The Great Grid Upgrade

North Humber to High Marnham

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North Humber to High Marnham

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Executive Summary

This Greenhouse Gas (GHG) Reduction Strategy has been developed for the Project to meet the Overarching National Policy Statement for Energy (EN-1) (NPS-EN1) (Department for Energy Security and Net Zero, 2025) requirement for a GHG reduction strategy to accompany Development Consent Order (DCO) applications.

This document sets out how the GHG emissions associated with the Project should be managed and reduced, in accordance with NPS-EN1 (Department for Energy Security and Net Zero, 2025) requirements.

This document should be read in conjunction with **Application Document 6.19 Chapter 19 Climate Change**. The GHG calculations presented in this GHG Reduction Strategy are also presented in the **Application Document 6.19 Chapter 19 Climate Change** which should be referred to for more detail on the calculation methodology and assessment of GHG impacts.

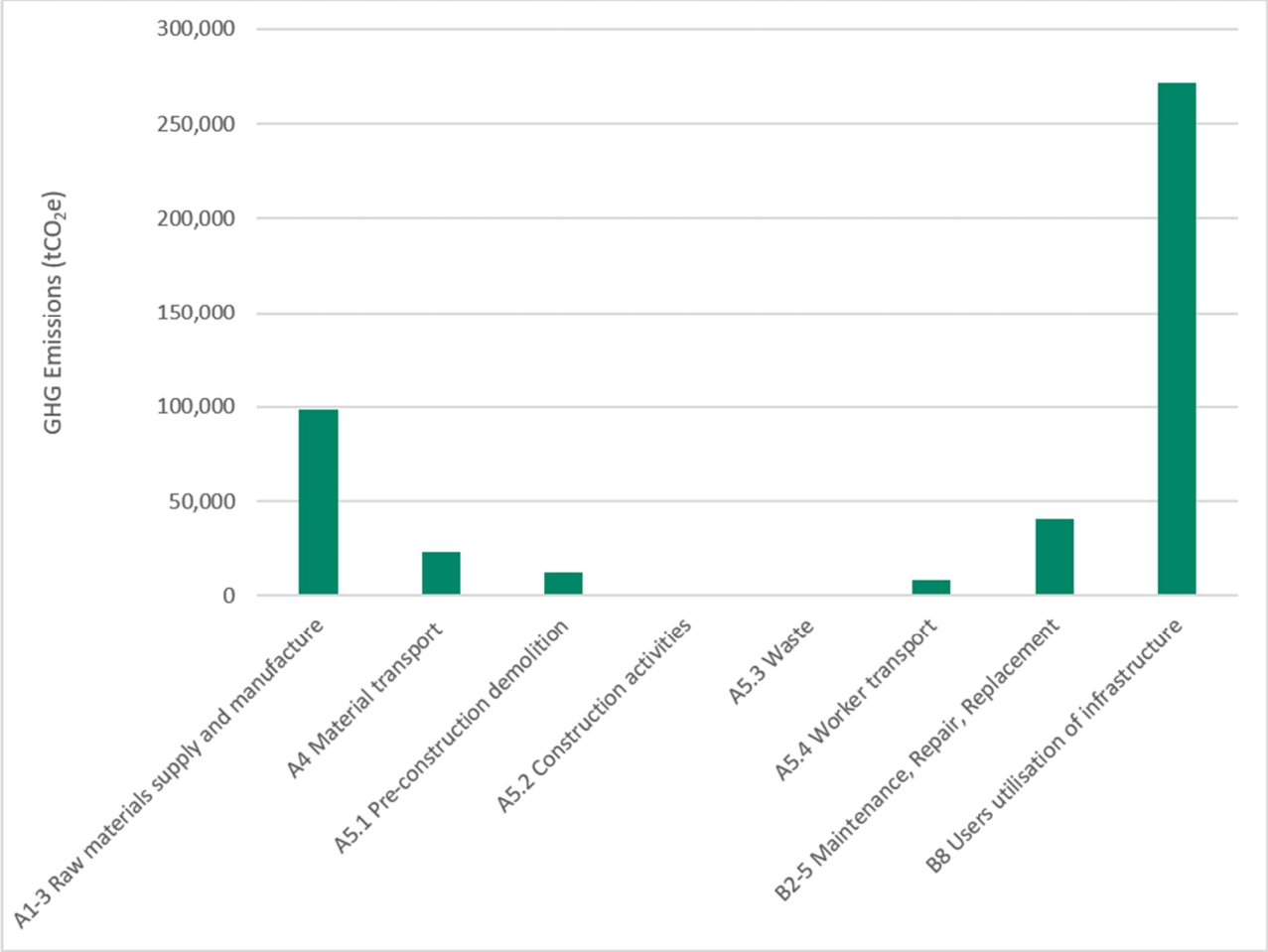
The GHG management process described in this document is structured in accordance with Publicly Available Specification (PAS) 2080:2023 Carbon Management in Buildings and Infrastructure (British Standards Institution, 2023) (PAS 2080 guidelines), which represents best practice for carbon management in the built environment. The GHG management process includes the following key steps:

- Identifying governance, roles and responsibilities in terms of GHG management;
- Developing a GHG baseline and identifying GHG hotspots;
- Identifying and prioritising GHG reduction opportunities, with the aid of a Decarbonisation Tracker; and
- Reviewing GHG reduction alignment with relevant GHG reduction targets.

The principal greenhouse gas emissions hotspot is the estimated transmission and distribution losses associated with the 90 km of 400 kV conductors accounting for approximately 60 per cent of the Project's lifecycle emissions. The proposed overhead line itself does not generate direct greenhouse gas emissions during operation, rather transmission and distribution losses are indirect GHG emissions arising from energy lost as heat during power flow, as additional power generation (and hence GHG emissions) is required to cover these losses. Emissions from raw material supply represent the second-largest source. Note that the term 'GHG baseline' in this document is from PAS 2080 guidelines (British Standards Institution, 2023) and refers to a basis against which GHG reductions can be assessed and may diverge from the terminology used in the Environmental Statement (ES). The GHG baseline is based on current design at outline design stage. This GHG Reduction Strategy sets out how GHG emissions should be managed as the Project progresses to detailed design and construction.

The GHG baseline is summarised graphically in Image ES 1, broken down per PAS 2080 guidelines (British Standards Institution, 2023), lifecycle module. More detail on what is included under each lifecycle module is provided in section 2 of this document.

Image ES 1 – Lifecycle GHG emissions



Potential carbon reduction opportunities have been grouped into the following categories:

- Strategy and Governance;
- Innovative Design;
- Lower Carbon Products; and
- Lean Construction Techniques.

Potential carbon reduction opportunities identified during a collaborative workshop with National Grid Electricity Transmission plc (National Grid) and the Project design teams held on 9 January 2026 are listed in the Decarbonisation Tracker in Annex A. This includes consideration of nature-based solutions where applicable, as per NPS EN-1 (Department for Energy Security and Net Zero, 2025) requirements. **These are only potential opportunities for GHG reduction and are not committed to through the DCO**.

Although construction and maintenance of the Project will result in GHG emissions, consideration also needs to be given to its role in wider UK policy to decarbonise the electricity grid. Over its lifetime the Project will be a key scheme for the UK to fulfil its net zero policy and transition away from fossil fuels. By reinforcing the electricity transmission network, the Project will facilitate the connection of new renewable and low carbon energy generation and transmission. Without Projects such as this, that facilitate the connection of low-carbon energy generation projects to the network, GHG intensity will not decrease as projected, thereby adversely affecting the UK's ability to meet its carbon reduction targets. This statement is consistent with the position taken in paragraph 150 of the Supreme Court Judgement in the

case of Finch, on behalf of the Weald Action Group) (Appellant) v Surrey County Council and others (Respondents) (Supreme Court of the United Kingdom, 2024).

This GHG Reduction Strategy is structured as follows, in line with PAS 2080 guidance for carbon management (British Standards Institution, 2023):

- **Section 1**: Introduction to the Project and purpose of this GHG Reduction Strategy.
- **Section 2**: Explanation of benefits of this GHG Reduction Strategy in terms of NPS EN-1 requirements (Department for Energy Security and Net Zero, 2025) and wider decarbonisation commitments. Sets out the GHG management approach for the Project, including objectives, coverage and GHG management process.
- **Section 3**: Presents the GHG baseline and GHG hotspots to inform key aspects for GHG reduction.
- **Section 4**: Sets out the process to identify and prioritise decarbonisation opportunities, referring to the identified opportunities for the Project listed in the Decarbonisation Tracker in Annex A.

1. Introduction

1.1 The Project

1.1.1 The Project is a new 400 kilovolt (kV) electricity transmission connection of approximately 90 kilometres (km) in overall length between two proposed new substations: the 400 kV Birkhill Wood Substation and 400 kV High Marnham Substation.

1.1.2 The proposed new substations are subject to separate planning applications. For more information, see **Application Document 5.4 Consents and Licences Required Under Other Legislation**.

1.1.3 The Project comprises:

- Approximately 90 km of new overhead line (Route Code 4AF) between the proposed new 400 kV Birkhill Wood Substation and 400 kV High Marnham Substation;
- Replacement and re-alignment of a section of the existing 400 kV overhead line (Route Code 4ZQ) between Brantingham and east of Broomfleet;
- Replacement and re-alignment of a section of the existing 400 kV overhead line (Route Code ZDA) between Ealand and west of Keadby;
- Line entry connections to a proposed new 400 kV Birkhill Wood Substation;
- Line entry connections to a proposed new 400 kV High Marnham Substation; and
- The Project would include other required works, for example, temporary diversions for works on existing overhead line routes, temporary access roads, highway works, temporary works compounds, work sites and ancillary works. The Project would also include utility diversions and drainage works. There would also be land required for environmental mitigation, offsetting, compensation and Biodiversity Net Gain (BNG).

1.1.4 A full description of the Project is provided in **Application Document 6.4 Chapter 4 Description of the Project**.

1.2 Background

1.2.1 This GHG Reduction Strategy has been developed for the Project in accordance with NPS EN-1 (Department for Energy Security and Net Zero, 2025) as part of the submission of the DCO application.

1.2.2 This GHG Reduction Strategy covers the Project as described in **Application Document 6.4 Chapter 4 Description of the Project**.

1.2.3 This GHG Reduction Strategy should be read in conjunction with **Application Document 6.19 Chapter 19 Climate Change**. The GHG calculations presented in this GHG Reduction Strategy are also presented in **Application Document 6.19 Chapter 19 Climate Change** which should be referred to for more detail on the calculation methodology and assessment of GHG impacts.

1.2.4 This GHG Reduction Strategy has been prepared following PAS 2080:2023 – Carbon Management in Buildings and Infrastructure (British Standards Institution, 2023) the foremost industry-wide standard for carbon management. PAS 2080 guidelines (British Standards Institution, 2023) represent best practice for carbon management in the built environment and has informed the structure of this GHG Reduction Strategy. The carbon management principles of the PAS 2080 guidelines are broadly applicable to all infrastructure types.

1.2.5 Given the national commitment to Net Zero GHG emissions by 2050 (HM Government, 2019), GHG emissions associated with infrastructure projects has become a vital topic for consideration and management throughout Project optioneering, design and delivery stages.

1.2.6 This GHG Reduction Strategy provides National Grid with a routemap, setting out how the GHG emissions associated with the Project should be managed and reduced. Key national and local legislation, policies and commitments requiring GHG emission reductions over the lifetime of the Project have informed the development of this GHG Reduction Strategy.

1.2.7 Throughout this GHG Reduction Strategy, the term 'GHG' includes the seven Kyoto Protocol GHGs (World Resources Institute & World Business Council for Sustainable Development, 2015):

- Carbon Dioxide (CO_2);
- Methane (CH_4);
- Nitrous Oxide (N_2O);
- Hydrofluorocarbons (HFCs);
- Perfluorocarbons (PFCs);
- Sulphur Hexafluoride (SF_6); and
- Nitrogen Trifluoride (NF_3).

1.2.8 Emissions of GHGs are expressed in tonnes of carbon dioxide equivalent (tCO_2e), i.e. the mass of CO_2 resulting in equivalent global warming potential.

1.2.9 This GHG Reduction Strategy presents the overarching GHG management principles and foundational GHG management requirements to reduce and manage GHG emissions related to the Project. This process helps maintain consistency, clarity, and collaboration, as well as a clear audit trail of applying best practices across the Project lifecycle. This GHG Reduction Strategy helps inform actions that should be undertaken at each relevant work stage.

1.2.10 This GHG Reduction Strategy should be used in conjunction with the Decarbonisation Tracker in Annex A, which contains a log of key carbon reduction opportunities identified for the Project. **These are potential opportunities for GHG reduction only and are not committed to through the DCO**. This includes consideration of nature-based solutions where applicable, as per NPS EN-1 requirements (Department for Energy Security and Net Zero, 2025).

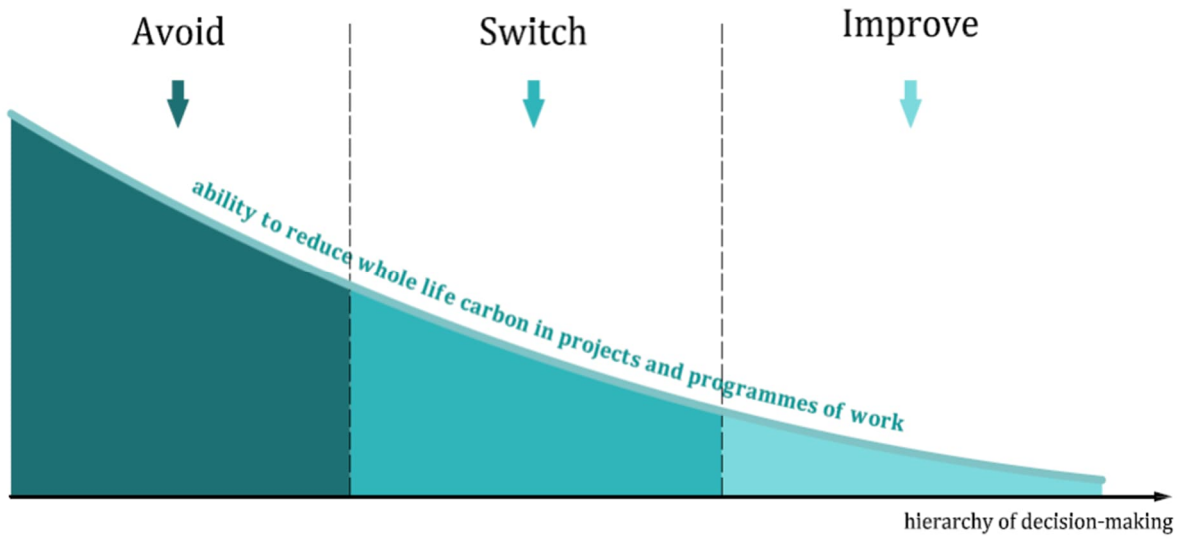
1.3 Benefits of this GHG Reduction Strategy

1.3.1 This GHG Reduction Strategy has been produced to meet the NPS EN-1 (Department for Energy Security and Net Zero, 2025) requirement for a GHG reduction strategy to accompany the DCO application submission for the Project.

1.3.2 This GHG Reduction Strategy presents how National Grid should effectively manage GHG emissions throughout the Project lifecycle in line with National Grid's net zero goals to reduce Scope 3 indirect emissions[1] by 37.5 per cent by 2033/34 (National Grid, 2026). This strategy encourages early consideration of GHG emissions and creation of appropriate governance structures and processes. Considering the GHG impacts associated with the Project early in the design process is critical to minimising associated GHG emissions and realising the greatest benefits.

1.3.3 Image 1.1 from the PAS 2080 guidelines (British Standards Institution, 2023), demonstrates the carbon reduction hierarchy, with carbon avoidance enabling the greatest level of removals. Carbon avoidance is more are achievable during the early stages of a project, as it is possible to implement more fundamental and transformative measures. For example, some cases include avoiding the Project or Project components altogether, and switching mode, method or material.

Image 1.1 – PAS 2080 guidelines carbon reduction hierarchy



1.3.4 As a project moves beyond the design stage to the delivery and operation phases, reducing GHG emissions is possible by making processes more efficient. However, while there is less scope for high-impact reduction measures at the later stages, it is still important to consider reduction measures across all lifecycle stages. In addition to mitigating climate change, effective GHG management can also provide the following benefits:

- Increasing client, designer and contractor collaboration;
- Unlocking innovation and driving better solutions;

[1] Scope 3 GHG emissions are all indirect emissions that occur in a company's value chain, both upstream and downstream, outside its direct control.

- Assisting commercial goals through cost savings, realised by increased efficiency, design and procurement choices;
- Meeting stakeholder and consumer aspirations through more ambitious climate and sustainability action; and
- Supporting wider sustainability goals, e.g., resource efficiency and waste reduction, biodiversity protection and training opportunities for staff.

1.3.5 Consistency and continuity across the project lifecycle are crucial for effective GHG management in any project. By implementing a proactive systems thinking and whole-life approach early on, National Grid can integrate GHG management throughout the Project, resulting in more efficient GHG mitigation and improved sustainability outcomes in line with National Grid's Net Zero goals (National Grid, 2026).

2. GHG Management Approach

2.1 GHG Reduction Strategy Objectives

2.1.1 This document describes how GHG emissions associated with the Project should be managed, in accordance with NPS EN-1 (Department for Energy Security and Net Zero, 2025) and the National Grid commitment towards Net Zero by 2050. The strategy describes GHG reduction opportunities to be considered during infrastructure delivery. The objectives of this GHG Reduction Strategy are to:

- Describe indicative governance, roles and responsibilities associated with GHG management;
- Provide, as far as practicable, a baseline assessment of the GHG impact of the Project;
- Facilitate early identification of potential GHG reduction opportunities;
- Describe the Project in the context of National Grid's GHG reduction target; and
- Describe the indicative process for ongoing GHG management, monitoring, reporting, and review.

2.2 GHG Reduction Strategy Coverage

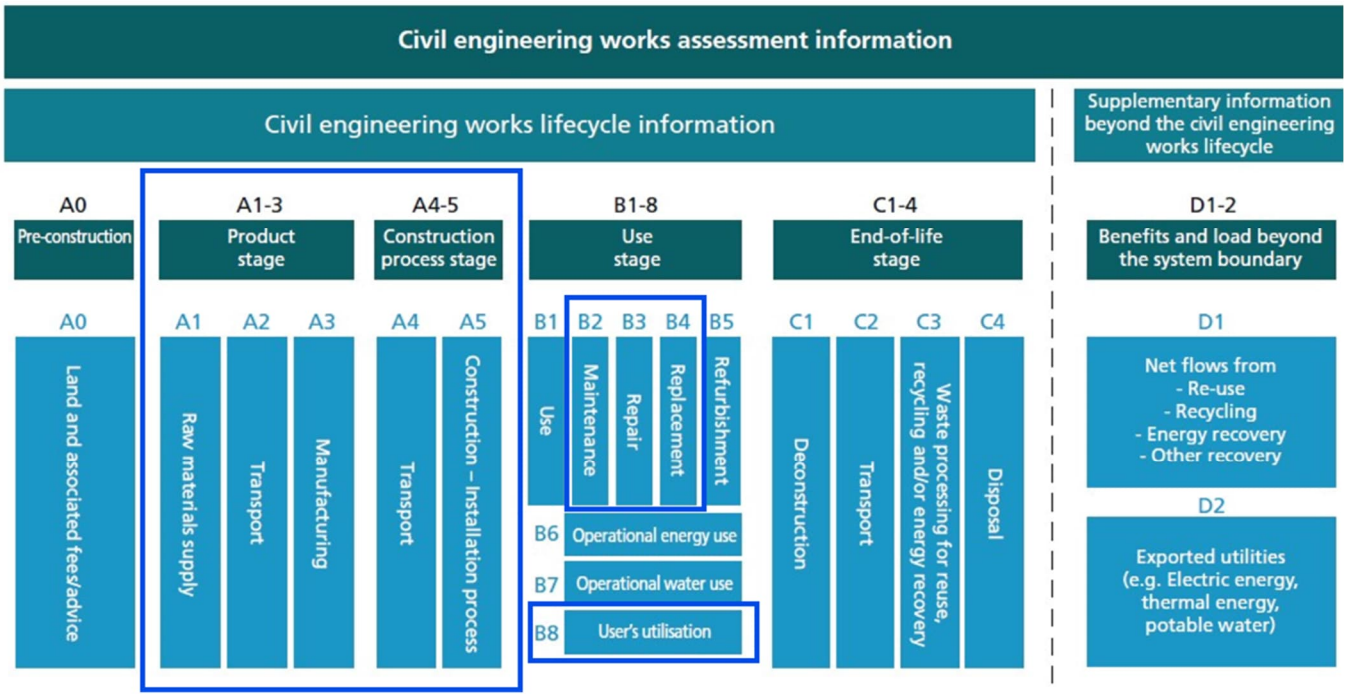
2.2.1 The scope and boundary of this GHG Reduction Strategy has been defined in line with best practice principles set out in the Royal Institute of Chartered Surveyors' (RICS) Whole Life Carbon Assessment guidelines (Royal Insitution of Chartered Surveyors, 2024) and the PAS 2080 guidelines (British Standards Institution, 2023). These principles can be applied across all sectors.

2.2.2 The RICS Whole Life Carbon Assessment (Royal Insitution of Chartered Surveyors, 2024) guidelines stipulate that as a minimum, whole life carbon assessments should account for all components relating to the Project during all life stages. As such, the PAS 2080 guidelines lifecycle modules included in this GHG Reduction Strategy have been selected based on relevance and materiality as informed by industry best practice and constraints in the practical availability of data.

2.2.3 The timescale and boundary of the GHG Reduction Strategy includes the GHG-emitting activities associated with the following PAS 2080 guidelines lifecycle modules, as illustrated in Image 2.1 including:

- Product Stage (A1-A3);
- Construction Process Stage - Transport (A4);
- Construction Process Stage - Installation Process (A5);
- Use Stage - Maintenance, Repair, and Replacement (B2-B4); and
- Use Stage - User's Utilisation (B8).

Image 2.1 – PAS 2080 guidelines lifecycle stages



2.2.4 Due to the unpredictability of the decommissioning stage, the 'end-of-life' lifecycle stage has been scoped out of this GHG Reduction Strategy, reflecting that the decommissioning environment and associated practices of the future may vary considerably to those observed currently. However, it is recognised that GHG reduction opportunities adopted during the design stage may reduce emissions associated with the decommissioning stage (e.g., reusability or recyclability of materials).

2.2.5 Similarly, the pre-construction stage (preliminary studies/works such as strategy development, design efforts, and Environmental Impact Assessment (EIA)) are assumed to be minimal and not a material contributor to the overall footprint. They are also scoped out of this GHG Reduction Strategy as they are not part of "construction" in the PAS 2080 guidelines.

2.2.6 Sources of GHG emissions associated with the whole lifecycle of the Project are listed in Table 2.1. The GHG emissions calculations focus on quantifiable key emissions sources ('hotspots'). The availability of accurate activity data determines quantifiable emissions.

2.2.7 The GHG emissions within the scope of the GHG Reduction Strategy correspond with the GHG emissions assessed in **Application Document 6.19 Chapter 19 Climate Change**, which also provides greater detail on the GHG assessment methodology and assessment of GHG impacts.

Table 2.1 – GHG emission sources considered within the scope of the GHG reduction strategy

PAS 2080 guidelines lifecycle stage		Emission source(s)	In scope of GHG reduction strategy?
Before Use Stage	Preconstruction Stage (A0)	Energy use and transportation demands from office-based tasks.	Scoped out as insufficient data to quantify and likely to be immaterial.
	Product Stage: Raw materials supply, transport and manufacture (A1-A3)	Indirect GHG emissions embedded within construction materials arising from raw material extraction, processing, manufacture and transportation, including emissions occurring outside the Order Limits.	In scope
	Construction Process Stage: Transport to works site; construction process (A4-A5)	Loss of biological capacity to absorb and process carbon stock loss due to land use change/land clearance. Fuel consumption used to transport plant and machinery to site. Fuel consumption used in transporting construction staff to site. Energy (electricity, fuel, etc.) consumption of plant, machinery, vehicles and generators etc. on site. Energy consumption required for transport and disposal of waste (including construction material waste and spoil). Energy consumption for the provision of potable water, and treatment of wastewater.	In scope
Use Stage	Use (B1)	Emissions emitted directly from the use of installed products and materials.	Scoped out as no material emissions are expected from direct use (e.g. refrigerant leakage) in the context of the Project.
	Maintenance, repair, replacement, refurbishment (B2-B5)	Emissions associated with repair and replacement of assets during the Project lifetime (including embodied carbon in materials, energy required for operation of machinery, and transport).	Maintenance and repair (B2-B3) are in scope. Replacement and refurbishment (B4-B5) are scoped out as the reference operational period considered for this GHG Reduction Strategy is 80 years.

PAS 2080 guidelines lifecycle stage		Emission source(s)	In scope of GHG reduction strategy?
	Operational energy use (B6)	Emissions associated with operation of infrastructure associated with the Project, such as lighting.	Emissions associated with transmission losses are calculated in B8.
	Users' utilisation of Infrastructure (B8)	Emissions associated with transmission losses.	In scope.
End of Life Stage	Deconstruction, transport, waste processing for recovery and disposal (C1-C4)	Emissions associated with materials removal and disposal.	Scoped out due to unpredictability of the decommissioning stage at this point in time.
Benefits and load beyond system boundary	Net flows from disposal methods used, and exported utilities (D1-D2)	Emissions associated with carbon flows beyond the Order Limits.	Scoped out as insufficient information to quantify at this point in time.

2.3 GHG Management Process

2.3.1 This section describes the key elements of this GHG Reduction Strategy, which provide a framework for effectively integrating Project-specific GHG reduction priorities across the Project lifecycle.

2.3.2 The key elements of the GHG management process include:

- Developing a GHG Baseline – based on design information available at time of GHG Reduction Strategy preparation, this provides expected whole-life GHG emissions. For the purposes of this GHG Reduction Strategy, the baseline (in tCO_2e) already accounts for the GHG reduction measures presented at the Project concept phase as listed in Annex A.
- Holding a GHG Workshop – held in collaboration with National Grid, the Project design team, and buildability advisors to identify, review, assess and prioritise GHG reduction opportunities.
- Producing a Decarbonisation Tracker – developed to record GHG reduction opportunities identified during discussions with the Project team, and to support implementation of the GHG reduction targets by assigning responsibility. This is inclusive of a framework mechanism that can be used to track progress throughout the Project lifecycle.
- Developing a GHG Reduction Strategy – this document, developed to support the delivery of GHG reduction opportunities across the Project lifecycle.

3. GHG Baseline

3.1 Approach

3.1.1 The GHG calculation presented in this GHG Reduction Strategy corresponds with the GHG calculation presented in **Application Document 6.19 Chapter 19 Climate Change**. For the purposes of the GHG Reduction Strategy, the term 'GHG baseline' is based on PAS 2080 guidelines (British Standards Institution, 2023) aligned terminology and refers to a basis against which GHG reduction measures and future GHG quantifications can be compared. This may diverge from the definition of the term 'baseline' in the ES.

3.1.2 The PAS 2080 guidelines (British Standards Institution, 2023) note that depending on the lifecycle stage at which quantification is made, either part or all the quantification may be based on predictive data (i.e., something forecasted or planned to occur) rather than actual activity data (e.g., recorded consumption amounts).

3.1.3 The GHG baseline for this GHG Reduction Strategy provides expected Project lifecycle emissions in tonnes of carbon dioxide equivalent (tCO_2e). This baseline has been developed based on predictive data and estimates.

3.1.4 The GHG baseline is presented to assist National Grid in understanding which stages or activities associated with the Project are key sources of GHG emissions and to provide a basis against which GHG reduction measures and future GHG quantifications can be compared.

3.1.5 Greenhouse gas emissions across the various lifecycle stages were calculated following the GHG Protocol's method (World Resources Institute & World Business Council for Sustainable Development, 2015), represented in the following equation:

Activity Data x GHG Emissions Factor = GHG emissions value

3.1.6 Activity data refers to data collected which represents activities which result in GHG emissions, for example, litres of diesel consumed, kWh of electricity consumed, etc. Activity data was requested from the Project team in a Request for Information (RFI) and follow up discussions with the Project design team. Where the activity data is unavailable, proxy data from similar projects and fundamental assumptions were used.

3.1.7 Emission factors refer to factors which convert activity data into corresponding GHG emissions. The activity data obtained, and emission factors used are detailed in **Table 3.1**.

3.2 GHG Calculation Method and Assumptions

3.2.1 Project data and information, industry benchmarks and proxies, and professional judgement have been used to estimate the Project's capital and operational GHG baseline. Calculations were undertaken using a bespoke GHG accounting tool developed by AECOM. Table 3.1 indicates how forecast GHG emissions have been determined per PAS 2080 guidelines lifecycle stage (British Standards Institution, 2023).

3.2.2 In accordance with **Application Document 6.19 Chapter 19 Climate Change** and asset lifespans presented in **Application Document 6.4 Chapter 4 Description of the Project**, a reference operational period of 80 years is assumed.

Table 3.1 – GHG calculation methods and assumptions

PAS 2080 guidelines lifecycle stage		GHG calculation method and assumptions
Before Use Stage	Preconstruction stage (A0)	Represents the preliminary studies and works such as strategy and brief development, design efforts, EIA, and cost planning. It has been assumed to be minimal and therefore not a material contributor to the overall footprint.
	Product Stage (A1-A3)	Estimated material quantities for cables, electrical equipment, steel, and concrete, etc., were obtained from an RFI and follow up discussions with the Project design team. Emission factors were obtained from the University of Bath Inventory of Carbon and Energy (ICE) (University of Bath, 2024). Where appropriate ICE factors were not available, for example for earthing rods, conversion factors from National Grid's internal carbon database were used. Material quantities were uplifted by respective wastage rates for each material type, based on wastage rate assumptions from RICS Whole Life Carbon Assessment for the Built Environment, 2nd Edition guidelines (RICS WLCA guidance) (Royal Insitution of Chartered Surveyors, 2024) including: • Glass: 1 per cent • Steel frame (beams, columns, braces): 1 per cent • Aggregate: 10 per cent • Asphalt: 6 per cent • Concrete in situ: 5 per cent • Concrete precast: 1 per cent • Other: 5 per cent (this was used where an element did not clearly sit with a waste rate as a conservative estimate).
	Material Transport (A4)	Emission factors from the Department for Energy Security and Net Zero (DESNZ) (Department for Energy Security and Net Zero, 2025) have been used and RICS default transport scenarios for UK projects (Royal Insitution of Chartered Surveyors, 2024): • Locally Manufactured (ready-mix concrete): 20 km by road • Locally manufactured (general), e.g. aggregate, earth, asphalt: 50 km by road • Regionally manufactured, e.g. plasterboard, blockwork, insulation, carpet, glass: 80 km by road • Nationally manufactured, e.g. structural timber, structural steelwork, reinforcement, precast concrete: 120 km by road

PAS 2080 guidelines lifecycle stage	GHG calculation method and assumptions
	• European manufactured, e.g. cross-laminated timber (CLT), facade modules: 1,500 km by road and 100 km by sea • Globally manufactured, e.g. specialist stone cladding: 500 km by road and 10,000 km by sea. • All materials (except concrete) - Rigid heavy good vehicles (HGV), All Rigids, tonne-km, including well to tank (WTT) (aligned with One Click LCA software, assumes an empty return journey is 43 per cent of a loaded journey (One CLick LCA, 2026)) • Concrete - Rigid HGV, All Rigids, tonne-km, including WTT (aligned with RICS, assumes a 100 per cent empty return journey - 0 per cent laden (Royal Insitution of Chartered Surveyors, 2024)) • All materials - Cargo ship, General Cargo, average, including WTT.
Construction Installation process (A5)	*A5.1 Pre-construction demolition*[2] An estimate on the RICS demolition benchmark (35 kg CO2e/m²) is used, assuming that, per m² of works, only 50 per cent of the construction compound and access track land take would require demolition. We consider this conservative because the benchmark reflects building projects, whereas most of the greenfield area for the Project is not expected to require demolition. *A5.2 Construction Activities* It is assumed that 10 per cent of the site compound area comprises portacabins, applying the RICS benchmark of 40 kg CO2e/m² to estimate the associated energy use. For key temporary hired equipment such as scaffolding, or steel plates emissions were proportioned in line with the average life span of the equipment. For example, if the average lifespan of scaffolding components is ten years and it is being used on a construction site for 3.5 years, then the fraction of embodied impacts that can be attributed to that project would be 35 per cent of the total embodied carbon. For the modular steel bridges a worst case was taken where the entire emissions are attributed to the Project, due to treating it as new steel structure.

[2] Following the IEMA GHG assessment guidance (Institute of Environmental Management Assessment, 2022), the lifecycle GHG impact assessment pre-construction demolition includes activities such as vegetation removal and/or management to facilitate the construction of temporary compounds and accesses, and cable installation; alongside the limited removal/dismantling of existing pylons. It is noted that there is no 'demolition' in its more traditional sense, owing to the Project's commitment to avoiding the loss of buildings.

PAS 2080 guidelines lifecycle stage		GHG calculation method and assumptions
		A5.3 Waste Royal Institution of Chartered Surveyors wastage rates and assumptions were applied for end-of-life scenarios per material type, these are the same as applied for the A1-A3 Product Stage and are taken from see Table 23 in the RICS WLCA guidance (Royal Insitution of Chartered Surveyors, 2024): • Glass: 1 per cent. • Steel frame (beams, columns, braces): 1 per cent. • Aggregate: 10 per cent. • Asphalt: 6 per cent. • Concrete in situ: 5 per cent. • Concrete precast: 1 per cent. • Other: 5 per cent (this was used where an element did not clearly sit with a waste rate as a conservative estimate). *A5.4 Worker transport* Emissions from transportation of workers to the work site (i.e., commuting) was calculated using Project-defined worker transport numbers and based on an estimated commute distance of 30 km. Unless otherwise indicated, it was assumed workers commute via car with an occupancy rate of one person per vehicle.
Use Stage	Maintenance, repair, replacement, refurbishment (B2-B5)	Emissions from maintenance and repair activities have been assumed in line the RICS WLCA guidance (Royal Insitution of Chartered Surveyors, 2024) including: • B2 Maintenance: 1 per cent of modules A1–A5; and • B3 Repair: Equivalent to 25 per cent of B2 maintenance impacts for the relevant items. • B4-B5: Replacement life cycles were informed by the design team, and transport scenarios were assumed in line with the assumptions applied in A4.
	Operational energy use (B6)	At this stage, data on other operational energy sources, such as lighting and CCTV, are not available. However, their impact is expected to be negligible compared to B8 transmission and distribution losses, given the scale (400 kV) and length of the infrastructure Greenhouse gas emissions from refrigerant leakage have not been accounted for due to a lack of available data at this stage in the design. However, it is assumed that no Sulphur hexafluoride (SF_6) equipment will be used in the Project, in accordance with National Grid policy. The global warming potential (GWP) of alternatives to SF_6 such as Perfluoroisobutyronitrile (C_4-FN) mixtures or Green Gas for Grid (G^3) are more than 99 per cent lower than that of SF_6.

PAS 2080 guidelines lifecycle stage		GHG calculation method and assumptions
		Having applied this reduced GWP to SF_6 leakage emissions calculated for similar transmission projects, it is considered that any refrigerant leakage emissions associated with the Project will not be material in the context of the overall footprint, and as such will not affect the outcome of this assessment.
	Users' utilisation (B8)	Transmission losses were conservatively estimated at 3 per cent, uplifting to account for increased losses of an overhead line system from The Institute of Engineering and Technology (IET) provided data of 2 per cent losses for a 100 km submarine alternating current cable circuit (The Institute of Engineering and Technology, 2025). It is assumed that the cable is designed for 70 per cent load factor. Department for Energy Security and Net Zero emission factors are used which account for anticipated grid decarbonisation over the 80-year reference period (Department for Energy Security and Net Zero, 2023).
End of Life Stage	Deconstruction, transport, waste processing for recovery and disposal (C1-C4)	As set out in **Application Document 6.4 Chapter 4 Description of the Project**, decommissioning of the Project has been scoped out of the assessment owing to the Project's design life (80 years) and expected alterations to the regulatory framework, good industry practices, and the future baseline in that period. The end-of-life stage is therefore not considered.

3.3 Baseline Results

3.3.1 Table 3.2 provides the GHG baseline for the Project. A series of measures to mitigate the GHG emissions from the Project have been identified. These mitigation measures have been included within the Decarbonisation Tracker (see Annex A).

Table 3.2 – GHG baseline results[3]

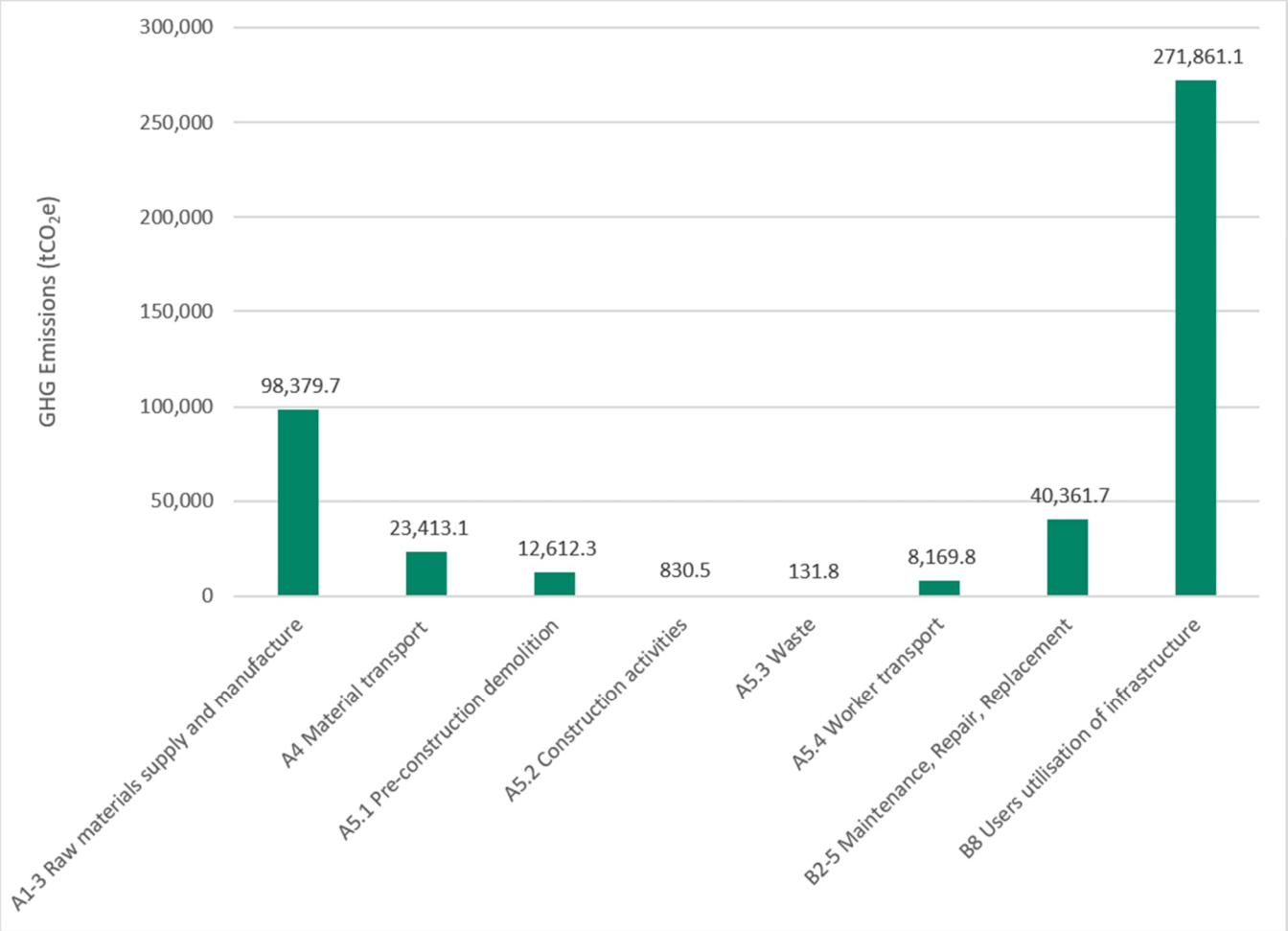
PAS 2080 guidelines lifecycle stage		Emission Source	Total GHG Emissions (tCO_2e)	Percentage of lifecycle emissions (per cent)
A: Before Use Stage	A1-A3 Product Stage	A1-A3 Raw materials supply and manufacture	98,379.7	22 per cent
	A4-A5 Construction Process Stage	A4 Material transport	23,413.1	5 per cent
		A5.1 Pre-construction demolition	12,611.7	3 per cent
		A5.2 Construction activities	830.5	<1 per cent
		A5.3 Waste	131.8	<1 per cent
		A5.4 Worker transport	8,169.8	2 per cent
		Total tCO_2e over Construction period	143,537.2	
B: Use Stage		B2-B5 Maintenance, Repair, Replacement	40,361.7	9 per cent
		B8 User's utilisation of infrastructure	271,861.1	60 per cent
		Total tCO_2e over Operational period	312,222.8	
		Total tCO_2e over Construction + Operational period	455,760	

[3] For simplicity decimals are rounded, which is why there might be a small variation in totals reported.

3.4 GHG Baseline and Hotspots

3.4.1 The GHG baseline is summarised graphically in Image 3.1. The principal emissions hotspot is the estimated transmission and distribution losses associated with the 90 km, 400 kV transmission connection accounting for approximately 60 per cent of the Project's lifecycle emissions[4]. Emissions from raw material supply represent the second-largest source.

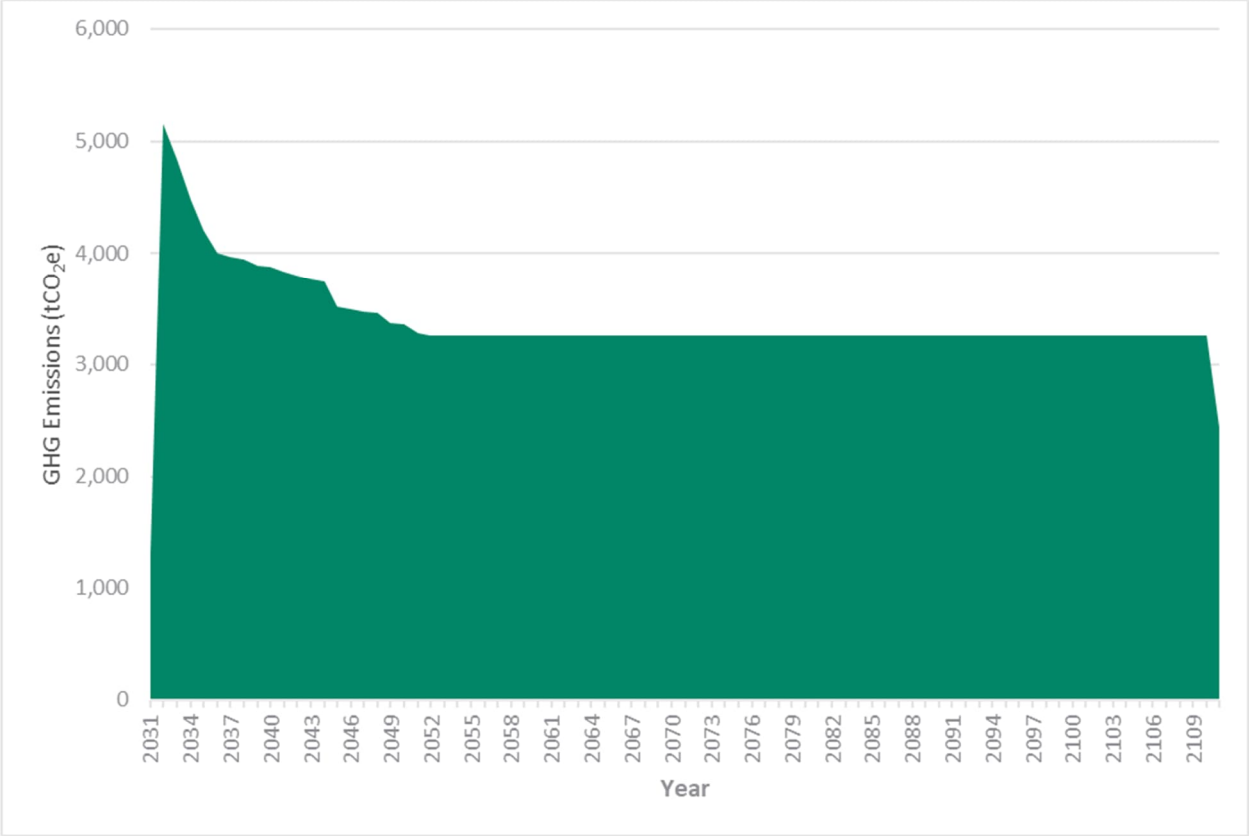
Image 3.1 – Lifecycle GHG emissions



3.4.2 B8 (Users' Utilisation — transmission and distribution losses) are modelled over an 80-year period and accumulate over time, representing a conservative scenario. As shown in Image 3.2**,** emissions decrease towards 2050 in line with Department for Energy Security and net zero projections (Department for Energy Security and Net Zero, 2023), reflecting the progressive decarbonisation of the electricity grid and the associated reduction in emissions intensity. While indirect emissions are incurred along the length of the proposed overhead line, this reflects the Project's role as enabling infrastructure for wider network decarbonisation. As such, it is a critical component of the net zero transition.

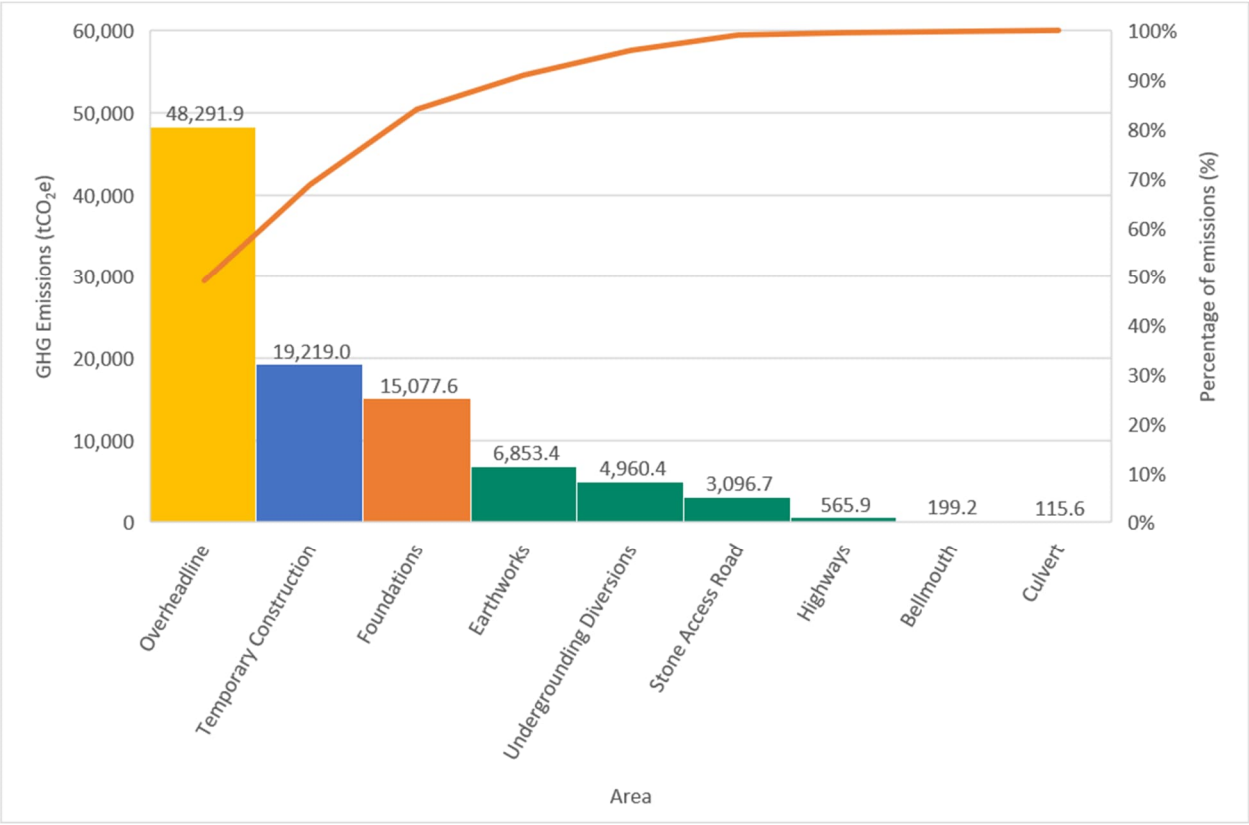
[4] The proposed overhead line will not generate direct GHG emissions during operation, rather transmission and distribution losses are indirect GHG emissions arising from energy lost as heat during power flow, as additional power generation (and hence GHG emissions) is required to cover these losses.

Image 3.2 – B8 user's utilisation - Transmission and distribution loss emissions



3.4.3 Since embodied (A1-A3) emissions in materials are a key GHG emissions hotspot, this is broken down into more detail in Image 3.3.

Image 3.3 – Embodied GHG emissions per element of works (A1-A3)



3.4.4 Image 3.3 shows that overhead line elements account for nearly 50 per cent of total material emissions, attributable to the size and 90 km length of the 400 kV proposed overhead line.

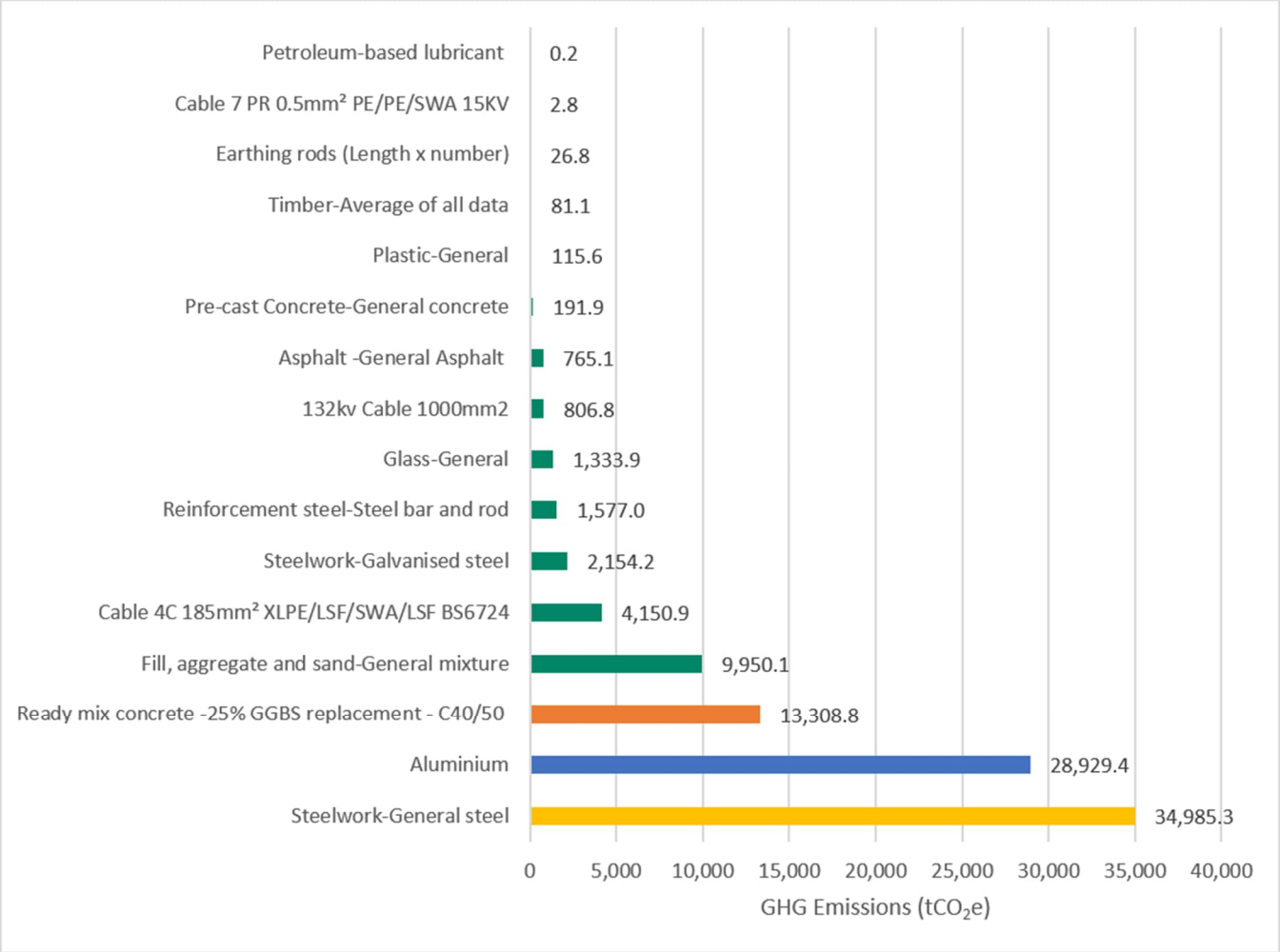
3.4.5 Temporary construction works such as modular steel bridges, scaffolding, and steel access panels constitute the second-largest source (less than 30 per cent). This reflects a conservative application of RICS guidance (Royal Insitution of Chartered Surveyors, 2024), apportioning emissions according to the ratio of the construction period to the equipment lifespan (for example if the average lifespan of scaffolding components is 10-years and it is being used on a construction site for 3.5 years, then the fraction of embodied impacts that can be attributed to that project would be 35 per cent of the total embodied carbon). For the modular bridges, a worst-case assumption is applied by treating it as a new steel structure and therefore the entire emissions are attributed to the Project.

3.4.6 Foundations (steel reinforcement and concrete) constitute the third-largest source at around 25 per cent of A1–A3 emissions, reflecting the carbon intensity of these materials.

3.4.7 As shown in Image 3.4 when analysing the A1-A3 emissions by material type, the primary contributor is general steelwork contributing around 35 per cent of A1-A3 emissions. This material is utilised as a structural component in the pylons and is also employed in temporary structures such as bridges and scaffolding.

3.4.8 The secondary contributor to A1-A3 emissions is aluminium, accounting for 29 per cent. This material is predominantly found in the conductors of the main line. Following aluminium, concrete is the third contributor, representing 13 per cent of emissions, primarily used in the foundations of the pylons, along with imported fill and aggregates, which contribute 10 per cent.

Image 3.4 – Material emissions (A1-A3)



3.4.9 Although the Project will result in GHG emissions, it will play a key role in decarbonising the UK's national electricity grid. Over its lifetime the Project will be a key scheme for the UK to fulfil its net zero policy and transition away from fossil fuels (HM Government, 2019). By reinforcing the electricity transmission network, the Project will facilitate the connection of new renewable and low carbon energy generation.

3.5 GHG Accounting Process

3.5.1 Greenhouse Gas calculations should be quantified at the end of each stage of infrastructure delivery (i.e. design stage; construction stage), to monitor emissions and reductions achieved.

3.5.2 A suitably qualified carbon practitioner should undertake calculations at each stage and should align with GHG Protocol (World Resources Institute & World Business Council for Sustainable Development, 2015) and PAS 2080 guideline (British Standards Institution, 2023) GHG quantification requirements.

4. GHG Reduction Opportunities

4.1 Identification of GHG Reduction Opportunities

4.1.1 Opportunities for the reduction of GHG emissions are identified in the Decarbonisation Tracker in Annex A and focus on reducing GHG emissions from key emissions sources. These are potential opportunities for GHG reduction only and are not committed to through the DCO. Identification of GHG reduction opportunities is a key part of the GHG management process and the Decarbonisation Tracker provides a framework for how opportunities can be identified and prioritised. These identified GHG reduction opportunities include consideration of nature-based solutions where applicable, as per NPS EN-1 requirements (Department for Energy Security and Net Zero, 2025).

4.1.2 Opportunities are identified in terms of the following four categories:

- Strategy and Governance;
- Innovative Design;
- Lower Carbon Products; and
- Lean Construction Techniques.

4.1.3 These categories extend across the Project lifecycle, from planning through design to delivery. By identifying and developing GHG reduction opportunities within these categories, all aspects of the Project should be considered, including management processes, procurement and company culture, and technical solutions.

4.1.4 The initial list of GHG reduction opportunities was developed during a GHG-focused workshop with representatives from National Grid and the Project design team. This was hosted online on the 9 January 2026.

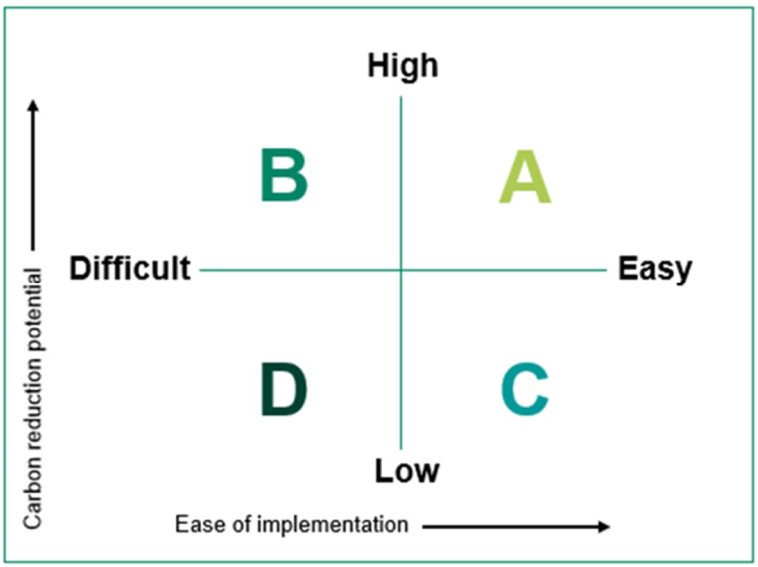
4.1.5 The Decarbonisation Tracker is a live document, which should be periodically updated throughout the Project lifecycle as further opportunities and actions are identified, as decisions are made concerning their feasibility, and as such opportunities are implemented.

4.1.6 Hence, this version is a current snapshot in time and will need to be reviewed at key Project stages by the Applicant (for example at detailed design, construction, etc.), where the responsibility for identifying and embedding these opportunities will shift.

4.2 Prioritisation of Opportunities

4.2.1 To understand the potential value of GHG reduction opportunities identified, each opportunity has been assigned a prioritisation rating based on a combination of its GHG reduction effectiveness and ease of implementation using the matrix shown in Image 4.1.

Image 4.1 – GHG reduction opportunity prioritisation matrix



4.2.2 The ‘carbon reduction potential’ aspect of the matrix is determined considering by the following:

- Additionality to business-as-usual (decarbonisation policy and market drivers);
- Minimising negative GHG impacts;
- Maximising GHG benefits; and
- Level of confidence in the effect.

4.2.3 The ‘ease of implementation’ aspect of the matrix is determined by considering the following:

- Cost implications – positive or negative;
- Resource capacity and capability;
- Technological impacts – enablers or constraints;
- Legislation – drivers or restrictions;
- Time limitations;
- Whether the opportunity fits with existing priorities and commitments; and
- Wider sustainability impacts – as enablers or constraints.

4.2.4 The ratings assigned to each opportunity should be seen only as an initial screening and should be reviewed periodically following further discussions and feasibility analysis as the Project progresses. Prioritisation ratings should also be assigned to any further measures identified and recorded within the Decarbonisation Tracker. This should be the responsibility of the National Grid project management team, unless delegated to the suitably qualified carbon practitioner or the owner assigned to each opportunity as appropriate.

4.2.5 Within the Decarbonisation Tracker, owners and key actions should be identified for each opportunity throughout the Project lifecycle. This enables specific responsibilities to be assigned within the Project’s organisational structure. The actions listed, and any further feasibility analysis, are the responsibility of the owner

assigned to each opportunity. Any opportunities without an assigned owner should rest with the National Grid project management team until an owner is identified.

4.2.6 The progress of each opportunity is reflected by the assigned status, which identifies the opportunities that have been implemented, those under consideration, those requiring further exploration, and those not being taken forward

4.3 Targets

4.3.1 National Grid's overarching decarbonisation commitment is to achieve net zero GHG emissions by 2050. This net zero target covers Scope 1, 2 and 3[5] emissions. National Grid's net zero target is underpinned by the following commitments (National Grid, 2026):

- Reduce absolute Scope 1 and 2 GHG emissions 60 per cent by 2030/31 (from a 2018/19 baseline).
- Reduce absolute Scope 3 GHG emissions (excluding sold electricity) by 37.5 per cent by 2033/34 (from a 2018/19 baseline).
- Move to a 100 per cent electric fleet by 2030 for their light-duty vehicles and pursue the replacement of our medium- and heavy-duty vehicles with zero carbon alternatives.
- Reduce absolute SF_6 emissions from their operations by 50 per cent by 2030/31 (from a 2018/19 baseline).
- Reduce absolute energy consumption in their flagship offices by 20 per cent by 2030/31 (from a 2020/21 baseline).
- Reduce our absolute annual air travel emissions by at least 50 per cent by 2025/26 (from a 2019/20 baseline) and offset any remaining emissions responsibly.
- Engage with the top 50 per cent of their US suppliers by emissions to establish a decarbonisation roadmap/action plan towards a Science Based Target by 2025/26.
- The top 80 per cent of their UK suppliers by emissions will have formally committed to set a Science Based Target by 2025/26.

4.3.2 Over its lifetime, the Project will be a key scheme for the UK to fulfil its net zero policy and transition away from fossil fuels. By reinforcing the electricity transmission network, the Project will facilitate the connection of new renewable and low carbon energy generation. The Project is therefore a key part of UK policy to decarbonise the electricity grid and transition to net zero by 2050.

4.3.3 While the Project has a key role to play in helping the UK's electricity grid to decarbonise, it is still important to reduce GHG emissions associated with the Project where possible. These GHG reductions can be driven by implementation of this GHG Reduction Strategy, in particular implementation of the Decarbonisation Tracker which assigns tasks and responsibilities to relevant parties.

[5] Scope 1: Direct emissions. Scope 2: Indirect emissions from the generation of purchased electricity, steam, heat, or cooling. Scope 3: All other indirect emissions.

4.4 Implementation

4.4.1 Requirements and responsibilities necessary for implementing the GHG Reduction Strategy should be written into contractual agreements, including suppliers and service providers.

4.4.2 Reporting progress against the agreed GHG targets should be written into the contract of those responsible for delivery.

4.4.3 Where performance against a particular target is challenging, a collaborative approach between all involved in target delivery should be necessary to identify additional/alternative actions to meet the target and/or identify a more appropriate target to reflect factors outside of the control of the Project e.g., policy changes.

4.4.4 Key contractual clauses relevant to the above should be documented within the specification and contract documents issued to the contractor at the tender stage

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Annex A Decarbonisation Tracker

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Annex A Decarbonisation Tracker

A.1.1 Table A.1 displays the decarbonisation opportunities identified during the carbon workshop held on 9 January 2026. It should be noted these are for information only and are **not** committed to through the DCO process.

Table A.1 – Decarbonisation tracker

Ref.	Work package	Opportunity	Description	Category	Assigned owner
O-1	Project Governance & Assurance	Actions implemented from previous schemes	Lessons learned from previous transmission schemes have been incorporated into the design to reduce carbon and improve construction efficiency. This approach avoids repeating higher carbon historic practices by applying proven methods that minimise material use, rework, and construction time. Embedding established good practice delivers lower embodied and construction-phase carbon while maintaining safety and performance.	Innovative Design	Main Work Contractor(s)
O-2	Route Selection & Alignment	Shortest route design	The route has been designed to be the shortest practical alignment following optioneering and environmental assessment. A shorter route reduces the total number of pylon, foundations, conductors, and access routes required, which in turn lowers the quantities of steel, concrete, and excavation. This results in reduced embodied carbon and lower emissions from construction and long-term maintenance activities.	Innovative Design	Lead Designer
O-3	Overhead Line Structures (Pylons)	Overhead line crossing	An overhead line solution has been selected in preference to an underground route due to lower carbon impacts. Underground construction typically requires extensive excavation, large volumes of concrete and specialist backfill, plastic ducting, and longer construction programmes, resulting in higher emissions and waste. Overhead lines use fewer materials, generate less waste, and can be installed more efficiently, reducing both embodied and construction-phase carbon.	Innovative Design	Lead Designer
O-4	Project Governance & Assurance	Standard design for rating National Grid Best Available Techniques (BAT)	Design solutions are based on Best Available Techniques(BAT) in line with National Grid specifications. Using BAT avoids over-design and unnecessary conservatism, reducing material quantities, limiting the risk of rework or early replacement, and minimising whole-life carbon impacts.	Innovative Design	Lead Designer

Ref.	Work package	Opportunity	Description	Category	Assigned owner
O-5	Conductors, Insulators & Fittings	Polymeric insulators	Polymeric insulators are used in place of traditional glass insulators where possible. These are lighter, reducing transport emissions and supporting smaller supporting components. They also offer improved performance in adverse weather conditions and reduced maintenance requirements, delivering lower operational carbon over the asset's lifetime. A comparison of service life between polymeric and glass insulators should be undertaken at detailed design to assess potential differences in longevity and whole-life carbon impact, ensuring any benefits are quantified.	Innovative Design	Designer/ Asset Owner
O-6	Materials & Circular Economy	Reuse and increase capacity of existing line	Reuse and uprating of the existing line were explored at an early stage as a lower-carbon option because it could have avoided new steel and concrete. Assessment identified that the existing infrastructure could not safely or reliably accommodate the required increase in capacity without extensive rebuilding, which would reduce the carbon benefit. New infrastructure is therefore necessary to meet future network requirements and support increased renewable energy transmission.	Innovative Design	Asset Owner
O-7	Route Selection & Alignment	Design flexibility	Design flexibility allows optimisation of pylon spacing, span lengths, and alignments to minimise overall material quantities. Where safe and appropriate, longer spans reduce the number of pylons and foundations required. Although this can slightly increase conductor length, the carbon impact of additional wire is lower than that of additional steel pylons and concrete foundations, resulting in a net reduction in embodied carbon.	Innovative Design	Lead Designer
O-8	Overhead Line Structures (Pylons)	Reduced pylons	The number of pylons has been minimised through detailed optioneering that assessed ground conditions, safety clearances, visual impact, and structural performance. Reducing pylon numbers directly lowers the quantity of steel and concrete required, which are the most carbon-intensive materials in transmission infrastructure. Fewer pylons also reduce construction activity, access requirements, and long-term maintenance emissions.	Innovative Design	Lead Designer

Ref.	Work package	Opportunity	Description	Category	Assigned owner
O-9	Foundations & Civil Engineering	Minimise concrete in foundations	Foundation designs have been selected to suit local ground conditions in order to minimise concrete use. Options include reduced-size pad foundations, piled foundations, rock-anchored solutions, or hybrid designs. Using the most appropriate foundation type avoids unnecessarily large concrete pours and reduces embodied carbon associated with cement production.	Innovative Design	Main Works Contractor(s)
O-10	Materials & Circular Economy	Composite materials	Verify that composite materials comply with the DCO envelope and Project specifications and undertake a comparative life-cycle assessment (LCA) against traditional steel and glass alternatives to quantify carbon savings and identify optimal material selection. Composite materials refer to engineered fibre-reinforced components used where suitable in place of traditional steel or glass. These materials could achieve equivalent performance with reduced weight and material volume. Lower weight reduces transport emissions and may allow smaller supporting structures and foundations, resulting in reduced embodied and whole-life carbon.	Innovative Design	Lead Designer
O-11	Foundations & Civil Engineering	Modular foundations	Modular foundations involve the use of precast concrete elements and are assessed alongside traditional in-situ construction. In-situ concrete is often less carbon-intensive in straightforward conditions due to lower transport and lifting requirements. Precast solutions may offer benefits in specific circumstances, such as reduced material waste, improved curing quality, or extended durability. The approach is to assess precast foundations on a case-by-case basis to identify where they offer a better whole-life carbon outcome.	Innovative Design	Designer & Main Works Contractor(s)
O-12	Materials & Circular Economy	End-of-life recovery of infrastructure	At decommissioning, structural materials such as steel members, concrete foundations, cables and fittings would be recovered wherever feasible. A Decommissioning Plan would prioritise dismantling for reuse and high-value recycling to minimise embodied carbon compared with primary production. An asset register would support material tracking and recovery.	Innovative Design	Asset Owner

Ref.	Work package	Opportunity	Description	Category	Assigned owner
O-13	Materials & Circular Economy	Recycle construction-phase materials	Construction works generate materials such as reinforcement offcuts, temporary works steel, timber formwork, pallets and cable drums. These would be segregated under the Construction Waste Management Plan to maximise reuse and recycling, reduce landfill, and lower embodied carbon through recovery of metals and other high-value materials.	Innovative Design	Asset Owner
O-14	Operational & Maintenance Efficiency	Standard pylon lifespan	The effective lifespan of pylons is extended through the use of protective treatments such as galvanisation and specialist coatings, alongside planned inspection and maintenance regimes. Measures such as repainting and localised repair reduce the need for full component replacement. Extending asset life spreads embodied carbon over a longer period and avoids the emissions associated with manufacturing new structures.	Innovative Design	Asset Owner
O-15	Route Selection & Alignment	Minimal drainage impacts	Drainage impacts have been minimised through route selection and pylon siting that avoid watercourses, flood-prone land, and sensitive ground conditions, where practicable. Where drainage is required, preference is given to natural drainage patterns and nature-based solutions rather than hard-engineered infrastructure. This reduces excavation, concrete use, and associated carbon emissions.	Innovative Design	Designer
O-16	Overhead Line Structures (Pylons)	Temporary construction hallways	Construction access routes have been designed to be as short and simple as possible, avoiding sensitive areas and reusing existing tracks where feasible. Reduced access requirements lower material use, limit excavation and reinstatement works, and reduce fuel consumption from construction traffic.	Innovative Design	Designer & Main Works Contractor(s)
O-17	Overhead Line Structures (Pylons)	Polymeric composite for pylons	Selected pylon components use polymeric composite materials instead of traditional steel or glass-based components. These materials are lighter but provide comparable structural and electrical performance. Reduced component weight lowers transport emissions and can reduce the size of cranes and lifting operations required on site. In some cases, lighter components can also allow	Innovative Design	Asset Owner & Main Works Contractor(s)

Ref.	Work package	Opportunity	Description	Category	Assigned owner
			smaller foundations or reduced foundation depths, further lowering the carbon associated with concrete and steel use.		
O-18	Ecology & Environmental Protection	Reduced pylon height	In certain locations, design optimisation and material choices allow pylon heights to be reduced by up to approximately 0.5 metres while maintaining safety clearances and performance. Shorter pylon require less steel in the main structure and arms and can also result in smaller foundation sizes. Even modest reductions in height therefore lead to measurable reductions in embodied carbon from steel fabrication and concrete foundation construction.	Innovative Design	Asset Owner & Main Works Contractor(s)
O-19	Materials & Circular Economy	Habitat protection	The route and pylon locations have been designed to avoid sensitive habitats and minimise watercourse crossings wherever possible. Avoidance reduces the need for carbon-intensive mitigation measures such as bridges, culverts, retaining structures, or habitat recreation works. By limiting disturbance, the Project reduces material use, heavy plant activity, and long-term maintenance interventions, delivering indirect carbon savings alongside ecological protection.	Innovative Design	Designer/ Environmental Lead
O-20	Materials & Circular Economy	Reuse construction materials	Where materials generated during construction are suitable, they are reused on site or elsewhere rather than being disposed of and replaced. For example, reusing suitable excavated material. Reuse lowers demand for new quarried or manufactured materials, reduces transport movements, and minimises waste disposal, all of which contribute to lower embodied and construction-phase carbon emissions.	Innovative Design	Asset Owner & Main Works Contractor(s)
O-21	Foundations & Civil Engineering	Lower carbon cement	Concrete specifications allow for the use of lower-carbon cement mixes where structural and durability requirements permit. These mixes reduce the proportion of traditional cement clinker, which is a major source of construction emissions. Even partial substitution can reduce the embodied carbon associated with foundations and structural concrete works.	Lower Carbon Products	Asset Owner & Main Works Contractor(s)

Ref.	Work package	Opportunity	Description	Category	Assigned owner
O-22	Materials & Circular Economy	Possibility to increase recycled content within steel	Opportunities are explored to increase the recycled content of steel components, subject to availability and performance specifications. Steel produced with higher recycled content typically has substantially lower embodied carbon than primary steel. Given the large quantities of steel used in transmission infrastructure, even small increases in recycled content can result in meaningful carbon savings at Project scale.	Lower Carbon Products	Asset Owner & Main Works Contractor(s)
O-23	Materials & Circular Economy	Products transported via recyclable crates	Transport of materials and components using recyclable or reusable crates rather than single-use plastic packaging. This reduces plastic waste and the carbon associated with manufacturing and disposing of packaging materials. In addition, crates are often more durable and stackable, which can improve transport efficiency and reduce the number of vehicle journeys required.	Lower Carbon Products	Asset Owner & Main Works Contractor(s)
O-24	Materials & Circular Economy	Steelworks sourcing	Confirming steel manufacturers provides an opportunity to consider suppliers with lower-carbon production processes, such as those using renewable energy or electric arc furnaces. Selecting suppliers with stronger environmental performance can reduce embodied carbon without changing the physical design of the infrastructure.	Lower Carbon Products	Asset Owner & Main Works Contractor(s)
O-25	Materials & Circular Economy	Consistent reviews of carbon concrete cement	As the design develops, further opportunities to reduce concrete-related carbon emissions would be reviewed, including alternative binders, fillers, or mix designs. This ensures that carbon reductions are maximised as specifications are refined and detailed construction information becomes available.	Lower Carbon Products	Asset Owner & Main Works Contractor(s)
O-26	Materials & Circular Economy	Modular design innovations	Modular construction approaches are assessed for repeatable elements beyond foundations, such as crane/construction platforms or compound structures. Off-site manufacture can improve material efficiency, reduce construction errors, and limit waste. Shorter on-site construction periods also reduce plant use and vehicle movements, leading to lower construction-phase carbon emissions.	Lower Carbon Products	Asset Owner & Main Works Contractor(s)

Ref.	Work package	Opportunity	Description	Category	Assigned owner
O-27	Route Selection & Alignment	Concrete from local batching plants	Source concrete from local batching plants where feasible to shorten transport distances. Reducing haulage distances lowers fuel consumption, traffic movements, and associated emissions, particularly given the large volumes of concrete required for foundation works.	Lower Carbon Products	Asset Owner & Main Works Contractor(s)
O-28	Foundations & Civil Engineering	Innovation around limestone filler	Limestone filler may be used to partially replace cement in concrete mixes where performance standards allow. Replacing cement reduces the carbon intensity of concrete because cement manufacture is energy-intensive. This provides a relatively simple material substitution with measurable embodied carbon benefits.	Lower Carbon Products	Asset Owner & Main Works Contractor(s)
O-29	Foundations & Civil Engineering	Steel rebar	Reinforcement design is optimised to avoid unnecessary steel, and recycled reinforcement is used where specification allows. Reduced quantities and higher recycled content both lower embodied carbon, as steel production is a major contributor to construction emissions.	Lower Carbon Products	Asset Owner & Main Works Contractor(s)
O-30	Materials & Circular Economy	Wiring – aluminium	Aluminium conductors are used due to their performance and recyclability. Aluminium is lighter than alternative materials, reducing transport emissions and supporting longer spans with fewer structures in some locations. When recycled aluminium is used, embodied carbon is substantially lower than for primary aluminium production.	Lower Carbon Products	Asset Owner & Main Works Contractor(s)
O-31	Conductors, Insulators & Fittings	ACSR (steel and aluminium) or aluminium alloy conductors	Aluminium conductor steel-reinforced (ACSR) or aluminium alloy conductors are selected to increase capacity within an existing corridor. Increasing capacity without constructing additional lines avoids the carbon associated with new pylons, foundations, and access routes, delivering carbon savings at a network level.	Lower Carbon Products	Asset Owner & Main Works Contractor(s)
O-32	Conductors, Insulators & Fittings	Plastic sheaf of wiring	Avoid plastic sheathing on conductors where not required for performance. Reducing plastic use lowers embodied carbon, simplifies materials, and improves recyclability at end of life, helping avoid waste and additional processing emissions.	Lower Carbon Products	Asset Owner & Main Works Contractor(s)

Ref.	Work package	Opportunity	Description	Category	Assigned owner
O-33	Construction Logistics & Access	Construction cabin efficiency	While on-site energy generation opportunities are limited, energy demand at construction compounds is reduced through efficient layout, energy-efficient cabins, and operational controls. Reducing energy demand lowers reliance on diesel generators and associated carbon emissions.	Lower Carbon Products	Asset Owner & Main Works Contractor(s)
O-34	Conductors, Insulators & Fittings	Polymeric composite	Polymeric composite materials are used for a range of selected components in place of traditional steel or glass. These materials are lighter, reducing transport emissions and the size of lifting equipment required. Their corrosion-resistant properties extend service life, reducing the need for maintenance or replacement. This results in lower embodied carbon and reduced operational carbon over the asset's lifetime.	Lower Carbon Products	Asset Owner & Main Works Contractor(s)
O-35	Construction Logistics & Access	Polymeric composite transport options	Certain polymeric composite components can be transported in more compact loads, reducing the number of vehicle trips required. Fewer transport movements lower fuel consumption and associated emissions. Compact delivery formats may also reduce on-site handling needs. Whole-life carbon impacts are assessed to ensure that any additional maintenance needs do not outweigh these transport-related carbon savings.	Lower Carbon Products	Asset Owner & Main Works Contractor(s)
O-36	Construction Logistics & Access	Energy generation at compounds	Energy use at construction compounds is reduced through efficient layouts, energy-efficient cabins, and demand-management practices. On-site generation opportunities are limited, but reducing total energy demand minimises the need for diesel generators or higher-carbon temporary power solutions, lowering operational emissions during construction.	Lean Construction Techniques	Main Works Contractor(s)
O-37	Construction Logistics & Access	Decarbonising fleets	Construction fleets increasingly use low-carbon fuels and electric vehicles where feasible. Substituting conventional diesel plant with electric or alternative-fuel machinery reduces greenhouse gas emissions associated with plant operations, especially for equipment with high operating hours.	Lean Construction Techniques	Main Works Contractor(s)

Ref.	Work package	Opportunity	Description	Category	Assigned owner
O-38	Construction Logistics & Access	Construction workers management	Travel arrangements for construction workers are managed to reduce individual car journeys. Coordinated transport, shared vehicles, or shuttle systems are used where suitable. Fewer vehicle trips reduce fuel use, minimise traffic congestion, and lower emissions during construction.	Lean Construction Techniques	Main Works Contractor(s)
O-39	Construction Logistics & Access	Staff parking	Staff parking strategies include provision for electric vehicle charging and shared-transport options. These measures encourage reduced reliance on petrol and diesel vehicles for commuting, lowering travel-related carbon emissions during construction.	Lean Construction Techniques	Main Works Contractor(s)
O-40	Materials & Circular Economy	Recycled aggregates	Recycled aggregates from local sources are used where specification and ground conditions allow. This reduces the need for extraction and processing of virgin aggregates, lowers transport distances, and supports circular-economy practices. The result is a reduction in embodied carbon compared with the use of new materials.	Lean Construction Techniques	Asset Owner & Main Works Contractor(s)
O-41	Construction Logistics & Access	Site compounds power source	Construction compounds are connected to the local electricity grid where possible, avoiding continuous use of diesel generators. Grid electricity typically has a lower carbon intensity. The use of low-carbon cabins and small-scale solar installations further reduces operational emissions.	Lean Construction Techniques	Main Works Contractor(s)
O-42	Digital, Surveys & Innovation	Helicopters and drones	Drones are used instead of helicopters for tasks such as conductor stringing, inspections, and survey work where feasible. Drones require less fuel, producing far lower carbon emissions. They also reduce noise, disturbance, and the need for repeated survey flights.	Lean Construction Techniques	Designer
O-43	Digital, Surveys & Innovation	Laser Imaging Detection and Ranging (LIDAR) surveys	High-resolution LIDAR surveys are undertaken using drones rather than helicopters. This provides accurate mapping data with a fraction of the fuel use and emissions. Drone-based surveys also reduce noise and environmental disturbance.	Lean Construction Techniques	Asset Owner

Ref.	Work package	Opportunity	Description	Category	Assigned owner
O-44	Digital, Surveys & Innovation	Utilising AI	Opportunities to use artificial intelligence and advanced analytics for monitoring and preventative maintenance explored. Predictive maintenance can identify issues earlier, enabling targeted repairs rather than full replacements. This extends asset life and avoids the carbon associated with manufacturing and installing new components.	Lean Construction Techniques	Main Works Contractor(s)
O-45	Construction Logistics & Access	Electric tools	Electric tools are used where practical instead of petrol-powered alternatives. Electric tools eliminate on-site fuel combustion and reduce noise. When supplied via grid electricity or low-carbon power sources, they lower operational emissions during construction.	Lean Construction Techniques	Main Works Contractor(s)
O-46	Construction Logistics & Access	Hydrotreated vegetable oil (HVO) and electric plant	Construction plant is assessed for suitability with HVO or electric power. Hydrotreated vegetable oil offers reduced lifecycle emissions compared with traditional diesel, while electric plant eliminates tailpipe emissions entirely when powered by low-carbon electricity. These options reduce construction-phase emissions.	Lean Construction Techniques	Main Works Contractor(s)
O-47	Construction Logistics & Access	Powering plant machinery	The feasibility of powering plant and other heavy construction machinery with electric or alternative fuels is considered. Heavy plant contributes considerably to construction emissions due to extended operating hours. Transitioning part of this fleet to low-carbon energy sources can deliver substantial emission reductions.	Lean Construction Techniques	Main Works Contractor(s)
O-48	Construction Logistics & Access	Pylon construction	Pylons are assembled in ground-level panels and lifted into position by cranes. This efficient method reduces time at height, minimises rework, and shortens installation periods. Shorter construction times reduce plant operating hours and fuel consumption, lowering construction-phase carbon.	Lean Construction Techniques	Asset Owner & Main Works Contractor(s)

Ref.	Work package	Opportunity	Description	Category	Assigned owner
O-49	Overhead Line Structures (Pylons)	Renewable energy connections	The Project increases grid capacity for renewable energy generation such as wind and solar. Although construction has a carbon footprint, improved transmission capacity enables higher volumes of low-carbon electricity to enter the system, helping to displace fossil-fuel generation and reducing national emissions over the infrastructure's lifetime.	Innovative Design	Asset Owner & Main Works Contractor(s)
O-50	Operational & Maintenance Efficiency	Additional penetration of renewable energy into the grid	The infrastructure is designed to transport large volumes of renewable electricity. By relieving constraints in the network, it prevents curtailment of renewable generation and supports continued growth of low-carbon energy sources. This provides substantial and long-lasting system-wide carbon reductions.	Innovative Design	Asset Owner
O-51	Operational & Maintenance Efficiency	Operation during maintenance	Maintenance strategies prioritise refurbishment methods such as repainting and targeted repairs instead of full component replacement. Extending asset life avoids the substantial embodied carbon associated with manufacturing, transporting, and installing new steel and concrete infrastructure.	Innovative Design	Designer
O-52	Operational & Maintenance Efficiency	Wires insulation	Overhead line conductors do not require insulation, reducing both material use and manufacturing emissions. Using fewer materials simplifies end-of-life recycling and reduces embodied carbon compared with insulated alternatives.	Innovative Design	Asset Owner
O-53	Conductors, Insulators & Fittings	End of life recycling	Pylons, conductors, and fittings are designed to be fully recyclable at the end of their service life. Recycling steel and aluminium requires less energy than producing new materials from raw sources, reducing carbon emissions and supporting circular-economy outcomes.	Innovative Design	Asset Owner

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