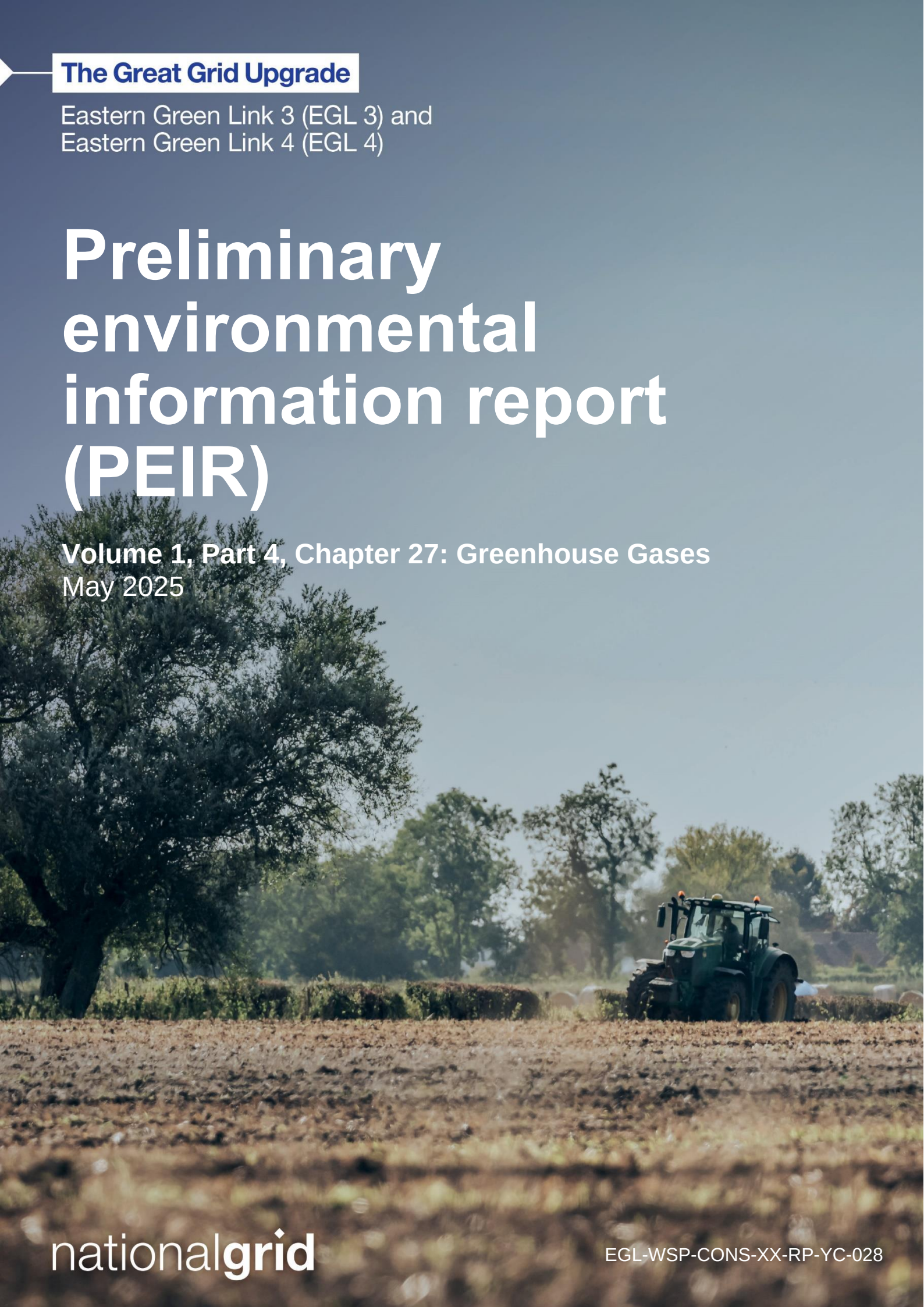
The Great Grid Upgrade

Eastern Green Link 3 (EGL 3) and
Eastern Green Link 4 (EGL 4)

Preliminary environmental information report (PEIR)

Volume 1, Part 4, Chapter 27: Greenhouse Gases

May 2025



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27.1 Introduction

27.1.1 This chapter presents the preliminary findings of the Environmental Impact Assessment (EIA) undertaken to date for the Eastern Green Link 3 (EGL 3) and Eastern Green Link 4 (EGL 4) English Onshore Scheme and English Offshore Scheme (termed collectively, the Projects), with respect to Greenhouse gas (GHG) emissions, including all relevant aspects of construction and operation. The preliminary assessment is based on information obtained to date. It should be read in conjunction with the description of the Projects provided in **Volume 1, Part 1, Chapter 4: Description of the Projects.**

27.1.2 This chapter describes the methodology used, the datasets that have informed the preliminary assessment, baseline conditions, environmental measures, and the preliminary GHG effects that could result from the Projects during the construction and operation phases.

27.1.3 This chapter should be read in conjunction with:

- **Volume 1, Part 1, Chapter 4: Description of the Projects**
- **Volume 1, Part 1, Chapter 5: PEIR Approach and Methodology**
- **Volume 1, Part 2, Chapter 9: Water Environment** (due to the relationship between climate change impacts and flood risk); and
- **Volume 1, Part 2, Chapter 12: Traffic and Transport** (due to the potential for traffic/plant greenhouse gas emissions associated with the English Onshore Scheme).

27.1.4 This chapter is supported by the following appendices:

- **Volume 2, Part 1, Appendix 1.2.A: Legislation and Policy Overview;**
- **Volume 2, Part 1, Appendix 1.5.A: Outline Register of Design Measures; and**
- **Volume 2, Part 1, Appendix 1.5.B: Outline Code of Conduction Practice.**

Limitations

27.1.5 The information provided in this PEIR is preliminary; the final assessment of potential significant effects will be reported in the Environmental Statement (ES). The PEIR has been produced to fulfil National Grid Electricity Transmission plc (NGET's) consultation duties in accordance with Section 42 of the PA2008 and enable consultees to develop an informed view of the preliminary potential significant effects of the Projects.

27.1.6 At this early design stage (PEI Report stage), design information is insufficient to allow any calculation of likely emissions, and therefore it is not possible to undertake the assessment of significance in line with the Institute of Environmental Management and Assessment (IEMA) guidance (Ref 27.1). Instead, a qualitative appraisal of likely significance has been undertaken at PEI Report stage, and emissions hotspots have been identified in order to feed into the ongoing design to avoid and reduce expected emissions from construction and operation.

27.1.7 A full quantitative assessment of GHG emissions will be provided within the ES.

Preliminary significance conclusions

27.1.8 For ease of reference, a summary of the significant and potential significant effects from the preliminary GHG emissions assessment is provided in **Table 27-1.** All other effects in relation to GHG emissions have been assessed as not significant. Further details of the methodology behind the assessment and a detailed narrative of the assessment itself are provided within the sections below.

Table 27-1 – Preliminary summary of significance of effects

Receptor and summary of predicted effects	Sensitivity/ importance/ value of receptor[1]	Magnitude of change[2]	Significance[3]	Summary rationale
Global environment	High	Medium	Minor adverse (not significant)	Construction activities will generate short term GHG emissions. Embedded mitigation measures in design can minimise these impacts.

1. The sensitivity/importance/value of a receptor is defined using the criteria set out in **Section 27.9** and is defined as [low, medium, high].
2. The magnitude of change on a receptor resulting from activities relating to the development is defined using the criteria set out in **Section 27.9** and is defined as [low, medium, high].
3. The significance of the environmental effects is based on the combination of the sensitivity/importance/value of a receptor and the magnitude of change and is expressed as major (significant), moderate (potentially significant) or minor/negligible (not significant), subject to the evaluation methodology outlined in **Section 27.9**.

27.2 Relevant technical guidance

27.2.1 The legislation and planning policy that informed the assessment of effects with respect to GHG emissions is provided within **Volume 2, Part 1, Appendix 1.2.A: Regulatory and Planning Context**. Further information on policies relevant to the Projects is provided in **Volume 1, Part 1, Chapter 2: Regulatory and Policy Overview.** Relevant technical guidance, specific to GHG emissions, that has informed this PEIR and will inform the assessment within the ES is summarised below.

Technical guidance

27.2.2 A summary of the technical guidance for GHG emissions is given in **Table 27-2.**

Table 27-2 – Technical guidance relevant to the GHG emissions assessment

Technical guidance document	Context
Ministry of Housing Communities and Local Government (2019). National Planning Policy Guidance (NPPG) (Ref 27.2)	Explains the processes and tools that can be used through the planning system in England. The guidance highlights the importance of and advises how to identify suitable climate change mitigation and adaptation measures in the planning process. This would require the implementation of appropriate measures by the local planning authorities.
IEMA Guidance: Assessing Greenhouse Gas Emissions and Evaluating their Significance (2022) (Ref 27.1)	The aim of this guidance is to assist practitioners with addressing GHG emissions assessment and mitigation in statutory and non-statutory EIA. It complements IEMA's earlier guide on Climate Change Resilience and Adaptation and builds on the Climate Change Mitigation and EIA overarching principles. The requirement to consider this topic has resulted from the 2014 amendment to the EIA Directive.
The Greenhouse Gas Protocol (Ref 27.3)	GHG Protocol establishes comprehensive global standardised frameworks to measure and manage GHG emissions from private and public sector operations, value chains and mitigation actions.
Publicly Available Standard (PAS) 2080 (2023) (Ref 27.4)	A standard for managing carbon in buildings and infrastructure. It looks at the whole value chain and aims to reduce carbon and cost through intelligent design, construction and use.
Intergovernmental Panel on Climate Change (IPCC) Guidelines for National Greenhouse Gas Inventories (Ref 27.5)	The 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories was adopted and accepted during the 49th Session of the IPCC in 2019. It was

Technical guidance document	Context
	prepared by the Task Force on National Greenhouse Gas Inventories (TFI) in accordance with the decision taken at the 44th Session of IPCC in Bangkok, Thailand, in 2016.
Royal Institution of Chartered Surveyors (RICS) Whole life carbon assessment for the built environment (2024) (Ref 27.6)	This standard addresses all element and component categories that make up a built asset, across every life cycle stage: from extracting the raw materials and manufacturing construction products, through construction and operation, to recovery or disposal at end of life. It also separately assesses the potential loads and benefits beyond the network boundary in the next life cycle.

27.3 Consultation and engagement

Overview

27.3.1 The assessment has been informed by consultation responses and ongoing stakeholder engagement. An overview of the approach to consultation is provided in **Volume 1, Part 1, Chapter 5: PEIR Approach and Methodology**.

Scoping Opinion

27.3.2 A Scoping Opinion was adopted by the Secretary of State, administered by the Planning Inspectorate, on 05 September 2024. A summary of the relevant responses received in the Scoping Opinion in relation to GHG emissions and confirmation of how these have been addressed within the assessment to date is presented in **Table 27-3.**

27.3.3 The information provided in the PEIR is preliminary and not all of the Scoping Opinion comments have been addressed at this stage, however, all comments will be addressed within the ES.

Table 27-3 – Summary of EIA Scoping Opinion responses for GHG emissions

Consultee	Consideration	How addressed in this PEIR
Planning Inspectorate	**Disposal of Waste (A5) – construction** The Scoping Report proposes to scope out this matter on the basis that emissions from the disposal of waste materials are not expected to give rise to potential significant effects, as the majority of waste generated is anticipated to be of an inert type. The Planning Inspectorate agrees that this matter can be scoped out of the ES.	Disposal of waste (A5) is scoped out of the assessment. Confirmation of the extent of non-inert waste arisings and appropriate management protocols will be provided in the ES.

Consultee	Consideration	How addressed in this PEIR
	The Planning Inspectorate considers, however, that the ES or application documents should include details on the management of any non-inert, i.e., non-hazardous or hazardous waste generated.	
Planning Inspectorate	**Maintenance, Repair, Replacement, Refurbishment (B2-B5) – operation** The Scoping Report notes that any maintenance or refurbishment which has the potential to generate emissions is predicted to be limited and therefore unlikely to give rise to potential significant effects. Attention is drawn, however, to Scoping Report paragraph 33.7.1, which indicates that operations and maintenance are to be considered in the methodology. The Planning Inspectorate, however, agrees that this matter can be scoped out of the ES.	Noted. Emissions are scoped out as per Scoping Opinion.
Planning Inspectorate	**Operational Energy Use (B6) – operation** The Scoping Report proposes to scope out this matter on the basis that the operational phase would require limited energy use as the operation is for the transmission of electricity. The Planning Inspectorate is in agreement with this reasoning and that this matter can be scoped out of the ES.	Noted. Emissions are scoped out as per Scoping Opinion.
Planning Inspectorate	**Operational Water Use (B7) – operation** The Scoping Report notes that the operational phase would require limited water use. The Planning Inspectorate is in agreement, and this matter can be scoped out of the ES.	Noted. Emissions are scoped out as per Scoping Opinion.
Planning Inspectorate	**End-user Emissions (B9/D) – operation** The Scoping Report proposes to scope out this matter on the basis that the operational phase would require limited energy or other resource use, as the operation is for the transmission of electricity. The Planning Inspectorate agrees this matter can be scoped out of the ES.	Noted. Emissions are scoped out as per Scoping Opinion.
Planning Inspectorate	**Decommissioning Process (C1) - decommissioning** **Transport and disposal of materials (C2 – C4) -decommissioning**	Decommissioning (C1 – C4) is scoped out as per Scoping Opinion. In the ES details will be confirmed as to how an

Consultee	Consideration	How addressed in this PEIR
	The Scoping Report proposes to scope out decommissioning, noting that the process of decommissioning is far in the future (40 years), and specific details are not known in terms of material volume or available disposal routes. The Planning Inspectorate agrees that this matter can be scoped out of the ES. The ES should, however, indicate how it is secured through the Development Consent Order(DCO) and that an assessment of decommissioning emissions at a later date will be undertaken.	assessment of decommissioning emissions at a later date will be undertaken (as secured through the DCO)

27.4 Data gathering methodology

27.4.1 The following information has been considered in drafting the PEIR and will be subject to further analysis during the EIA process for those matters which have been considered at this stage of the assessment (see **Table 27-6**).

- Initial scale and elements of the Projects are determined from the design team's work and associated drawings.
- Activity data, including forecast construction and operational energy data, will be sourced from the design team's work.

Study area

27.4.2 The assessment of GHG emissions is not restricted by geographical area, instead focusing on any increase or decrease in emissions as a result of the Projects, wherever that may be. This includes:

- Construction emissions from the Project’s footprint, but also relating to the transport of materials to and from the Site and their manufacture. This may be distant from the Project’s location, for example, GHG emissions associated with the manufacture of concrete in terms of embodied carbon and energy in the production process.
- Operation emissions (increase or reduction) which result from the operation of the Projects and any shifts in energy usage that may occur. In this case, GHG emissions include those for embodied emissions arising from materials and waste for the operation of the Projects, operational energy and water use.

Desk study

27.4.3 Initial analysis has reviewed design details available at the point of preparation of the PEIR.

Survey work

27.4.4 No survey work has been required in the preparation of the PEIR. It is not anticipated that any survey work specific to the GHG assessment will be required in preparation of the ES.

27.5 Overall baseline

Current baseline

27.5.1 GHG emissions occur constantly and widely as a result of natural and human activity, including land use and land use change, energy consumption (e.g., fossil fuels, purchased energy from the grid and/or other sources) and industrial processes. The GHG assessment only considers the scenario in which the Projects result in additional or avoided emissions in comparison to the baseline.

27.5.2 The latest summary of GHG emissions (Ref 27.7) for the relevant regions, and the UK are presented in **Table 27-4.** The emissions sources are a subset of the total emissions for each region, chosen for their relevance to the Projects, with the grand total for all emissions sources provided. These emissions have only been provided for context and are not the current baseline emissions for this assessment.

Table 27-4 – UK and regional GHG emissions (2022)

Emissions Source	Cambridgeshire ($ktCO_2e$)	Lincolnshire ($ktCO_2e$)	Norfolk ($ktCO_2e$)	UK ($ktCO_2e$)
Industry Electricity	136.2	129.3	128.9	11,642.4
Industry Gas	181.3	99.4	147.8	14,197.0
Large Industrial Installations	77.7	12.2	99.7	26,157.2
Industry 'Other'	108.1	152.1	140.7	10,347.4
Industry Total	**503.2**	**393.0**	**517.2**	**62,344.1**
Commercial Electricity	225.9	194.3	219.3	19,072.8
Commercial Gas	121.4	91.8	90.7	12,543.0
Commercial 'Other'	20.4	23.6	27.2	2,280.0
Commercial Total	**367.6**	**309.8**	**337.2**	**33,895.8**
Public Sector Electricity	50.3	30.7	35.1	3,611.1
Public Sector Gas	93.5	73.7	75.0	7,019.4
Public Sector 'Other'	15.1	9.1	11.7	1,064.3
Public Sector Total	**158.9**	**113.4**	**121.8**	**11,694.8**
Domestic Electricity	220.8	252.7	328.6	20,500.1

Emissions Source	Cambridgeshire ($ktCO_2e$)	Lincolnshire ($ktCO_2e$)	Norfolk ($ktCO_2e$)	UK ($ktCO_2e$)
Domestic Gas	493.0	537.8	537.3	53,287.5
Domestic 'Other'	145.4	209.1	322.6	10,477.4
Domestic Total	**859.2**	**999.5**	**1,188.4**	**84,265.0**
Road Transport (A roads)	971.1	839.9	871.7	44,172.8
Road Transport (Motorways)	261.2	0.0	0.0	23,978.4
Road Transport (Minor roads)	435.9	524.1	679.1	41,783.3
Diesel Railways	32.7	32.9	9.6	1,593.4
Transport 'Other'	56.8	31.6	155.8	3,128.5
Transport Total	**1,757.6**	**1,428.6**	**1,716.2**	**1,14,656.4**
Net Emissions: Forest land	-53.4	-139.6	-343.8	-18,255.0
Net Emissions: Cropland	92.8	244.9	186.8	9,346.0
Net Emissions: Grassland	-41.5	-80.1	-81.4	-8,870.3
Net Emissions: Settlements	22.0	29.4	35.2	3,133.9
Net Emissions: Peatland	1,451.6	606.8	920.5	15,175.3
Net Emissions: Bioenergy Crops	-0.3	-0.8	-0.6	-8.9
Net Emissions: Other LULUCF	2.6	6.1	6.2	237.0
LULUCF Net Emissions	**1,473.9**	**666.6**	**723.0**	**757.9**
Agriculture Electricity	17.4	43.2	23.2	915.3
Agriculture Gas	3.5	11.6	8.9	663.0
Agriculture 'Other'	144.3	206.1	198.3	6,286.5
Agriculture Livestock	77.1	246.3	382.1	29,729.9
Agriculture Soils	741.5	675.9	689.8	11,986.9

Emissions Source	Cambridgeshire ($ktCO_2e$)	Lincolnshire ($ktCO_2e$)	Norfolk ($ktCO_2e$)	UK ($ktCO_2e$)
Agriculture Total	**983.8**	**1,183.0**	**1,302.4**	**49,581.5**
Landfill	197.8	112.6	150.5	13,473.4
'Other' Waste Management	147.0	67.6	74.5	5,260.4
Grand Total	**6,449.1**	**5,274.2**	**6,131.3**	**3,75,929.3**

Notes:

1. The units of $ktCO_2e$ refer to kilo tonnes of carbon dioxide equivalent. 1 $ktCO_2e$ is the same as 1,000 tCO_2e.
2. LULUCF refers to Land Use, Land-Use Change and Forestry.
3. All reported numbers are rounded. Some sub-totals do not sum precisely as a result.

27.5.3 Context for offshore emissions is provided through UK reported GHG emissions associated with domestic shipping. For inventory reporting purposes, domestic and international shipping emissions are defined by voyage start/destinations (i.e., a voyage from a UK port to a UK port is classed as UK domestic for reporting purposes), rather than by the vessel itself (e.g., UK registered vessels may conduct voyages to foreign ports). Automatic Identification System (AIS) data is used to enable fuel consumption estimates associated with different vessels. The latest available data (Ref 27.8) shows reportable UK domestic shipping emissions of 5,300 $ktCO_2e$. This is 5% of total UK domestic transport emissions.

27.5.4 Since the Projects contribute to wider action associated with UK national net zero targets, the current baseline is therefore viewed as existing UK carbon budgets and sectoral allocations as recommended by the Climate Change Committee (CCC).

27.5.5 On this basis, the current UK carbon budget (2023 – 2027) of 1,950 million tCO_2e and power sector allocation of 143 million tCO_2e (29 million tCO_2e average per year) form the current baseline. The change in GHG emissions associated with the Projects are evaluated against national, regional and local targets for decarbonisation (the future baseline).

Future baseline

27.5.6 GHG emissions are required to reduce in the future to meet government targets. The UK Government has set a net zero target, which requires the UK to reduce GHG emissions by 100% below 1990 levels by 2050. Policy has been implemented at national, regional and local scales in order to achieve targets for decarbonisation. The future baseline considers relevant policy and a number of the UK carbon budgets (including sectoral allocations) over the lifetime of the Projects: the fourth carbon budget (2023 to 2027) of 1,950 million tCO_2e, the fifth carbon budget (2028 to 2032) of 1,725 million tCO_2e and the sixth carbon budget (2033 to 2037) of 965 million tCO_2e.

27.5.7 It is recognised that there are a number of other proposed and committed developments within the surrounding area that could alter the future baseline in the absence of the Projects. The potential for cumulative effects will be considered according to the approach outlined within **Volume 1, Part 1, Chapter 5: PEIR Approach and Methodology** and **Volume 1, Part 4, Chapter 28: Cumulative Effects.**

27.5.8 Emissions from a ‘no development’ case in the future baseline is represented by the existing GHG emissions from the Site prior to construction and operation of the Projects or by the GHG emissions arising from an alternative project design and assumptions. Since there is no physical development and activity at the location of the Projects in the no development scenario, the GHG emissions prior to construction and operation will be zero.

27.6 Environmental measures

27.6.1 As set out in **Volume 1, Part 1, Chapter 5: PEIR Approach and Methodology**, the environmental measures are characterised as design measures or control and management measures. A range of environmental measures would be implemented as part of the Projects and will be secured in the DCO as relevant.

27.6.2 **Table 27-5** outlines how these design and control measures will influence the GHG emissions assessment. Measures listed in **Table 27-5** have been assigned references, for example (GHG01). These align with the references provided in **Volume 2, Part 1, Appendix 1.5.B: Outline CoCP in Volume 2** for ease of cross-reference.

27.6.3 In addition to the measures listed in **Table 27-5**, standard mitigation measures, comprising management activities and techniques, would be implemented during the construction of the Projects to limit effects through adherence to good site practices and achieving legal compliance. These are listed in **Volume 2, Part 1, Appendix 1.5.B: Outline CoCP** and are not repeated below. In addition to the above, an Outline CEMP listing the measures which are specifically relevant to the English Offshore Scheme can be found in **Volume 2, Part 1, Appendix 1.5.C: Outline Construction Environmental Management Plan**.

27.6.4 In addition, design measures identified through the EIA process have been applied to avoid or reduce potential significant effects. Design measures included that a relevant GHG receptors are included in **Table 27-5** below under Design and Operation and are also included in **Volume 2, Part 1, Appendix 1.5.A: Register of Design Measures**

Table 27-5 – Summary of the environmental measures

Receptor	Potential changes and effects	Embedded measures	ID reference
Construction			
Global environment	GHG emissions reduction	Applying the waste hierarchy to seek re-use and recycling or re-purposing of materials in preference to the use of virgin materials. Use of waste management protocols to segregate waste arisings and enable effective resource use.	GHG01
Global environment	GHG emissions reduction	Using more modern and efficient construction plant and delivery vehicles, and/or those powered by electricity from alternative/lower carbon fuels.	GHG02
Design and Operations			
Global environment	GHG emissions reduction	The Projects would consider a range of design optimisation measures to reflect the carbon reduction hierarchy (detailed below and found in clause 6.1.4 of PAS 2080:2023): • reduce the number of elements required for the Projects; • reduce the requirement for construction materials by smart design; • substitute-in and use alternative raw materials and resources with lower embodied carbon; and • efficient construction processes, such as embracing design for manufacture and assembly.	GHG01
Global environment	GHG emissions reduction	The Project would maximise the opportunity to use more sustainable materials by specifying, in procurement documentation, that materials and products with reduced embodied carbon emissions, and materials/resources featuring recycled content (where safe and of sufficient integrity for engineering).	GHG02

Receptor	Potential changes and effects	Embedded measures	ID reference
Global environment	GHG emissions reduction	Designing, specifying and constructing the Projects with a view to maximising the operational lifespan and minimising the need for maintenance and refurbishment (and thus reducing the frequency of releasing associated GHG emissions).	GHG03
Global environment	GHG emissions reduction	The Projects ancillary infrastructure and equipment (such as lighting and telecommunications) will comply with the relevant design standard and specifications and will be selected for its durability and energy efficiency credentials.	GHG04
Global environment	GHG emissions reduction	All design decisions to be framed by the six principles of circular economy set out in BS8001:2017. Resource Efficiency targets will include diversion of 100% of avoidable waste streams from landfill and a minimum overall recycling rate of at least 80% as well as an average recycled content by value of 30% for applicable construction materials.	GHG05
Global environment	GHG emissions reduction as a result of SF_6 leakage	To meet NGET's environmental commitment to a 50% reduction in SF6 emissions from a 2018/19 baseline by 2030, and environmental ambition to eliminate SF6 equipment by 2050, the procurement of new SF6 equipment is no longer acceptable. Where use of SF6-free technology for a specific application is not technically viable or is commercially restrictive, a deviation shall be sought as an exceptional case.	GHG06

27.7 Scope of the assessment

Spatial scope and study area

27.7.1 The assessment of GHG emissions is not restricted by geographical area, instead focusing on any increase or decrease in emissions as a result of the Projects, wherever that may be. **Section 27.4** above outlines what the GHG assessment includes.

Temporal scope

27.7.2 The temporal scope of the assessment of GHG emissions is consistent with the period over which the Projects would be carried out. It covers the period of construction and the entire operational lifetime.

27.7.3 The Projects are expected to have a life span of more than 40 years. If decommissioning is required at this point in time, then activities and effects associated with the decommissioning phase are expected to be of a similar level to those during the construction phase works, albeit with a lesser duration of two years. Acknowledging the complexities of completing a detailed assessment for decommissioning works up to 40 years in the future, it is considered that the significance of effects relating to the decommissioning phase would be no greater than those from the construction phase and decommissioning effects are not discussed in detail in this chapter; however, **Table 4-21** in **Volume 1, Part 1, Chapter 4: Description of the Projects** provides a high level summary assessment of the likely activities associated with decommissioning. Furthermore, should decommissioning take place, it is expected that an assessment in accordance with the legislation and guidance at the time of decommissioning would be undertaken.

Identification of receptors

27.7.4 The impacts of GHG emissions relate to their contribution to global warming and climate change. These impacts are global and cumulative in nature, with every tonne of GHG emissions contributing to impacts on natural and human systems. GHG emissions result in the same global effects wherever and whenever they occur, and, therefore, the sensitivity of different human and natural receptors is not considered.

Potential effects considered within this assessment

27.7.5 The PAS2080:2023 lifecycle stages describe the sources of activities that may give rise to GHG emissions. These apply to the Construction, Operational and Decommissioning stages of the Projects.

27.7.6 With reference to all PAS 2080:2023 lifecycle stages, the impacts scoped in or out for GHGs are as follows:

Table 27-6 – GHG emissions lifecycle stages scoped in or out for further assessment

Impacts	Phase	Scoped In	Scoped Out	Justification
Product Stage (manufacture and transport of raw materials to suppliers) (A1-3)	Construction	✓		Raw materials required for the Projects would result in embodied emissions that have the potential to be large.
Transport of Materials to Site (A4)	Construction	✓		Construction phase emissions from fuel/energy consumption due to the delivery of material to the site have the potential to be large.
Plant and Equipment Use during Construction (A5)	Construction	✓		Emissions from the plant and equipment used during the construction of the Projects have the potential to be large.
Transport of Waste (A5)	Construction	✓		Emissions from fuel/energy consumption due to the transport of waste materials have the potential to be large.
Disposal of Waste (A5)	Construction		✓	Emissions from the disposal of waste materials is not expected to be large as it will predominantly comprise inert waste.
Land use, Land Use Change and Forestry (A5)	Construction	✓		Emissions from the change in land use from existing agricultural land may be significant.
Operation (B1)	Operation	✓		Leakage of Sulphur Hexafluoride (SF_6) from switchgear or circuit-breakers.
Maintenance, Repair, Replacement, Refurbishment (B2-5)	Operation		✓	The Projects are not designed with the expectation of any significant plant maintenance and repair activities, or refurbishment being required, and therefore emissions due to

Impacts	Phase	Scoped In	Scoped Out	Justification
				these activities are expected to be minimal.
Operational Energy Use (B6)	Operation		✓	The Projects are not designed with the expectation of any significant operational energy use and therefore emissions due to these activities are expected to be minimal.
Operational Water Use (B7)	Operation		✓	The Projects are not designed with the expectation of any significant operational water use and therefore emissions due to these activities are expected to be minimal.
Land Use, Land Use Change and Forestry (B8)	Operation	✓		The reduction in carbon sequestration due to the land use change from the Projects may be significant.
End-user Emissions (B9/D)	Operation		✓	The Projects are not designed with the expectation of any significant end user emissions and therefore emissions due to these activities are expected to be minimal.
Decommissioning Process (C1)	Decommissioning		✓	The potential effects of the decommissioning phase of the Projects have been scoped out. This is due to uncertainties around the fate of infrastructure at this stage (40 years in future).
Transport and Disposal of Materials (C2-4)	Decommissioning		✓	The potential effects of the decommissioning phase of the Projects have been scoped out. This is due to uncertainties around the fate of infrastructure at this stage (40 years in future).

27.8 Key parameters for assessment

Realistic worst-case design scenario

27.8.1 At this stage of the design process, there is uncertainty as to the location and spatial extent of many key design elements associated with the Projects.

27.8.2 In general terms, the key activities that will cause GHG emissions within the Projects relate to the quantities of materials used, the manufacture and transport of those materials to the sites and the construction of the Projects (associated plant equipment and resource use).

27.8.3 Given the extensive design envelope, it is not considered useful to quantify projected GHG emissions at PEIR since the output figures will necessarily sit within a wide range. Quantified details will be presented within the ES.

27.8.4 Good practice design work, aligned with a PAS2080:2023 approach, will continue to look to minimise resource needs and, by extension, GHG emissions associated with the Projects.

27.8.5 At ES stage, when a more developed design proposal is in place, a quantified assessment of significance will be undertaken. This will be a 'worst case' scenario since it will incorporate an estimated bill of quantities and model primary activities as set out in an indicative schedule.

Consideration of construction scenarios

27.8.6 As detailed in **Volume 1, Part 1, Chapter 4: Description of the Projects**, the timing of construction activities set out within this PEIR is indicative. To allow for any unexpected circumstances and a realistic worst-case assessment, the impact assessment for the English Onshore Scheme and English Offshore Scheme considers the following construction scenario to ensure the worst-case scenario for GHG emissions can be identified and assessed:

- Delivery of the concurrent scenario as described in **Volume 1, Part 1, Chapter 4: Description of the Projects** will be used for the assessment. This represents a scenario where there is the most complexity in terms of programmes of works. This means potentially the largest challenge in managing GHG emissions associated with the transport of materials and workers, as well as use of plant and equipment in construction activities. This can therefore be considered a worst-case scenario.

27.9 Assessment methodology

Overview

27.9.1 The generic project-wide approach to the assessment methodology is set out in **Volume 1, Part 1, Chapter 5: PEIR Approach and Methodology**. However, whilst this has informed the approach that has been used in this GHG emissions assessment, it is necessary to set out how this methodology has been applied, and adapted as appropriate, to address the specific needs of this GHG assessment. Details are provided below.

Approach

27.9.2 The assessment approach considers the likely magnitude of GHG emissions (or avoided emissions) in comparison to the baseline without the Projects. It considers emissions throughout the lifecycle of the Projects, addressing:

- Construction phase - e.g., embodied emissions associated with materials, transportation of materials to the Site and waste/arisings from the Site, and the construction process; and
- Operation phase - e.g., maintenance and replacement of original materials.

27.9.3 For all PAS 2080:2023 lifecycle stages and sub-stages of the Projects that are scoped in, the assessment will include the following:

- collection of available data/information on the scale of GHG emitting activities (e.g. tonnes of concrete, litres of fuel, kWh electricity) and GHG capturing activities for the baseline and for the Projects. In each case, this will cover the whole study period (minimum design life of 40 years); and
- calculation of the GHG emissions by applying a suitable emissions factor (per unit of emissions generating or capturing activity).

27.9.4 Emissions calculations will focus on emissions annually and throughout the Project's lifecycle. Values will be reported as tonnes of CO_2 equivalents (tCO_2e).

27.9.5 The assessment of construction and operation impacts will be undertaken in line with the following guidance:

- PAS 2080:2023 (Ref 27.5).
- ISO 14064-1:2018 (Ref 27.10).
- GHG Protocol (Ref 27.4).
- IPCC Guidelines for National Greenhouse Gas Inventories (Ref 27.6).

Magnitude of impact

27.9.6 Any magnitude of emitted or avoided GHG emissions makes a cumulative contribution to climate change (adverse or beneficial, respectively). There are currently no agreed thresholds for what level of GHG emissions is considered significant in the context of the EIA Regulations (2017) (Ref 27.11). Therefore, to contextualise the carbon emissions of the Projects, these will be compared to the UK Carbon Budgets (Ref 27.12).

Significance of effect

27.9.7 Significance of GHG impacts is assessed in line with IEMA guidance (Ref 27.13): "*a development's emissions should be based on its net impact over its lifetime, which may be positive, negative or negligible. The evaluation of significance should not just focus on GHG emissions, or the magnitude of those emissions, but whether the Proposed Developments contribute to reducing GHG emissions relative to a comparable baseline consistent with a trajectory towards net zero by 2050.* "

27.9.8 The following terms are used to define the significance of the effects identified as set out in IEMA Guidance:

- Major Negative (significant): the GHG impacts are not mitigated or are only compliant with do-minimum standards set through regulation, and do not provide further reductions required by existing local and national policy nor make a meaningful contribution to the UK's trajectory towards net zero.
- Moderate Negative (significant): the GHG impacts are partially mitigated and may partially meet the applicable existing and emerging policy requirements, but would not fully contribute to decarbonisation in line with local and national policy goals, falling short of fully contributing to the UK's trajectory towards net zero.
- Minor Negative (not significant): the GHG impacts are fully consistent with applicable existing and emerging policy requirements and good practice design standards; they are fully in line with measures necessary to achieve the UK's trajectory towards net zero.
- Negligible (not significant): the GHG impacts are reduced through measures that go well beyond existing and emerging policy and design standards for projects of this type, such that radical decarbonisation or net zero is achieved well before 2050.
- Positive (significant): the net GHG impacts are below zero, causing a reduction in atmospheric GHG concentration, whether directly or indirectly, compared to the without-project baseline, substantially exceeding net zero requirements with a beneficial climate impact.

Preliminary assessment of cumulative effects

27.9.9 The approach to cumulative effects assessment (CEA) for GHGs differs from that for many EIA topics. All global cumulative GHG sources are relevant to the effect on climate change, and this is taken into account in defining the receptor as being of ‘high’ sensitivity. Effects of GHG emissions from specific cumulative projects are not assessed, as there is no basis for selecting any particular (or more than one) cumulative project that has GHG emissions for assessment over any other. Additionally, the contextualisation of GHG emissions, by its nature, incorporates the cumulative contributions of other GHG sources which make up that context. Therefore, it is not necessary to carry out a separate CEA of GHG emissions as part of this EIA. This approach is in accordance with IEMA guidance.

27.10 Preliminary assessment of GHG effects

27.10.1 In terms of the English Offshore Scheme, sources of GHG emissions to be minimised in design relate to:

- Construction: Routeing of the HVDC cables and the associated embodied carbon associated with the production of the cables. Efficient routeing will minimise the length of cables required and the associated GHG emissions.
- Construction: Laying of the cables. Cable installation will be carried out by specialist marine vessels. The associated fuel use by the vessels will result in GHG emissions. The means of cable installation (displacement of existing seabed material and/or encapsulation of cabling) will determine the quantities of any additional materials required.
- Operation: Maintenance and repair of cables. The associated fibre optic cabling enables remote monitoring of the cables, avoiding the need for regular inspection by

a marine vessel. Repair and replacement of cable sections will be carried out in a similar manner to installation.

27.10.2 In terms of the English Onshore Scheme, sources of GHG emissions to be minimised in design relate to:

- Construction: Embodied carbon associated with installed assets (converter station equipment, HVDC and HVAC cables, substation equipment and materials in works on existing 400 kV overhead lines). Avoiding use of SF_6 in switchgear where practical.
- Construction: Fuel use in plant equipment used in construction works. Protocols set out in **Volume 2, Part 1, Appendix 1.5.B: Outline CoCP** regarding equipment specifications, use of lower carbon alternative fuels to diesel and idling regimes when not in use, all contribute to minimising impacts.
- Construction: Traffic management in relation to the movement of materials and staff to the site. Efficient logistics and site travel management plans can minimise GHG impacts through promoting the use of low emission vehicles.
- Operation: Maintenance activities associated with operating assets.

27.10.3 Given the environmental measures identified in **Table 27-5** an initial assessment of the potential impacts of the Projects is that it will give rise to a minor negative (not significant) effect. This is on the basis of comparison against existing UK and sectoral carbon budget targets (**Table 27-7)**.

Table 27-7 – Context for assessment of significance: UK Carbon Budgets

Carbon Budget (tCO_2e)	4th (2023 – 2027)	5th (2028 – 2032)	6th (2033 – 2037)
Total UK Carbon Budget	1,950,000,000	1,725,000,000	965,000,000
CCC Sector Budget	189,160,000	92,570,000	35,740,000

27.10.4 Construction works for the Projects will fall within the 5th and 6th Carbon Budget periods. Whilst a quantitative assessment has not been carried out for this PEIR, it is possible to use the territorial emissions reported in **Table 27-4** as a means of evaluating the scale of GHG emissions that would constitute significant. If, for example, Construction emissions amounted to 1% of the 5th UK Carbon Budget, this would translate as 17,250 $ktCO_2e$. In territorial GHG emission terms, this would amount to almost the total GHG emissions of Cambridgeshire, Lincolnshire and Norfolk combined (17,854.6 $ktCO_2e$ in 2022). Embedded good design and construction practice means that the actual impacts will be much lower.

27.10.5 Operation stage emissions will be much lower than the Construction stage, given minimal maintenance/repair requirements and no significant fuel or water requirements in operation. This is reflected in the Scoping Opinion response and the agreement to scope out a number of lifecycle stages in Operation (as summarised in **Table 27-3**).

27.10.6 In summary, while there will be GHG emissions arising from the Construction and Operation of the Projects, these emissions are not considered to be of a sufficient scale to impact the overall trajectory of the UK's net zero targets.

27.11 Transboundary Effects

27.11.1 The assessment methodology includes contextualisation against the UK and Scottish carbon budgets and net zero targets, which have been set under international commitments to the Paris Agreement. The contextualisation of GHG emissions, by its nature, incorporates the transboundary effects.

27.12 Further work to be undertaken

27.12.1 The information provided in this PEIR is preliminary; the final assessment of potential significant effects will be reported in the ES.

27.12.2 Details included in the analysis in the ES will relate to all elements of the Projects as set out in **Volume 1, Part 1, Chapter 4: Description of the Projects.**

27.12.3 In terms of Construction, analysis will quantify potential impacts in relation to those lifecycle stages scoped into the assessment. Specifically:

- Raw materials – Embodied carbon associated with selected materials [Lifecycle stage - A1-3)].
- Movement of raw materials - Transport of Materials to Site [Lifecycle stage - A4].
- Plant and Equipment Use during Construction [Lifecycle stage – A5].
- Transport of Waste to suitable disposal sites [Lifecycle stage – A5].
- Land use, Land Use Change and Forestry – any residual impacts in terms of carbon sinks within the sites [Lifecycle stage – A5].

27.12.4 In terms of Operation, analysis will quantify potential impacts in relation to those lifecycle stages scoped into the assessment. Specifically:

- Leakage of Sulphur Hexafluoride (SF_6) from switchgear or circuit-breakers [Lifecycle stage – B1].
- Land use, Land Use Change and Forestry – The reduction in carbon sequestration due to the land use change from the Projects [Lifecycle stage – B8].

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