Lime Down
Solar Park

Environmental Statement

Volume 1, Chapter 7: Climate Change

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7 Climate Change

7.1 Introduction

7.1.1 This chapter presents the findings of the Environmental Impact Assessment (EIA) in relation to the potential Climate Change impacts as a result of the Scheme. For more details about the Scheme, refer to **ES Volume 1, Chapter 3: The Scheme [EN010168/APP/6.1]**.

7.1.2 The chapter identifies and proposes measures to address the potential effects on Climate Change, during the construction, operation and maintenance, and decommissioning phases of the Scheme.

7.1.3 This chapter should be read in conjunction with **ES Volume 1, Chapter 11: Hydrology, Flood Risk and Drainage [EN010168/APP/6.1]**.

7.2 Consultation

7.2.1 A request for an EIA Scoping Opinion was sought from the Secretary of State through the Planning Inspectorate in July 2024. The issues raised in the Scoping Opinion are summarised and responded to within **ES Volume 3, Appendix 1-2: Scoping Opinion Responses [EN010168/APP/6.3],** which demonstrates how the matters raised in the Scoping Opinion are addressed in this ES. Matters where the scope of the assessment has been raised by the Planning Inspectorate are summarised in **Table 7-1** below.

Table 7-1: Planning Inspectorate Scoping Opinion Responses

ID	Summary of Matter	Response
3.1.1	Climate Change: sea level rise The Scoping Report states that the Scheme is not located in an area that is susceptible to sea level rise. The Inspectorate agrees that significant effects are not likely to occur and an assessment of sea level rise in the in-combination climate change impact assessment and climate change resilience assessment can be scoped out of further assessment.	Noted. Sea level rise has been scoped out.
3.1.2	Climate Change: in-combination climate change impact assessment The Applicant proposes to scope out an in-combination climate change impact assessment from the climate chapter of the ES on the basis that climate change impacts relevant to the Scheme will be assessed through the other relevant topics of the ES. Given that climate change impacts relevant to the Schemes will be	Noted. The relevant climate change factors, increased flooding events, have been assessed in **ES Volume 1, Chapter 11: Hydrology, Flood Risk and Drainage [EN010168/APP/6.1]**, impacts on watercourses and associated sensitive habitats, and Ground Conditions have been assessed in **ES Volume 1, Chapter 9: Ecology and Biodiversity [EN010168/APP/6.1]** and interactions

ID	Summary of Matter	Response
	assessed Scheme other relevant topics of the ES, the Inspectorate agrees to scope out an in-combination climate change impact assessment from the climate change chapter. The climate change chapter should signpost where in the ES the relevant climate change factors have been assessed.	with groundwater and soil stability have been assessed in **ES Volume 1, Chapter 19: Ground Conditions and Contamination [EN010168/APP/6.1].** This Chapter summarises these findings. Topic scoped in.
3.1.3	Climate Change: mitigation. Limited information has been provided with regard to mitigation measures. Any relevant mitigation measures identified from the assessment should be clearly described in the ES and secured through the DCO.	Embedded mitigation is included within this ES (See Section 7.9). Topic scoped in.
3.1.4	Climate Change: greenhouse gas (GHG) impact assessment assumptions The GHG impact assessment within the ES should clearly describe any assumptions made in determining the quantification of any emissions reduction resulting from the Scheme such as the displacement of fossil fuel power generation.	Assumptions are included within the ES (See Section 7.4, the Future Baseline in Section 7.7, the assessment itself in Section 7.10 and the Appendix). Topic scoped in.
3.1.5	Climate Change: GHG emissions The Inspectorate notes that the Scoping Report does not provide the calculation methods for GHG emissions. For the avoidance of doubt, the ES should specify the methods used to quantify GHG emissions relating to the Scheme.	A detailed methodology is provided in this ES chapter (See Section 7.6).
3.1.6	Climate Change: assessment methodology – climate change resilience assessment The Scoping Report does not provide a description of the methodology to be used in the climate change resilience assessment. The ES should explain how the climate change resilience impacts have been identified and the methodology that will be used to determine the significance of effects. Any use of professional judgement to assess significance should be fully justified within the ES.	A detailed methodology is provided in this ES chapter which aligns with industry standard good practice methodology from the Institute of Sustainability and Environmental Professionals (ISEP) (See Section 7.6). Topic scoped in.

ID	Summary of Matter	Response
3.1.7	Climate Change: significance criteria – GHG impact assessment The Scoping Report does not clearly set out how the level of significance for the Scheme GHG emissions and potential impact to the climate will be determined. The assessment presented in the ES should address this. It should be aligned with the approach presented within the Institute of Environmental Management and Assessment (IEMA)'s 'Assessing Greenhouse Gas Emissions and Evaluating their Significance' as the basis for the assessment of effects. With reference to Scoping Opinion ID 3.1.6 above, a separate methodology and criteria should also be presented for the assessment of climate resilience.	A detailed methodology for determining the level of significance is provided in this ES chapter which aligns with the methodology from the Institute of Sustainability and Environmental Professionals (ISEP). (See Section 7.6). Topic scoped in. A detailed methodology and criteria for climate resilience is provided in this ES chapter which aligns with industry standard good practice methodology from the Institute of Sustainability and Environmental Professionals (ISEP). (See Section 7.6, paragraph 7.6.24 to 7.6.35). Topic scoped in.

7.2.2 Engagement has been undertaken with stakeholders in relation to Climate Change. The matters raised are summarised in **Table 7-Table** 7-2 below.

Table 7-2: Summary of Engagement Undertaken

Consultee and Date	Issue/Climate Change	Response
Wiltshire Council Climate Team (Email, 24.03.25)	GHG Assessment It is relevant to also compare the whole life estimated GHG emissions against a BAU scenario. The BAU might be considered a continuation of current uses at the Sites. In order to consider climate commitments made by Wiltshire Council reference is suggested to the outward-facing delivery plan for the whole county of Wiltshire "Climate Strategy Delivery Plan for Wiltshire".	The ES includes the comparison with the Business As Usual (BAU) scenario (see Paragraph 7.7) and references to the outward facing delivery plan for the whole county of Wiltshire "Climate Strategy Delivery Plan for Wiltshire" (Paragraph 7.3.39).
Wiltshire Council Climate Team (Email, 24.03.25)	Climate change is acknowledged to be a cross-cutting issue in development and it is agreed that it should be addressed in technical detail within relevant sections e.g. precipitation within drainage. However, it is important that the Climate Change chapter provides non-technical summaries as indicated within Table 6.2.	Please see Paragraph 7.10.117. Topic Scoped in. The ES includes a non-technical summary of Climate Change (See **ES Volume 4, Non-Technical Summary [EN010168/APP/6.5]).**

7.2.3 Statutory consultation was held between 29 January 2025 and 19 March 2025. A full list of consultation responses in relation to Climate Change are presented in the **Consultation Report [EN010168/APP/5.1]** submitted as part of the Application.

7.2.4 A further round of targeted consultation was undertaken between 3 June 2025 and 11 July 2025 following changes to the development boundary area of the Scheme presented in the PEIR and at Stage Two Statutory Consultation. Further detail regarding the targeted consultation is provided in **ES Volume 1, Chapter 1: Introduction [EN010168/APP/6.1]**.

7.3 Legislation, Planning Policy and Guidance

7.3.1 A summary of applicable legislation, planning policy and other guidance documents relating to the Climate Change assessment for the Scheme is provided below.

7.3.2 Full details of the legislation, policy, and guidance of relevance to the assessment of Climate Change is provided in full in **ES Volume 1, Chapter 5: Energy Need Legislative Context and Energy Policy [EN010168/APP/6.1]**.

Legislation

7.3.3 Applicable legislation to inform the Climate Change assessment includes:

International Legislation

Kyoto Protocol (Ref 7-1).

7.3.4 The Kyoto Protocol is a United Nations international treaty adopted in 1997 under the United Nations Framework Convention on Climate Change (UNFCCC). It set binding emission reduction targets for developed countries to reduce greenhouse gas (GHG) emissions, with the goal of mitigating the effects of climate change. The GHG definitions from the Kyoto Protocol have been used to inform this assessment of Climate Change.

The Paris Agreement (Ref 7-2)

7.3.5 The Paris Agreement is a legally binding international treaty on climate change. It was adopted by 196 Parties at the UN Climate Change Conference (COP21) in Paris, France, on 12 December 2015. It entered into force on 4 November 2016 and was ratified by the UK later that month. Its overarching goal is to hold the increase in the global average temperature to well below 2°C above pre-industrial levels and pursue efforts to limit the temperature increase to 1.5°C above pre-industrial levels.

7.3.6 The Glasgow Climate Pact (Ref 7-3), adopted at the 2021 United Nations Climate Change Conference (COP26) in Glasgow, Scotland and the Sharm El-Sheikh Implementation Plan (Ref 7-4), adopted at the 2022 United Nations

Climate Change Conference (COP27) in Sharm El-Sheikh, Egypt reaffirmed the goal of the Paris Agreement.

UK Legislation

The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (the EIA Regulations) (Ref 7-5)

7.3.7 The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 require that projects which might have significant effects on the environment to carry out a formal impact assessment. The Infrastructure Planning Regulations cover projects that are classified as Nationally Significant Infrastructure Projects, which are regulated under the Planning Act 2008 (Ref 7-6).

Climate Change Act 2008 (Ref 7-7)

7.3.8 The Climate Change Act 2008 sets a framework for reducing GHG emissions and a target for net zero emissions by 2050. Additionally, it requires the establishment of carbon budgets.

Climate Change Act 2008 (2050 target amendment) Order 2019 (Ref 7-8)

7.3.9 The 2019 amendment to the Climate Change Act 2008 changed the target for the UK to “net-zero” emissions by 2050.

Carbon Budgets Order (2009) (Ref 7-9) Carbon Budget Order (2011) (Ref 7-10), Carbon Budget Order (2016) (Ref 7-11), Carbon Budget Order (2021) (Ref 7-12).

7.3.10 Established under the Climate Change Act 2008 (Ref 7-8), these Carbon budgets set legally binding limits on the total amount of GHGs the UK can emit over a five-year period, called budgetary periods, towards the goal of net zero by 2050.

7.3.11 **Table 7-3** shows the Carbon budget periods and the binding limits on the total amount of GHGs expressed in Million Tonnes of carbon dioxide equivalent ($MtCO_2e$).

Table 7-3 UK National Carbon Budgets

Carbon Budget	Total Budget ($MtCO_2e$)
3rd (2018 – 2022)	2,544
4th (2023 – 2027)	1,950
5th (2028 – 2032)	1,725
6th (2033 – 2037)	965
7th (2038 – 2042)	535*

*Carbon budget under review by UK Government so not yet statutory. Recommended level by the Climate Change Committee (CCC) (Ref 7-13).

7.3.12 The 7th Carbon Budget covering the period from 2038 to 2042 is currently under review and the government has until June 30, 2026, to legislate for it. For the purpose of this assessment, the recommended level for the 7th Carbon Budget by the Climate Change Committee (CCC) (Ref 7-13) will be applied.

7.3.13 All assumptions past 2042 will use the 7th Carbon Budget.

National Planning Policy

National Policy Statement (NPS) for Energy EN-1 (January 2024) (Ref 7-14)

7.3.14 The NPS guidance makes it easier for decision makers, applicants and the wider public to understand:

- Government policy on the need for nationally significant infrastructure projects (NSIPS);
- How applications for energy infrastructure will be assessed; and
- The way in which impacts and mitigations will be judged.

7.3.15 With particular reference to Section 2.2 (Net zero by 2050), Section 2.3 (Meeting net zero), Section 2.4 (Decarbonising the power section), Section 4.10 (Climate Change Adaptation and Resilience) and Section 5.3 (Greenhouse Gas Emissions); Paragraph 4.10.4 recognises the role of climate change adaptation in respect of GHG emissions, coastal change and flood risk.

7.3.16 Paragraphs 4.10.5 to 4.10.12 relate to Lime Down Solar Park Limited's (hereafter referred to as the 'Applicant') assessment and Paragraphs 4.10.13 to 4.10.19 relate to the Secretary of State's decision-making regarding adaptation measures and resilience in response to climate projections. The guidance states that applications for new generating stations and related infrastructure should be contained in a single application to the Secretary of State or in separate applications submitted in tandem which have been prepared in an integrated way. The Secretary of State should be satisfied that appropriate network connection arrangements are/will be in place for a given project regardless of whether one or multiple (linked) applications are submitted.

7.3.17 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 phase;
- How reduction in energy demand and consumption during operation has been prioritised in comparison with other measures;
- How operational emissions have been reduced as much as possible through the application of best available technology 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 requires a GHG Reduction Strategy to be produced. The reduction strategy measures are included within the **Outline Construction Environmental Management Plan (CEMP) [EN010168/APP/7.12]** and **Outline Operational Environmental Management Plan (OEMP) [EN010168/APP/7.13]**, rather than as a standalone document.

7.3.18 The guidance also states that a GHG assessment should be used to drive down GHG emissions at every stage of the Scheme's development and ensure that emissions are minimised as far as possible for the type of technology, taking into account the overall objectives of ensuring our supply of energy always remains secure, reliable and affordable, while transitioning to net zero.

7.3.19 Regarding the Secretary of State decision making, the guidance states that the Secretary of State should be content that the GHG emissions have been assessed as far as possible and all reasonable steps to reduce the GHG emissions have been taken. However, in light of the vital role energy infrastructure plays in the process of economy wide decarbonisation, the Secretary of State must accept that there are likely to be some residual

emissions from construction and decommissioning of energy infrastructure. Operational emissions will be addressed in a managed, economy-wide manner, to ensure consistency with carbon budgets, net zero and our international climate commitments. The Secretary of State does not, therefore need to assess individual applications for planning consent against operational carbon emissions and their contribution to carbon budgets, net zero and international climate commitments.

NPS for Renewable Energy Infrastructure EN-3 (January 2024) (Ref 7-15)

7.3.20 Section 2.10 reaffirms the government commitment to sustained growth in solar capacity to align with the net-zero emissions by 2050 target. It recognises the important role of solar energy in delivering the government's goals for greater energy independence. The government seeks large scale ground-mount solar deployment across the UK. It recognised that solar farms are one of the most established renewable electricity technologies in the UK and the cheapest for of electricity generation.

7.3.21 Section 2.4 (Adaptation) and specially Paragraph 2.4.11 for solar Photovoltaic (PV), emphasise that if the Scheme is proposed in a low-lying exposed site, the increased risk of flooding and the impact of higher temperatures should be particularly considered.

NPS for Electricity Networks Infrastructure EN-5 (January 2024) (Ref 7-16)

7.3.22 Paragraph 2.3.2 highlights the importance of climate change resilience. It states that the applicant should assess the vulnerability and resilience of the proposed infrastructure to climate change impacts, including:

- Flooding;
- Effects of wind and storms on overhead lines;
- Higher average temperatures leading to increased transmission losses;
- Earth movement or subsidence caused by flooding or drought; and
- Coastal erosion.

7.3.23 The NPSs listed above came into effect on 17 January 2024. These NPSs set out the Government's energy policy for the delivery of nationally significant energy infrastructure, the need for new energy infrastructure, and guidance for the determination of an application for a Development Consent Order (DCO).

7.3.24 The relevant NPS requirements, together with an indication of where in the ES the information is provided to address these requirements, are provided in the **ES Volume 3, Appendix 5-1: NPS Requirements [EN010168/APP/6.3].**

7.3.25 Draft versions of EN-1, EN-3 and EN-5 were published in May 2025. These continue to highlight the need for new nationally significant energy projects.

With regards to Climate Change, emphasis continues to be placed on the government targets to be the first major economy to be net zero by 2050 and the importance of seeking to meet the outcomes set out in the Clean Power 20230 Action Plan. This is reliant on large scale delivery of low carbon generation technologies such as solar.

National Planning Policy Framework (NPPF) (December 2024)[1] (Ref 7-17)

7.3.26 The National Planning Policy Framework sets out the Government's planning policies for England and how these are expected to be applied. Section 14 highlights the importance of integrating climate change considerations into the planning system by promoting for development that reduces GHG emissions and enhances resilience against future climate risks. Paragraph 168 states that when determining applications for renewable and low carbon energy developments, local planning authorities should not require applicants to demonstrate the overall need for renewable or low carbon energy, and give significant weight to the benefits associated with renewable and low carbon energy generation and the proposal's contribution to a net zero future.

7.3.27 The NPPF (December 2024) states in paragraphs 170 to 182 that inappropriate development in areas at risk of flooding should be avoided by directing development away from areas at highest risk. Where development is necessary in such areas, it should be made safe for its lifetime without increasing flood risk elsewhere. Subsequently, it states that Plans should apply a sequential, risk-based approach to the location of development, considering all sources of flood risk and resilience.

Net Zero Strategy, 2021 (Ref 7-18)

7.3.28 The Net Zero Strategy represents the Government's plan to transition to a net-zero economy while supporting economic growth and job creation. It outlines a set of policies and initiatives aimed at reducing carbon emissions across every sector of the UK economy to achieve Net Zero by 2050.

Clean Growth Strategy, 2017 (Ref 7-19)

7.3.29 Published in 2017, it outlines how the UK will achieve the carbon budgets set out under the Climate Change Act. It includes policies to support clean technology innovation, improve energy efficiency, and enhance the route to market for renewable technologies.

UK Third Climate Change Risk Assessment 2022 (Ref 7-20)

7.3.30 The Climate Change Act 2008 mandates that the UK Government conducts a Climate Change Risk (CCR) Assessment every five years and creates an adaptation program to address identified risks. The UK CCR Assessment for 2022 was released in January 2022. The third CCR Assessment highlights the

[1] In February 2025, there was a 'correction' to the NPPF, but it is still dated as December 2024.

dangers of inaction regarding climate change and stresses that the UK's pioneering net zero strategy must incorporate adaptation measures to ensure future resilience. This involves further development of the domestic renewable energy sector.

The UK's Nationally Determined Contribution (NDC) (Ref 7-21)

7.3.31 The policy outlines the country's commitment to reducing GHG emissions in accordance with the Paris Agreement on climate change. Specifically, the UK aims to achieve a reduction of GHG emissions by at least 68% by 2030, relative to 1990 levels. As part of this commitment, the NDC emphasises the development of solar energy as a key strategy for reducing dependence on fossil fuels and lowering the nation's carbon footprint.

Climate Change: third national adaptation programme (2023 – 2029) (Ref 7-22)

7.3.32 The Climate Change: Third National Adaptation Programme (2023 – 2029) (NAP3) was produced by the Department for Environment, Food and Rural Affairs (DEFRA) and launched in 2023.

Clean Power 2030 Action Plan (Ref 7-23)

7.3.33 The government's Clean Power 2030 plan provides a clear policy framework that supports the development of renewable energy projects. It sets a target of at least 95% of Great Britain's generation; reducing the carbon intensity of our generation from 171gCO_2e/kWh in 2023 to well below 50gCO_2e/kWh in 2030. This will be achieved through a significant expansion of renewable energy capacity, including 45 to 47GW of solar power complemented by 23 to 27GW of battery capacity and other flexible capacity systems.

Local Planning Policy

7.3.34 Local planning policies that are relevant to the Scheme and Climate Change are:

Wiltshire Core Strategy (WCS) (Ref 7-24)

7.3.35 The Scheme is located completely within Wiltshire Councils administrative boundary. The current Local Plan is the WCS, adopted in 2015. Wiltshire Council has published a draft Wiltshire Local Plan, with adoption expected at the end of in late 2024 or early 2025. The Wiltshire Local Plan Regulation 19 consultation was undertaken in autumn 2023 (Ref 7-25). The WCS outlines six key 'strategic' challenges for Wiltshire. Addressing Climate Change is listed as one of these key 'strategic' objectives to be addressed by the Wiltshire Core Strategy.

7.3.36 Local planning policies that are relevant to the Scheme and Climate Change are:

- Core Policy 42: Standalone Renewable Energy Installations; and

- Core Policy 67: Flood Risk.

7.3.37 As part of the emerging Local Plan, Wiltshire Council has updated their policies. The emerging Local Plan policies relevant to this Chapter are listed below:

- Policy 86: Renewable Energy (Formerly Core Policy 42); and
- Policy 95: Flood Risk (Formerly Core Policy 67).

Wiltshire Council Climate Strategy (2022) (Ref 7-26)

7.3.38 While the Wiltshire Council Climate Strategy is a non-statutory document and is not part of the local development plan, it sets a framework for reducing emissions in Wiltshire from 2022 to 2027 and for making the county resilient to climate impacts. The strategy states that many of the solutions needed to reduce GHG emissions are already available. It includes the use of solar and wind energy as part of these solutions.

Wiltshire Council Climate Delivery Plan (2025) (Ref 7-27)

7.3.39 The delivery plan outlines Wiltshire Council's priorities for action on climate change as well as implementation steps towards becoming carbon neutral by 2030. One of the focus areas for 2025 is to decarbonise the Council building reducing Scope 1 and 2 emissions and mentions it can be achieved by a Community Energy generator or via a commercial scheme.

7.3.40 Other priorities around the energy sector are to support the development of community energy groups and empower communities to develop energy projects and create an energy system to support the net zero transition.

Wiltshire Council Climate Adaptation Delivery Plan (2025-29) (2025) (Ref 7-28)

7.3.41 The Adaptation Delivery Plan (2025-29) sets out Wiltshire Council's response to risks from a changing climate on service delivery, assets and business plan objectives considering risks up to 2°C rise predicted by 2050.

Other Guidance

7.3.42 Other guidance documents relevant to the assessment of the impacts of the Scheme on Climate Change include:

World Business Council for Sustainable Development and World Resources Institute GHG Protocol guidelines (Ref 7-29)

7.3.43 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.

Environmental Impact Assessment Guide to: Assessing Greenhouse Gas Emissions and Evaluating their Significance. Institute of Sustainability and Environmental Professionals (2022) (ISEP) (Ref 7-30)

7.3.44 This Guidance provides a framework for evaluating the GHG emissions from a development project. It includes methods for quantifying emissions, assessing their significance, and identifying mitigation measures.

Climate Change Adaption Practitioner Guidance (2022) (ISEP) (Ref 7-31)

7.3.45 This Guidance provides steps for assessing climate risks, developing adaptation strategies, and implementing measures to enhance resilience.

Environmental Impact Assessment Guide to: Climate Change Resilience and Adaptation (2020) (ISEP) (Ref 7-32)

7.3.46 This guidance provides steps for assessing climate resilience and in-combination climate impacts.

Planning Policy Guidance (PPG) (Ref 7-33)

7.3.47 The Climate Change section advises how to identify suitable mitigation and adaptation measures in the planning process to address the impacts of climate change.

Greenhouse Gas Reporting: Conversion Factors 2024 (Ref 7-34)

7.3.48 The UK Government issues emission conversion factors for use to report on GHG emissions.

7.4 Assessment Assumptions and Limitations

7.4.1 The methodology for Climate Change GHG emissions has considered the following assumptions.

Carbon Budgets

7.4.2 Considering the recommended level by the Climate Change Committee (CCC) for the 7th carbon budget, current carbon budgets are only available up to 2042. As the Scheme is expected to be operational past this; all assumptions past 2042 will use the 7th Carbon Budget. The 7th Carbon Budget covering the period from 2038 to 2042 is currently under review and was not yet adopted by the Government at the time of writing.

Baseline Emissions

7.4.3 For the lifecycle GHG impact assessment, the baseline is a ‘business as usual’ scenario whereby the Scheme is not implemented. The baseline comprises existing carbon stock and sources of GHG emissions within the Site from the existing activities on-site. In this case the future baseline is also based on a zero emissions scenario.

Construction Plant

7.4.4 Fuel use for construction plant is not known at the time of writing, as such it has not been possible to complete a calculation of these emissions. Good practice

measures are included in the **Outline CEMP [EN010168/APP/7.12]** to limit emissions during the construction phase. Based on the relatively small scale and short duration of the construction works required as well as the implementation of emission reduction measures in the **Outline CEMP [EN010168/APP/7.12]** it is considered that the fuel use for construction plan represent less than 1% of the total GHG emissions. This is in line with similar solar farm projects, where the construction plant GHG emissions represent less than 1% of the total GHG emissions.

Construction Phase

7.4.5 The construction of the Scheme is proposed to be phased over a two-year period and, subject to the DCO consenting process, the earliest construction could start is 2027. For the purposes of this assessment, the construction phase is assumed to have a duration of two years. This is expected to be a realistic worst-case assumption for this assessment, as it represents the expected maximum build time and therefore the maximum total emissions and impacts occurring as a result of the construction phase.

Assessment of Ancillary Products on Site

7.4.6 According to the ISEP guidance, activities that do not significantly change the result of the assessment can be excluded where the expected emissions are less than 1% of the total emissions, and where all such exclusions total a maximum of 5% of the total emissions. In the case of the GHG assessment, the emissions associated with ancillaries such as fencing, portacabins, security system (closed-circuit television (CCTV) camera system), etc. are considered minor and are expected to contribute less than 1% of the total emissions. Anything not explicitly referenced can be assumed to not have been quantified as emissions are anticipated to be negligible.

7.4.7 Therefore, these minor emissions will be excluded from the quantification, as including them would not significantly impact the overall results.

7.4.8 In addition, wherever relevant, conservative assumptions will be made such that the predicted GHG emissions are likely to be at the upper limit of potential emissions from the Scheme.

7.4.9 All other inputs and outputs to the relevant processes for which data are available are included in this assessment.

Construction Worker Vehicle Movements

7.4.10 The UK Government 2024 emission conversion factors for ‘average car’ and ‘average local bus’, including Well-To-Tank (WTT) emissions will be applied to average distance travelled and total worker numbers to calculate GHG emissions associated with worker transport.

7.4.11 The distance is assumed to be equal to the average trip length for business in the UK in 2023 (19.6 miles) for car and shuttle bus trips. It is assumed that there will be 1,244 daily two-way worker movements, of which 622 will be by car and 622 by shuttle bus. Each car is considered to transport 1.5 people and each shuttle 20 people. This translates to 416 two way car movements and 32 shuttle bus movements. These assumptions are consistent with **ES Volume 1, Chapter 13: Transport and Access [EN010168/APP/6.1].**

Transport of Materials

7.4.12 At the time of writing, the manufacturer of Solar PV Panels has not yet been chosen. It is assumed that the Solar PV Panels will be sourced from China as China accounts for 80% of global Solar PV Panel production. The manufacture and transport of Solar PV Panels and batteries are the largest sources of GHG emissions from the Scheme.

7.4.13 Heavy Goods Vehicle (HGV) and sea freight distances assumed for transportation of materials and waste are outlined below. The country of origin for materials have been chosen as China, and assumptions have been made around the specific ports used, based on proximity to relevant manufacturing facilities within each country. The following assumptions apply:

- HGV transport of materials within China prior to sea freight transportation – 150km (based on the average distance of a number of major manufacturing centres in and around Shanghai to the nearest port);
- While sea freight may come into a closer port, such as Avonmouth, as a conservative approach, it has been assumed that freight will travel from Dover to the Site;
- Sea freight distance from China to England –21,880 km (based on the sea freight distance between Shanghai and Dover);
- For HGV transportation of materials, the UK Government GHG 2021 Conversion Factors for 'Rigid HGV >7.5-17t' and 'Articulated HGV >3.5 – 33t' have been applied, including WTT emissions. It has been assumed that HGVs are 50% laden; this approach is more conservative than assuming HGV are 100% laden on incoming trips and 0% laden on outgoing trips.
- For tippers around the Site, the distance has been assumed to be the National Travel Survey (NTS) (Ref 7-35) average trip distance for business on the assumption that these vehicles would not be transporting materials from China. The value for 'average HGV' has been used; and
- For sea freight transportation, the UK Government GHG 2021 Conversion Factors (Ref 7-34) for 'General Cargo –Average' has been applied, including WTT emissions.

Embodied Carbon in Production of Scheme Materials/Components

7.4.14 All assumptions made within the calculations for estimating the embodied carbon of the materials used for the Scheme have been set out within the individual sections detailed in Section 7.9.10.

Product Replacement

7.4.15 The Scheme is expected to be operational from 2029 and to generate more than 50MW of electricity. This assessment accounts for efficiency losses of the Solar PV Panels over time based on an initial 2% degradation in the first year and 0.45% for every additional year for a lifespan of 40 years. For the purpose of this assessment, the replacement of panels has been considered at 30 years at which point the same assumptions of a 2% loss in the first year and 0.45% loss for every additional year has been used.

7.4.16 Operational maintenance involving the replacement of components during the Scheme's life span is determined by replacement rates observed in similar projects and the expected design life of the components.

7.4.17 Whilst Solar PV Panels can have a lifespan of up to 40 years or more, it has been assumed that Solar PV Panels will be replaced once during the lifetime of the Scheme. The Solar PV Panels are anticipated to be replaced over a 12-to-24-month period.

7.4.18 The BESS Container batteries could be replaced up to five times during the operation and maintenance phase.

7.4.19 Replacement rates are summarised in the below table:

Table 7-4: Replacement Rates for Products

Component	Comment	Replacement Frequency	Recyclable
Solar PV Panels	The approximate operational life of Solar PV Panels is 40 years. It is assumed that replacement would be undertaken once during the operation of the Scheme.	Once during the Scheme's lifespan.	Yes
Solar PV Mounting Structures	Replacement is not anticipated during the Schemes operation and maintenance phase.	None	Yes
On-Site Cables (low voltage DC on-site cabling between Solar PV Panels and Conversion Units)	It is not anticipated that the On-Site cables will need to be replaced during the operation and	Approx 20% of On-Site cables once during the Scheme's lifespan.	Yes

Component	Comment	Replacement Frequency	Recyclable
	maintenance phase, although an allowance has been made for up to 20% of the On-Site cabling to be replaced due to damage or defects.		
Batteries (within the BESS)	Assumed design life of up to 10 years.	Every 10 years. Five times during the Scheme's lifespan.	Yes
Interconnecting Cable (medium voltage AC on-site cabling)	Replacement is not anticipated during the Schemes operation and maintenance phase.	None.	Yes
Transformers (Element within the Standalone Conversion Units)	Assumed design life of 30 years, although replacement will only be carried out if required for performance or health and safety reasons.	Every 30 years.	Yes
Inverters	Assumed design life of 10 years.	Every 10 years. Five times during the Scheme's lifespan.	Yes
Grid Connection Cables (HV Cabling)	Replacement is not anticipated during the Schemes operation and maintenance phase.	None.	Yes
On-site Substations (132kV and 400kV)	Replacement of the building is not anticipated during the Schemes operation and maintenance phase.	None.	Yes

Assessment of Future Baseline for Comparison with 'With Scheme' Scenario

7.4.20 To account for the beneficial effect of the Scheme in reducing GHG emissions compared to a 'without scheme' scenario, the ES assesses the impact of the Scheme against the forecasted average intensity (g/kWh) from the grid as published by Department for Energy Security and Net Zero (Ref 7-36). Using 'Data Table 1-19', Table 1: Electricity emissions factors to 2100, $kgCO_2e/kWh$ for the forecast emissions data for 2029.

7.4.21 The future baseline used for the assessment will be the gCO_2e/kWh intensity of the operation and maintenance phase of the Scheme. The grid carbon intensity for 2029, the first year of operation of the Scheme, is forecasted to be 0.049 gCO_2e/kwh.

7.4.22 This process will be calculated for the lifetime of the Scheme.

7.5 Study Area

GHG Impact Assessment:

7.5.1 In accordance with the latest ISEP guidance (Ref 7-30), the Study Area for the assessment of GHG emissions is considered to be the global climate.

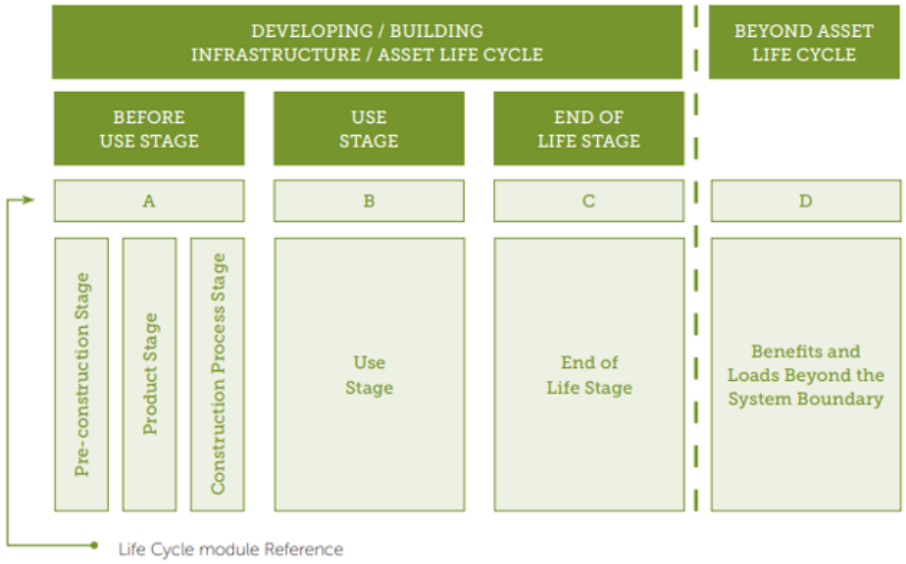
7.5.2 The GHG Impact Assessment is based on the Scheme lifecycle stages shown in Plate 7-1. The considered stages include: the before use stage (A), hereafter referred to as the 'construction phase', the use stage (B), referred to as the 'operation and maintenance phase', and end of life stage (C), referred to as the 'decommissioning phase'.

7.5.3 Direct emissions are defined as those directly resulting as from the Scheme, e.g. tailpipe emissions from vehicles travelling to the Site. Indirect emissions are those not directly caused by the Scheme but generated as a result of the manufacturing of Scheme components. This includes embodied carbon within construction materials.

7.5.4 Both direct emissions and indirect emissions have been considered in the assessment.

7.5.5 The operation and maintenance phase of the Scheme is projected to span 60 years.

Plate 7-1: Modular approach of life cycle stages and modules (Ref 7-30)



Source: IEMA. EIA Guide.

In-combination Climate Change Impact (ICCI) Assessment:

7.5.6 The ICCI Study Area considers receptors that are identified within other relevant chapters, for example, the Flood Risk assessment as outlined in **ES Volume 1, Chapter 9: Ecology and Biodiversity, Chapter 11: Hydrology, Flood Risk and Drainage, Chapter 13: Transport and Access and Chapter 19: Ground Conditions [EN010168/APP/6.1],** that will be impacted by the Scheme in combination with future climatic conditions.

Climate Change Risk (CCR) Assessment

7.5.7 For the CCR Assessment, the Study Area for this assessment is the Order Limits of the Scheme.

7.5.8 The climate resilience review will provide a description of how the Scheme will be impacted by climate change and how it will be designed to be more resilient to the impacts identified during the review of the UK Climate Projections 2018 (UKCP18) data (Ref 7-37).

7.6 Assessment Methodology

7.6.1 This section sets out the scope and methodology for the assessment of the impacts of the Scheme on Climate Change (GHG Impact Assessment), the In-combination Climate Change Impact Assessment and the impacts of Climate Change on the Scheme (Climate Change Risk Assessment).

Sources of Information

7.6.2 In the preparation of this chapter, the following sources of published information have been used:

- World Business Council for Sustainable Development and World Resources Institute (2004) The GHG Protocol: A Corporate Accounting and Reporting Standard. Revised Edition. (Ref 7-29);
- ISEP (2022a) Environmental Impact Assessment Guide to: Assessing Greenhouse Gas Emissions and Evaluating their Significance 2nd Edition. Institute of Environmental Management and Assessment (ISEP). (Ref 7-30);
- ISEP (2022b) Climate Change Adaption Practitioner Guidance. (Ref 7-31);
- ISEP (2020) Environmental Impact Assessment Guide to Climate Change Resilience and Adaptation. (Ref 7-32);
- Department for Energy Security and Net Zero (2024) UK Government GHG Conversion Factors for Company Reporting (Ref 7-34);
- UK Met Office (2018) UK Climate Projections 2018 (UKCP18) (Ref 7-35); and

- UK Met Office (2019) Historic climate data (Ref 7-36).

Impact Assessment Methodology

7.6.3 The methodologies described in the following section have been developed in line with the relevant planning policy and appropriate industry standard guidance for assessing GHGs (ISEP document 'Environmental Impact Assessment Guide to: Assessing Greenhouse Gas Emissions and Evaluating their Significance 2nd Edition', (Ref 7-30)) and considering climate change resilience (CCR) and adaptation (Ref 7-31) in EIA.

GHG Impact Assessment

7.6.4 All GHG emissions arising over the lifecycle of the Scheme will be assessed through the lifecycle GHG impact Assessment. Direct emissions from the Scheme, indirect emissions resulting from the Scheme but arising from activities outside the Site and embodied carbon within materials and components required for the Scheme are all considered as part of the GHG impact assessment.

7.6.5 In line with the World Business Council for Sustainable Development and World Resources Institute GHG Protocol (Ref 7-29), the potential effects of the Scheme on the climate have been assessed.

7.6.6 The approach to assessing emissions follows the different phases of the Scheme including construction, operation and maintenance, and decommissioning.

7.6.7 The seven Kyoto Protocol GHGs have been considered in this assessment, which are in-line with the 'GHG protocol' (Ref 7-29):

- Carbon dioxide (CO_2);
- Methane (CH_4);
- Nitrous oxide (N_2O);
- Sulphur hexafluoride (SF_6);
- Hydrofluorocarbons (HFCs);
- Perfluorocarbons (PFCs); and
- Nitrogen trifluoride (NF_3).

7.6.8 It should be noted that within this assessment, 'GHG emissions' represent all seven Kyoto Protocol GHGs. The unit of $kgCO_2e$, (kilograms CO_2 equivalent) tCO_2e (tonnes CO_2 equivalent) or $MtCO_2e$ (Megatonnes of CO_2 equivalent) captures CO_2 as well as the other GHGs of concern and has been used as the unit to quantify GHGs within this assessment.

7.6.9 The Department for Energy Security and Net Zero (DESNZ) 2024 conversion factors for reporting (Ref 7-34) have been used as a calculation-based methodology for estimating the anticipated GHG emissions arising during the construction, operation and decommissioning activities of the Scheme:

Activity data x GHG emissions factor = GHG emissions value

7.6.10 For example, if a construction worker is expected to make a total 1,200 km of trips over the construction phase in their petrol car, the 'activity data' for this would be 1,200 km. The GHG emissions factor for this as sourced from the DESNZ 2024 inventory for a petrol car is 0.25987 kgCO_2e/km. Therefore, the calculation would be:

1,200 km (Activity) x 0.00025987 tCO_2e/km (GHG emissions Factor)

= 0.311 tCO_2e (GHG Emissions Value)

Sensitivity of Receptors

7.6.11 For the purposes of this assessment, it has been considered that any increase in GHG emissions compared to the baseline has the potential to have an impact, due to the high sensitivity of the global climate to increases in GHG emissions. This is in line with the latest ISEP guidance (Ref 7-30), which states that all GHG emissions have the potential to be significant.

Magnitude of Impacts

7.6.12 ISEP guidance (Ref 7-30) states that there are currently no agreed methods to evaluate thresholds of GHG significance. Therefore, the application of the standard EIA significance criteria is not considered to be appropriate for climate change assessments, and that professional judgement is required to contextualise a project's GHG emission impacts.

7.6.13 The guidance explains that "*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*."

7.6.14 **Table 7-5** presents the different significance levels as per the latest version of ISEP guidance. 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 7-5 Significance levels as per ISEP guidance for GHG Assessment (Box 3, Ref 7-30)

Significance Level	Definition	Significant
Major Adverse	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.	Yes
Moderate Adverse	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.	Yes
Minor Adverse	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.	No
Negligible	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.	No
Beneficial	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.	Yes

7.6.15 As noted, it is down to the practitioner's professional judgement on how best to contextualise a project's GHG impact. In GHG accounting, it is considered good practice to contextualise emissions against pre-determined carbon budgets.

7.6.16 The UK has national carbon budgets which have been determined as being compatible with net zero and international climate commitments. For this Scheme, the most appropriate sector carbon budget is for the electricity supply sector. Indicative carbon budgets are available for the electricity supply sector (Ref 7-13). The electricity supply sectoral carbon budgets (Table 7-6) are in place to track the sector's pathway to being carbon neutral by 2050. Progress against these budgets is reviewed annually and future budgets are set 12 years in advance.

Table 7-6: Relevant UK Carbon Budgets

Carbon Budget	Total budget ($MtCO_2e$)	Sectoral Carbon Budget year	Annual Electricity Supply Sectoral Carbon budget ($MtCO_2e$)
3rd (2018 – 2022)	2,544	-	-
		-	-
		2020	51.26
		2021	49.71
		2022	48.48
4th (2023 – 2027)	1,950	2023	44.01
		2024	44.44
		2025	41.65
		2026	32.36
		2027	26.70
5th (2028 – 2032)	1,725	2028	23.75
		2029	22.40
		2030	18.55
		2031	15.77
		2032	12.09
6th (2033 – 2037)	965	2033	9.86
		2034	8.00
		2035	6.20
		2036	6.01
		2037	5.67
7th (2038 – 2042)*	535	2038	4.98*
		2039	4.79*
		2040	4.60*
		2041	4.04*
		2042	3.48*

*the 7th carbon budget will be set by June 2026. Initial Climate Change Committee advice has given the total carbon budget and energy sectors (Ref 7-13) but this is subject to change.

7.6.17 The receptor for the GHG Assessment is the global atmosphere. All projects worldwide have the potential to contribute to cumulative impacts on the global climate through their GHG emissions. As per ISEP and precedent, and supported in case law, it is not appropriate to undertake a cumulative assessment for GHG assessments, as the climate is global and so a cumulative assessment would require an assessment of all potential worldwide future

developments which is not feasible, and it is not appropriate to seek to only assess only some specific schemes. Instead, the appropriate approach is to consider the Scheme's emissions in the context of Carbon budgets as they are considered to be inherently cumulative. Hence, to assess the impact of GHG emissions from the Scheme, the carbon budgets for the electricity supply sector have been used to help establish significance (**Table 7-6**). To provide further perspective, emissions from the Scheme have also been considered in the context of the full UK carbon budgets. The UK carbon budgets are in place to restrict the total amount of GHG emissions the UK can legally emit in a five-year period.

7.6.18 A qualitative approach has been taken for assessing the significance of GHG emissions arising as a result of the Scheme for the years beyond 2042. A quantitative approach is not possible beyond 2042 as, although the carbon budgets are set to decrease over time, there will still be permitted GHG emissions beyond 2050, but with offsetting measures in place to ensure net emissions are zero. The rate at which they will decrease is not known, so beyond 2042, emissions will be compared against the last available Carbon Budget.

Cumulative effects

7.6.19 As per ISEP and precedent, and supported in case law, it is not appropriate to do a cumulative assessment for GHG assessments, as the climate is global so would be inappropriate to choose just one project. Carbon budgets can be used as a proxy instead as they are inherently cumulative.

In-combination Climate Change Impact (ICCI) Assessment:

7.6.20 The ICCI assessment methodology has been developed in line with the ISEP– 'Environmental Impact Assessment Guide to Climate Change Resilience and Adaptation' (Ref 7-31).

7.6.21 According to the guidance, an ICCI effect is "*When a projected future climate impact (e.g. increase in temperatures) interacts with an effect identified by another topic and exacerbates its impact. For example, if the biodiversity topic identifies an effect on a habitat or species receptor due to a project/scheme, such as loss of habitat, and in addition projected future higher temperatures will increase the vulnerability of this habitat to fragmentation, this is an ICCI*."

7.6.22 An ICCI assessment identifies how identified receptors in the surrounding environment are affected by the Scheme in combination with future climate change conditions. Climate change impacts relevant to the Scheme will be assessed through the other relevant topics of the ES. These in-combination effects are summarised within this chapter.

7.6.23 The related disciplines and the anticipated effects of climate change in **Table 7-7** are considered in the ICCI Assessment.

Table 7-7: Climate Change Factors for ICCI Assessment

Related ES Volume 1 Topic [EN010168/APP/6.1].	Anticipated Effect
Chapter 11: Hydrology, Flood Risk and Drainage	Precipitation changes. Increased risk of flooding. Reduced drainage.
Chapter 9: Ecology and Biodiversity	Climate change impacting species and habitats.
Chapter 13: Transport and Access	Greenhouse gas emissions from vehicle movements.
Chapter 19: Ground Conditions	Changing dryness and soil quality as a result of climate change

Climate Change Risk Assessment

7.6.24 For the CCR Assessment, the Scheme during construction, operation and maintenance, and decommissioning phases is considered the receptor. The CCR Assessment provides a description of how the Scheme will be affected by climate change impacts, taking into consideration the embedded mitigation measures that have been designed into the Scheme so that it will be more resilient to the impacts identified during the review of the UK Climate Projections 2018 (UKCP18) data (Ref 7-38).

7.6.25 UKCP18 data and historic climate data from the Met Office were acquired to establish the future and historic baseline climate conditions (Ref 7-39).

7.6.26 The EIA regulations require information regarding the vulnerability of the Scheme to climate change. An assessment has been developed based on the ISEP 'Environmental Impact Assessment Guide to: Climate Change Resilience and Adaption' document (Ref 7-31), which assesses the Scheme's resilience to potential impacts caused by climate change.

7.6.27 The risks to the Scheme associated with an increased frequency of extreme weather events, as highlighted by UKCP18 projects will be assessed. The Scheme's resilience against gradual climatic changes over the lifespan of the Scheme, expected to be 60 years, will also be considered.

7.6.28 Vulnerable and sensitive receptors were identified, and the sensitivity of the receptors determined using quantifiable data, where available. The susceptibility and vulnerability of the receptor are considered alongside its value and importance.

7.6.29 The susceptibility of the receptor is determined using the following scale:

- **High susceptibility**: receptor has no ability to withstand/not be substantially altered by the projected changes to the existing/prevailing climatic factors (e.g. lose much of its original function and form).

- **Moderate susceptibility**: receptor has some limited ability to withstand/not be altered by the projected changes to the existing/prevailing climatic conditions (e.g. retain elements of its original function and form).
- **Low susceptibility**: receptor has the ability to withstand/not be altered much by the projected changes to the existing/prevailing climatic factors (e.g. retain much of its original function and form).

7.6.30 The vulnerability of the receptor is determined using the following scale:

- **High vulnerability**: receptor is directly dependent on existing/prevailing climatic factors and reliant on these specific existing climate conditions continuing in future (e.g. river flows and groundwater level) or only able to tolerate a very limited variation in climate conditions.
- **Moderate vulnerability**: receptor is dependent on some climatic factors but able to tolerate a range of conditions (e.g. a species which has a wide geographic range across the entire UK but is not found in southern Spain).
- **Low vulnerability**: climatic factors have little influence on the receptors.

7.6.31 The likely effects of climate change on the Scheme will be evaluated to identify the magnitude i.e. the degree of change from the relevant baseline conditions. Magnitude is based on a combination of likelihood and consequence.

7.6.32 The criteria to assess the likelihood of occurrence and the consequence of the hazard produced by the climate change impact are defined in **Table 7-8** and

7.6.33 **Table 7-9**. The consequence of the climate risk will be determined using professional judgement and supporting evidence.

Table 7-8: Criteria to Assess Likelihood of Climate Change Risk Impact

Level of Likelihood	Definition of Likelihood
Very low	It is highly improbable that the impact will occur during the operation and maintenance phase or the construction phase of the assets or systems. The event might occur once during the lifetime of the project (60 years).
Low	The event occurs once during the lifetime of the Scheme (60 years).
Medium	The event occurs limited times during the lifetime of the project (60 years), e.g. approximately once every 15 years, typically four events.
High	The event occurs several times during the lifetime of the project (60 years), e.g. approximately once every five years, typically 12 events.
Very High	The event occurs multiple times during the lifetime of the project (60 years), e.g. approximately annually, typically 60 events.

Table 7-9: Measure of CCR Consequence

Consequence of impact	Description
Very large adverse	▪ Single or multiple deaths involving any persons; ▪ Disastrous work interruption; ▪ Huge financial loss; and ▪ Devastating environmental implications.
Large adverse	▪ Major injuries, including permanent disabling injuries of over 14 days; ▪ Major work interruption; ▪ Serious financial loss; and ▪ Severe environmental implications.
Minor adverse	▪ Injury requiring first aid treatment; ▪ Causing interruption of work for three days or less; ▪ Slight financial loss or cost; and ▪ Slight environmental consequence.
Negligible adverse	▪ Minor cuts/abrasions requiring minimal treatment; ▪ Causing minimal work interruption; ▪ No financial loss or costs; and ▪ No environmental consequence.

7.6.34 The receptor significance is evaluated using the sensitivity and magnitude of effect that are combined in the significance matrix shown in **Table 7-10**.

Table 7-10: Significance matrix

		Measure of Likelihood*				
		Very Low	**Low**	**Medium**	**High**	**Very High**
Measure of Consequence	**Negligible**	NS	NS	NS	NS	NS
	Minor	NS	NS	NS	**S**	**S**
	Moderate	NS	NS	**S**	**S**	**S**
	Large	NS	**S**	**S**	**S**	**S**
	Very large	NS	**S**	**S**	**S**	**S**

*NS: Not Significant, S: Significant

7.6.35 Embedded mitigation measures of the Scheme have been considered as part of the review of potential impacts. These measures are detailed in Section 7.9.

Cumulative Effect

7.6.36 As per ISEP and precedent, and supported in case law, it is not appropriate to do a cumulative assessment for GHG assessments, as the climate is global so would be inappropriate to choose just one project. Carbon budgets can be used as a proxy instead as they are inherently cumulative.

7.7 Baseline Conditions

7.7.1 This section describes the existing and anticipated future baseline conditions for the Climate Change assessment.

GHG Impact Assessment

Existing Baseline

7.7.2 The current use of the Site (2025) 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 on the Site.

7.7.3 For the lifecycle GHG impact assessment, the baseline is a 'business as usual' scenario whereby the Scheme is not implemented. The baseline comprises existing carbon stock and sources of GHG emissions within the Site from the existing activities on-site. As a conservative approach, the baseline activities on site will be assumed to be generating zero emissions of CO_2e.

Future Baseline

7.7.4 The Scheme is expected to provide a substantial source of renewable electricity for the country. Compared to the emissions generated from the current grid as a UK average, the Scheme is anticipated to result in a net reduction in GHG emissions. This was assessed by the comparison of emissions of Carbon Dioxide and equivalent gases (CO_2e) from existing UK average grid emissions forecasts for 2029 (49 gCO_2e/kWh), the first year of operation of the Scheme, and the carbon intensity of the Scheme. By using the first operational year data, the assessment avoids the inherent uncertainties and potential fluctuations that may arise in future years. This includes uncertainties related to technological advancements, policy changes, market dynamics, and other factors that could impact the grid's carbon intensity and the Scheme's emissions. This means that the effect of the scheme on future national grid intensity is not double counted.

7.7.5 Additionally, typical emissions associated with other energy generating technologies is presented for completeness in **Table 7-11** (Ref 7-37), This shows the lifecycle emissions from different technologies as sourced from a United Nations Commissioned study. Caution is needed when comparing the Scheme with the United Nations assessment results, as the report explains that local conditions impact the carbon intensity of the technologies (Ref 7-37).

Table 7-11 Typical Life-cycle GHG Emissions of different Electricity Sources

Electricity Source	Technology	Lifecycle GHG Emissions (gCO_2e/kWh)
Coal	Coal Power equipped with a carbon capture and storage (CCS)	147 - 469
Natural Gas	Natural Gas combined cycle plant with CCS	90 - 220
Nuclear	Nuclear power	5.1 - 6.4
Solar	Concentrated Solar Power (CSP)	27 - 122
	Photovoltaics	8 - 83
Wind	Onshore Wind Power	7.8 - 16
	Offshore Turbines	12 - 23
Hydropower	Hydropower	6 – 147

7.7.6 Consideration was given to the wider impacts of the Scheme including in the context of the carbon budget targets developed for the UK, and the Scheme's overall contribution to climate change.

7.7.7 In the absence of the Scheme, it is considered there will be no change to the future baseline for climate change.

Climate Change Risk

Existing Baseline

7.7.8 The most recent available and completed historic climate data acquired by the Met Office from the closest Met Office Station to the Scheme (Yeovilton) for the 30-year climate period of 1991 – 2020 will provide the current baseline for the CCR Review (Ref 7-39). Yeovilton Met Office Station is approximately 55km to the southwest of the Scheme. This is summarised in **Table 7-12** below.

Table 7-12: Historic Climate Data

Climatic Factor	Month	Value
Average annual maximum daily temperature (°C)	-	14.89
Warmest month on average (°C)	July	21.93
Coldest Month on average (°C)	February	1.81

Climatic Factor	Month	Value
Mean annual rainfall levels (mm)	-	729.53
Wettest month on average (mm)	November	81.87
Driest month on average (mm)	May	47.15

Future Baseline

7.7.9 It is anticipated that the future baseline will be different from the current present-day baseline, due to changes in climate. For this assessment, UKCP18 probabilistic projections have been provided for 30-year periods from 2020 – 2099 (Ref 7-38) and obtained for the following climate variables which includes annual and seasonal changes in climatic conditions over the land area of the Scheme.

- Mean annual air temperature;
- Maximum air temperature;
- Mean annual precipitation; and
- Mean annual cloud cover.

7.7.10 A representative 25 km^2 grid square that encompasses the Scheme's location has been used to analyse the UKCP18 probabilistic projections for changes in average climate. Temperature, precipitation, and cloud anomalies are considered relative to the 1981 to 2010 baseline. These variables are illustrated in **Table 7-13**.

7.7.11 There are a range of different climate scenarios also known as Representative Concentration Pathways (RCPs) used in UKCP18 that help inform future trends in emissions (Ref 7-40). For this assessment RCP 8.5 has been used, which assumes a 'business as usual' pathway for climate change as recommended by the ISEP guidance.

7.7.12 The impact of climate change will be determined over the course of the Scheme's lifetime, which is estimated to be 60 years for the purpose of the EIA.

Table 7-13: Anomalies for probabilistic projections (25km^2) over UK for RCP8.5

Variable	2020-2049	2050-2079	2070-2099
Mean air temperature anomaly at 1.5 m (°C)	1.0	2.4	3.7
Precipitation rate anomaly[%]	1.0	-0.4	0.7

Variable	2020-2049	2050-2079	2070-2099
Maximum air temperature anomaly at 1.5 m [°C]	1.1	2.6	4.0
Total cloud anomaly [%]	-2.2	-5.1	-7.7

7.8 Potential Impacts

7.8.1 Embedded mitigation measures being incorporated into the design and construction of the Scheme are set out in Section 7.9 below. Prior to the implementation of any mitigation (embedded or additional), the Scheme has the potential to affect Climate Change (positively or negatively), during construction, operation and decommissioning. The potential beneficial impacts include the generation of renewable energy and the associated reduction in GHG emissions compared to the existing grid mix. The potential adverse impacts include emissions from construction activities, transportation, and the embodied carbon in materials used.

7.9 Embedded Mitigation

7.9.1 The Scheme has been designed, as far as practicable, to avoid and reduce impacts and effects on Climate Change and to increase Climate Change resilience through the process embedding measures into the design. In addition, how the Scheme is constructed, operated and maintained, and decommissioned would be controlled through measures secured in the DCO in order to manage and minimise potential environmental effects (required as a result of legislative requirements and/or standard sectoral practices). The relevant measures which form the GHG Reduction Strategy for the Scheme, as is required by NPS EN-1, are included within the **Outline CEMP [EN010168/APP/7.12]** and **Outline OEMP [EN010168/APP/7.13],** as relevant, rather than forming a separate document**.**

7.9.2 The following embedded mitigation measures have been incorporated into the Scheme design.

Construction (2027-2029)

GHG Impact

7.9.3 Embedded mitigation measures will be implemented to reduce the GHG impact of the Scheme. Specific embedded mitigation measures include the following and are also included in the **Outline CEMP [EN010168/APP/7.12]** and **Outline Site Waste Management Plan [EN010168/APP/7.16].**

7.9.4 Reducing waste:

- Reuse of materials on-site wherever feasible, e.g. reuse of excavated soil for landscaping;

- Off-site prefabrication, where practical, including the use of prefabricated elements;
- Segregation of waste at source, where practical, to facilitate a high proportion and high-quality recycling; and
- Off-site reuse, recycling and recovery of materials and waste where reuse on-site is not practical, e.g. through use of an off-site waste segregation or treatment facility or for direct reuse or reprocessing off-site.

7.9.5 General practices:

- Adopting the Considerate Constructors Scheme (CCS) to assist in reducing pollution, including GHGs, from the Scheme by employing good industry standard practice measures, e.g. recycling and separating waste and choosing low carbon and recyclable materials where feasible; and
- Conducting regular planned maintenance of the construction plant and machinery to optimise efficiency.

7.9.6 Reducing vehicle emissions:

- Encouraging the use of lower carbon modes of transport by identifying and communicating local bus connections and pedestrian and cycle access routes to/from the Scheme to all construction staff, and providing appropriate facilities for the safe storage of cycles;
- Switching vehicles and plant off when not in use and ensuring construction vehicles conform to current applicable EU emissions standards adopted by the UK (Ref 7-44); and
- Implementing a shuttlebus to reduce the number of trips made by construction staff.

Climate Change resilience

7.9.7 Climate change resilience measures are embedded within the Scheme, particularly in relation to flood risk. These measures are outlined below. The specific flood risk impacts and associated mitigation measures are discussed in more detail in **ES Volume 1, Chapter 11: Hydrology, Flood Risk and Drainage [EN010168/APP/6.1]** and include:

- Associated electrical infrastructure, including substations and Conversion Units (refer to **ES Volume 1, Chapter 3: The Scheme [EN010168/APP/6.1]**) are sequentially located to areas with a 'Low' probability of flooding (less than 1 in 1,000 annual probability of river or sea flooding (<0.1%)), where practicable;
- Less-flood sensitive infrastructure forming the wider Scheme (Solar PV Panels and cabling) will be sequentially located outside the 1 in 100 plus

climate change annual probability extent (1% +CC) or where this is not practicable restricted to areas which would experience less than 1m depth of flooding during the same event;

- For both fixed and tracker panels, all sensitive and electrical equipment on the Solar PV Panel will be elevated by the legs (including the solar panel face itself) so that it is no less than 0.6 metres above the above the 0.1% Annual Exceedance Probability (AEP) flood level;
- Tracker panel units will be mounted on raised frames (raised a minimum of 0.4 metres when on maximum rotation angle) and will therefore be raised above surrounding ground levels and fitted with a tracking system. During times of flooding, solar panels may be stowed by the tracking system algorithm onto a horizontal plane, to the minimum post height of 2.5 metres above ground level. This ensures that all sensitive and electrical equipment on the solar panel is raised to a minimum of 2.5 metres above ground level in the horizontal position;
- Protecting workers and resources from extreme weather conditions through appropriate PPE and working practices as secured through the detailed CEMP; and
- Monitoring weather forecasts and the news for Environment Agency flood warnings, relevant weather warnings, and water levels of the local waterways. This will be included within the detailed CEMP.

Operation (2029-2089)

7.9.8 Embedded mitigation measures to be applied during the operation and maintenance phase are set out in the **Outline OEMP [EN010168/APP/7.13]**. Specifically, those measures which are applicable for both construction and operation are set out below:

- Using equipment's cooling systems where necessary, i.e. for the BESS Area and for the standalone conversion units, and adapting working practices and equipment used based on current weather conditions;
- Protecting workers and resources from extreme weather conditions through appropriate PPE and working practices as secured through the OEMP;
- Monitoring weather forecasts and the news for Environment Agency flood warnings, relevant weather warnings, and water levels of the local waterways. This will be included within the OEMP; and
- BESS Area to include Heating, Ventilation and Cooling (HVAC) systems which would be contained within the individual equipment containers.

7.9.9 The Scheme itself mitigates against the effects of climate change. There is a need to generate electricity and generating this through solar power results in less GHG emissions than other conventional methods.

Decommissioning (2089-2091)

7.9.10 Similar measures will be developed prior to the decommissioning phase for the use of lower-carbon and more climate change resilient methods and will be outlined in the **Outline Decommissioning Statement (DS)** [**EN010168/APP/7.14**]. Detail about the measures is limited as the decommissioning environment beyond 2089 is likely to be considerably different to today.

7.10 Assessment of Likely Impacts and Effects

7.10.1 This section considers the potential impacts outlined in Section 7.8 and, taking into account the committed mitigation measures as detailed in Section 7.9, assesses the potential for the Scheme to generate effects using the methodology as detailed in Section 7.6.

GHG Impact Assessment

7.10.2 For each lifecycle stage of the Scheme (construction, operation and maintenance, and decommissioning), the associated GHG emissions are identified and assessed.

7.10.3 A summary of the anticipated GHG emissions arising from the Scheme are shown below:

Table 7-14: Possible sources of GHG emissions

Lifecycle Stage	Activity	Primary emission sources
Construction phase	The mining and generation of raw materials and manufacturing of products necessary to make equipment.	GHG emissions that are embodied within the product.
	This stage is anticipated to create a significant input to GHG emissions, due to the materials that contain high levels of embodied carbon, complex manufacturing processes and equipment design.	GHGs that are produced during manufacturing
	Construction activity on-site.	Energy consumption on-site. Commuting construction workers.
	Construction materials that are transported and not integrated in embodied GHG emission. Equipment required is likely to	Transportation of materials to the Sites and the amount of fuel consumed.

Lifecycle Stage	Activity	Primary emission sources
	require shipment, due to overseas origin.	
	Construction workers that would need transportation to the Site.	Transportation of workers to the Sites and resulting GHG emissions.
	Waste produced during the construction process that need to be disposed.	GHG emissions produced from the transportation and removal of waste materials
	Water use	Treatment of wastewater and supply of potable water
Operation and maintenance phase	Scheme maintenance	GHG emissions from maintenance. The operational aspects are expected to be negligible in the context of overall GHG emissions.
	Replacement of materials (i.e. batteries and replacement panels) Water use on site for fire suppression and cleaning panels.	GHG emissions that are embodied within the products and the transportation of the materials.
Decommissioning phase	Decommissioning activity occurring on-site.	Energy consumption of on-site vehicles and generators.
	Removal and transportation of any waste materials.	GHG emissions generated from the transportation and disposal of waste materials.
	Workers that would need to be transported to the Site	Transportation of workers to site and resulting GHG emissions

7.10.4 The impacts and effects (both beneficial and adverse) associated with the construction, operation and maintenance, and decommissioning of the Scheme are outlined in the sections below.

7.10.5 Whilst it is important to understand the GHG impacts at each individual lifecycle stage, it is also important to understand the net lifecycle GHG impact of the Scheme due to the long-term cumulative nature of GHG emissions over the assessed lifespan of the Scheme.

7.10.6 The net impact of the Scheme is also identified and assessed, taking into account the renewable energy generation and the benefit of this in the context of the wider energy generation sector and the National Grid average GHG intensity inclusive of future estimated emissions. This overall assessment, which accounts for all GHG emissions over the assessed lifespan of the Scheme, compares the Scheme's GHG intensity to the projected National Grid average GHG intensity for 2029, the year where the Scheme will be operational, to quantify the net GHG impact of the Scheme compared with other predicted energy generation sources. By using the first operational year data, the

assessment avoids the inherent uncertainties and potential fluctuations that may arise in future years. This includes uncertainties related to technological advancements, policy changes, market dynamics, and other factors that could impact the grid's carbon intensity and the Scheme's emissions. This does not double count for the effectiveness that the scheme will have in reducing overall grid emission intensity.

Construction (2027-2029)

7.10.7 The construction phase is anticipated to take approximately two years (24 months). Construction activities will be carried out Monday to Friday 07:00-18:00 and between 08:00 and 13:30 on Saturdays.

7.10.8 The construction phase for the Scheme includes the preparation of the Site, installing the access tracks, erection of security fencing, assembly and erection of the Solar PV Panels, installation of the inverters/transformers and grid connection.

7.10.9 The construction of the BESS Area element of the Scheme will include the preparation of the Site, installation of the access roads, erection of security fencing, assembly of the battery system, and installation of the Conversion unit and grid connection.

7.10.10 Calculations for the embodied carbon within the various products to be used on site and the sources for each are set out below.

Solar PV Panels

7.10.11 A Solar PV Panel is composed of multiple modules. It is estimated the total number of modules for Lime Down will be 598,260.

7.10.12 The EIA allows for either tracking or fixed panels. For the purpose of the GHG assessment, a conservative approach assuming the heavier tracking panels would be used has been included which result in greater GHG emissions. Should fixed panels be selected for the final design there would be a negligible decrease in emissions from this element of the Scheme.

7.10.13 The total weight of an individual module is anticipated to be 38.3 kg. For the purpose of this assessment it is considered that each module has 156 individual solar cells. The primary materials which go into construction of a Solar PV Panel are silicon, steel and glass.

7.10.14 The Global Silicon Council have produced a document, "Silicon-Chemistry Carbon Balance: An assessment of Greenhouse Gas Emissions and Reductions" (Ref 7-41) which states that each cell contains approximately 11g of silicon. Silicon has an embodied carbon value of 6 $kgCO_2e/kg$. Based on these figures, it is calculated that each panel has 1.584 kg silicon and an embodied carbon value of 9.504 $kgCO_2e$. The total embodied silicon from Solar PV Panels used by the Scheme is 6,160 tCO_2e

7.10.15 The surface area for one panel is anticipated to be 3.10 m^2. A value of 2.5 kg per mm thickness per m^2 as derived from (Ref 7-41) and glass thickness of 3.5 mm. The glass weight per panel is therefore 27.13 kg. An embodied carbon value of 1.4028 $kgCO_2e$ has been taken from (Ref 7-34) for glass. This gives a total of 22,772 tCO_2e for glass used across the Scheme.

7.10.16 It has been assumed that the remaining weight of the Solar PV panel, excluding silicon and glass, is primarily composed of steel. This gives an estimated weight of 9.45 kg steel per module. Using a value of 2.71 $kgCO_2e/kg$ this gives a total of 25.60 $kgCO_2e$ per module. The steel emissions from all solar modules used by the Scheme is 15,320 tCO_2e.

7.10.17 It is considered that each MW of electricity generated requires around 40 tonnes of Solar PV Mounting Structures. It has been assumed that all Solar PV Mounting Structures will be primarily made of steel.

7.10.18 Using a value of 2.71 $kgCO_2e/kg$ (Ref 7-34) and assuming the Scheme will generate the export capacity of 500 MW, a value of 54,200 tCO_2e has been estimated for the Solar PV Mounting Structures.

7.10.19 The total embodied carbon for all Solar PV Panels and Solar PV Mounting Structures, accounting for the materials used in the Scheme is: 98,451 tCO_2e.

Transformers, Inverters and Switchgear (contained within Conversion Units)

7.10.20 To calculate the embodied carbon associated with the production of the transformers to be used by the Scheme, the material breakdown of a typical transformer as reported in a lifecycle assessment produced by Hegedic et al (2016) (Ref 7-42) was used as a benchmark to estimate material quantities associated with the transformers required for the Scheme.

7.10.21 For the purpose of this assessment, it is assumed a total of two (2) x 400/33 kV, six (6) x 132/33 kV and 166 439kVA 33kV transformers with inverters and switchgear would be installed on Site.

7.10.22 The total weight of each transformer type is based on specifications of equipment on previous Island Green Power solar schemes.

7.10.23 The materials used in transformers are oil, steel, copper and plasterboard as set out in (Ref 7-42). The proportions of typical material are also shown in (Ref 7-42). As the total weight is known, the remaining materials have been proportioned out appropriately.

Table 7-15: Materials of $kgCO_2e$ in Transformers and Switchgear

Material	Total Weight (tonnes)	$kgCO_2e/kg$	tCO_2e
Steel	1266	2.364	2994
Copper	332	2.710	900
Plasterboard	83	0.390	32
Oil	370	1,401	518

Material	Total Weight (tonnes)	$kgCO_2e/kg$	tCO_2e
Total			4,445

Electrical Cables

7.10.24 Indicative cable lengths (2,755 km, of which 2.12 km correspond to high voltage cables) and weights (292.96 tonnes of which 50.95 tonnes correspond to high voltage cables) were estimated for Grid Connection Cables, On-Site Cables and Interconnecting Cables for the whole of the Scheme.

7.10.25 Total weight per meter was estimated for the two main materials based on cables used for similar schemes used within the cables. These are copper (21 kg/m) and aluminium (10.7 kg/m). The remaining weight is assumed to be polyethylene.

7.10.26 Embodied carbon values for each material have been taken from (Ref 7-34) and are shown below:

7.10.27 Copper: 2.71 $kgCO_2e/kg$;

7.10.28 Aluminium: 6.67 $kgCO_2e/kg$; and

- Polyethylene: 2.54 $kgCO_2e/kg$

7.10.29 The total embodied carbon from all electrical cables used by the Scheme is 876 tCO_2e.

BESS Containers

7.10.30 For the purpose of this assessment, a value of 100 $kgCO_2e$ per kWh is considered as a realistic worst case assumption. The assessed MWh battery storage has been assumed as 1,000 MWh.

7.10.31 Based on the above assumptions the total CO_2e from batteries is: 100,000 tCO_2e.

Shipping of Materials

7.10.32 Based on the provided shipping weights and making the precautionary assumption that all products would come from China, the below calculations are made. Shipping distance from Shanghai to Dover is 21,880km.

Table 7-16: Shipping GHG Emissions

Shipping Weight (tonnes)	Distance (km)	$kgCO_2e$/tonne/km*	$kgCO_2e$	tCO_2e
58,855	21,880	0.01321	17,011,028	17,011

* General Average Cargo Ship from Ref 7-34

Vehicle Movements

7.10.33 A 1-way distance of 31.36 km per journey has been assumed for the worker transportation calculations. The UK Government 2024 emissions factors for 'Average car' and 'Average Local Bus', including WTT emissions, have been applied to this distance and total worker numbers to calculate GHG emissions associated with worker transport.

7.10.34 There are 1,390 forecast daily construction worker movements (two-way trips) and an estimated construction phase of 529 days (estimated based on a worst case scenario of the Construction phase being 2 years). For the purpose of this assessment it is assumed 32 two-way trips by shuttlebus (20 people per shuttlebus equals to 622 worker movements) and 416 two-way trips by car considering 1.5 people per car (622 worker movements). Considering the conversion factor for a vehicle medium car for car movements and average local bus for the Shuttlebus, the total GHG emissions for construction workers is detailed in the table below:

Table 7-17: Construction Worker GHG Emissions

Vehicles	Number of Trips	Average Distance (km)	$kgCO_2e$/km (Ref 7-34)	$kgCO_2e$	tCO_2e
Vehicles	222,180	31.36	0.16807	1,171,039	1,171
Shuttle Bus	20,102	31.36	2.1692	1,367,461	1,367
Total					2,538

7.10.35 The total HGV trips for the Site have been estimated as 26,086 two-way trips and are set out below. This assessment has assumed that all the trips will be from China. The distance is estimated from industrial areas around Shanghai as detailed in Paragraph 7.4.13, and then from Dover to the Sites. The total road distance is consider to be 588.4 km. It is assumed that half of delivery vehicles will be articulated HGVs and half will be Rigid HGVs. To account for delivery to and from the Sites, it is assumed that vehicles will be 50% laden.

Table 7-18: Construction HGV GHG Emissions

Vehicles	Number of Trips	Average Distance (km)	$kgCO_2e$/km (Ref 7-34)	$kgCO_2e$	tCO_2e
HGV 50% Articulated	13,043	588.4	0.76642	5,881,891	5,882
HGV 50% Rigid	13,043	588.4	0.62106	4,766,326	4,766
Total					10,648

7.10.36 The total emissions from vehicle movements associated with the Scheme during construction has been estimated as 2,538 tCO_2e for construction workers and 10,648 tCO_2e for HGV.

Waste

7.10.37 Waste streams during the construction phase which have been assessed for their GHG Emissions include:

- Sewage Waste; and
- Excavated Ground material which cannot be reused.

7.10.38 Sewage waste generated during construction has been estimated at 16,376 m^3. Using a conversion factor of 0.18574 $kgCO_2e/m^3$ for water treatment (Ref 7-34), the total estimated emissions from sewage waste have been calculated at 3 tCO_2e.

7.10.39 It is estimated there will be a cut and fill balance and that no ground material will be trucked off site.

7.10.40 It is assumed that 5% of the concrete feet could be damaged unintentionally during the construction process and disposed of. This is estimated to be 78.50 tonnes. Using a conversion factor of 1.23393 $kgCO_2e/m^3$ for concrete disposed at landfill (Ref 7-31), the total estimated emissions from the damaged concrete feet have been calculated at 0.1 tCO2e.

7.10.41 The total waste generated during construction results in an estimated 3 tCO_2e.

Water Use

7.10.42 Water use has been estimated for:

- Water consumed for construction and cleaning of HGV and other equipment in litres; and
- Potable and non-potable water for drinking and sanitary purpose in litres.

Table 7-19: Total Construction Phase Water Use Emissions

Water use during construction (million litres)	Water Supply emissions ($kgCO_2e$/ million litres) (Ref 7-34)	$kgCO_2e$	tCO_2e
17.8	153.10865	2,720	3

Energy Use

7.10.43 Electricity for temporary site security during the construction phase and electricity for office cabin and welfare centres has been estimated for the construction phase.

Table 7-20: Energy usage during Construction Phase GHG Emissions

Total Energy usage (kWh)	Total kg CO_2e per kwh (Ref 7-34)	tCO_2e over construction phase
1,062,030	0.20705	220

Packaging of Materials

7.10.44 Information relating to the packaging for the Solar PV Panels and Solar PV Mounting Structures has been provided as set out below. As the volume has been provided but not the weight, typical conversion factors have been used to calculate the total weight and the total emissions from the packaging materials to be used.

Table 7-21: Packaging Materials Embedded GHG Emissions

Packaging Item	Total Volume (m^3)	Assumed Density Material (tonnes/m^3)	Total Weight (tonnes)	$kgCO_2e$/ tonne for material (Ref 7-34)	Total tCO_2e
Pallet Wood	8,253	0.70	5,777	6.41	37.03
Polyurethane Foam pad for cushioning between modules	5,487	0.024	131.69	6.41	0.84
Paper and Board	8,537	0.60	5,122.20	6.41	32.84
Corner pieces and edge spacers made of HDPE	100	0.02	2.40	6.41	0.02
Cable Drums	1,153	0.70	807.10	6.41	5.17
Pallet Nails	1,427,849[a]	0.79[b]	1.13	6.41	0.01
Total					75.91

a: Total number of pallet nails

b: Nail weight (g)

Summary of Construction GHG Emissions

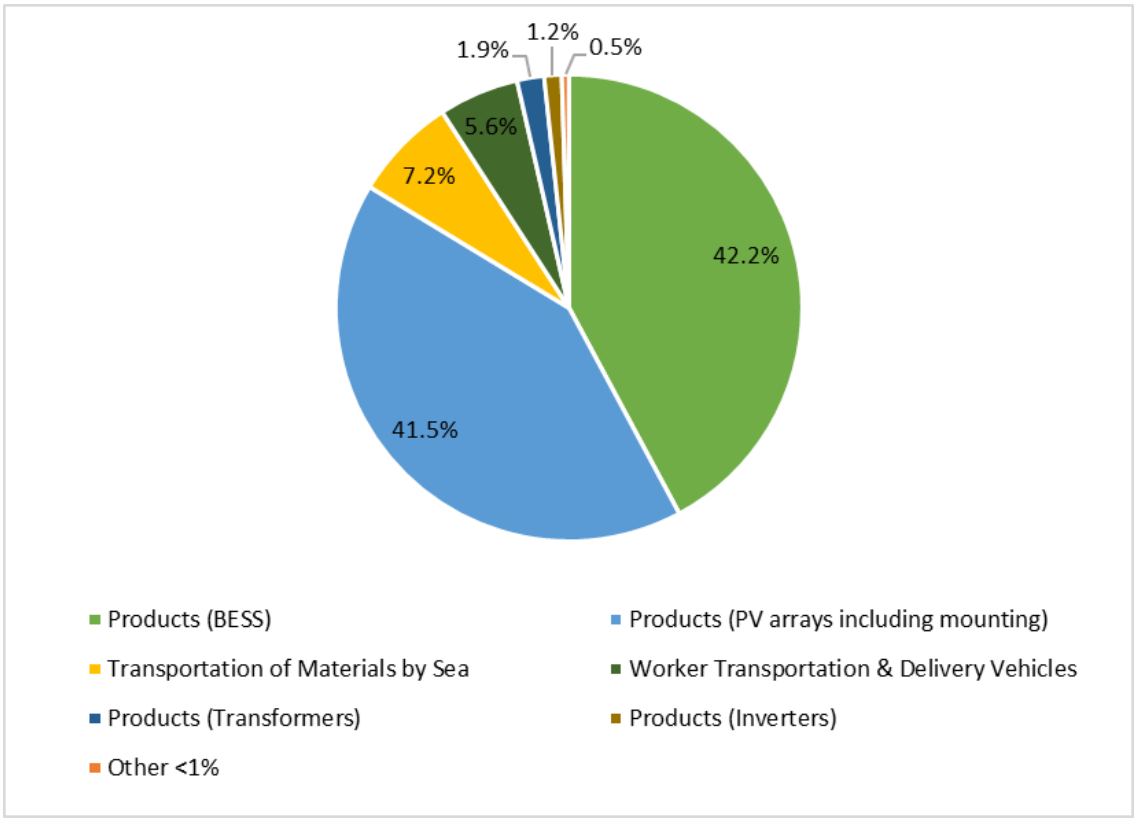
7.10.45 During the construction phase, the greatest impact of GHGs is the result of embodied carbon in the materials used for construction. As mentioned previously; the Solar PV Panels are expected to be sourced from China or a country of similar distance. The manufacture and supply of Solar PV Panels and

batteries will be the largest source of GHG emissions. The summary of GHG emissions during the construction phase is shown below.

Table 7-22: Construction GHG Emissions

Emissions Source	Emissions (tCO_2e)	% Construction Emissions
Products (BESS containers)	100,000	42.2
Products (Solar PV Panels including Solar PV Mounting Structures)	98,451	41.5
Transportation of Materials by Sea	17,011	7.2
Worker Transportation and Delivery Vehicles	13,187	5.6
Products (Transformers)	4,445	1.9
Products (Inverters)	2,872	1.2
Products (Cables)	876	0.4
Energy Usage for Construction Phase	220	0.1
Packaging	76	0.03
Concrete Feet	5	0.002
Water Usage	3	0.001
Waste	3	0.001
Total	**237,149**	**100.0**

Plate 7-2: Construction GHG Emissions



7.10.46 It has been identified that products and transportation of materials and workers will likely produce the greatest amount of GHG emissions and mitigation efforts will concentrate on these priority areas.

Significance of Effect (Construction)

7.10.47 Worst case total GHG emissions from the construction phase are estimated to equate to around 237,149 tCO2e.

7.10.48 GHG emissions from construction activities will be limited to the duration of the construction phase (anticipated to be 2 years). The emissions from the construction will not be evenly weighted between the 2 years but for the purpose of this assessment it is considered emissions will be evenly weighted between both years and will be made in 2027 and 2028. When annualised, the total annual construction emissions equate to around 118,574 tCO_2e.

7.10.49 **Table 7-23** presents the estimated construction emissions against the carbon budget periods during which they arise. Construction emissions will fall under the 4th and 5th UK carbon budgets.

7.10.50 As the construction phase will fall within the 4th and 5th carbon budgets, the annual emissions of each phase have been compared to the relevant annualised carbon budgets to enable assessment of the phases individually.

Table 7-23: Construction GHG Emissions and UK Carbon Budgets

Relevant UK Carbon Budget	Annualised UK Carbon Budget (tCO_2e)	Annual Construction Emissions for the Scheme During Carbon Budget Period (tCO_2e)	Construction Emissions for the Scheme as a Proportion of Carbon Budget
4th Carbon Budget (2023 to 2027)	390,000,000	118,574	0.030%
5th Carbon Budget (2028 to 2032)	345,000,000	118,574	0.034%

7.10.51 Annual emissions from the construction of the Scheme do not contribute to equal to or more than 0.030% and 0.034% of the 4th and 5th carbon budgets respectively. The magnitude of effect is therefore considered low. GHG emissions from the construction of the Scheme are considered to have a Minor Adverse effect on the climate.

Operation (2029-2089)

7.10.52 GHG emissions will be generated as a result of operational activities such as the transportation of operational workers to and from the Site, water consumption, and replacement and maintenance activities.

Sulphur hexafluoride

7.10.53 Sulphur hexafluoride (SF_6) is a potent GHG that will be used in electrical equipment associated with the Scheme: gas-insulated switchgear and transformers. SF_6 has a very high Global Warming Potential (GWP) of 23,900 compared to CO_2, meaning its potential to contribute to global warming is significantly greater that CO_2 over a 100-year period.

7.10.54 SF_6 is included in the Kyoto protocol as a GHG that should be considered in GHG assessments. While SF_6 has the potential to result in GHG emissions over the lifetime of the Scheme (i.e., during production, operation through leakage, and decommissioning), it has not been possible to quantify the potential fugitive emissions from SF_6 leakage. However, the Scheme will adhere to good practice and guidance. Gas-insulated switchgear equipment is now supplied to minimise leakages. Additionally, through regular checks of the equipment for gas leaks, it can be expected the leaks to be de minimis.

Maintenance Travel

7.10.55 For the purpose of this assessment, the operation and maintenance phase daily maintenance trips are considered equal to the construction phase daily trips as a worst case scenario. The figures are consistent with the transport chapter. Therefore, the operation and maintenance phase of the Scheme would generate approximately 74,859 tCO_2e as a result of operational workers travelling to and from the Sites for maintenance throughout the 60 year Scheme operation and maintenance phase.

7.10.56 The operation and maintenance GHG emissions calculated reflect a worst-case as the trips for maintenance are expected to be less than those required during construction. Additionally, calculations for worker transportation have been carried out using current conversion emissions factors to estimate emissions over the operational lifetime of the Scheme. However, carbon and emissions associated with energy and fuel use throughout the supply chain are anticipated to be lower in the future as a result of grid decarbonisation and machinery and vehicle electrification in line with the UK's net zero carbon emissions target for 2050.

Replacement of Scheme Components

7.10.57 The lifespan for the proposed BESS Containers is 10 to 15 years. For the purpose of this assessment, it is assumed that the design lifespan is 10 years as a worst case assumption. The BESS Containers are expected to require five (5) replacements throughout the operation and maintenance phase. While technology may have improved and some of the assumptions used, which underpin the embodied carbon values, as a conservative approach, it has been assumed that the embodied carbon at replacement will be the same as during the construction phase (see Paragraph 7.10.30). For each BESS Container replacement, considering the embodied carbon within the BESS Container and transportation emissions (sea and land) as described for the operation and

maintenance phase for each replacement, it is estimated that 106,170.7 tCO_2e will be emitted. This results in a total of 530,853.4 tCO_2e over the Scheme's lifespan considering five replacements.

7.10.58 It has been assumed that all panels will be fully replaced once during the lifecycle of the Scheme. Additionally, a 10% ad hoc replacement (0.16% replacement per year) was considered as a worst-case assumption. This results in a total estimated 57,039 tCO_2e over the Scheme's lifespan, inclusive of transportation emissions (sea and land).The Solar PV Mounting Structures are not assumed to require replacement.

7.10.59 Inverters are anticipated to have a lifespan of 10 years and as such are assumed to be replaced five times during the operation and maintenance phase. Transformers are anticipated to have a lifespan of 30 years and are assumed to be replaced once during the Scheme's lifespan as a worst case assumption. These replacements will generate tCO_2e for inverters and 5,038 tCO_2e for transformers inclusive of shipment.

Water Consumption

7.10.60 During operation to maintain the effectiveness and energy generation efficiency of the solar modules the panels will be cleaned, for the purpose of this assessment it is considered that the panels will be cleaned once per year. Water will be used for cleaning of the Solar PV Panels and for supply of drinking water on site. It is estimated 0.42 million litres per annum will be used. Over the lifespan of the Scheme, 25.4 million litres are estimated to be used.

7.10.61 Based on a water supply 149 $kgCO_2e$/million litres gives a total of 4 tCO_2e water use during the operation and maintenance phase of the Scheme.

Operational Waste and Packaging

7.10.62 There is anticipated to be 743.13 m^3 of sewage waste from the Scheme per annum. Using the wastewater value methodology as per the construction phase this gives a total of 44.6 tCO_2e over the Scheme's 60-year lifespan.

7.10.63 Packaging used during the replacement of products has been set below.

Table 7-24: Packaging Materials Embedded GHG Emissions

Packaging Item	Total Volume (m^3)	Assumed Density Material (tonnes/m^3)	Total Weight (tonnes)	$kgCO_2e$/ tonne for material (Ref 7-34)	Total tCO_2e
Pallet Wood	5,895	0.70	4,126.50	6.41	26.45
Polyurethane Foam pad for cushioning between modules	5,488	0.02	131.71	6.41	0.84

Packaging Item	Total Volume (m^3)	Assumed Density Material (tonnes/m^3)	Total Weight (tonnes)	kgCO_2e/ tonne for material (Ref 7-34)	Total tCO_2e
Paper and Board	6,098	0.60	3,658.80	6.41	23.46
Corner pieces and edge spacers made of HDPE	100	0.02	2.40	6.41	0.02
Cable Drums	221	0.70	154.70	6.41	0.99
Pallet Nails	142,458	0.79	1.13	6.41	0.01
Total					51.77

a: Total number of pallet nails

b: Nail weight (g)

Energy Usage

7.10.64 There will be some required energy use for operation of the Sites for the CCTV and monitoring systems and for the office. It is anticipated that GHG emissions from energy usage will reduce over the lifespan of the Scheme as a result of the decarbonization of the grid. However, that assumption is reliant on Schemes such as this one being developed. As a conservative assumption, the baseline value for 2029 from DESNZ (Ref 7-36) has been applied and the same emissions per kWh have been applied over the estimated 60-year Scheme lifespan.

Table 7-25: Operational GHG Emissions from Energy Usage

Total Energy usage (kwh)	Total kg CO_2e per kWh	tCO_2e over Scheme lifespan
79,650,900	0.0489	3,896

Ancillary BESS-Driven Carbon Reductions

7.10.65 The BESS Area is assumed to have a capacity of 1,000 MWh and has the capacity to supply 17,520 GWh to the grid over the Scheme's lifespan.

7.10.66 It is assumed the BESS Area is primarily charged from the solar farm's generation and discharged back into the grid once per day at a typical round-trip efficiency of 85% and has a degradation of 80%.

7.10.67 The additional benefits of the BESS Area can be calculated by comparing the energy provided by the BESS Area after being charged by the Scheme's energy generation with the projected carbon intensity of the grid in 2029 (Ref 7-36). According to these calculations, the use of the BESS Area for grid balancing could deliver an additional carbon saving of approximately 245,696 tCO_2e over the Scheme's lifespan.

7.10.68 However, to avoid potential double-counting of emissions savings, these additional carbon savings from the BESS Areas grid balancing function have not been included in the overall GHG assessment for the Scheme. The assessment focuses on the primary emissions reductions achieved through energy generation alone.

7.10.69 While these additional BESS-related savings are not factored into the overall assessment, it is important to acknowledge the significant climate change mitigation potential of integrating the BESS Area as part of the overall solar farm development. The BESS Area provides a distinct and valuable grid services function that can lead to substantial further emissions reductions beyond just the renewable energy generation.

Summary of Operational Effects

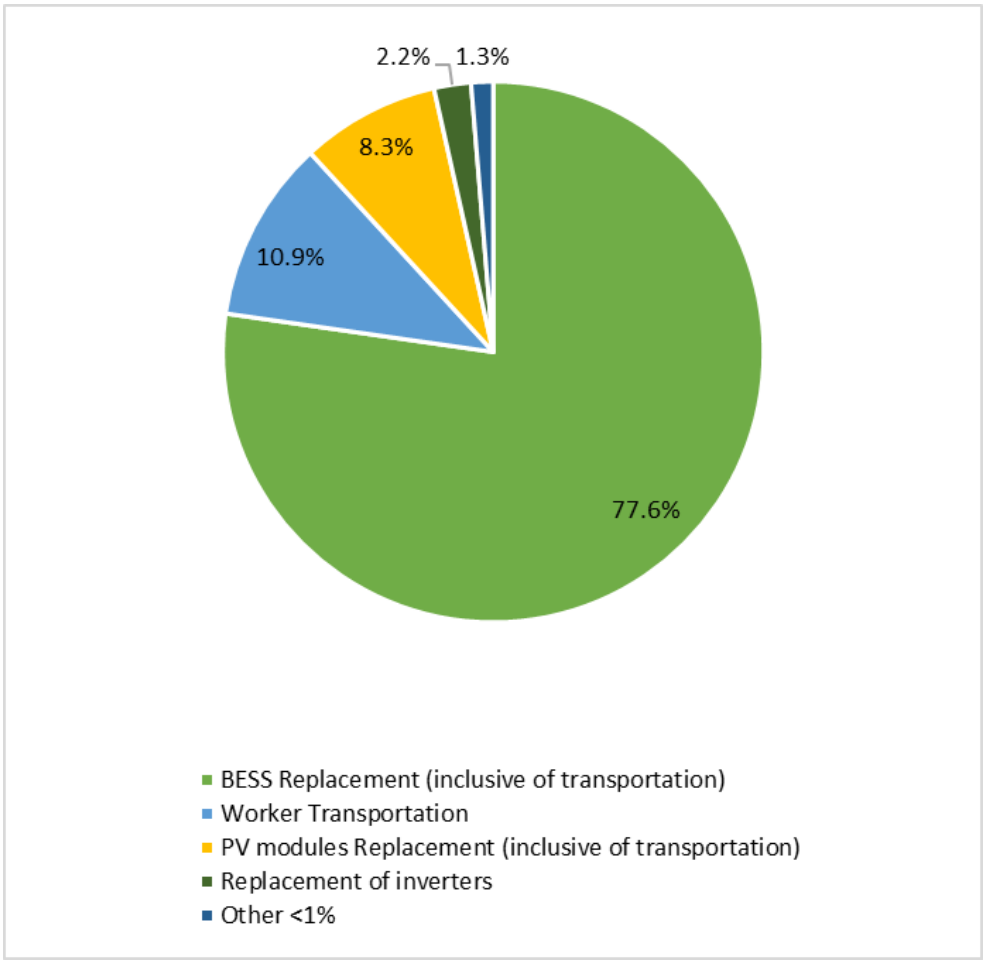
7.10.70 The below summary provides estimated GHG emissions over the whole 60-year operation and maintenance phase. As shown, the production of replacement batteries which are estimated to occur five times during the Scheme's lifespan is the greatest contribution to GHG emissions during operation and maintenance.

7.10.71 It should be noted that all estimated emissions are based on the current best available baseline data. It is anticipated that GHG emissions will reduce from the below sources in future years as technology improves and further policy and legislation, which are assumed to bring further GHG reductions, takes effect.

Table 7-26: Operational GHG Emissions

Emissions Source	Emissions (tCO_2e)	% Operational Emissions
BESS Replacement (inclusive of transportation)	530,853	77.27
Worker Transportation	74,859	10.90
PV modules Replacement (inclusive of transportation)	57,039	8.30
Replacement of inverters	15,206	2.21
Replacement of transformers	5,038	0.73
Energy Usage for Operation and Maintenance Phase	3,896	0.57
Packaging	52	0.01
Operational Waste	45	0.01
Water Usage	4	0.001
Total	**686,989**	**100**

Plate 7-3: Operational GHG Emissions



Significance of Effect (Operation)

7.10.72 As previously stated, the operation and maintenance phase of the Scheme will encompass the 5th (2028 – 2032), 6th (2033 – 2037) and 7th (2038 – 2042) national carbon budgets, however, budgets beyond this have not been published or recommended yet. Due to the nature of the Scheme, it is unlikely that any emissions derived from the operation and maintenance phase will produce GHG emissions >1% of the 5th, 6th or 7th carbon budgets. It is anticipated that the magnitude of effect is likely to be low.

7.10.73 Renewable energy generation from the Scheme during the first year of operation is estimated to be around 415,000MWh/year if tracker panels are used and around 438,000 MWh/year if fixed panels are implemented. To account for product degradation, a 2% degradation factor for the first year has been applied, followed by a 0.45% degradation factor for each subsequent year. This results in an estimated energy generation figure of 365,436 MWh in the final year of operation for tracker panels and 376,614 MWh for fixed panels. The total energy generated by the Scheme would be around 23.54 TWh and 24.26 TW over the 60-year Scheme lifespan for tracker and fixed panels respectively.

It is possible this is a slightly conservative estimate as future climate projections indicate a reduction in annual cloud cover over time (**Table 7-13**) which may have a beneficial impact on the energy generation potential of the Scheme but has not been taken into account in the calculations.

7.10.74 Accounting for the estimated construction phase and operation phase emissions, the Scheme's total carbon intensity value is 39.63 gCO_2e/kWh for tracker panels and 38.46 gCO_2e/kWh for fixed panels.

7.10.75 The available UK grid carbon intensity figure only considers operational emissions from the generation of electricity (Ref 7-34).

7.10.76 As such, to compare the performance of the Scheme with the grid emissions, the analysis is solely on the emissions associated with the ongoing operational activities. The emissions generated during the initial construction phase and eventual decommissioning are not included within this specific comparative assessment as recommended by ISEP guidance (Ref 7-30).

7.10.77 By aligning the lifetime energy generation figures with the other operational GHG emissions, the Scheme achieves a carbon intensity of 29.18 gCO_2e/kWh for tracker panels and 28.31 gCO_2e/kWh for fixed panels. This operational carbon intensity represents a significant improvement compared to the current carbon intensity of the UK grid.

7.10.78 It is worth noting that the calculation of the Scheme's carbon intensity has taken a conservative, reasonable worst-case approach. The assessment has incorporated assumptions that err on the side of caution, ensuring that the reported emissions profile is not understated. This approach provides confidence that the Scheme's actual carbon intensity will likely be even better than the presented figures.

7.10.79 For context only (noting that in the future all new such power station will need to be carbon capture ready and that it is ultimately intended that CCS will be applied to existing power stations, it is noted that the most carbon-efficient fossil-fuelled technology available is a gas-fired Combined Cycle Gas Turbine (CCGT) generating facility, which has a representative figure carbon intensity of 350 gCO_2e/kWh. It should be noted that NPS EN-1 (January 2024) requires all combustion power stations with a capacity at or over 300 MW to be constructed Carbon Capture Ready.

7.10.80 For the purpose of this assessment, the Scheme is compared to a 'without scheme' baseline based on the Department for Energy Security and Net Zero UK grid average projection for the first scheme operation year of 2029 (Ref 7-36).

7.10.81 The significance of effect will be concluded on for the whole lifespan of the Scheme (see 'Overall GHG Significance Effect section from Paragraph 7.10.87 onwards').

Decommissioning (2089-2091)

7.10.82 As the decommissioning activities associated with the Scheme will occur far into the future, more than 60 years from the date of writing this report; there is uncertainty over the total estimate of GHG emissions that will be produced and the available technology. However, the decommissioning phase GHG emissions are expected to be significantly lower than the construction phase. This is because the decommissioning activities do not require the extensive manufacturing, transportation, and installation of new equipment. The main decommissioning activities, such as dismantling, removal, and site restoration, are generally less emission intensive. Additionally, as the economy decarbonises over the coming years in line with national policy, emissions from sources such as worker transport and waste disposal are anticipated to be much lower.

7.10.83 For the purpose of this assessment, it is considered that the worker transportation emissions, the energy used by decommissioning equipment, the waste generated, and the water used produce the same emissions as for the construction phase. The HGV movements for removal are considered to emit half the emissions than the construction phase.

7.10.84 The decommissioning phase emissions account for less than 1% of the total GHG emissions of the Scheme.

Table 7-27 Decommissioning GHG Emissions

Emissions Source	Emissions (tCO_2e)	% Operational Emissions
Removal of onsite products and materials	5,324	59.14
Worker Transportation	2,582	28.68
Waste	876	9.73
Energy Usage for Decommissioning Phase	220	2.44
Water Usage	1	0.01
Total	**9,002**	**100.00**

Significance of Effect (Decommissioning)

7.10.85 The projected lifespan of the Scheme is estimated to be 60 years so it is unknown at this stage what the effects will be in the future. Also, the decommissioning phase GHG emissions will be lower than construction, for example because the products do not need to be produced and there will be technological advancements unknown to date.

7.10.86 Therefore, based on the expected lower emissions profile of the decommissioning phase compared to construction, the magnitude of effect is therefore considered low. GHG emissions from the decommissioning of the Scheme are considered to have a Minor Adverse effect on the climate. While it

is anticipated the GHG emissions will be less for decommissioning compared to construction, there will still likely be emissions arising at this stage, as such, it is anticipated that the effect of decommissioning on Climate Change will be minor adverse. This is based on the Scheme's GHG impacts being fully consistent with applicable existing and emerging policy requirements and good practice design standards at the time of decommissioning. This is not considered significant in EIA terms.

Overall GHG Significance Effect

7.10.87 UK's 4th, 5th and 6th carbon budgets have been used to contextualise emissions from the Scheme in line with ISEP guidance on Assessing Greenhouse Gas Emissions and Evaluating their Significance (Ref 7.28).

7.10.88 The UK's 5th carbon budget has been used to contextualise the magnitude of GHG emissions from the Scheme in **Table 7-28**, depending on the years in which the emissions are expected to occur. Construction emissions will fall under the 4th (2027) and 5th (2028) UK carbon budgets. For this comparison, it was considered that construction emissions will occur 50% in 2027 and 50% in 2028. In line with ISEP guidance on Assessing Greenhouse Gas Emissions and Evaluating their Significance, the electricity carbon budgets have been used to contextualise emissions from the Scheme. The operation and maintenance phase of the Scheme accounts for less than 1% of the 2027 and 2028 Electricity Carbon budgets. The Scheme will be operational no earlier than 2029, and therefore operational emissions up to 2037 (the end of the 6th carbon budget) will fall under the 5th, 6th and 7th UK carbon budgets, beyond which point no carbon budgets have yet been published either in full or for initial review.

Table 7-28 Contextualization of the Construction phase GHG emissions with the UK Carbon Budgets

Relevant Electricity Supply Sectoral UK Carbon Budgets	Annual Electricity Supply Sectoral Carbon budget ($MtCO_2e$)	Annual Emissions for the Scheme During Carbon Budget Period ($MtCO_2e$)	Emissions from the Scheme as a Proportion of Carbon Budget per annum
2027	26.7	0.117	0.44%
2028	23.8	0.117	0.49%

7.10.89 The UK carbon budgets are based on production emissions, rather than consumption. It should be noted that the bulk of manufactured components in this Scheme are manufactured overseas and imported to the UK. Furthermore, the manufacture of these components is the major contributor to the Scheme's GHG emissions.

7.10.90 Once in the operation and maintenance phase, the Scheme will achieve emissions reductions compared to the without-Scheme baseline, i.e. in a scenario in which the Scheme does not go ahead and the power it generates is provided by the 2029 grid supply projections which is inclusive of higher carbon generation sources than the Scheme.

7.10.91 The future baseline, a scenario without the Scheme, is based on forecast UK grid average energy emissions available from the Department for Energy Security and Net Zero (Ref 7-36) for the year 2029 (49 gCO_2e/kWh). The operational energy intensity allows isolated comparison of the emissions associated with operation of the Scheme compared to the alternative.

7.10.92 As the GHG electricity generation intensity figure for the Scheme is anticipated to sit continually below the forecast grid average for 2029, GHG emissions savings are expected to be achieved throughout the lifetime of the Scheme compared to a generation scenario in the absence of the Scheme. Therefore, the GHG emissions during construction, operation, and decommissioning of the Scheme can be considered to be 'offset' by the net positive impact of the Scheme on GHG emissions and the UK's ability to meet its carbon targets.

7.10.93 For the first operational year of the Scheme in 2029, the average emissions intensity from the grid are estimated to be 49 gCO2e/kWh (Ref 7-36). This is compared with the operational carbon intensity of the Scheme, which is projected to be 29.18 gCO_2e/kWh for tracker panels and 28.31 gCO_2e/kWh for fixed panels. The Scheme will have a positive effect in reducing emissions. The average carbon dioxide emission per kilowatt hour is lower than the average gCO_2e/kWh from the grid and therefore the Scheme will contribute to reducing the average emissions from the grid.

7.10.94 The comparison with other energy sources is set out below in **Table 7-29**.

Table 7-29 Comparison of Scheme Energy Intensity with other methods

Electricity Source	Technology	Lifecycle GHG Emissions (gCO_2e/kWh)
Coal	Coal Power equipped with a carbon capture and storage (CCS)	147 - 469
Natural Gas	Natural Gas combined cycle plant with CCS	90 - 220
Nuclear	Nuclear power	5.1 - 6.4
Typical Solar	Concentrated Solar Power (CSP)	27 - 122
	Photovoltaics	8 - 83
Wind	Onshore Wind Power	7.8 - 16
	Offshore Turbines	12 - 23

Electricity Source	Technology	Lifecycle GHG Emissions (gCO_2e/kWh)
Hydropower	Hydropower	6 – 147
Lime Down Solar Scheme	**Fixed Panels**	**28.31**
	Tracker Panels	**29.18**

7.10.95 As shown, in comparison to other energy generating methods, the scheme is less emitting than non-renewable sources and is towards the lower end of typical GHG emissions from Solar energy generation.

7.10.96 Over the Scheme's lifespan, which is estimated to be 60 years for the purpose of this assessment, it is estimated the Scheme will result in a net saving of 218,611 tCO_2e if tracker panels are used or 253,839 tCO2e for fixed panels in comparison with a scenario whereby the Scheme does not come into effect and emissions from the grid in the baseline year of operation were used.

7.10.97 As the GHG emissions from the Scheme in operation will offset emissions in a comparative scenario where energy generation may be from other sources with a higher carbon intensity, it is considered that the overall GHG impact of the Scheme is **beneficial and significant**. The Scheme avoids GHG emissions compared to the defined project future baseline in which energy producing emissions remain fixed in the opening year. The carbon intensity of the Scheme is lower than the projected grid carbon intensity for the future baseline.

7.10.98 The lifecycle carbon intensity of the Scheme (estimated to be 29.18 gCO_2e/kWh and 28.31 gCO_2e/kWh for tracker and fixed panels) is towards the lower end of the range for that generated from the poly-silicon, ground mounted solar energy sources as presented in **Table 7-11**. This is indicative of good practice for a ground-mounted solar PV system and falls considerably below the carbon intensity values for electricity generated by fossil fuel power stations. This demonstrates that the Scheme has been designed and located to minimise its carbon intensity, taking into account the geographical conditions of the Site.

7.10.99 Whilst the carbon intensity of electricity generated by the Scheme is higher than the lifecycle data for alternative low carbon forms of generation such as nuclear and onshore wind, it should be noted that NPS EN-1 (Ref 7-14) emphasises that to ensure reliable electricity systems during the transition to net zero 2050, the UK must adopt a diverse mix of renewable energy sources (including solar projects) to come forward.

Climate Change Risk Assessment

7.10.100 Potential climate risks to the construction, operation and maintenance and decommissioning phases and the likelihood, consequence and significance of these risks are detailed in **Table 7-18** and **Table 7-19**.

7.10.101 Future climate change projections have been reviewed and the sensitivity of Scheme components have been examined, before commenting on the adequacy of the climate change resilience measures built into the Scheme.

7.10.102 The receptor for the review of climate change resilience is the Scheme itself, including all infrastructure, assets, and workers on-site during construction, operation, and decommissioning. The sensitivity of the receptors has been evaluated based on their vulnerability, susceptibility to climate change associated impacts and their overall importance.

Table 7-30 Sensitivity of receptors

Receptors	Vulnerability	Susceptibility	Importance	Overall Sensitivity
Buildings and infrastructure including equipment and building operations	Moderate	Moderate	High	Medium
Human Health including construction workers and site users	Moderate	Moderate	High	Medium

7.10.103 The Climate Change risk assessment has considered the measures which are embedded into the design (see Section 7.9). These are considered an adequate response to the projected climate change impacts to which the Scheme would be exposed.

7.10.104 As a result of the proposed resilience measures no significant climate change risks during the construction, operation and maintenance or decommissioning phase have been identified.

Construction (2027 - 2029)

7.10.105 Due to projected changes in climate and increased environmental extremes; sensitive receptors during the construction process may be vulnerable. The climate risks are summarised in the table below.

Table 7-31 Construction Phase Climate Risk.

Climate Risk	Receptor	Consequence
Increased probability of extreme weather events	Buildings and Infrastructure	Restriction to site access and working hours causing delay to construction. Damage to materials

Climate Risk	Receptor	Consequence
Increased temperatures and heatwaves	Human Health	Poor working conditions impacting specific construction activities.
Increase rainfall events	Human Health	Poor working conditions impacting specific construction activities.

7.10.106 The climatic changes expected to take place during the construction phase have the potential to cause delays to the construction schedule due to the occurrence of severe weather events. The extreme weather conditions may also impact the health and safety of the workers on site. Nonetheless, the construction phase takes place within the early stages of the 2020 – 2039 range of climate scenarios as detailed in **Table 7-12**. As a consequence, the expected climate changes are not as severe and will likely be able to be mitigated against.

Operation (2029-2089)

7.10.107 The projected changes in climate and increased environmental extremes are likely to be more severe during the estimated 60 years life span of the Scheme. The climate risks are summarised in the table below.

Table 7-32 Operation and Maintenance Phase Climate Risk

Climate Risk	Receptor	Consequence
Increased frequency of severe weather events	Buildings and Infrastructure	Damage to infrastructure/assets due to heat stress or storm/flood damage
Increased summer and winter temperatures	Buildings and Infrastructure	Increase in the ambient temperature of energy storage units, resulting in higher ventilation and cooling requirements
Increased summer temperatures	Human Health	Health and safety risk due to increased risk of fire
Increased winter precipitation	Human Health	Health and safety risk due to increase in surface water flooding and standing water leading to land subsidence

Decommissioning

7.10.108 During the decommissioning phase, the risks will be the same as those in the construction phase identified in **Table 7-31**.

7.10.109 However, the impacts of climate change are expected to worsen and increase based on the currently available projections. This may increase the vulnerability

of sensitive receptors mentioned above for the construction process, however this has been factored in and does not change the outcome of the assessment.

Overall CCR Impact

7.10.110 Based on the above assessment, without appropriate mitigation the Scheme is at high risk to climate change impacts.

7.10.111 Embedded mitigation measures to increase the resilience of the Scheme to climatic changes are outlined in previous sections and summarised in **Table 7-33** and **Table 7-34**.

7.10.112 The CCR review has considered the measures which are integrated into the design (see Section 7.9) and based on the outcomes of the assessment, are considered an adequate response to the projected climate change impacts to which the Scheme would be exposed.

7.10.113 Detail of the risks, mitigation and likely significance is contained in **Table 7-33** for the construction and decommissioning phases and **Table 7-34** for the operation and maintenance phase.

Table 7-33 Potential Climate Change Impacts and Embedded Mitigation Measures during Construction and Decommissioning phase

Climate hazard	Potential Climate Change Impact	Receptor	Potential Climate Change Risk to Scheme	Embedded mitigation measure	Likelihood of Significant Effect	Consequence	Significance
High temperatures	Increase in annual temperature	Solar PV Panels, Construction Compounds, Site workers and visitors	Overheating of electrical equipment. Damage to materials. Risk of overheating to workers.	External contractors appointed by the Applicant will monitor weather forecasts and plan works accordingly, protecting workers and resources from any extreme weather conditions as described in the **Outline CEMP [EN010168/APP/7.12].**	Low	Minor adverse	Not Significant
	Increase in summer temperature	Buildings , Infrastructure, Site workers and visitors	Overheating of electrical equipment. Damage to materials. Risk of overheating to workers.	External contractors appointed by the Applicant will monitor weather forecasts and plan works accordingly, protecting workers and resources from any extreme weather conditions as described in the **Outline CEMP [EN010168/APP/7.12].**	Low	Minor adverse	Not Significant
	Increase in heat waves	Workers, staff and visitors on Site	Increased heat stress/heat exhaustion for workers.	External contractors appointed by the Applicant will monitor weather forecasts and plan works accordingly,	Low	Minor adverse	Not Significant

Climate hazard	Potential Climate Change Impact	Receptor	Potential Climate Change Risk to Scheme	Embedded mitigation measure	Likelihood of Significant Effect	Consequence	Significance
				protecting workers and resources from any extreme weather as described in the **Outline CEMP [EN010168/APP/7.12].**			
		Plant and vehicles, physical structures, materials,	Overheating of electrical equipment. Damage to materials	External contractors appointed by the Applicant will monitor weather forecasts and plan works accordingly, protecting workers and resources from any extreme weather. Equipment has cooling systems where necessary as described in the **Outline CEMP [EN010168/APP/7.12].**	Low	Minor adverse	Not Significant
High precipitation	Increase to winter rainfall	Plant and vehicles, physical structures, materials, and access routes to Solar PV Sites and access routes to Solar PV Sites.	Viability of and access to Solar PV Sites (such as heavy rain resulting in surface water flooding of local roads, sources of power supply or inundation of Solar PV Sites).	External contractors appointed by the Applicant will monitor weather forecasts and receive Environment Agency's (EA) flood alerts and plan works accordingly, protecting workers and resources from any extreme weather conditions	Low	Minor adverse	Not Significant

Climate hazard	Potential Climate Change Impact	Receptor	Potential Climate Change Risk to Scheme	Embedded mitigation measure	Likelihood of Significant Effect	Consequence	Significance
				such as storms, flooding as described in the **Outline CEMP [EN010168/APP/7.12].**			
Increase in storm intensity	Stronger winds, heatwaves, heavy precipitation	Plant and vehicles, physical structures, materials, and access routes to Solar PV Sites.	Damage to structures/materials/equipment and resulting in delays to programme and associated costs and/or unacceptable safety risks. May include high winds increasing dust (and other debris) and storm surge.	External contractors appointed by the Applicant will monitor weather forecasts and receive Environment Agency flood warnings and alerts and plan works accordingly, protecting workers and resources from any extreme weather conditions as described in the **Outline CEMP [EN010168/APP/7.12].**	Low	Moderate adverse	Not Significant
Increased fire risk	Drier and hotter conditions leading to increased risk of wildfires and uncontrolled fires	Buildings, Infrastructure, Site workers and visitors	Damage to structures/materials/equipment and resulting in delays to programme and associated costs and/or unacceptable safety risks.	Fire suppression system on site to rapidly action in case of fire as described in the **Outline CEMP [EN010168/APP/7.12].**	Very Low	Moderate adverse	Not Significant

Climate hazard	Potential Climate Change Impact	Receptor	Potential Climate Change Risk to Scheme	Embedded mitigation measure	Likelihood of Significant Effect	Consequence	Significance
			Threat to health and safety of workers and visitors				

Table 7-34 Potential Climate Change Impacts and Embedded Mitigation Measures during Operation and Maintenance phase

Climate hazard	Potential Climate Change Impact	Receptor	Potential Climate Change Risk to Scheme	Existing or embedded mitigation measure	Likelihood of Significant Effect	Consequence	Significance
High temperatures	Increase in summer temperature and increase in heatwaves	All receptors (infrastructure, buildings, workers and staff)	Increase in air conditioning requirements. Overheating of electrical equipment. Risk of overheating to workers.	BESS Area systems would include HVAC systems and these would be contained within the individual equipment containers as well as other measures outlined in the **Outline Battery Safety Management Plan (BSMP) [EN010168/APP/7.21].** Workers and staff to forecasts and plan works accordingly as described in the **Outline CEMP [EN010168/APP/7.12].**	Low	Moderate adverse	Not Significant
High precipitation	Increase to winter rainfall	All receptors (infrastructure, buildings, workers and staff)	Surface water flooding and standing waters. Deterioration of structures or foundations due to increase in soil moisture levels. Damage to building surfaces/exposed utilities from	The **Outline Water Resources Strategy (WRS) [EN010168/APP/7.25]** accompanying the DCO application, describes water management measures to control	Low	Minor adverse	Not Significant

Climate hazard	Potential Climate Change Impact	Receptor	Potential Climate Change Risk to Scheme	Existing or embedded mitigation measure	Likelihood of Significant Effect	Consequence	Significance
			increased drying/wetting and increase frost penetration	surface water run-off and drain hardstanding and other structures.			
Low precipitation	Decrease to summer rainfall	All receptors (infrastructure, buildings, workers and staff)	Water shortages. Deterioration of structures or foundations due to decrease in soil moisture levels.	Not Applicable	Very Low	Minor adverse	Not Significant
Increase in storm intensity	Stronger winds, heatwaves, heavy precipitation	Plant and vehicles, physical structures, materials, and access routes to Solar PV Sites.	Surface water flooding and standing waters. Deterioration of structures or foundations due to increase in soil moisture levels. Damage to building surfaces/exposed utilities from increased drying/wetting and increase frost penetration or tree falls. Strong winds damaging structures directly or via falling trees and debris.	The **Outline WRS [EN010168/APP/7.25]** accompanying the DCO application, describes water management measures to control surface water run-off and drain hardstanding and other structures.	Low	Minor adverse	Not Significant
Increased fire risk	Drier and hotter conditions leading to increased risk of wildfires and	Buildings, Infrastructure, Site workers and visitors	Damage to structures/materials/equipment and resulting in delays to programme and associated costs and/or unacceptable safety risks.	Fire suppression system on site to rapidly action in case of fire as described in the **Outline CEMP [EN010168/APP/7.12].**	Very Low	Moderate adverse	Not Significant

Climate hazard	Potential Climate Change Impact	Receptor	Potential Climate Change Risk to Scheme	Existing or embedded mitigation measure	Likelihood of Significant Effect	Consequence	Significance
	uncontrolled fires		Threat to health and safety of workers and visitors				

In-Combination Climate Change Impact Assessment

7.10.114 The greatest risk of in combination effects are increased flooding events from extreme weather arising from a changing climate.

7.10.115 There is potential for in-combination effects on receptors, including flood risk to future people and/or property at the Solar PV Sites and surrounding areas, construction workers and construction equipment, and local watercourses and groundwater bodies. These effects may arise in conjunction with Ecology (**ES Volume 1, Chapter 9: Ecology and Biodiversity [EN010168/APP/6.1]**), particularly regarding impacts on watercourses and associated sensitive habitats, and Ground Conditions (**ES Volume 1, Chapter 19: Ground Conditions and Contamination [EN010168/APP/6.1**]), with respect to interactions with groundwater and soil stability.

7.10.116 Referring to the list of receptors in **ES Volume 1, Chapter 21: Cumulative Effects and In-Combination Effects [EN010168/APP/6.1],** there is potential for in-combination effects with Ecology and Biodiversity, Ground Conditions and Hydrology and Flood Risk.

7.10.117 The in-combination with climate change effects have been assessed in relevant chapters of this ES as set out below, focused on the operation and maintenance phase:

- **Chapter 9: Ecology and Biodiversity [EN010168/APP/6.1]** in relation to potential climate change impacts on habitats and/or species. Furthermore, habitats might become more threatened or rare over time, especially wetland or woodland habitats which are relatively uncommon within the Order Limits;
- **Chapter 11: Hydrology, Flood Risk and Drainage [EN010168/APP/6.1]** in relation to potential increases in flood risk when accounting for climate change scenarios, to future people and property at the Solar PV Sites and surrounding areas, construction workers and equipment, local watercourses, and groundwater bodies. Chapter 11, assesses the impact of climate change on flood risk using the latest Environment Agency guidance (Flood Risk Assessments: Climate Change Allowances, Environment Agency, February 2023). For example, drainage measures have been sized to contain the 1 in 100-year rainfall event plus 45% climate change uplift without uncontrolled runoff;
- **Chapter 13: Transport and Access [EN010168/APP/6.1]** in relation to construction vehicles greenhouse gas emissions which have an impact on the global climate; and
- **Chapter 19: Ground Conditions [EN010168/APP/6.1**] in relation to potential changes in ground conditions (e.g. disturbance of potentially

contaminated land, mobilisation of pollutants, alteration of drainage pathways).

7.10.118 Following the respective mitigation measures outlined in those chapters, the impacts of the Scheme when accounting for climate change, are considered to be effectively managed and mitigated.

7.11 Additional Mitigation

7.11.1 While worst case assumptions have been made for the purpose of the GHG vehicle type around use of HGVs for transport of construction materials, wherever possible vehicles with lower carbon emissions would be used. This should be achievable as technology improves and lower emission HGVs become more available.

7.11.2 As discussed in Paragraph 7.9, the Scheme incorporates embedded GHG mitigation measures that prioritise the use of low-carbon design materials and construction practices.

7.11.3 Other embedded GHG mitigation measures include construction phase waste reduction, the use of low-carbon materials, and transport emission controls, as well as climate resilience measures such as flood risk management. Based on the conclusions of the assessment, no additional mitigation measures are required in terms of Climate Change.

Monitoring

7.11.4 Monitoring the weather is essential and it is described in the **Outline CEMP [EN010168/APP/7.12], Outline OEMP [EN010168/APP/7.13]** and **Outline DS [EN010168/APP/7.14]**. This includes regularly monitoring weather forecasts and the news for Environment Agency flood warnings, relevant weather warnings, and water levels of the local waterways. Monitoring weather forecasts will be integral to planning works accordingly and safeguarding against extreme weather conditions. As detailed in the **Outline CEMP [EN010168/APP/7.12], Outline OEMP [EN010168/APP/7.13]** and **Outline DS [EN010168/APP/7.14]**, this proactive approach ensures the safety of workers and the protection of infrastructure. Additionally, external contractors appointed by the Applicant will be responsible for monitoring weather forecasts and receiving Environment Agency flood warnings and alerts. This ensures that all works are planned and executed in a manner that minimizes risks associated with adverse weather. By responding appropriately and in a timely manner to varying weather conditions, the Scheme can effectively mitigate potential disruptions and ensure the continuity and safety of its operations.

7.12 Residual Effects and Conclusions

GHG Assessment

Residual Effects

7.12.1 This section summarises the residual significant effects of the Scheme on Climate Change following the implementation of embedded and additional mitigation.

7.12.2 During the different stages of the Scheme (construction, operation, and decommissioning), GHG emissions will be generated byproducts, transport, energy, and fuel-use used by the Scheme.

7.12.3 Significant residual effects are defined as **significant and beneficial** for the whole Scheme lifecycle for the GHG assessment. For Construction and Decommissioning residual effects are defined as **Minor adverse** and are listed in **Table 7-35**. **Table 7-36** lists the residual effects for the operation and maintenance phase, which are defined as **significant and beneficial**.

Conclusions

7.12.4 The GHG assessment findings indicate the Scheme will yield beneficial impacts and achieve a net reduction in GHG emissions. This is compared to a scenario without the Scheme, where energy would need to be generated using the grid methods.

Climate Change Risk Assessment

Residual Effects

7.12.5 The climate change risk assessment has considered the measures which are integrated into the design (see Section 7.9). These measures are considered adequate to address the projected climate change impacts to which the Scheme would be exposed.

7.12.6 The design incorporates climate resilience through embedded design mitigation measures.

Conclusions

7.12.7 The Scheme's design and integrated mitigation measures effectively address climate change risks. No significant climate change risks during the construction, operation and maintenance or decommissioning phase have been identified.

7.12.8 See **ES Volume 1, Chapter 22: Summary of Significant Effects [EN010168/APP/6.1]** for a summary of significant effects.

Table 7-35 Summary of Significant Residual Effects (Construction and Decommissioning)

Receptor	Sensitivity (value)	Description of impact	Mitigation/Enhancement measure	Residual effect after mitigation
Global Climate	High	GHG emissions arising principally from the embodied carbon of materials. Particularly embodied carbon of Solar PV Panels and batteries.	Reduce waste, maximizing reuse and recycling, and reducing emissions from construction activities and transportation. Measures to be contained in the **Outline CEMP [EN010168/APP/7.12],** the **Outline DS [EN010168/APP/7.14]** and the **Outline Site Waste Management Plan [EN010168/APP/7.16].**	Minor Adverse residual effect, as every GHG emission pose a risk to the global climate. Despite this, the emissions generated during the construction will be totally offset during the operation and maintenance phase as the Scheme will result in lower emissions compared to not building the Scheme.
Scheme (Plant and vehicles, physical structures, materials, and access routes to sites) and Workers, staff and visitors on site	Moderate	Stronger winds, heatwaves, heavy precipitation and increased risk of fires/wildfires.	Resilient design of infrastructure. The contractors will monitor weather forecasts and receive Environment Agency's (EA) flood alerts and plan works accordingly, protecting workers and resources from any extreme weather conditions such as storms. Measures to be contained **Outline CEMP [EN010168/APP/7.12]** and the **Outline DS [EN010168/APP/7.14].**	Not significant

Table 7-36 Summary of Significant Residual Effects (Operation and Maintenance)

Receptor	Sensitivity (value)	Description of impact	Mitigation/Enhancement measure	Residual effect after mitigation
Global Climate	High	GHG emissions arising principally from the embodied carbon of materials that need to be replaced during the Scheme lifespan. Particularly batteries and Solar PV Panels.	Reduce waste, maximizing reuse and recycling, and reducing emissions from operation. Measures to be contained CEMP, OEMP.	**Significant beneficial effect**. The emissions generated will be totally offset as the Scheme will result in lower emissions per kWh compared to not building the Scheme.
Scheme (Plant and vehicles, physical structures, materials, and access routes to sites) and Workers, staff and visitors on site	Moderate	Stronger winds, heatwaves, heavy precipitation and increased risk of fires/wildfires.	Resilient design of infrastructure. The contractors will monitor weather forecasts and receive Environment Agency's (EA) flood alerts and plan works accordingly, protecting workers and resources from any extreme weather conditions such as storms. Measures to be contained within the detailed CEMP and OEMP.	Not significant

7.13 Cumulative Effects Assessment

Inter-Project Cumulative Effects

7.13.1 This section presents an assessment of cumulative effects between the Scheme and other proposed and committed plans and projects.

7.13.2 This assessment has been made with reference to the methodology and guidance set out in **ES Volume 1, Chapter 6: EIA Methodology [EN010168/APP/6.1]** and shortlist of cumulative plans and projects identified in **ES Volume 3, Appendix 21-1: Long List of In-Combination Effects and Cumulative Developments [EN010168/APP/6.3]**.

7.13.3 For individual receptors, this cumulative effect assessment identifies where the assessed effects of the Scheme could interact with effects arising from other plans and/or projects on a spatial and/or temporal basis.

7.13.4 The receptor for the GHG Assessment is the global atmosphere. All projects worldwide have the potential to contribute to cumulative impacts on the global climate through their GHG emissions. As per ISEP and precedent, and supported in case law, it is not appropriate to undertake a cumulative assessment for GHG assessments, as the climate is global and so a cumulative assessment would require an assessment of all potential worldwide future developments which is not feasible, and it is not appropriate to seek to only assess only some specific schemes. Instead, the appropriate approach is to consider the Scheme's emissions in the context of Carbon budgets as they are considered to be inherently cumulative. This has been done in **Section 7.10** of this chapter.

7.13.5 The receptor for the Climate Resilience Review is the Scheme itself. As the effects being judged are to the project itself there can be no cumulative effects to other receptors.

In-Combination Cumulative Effects

7.13.6 In-combination cumulative effects are those where impacts from two or more environmental disciplines are considered likely to result in a new or different likely significant effect, or an effect of greater significance, than any one of the impacts on their own. The identified in-combination effects are set out within **ES Volume 1, Chapter 21 Cumulative and In-Combination Effects [EN010168/APP/6.1]**.

7.13.7 No in-combination effects alongside climate change have been identified as a result of the Scheme.

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