Candwr Solar Farm

Pre Application Consultation

Environmental Statement

Appendix 2.6 Greenhouse Gases and Climate Change Resilience Assessment

2 July 2026

TotalEnergies

Report

Candwr Solar Farm

Greenhouse Gas and Climate Change Resilience Assessment

For Candwr Solar Ltd

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Air Quality CONSULTANTS | PART OF Logika Group

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Introduction

1.1 This report has been prepared by Air Quality Consultants Ltd (AQC) and presents an assessment of the effects of the Proposed Candwr Solar Farm Development upon Greenhouse Gases (GHG) and Climate Change.

1.2 The assessment is presented in two parts:

- Part A: **GHG Assessment**: this provides a quantification of the GHG emissions resulting from the construction, operation and decommissioning of the Proposed Development, and an assessment against the net GHG emissions saved by the Proposed Development during its lifetime (assumed to be 2031 – 2070) in providing renewable electricity which reduces reliance on fossil fuels such as natural gas; and

- Part B: **Climate Change**: this is an assessment of the ability of the Proposed Development to adapt to and be resilient to potential future changes in climate, such as hotter drier summers, warmer wetter winters and increased storminess.

1.3 GHGs are gaseous compounds that have been identified as contributing to a warming effect in the Earth's atmosphere. The primary GHG of concern is carbon dioxide (CO_2) which is emitted from combustion sources such as vehicular transport and energy plant (and is therefore relevant to the energy required to manufacture goods and materials used to construct the Proposed Development). Other GHGs also contribute to climate change and these are accounted for based on their Global Warming Potential (GWP). The combined effect of all GHG emissions is presented as carbon dioxide equivalent (CO_2e) and accounts for the seven GHGs included in the United Nations Framework Convention on Climate Change's (UNFCCC) Kyoto Protocol. These are: carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), sulphur hexafluoride (SF_6), and nitrogen trifluoride (NF_3).

1.4 Within this assessment, the term 'carbon' is used to describe all GHG emissions, i.e. all emissions which might contribute to climate change, the predominant contributor of which is CO_2. The term CO_2e is also used, which refers to carbon dioxide equivalent, which is the main metric for measuring and reporting GHG emissions.

1.5 A description of the methods used in the assessment is set out in this assessment. This is followed by a description of the relevant baseline conditions, future baseline conditions and sensitive receptors, together with an assessment of the likely potential effects of the Proposed Development during construction, once the Proposed Development is completed and operational and during decommissioning. Consideration of the potential significant environmental effects has been undertaken throughout the design of the Proposed Development, and specific environmental measures relevant to GHGs and Climate Change identified and are inherent within the assessment. To conclude, a summary of the assessment is presented along with the next steps, where applicable.

2 Part A: Greenhouse Gas

Assessment Methodology and Significance Criteria

The Study Area

2.1 The study area for the GHG assessment is defined by the likely location of emissions sources that contribute to the Proposed Developments' lifecycle footprint. These include all on-Site and off-Site emissions directly and indirectly as a result of the Proposed Development throughout its lifecycle, including during construction, operation and decommissioning, and includes emissions that arise throughout the supply chains of the energy, materials and components that make up the Proposed Development, emissions from transportation of materials and workers to the Site, and emissions from the end of life treatment of decommissioned materials. These supply chain emissions will occur in the UK and overseas. The emissions sources considered are detailed further in Table 2-1.

Establishing the Baseline

2.2 The Proposed Development generates electricity, 100% of which will be used by Dwr Cymru Welsh Water (DCWW) at various sites. As such, it is appropriate to define two baseline scenarios when assessing GHGs:

1) The 'Site' baseline: the GHG emissions of the physical Site; and

2) The 'Energy' baseline: the GHG emissions associated with the fossil fuel electricity to be replaced by the Proposed Development.

Site Baseline

2.3 The existing land use within the Site is predominantly agricultural land, comprising arable fields with boundary hedgerows, ditches, woodland, and farm access tracks.

2.4 The agricultural activities that would otherwise take place at the Site would contribute to GHG emissions due to standard agricultural practices, including the use of farm machinery, soil erosion and application of fertilisers and pesticides. The Site also includes carbon sinks, being habitats such as hedgerows and woodland that sequester carbon by absorbing CO_2 from the atmosphere, which is stored in the vegetation itself and also in the soil from which they grow. Natural England[1] estimate average net GHG emissions from land under arable agricultural to be 0.29 tCO_2e/ha/yr; given the Site area of 47.6 ha, this constitutes for an estimated annual emissions rate of 13.8 tCO_2e per year.

2.5 Without the Proposed Development, it is assumed that the agricultural activities will remain unchanged in the future; the current and future baselines are therefore the same.

2.6 Should the Proposed Development come forward, while there will be changes to the Site in terms of the physical solar panels and other components of the Proposed Development, the characteristics of the ground conditions will remain broadly consistent with the existing situation. There may be further areas that are temporarily disturbed by construction and decommissioning activities, as well as areas that would be unaffected by the Proposed Development. This includes many of the carbon sinks currently present on Site, such as hedgerows that are expected to remain.

[1] Natural England (2021). Carbon storage and sequestration by habitat: a review of the evidence (second edition). Available online: https://publications.naturalengland.org.uk/publication/5419124441481216

Energy Baseline

2.7 The UK's energy use contributes to global GHG emissions predominantly through the combustion of fossil fuels in the generation of electricity, and directly in the use of fuels in internal combustion engine (ICE) vehicles, boilers, and other uses. As a greater number of renewable energy projects have come online, the carbon emissions associated with the UK's energy use have decreased, and this trend is anticipated to continue into the future. The change in the emissions profile of the energy mix is driven by three main factors:

1) Fossil fuel electricity power stations are directly replaced by renewable stations;

2) Fossil-fuel vehicles (ICE vehicles) are replaced by electric vehicles, increasing total electricity demand; and

3) Energy demand is increasing in general, due in part to our increasing need for electricity for data storage and transfer in our increasingly digital world.

2.8 Therefore, the Proposed Development can be compared to a UK energy baseline where the Proposed Development is not built and does not increase the UK's total available renewable electricity supply.

2.9 It is understood that the energy generated by the Proposed Development will be used by DCWW which, in the absence of the Proposed Development, would obtain its energy from the UK electricity grid. While the overall UK electricity grid mix is decarbonising over time, the addition of the Proposed Development and the resulting reduction in energy demand from the grid will displace fossil electricity, rather than average electricity, whether by allowing the phase-out of an existing fossil fuel power station, or by avoiding the need for a (likely natural gas fuelled) power source to meet increasing demand. Ultimately, it is considered that the provision of solar energy for use by DCWW will displace the need for electricity generated by fossil fuels within the UK grid.

2.10 The current energy baseline assumes that energy from the Proposed Development will allow the phase out of existing natural gas power generation in the UK and the energy generated by the Proposed Development will therefore displace electricity generated by use of natural gas.

2.11 For the future energy baseline, it is assumed that natural gas power generation is retained in operation in the absence of the Proposed Development and is retrofitted with Carbon Capture and Storage (CCS) technology by 2035 as part of the UK's industrial decarbonisation strategy.

Identifying Receptors and Receptor Sensitivity

2.12 The GHG assessment does not include identification of local sensitive receptors, as GHG emissions do not directly affect specific locations, but lead to indirect effects by contributing to global climate change. Identification of sensitive areas for climate change has been undertaken by the Intergovernmental Panel on Climate Change (IPCC)[2]. Impacts on specific areas are not included within this assessment since the impacts of GHG emissions will affect the global atmosphere and therefore need to be considered in a total context, rather than focus on localised areas.

2.13 The sensitive receptor with respect to GHG emissions is therefore the global atmosphere, where GHGs contribute to increasing atmospheric temperatures and resultant climate change effects.

[2] IPCC (2022) 'AR6 Climate Change 2022: Impacts, Adaptation, and Vulnerability'.

Assessment Methodology

2.14 The GHG assessment adopts a whole life-cycle approach to quantify the GHG footprint for the Proposed Development, encompassing the emissions from the following stages of the Proposed Development's lifetime: construction (subdivided into material embodied carbon, transport to Site, and installation activities), operation, and decommissioning.

2.15 The expected GHG emissions have been quantified using a calculation-based methodology as per the following equation, which is that stated in the conversion factors methodology for company reporting, published by the UK Government[3]:

Activity data x GHG emissions factor = GHG emissions value

2.16 Table 2-1 sets out in more detail what activities and sources of emissions are considered as part of the assessment. The data and assumptions used to calculate the GHG footprint are described further in Appendix A3.

Table 2-1: Potential Sources of GHG Emissions

Lifecycle Stage /Sub-division	Activity	Primary Emission Sources
Construction - Material Embodied Carbon	Raw material extraction and processing, and manufacturing of components required to construct the Proposed Development e.g., -Panels; -Cabling; and -Substations.	GHG emissions from the extraction and production of raw materials. GHG emissions from vehicle use transporting raw materials to processing sites and on to product manufacture. GHG emissions during manufacture of components.
Construction - Transport to Site	Transportation of the materials required to construct the Proposed Development from the point of manufacture to the Site.	GHG emissions from the production and combustion of fuels used in transport.
Construction - Installation Activities	On-Site construction activity, including emissions from construction equipment. Transportation of construction workers to and from the Site. Transport of material used in construction (that do not form part of the final Proposed Development), i.e. materials for the access tracks and temporary construction compound, and construction waste.	Energy (electricity, fuel, etc.) consumption from plant and vehicles and generators on-Site. Fuel consumption from transportation of temporary constructions materials to the Site and of workers to and from the Site.
Operation	Operation of the Proposed Development, including: Operational transport associated with service and maintenance vehicles accessing the Proposed Development.	GHG emissions from operational transport (e.g. maintenance vehicle movements). Embodied GHG emissions in replacement materials and components, including their

[3] DESNZ (2025) 2025 Government greenhouse gas conversion factors for company reporting. Available at: https://assets.publishing.service.gov.uk/media/6846b0870392ed9b784c0187/2025-GHG-CF-methodology-paper.pdf

Lifecycle Stage /Sub-division	Activity	Primary Emission Sources
	Repair and maintenance of the Proposed Development. The net energy generated by the Proposed Development and exported to the national grid, accounting for energy lost in storage and transmission on Site, and any energy used on-Site, for example from the inverter stations/ substation control rooms with low-charge cooling systems.	transportation, and transport to remove damaged components. Emissions from leakage of any SF_6 used within key components of the Proposed Development.
Decommissioning	On-Site decommissioning activity. Transportation of waste materials. Transportation of workers to and from the Site.	Energy (electricity, fuel, etc.) consumption from plant, vehicles, and machinery. GHG emissions from the transportation of waste. GHG emissions from transportation of workers to and from the Site.

Significance Criteria

2.17 The ISEP (2026)[4] guidance on *Assessing Greenhouse Gas Emissions and Evaluating their Significance* identifies three underlying principles to inform the assessment of significance, as follows:

- GHG emissions from all projects will contribute to climate change, the largest interrelated cumulative environmental effect;
- The consequences climate change have the potential to result in significant environmental effects on all topics in the EIA Directive, including population, fauna, soil, etc.; and
- GHG emissions have a combined environmental effect that is approaching a scientifically defined environmental limit and as such any GHG emissions or reductions from a project might be considered to be significant.

2.18 Based on these principles, ISEP conclude that:

- When evaluating significance, all new GHG emissions contribute to an adverse environmental effect, however, some projects will replace existing development or baseline activity that has a higher GHG profile. The significance of a project's emissions should therefore be based on its net impact over its lifetime, which may be positive, negative or negligible;
- where GHG emissions cannot be avoided, the goal of the EIA process should be to reduce a project's residual emissions at all stages; and
- where GHG emissions remain significant, but cannot be further reduced, approaches to remove a project's remaining emissions through actions within its supply chain should be considered.

2.19 The first point above is important in the context of the Proposed Development, as it is designed to provide zero emission energy at point of generation that will reduce the reliance upon high-emission forms of power generation such as use of fossil natural gas. The GHG assessment will therefore consider the Proposed Development's lifecycle GHG emissions against a future baseline (i.e. counterfactual scenario) which is the generation of electricity using natural gas. The baseline will only consider the

[4] ISEP (2026) Assessing Greenhouse Gas Emissions and Evaluating their Significance. Edition 2.1.

operational emissions and not hypothesise about the construction of any new fossil fuel power stations (i.e. it assumes there will be no construction-related emissions in the baseline). The resulting comparison will allow the GHG benefits (i.e. savings) of the Proposed Development to be contextualised.

2.20 In advising on the significance of any net change in GHG emission resulting from a development, ISEP identify that in order to limit the adverse effects from climate change global temperature change needs to be limited to well below 2°C, aiming for 1.5°C. The implication of this objective is that global emissions need to fall to net zero by 2050.

2.21 The UK's response to limiting climate change was enshrined in law through the Climate Change Act 2008 which requires the UK economy to be net zero by 2050 following a trajectory set through five-yearly carbon budgets. The 2050 target (and interim budgets set to date) are, according to the Climate Change Committee (CCC), compatible with the required magnitude and rate of GHG emissions reductions required in the UK to meet the goals of the Paris Agreement, thereby limiting severe adverse effects.

2.22 It follows, therefore, that the significance of any net change of GHG resulting from a development is not determined by whether a project emits GHG emissions, nor the magnitude of GHG emissions alone, but rather the extent to which it contributes to reducing GHG emissions consistent with a trajectory towards net zero by 2050.

2.23 To establish the significance of the GHG emissions from a development therefore requires expert judgments on:

- The consistency with policy requirements, since these have been specified to ensure the economy decarbonises in line with the UK's net zero target; and
- The degree to which the development has sought to mitigate its emissions.

2.24 Examining each of these dimensions allows the assessment to make professional judgment on the likely significance of effects based on a set of significance criteria established in the ISEP Guidance, summarised in Table 2-2.

Table 2-2: Significance Criteria for the GHG Impact Assessment

Rating	Description	Criteria to Determine Significance of Net GHG Emissions
Major Adverse	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.	A project's net 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.
Moderate Adverse	A project with moderate adverse effects falls short of fully contributing to the UK's trajectory towards net zero.	A project's net 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.

Rating	Description	Criteria to Determine Significance of Net GHG Emissions
Minor Adverse	A project with minor adverse effects is fully in line with measures necessary to achieve the UK's trajectory towards net zero.	A project's net GHG impacts are: fully consistent with applicable existing and emerging policy requirements; and in line with good practice design standards for projects of this type.
Negligible	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.	A project's net GHG impacts are: reduced through measures that go well beyond existing and emerging policy; and better than good practice design standards for projects of this type, such that radical decarbonisation or net zero is achieved well before 2050.
Beneficial	A project with beneficial effects substantially exceeds net zero requirements with a positive climate impact.	A project's net GHG impacts are: below zero; and it causes a reduction in atmospheric GHG concentrations, whether directly or indirectly, compared to the without-project baseline.

2.25 The ISEP Guidance states:

"A project that is compatible with the budgeted, science based 1.5°C trajectory (in terms of rate of emissions reduction) and which complies with up-to-date policy and 'good practice' reduction measures to achieve that has a minor adverse effect that is not significant. It may have residual emissions but is doing enough to align with and contribute to the relevant transition scenario, keeping the UK on track towards net zero by 2050."

"A project that achieves emissions mitigation that goes substantially beyond the reduction trajectory, or substantially beyond existing and emerging policy compatible with that trajectory, and has minimal residual emissions, is assessed as having a negligible effect that is not significant. This project is playing a part in achieving the rate of transition required by nationally set policy commitments."

2.26 ISEP also advises that:

- Major adverse, moderate adverse and beneficial effects should be considered significant in the context of EIA. Minor adverse and negligible effects are considered to be not significant;
- In the case of large-scale developments, irrespective of the level of mitigation, if net GHG emissions exceed 5% of UK or devolved administrations carbon budget, that this is a level of change that is considered significant. However, where the net GHG emissions are less than 5% of a GHG budget, this does not equate to non-significance. The guidance clarifies that "*a conclusion of non-significant GHG effects is a high bar and requires clear evidence*"; for projects where the emissions are less than 5% of the GHG budget, significance is based on the level of mitigation and whether the project mitigation is "*net zero trajectory-compatible*";
- Meeting the minimum standards set through existing policy or regulation cannot necessarily be taken as evidence of avoiding a significant adverse effect, and it is recommended therefore that the assessment also considers emerging policy/ standards and the guidance of expert bodies such as the Committee on Climate Change on necessary policy developments, particularly for multi-phased projects with long timescales. Mitigation should align with net zero and be

evidence-based, specific, meaningful and secured. Where this is not the case, effects "should typically be judged to be at least moderate adverse and hence significant". However, it is acknowledged that where there is uncertainty concerning mitigation (particularly in the earlier stages of planning where the design of the development is not yet finalised), conclusions of significance should be drawn cautiously and explicitly state these uncertainties;

- Likely significant effects should be assessed for each applicable project stage, in isolation (i.e. construction and operation), before determining the overall significance as it is possible for individual project stages to have a significant effect even if the combined whole-life effect is non-significant; and

- To aid decision making it is important to inform the decision maker about the relative severity of environmental effects such that they can be weighed in a planning balance. Therefore, it is essential to provide context for the magnitude of GHG emissions reported in the EIA in a way that aids evaluation of these effects by the decision maker. ISEP advise that context can be provided through comparison of the whole life GHG emissions resulting from a development with national, local and sectoral totals, as well as carbon budgets.

2.27 Therefore, the assessment of significance is established over two steps as follows:

Step 1: Establish Context of GHG Emissions and any change of emissions

2.28 Context for decision making is provided by comparing the net change in the whole life GHG emissions resulting from the Development, taking account of the counterfactual baseline scenario, and comparison of net emissions against national and sectoral GHG emissions totals, and carbon budgets. Where emissions are more than 5% of a national carbon budget, they are considered significant, otherwise the assessment progresses to Step 2.

2.29 In addition, a lifetime carbon intensity for the electricity generated by the Proposed Development is calculated (i.e. gCO_2e/kWh taking account of all construction, operational and decommissioning emissions) for comparison to other energy generation forms.

Step 2: Determine Significance of Effects

2.30 Significance of effects is established through applying the criteria detailed in Table 2-2 based on professional judgement that considers:

- Step 2a: The consistency of the Development with national and local policies designed to limit GHG emissions and meet the UK's net zero target; and

- Step 2b: The robustness, timeliness and efficacy of mitigation measures proposed to eliminate, reduce, substitute and remove GHG emissions.

2.31 In line with ISEP guidance[4], the significance of effects has been evaluated or the following stages:

- Construction Phase

- Operation Phase

- The Whole Lifecycle

2.32 In accordance with the GHG mitigation hierarchy[5], ISEP recommends that mitigation should in the first instance seek to eliminate GHG emissions. Where GHG emissions cannot be avoided, a development should aim to reduce GHG emissions, either through absolute reductions in emissions (through improvements in efficiency/optimisation) or by substituting energy/materials for sources with

[5] ISEP (2026) GHG Mitigation Hierarchy. Available: https://www.isepglobal.org/learn/greenhouse-gas-management-hierarchy/

a lower GHG emission intensity (e.g. adoption of renewables and low-carbon technologies). Where additional GHG emissions remain but cannot be further reduced or substituted at source, approaches should be considered that remove the project's remaining emissions, for example through investment in carbon removals within a company/project's own value-chain.

Baseline Conditions

2.33 As discussed in Paragraph 2.2, the two baseline scenarios have been defined; Site and Energy.

Site Baseline

2.34 Site carbon emissions and sinks, associated with the alternative agricultural use of the land are estimated to be 13.8 tCO_2e per year, as discussed in Paragraph 2.4.

Energy Baseline

2.35 The electricity generated in the Energy baseline is from an unabated natural gas-fired combined cycle gas turbine (CCGT) power station to 2035 at which time it is anticipated that the CCGT power station would have a CCS installed (where a 2035 Net Zero energy grid would require CCS technology, as set out in NPS EN-1[6]). This CCS system would reduce direct GHG emissions by 90% (see Section 2.1.1 of Decarbonisation Readiness Guidance[7]). This approach has been adopted as it is part of the UK's industrial decarbonisation strategy to use CCS technology, which applies to fossil-fuel power stations. While the Decarbonisation Readiness Guidance applies just to England, it is considered that the worst-case approach is to assume that the 90% reduction in emissions would apply, given that the energy produced by the Proposed Development will ultimately replace the need for electricity generated by fossil fuels within the UK grid as a whole.

2.36 The direct operational emissions from unabated natural gas fired CCGT power stations are 382 gCO_2e/kWh, which is taken from the Government's 2024/2025 fuel mix disclosure data[8]. From 2035, this will reduce to 38.2 gCO_2e/kWh to account for CCS.

2.37 The indirect Well-to-Tank (WTT) emissions (the emissions from the extraction and processing of the natural gas and transportation to the power station) are taken from DESNZ 2025 UK Government GHG Conversion Factors for Company Reporting: 0.03 kgCO2e/kWh for the combustion of natural gas. The WTT emissions rate for producing 1 kWh of electricity (accounting for losses when converting natural gas energy into electrical energy) is calculated by comparing the direct emissions for producing electricity using natural gas to the direct emissions of burning natural gas. This yields indirect (WTT) emissions of 63.1 gCO2e/kWh, which remains unchanged with the addition of CCS.

2.38 The Proposed Development has a peak output electricity produced annually of 49,776 MWh, with an assumed 0.45% degradation each year due to the degradation of the solar panel units, hence the total output for the Proposed Development is 1,903,038 MWh over the 40-year lifetime (accounting for an assumed one-off solar panel replacement, which restores original performance after 25 years of the operational lifetime, assumed to be 2056).

[6] Department for Energy Security and Net Zero (DESNZ), 2025. *Overarching National Policy Statement for energy (EN-1)*. (last updated 6 January 2026)[Online] Accessed: 02 February 2026, Available at: https://assets.publishing.service.gov.uk/media/695d1015f41883f4e50ed9ab/overarching-national-policy-statement-for-energy-en-1-web-accessible.pdf

[7] Environment Agency (2025) *Decarbonisation Readiness (DR) Guidance*. Available at: https://assets.publishing.service.gov.uk/media/670d4cdd92bb81fcdbe7b7db/decarbonisation-readiness-consultation-government-response.pdf

[8] https://www.gov.uk/government/publications/fuel-mix-disclosure-data-table

Current Baseline Conditions

2.39 Emissions from the generation of electricity from natural gas fired CCGT power stations is provided in Table 2-3. These emissions will continue annually from 2031 to 2034, at which point it is assumed the CCGT will be equipped with CCS technology.

Table 2-3: Current Annual Energy Baseline Emissions 2031 – 2034 (tCO_2e/year)

Indirect Emissions (WTT)	Direct Emissions	Total Emissions
3,118	18,886	22,005

Future Baseline Conditions

2.40 From 2031 to 2034, it is assumed that natural gas power operates unabated and annual emissions are the same as those shown in Table 2-3. From 2035, until the end of the life of the Proposed Development in 2070, the alternative natural gas power plant annual emissions based on the first year of operation in 2035 (note this assumes the compounded annual 0.45% degradation of the solar panels on the energy output) are set out in Table 2-4, with cumulative lifetime emissions (including the periods with and without CCS) are set out in Table 2-5.

Table 2-4: Future Annual Energy Baseline Emissions 2035-2070 (tCO_2e/year)

Indirect Emissions (WTT)	Direct Emissions	Total Emissions
3,083	1,867	4,951

Table 2-5: Lifetime Energy Baseline Emissions 2031-2070 (tCO_2e)

Indirect Emissions (WTT)	Direct Emissions	Total Emissions
120,034	140,687	260,722

Potential Effects

Environmental Measures

Construction Phase

2.41 An outline Construction Traffic Management Plan (oCTMP) has been submitted with the planning application, with a detailed CTMP and a Construction Environmental Management Plan (CEMP) to be secured by planning condition. These plans include measures which will minimise use of materials and decrease waste, as well as procedures to reduce traffic movements during the construction phase, including measures such as:

- where technical specifications allow, maximise the recycled content of construction materials such as concrete and steel;
- incentivise use of local suppliers with a view to shorten project supply chains and environmental footprint;

- where possible and practical, use the hierarchy of avoid, reduce, substitute and compensate when using materials, including temporary on-Site materials;
- consideration of sustainable transport options for workers, including shuttle bus, car and cycle parking facilities on-Site;
- encouraging and facilitating staff car share where possible and practical;
- the use of existing hard standing, roads and tracks to locate access routes as much as practicable to minimise land take for access;
- on-Site mobile and non-mobile plant should conform to the latest emissions standards, with mobile vehicles conforming to Euro 6 standards as a minimum; and
- investigate the option of using HVO fuels or electric versions for all plant where possible.

2.42 A Site Waste Management Plan (SWMP) will also be produced and included within the oCEMP, including principals that are a part of the Considerate Constructors Scheme and its Code of Considerate Practice. Measures in the Plan to minimise GHG emissions include minimising the creation of waste, and procedures to separate and recover construction waste to increase recycling rates.

2.43 Materials with lower GHG emissions will be considered in the selection of construction materials and components.

Operational Phase

2.44 Given the nature of the Proposed Development as a renewable energy project, it is anticipated to have an overall positive effect with regard to GHG emissions during its operation. Notwithstanding this, an Operational Environmental Management Plan (OEMP) will be secured by planning condition, this will include adherence to best practice relating to the use of materials and sustainable travel will ensure minimising operational emissions. Within this OEMP it should also include the mitigation measures proposed within the construction phase relevant to any replacement and maintenance which takes place.

2.45 Potential emissions of SF_6 associated with the Proposed Development have been quantified using reasonable worst-case assumptions and are expected to contribute 0% (when rounded) of the Proposed Development's total emissions (see Table 2-10). The Proposed Development will be designed as far as practicable so that no component will require the use of SF_6, which is highly carbon intensive when emitted to the atmosphere. However, in the event that the use of SF_6 cannot be avoided, its usage will be justified and closely recorded and monitored.

Decommissioning Phase

2.46 A Decommissioning Environmental Management Plan (DEMP) will be secured by planning condition, which will set out how the waste will be managed and will detail opportunities for re-use and recycling, as well as how traffic movements will be minimised during decommissioning.

Assessment of Likely Significant Effects

2.47 A summary of the GHG emissions of the Proposed Development is provided below in Table 2-6. The data and assumptions used to derive these results are available in Appendix A3.

Table 2-6: Lifecycle GHG Footprint of Proposed Development

Life Cycle Stage	Total Emissions (tCO_2e)	Emissions Intensity (gCO_2e/kWh)	Percentage Contribution of Stage (%)
Material Embodied Carbon	32,133	16.9	50
Transport to Site	3,160	1.7	5
Installation Activities	4,436	2.3	7
Operation	20,910	11.0	32
Decommissioning	3,856	2.0	6
Total	**64,495**	**33.9**	**100**

2.48 Material Embodied Carbon constitutes 50% of total GHG emissions for the Proposed Development. The relative contribution of different material components are provided in Table 2-7.

Table 2-7: GHG breakdown of Material Embodied Carbon

Life Cycle Stage	Total Emissions (tCO_2e)	Emissions Intensity (gCO_2e/kWh)	Percentage Contribution of Stage (%)
PV Panels	25,446	13.4	39
Steel Frames	4,854	2.6	8
Substations	257	0.1	0
MV Station	703	0.4	1
Fencing and CCTV	53	0	0
Inverters	692	0.4	1
Transformers	57	0	0
Cabling	70	0	0
Total	**32,133**	**16.9**	**50**

2.49 Transport of materials to Site constitutes 5% of total GHG emissions for the Proposed Development. The relative contribution of the transport of the material components is provided in Table 2-8.

Table 2-8: GHG breakdown of Transport to Materials to Site

Life Cycle Stage	Total Emissions (tCO_2e)	Emissions Intensity (gCO_2e/kWh)	Percentage Contribution of Stage (%)
International transport	2,998	1.6	5
Domestic transport	163	0.1	0
Total	**3,160**	**1.7**	**5**

2.50 Installation activities include construction Site activities, as well as staff travel to and from the Site. Emissions from Installation Activities constitute 7% of total emissions. The relative contributions of the different installation activities are provided in Table 2-9.

Table 2-9: GHG breakdown of Installation Activities

Life Cycle Stage	Total Emissions (tCO_2e)	Emissions Intensity (gCO_2e/kWh)	Percentage Contribution of Stage (%)
Construction Site Activities	2,544	1.3	4
Construction Staff Travel	1,735	0.9	3
Temporary Structures	158	0.1	0
Total	**4,436**	**2.3**	**7**

2.51 Operational emission sources include the embodied emissions in replacement parts, transport of replacement and damaged parts, staff travel, and SF_6 leakage, and make up 32% of the total emissions of the Proposed Development. Operational emissions are detailed in Table 2-10.

Table 2-10: GHG breakdown of Operational Emissions

Life Cycle Stage	Total Emissions (tCO_2e)	Emissions Intensity (gCO_2e/kWh)	Percentage Contribution of Stage (%)
Replacement Parts	19,652	10.3	30
Parts Transport	1,155	0.6	2
Staff Travel	103	0.1	0
SF_6 Leakage	39	0.02	0
Total	**20,910**	**11.0**	**32**

2.52 Decommissioning emission sources consist of onsite decommissioning activities, staff travel, and waste transport, and make up 6% of total emissions of the Proposed Development. Decommissioning emissions are detailed in Table 2-11.

Table 2-11: GHG breakdown of Decommissioning Emissions

Life Cycle Stage	Total Emissions (tCO_2e)	Emissions Intensity (gCO_2e/kWh)	Percentage Contribution of Stage (%)
Site Activities	2,544	1.3	4
Material Transport	155	0.1	0
Decommissioning Vehicles	1,157	0.6	2
Total	**3,856**	**2.0**	**6**

Comparison Against Baselines

2.53 With reference to the Site baseline, all emissions from the Proposed Development are additional emissions.

2.54 With reference to the energy baseline, the Proposed Development will provide renewable electricity that would otherwise be generated via the combustion of natural gas. Specifically, the Proposed Development is supportive of government policy to transition the national grid to renewables, enabling the removal of fossil fuel generated fuel electricity (e.g., natural gas) from the grid. The energy baseline compares the lifecycle carbon emissions of the Proposed Development to that of a natural gas-fired power generation using CCGT, with CCS assumed to be installed from 2035.

Table 2-12: Comparison of Proposed Development against energy baseline

Timeframe	Energy Baseline emissions (tCO_2e)	Proposed Development emissions (tCO_2e)	Net emissions savings (tCO_2e)
Upfront carbon	0 [a]	39,723	-39,723
2028-2034	88,020	2,091	85,929
2035-2068	172,702	18,819	153,882
Decommissioning	0 [b]	3,856	-3,856
Lifetime total	**260,722**	**64,495**	**196,226**

[a] It is assumed the natural gas power station is already constructed and therefore upfront emissions have already occurred. For simplicity and to provide a worst-case assessment, no upfront carbon for the CCS system is accounted for.

[b] Whilst decommissioning emissions will occur as part of decommissioning of natural gas power stations, these emissions are assumed to be zero to provide a worst-case assessment.

2.55 It should be noted that Table 2-12 does not provide a precisely like-for-like comparison, as the Proposed Development includes full life cycle emissions (construction, operation, decommissioning) whereas the energy baseline includes only operational emissions. Nonetheless, there is a substantial net reduction in emissions considering the life cycle carbon emissions of the solar farm compared to the continued operation of a natural gas power station, even with CCS.

Assessment of Significance of Effects

2.56 The assessment of the significance of the GHG emissions is informed through ISEP guidance detailed in Paragraphs 2.17 to 2.32 above and follows a two-step process detailed below.

Step 1: Establish Context

2.57 The Proposed Development extends across the administrative areas of Monmouthshire County Council (MCC), Newport City Council (NCC) and Torfaen County Borough Council (TCBC). To establish context, the GHG emissions from the Proposed Development are compared to:

- UK carbon budgets;
- MCC carbon budgets;
- NCC carbon budgets; and

- TCBC carbon budgets.

2.58 The UK has legislated a 2050 net zero target following recommendations and analysis completed by the CCC[9]. To meet this target, the CCC sets carbon budgets to establish carbon emissions limits.

2.59 Recommended carbon budgets at the Local Authority level have been extrapolated from this CCC analysis and from historical Local Authority emissions to provide recommended carbon budgets for the Monmouthshire County Council local authority[10].

2.60 While the emissions from the Proposed Development have been compared against budgets for MCC, TBCB, and NCC respectively, in reality the Proposed Development is split between each of these local authority areas, and so just a fraction of its GHG emissions are relevant in the context of each local authority's carbon budgets.

Construction GHG Emissions

2.61 The construction emissions of the Proposed Development (occurring between 2029 and 2030) coincide with the UK's 5th carbon budget period 2028-2032.

2.62 Table 2-13 summarises the GHG emissions from the Proposed Development during the construction phase against the respective carbon budgets for the UK, MCC, NCC, TCBC.

2.63 The Proposed Development contributes 0.002% to the 5th UK national carbon budget. This is well below the 5% threshold for significance described in the ISEP guidance[4]. Moreover, the emissions of the Proposed Development are predicted to comprise no greater than 2.9% of GHG emissions to any local budget, which is a commensurate contribution for a development of this nature and is an overestimation, as discussed in Paragraph 2.60.

Table 2-13: Contribution of the Construction Phase of the Proposed Development to National and Local Carbon Budgets during the 5th Carbon Budget (2028 – 2032)

Area	Budget ($MTCO_2e$)	Proposed Development GHG Emissions ($MTCO_2e$	Contribution to Budget (%)
UK	1,725	0.0397	0.002
MCC	2.63		1.5
TBCB	1.38		2.9
NCC	3.65		1.1

Operational GHG Emissions

2.64 The operational emissions of the Proposed Development (occurring from 2031 onwards) coincide with the UK's 5th, 6th and 7th carbon budgets, which cover the periods 2028-2032, 2033-2037, and 2038-2042 respectively (noting that the 7th carbon budget has not yet been adopted into legislation). There are no official UK carbon budgets available for the period 2043 onwards. It should be noted that the operational emissions from 2050 to 2068, as well as the decommissioning emissions, fall

[9] Most recently: https://www.theccc.org.uk/publication/the-seventh-carbon-budget/
[10] AQC (2025) Logika Local Authority Carbon Budget Tool. Available at: https://www.aqconsultants.co.uk/CMSPages/GetFile.aspx?guid=5404875c-6eba-444e-bcd8-2cfc6eca29df

beyond Net Zero 2050 and therefore are outside the time horizon of UK budgets. Any emissions beyond 2050 will need to be offset by equivalent carbon removals.

2.65 Table 2-14 summarises the GHG emissions from the Proposed Development during the operational phase against the respective carbon budgets for the UK, MCC, NCC, TCBC.

2.66 The gross emissions of the Proposed Development contribute no more than 0.005% to any of the UK national carbon budgets. This is well below the 5% threshold for significance described in the ISEP guidance[4]. Additionally, as shown the gross emissions of the operational phase comprise no greater than 0.5% of GHG emissions from any local budget, which is commensurate for a development of this nature and is an overestimation, as discussed in Paragraph 2.60.

2.67 When taking account of the Energy baseline, the Proposed Development is shown to lead to a net reduction in emissions.

Table 2-14: Contribution of the Operational Phase of the Proposed Development to National and Local Carbon Budgets

Budget Period	Area	Budget ($MTCO_2e$)	Proposed Development GHG Emissions ($MTCO_2e$		Contribution to Budget (%)	
			Gross	Net	Gross	Net
5th Carbon Budget (2028 – 2032)	**UK**	1,725	0.001	-0.012	0.0001	-0.0007
	MCC	2.63			0.04	-0.5
	TBCB	1.38			0.08	-0.9
	NCC	3.65			0.03	-0.3
6th Carbon Budget (2033 - 2037)	**UK**	965	0.003	-0.030	0.0003	-0.003
	MCC	1.66			0.2	-1.8
	TBCB	0.87			0.3	-3.4
	NCC	2.30			0.1	-1.3
7th Carbon Budget (2038 – 2042) [a]	**UK**	535	0.003	-0.030	0.0005	-0.006
	MCC	0.94			0.3	-3.2
	TBCB	0.49			0.5	-6.1
	NCC	1.30			0.2	-2.3

[a] The 7th Carbon Budget is not legislated.

Whole Life GHG Emissions

2.68 Table 2-15 summarises the GHG emissions from the Proposed Development, taking account of both the construction and operational phases, as a percentage of the UK's and Monmouthshire County Council's 5-year carbon budgets.

2.69 As shown, the gross emissions of the Proposed Development are expected to contribute no more than 0.0024% to any of the UK national carbon budgets. This is well below the 5% threshold for significance described in the ISEP guidance[4].

2.70 Moreover, the gross emissions of the Proposed Development are predicted to comprise no greater than 2.9% of GHG emissions to any local budget, which is a commensurate contribution for a development of this nature and is an overestimation, as discussed in Paragraph 2.60.

Table 2-15: Contribution of Proposed Development to National and Local Carbon Budgets

Budget Period	Area	Budget ($MTCO_2e$)	Proposed Development GHG Emissions ($MTCO_2e$		Contribution to Budget (%)	
			Gross	Net	Gross	Net
5th Carbon Budget (2028 – 2032)	**UK**	1,725	0.041	0.028	0.0024	0.0016
	MCC	2.63			1.6	1.1
	TBCB	1.38			2.9	2.0
	NCC	3.65			1.1	0.8
6th Carbon Budget (2033 - 2037)	**UK**	965	0.003	-0.030	0.0003	-0.003
	MCC	1.66			0.2	-1.8
	TBCB	0.87			0.3	-3.4
	NCC	2.30			0.1	-1.3
7th Carbon Budget (2038 – 2042) [a]	**UK**	535	0.003	-0.030	0.0005	-0.006
	MCC	0.94			0.3	-3.2
	TBCB	0.49			0.5	-6.1
	NCC	1.30			0.2	-2.3

[a] The 7th Carbon Budget is not legislated.

2.71 It should be noted that much of the embodied GHG emissions (which make up the majority of construction emissions and emissions from operational replacement parts) will be emitted abroad during product manufacture and therefore sit outside the scope of the UK's carbon budgets.

2.72 While the Proposed Development will result in operational emissions from 2031, it will enable substantial emissions reductions relative to the electricity generation from natural gas power plants, both with and without CCS technology.

Step 2: Determine Significance

2.73 The significance of effects is established through applying the criteria detailed in Table 2-2. This requires judgments on:

- The consistency of the Proposed Development with national and local policies designed to limit GHG emissions and meet the UK's net zero target; and

- The robustness, timeliness and efficiency of mitigation measures adopted by the Proposed Development to avoid, reduce and compensate GHG emissions.

2.74 Each is considered further below.

Step 2a Consistency of the Proposed Development with National, Regional and Local Policies

National

2.75 The key relevant national policies and legislation are the Energy Act (2023)[11], NPPF (amended February 2025), the Future Wales National Plan 2040, and Net Zero Strategy: Build Back Greener (2021)[12], which support the development of solar farms to produce renewable energy. Specifically, Policy 17 – *Renewable and Low Carbon Energy and Associated Infrastructure* of the Future Wales National Plan states:

"The Welsh Government strongly supports the principle of developing renewable and low carbon energy from all technologies and at all scales to meet our future energy needs. In determining planning applications for renewable and low carbon energy development, decision-makers must give significant weight to the need to meet Wales' international commitments and our target to generate 70% of consumed electricity by renewable means by 2030 in order to combat the climate emergency."

2.76 The Clean Power 2030 Action Plan (2024)[13] stated an ambition of 45-47 GW of solar electricity delivered by 2030, with the expectation the grid carbon intensity will reduce from 171 gCO_2e/kWh of direct emissions in 2023 to less than 50g CO_2e/kWh in 2030. In 2025, an update[14] was published with an updated capacity range for 2035 of 45 – 69. While it will not be operational until 2031, the Proposed Development will contribute to the 2035 goal directly, providing 46 MW of solar electricity, with zero direct carbon emissions, and with a carbon intensity of 35.5 gCO_2e/kWh.

2.77 Overall, the Proposed Development is demonstrated to result in lifecycle GHG benefits and contribute in the transition to net zero, and is supported by key national policy.

Regional

2.78 There are no regional policies that apply in this instance.

Local

2.79 As discussed in Paragraph 2.57, the Proposed Development extends across the administrative areas of MCC, NCC and TCBC. Local planning policy for each of these authorities has been considered.

2.80 The Monmouthshire Local Development Plan[15] was adopted in February 2014, and within this Policy DES1 General Design and Policy S7 Infrastructure Provision highlight the need for renewable energy

[11] HMSO (2023) Energy Act 2023. Available at: https://www.legislation.gov.uk/ukpga/2023/52/contents
[12] HM Government (2021) Net Zero Strategy: Build Back Greener. Available at: https://assets.publishing.service.gov.uk/media/6194dfa4d3bf7f0555071b1b/net-zero-strategy-beis.pdf
[13] DESNZ (2024) *Clean Power 2030 Action Plan: A new era of clean electricity*. Available at: https://assets.publishing.service.gov.uk/media/677bc80399c93b7286a396d6/clean-power-2030-action-plan-main-report.pdf
[14] DESNZ (2025) *Clean Power 2030 Action Plan: A new era of clean electricity – connections reform annex (updated April 2025)*. Available at: https://www.gov.uk/government/publications/clean-power-2030-action-plan/clean-power-2030-action-plan-a-new-era-of-clean-electricity-connections-reform-annex
[15] Monmouthshire County Council, 2014. *Monmouthshire Local Development Plan*. Available at: https://www.monmouthshire.gov.uk/planning-policy/monmouthshire-local-development-plan/

infrastructure, and the Proposed Development will thus be in support of these policies by providing a source of renewable energy.

2.81 In 2024, MCC published a draft Replacement Local Development Plan 2018-2033[16], and within this Table 3 Renewable Energy Targets sets out a range of targets with respect to Ground Mounted Solar energy generation between 82,000 and 165,564 MWh per year. The Proposed Development will support these targets by providing capacity for the generation of 49,776 MWh per year.

2.82 The TCBC Local Development Plan[17] was adopted in 2013. Policy S3 Climate Change says that the Council will support development proposals where they show consideration of a number of criteria, including "*utilising renewable and low or zero carbon energy technologies to generate heat and electricity requirements.*" The Proposed Development supports this policy by providing a source of renewable energy.

2.83 The NCC Local Development Plan[18] was adopted in 2015. Within the Plan, Objective 2 Climate Change identifies one of its monitoring targets as "*an increase in the number of renewable energy schemes permitted.*" The Proposed Development will support this target through the provision of an additional renewable energy scheme.

2.84 Overall, the Proposed Development is consistent with relevant local policies relating to GHG emissions.

Step 2b: Robustness, Timeliness and Efficacy of Mitigation

2.85 The final stage of the assessment of significance is to consider the GHG emissions in the context of the proposed mitigation.

2.86 As previously outlined, the Development will result in net GHG emissions as a result of its construction and decommissioning, while its net emissions during its operation indicate that it will lead to a reduction in GHG emissions when compared to the Energy baseline. Similarly, over the whole lifecycle of the Proposed Development, its net emissions when compared to the energy baseline will be negative when considering the construction, operation, and decommissioning emissions as a whole.

2.87 The gross GHG emissions generated by the Proposed Development as a result of its construction, operation, and decommissioning are also considered. As described in Paragraphs 2.41 to 2.46, mitigation measures will be implemented to eliminate, reduce, substitute and remove GHG emissions during the construction phase, operational phase and decommissioning of the Proposed Development. A combination of the approved design and planning conditions will ensure the proposed mitigation measures can be delivered.

2.88 The principles of the ISEP guidance are that where GHGs cannot be avoided, mitigation (in the form of environmental measures) should be provided to minimise GHGs.

2.89 Environmental measures, including embedded and additional mitigation adopted by the Proposed Development to minimise GHG emissions from the construction, operational and decommissioning phases are described in Paragraphs 2.41 to 2.46. The Proposed Development will result in a net reduction in GHG emissions, but nonetheless, in accordance with good practice, measures will be developed through a CEMP, OEMP and other environmental management plans to avoid and

[16] Monmouthshire County Council, 2024. *Replacement Local Development Plan 2018-2033*. Available at: https://www.monmouthshire.gov.uk/app/uploads/2025/10/SD8-Monmouthshire-Deposit-RLDP-Oct-2024.pdf
[17] Torfaen County Borough Council, Local Development Plan, Available at: https://www.torfaen.gov.uk/en/Related-Documents/Forward-Planning/Adopted-Torfaen-LDP-Writen-Statement.pdf
[18] Newport City Council, 2015. *Newport Local Development Plan.* Available at: https://www.newport.gov.uk/planning-policy/local-development-plan.aspx

reduce GHG emissions during construction and operation where practicable. These management plans will be secured via planning condition.

Overall Assessment of Significance

2.90 The assessment has considered the context of the Development's GHG emissions (by comparison with carbon budgets), as well as the compliance of the Development with relevant national, regional and local policies and the robustness, timeliness and efficacy of the mitigation to eliminate, reduce, substitute and remove GHG emissions.

2.91 The sections below summarise the overall significance of the GHG effects associated with the Development in line with the ISEP[4] approach summarised in Table 2-2.

Construction

2.92 Although the construction works contribute to local and national GHG emissions, the maximum contribution to any carbon budget is 2.9%. The Proposed Development comprises 0.002% of the national budget, which is less than the 5% threshold within the ISEP guidance. However, in line with the guidance, significance is not just based on whether a project's contributions are less than 5% of the national budget but is also based on the level of mitigation and whether the project mitigation is "*net zero trajectory-compatible*".

2.93 The Proposed Development meets the applicable minimum national and local policy requirements, and has included mitigation measures embedded within the design of the Proposed Development associated with lower emissions from construction transport and site activities (as evidenced in the CEMP, and SWMP). It is therefore judged that the Proposed Development meets minimum policy requirements and adopts good practice measures which align with a trajectory towards net zero.

2.94 Additionally, the ISEP guidance[4] states "*Construction-phase mitigation should, in most cases, include embodied carbon to be meaningful*", this is because "*reducing material use and selecting low carbon materials provide far greater carbon savings than improving construction site efficiencies*". The GHG emissions associated with embodied carbon within the Proposed Development as presented in Table 2-7 have been calculated using reasonable worst-case assumptions regarding the durability and specifications of the materials required. While the exact sources and models of the materials used within the Proposed Development are not known at this stage of the planning application, consideration will be given to the embodied carbon and durability of the materials used, including, where appropriate, consideration of Environmental Product Declarations (EPDs) to achieve the minimum practicable GHG emissions in the selection and sourcing of components.

2.95 Therefore, in line with ISEP guidance[4], as the construction of the Proposed Development:

- emissions are a very small proportion of the carbon budgets;
- mitigation meets the minimum national and local policy requirements; and
- include mitigation which is judged to be in line with the trajectory towards net zero, including embodied carbon savings.

2.96 The overall GHG effect of the construction phase is considered to be minor adverse and therefore not significant.

Operation

2.97 Although the gross emissions of the Proposed Development contribute to local and national GHG emissions, the maximum contribution to any carbon budget is 0.6%. The Proposed Development comprises a maximum of 0.0014% of the national budget, which is less than 5% of the national carbon

budget. However, in line with the ISEP guidance[4], significance is not just based on whether a project's contributions are less than 5% of the national budget but also on the level of mitigation, and whether the project mitigation is "*net zero trajectory-compatible*".

2.98 With respect to GHG emissions associated with use, maintenance, repair and replacement, as discussed in Paragraph 2.94, components will be selected during construction to be as durable as practicable (and as such the replacement rates of components during the lifetime of the Proposed Development will be minimised as far as possible).

2.99 With respect to transport, operational movements are expected to be negligible, comprising 0% (when rounded) of the Proposed Development's total emissions (see Table 2-10). As such, the Proposed Development is expected to align with net-zero with respect to emissions from transport.

2.100 Moreover, as a renewable energy project, when comparing the emissions of the Proposed Development with the Energy Baseline, the Proposed Development results in a net reduction of emissions. As such, the Proposed Development by its nature aligns with net-zero.

2.101 Overall, in line with the ISEP guidance[4], as the Proposed Development operation:

- emissions are a very small proportion of the carbon budgets;
- mitigation meets the minimum national, regional and local policy requirements; and
- leads to a net reduction in GHG emissions and includes mitigation which is judged to be in line with the trajectory towards net zero.

2.102 As such, the GHG effect of operation is considered to be significant beneficial.

Whole life Cycle

2.103 Although the gross emissions (and, during the 5th Carbon Budget period, the net emissions) of the Proposed Development contribute to local and national GHG emissions, the total contribution is up to 3.1% of all budgets and up to 0.0025% of the national budget. However, in line with the ISEP guidance[4], where the emissions are less than 5% of the GHG budget, significance is based on the level of mitigation, and whether the project mitigation is "*net zero trajectory-compatible*". The mitigation and significance has therefore been considered for each development phase.

2.104 Moreover, when comparing the emissions of the Proposed Development to the energy baseline, it results in an overall reduction in emissions over its lifetime, including emissions during the construction, operation, and decommissioning phases.

2.105 Based on the criteria set out in Table 2-2, it is therefore judged that the Proposed Development would have a significant beneficial impact on GHG emissions. The assessment of significance has followed a two-step process consistent with ISEP guidance and is summarised below in Table 2-16.

Table 2-16: Assessment of Significance

Step	Description	Assessment	Applicable ISEP rating
Step 1	Context	The Proposed Development's gross emissions contribute to a very small component of the UK's and MCC's, TCBC's and NCC's carbon budgets. When considering whole life GHG emissions, the Proposed Development	Beneficial Significant

Step	Description	Assessment	Applicable ISEP rating
		will result in a net reduction in GHG emissions through provision of renewable electricity compared to electricity generated from fossil fuels.	
Step 2	Consistency with Policy	The Proposed Development is consistent with applicable existing and emerging policy requirements.	
	Mitigation	The Proposed Development has adopted measures to avoid and minimise GHG emissions during the construction, operational and decommissioning phases and will support the transition to net zero by or before 2050.	

2.106 Based on and with reference to ISEP's significance criteria (see Table 2-16) the GHG assessment therefore finds that the effects are indirect, long-term, UK-wide **significant beneficial effects**. This is a judgment based on the balance of the effects, but applying considerable weight to the Proposed Development resulting in a net reduction in GHG emissions from power generation compared to electricity generated from fossil fuels. Measures to avoid and reduce carbon during construction, operation and decommissioning are outlined in the environmental measures section. The assessment demonstrated significant beneficial effects on greenhouse gas emissions from avoided CO_2e emissions and no additional mitigation measures are proposed.

3 Part B: Climate Change Resilience Assessment (CCRA)

3.1 Climate change by its nature occurs over many decades and future changes, as modelled by United Kingdom Climate Change Projections 2018 (UKCP18), project climate change in the 2030s and beyond. The CCRA seeks to establish the potential for significant effects of climate change on the Proposed Development in the future – when it is anticipated that changes from the existing climate will have occurred – and potential risks these may pose to the operational function of the Proposed Development.

Assessment Methodology

3.2 The assessment methodology for the climate resilience assessment considers the recommendations in the ISEP *Environmental Impact Assessment Guide to: Climate Change Resilience and Adaptation*[19] and has been adapted to ensure the assessment is proportionate to the Scheme.

3.3 Following ISEP Guidance, the assessment is carried out over six-steps (0-5), as follows:

Step 0 Build Climate Resilience into the Project

3.4 In terms of mitigation to climate change, this is principally a function of the design which needs to anticipate future risks and build in appropriate adaptation measures as required. There is, therefore, an important focus on embedded measures to address future climate change.

3.5 This assessment considers the climate resilience measures and mitigation embedded in the design of the Proposed Development. A review of the resilience measures embedded in the Development is provided in Paragraphs 3.38 to 3.40.

Step 1: Define the Scope and Study Area

3.6 The study area for climate resilience, unlike other disciplines, focuses on the impact the future climate will have on the Proposed Development (as opposed to the impact of the Proposed Development on the environment). The study area is therefore limited to the footprint of the Proposed Development, split into its constituent parts (receptors, as identified in Paragraph 3.41).

Step 2: Establish Baseline Conditions

3.7 The assessment of resilience of the Proposed Development to the impacts of climate change was informed by regional scale information on historical and projected change in climate variables, and other studies undertaken relevant to the Development.

[19] ISEP (2020) Environmental Impact Assessment Guide to: Climate Change Resilience & Adaptation. Available at: https://www.iema.net/media/mabhqino/iema-eia-climate-change-resilience-june-2020.pdf.

3.8 The future baseline conditions were defined by potential climate risks identified in the UK Climate Change Risk Assessment[20] and the Key Climate Projections: Headline Findings[21] produced by the Met Office UK. These are based on the UKCP18[22] dataset.

3.9 The dataset provides probabilistic climate change projections for predefined 30-year periods for annual, seasonal and monthly changes to mean climatic conditions over land areas. For the purpose of the assessment, UKCP18 probabilistic projections for the following climate variables have been obtained:

- Mean annual temperature;
- Mean summer temperature;
- Mean winter temperature;
- Mean annual rainfall;
- Mean summer rainfall;
- Mean winter rainfall; and
- Sea level rise.

3.10 UKCP18 probabilistic projections are available at regional level, and have been analysed for Wales, which is where the Proposed Development is located. These figures are expressed as temperature/ rainfall anomalies in relation to the 1981-2000 baseline.

3.11 UKCP18 uses a range of possible scenarios, classified as Representative Concentration Pathways (RCPs), to inform differing future emission trends. These RCPs "… specify the concentrations of greenhouse gases that will result in total radiative forcing increasing by a target amount by 2100, relative to preindustrial levels." RCP8.5 has been used as a worst-case scenario for this assessment.

3.12 As the design life of the Proposed Development is expected to be 40 years, in adopting RCP8.5 the CCRA assessment has considered a scenario that reflects the potential change in climate resulting from the highest predicted level of global warming (>4 degree increase in global average temperatures) in the time horizon of 2060-2079 to assess the impact of climate change over the lifetime of the Proposed Development.

Step 3: Identify Vulnerability and Sensitivity of Receptors

3.13 During this step, relevant receptors in the Development which may be affected by climate change (e.g., change in average weather conditions and extreme events) are identified.

3.14 The ISEP Guidance describes that the assessment should consider the susceptibility and vulnerability of the receptors to future climate change. The guidance provides examples of 'low', 'moderate' and 'high' susceptibility and vulnerability, but is not prescriptive in defining a scale for overall receptor sensitivity, which is determined with professional judgement. For the purposes of this assessment, it is

[20] HM Government, (2022). UK Climate Change Risk Assessment 2022. Available at: https://assets.publishing.service.gov.uk/media/61e54d8f8fa8f505985ef3c7/climate-change-risk-assessment-2022.pdf
[21] Met Office UK, (2022). UK Climate Projections: Headline Findings. [Online]. Available at: https://www.metoffice.gov.uk/binaries/content/assets/metofficegovuk/pdf/research/ukcp/ukcp-headline-findings-v2.pdf
[22] Met Office UK, (2018). UK Climate Projections. [Online]. Available at: https://www.metoffice.gov.uk/research/approach/collaboration/ukcp/index

not necessary to identify specific individual receptors, other than the general classification identified. All receptors included in the assessment are considered to be of 'high' sensitivity, which is worst-case.

Step 4: Determine Magnitude of Effect

3.15 This step assesses the magnitude of effect for each hazard (using definitions in Table 3-3) based on scoring the likely consequence and likelihood (probability) of that hazard arising, using a five-point scale described in Table 3-1 and Table 3-2. The assessment of magnitude of effect and scoring of likelihood and consequence are based on ISEP Guidance[19].

Table 3-1: Qualitative Description of Consequence

Measure of Consequence	Description
Very Small	No damage to the Proposed Development, minimal adverse effects on health, safety and the environment or financial loss. Little change to service and disruption lasting less than one day.
Small	Localised disruption or loss of service. No permanent damage, minor restoration work required: disruption lasting less than one day. Small financial losses and/ or slight adverse health or environmental effects.
Medium	Limited damage and loss of service with damage recoverable by maintenance or minor repair. Disruption lasting more than one day but less than one week. Moderate financial losses. Adverse effects on health or the environment.
Large	Extensive damage and severe loss of service. Disruption lasting more than one week. Early renewal of 50-90% of the Proposed Development. Permanent physical injuries and/or fatalities. Major financial loss. Significant effect on the environment, requiring remediation.
Very Large	Permanent damage and complete loss of service. Disruption lasting more than one week. Early renewal of the Proposed Development >90%. Severe health effects or fatalities. Extreme financial loss. Very significant loss to the environment requiring remediation and restoration.

Table 3-2: Qualitative Description of Likelihood

Measure of Likelihood	Description
Very High	The event occurs multiple times during the lifetime of the Proposed Development e.g., approximately annually.
High	The event occurs several times (approximately 12 events) during the lifetime of the Proposed Development.
Medium	The event occurs limited times (approximately 4 events) during the lifetime of the Proposed Development.
Low	The event occurs once during the lifetime of the Proposed Development.
Very Low	The event may occur once during the lifetime of the Proposed Development or may not occur at all.

3.16 These determinants are combined to assess the significance of effects on receptors, as shown in Table 3-3. The assessment is qualitative and uses expert judgment based on knowledge of similar schemes, engagement with the wider project team, and a review of relevant literature.

3.17 The assessment of significance follows the approach outlined in ISEP Guidance and takes environmental measures (embedded mitigation/ adaptation) into account. These environmental measures (embedded mitigation / adaptation), identified in Paragraphs 3.38, 3.39, and 3.40, have been identified through consultation with the project team.

Table 3-3: Significance of Effects Matrix

Likelihood of Hazard Occurring	Consequence of Hazard Occurring				
	Very Small	Small	Medium	Large	Very Large
Very High	Minor	Moderate	Moderate	Major	Major
High	Negligible	Minor	Moderate	Major	Major
Medium	Negligible	Minor	Moderate	Major	Major
Low	Negligible	Negligible	Moderate	Moderate	Major
Very Low	Negligible	Negligible	Negligible	Minor	Minor

Step 5 Identify Likely Significant Effects

3.18 The likely significant effects are determined for each hazard from the magnitude of effect, taking account of the receptor sensitivity. As all receptors in the assessment are considered to be high sensitivity, major and moderate effects are considered to be significant and negligible and minor effects are considered not significant.

3.19 Following identification of likely significant effects, further adaptation measures for any significant effects are identified through expert opinion, based on knowledge of similar schemes, and effects of climate change on receptors are assessed using the criteria set out in Table 3-1, Table 3-2 and Table 3-3.

Assumptions and Limitations

3.20 This assessment provides a broad indication of the potential impacts of climate change on the Proposed Development based on a qualitative assessment and professional judgment using knowledge of similar schemes. The UKCP18 projections are the most up-to-date projections of climate change for the UK.

3.21 UKCP18 provides probabilistic projections of future climate for a range of emissions scenarios. Future GHGs emissions, and resulting pathway, is uncertain. A precautionary approach, consistent with ISEP Guidance has therefore been adopted by selecting a high emissions scenario (RCP8.5).

3.22 The determination of significance has been undertaken under the assumption that industry design standards will be adhered to where detailed design information is unavailable.

Baseline Conditions

Current Baseline Conditions

3.23 The current baseline for the CCRA assessment is the current climate at the Site. Historic climate data has been obtained from the Met Office website, recorded by the closest Met Office station to the Site which is the Cardiff Bute Park Station, approximately 23 km southwest of the Site. The current flood risk climate hazards for the Site have been identified based on the Flood Risk Assessment that is provided as part of this planning application.

3.24 Historic climate data for the 30-year periods of 1981-2010 and 1991-2020 (the standard baseline for climate data), are summarised in Table 3-4.

Table 3-4: Historic Climate Data Summary

Climate Factor	Month (1981-2010)	Value	Month (1991-2020)	Value
Warmest month on average (Average daily mean temp °C)	Jul	17.5	Jul	17.5
Coldest month on average (Average daily mean temp °C)	Jan	5.3	Jan	5.4
Mean annual rainfall levels (mm)	-	95.4	-	99.8
Wettest month on average (Average monthly rainfall) (mm)	Oct	130.6	Dec	139.6
Driest month on average (Average monthly rainfall) (mm)	Jun	65.3	Jun	71.2

3.25 When comparing the 30-year climate averages between 1981-2010 and 1991-2020, there is an increase in temperature for the coldest month. There is a slight increase in mean annual rainfall level, and an increase in the average monthly rainfall in both the wettest and driest month.

3.26 The Met Office historic 10-year averages for station identify gradual warming in both the winter and summer averages between 1975 and 2024. Additionally, there was a slight increase in winter average monthly rainfall, but a slight decrease in summer average monthly rainfall. Information on average daily mean temperatures (°C) and mean monthly rainfall (mm) is summarised in Table 3-5.

Table 3-5: Historic 10-year Averages for Temperature and Rainfall at Cardiff Bute Station

Decade	Mean Daily Average Temperatures (°C)		Mean Monthly Rainfall (mm)	
	Winter (Oct-Mar)	Summer (Apr-Sep)	Winter (Oct-Mar)	Summer (Apr-Sep)
1975 - 1984	6.8	13.9	113.7	71.1
1985 - 1994	7.3	14.3	115.9	68.1
1995 - 2004	7.5	14.7	114.7	84.6
2005 - 2014	7.4	14.6	116.0	85.4

Decade	Mean Daily Average Temperatures (°C)		Mean Monthly Rainfall (mm)	
	Winter (Oct-Mar)	Summer (Apr-Sep)	Winter (Oct-Mar)	Summer (Apr-Sep)
2015 - 2024	8.0	15.3	130.3	80.5

3.27 There has been a significant human influence on the observed warming in the UK annual temperature since 1950. Statistical results from extreme value analysis suggest that the UK daily maximum and minimum temperature extremes have increased by just over 1°C since the 1950s, and that heavy seasonal and annual rainfall events have also increased.

3.28 Table 3-6 below sets out the current climate hazards within the Site.

Table 3-6: Current Climate Change Hazards

Climate Hazard	Current Baseline
Fluvial / Tidal Flooding	The Welsh Government Development Advice Map (DAMS) identifies the majority of the Site as being situated within Flood Zone 1, meaning there is less than 1 in 1,000 probability of flooding in any given year. A small area is located within Flood Zone 2 and 3 which lies adjacent to Candwr Brook.
Pluvial (Surface Water) Flooding	The Flood Map for Planning for Surface Water and Small Watercourses by Natural Resource Wales shows that the Site has a predominantly 'low' risk of flooding from surface water and small watercourses (less than 1 in 1,000 in a given year), although Surface water flow paths are noted across the Site predicting small areas to be at risk.
Groundwater Flooding	The Flood Risk Assessment considers the risk of groundwater flooding to be low.
Drought	The Proposed Development is within a Water Resource Zone identified as high risk for drought by Welsh Water[23].
Extreme Weather Events	Monmouthshire, Torfaen, and Newport are susceptible to winter storms (typically winds and rain) and summer heatwaves in recent years. Severe winter snow and ice events are infrequent.

Future Baseline Conditions

3.29 The future baseline conditions have been defined by potential climate risks identified in the UK Climate Change Risk Assessment[20], National Adaptation Programme[24], and the Key Climate Projections: Headline Findings produced by the Met Office UK[25]. These are based on the UKCP18 dataset[26]. The projections have been made for the administrative regions; the Site is located in the administrative region of Wales.

[23] Welsh Water (2026) Final Drought Plan 2025. Available at: https://www.dwrcymru.com/en/our-services/water/water-resources/final-drought-plan-2025
[24] Defra (2018) The National Adaptation Programme and the Third Strategy for Climate Adaptation Reporting.
[25] Defra, BEIS, Met Office & Environment Agency (2022) UK Climate Projections: Headline Findings. Available: ukcp18_headline_findings_v4_aug22.pdf.
[26] Defra, BEIS, Met Office & Environment Agency (2022) UK Climate Projections Key Results Spreadsheet. Available: ukcp18-key-results-2022.xlsx

3.30 Table 3-7 shows projected changes in temperature (expected to increase), rainfall (expected to increase in winter and decrease in summer) with the 50% probability level as the core value in the centre, with the 10%-90% probability range on either side.

Table 3-7: Projected Changes in Climate Variables, relative to 1981-2000 baseline

Variable	Projected change in period 2060-2079		
	10th percentile	50th percentile	90th percentile
Mean annual temperature (°C)	1.3	2.6	3.9
Mean winter temperature (°C)	0.7	2.2	3.8
Mean summer temperature (°C)	1.3	3.3	5.4
Mean winter precipitation (%)	-3	15	36
Mean summer precipitation (%)	-50	-25	0

3.31 The projected changes indicate increasingly erratic weather patterns that are likely to lead to greater numbers of extreme weather events that may affect the Site.

3.32 The extreme weather events include heatwaves, droughts, and increases in localised intense precipitation events, (precursor to flooding) with some climate models predicting an increase in frequency and intensity of winter storms. Increase in the frequency and intensity of these extremes can put further pressure on resources and increase risk posed to infrastructure and public health and safety.

3.33 Winds associated with major storm events can be some of the most damaging and disruptive events for the UK with implications for property, power networks, road and rail transport and aviation. Calm periods with little wind, particularly over prolonged periods, can affect air quality whilst winds from a particular direction can be a critical factor in the spread of particulates. Both cases are also examples where the combination of factors such as wind, temperature and precipitation can exacerbate their impacts (e.g., air quality issues tend to be worse under conditions of light winds and higher temperatures; pathogen spread can require wind, temperature and precipitation conditions to be favourable)[27].

3.34 Changes in wind speeds are not currently available at regional level and there remains considerable uncertainty in the projections with respect to wind speed. Across the UK, near surface wind speeds are expected to increase in the second half of the 21st century with winter months experiencing more significant impacts of winds. This is accompanied by an increase in frequency of winter storms over the UK. However, the increase in wind speeds is projected to be modest. There are no compelling trends in storminess as determined by maximum gust speeds from the UK wind network over the last four decades[28] .

3.35 Sea level rise in 2070 is predicted to be between 0.31 m (5th percentile) and 0.64 m (95th percentile) relative to the 1981 – 2000 average.

3.36 The UK Climate Change Risk Assessment 2022[20] lists the following climate change risks for energy infrastructure:

[27] Met Office (2019) *UKCP18 Factsheet: Wind.*
[28] Royal Meteorological Society (2018) *International Journal of Climatology; State of the UK Climate 2017.*

- I1: Risks to infrastructure networks (water, energy, transport, ICT) from cascading failures (Very high potential costs); and
- I2: Risks to infrastructure services from river, surface water and groundwater flooding failures (High to Very high potential costs).

3.37 In summary, Table 3-7 and baseline climate risks examined in Table 3-5 and Table 3-6 the following future climate hazards have been identified as relevant to the assessment:

- Hotter summers: increased magnitude and frequency of heatwaves, increased risk of fires (including wildfires);
- Drier summers: increased magnitude and frequency of drought, increased severity of water shortages and water stress;
- Wetter winters: increased intensity of winter rainfall, increased risk of fluvial, pluvial and groundwater flooding; and
- Winds and storms: increased magnitude and frequency of high winds and storms.

Environmental Measures

Construction Phase

3.38 The CEMP and Construction Phase Plan (CPP), to be secured by planning condition, will include a number of measures which will minimise impacts from climate risks, as well as principals which would be included as part of Considerate Constructors Scheme, best practice and Code of Conduct. Key measures include:

- Appropriate health and safety plans in place during construction to avoid exposure to extreme or inclement weather, including Health and Safety Manager will be responsible for the monitoring and controlling of health and safety compliance and related rules and regulations on-Site. Health and safety plans and Risk Assessment Method Statement (RAMS) developed for on-Site activities will be required to account for potential risks related to extreme weather;
- Site staff will be provided with appropriate PPE and undertake works in accordance with approved RAMS;
- Provision of adequate welfare facilities for construction staff;
- Contractors will monitor weather forecasts and plan works accordingly, protecting workers and resources from any extreme weather conditions such as storms, flooding;
- Contractors will receive Environment Agency's (EA) flood and wildfire risk alerts and plan works accordingly, protecting workers and resources from any potential on-site fires, tidal surges or sea level-related flooding;
- Electrical equipment and plant will be stored away from direct sunlight when not in use;
- Water management measures to be implemented to protect the water environment from adverse effects during construction;
- Dust management to be implemented including measures to protect against wind whipping and dust resuspension;
- Air conditioning in cabs of powered machinery to protect operators;
- Construction equipment should be fit for purpose and adequately maintained, including checking for damage after extreme weather; and

- Construction materials will be sourced from local suppliers, where practicably possible, to reduce the length of vehicle trips to the Site.

Operational Phase

3.39 A number of measures to minimise climate impacts have been included within the design of the Proposed Development, as well as measures included within the OEMP to be secured by planning condition. Additionally, given that activities during operation will include further construction activities during maintenance, appropriate measures should be drawn from the CEMP as measures during operation, to be secured by planning condition. Relevant OEMP and CEMP measures include:

- Monitoring weather forecasts and the EA's flood and wildfire risk alerts and planning works accordingly, protecting workers and resources from extreme weather conditions;
- Where monitoring systems indicate a risk of fire, managing vegetation where appropriate to reduce fuel loads, and consider implementing fire breaks to discourage spreading of fires during wildfire events;
- Measures to protect staff welfare during heat waves, including planning work around extreme heat where possible;
- All structures will be designed and installed to relevant standards and specifications;
- Equipment and structures rated to withstand higher temperatures; cooling capacity for substation to be designed to accommodate high cooling demand;
- Equipment designed to consider heat tolerance to ensure specification suitable to adapt to high summer temperatures and minimise energy losses;
- The design of the Proposed Development considers the fluvial flood risk of all areas within the Site and avoids development of solar PV arrays on areas of the highest flood risk, elevating the solar PV modules on frameworks, and implementing sustainable urban drainage systems;
- Maintenance and servicing will include the inspection, repair, adjustment, altering, removal, reconstruction, refurbishment replacement or improvement of equipment to ensure the continued effective operation of the Proposed Development;
- Planting specifications will be developed, prioritising species tolerant to Site-specific climate risks (heat, drought, soil conditions, flooding);Landscaping and planting will be adequately maintained in line with the outline Landscape and Ecology Management Plan (oLEMP);
- Procedures to consider water efficiency measures; and
- Swales and other SuDS features reduce flood risk in high rainfall events.

Decommissioning

3.40 The measures to minimise climate change impacts during decommissioning will be the same as those during construction, given the similarity of the activities during the two phases. The decommissioning is anticipated to occur over 12 months, compared to 18 months duration of construction. While the proposed on-site 132 kV substation and its ancillary security measures are expected to remain in situ, the remainder of the Proposed Development would be decommissioned and hence activities will be similar to those during construction, and therefore it is appropriate to use the same environmental measures.

Assessment of Likely Significant Effects

Receptors and Receptor Sensitivity

3.41 The key receptors identified for inclusion in the CCRA assessment are set out below. As discussed in Paragraph 3.14, all receptors are assumed to be of 'high' sensitivity. Each has been identified using professional judgement as being in some way vulnerable to the effects of future climate change hazards:

- Construction
  - Construction staff and workers;
  - Construction equipment, machinery and materials; and
  - Construction Site access roads and compounds;
- Operation
  - Renewable energy infrastructure (solar PV panels, on-Site cabling, substations, foundations);
  - Site staff (maintenance workers);
  - Site access (entrance tracks); and
  - Landscaping and biodiversity.
- Decommissioning
  - Decommissioning staff and workers;
  - Decommissioning equipment, machinery and materials; and
  - Decommissioning site access roads and compounds.

Potential Impacts and Mitigation

3.42 A number of potential impacts were identified along with measures to reduce these impacts. The results are detailed in Table 3-8, Table 3-9, and Table 3-10.

Table 3-8: Climate Hazards and Mitigation – Construction phase

Climate Hazard	Receptor	Potential Impact	Design Measure to Mitigate Impacts
Hotter Summers. Extreme Temperatures (Heatwaves)	Construction infrastructure and equipment	Overheating of electrical equipment	Will be included within the **CEMP**, to be secured by condition**.** Contractors will monitor weather forecasts and plan works accordingly, protecting workers and resources from any extreme weather conditions. Specific responsibilities are included in the **CEMP**. Electrical construction equipment and plant will be stored away from direct sunlight when not in use.
		Overheating of machines and site offices	To be included within the **CEMP**, to be secured by condition**.** Contractors will monitor weather forecasts and plan works accordingly, protecting workers and resources from any extreme weather. Air conditioning to be used where required.
		Damage to key infrastructure from wildfires	To be included within the **CEMP**, to be secured by condition. Monitoring of EA wildfire risk alerts. Monitoring of CCTV to assist as an early warning system. Incorporation of suitable fire suppression systems, to be confirmed at the detailed design stage.
	Construction site staff/personnel	Risk of overheating to workers	To be included within the **CPP**, to be secured by condition**.** Contractors will monitor weather forecasts and plan works accordingly, protecting workers and resources from any extreme weather. Specific responsibilities are included in the **CPP**. Air conditioning in cabs of powered machinery to protect operators.
		Increased heat stress/ heat exhaustion for workers.	
		Risk to life from wildfires	Monitoring of EA wildfire risk alerts and CCTV to assist as an early warning system. Fire procedure, including an emergency evacuation plan, to be included within the **CPP** and secured by condition to ensure the safety of staff in the event of a fire. Incorporation of suitable fire suppression systems, to be confirmed at the detailed design stage.
Wetter Winters, Extreme Rainfall	Construction infrastructure and equipment	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).	To be included within the **CEMP** and/or the **CPP**, to be secured by condition**.** 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. Infrastructure flood resilience detailed in the standalone **Floor Risk and Drainage** report. Specific responsibilities will be included in the **CEMP** and/or **CPP**.
	Construction site staff/personnel	Risk of injury or threat to life from flooding	To be included within the **CEMP** and/or the **CPP**, and secured by condition. 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. Infrastructure for flood resilience detailed in the

Climate Hazard	Receptor	Potential Impact	Design Measure to Mitigate Impacts
			standalone **Floor Risk and Drainage** report. Specific responsibilities are to be included in the **CEMP** and/or the **CPP**.
Drier Summers, Drought	Construction infrastructure and equipment	Water shortages for site works	The **CEMP** (to be secured by condition) will include water management measures, that will provide greater detail regarding the mitigation to be implemented to protect the water environment from adverse effects during construction.
	Construction site staff/personnel	Water shortages for staff welfare	The **CEMP** (to be secured by condition) will include water management measures, that provide greater detail regarding the mitigation to be implemented to protect the water environment from adverse effects during construction.
Wind and Storms	Construction infrastructure and equipment	Damage to site offices, compounds or partially installed components resulting in delays to programme and associated costs and/or unacceptable safety risks	To be included within the **CEMP** (to be secured by condition). Contractors will monitor weather forecasts and receive Environment Agency flood warnings and alerts, and plan works accordingly, protecting resources from any extreme weather conditions. Specific responsibilities are to be included in the **CEMP**.
		High winds increasing dust (and other debris)	Dust management will be included in the **CEMP** (to be secured by condition) including measures to protect against wind whipping and dust resuspension.
	Construction site staff/personnel	Increased potential for slips, trips and falls	To be included within the **CEMP** and/or the **CPP** to be secured by condition. Contractors will monitor weather forecasts and receive Environment Agency flood warnings and alerts, and plan works accordingly, protecting resources from any extreme weather conditions. Health and Safety Manager will be responsible for the monitoring and controlling of health and safety compliance and related rules and regulations on-site. Health and safety plans developed for construction activities will be required to account for potential climate change impacts on workers. Specific responsibilities are to be included in the **CEMP** and/or **CPP**.

Table 3-9: Climate Hazards and Mitigation – Operation and Maintenance

Climate Hazard	Receptor	Potential Impact	Design Measure to Mitigate Impacts
Hotter Summers. Extreme Temperatures (Heatwaves)	Renewable energy infrastructure (solar PV modules, battery energy storage systems (BESS) and inverters)	Overheating of electrical equipment	To be included within the **OEMP** and secured via condition**.** All structures will be designed to relevant standards and specifications. Cooling systems used on BESS will accommodate suitable peak ambient temperatures accounting for inter-year variability and future climate change. It is anticipated that maintenance and servicing will include the inspection, repair, adjustment, altering, removal, reconstruction, refurbishment replacement or improvement of equipment to ensure the continued effective operation of the Scheme.
		Damage to key infrastructure resulting from fire	To be included within the **OEMP** and secured via condition. Monitoring of EA wildfire risk alerts to assist as an early warning system. Incorporation of suitable fire suppression systems, to be confirmed at the detailed design stage. Where practicable, managing vegetation to reduce fuel loads, and consideration towards implementing fire breaks to discourage spreading of fires during wildfire events
	Site staff/personnel	Increased heat stress/ heat exhaustion for workers	Measures to protect staff welfare during heat waves are to be included within the **OEMP** and secured via condition. This includes planning work around extreme heat where possible.
		Risk to life from fire	Fire procedure, including an emergency evacuation plan, to be included within the **OEMP** (secured by condition) to ensure the safety of staff in the event of a fire.
	Habitats and biodiversity	Damage to vegetation and biodiversity and potential to affect growth rates of habitats	Habitat protection and enhancement to include natural habitats for the area. Active management will improve resilience to future climate changes. Measures to protect and enhance habitats and biodiversity are included within the **oLEMP** submitted with the planning application.
		Increased risk of fire, potentially causing damage to vegetation and biodiversity	Regular monitoring of any damage to vegetation, and replacement where required, as specified within the **oLEMP**.
	Renewable energy	Surface water flooding and standing waters.	To be included within the **OEMP** and secured via condition. Contractors will monitor weather forecasts and receive Environment Agency's (EA) flood alerts

Climate Hazard	Receptor	Potential Impact	Design Measure to Mitigate Impacts
Wetter Winters, Extreme Rainfall	infrastructure (solar PV modules, BESS units and inverters)	Deterioration of structures or foundations due to increase in soil moisture levels.	and plan works accordingly, protecting workers and resources from any extreme weather conditions such as storms, flooding. Infrastructure flood resilience detailed in the standalone **Floor Risk and Drainage** report included within the planning application. This includes elevating the solar PV modules on frameworks, and implementing sustainable urban drainage systems. It is anticipated that maintenance and servicing will include the inspection, repair, adjustment, altering, removal, reconstruction, refurbishment replacement or improvement of equipment to ensure the continued effective operation of the Scheme.
		Damage to surfaces/ exposed utilities from increased drying/wetting and increase frost penetration	
	Site staff/personnel	Risk of injury or threat to life from flooding	
	Habitats and biodiversity	Damage to vegetation and biodiversity and potential to affect growth rates of habitats	Habitat protection and enhancement to include natural habitats for the area. Active management will improve resilience to future climate changes. Measures to protect and enhance habitats and biodiversity are included within the **oLEMP** and **ES Chapter 6 Ecology**.
Drier Summers, Drought	Renewable energy infrastructure (solar PV modules, BESS units and inverters) and Site access	Water shortages	Procedures to consider water efficiency measures are to be included within the **OEMP** to be secured by condition. Contractors will monitor weather forecasts and plan works accordingly, protecting workers and resources from any extreme weather conditions. All structures and components will be designed to relevant standards and specifications. It is anticipated that maintenance and servicing will include the inspection, repair, adjustment, altering, removal, reconstruction, refurbishment replacement or improvement of equipment to ensure the continued effective operation of the Scheme
		Deterioration of structures or foundations due to decrease in soil moisture levels	
	Landscaping and biodiversity	Damage to plants and biodiversity and potential to affect growth rates of habitats	
Wind and Storms	Renewable energy infrastructure (solar PV	Surface water flooding and standing waters	To be included within the **OEMP** to be secured via condition. 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. Infrastructure flood

Climate Hazard	Receptor	Potential Impact	Design Measure to Mitigate Impacts
	modules, BESS units and inverters)	Deterioration of structures or foundations due to increase in soil moisture levels	resilience detailed in the standalone **Floor Risk and Drainage** report submitted with the planning application**.** All structures and components will be designed to relevant standards and specifications. It is anticipated that maintenance and servicing will include the inspection, repair, adjustment, altering, removal, reconstruction, refurbishment replacement or improvement of equipment to ensure the continued effective operation of the Scheme.
	Site staff/personnel	Increased potential for slips, trips and falls	
	Habitats and biodiversity	Damage to vegetation and biodiversity and potential to affect growth rates of habitats	Habitat protection and enhancement to include natural habitats for the area. Active management will improve resilience to future climate changes. Measures to protect and enhance habitats and biodiversity are included within the **oLEMP** and **ES Chapter 6 Ecology**.

Table 3-10: Climate Hazards and Mitigation – Decommissioning Phase

Climate Hazard	Receptor	Potential Impact	Design Measure to Mitigate Impacts
Hotter Summers. Extreme Temperatures (Heatwaves)	Decommissioning infrastructure and equipment	Overheating of electrical equipment	To be included within the **DEMP** and secured via condition. Contractors will monitor weather forecasts and plan works accordingly, protecting workers and resources from any extreme weather conditions. Specific responsibilities are included in the **DEMP**. Electrical decommissioning equipment and plant will be stored away from direct sunlight when not in use.
		Overheating of machines and site offices	To be included within the **DEMP** and secured via condition. Contractors will monitor weather forecasts and plan works accordingly, protecting workers and resources from any extreme weather. Air conditioning to be used where required.
	Decommissioning site staff/personnel	Risk of overheating to workers	To be included within the **DEMP** and secured via condition. Contractors will monitor weather forecasts and plan works accordingly, protecting workers and resources from any extreme weather. Specific responsibilities will be included in the **DEMP**. Air conditioning in cabs of powered machinery to protect operators.
		Increased heat stress/ heat exhaustion for workers.	

Climate Hazard	Receptor	Potential Impact	Design Measure to Mitigate Impacts
		Risk to life from fire	Monitoring of EA wildfire risk alerts and CCTV to assist as an early warning system. Fire procedure, including an emergency evacuation plan, to be included within the **DEMP** to ensure the safety of staff in the event of a fire.
Wetter Winters, Extreme Rainfall	Decommissioning infrastructure and equipment	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).	To be included within the **DEMP** and secured via condition**.** 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. Specific responsibilities will be included in the **DEMP**.
	Decommissioning site staff/personnel	Risk of injury or threat to life from flooding	Included within the **DEMP** to be secured by condition. 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. Specific responsibilities are included in the **DEMP**.
Drier Summers, Drought	Decommissioning infrastructure and equipment	Water shortages for site works	The **DEMP** (to be secured via condition) includes water management measures, that will provide greater detail regarding the mitigation to be implemented to protect the water environment from adverse effects during decommissioning.
	Decommissioning site staff/personnel	Water shortages for staff welfare	The **DEMP** (to be secured via condition) includes water management measures, that provide greater detail regarding the mitigation to be implemented to protect the water environment from adverse effects during decommissioning.
Wind and Storms	Decommissioning infrastructure and equipment	Damage to site offices, compounds or components resulting in delays and associated costs and/or unacceptable safety risks	Included within the **DEMP** and secured via condition. Contractors will monitor weather forecasts and receive Environment Agency flood warnings and alerts, and plan works accordingly, protecting resources from any extreme weather conditions. Specific responsibilities are included in the **DEMP**.
		High winds increasing dust (and other debris)	Dust management is included in the **DEMP** (to be secured via condition) including measures to protect against wind whipping and dust resuspension.

Climate Hazard	Receptor	Potential Impact	Design Measure to Mitigate Impacts
	Habitats and biodiversity	Damage to habitats from decommissioning equipment or partially decommissioned components due to storm events	Contractors will monitor weather forecasts and receive Environment Agency flood warnings and alerts, and plan works accordingly, thus minimising the risk to habitats of damage from decommissioning activities during any extreme weather conditions. Specific responsibilities are included in the **DEMP**. Mitigations include conducting updated surveys prior to works, and measure to reduce air, water, dust, silt, light and noise pollution to avoid disturbance to sensitive species.
	Decommissioning site staff/personnel	Increased potential for slips, trips and falls	To be included within the **DEMP** and secured via condition. Contractors will monitor weather forecasts and receive Environment Agency flood warnings and alerts, and plan works accordingly, protecting resources from any extreme weather conditions. Health and Safety Manager will be responsible for the monitoring and controlling of health and safety compliance and related rules and regulations on-site. Health and safety plans developed for decommissioning activities will be required to account for potential climate change impacts on workers. Specific responsibilities are included in the **DEMP**.

Step 3: Assess the Significance of Effects of Climate Change on Receptors

3.43 Table 3-11 (construction), Table 3-12 (operation), and Table 3-13 (decommissioning) detail the assessment of the climate risks identified in Step 2 above. This takes into account projections of future climate change in the period up to 2032 for construction, up to 2070 for operation, and up to 2071 for decommissioning, as well as mitigation designed into the Scheme and to be included within the **CEMP**. It should be noted that precautionary judgements have been made to allow for a conservative assessment.

Table 3-11: Climate Resilience Assessment – Construction Phase

Climate Hazard	Receptor	Potential Impact	Likelihood	Consequence	Significance
Hotter Summers. Extreme Temperatures (Heatwaves)	Construction infrastructure and equipment	Overheating of electrical equipment	Very Low	Negligible	Negligible (Not Significant)
		Overheating of machines and site offices	Medium	Negligible	Negligible (Not Significant)
		Damage to key infrastructure from fire	Very Low	Medium	Negligible (Not Significant)
	Construction site staff/personnel	Risk of overheating to workers	Medium	Negligible	Negligible (Not Significant)
		Increased heat stress/ heat exhaustion for workers.	Low	Negligible	Negligible (Not Significant)
		Risk to life from fire	Very Low	Very Large	Minor Adverse (Not Significant)
Wetter Winters, Extreme Rainfall	Construction infrastructure and equipment	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).	Medium	Small	Minor Adverse (Not Significant)
	Construction site staff/personnel	Risk to life from flooding	Very Low	Medium	Negligible (Not Significant)
Drier Summers, Drought	Construction infrastructure and equipment	Water shortages for site works	Very Low	Small	Negligible (Not Significant)

Climate Hazard	Receptor	Potential Impact	Likelihood	Consequence	Significance
	Construction site staff/personnel	Water shortages for staff welfare	Very Low	Medium	Negligible (Not Significant)
Wind and Storms	Construction infrastructure and equipment	Damage to site offices, compounds or partially installed components resulting in delays to programme and associated costs and/or unacceptable safety risks	Low	Small	Negligible (Not Significant)
		High winds increasing dust (and other debris)	Medium	Negligible	Negligible (Not Significant)
	Construction site staff/personnel	Increased potential for slips, trips and falls	Very Low	Small	Negligible (Not Significant)

Table 3-12: Climate Resilience Assessment – Operation and Maintenance

Climate Variable	Receptor	Potential Impact	Likelihood	Consequence	Significance
Hotter Summers. Extreme Temperatures (Heatwaves)	Renewable energy infrastructure (solar PV modules, BESS units and inverters)	Overheating of electrical equipment	Low	Minor Adverse	Negligible (Not Significant)
		Damage to key infrastructure from fire	Very Low	Medium	Negligible (Not Significant)
	Site staff/personnel	Increased heat stress/ heat exhaustion for workers	Low	Negligible	Negligible (Not Significant)
		Risk to life from fire	Very Low	Very Large	Minor Adverse (Not Significant)
	Habitats and biodiversity	Damage to vegetation and biodiversity and potential to affect growth rates of habitats	Low	Small	Negligible (Not Significant)
Wetter Winters, Extreme Rainfall	Renewable energy infrastructure (solar PV modules, BESS units and inverters)	Surface water flooding and standing waters.	Medium	Small	Minor Adverse (Not Significant)
		Deterioration of structures or foundations due to increase in soil moisture levels.	Low	Small	Negligible (Not Significant)
		Damage to surfaces/ exposed utilities from increased drying/wetting and increase frost penetration	Low	Small	Negligible (Not Significant)
	Site staff/personnel	Risk to life from flooding	Very Low	Medium	Negligible (Not Significant)
	Habitats and biodiversity	Damage to vegetation and biodiversity and	Low	Negligible	Negligible (Not Significant)

Climate Variable	Receptor	Potential Impact	Likelihood	Consequence	Significance
		potential to affect growth rates of habitats			
Drier Summers, Drought	Renewable energy infrastructure (solar PV modules, BESS units and inverters) and Site access	Water shortages	Low	Small	Negligible (Not Significant)
		Deterioration of structures or foundations due to decrease in soil moisture levels	Low	Small	Negligible (Not Significant)
	Habitats and biodiversity	Damage to vegetation and biodiversity and potential to affect growth rates of habitats	Low	Small	Negligible (Not Significant)
Wind and Storms	Renewable energy infrastructure (solar PV modules, BESS units and inverters)	Surface water flooding and standing waters	Medium	Small	Minor Adverse (Not Significant)
		Deterioration of structures or foundations due to increase in soil moisture levels	Low	Small	Negligible (Not Significant)
	Site staff/personnel	Increased potential for slips, trips and falls	Very Low	Medium	Negligible (Not Significant)
	Landscaping and biodiversity	Damage to plants and biodiversity and potential to affect growth rates of habitats	Very Low	Negligible	Negligible (Not Significant)

Table 3-13: Climate Resilience Assessment – Decommissioning Phase

Climate Hazard	Receptor	Potential Impact	Likelihood	Consequence	Significance
Hotter Summers. Extreme Temperatures (Heatwaves)	Decommissioning infrastructure and equipment	Overheating of electrical equipment	Very Low	Negligible	Negligible (Not Significant)
		Overheating of machines and site offices	Medium	Negligible	Negligible (Not Significant)

Climate Hazard	Receptor	Potential Impact	Likelihood	Consequence	Significance
	Decommissioning site staff/personnel	Risk of overheating to workers	Medium	Negligible	Negligible (Not Significant)
		Increased heat stress/ heat exhaustion for workers.	Low	Negligible	Negligible (Not Significant)
		Risk to life from fire	Very Low	Very Large	Minor Adverse (Not Significant)
Wetter Winters, Extreme Rainfall	Decommissioning infrastructure and equipment	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).	Medium	Small	Minor Adverse (Not Significant)
	Decommissioning site staff/personnel	Risk to life from flooding	Low	Medium	Minor Adverse (Not Significant)
Drier Summers, Drought	Decommissioning infrastructure and equipment	Water shortages for site works	Very Low	Small	Negligible (Not Significant)
	Decommissioning site staff/personnel	Water shortages for staff welfare	Very Low	Medium	Negligible (Not Significant)
Wind and Storms	Decommissioning infrastructure and equipment	Damage to site offices, compounds or components resulting in delays and associated costs and/or unacceptable safety risks	Low	Small	Negligible (Not Significant)
		High winds increasing dust (and other debris)	Medium	Negligible	Negligible (Not Significant)

Climate Hazard	Receptor	Potential Impact	Likelihood	Consequence	Significance
	Habitats and biodiversity	Damage to habitats from decommissioning equipment or partially decommissioned components due to storm events	Low	Small	N Negligible (Not Significant)
	Decommissioning site staff/personnel	Increased potential for slips, trips and falls	Low	Small	Negligible (Not Significant)

Step 4: Establish Further Adaptation Measures and Determine Residual Effects

3.44 Table 3-11, Table 3-12, and Table 3-13 show that there are no likely significant effects in relation to climate change resilience during construction, operation, or decommissioning.

3.45 Measures will need to be developed as part of the detailed **CEMP**, **DEMP**, **LEMP** and **OEMP** in order to ensure the construction works and the Scheme during operation and decommissioning are appropriately resilient to future climate change.

Summary & Conclusions

3.46 The resilience of the Scheme to climate change has been assessed. Four key climate hazards have been identified, these being:

- hotter summers with extreme temperatures (heatwaves);
- wetter winters including extreme rainfall (pluvial and groundwater flooding);
- drier summers and drought; and
- increased wind and storms.

3.47 The assessment considers the recommendations in the ISEP *Guide to Climate Change Resilience and Adaptation*[19] and was adapted to ensure the assessment was proportionate to the Scheme. It utilised the most up-to-date published projections of climate change for the UK, and adopted a precautionary approach whereby a high-emissions scenario was selected (as suggested by ISEP).

3.48 Resilience and adaptation measures for the Scheme have been provided by the Applicant's Project Team and taken from detailed information within the planning submission documents. Further measures will be developed within the detailed production of the CEMP, DEMP, LEMP and OEMP documents.

3.49 The assessment has identified that there are no significant effects in relation to climate change resilience during construction, operation, or decommissioning.

A1 Glossary

AQC	Air Quality Consultants
BESS	Battery Energy Storage Systems
CEMP	Construction Environmental Management Plan
CH_4	Methane
CO_2	Carbon Dioxide
CO_2e	Carbon Dioxide equivalent
DEMP	Decommissioning Environmental Management Plan
GHG	Greenhouse Gas
GWP	Global Warming Potential
HFC	Hydrofluorcarbons
HMSO	His Majesty's Stationery Office
ISEP	Institute of Sustainability and Environmental Professionals
NF_3	Nitrogen Trifluoride
N_2O	Nitrous Oxide
NPPF	National Planning Policy Framework
OEMP	Operational Environmental Management Plan
oLEMP	Outline Landscape and Ecology Management Plan
PFC	Perfluorocarbons
PV	Photovoltaic
SF_6	Sulphur Hexafluoride
UKCP18	UK Climate Projections 2018
UNFCCC	United Nations Framework Convention on Climate Change

A2 Legislation, Planning Policy and Guidance

A2.1 In preparing the assessment, consideration has been given to the requirements of national and local planning policies.

Legislation and National Planning Policy

Carbon Budget and Growth Delivery Plan[29]

A2.2 The Carbon Budget and Growth Delivery Plan sets out how the government meets its statutory carbon budgets.

A2.3 The plan concludes that it has the necessary components to enable the UK's fourth, fifth and sixth Carbon Budgets to be met.

A2.4 In relation to clean energy generation, specifically ground mounted solar, table 4 (row 122) within the Plan states: 'Delivering Clean Power by 2030 will require the rapid deployment of ground mount solar. The Government is working to ensure that the planning system supports the rapid increases in deployment needed to meet its ambitions.'

Climate Change Act 2008 (2050 Target Amendment) Order 2019 and Carbon Budget Order 2021

A2.5 The overarching Act in relation to climate is the Climate Change Act 2008[30], which was amended in June 2019[31]. The Act introduces a legally binding target to reduce the UK's GHG emissions to zero net carbon (i.e. 100% below 1990 levels) by 2050. It also provides for a Climate Change Committee (CCC) with power to set out carbon budgets binding on the Government for five-year periods.

A2.6 The Carbon Budget Order 2021 came into force in June 2021[32]. It sets a legal obligation to meet the targets of the Climate Change Act 2008 and subsequent amendment to cut GHG emissions by 78% by 2035.

A2.7 The first three carbon budgets set out a binding 38% CO_2e reduction relative to 1990 levels by 2020, and the UK Government subsequently adopted the fourth (2023-2027), fifth (2028-2032) and sixth (2033-2037) carbon budgets to reduce CO_2e by 52% relative to 1990 levels by 2025, by 58% relative to 1990 levels by 2030, and by 78% relative to 1990 levels by 2035, respectively.

A2.8 The CCC also produces annual reports to monitor the progress in meeting these carbon budgets. As a consequence of the enactment of the Climate Change Act, a raft of policy at national and local level has been developed aimed at reducing carbon emissions.

Clean Power 2030 Action Plan: A new era of clean electricity (2024)[13],updated in April 2025

A2.9 States an ambition of 45-47 GW of solar electricity delivered by 2030, with the expectation the grid carbon intensity will reduce from 171gCO2e/kWh in 2023 to less than 50gCO2e/kWh in 2030. The 2025 update set out capacity ranges for 2035, derived from the National Energy System Operator's Future Energy Scenario for 2035. The targeted 2035 capacity range for solar electricity is 45 – 69 GW.

[29] DESNZ (2025). Carbon budget and growth delivery plan. Available at: https://www.gov.uk/government/publications/carbon-budget-and-growth-delivery-plan-2025
[30] HMSO (2008) 'Climate Change Act 2008'.
[31] HMSO (2019) 'The Climate Change Act 2008 (2050 Target Amendment) Order 2019'.
[32] HMSO (2021) 'The Carbon Budget Order 2021'.

Decarbonising Transport: A Better, Greener Britain[33]

A2.10 Amends the 2050 carbon emissions target in the Climate Change Act 2008 from 80% below 1990 levels to zero net carbon (i.e. 100 % below 1990 levels). This new target will essentially end the UK's contribution to climate change by 2050.

Energy Act 2023[11]

A2.11 Enacted in October 2023, the Energy Act makes provisions regarding energy production and security and the regulation of the energy market.

Energy White Paper: Powering our Net Zero Future (2020)[34]

A2.12 Sets out the plan for growth and decarbonisation of the UK's energy supply out to 2050, in line with the 2050 net zero target.

A2.13 Provides a framework of policies and incentives to accelerate investment in renewable energy infrastructure and acknowledges that "onshore wind and solar will be key building blocks of the future generation mix".

Infrastructure Planning (Onshore Wind and Solar Generation) Order 2025[35]

A2.14 This order sets the capacity threshold at which energy projects are nationally significant infrastructure projects at more than 100 megawatts.

Net Zero Strategy: Build Back Greener (2021)[12]

A2.15 The UK Government's Net Zero Strategy sets out the strategy for achieving the UK's binding commitment to net zero carbon emissions by 2050.

A2.16 The Strategy sets out a number of key aims and objectives to decarbonise the UK economy across all sectors.

A2.17 The strategy states that all of the UK's electricity supply is from low carbon sources by 2035,, with electricity sourced predominantly from wind and solar generation, supported by nuclear power in addition to an increase in energy storage capacity, gas with carbon capture and storage (CCS), and hydrogen to increase the flexibility of supply.

Clean Growth Strategy[36]

A2.18 The Clean Growth Strategy sets out a comprehensive set of policies and proposals that aim to accelerate the pace of "clean growth", i.e. deliver increased economic growth and decreased emissions. In the context of the UK's legal requirements under the Climate Change Act, the UK's approach to reducing emissions has two guiding objectives: a) to meet our domestic commitments

[33] DfT (2021) Decarbonising Transport: A Better, Greener Britain. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1009448/decarbonising-transport-a-better-greener-britain.pdf
[34] HMSO (2020) The Energy White Paper. Powering our Net Zero Future. Available at: https://www.gov.uk/government/publications/energy-white-paper-powering-our-net-zero-future
[35] HMSO (2025) Infrastructure Planning (Onshore Wind and Solar Generation) Order 2025. Available at: https://www.legislation.gov.uk/ukdsi/2025/9780348269765/data.pdf
[36] HM Government (2017) The Clean Growth Strategy: Leading the way to a low carbon future. Available at: https://assets.publishing.service.gov.uk/media/5ad5f11ded915d32a3a70c03/clean-growth-strategy-correction-april-2018.pdf

at the lowest possible net cost to UK taxpayers, consumers and businesses; and b) to maximise the social and economic benefits for the UK from this transition.

UK Infrastructure: A 10 Year Strategy (2025)[37]

A2.19 The UK Infrastructure Strategy was adopted in June 2025 and describes how UK Government will reach the governments mission to "put the UK on the path to meeting its net zero emissions target by 2050: bold action is needed to transform the UK's infrastructure to meet net zero and climate change commitments. The government will continue to decarbonise the UK's power, heat and transport networks – which together account for over two-thirds of UK emissions - and take steps to adapt to the risks posed by climate change."

A2.20 Chapter 4 'Becoming a clean energy superpower' discusses decarbonisation of the power sector and outlines the key role of wind, solar and other renewable energy sources in achieving this.

Technical Guidance

The National Adaptation Programme (NAP3) and the Fourth Strategy for Climate Adaptation Reporting[38]

A2.21 Sets out the UK Government's response to the third Climate Change Risk Assessment[20], showing the policies and actions UK Government is, and will be, implementing and taking to address the risks and opportunities posed by a changing climate. The programme is focussed on three main themes: "action", "information" and "coordination" and states: *"The UK Government's vision for adaptation is for a country that effectively plans for and is fully adapted to the changing climate, with resilience against each of the identified climate risks."*

A2.22 The Programme forms part of the five-yearly cycle of requirements laid down in the Climate Change Act 2008 to drive a dynamic and adaptive approach to building the UK's resilience to climate change.

UK Climate Change Risk Assessment[20]

A2.23 Sets out and evaluates sixty-one climate change risks on the UK.

A2.24 Risks for energy infrastructure are identified.

ISEP (formerly IEMA) (2020) EIA Guide to: Climate Change Resilience and Adaptation

A2.25 This document is seen as a reference point for considering climate change within EIA. This guidance gives a 7-step process toward building climate resilience into a project or development.

CCC Net Zero Technical Report[39]

A2.26 Information on UK climate mitigation goals and the technology and policy required to achieve them.

[37] HM Treasury & National Infrastructure and Service Transformation Authority (2025). UK Infrastructure: A 10 Year Strategy. Available at: https://www.gov.uk/government/publications/uk-infrastructure-a-10-year-strategy
[38] DEFRA (2023) The Third National Adaptation Programme and the Fourth Strategy for Climate Adaptation Reporting. Available at: https://assets.publishing.service.gov.uk/media/64ba74102059dc00125d27a7/The_Third_National_Adaptation_Programme.pdf
[39] CCC (2019) Net Zero, Technical Report. Available at: https://www.theccc.org.uk/publication/net-zero-technical-report/

ISEP (formerly IEMA) Guide: Assessing Greenhouse Gas Emissions and Evaluating their Significance[4]

A2.27 ISEP EIA Guide: Climate Change Resilience and Adaptation[19] Provides guidance on integrating climate change assessment and mitigation into Local Plans and planning applications.

PAS 2080:2023 Carbon Management in Buildings and Infrastructure[40]

A2.28 Provides guidance on quantifying GHG emissions.

Planning Practice Guidance for Climate Change[41]

A2.29 Provides guidance on integrating climate change assessment and mitigation into Local Plans and planning applications.

Seventh Carbon Budget: Advice for the UK Government[42]

A2.30 In February 2025, the CCC published its recommendations to the UK Government on the seventh carbon budget, covering the period 2038 to 2042. The recommended target is to achieve an 87% reduction in UK emissions by 2040, relative to 1990 levels. The recommended five-year budget is 535 $MtCO_2e$.

A2.31 The CCC's report is a recommendation to UK Government, and it is expected that UK Government will formally adopt the CCC's Seventh Carbon Budget recommendation by June 2026.

The Greenhouse Gas Protocol Corporate Accounting and Reporting Standard (GHG Protocol)[43]

A2.32 Provides guidance on quantifying GHG emissions.

Local Planning Policy

Monmouthshire Local Development Plan[15]

A2.33 At the time of writing, this is the most recent adopted development plan for the local authority area. Policy SD1 on *Renewable Energy*. This sets out the requirements for renewable energy schemes to be permitted as quoted in Paragraph 2.80.

A2.34 In addition, it contains Policy DES1 on *General Design*, which highlights the importance of renewable energy infrastructure, stating:

"*All development should be of a high quality sustainable design and respect the local character and distinctiveness of Monmouthshire's built, historic and natural environment. Development proposals will be required to:*

[…]

[40] BSI (2023) PAS 2080: 2023 Carbon Management in Buildings and Infrastructure. Available at: https://www.bsigroup.com/siteassets/pdf/en/insights-and-media/insights/brochures/pas_2080.pdf
[41] HM Government (2019) Planning Practice Guidance for Climate Change. Available at: https://www.gov.uk/guidance/climate-change
[42] CCC (2025) Seventh Carbon Budget: Advice for the UK Government. Available at: https://www.theccc.org.uk/wp-content/uploads/2025/02/The-Seventh-Carbon-Budget.pdf
[43] World Resources Institute, World Business Council for Sustainable Development (2001) The Greenhouse Gas Protocol, A Corporate Accounting and Reporting Standard. World Resource Institute, Revised Edition. Available at: https://ghgprotocol.org/sites/default/files/standards/ghg-protocol-revised.pdf

j) achieve a climate responsive and resource efficient design. Consideration should be given to location, orientation, density, layout, built form and landscaping and to energy efficiency and the use of renewable energy, including materials and technology"

A2.35 Similarly, Policy S7 on *Infrastructure Provision* states:

"The infrastructure needed to service and deliver sustainable development must be in place or provided in phase with proposed development. Where existing infrastructure is inadequate to serve the development, new or improved infrastructure and facilities to remedy deficiencies must be provided. Where provision on-site is not appropriate, off-site provision, or a financial contribution towards it, will be sought.

[…]

Planning Obligations may be sought to secure improvements in infrastructure, facilities, services and related works, where they are necessary to make development acceptable. In identifying appropriate contributions due regard will be paid to the overall development viability, including the cost of measures that are necessary to physically deliver a development and ensure that it is acceptable in planning terms.

Such obligations may include:

[…]

11. Renewable / low carbon energy infrastructure."

Replacement Local Development Plan 2018-2033

A2.36 MCC is preparing a Replacement Local Development Plan to cover the period between 2018 and 2033, a draft of which was published in 2024. Within this draft there are a number of policies relevant to climate change and renewable energy, including:

- Strategic Policy S4 – Climate Change
- Policy NZ1 – Monmouthshire Net Zero Homes
- Policy CC1 – Sustainable Drainage Systems
- Policy CC2 – Renewable Energy Allocation; and
- Policy CC3 – Renewable Energy Generation.

A2.37 As discussed in Paragraph 2.81, the draft replacement plan also sets out a range of targets for a number of renewable technologies, including Ground Mounted Solar energy generation.

TCBC Local Development Plan[17]

A2.38 The development plan was adopted in 2013. In relation to renewable energy it contains Policy S3 on *Climate Change*, which states:

"Development proposals shall seek to mitigate the causes of further climate change and adapt to the current and future effects of climate change; and will be supported where they demonstrate consideration of the following hierarchy of criteria (where appropriate):

[…]

d) Utilising renewable and low or zero carbon energy technologies to generate heat and electricity requirements which includes heating, cooling and power networks powered by renewable energy

sources, or that connect to existing Combined Heat and Power or communal / district heating networks."

A2.39 In addition, Policy S8 on *Planning Obligations* states:

"Planning obligations will be required on development proposals through S106 legal agreements where they are necessary to address the impacts of development and to make the proposal acceptable in land use planning terms. Based on evidence of local need and / or generation of need by the proposal, taking into account site specific circumstances, viability and LDP Objectives, planning obligations will be specifically targeted to achieve the key priorities of:

[…]

j) Renewable energy and energy efficiency;"

NCC Local Development Plan[18]

A2.40 The NCC Local Development Plan was adopted in 2015 and contains Policy CE10 on *Renewable Energy*, which states:

"Renewable energy schemes will be considered favourably, subject to there being no overriding environmental and amenity considerations. Small scale micro-generation will be encouraged within the settlement boundary. Large scale proposals may be more appropriately located outside of the defined settlement boundary if no appropriate brownfield sites exist. The cumulative impacts of renewable energy schemes will be an important consideration."

A2.41 In addition, Objective 2 on *Climate Change* states:

"To ensure that development and land uses in Newport make a positive contribution to minimising, adapting to or mitigating against the causes and impacts of climate change, by incorporating the principles of sustainable design, changes to travel behaviour, managing the risks and consequences of flooding, and improving efficiency in the use of energy, waste and water."

A2.42 In support of this objective, the plan identifies *"an increase in the number of renewable energy schemes permitted"* as one of the monitoring targets.

A3 Greenhouse Gases Data and Assumptions

A3.1 This appendix sets out the data and assumptions used to calculate the Greenhouse Gases (GHG) footprint for the Proposed Development.

GHG Emissions Background Data

Material Embodied Carbon

A3.2 Embodied carbon emissions from the construction phase of the Proposed Development have been estimated based on extensive data and information provided by the Applicant, including:

- Plans for the Proposed Development, including fencing and cabling; and
- Quantities, sizes, weights, specifications and dimensions for key components of the solar infrastructure (including solar PV modules, substations and transformer station, and string inverters).

A3.3 These input data have been processed and combined with embodied carbon emissions factors from a number of sources to model the embodied carbon emissions. A summary of the sources and assumptions used in the calculation of embodied carbon emissions is presented in Table A3-1.

Table A3-1: Emission Factors to Calculate Material Embodied Carbon

Component	GHG Emission Factor Source and Assumption
Solar PV modules	GHG emissions factor of 0.42 $kgCO_2e$/functional unit (watt-peak) calculated using an Environmental Performance Declaration (EPD) for WIN WIN EPD-IES-0007690:003 monocrystalline solar panels (manufactured in China)[44]. A total emissions value was calculated based on an assumption of 645 watt-peaks per panel and scaled to the 93,708 modules that constitute the Proposed Development.
Frameworks/Mounting structures	GHG emission factor for galvanised steel obtained from ICE 4.1 database[45]
Onsite Cabling	Material composition of cables assumed from the Lifecycle Carbon Impact Assessment of the Respond Project Report[46]. GHG emission factors for aluminium, copper, and plastics (XLPE and MDPE) obtained from ICE 4.1[45].
Substations	Materials and weight based on equivalent component in Lifecycle Carbon Assessment of the Vestas V236-15MW study[47] and adjusted for the dimensions and specifications set out by the Applicant.

[44] WIN WIN Precision Technology Co., Ltd. (2024). Environmental Product Declaration: EPD-IES-0007690:003 – WIN WIN Mono Crystalline Silicon Photovoltaic (PV) Modules. International EPD System. Available at: EPD-IES-0007690:003 EPD of WIN WIN Mono Crystalline Silicon Photovoltaic (PV) Modules | EPD International
[45] University of Bath (2024) Inventory of Carbon and Energy (ICE) Version 4.1.
[46] FuturoFirma (2018) Lifecycle Carbon Impact Assessment of the Respond Project: https://www.enwl.co.uk/globalassets/innovation/respond/respond-key-documents/carbon-impact-assessment-final-report.pdf
[47] Vestas (2024) Life Cycle Assessment of electricity production from an offshore V236-15MW wind plant. Available at: https://www.vestas.com/content/dam/vestas-com/global/en/sustainability/environment/LCA%20of%20Electricity%20Production%20from%20an%20offshore%20V236-15MW.pdf.coredownload.inline.pdf

Component	GHG Emission Factor Source and Assumption
	GHG emission factors based on obtained from ICE 4.1[45].
String Inverters	GHG emissions factor of 4 t CO_2e/unit has been calculated using an Environmental Performance Declaration (EPD) for Huawaei SUN2000-330KTL-H2 inverters (manufactured in China)[48]. The quantity was scaled to the quantity provided by the Applicant.
Transformer Station	Materials and weight based on equivalent component in Lifecycle Carbon Assessment of the Vestas V162-6.2 MW study[49]. GHG emission factors based on obtained from ICE 4.1[45].

Transport to Site

A3.4 The construction components are transported to the Site, resulting in transport-related emissions. The modes and distances have been estimated based on:

- International transport has been assumed to use shipping mode. The distances for the solar PV module and other solar farm components (PV panels and frameworks, string inverters, and transformer station) were estimated from a presumed manufacture location of China, using a Suez Canal route; and
- Domestic transport has been assumed to use be transported by Heavy Good Vehicle (HGV), with an assumed distance of 250 km.

A3.5 Emission factors for these modes have been taken from DESNZ[50], as shown in Table A3-2.

Table A3-2: Emission Factors to calculate Material Transport

Transport Means	Emission Factor Name	Emission Factor Value (tCO_2e/tkm)
Ship (Fuel Use Emissions)	Average container ship	0.000016
Ship (WTT)[51]	Average container ship	0.000004
HGV (Fuel Use Emissions)	All HGVs (50% laden)	0.000122
HGV (WTT)	All HGVs (50% laden)	0.000029

Installation Activities

A3.6 Installation activities include construction site activities, staff travel to and from the Site.

[48] Huawaei Digital Power Technologies Co. Ltd (2021). SUN2000-330KTL-H2. International EPD System. Available at: https://www.epditaly.it/wp-content/uploads/2016/12/MR-EPDITALY0074.pdf
[49] Vestas (2-23). Life Cycle Assessment of electricity production from an Onshore V162-6.2 MW wind plant. Available at: https://www.vestas.com/content/dam/vestas-com/global/en/sustainability/reports-and-ratings/lcas/LCA%20of%20Electricity%20Production%20from%20an%20onshore%20EnVentus%20V162-6.2.pdf.coredownload.inline.pdf
[50] DESNZ (2025) UK Government GHG Conversion Factors for Company Reporting. Available at: https://www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2025.
[51] WTT: Well-to-Tank – the upstream emissions from fuel production and transportation.

Construction Site Activities

A3.7 Numbers and type of machine/plant have been estimated based on construction information provided for other similar schemes within the UK. Site operating hours and the duration of work have been similarly estimated using professional judgement based on typical construction schedules for similar schemes and scaled to a worst-case construction programme of 18 months, as advised by the Applicant. Each machine is assumed to operate at 50% engine load.

A3.8 Fuel consumption for each machine/plant has been obtained from data in the European Environment Agency/EMEP emissions inventory guidebook[52]. The data provides fuel consumption per hour. Emissions factors for diesel fuel consumption have been obtained from DESNZ[50].

Staff Travel

A3.9 As a worst-case, it has been assumed that a maximum of 150 vehicles per day will be used by construction staff travelling to and from the Site. These trips have been scaled to the 18-month construction phase, and it has been assumed that each trip will have an average distance of 50 km, as a reasonable worst-case assumption. An emission factor for private car trips, including WTT, has been obtained from DESNZ[50] and calculated as 0.000422 tCO_2e/km (accounting for a trips two and from the Site).

Operation

A3.10 Operational emission sources are the embodied emissions in replacement parts, transport of replacement parts and staff travel.

Replacement Parts

A3.11 Assumptions have been made in relation to replacement rates for the components within the Proposed Development using professional judgement based on known replacement rates for equivalent parts in similar schemes previously assessed by AQC within the UK. The same materials and emission factors have been used as in the calculations of material embodied carbon as presented in Table A3-1.

Material Transport

A3.12 The transport emissions of the replacement parts is assumed to be the same as for the original construction parts (see Paragraphs A3.4 and A3.5 alongside Table A3-2), relative to the quantities replaced.

Staff Travel

A3.13 As advised by the Applicant, it has been assumed that on average, approximately ten two-way vehicle trips per month will be generated by operational staff travel. A one-way distance of 50 km is assumed for these journeys, using DESNZ[50] emissions factors, as per Paragraph A3.9.

Sulphur Hexafluoride (SF_6) Emissions

A3.14 Whilst alternatives to SF_6 will be utilised as far as is practicable, assumptions regarding the mass of SF_6 incorporated in key components of the Proposed Development have been made in line with the relevant Lifecycle Carbon Assessment studies used for each component[44,46,47,48,49] Taking into account the corresponding replacement rates for each component as discussed in Paragraph A3.11, emissions for the reasonable worst-case total SF_6 leakage during the lifetime of the Proposed

[52] EEA/EMEP (2019). Air pollutant emissions inventory guidebook 2019, Part 1.A.4 Non Road Mobile Machinery.

Development have been calculated assuming a conservative leakage rate of 1%[47], using the emissions factor for SF_6 taken from DESNZ[50].

Decommissioning

A3.15 Decommissioning emission sources consist of on-Site decommissioning activities, staff travel, and waste transport. Note that no credit is given for avoided emissions from recycling and recovery of end-of-life materials. This is because the UK is expected to have reached net zero emissions, and so the primary production that is avoided due to the recycling of the solar farm components is expected to be at or near zero emissions. There is therefore no net credit from recycling.

Waste Transport

A3.16 All on-site materials are assumed to be transported via HGV for treatment, with an assumed distance of 250 km. The emission factor has been taken from DESNZ[50] for HGV. This is a worst-case assumption, given the predicted improvement to fleet emissions between now and 2070 (the end of the Proposed Development lifetime, when decommissioning occurs).

On-Site Activities and Staff Travel

A3.17 Decommissioning activities and travel have been assumed to be comparable to those during construction, although emissions for on-site activities have been scaled to a shorter 12-month decommissioning period. Additionally, it is anticipated that fewer road trips will be required – particularly as the Applicant has advised that some on-site structures, such as the proposed 132 kV substation and ancillary security measures around the substation compound, will be retained on a permanent basis.

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