circuit of the double circuit route from Cottam substation located at the eastern edge of Nottinghamshire on the west bank of the River Trent at Cottam near Retford, to Staythorpe substation located between Southwell and Newark-on-Trent in Nottinghamshire (ZDA, ZDF Route).

Existing 400 kV OHL between Cottam and Staythorpe was built in 1958. It was last refurbished in 1987.

The existing 400 kV circuit between Cottam and Staythorpe substation comprises:

- 2 x 500mm$^2$ AAAC Rubus conductor on L2 towers (route length of 27.8km).
- 2 x 2500mm$^2$ 400 kV XLPE cable between cable sealing end at Cottam substation and existing tower) (500 metres route length).

**WRRE**

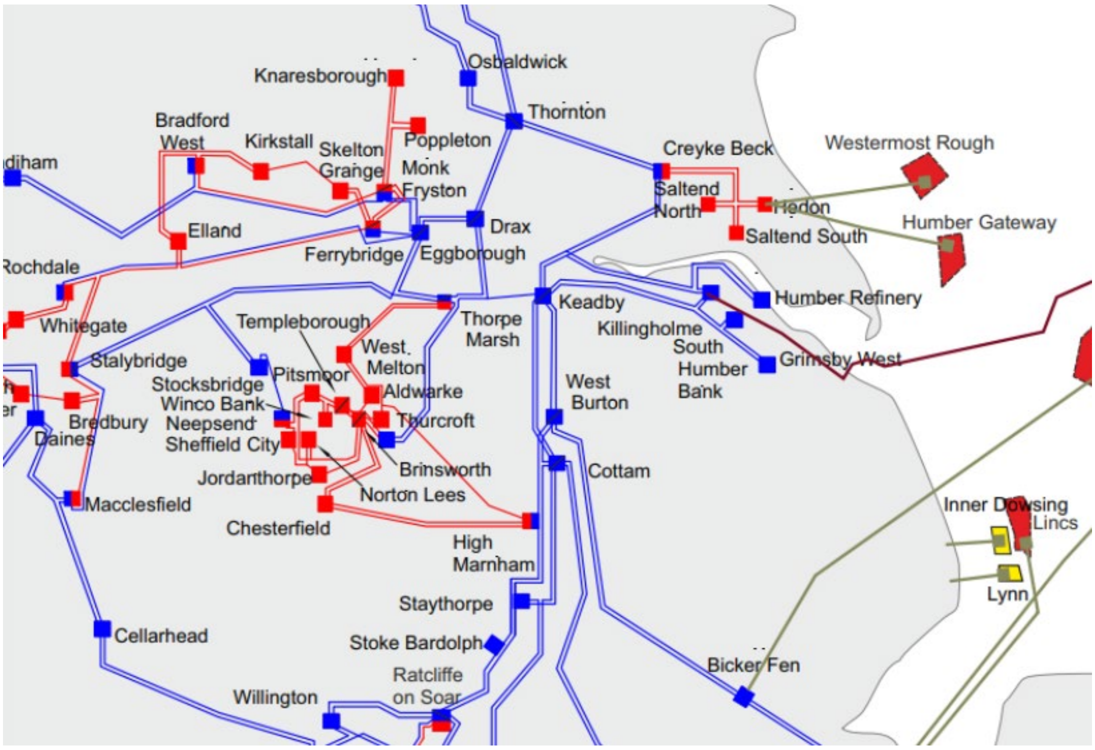
The 400 kV route runs on one circuit of the double circuit route from West Burton substation located near Gainsborough, Lincolnshire to High Marnham Substation located approximately 0.8km north of the village of Marnham (ZDA Route). From High Marnham it runs on one circuit of the double circuit route to Stoke Bardolph Substation in Stoke Bardolph, Gedling District (ZDA, ZDF Route). Then it continues on one circuit of the double circuit ZD Route from Stoke Bardolph Substation to Ratcliffe-on-Soar Substation in Ratcliffe on Soar, Rushcliffe.

The existing 400 kV circuit between West Burton and Ratcliffe-on-Soar via High Marnham substation comprises:

- **West Burton – High Marnham (A403), 14.9km.**
  - Existing OHL is L2 towers.
  - 0.229km of 2 x 2000mm$^2$ oil filled cable.
  - 2×591 mm$^2$ ACCR 3M Curlew @190ºC.
- **High Marnham – Stoke Bardolph (A41E), 40.7km.**

    - Existing OHL is L2 with 2 x 500mm[2] AAAC Rubus
- **Stoke Bardolph – Ratcliffe-on-Soar (A41F), 24.6km.**
    - Existing OHL is L2 with 2 x 500mm[2] AAAC Rubus.
    - 0.179km of 2 x 2000mm[2] oil filled cable

**Figure 3**




## 2.2.4 Historical Funding

No additional funding has been provided for this project to date. All preliminary work completed at risk following the final determination decision from Ofgem not to provide PCF funding, has been at risk.

### 2.2.4.1 Early Asset Write Offs (EAWO)

Early Asset Write Off (EAWO) of [redacted] for WRRE which would occur in [redacted]

Early Asset Write Off (EAWO) of [redacted] for SCRE which would occur in [redacted]

# 3. Drivers & Needs Case

The SCRE and WRRE investment is driven by several key factors, both from a whole-system perspective and in terms of the specific asset needs:

**NESO requirements**

WRRE and SCRE are projects to upgrade existing 400 kV overhead lines so they can carry more power. In the Network Options Assessment (NOA) carried out in [redacted], both projects were given the wrong recommendations and delivery timings. WRRE was identified as essential but with an [redacted], while SCRE was incorrectly placed on hold. These issues have since been corrected. In [redacted], [redacted], reflecting their importance to the wider electricity system

The main purpose of upgrading WRRE and SCRE is to relieve pressure on the network caused by large volumes of new electricity generation. Together, the projects strengthen key parts of the system known as the B8 and B7a boundaries, allowing significantly more power to flow across the network. When delivered alongside EDEU, the projects provide 1,075 MW of additional capacity on the B8 boundary, while WRRE alone also delivers 1,739 MW of additional capacity on the B7a boundary.

WRRE and SCRE are also critical enablers for the EDEU project, as they provide the routes needed to move power away from the High Marnham area. All three projects need to be completed to achieve the full benefit. If WRRE and SCRE were not delivered, power flows would be constrained at High Marnham, particularly once the new North Humber to High Marnham overhead line is connected. This would put both the delivery of that project and its associated incentive dates at risk.

**Customer connections requirements**

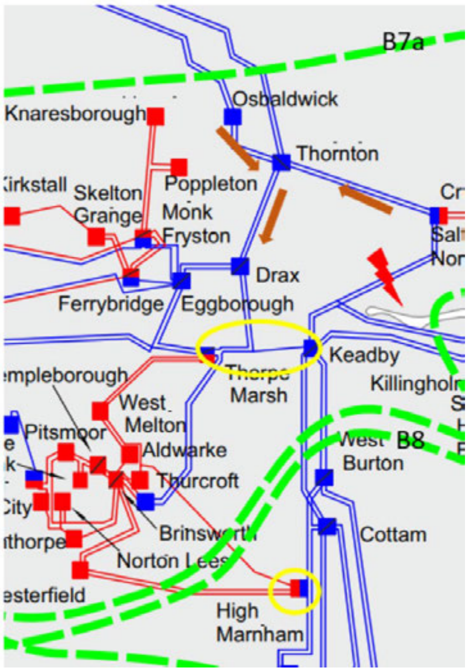
WRRE contains additional customer drivers as this is non-attributable enabling works for several contracted customers as outlined in 3.1, table 3:

As shown in Fig 4, Power flows constraining the B7a and B8 boundary, the two main 400 kV lines running west to east are highlighted in yellow. These are the Drax–Keadby–Thorpe Marsh line and the High Marnham SGT1 line. If there is a double circuit fault on the Creyke Beck–Keadby circuit and the North Humber to High Marnham project is not yet in place, electricity is forced to flow through these two single circuits instead. Most of the power would flow via the Drax–Keadby–Thorpe Marsh route because it offers the easiest path for electricity to travel.

When this extra flow is combined with generation from North Humber and the wider north-east, the circuit becomes heavily overloaded. This then restricts power flows across both the B7a and B8 network boundaries.

Delivering the EDEU, SCRE and WRRE projects helps solve this problem by creating new routes for electricity to flow. These new paths reduce the strain on the overloaded circuits and ease the constraints on the network.

**Figure 4: Power flows constraining the B7a and B8 boundary**




**Asset Health Requirements**

While the primary focus is on increasing network capacity, there are also asset health considerations for the existing fittings and insulation on the [redacted] Routes. Asset Health issues identified for SCRE and WRRE circuits are described in Section 3.2. The proposed reconductoring projects will address the identified asset health issues by replacing the conductors and the fittings as well as necessary steelwork, ensuring continued reliability and longevity of the circuits.

## 3.1 Customers

The testing and setting of ACL dates for customer contracts within scope of connections reform is ongoing throughout 2026. Confirmation of agreed ACL dates will therefore be presented in the next stage of submission Project Assessment.

**Table 3: Details of customers with contracted connections**

| Customer name | Project name | Technology Type | Embedded Generation | MW Size | Voltage | Original ACL date | Additional bays | Connections Reform Gate |
|---|---|---|---|---|---|---|---|---|
| [redacted] | | | | | | | | |

## 3.2 Asset Health

Whilst the needs case for the Investment is driven by the increase in boundary capacity requirements, the proposed solution must also solve future SCRE and WRRE asset health-related issues to avoid further interventions that could delay the path towards a net zero economy and increase the overall cost.

A summary of the current asset health position is provided in Table 4 and Table 5, which reflects [redacted]

[redacted]

**SCRE:**

**Cottam to Staythorpe 1 (A408), 27.8km;**

- The existing 400 kV OHL between Cottam and Staythorpe was built in 1958 and last refurbished in 1987.
- The route was surveyed as part of a steelwork inspection in September 2021–22. Tower steelwork has primarily been graded between Grade 1 and Grade 4, with Grade 5 steelwork identified on two towers only.

Insulators and fittings inspections were carried out in 2023. Analysis concluded that phase fittings are in reasonable to poor condition, while earthwire fittings are poor, showing signs of rust and wear.

**WRRE:**

**West Burton – High Marnham (A403), 14.9km.**

- The existing 400 kV OHL between West Burton and High Marnham was built in 1955 and refurbished in 2013, when the conductor and earthwire were replaced along with associated fittings.
- The route was surveyed as part of a steelwork inspection in September 2019, with a helicopter survey completed in 2024. Tower steelwork is primarily graded Grade 1 to Grade 4, with Grade 5 bars identified at tower ZDA231.
- The section between towers [redacted] is currently strung with 2 × [redacted] conductors. The conductor on this section is in good condition and will be re-utilised (no replacement required).
- This section of the [redacted] route is fitted with [redacted] which will also be re-utilised.
- Insulators and fittings inspections were carried out in 2023, concluding that phase fittings are in good condition.

**High Marnham – Stoke Bardolph (A41E), 40.7km.**

- The existing OHL is L2, fitted with 2 × 500 mm² AAAC Rubus conductors.
- The 400 kV OHL was built in 1958 and last refurbished in 1987. Steelwork inspections were undertaken in September 2021–22, with a helicopter survey completed in 2024.
- Tower steelwork is primarily graded Grade 1 to Grade 4, with Grade 5 steelwork identified on two towers only.
- Insulators and fittings inspections in 2023 identified that the 190 kN porcelain insulators (tension and suspension sets) require replacement with glass insulator discs.
- Earthwire fittings are in poor condition, showing corrosion and wear.

**Stoke Bardolph – Ratcliffe-on-Soar (A41F), 24.6km.**

- The existing OHL is L2, strung with 2 × 500 mm² AAAC Rubus, with an additional 0.179 km of 2 × 2000 mm² oil-filled cable.
- The 400 kV OHL between Stoke Bardolph and Ratcliffe-on-Soar was built in 1958 and last refurbished in 1987. Steelwork inspections and condition monitoring were carried out in 2020, with a helicopter survey completed in 2024.
- Insulators and fittings inspections were undertaken in 2021–22. The majority of the ZD route is fitted with 190 kN grey porcelain insulator discs (tension and suspension), which require replacement with glass insulator discs to reduce the risk of porcelain tensile cracking caused by corrosion.
- 39 towers have earthwire fittings identified as worn or exhibiting wear. Additional findings include:
    - Rusting and worn earthwire fittings
    - Suspension tower yoke plates beginning to corrode
    - The majority of phase and earthwire dampers starting to droop
- Tower steelwork is primarily graded Grade 3 to Grade 4, with Grade 5 steelwork identified on some towers.

To address the asset health issues identified above, necessary refurbishment works have been included within the SCRE and WRRE project scopes.

- Grade 5 and 6 steelwork will be replaced and painted.
- Grade 4 steelwork will be recovered and painted.
- Where required, degraded steel members will be replaced.

Proactive refurbishment during the reconductoring works will reduce future operational risk. Additional refurbishment activities include repair of earth tapes, replacement of anti-climbing devices, replacement of accessories (e.g. property plates and “Danger of Death” plates), and gantry refurbishment where necessary.

Steelwork refurbishment is essential to maintain the structural integrity of the towers, particularly as they will be required to support increased loads due to conductor upgrades. Structural assessments of tower steelwork and foundations have been carried out as part of scheme development, identifying additional members requiring replacement.

For the WRRE Ratcliffe-on-Soar to Stoke Bardolph circuit, strung with GZTACSR Matthew conductor, four towers on the ZD route were identified with over-utilised steelwork. No towers were found to exceed original deterministic foundation design loads. Detailed design for the remaining WRRE circuits is ongoing.

# 4. Optioneering

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

## 4.1 Strategic Options

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

**Table 6: Strategic Options Summary Table**

| Option Number | Option Name | Option Description |
|---|---|---|
| A | Do nothing | The network is kept in its current state, and no circuit upgrades are made |
| B | Hotwiring | Meet the increased rating by thermally uprating the existing line (re-tensioning, clamp re-positioning and/or ECL insulator changes) to safely operate at the higher conductor temperature |
| C | Install power flow control devices | Meet the increased rating by installing power flow control devices enabling active control and redistribution of power flows on the network circuit. |
| D | Reconductoring | Meet the increased rating by increasing the capacity of the existing circuit by replacing the conductors with new higher rated conductors and all associated insulators, fittings and (if required) steelwork reinforcement |
| E | New circuit | Meet the increased rating by building a new circuit |
| F | Dynamic line rating | Meet the increased rating by using real-time monitoring and dynamic calculation of line capacity (based on actual weather and conductor conditions such as wind cooling, ambient temperature, solar heating, temperature/sag) to increase the permitted rating when conditions allow. |

From these six strategic options, we identified 11 sub-options of option D. These sub options assess the feasibility of all standard conductors and bundle configurations that are compatible with the existing L2 tower type along the WRRE and SCRE single circuits. All other conductors (including [redacted]) and alternative bundle configurations have been excluded, as they are not approved for use on L2 towers.

Only sub-options of option D were taken forward to the short list. All other options were discounted in our optioneering process as they either did not meet the MVA required rating or could not be delivered by [redacted] A descriptive rationale is explained in section 4.3, table X.

To identify the most suitable options we considered the following additional factors to the primary driver.

- We examined current and future load requirements utilising the tCNSP2 [redacted]
- It is important to note that no sensitivity was performed in terms of timing, as timescales are limited by system access constraints due to the significant volume of works in the region.

We took forward Option D-1 and D-4 for a more detailed analysis to determine which conductor system would be the most suitable to address all drivers and additional considerations.

## 4.2 Siting

There was no siting study conducted as there is no proposed change to the existing routes.

## 4.3 Longlist of options considered

**Table 7: Longlist table**

| Options | Technical Description | Single Line Diagram (SLD) | Layout of all Route Works | Relevant Survey Works | Consenting Risks & Environmental Impact | Reason for Rejecting or Taking Forward the Option |
|---|---|---|---|---|---|---|
| **A: Do Nothing** Rejected | The network is kept as is, circuits are not uprated | N/A | N/A | N/A | N/A | **Engineering:** Would not deliver the required 3100MVA rating **Compliance:** Would not comply with SQSS |
| **B: Hotwiring the Feckenham – Ironbridge Circuit** Rejected | | N/A | N/A | N/A | N/A | **Engineering:** Would achieve a 2210MVA which does not deliver the required 3100MVA rating |
| **C: Install Power Control Devices (Smart Valves or Quad boosters)** Rejected | | N/A | N/A | N/A | N/A | **Engineering:** Insufficient to resolve the thermal limitations due to the increasing north-to-south power flows. Additionally, the introduction of impedance exacerbates voltage stability issues, particularly under certain fault conditions. The use of a power control device would cause overloads on adjacent circuits and exacerbate voltage issues. |
| **D-1: Reconductor the existing circuit with [redacted]** Taken Forward | Replace the twin 500mm² Rubus conductors with twin 620mm² [redacted] conductors, increasing the circuit's winter post-fault capacity to [redacted] | *Appendix C* N.B. the layout of the route is the same for all options. | *Figure 4* N.B. the layout of the route is the same for all options. | Standard project development surveys required. Minor additional surveys as the new conductor system have increased clearance compared to the old. | Minor consenting requirements, only if additional ground works are needed to achieve clearance. | **Engineering:** This option effectively addresses the thermal limitations and meets the forecasted demand with a 3100MVA rating **Cost:** Likely to be the lowest cost credible option |
| **D-2: Reconductor with [redacted]** | Replace the twin 500mm2 Rubus conductors with twin 772mm² [redacted], increasing the | | | Some additional surveys required due to the land take at EPZ | | **Compliance:** As of February 2025, type registration of [redacted] has been withdrawn, therefore this is no longer a compliant solution. |

| | | | | | | |
|---|---|---|---|---|---|---|
| **Rejected** | circuit's winter post-fault capacity to [redacted] | | | locations being different to other conductor types. Further FEED studies would also be needed due to the additional tension and ice loading this conductor is subject to. | | |
| **D-3: Reconductor with** [redacted]<br><br>**Rejected** | Replace the twin 500mm2 Rubus conductors with [redacted], increasing the circuit's winter post-fault capacity to 3905MVA when strung at 150°C. | | | N/A | N/A | **Compliance:** As of February 2025, type registration for the [redacted] has been withdrawn, therefore this is no longer a compliant solution. |
| **D-4:** [redacted]<br><br>**Taken Forward** | This option involves replacing the twin 500$mm^2$ Rubus conductors with twin 525$mm^2$ [redacted]ncreasing the circuit's winter post-fault capacity t [redacted] | | | Standard project development surveys required. Minor additional surveys as the new conductor system have increased clearance | Minor consenting requirements, only if additional ground works are needed to achieve clearance. | **Engineering:** This option effectively addresses the thermal limitations and meets the forecasted demand with a 3180MVA rating. Provides some futureproofing.<br>**Operability:** Only 47km of [redacted] is deployed on the network so there is limited operation and maintenance data<br>**Future Proofing:** Although [redacted] is type registered at 210°C and would deliver a 3320MVA rating, existing [redacted] on the network is [redacted]. |
| **D-5:** [redacted]<br><br>**Rejected** | This option involves replacing the twin 500$mm^2$ Rubus conductors with twin 400$mm^2$ [redacted] This would decrease the circuit's winte [redacted] | | | Standard project development surveys required. Minor additional surveys as the new conductor system have increased | | **Engineering:** Would achieve a 1710MVA which does not deliver the required 3100MVA rating and is less than the existing Rubus conductors<br>**Compliance:** Zebra conductor is no longer an approved conductor for new installations. |

| | | | | | | |
|---|---|---|---|---|---|---|
| | [redacted]. | | | clearance compared to the old. | | |
| **D-6** [redacted]<br><br>**Rejected** | This option involves replacing the twin 500mm$^2$ Rubus conductors with twin 500mm$^2$ [redacted] is would decrease the circuit's winte [redacted] | | | Standard project development surveys required. Minor additional surveys as the new conductor system have increased clearance compared to the old. | | **Engineering:** Would achieve a 1930MVA which does not deliver the required 3100MVA rating and is less than the existing Rubus conductors |
| **D-7: Reconductor with** [redacted]<br><br>**Rejected** | This option involves replacing the twin 500mm$^2$ Rubus conductors with twin 425mm$^2$ [redacted] This would decrease the circuit's winter [redacted] | | | Standard project development surveys required. Minor additional surveys as the new conductor system have increased clearance compared to the old. | | **Engineering:** Would achieve a 2000MVA which does not deliver the required 3100MVA rating and is less than the existing Rubus conductors |
| **D-8: Reconductor with** [redacted]<br><br>**Rejected** | This option involves replacing the twin 500mm$^2$ Rubus conductors with twin 570mm$^2$ [redacted] This would increase the circuit's winter [redacted]. | | | Standard project development surveys required. Minor additional surveys as the new conductor system have increased clearance compared to the old. | | **Engineering:** Would achieve a 2420MVA which does not deliver the required 3100MVA rating |
| **D-9: Reconductor with** [redacted]<br><br>**Rejected** | This option involves replacing the twin 500mm$^2$ Rubus conductors with twin 780mm$^2$ [redacted] This would | | | Standard project development surveys required. Minor additional surveys as the | | **Compliance:** Type registration of [redacted] has been withdrawn, therefore this is no longer a compliant solution. |

| | | | | | | |
|---|---|---|---|---|---|---|
| | increase the circuit's winte[redacted] | | | new conductor system have increased clearance compared to the old. | | |
| **D-10: Reconductor with[redacted]**<br><br>Rejected | This option involves replacing the twin 500mm² Rubus conductors with twin 700mm²[redacted]. This would increase the circuit's winter[redacted] | | | Standard project development surveys required. Minor additional surveys as the new conductor system have increased clearance compared to the old. | | **Engineering:** Would achieve a 2720MVA which does not deliver the required 3100MVA rating |
| **D-11: Reconductor with** [redacted]<br><br>Rejected | This option involves replacing the twin 500mm² Rubus conductors with twin 620mm²[redacted] increasing the circuit's winter[redacted] | | | | | **Compliance:** [redacted] is currently not type registered so is not a compliant solution.<br>**Deliverability:** Type registration activities are being progressed with a single manufacturer, which is the only suppler engaged in the formal type registration process at this time<br>**Operability:** Experience from the early deployment of newly introduced conductor technologies on the network indicates that such conductors can present operational and delivery challenges, particularly in relation to installation productivity, constructability, and the establishment of repeatable installation practices. In the absence of sufficient operational deployment, established productivity benchmarks, and mature supply chain resilience, there is currently insufficient evidence to support the inclusion of the Holmes conductor within the optioneering beyond the initial options list.[1] |

[1] At the time of writing, the new[redacted]is being progressed through type registration with a single manufacturer based in Bahrain. Wider market engagement is ongoing, however no additional manufacturers are currently in the formal type-registration process. The current supply route has experienced constraints associated with wider

| | | | | | | |
|---|---|---|---|---|---|---|
| **E: New 400 kV overhead line**<br><br>**Rejected** | | N/A | N/A | N/A | DCO required to deliver a new OHL which would lead to a 10-year planning and build time. Highest risk | **Programme:** Would not meet the required boundary capacity by [redacted]<br>**Deliverability:**<br>**Consents:** Would require a DCO which is high risk and lengthy<br>**Cost:** Cost would be significantly higher than the alternative options.<br>**Environment:** Significant environmental impact with a new build route compared to other credible options |
| **F: Dynamic Line Rating**<br><br>**Rejected** | | N/A | N/A | N/A | N/A | **Engineering:** Would achieve a rating similar to hotwiring, which is insufficient. Additionally, it would only achieve a short-term rating that can only be used in live operational planning scenarios, not permanently as a continuous rating |

Based on the rationale explained in this section we have discounted all options except two sub-options D-1 and D-4. Options A to C and option F would not meet the required 3100MVA winter post-fault continuous rating and options E would not satisfy the need by [redacted] Only D-1 and D-4 were deemed credible as they were the only conductors that can achieve the rating and are compliant with the use of the existing L2 towers.

---

global and geopolitical factors, introducing uncertainty around manufacturing capacity, delivery timelines, and supply resilience. These factors, combined with limited operational deployment to date, contribute to the overall delivery and commercial risk associated with adoption at this stage.

### 4.3.1 Influence of stakeholders on shortlisting

Even though the project pertains to an existing OHL route, the proposed works will impact local communities, and NGET has the responsibility to manage these relationships. NGET will seek to mitigate potential disruptions (e.g., minor road closures, railway crossings, designated land assents, access to third party land, etc.) by engaging early with local stakeholders and parish councils, carrying out letter drops and communicating the disruptions to impacted residents and local businesses.

NGET engaged with third parties such as landowners to discuss the access routes, local DNOs and other stakeholders e.g. [redacted] to discuss expected road closures and crossing agreements to complete the work scope.

## 4.4 Shortlisted Options

The shortlisted options for this investment are:

- Option D-1: the reconductoring of the SCRE and WRRE single circuits through a full asset refurbishment of both fittings and the new conductors with [redacted] at [redacted].; and
- Option D-4: the reconductoring of the SCRE and WRRE single circuits through a full asset refurbishment of both fittings and the new conductors with [redacted] at [redacted]

The System Design Table included in appendix B demonstrates how the system design of the below shortlisted options has been considered in meeting the investment drivers of the project.

### 4.4.1 Option D-1 – Reconductoring with [redacted]

This option involves the reconductoring of the SCRE and WRRE OHL circuits, by replacing the existing setup of twin 500mm$^2$ Rubus with twin 620mm$^2$ [redacted] conductors. [redacted] conductors can be strung at [redacted]. Using the existing L2 towers, a full refurbishment of fittings and the new conductor will be carried out, with the need to also strengthen the infrastructure's steelwork. To further enhance the system's capabilities, the current earth wire will also be substituted with an optical ground wire (OPGW).

The reconductoring will extend the OHL circuit's life by 40 years, as the existing conductor system, including all fittings would be replaced with a new conductor system, to meet the load-driven capacity requirements.

[redacted]

This option involves the reconductoring of the SCRE and WRRE OHL circuits, by replacing the existing setup of twin 500mm$^2$ Rubus with twin 525mm$^2$ Curlew conductors. [redacted] conductors can be strung at [redacted] using the existing L2 towers, a full refurbishment of fittings and the new conductor will be carried out, with the need to also strengthen the infrastructure's foundation and steel. To further enhance the system's capabilities, the current earth wire will also be substituted with an optical ground wire (OPGW).

The reconductoring will extend the OHL circuit's life by 40 years, as the existing conductor system, including all fittings would be replaced with a new conductor system, to meet the load-driven capacity requirements.

As part of this investment, we have looked at the substation equipment and other limiting factors and determined that no further work would be required to achieve the 3100MVA winter post fault rating for both shortlisted options. For this investment, we have not costed or studied any further substation equipment as this would be additional unnecessary spend at this stage that is not required to achieve the need.

## 4.5 Detailed qualitative analysis of shortlisted options

**Table 8: Detailed Qualitative Assessment Table**

| | Optioneering Categories | | | | |
|---|---|---|---|---|---|
| **Option** | **Engineering** | **Environmental** | **Deliverability** | **Economic/Consumer Value** | **Consenting /Stakeholder** |
| **Option D-1 – Reconductor with [redacted]** | This option effectively addresses the thermal limitations and meets the forecasted demand with a 3100MVA rating. [redacted] meets the required ratings for the L2 ZDA, ZDF and ZD routes (SCRE and WRRE) but isn't the highest rated conductor. | [redacted] has less MVH Losses per year against the alternative Options suitable for L2 towers per KM. | [redacted] is used extensively across the network giving confidence in operation and maintenance of the system. | As per the quantitative analysis below, Option D-1 is the lowest TOTEX Value. | Throughout the route all options would require the same consenting and stakeholder engagement.<br><br>To a large extent the installation of a gap conductor requires similar land take to [redacted] installation. |
| | Neutral | Benefit | Benefit | Benefit | Neutral |
| **Option D-4 – Reconductor with [redacted]** | Use of highest rated conductor using existing infrastructure. This option effectively addresses the thermal limitations and meets the forecasted demand with a 3180MVA rating. Provides some futureproofing. | [redacted] has higher MVH Losses per year against the alternative Options suitable for L2 towers per KM. | First and only installation of [redacted] on NGET network was in 2013 ~47km. The installation of [redacted] was found to be technically more complex and limited knowledge and expertise from that installation remain within industry leading to more burdensome maintenance requirements.<br><br>[redacted] is also only type registered to a single manufacturer creating a sole supplier dependency. | As per the quantitative analysis below, Option D-4 is the second lowest TOTEX Value. | Throughout the route all options would require the same consenting and stakeholder engagement.<br><br>To a large extent the installation of a [redacted] requires similar land take to [redacted] installation. |
| | Benefit | Detractor | Detractor | Detractor | Neutral |

Based on the qualitative assessment above, D-1 is our preferred option because it meets the minimum 3100MVA winter post-fault requirement and compared to Option D-4, it has materially lower capex and lower transmission losses, resulting in lower TOTEX ensuring value for consumers. It also uses a proven, widely deployed conductor type, reducing delivery, operational and maintenance risk and improving supply chain resilience, whilst still enabling the full refurbishment of conductor, fittings and targeted steelwork interventions.

## 4.6 Detailed Quantitative Analysis of Shortlisted Options

### 4.6.1 Cost estimates of shortlisted options

To assess the shortlisted options, cost estimates have been created for quantitative economic comparison. All capex costs are derived from the Cost Book (23/34 prices). We have applied a 13.8% contingency, based on historic project analysis across a range of completed projects, to account for unforeseen circumstances and incorporate estimating risk that crystallises during implementation.

**Table 9 WRRE Cost Estimate Breakdown**

| Unit | D-1 Reconductor with [redacted] (£m) | D-4 Reconductor with [redacted] (£m) |
|---|---|---|
| [redacted] | [redacted] | [redacted] |
|  | [redacted] | [redacted] |

**Table 10 SCRE Cost Estimate Breakdown**

| Unit | D-1 Reconductor with [redacted] (£m) | D-4 Reconductor with [redacted] (£m) |
|---|---|---|
| [redacted] | [redacted] | [redacted] |
|  | [redacted] | [redacted] |

Option D-1 is lower cost than Option D-4 because [redacted] are approximately 75% more expensive than [redacted].

#### 4.6.1.1 Cost drivers

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

The only factor driving the difference between options is the cost of the conductors.

### 4.6.2 Cost-Benefit Analysis

#### 4.6.2.1 Purpose and Approach

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

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

Our CBA considers:

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

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

For each option considered, we have quantified:

(i) Initial CAPEX investment required

(ii) Future end of life replacement costs

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

- Option D-1: the reconductoring of both circuits through a full asset refurbishment of both fittings and the new conductors with [redacted] at [redacted].; and
- Option D-4: the reconductoring of both circuits through a full asset refurbishment of both fittings and the new conductors with [redacted]

#### 4.6.2.2 CBA Outcome

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

**Table 11:SCRE Lifetime Cost-Benefit Analysis (2023/2024 base prices, central carbon pricing, discounted values)**

| Option | Initial Investment (£m) | PV of Lifetime Costs (£m) | PV of Monetised Benefits (£m) | NPV (£m) |
|---|---|---|---|---|
| Option D-1 | [redacted] | [redacted] | [redacted] | [redacted] |
| Option D-4 | [redacted] | [redacted] | [redacted] | [redacted] |

On the basis of the discounted lifetime CBA results (Table 11), **Option D-1** delivers [redacted] and therefore represents the preferred option on consumer value grounds. This analysis is subject to confirmation through deliverability, consents/land, outage and risk considerations, and any CBA sensitivities set out in the assumptions below.

**Table 12: WRRE Lifetime Cost-Benefit Analysis (2023/2024 base prices, central carbon pricing, discounted values)**

| Option | Initial Investment (£m) | PV of Lifetime Costs (£m) | PV of Monetised Benefits (£m) | NPV (£m) |
|---|---|---|---|---|
| Option D-1 | [redacted] | [redacted] | [redacted] | [redacted]) |
| Option D-4 | [redacted] | [redacted] | [redacted] | [redacted]) |

On the basis of the discounted lifetime CBA results (Table 11), **Option D-1** delivers [redacted] and therefore represents the preferred option on consumer value grounds. This analysis is subject to confirmation through deliverability, consents/land, outage and risk considerations, and any CBA sensitivities set out in the assumptions below.

#### 4.6.2.3 Assumptions of the CBA analysis

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

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

#### 4.6.2.4 Costs

**Table 13: SCRE Summary of all additional Capex costs (2023/2024 base prices)**

[redacted]

**Table 14: WRRE Summary of all additional Capex costs (2023/2024 base prices)**

[redacted]

#### 4.6.2.5 Benefits

The following benefits have been included within the CBA:

- Carbon cost of construction reduction
- Transmission loss reduction
- Constraint cost reduction

Table 15 presents the summary of all (undiscounted) benefits, including environmental and non-environmental benefits, considering the central base case carbon price.

**Table 15 SCRE: Summary of all benefits**

[redacted]

**Table 16 WRRE: Summary of all benefits**

[redacted]

## 4.7 Preferred solution

Following the assessment of the qualitative analysis and quantitative analysis above we consider that Option D-1: is the preferred solution.

In conclusion, Option D-1 (reconductoring with [redacted] at [redacted] is the preferred option because it meets the minimum 3100MVA winter post-fault requirement and can be delivered within the [redacted], while providing the lowest whole-life cost. Compared to Option D-4, it has materially lower capex and lower transmission losses, resulting in a stronger NPV and better value for consumers. It also uses a proven, widely deployed conductor type, reducing delivery, operational and maintenance risk and improving supply chain resilience, whilst still enabling the full refurbishment of fittings and targeted steelwork/foundation interventions to ensure network reliability.

### 4.7.1 Project benefits, outputs & deliverables

The preferred option is Option D-1: Reconductor with [redacted] at [redacted].

The key outputs and benefits delivered by this option, and how they align to the pillars of our ambition for RIIO-ET3 are as follows:

| | |
|---|---|
| Output & Proposed PCD | The reconductoring of SCRE and WRRE 400 kV single circuits with [redacted] |

- **Increasing the circuits' winter post-fault rating** from [redacted]
- **Ensuring network reliability and stability** by preventing overloads during fault conditions.
- By reinforcing the SCRE and WRRE single circuits and replacing Grade 4 and 5 steelwork, we will **strengthen the reliability and resilience of our transmission infrastructure** including preventing overloads during fault conditions.
- **Carrying out a single programme of works allows for more cost- and time-efficient delivery,** aligning with system access opportunities, minimising supply chain risks whilst minimising environmental and local impacts.
- **Deliver via the Great Grid Partnership** supply chain initiative to de-risk delivery

# 5. Project Delivery

## 5.1 Proposed deliverability programme

A summary of the schedule is shown in Table 17. The delivery date (ACL - Available for Commercial Load) for SCRE is [redacted] for WRRE is [redacted]. The programme of works considers various factors to ensure its successful execution. System access and resource availability over the ET3 period have been assessed, allowing for indicative outage dates to be identified. These outages are currently estimated to be over three outage seasons completed by [redacted]

[redacted]

Table 17 below shows the key milestones and associated dates.

**Table 17: Key milestones**

[redacted]

[redacted]

## 5.2 Procurement & contracting strategy

SCRE and WRRE projects will be delivered via the Great Grid Partnership (GGP). The GGP is a Collaborative Partnership bringing together seven of National Grid's supply chain partners to deliver a programme of ASTI and ASTI enabling projects. The decision to use GGP for SCRE and WRRE was driven by the need to secure skilled design and construction capacity early, enable parallel working across design, consenting and delivery activities, and reduce programme risk in a highly constrained market environment. Traditional competitive tendering approaches were assessed but discounted as they would require sequential design and tender stages and materially extend timelines. The GGP has enabled the early securing of both design and construction capability for SCRE/WRRE, incentivising main works partner involvement from the outset. This supports design optimisation for delivery, reduces the need for re-design, and allows activities that would otherwise be sequential to be undertaken in parallel. As a result, the programme can be advanced without compromising design assurance or safety.

The GGP uses an enterprise model that was established through a competitive procurement process. Following the decision to adopt the enterprise model, we needed to secure the partners with appropriate scale and expertise to help us design and deliver the ASTI onshore portfolio. We required significant design, consenting and environmental support from major consulting engineer firms as well as sufficient construction resource to achieve the volume of work at the pace required. [redacted]

[redacted]

The GGP preserves competitive tension through governed work allocation processes and benchmarking, while avoiding repeated full tender exercises that would not be compatible with the required delivery pace. Early and ongoing engagement with the supply chain through the GGP has enabled partners to invest in skills, resources and equipment, strengthening resilience across the wider ASTI portfolio and UK energy infrastructure sector.

SCRE and WRRE went through the [redacted]

A contract was awarded i [redacted]

The GGP Enterprise model incorporates a comprehensive set of mechanisms to ensure efficient delivery and achieve consumer value throughout the delivery process. All cost proposals submitted to Ofgem are developed through technical evaluations and ongoing scrutiny from the GGP Partners, ensuring that it reflects only what is necessary to achieve the agreed scope. This is supported by client-led cost assurance and benchmarking, validating that the proposed scope, programme, and costs are appropriate for the outcomes being delivered.

We have worked with Ofgem throughout the development and inception of the GGP. In its April 2024 letter, Ofgem confirmed its support for the strategic intent underpinning the GGP model, including early supplier involvement, shared incentives, and portfolio- based planning. These principles are directly aligned with the requirements of SCRE's and WRRE's accelerated programme.

Full details of the GGP model, partner procurement and commercial framework will be set out in our submission to Ofgem titled 'GGP Procurement Assessment – May 2026' and through specific engagement sessions.

## 5.3 Risk & risk management

Following are the associated risks involved with this investment:

**Table 18: Risk Summary Table**

| Risk | Description | Mitigation measure |
|---|---|---|
| SCRE and WRRE outage cancellation | There is a threat that the already secured SCRE and WRRE outages are cancelled due to an unexpected event e.g. system fault | Validate that the network remains secure for credible contingencies during the outage and identify limits where the outage becomes at risk. Plan critical outages in periods with lower demand and lower known risk. Reduce background fault likelihood. |
| War (Middle East conflict). | There is a risk that project cost and schedule increase due to action in the Middle East / subsequent impacts of that action | Due to the conflict in the Middle East and [redacted], there is a risk that conductor ordered from [redacted] would not be delivered on site ahead of the 2026 outage [redacted] / subsequent impacts of that action. |

| | | |
|---|---|---|
| Limited Existing rights in place along the existing route | Land rights will have to be dealt with as new rights along the route due to a lack of existing land rights held by NG. [redacted] re no longer relevant | [redacted] |
| 3rd Party interface at West Burton | Multiple agreements are required with 3rd party stakeholders to carry out underground cable replacement works at West Burton and substation. [redacted] To date, project team established collaborating relationships with all the affected stakeholders and obtained agreements in principle for works to be carried out. There is a risk that the agreements in principle are not made formal | Regular collaboration with all affected stakeholders is in place. Support was sought from lands team to support negotiations and obtain necessary agreements formally from all the affected stakeholders |
| Level 3 surveys – late findings | [redacted] There is a threat that there is limited time obtain necessary license agreement required for early and main construction works | Level 3 surveyors are required to share concerning survey results immediately to allow for quick consenting action |

# 6. Conclusion

This document outlines the investment decision making process relating to the proposed strategy for the uprating the SCRE and WRRE OHL single circuits.

The works to be undertaken involve reconducting of the [redacted] OHL single circuits by substituting the existing twin 500$mm^2$ Rubus conductors with twin 620$mm^2$ [redacted] conductors rated at [redacted]

In addition to delivering the primary investment driver of increasing [redacted], the preferred option offers a robust and deliverable solution within the required timescales advised by NESO. The use of proven technology on existing infrastructure reduces delivery risk, avoids unnecessary repeat interventions, and ensures strong alignment with NGET's regional strategy and strategic investment principles.

The preferred option minimises the need for repeat asset-health-driven interventions associated with ageing OHL infrastructure as a direct outcome of addressing the primary investment driver. Delivering these works as a single, coordinated programme enables efficiencies and defers the requirement for future replacement of degraded OHL assets.

The investment has a forecasted expenditure of [redacted] and is expected to be delivered by [redacted] The proposed solution offers significant design and network resilience benefits compared to other options:

- Replacing the conductor system will limit number of asset health interventions, avoiding a double programme of works and a double mobilisation of construction.
- Providing the required 3100MVA capacity to meet future demand while also being the most cost-effective solution for the consumer.

This submission outlines a preferred solution to satisfy the investment drivers. It seeks confirmation of eligibility under Special Condition 3.18, confirmation of eligibility for PCF under Special Condition 3.15, confirmation of re-opener Track 3 EL and NC and formal approval of the preferred option.

| | |
|---|---|
| **Main Drivers** | Load-related:<br>The key driver of WRRE is to relieve the identified network constraint, by providing boundary uplift across B8 and B7a. WRRE in combination with EDEU[2], provides a B8 boundary uplift of 1075MW. WRRE, alongside EDEU and SCRE (Cottam to Staythorpe uprating) helps to reinforce the B8 boundary and relieving power flow constraints within the High Marnham area.<br>Secondary driver is non-attributable enabling works for a number of signed customers offers. There are a list of customer connection offers that rely on the SCRE and WRRE projects:<br>[redacted] |

[2] EDEU is not part of this funding request.

| | |
|---|---|
| | SCRE and WRRE require reconductoring with a full replacement of conductor fittings, including the earthwire, then tower strengthening will be required to allow for the new conductor system. |
| **Preferred Options** | Option D-1 – Reconductoring with [redacted] at [redacted] |
| **Estimated Cost & Timing** | **WRRE Estimated Cost**<br>• Estimated capital cost: [redacted] (2023/24 prices, [redacted]<br>• **Timing:** Achieve [redacted].<br>**SCRE Estimated Cost**<br>• Estimated capital cost: [redacted] (2023/24 prices, [redacted]<br>• **Timing:** Achieve [redacted]. |
| **Outputs** | The preferred option will enable the following outputs:<br>Uprating the 400 kV West Burton to High Marnham (A403), High Marnham to Stoke Bardolph (A41E), Ratcliffe-on-Soar to Stoke Bardolph (A41F) (WRRE) and Cottam to Staythorpe 1 (SCRE) single circuits would increase thermal capacity allowing power to flow out of High Marnham substation and subsequently increase the boundary capability.<br>Using preferred [redacted] at [redacted] conductor would provide opportunity for more than 2.5GW of additional customer connection offers to be accepted. Maximising system capacity and opportunity for additional customer connections are decisive unquantifiable benefits provided by this option.<br>We propose a mechanistic OHL Reconductoring Price Control Deliverable We propose two Price Control Deliverables (PCD) for OHL uprating for this investment relating to the delivery of the outputs by the end of the RIIO-ET3 price control period |

# Appendices

## Appendix A: Acronyms

**Table A.1 - Acronyms:**

| Acronym | Definition |
|---|---|
| ACL | Available for Commercial Load |
| ASTI | Accelerated Strategic Transmission Investment |
| BPDT | Business Plan Data Tables |
| CBA | Cost Benefit Analysis |
| CGNC | North Humber to High Marnham project |
| CPO | Compulsory Purchase Order |
| CT | Current Transformer |
| DCO | Development Consent Order |
| DNO | Distribution Network Operator |
| ECI | Early Contractor Involvement |
| EDEU | Brinsworth to High Marnham Project |
| EISD | Earliest in Service Date |
| EJP | Engineering Justification Paper |
| EPC | Engineering Procurement and Construction |
| EUL | Estimating Units Lines |
| FEED | Front End Engineering Design |
| FSA | First Site Access |
| GGP | Great Grid Partnership |
| HND | Holistic Network Design |
| LPA | Local Planning Authority |
| MVA | Megavolt Ampere |
| M&O | Maintenance & Operations |
| NESO | National Energy System Operator |
| NGED | National Grid Electricity Distribution |
| NGET | National Grid Electricity Transmission |
| NOA | Network Options Assessment |

| | |
|---|---|
| ODI | Output Delivery Incentive |
| OHL | Overhead Line |
| OPGW | Optical ground wire |
| SCRE | Cottam- Staythorpe reconductoring project |
| tCSNP2 | Transitional Centralised Strategic Network Plan 2 |
| VT | Voltage transformer |
| WP1 | Work Allocation Process |
| WRRE | West Burton-High Marnham- Stoke Bardolph- Ratcliffe on Soar single circuit reconductoring |

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

*Table 10: SCRE System Design Table*

[redacted]

[redacted]

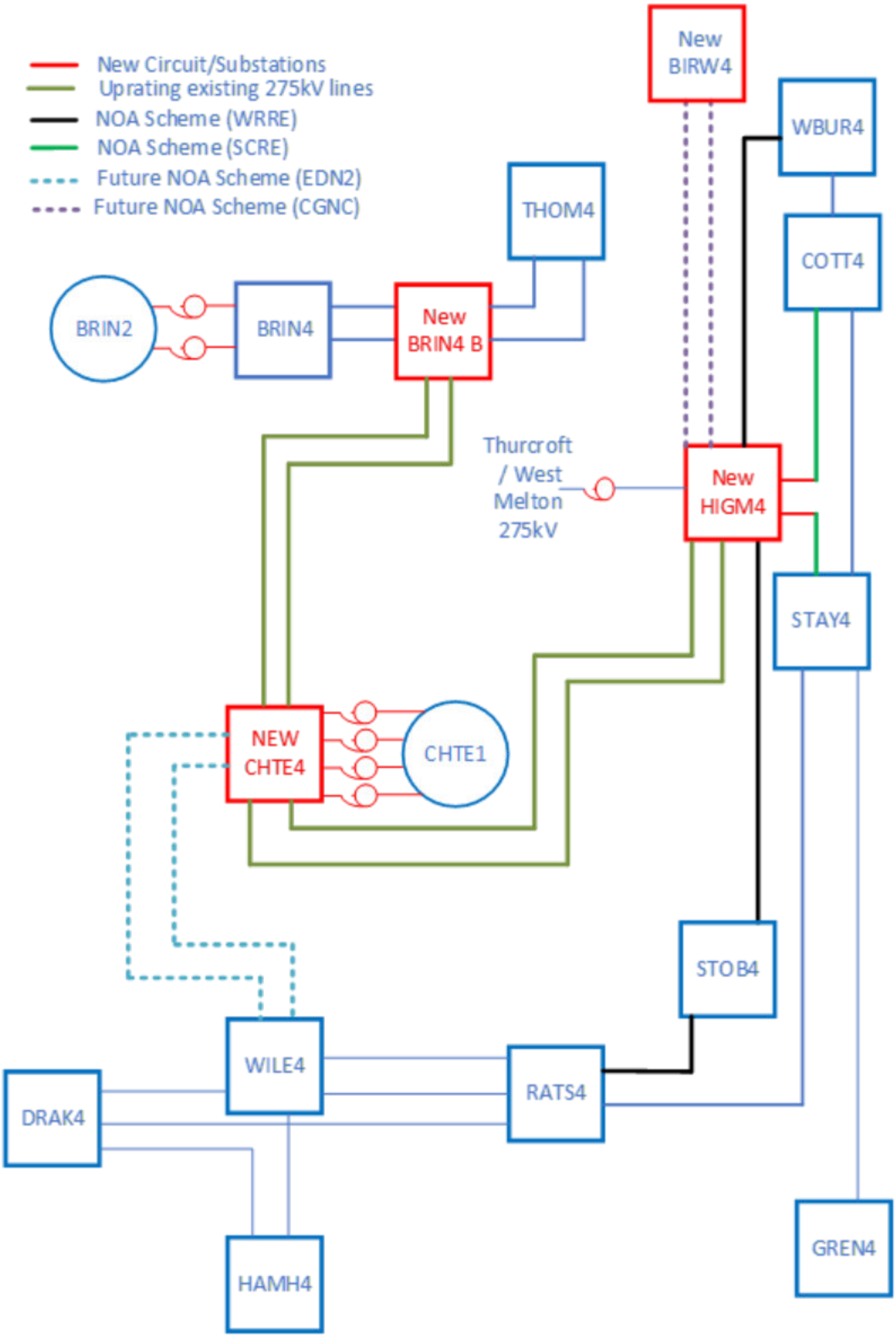
[redacted]

[redacted]

Confidential

[redacted]

# Appendix C: SCRE & WRRE Network Map



[redacted]

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

Registered in England and Wales
No. 4031152
nationalgrid.com