The Droves Solar Farm

Chapter 13: Climate Change (Tracked)

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13.1 Introduction

13.1.1 This chapter of the Environmental Statement (ES) presents the findings of the Environmental Impact Assessment (EIA) of effects on Climate Change as a result of the Scheme.

13.1.2 This chapter identifies and proposes measures to address the potential impacts and likely significant effects in relation to Climate Change during the construction, operational and decommissioning phases.

13.1.3 The information presented within this chapter has been informed by the Scheme information provided in **ES Chapter 5: The Scheme [APP/5.1]**.

13.1.4 The following aspects have been considered within the Climate Change assessment process:

- Lifecycle Greenhouse Gas (GHG) Impact Assessment: the impact of the Scheme considering all embodied carbon GHG emissions associated with the products used over the Scheme's entire lifecycle and all GHG emissions resulting from construction, operational and decommissioning phase activities.
- In-Combination Climate Impacts (ICCI) Assessment: considering combined effects of the Scheme contributing to climate change, their interactions and cumulative impact on the environment; and
- Climate Change Resilience: the resilience of the Scheme to climate change impacts.

13.1.5 This Climate Change chapter has been prepared by Bureau Veritas (see **ES Appendix 1.1: Statement of Competence [APP/6.4]**).

13.1.6 This document has been updated at ~~Pre-examination Additional Submission~~ Deadline 1 ~~to use the same water consumption figures as used in the rest of the DCO Application, for consistency, as well as fix broken in-text cross-references~~ to clarify the weight of silicon used in the calculations, and apply this to the calculations within the chapter, as well as amend minor typographical errors. The document references have not been updated from the original submission. Please refer to the **Guide to the Application [APP/1.3.1]** for the list of current versions of documents.

13.2 Consultation

Scoping Opinion

13.2.1 On 8 November 2024, the Applicant submitted a Scoping Opinion Request to the Planning Inspectorate (PINS) (see **ES Appendix 2.1: EIA Scoping Opinion Request [APP/6.4]**) in support of a request for a Scoping Opinion from PINS on behalf of the Secretary of State (SoS) pursuant to Regulation 10 of the EIA Regulations. A Scoping Opinion (see **ES Appendix 2.2: Scoping Opinion Response [APP/6.4])** was adopted by PINS on 18 December 2024.

13.2.2 The issues raised in the Scoping Opinion relating to Climate Change are summarised and responded to within **ES Appendix 13.1: Consultation and Legislation, Planning Policy and Guidance [APP/6.4]** which demonstrates how the matters raised in the Scoping Opinion are addressed in this ES.

Statutory Consultation and Preliminary Environmental Information Report (PEIR)

13.2.3 Statutory consultation was held between 21 May 2025 and 9 July 2025. No responses to the PEIR related to Climate Change, so no further information has been provided in the form of Statutory Consultation Responses.

13.2.4 Further engagement specific to Climate Change was not considered to be required following the consultation detailed above.

13.3 Legislation, Planning Policy and Guidance

13.3.1 A summary of applicable legislation, planning policy and other guidance documents against which the Scheme will be considered relating to Climate Change is set out in **ES Appendix 13.1: Consultation and Legislation, Planning Policy and Guidance [APP/6.4]**.

13.4 Assessment Assumptions and Limitations

13.4.1 The Climate Change assessment has considered the following assumptions and limitations:

Carbon Budgets

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

Baseline Emissions

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

Construction Plant

13.4.4 Anticipated construction plant may include on site machinery, excavators, concrete mixers, large vehicles and generators. This plant is likely to generate some emissions.

13.4.5 Good practice measures have been included in the **outline Construction Environmental Management Plan (oCEMP) [APP/7.6]** to limit emissions during the construction phase. These include:

- Shutting down plant and equipment that is in intermittent use

- Avoiding idling
- Exploring use of alternative fuels
- Enforcing site speed limits
- Providing training to all site personnel on pollution control and methods to minimise emissions; and
- Effective planning to reduce trips and waste.

13.4.6 Based on the relatively small scale and short duration of the construction works required as well as the implementation of emission reduction measures in the **oCEMP [APP/7.6]**, it is considered that the fuel use for construction plant represent less than 1% of the total GHG emissions. This is in line with similar solar farm projects, where the construction plant GHG emissions represent less than 1% of the total GHG emissions.

Construction Phase Duration

13.4.7 The construction of the Scheme is anticipated to take place over 24 months. The final programme will be dependent on the detailed layout design and potential environmental constraints on the timing of construction activities. However, the Scheme is anticipated to energise in Q4 2033 or as early as National Grid are able to offer. Based on Q3 2033 energisation, it is anticipated that the earliest the Construction Phase would commence would be Q3 2031. For the purposes of this assessment, the construction phase is assumed to have a duration of two years. This is expected to be a realistic worst-case assumption for this assessment, as it represents the expected maximum build time and therefore the maximum total emissions and impacts occurring as a result of the construction phase.

Assessment of Ancillary Products on Site

13.4.8 According to the ISEP guidance, activities that do not significantly change the result of the assessment can be excluded where the expected emissions are less than 1% of the total emissions, and where all such exclusions total a maximum of 5% of the total emissions. In the case of the GHG assessment, the emissions associated with ancillaries such as fencing, portacabins, security system (closed-circuit television (CCTV) camera system), etc. are considered minor and are expected to contribute less than 1% of the total emissions. Anything not explicitly referenced can be assumed to not have been quantified as emissions are anticipated to be negligible. Therefore, these minor emissions will be excluded from the quantification, as including them would not significantly impact the overall results. In addition, wherever relevant, conservative assumptions will be made such that the predicted GHG emissions are likely to be at the upper limit of potential emissions from the Scheme. All other inputs and outputs to the relevant processes for which data are available are included in this assessment.

Construction Worker Vehicle Movements

13.4.9 The UK Government 2025 emission conversion factors (Ref. 13-1) for 'average petrol car', 'average local bus' and 'All HGVs' including Well-To-Tank (WTT) emissions have been applied to average distance travelled and total worker numbers to calculate GHG emissions associated with worker transport.

13.4.10 The distance is assumed to be equal to the average trip length for business in the UK in 2024 (18.8 miles/ 30.3km) (Ref 13-2) for car and shuttle bus trips. The project's transport consultants (Velocity Transport Planning) have advised that there will be a total of 526 daily two-way staff/LGV vehicle movements and 96 daily two-way HGV vehicle movements.

13.4.11 Of the 526 staff/LGV vehicle movements, it is assumed that 50% (244 daily two-way trips) will be by car and 50% (19 daily two-way trips) by shuttle bus. Each car is considered to transport 1.5 person and each shuttlebus 20 people.

Transport of Materials

13.4.12 At the time of writing, the manufacturer of the PV panels is assumed to be LONGi Solar Technology Co., Ltd. who are based in China. It is assumed that the PV panels will be shipped from China and therefore that the manufacture and transport of PV panels and batteries are the largest sources of GHG emissions from the Scheme.

13.4.13 Heavy Goods Vehicle (HGV) and sea freight distances assumed for transportation of materials and waste are outlined below. The country of origin for materials is assumed to be 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)
- Sea freight distance from China to England – 24,582 km (based on the sea freight distance between Shanghai and King's Lynn)

13.4.14 For HGV transportation of materials, the UK Government GHG 2025 Conversion Factors (Ref. 13-1) for 'All HGVs' have been applied, including WTT emissions. It has been assumed that HGVs are 50% laden; this approach is more conservative than assuming HGV are 100% laden on incoming trips and 0% laden on outgoing trips

13.4.15 Total numbers for tippers and other non-road mobile machinery are unknown at this stage. However, the oCEMP details several measures which will minimise emissions as detailed below:

- All NRMM should use fuel equivalent to ultra-low sulphur diesel (fuel meeting the specification within EN590:2004);

- All NRMM should comply with either the current or previous EU Directive Staged Emission Standards (97/68/EC, 2002/88/EC, 2004/26/EC). As new emission standards are introduced the acceptable standards will be updated to the most current standard;
- All NRMM should be fitted with Diesel Particulate Filters conforming to defined and demonstrated filtration efficiency (load/duty cycle permitting);
- The ongoing conformity of plant retrofitted with Diesel Particulate Filters, to a defined performance standard should be monitored via regular checks;
- Implementation of energy conservation measures including instructions to throttle down or switch off idle construction equipment; switch off the engines of trucks while they are waiting to access the site and while they are being loaded or unloaded; and ensure equipment is properly maintained to ensure efficient energy consumption; and
- NRMM and plant should be well maintained. If any emissions of dark smoke occur then the relevant machinery will stop immediately and any problem rectified.

13.4.16 With these measures in place, it is not anticipated that there would be any significant emissions from tippers or other non-road mobile machinery.

13.4.17 For sea freight transportation, the UK Government GHG 2025 Conversion Factors (Ref. 13-1) for 'General Cargo –Average' has been applied, including WTT emissions.

Embodied Carbon in Production of Scheme Materials/Components

13.4.18 All assumptions made within the calculations for estimating the embodied carbon of the materials used for the Scheme have been set out within the individual sections detailed in Section 13.6.

Product Replacement

13.4.19 The Scheme is expected to be operational from 2033 and to generate more than 50MW of electricity. This assessment accounts for efficiency losses of the PV panels over time based on an initial 1% degradation in the first year and 0.35% for every additional year for a lifespan of 40 years. For the purpose of this assessment, the replacement of PV panels has been considered at 40 years at which point the same assumptions of a 1% loss in the first year and 0.35% loss for every additional year has been used.

13.4.20 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.

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

13.4.22 The BESS batteries could be replaced up to five times during the operational phase.

13.4.23 Replacement rates are summarised in the below table:

Table 13-1 Estimated Replacement Rate of Components

Component	Comment	Design life/Replacement Frequency	Recyclable
PV Panels	The approximate operational life of PV Panels is 40 years. It is assumed that repowering would be undertaken once during the operational of the Scheme.	Once during the operational phase	Yes
Ground mounted PV Modules	Replacement is not anticipated during Scheme operation.	Entire operational phase	Yes
DC Cables (low voltage on-site cabling between PV Panels and Conversion Units)	It is not anticipated that the DC cables will need to be replaced during operation, although an allowance has been made for up to 20% of the DC cabling to be replaced during the Scheme operational due to damage or defects.	20% of cable over entire operational phase	Yes
BESS batteries	Assumed design life of up to 10 years.	Up to 5 times over entire operation phase	Yes
Inverters	Replacement is not anticipated during Scheme operation.	Entire operation al phase	Yes
AC Cable (medium voltage on-site cabling)	Replacement is not anticipated during Scheme operation.	Entire operational phase	Yes
Transformers	Up to one replacement during operation phase (will only be carried out if required for performance or health and safety reasons).	Once during the operational phase	Yes

Component	Comment	Design life/Replacement Frequency	Recyclable
Switchgear	Replacement is not anticipated during Scheme operation.	Entire operational phase	Yes
HV Cabling (Grid Connection Cable)	Replacement is not anticipated during Scheme operation.	Entire operational phase	Yes
On-Site Substation (National Grid Substation and Customer Substation)	Replacement of substations is not anticipated during Operational Phase.	Entire operational phase	Yes

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

13.4.24 Historically, the method used to compare against a future 'without Scheme' is to compare the proposed Scheme with another source of energy generation. This has typically used Combined Cycle Gas Turbines (CCGT) as the dominant controllable technology used in the UK to generate electricity and therefore the technology most likely to be displaced due to new solar generation coming online.

13.4.25 The approach would use a value of emissions per unit of energy from CCGT typically in the format 'gCO_2e/kwh' i.e. grams of carbon dioxide equivalent emissions per kilowatt-hour of energy and compare this against the gCO_2e/kwh from the Scheme.

13.4.26 However, in the decision letter for the Gate Burton Solar DCO, the SoS stated that:

"The Secretary of State considers that comparison to a counterfactual CCGT facility is an inappropriate baseline, noting that 2011 NPS EN-1 requires all combustion power stations with a capacity over 300MW to be constructed Carbon Capture Ready, and he therefore does not consider it viable to use unmitigated emissions as a baseline any longer. The ExA concluded that the net GHG emissions are below zero compared to this baseline and for this, and other reasons, ascribed great positive weight to the GHG savings of the Proposed Development. While the Secretary of State does not accept the applicant's baseline, as the ExA had, with reference to the carbon budget contributions from the Proposed Development, the carbon intensity of the Proposed Development as compared to the UK grid average and all other information within the Applicant's ES, he is satisfied that the Proposed Development would result in considerable carbon savings compared to the UK grid average and supports the trajectory to net zero."

13.4.27 As such, it is not considered appropriate to use CCGT as a point of comparison.

13.4.28 Based on this decision, a different approach, using the forecast UK Grid Average emissions of kgCO_2e/kWh, was taken. The value for this was sourced from “Green Book supplementary guidance: valuation of energy use and greenhouse gas emissions for appraisal” (Ref. 13-3). Specifically, ‘Table 1’ of ‘Data Tables 1-19’ provides this information.

13.4.29 The grid carbon intensity for the 2033 baseline year is estimated to be 0.038 gCO_2e/kwh.

13.4.30 However, there are significant limitations with only comparing to the grid average emissions. The UK grid emissions factors include transmission and distribution losses, including significant losses due to power station inefficiency. However, they do not account for embodied carbon or “Well-To-Tank” (WTT) emissions associated with the different means of generating electricity across the grid as this report seeks to do.

13.4.31 As such, when comparing to the future baseline, we have shown a comparison with other energy generating methods and taken a holistic approach with regards to the overall comparison of a future ‘without scheme’ baseline within the summary of effect.

13.5 Study Area

GHG Impact Assessment:

13.5.1 In accordance with the latest ISEP guidance (Ref. 13-7) the Study Area for the assessment of GHG emissions is considered to be the global climate.

13.5.2 The GHG Impact Assessment is based on the Scheme lifecycle stages shown in Figure 13-1~~Figure 13-1~~. The considered stages include the before use stage (A), hereafter referred to as the ‘construction phase’, the use stage (B), referred to as the ‘operational phase’, and end of life stage (C), referred to as the ‘decommissioning phase’.

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

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

13.5.5 The operational phase of the Scheme is projected to span 60 years.

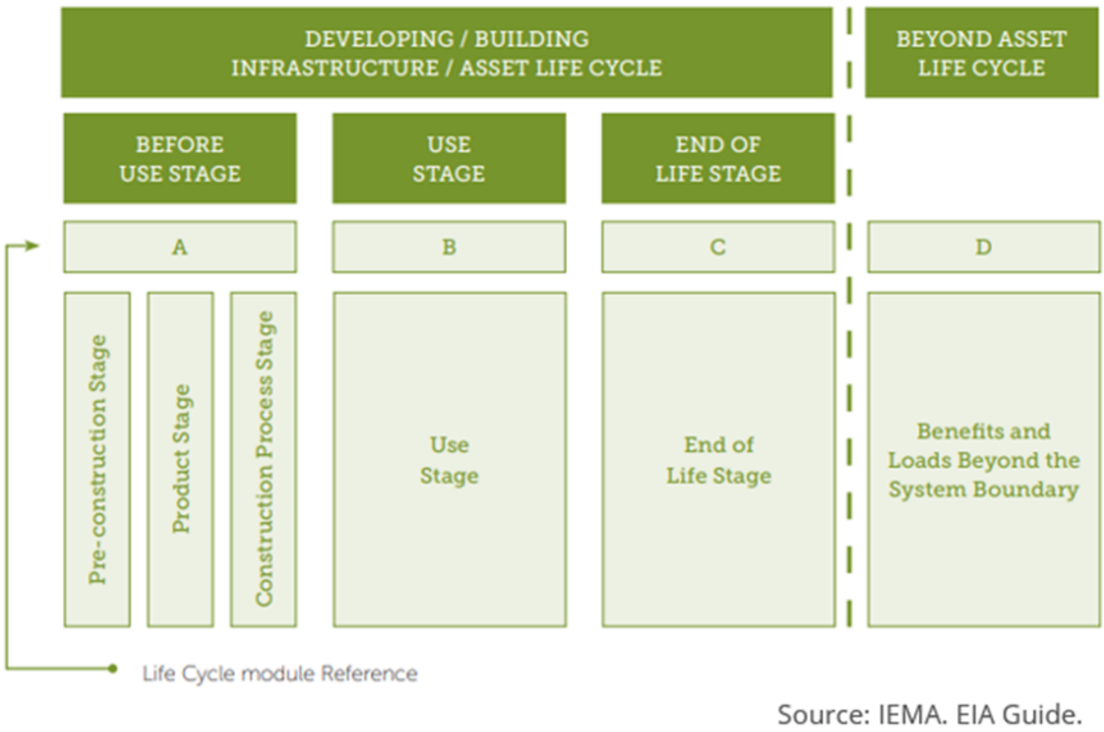


Figure 13-1 Modular approach of life cycle stages and modules (Ref. 13-7)

In-combination Climate Change Impact (ICCI) Assessment:

13.5.6 The ICCI Study Area considers receptors that are identified within other relevant chapters, for example, the Flood Risk assessment as outlined in **ES Chapter 12: Water Resources [APP/6.2]**, that will be impacted by the Scheme in combination with future climatic conditions.

Climate Change Resilience (CCR) Assessment

13.5.7 For the CCR Assessment, the Study Area for this assessment is the Order limits of the Scheme.

13.5.8 The climate resilience review has provided a description of how the Scheme will be impacted by climate change and how it is designed to be more resilient to the impacts identified during the review of the UK Climate Projections 2018 (UKCP18) data (Ref. 13-5).

13.6 Assessment Methodology

13.6.1 This section sets out the scope and methodology for the assessment of the impacts of the Scheme on Climate Change.

13.6.2 To summarise the key issues for the assessment are:

- Greenhouse Gas emissions arising from products, construction, operational and decommissioning phases. Elevated greenhouse gases emissions associated with human activities are the primary cause of climate change
- The effects of a changing climate on the scheme itself; and
- How a changing climate will have wider impacts connected to other environmental considerations (e.g. flood risk).

Sources of Information

13.6.3 The following sources of information that have been consulted in the preparation of this chapter:

- World Business Council for Sustainable Development and World Resources Institute (2004) The GHG Protocol: A Corporate Accounting and Reporting Standard. Revised Edition (Ref. 13-28)
- ISEP (2022a) Environmental Impact Assessment Guide to: Assessing Greenhouse Gas Emissions and Evaluating their Significance 2nd Edition (Ref 13-6)
- ISEP (2022b) Climate Change Adaption Practitioner Guidance (Ref 13-7)
- ISEP (2020) Environmental Impact Assessment Guide to Climate Change Resilience and Adaptation (Ref. 13-29)
- Department for Energy Security and Net Zero (2025) UK Government GHG Conversion Factors for Company Reporting (Ref 13-1)
- UK Met Office (2018) UK Climate Projections 2018 (UKCP18) (Ref 13-5); and
- UK Met Office (2019) Historic climate data (Ref 13-8).

Potential Impacts

13.6.4 The potential beneficial impacts include the generation of renewable energy and the associated reduction in GHG emissions compared to alternative more carbon intensive methods of energy generation. The potential adverse impacts include emissions from construction activities, transportation, and the embodied carbon in materials used.

13.6.5 The Climate Change assessment follows the general approach to undertaking EIA, explained in **ES Chapter 2: EIA Process and Methodology [APP/6.1]**, albeit it has been modified in to align with the relevant planning policy and appropriate industry standard guidance for assessing GHGs (ISEP document 'Environmental Impact Assessment Guide to: Assessing Greenhouse Gas Emissions and Evaluating their Significance 2nd Edition' (Ref. 13-6) and considering climate change resilience (CCR) and adaptation (Ref 13-7).

13.6.6 The methodology for attributing sensitivity of receptors, magnitude of effects and the significance of effects in relation to Climate Change is described further below in this chapter of the ES.

Lifecycle GHG Impact Assessment

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

13.6.8 In line with the World Business Council for Sustainable Development and World Resources Institute GHG Protocol (Ref. 13-28), the potential effects of the Scheme on the climate have been assessed.

13.6.9 The approach to assessing emissions follows the different phases of the Scheme including construction, operational and decommissioning phase.

13.6.10 The seven GHG described in the Kyoto Protocol guidelines (Ref. 13-30) 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).

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

13.6.12 The Department for Energy Security and Net Zero (DESNZ) 2025 conversion factors for reporting (Ref. 13-1) have been used as a calculation-based methodology for estimating the anticipated GHG emissions arising during the construction, operational, and decommissioning activities of the Scheme:

Activity data x GHG emissions factor = GHG emissions value

13.6.13 For example, if a construction worker is expected to make a total 1,200km of trips over the construction phase in their petrol car, the 'activity data' for this would be 1,200km. The GHG emissions factor for this as sourced from the DESNZ 2025 inventory for an average petrol car is 0.16272 $kgCO_2e$/km. Therefore, the calculation would be:

1,200km (Activity) x 0.00016272tCO_2e/km (GHG emissions Factor)

= 0.195tCO_2e (GHG Emissions Value)

Sensitivity of Receptors

13.6.14 For the purposes of this assessment, the receptor for the GHG assessment is the global climate which has been defined as 'high' sensitivity as any additional GHG impacts could compromise the UK's ability to reduce its GHG emissions and therefore meet its future 5-year carbon budgets and Net Zero by 2050 target. This is in line with the latest ISEP guidance (Ref. 13-6), which states that all GHG emissions have the potential to be significant.

Magnitude of Impacts

13.6.15 Standard GHG accounting and reporting practices have been followed to assess the effect of the Scheme on the global climate. The ISEP guidance states that *"it is up to the GHG practitioner's professional judgement to decide which tool is most appropriate for the project at hand with regard to assessing the magnitude of GHG impacts"*. The GHG accounting method is deemed most appropriate for this part of the assessment.

13.6.16 ISEP guidance (Ref 13-7) 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.

13.6.17 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."

13.6.18 Table 13-2~~Table 13-2~~ presents the different significance levels as per the latest version of ISEP guidance. The guidance emphasises that:

"a project that follows a 'business-as-usual' or 'do minimum' approach and is not compatible with the UK's net zero trajectory or accepted aligned practice or area-based transition targets, results in a significant adverse effect. It is down to the practitioner to differentiate between the 'level' of significant adverse effects e.g. 'moderate' or 'major' adverse effects."

Table 13-2 Significance levels as per ISEP guidance (Box 3 (Ref 13-7))

Significance Level	Definition	Significant
Major adverse	The project's GHG impacts are not mitigated or are only compliant with do-minimum standards set through regulation, and do not provide further reductions required by existing local and national policy for projects of this type. A project with major adverse effects is locking in emissions and does not make a meaningful contribution to the UK's trajectory towards net zero.	Yes
Moderate adverse	The project's GHG impacts are partially mitigated and may partially meet the applicable existing and emerging policy requirements but would not fully contribute to decarbonisation in line with local and national policy goals for projects of this type. A project with moderate adverse effects falls short of fully contributing to the UK's trajectory towards net zero.	Yes
Minor adverse	The project's GHG impacts would be fully consistent with applicable existing and emerging policy requirements and good practice design standards for projects of this type. A project with minor adverse effects is fully in line with measures necessary to achieve the UK's trajectory towards net zero.	No
Negligible	The project's GHG impacts would be reduced through measures that go well beyond existing and emerging policy and design standards for projects of this type, such that radical decarbonisation or net zero is achieved well before 2050. A project with negligible effects provides GHG performance that is well 'ahead of the curve' for the trajectory towards net zero and has minimal residual emissions.	No
Beneficial	The project's net GHG impacts are below zero and it causes a reduction in atmospheric GHG concentration, whether directly or indirectly, compared to the without-project baseline. A project with beneficial effects substantially exceeds net zero requirements with a positive climate impact.	Yes

13.6.19 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.

13.6.20 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 13-4).The electricity supply sectoral carbon budgets (Table 13-3~~Table 13-3~~) 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 13-3 UK Carbon Budgets

Carbon Budget	Total budget (MtCO2e)	Sectoral Carbon Budget year	Annual Electricity Supply Sectoral Carbon budget (MtCO2e)
4th (2023 – 2027)	1,950	2023	44.01
		2024	44.44
		2025	41.65
		2026	32.36
		2027	26.70
5th (2028 – 2032)	1,725	2028	23.75
		2029	22.40
		2030	18.55
		2031	15.77
		2032	12.09
6th (2033 – 2037)	965	2033	9.86
		2034	8.00

Carbon Budget	Total budget (MtCO2e)	Sectoral Carbon Budget year	Annual Sectoral Electricity Carbon Supply budget (MtCO2e)
		2035	6.20
		2036	6.01
		2037	5.67
7th (2038 – 2042)*	535	2038	4.98*
		2039	4.79*
		2040	4.60*
		2041	4.04*
		2042	3.48*

** The 7th carbon budget will be set by June 2026. Initial Climate Change Committee advice has given the total carbon budget and energy sectors but this is subject to change[1].*

13.6.21 The receptor for the GHG Assessment is the global atmosphere. All projects worldwide have the potential to contribute to cumulative impacts on the global climate through their GHG emissions. As per ISEP and precedent, and supported in case law, it is not appropriate to undertake a cumulative assessment for GHG assessments, as the climate is global and so a cumulative assessment would require an assessment of all potential worldwide future developments which is not feasible, and it is not appropriate to seek to only assess some specific schemes. Instead, the appropriate approach is to consider the Scheme's emissions in the context of Carbon budgets as they are considered to be inherently cumulative. Hence, to assess the impact of GHG emissions from the Scheme, the carbon budgets for the electricity supply sector have been used to help establish significance (Table 13-3~~Table 13-3~~).

13.6.22 To provide further perspective, emissions from the Scheme have also been considered in the context of the full UK carbon budgets. The UK carbon budgets are in place to restrict the total amount of GHG emissions the UK can legally emit in a five-year period.

[1] Clean Power 2030 Action Plan, DESNZ, 2024. Available at: https://assets.publishing.service.gov.uk/media/677bc80399c93b7286a396d6/clean-power-2030-action-plan-main-report.pdf

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

Cumulative effects

13.6.24 As per ISEP and precedent, and supported in case law, it is not appropriate to complete a cumulative assessment for GHG assessments, as the climate is global so it is considered inappropriate and impractical to choose any number of projects in isolation. Carbon budgets can be used as a proxy instead as they are inherently cumulative.

In-combination Climate Change Impact (ICCI) Assessment

13.6.25 The scope of the ICCI assessment methodology has been developed in line with the ISEP – 'Environmental Impact Assessment Guide to Climate Change Resilience and Adaptation' (Ref. 13-31).

13.6.26 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, how an increase in rainfall due to climate change may lead to a higher risk of flooding, this is an ICCI."

13.6.27 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 have been assessed through the other relevant topics of the ES. For example, how an increase in rainfall may lead to a higher risk of flooding, has been covered in **ES Chapter 12: Water Resources [APP/6.2]**. These in-combination effects have been summarised within this Climate Change ES chapter.

13.6.28 The related disciplines and the anticipated effects of climate change considered in the ICCI Assessment are detailed in Table 13-4~~Table 13-4~~.

Table 13-4: Climate Change Factors for ICCI Assessment

Related ES Volume 1 Topic	Anticipated Effect
Chapter 12: Water Resources [APP/6.2]	Precipitation change. Increased risk of flooding. Reduced drainage.
Chapter 7: Ecology and Biodiversity [APP/6.2]	Climate change impacting species and habitats.

Related ES Volume 1 Topic	Anticipated Effect
Chapter 9: Transport and Access [APP/6.2]	Greenhouse gas emissions from vehicle movements.
Chapter 11: Soils and Agriculture [APP/6.2]	Changing dryness and soil quality as a result of climate change

Climate Change Resilience Assessment (CCR)

13.6.29 While the lifecycle GHG Impact Assessment assesses the significance of the GHG impact of the Scheme on the global climate, the CCR provides a review of the impacts of climate change on the Scheme, as required in line with the ISEP guidance.

13.6.30 For the CCR Assessment, the Scheme during the construction, operation 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. 13-5).

13.6.31 The EIA Regulations require information regarding the vulnerability of the Scheme to climate change. An assessment has been developed based on the ISEP Environmental Impact Assessment Guide to: Climate Change Resilience and Adaption' document (Ref. 13-7), which assesses the Scheme's resilience to potential impacts caused by climate change.

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

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

13.6.34 The susceptibility of the receptor has been 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); and

- **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).

13.6.35 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); and
- **Low vulnerability:** climatic factors have little influence on the receptors.

13.6.36 The likely effects of climate change on the Scheme have been 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.

13.6.37 The criteria to assess the likelihood of occurrence and the consequence of the hazard produced by the climate change impact are defined in Table 13-5~~Table 13-5~~ and Table 13-6~~Table 13-6~~Table 13-6~~Table 13-6~~. The consequence of the climate risk will be determined using professional judgement and supporting evidence.

Table 13-5 Criteria to Assess Likelihood of CCR 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 Scheme. The event has the potential to occur once during the construction, operational and decommissioning phases of the Scheme (64 years) but it is unlikely.
Low	The event occurs once during the construction, operational and decommissioning phases of the scheme (64 years), e.g. once in 64 years.
Medium	The event occurs limited times during the construction, operational and decommissioning phases of the Scheme (64 years), e.g. approximately once every 15 years, typically 4 events.

Level of Likelihood	Definition of Likelihood
High	The event occurs several times during the construction, operational and decommissioning phases of the scheme (64 years), e.g. approximately once every five years, typically 12 events.
Very High	The event occurs multiple times during the construction, operational and decommissioning phases of the Scheme (64 years), e.g. approximately annually, typically 64 events.

Table 13-6 Measure of CCR Consequence

Consequence of Impact	Description
Very large adverse	• Single or multiple deaths involving any persons • Disastrous work interruption • Huge financial loss; and • Devastating environmental implications.
Large adverse	• Major injuries, including permanent disabling injuries of over 14 days • Major work interruption • Serious financial loss; and • Severe environmental implications.
Moderate adverse	• 4 - 14 day lost-time injury(s). Medical treatment required • Substantial work interruption • Considerable financial loss; and • Moderate environmental implications.
Minor adverse	• Injury requiring first aid treatment • Causing interruption of work for 3 days or less • Slight financial loss or cost; and • Slight environmental consequence.
Negligible adverse	• Minor cuts/abrasions requiring minimal treatment • Causing minimal work interruption • No financial loss or costs; and • No environmental consequence.

13.6.38 The receptor significance is evaluated using the sensitivity and magnitude of the effect that are combined in the significance matrix shown in Table 13-7~~Table 13-7~~.

Table 13-7 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: Not Significant, S: Significant*

13.6.39 Embedded mitigation measures of the Scheme have been considered as part of the review of potential impacts. These measures are detailed in Section 13.8.

Cumulative Effect

13.6.40 As per ISEP and precedent, and supported in case law, it is not appropriate to complete a cumulative assessment for GHG assessments, as the climate is global so it is considered inappropriate and impractical to choose any number of projects in isolation. Carbon budgets can be used as a proxy instead as they are inherently cumulative.

13.7 Baseline Conditions

GHG Impact Assessment

Existing Baseline

13.7.1 Currently (2025), the majority of the Site is consists of large, open arable fields that are farmed by a mixture of arable cropping, agri-environmental land management, and areas of outdoor livestock production. The baseline GHG emissions are dependent on the soil and vegetation types present and the fuel used for the operation of any plant and machinery on the Site.

13.7.2 For the lifecycle GHG impact assessment, the baseline is a ‘business as usual’ scenario whereby the Scheme is not implemented. The baseline comprises existing carbon stock and sources of GHG emissions within the Site from the existing activities on-site. However, as a conservative approach for the assessment, the baseline activities on site have been assumed to be generating zero emissions of CO_2e.

Future Baseline

13.7.3 The Scheme is expected to provide a substantial source of renewable electricity for the country. Comparison against forecast UK long-run marginal grid emissions forecasts for 2033 (Ref 13-3) have been considered.

13.7.4 The forecasts used to assess the UK grid emissions as a point of comparison decrease rapidly throughout the 2030s as shown in Figure 13-2Figure 13-2.

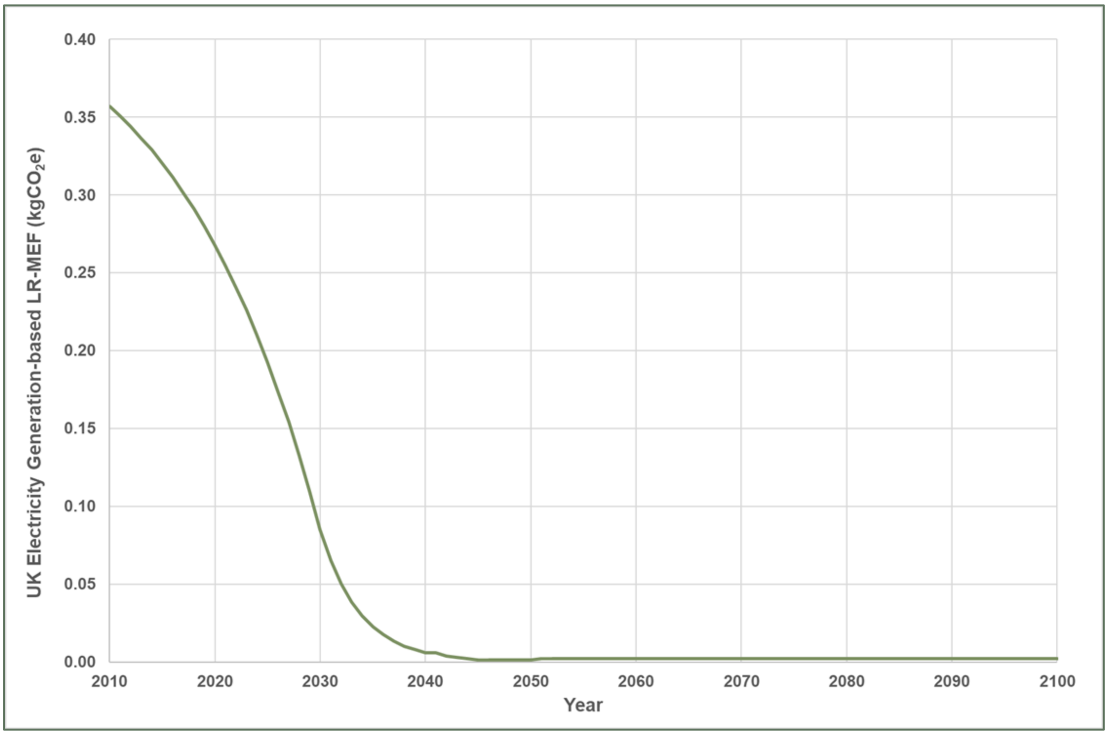


Figure 13-2: UK electricity long-run marginal emissions factors 2010-2100

13.7.5 These factors are based on Combined Cycle Gas Turbine (CCGT) plants which have been the long-run marginal electricity generators and thus the marginal emissions factor in 2010 reflects that of a typical CCGT plant (0.357 kgCO2e/kWh before taking into account distribution and transmission losses). However, as the power sector changes to meet the UK's Nationally Determined Contributions (NDC) in 2030, Carbon Budget 6 (CB6) in 2033-37, and net zero by 2050, low carbon generation will increase significantly both as a proportion of total and marginal generation.

13.7.6 The emissions factors within this table are generation weighted averages (Ref. 13-3) for each year and do not account for any embodied carbon or lifecycle analysis of the emissions associated with developing any of the energy generating plant.

13.7.7 For reference, the 2025 long-run marginal emissions factor from (Ref. 13-3) is 0.193 kgCO_2e/kWh, while the actual 2025 GHG conversion factor reported in (Ref. 13-1) is 0.177 kgCO_2e/kWh, both of which do not include WTT emissions associated with electricity from the Grid.

13.7.8 Government conversion factors (Ref. 13-1) also report Well-to-tank (WTT) conversion factors for the generation and transmission and distribution of UK electricity, which should be used to report the Scope 3 emissions of extraction, refining and transportation of primary fuels before their use in the generation of electricity. In 2025, these were 0.0459 kgCO_2e/kWh for UK grid electricity generation and 0.00397 kgCO2e/kWh for UK grid electricity transmission and distribution. Accounting for all emissions associated with WTT processes gives a combined emissions factor for 2025 of 0.22687 kgCO_2e/kWh, which is greater than the 2025 long-run marginal emissions factor from *[Ref 13-3]* of 0.193kgCO_2e/kwh.

13.7.9 The forecast for Electricity generation output by technology in Holistic Transition to net zero by 2050 (shown in Figure 13-3~~Figure 13-3~~) assumes 8.7% of electricity generation (43.1 TWh/annum) in 2033 and 11.0% (83.3 TWh/annum) in 2050 to come from solar PV sources (Ref. 13-27). The Scheme itself would be contributing to that forecast amount.

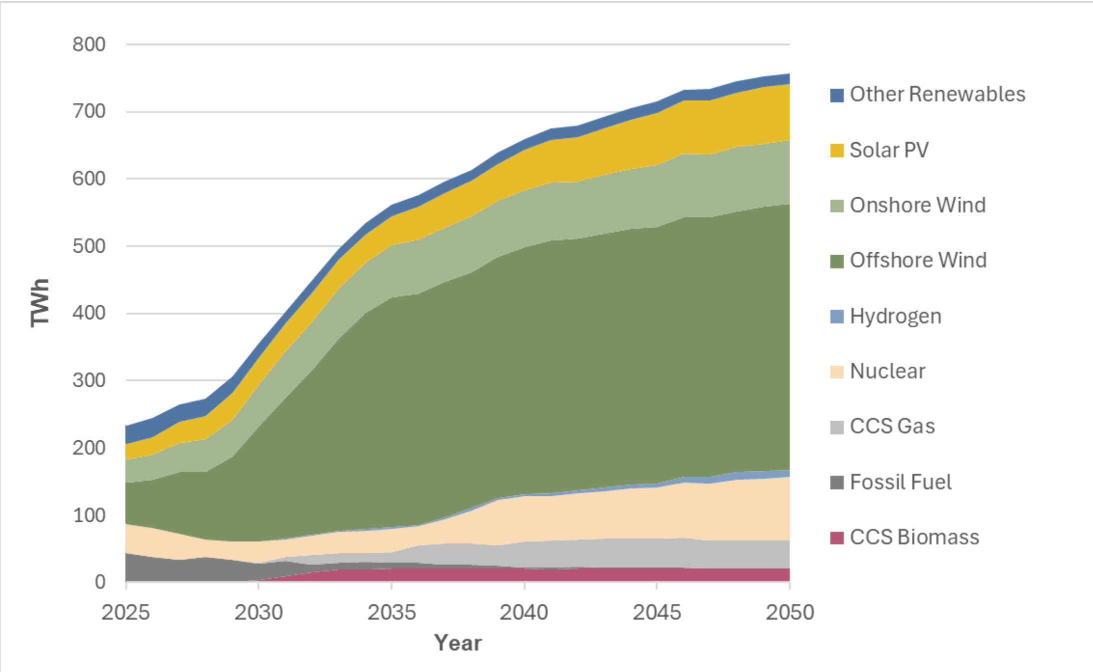


Figure 13-3: Electricity generation output by technology in Holistic Transition [Ref. 13-27]

13.7.10 This shows the challenge of using the UK Grid Average forecasts as a point of comparison for the future baseline for Greenhouse Gas Emissions.

13.7.11 Additionally, a comparison with other energy generating technologies is presented for completeness.

13.7.12 The UNECE report on Carbon Neutrality in the UNECE Region: Integrated Life-cycle Assessment of Electricity Sources (Ref. 13-9) shows the lifecycle emissions from different technologies – these are shown in Table 13-8Table 13-8 below. Caution is needed when comparing the Scheme with the United Nations assessment results, as the report explains that local conditions impact the carbon intensity of the technologies.

Table 13-8 Lifecycle GHG Emissions of different Electricity Sources

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

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

13.7.14 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 Resilience

Existing Baseline

13.7.15 The most recent available and completed historic climate data acquired by the Met Office from the closest Met Office Station to the Scheme (Marham) for the 30-year climate period of 1991 – 2020 (Ref. 13-8) provides the current baseline for the CCR Assessment. Marham Met Office Station is located approximately 6.75km west of the Scheme.

13.7.16 Long-term historic average climate data for Marham is provided in Table 13-9Table 13-9 below.

Table 13-9 Historic Climatic Data for the Study Area (1991 – 2020)

Climatic Factor	Month	Value
Average annual maximum daily temperature (°C)	-	14.51
Warmest Month on average (°C)	July	22.53
Coldest Month on average (°C)	January	1.07
Mean annual rainfall levels (mm)	-	660.31
Wettest month on average (mm)	October	66.43
Driest month on average (mm)	February	43.19

Future Baseline

13.7.17 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
- Maximum annual air temperature
- Minimum annual air temperature
- Mean annual precipitation; and
- Mean annual cloud cover.

13.7.18 A representative 25 km² grid square at the geographical centre of the Site that encompasses the Site'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 are shown in Table 13-10Table 13-10.

13.7.19 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. 13-10). For this assessment RCP 8.5 has been used, which assumes a 'business as usual' pathway for climate change, which represents a worst-case scenario as recommended by the ISEP guidance.

13.7.20 The impact of climate change has been determined over the course of the Scheme's construction (2 years), operational (60 years) and decommissioning (maximum 2 years) phases for the purpose of the EIA.

Table 13-10 Anomalies for probabilistic projections (25km) over UK for RCP8.5

Variable	2020-2049	2050-2079	2070-2099
Mean air temperature anomaly at 1.5 m (°C)	1.06	2.40	3.62
Maximum air temperature anomaly at 1.5 m (°C)	1.16	2.57	3.83
Minimum air temperature anomaly at 1.5 m (°C)	0.97	2.30	3.50
Precipitation rate anomaly (%)	-1.07	-4.21	-3.32
Total cloud anomaly (%)	-1.91	-4.48	-6.95

13.8 Embedded Mitigation

13.8.1 Embedded mitigation measures being incorporated into the design and construction of the Scheme are set out below and in the **Design Principles, Parameters and Commitments [APP/5.8]**. Prior to the implementation of any mitigation (embedded or additional), the Scheme has the potential to affect Climate Change receptors (positively or negatively), during construction, operational and decommissioning phases. The potential beneficial impacts include the generation of renewable energy and the associated reduction in GHG emissions compared to the existing grid mix. The potential adverse impacts include emissions from construction activities, transportation, and the embodied carbon in materials used.

13.8.2 The Scheme has been designed, as far as practicable, to avoid and reduce impacts and effects on Climate Change and to increase Climate Change resilience through the process embedding measures into the design. In addition, how the Scheme is constructed, operated and maintained, and decommissioned would be controlled through measures secured in the DCO in order to manage and minimise potential environmental effects (required as a result of legislative requirements and/or standard sectoral practices). The relevant measures which form the GHG Reduction Strategy as required in the NPS are included within the **oCEMP [APP/7.6]** and **oOEMP [APP/7.8]**, as relevant, rather than forming a separate document.

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

Embedded Construction Phase Mitigation (2031-2033)

GHG Impact

13.8.4 Embedded mitigation measures will be implemented to reduce the GHG impact of the Scheme. Specific embedded mitigation measures include the following and are also included in the **outline Construction Environmental Management Plan** (**oCEMP) [APP/7.6]** and **ES Chapter 16: Other Environmental Matters – Waste [APP/6.2]**.

13.8.5 Reducing waste:

- Off-site prefabrication, where practical, including the use of prefabricated elements
- Segregation of waste at source, where practical, to facilitate a high proportion and high-quality recycling
- 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 Development Area where practicable to minimise the use of natural resources and unnecessary materials (e.g. reusing excavated soil for fill requirements); and
- Off-site reuse, recycling and recovery of materials and waste where reuse on-site is not practical, e.g. through use of an off-site waste segregation or treatment facility or for direct reuse or reprocessing off-site.

13.8.6 General Practices:

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

- Retention of existing vegetation as far as practicable. Carbon associated with hedgerows and trees will be locked into the soil

13.8.7 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 adopted by the UK; and
- Implementing a shuttlebus to transport employees to the sites, thus reducing the number of trips made by construction staff.

Climate Change Resilience

13.8.8 Climate change resilience measures are embedded within the Scheme, particularly in relation to flood risk. These measures are outlined below. The specific flood risk impacts and associated mitigation measures are discussed in more detail in **ES Chapter 12: Water Resources [APP/6.2]** and **Appendix 12.2 Flood Risk Assessment (FRA) [APP/6.4]** and include:

- Access will be taken from existing access points, where suitable, and would initially be asphalt followed by graded Type 2 or 3 washed / clean aggregate or just use graded Type 2 or 3 washed / clean aggregate. Where new access points are required, the bellmouth will typically be asphalt and would be limited in extent. This limits the potential for increased surface water runoff rates and sedimentation effects during rainfall events
- As outlined in **ES Appendix 12.2: Flood Risk Assessment (FRA) [APP/6.4]**, the Scheme has been sequentially designed to locate the most electrically sensitive infrastructure (e.g. Solar PV arrays, the substation compounds, inverters and transformers) outside of Flood Zones 2 and 3 to mitigate against the risk of flooding.
- Given the relatively short construction phase (anticipated to be 24 months) and gently sloping Site, it is not anticipated that significant amounts of sediment will be generated. The Scheme will adhere to a detailed CEMP - to be provided by the Construction Contractor and based on the oCEMP, which will ensure compliance with the relevant guidance, such as the archived PPGs, as set out in **ES Appendix 13.1: Consultation and Legislation, Planning Policy and Guidance [APP/6.4].**
- Access to the Scheme during the construction phase would 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
- Crossings will be designed as part of detailed design, post-consent, and the **oCEMP [APP/7.6]** commits to the soffit level of any bridges sitting above the design flood level. The design flood level for permanent crossings would be the 1% AEP plus

Upper End climate change scenario (40% CC) and will involve the following parameters:

- Soffit height of the bridge will be a minimum of 600 mm above the 1% AEP + Climate change allowance flood level
- All abutments must be set back a minimum 1m from the top of the bank and as minimal as possible; and
- All parapets and railings need to be permeable and open as possible with a minimum 10mm spacing.

13.8.9 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
- Measures to protect 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 waterway; and
- BESS systems would include heating, ventilation and cooling (HVAC) systems and these would be contained within the individual equipment containers.

Embedded Operational Phase Mitigation (2033-2093)

13.8.10 Replacement activities, as well as regular planned maintenance of the Scheme, will occur during the operational phase. Where applicable, the construction mitigation measures as outlined above will also be put in place during operation to optimise efficiency and will be outlined in the Operational Environmental Management Plan (OEMP), to be prepared in accordance with the **outline Operational Environmental management Plan (oOEMP) [APP/7.8]**.

13.8.11 Specifically, the following embedded mitigation measures will be in place for operation:

- 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 through appropriate PPE and working practices as secured through the OEMP
- Monitoring weather forecasts and the news for Environment Agency flood warnings, relevant weather warnings, and water levels of the local waterways. This has been detailed in the **oOEMP [APP/7.8]** for inclusion within the OEMP; and
- BESS systems would include HVAC systems and these would be contained within the individual equipment containers.

13.8.12 The following embedded mitigation measures have been incorporated into the Scheme's design for the operational phase, as outlined in **ES Appendix 12.2: Flood Risk Assessment (FRA) [APP/6.4]:**

- The following built aspects will be served by a Sustainable Drainage Systems (SuDS)network designed to the 1% Annual Exceedance Probability (AEP) event plus 40% climate change allowance:
- Work No. 2: BESS
- Work No. 3: Customer Substation; and
- Work No. 4: National Grid Substation.
  - Access tracks will be served by trackside drainage ditches and will include check dams at regular intervals, as stipulated in the SuDS Manual, to prevent the rapid transfer of water downslope.
  - Flexibility for either Single Axis Trackers or Fixed South Facing PV Arrays to be implemented at the Scheme has been built into the DCO Application. For the purposes of this assessment, Single Axis Trackers have been considered as a worst-case scenario due to their greater infrastructure needs, resulting in higher embodied carbon. The PV panels will have metal Mounting Structures that hold PV Panels in rows, either secured via metal post driven into the ground at a maximum depth of 4 m or weighed down using concrete feet (detailed in **ES Chapter 5: The Scheme [APP/6.2]**)
  - The Solar PV Array will comprise rows of solar panel modules mounted on metal frames and pile driven into the ground to limit the footprint of PV array units. All sensitive and electrical equipment on the PV panel will be elevated by the legs (including the PV panel face itself)
  - The panels would be mounted at least 0.4 m from the ground at the lowest point. Once rainfall has fallen off a Solar PV Array, the water will be able to spread and flow along the ground under the Solar PV Arrays evenly into the rain-shadow of the row below, so as to mobilise the same percentage of the ground for infiltration as was available prior to the installation of Solar PV Arrays. Additionally, the Solar PV array tables will have regular rainwater gaps to prevent water being concentrated along a single drip line. As such, rainfall landing on the solar panels will drain through rainwater gaps and infiltrate into the ground beneath and between each row of panels,
  - **ES Appendix 12.2: Flood Risk Assessment (FRA) [APP/6.4]** commits the Scheme to having dedicated contaminated water tanks with automated penstocks to prevent fire suppressant reaching the infiltration components of the SuDS network, in the rare event of a fire within Work Nos. 2, 3 or 4. which experience less than 1m depth of flooding during the same event.

Embedded Decommissioning Phase Mitigation (2093-2095)

13.8.13 Similar measures to the construction phase will be developed prior to the decommissioning phase for the use of lower-carbon and more climate change resilient methods, as highlighted in the **outline Decommissioning Strategy (oDS) [APP/7.10].**

13.8.14 Decommissioning is expected to occur in 2093. The requirements for decommissioning are subject to change as the environment beyond 2093 is likely to be considerably different to today. The future technological, regulatory, and environmental landscape beyond 2089 is difficult to predict with certainty, so maintaining flexibility in the decommissioning approach is prudent.

13.9 Assessment of Likely Effects

13.9.1 This section identifies and characterises potential impacts arising during the construction, operation and decommissioning Phases of the Scheme.

13.9.2 Taking into account the embedded mitigation measures as detailed in Section 13.8, the potential for the likely effects of the Scheme on Climate Change receptors has been assessed using the methodology as detailed in Section 13.6 of this ES chapter. In the sections below, effects during the construction, operational and decommissioning phases of the Scheme are assessed for Climate Change receptors scoped into the assessment.

13.9.3 Any additional mitigation required to reduce these effects is then set out in Section 13.10 below. Thereafter, an assessment is made of the significance of any residual effects after all mitigation measures have been accounted for.

GHG Impact Assessment

13.9.4 For each lifecycle stage of the Scheme (construction, operational, and decommissioning), the associated GHG emissions have been identified and assessed.

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

Table 13-11 Possible sources of GHG emissions

Lifecycle Stage	Activity	Primary emission sources
Construction phase	This stage is anticipated to create a significant input to GHG emissions, due to the materials that contain high levels of embodied carbon, extraction and generation of raw materials, complex manufacturing processes and equipment design.	GHGs that are produced during manufacturing and extraction and design.
	Construction activity on-site.	Energy consumption on-site. Commuting construction workers.

Lifecycle Stage	Activity	Primary emission sources
	Construction materials that are transported and not integrated in embodied GHG emission. Equipment required is likely to require shipment, due to overseas origin.	Transportation of materials to the Sites and the amount of fuel consumed.
	Construction workers that would need transportation to the Site.	Transportation of workers to the Sites and resulting GHG emissions.
	Waste produced during the construction process that need to be disposed.	GHG emissions produced from the transportation and removal of waste materials.
	Water use	Treatment of wastewater and supply of potable water.
Operation phase	Scheme maintenance	GHG emissions from maintenance. The operational aspects are expected to be negligible in the context of overall GHG emissions.
	Replacement of materials (i.e. batteries and replacement panels) Water use on site for fire suppression and cleaning panels.	GHG emissions that are embodied within the products and the transportation of the materials.
Decommissioning phase	Decommissioning activity occurring on-site.	Energy consumption of on-site vehicles and generators.
	Removal and transportation of any waste materials.	GHG emissions generated from the transportation and disposal of waste materials.
	Workers that would need to be transported to the Site	Transportation of workers to site and resulting GHG emissions.

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

13.9.7 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.

13.9.8 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, the National Grid average GHG intensity inclusive of future estimated emissions, and associated considerations with the change in downstream emissions as a result of generating renewable energy.

Construction Phase (2031-2033)

13.9.9 For the purposes of the GHG impact assessment, the construction phase is anticipated to take place over 24 months. Based on Q4 2033 energisation, it is anticipated that the earliest the construction phase would commence would be Q3 2031. There is likely to be a pre-construction period preceding the construction phase of approximately six months (Q1 and Q2 2031) to allow site preparation works.

13.9.10 The following components are anticipated to be installed during the construction phase:

- Solar PV Panels mounted on Mounting Structures
- Up to 134 Inverter Conversion Units
- A Battery Energy Storage System (BESS) area
- A Customer Substation
- A National Grid Substation
- Grid Connection Infrastructure; and
- Cabling and other Associated Development and Ancillary Infrastructure

13.9.11 Calculations for the embodied carbon within the various products to be used on site and the PV panels are detailed below.

PV panels

13.9.12 A PV panel is composed of multiple modules. It is estimated the total number of modules for Scheme will be 924,336.

13.9.13 For the purpose of the GHG assessment, a conservative approach assuming the Single Axis Trackers has been included which results in a lower yield (MWh/year in year 1). Should Fixed South Facing PV Arrays be selected for the final design, there would be a negligible decrease in emissions from this element of the Scheme. The EIA allows for either tracking or fixed panels.

13.9.14 Based on indicative product specification details, the total weight of an individual module is anticipated to be 33.5kg. For the purpose of this assessment, it is considered that each module has 144 individual solar cells. The primary materials which go into construction of the PV Panel are silicon, anodized aluminium, and glass.

13.9.15 The Global Silicon Council have produced a document, “Silicon-Chemistry Carbon Balance: An assessment of Greenhouse Gas Emissions and Reductions” (Ref. 13-11) which states that each cell contains approximately 11 g of silicon. Silicon has an embodied carbon value of 6 kgCO_2e/kg. Based on these figures, it is calculated that each panel has 1.5846 g silicon and an embodied carbon value of 9.5046 kgCO_2e. The total embodied silicon from PV Panels used by the Scheme is 8,785874 tCO_2e.

13.9.16 The surface area for one panel is anticipated to be 2.70 m^2. A value of 2.5 kg per mm thickness per m^2 as derived from the “Silicon-Chemistry Carbon Balance: An assessment of Greenhouse Gas Emissions and Reductions” (Ref. 13-11) and glass thickness of 2.0 mm (dual glass, 2.0 mm + 2.0 mm heat strengthened glass) gives a glass weight per panel of 27.0 kg. An embodied carbon value of 1.4028 kgCO_2e/kg has been taken from the DESNZ 2025 GHG conversion factors (Ref. 13-1) for glass. This gives a total of 35,009 tCO_2e for glass used across the Scheme.

13.9.17 It has been assumed that each PV panel contains 4.6 kg of anodized aluminium. Using a value of 8.66 kgCO2e/kg (Aluminium, all data collected) taken from the Inventory of Carbon & Energy (ICE) database (Ref. 13-12), this gives a total of 39.8 kgCO2e per module. The aluminium emissions from all solar modules used by the Scheme are 36,819 tCO2e.

13.9.18 It is considered that 20,854 mounting structures weighing 800 kg each will be required, and that all mounting structures will be primarily made of steel.

13.9.19 Using a value of 2.71 kgCO2e/kg [Ref. 13-12], a value of 45,211 tCO2e has been estimated for the Mounting Structures.

13.9.20 The total embodied carbon for all PV Panels and Mounting Structures, accounting for the materials used in the Scheme is **125,825~~913~~ tCO_2e**.

Transformers and Switchgear (contained within Conversion Units)

13.9.21 To calculate the embodied carbon associated with the production of the Transformers to be used by the Scheme, the material breakdown of a typical Transformer as reported in a lifecycle assessment produced by Piotrowski & Markowska (2025)) (Ref. 13-9) was used as a benchmark to estimate material quantities associated with the Transformers required for the Scheme.

13.9.22 For the purpose of this assessment, it is assumed that up to four x 400/33kV Transformers would be installed on Site.

13.9.23 The total weight of each Transformer type is based on specifications of equipment on previous Island Green Power (IGP) solar schemes, such as West Burton and Cottam schemes.

13.9.24 The materials used in Transformers are oil, steel, copper and pressboard as set out in (Ref. 13-13). The proportions of typical material are also shown in (Ref. 13-13). As the total weight is known, the remaining materials have been proportioned out appropriately.

13.9.25 The total embodied carbon for the Transformers and Switchgear is **2,410 tCO_2e**.

Table 13-12 Materials of $kgCO_2e$ in Transformers and Switchgear

Material	Total Weight (tonnes)	$kgCO_2e/kg$	tCO_2e
Steel	252.5	2.5	631.1
Electrical Steel	245.0	3.0	735.1
Copper	122.5	4.738	580.5
Pressboard	64.0	1.289	82.5
Oil	272.0	1.401	381.1
Total			**2,410**

Inverters

13.9.26 It is anticipated that a maximum of 268 inverters will be installed during the construction phase.

13.9.27 To calculate the embodied carbon associated with the Inverters, a previously determined value for embodied energy of PV system Inverters of 210 kWh/kW was used (Ref. 13-2424).

13.9.28 The electricity emissions factor for China (Ref. 13-25) was used, as this is the assumed country of origin for the Inverters.

13.9.29 Based on the above, the total embodied carbon emissions of the Inverters are calculated as **2,990 tCO_2e**.

Table 13-13 Embodied carbon emissions of Inverters

Maximum Number of Inverters	Embodied Energy (kWh/kW)	Embodied Energy per inverter tCO_2e	Total Embodied Energy of Inverters tCO_2e
268	210	11.15	2,990

Electrical Cables

13.9.30 Indicative cable lengths (3,768 km, of which 3.19 km correspond to high voltage cables) and weights (364.9 tonnes of which 76.5 tonnes correspond to high voltage cables) were estimated for Grid Connection Cables, on-site cables, and interconnecting cables for the whole of the Scheme.

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

13.9.32 Embodied carbon values for each material have been taken from (Ref. 13-13) and are shown below:

- Copper: 2.71 kgCO_2e/kg
- Aluminium: 6.67 kgCO_2e/kg; and
- Polyethylene: 2.54 kgCO_2e/kg.

13.9.33 The total embodied carbon from all electrical cables used by the Scheme is **1,107 tCO_2e.**

BESS

13.9.34 For the purpose of this assessment, a value of 100 kgCO_2e per kWh is considered as a realistic worst-case assumption based on manufacturer guidance. This is a conservative approach, and other recent studies (see (Ref. 13-16) and (Ref. 13-17)) have reported significantly lower emissions factors.

13.9.35 The assessed MWh battery storage is 2,640 MWh.

13.9.36 Based on the above assumptions the total CO_2e from batteries is **264,000 tCO_2e.**

Shipping of Materials

13.9.37 Based on the provided material weights and making the precautionary assumption that all products would come from China, the below calculations are made. Shipping distance from Shanghai to King's Lynn is 24,582 km.

Table 13-14 Shipping GHG Emissions

Shipping Weight (tonnes)	Distance (km)	kgCO_2e/tonne/km*	kgCO_2e	tCO_2e
90,474	24,582	0.01321	29,379,520	**29,380**

* *General Average Cargo Ship from (Ref 13-1)*

13.9.38 The total emissions from shipping of materials associated with the Scheme during construction has been estimated as **29,380 tCO_2e.**

Vehicle Movements

13.9.39 A 1-way distance of 30.26 km per journey has been assumed based on the average trip distance for business from (Ref. 13-2) for the worker transportation calculations, giving an average 2-way trip length of 60.51 km. The UK Government 2025 emissions factors (Ref. 13-1) for 'Average petrol car' and 'Average Local Bus', including WTT emissions, have been applied to this distance and total worker numbers to calculate GHG emissions associated with worker transport. As the conversion factor for 'Average Local Bus' is 0.10385 kgCO_2e/passenger/km, the factor was multiplied by 20 (the number of workers assumed per shuttlebus).

13.9.40 There are 526 forecast daily two-way trips for staff/LGV worker movements and 96 forecast two-way HGV trips. and an estimated construction phase of 596 days (estimated based on a worst-case scenario of the construction phase being 2 years). For the purpose of this assessment, it is assumed that 19 trips will be by shuttle bus (20 workers per bus, equal to 380 worker movements), and 244 two-way trips by car considering 1.5 people per car (366 worker movements).

13.9.41 Considering the conversion factor for an average petrol car for car movements, an average local bus for the Shuttlebus, and all HGVs for HGV movements during the construction phase, the total GHG emissions for construction vehicle movements is detailed in the table below.

Table 13-15 Construction Worker GHG Emissions

Vehicles	Number of Trips	Average Distance (km)	kgCO_2e/km	kgCO_2e	tCO_2e
Shuttle Bus	11,324	60.51	2.077	1,423,224	1,423
Cars	145,424	60.51	0.163	1,431,904	1,432
HGVs	57,216	60.51	0.836	2,894,032	2,894
Total					**5,749**

13.9.42 It is estimated that there will be 3,191 two-way HGV trips to the Site during the construction phase associated with the transport of materials. The assessment is set out below and has assumed that all the trips will be from China. The total road distance (130 km) was estimated from industrial areas around Shanghai, and then from King's Lynn to the Site. A conversion factor for 'All HGVs, 50% Laden' from (Ref. 13-1) was used to account for variation in HGV types and for differences in HGV load during delivery to and from the Sites.

Table 13-16 Construction HGV GHG Emissions from Transport of Materials

Vehicles	Number of Trips	Average Distance (km)	$kgCO_2e/km$]	$kgCO_2e$	tCO_2e
HGV 50% Laden	3,191	130	0.84	346,752	347

13.9.43 The total emissions from vehicle movements associated with the Scheme during the construction phase has been estimated as **6,096 tCO_2e**.

Waste

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

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

13.9.45 Sewage waste generated during construction has been estimated at 13,990 m^3. Using a conversion factor of 0.17088 $kgCO_2e/m^3$ for water treatment (Ref. 13-1), the total estimated emissions from sewage waste have been calculated at 2.39 tCO_2e.

13.9.46 The estimated ground material expected to be excavated which will not be suitable for refill or compaction has been calculated at 157,693 m^3. Using a typical density value for mixed construction and demolition of 1.2 tonnes per m^3 (Ref.13-14), and a conversion factor for average construction of 1.00835 $kgCO_2e$/tonne (Ref. 13-1), the total estimated emissions from excavation material waste have been calculated as 190.8 tCO_2e.

13.9.47 The total waste generated during construction results in an estimated **193.2 tCO_2e**.

Water Use

13.9.48 Water use has been estimated for:

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

Table 13-17 Total Construction Phase Water Use Emissions

Water use during construction (m^3)	$kgCO_2e/m^3$	$kgCO_2e$	tCO_2e
17,296	0.19130	3,308.72	3.30872

Energy Use

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

Table 13-18 Energy usage during Construction Phase GHG Emissions

Total Energy usage (kWh)	Total $kgCO_2e$ per kWh	$kgCO_2e$	tCO_2e
1,417,000	0.17700	250,809	251

Packaging of Materials

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

13.9.51 Emissions per tonne of material are sourced from DESNZ (Ref. 13-1).

Table 13-19 Energy usage during Construction Phase GHG Emissions

Packaging Item	Total Volume (m^3)	Assumed Density Material ($tonnes/m^3$)	Total Weight (tonnes)	$kgCO_2e$/tonne for material	Total tCO_2e
Pallet Wood	13,104.33	0.7	9173.03	4.68568	42.98
Polyurethane Foam pad for cushioning between modules	8,954.66	0.024	214.91	4.68568	1.01
Corrugated Cardboard, plastic wrap and Kraft cardboard	13,366.42	0.6	8019.85	4.68568	37.58

Packaging Item	Total Volume (m^3)	Assumed Density Material (tonnes/m^3)	Total Weight (tonnes)	$kgCO_2e$/tonne for material	Total tCO_2e
Corner pieces and edge spacers made of HDPE	163.21	0.965	157.49	4.68568	0.74
Pallet Nails	4.01	7.874	31.61	4.68568	0.15
Cable Drum Wood	912.13	0.7	638.49	4.68568	2.99
Total					**85.45**

Pylons

13.9.52 It is estimated that during the construction phase of the Scheme, up to ten new pylons will be installed and up to five existing pylons will be removed.

13.9.53 The estimated total weights of each pylon tower and wire type expected to be removed during the construction phase are provided in Table 13-20~~Table 13-20~~.

13.9.54 To estimate the embodied carbon associated with pylon removal, the 2025 GHG emissions factor for waste disposal of metal (Ref. 13-1) was applied to the total weights of each pylon component to be removed during the construction phase. This gives a value of 255.3 $kgCO_2e$ for emissions associated with pylon removal.

Table 13-20 Emissions associated with Pylon Removal

Component	Total weight (tonnes)	$kgCO_2e$/tonne for material	$kgCO_2e$
L6(c) D STD tower	109.0	1.00835	109.9
L6(c) D30 STD tower	36.1	1.00835	36.4
L6(c) D60 STD tower	41.3	1.00835	41.6
Keziah Earthwire ($160mm_2$ AACSR) 736kg/km	1.2	1.00835	1.2
Araucaria Conductor ($700mm^2$) 2266kg/km	65.7	1.00835	66.2

Component	Total weight (tonnes)	$kgCO_2e$/tonne for material	$kgCO_2e$
Total			**255.3**

13.9.55 For the purpose of this assessment, it has been assumed that twice as many pylons will be installed as are removed. The total weights of each component installed are therefore double those in Table 13-20~~Table 13-20~~.

13.9.56 To estimate the embodied carbon associated with pylon installation, emissions factors for aluminium and steel (all data collected) from the ICE database (V4.0 – Dec 2024) (Ref. 13-12) were applied to the data. This gives an estimated embodied energy for pylon installation of **2,163~~1~~.1 tCO_2e.**

Table 13-21 Embodied carbon emissions associated with Pylon Installation

Component	Total weight (kg)	$kgCO_2e$/kg for material	$kgCO_2e$	tCO2e
L6(c) D STD tower	218,030	2.6973	588,100	588.1
L6(c) D30 STD tower	72,116	2.6973	194,521	194.5
L6(c) D60 STD tower	82,560	2.6973	222,692	222.7
Keziah Earthwire (160mm^2 AACSR) 736kg/km	2,370	8.6594	20,522	20.5
Araucaria Conductor (700mm^2) 2266kg/km	131,337	8.6594	1,137,302	1137.3
Total				**2163~~1~~.1**

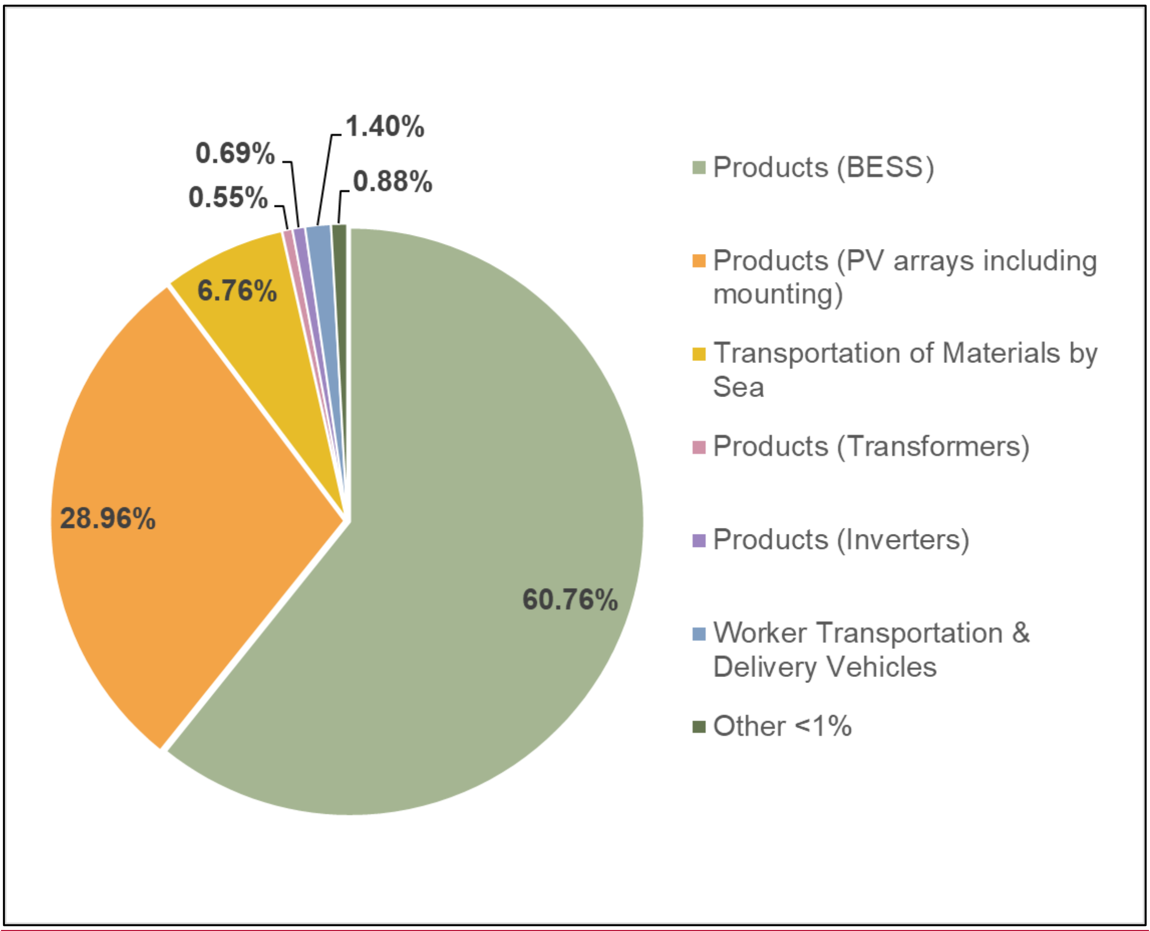
13.9.57 This gives a total value of **2163.4 tCO_2e** for pylon installation and removal.

Summary of Construction GHG Emissions

13.9.58 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. The manufacture and supply of PV Panels and BESS will be the largest source of GHG emissions. The summary of GHG emissions during the construction phase is shown in Table 13-22~~Table 13-22~~ below.

Table 13-22 Construction GHG Emissions

Emissions Source	Emissions (tCO_2e)	% Construction Emissions
Products (BESS)	264,000	60.75
Products (PV arrays including mounting)	125,825~~913~~	28.96~~7~~
Transportation of Materials by Sea	29,380	6.76
Worker Transportation & Delivery Vehicles	6,096	1.40
Products (Inverters)	2,990	0.69
Products (Transformers)	2,410	0.55
Pylons	2,163	0.50
Products (Cables)	1,107	0.25
Energy Usage	251	0.06
Waste	193	0.04
Packaging	85	0.02
Water Usage	3	<0.01
Total	**434,503~~591~~**	**100.0**


1.40%
0.69%
0.88%
0.55%
6.76%
28.96%
60.76%
Products (BESS)
Products (PV arrays including mounting)
Transportation of Materials by Sea
Products (Transformers)
Products (Inverters)
Worker Transportation & Delivery Vehicles
Other <1%

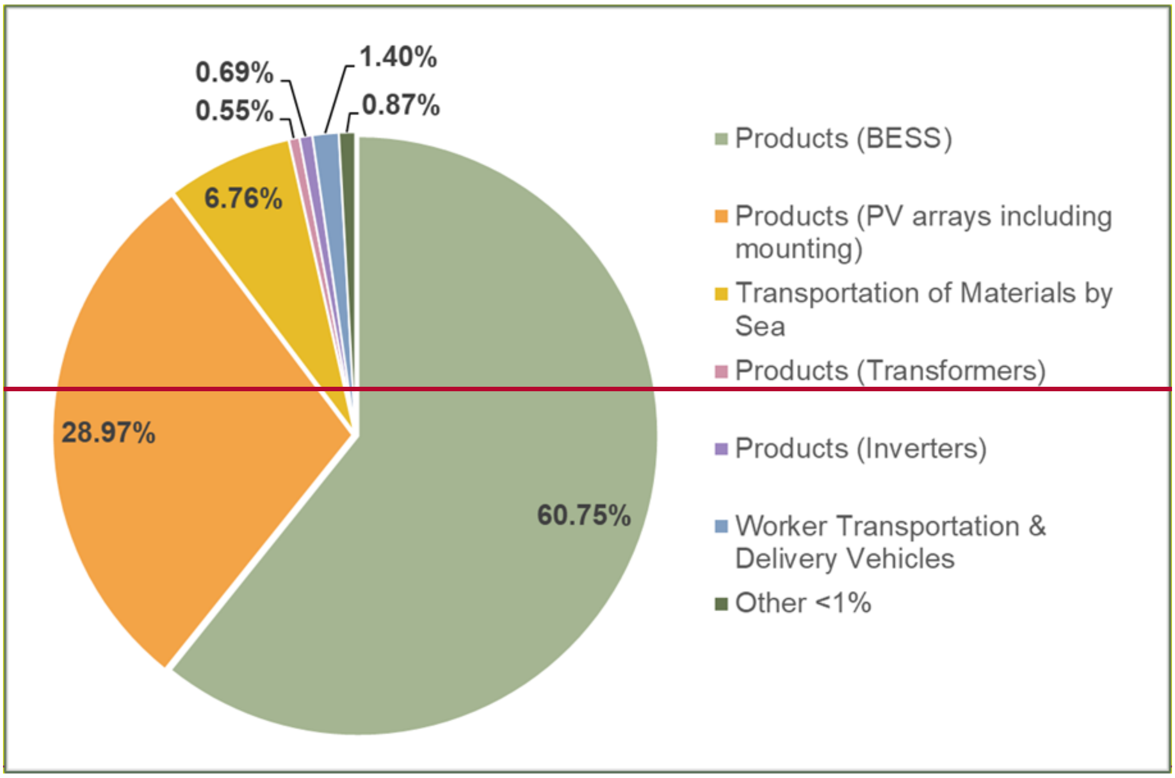


Figure 13-4: Construction GHG Emissions

13.9.59 It has been identified that embodied carbon from the BESS and PV panels will produce the greatest amount of GHG emissions and mitigation efforts will concentrate on these priority areas.

Significance of Effect (Construction)

13.9.60 Worst case total GHG emissions from the construction phase are estimated to equate to around **434,503~~91~~ tCO_2e**.

13.9.61 GHG emissions from construction activities will be limited to the duration of the construction phase (anticipated to be 2 years). The emissions from the construction phase will not be evenly weighted between the 2 years, but for the purpose of this assessment it is considered emissions will be evenly weighted between both years and will be made from Q3 2031 until Q3 2033. When annualised, the total annual construction emissions equate to around 217,252~~296~~ tCO_2e.

13.9.62 Table 13-23~~Table 13-23~~ presents the estimated construction emissions against the carbon budget periods during which they arise. Construction emissions will fall under the 5th and 6th UK carbon budgets. For the purposes of this assessment, it is assumed that 50% of construction emissions will fall under the 5th carbon budget and 50% under the 6th carbon budget. Although the majority of the construction phase falls under the 5th carbon budget, using a 50:50 split of construction emissions provides a conservative approach considering the 6th carbon budget is decreased by approximately 50% compared to the 5th.

13.9.63 The annual emissions of the construction phase have been compared to the relevant annualised carbon budgets in Table 13-23~~Table 13-23~~ below to enable assessment of the construction phase in isolation.

Table 13-23 Construction GHG Emissions and UK Carbon Budgets

Relevant UK Carbon Budget	Annualised UK Carbon Budget (tCO_2e)	Annual Construction Emissions for the Scheme During Carbon Budget Period (tCO_2e)	Construction Emissions for the Scheme as a Proportion of Carbon Budget
5th Carbon Budget (2028 to 2032)	345,000,000	217,296	0.06%
6th Carbon Budget (2033 to 2037)	193,000,000	217,296	0.11%

13.9.64 Annual emissions from the construction of the Scheme do not contribute to equal to or more than 0.06% and 0.11% of the 5th and 6th carbon budgets respectively. The magnitude of effect is therefore considered low. GHG emissions from the construction of the Scheme are considered to have a Minor Adverse effect on the climate, which is **not significant**.

Operation Phase (2033-2093)

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

Sulphur hexafluoride (SF_6)

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

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

Maintenance Travel

13.9.68 For the purpose of this assessment, it is assumed that there will be 75,000 maintenance labour days over the operational phase and an additional 83,940 labour days associated with product replacement. Assuming there are 1.5 workers per car travelling the average commute length of 14.32 km from (Ref. 13-2) and using the 2025 GHG conversion factor for an average petrol car (Ref. 13-1), the operational phase of the Scheme would generate approximately **498 tCO_2e** as a result of workers travelling to and from the Site for maintenance and replacement works.

13.9.69 Calculations for worker transportation have been carried out using current conversion emissions factors to estimate emissions over the operational lifetime of the Scheme. However, carbon and emissions associated with energy and fuel use throughout the supply chain are anticipated to be lower in the future as a result of grid decarbonisation and machinery and vehicle electrification in line with the UK's net zero carbon emissions target for 2050.

Replacement of Scheme Components

13.9.70 The lifespan for the proposed BESS units is 10 to 15 years. For the purpose of this assessment, it is assumed that the design lifespan is 10 years as a worst-case assumption. The BESS units are expected to require up to five replacements throughout the operational phase. While technology may have improved and some of the assumptions used which underpin the embodied carbon values, as a conservative approach, it has been assumed that the embodied carbon at replacement will be the same as during the construction phase, equivalent to **1,371,619 tCO_2e**, inclusive of transportation emissions (sea and land) as described for the operational phase for each replacement.

13.9.71 It has been assumed that all PV panels will be fully replaced once during the lifecycle of the Scheme. Additionally, a 3% ad hoc replacement was considered based on a 0.05% failure rate per year. This results in a total estimated **94,305 tCO_2e** over the Scheme lifespan, inclusive of transportation emissions (sea and land). The Mounting Structures are not assumed to require replacement.

13.9.72 Transformers are anticipated be replaced up to once during the operational phase. This results in a total estimated **2,732 tCO_2e** over the Scheme lifespan, inclusive of transportation emissions (sea and land).

13.9.73 Up to 20% of DC cables (15,307 kg) are expected to be replaced over the operational phase. This results in a total estimated **46 tCO_2e** over the Scheme lifespan, inclusive of transportation emissions (sea and land).

Water Consumption

13.9.74 During operational, to maintain the effectiveness and energy generation efficiency of the PV Panels, they will be cleaned. For the purpose of this assessment, it is considered that the PV Panels will be cleaned once per year and that water required for other uses would be negligible. Over the operational phase of the Scheme, it is estimated that 46,590 m^3 of water will be consumed.

13.9.75 Based on a water supply conversion factor of 0.1913 $kgCO_2e/m^3$, a total of **8.91 tCO_2e** will be generated from water use during the operation phase of the Scheme.

Operational Waste and Packaging

13.9.76 There is anticipated to be 15,894 m^3 of sewage waste from the Scheme over the entire operation phase. Using the wastewater value methodology as per the construction phase this gives a total of **2.72 tCO_2e** over the Scheme's 60-year operational phase.

13.9.77 Emissions associated with packaging materials used per annum and during the replacement of products (PV Panels, BESS and Inverters) are set out in Table 13-24~~Table 13-24~~ below.

Table 13-24 Packaging Materials Embedded GHG Emissions

Packaging Item	Total Volume (m^3)	Assumed Density Material (tonnes/m^3)	Total Weight (tonnes)	$kgCO_2e$/tonne for material	Total tCO_2e
Pallet Wood	9,917.53	0.7	6942.27	4.68568	32.53
Polyurethane Foam pad for cushioning between modules	9,223.30	0.024	221.36	4.68568	1.04
Corrugated Cardboard, plastic wrap and Kraft cardboard	10,115.88	0.6	6069.53	4.68568	28.44
Corner pieces and edge spacers made of HDPE	168.10	0.965	162.22	4.68568	0.76
Pallet Nails	3.04	7.874	23.92	4.68568	0.11
Total					**62.88**

13.9.78 Packaging waste resulting from the replacement of Scheme components is estimated to result in a total of 62.88 tCO_2e over the Scheme's operational phase. This gives a total value of **65.59 tCO_2e** for operational waste and packaging.

Energy Usage

13.9.79 There will be some required energy use for operation of the Site for the CCTV and monitoring systems and for the office. It is anticipated that GHG emissions from energy usage will reduce over the operation phase of the Scheme as a result of the decarbonization of the grid. However, that assumption is reliant on Schemes such as this one being developed. As a conservative assumption, the baseline value for 2033 from DESNZ (Ref. 13-1) has been applied and the same emissions per kWh have been applied over the estimated 60-year operational phase.

Table 13-25: Operational GHG Emissions from Energy Usage

Total Energy usage (kwh)	Total kg CO_2e per kWh	tCO_2e over project lifespan
150,480,000	0.03842	**5,782**

Ancillary BESS-Driven Carbon Reductions

13.9.80 The BESS is a separate but associated part of the Scheme which will support the operation of the solar part of the scheme.

13.9.81 The BESS is assumed to have a capacity of 2,640 MWh and has the capacity to supply 46,253 GWh to the grid over the Scheme's lifespan.

13.9.82 It is expected that the BESS will largely be charged with energy generated from low carbon sources, though the exact nature of emissions going into charging it has not been fully assessed. More information is available in Section 6.10 of the **Statement of Need [APP/5.4].**

13.9.83 The additional benefits of the BESS can be calculated by comparing the energy provided by the BESS after being charged by the Scheme's energy generation with the projected carbon intensity of the grid in 2033 (Ref. 13-3).

13.9.84 Working assumptions include that the BESS is primarily charged with low carbon energy and discharged back into the grid once per day at a typical round-trip efficiency of 85% and a charging capacity of 80%.

13.9.85 As the projected grid carbon intensity does not account for Well-to-Tank emissions associated with energy generation, the operational intensity of the Scheme was calculated using all operational emissions except those associated with BESS replacement.

13.9.86 According to these calculations, the BESS could deliver a carbon saving of approximately 1,382,016 tCO_2e over the Scheme's lifespan without accounting for any emissions as a result of the energy generation used to charge the BESS.

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

13.9.88 While these additional BESS-related savings are not factored into the overall assessment, it is important to acknowledge the significant climate change mitigation potential of integrating the BESS as part of the overall solar farm development. The support the BESS provides to the main solar array and the electricity system during its operation will lead to further emissions reductions beyond just the renewable energy generation provided by the Solar scheme without its inclusion.

Summary of Operational Effects

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

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

Table 13-26: Operational GHG Emissions

Emissions Source	Emissions (tCO_2e)	% Operational Emissions
BESS Replacement (inclusive of transportation)	1,371,619	92.99
PV modules Replacement (inclusive of transportation)	94,305	6.39
Energy Usage for Operational Period	5,782	0.39
Replacement of transformers (inclusive of transportation)	2,732	0.19
Worker Transportation	498	0.03
Packaging	63	<0.01

Emissions Source	Emissions (tCO_2e)	% Operational Emissions
Water Usage	9	<0.01
DC Cable replacement	41	<0.01
Operational Waste	3	<0.01
Total	**1,475,010**	**100.0**

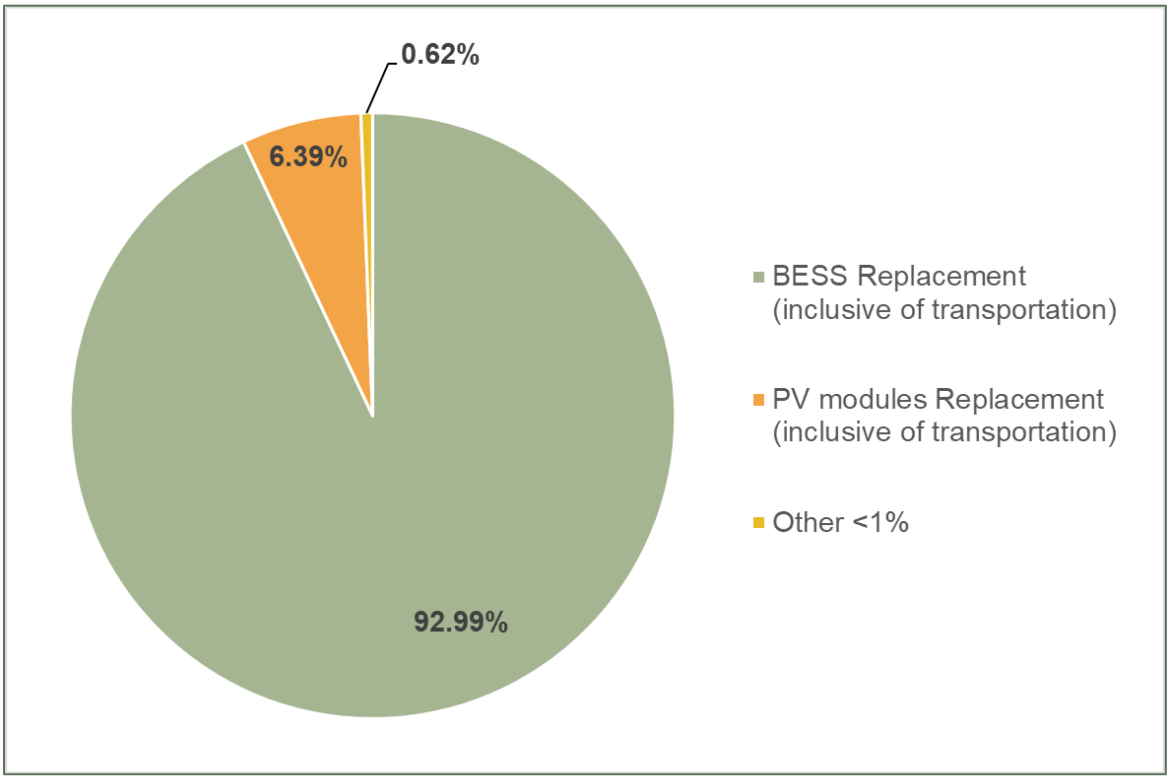


Figure 13-5: Operational GHG Emissions

Significance of Effect (Operation)

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

13.9.92 Renewable energy generation from the Scheme during the first year of operation is estimated to be around 659,480 MWh/year for single-axis tracker panels. To account for product degradation, a 1% degradation factor for the first year has been applied, followed by a 0.35% degradation factor for each subsequent year. This results in an estimated energy generation figure of 610,809 MWh in the final year of operation. The total energy generated by the Scheme would be around 37.22 TWh over the 60-year Scheme operational phase. It is possible this is a slightly conservative estimate as future climate projections indicate a reduction in annual cloud cover over time which may have a beneficial impact on the energy generation potential of the Scheme but has not been taken into account in the calculations.

13.9.93 Accounting for the estimated construction, operational and decommissioning phase emissions, the Scheme's total carbon intensity value is 51.44 gCO_2e/kWh.

13.9.94 The available UK grid carbon intensity figure only considers operational emissions from the generation of electricity.

13.9.95 As such, to compare the performance of the Scheme with the grid emissions, the analysis is solely on the emissions associated with the ongoing operational activities. The emissions generated during the initial construction phase and eventual decommissioning phase are not included within this specific comparative assessment, as recommended by ISEP guidance (Ref. 13-6).

13.9.96 By aligning the lifetime energy generation figures with the other operational GHG emissions, the Scheme achieves an operational intensity of 39.63 gCO_2e/kWh. This is at a consistent level as the CP2030 emissions expectation for 2030.

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

13.9.98 For context only (noting that in the future all new such power station will need to be carbon capture ready and that it is ultimately intended that CCS will be applied to existing power stations) it is noted that the most carbon-efficient fossil-fuelled technology available is a gas-fired CCGT generating facility, which has a representative figure carbon intensity of 350 gCO_2e/kWh. It should be noted that NPS EN-1 (January 2024) (Ref. 13-33) requires all combustion power stations with a capacity at or over 300 MW to be constructed Carbon Capture Ready. It is also worth noting that there is no current requirement for existing CCGT to retrofit CCS.

13.9.99 In line with ISEP guidance (Ref. 13-6), the significance of effect will be concluded on for the whole lifespan of the Scheme in Sections 13.9.131 to 13.9.134.

Decommissioning Phase (2093-2095)

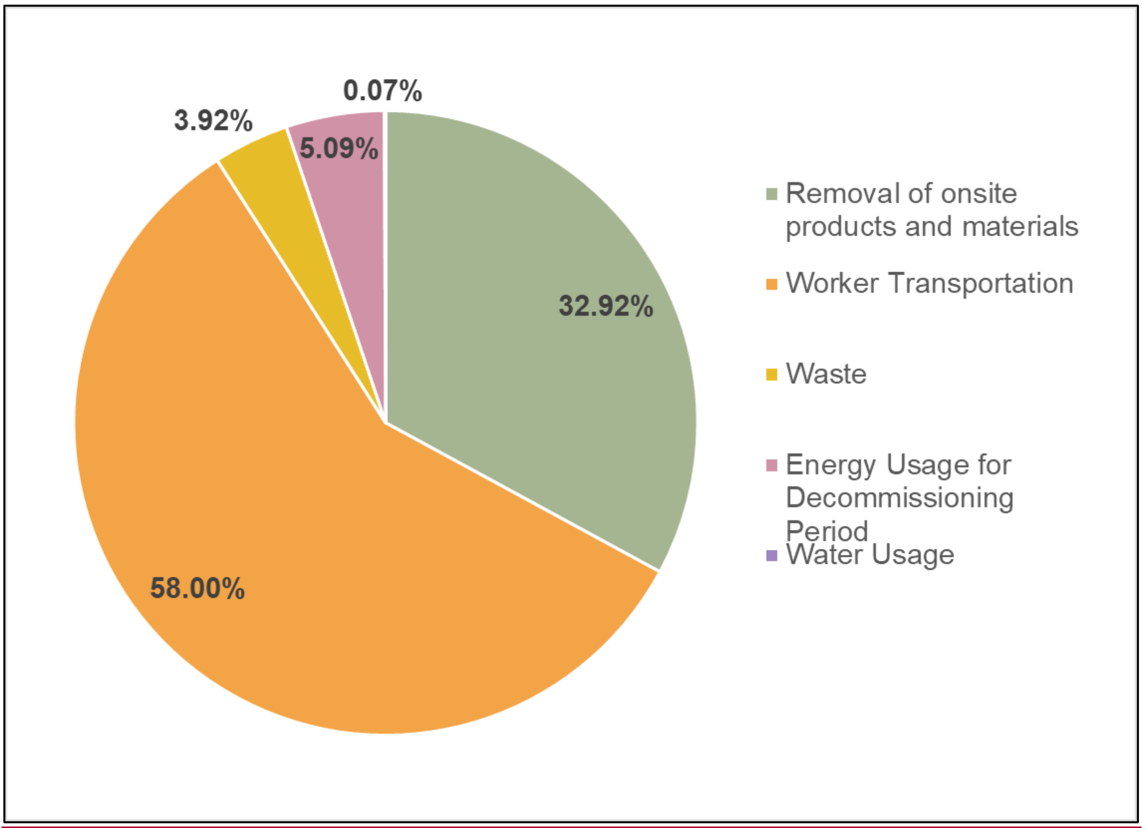
13.9.100 As the decommissioning activities associated with the Scheme will occur far into the future, more than 60 years from the time of writing; there is uncertainty over the total estimate of GHG emissions that will be produced and the available technology. However, the decommissioning phase GHG emissions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

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

13.9.102 The decommissioning phase emissions account for less than 0.3% of the total GHG emissions of the Scheme.

Table 13-27 Decommissioning GHG Emissions

Emissions Source	Emissions (tCO_2e)	% Decommissioning Emissions
Worker Transportation	2,855	58.00
Removal of onsite products and materials	1,620	32.92
Energy Usage for Decommissioning Period	251	5.09~~10~~
Waste	193	3.92~~3~~
Water Usage	3	0.07~~6~~
Total	**4,922**	**100.00**



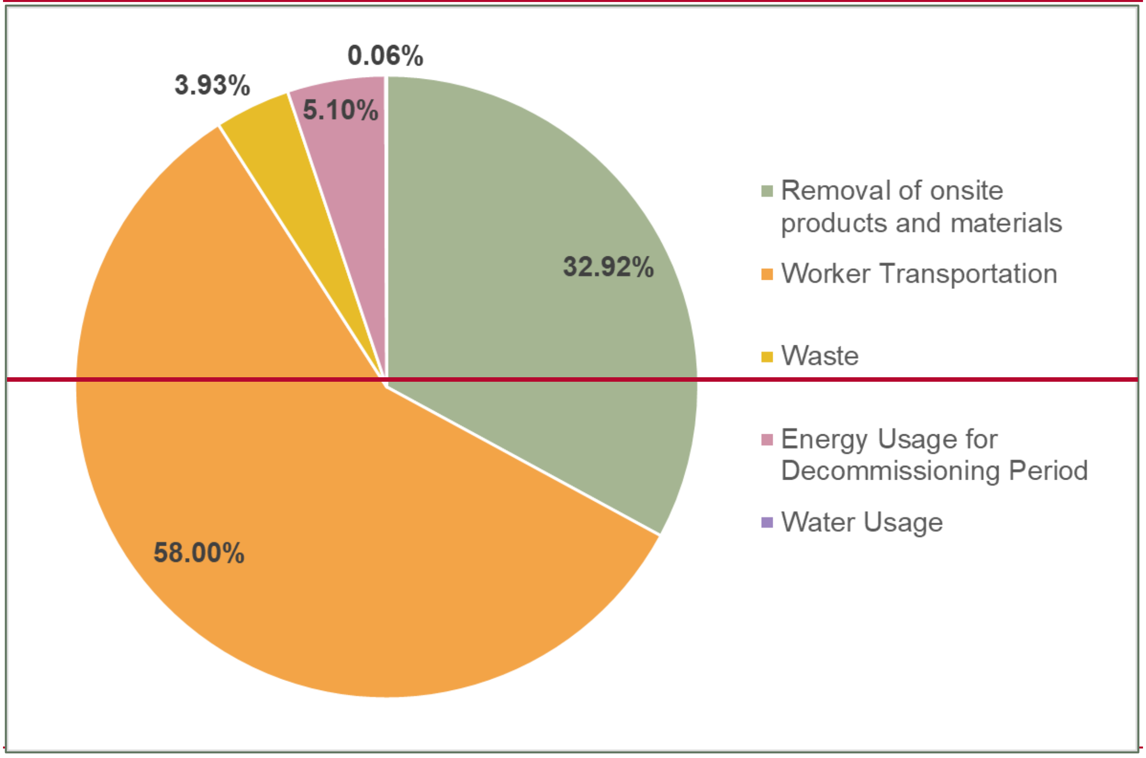


Figure 13-6: Decommissioning GHG Emissions

Significance of Effect (Decommissioning)

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

13.9.104 Therefore, based on the expected lower emissions profile of the decommissioning phase compared to the construction phase, the magnitude of impact is therefore considered low. GHG emissions from the decommissioning of the Scheme are considered to have a Minor Adverse effect on the climate. This is based on the project's GHG impacts being fully consistent with applicable existing and emerging policy requirements and good practice design standards at the time of decommissioning. This is **not significant** in EIA terms.

Overall GHG Significance Effect

Significance in Context with Carbon Budgets

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

13.9.106 The UK's 5th and 6th carbon budgets have been used to contextualise the magnitude of GHG emissions from the Scheme in Table 13-28~~Table 13-28~~, depending on the years in which the emissions are expected to occur. Construction emissions will fall under the 5th (2031/2032) and 6th (2033) UK carbon budgets. For this comparison, it was considered that construction emissions will occur 50% in 2032 and 25% in 2031 and 2033. In line with ISEP guidance on Assessing Greenhouse Gas Emissions and Evaluating their Significance, the electricity carbon budgets have been used to contextualise emissions from the Scheme. On average, the operational phase of the Scheme accounts for 1.20% of the 2031-2033 Electricity Carbon budgets.

Table 13-28 Contextualization of the Construction phase GHG emissions with the UK Carbon Budgets

Relevant Electricity Supply Sectoral UK Carbon Budgets	Annual Electricity Supply Sectoral Carbon budget ($MtCO_2e$)	Annual Emissions for the Scheme During Carbon Budget Period ($MtCO_2e$)	Emissions from the Scheme as a Proportion of Carbon Budget per annum
2031	15.77	0.108	0.69%
2032	12.09	0.217	1.80%
2033	9.86	0.108	1.10%
Average			**1.20%**

13.9.107 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.

Significance in Comparison to Forecast Emissions from Grid 'Without Scheme'

13.9.108 Once in the operational phase, 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 2033 grid supply projections which is inclusive of higher carbon generation sources than the Scheme.

13.9.109 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 for the year 2033 (0.038 kgCO_2e/kWh). The operational energy intensity allows isolated comparison of the emissions associated with operation of the Scheme compared to the alternative.

13.9.110 However, it should be noted the operational intensity of the Scheme is heavily impacted by the embodied carbon emissions associated with product replacement; in particular, replacement of the BESS, which is predicted to account for 93% of operational phase emissions. These are considered WTT emissions which are not accounted for in the 2033 grid emissions factor.

Significance of each element of the Scheme (Solar/BESS)

13.9.111 The scheme is comprised of two main elements, the solar scheme itself and the supporting BESS.

13.9.112 As highlighted within the operational and construction phase emissions assessment and the preceding section, the primary source of emissions associated with the Scheme over its lifecycle will be from embodied GHG emissions within the battery products associated with the BESS. As these are considered WTT emissions which are not accounted for in the 2033 grid emissions factor, the operational intensity of the Scheme and the 2033 grid projection factor are not directly comparable.

13.9.113 Additionally, the emissions associated with BESS replacement have been calculated under the assumption that the same BESS technology will be used for the entire operational phase of the Scheme. As the operational phase of the Scheme is 60 years and the BESS will be replaced up to five times over this period, it is likely that the Scheme will be able to utilise more efficient and sustainable BESS technology in future years.

13.9.114 Doing such a comparison to quantify the emissions reductions associated with the Scheme, compared to a without Scheme scenario, therefore presents significant challenges. To further demonstrate this, Table 13-29~~Table 13-29~~ shows the 2033 grid projection factor compared to the Scheme considering the solar scheme and supporting BESS elements separately.

13.9.115 Comparing the operational intensity of the solar scheme itself (including WTT emissions associated with PV panel replacement and all other operational emissions sources) to the 2033 grid projection factor results in a net emissions reduction of -1,326,682 tCO_2e over the Scheme's lifetime.

13.9.116 Comparing the operational intensity of the BESS (including WTT emissions associated with BESS replacement) with the 2033 grid projection factor results in a net emissions increase of +1,371,619 tCO_2e. This demonstrates the challenges with using the current approach to quantify benefits of the Scheme by comparing to grid projection factors which do not account for WTT emissions or downstream benefits. Note that the value below only accounts for operational emissions / operational intensity hence the different values in Tables 13.29 and 13.30.

Table 13-29 Operational Emissions Intensity from each element of the Scheme

Operational Values	Solar Emissions	BESS Emissions	Total Scheme Emissions
Predicted energy capacity (MWh)	37,220,144		
Operational Intensity (gCO_2e/kwh)	2.78	36.85	39.63
Operational emissions reductions compared to 2033 UK Grid (tCO_2e)	**-1,326,682**	**+1,371,619**	**+44,937**

Significance of Scheme in Comparison with other Energy Generating Methods

13.9.117 The carbon intensity of the Scheme was calculated using total lifetime GHG emissions from the construction, operational, and decommissioning phases and is compared to other energy sources below in Table 13-30~~Table 13-30~~.

Table 13-30 Comparison of Scheme Energy Intensity with other methods

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

Electricity Source	Technology	Lifecycle GHG Emissions (gCO_2e/kWh)
The Droves Solar Scheme Total Emissions Intensity		**51.44**

13.9.118 It should be noted that these figures are inclusive of embodied carbon within the infrastructure required to generate energy.

13.9.119 As shown, in comparison to other energy generating methods, the Scheme is less emitting than non-renewable sources over the course of its lifetime and is typical of GHG emissions from Solar energy generation.

Downstream Emissions Savings as a result of the Scheme

13.9.120 As set out in Chapter 4 of the **Statement of Need [APP/5.4]**, the Scheme is designed to help achieve the UK's 2050 Net Zero Obligation. It is recognised that there is a wider need beyond offsetting emissions from fossil fuels in electricity generation to reduce emissions from other sources. Once the electricity supply is sourced from zero and low emissions sources, such as the Scheme, a plentiful supply will encourage and enable electrical solutions to displace fossil fuels in many applications outside of the traditional electricity sector.

13.9.121 The government published their Clean Power 2030 Action Plan in December 2024 (Ref 13-34). The Action Plan states that delivering Clean Power 2030:

"Paves the way to decarbonising the wider economy by 2050 as we pursue the electrification of heat in buildings, transport, and industry. By 2050, annual electricity demand is likely to at least double. Clean power by 2030 prepares us for the rapid growth in power demand expected over the 2030s and 40s" (Ref. 13-34, p11).

13.9.122 The increased power demand will likely be made from:

- Moving towards electrification of the vehicle fleet and no longer selling petrol and diesel cars (Ref. 13-19)
- *Alternatives to gas heating and cooking in homes* (Ref. 13-21) (Ref. 13-22).; and
- Industrial processes, e.g. data centres (Ref. 13-20).

13.9.123 These measures to decrease GHG emissions from these sources will increase electrical energy demand. The Scheme seeks to address this requirement through the generation and storage of renewable energy.

13.9.124 While much of the implications and technology around these scientific advancements is evolving, we have focussed on two areas which demonstrate that the energy provided by the Scheme will have downstream emissions reduction effects. This demonstrates the effect of the Scheme on delivering carbon emissions benefits through the electrification of other sectors.

Electrification of Vehicle Fleet

13.9.125 Defra publish an 'Emissions Factors Toolkit' [Ref. 13-23] to assist local authorities with quantifying emissions from vehicles with forecast years up to 2050. In the forecast opening year of 2033, using the NAEI forecast in rural England, 75% of the fleet will use some form of internal combustion engine (ICE) technology, i.e., not use battery electric.

13.9.126 DESNZ emissions from an average ICE passenger vehicle accounting for Diesel and Hybrid vehicles is 15.7 kgCO_2e/100km (Ref. 13-1). An analysis of Vehicle Certification data suggests that the average power consumption of an electric vehicle is 17.2 kWh/100km.

13.9.127 The Scheme is predicted to produce 659,480 MWh of energy per year. Given the average power consumption of an EV of 17.2 kWh/100km and the average distance travelled per year of 7,100 km (Ref. 13-26), the Scheme would have the capacity to power up to 540,026 EVs per year. While it is accepted that the Scheme itself would not directly lead to the uptake of electric vehicles, it does provide the capacity for EV charging using renewable energy. Using the 2033 UK Grid average for emissions from charging, the emissions saving of switching from ICE vehicles to EV vehicles results in an annual emissions saving of 25,060 tCO_2e for EV.

Replacement of Natural Gas use in Homes

13.9.128 While there is no mandate for the removal of gas systems in UK homes, there are UK Government schemes to encourage low carbon homes and boiler upgrades (Ref. 13-21 and Ref. 13-22).

13.9.129 The average UK household currently uses 11,500 kWh of natural gas per year (Ref 13-18) mainly for heating and cooking. The energy generated per year by the Scheme could therefore replace the use of natural gas in 57,346 homes annually. Using the 2025 GHG emissions factor for natural gas from the UK grid of 0.18296 kgCO_2e/kWh, this would result in an annual emissions saving of 120,658 tCO_2e.

13.9.130 Without this scheme, and others like it coming forwards, it is not clear how a sufficient quantity of low carbon electricity could be generated to meet the UK's need to securely supply energy to decarbonise its transport, home heating and other fossil-fuel intensive sectors. This could put the UK's achievement of the legally binding 2050 net zero target at risk.

Overall significance of effect

13.9.131 The lifecycle carbon intensity of the Scheme (estimated to be 51.29 gCO_2e/kWh) is mid-range for that generated from the poly-silicon, ground mounted solar energy sources as presented in Table 13-8~~Table 13-8~~. This is indicative of good practice for a ground-mounted solar PV system and falls considerably below the carbon intensity values for electricity generated by fossil fuel power stations. This demonstrates that the Scheme has been designed and located to minimise its carbon intensity, taking into account the geographical conditions of the Site.

13.9.132 The Scheme will provide electricity capacity to enable lower emissions technologies to be brought forward in non-traditional electricity-use sectors such as transport and home heating.

13.9.133 Whilst the carbon intensity of electricity generated by the Scheme is higher than the lifecycle data for alternative low carbon forms of generation such as nuclear and onshore wind, it should be noted that NPS EN-1 (Ref. 13-33) emphasises that to ensure reliable electricity systems during the transition to net zero 2050, the UK must adopt a diverse mix of renewable energy sources (including solar projects) to come forward.

13.9.134 Based on the above considerations, it is considered that the overall GHG impact of the Scheme is **Beneficial and Significant**, as the Scheme achieves emissions mitigation that goes substantially beyond the reduction trajectory, or substantially beyond existing and emerging policy compatible with that trajectory. The Scheme is playing a part in achieving the rate of transition required by nationally set policy commitments. The Scheme avoids GHG emissions in the without-project baseline.

Climate Change Resilience Assessment

13.9.135 The Climate Change Resilience Assessment has considered the measures which are integrated into the design. These are considered an adequate response to the projected climate change impacts to which the Scheme would be exposed.

13.9.136 Potential climate risks to the construction, operational, and decommissioning phases and the likelihood, consequence and significance of these risks are detailed in Table 13-31~~Table 13-31~~ and Table 13-32~~Table 13-32~~.

13.9.137 Effects occurring during construction and decommissioning are considered short-term and operational effects are long-term, due to the duration of each phase.

13.9.138 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.

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

Table 13-31 Sensitivity of receptors

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

13.9.140 The CCR Assessment has considered the measures which are embedded into the design (see Section 13.8). These are considered an adequate response to the projected climate change impacts to which the Scheme would be exposed.

13.9.141 As a result of the proposed resilience measures **no significant** climate change risks during the construction, operational or decommissioning phase have been identified.

Construction Phase

13.9.142 Due to projected changes in climate and increased environmental extremes; sensitive receptors during the construction phase may be vulnerable. The climate risks are summarised in the Table 13-32~~Table 13-32~~ below.

Table 13-32 Construction Phase Climate Risk.

Climate Risk	Receptor	Consequence
Increased probability of extreme weather events	Buildings and Infrastructure	Restriction to site access and working hours causing delay to construction. Damage to materials
Increased temperatures and heatwaves	Human Health	Poor working conditions impacting specific construction activities.
Increase rainfall events	Human Health	Poor working conditions impacting specific construction activities.

13.9.143 The climatic changes expected to take place during the construction phase have the potential to cause delays to the construction schedule due to the occurrence of severe weather events. The extreme weather conditions may also impact the health and safety of the workers on Site. Nonetheless, the construction phase takes place within the early stages of the 2020 – 2039 range of climate scenarios as detailed in Table 13-33~~Table 13-33~~. Table 13-9~~Table 13-9~~. As a consequence, the expected climate changes are not as severe and will likely be able to be mitigated against.

Operational Phase

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

Table 13-33 Operation and Maintenance Phase Climate Risk

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

Decommissioning Phase

13.9.145 During the decommissioning phase, the risks will be the same as those in the construction phase identified in Table 13-32~~Table 13-32~~.

13.9.146 However, the impacts of climate change are expected to worsen and increase based on the currently available projections. This may increase the vulnerability of sensitive receptors mentioned above for the construction process, this has been factored in and does not change the outcome of the assessment.

Overall CCR Impact

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

13.9.148 Embedded mitigation measures to increase the resilience of the Scheme to climatic changes are outlined in previous sections and summarised in Table 13-34~~Table 13-34~~,

Table 13-35 and Table 13-36. These tables consider the effect on the scheme itself as well as effects on human health.

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

13.9.150 As a result of the proposed resilience measures **no significant** climate change risks during the construction, operational, or decommissioning phase have been identified.

Table 13-34 Potential Climate Change Impacts and Embedded Mitigation Measures during Construction Phase

Climate hazard	Potential Climate Change Impact	Receptor	Potential Climate Change Risk to the Scheme	Embedded mitigation	Likelihood	Consequence	Significance
High temperatures	Increase in annual temperature	Workers, staff and visitors on site	Risk of overheating to workers	External contractors will monitor weather forecasts and plan works accordingly, protecting workers and resources from any extreme weather conditions. As detailed in the **oCEMP [APP/7.6]**.	Low	Minor adverse	**Not Significant**
		Plant and vehicles, physical structures, materials	Overheating of electrical equipment. Damage to materials.	BESS Equipment has HVAC cooling systems where necessary. The increase in annual temperature remains within	Low	Minor adverse	**Not Significant**

Climate hazard	Potential Climate Change Impact	Receptor	Potential Climate Change Risk to the Scheme	Embedded mitigation	Likelihood	Consequence	Significance
				tolerance ranges for the materials being used.			
High temperatures	Increase in summer temperature	All receptors	Overheating of electrical equipment. Damage to materials. Human Health Risk of overheating to workers.	Contractor will monitor weather forecasts and plan works accordingly, protecting workers and resources from any extreme weather conditions. As detailed in the **oCEMP [APP/7.6]**.	Low	Minor adverse	**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	Very Low	Minor adverse	**Not Significant**

Climate hazard	Potential Climate Change Impact	Receptor	Potential Climate Change Risk to the Scheme	Embedded mitigation	Likelihood	Consequence	Significance
				resources from any extreme weather. As detailed in the **oCEMP [APP/7.6]**.			
		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. As detailed in the **oCEMP [APP/7.6]**. BESS has HVAC cooling systems where necessary.	Very Low	Minor adverse	**Not Significant**

Climate hazard	Potential Climate Change Impact	Receptor	Potential Climate Change Risk to the Scheme	Embedded mitigation	Likelihood	Consequence	Significance
High precipitation	Increase to winter rainfall	Plant and vehicles, physical structures, materials, and access routes to sites and access routes to sites.	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).	External contractors will monitor weather forecasts and receive Environment Agency's (EA) flood alerts and plan works accordingly, protecting workers and resources from any extreme weather conditions such as storms, flooding. As detailed in the **oCEMP [APP/7.6]**.	Very Low	Minor adverse	**Not Significant**
Low precipitation	Decrease to summer rainfall	All receptors	Increased construction dust leading to nuisance dust and impacts on human health.	Dust mitigation measures. As detailed in the	Low	Minor adverse	**Not significant**

Climate hazard	Potential Climate Change Impact	Receptor	Potential Climate Change Risk to the Scheme	Embedded mitigation	Likelihood	Consequence	Significance
				oCEMP [APP/7.6].			
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 leading to nuisance dust and impacts on human health.	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. As detailed in the **oCEMP [APP/7.6]**.	Low	Moderate adverse	**Not Significant**
Increased fire risk	Drier and hotter conditions leading to	Buildings, Infrastructure,	Damage to structures/materials/equipment and resulting in delays to	Fire suppression system on site to rapidly action in	Very Low	Moderate adverse	**Not Significant**

Climate hazard	Potential Climate Change Impact	Receptor	Potential Climate Change Risk to the Scheme	Embedded mitigation	Likelihood	Consequence	Significance
	increased risk of wildfires and uncontrolled fires	Site workers and visitors	programme and associated costs and/or unacceptable safety risks. Threat to human health and safety of workers and visitors	case of fire as described in the **oCEMP [APP/7.6]**.			

Table 13-35 Potential Climate Change Impacts and Embedded Mitigation Measures during Operational Phase.

Climate hazard	Potential Climate Change Impact	Receptor	Potential Climate Change Risk to Proposed Development	Existing or embedded mitigation measure	Likelihood	Consequence	Significance
High temperatures	Increase in summer temperature	All receptors (infrastructure, buildings, workers and staff)	Increase in air conditioning requirements. Overheating of electrical equipment. Human health risk of overheating to workers.	BESS systems would include HVAC systems, and these would be contained within the individual equipment containers. Workers and staff to forecasts and plan works accordingly. As detailed in the **oOEMP [APP/7.8]**.	Low	Moderate adverse	**Not Significant**
High temperatures	Increase in heat waves	All receptors (infrastructure, buildings, workers and staff)	Increase in air conditioning requirements. Overheating of electrical equipment. Human health risk of overheating to workers.	BESS systems would include HVAC systems and these would be contained within the individual equipment containers. Workers and staff to forecasts and plan works accordingly. As detailed in the **oOEMP [APP/7.8]**.	Low	Moderate adverse	**Not Significant**
High precipitation	Increase to winter rainfall	All receptors (infrastructure, buildings,	Surface water flooding and standing waters.	All sensitive and electrical equipment on the PV panel will be elevated by legs or mounted on raised frames.	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	Likelihood	Consequence	Significance
		workers and staff)	Deterioration of structures or foundations due to increase in soil moisture levels. Damage to building surfaces/ exposed utilities from increased drying/wetting and increase frost penetration.				
Low precipitation	Decrease to summer rainfall	All receptors (infrastructure, buildings, workers and staff)	Water shortages. Deterioration of structures or foundations due to decrease in soil moisture levels.	Water expected to be stored on site for fire suppression	Very Low	Minor adverse	**Not Significant**
Increase in storm intensity	Stronger winds, heatwaves, heavy precipitation	Plant and vehicles, physical structures, materials, and access routes to sites	Surface water flooding and standing waters. Deterioration of structures or foundations due to increase in soil moisture levels. Damage to building surfaces/ exposed utilities from increased	The **oOEMP [APP/7.8]** accompanying the DCO Application, describes water management measures to control surface water run-off and drain hardstanding and other structures.	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	Likelihood	Consequence	Significance
			drying/wetting and increase frost penetration or tree falls. Strong winds damaging structures directly or via falling trees and debris which may impact human health.				
Increased fire risk	Drier and hotter conditions leading to increased risk of wildfires and uncontrolled fires	Buildings, Infrastructure, Site workers and visitors	Damage to structures/materials/equipment and resulting in delays to programme and associated costs and/or unacceptable safety risks. Human health risk to safety of workers and visitors.	Fire suppression system on site to rapidly action in case of fire as described in the **oOEMP [APP/7.8]**	Very Low	Moderate adverse	**Not Significant**

Table 13-36 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	Likelihood	Consequence	Significance
High temperatures	Increase in annual temperature	All receptors	Overheating of electrical equipment. Damage to materials. Human health risk of overheating to workers.	Contractor will monitor weather forecasts and plan works accordingly, protecting workers and resources from any extreme weather conditions. As outlined in the **oDS [APP/7.10]**.	Low	Minor adverse	**Not Significant**
High temperatures	Increase in summer temperature	All receptors	Overheating of electrical equipment. Damage to materials. Human health risk of overheating to workers.	Contractor will monitor weather forecasts and plan works accordingly, protecting workers and resources from any extreme weather conditions. As outlined in the **oDS [APP/7.10]**.	Low	Minor adverse	**Not Significant**

Climate hazard	Potential Climate Change Impact	Receptor	Potential Climate Change Risk to Proposed Development	Existing or embedded mitigation measure	Likelihood	Consequence	Significance
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. As outlined in the **oDS [APP/7.10]**.	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. As outlined in the **oDS [APP/7.10]**.	Very Low	Minor adverse	**Not Significant**
High precipitation	Increase to winter rainfall	Plant and vehicles, physical structures, materials, and	Viability of and access to sites (such as heavy rain resulting in surface water flooding of local roads,	External contractors will monitor weather forecasts and receive Environment Agency's (EA) flood	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	Likelihood	Consequence	Significance
		access routes to sites and access routes to sites.	sources of power supply or inundation of sites).	alerts and plan works accordingly, protecting workers and resources from any extreme weather conditions such as storms, flooding. As outlined in the **oDS [APP/7.10]**.			
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 which may lead to nuisance and impacts on human health.	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. As outlined in the **oDS [APP/7.10]**.	Low	Moderate adverse	**Not Significant**

In-Combination Climate Change Impact Assessment

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

13.9.152 Given the nature of the Scheme, the increase of permanent impermeable area on the Site will be negligible, however equipment such as the Customer Substation, National Grid Substation, and BESS areas will generate increased surface water runoff when compared to the current agricultural 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 has been embedded in the Scheme.

13.9.153 **ES Chapter 12: Water Resources [APP/6.2]** provides insight into the likely effects of climate change on flood risk around the Site. The chapter concludes that 1% Annual Exceedance Probability (AEP) + 20% climate change, the 0.5% AEP and the 0.1% AEP flood outlines do not encroach into the Site area. As such, the risk to flooding has been deemed as **not significant**.

13.9.154 Besides the risk of increased flooding, Climate Change also has the potential to affect species and habitats. This has been considered in **ES Chapter 7: Ecology and Biodiversity [APP/6.2]** and the potential risks of a changing climate detailed therein. Measures to mitigate against Climate Change for habitats and species include the selection of new planting that is locally appropriate and resilient to foreseeable changes in climate and disease. Management is detailed in the **oLEMP [APP/7.11]**. The Scheme itself will reduce national GHG emissions and help to mitigate the effects of climate change and as such is not anticipated to have a significant in combination effect on species and habitats. The in-combination climate effect with Ecology and Biodiversity is **not significant**.

13.9.155 As set out in **Chapter 14: Socio-economics [APP/6.2]** the Scheme will generate jobs and affect people’s movements and activities there will be in-combination effects with socio-economics. That is to say that the Scheme itself will result in economic activity which will directly lead to emissions. The assessment of these emissions has been identified through the GHG assessment and are included within the overall GHG assessment, e.g. for vehicle emissions from worker transport. Following implementation of the proposed mitigation, the residual effect is considered to be Negligible and **not significant**.

13.9.156 In addition, the in-combination with climate change effects have been assessed in relevant chapters of this ES as set out below, focused on the operational phase:

- **Chapter 7: Ecology and Biodiversity [APP/6.2]** in relation to potential climate change impacts on habitats and/or species. Furthermore, habitats might become more threatened or rare over time, especially wetland or woodland habitats which are relatively uncommon within the Order limits

- **Chapter 9: Transport and Access [APP/6.2]** in relation to construction vehicles greenhouse gas emissions which have an impact on the global climate. These are considered within this ES chapter
- **Chapter 11: Soils and Agriculture [APP/6.2]** in relation to potential changes in ground conditions (e.g. disturbance of potentially contaminated land, mobilisation of pollutants, alteration of drainage pathways); and
- **Chapter 12: Water Resources [APP/6.2]** in relation to potential increase in runoff and flood risk.

13.9.157 Following the respective mitigation measures outlined in the above ES chapters, the impacts of the Scheme when accounting for climate change, are considered to be effectively managed, mitigated, and **not significant**.

13.10 Additional Mitigation

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

13.10.2 As discussed in Section 13.8, the Scheme incorporates embedded GHG mitigation measures that prioritise the use of low-carbon design materials and construction practices.

13.10.3 The embedded GHG mitigation measures include construction phase waste reduction, the use of low-carbon materials, and transport emission controls, as well as climate resilience measures such as flood risk management. The assessment of the Scheme's design and operational parameters demonstrates that the current measures are adequate. Specifically, the Scheme is expected to save GHG emissions compared to the grid in 2025, supporting the UK's transition to net zero emissions. Based on the conclusions of the assessment, no additional mitigation measures are required in terms of Climate Change.

Monitoring

13.10.4 Monitoring the weather is essential and it is described in the **oOEMP [APP/7.8]**. This includes regularly monitoring weather forecasts and the news for Environment Agency flood warnings, relevant weather warnings, and water levels of the local waterways. Monitoring weather forecasts will be integral to planning works accordingly and safeguarding against extreme weather conditions. As detailed in the **oOEMP [APP/7.8]**, **oCEMP [APP/7.6]** and the **oDS [APP/7.10],** this proactive approach ensures the safety of workers and the protection of infrastructure. Additionally, external contractors appointed by the Applicant will be responsible for monitoring weather forecasts and receiving Environment Agency flood warnings and alerts. This ensures that all works are planned and executed in a manner that minimises risks associated with adverse weather. By responding appropriately and in a timely manner to varying weather conditions, the

Scheme can effectively mitigate potential disruptions and ensure the continuity and safety of its operations.

13.11 Residual Effects and Conclusions

GHG Assessment

Residual Effects

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

13.11.2 During the construction, operational and decommissioning phases of the Scheme, GHG emissions will be generated by products, transport, energy, and fuel-use used by the Scheme.

13.11.3 Significant residual effects are defined as significant and beneficial for the whole Scheme lifecycle for the GHG assessment. For the construction and decommissioning phases, residual effects are defined as **Minor Adverse (not significant)** and are listed in Table 13-37~~Table 13-37~~Table 13-37~~Table 13-37~~. Table 13-38~~Table 13-38~~Table 13-38~~Table 13-38~~ lists the residual effects for the operational phase, which are defined as **Significant and Beneficial**.

13.11.4 In addition to the numeric assessment, the Scheme will also enable additional downstream benefits through the facilitating future uptake of low emissions technology outside of traditional electricity uses.

Conclusions

13.11.5 The GHG assessment findings indicate the Scheme will yield **Significant Beneficial** impacts on total GHG emissions.

Climate Change Resilience Assessment

Residual Effects

13.11.6 The CCR Assessment has considered the measures which are integrated into the Scheme design (see Section 13.8). These measures are considered adequate to address the projected climate change impacts to which the Scheme would be exposed.

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

Conclusions

13.11.8 The Scheme's design and integrated mitigation measures effectively address climate change risks. No significant climate change risks during the construction, operational, or decommissioning phases have been identified.

13.11.9 See **ES Chapter 18: Summary of Effects [APP/6.2]** for a summary of effects.

In-Combination Climate Change Impact Assessment

13.11.10 Climate Change will affect many different environmental factors relevant to this scheme. These include, but are not limited to, ecology, transport, soils and water resources.

13.11.11 Following the respective mitigation measures outlined in the accompanying ES chapters, the residual in combination effects of the Scheme when accounting for climate change, are considered to be effectively managed, mitigated, and **not significant**.

Table 13-37 Summary of Significant Residual Effects (Construction and Decommissioning)

Receptor	Sensitivity (value)	Description of impact	Mitigation/Enhancement measure	Residual effect after mitigation
Global Climate	High	GHG emissions arising principally from the embodied carbon of materials. Particularly embodied carbon of PV Panels and batteries.	Reduce waste, maximizing reuse and recycling, and reducing emissions from construction activities and transportation. Measures detailed in the **oCEMP [APP/7.6],** the **oDS [APP/7.10]**.	Minor Adverse residual effect, as every GHG emission poses a risk to the global climate. **Not significant.**
Scheme (Plant and vehicles, physical structures, materials, and access routes to sites) and Workers, staff and visitors on site	Moderate	Stronger winds, heatwaves, heavy precipitation and increased risk of fires/wildfires.	Resilient design of infrastructure. The contractors will monitor weather forecasts and receive Environment Agency's (EA) flood alerts and plan works accordingly, protecting workers and resources from any extreme weather conditions such as storms. Measures detailed in the **oCEMP [APP/7.6],** the **oDS [APP/7.10]**.	**Not significant.**

Table 13-38 Summary of Significant Residual Effects (Operational Phase)

Receptor	Sensitivity (value)	Description of impact	Mitigation/Enhancement measure	Residual effect after mitigation
Global Climate	High	GHG emissions arising principally from the embodied carbon of materials that need to be replaced during the Scheme lifespan. Particularly batteries and PV Panels. Offset of emissions in comparison to a 'without scheme' baseline where energy may be produced by other more highly emitting methods. The scheme will facilitate future uptake of low emissions technology outside of traditional electricity uses.	Reduce waste, maximizing reuse and recycling, and reducing emissions from operation. Measures detailed within the **oCEMP [APP/7.6]** and **oOEMP [APP/7.8]**.	**Significant beneficial effect**.
Scheme (Plant and vehicles, physical structures, materials, and access routes to sites) and Workers,	Moderate	Stronger winds, heatwaves, heavy precipitation and increased risk of fires/wildfires.	Resilient design of infrastructure. The contractors will monitor weather forecasts and receive Environment Agency's (EA) flood alerts and plan works accordingly, protecting workers	**Not significant**

Receptor	Sensitivity (value)	Description of impact	Mitigation/Enhancement measure	Residual effect after mitigation
staff and visitors on site			and resources from any extreme weather conditions such as storms. Measures detailed within the **oCEMP [APP/7.6]** and **oOEMP [APP/7.8]**.	

13.12 Cumulative Effects Assessment

Inter-Project Cumulative Effects

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

13.12.2 This assessment has been made with reference to the methodology and guidance set out in **Chapter 2: EIA Process and Methodology [APP/6.1]** of this ES and shortlist of cumulative plans and projects identified in **Appendix 2.4: Cumulative Schemes [APP/6.4]** of this ES.

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

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

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

In-Combination Cumulative Effects

13.12.6 Refer to Section 13.9.157 'In-combination Climate Change Impact Assessment'. This section concludes that following the adoption of mitigation measures, any cumulative impacts on the Scheme are considered to be effectively managed.

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Glossary

Term	Acronym	Definition
Battery Energy Storage System	BESS	A system that stores electrical energy in batteries for later use, often used in conjunction with renewable energy sources like solar or wind
Climate Change Committee	CCC	An independent, statutory body that advises the UK government on emissions targets and climate change policy
Combined Cycle Gas Turbine	CCGT	A type of power plant that combines a gas turbine and a steam turbine to generate electricity, often with higher efficiency than traditional gas turbines
Climate Change Risk	CCR	The potential for climate change to have impacts on a project, system, or organization
Carbon Capture and Storage	CCS	A technology that captures carbon dioxide emissions from sources like power plants and stores them underground, preventing their release into the atmosphere
Considerate Constructors Scheme	CCS	A voluntary scheme that encourages construction sites to be managed in a considerate and responsible manner
Construction and Environmental Management Plan	CEMP	A plan that outlines the environmental management and mitigation measures to be implemented during the construction phase of a project
Methane	CH_4	A potent greenhouse gas that is the main component of natural gas.
Carbon Dioxide	CO_2	The primary greenhouse gas emitted through human activities, such as the burning of fossil fuels.
Concentrated Solar Power	CSP	A type of solar energy technology that uses mirrors or lenses to concentrate sunlight and generate heat, which is then used to produce electricity.
Development Consent Order	DCO	A type of planning permission for nationally significant infrastructure projects in the UK

Term	Acronym	Definition
Department for Environment, Food and Rural Affairs	Defra	A UK government department responsible for environmental protection, food production, and rural communities
Department for Energy Security and Net Zero	DESNZ	A UK government department responsible for energy policy and achieving net zero
Environment Agency's	EA	The public body responsible for environmental regulation and management in England
Environmental Impact Assessment	EIA	A process that identifies and evaluates the potential environmental impacts of a proposed project
Greenhouse Gas	GHG	Gases in the Earth's atmosphere that trap heat and contribute to climate change, such as carbon dioxide, methane, and nitrous oxide
Global Warming Potential	GWP	A measure of how much energy the emissions of one ton of a gas will absorb over a given period, relative to the emissions of one ton of carbon dioxide
Hydrofluorocarbons	HFCs	Synthetic greenhouse gases used in refrigeration and air conditioning systems
Heavy Goods Vehicle	HGV	A large commercial vehicle, such as a truck or lorry, that is used to transport goods
Heating, Ventilation and Cooling	HVAC	The systems and technologies used to regulate temperature and air quality in buildings.
In-combination Climate Change Impact	ICCI	The combined impact of a project and the climate change impacts.
Institute of Sustainability and Environmental Professionals	ISEP	A global membership body for environmental practitioners.
Kilograms of Carbon Dioxide Equivalent	$kgCO_2e$	A unit used to measure the global warming potential of different greenhouse gases

Term	Acronym	Definition
Megatonnes of Carbon Dioxide Equivalent	$MtCO_2e$	A unit used to measure large quantities of greenhouse gas emissions
Nitrous Oxide	N_2O	A potent greenhouse gas, often associated with agricultural activities
Third National Adaptation Programme (2023 – 2029)	NAP3	The UK government's plan for adapting to the impacts of climate change
Nationally Determined Contribution	NDC	A country's plan for reducing greenhouse gas emissions under the Paris Agreement
Nitrogen Trifluoride	NF_3	A potent greenhouse gas used in the electronics industry
National Planning Policy Framework	NPPF	The UK government's policy for planning and development
National Policy Statement	NPS	Government policy statements that provide guidance for nationally significant infrastructure projects
Nationally Significant Infrastructure Projects	NSIPs	Large-scale infrastructure projects in the UK that require a Development Consent Order.
National Travel Survey	NTS	A survey conducted by the UK government to collect data on personal travel patterns
Open-Cycle Gas Turbine	OCGT	A type of power plant that uses a gas turbine to generate electricity, often with lower efficiency than combined-cycle gas turbines.
Perfluorocarbons	PFCs	Synthetic greenhouse gases used in various industrial processes
Planning Policy Guidance	PPG	Supplementary guidance to the National Planning Policy Framework
Pollution Prevention Plan	PPP	A plan that outlines measures to prevent or mitigate pollution during a project

Term	Acronym	Definition
Photovoltaic	PV	The technology used to convert solar energy into electricity
Representative Concentration Pathways	RCPs	Scenarios used by the Intergovernmental Panel on Climate Change to project future climate change
Sulphur Hexafluoride	SF_6	A potent greenhouse gas used in electrical equipment
Tonnes of Carbon Dioxide Equivalent	tCO_2e	A unit used to measure greenhouse gas emissions
UK Climate Projections 2018	UKCP18	The latest set of climate change projections for the UK
United Nations Framework Convention on Climate Change	UNFCCC	An international treaty aimed at addressing climate change
Well-To-Tank	WTT	A method of accounting for the greenhouse gas emissions associated with the production and distribution of fuels, before they are used in a vehicle or other application.

THE DROVES
SOLAR FARM