Light Valley Solar

Environmental Statement Volume 1

Chapter 9: Greenhouse Gas Emissions

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Light Valley Solar

Infrastructure Planning

Planning Act 2008

The Infrastructure Planning
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Light Valley Solar

DCO Submission

Chapter 9: Greenhouse Gas Emissions

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9.1 Introduction

9.1.1 This chapter assesses the likely significant effects arising from greenhouse gas (GHG) emissions associated with the construction, operation (including maintenance) and decommissioning of the Proposed Development.

9.1.2 This chapter sets out the relevant legislation, policy, standards and guidance applied to the assessment process; consultation undertaken to inform the assessment; assessment methodology; the relevant baseline conditions upon which the assessment is based; embedded mitigation considered in place before the assessment is undertaken; the likely significant effects that may arise as a result of the Proposed Development considering embedded mitigation; further mitigation requirements to reduce or remove any identified likely significant effects; the remaining residual effects following further mitigation; and any monitoring required for remaining significant effects.

9.1.3 The conclusions of the following topic assessments are considered relevant to the receptors considered within this assessment, and as such are taken into account in the overall assessment for GHG emissions:

1) Chapter 6: Biodiversity (ES Volume 1) [**EN0110012/APP/LVS/06.01.06**].

9.1.4 This chapter is supported by the following appendices:

1) Appendix 9.1: GHG Emissions Assessment (ES Volume 3) [**EN0110012/APP/LVS/06.03.09.01**].

9.2 Scope of the assessment

9.2.1 The EIA Scoping Report (see Appendix 1.1 (ES Volume 3) [**EN0110012/APP/LVS/06.03.01.01**]) set out the proposed scope for the assessment of GHG emissions. The scope of the GHG emissions assessment is summarised in Table 9-1 below.

Table 9-1 GHG emissions assessment scope

Aspect	Phase	Scoped in / out	Summary comments
GHG Emissions	Construction	Scoped in	N/A
	Operation	Scoped in	N/A
	Decommissioning	Scoped in	N/A

Study Area

9.2.2 The GHG emissions assessment considers the emissions arising from the construction, operation and decommissioning of the Proposed Development, some of which will be emitted within the Order Limits, but the majority of which will be emitted outside the Order Limits on a global scale e.g. extraction,

manufacture, and transport of materials to the Site. The assessment also considers the benefits from renewable energy generation over the operational life of the Proposed Development.

9.3 Relevant legislation, policy, standards and guidance

9.3.1 The following section identifies the relevant legislation, planning policy, standards and guidelines which underpin the assessment methodology for GHG emissions and have informed the assessment, including the identification of mitigation.

9.3.2 GHG emissions policy is typically incorporated into the same policy documents and structures as with climate resilience policy, therefore this section should be read in conjunction with section 7.3 of Chapter 7: Climate Change Resilience (ES Volume 1) [**EN0110012/APP/LVS/06.01.07**].

Legislation

Table 9-2 GHG emissions - Legislation

Legislation	Relevance to assessment
The Kyoto Protocol, United Nations Framework Convention on Climate Change (UNFCCC) (Ref 1)	An international treaty adopted in 1997 that extends the UNFCCC and commits member parties to reducing GHG emissions. The Kyoto Protocol sets emission reduction targets for developed countries to reduce GHG emissions. The UK is party to the treaty and as such is required to reduce its GHG emissions. This chapter provides a GHG assessment for the Proposed Development in line with this aim of reducing GHG emissions.
The Paris Agreement, UNFCCC (Ref 2)	The Paris Agreement is a treaty adopted in 2015 that pledges to limit the increase in global average temperature to well below 2 degrees Celsius (°C), and to aim for 1.5°C, above pre-industrial levels. The Glasgow Climate Pact, adopted at the 2021 United Nations Climate Change Conference (COP26) in Glasgow, Scotland and the Sharm El-Sheikh Implementation Plan, adopted at the 2022 United Nations Climate Change Conference (COP27) in Sharl El-Sheikh, Egypt reaffirmed the goals of the Paris Agreement. This chapter provides a GHG assessment for the Proposed Development in line with this aim of reducing GHG emissions.
The Climate Change Act 2008, as amended by the Climate Change Act (2050 Target Amendment) Order 2019 (Ref 3Ref 3)	The Climate Change Act commits the UK to GHG emissions reductions and reporting. The Act requires the setting of five-yearly Carbon Budgets that are not to be exceeded. The amendment Order updates the Climate Change Act, stating the UK's net zero target by 2050. This chapter provides a greenhouse gas assessment for the Proposed Development in line with this aim of reducing GHG emissions.
The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (Ref 4)	The regulations require: "5. A description of the likely significant effects of the development on the environment resulting from, inter alia—

Legislation	Relevance to assessment
	(f) the impact of the project on climate (for example the nature and magnitude of greenhouse gas emissions) and the vulnerability of the project to climate change" This chapter provides a greenhouse gas assessment for the Proposed Development, meeting the requirement to assess GHG emissions.
The Carbon Budget Order 2021 Climate Change Committee Sixth Carbon Budget (Ref 5)	This sets the carbon budgets for each relevant budgetary period. The sixth Carbon Budget (covering the period from 2033 to 2037) is the first budget to take account of the UK Government's 2050 net zero target. The seventh carbon budget was released by the Climate Change Committee in February 2025 but is not yet enshrined in law. These carbon budgets are used in this chapter to contextualise the scale of emissions arising from the Proposed Development and assess significance.
The Carbon Budget and Growth Delivery Plan (Ref 6)	The Carbon Budget and Growth Delivery Plan outlines a package of proposals and policies from the UK Government that aim to enable Carbon Budgets 4-6 to be met. The establishment of renewable energy generation, including solar, forms part of the plan. The Carbon Budget and Growth Delivery Plan provides additional context for the carbon budgets and is used in this chapter to contextualise the scale of emissions arising from the Proposed Development and assess significance.

Policy

Table 9-3 GHG emissions - Policy

Policy	Relevance to assessment
Overarching National Policy Statement for Energy (EN-1) (Ref 7Ref 7)	With reference to paragraphs 2.3.3, 3.3.57, 3.3.84 in relation to the UK's Net Zero target by 2050, 2035 Carbon Budget 6 reductions and objectives for energy systems; Section 2.3 in relation to UK's overall GHG emissions from power sector; and Section 5.3 in relation to GHG assessment and mitigation. Paragraphs 5.3.4 to 5.3.7 are relevant to the Applicant assessment relevant policy, assessment requirements, mitigation and Paragraphs 5.3.8 to 5.3.12 include Secretary of State decision making criteria regarding GHG emissions and mitigation. The guidance states that, all proposals for energy infrastructure projects should include a GHG assessment as part of their ES including: ▪ A whole life GHG assessment showing construction, operational and decommissioning GHG impacts; ▪ An explanation of the steps that have been taken to drive down the climate change impacts at each of those stages; ▪ Measurement of embodied GHG impact from the construction stage; ▪ How reduction in energy demand and consumption during operation has been prioritised in comparison with other measures;

Policy	Relevance to assessment
	▪ How operational emissions have been reduced as much as possible through the application of BAT for that type of technology; ▪ Calculation of operational energy consumption and associated carbon emissions; ▪ Whether and how any residual GHG emissions will be (voluntarily) offset or removed using a recognised framework; and ▪ Where there are residual emissions, the level of emissions and the impact of those on national and international efforts to limit climate change, both alone and where relevant in combination with other developments at a regional or national level, or sector level, if sectoral targets are developed. Paragraph 5.3.7 states that steps taken to minimise and offset emissions should be set out and secured within the DCO. The GHG reduction measures for the Proposed Development are included within the oCEMP [**EN0110012/APP/LVS/07.02**], oOEMP [**EN0110012/APP/LVS/07.03**] and oDEMP [**EN0110012/APP/LVS/07.04**]. This chapter provides a GHG assessment for the Proposed Development in line with this aim of reducing GHG emissions.
National Policy Statement for Renewable Energy Infrastructure (EN-3) (Ref 8)	This policy covers renewable energy infrastructure. NPS EN-3 recognises solar farms as one of the most established renewable electricity technologies in the UK and the cheapest form of electricity generation worldwide. It provides clear support for large scale solar development, stating that: "The UK has huge potential for solar power: it is a cost-effective, versatile, and effective technology. Solar energy is at the heart of our Clean Power 2030 Mission. The government is committed to working with industry to radically increase our existing solar capacity by 2030 to boost growth across the country, create thousands of high-skill, future-proofed jobs and tackle the climate crisis." This chapter provides a GHG emissions assessment for the Proposed Development in line with this aim of reducing national GHG emissions with solar power.
National Policy Statement for Electricity Networks Infrastructure (EN-5) (Ref 9)	This policy covers renewable energy network infrastructure such as 'for electricity grid infrastructure, all power lines in scope of EN-5 including network reinforcement and upgrade works, and associated infrastructure such as substations.'
National Planning Policy Framework (NPPF) (Ref 10)	The NPPF sets out the UK Government's planning policies for England and how these should be applied. Whilst the policies set may be relevant to the assessment, the NPPF does not form the basis for a decision on a Nationally Significant Infrastructure Project (NSIP). Key sections of relevance to this assessment include paragraphs 161 and 164 in relation to reduction of carbon dioxide (CO_2) emissions through design and reduced energy consumption. This chapter provides a GHG emissions assessment for the Proposed Development in line with this aim of reducing GHG emissions.

Policy	Relevance to assessment
The Clean Growth Strategy Department for Energy Security and Net Zero (DESNZ) and Department for Business, Energy & Industrial Strategy (BEIS) (Ref 11Ref 11)	This strategy document sets out key policies and proposals to accelerate clean growth. It projects power sector emissions, taking into account the clean growth pathway between 1990 and 2050. The Proposed Development, the emissions it produces through construction, operation and decommissioning, along with the emissions avoided via the generation of electricity can be understood as part of the decarbonisation process of the power sector. This chapter provides a GHG emissions assessment for the Proposed Development in line with this aim of reducing national GHG emissions with solar power. This is an older document from the previous Conservative Government, however, it has been included as demonstration of an extended Govt commitment to reducing GHG emissions.
UK's 2035 Nationally Determined Contribution (NDC) emissions reduction target under the Paris Agreement (Ref 12)	Further to the above, the UK's 2035 NDC target, announced by the Prime Minister at COP29 in November 2024, is to reduce all GHG emissions by at least 81% on 1990 levels, excluding international aviation and shipping emissions. This chapter provides a GHG emissions assessment for the Proposed Development in line with this aim of reducing national GHG emissions.
British Energy Security Strategy (Ref 13)	This strategy sets out how the UK will accelerate homegrown power for greater energy independence. The strategy has a 2030 ambition of up to 70 GW of solar by 2035, and a 2050 ambition of a low-cost, net zero consistent electricity system, most likely to be composed predominantly of wind and solar generation. This chapter provides a GHG emissions assessment for the Proposed Development in line with this aim of delivering low carbon energy generation.
Net Zero Strategy: Build Back Greener (Ref 14)	This strategy sets out policies and proposals for decarbonising all sectors of the economy to meet the net zero target by 2050. The strategy includes policy for the UK to be powered entirely by clean electricity by 2035 (subject to security of supply). This chapter provides a GHG emissions assessment for the Proposed Development in line with this aim of delivering low carbon energy generation.
Powering Up Britain: Net Zero Growth Plan (Ref 15Ref 15)	This strategy provides additional detail on the Just Transition of the main sectors of the UK economy and delivering the UK Government's commitments to net zero by 2050, as set out in the Carbon Budget and Growth Delivery Plan (Ref 6). The Plan notes the Government's establishment of a solar taskforce. This chapter provides a GHG emissions assessment for the Proposed Development in line with this aim of delivering low carbon energy generation. This is an older document from the previous Conservative Government, however, it has been included as demonstration of an extended Government commitment to reducing GHG emissions.

Policy	Relevance to assessment
Clean Energy Industries Sector Plan (Ref 16Ref 16)	The Clean Energy Industries Sector Plan doubles down on the UK's existing strengths in frontier clean energy industries with the biggest growth opportunities. The Plan's ambition is to make the UK a global leader by 2035, doubling investment levels across our frontier clean energy industries to over £30 billion per year and creating good jobs across the country.
UK Infrastructure: A 10 Year Strategy (Ref 17Ref 17)	This document indicates that the Government will use infrastructure policy and investment to deliver clean power by 2030 and accelerating to net zero, including by delivering a flexible, low carbon electricity system by 2030: the Clean Power Action Plan will aim to secure 43-50 GW of offshore wind, 27-29 GW of onshore wind and 45-47 GW of solar generation by 2030.
Clean Power 2030 Action Plan (Ref 18Ref 18)	The Clean Power 2030 Action Plan reinforces the urgent need for low carbon generation schemes to come forwards to pave the way to decarbonising the wider economy (including heat, transport and industry) by 2050. This chapter provides a GHG emissions assessment for the Proposed Development in line with this aim of delivering low carbon energy generation.
Energy System Operator's: Future Energy Scenarios 2025 (Ref 19)	A strategic planning document that provides an independent view of possible pathways for Great Britain's energy system to reach net zero by 2050. The scenarios project an installed solar capacity of 43.3-46.8 GW by 2030, more than doubling the 2024 capacity of 18.8 GW. By 2050 the FES projects an installed solar capacity of 87.2-101.0 GW in the UK in order to achieve net zero by 2050.
North Yorkshire Council Climate change strategy 2023-2030 (Ref 19)	The strategy outlines the Council's response to the Climate Emergency and how it aims to help deliver the ambition for the region to be net zero by 2034 and carbon negative by 2040. This includes a target to install an additional 2,500 megawatt (MW) of capacity from solar, onshore wind and hydropower by 2038. This chapter provides a GHG emissions assessment for the Proposed Development in line with this aim of delivering low carbon energy generation within the region.
Selby District Core Strategy Local Plan, adopted 2013 (Ref 21)	Strategy Policy SP15 on Sustainable Development and Climate Change States that: "7.2 The Core Strategy policies aim to reduce greenhouse gas emissions and protect resources, whilst providing opportunities to exploit realistic alternatives to 'fossil fuels' by promoting renewable energy." This chapter provides a GHG emissions assessment for the Proposed Development in line with this aim of delivering low carbon energy generation within the region.

Standards and guidance

Table 9-4 GHG emissions - standards and guidance

Standards and guidance	Relevance to assessment
IEMA EIA Guide to: Assessing GHG Emissions and Evaluating their Significance Institute of Environmental Management and Assessment (IEMA)[1] (Ref 22)	This updated guidance from IEMA provides a revised, and more nuanced, approach to the assessment of GHG emissions and their significance within an EIA than the previous iteration. It directs the assessment to adopt a whole life carbon approach to the quantification of GHG emissions. It also requires the assessment of significance to consider not just the magnitude of GHG emissions arising from a development, but also the role that the Proposed Development (and resultant increases and decreases in GHG emissions) will play in the transition to net zero in 2050. The GHG emissions assessment provided within this chapter aligns with the principles of the IEMA guidance.
World Business Council for Sustainable Development and World Resources Institute GHG Protocol guidelines (Ref 23)	The Greenhouse Gas Protocol (GHG Protocol) is a globally recognised standard for measuring and managing GHG emissions. It provides a consistent framework for GHG reporting.
Low Energy Transformation Initiative (LETI) Embodied Carbon Primer (Ref 24)	The LETI Embodied Carbon Primer sets challenging net zero carbon targets for the built environment industry, current regulations and construction practices. It also provides a useful source of benchmark information to support the quantification of GHG emissions. This guidance has been used as the basis of some assumptions for GHG emissions assessment where detailed information associated with the Proposed Development is not available at time of assessment.
Royal Institution of Charted Surveyors (RICS), 'Whole life carbon assessment for the built environment' (2nd Edition) (Ref 25)	This guidance document provides a comprehensive methodology for industry professionals to calculate and report the quantity of GHG emissions throughout all life cycle stages of a project. This guidance has been used as the basis of some assumptions for GHG emissions assessment where detailed information associated with the Proposed Development is not available at time of assessment.
The British Standards Institution (Ref 26), BSI - PAS 2080:2023 'Carbon Management in Buildings and Infrastructure' (Ref 27)	This standard provides a framework for whole life carbon management, including all stakeholders, and any development to be in line with government's net zero 2050 pathway. The GHG emissions assessment provided within this chapter aligns with the principles of the PAS 2080 framework.
United Nations Economic Commission Europe's (UNECE), 'Carbon	The report presents an assessment of various electricity generation technologies and their associated environmental impacts across its various metrices such as health, ecosystems, and resource

[1] In July 2025, IEMA rebranded to the Institute of Sustainability and Environmental Professionals (ISEP). As the GHG Emissions guidance was published when the organisation was IEMA, reference to the IEMA guidance is made throughout.

Standards and guidance	Relevance to assessment
Neutrality in the UNECE Region: Integrated Life-cycle Assessment of Electricity Sources' (Ref 28)	requirement through their life cycle. The document also provides information on energy storage; comparison of lifecycle impacts of selected electricity storage options which could be useful in the design stage and during consideration of alternatives that have a minimum carbon footprint. This guidance has been used as the basis of some assumptions for GHG emissions assessment where detailed information associated with the Proposed Development is not available at time of assessment.

9.4 Stakeholder engagement and consultation

Scoping Opinion

9.4.1 An EIA Scoping Report (Appendix 1.1 (ES Volume 3) **[EN0110012/APP/LVS/06.03.01.01]**) was submitted to the Planning Inspectorate (PINS) on 11 November 2024. The EIA Scoping Opinion (Appendix 1.2 (ES Volume 3) **[EN0110012/APP/LVS/06.03.01.02]**) was issued by PINS on 19 December 2024. As shown in Table 9-5 below, there were no matters requiring comment from PINS with regards to GHG emissions.

Table 9-5 GHG emissions – EIA Scoping Opinion comments

EIA Scoping Opinion I.D	EIA Scoping Opinion comment	How is this addressed
PINS [ID 3.5.1]	PINS noted that "no matters have been scoped out of the assessment."	As PINS had no further comments, no further action required.

9.4.2 Local Authorities provided comment relating to climate change as part of the formal scoping process. Where comments relate to climate change resilience, these are provided within section 7.4 of Chapter 7: Climate Change Resilience (ES Volume 1) [**EN0110012/APP/LVS/06.01.07**]. There are no statutory consultees for GHG emissions, and therefore no further specific engagement has taken place to inform the scope or approach to assessment.

Statutory consultation

9.4.3 A period of statutory consultation took place between 26 June to 7 August 2025 wherein consultees were able to respond to preliminary environmental information set out in the Preliminary Environmental Information Report (PEIR). Table 9-6 outlines the statutory consultation responses relating to greenhouse gas emissions and how these have been addressed through the ES.

9.4.4 Responses to the Statutory Consultation are outlined in the Consultation Report [**EN0110012/APP/LVS/05.01**].

Table 9-6 Statutory consultation comments

Consultee	Comments	How has this comment been addressed	Location of response in this ES
Riccall Parish Council	Has a full lifecycle carbon assessment been conducted for the project?	A GHG emissions assessment is being produced as part of this ES that sets out the whole life carbon emissions associated with the project. Results of this assessment are provided in Section 9.9 of this chapter.	Section 9.9 of Chapter 9: Greenhouse Gas Emissions (ES Volume 1) [**EN0110012/APP/LVS/06.01.09**].

Targeted consultation

9.4.5 A period of targeted consultation took place between 16 October 2025 and 20 November 2025, during which feedback was encouraged to comment on minor changes in the Proposed Development boundary, in relation to access points during construction and operation; visibility splays to ensure safe sightlines for vehicles entering and exiting the Proposed Development; passing places on narrow roads; access requirements for abnormal indivisible loads (less frequent but large delivery vehicles that have wider turning circles); cable route adjustments to avoid environmental and engineering constraints; and permissive paths to enable increased public access routes within the Solar Development Sites. There were no targeted consultation comments relating to GHG Emissions.

Stakeholder engagement

9.4.6 The following stakeholders have been engaged with regards to GHG emissions as part of the assessment process:

1) Natural England.

9.4.7 The outputs of the engagement undertaken are presented in Table 9-7.

Table 9-7 GHG Emissions - Engagement undertaken

Stakeholder	Date engaged	Matters raised	Response
Natural England	16 April 2025	Natural England stated that the ES should address GHG sequestration potential of the Proposed Development on the	Comment noted. Meeting held with Natural England on Wednesday 16 April 2025 to discuss this issue. Natural England agreed with the methodology outlined within the EIA Scoping Report to include a land

Stakeholder	Date engaged	Matters raised	Response
		natural environment and set out measures that will be adopted to address these impacts.	use assessment as part of the GHG emissions chapter. This assessment is included in Section 9.9. Natural England said it did not anticipate providing further feedback on this topic.

9.5 Methodology

Overview

9.5.1 This section outlines the methodology employed for assessing the GHG emissions associated with the construction, operation (including maintenance) and decommissioning phases of the Proposed Development.

9.5.2 Given the level of design details available, the GHG emissions assessment relies on a series of assumptions and benchmarks to give a reasonable estimation of activities and materials associated with the Proposed Development, where these are not yet known. These assumptions are referenced in Section 9.6. This assessment presents the GHG emissions associated with the current and future baseline and each lifecycle stage of the Proposed Development. GHG emissions is calculated by converting 'activity data' into GHG emissions through application of widely used and referenced GHG emission conversion factors.

Baseline methodology

Desktop sources

9.5.3 The following desktop sources are used to inform the existing baseline conditions of the Study Area:

1) Carbon storage and sequestration by habitat: a review of the evidence (second edition), 2021 (Ref 29).

Surveys

9.5.4 No surveys were required for the assessment of GHG emissions.

Sensitive receptors

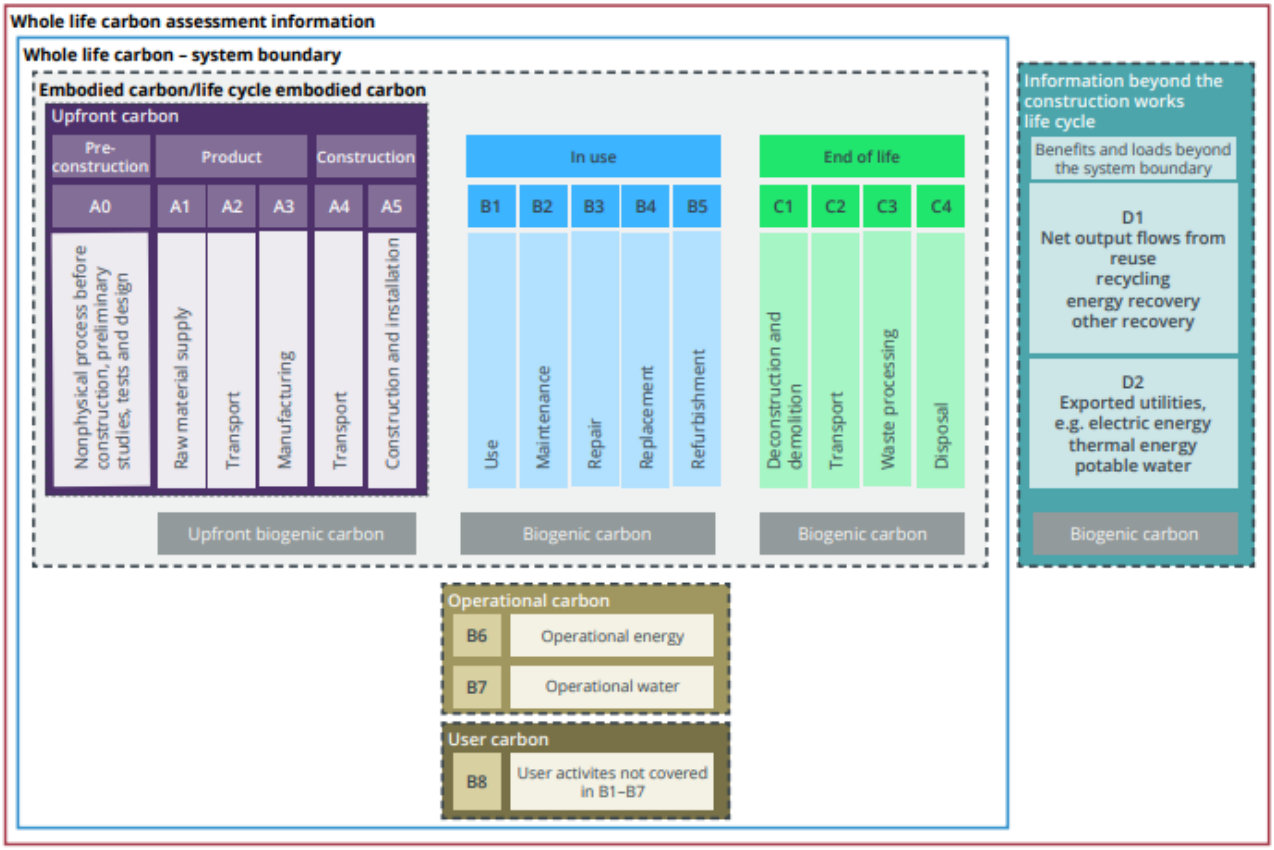
9.5.5 For the GHG emissions assessment, emissions are not geographically limited and have a global effect rather than directly affecting local receptors. As per IEMA guidance (Ref 22), the receptor is therefore the global atmosphere. The receptor has a high sensitivity, given the severe consequences of global climate change and the cumulative contributions of all GHG emission sources.

Assessment methodology

9.5.6 The GHG emissions assessment has followed a project lifecycle approach to calculate estimated GHG emissions arising from the construction, operation and decommissioning phases of the Proposed Development in tonnes of carbon dioxide equivalent (tCO_2e) and to identify GHG 'hot spots' (i.e. emissions sources likely to generate the largest amount of GHG emissions). This enables the identification of priority areas for mitigation in line with the principles set out in IEMA guidance (Ref 22).

9.5.7 The lifecycle stages included within the GHG emissions assessment are defined in the RICS 'Whole life carbon assessment for the built environment' guidance (Ref 25) and include: the before use stage (A), hereafter referred to as the 'construction phase', the use stage (B), referred to as the 'operational phase', and end of life stage, referred to as 'decommissioning phase' (C). These stages are broken down in Plate 9-1.

Plate 9-1 Building and infrastructure life cycle stages and information modules (Ref 25)



9.5.8 Table 9-8 summarises the anticipated GHG emissions sources associated with the Proposed Development. Further details are provided in Appendix 9.1: Greenhouse Gas Emissions Assessment (ES Volume 3) **[EN0110012/APP/LVS/06.03.09.01].**

Table 9-8 Lifecycle stages and associated activities, emission sources and impacts.

Phase	Whole Life Carbon Lifecycle Stage	Activity	Emission source and impact
Construction	Product stage (A1-3)	Raw material extraction, transport to factory and manufacturing of materials	Embodied GHG emissions associated with the required raw materials for construction of the Proposed Development.
	Transport stage (A4)	Transportation of materials to Site	GHG emissions from fuel consumption of vehicles used for transportation.
	Construction process stage (A5)	Construction activities	GHG emissions from fuel/energy/water consumption of plant, construction practices and ancillary services.
		Transportation of construction workers	GHG emissions from fuel consumption of vehicles used. Following RICS (Ref 25) guidance this is excluded from the GHG emissions assessment; minimal impact envisaged.
		Transportation and disposal of construction waste streams	GHG emissions from fuel consumption of vehicles used. GHG emissions released from waste disposal method.
Operation	In-use (B1)	Non-energy-related impacts	B1 emissions, including sulphur hexafluoride (SF_6) use in substations, are considered qualitatively but not included within the full GHG emissions assessment.
	Maintenance, repair and replacement (B2-B4)	Routine maintenance, repair and replacement of components	GHG emissions associated with carrying out required maintenance such as regular inspections during operation. Embodied carbon associated with materials used for repair and replacement of elements during operation (this includes replacement of most elements of the

Phase	Whole Life Carbon Lifecycle Stage	Activity	Emission source and impact
			Proposed Development at least once across its lifetime).
	Refurbishment (B5)	Planned site refurbishment	No impact is envisaged as it is assumed there is no planned refurbishment, which involves a change of use of the Site, within the operational lifespan of the Proposed Development. Therefore, B5 emissions are not applicable to the Proposed Development.
	Operational energy (B6) and water consumption (B7)	Energy and water consumption	Minimal impact envisaged. Whilst water will be used to clean panels, the volumes are so low that assessment is not required. Therefore, B6 and B7 emissions are assumed to be negligible and not assessed further.
	Other operational emissions and user activities (B8)	Operational consumption and site user activities	Negligible impact envisaged. Assuming no chemical or process emissions or user emissions. Therefore, B8 emissions are assumed to be negligible and not assessed further.
Decommissioning	Decommissioning (C1)	Deconstruction of the Proposed Development	GHG emissions associated with demolition, decommissioning and deconstruction activities.
	Transport (C2)	Transport of materials from Site to waste processing or disposal centre	GHG emissions associated with the transport of decommissioned materials from Site.
	Waste processing (C3)	Waste processing of waste using techniques such as reusing, recycling or other recovery such as composting or backfill	GHG emissions associated with the processing of decommissioned materials.
	Disposal (C4)	Disposal of waste either through landfilling or incineration	GHG emissions associated with the disposal of

Phase	Whole Life Carbon Lifecycle Stage	Activity	Emission source and impact
			decommissioned materials.
Outside the boundary	Land use emissions (D)	Changes to currently vegetated land	GHG emissions and removals associated with land use change.
	Electricity generation (D)	Generation of low carbon electricity	Assessment of the low carbon electricity generated and exported to the grid as a result of the Proposed Development, compared with emissions associated with the equivalent generation of the grid.

9.5.9 For this detailed GHG emissions assessment , the GHG emissions associated with the current baseline and each lifecycle stage, are calculated by converting 'activity data' into GHG emissions through application of widely used and reference emission conversion factors, as follows:

Activity data x GHG emissions factor = GHG emissions

9.5.10 Where:

1) *Activity data* – a measure of the quantity of an activity; and
2) GHG factor – a measure of the GHG emissions per unit of activity.

9.5.11 The key emissions factors which are used in the GHG emissions assessment are from the following sources:

1) Carbon storage and sequestration by habitat: a review of the evidence (second edition) (Ref 29);
2) Greenhouse Gas Reporting: Conversion Factors 2025 (Ref 31);
3) Inventory of Carbon & Energy (ICE) database Version 4 (Ref 32); and
4) Green Book supplementary guidance: valuation of energy use and greenhouse gas emissions for appraisal (Ref 33).

9.5.12 The methodology focuses on assessing the impact of the Proposed Development on GHG emissions by quantifying the net GHG emissions[2] arising from each lifecycle stage. Emissions associated with the Proposed Development are compared with the baseline Do Minimum (DM) scenario to quantify the net impact of the Proposed Development.

9.5.13 To assess the potential benefits of the Proposed Development, the assessment compares the GHG intensity of the Proposed Development to that of the National

[2] GHG emissions are reported as tonnes of carbon dioxide equivalent (tCO2e) which presents a single metric reflecting the varying climate change impact of the seven greenhouse gases included in the Kyoto protocol (Ref 1). These seven gases are: carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), sulfur hexafluoride (SF_6), nitrogen trifluoride (NF_3).

Grid average GHG intensity, to quantify the net impact of the Proposed Development compared with other predicted energy generation sources, in GHG terms.

9.5.14 Following IEMA guidance (Ref 22), activities that do not significantly change the result of the assessment can be excluded where emissions are expected to be less than 1% of total emissions, and where all such exclusions total a maximum of 5% of total emissions.

9.5.15 Following the RICS guidance (Ref 25), the carbon impacts reported must reflect the accuracy of the calculation. Therefore, calculations and totals within this assessment are reported to three significant figures.

Assigning receptor sensitivity and magnitude

9.5.16 In line with IEMA guidance, the sensitivity of the receptor (global climate) to increases in GHG emissions is always defined as 'high'. This reflects the severe consequences of global climate change and the cumulative contributions of all GHG emission sources. The rationale is as follows:

1) GHG emission impacts could compromise the Climate Change Committee's (CCC) sectoral construction and net zero pathways and therefore the ability to meet its future carbon reduction trajectory;
2) GHG emission impacts could compromise the UK's ability to reduce its GHG emissions and therefore the ability to meet its future legally binding carbon budgets;
3) The extreme importance of limiting global warming to below 2°C above industrial levels, while pursuing efforts to limit such warming to 1.5°C as set out in the Paris Agreement and a recent report by the Intergovernmental Panel on Climate Change highlighted the importance of limiting global warming below 1.5°C; and
4) Disruption to global climate is already having diverse and wide-ranging impacts to the environment, society, the economy and natural resources. Known effects of climate change include increased frequency and duration of extreme weather events, temperature changes, rainfall and flooding, and sea level rise and ocean acidification. These effects are largely accepted to be negative, profound, global, likely, long term to permanent, and are transboundary and cumulative from many global actions.

9.5.17 The magnitude of impacts and significance conclusions are defined from Major Adverse to Beneficial and are discussed further in Table 9-9.

9.5.18 The Proposed Development is expected to generate renewable energy over its 60-year maximum operational life, to further contextualise these emissions, the emissions associated with the generation of an equivalent amount of electricity via the National Grid is calculated using the Generation Based Long-run Marginal Electricity emissions factors to 2100 (Ref 33) and is included Section 9.9: Renewable energy generation. This calculation uses the emission factor for the first year of operation of the Proposed Development (2030) of 85 tCO_2e/GWh.

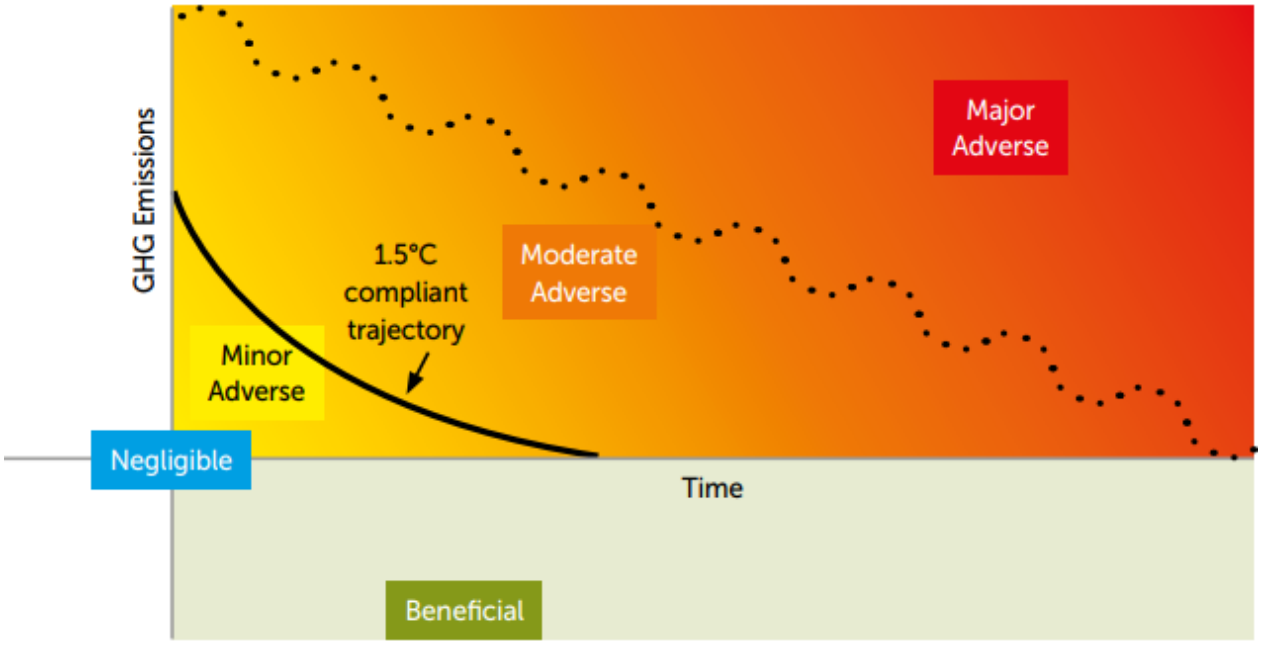
Significance criteria

9.5.19 The IEMA guidance (Ref 22) states that there are currently no agreed methods to evaluate thresholds of GHG significance, that the application of the standard EIA significance criteria is not considered to be appropriate for climate change mitigation assessments, and that professional judgement is required to contextualise a project's GHG emission impacts.

9.5.20 Guidance from IEMA has been adopted for assessing the significance of the Proposed Development's GHG emissions, in addition to GHG accounting and reporting principles.

9.5.21 The IEMA guidance describes five levels of significance (shown in Plate 9-2 below) "*which are not solely based on whether a project emits GHG emissions alone, but how the project makes a relative contribution towards achieving a science-based 1.5°C aligned transition towards net zero*".

Plate 9-2 Different levels of significance plotted against the UK's net zero compatible trajectory (Ref 21)



9.5.22 Table 9-9 presents the different significance levels (as shown in Plate 9-2) as per the latest version of IEMA guidance (Ref 22). The guidance emphasises that "*a project that follows a 'business-as-usual' or 'do minimum' approach and is not compatible with the UK's net zero trajectory, or accepted aligned practice or area-based transition targets, results in a significant adverse effect. It is down to the practitioner to differentiate between the 'level' of significant adverse effects e.g. 'moderate' or 'major' adverse effects*."

Table 9-9 Significance levels as per IEMA guidance

Definition	Significance Level	Significance Conclusion
The project's 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 for projects of this type. A project with major adverse effects is locking in emissions and does not make a meaningful contribution to the UK's trajectory towards net zero.	Major adverse	Significant
The project's 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 for projects of this type. A project with moderate adverse effects falls short of fully contributing to the UK's trajectory towards net zero.	Moderate adverse	Significant
The project's GHG impacts would be fully consistent with applicable existing and emerging policy requirements and good practice design standards for projects of this type. A project with minor adverse effects is fully in line with measures necessary to achieve the UK's trajectory towards net zero.	Minor adverse	Not Significant
The project's GHG impacts would be 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. A project with negligible effects provides GHG performance that is well 'ahead of the curve' for the trajectory towards net zero and has minimal residual emissions.	Negligible	Not Significant
The project's net GHG impacts are below zero and it causes a reduction in atmospheric GHG concentration, whether directly or indirectly, compared to the without-project baseline. A project with beneficial effects substantially exceeds net zero requirements with a positive climate impact.	Beneficial	Significant

9.5.23 The guidance also states that professional judgement should be used to determine how best to contextualise a project's GHG impact and assign the level of significance. On this basis, a development that is considered to follow a business-as-usual or do-minimum approach is considered to have a significant adverse effect. In addition to the overall evaluation of significance, in line with IEMA guidance (Ref 22): "*Any increase in carbon emissions alone is not a reason to refuse development consent, unless the increase in carbon emissions resulting from the project is so significant that it would have a material impact on the ability of Government to meet its carbon reduction targets, including carbon budgets*".

Table 9-10 Carbon budget periods relevant to this assessment

Carbon Budget & Period	Five-year Carbon Budget Limit	Reduction below 1990 levels
Fourth (2023 – 2027)	1,950 $MtCO_2e$	50% by 2025

Carbon Budget & Period	Five-year Carbon Budget Limit	Reduction below 1990 levels
Fifth (2028 – 2032)	1,725 $MtCO_2e$	68% by 2030
Sixth (2033 – 2037)	965 $MtCO_2e$	78% by 2035
Seventh (2038-2042) [3]	535 $MtCO_2e$	87% by 2040

9.5.24 To contextualise GHG emissions of the Proposed Development, this GHG emissions assessment provides a comparison against UK Carbon Budgets (Table 9-10) in Table 9-15 of Section 9.9 of this chapter. The main reference periods for assessing GHG emissions for the Proposed Development, cover 2025-2042 (Fourth – Seventh[3] Carbon Budgets). Any emissions released after that period are presented in a 'Beyond: 2043 – 2094' grouping.

9.5.25 It is noted that the contribution of most individual projects to national level budgets will be small, so the UK context will have limited value in assessing significance. It is proposed that the GHG emissions assessment, therefore, uses the IEMA guidance (Ref 22) to assess the significance of effects with the UK carbon budgets being used to provide context to the GHG emissions.

9.5.26 The GHG emissions assessment also considers the context that the Proposed Development will play in the decarbonisation of the power sector in England and the wider UK. This assessment calculates the estimated carbon emissions from the generation of the equivalent amount of electricity via the UK National Grid. These emissions are considered avoided via the generation provided by the Proposed Development.

9.5.27 The eventual emissions from the Proposed Development will be affected by the wider response across the UK to meeting the net zero by 2050 target. Linked to this is uncertainty in the future carbon intensity of energy generation and emissions from transport, and these are increasingly unclear in the longer term towards 2050.

9.6 Assumptions and limitations

9.6.1 A GHG emissions assessment has been undertaken on the basis of the information available at the time of assessment. The information used in the assessment aligns with the detail provided in Chapter 2: The Proposed Development (ES Volume 1) [**EN0110012/APP/LVS/06.01.02**], section 2.6 Description of the Proposed Development.

9.6.2 Assumptions and judgements to support the GHG emissions assessment are made from either:

1) Available design detail as of time of writing;
2) Engineering specialist knowledge;

[3] The Climate Change Committee (CCC) made its recommendations on the Seventh Carbon Budget Period in a report to the UK Government 26th February 2025. The Government is to propose a level for the Seventh Carbon Budget period to Parliament, for Parliament to approve or reject. This must take place by 30 June 2026.

3) Environmental specialist knowledge;
4) Climate change/carbon specialist knowledge;
5) Manufacturer specifications; or
6) Benchmark data from previous comparable projects and publicly available information from solar PV NSIP projects e.g. amount of steel, aggregates, aluminium (normalised to the scale of the Proposed Development).

9.6.3 This chapter should be read in conjunction with Appendix 9.1: Greenhouse Gas Emissions Assessment (ES Volume 3) [**EN0110012/APP/LVS/06.03.09.01**], which gives a detailed account of the assumptions used in the GHG emissions assessment at ES.

9.6.4 The following principal assumptions have been used for this assessment working with the design team at this ES stage:

1) The Proposed Development will have an installed generating capacity of 662MW based on Figure 2.1: Illustrative Site Layout Plan (ES Volume 2) [**EN0110012/APP/LVS/06.02.02.01**[**01.08**]].
2) The operational life of the Proposed Development is up to 60 years, as per Chapter 2: The Proposed Development (ES Volume 1) [**EN0110012/APP/LVS/06.01.02**].
3) The manufacturer of solar photovoltaic (PV) panels has not yet been chosen, however an assumption of 920,640 (no.) of solar PV panels has been used to inform the assessment. Due to the higher capacity planting arrangement of Fixed South Facing panels, in comparison with a Single Axis Tracker panel arrangement, this assessment accounts for Fixed South Facing panels only, as this results in a greater embodied carbon associated with the materials used and construction.
4) It has been assumed that the, BESS, solar PV modules and PV framework will be delivered during the construction phase via sea and HGV from suppliers in China, whereas the rest of the materials are assumed to be sourced more locally. Sea freight distance from China to England is assumed to be 22,000 km (based on the sea freight distance between Shanghai and Dover) and the HGV transport from factory to Shanghai Port and Port of Dover to Site are assumed to be 500km each. For all other modes of transport, the assessment applies transportation distances from the RICS guidance (Ref 25).
5) Fuel will be consumed on-site during the construction phase, both in generators and in plant and machinery. It is assumed that generators will run for the totality of the hours of construction activities, as stated in Chapter 2: The Proposed Development (ES Volume 1) [**EN0110012/APP/LVS/06.01.02**]: Monday to Friday 07:00-18:00 and between 08:00 and 13:30 on Saturdays, over the (up-to) 36-month construction period.

6) Assessment of embodied carbon in materials during the construction phase is based upon design information with supplementary assumptions and benchmarks as confirmed by the Applicant. Further details of the design parameters of the Proposed Development are available in section 2.6 of Chapter 2: The Proposed Development (ES Volume 1) [**EN0110012/APP/LVS/06.01.02**], while conversion factors used for the assessment can be found in Appendix 9.1: Greenhouse Gas Emissions Assessment (ES Volume 3) [**EN0110012/APP/LVS/06.03.09.01**].

7) The indicative size and weight of PV cells has been sourced from comparable supplier product information of cells manufactured in China.

8) The Applicant has provided the following assumptions for maintenance and replacement of principal parts during the operational phase with more detail on the Operational programme of replacement activities set out in Chapter 2: The Proposed Development (ES Volume 1) [**EN0110012/APP/LVS/06.01.02**]:

   a) Solar PV modules will be replaced depending on efficiency. It is expected that all panels in the array will be replaced once over the design life of the Proposed Development, and further replacement will be required on an ad hoc basis (assumed to be 10% of the originally installed PV modules);
   b) It is expected that all transformers will be replaced once during the lifespan of the Proposed Development.
   c) All the BESS cells are assumed to require replacement up to 5 times during the design life of the Proposed Development;
   d) It is anticipated that structures will not need to be replaced during the proposed design life; and
   e) It is anticipated that cables will not need replacing during the proposed design life.

9) Sulphur hexafluoride (SF6) (from its use in certain electric components such as gas-insulated switchgears and transformers during production, operation through leakage, and dismantling) is a potential source of GHG emissions over the lifetime of the Proposed Development however it is not possible to accurately quantify the small volumes of fugitive emissions from the leakage of SF6 due to insufficient data. Manufacturers of electrical switchgear and transformers are increasingly able to provide equipment that either does not contain any SF_6 or is sealed for life with extremely low leakage rates. On this basis, emissions from SF_6 are excluded from the assessment.

10) As per Chapter 2: The Proposed Development (ES Volume 1) [**EN0110012/APP/LVS/06.01.02**], section 2.9, it is assumed that the process of decommissioning would involve the removal of all solar infrastructure, including the solar PV modules, and BESS and all associated infrastructure to 1.2 m below ground level (bgl); to be recycled or disposed of in accordance with good practice and processes at that time.

It is therefore likely that any cable connections within the Cable Route Corridor would remain in place following decommissioning as this is current best practice. It is assumed that decommissioning phase emissions from the use of plant, worker travel, water and wastewater consumption would be 50% of the corresponding emissions during the construction phase, as per RICS guidance. This is considered to be a conservative estimate given the UK's net zero commitments, which would be expected to result in lower percentage of emissions than this 50% benchmark at that point in time.

11) The transport of deconstructed materials and waste at end of life has been assumed to be 50% of emissions as those calculated for the transport of construction materials (module A4), using the above 50% reduction as a proxy in lieu of specific guidance or project information. Again, given projections for the decarbonisation of the transport sector by 2050 this assumption represents a conservative approach to the GHG emissions assessment.

12) The GHG emissions for the end-of-life waste processing and disposal of materials have been calculated using default waste processing rates per material type within the RICS guidance and DESNZ (Ref 26) GHG emissions conversion factors per material type and waste route.

9.6.5 Further details of the assessment and assumptions used can be found in Appendix 9.1: Greenhouse Gas Emissions Assessment (ES Volume 3) **[EN0110012/APP/LVS/06.03.09.01]**.

9.7 Baseline conditions

Existing baseline conditions

9.7.1 Aligning with IEMA guidance (Ref 22), the baseline (Do-Minimum (DM) scenario) is the scenario against which the impact of the Proposed Development is compared and assessed. The DM scenario comprises the cumulative GHG emissions within the Study Area over the appraisal period, but without implementation of the Proposed Development.

9.7.2 The current use of the land within the Order Limits predominantly consists of arable land, managed trees and hedgerows. The baseline agricultural GHG emissions are dependent on the soil and vegetation types present, and the fuel used for the operation of any plant and machinery within the Order Limits.

9.7.3 For the lifecycle GHG emissions assessment, the baseline is a 'business as usual' scenario whereby the Proposed Development is not implemented. The baseline comprises existing carbon stock and GHG emissions from sequestration within the Order Limits.

9.7.4 Baseline GHG emissions for the Proposed Development are summarised in Table 9-11. These emissions represent the sequestered carbon as a result of the annual carbon stored by the habitat type. This activity has been converted into equivalent GHG emissions and are a negative figure to demonstrate the

sequestration of emissions from the environment, as opposed to release of emissions.

Table 9-11 Annual baseline GHG emissions for the Proposed Development

Emission Source	GHG Emissions per year (carbon dioxide representative, $tCO_2e\ y^{-1}$)
Stage D – land use and forestry emissions associated with the Proposed Development	51.07

Future baseline

9.7.5 The future baseline is defined as the GHG emissions arising from the Site in the absence of the Proposed Development. In this scenario it is assumed that no construction activity would take place within the Order Limits of the Proposed Development, and that this area would continue to operate in its current configuration.

9.7.6 In the absence of the Proposed Development, it is considered there will be no change to the future baseline for GHG emissions as reported in Table 9-11.

9.8 Embedded and good practice mitigation and enhancement measures

Embedded mitigation and management plans

9.8.1 Embedded measures are modifications to the design of a scheme, made during the pre-application phase, that are an inherent part of the design and do not require additional action to be taken. Good practice measures are standard approaches and actions undertaken to avoid or reduce environmental impacts in line with best practice guidance and legislative requirements.

9.8.2 These management plans incorporate embedded and good practice measures, as well as any further mitigation that arises out of the EIA process. Outline versions of these management plans are submitted alongside the ES as part of this DCO Application to secure the commitments within each assessment.

9.8.3 Measures for the Proposed Development relevant to GHG emissions already committed to are presented below.

Construction

9.8.4 The Outline Construction Environmental Management Plan (oCEMP) **[EN0110012/APP/LVS/07.02]** includes measures that are considered standard good practice to be implemented by the contractor to reduce the likelihood of impacts or their magnitude, if they were to occur. The oCEMP is included within the DCO Application and the measures within it are secured through DCO Application requirements. These measures, are outlined below:

1) Increasing recyclability by segregating construction waste to be re-used and recycled where reasonably practicable;
2) Designing, constructing and implementing the Proposed Development in such a way as to minimise the creation of waste through careful construction management to avoid over ordering of materials and maximise the use of alternative materials with lower embodied carbon, such as locally sourced products and materials with a higher recycled content where feasible;
3) Reusing suitable infrastructure and resources already available in the Order Limits where practicable to minimise the use of natural resources and unnecessary materials (e.g. reusing excavated soil for fill requirements or storing, preserving and restoring top soil);
4) Switching vehicles and plant off when not in use and ensuring construction vehicles conform to current EU or international emissions standards; and
5) Conducting regular planned maintenance of the construction plant and machinery to optimise efficiency.

In addition, a Construction Traffic Management Plan (CTMP) will be in place for the Proposed Development. Optimisation of traffic to and from the Site will help to reduce the GHG emissions associated with construction traffic. An Outline CTMP (oCTMP) **[EN0110012/APP/LVS/07.12]** is included as part of the DCO Application to secure the commitments contained within through DCO Application requirements. Measures include:

6) Encouraging the use of lower carbon modes of transport by identifying and communicating any local transport connections and pedestrian and cycle access routes to / from the Proposed Development to all construction staff, and providing appropriate facilities for the safe storage of cycles;
7) A separate Travel Plan has not been developed for the Proposed Development as it is acknowledged that the rural nature of the surrounding area and the shift patterns (early starts) means that the majority of construction workers will rely on a vehicle to get to Site. The Proposed Development does however seek to reduce the number of single occupancy car trips by:
    a) Providing shared transport (minibuses) and encouraging workers to use the minibuses to travel to the Site;
    b) Encourage those travelling by car-to-car share with others; and
    c) Provide secure cycle parking, within the Solar Development Site Construction Compounds / Cable Construction Compound.

Operation

9.8.5 There is no embedded mitigation for the operation of the Proposed Development beyond regular maintenance to ensure optimal energy generation efficiency and extending the operational life of components where practicable.

9.8.6 Where applicable, for example, for replacement activities the construction mitigation measures will also be conducted during operation to optimise efficiency and are outlined in the Outline Operational Environmental Management Plan (oOEMP) **[EN0110012/APP/LVS/07.03]** which is included as part of the DCO Application.

9.8.7 These measures include:

1) Segregating waste to be re-used and recycled where reasonably practicable;
2) When replacing assets, minimise the creation of waste and maximise the use of alternative materials with lower embodied carbon, such as locally sourced products and materials with a higher recycled content where feasible;
3) Reusing suitable infrastructure and resources already available within the Sites where practicable to minimise the use of natural resources and unnecessary materials (e.g. reusing excavated soil for fill requirements);
4) Switching vehicles and plant off when not in use and ensuring vehicles conform to current UK emissions standards; and
5) Conducting regular planned maintenance of the plant and machinery to optimise efficiency.

Decommissioning

9.8.8 Similar measures to the construction phase will be developed prior to the decommissioning phase and these are outlined in the Outline Decommissioning Environmental Management Plan (oDEMP) **[EN0110012/APP/LVS/07.04]**. The oDEMP includes measures that are considered standard good practice to be implemented by the contractor and reflect the measures outlined above for the oCEMP. However, new best practices and methods may become common place in the future that go beyond those listed for the oCEMP and therefore would be included in the detailed DEMP(s) as appropriate.

9.8.9 The requirements for decommissioning are subject to change as the environment beyond 2089 is likely to be considerably different to today. The future technological, regulatory, and environmental landscape beyond 2089 is difficult to predict with certainty, so maintaining flexibility in the decommissioning approach is prudent.

9.8.10 These management plans incorporate embedded and good practice measures, as well as any further mitigation that falls out of the EIA process.

9.8.11 It is a requirement of the DCO Application for final iterations of the management plans referred to above to be produced and signed off by North Yorkshire Council in advance of the relevant phase of development and for this final version to be in substantial accordance with the outlines.

9.9 Assessment of likely impacts and effects

9.9.1 This section presents the results of the assessment of likely significant effects with the embedded and good practice mitigation measures, described in the previous section, in place. Further detail on assessment assumptions is provided within Appendix 9.1: Greenhouse Gas Emissions Assessment (ES Volume 3) **[EN0110012/APP/LVS/06.03.09.01]**.

9.9.2 For the purposes of this assessment, it has been considered that any increase in GHG emissions compared with the baseline has the potential to have an impact, due to the high sensitivity of the receptor (global climate) to increases in GHG emissions.

9.9.3 The net impact of the Proposed Development is also identified and assessed, taking into account the predicted renewable energy generation and the benefit of this in the context of the wider energy generation sector and the forecasted National Grid average GHG intensity. This overall assessment compares the GHG intensity of the Proposed Development to the National Grid average GHG intensity. The assessment quantifies the net impact of the Proposed Development compared with other predicted energy generation sources, in GHG terms.

Construction effects

9.9.4 For the purposes of the GHG emissions assessment, the construction phase is anticipated to last up to three years. Emissions will result from activities during site preparation / enabling works, construction and commissioning activities as detailed in Table 9-12. Detail of the assumptions used for the GHG emissions assessment can be found in Appendix 9.1: Greenhouse Gas Emissions Assessment (ES Volume 3) **[EN0110012/APP/LVS/06.03.09.01]**.

Table 9-12 Construction GHG emissions

Emission Source	Emissions (tCO_2e)[4]	% Construction Emissions
Embodied Carbon – Materials (A1-3)	532,000	90.09%
Transport of materials (A4)	55,200	9.35%
Waste disposal (A5)	1,100	0.19%
Water and fuel use (A5)	2,220	0.38%
Total Construction Emissions	590,520	100%

9.9.5 The total GHG emissions from the construction phase are estimated to equate to around 590,520 tCO_2e using conservative design assumptions. During the construction phase, the greatest impact of GHG emissions is the result of embodied carbon in the materials used for construction.

[4] As per RICS guidance, for projects at during technical design, calculations and totals should be reported to three significant figures at building or asset level.

9.9.6 The greatest proportion of GHG emissions during the construction phase come from the production of batteries used in the BESS, from the manufacture of the solar PV panels and the PV framework (steel), followed by concrete and rebar used for foundations to support the substations and BESS. The manufacture of PV Conversion Units and the conversion units for the BESS will contribute to GHG emissions, and a smaller proportion associated with transformers, cables, concrete and aggregate.

9.9.7 Other sources of emissions during construction within the scope of the GHG emissions assessment include emissions from Solar Development Site Construction Compounds / Cable Construction Compounds and transportation of construction materials, water, energy, and fuel use for construction activities including fuel consumed by construction plant and machinery, fuel use for the transportation of construction materials to the Site, transportation of construction workers to and from the Site and the transportation and disposal of waste.

Operational effects

9.9.8 During the operation and maintenance phase, GHG emissions will likely arise from the generation of consumed mains electricity to provide heat and power to any proposed buildings on the Solar Development Sites and BESS areas, i.e. the substations, control room and storage buildings. An annual energy demand for the Proposed Development has been obtained from benchmark data to estimate a GHG emissions worst case scenario.

9.9.9 Scheduled replacement activities will be required as part of the Proposed Development, for example, replacement of panels and batteries will be required as part of maintenance activities. The estimated lifetime and replacement rates for PV Panels and batteries are described in more detail in Section 9.6.

9.9.10 These scheduled replacements are responsible for the majority of emissions during the operation of the Proposed Development. The same embodied and transportation emissions factors used for the construction emissions are used to quantify the impact of installation and replacement of these components as a worst-case scenario.

9.9.11 Table 9-13 provides the operational emissions for the Proposed Development. Detail of the assumptions used for the GHG emissions assessment can be found in Appendix 9.1: Greenhouse Gas Emissions Assessment (ES Volume 3) **[EN0110012/APP/LVS/06.03.09.01]**.

Table 9-13 Operation GHG emissions

Emission Source	Emissions (tCO_2e)[5]	% Construction Emissions
Maintenance Impacts (B2)	5,910	0.47%
Repair Impacts (B3)	1,480	0.12%

[5] As per RICS guidance, for projects at during technical design, calculations and totals should be reported to three significant figures at building or asset level.

Emission Source	Emissions (tCO_2e)[5]	% Construction Emissions
Component Replacement (B4)[6]	1,260,000	99.42%
Total Operation Emissions	1,266,790	100%

9.9.12 It is estimated that the component replacement will account for GHG emissions of 1,260,000 tCO_2e, based on the replacement rate assumptions applied for an up to 60-year scheme lifespan, 99.42% of the total 1,266,790 tCO_2e operational phase emissions for the Proposed Development.

9.9.13 Operational activities such as the transportation of operational workers to and from the Proposed Development and emissions from mains water consumption, wastewater treatment and the transport and treatment of waste from staff facilities are excluded from the assessment as they are expected to be minor (as explained in Table 9-8).

9.9.14 While sulphur hexafluoride (SF_6) is a potential source of GHG emissions over the lifetime of the Proposed Development (i.e. derived from certain electric items such as gas-insulated switchgear and gas-insulated transformers during production, operation through leakage, and dismantling), it has not been possible to quantify fugitive emissions from the leakage of SF_6 due to insufficient research data being available on this topic. SF_6 is one of the seven GHGs identified by the Kyoto Protocol (Ref 1) due to its high Global Warming Potential (GWP)[7] of 22,800 (Ref 29).

9.9.15 This assessment assumes that SF_6 emissions will be negligible (as explained in Table 9-8), however the Proposed Development will adhere to good practice and guidance, for example, using gas-insulated switchgear equipment to minimise leakages. Additionally, through regular checks of the equipment for gas leaks, it can be expected that emissions from leaks would be de minimis. This is secured via the Outline Operational Environmental Management Plan (oOEMP) **[EN0110012/APP/LVS/07.03].**

9.9.16 In addition, the operation of the Proposed Development will generate electricity that contributes to the decarbonisation of the UK electricity grid, this is discussed further in paragraph 9.9.30 as part of the wider significance of effects section.

Decommissioning effects

9.9.17 As the decommissioning activities associated with the Proposed Development will occur far into the future, more than 65 years from the date of writing this ES chapter; there is considerable uncertainty over the total estimate of GHG emissions that will be produced and the available technology. Therefore, prior to decommissioning, a Decommissioning Environmental Management Plan will be prepared that must be substantially in accordance with the oDEMP

[6] Component replacement emissions in module B4 includes emissions associated with the transportation of components to site.
[7] GWP allow comparisons of the global warming impacts of different gases. Specifically, it is a measure of how much energy the emission of 1 ton of a gas will absorb over a given period of time, relative to the emission of 1 ton of carbon dioxide (CO2). The larger the GWP, the more that a given gas warms the Earth compared to CO2 over that time period.

[EN0110012/APP/LVS/07.04], as secured through the requirements in the draft DCO.

9.9.18 The decommissioning phase primarily involves the dismantling and removal of these existing components, which is generally less emissions-intensive than the initial construction activities.

9.9.19 To contextualise the potential impact of the decommissioning phase, Table 9-14 below outlines potential emissions based on current understanding of the design, assuming current construction and decommissioning practices. Detail of the assumptions used for the GHG emissions assessment can be found in Appendix 9.1: Greenhouse Gas Emissions Assessment (ES Volume 3) **[EN0110012/APP/LVS/06.03.09.01]**.

Table 9-14 Decommissioning GHG emissions

Emission Source	Emissions (tCO_2e)[8]	% Construction Emissions
Fuel and Water Use (C1)	1,110	18.57%
Transport of waste Materials (C2)	3,860	64.54%
Recycling components (C3 & C4)	1,010	16.89%
Total Decommissioning Emissions	5,980	100%

9.9.20 As technology and recycling methods evolve over the 60-year operational period of the Proposed Development, the decommissioning process is likely to become more efficient and sustainable, further reducing the relative contribution of decommissioning emissions. Therefore, the GHG emissions during the decommissioning phase are negligible in comparison with the construction or operation and maintenance phases of the Proposed Development. This is because the highest GHG emissions for a solar project typically arise from the manufacturing of the Solar PV Panels, BESS area, and other key infrastructure components, which account for the majority of the Proposed Development's lifetime emissions and are reported as part of the construction and operational phases.

Significance of effects

9.9.21 In line with IEMA guidance (Ref 22), the contextualisation of construction and operational GHG emissions has been carried out based on a comparison of GHG emissions associated with the Proposed Development against UK's trajectory to net zero. The UK's Carbon Budgets have been used where budgets currently exist (carbon budgets 5 and 6), in addition to the CCC's 7th Carbon Budget report trajectory beyond the last available Carbon Budget.

9.9.22 Absolute emissions attributable to the Proposed Development, have been calculated and presented against the five-year carbon budget periods in Table 9-15 below.

[8] As per RICS guidance, for projects at during technical design, calculations and totals should be reported to three significant figures at building or asset level.

Table 9-15 Comparison of the Proposed Development to UK Carbon Budgets

Proposed Development Element	Carbon Budget 5 (2028-2032)	Carbon Budget 6 (2033-2037)	Carbon Budget 7[9] (2038-2042)	Beyond: 2043 - 2094[10]
Carbon Budget Total (tCO_2e)	1,725,000,000	965,000,000	535,000,000	N/A
Construction Emissions (tCO_2e)	590,520	0	0	0
Construction Percentage of Carbon Budget (%)	0.03423%	0%	0%	0%
Operation Emissions (tCO_2e)	246	616	200,616	1,065,312
Operation Percentage of Carbon Budget (%)	0.00001%	0.00006%	0.03750%	N/A
Decommissioning Emissions (tCO_2e)	0	0	0	5,980
Decommissioning Percentage of Carbon Budget (%)	0%	0%	0%	N/A
Total Emissions (tCO_2e)	590,766	616	200,616	1,071,292
Total Percentage of Carbon Budget (%)	0.03425%	0.00006%	0.03750%	N/A

Construction

9.9.23 During construction, taking the magnitude of emissions against the carbon budgets in Table 9-15, the overall effect of GHG emissions is considered to be minor adverse and not significant in EIA terms. Construction emissions are not of a scale that will impact on the ability of the UK to meet its carbon reduction targets.

Operation

9.9.24 In the absence of considering the benefits that accrue from the generation of renewable electricity, given the scale of equivalent generation emissions using conventional energy generation methods, and the scale of operation emissions in comparison to the Carbon Budgets, this assessment concludes the operational emissions of the Proposed Development would be minor adverse and not significant in EIA terms

[9] The Climate Change Committee (CCC) made its recommendations on the Seventh Carbon Budget Period in a report to the UK Government 26th February 2025. The Government is to propose a level for the Seventh Carbon Budget period to Parliament, for Parliament to approve or reject. This must take place by 30 June 2026.
[10] The majority of emissions fall in the period of 2043 onwards, fall outside of the UK Carbon Budgets boundary.

9.9.25 However, the renewable energy generation from the Proposed Development will provide significant beneficial effects as outlined in the next section.

Renewable energy generation

9.9.26 The UK is reliant on increasing renewable energy generation as part of the national trajectory to net zero by 2050. Renewable energy generation from the solar sector is an integral part of the UK's net zero strategy.

9.9.27 Whilst this assessment has focused on the emissions associated with the Proposed Development, it has not sought to assess or demonstrate the impact that this Proposed Development will have on the wider decarbonisation of the UK energy grid.

9.9.28 The IEMA guidance (Ref 22) on the assessment of GHG emissions places emphasis on the importance of contextualisation of Proposed Development emissions as part of the process of determining the significance of impacts. IEMA directs that:

9.9.29 "*The crux of significance therefore is not whether a project emits GHG emissions, nor even the magnitude of GHG emissions alone, but whether it contributes to reducing GHG emissions relative to a comparable baseline consistent with a trajectory towards net zero by 2050 [or other date as defined in targets for devolved administrations]*"

9.9.30 While the assessment of GHG emissions from the Proposed Development confirms that emissions will arise from the construction, operation, and decommissioning of the Proposed Development - it is also necessary to consider the context that the Proposed Development will play in the decarbonisation of the power sector in the UK. Given that the Proposed Development falls within the need for low carbon energy generation to replace existing fossil-fuelled power generation as part of the UK's transition to net zero, and that a wider benefit will accrue to the decarbonisation of electrical power in the UK, the Proposed Development is considered to be beneficial when this wider contribution is considered.

9.9.31 The total energy generated by the Proposed Development is expected to be approximately 568 GWh per year (when allowing for degradation of panels over their life), totalling 34,100 GWh over the Proposed Development's 60-year operational life. This equates to an energy intensity of 54.6 tCO_2e/GWh for the Proposed Development.

9.9.32 The equivalent energy generation by the UK power grid (using the first operational year of 2030) is calculated to be 2,900,000 tCO_2e for the 60-year period; at an energy intensity of 85.0 tCO_2e/GWh.

9.9.33 In addition to the generation of electricity, it is noted that the inclusion of the BESS provides the potential for grid balancing by allowing storage of electricity during periods of low demand but while PV generation is high. This helps reduce wider reliance on fossil-fuel electricity generation elsewhere. While the impact of this grid balancing has not been quantified as part of this assessment, it is expected

to have a positive impact in emission terms during the Proposed Development's operational phase.

9.9.34 The Energy System Operator's: Future Energy Scenarios (FES) 2025 (Ref 19) report which outlines credible scenarios[11] for decarbonising the UK's energy system and achieving net zero projects an installed solar capacity of 43.3-46.8 GW by 2030, more than doubling the 2024 capacity of 18.8 GW. By 2050 the FES projects an installed solar capacity of 87.2-101.0 GW in the UK. The Proposed Development contributes to the achievement of this capacity being installed.

9.9.35 When considering the beneficial renewable energy generation that will aid the UK in achieving its net zero targets the Proposed Development provide significant beneficial effects.

9.9.36 Further details of how the equivalent emissions are calculated can be found in Appendix 9.1: Greenhouse Gas Emissions Assessment (ES Volume 3) **[EN0110012/APP/LVS/06.03.09.01]**.

Decommissioning

9.9.37 During decommissioning, taking the magnitude of emissions against the carbon budgets in Table 9-15, the overall effect of GHG emissions is considered to be minor adverse and not significant in EIA terms.

Overall significance of effects

9.9.38 While the assessment concludes there is a minor adverse impact from construction, operation and decommissioning of the Proposed Development, given the context of the purpose of the Proposed Development to deliver renewable energy it is reasonable to conclude there is a significant benefit in GHG emissions terms for the Proposed Development as a whole when considering all stages of the Proposed Development.

9.10 Additional mitigation

9.10.1 Additional mitigation is action that requires additional site and project specific activity in order to achieve a reduction in effect, and/or anticipated outcome. Additional mitigation identified for GHG emissions are presented below.

Construction

9.10.2 Minimising GHG emissions through design is a core principle of the UK Government's Infrastructure Carbon Review (Ref 34) and guidelines for the specification of infrastructure carbon management (such as PAS 2080 (Ref 27)). In this context, carbon management is assumed to be addressed in the planning, design and construction of the Proposed Development, including appropriate

[11] The FES report defines three net zero pathway scenarios as (1) Holistic Transition, (2) Electric Engagement and (3) Hydrogen Evolution. The ranges provided in paragraph 9.9.34 are those documented in Tables 3 & 26 of the FES report for all three scenarios for 2030 and 2050 (Ref 19).

consideration of any relevant planning requirements, guidelines and best practice.

9.10.3 At this stage in the Proposed Development, full construction design and logistics are yet to be confirmed. However, a range of construction and procurement strategies will be investigated to identify mitigation measures to reduce the GHG emissions associated with the Proposed Development, across the full project life cycle. The PAS 2080 carbon management hierarchy will be followed, examples of this are provided in Table 9-16.

Table 9-16 Additional mitigation hierarchy examples

PAS 2080:2023 Carbon Hierarchy	Best practice hierarchy	Example mitigation measures
Build nothing Assess the basic need for development and consider alternative approaches to achieve the desired outcomes.	Avoid/Prevent	Maximise potential for re-using and/or refurbishing existing assets to reduce the extent of new construction required, and/or explore lower carbon alternatives to deliver the project objectives (i.e. shorter route alternatives with smaller construction footprints).
Build less Evaluate the potential for re-using and/or refurbishing existing assets to reduce the extent of new construction required	Reduce	Maximise potential for re-using and/or refurbishing existing assets to reduce the extent of new construction required, and/or explore lower carbon alternatives to deliver the project objectives (e.g. shorter route alternatives with smaller construction footprints). Careful construction management to avoid over-ordering of materials, to reduce transportation emissions. The sustainable reuse of soil and aggregate materials won from excavation
Build clever Consider the use of low carbon solutions (including technologies materials and products) to minimise resource consumption during the construction and operation		
Build efficiently Consider techniques which can be used to reduce resource consumption during construction and operation	Remediate	Identify, assess and integrate measures to further reduce carbon through on or off-site offsetting or sequestration (as a last resort).

Operation

9.10.4 The mitigation measures presented for the construction of the Proposed Development should also be considered for maintenance and repair of materials during operation. During the operational phase of the Proposed Development, continual opportunities to reduce GHG emissions, where these are practicable to deliver, should be considered throughout the life of the asset (e.g. procuring more efficient products as they improve over time, utilising electric vehicles (EVs) for

transport as more EVs enter the market, use of electric plant to replace key elements). These mitigations are outlined in the Outline Operational Environmental Management Plan (oOEMP) **[EN0110012/APP/LVS/07.03]** which is included as part of the DCO Application.

Decommissioning

9.10.5 With the decommissioning phase planned to occur over 40 years in the future, decommissioning methods and program are not currently known. However, a range of decommissioning strategies will be investigated to identify mitigation measures to reduce the GHG emissions associated with the Proposed Development, across the full project life cycle.

9.11 Residual effects

Construction effects

9.11.1 The construction stage measures have the potential to reduce GHG emissions from the Proposed Development through detailed design stage. However, the nature of the Proposed Development requires significant volumes of building materials, and associated construction related emissions.

9.11.2 The residual construction effects would remain **minor adverse (not significant)** as presented above.

Operational effects

9.11.3 The overall aim of the Proposed Development is to generate renewable energy, therefore as noted in Section 9.9, the assessment has concluded significant beneficial effects in EIA terms. Despite the residual emissions associated with construction and decommissioning, the Proposed Development is, by design, reducing national emissions and the UK's reliance on fossil fuels within the UK National Grid.

9.11.4 The residual operational effects would remain **beneficial (significant)** as presented above.

Decommissioning effects

9.11.5 It is likely there will be fuel and material processing required for decommissioning the Proposed Development. It is unknown at this stage the magnitude of decommissioning GHG emissions; however, given the nature and scale of the Proposed Development it is expected that there will be residual decommissioning-related emissions.

9.11.6 The residual decommissioning effects would remain **minor adverse (not significant)** as presented above.

9.12 Monitoring

9.12.1 No further monitoring has been identified as required.

9.13 Summary

9.13.1 Table 9-17 presents a summary of the GHG emissions assessment, detailing further mitigation requirements and residual effects.

Table 9-17 Greenhouse gas emissions - assessment summary

	Receptor/ aspect and sensitivity /value /importance	Description of impact	Magnitude	Significance of effect	Additional mitigation	Residual effect and significance
Construction						
GHG Emissions	Global climate – High sensitivity	Release of GHG emissions in the construction of the Proposed Development, contributing to warming of the global climate.	Low	Minor adverse (not significant)	Mitigation through the application of the PAS 2080 Carbon Management Hierarchy of Build Nothing, Build Less, Build Clever, Build Efficiently principles should be applied through detailed design to reduce construction emissions as far as practicable.	The Proposed Development will have minor adverse residual emissions relating to the construction phase. Good practice will seek to reduce residual emissions through mitigation measures set out in Section 9.10.
Operation						
GHG Emissions (maintenance and replacement)	Global climate – High sensitivity	Release of greenhouse gases in the operation of the physical elements of the Proposed Development, contributing to warming of the global climate.	Low	Minor adverse (not significant)	Mitigation through the application of the PAS 2080 Carbon management Hierarchy of Build Nothing, Build Less, Build Clever, Build Efficiently principles should be applied through	The Proposed Development will have residual emissions relating to the operational phase. Good practice will seek to reduce residual emissions through mitigation measures set out in Section 9.10.

	Receptor/ aspect and sensitivity /value /importance	Description of impact	Magnitude	Significance of effect	Additional mitigation	Residual effect and significance
					detailed design to reduce embodied emissions during operation as far as practicable	
GHG emissions (renewable energy generation)	Global climate – High sensitivity	Benefits arising from the supply of low-carbon electricity	High	Beneficial (significant)	No additional mitigation proposed as the Proposed Development will have a positive impact due to the renewable energy generation.	The consideration of significance also considers the wider context, and the generation of low carbon electricity as discussed in Section 9.9.
Decommissioning						
GHG Emissions	Global climate – High sensitivity	Release of greenhouse gases in the construction of the Proposed Development, contributing to warming of the global climate.	Low	Minor adverse (not significant)	Mitigation through the application of the PAS 2080 Carbon management Hierarchy of Build Nothing, Build Less, Build Clever, Build Efficiently principles should be applied through detailed design to reduce construction emissions as far as practicable	The Proposed Development will have residual emissions relating to the decommissioning phase. Good practice will seek to reduce residual emissions through mitigation measures set out in Section 9.10.

9.14 Cumulative assessment

9.14.1 The assessment of cumulative impacts as carried out for other environmental topics is not transferable to the assessment of GHG emissions in an analogous way, as the single receptor for GHG emissions is the global climate in the atmosphere. Impacts arising from GHG emissions differ from other environmental impacts in several important ways:

1) The environmental impact arising from GHG emissions is the aggregation and increased concentration of GHG emissions within the atmosphere (the single receptor for the GHG assessment);
2) The location of the emissions source is not relevant to the impact arising from it; it is not feasible to identify a Zone of Influence (ZoI) for GHG emissions at any geographic scale greater than the global scale. Any development leading to GHG emissions has the same impact whether it is located near to the Proposed Development or in another region/country; and
3) The climate change impacts on a given location arise from the aggregated GHG emissions levels in the atmosphere, not from the magnitude of GHG emissions in the local area.

9.14.2 It is precisely for this reason that the strategic approach adopted by the UK, and other governments is to develop a set of increasingly stringent Carbon Budgets at a national scale to manage and monitor progression towards the UK's 2050 net zero carbon target.

9.14.3 The inappropriateness of undertaking a cumulative appraisal (other than by contextualising against Carbon Budgets) is reflected in the IEMA guidance (Ref 22). This guidance notes that "*effects from specific cumulative projects…should not be individually 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*".

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