# Green Hill Solar Farm

## Preliminary Environmental Information Report

## Chapter 07 Climate Change

Prepared by: Bureau Veritas

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# Contents

# 7 Climate Change

## 7.1 Introduction

7.1.1 This chapter of the Preliminary Environmental Information Report (PEIR) presents the findings of the Environmental Impact Assessment (EIA) work undertaken to date concerning the potential impacts of the Scheme on the climate during the construction, operational and maintenance, and decommissioning phases. The following aspects will be considered within the climate change assessment process and will align with the requirements of the Infrastructure Planning (Environmental Impact Assessment) Regulations (2017) (Ref.1):

- Greenhouse Gas (GHG) Emissions Impact Assessment – The impact of GHG emissions arising from the Scheme on the climate over its lifetime;
- Climate Change Risk (CCR) Review – The resilience of the Scheme to climate change impacts; and
- In-combination Climate Change Impact (ICCI) – The combined impact of the Scheme and future climate change on the receiving environment.

7.1.2 For more details about the Scheme, refer to **Chapter 4: Scheme Description** of this PEIR.

7.1.3 This chapter is supported by the following tables:

- Table 7.1: Summary of Consultation and Responses.
- Table 7.2: UK National Carbon Budgets.
- Table 7.3: Possible Sources of GHG Emissions.
- Table 7.4: Significance levels as per IEMA guidance (Box 3 Ref.24).
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## 7.2 Consultation

7.2.1 An EIA Scoping Report was submitted to the Planning Inspectorate (PINS) in July 2024, with a formal request for Scoping Opinion. PINS subsequently issued the Scoping Opinion on the proposed scope in August 2024. Consultation undertaken throughout the pre-application and scoping phase for the Scheme has informed the approach to the climate change assessment and the information provided within this chapter.

7.2.2 A summary of consultation and response to the Scoping Report are outlined below in **Table 7.1**.

**Table 7.1: Summary of Consultation and Responses**

| Consultee and Date | Response | Outcome and any further steps anticipated |
|---|---|---|
| The Planning Inspectorate<br><br>Scoping Opinion<br><br>August 2024 | **Sea Level Rise**<br><br>The Applicant explains that the Proposed Development 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 that an assessment of sea level rise can be scoped out of further assessment. | Scope agreed and no further action required. |
| The Planning Inspectorate<br><br>Scoping Opinion<br><br>August 2024 | **Significance Criteria and Methods**<br><br>The Scoping Report does not set out the significance criteria used for the climate change chapter, nor the guidance proposed to be used for the assessment. If the conclusions in the Climate Change ES chapter rely on the overarching methodology in the ES, then this needs to be clearly stated. The ES needs to state which guidance has been used to derive the methods for assessment of this aspect. | Section 7.4 of this PEIR chapter expands on the proposed significance criteria and methodology |
| The Planning Inspectorate<br><br>Scoping Opinion<br><br>August 2024 | **Carbon Budgets**<br><br>The Scoping Report states that for operational stages post 2037, the sixth UK carbon budget will be used, as later carbon budgets are not available. Should a later carbon budget become available prior to submission of the application, this should be used for post 2037 rather than the sixth UK carbon budget. | This is accepted. For the purpose of the assessment the furthest future Carbon Budget will be used as a conservative approach. |

## 7.3 Legislation, Planning Policy and Guidance

7.3.1 This section provides an overview of the legislation, planning policy and guidance against which the Scheme will be considered for climate change.

### Legislation

#### International Legislation

*Kyoto Protocol (Ref.2)*

7.3.2 The Kyoto Protocol is a United Nations adopted in 1997 and set targets for developed countries to reduce GHG emissions. The GHG definitions from the Kyoto Protocol have been used to inform this assessment of Climate Change.

*The Paris Agreement (Ref.4)*

7.3.3 As stated on the United Nations website, 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 4th November 2016.

7.3.4 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.

#### UK Legislation

7.3.5 *The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (Ref.3)*

7.3.6 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.

*Climate Change Act 2008 (Ref.5)*

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

*Climate Change Act 2008 (2050 target amendment) Order 2019 (Ref.6)*

7.3.8 This 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) Carbon Budget Order (2011) (Ref.8), Carbon Budget Order (2016) (Ref.9), Carbon Budget Order (2021) (Ref.10)*

7.3.9 Established under the Climate Change Act 2008, 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. **Table 7.2** 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 7.2: 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 |

## Planning Policy

### National Planning Policy

*National Policy Statement (NPS) for Energy EN-1 (Ref.11)*

7.3.10 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.

7.3.11 With particular reference to sections 2.2 (Net zero by 2050), 2.3 (Meeting net zero), 2.4 (Decarbonising the power section), 4.10 (Climate Change Adaptation and Resilience) and 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.

7.3.12 Paragraphs 4.10.5 to 4.10.12 in relation to the applicant's assessment and paragraphs 4.10.13 to 4.10.19 in relation 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.

7.3.13 Paragraphs 5.3.4 to 5.3.7 are relevant in relation to the applicant assessment relevant policy, assessment requirements, mitigation and paragraphs 5.3.8 to 5.3.12 include Secretary of State decision making criteria regarding GHG emissions and mitigation. The guidance states that, all proposals for energy infrastructure projects should include a GHG assessment as part of their ES including:

- *A whole life GHG assessment showing construction, operational and decommissioning GHG impacts;*
- *An explanation of the steps that have been taken to drive down the climate change impacts at each of those stages;*
- *Measurement of embodied GHG impact from the construction stage;*
- *How reduction in energy demand and consumption during operation has been prioritised in comparison with other measures;*
- *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*.

7.3.14 The guidance also states that, a GHG assessment should be used to drive down GHG emissions at every stage of the proposed 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, as we transition to net zero.

7.3.15 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 (Ref.12)*

7.3.16 Section 2.10 reaffirms the government commitment to sustained growth in solar capacity to align with the net-zero emissions by 2050 target. With reference to section 2.4 (Adaptation) and paragraph 2.4.11 for solar photovoltaic.

*NPS for Electricity Networks Infrastructure EN-5 (Ref.13)*

7.3.17 With particular reference to paragraph 2.3.2 regarding the importance of climate change resilience.

*National Planning Policy Framework (NPPF) (Ref.13)*

7.3.18 The NPPF sets out the government's planning policies for England and how they should be applied. In particular, Section 14 highlights the importance of integrating climate change considerations into the planning system by promoting for development that reduces greenhouse gas emissions and enhances resilience against future climate risks.

*Net Zero Strategy, 2021 (Ref.15)*

7.3.19 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.16)*

7.3.20 Published in 2017, is designed to outline 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.17)*

7.3.21 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 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.18)*

7.3.22 The policy outlines the country's commitment to reducing greenhouse gas emissions in accordance with the Paris Agreement on climate change. Specifically, the UK aims to achieve a reduction of greenhouse gas emissions by at least 68% by 2030, relative to 1990 levels. As part

of this commitment, the NDC emphasizes 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.19)*

7.3.23 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.

**Local Planning Policy**

*North Northamptonshire Carbon Management Plan 2022 (Ref.20)*

7.3.24 The document outlines the regional strategy to reduce carbon emissions and addressing climate change. The plan outlines a range of objectives focused on achieving carbon neutrality by 2030, improving energy efficiency, and promoting sustainable practices. Key objectives include reducing greenhouse gas emissions, increasing the use of renewable energy, enhancing climate resilience, and encouraging sustainable development and transportation.

*West Northamptonshire Joint Core Strategy Local Plan (Version 1.0) (Ref.21)*

7.3.25 The West Northamptonshire Joint Core Strategy Local Plan (Part 1) states in paragraph 4.44:

*"Development that aims to secure sustainable communities is designed to minimise its impact on the environment and so combat climate change. A realistic and serious response to meeting climate change objectives must be made through the JCS direction on policies. Larger scale developments, including Sustainable Urban Extensions (SUEs), provide the opportunity to secure exemplary standards of design, renewable or low carbon energy generation and through the location of development reduce the need to travel. All development proposals will need to fully consider climate change adaption to meet the vision of sustainable development."*

*An Environmental Framework for the West Northamptonshire Unitary Authority, West Northamptonshire Environment Task and Finish Group (Ref.22)*

7.3.26 The framework identified decisions, policies and services, which could all contribute towards protecting the environment and tackling climate change. It recommends declaring a climate emergency and bringing forward further renewable energy generation and storage projects.

*Northamptonshire Climate Change Strategy 2020 – 2023 (Ref.23)*

7.3.27 The document reflects the county's commitment to address climate change and reduce carbon emissions. It aims to increase the adoption of renewable energy sources such as solar energy.

**Guidance**

*Environmental Impact Assessment Guide to: Assessing Greenhouse Gas Emissions and Evaluating their Significance. Institute of Environmental Management and Assessment (2022) (IEMA) (Ref.24)*

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

*Climate Change Adaption Practitioner Guidance (2022) (IEMA) (Ref.25)*

7.3.29 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) (IEMA) (Ref.26)*

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

*Planning Policy Guidance (PPG) (Ref.27)*

7.3.31 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 2023 (Ref.28)*

7.3.32 The UK Government issues emission conversion factors for use to report on greenhouse gas emissions.

## 7.4 Assessment Methodology

### Study Area

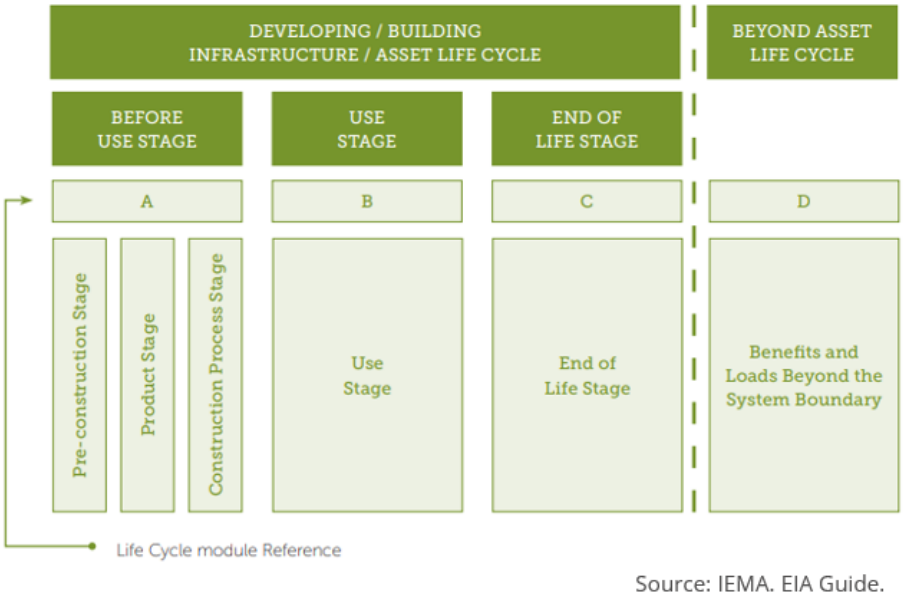
**Greenhouse Gas (GHG) Impact Assessment**:

7.4.1 According to the latest IEMA guidance, the Study Area for the assessment of GHG emissions is considered to be the global climate.

7.4.2 The preliminary GHG Impact Assessment is based on the Scheme lifecycle stages shown in **Figure 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 Mmaintenance phase', and end of life stage (C), referred to as the 'decommissioning phase'. Both direct emissions from activities within the Scheme, as well as indirect emissions from activities outside the Scheme, for example, embodied carbon within construction materials and emissions arising during transportation of materials and personnel to the Scheme, have been considered in the assessment.

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

**Figure 7. 1 Modular approach of life cycle stages and modules (Ref.24)**




Source: IEMA. EIA Guide.

**In-combination Climate Change Impact (ICCI) Assessment**:

7.4.4 The ICCI Study Area considers receptors that are identified within the Flood Risk assessment as outlined in **Chapter 10: Hydrology, Flood Risk and Drainage** and other relevant topic chapters (for example, ecology and arboriculture chapters) that will be impacted by the Scheme in combination with future climatic conditions.

7.4.5 Baseline Conditions for the ICCI Assessment will be determined using the climate change projections data.

**Climate Change Risk (CCR) Assessment**

7.4.6 For the CCR Assessment, the Study Area for this assessment is the Order Limits of the Scheme during construction, operation and maintenance and decommissioning phases.

7.4.7 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.

**Impact Assessment Methodology**

7.4.8 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 (Ref.24) and considering climate change resilience and adaptation (Ref.25) in EIA.

7.4.9 While the lifecycle GHG impact assessment assesses the significance of the GHG impact of the Scheme, the CCR review does not assess the significance as only a review of the impacts is required in line with the IEMA guidance.

**GHG Impact Assessment**

7.4.10 The PEIR GHG Impact Assessment offers initial information on a quantitative assessment of GHG impacts, based on the preliminary data available at the time of writing (September 2024). The final submitted ES will include a comprehensive GHG Impact Assessment. Any remaining data gaps in the ES will be explicitly noted, and a qualitative method for evaluating GHG impacts will be applied, in accordance with IEMA guidelines.

7.4.11 For the baseline scenario, the GHG emissions from land use, current methods of generating power taking into account the progressive shift to Net Zero through the requirement for new combustion power stations >300MW to be Carbon Capture Ready (CCR), and the development of carbon capture projects to reduce emissions from existing plant, and available baseline information were considered to the extent possible. For the Scheme, a project lifecycle approach was followed to estimate the GHG emissions associated with different stages of the Scheme, including construction, operation and maintenance, and decommissioning, expressed in tonnes of $CO_2$ equivalent ($tCO_2e$). **Table 7.3** summarises potential sources of GHG emissions for each stage of the Scheme.

**Table 7.3: Possible Sources of GHG Emissions**

| Lifecycle Stage | Activity | Primary Emission Sources |
|---|---|---|
| Construction Phase | The extraction of raw materials and manufacturing of products necessary to make equipment.<br><br>This stage is anticipated to contribute significantly to GHG emissions, due to the materials that contain high levels of embodied carbon, complex manufacturing processes and equipment design. | GHG emissions embodied within the product.<br><br>GHGs that are produced during manufacturing. |
| | 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. |
| | Construction activity on-site. | Energy consumption on-site. Commuting construction workers. |
| | Waste produced during the construction process that needs to be disposed of. | 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 operation | Emissions from routine maintenance are expected to be negligible. However, the periodic replacement of components will be assessed as part of the Scheme operation. An indicative schedule of panel replacements will be used to inform the assessment. |
| | Scheme maintenance | |
| | Replacement materials (i.e. batteries and replacement panels) | |
| | Water use on-site for fire suppression and cleaning panels | |
| 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. The use of materials with high associated waste treatment emissions. |
| | Workers that would need to be transported to the site | Transportation of workers to site and resulting GHG emissions. |

7.4.12 The study includes activities that might be prevented or changed due to the Scheme, such as existing power production methods. The assessment also considers the emissions avoided as a result of the Scheme, for example, comparison with the UK grid average emissions without the scheme in place.

7.4.13 The seven GHG described in the Kyoto Protocol guidelines (Ref.2) are considered within the assessment over the Scheme's lifecycle:

- Carbon dioxide ($CO_2$);
- Methane ($CH_4$);
- Nitrous oxide ($N_2O$);
- Sulphur hexafluoride ($SF_6$);
- Hydrofluorocarbons (HFCs);

- Perfluorocarbons (PFCs); and
- Nitrogen trifluoride ($NF_3$).

7.4.14 It should be noted that within this assessment, 'GHG emissions' broadly represent all seven Kyoto Protocol GHGs and will be given the unit of '$tCO_2e$' representing tonnes of $CO_2$ equivalent emissions.

7.4.15 The BEIS 2023 emissions factors guidance will be used as a calculation-based methodology for estimating the anticipated GHG emissions arising during the construction, operation and maintenance and decommissioning activities of the Scheme (Ref.28). The calculation will be:

*Activity data x GHG emissions factor = GHG emissions value*

7.4.16 For example, if a construction worker is expected to make a total 1,200km of trips over the construction period in their petrol car the activity data for this would be 1,200km. The GHG emissions factor for this as sources from the BEIS 2023 inventory for a petrol car is 0.25987kg$CO_2$e/km. Therefore, the calculation would be:

1,200km (*Activity)* x 0.00025987t$CO_2$e/km (*GHG emissions Factor)*

= 0.311t$CO_2$e (*GHG Emissions Value)*

*Sensitivity of Receptors*

7.4.17 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 receptor (global climate) to increases in GHG emissions. This is in line with the latest IEMA guidance (Ref.24), which states that all GHG emissions have the potential to be significant.

*Magnitude of Impacts*

7.4.18 IEMA guidance (Ref.24) states that there are currently no agreed methods to evaluate thresholds of GHG significance, that the application of the standard EIA significance criteria is not considered to be appropriate for climate change mitigation assessments, and that professional judgement is required to contextualise a project's GHG emission impacts.

7.4.19 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."*

7.4.20 **Table 7.4** presents the different significance levels as per the latest version of IEMA 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 7.4: Significance levels as per IEMA guidance (Box 3 Ref.24)**

| 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 |

| Significance Level | Definition | Significant |
|---|---|---|
| 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 |

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. The UK has a defined national carbon budget and budgets set by industry bodies 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. Currently, indicative carbon budgets are available for the electricity supply sector (Ref.30). The electricity supply sectoral carbon budgets (**Table 7.5**) 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 7.5: 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 |

| Carbon Budget | Total budget ($MtCO_2e$) | Sectoral Carbon Budget year | Annual Electricity Supply Sectoral Carbon budget ($MtCO_2e$) |
|---|---|---|---|
| | | 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 |

7.4.21 To assess the impact of GHG emissions from the Scheme, the carbon budgets for the electricity supply sector have been used as a proxy for the climate (**Table 7.5**). To provide further perspective, emissions from the Scheme have also been considered in the context of the UK carbon budgets. The UK carbon budgets are in place to restrict the amount of GHG emissions the UK can legally emit in a five-year period.

7.4.22 A qualitative approach has been taken for assessing the significance of GHG emissions arising as a result of the Scheme for the years beyond 2037. A quantitative approach is not possible beyond 2037 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 it is not possible to predict the quantity of emissions permitted within the carbon budgets beyond 2037. Should future carbon budgets become available following the submission of the PEIR, these would be the relevant carbon budget for future assessments including the ES.

**In-combination Climate Change Impact (ICCI) Assessment:**

7.4.23 The ICCI assessment methodology has been developed in line with the IEMA – 'Environmental Impact Assessment Guide to Climate Change Resilience and Adaptation' (Ref.26).

7.4.24 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.'*

7.4.25 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. For example, how an increase in rainfall due to climate change may lead to a higher risk of flooding, is covered in the **Chapter 10: Hydrology, Flood Risk and Drainage**. These in-combination effects are summarised within the climate change chapter.

7.4.26 The factors in **Table 7.6** are considered in the ICCI Assessment.

**Table 7.6: Climate Change Factors for ICCI Assessment**

| Factor | Anticipated Effect |
|---|---|
| Temperature change | The anticipated increase in temperature will be summarised within the locality, and any impacts from the Scheme discussed within the climate change chapter with regards to the effect of localised heat island effects. |

| Factor | Anticipated Effect |
|---|---|
| Precipitation change | This will be considered in the Hydrology, Flood Risk and Drainage Chapter and summarised within the climate change chapter. |
| Extreme weather conditions (wind) | The anticipated increase in extreme wind/hailstorm and other events within the locality will be summarised and any impacts on the Scheme discussed within the climate change chapter. |

**Climate Change Risk Assessment**:

7.4.27 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.30).

7.4.28 UKCP18 data and historic climate data from the Met Office were acquired to establish the future and historic baseline climate conditions (Ref.32).

7.4.29 The EIA regulations require information regarding the vulnerability of the Scheme to climate change. An assessment has been developed based on the IEMA 'Environmental Impact Assessment Guide to: Climate Change Resilience and Adaption' document (Ref 26), which assesses the Scheme's resilience to potential impacts caused by climate change.

7.4.30 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.

7.4.31 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.

7.4.32 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).

7.4.33 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.

7.4.34 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.

7.4.35 The criteria to assess the likelihood of occurrence and the consequence of the hazard produced by the climate change impact are defined in **Table 7.7** and **Table 7. 8**. The consequence of the climate risk will be determined using professional judgement and supporting evidence.

**Table 7.7: Criteria to Assess Likelihood of Climate Change Impact**

| Level of Likelihood | Definition of Likelihood |
|---|---|
| Very low | It is highly improbable that the impact will occur during the operational phase or the construction phase of the assets or systems. The event might occur once during the lifetime of the project (60 years). |
| Low | Impact is not expected to occur during the operational phase or the construction phase of the assets or systems. |
| Medium | The event occurs limited times during the lifetime of the project (60 years), e.g. approximately once every 15 years, typically 4 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. 8: Measure of consequence**

| Consequence of impact | Description |
|---|---|
| Very large adverse | ▪ Single or multiple deaths involving any persons;<br>▪ Disastrous work interruption;<br>▪ Huge financial loss;<br>▪ Devastating environmental implications. |
| Large adverse | ▪ Major injuries, including permanent disabling injuries of over 14 days;<br>▪ Major work interruption;<br>▪ Serious financial loss;<br>▪ Severe environmental implications. |
| Moderate adverse | ▪ 4 - 14 day lost-time injury(s). Medical treatment required;<br>▪ Substantial work interruption;<br>▪ Considerable financial loss;<br>▪ Moderate environmental implications. |
| Minor adverse | ▪ Injury requiring first aid treatment;<br>▪ Causing interruption of work for 3 days or less; |

| Consequence of impact | Description |
|---|---|
| | ▪ Slight financial loss or cost;<br>▪ Slight environmental consequence. |
| Negligible adverse | ▪ Minor cuts/abrasions requiring minimal treatment;<br>▪ Causing minimal work interruption;<br>▪ No financial loss or costs;<br>▪ No environmental consequence. |

7.4.36 The receptor significance is evaluated using the sensitivity and magnitude of effect that are combined in the significance matrix shown in **Table 7. 9**.

**Table 7. 9: Significance matrix**

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

*NS: No significant; S: Significant

7.4.37 Embedded mitigation measures of the Scheme have been considered as part of the review of potential impacts.

## 7.5 Assessment Assumptions and Limitations

7.5.1 This preliminary assessment is based on baseline and Scheme design information available at the time of writing this chapter. A full assessment is being undertaken as part of the EIA that will use the baseline and Scheme design after this has been refined following statutory consultation and as additional information becomes available. The final assessment will be presented within the ES.

7.5.2 Where the Scheme designs and details are either not yet known or incomplete at this stage, either assumptions have been made based on professional judgment, or, in the event that it is not possible to make any assumptions, no attempt at a full assessment has been made.

7.5.3 The methodology for the climate change assessment has considered the following assumptions outlined below at this PEIR stage. Assumptions will be updated in line with any additional information and outlined within the ES.

### Assumptions for Construction Plant

7.5.4 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 may 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.

7.5.5 At this stage, fuel use for construction plant is not known. Best practice measures for conserving fuel should be included in the CEMP and CTMP as appropriate.

**Assumptions for Construction Worker Vehicle Movements**

7.5.6 The UK Government 2021 emissions factors for 'average car' and 'average diesel van', including well-to-tank (WTT) emissions[1] will be applied to average distance travelled and total worker numbers to calculate GHG emissions associated with worker transport.

**Assumptions for Transport of Materials**

7.5.7 At the time of writing, the manufacturer of solar photovoltaic (PV) panels has not yet been chosen and therefore the number and size of modules likely to be installed is not available. As the leading global manufacturer of solar panels, it is anticipated that the PV panels will be sourced from China as China accounts for 80% of global PV panel production. The manufacture and transport of PV panels and materials will likely be the largest sources of GHG emissions from the Scheme.

7.5.8 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 Europe and 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);
- HGV transport of materials within Europe, including distance prior to, and following, sea freight transportation – 1,650km (based on half of the reasonable maximum distance equipment might be transported within Europe, plus the distance between Dover and the Sites);
- Sea freight distance from China to England –21,880km (based on the sea freight distance between Shanghai and Dover);
- Sea freight distance from Europe to England – 50km (based on the sea freight distance between Calais 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' has been applied, including WTT emissions. It has been assumed that HGVs are 50% laden; and
- For sea freight transportation, the UK Government GHG 2021 Conversion Factors for 'General Cargo –Average' has been applied, including WTT emissions.

**Assumptions for Embodied Carbon within Products**

7.5.9 At this stage, due to limited technical specifications available, the estimated size and weight of the PV cells have been obtained from similar products on other UK solar schemes. For the PEIR climate change assessment, it has been considered that the whole area of the Sites is covered by solar panels at a rate per hectare similar to other Solar NSIPs. This assumption will change following design refinement. The dominant materials associated to the manufacture of solar panels are metals and glass and therefore GHG emission estimates will based on the production of these materials using emission rates from the Inventory of Carbon and Energy version 3 (ICE v3) database (Ref.33) for glass and UK Government GHG Conversion Factors for Company

[1] Well-to-tank emissions, also known as upstream or indirect emissions, are the GHG emissions released into the atmosphere from the production, processing and delivery of a fuel to the point of use.

Reporting 2021 database (Ref.28) for metals. This information will be reviewed in the ES chapter assessment once more data is available.

7.5.10 At the stage of writing the PEIR, there is not enough technical data available to estimate the embodied carbon of the PV inverters, switchgear and structures. The worst-case scenario assessed for the embodied carbon emissions generated from the production of the solar panels is expected to compensate for the missing information. A more detailed analysis of the individual products will be provided within the ES.

### Assumptions for Operational Phase

7.5.11 The Scheme is expected to be operational from 2029 and to generate 500MW of electricity. This accounts for efficiency losses of the 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. The replacement of panels has been considered at 40 years at which point the same assumptions of a 2% loss in the first year at this point and 0.45% loss after this point has been used.

7.5.12 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. As a conservative assessment, it is assumed that all PV panels will need to be replaced once during the Scheme's design life. BESS cells have been assessed as requiring two replacements during the Scheme's life span

### Assumptions for Climate Change Risk Uncertainties

7.5.13 Climate change projections are subject to uncertainties due to the complexity of the climate system and uncertainty over future greenhouse gas emission levels and modelling uncertainties used to develop the Met Office's predictions.

7.5.14 To address these uncertainties, UKCP18 provides a range of likely climate changes to give a lower and upper estimate. This allows for provision of a greater level of confidence for the magnitude and impact of climate change effects.

7.5.15 The UKCP18 predictions go as far as 2099. The development is expected to operate beyond this period. As the best available information, 2099 will be used as a baseline for all future years beyond 2081.

## 7.6 Baseline Conditions

7.6.1 This section describes the baseline environmental characteristics for the Scheme and surrounding areas with specific reference to climate change.

### GHG Impact Assessment

#### Existing Baseline

7.6.2 The current use of the Sites 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 Sites.

7.6.3 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 Sites 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

7.6.4 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 the generation of fewer GHG emissions. This will be assessed by the

comparison of emissions of Carbon Dioxide and equivalent gases ($CO_2e$) from existing UK average grid emissions forecast and the carbon intensity of the Scheme. The development of carbon capture projects to reduce emissions from existing plant and available baseline information were considered to the extent possible.

7.6.5 The assessment will establish the baseline which will consider the factors above and will then consider the GHG emissions over the Scheme's lifetime.

7.6.6 Consideration will be 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.

7.6.7 In the absence of the Scheme, it is considered there will be no change to the future baseline for climate change. The baseline details (including the energy generated by fossil fuels) are not anticipated to change in the absence of the Scheme.

### Climate Change Risk

#### Existing Baseline

7.6.8 The most recent available and completed historic climate data acquired by the Met Office from the closest Met Office Station to the Scheme (Oxford) for the 30-year climate period of 1981 – 2010 will provide the current baseline for the CCR Review (Ref.32). This is summarised in **Table 7.10** below.

**Table 7.10: Historic Climate data**

| Climatic Factor | Month | Figure |
|---|---|---|
| Average annual maximum daily temperature (°C) | - | 14.5 |
| Warmest month on average (°C) | July | 22.7 |
| Coldest Month on average (°C) | February | 1.8 |
| Mean annual rainfall levels (mm) | - | 54.9 |
| Wettest month on average (mm) | October | 69.6 |
| Driest month on average (mm) | February | 42.5 |

#### Future Baseline

7.6.9 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 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;
- Mean summer air temperature;
- Mean winter air temperature;
- Mean annual precipitation;
- Mean summer precipitation;
- Mean winter precipitation;
- Mean annual cloud cover;
- Mean summer cloud cover; and
- Mean winter cloud cover.

7.6.10 A representative 12km$^2$ grid square at the geographical centre of the Scheme 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 7.11**.

7.6.11 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.30). For this assessment RCP 8.5 has been used, which assumes a 'business as usual' pathway for climate change as recommended by the IEMA guidance.

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. For the assessment, the climatic impacts of GHG emissions at the 10%, 50% and 90% probability levels up to 2099 are included which covers the assessment up to the 2089 expected decommissioning date.

**Table 7.11: Anomalies for probabilistic projections (25km) over UK for RCP8.5**

| Variable | 2020-2049 | 2050-2079 | 2070-2099 |
|---|---|---|---|
| Mean air temperature anomaly at 1.5m (°C) | + 1.0 (+0.1 to +2.1) | + 2.3 (+0.7 to +4.4) | + 3.5 (+1.3 to +6.5) |
| Mean Winter air Temperature anomaly at 1.5m (°C) | + 0.9 (-0.1 to +1.9) | + 2.1 (+0.4 to +3.8) | + 3.0 (+0.8 to +5.3) |
| Mean Summer air Temperature anomaly at 1.5m (°C) | + 1.3 (+0.2 to +2.5) | + 3.1 (+1.1 to +5.5) | + 3.1 (+1.1 to +5.5) |
| Mean annual precipitation rate [mm/day] | + 1.7 (-20.8 to +22.5) | - 0.4 (-36.0 to +32.4) | - 0.8 (-47.4 to +42.8) |
| Mean Winter precipitation rate [mm/day] | + 6.7 (-8.9 to +25.2) | + 13.9 (-11.0 to +43.7) | + 21.3 (-10.4 to +62.3) |
| Mean Summer precipitation rate [mm/day] | - 7.6 (-32.2 to +18.5) | - 22.5 (-52.4 to +9.5) | - 34.3 (-65.6 to +5.0) |
| Mean annual cloud cover (%) | - 1.7 (-10.0 to +4.6) | - 3.1 (-18.7 to +5.9) | - 4.5 (-25.5 to +6.6) |
| Mean Winter cloud cover (%) | - 0.5 (-5.1 to +4.1) | + 0.1 (-6.7 to +6.9) | - 0.6 (-9.1 to +8.1) |
| Mean Summer cloud cover (%) | - 4.8 (-16.9 to +5.4) | - 11.4 (-31.7 to +4.7) | - 17.1 (-42.6 to +3.8) |

## 7.7 Embedded Mitigation Measures

7.7.1 The way that potential environmental impacts have been or will be prevented, avoided or mitigated to reduce impacts to a minimum through design and/or management of the Scheme is outlined in this section and will be taken into account as part of the assessment of the potential effects. Proposed environmental enhancements are also described where relevant.

7.7.2 The following embedded mitigation measures for construction, operation and maintenance and decommissioning have been incorporated into the Scheme design, with detailed proposals and locations to be submitted with the DCO application.

### Embedded Construction Mitigation Measures

#### GHG Impact

7.7.3 Embedded mitigation measures will be implemented to reduce the GHG impact of the Scheme. Specific embedded mitigation measures include the following and will also be included in the Outline Construction Environment Management Plan (OCEMP):

*Reducing waste*

- Increasing recyclability by segregating construction waste to be re-used and recycled where reasonably practicable;

- Designing, constructing and implementing the Scheme in such a way as to minimise the creation of waste and maximise the use of alternative materials with lower embodied carbon, such as locally sourced products and materials with a higher recycled content where feasible;
- Reusing suitable infrastructure and resources already available within the Sites where possible to minimise the use of natural resources and unnecessary materials (e.g. reusing excavated soil for fill requirements);

*General practices*

- Adopting the Considerate Constructors Scheme (CCS) to assist in reducing pollution, including GHGs, from the Scheme by employing good industry practice measures;
- Conducting regular planned maintenance of the construction plant and machinery to optimise efficiency.

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 EU emissions standards.

**Climate change resilience**

7.7.4 Climate change resilience measures are embedded within the Scheme, particularly in relation to flood risk. These measures are outlined below, with detailed proposals and locations to be submitted with the DCO application. The specific flood risk impacts and associated mitigation measures are discussed in more detail in **Chapter 10: Hydrology, Flood Risk and Drainage** and include:

- Eight metre easements have been established around all watercourses, including main rivers and ordinary watercourses.
- All service cabling should be designed and installed to be flood resilient / water compatible. This should be achieved in accordance with appropriate design standards and best practise guidance.
- Beyond this, the separation of construction/decommissioning groundworks from drainage ditches has been maximised.
- Existing access tracks, where practicable, will be retained, limiting the requirement to develop new access which can disturb soils and lead to compaction. Where new access tracks are required, they have been designed to avoid crossing drainage ditches, where practicable.
- The Outline Construction Environment Management Plan (OCEMP) accompanying the DCO application, will describe water management measures to control surface water run-off and drain hardstanding and other structures during the construction, operation and decommissioning of the Scheme. This will form part of a Pollution Prevention Plan (PPP) to be implemented for the Scheme.
- In addition, a Water Management Plan (which will form part of a detailed CEMP) will include details of pre, during and post-construction water quality monitoring. This will be based on a combination of visual observations and reviews of the Environment Agency's automatic water quality monitoring network.

- With regards to flood risk, the individual Sites which make up the Scheme have been assessed on the best available data for each Site. Based on the assessed flood risk the following embedded design has been implemented:
    - Critical infrastructure within the Scheme (the conversion units, substations and energy storage compounds) will be sequentially located where possible to an area with a "Low probability of flooding" and therefore in land assessed as having a less than 1 in 1,000 annual probability of river or sea flooding (<0.1%); and
    - Non-flood sensitive infrastructure forming the wider Scheme (PV arrays 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 experience less than 1 m depth of flooding during the same event.
    - Flexibility for either tracker or fixed panels has been built into the EIA. The solar panels will have metal frames that hold solar panels in rows, either secured via metal post driven into the ground at a depth of 1.5-3.5m or weighed down using concrete feet (detailed in the Project Description Chapter.
    - For both fixed and tracker panels, all sensitive and electrical equipment on the solar panel will be elevated by the legs (including the solar panel face itself) so that it is no less than 0.6 m above the surrounding peak flood level.
    - Tracker panel units will be mounted on raised frames (raised a minimum of 0.4 m 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 m above ground level. This ensures that all sensitive and electrical equipment on the solar panel is raised to a minimum of 2.5 m above ground level in the horizontal position.

7.7.5 It is also noted that, currently, the fields within the Study Area are typically used for arable farming and are ploughed to within a closer distance of the ditches than the separations proposed for the Scheme. The "with Scheme" scenario is therefore better in terms of drainage than the baseline scenario. The "with Scheme" scenario also does not include application of nitrates to the land, which is carried out periodically in the baseline scenario, and this will lead to further improvements in water quality in the "with Scheme" scenario compared to the baseline scenario.

- Access to the Site during construction, operation and decommissioning will be taken from new permeable or existing farm tracks accessed from the local highway network. This limits the potential for increased surface water runoff rates and sedimentation effects during construction / decommissioning.
- With regards to flood risk, the Sites which make up the Scheme have been assessed on the best available data. Based on the assessed flood risk the following embedded design has been implemented:
- Critical infrastructure within the Scheme (the conversion units and substations) have been sequentially located within Zone 1, an area with a "Low probability of flooding" and therefore in land assessed as having a less than 1 in 1,000 annual probability of river or sea flooding (<0.1%);
- All fields within the BESS Site are within Flood Zone 3 (high risk) of flooding. Hydraulic Modelling has been carried out and is subject to EA approval. Due to the depths modelled at BESS3, the sub-site will be dismissed, and no BESS infrastructure will be developed in this area. Given the locations of the proposed BESS developments, excluding the north of BESS1, the site is considered to be at Low risk of fluvial flooding. As the north of BESS1 is modelled to have depths of up to 0.67m, the risk in this area is considered to be Moderate. The model

and the results are explained in more detail in **Chapter 10: Hydrology, Flood Risk and Drainage**.

- Non-flood sensitive infrastructure forming the wider Scheme (PV arrays and cabling) have been 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 experience less than 1 m depth of flooding during the same event.
- Flexibility for either tracker or fixed panels have been built into the EIA. Foundations are most likely to be galvanised steel poles driven into the ground. These will either be piles rammed into a pre-drilled hole, or a pillar attaching to a steel ground screw.
- For both fixed and tracker panels all sensitive and electrical equipment on the solar panel will be elevated by the legs so that it is no less than 0.6 m above the surrounding peak flood level.
- Tracker panel units will be mounted on raised frames (usually raised a minimum of 0.4m 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 2.3 m above ground level. This ensures that all sensitive and electrical equipment on the solar panel is raised to a minimum of 2.3 m above ground level in the horizontal position.
- The design of the Scheme has ensured that the flood defences protecting the Scheme can be inspected and maintained by the operator of the Scheme to ensure their functionality throughout the lifetime of the Scheme.
- Utilising permeable surfacing (Type 2 aggregate) for the Site access, ensuring that surface water is retained where it falls and is allowed to infiltrate to subsoils as per the existing situation.
- Installation of linear infiltration trenches around Critical infrastructure (the substations and energy storage compounds) or any other required hardstanding such as concrete bases. Infiltration trenches will ensure that any surface water generated by hardstanding is retained adjacent to the infrastructure, allowing it to infiltrate to subsoils as per the existing situation.
- Implementation of suitable planting (such as a wildflower or grass mix) so the ground cover is strengthened and is unlikely to generate surface water runoff rates beyond the baseline scenario.

7.7.6 Additional climate change resilience measurements will be embedded within the Scheme:

- Using equipment's cooling systems where necessary/adapting working practices and equipment used based on current weather conditions;
- Protecting workers and resources from extreme weather conditions;
- Monitoring weather forecasts and the news for Environment Agency flood warnings, relevant weather warnings, and water levels of the local waterways.
- Battery Energy Storage System (BESS) systems would include Heating, Ventilation and Cooling (HVAC) systems and these would be contained within the individual equipment containers;

7.7.7 Health and safety plans developed for construction and decommissioning activities will be required to account for potential climate change impacts on workers, such as flooding and heatwaves.

**Embedded Operation Mitigation Measures**

7.7.8 Where applicable, the construction mitigation measures, and regular planned maintenance of the Scheme will also be conducted during operation to optimise efficiency and will be outlined in the Operational Environmental Management Plan (OEMP).

**Embedded Decommissioning Mitigation Measures**

7.7.9 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 Decommissioning Environmental Management Plan (DEMP). It is not considered appropriate to specify such requirements now as the decommissioning environment beyond 2089 is likely to be considerably different to today.

## 7.8 Assessment of Likely Impacts and Effects

7.8.1 Considering the embedded mitigation measures as detailed in Section7.7, the potential for the Scheme to generate effects was assessed using the methodology as detailed in Section 7.4 of this chapter. In the sections below, associated impacts and effects during the construction, operation and maintenance and decommissioning phases of the Scheme are discussed.

### GHG Impact Assessment

7.8.2 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. The PEIR assessments have been based on a preliminary GHG assessment which used available design information, comparisons with similar proposed developments and industry benchmarks. It should be noted that the information used to inform the assessments is preliminary and is subject to change within the full application. The assessment below provides the best estimates available at the current time.

7.8.3 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.

7.8.4 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 National Grid average GHG intensity to quantify the net GHG impact of the Scheme compared with other predicted energy generation sources.

**Construction (2027-2029)**

7.8.5 For the purposes of the GHG impact assessment, the construction phase is anticipated to last for two years. Emissions will result from activities during site preparation / enabling works, construction, commissioning activities, the production of materials e.g. extraction of raw materials and manufacturing products necessary to make equipment, and the transportation of the equipment as detailed in **Table 7.3**.

7.8.6 The construction phase for the solar element of the Scheme includes the preparation of the Sites, installing the access tracks, erection of security fencing, assembly and erection of the PV arrays, installation of the inverters/transformers and grid connection.

7.8.7 The construction of the energy storage system element of the Scheme will include the preparation of the Sites, installation of the access roads, erection of security fencing, assembly of the battery system, and installation of the switch-room and grid connection.

7.8.8 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 PV panels are expected to be sourced from China or a country of similar distance and therefore, the manufacture and supply of PV panels and associated equipment will likely be the largest source of GHG emissions.

7.8.9 For this PEIR, a worst-case estimate has been carried out in the absence of additional technical data for all products to be provided on site. The GHG emissions associated with the construction activities are detailed in **Table 7.12.**

**Table 7.12: Construction GHG emissions**

| Emission Source | Emissions ($tCO_2e$) | % Construction Emissions |
|---|---|---|
| Products (PV Arrays) | 477,926 | 65.12 |
| Products (Batteries) | 200,000 | 27.25 |
| Products (Cables) | 5,387 | 0.73 |
| Transportation of Materials by Land | 28,646 | 3.90 |
| Transportation of Materials by Sea | 24,664 | 2.57 |
| Worker Transportation | 3,097 | 0.42 |
| **Total** | **739,720** | **100** |

7.8.10 It is anticipated that the above values are subject to change with more detailed design, but emissions are expected to decrease from the worst case assumptions used within this preliminary assessment. This will be captured in the Environmental Statement.

7.8.11 In the ES, estimates of the GHGs from other sources of emissions during the construction phase will be included. These include and are not limited to; GHG emissions from energy use, water and fuel used during construction activities and the disposal of waste materials from the Sites. In the interim, the estimated GHG emissions associated with the PV arrays has been calculated as worst case to compensate for the missing data.

7.8.12 It is assumed that with the conversion of arable land to grassland required for the installation of Solar PV panels; there will be an increase in sequestrated carbon, due to the conversion of large cropland areas into grassland, which has greater carbon sequestration potential. However, for the purpose of this assessment, it is assumed that these grasslands will be reverted back to cropland after the Scheme is decommissioned, releasing any stored carbon back into the atmosphere. Following a conservative approach, the positive GHG impact from the land use change is considered temporary, only though the lifespan of the Scheme, and has been excluded from the lifecycle GHG impact assessment. This conservative approach may underestimate the Scheme's beneficial effects, as any trees and hedgerows planted could remain post-decommissioning, allowing continued carbon storage in soil and vegetation.

**Significance of Effect (Construction)**

7.8.13 Total GHG emissions from the construction phase are estimated to equate to around 739,720 $tCO_2e$ using conservative design assumptions.

7.8.14 GHG emissions from construction activities will be limited to the duration of the construction phase (2 years). When annualised, the total annual construction emissions equate to around 366,951 $tCO_2e$, though it should be noted that the majority of emissions arise from embodied carbon associated with the manufacture of products.

7.8.15 The significance of effect will be assessed for the lifespan of the Scheme (see paragraph 7.8.31).

**Operation**

7.8.16 During the operational phase, GHG emissions will likely arise from the generation of consumed mains electricity to heat and power any proposed buildings on Site, i.e. the substations, control room and energy storage areas. Within the ES, an annual energy demand for the Scheme will be obtained from benchmark data to estimate a worst case in terms of emission scenario.

7.8.17 Scheduled replacement activities will be required as part of the Scheme, replacement of panels and batteries will likely be required as part of maintenance activities, the estimated lifetime and replacement rates for PV Panels and batteries described in paragraph 7.5.12, and the same embodied and transportation emissions factors used to quantify the impact of construction, the replacement of these components is estimated to result in GHG emissions of 942,229 $tCO_2e$ across the 60 year scheme lifespan based on current estimates.

7.8.18 GHG emissions will also be generated as a result of additional operational activities such as the transportation of operational workers to and from the Site and some minor emissions from mains water consumption, wastewater treatment and the transport and treatment of waste from staff facilities.

7.8.19 For this chapter only the emissions for the replacement of products were considered inclusive of embodied carbon and associated transport. As these calculations are a conservative estimate, as described in paragraph 7.5.9, it is expected that it will cover other minor emissions such as water usage, which will be discussed in greater detail within the final ES.

7.8.20 While sulphur hexafluoride ($SF_6$) is a potential source of GHG emissions over the lifetime of the Scheme (i.e. derived from certain electric items such as gas-insulated switchgear and gas-insulated transformers during production, operation through leakage, and dismantling), it has not been possible to quantify fugitive emissions from the leakage of $SF_6$ due to insufficient research data being available on this topic. $SF_6$ is one of the seven GHGs identified by the Kyoto Protocol (Ref.2) due to its high Global Warming Potential (GWP) of 23,900. GWP allow comparisons of the global warming impacts of different gases. Specifically, it is a measure of how much energy the emission of 1 ton of a gas will absorb over a given period of time, relative to the emission of 1 ton of carbon dioxide ($CO_2$). The larger the GWP, the more that a given gas warms the Earth compared to $CO_2$ over that time period. It is not anticipated that $SF_6$ emissions will significantly affect the overall outcome of this assessment, however, the ES will discuss this in greater detail.

**Significance of Effect**

7.8.21 Renewable energy generation from the Scheme during the first year of operation is estimated to be around 800,000 MWh/year. To account for natural wear and tear of products on site, 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 719,615MWh in the final year of operation. The total energy generated by the Scheme would be around 44.07 TWh over the 60-year Scheme lifespan. It is possible this is a slightly conservative estimate as future climate projections indicate a reduction in annual cloud cover over time (**Table 7.11**) which may have a beneficial impact on the energy generation potential of the Scheme and has not been taken into account in the calculations.

7.8.22 Accounting for the estimated construction phase and operation phase emissions, the Scheme's total carbon intensity value is 37.65 $gCO_2e/kWh$.

7.8.23 In 2023, the UK grid carbon intensity was 207 $gCO_2e/kWh$. The available UK grid carbon intensity figure only takes into account operational emissions from the generation of electricity, primarily from the fossil fuels used to power gas-fired and occasionally coal-fired power stations (Ref.28).

7.8.24 Currently, the most carbon-efficient fossil-fueled technology available is gas-fired Combined Cycle Gas Turbine (CCGT) generating facility, which has a representative figure for the carbon intensity of a CCGT is 350 $gCO_2e/kWh$.

7.8.25 It should be noted that NPS EN-1 2024 requires all combustion power stations with a capacity at or over 300MW to be constructed Carbon Capture Ready (CCR). The development is compared to the UK grid average.

7.8.26 A range of other low-carbon electricity generation technologies are available, such as on- and offshore wind, biomass and nuclear power. Each of these technologies will have a different carbon intensity in terms of total emissions per kWh of electricity generated. A literature review indicates a range of carbon intensity figures for each power source, making it challenging to directly compare the carbon impact of a specific installation, such as the Scheme, with data for a broad generation technology.

7.8.27 As the UK electricity sector continues to decarbonise, a range of different low-carbon generation technologies will be required to support an electricity generation system that can balance emissions reductions, security of supply and affordability.

7.8.28 The significance of effect will be studied for the whole lifespan of the Scheme (see "Overall GHG Significance Effect section from paragraph 7.8.31 onwards).

**Decommissioning**

7.8.29 As the decommissioning activities associated with the Scheme will occur far into the future, more than 65 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. Therefore, prior to decommissioning, a DEMP will be prepared.

**Significance of Effect**

7.8.30 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 overall GHG reductions achieved by the Scheme are considered to offset and outweigh any GHG impacts associated with the decommissioning phase of the Scheme. Therefore, it is considered that the magnitude of effect of the decommissioning phase will be negligible.

**Overall GHG Significance Effect**

7.8.31 UK's fourth, fifth and sixth carbon budgets have been used to contextualise emissions from the Scheme in line with IEMA guidance on Assessing Greenhouse Gas Emissions and Evaluating their Significance (Ref.25).

7.8.32 The UK's fifth carbon budget has been used to contextualise the magnitude of GHG emissions from the Scheme in **Table 7.13**, depending on the years in which the emissions are expected to occur. Construction emissions will fall under the 4$^{th}$ (2027) and 5$^{th}$ (2028 and 2029) UK carbon budgets. For this comparison, it was considered that construction emissions will occur 25% in 2027, 50% in 2028 and 25% in 2029 due to only 2028 being the full year for which construction activities are anticipated. In line with IEMA guidance on Assessing Greenhouse Gas Emissions and Evaluating their Significance, the sectoral carbon budgets for electricity supply have also been used to contextualise emissions from the Scheme. The operational phase of the Scheme accounts for less than 1% of the 2027 and 2029 Electricity Supply Carbon budget, and 1.5% of the 2028 Electricity Supply Carbon budget. 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 5$^{th}$ and 6$^{th}$ UK carbon budgets, beyond which point no carbon budgets have yet been published. The operational phase accounts for less than 1% of Electricity Supply Carbon budgets from 2029 to 2037 combined. Emissions during the operational phase will primarily be associated with embodied carbon in replacement products.

**Table 7.13: 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 ($tCO_2e$) | Emissions from the Scheme as a Proportion of Carbon Budget |
|---|---|---|---|
| 2027 | 26.7 | 0.18 | 0.7% |
| 2028 | 23.75 | 0.37 | 1.5% |
| 2029 | 22.4 | 0.18 | 0.8% |

7.8.33 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.

7.8.34 Once in operation, the Scheme will achieve emissions reductions compared to the without-project baseline, i.e. in a scenario in which the Scheme does not go ahead and the power it generates is provided by the current grid supply, inclusive of higher carbon generation sources such as CCGT. The current emissions from a CCGT are 350 $gCO_2e/kWh$. The current UK grid average energy generation is 180 $gCO_2e/kWh$.

7.8.35 The business as usual scenario, a scenario without the Scheme, is based on forecast UK grid average energy emissions available from the Department for Energy Security and Net Zero. The operational energy intensity allows isolated comparison of the emissions associated with operation of the Scheme compared to the alternative. The operational intensity of the Scheme is 37.95 $gCO_2e/kWh$.

7.8.36 As the GHG electricity generation intensity figure for the Scheme is anticipated to sit continually below the forecast grid average, GHG emissions savings are expected to be achieved throughout the lifetime of the Scheme compared to other fossil fuel energy generation types. 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. It would be possible for a low-carbon energy generation project to have a GHG intensity below the projected grid for most of its lifetime, but above it towards the end of its lifetime and still have an overall positive impact on the UK's ability to meet its carbon targets. However, comparison to grid emissions is not a suitable comparison as decarbonisation of the grid relies on investment in low carbon technologies, such as this Scheme. Although, during the next 60 years carbon capture will serve to reduce the current grid emissions, these technologies have approximately 4.5 times the emissions of this Scheme. Carbon capture alone will not be enough to cause the wider grid emissions to fall below the calculated emissions for the Scheme. Emissions associated with the grid are also based only on the fuel consumed by power stations and are therefore not relevant in the context of the Scheme where the calculation of emissions includes the carbon associated with the Sites construction, for example, the manufacture and transport of the generating station infrastructure itself.

7.8.37 As the GHG emissions from the scheme in operation will offset emissions in a comparative scenario where energy generation may be from other sources inclusive of CCGT, it is considered that the overall GHG impact of the Scheme is **beneficial** and **significant**, as it will play a part in achieving the rate of transition required by nationally set policy commitments and supporting the trajectory towards net zero. The without-project baseline alternative would result in higher GHG emissions.

### Climate Change Risk Assessment

7.8.38 Potential climate risks to the construction, operation and maintenance and decommissioning phases, the likelihood, consequence and significance are detailed in **Table 7.14**, **Table 7.** 15 and Table 7.16 respectively.

**Table 7.14 Potential Climate Change Impacts and Embedded Mitigation Measures during Construction Phase**

| Climate hazard | Potential Climate Change Impact | Receptor | Potential Climate Change Risk to Proposed Development | Existing or embedded mitigation measure | Result of mitigation measure on resilience | Likelihood | Consequence | Significant or Not Significant |
|---|---|---|---|---|---|---|---|---|
| High temperatures | Increase in annual temperature | Workers, staff and visitors on site | Risk of overheating to workers. | Contractor will monitor weather forecasts and plan works accordingly, protecting workers and resources from any extreme weather conditions. | Risk reduced through mitigation | Low | Minor adverse | Not Significant |
| | | Plant and vehicles, physical structures, materials, | Overheating of electrical equipment.<br><br>Damage to materials. | Equipment has cooling systems where necessary.<br><br>The increase in annual temperature remains within tolerance ranges for the materials being used. | Risk reduced through mitigation | Low | Minor adverse | Not Significant |
| High temperatures | Increase in summer temperature | All receptors | Overheating of electrical equipment.<br><br>Damage to materials.<br><br>Risk of overheating to workers. | Contractor will monitor weather forecasts and plan works accordingly, protecting workers and resources from any extreme weather conditions. | Risk reduced through mitigation | Low | Minor adverse | Not Significant |

| Climate hazard | Potential Climate Change Impact | Receptor | Potential Climate Change Risk to Proposed Development | Existing or embedded mitigation measure | Result of mitigation measure on resilience | Likelihood | Consequence | Significant or Not Significant |
|---|---|---|---|---|---|---|---|---|
| High temperatures | Increase in heat waves | Workers, staff and visitors on site | Increased heat stress/ heat exhaustion for workers. | The Contractor will monitor weather forecasts and plan works accordingly, protecting workers and resources from any extreme weather. | Risk reduced through mitigation and resilience incorporated into the design. | Very Low | Minor adverse | Not Significant |
| | | Plant and vehicles, physical structures, materials, | Overheating of electrical equipment. Damage to materials | The Contractor will monitor weather forecasts and plan works accordingly, protecting workers and resources from any extreme weather.<br><br>Equipment has cooling systems where necessary. | Risk reduced through mitigation and resilience incorporated into the design. | Very Low | Minor adverse | Not Significant |
| High precipitation | Increase to winter rainfall | Plant and vehicles, physical structures, materials, and access routes to sites and access | Viability of and access to sites (such as heavy rain resulting in surface water flooding of local roads, sources of power supply or inundation of sites). | 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 | Risk reduced through mitigation | Very Low | Minor adverse | Not Significant |

| Climate hazard | Potential Climate Change Impact | Receptor | Potential Climate Change Risk to Proposed Development | Existing or embedded mitigation measure | Result of mitigation measure on resilience | Likelihood | Consequence | Significant or Not Significant |
|---|---|---|---|---|---|---|---|---|
| | | routes to sites. | | conditions such as storms, flooding. | | | | |
| Low precipitation | Decrease to summer rainfall | All receptors | Increased construction dust. | Dust mitigation measures will be included within the CEMP. | Risk reduced through mitigation | Low | Minor adverse | Not significant |
| Increase in storm intensity | Stronger winds, heatwaves, heavy precipitation | Plant and vehicles, physical structures, materials, and access routes to 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. | The Contractor 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. | Risk reduced through mitigation | Low | Moderate adverse | Not Significant |

**Table 7. 15 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 Proposed Development | Existing or embedded mitigation measure | Result of mitigation measure on resilience | Likelihood | Consequence | Significance |
|---|---|---|---|---|---|---|---|---|
| High temperatures | Increase in summer temperature | All receptors (infrastructure, buildings, workers and staff) | Increase in air conditioning requirements.<br><br>Overheating of electrical equipment.<br><br>Risk of overheating to workers. | BESS systems would include HVAC systems and these would be contained within the individual equipment containers.<br><br>Workers and staff to forecasts and plan works accordingly. | Risk reduced through mitigation | Low | Moderate adverse | Not Significant |
| High temperatures | Increase in heat waves | All receptors (infrastructure, buildings, workers and staff) | Increase in air conditioning requirements.<br><br>Overheating of electrical equipment.<br><br>Risk of overheating to workers. | BESS systems would include HVAC systems and these would be contained within the individual equipment containers.<br><br>Workers and staff to forecasts and plan works accordingly. | Risk reduced through mitigation | Low | Moderate adverse | Not Significant |
| High precipitation | Increase to winter rainfall | All receptors (infrastructure, buildings, workers and staff) | Surface water flooding and standing waters.<br><br>Deterioration of structures | All sensitive and electrical equipment on the solar panel will be elevated by legs or mounted on raised frames. | Risk reduced through design | Very Low | Moderate adverse | Not Significant |

| Climate hazard | Potential Climate Change Impact | Receptor | Potential Climate Change Risk to Proposed Development | Existing or embedded mitigation measure | Result of mitigation measure on resilience | Likelihood | Consequence | Significance |
|---|---|---|---|---|---|---|---|---|
| | | | or foundations due to increase in soil moisture levels.<br><br>Damage to building surfaces/ exposed utilities from increased drying/wetting and increase frost penetration | | | | | |
| Low precipitation | Decrease to summer rainfall | All receptors (infrastructure, buildings, workers and staff) | Water shortages.<br><br>Deterioration of structures or foundations due to decrease in soil moisture levels. | Water expected to be stored on site for fire suppression | Risk reduced through mitigation | Very Low | Minor adverse | Not Significant |
| Increase in storm intensity | Stronger winds, heatwaves, | Plant and vehicles, physical structures, | Surface water flooding and | The OCEMP accompanying the DCO application, will describe water management measures to control | Risk reduced through mitigation | Very Low | Minor adverse | Not Significant |

| Climate hazard | Potential Climate Change Impact | Receptor | Potential Climate Change Risk to Proposed Development | Existing or embedded mitigation measure | Result of mitigation measure on resilience | Likelihood | Consequence | Significance |
|---|---|---|---|---|---|---|---|---|
| | heavy precipitation | materials, and access routes to sites | standing waters.<br><br>Deterioration of structures or foundations due to increase in soil moisture levels.<br><br>Damage to building surfaces/ exposed utilities from increased drying/wetting and increase frost penetration or tree falls.<br><br>Strong winds damaging structures directly or via falling trees and debris. | surface water run-off and drain hardstanding and other structures. | | | | |

**Table 7.16 Potential Climate Change Impacts and Embedded Mitigation Measures during Decommissioning Phase.**

| Climate hazard | Potential Climate Change Impact | Receptor | Potential Climate Change Risk to Proposed Development | Existing or embedded mitigation measure | Result of mitigation measure on resilience | Likelihood | Consequence | Significance |
|---|---|---|---|---|---|---|---|---|
| High temperatures | Increase in annual temperature | All receptors | Overheating of electrical equipment.<br><br>Damage to materials.<br><br>Risk of overheating to workers. | Contractor will monitor weather forecasts and plan works accordingly, protecting workers and resources from any extreme weather conditions. | Risk reduced through mitigation | Low | Minor adverse | Not Significant |
| High temperatures | Increase in summer temperature | All receptors | Overheating of electrical equipment.<br><br>Damage to materials.<br><br>Risk of overheating to workers. | Contractor will monitor weather forecasts and plan works accordingly, protecting workers and resources from any extreme weather conditions. | Risk reduced through mitigation | Low | Minor adverse | Not Significant |
| High temperatures | Increase in heat waves | Workers, staff and visitors on site | Increased heat stress/ heat | The Contractor will monitor weather forecasts and | Risk reduced through mitigation and resilience | Very Low | Minor adverse | Not Significant |

| Climate hazard | Potential Climate Change Impact | Receptor | Potential Climate Change Risk to Proposed Development | Existing or embedded mitigation measure | Result of mitigation measure on resilience | Likelihood | Consequence | Significance |
|---|---|---|---|---|---|---|---|---|
| | | | exhaustion for workers. | plan works accordingly, protecting workers and resources from any extreme weather. | incorporated into the design. | | | |
| | | Plant and vehicles, physical structures, materials, | Overheating of electrical equipment. Damage to materials | The Contractor will monitor weather forecasts and plan works accordingly, protecting workers and resources from any extreme weather.<br><br>Equipment has cooling systems where necessary. | Risk reduced through mitigation and resilience incorporated into the design. | Very Low | Minor adverse | Not Significant |
| High precipitation | Increase to winter rainfall | Plant and vehicles, physical structures, materials, and access routes | Viability of and access to sites (such as heavy rain resulting in surface water flooding of local | The contractors will monitor weather forecasts and receive Environment | Risk reduced through mitigation | Very Low | Minor adverse | Not Significant |

| Climate hazard | Potential Climate Change Impact | Receptor | Potential Climate Change Risk to Proposed Development | Existing or embedded mitigation measure | Result of mitigation measure on resilience | Likelihood | Consequence | Significance |
|---|---|---|---|---|---|---|---|---|
| | | to sites and access routes to sites. | roads, sources of power supply or inundation of sites). | Agency's (EA) flood alerts and plan works accordingly, protecting workers and resources from any extreme weather conditions such as storms, flooding. | | | | |
| Low precipitation | Decrease to summer rainfall | All receptors | None | None | Not Applicable | Not Applicable | Not Applicable | Not Applicable |
| Increase in storm intensity | Stronger winds, heatwaves, heavy precipitation | Plant and vehicles, physical structures, materials, and access routes to 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 | The Contractor 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. | Risk reduced through mitigation | Low | Moderate adverse | Not Significant |

| Climate hazard | Potential Climate Change Impact | Receptor | Potential Climate Change Risk to Proposed Development | Existing or embedded mitigation measure | Result of mitigation measure on resilience | Likelihood | Consequence | Significance |
|---|---|---|---|---|---|---|---|---|
| | | | debris) and storm surge. | | | | | |

**Significance of Effect**

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

7.8.40 The climate change risk assessment has considered the measures which are integrated into the design (see Section 7.7). These are considered an adequate response to the projected climate change impacts to which the Scheme would be exposed.

7.8.41 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.

**In Combination Risk Assessment**

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

7.8.43 Given the nature of the Scheme, the increase of permanent impermeable area on the Site will be negligible, however equipment such as the proposed substations and battery / energy storage areas will generate increased surface water runoff when compared to the current undeveloped nature of the Site. There can be no off-site detriment in terms of surface water runoff rates and volumes and therefore it is proposed to maintain the predevelopment surface water regime post development. Mitigation by design measurements as described in section 7.7 sub section Climate Change Resilience will be embedded in the Scheme.

7.8.44 Following implementation of the proposed mitigation the residual effect is considered to be negligible, **not significant**.

## 7.9 Additional Mitigation Measures

7.9.1 No additional mitigation measures for the Scheme are considered to be required for any given phase as no significant adverse effects are predicted. However, this will be investigated further within the ES.

## 7.10 Residual Effects

7.10.1 This section summarises the residual significant effects of the Scheme following the implementation of embedded mitigation as outlined in section 7.7 of this chapter.

7.10.2 During the different phases of the Scheme (construction, operation including maintenance, and decommissioning), inevitable GHG emissions will be generated with associated transport, energy, and fuel-use. Despite this, the Scheme will provide a means of energy generation which negates GHG emissions from more polluting sources and aids in reducing UK grid average energy generation emissions, it is therefore considered that the overall GHG impact of the Scheme is beneficial and significant, as it will play a part in achieving the rate of transition required by nationally set policy commitments and supporting the trajectory towards net zero.

7.10.3 Whilst at this stage of the project, residual effects due to climate risks have not been fully assessed, it is anticipated that through the use of further mitigation measures such as BESS systems including HVAC systems and being contained within the individual equipment container and when possible not placing sensitive electrical equipment in flood risk areas and applying the mitigation measures described in the section 7.7, there will be a result in no significant residual adverse effects.

## 7.11 Cumulative Effects

7.11.1 The ES will give consideration to potential cumulative effects of the Scheme and other relevant projects within the vicinity of the Scheme on a single receptor/resource.

7.11.2 A list of cumulative projects can be found in **Volume 3**, **Appendix 2.2** of the PEIR, the list will be reviewed and refined in preparation of the DCO application submission through further consultation and will be presented and assessed in the ES. Cumulative effects will be listed within **Chapter 25: Cumulative Effects** of the ES.

**Cumulative effects**

7.11.3 The receptor for the GHG Assessment is the global climate. The receptor for the Climate Resilience Review is the extent of the Scheme. Given this, the potential for cumulative effects on climate change is considered within the overall assessment.

7.11.4 There are considered to be no cumulative effects in conjunction with other similar developments or as the combined effect of a set of developments following respective mitigation that would cumulatively impact the Scheme.

**In-combination effects**

7.11.5 There are considered to be no in-combination effects from inter-topic relationships following respective mitigation that would cumulatively impact the Scheme.

## 7.12 Summary

7.12.1 This chapter of the PEIR has identified the existing environment in relation to climate change and the assessment work that has been undertaken to date including preliminary GHG assessment, assessment of likely Climate Resilience considerations and cross reference with other relevant topic chapters which consider the effects of Climate Change, e.g. Hydrology and Flood Risk.

7.12.2 The key objective of the PEIR is to provide relevant information at this stage of the project which can inform relevant consultees and inform likely outcomes and assessment methodologies to be incorporating into the ES.

**GHG Emissions**

7.12.3 The findings of the PEIR show that embodied emissions in product generation and transport are the primary contributor to GHG emissions from the Scheme. These are predicted to be offset by the reduced energy generation emissions to the UK grid as a result of the scheme.

7.12.4 Within the ES, a more detailed breakdown and assessment of scheme GHG emissions will be undertaken as the scheme design develops and more information is available with regards to specific product types and quantities to be deployed on the site.

**Climate Change Risk Assessment**

7.12.5 Likely changes to the climate around the Scheme have been considered and best practice mitigation measures included as part of embedded mitigation in operational methods. With these measures in place, it is predicted that the Scheme can be resilient to changes in localised Climate.

**In-combination Climate Change Impact Assessment**

7.12.6 There are considered to be no in-combination effects from inter-topic relationships e.g. increased flood risk or risks from low rainfall following respective embedded design mitigation that would cumulatively impact the Scheme.

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