Frodsham Solar

Environmental Statement: Volume 1
Chapter 5: Climate Change

May 2025

Cubico
SUSTAINABLE INVESTMENTS

PINS Ref: EN010153
Document Ref: EN010153/DR/6.1
Planning Act 2008; and Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations Regulation 5(2)(a)

Revision P01

Document Control

Revision	Date	Prepared By	Reviewed / Approved By
P01	May 2025	J Snow	R Flavell / A Russell

Prepared For:
Frodsham Solar Ltd

Prepared By:

Well House Barns, Chester Road, Bretton, Chester, CH4 0DH
1st Floor, Barfield House, Alderley Road, Wilmslow, SK9 1PL
Maling Exchange, Studio 307, Hoults Yard, Walker Road, Newcastle Upon Tyne, NE6 2HL

T: 0344 8700 007
enquiries@axis.co.uk
www.axis.co.uk

CONTENTS

TABLES

APPENDICES

IMAGES

5.0 CLIMATE CHANGE

5.1 Introduction

5.1.1 This chapter of the Environmental Statement (ES) presents the findings of the assessment of the resilience of the Proposed Development to the effects of climate change, and the likely significant effects of the Proposed Development on climate change, specifically the impact of greenhouse gas (GHG) emissions.

5.1.2 Naturally occurring GHG emissions such as carbon dioxide (CO_2) act as a blanket around the earth (a process called the 'GHG effect'). Increases in GHG emissions are resulting in an enhancement of the GHG effect, resulting in an increase in global temperatures (global warming). These changes in global temperatures are driving changes in short-term weather events as well as extremes in longer-term climate variability (referred to as climate change).

5.1.3 For a detailed description of the Proposed Development, refer to **ES Vol 1 Chapter 2: The Proposed Development [EN010153/DR/6.1]**.

5.1.4 This chapter is accompanied by the following appendices:

i) **ES Vol 2 Appendix 5-1: GHG Assessment [EN010153/DR/6.2]**;
ii) **ES Vol 2 Appendix 5-2: Climate Baseline Report [EN010153/DR/6.2]**;
iii) **ES Vol 2 Appendix 5-3: Climate Resilience Assessment [EN010153/DR/6.2]**; and
iv) **ES Vol 2 Appendix 5-4: In-combination Climate Change Impacts Assessment [EN010153/DR/6.2]**.

5.1.5 This chapter should be read in conjunction with:

i) **ES Vol 1 Chapter 7: Terrestrial Ecology [EN010153/DR/6.1]**;
ii) **ES Vol 1 Chapter 9: Flood Risk, Drainage and Surface Water** [**EN010153/DR/6.1**]; and
iii) **ES Vol 1 Chapter 10: Ground Conditions [EN010153/DR/6.1]**.

5.1.6 The following sections of this chapter include:

i) a description of relevant legislation, planning policy and guidance which has informed the assessment;
ii) a summary of consultation with stakeholders;
iii) a description of the methodology for the assessment, including details of the study area and the approach to the assessment of effects;
iv) a review of baseline conditions;
v) details of the measures proposed to avoid or reduce environmental effects, including mitigation and design measures that form part of the Proposed Development;
vi) an assessment of the likely significant effects in relation to climate change during the construction, operation and decommissioning phases of the Proposed Development;
vii) identification of any additional mitigation measures or monitoring required in relation to likely significant effects; and
viii) a summary of the residual effects of the Proposed Development in relation to climate change.

Summary of Competency

5.1.7 The author of this assessment is an environmental consultant with three and a half years' experience in planning and the environment in a variety of sectors including energy, transport and waste. The assessment has been reviewed by a chartered environmental consultant and chartered scientist with over 15 years' experience with extensive knowledge of planning and environmental issues and has undertaken and managed EIA and DCO projects on matters relating to climate change for a range of renewable technologies including solar.

5.2 Legislation, Policy and Guidance

International Agreements

5.2.1 The United Nations Framework Convention on Climate Change (UNFCCC) was adopted in 1992 with the aim of preventing dangerous human interference with the climate system. Following the adoption of the UNFCCC, several agreements have followed including the Kyoto Protocol[i] and more recently the Paris Agreement[ii].

5.2.2 The Kyoto Protocol was adopted on 11 December 1997 and, owing to a complex ratification process, entered into force on 16 February 2005. The Kyoto Protocol is an international agreement that commits industrialised countries and economies in transition to reduce GHG emissions in accordance with agreed individual targets. The targets were based on the scientific consensus that global warming is occurring; that human-made CO_2 emissions are driving it and that industrialised countries and economies in transition are largely responsible for the current high levels of GHG emissions in the atmosphere.

5.2.3 Although the Kyoto Protocol technically remains in force, the Paris Agreement has, in effect, superseded the Kyoto Protocol. This was adopted on 4 November 2016. This is an international agreement created as a result of the UNFCCC Conference of the Parties (COP) 21 in 2015. The goal of the Paris Agreement is to limit global average temperature rise to well below 2°C, preferably 1.5°C, compared to pre-industrial levels. The agreement was a landmark in the climate change process. The Paris Agreement recognised that climate change is a shared problem and called on all countries to set emissions targets. Today, 195 parties have committed to the Paris Agreement and are required to produce Nationally Determined Contributions that set out their targets to meet the Paris Agreement targets through national legislation.

Legislation

5.2.4 Statutory legislation with regard to climate change is provided for within the following:

i) The Infrastructure Planning (Environmental Impact Assessment (EIA)) Regulations 2017[iii];
ii) Climate Change Act 2008[iv];
iii) Climate Change Act 2008 (2050 Target Amendment) Order 2019[v];
iv) The Carbon Budgets Order 2009[vi];
v) The Carbon Budgets Order 2011[vii];
vi) The Carbon Budgets Order 2016[viii]; and
vii) The Carbon Budgets Order 2021[ix].

5.2.5 The UK's legislation on climate change was established within the Climate Change Act 2008. It requires the UK government to set legally binding 'carbon budgets' to act as stepping stones towards 2050 and to produce Climate Change Risk Assessments (CCRAs) and National Adaptation Programmes (NAPs) every five years. In 2019, the report titled: *'Net Zero - The UK's Contribution to Stopping Global Warming'*[x] was published by the Committee on Climate Change (CCC) responding to the UK government's request to reassess the UK's long-term emission targets. The CCC recommended the new emissions target of net-zero greenhouse gases by 2050 (rather than 80% which was set in 2008). The new target reflected the increased ambition of the 2015 Paris Agreement and wider updates to the evidence base on tackling climate change. This CCC report further led to the Climate Change Act 2008 (2050 Target Amendment) Order 2019 which set the net zero target into legislation.

5.2.6 Since the Climate Change Act 2008, six carbon budgets have been set to date under the following Orders, covering the period 2008 to 2037:

i) The Carbon Budgets Order 2009 (2008-2022);
ii) The Carbon Budgets Order 2011 (2023-2027);

iii) The Carbon Budgets Order 2016 (2028-2032); and
iv) The Carbon Budgets Order 2021 (2033-2037).

5.2.7 The Sixth Carbon Budget, the first to be set under the UK's new net zero target, was legislated for in June 2021 and provides ministers with advice on the amount of GHGs the UK can emit during the period 2033-2037, in order to comply with the net zero trajectory. One of the key recommendations in the Sixth Carbon Budget[xi] is to expand low carbon energy supplies including renewable sources such as solar and wind. Furthermore, the Seventh Carbon Budget was published in February 2025. It has been recommended by the Climate Change Committee (CCC) but has not yet been legislated. The Seventh Carbon Budget covers the five-year period 2038-2042 and lays out the emissions envelope, the pathway and the main actions the UK will need to reach Net Zero by 2050. It sets out that the Seventh Carbon Budget will be delivered through: electricity, low-carbon fuels and carbon capture and storage (CCS), nature, engineered removals, and demand. The largest share of emissions reduction during the budget period is delivered from electrification and low-carbon electricity supply.

5.2.8 The Carbon Budgets have been used within this assessment to inform whether the GHG emissions associated with the Proposed Development would be significant or not, and the lifetime GHG emissions have been compared to the net zero trajectory in line with the guidance from the Institute of Environmental Management and Assessment (IEMA).

5.2.9 As a requirement of the Climate Change Act 2008, the UK government has a duty to undertake regular five-yearly CCRAs and complete a NAP. The CCRA identifies the range of climate risks and opportunities facing the UK from current and predicted climate change, whilst the NAP sets the actions that UK government and others will take to adapt to the impacts of climate change in the UK.

5.2.10 The third five-year programme, the Third NAP (NAP3)[xii], covers the period 2023 to 2028. NAP3 sets out a clear overarching vision that reflects the

importance of the need to adapt while responding to every risk and opportunity in the CCRA and provides more detail on how the UK government proposes to address each individual risk. Additionally, NAP3 was the first NAP to consider the international risks impacting the UK.

5.2.11 NAP3 identifies the following six key areas of climate change risks, and the actions planned to improve resilience to them:

i) Flooding and costal change risk to communities, businesses and infrastructure;
ii) Risks to health, wellbeing and productivity from high temperatures;
iii) Risks of shortages in the public water supply for agriculture, energy generation and industry;
iv) Risks to natural capital including terrestrial, coastal, marine and freshwater ecosystems, soils and biodiversity;
v) Risks to domestic and international food production and trade; and
vi) New and emerging pests and diseases and invasive and non-native species affecting people, plants and animals.

National Policy and Guidance

5.2.12 The following National Policy Statements set out national planning policies in relation to nationally significant solar photovoltaic generation developments:

i) Overarching National Policy Statement for Energy (NPS EN-1)[xiii];
ii) National Policy Statement for Renewable Energy Infrastructure (NPS EN-3)[xiv]; and
iii) National Policy Statement for Electricity Networks Infrastructure (EN-5)[xv].

5.2.13 The National Planning Policy Framework (NPPF)[xvi] and the Planning Practice Guidance (PPG) for Climate Change[xvii] are also important and relevant considerations.

5.2.14 Relevant national policies from the above documents for the production of this ES chapter and associated appendices are summarised in Table 5-1.

Table 5-1– Summary of national planning policy

Document	Policy / Paragraph Reference	Summary of Policy / Paragraph	Where addressed in the ES
NPS EN-1	Paragraph 4.10.5 – 4.10.12	Requires Applicants to consider nature-based solutions and green infrastructure to support climate change adaption. Requires Applicants to set out how the Proposed Development will take account of the direct and indirect projected impacts of climate change and assess a range of climate change scenarios. Requires applicants to demonstrate that that the Proposed Development has a high level of climate resilience built-in from the outset and that the Proposed Development can be adapted over its lifetime to remain resilient to a credible maximum climate change scenario. The results should be considered alongside relevant research based on the climate change projections.	**ES Vol 1 Chapter 7: Terrestrial Ecology ES [EN010153/DR/6.1]** considers green infrastructure within the Proposed Development. **Vol 2 Appendix 5-2: Climate Baseline Report [EN010153/DR/6.2]** has conservatively used projections for 2060-2079 for a 'high emissions scenario' (RCP8.5) to calculate the future climate baseline. The resilience of the Proposed Development to climate change has been assessed in **ES Vol 2 Appendix 5-3: Climate Resilience Assessment [EN010153/DR/6.2]**.
	Paragraph 5.3.5 – 5.3.7	Requires Applicants to include a GHG Assessment as part of the ES. Requires Applicants to seek opportunities to reduce GHG emissions at every stage of a project. Requires Applicants to look for opportunities within the Proposed Development to embed nature-based or technological solutions to mitigate or offset the emissions of construction and decommissioning. Requires Applicants to set out a GHG Reduction Strategy, which outlines the steps taken to minimise and offset reductions.	The GHG emissions associated with the Proposed Development have been calculated in **ES Vol 2 Appendix 5-1: GHG Assessment [EN010153/DR/6.2]**. Climate change mitigation measures have been incorporated into **ES Vol 1 Chapter 5: Climate Change [EN010153/DR/6.1]**. The mitigation measures include measures relating to minimising GHG emissions during the lifetime of the Proposed Development. These measures will be included within the full CEMP, OEMP and DEMP which will be developed in substantial accordance with

Document	Policy / Paragraph Reference	Summary of Policy / Paragraph	Where addressed in the ES
			the **oCEMP [EN010153/DR/7.5]**, **oOEMP [EN010153/DR/7.5]**, and **oDEMP [EN010153/DR/7.5]** respectively.
	Section 5.8	Sea levels will continue to rise beyond the end of the century, increasing risks to vulnerable coastal communities. Within the lifetime of energy projects, these factors will lead to increased flood risks in areas susceptible to flooding, and to an increased risk of the occurrence of floods in some areas which are not currently thought of as being at risk. A robust approach to flood risk management is a vital element of climate change adaptation; the applicant and the Secretary of State should take account of the policy on climate change adaptation in Section 4.10.	The resilience of the Proposed Development to sea level rise has been assessed in **ES Vol 2 Appendix 5-3: Climate Resilience Assessment [EN010153/DR/6.2]** and accounted for within **ES Vol 2 Appendix 9-1 Flood Risk Assessment and Drainage Strategy [EN010153/DR/6.2]**.
NPS EN-3	Paragraph 2.4.11	Where the Proposed Development is located in low lying exposed sites, Applicants are required to consider how plant will be resilient to increased risk of flooding and impacts of higher temperatures.	The resilience of the Proposed Development to flooding and increased summer temperatures has been assessed in **ES Vol 2 Appendix 5-3: Climate Resilience Assessment [EN010153/DR/6.2]**.
NPS EN-5	Paragraph 2.3.2 – 2.3.3	Requires applicants to set out to what extent the Proposed Development is expected to be vulnerable to climate change, and, as appropriate, how it has been designed to be resilient to: • flooding, particularly for substations that are vital to the network; and especially in light of changes to groundwater levels resulting from climate change; • the effects of wind and storms on overhead lines; • higher average temperatures leading to increased transmission losses; • earth movement or subsidence caused by flooding or drought (for underground cables); and • coastal erosion – for the landfall of offshore transmission cables and their associated substations in the inshore and coastal locations respectively.	**ES Vol 2 Appendix 5-3: Climate Resilience Assessment [EN010153/DR/6.2]** assesses the vulnerability of receptors on Site to a number of climate change effects agreed within the **ES Vol 2 Appendix 1-2 Planning Inspectorate Scoping Opinion (July 2023) [EN010153/DR/6.2]**.

Document	Policy / Paragraph Reference	Summary of Policy / Paragraph	Where addressed in the ES
		Section 4.9 of EN-1 advises that the resilience of the project to the effects of climate change must be assessed in the Environmental Statement (ES) accompanying an application. For example, future increased risk of flooding would be covered in any flood risk assessment (see Sections 5.8 in EN-1).	
NPPF	Paragraph 164	New development should be planned for in ways that: a) avoid increased vulnerability to the range of impacts arising from climate change. When new development is brought forward in areas which are vulnerable, care should be taken to ensure that risks can be managed through suitable adaptation measures, including through incorporating green infrastructure and sustainable drainage systems; and b) help to reduce greenhouse gas emissions, such as through its location, orientation and design. Any local requirements for the sustainability of buildings in plans should reflect the Government's policy for national technical standards.	The resilience of the Proposed Development to climate change has been assessed in **ES Vol 2 Appendix 5-3: Climate Resilience Assessment [EN010153/DR/6.2]**. The GHG emissions associated with the Proposed Development have been calculated in **ES Vol 2 Appendix 5-1: GHG Assessment [EN010153/DR/6.2]**. Climate change mitigation measures have been incorporated into **ES Vol 1 Chapter 5: Climate Change [EN010153/DR/6.1]**. The mitigation measures include the mitigation of GHG emissions at the Proposed Development the mitigation of the effects of climate change. These measures will be included within the full CEMP, OEMP and DEMP which will be developed in substantial accordance with the **oCEMP [EN010153/DR/7.5]**, **oOEMP [EN010153/DR/7.5]**, and **oDEMP [EN010153/DR/7.5]** respectively.
PPG	Climate Change Section	Provides guiding principles on how planning can help to mitigate climate change by reducing emissions from a	The resilience of the Proposed Development to climate change has been

Document	Policy / Paragraph Reference	Summary of Policy / Paragraph	Where addressed in the ES
		new development, and how new developments can be built to be resilient and adapt to climate change.	assessed in **ES Vol 2 Appendix 5-3: Climate Resilience Assessment [EN010153/DR/6.2]** following the principles in the PPG.

Local Policy and Guidance

5.2.15 The following local policy and guidance has been considered:

i) Cheshire West and Chester Local Plan (Part One) Strategic Policies[xviii];
ii) Cheshire West and Chester Local Plan (Part Two) Land Allocations and Detailed Policies[xix];
iii) Cheshire West and Chester Climate Emergency Response Plan[xx];
iv) Cheshire West and Chester Emergency Response Plan and Carbon Management Plan Annual Review 2023[xxi];
v) Ince Neighbourhood Plan[xxii]; and
vi) Frodsham Neighbourhood Plan[xxiii] ('FNP') (2024).

5.2.16 Relevant local planning policies from the above documents for the production of this chapter and associated appendices are summarised in Table 5.2.

Table 5-2– Summary of local planning policy and guidance

Document	Policy / Paragraph Reference	Summary of Policy / Paragraph	Where addressed in the ES
CWaCC Local Plan (Part One)	Policy STRAT 1	Proposals that are in accordance with relevant policies in the Plan and support the following sustainable development principles will be approved without delay, unless material considerations indicate otherwise: - Mitigate and adapt to the effects of climate change, ensuring development makes the best use	Climate change mitigation measures have been incorporated into **ES Vol 1 Chapter 5: Climate Change [EN010153/DR/6.1]**. The mitigation measures include the mitigation of GHG emissions at the Proposed Development and the

Document	Policy / Paragraph Reference	Summary of Policy / Paragraph	Where addressed in the ES
		of opportunities for renewable energy use and generation. - Ensure the prudent use of our natural finite resources whilst promoting the re-use, recovery and recycling of materials	mitigation of the effects of climate change. The **oCEMP [EN010153/DR/7.5]**, **oOEMP [EN010153/DR/7.6]**, and **oDEMP [EN010153/DR/7.7]** include provision for the sustainable use of materials and management of waste in accordance with the waste hierarchy, ensuring prudent use of natural finite resources whilst promoting the re-use, recovery and recycling of materials.
	Policy STRAT 11	The Council will support the provision of appropriate new infrastructure, including schemes intended to mitigate and adapt to climate change.	The Proposed Development is intended to mitigate the effects of climate change by producing renewable energy. Additionally, climate change mitigation measures have been incorporated into **ES Vol 1 Chapter 5: Climate Change [EN010153/DR/6.1]**. The mitigation measures include the mitigation of GHG emissions at the Proposed Development and the mitigation of the effects of climate change. These measures will be included within the detailed CEMP, OEMP and DEMP which will be developed in substantial accordance with the **oCEMP [EN010153/DR/7.5]**, **oOEMP [EN010153/DR/7.6]**, and **oDEMP [EN010153/DR/7.7]** respectively.
	Policy ENV 6	Development should, where appropriate: - Mitigate and adapt to the predicted effects of climate change	The current and future climate has been outlined in **ES Vol 2 Appendix 5-2: Climate Baseline Report [EN010153/DR/6.2]** and climate change mitigation measures have been incorporated into **ES Vol 1 Chapter 5: Climate Change**

Document	Policy / Paragraph Reference	Summary of Policy / Paragraph	Where addressed in the ES
			[EN010153/DR/6.1]. The mitigation measures include the mitigation of GHG emissions at the Proposed Development and the mitigation of the effects of climate change. These measures will be included within the detailed CEMP, OEMP and DEMP which will be developed in substantial accordance with the **oCEMP [EN010153/DR/7.5]**, **oOEMP [EN010153/DR/7.6]**, and **oDEMP [EN010153/DR/7.7]** respectively. One of the Design Principles for the project is to ensure the Proposed development is resilient to flooding and will not increase flood risk elsewhere, taking account of the impacts of climate change Design Approach Document (DAD) [EN010153/DR/5.8].
Cheshire West and Chester Climate Emergency Response Plan	Executive Summary	In 2019 Cheshire West and Chester Council voted unanimously to declare a climate emergency. The Emergency Response Plan was informed by the Tyndall Carbon Budgets for CWaCC.	The GHG emissions associated with the Proposed Development have been calculated in **ES Vol 2 Appendix 5-1: GHG Assessment [EN010153/DR/6.2]**. Although not required by law, the GHG emissions have been compared to the local carbon budgets produced by the Tyndall Carbon Budget Tool in **ES Vol 1 Chapter 5: Climate Change [EN010153/DR/6.1]**.
Ince Neighbourhood Plan	Policy CC1	Renewable Energy – The plan states that developments should be designed to minimise energy consumption, through the use of sustainable materials, high energy efficiency levels, the incorporation of renewable energy initiatives and the efficient design of the building.	The development is inherently delivering renewable energy. However, it is important to still construct and operate in a way so as to reduce energy consumption. The **oCEMP [EN010153/DR/7.5]**, **oOEMP [EN010153/DR/7.6]**, and **oDEMP [EN010153/DR/7.7]**

Document	Policy / Paragraph Reference	Summary of Policy / Paragraph	Where addressed in the ES
			include provision for the sustainable use of materials and management of waste in accordance with the waste hierarchy, Design Principle 5.
	Policy CC3	Sustainable Transport – The plan states that developments that reduce car usage, and extensions or improvements to pedestrian, equestrian and cycle routes and facilities along with any improvements to public transport services will be supported.	Sustainable transportation has been implemented into the design of the Proposed Development where possible, as seen by the measures in the **Outline Construction Traffic Management Plan [EN010153/DR/7.4]**. The GHG emissions associated with the Proposed Development (including transport emissions) have been calculated in **ES Vol 2 Appendix 13-1: GHG Assessment [EN010153/DR/6.2]**.
Frodsham Neighbourhood Plan	Policy H5	Design and Character – The plan encourages the use of sustainable materials, the incorporation of renewable energy initiatives and the efficient design of buildings.	The **oCEMP [EN010153/DR/7.5]**, **oOEMP [EN010153/DR/7.6]**, and **oDEMP [EN010153/DR/7.7]** include provision for the sustainable use of materials and management of waste in accordance with the waste hierarchy, Design Principle 5.

Other Guidance

5.2.17 The Institute of Environmental Management and Assessment (IEMA) is the global professional body for anyone working in environment and sustainability. IEMA have provided resources, tools, networking, knowledge sharing, and high-quality formal training and qualifications for over 25 years with the aim to raise the bar for professionalism in sustainability. The following IEMA guidance have been considered.

i) Environmental Impact Assessment Guide to: Assessing Greenhouse Gas ('GHG') Emissions and Evaluating their Significance[xxiv] (herein referred to as the 'IEMA GHG Guidance'); and

ii) Environmental Impact Assessment Guide to: Climate Change Resilience and Adaptation[xxv] (herein referred to as the 'IEMA Climate Change Resilience Guidance').

5.2.18 The assessment of GHG emissions has been undertaken in line with IEMA GHG Guidance and the assessment of the resilience of the Proposed Development to the effect of climate change and the assessment of the In-Combination Climate Change Impacts (ICCIs) have been undertaken in line with the IEMA Climate Change Resilience Guidance.

5.3 Assumptions and Limitations

Climate Resilience

5.3.1 The current climate baseline for the Site has been determined based on Met Office historical climate averages data from the period 1991-2020, (the most recent period of climate data from the Met Office) from the closest meteorological station with this historical data, Hawarden[xxvi] (approximately 22 km to the south west of the Site in a straight line) and Met Office UK regional climate summaries from the same time period for North West England & the Isle of Man[xxvii]. It is noted that the Liverpool Speke Airport meteorological station is closer, but this is not a Met Office climate station. The future baseline has been calculated by taking the UKCP18 projections. The UKCP18 regional profiles are based on the UK administrative regions and therefore, vary slightly from the Met office regional profiles. Within the Met office regional profiles, the Site falls just within North West England and the Isle of Man; however, within the UK administrative regions, the Site falls within North West England. Therefore, some of the results may be slight over or under estimations. Nevertheless, they offer an estimate sufficient for this assessment.

5.3.2 There may be some uncertainty over the climate change projections. Being projections, they are in their nature not definite. However, they have been taken from UKCP18, which provides the most up to date assessment of how the UK climate may change in the future and are supported by the Department for Energy Security and Net Zero (DESNZ) and the Department for Environment Food and Rural Affairs ('Defra'). This assessment has used projections for 2060-2079 for a 'high emissions scenario' (RCP8.5). This is considered to be conservative as it is based on a significant increase in coal use across the world but is recommended for use by IEMA unless a case can be made for using a different, lower emission scenario. In UKCP18, the probabilistic projections provide local low, central and high changes across the UK, corresponding to 10%, 50% and 90% probability levels. This assessment has used the central estimate, which is considered to be the level

at which as much evidence points to a lower outcome as a higher one. However, any under or over estimations will not impact the outcome of the assessment, as significance assumptions have been based on the impacts which climate change cause (i.e. an increase in temperature, not an increase in temperature of X°C), for which small differences in the magnitude of change will not influence.

GHG Emissions

5.3.3 The largest single source of GHG emissions from the Proposed Development is likely to result from the manufacture and transport of the solar PV modules. Candidate equipment has been utilised as the basis of assessment from outside of the UK, including China and Europe, to allow for a robust assessment. This will increase the embodied and transport emissions but this is consistent with other large scale UK solar schemes.

5.3.4 Both the life expectancy and failure rate of the equipment has been factored into the replacement calculations within the operational stage of the GHG assessment. The emissions associated with replacement include those associated with the manufacture of the equipment, transport to the Proposed Development, and disposal and transport of waste materials (i.e. the swapped equipment). The replacement emissions due to the equipment life expectancy have been allocated to the year that each piece of equipment would be replaced based on the assumed life expectancy whereas the replacement emissions due to failure have been spread over the operational lifetime of the Proposed Development. The life expectancy of the equipment applied is conservative and is expected to be longer than applied. Therefore, the calculated GHG emissions are conservative.

5.3.5 The construction and operational data used in the GHG assessment has been supplied by the Applicant. The embodied carbon factors used in the GHG assessment have come from reputable sources such as the Institute of Circular Ecology's Embodied Carbon Database[xxviii], DESNZ's Greenhouse gas reporting conversion factors 2024[xxix], and recent academic papers where

possible. The source of each factor used has been referenced within **ES Vol 2 Appendix 5-1: GHG Assessment [EN010153/DR/6.2]**.

5.3.6 The government's policy is to decarbonise grid electricity. The previous government set a target to bring all GHG emissions to net zero by 2050, with all electricity to come from low carbon sources by 2035, and the incoming government's plan is that this is achieved by 2030. The purpose of the Proposed Development is to support these policies and to displace fossil-fuelled power stations. Therefore, for the purposes of this report, the benefits using the current marginal technology (unabated combined cycle gas turbines (CCGT)) has been assessed as a comparator. It is considered that until such time that all unabated CCGT has been eradicated from the grid this is an appropriate comparator. However, in recognition of recent SoS decisions (Gate Burton Solar, Net Zero Teeside and Heckington Fen Solar Park) which suggests that using unabated CCGT as a baseline is inappropriate, the assessment has also used the current grid mix as an alternative comparator to provide a range for the offset emissions.

5.3.7 Emissions from the decommissioning process at the end of the design life are very difficult to estimate due to the substantial uncertainty surrounding decommissioning methodologies and approaches so far into the future. It has been assumed that the resources and effort required for decommissioning will be equivalent to those required for construction. This is considered to be a worst-case scenario, as future developments in methodologies and technological advances are likely to reduce the GHG impact of decommissioning. It is assumed that the land will be returned to its existing land use following decommissioning of the Proposed Development as per **ES Vol 1 Chapter 1: Introduction [EN010153/DR/6.1]**. This is a worst-case scenario as most solar schemes do not require the Applicants to remove mitigation provided on the Site. It is likely that and tree and scrub planting, together with created pond and wetland habitats would be retained, together with habitats created within the Non-Breading Bird Mitigation Area (NBBMA). However, as the land would be handed back to the landowners on completion

of decommissioning the long-term retention of the landscaping improvement works cannot be guaranteed. A such a worst-case assessment is presented in this chapter.

5.4 Consultation and Engagement

5.4.1 A scoping exercise was undertaken in to establish the content of the assessment and the approach and methods to be followed within the ES.

5.4.2 **ES Vol 2 Appendix 1-1: Frodsham Solar Scoping Report (May 2023) [EN010153/DR/6.2]** was submitted to PINS on 30 May 2023. The report sets out the findings of the scoping exercise and details the technical guidance, standards, best practice and criteria to be applied in the assessment to identify and evaluate the likely significant effects of the Proposed Development on climate change.

5.4.3 **ES Vol 2 Appendix 1-2: Planning Inspectorate Scoping Opinion (July 2023) [EN010153/DR/6.2]** was received on 10 July 2023. The feedback received from PINS and stakeholders within the Scoping Opinion, is summarised in Table 5-3.

5.4.4 The PEIR consultation took place between 7th November and 19th December 2024. The feedback received from PINS and stakeholders within the PEIR consultation, is summarised in Table 5-4.

5.4.5 Table 5-5 sets out other engagement or consultation undertaken in relation to climate change matters.

Table 5-3 – Scoping responses

Consultee	Topic	Comment	Response
Planning Inspectorate	Climate change effects during decommissioning and construction from: i. Increase in winter precipitation ii. Decrease in summer precipitation iii. Increased frequency and magnitude of wind and storms iv. Increase in summer temperatures v. Changes in cloud cover vi. Sea level rise	The Inspectorate agrees that changes in precipitation, frequency and magnitude of wind and storms, summer temperatures, changes in cloud cover and sea level rise as a result of climate change are unlikely to give rise to significant effects on the construction and decommissioning phases of the Proposed Development. Therefore, the Inspectorate is content to scope these matters out, however the ES should explain how the development has been designed to be resilient to such effects.	Resilience of the operational design has been considered within **Section 5.7** and **ES Vol 2 Appendix 5-3: Climate Resilience Assessment [EN010153/DR/6.2]**.
Planning Inspectorate	Changes in water availability (climate change resilience) – all phases	Paragraph 12.5.3 of the Scoping Report identifies the potential for changes in water availability to result in more acid soils and/ or water which can increase the deterioration of building materials. Given that the Scoping Report states that materials used will be chosen to be appropriate for existing ground conditions and would be able to withstand changes in soil acidity as a result of changes in water availability, the Inspectorate is content to scope this matter out. The ES should ensure that appropriate security is provided within the DCO to ensure use of such materials.	**ES Vol 1 Chapter 10: Ground Conditions [EN010153/DR/6.1]** has considered the nature of ground conditions and suitability of material use. Embedded mitigation set out in this chapter includes *"Materials specification for piling, other foundations and laying of site services would be determined at detailed design to mitigate against risks to property presented from the chemically aggressive belowground environment."* These measures will be included within the full Construction Environmental Management Plan (CEMP) which will be developed in substantial accordance with the **Outline Construction Environmental Management Plan (oCEMP) [EN010153/DR/7.5]**, as secured by DCO Requirement.

Consultee	Topic	Comment	Response
Planning Inspectorate	Changes to snow and ice (climate change resilience) – all phases	The Inspectorate agrees to scope this matter out on the basis that UKCP18 predictions anticipate less snow and ice than the current baseline and that the risk from snow and ice is not anticipated to increase with climate change.	Changes to snow and ice has accordingly not been considered within the **ES Vol 2 Appendix 5-3: Climate Resilience Assessment [EN010153/DR/6.2]**.
Planning Inspectorate	Consideration of GHG emissions from certain activities during operation and decommissioning: i. Raw material extraction, manufacturing of products and transportation of raw materials to the place of manufacturing ii. Transportation of product to the Proposed Development iii. Emissions from onsite construction activities iv. Transportation of construction materials (where not included in the product-stage embodied GHG emissions) v. Loss of peat	The Inspectorate agrees to scope these matters out on the basis that impacts would be limited to the construction phase only, for which a construction phase assessment for each of the listed potential impacts has been proposed.	The following have been considered during construction, and for replacement parts, within the **ES Vol 2 Appendix 5-1: GHG Assessment [EN010153/DR/6.2]**: i. Raw material extraction, manufacturing of products and transportation of raw materials to the place of manufacturing ii. Transportation of product to the Proposed Development iii. Emissions from on-site construction activities iv. Transportation of construction materials (where not included in the product-stage embodied GHG emissions) v. Loss of peat
Planning Inspectorate	Travel of construction workers (GHG emissions) – all phases	The Applicant proposes to scope this matter out on the basis that emissions from the travel of construction workers are expected to be negligible in context of the other sources of emissions during construction and the overall GHG emission savings associated with the Proposed Development. In the absence of further detail, the Inspectorate cannot agree to scope this matter out at this time. The Inspectorate would expect potential GHG emissions associated with the travel of	Travel of workers has been considered during construction, operation and decommissioning within **ES Vol 2 Appendix 5-1: GHG Assessment [EN010153/DR/6.2]**.

Consultee	Topic	Comment	Response
		construction workers to be characterised within the ES and an assessment of impacts provided where there is the potential for likely significant effects to occur.	
Planning Inspectorate	Energy consumption from the provision of clean water and treatment of wastewater – all phases	The Applicant proposes to scope this matter out on the basis that energy consumption from the provision of clean water and treatment of wastewater is expected to be negligible in context to the overall GHG emission savings. In the absence of further detail, the Inspectorate cannot agree to scope this matter out at this time.	Energy consumption from the provision of clean water and treatment of wastewater has been considered during all phases within the **ES Vol 2 Appendix 5-1: GHG Assessment [EN010153/DR/6.2]**.
Planning Inspectorate	GHG emissions of the following during construction and decommissioning: i. Leakage of GHGs ii. Energy generated	The Inspectorate agrees to scope these matters out on the basis that impacts would be limited to the operational phase only, for which an operational phase assessment for each of the listed potential impacts has been proposed.	Leakage of GHGs and energy generated have been considered during the operational phase within the **ES Vol 2 Appendix 5-1: GHG Assessment [EN010153/DR/6.2]**. The leakage of GHGs has been considered qualitatively.
Planning Inspectorate	Energy consumption, material and waste generation from ongoing site maintenance – all phases	The Applicant proposes to scope this matter out on the basis that operational emissions related to maintenance are expected to be negligible in context to the overall GHG emissions. Although limited information is provided within the Scoping Report with regard to the potential energy consumption and material and waste generation, considering the nature of the Proposed Development, the Inspectorate agrees to scope this matter out.	Energy consumption and material and waste generation from ongoing site maintenance and replacement activity has been considered during the operational phase within **ES Vol 2 Appendix 5-1: GHG Assessment [EN010153/DR/6.2]** because the information was available.
Planning Inspectorate	GHG emissions of the following during construction and operation: i. Emissions from onsite decommissioning activities ii. Transportation and disposal of waste materials	The Inspectorate agrees to scope these matters out on the basis that impacts would be limited to the decommissioning phase only, for which a decommissioning phase assessment for each of the listed potential impacts has been proposed.	Emissions from on-site decommissioning activities and transportation and disposal of waste materials have been considered during the decommissioning phase within the

Consultee	Topic	Comment	Response
			ES Vol 2 Appendix 5-1: GHG Assessment [EN010153/DR/6.2].
Planning Inspectorate	Travel for workers during decommissioning	The Applicant proposes to scope this matter out on the basis that emissions from the travel of workers associated with decommissioning are expected to be negligible in context of the other sources of emissions during decommissioning and the overall GHGs emission savings associated with the Proposed Development. The Applicant's attention is drawn to ID 3.6.5. In the absence of further detail, the Inspectorate cannot agree to scope this matter out at this time. The Inspectorate would expect potential GHG emissions associated with the travel of decommissioning workers to be characterised within the ES and an assessment of impacts provided where there is the potential for likely significant effects to occur.	Travel for workers during the decommissioning phase has been considered during the decommissioning phase within the **ES Vol 2 Appendix 5-1: GHG Assessment [EN010153/DR/6.2]**.
CWaCC	General	CWaCC declared a Climate Emergency in 2019. Response to this existential threat included the ability of the borough to contribute significantly with solar by 2030 to 400MW capacity. The Proposed Development is a key project in potentially delivering on the borough's contribution.	Addressed within **section 5.2**.
CWaCC	National Planning Policy	Draft NPS EN -3 provides guidance at 3.4.10. Solar PV sites may also be proposed in low lying exposed sites. For these proposals, applicants should consider, in particular, how plant will be resilient to increased risk of flooding; and impact of higher temperatures.	Addressed within **section 5.2**. This matter is considered within the assessment.
CWaCC	Local Planning Policy	The following LP1 policies should be added to the list: i. STRAT 10 Transport and Accessibility ii. STRAT 11 Infrastructure iii. ENV 1 Flood risk and water management iv. ENV3 Green Infrastructure v. ENV4 Biodiversity and geodiversity	Addressed all the policies within **section 5.2**.

Consultee	Topic	Comment	Response
		vi. ENV 7 Alternative energy supplies vii. ENV 8 Managing waste	
CWaCC	Local Planning Policy (LP2)	The following LP2 policies should be added to DM4 with regard to consideration of climate change: i. DM 40 Development and flood risk; ii. DM 31 - Air quality iii. DM 40 - Development and flood risk iv. DM 51 - Wind energy v. DM 52 - Solar energy vi. DM 53 - Energy generation, storage and district heat networks	Addressed all the policies within **section 5.2**. However, DM31 and DM51 are not relevant to this climate change assessment and have not been considered further.
CWaCC	Potential Effects and Mitigation (GHC Emissions) (Construction) (iv) (Loss of peat)	The document addresses and scopes in the loss of peat for further enquiry. Natural England's comments should be sought in this regard. Additional measures should be considered to prevent impacts on peat / GHG emissions. For example, trenchless or shallow cable routing or re-routing to avoid peat areas. Having regard to draft NPS EN3 (3.10.147), to ensure the development will result in minimal disruption to the ecology, or release of CO_2 and that the carbon balance savings of the Proposed Development are maximised, the solar farm layout and construction methods need to be designed to minimise soil disturbance during construction and maintenance of roads, tracks, and other infrastructure.	Loss of peat has been considered qualitatively within the GHG Assessment. **ES Vol 1 Chapter 10: Ground Conditions [EN010153/DR/6.1]** has assessed the potential for peat to be present across the Site and whether there would be any impact on peat present. The ground investigation data shows that there is no peat present at depths which could be impacted by the Proposed Development.
CWaCC	Increased frequency and magnitude of wind and storms	Storm damage needs to consider potential for damage from outside risks falling or causing damage to the project inside the Site.	This has been considered within **ES Vol 2 Appendix 5-3: Climate Resilience Assessment [EN010153/DR/6.2]**.

Table 5-4 – PEIR Consultation Response

Consultee / Respondent	Comment	Response
Natural England	Renewable energy should be developed sustainably to ensure it does not harm the natural environment. Developments must balance climate action with nature conservation by recognising that they are interconnected. Additionally, developments should consider cumulative impacts, unintended consequences, and regional disparities to ensure responsible expansion.	Commentary has been noted. **ES Vol 1 Chapter 7: Terrestrial Ecology [EN010153/DR/6.1]** demonstrates that the Proposed Development would not be delivered at the expense of conservation. The Proposed Development has been designed to largely retain important ecological features within the Site and also includes significant habitat enhancement provisions which would be managed for the benefit of wildlife over the long term and would provide biodiversity gains for a wide variety of species. **ES Vol 1 Chapter 10 Ground Conditions [EN010153/DR/6.1]** demonstrates there have been no surface deposits of peat identified across the Site. Additionally, the Proposed Development would not impact upon any areas of peat as these have only been identified at depth below the extent of the Proposed Development.
CWaCC	CWaCC agree with the utilisation of the high emission scenario (RCP 8.5) and with the usage of CCGT and grid mix as joint comparators.	Comment has been noted.
CWaCC	CWaCC are content with the elements scoped in/out based on the Scoping Opinion and are content with the methodology adopted.	Comment has been noted.
CWaCC	CWaCC are satisfied with the PEIR regarding climate change.	Comment has been noted.
CWaCC	Information regarding the western side of the Site should be provided/confirmed as part of the DCO submission.	**ES Vol 1 Chapter 10: Ground Conditions [EN010153/DR/6.1]** concludes that the Proposed Development would not impact upon any areas of peat as these have only been identified at depth below the extent of the Proposed Development.

Consultee / Respondent	Comment	Response
	A geo-archaeological report might be of assistance in clarifying the nature of the peat deposits present on the Site. The report would clarify the stratigraphic sequence at the Site. Although the below-ground impact of the development is limited to no more than 1m below present ground level, where it is unlikely to seriously affect any well-preserved deposits, this is an area where it may be beneficial for the Applicant and their specialist advisors to demonstrate the nature of this below-ground intrusion in their submission.	Therefore, **ES Vol 2 Appendix 13-1: GHG Assessment [N010153/DR/6.2]** has not considered the active loss of peat.

Table 5-5 – Other Stakeholder Engagement

Consultee / Respondent	Comment	Response
Environment Agency (meeting 13th July 2024)	During the meeting the EA set out that the FRA should demonstrate that the Proposed Development includes suitable mitigation measures and flood resilient construction that will allow the development to remain operational for its 40-year lifespan. This includes confirming that all the flood sensitive equipment associated with the Proposed Development remains operational during a 0.1% event.	The FRA (**ES Vol 3 Technical Appendix 9-1 [EN010153/DR/6.3]**) provides an assessment to the requested flooding scenarios. All flood sensitive equipment has been raised about the agreed flood design level as presented in **ES Vol 1 Chapter 2: Proposed Development [EN010153/DR/6.1]** and **ES Vol 2 Figure 2.6 [EN010153/DR/6.2]** and the **Design Parameters [EN010153/DR/7.1]**.

5.5 Assessment Methodology

5.5.1 The methodologies described in the following section have been developed in line with the relevant planning policy and the following industry guidance:

i) the IEMA GHG Guidance; and
ii) the IEMA Climate Change Resilience Guidance.

Climate Resilience

Study Area

5.5.2 For the climate change resilience assessment, the Proposed Development during construction, operation and decommissioning, is considered the receptor and therefore the study area is the Order Limits as described in **ES Vol 1 Chapter 1: Introduction [EN010153/DR/6.1]**.

Scope of Assessment

5.5.3 The scope of the climate resilience assessment, in accordance with the **ES Vol 2 Appendix 1-2: Planning Inspectorate Scoping Opinion [EN010153/DR/6.2]** is provided in Table 5-6.

Table 5-6 – Climate change effects scoped in and out of the climate resilience assessment

Topic	Construction	Operation	Decommissioning
Increase in winter precipitation	Scoped Out	Scoped In	Scoped Out
Decrease in summer precipitation	Scoped Out	Scoped In	Scoped Out
Changes in water availability	Scoped Out	Scoped Out	Scoped Out
Increased frequency and magnitude of wind and storms	Scoped Out	Scoped In	Scoped Out
Increase in summer temperatures	Scoped Out	Scoped In	Scoped Out
Changes in cloud cover	Scoped Out	Scoped In	Scoped Out

Topic	Construction	Operation	Decommissioning
Sea level rise	Scoped Out	Scoped In	Scoped Out
Changes to snow and ice	Scoped Out	Scoped Out	Scoped Out

5.5.4 As set out in the **ES Vol 2 Appendix 1-2: Planning Inspectorate Scoping Opinion [EN010153/DR/6.2]**, climate change is unlikely to impact upon the construction phase of the Proposed Development given that, if consented, construction would occur in the near future when the climatic conditions are well understood and would be accounted for in the construction practices. Weather conditions would have the greatest effect on the construction and measures to minimise the effects will be included within the full CEMP which will be developed in substantial accordance with the **oCEMP [EN010153/DR/7.5]**. Similarly, effects during the decommissioning phase have been scoped out. Measures to minimise the effects will be included within the full DEMP which will be developed in substantial accordance with the **Outline Decommissioning Environmental Management Plan (oDEMP) [EN010153/DR/7.7]**. The CEMP and DEMP would be prepared in advance of the respective works phases for approval by the Local Planning Authority. This is secured via a Requirement in Schedule 2 of the draft DCO.

Assessment Methodology

5.5.5 The assessment of the resilience of the Proposed Development to climate change has been undertaken in line with the IEMA Climate Change Resilience Guidance. This includes quantifying the current and future baseline climate, identifying receptors sensitive to the projected changes to climate and their level of sensitivity, determining the magnitude of impacts, and the significance of any effects.

5.5.6 In order to determine the existing baseline climate, climate averages from the period 1991-2020 have been sourced from the nearest meteorological site to the Proposed Development (Hawarden) and Met Office UK regional climate

summary (North West England & the Isle of Man) from the same time period, as published on the Met Office website.

5.5.7 The future baseline has been defined using UK Climate Projections 2018 (UKCP18). UKCP18 are a set of climate projections and tools to access climate data. The data used within this assessment has been extracted from the UKCP18 key results. The identified changes have then been applied to the current baseline climate conditions to give a prediction of the local future climate conditions.

5.5.8 The climate resilience assessment systematically describes how each receptor could be impacted by the effects of the projected changes to climate change that have been scoped into the climate resilience assessment.

Assessment of Significance / Assessment Criteria

5.5.9 For each receptor, the significance of each predicted effect of climate change has been assessed. This has considered the sensitivity of the receptor and the magnitude of impact.

Sensitivity

5.5.10 The sensitivity of a receptor is "*the degree of response of a receiver to a change and its capacity to accommodate and recover from a change if it were to be affected*" [xxv]. This should account for the susceptibility, vulnerability, and the value / importance of the receptor.

i) Susceptibility is defined as *"the ability of the receptor to be affected by a change"* [xxv].
ii) Vulnerability is defined as "*the potential exposure of the receptor to a change"* [xxv] which is the inverse of resilience.
iii) Receptors are defined as *"elements of the project relevant to the location, nature and scale of the development"* [xxv].

5.5.11 Resilience is the measure of the ability of a receptor to respond to changes in experiences. If a receptor or a project has good climate change resilience, it is able to respond to the changes in climate in a way that ensures it retains much of its original function and form. A receptor or project that has poor climate change resilience will lose much of its original function or form as the climate changes.

5.5.12 The scale of the susceptibility and vulnerability has been determined using the IEMA Climate Change Resilience Guidance as set out in Table 5-7.

Table 5-7 – Climate change receptors – susceptibility and vulnerability Scale

Scale	Susceptibility	Vulnerability
High	Receptor has no ability to withstand / not be substantially altered by the projected changes to the existing / prevailing climatic factors (e.g. lose much of its original function and form) (e.g. electronic aspects of the operational equipment would be highly susceptible to being affected by flooding if the electronic aspects are located in a flood risk zone).	Receptor is directly dependent on existing / prevailing climatic factors and reliant on these specific existing climate conditions continuing in future or only able to tolerate a very limited variation in climate conditions (e.g. electronic aspects of the operational equipment are highly vulnerable to being exposed to flooding as, if the electronic aspects of the operational equipment were to be submerged, they would no longer work and would need to be replaced).
Moderate	Receptor has some limited ability to withstand / not be altered by the projected changes to the existing / prevailing climatic conditions (e.g. retain elements of its original function and form) (e.g. On-site workers would be moderately susceptible to being affected to increases in temperature on a hot day as workers may overheat causing heatstroke or hyperthermia. However, humans can withstand a range of conditions).	Receptor is dependent on some climatic factors but able to tolerate a range of conditions (e.g. On-site workers are moderately vulnerable to being exposed to increases in temperature but humans can withstand a range of conditions.
Low	Receptor has the ability to withstand / not be altered much by the projected changes to the existing/prevailing climatic factors (e.g. retain much of its original function and form). (e.g.	Climatic factors have little influence on the receptors (consider whether it is justifiable to assess such receptors further within the context of EIA – i.e. it is likely that such issues should have been excluded

Scale	Susceptibility	Vulnerability
	the operational equipment is not susceptible to being affected by decreased summer precipitation as the operational equipment does not require water.	through the EIA scoping process). (e.g. the operational equipment is not vulnerable to being exposed to decreased summer precipitation as the operational equipment is not influenced by precipitation).

5.5.13 In addition to the susceptibility and vulnerability, the value/importance of the receptor has been used to reach a reasoned conclusion on sensitivity using professional judgement.

5.5.14 The greater the susceptibility, and/or vulnerability of the receptor, the greater the likelihood that the receptor would also be of higher sensitivity. For instance, a high-value receptor that has very little resilience to change in climate is considered to be more likely to have a higher sensitivity than a high-value receptor that is very resilient to changes in climate. The sensitivity of the receptor to the effect of climate change has been deemed to be low, medium or high. These descriptors have been determined based on professional judgement and are in line with the examples described below.

5.5.15 The sensitivity of a receptor to the impacts from fluvial flooding could be described as ‘low’ under the following scenario:

i) The value of the receptor is low – such as an unused non-Best and Most Versatile agricultural field;
ii) The vulnerability is low – as it does not lie within the flood plain so is unlikely to be impacted by fluvial flooding associated with increased rainfall as a result of climate change; and
iii) The susceptibility is low – as the receptor would have the ability to return to its previous use as the event would only cause temporary loss of use of the field, and damages would be limited.

5.5.16 The sensitivity of a receptor to the impacts from fluvial flooding could be described as ‘high’ under the following scenario:

i) The value of the receptor is high – such as a residential property;
ii) The vulnerability is high – as it lies within the flood plain and is likely to be impacted by fluvial flooding associated with increased rainfall as a result of climate change; and
iii) The susceptibility is high – as there are no flood defences or on-site mitigation measures and therefore no ability to withstand fluvial flooding.

5.5.17 The sensitivity of a receptor to the impacts from fluvial flooding could be described as 'medium' under the following scenario:

i) The value of the receptor is high – such as a residential property;
ii) The vulnerability is high – as it lies within the flood plain and is likely to be impacted by fluvial flooding associated with increased rainfall as a result of climate change; and
iii) The susceptibility is low – as there are effective mitigation measures in place such as flood defences which would allow the property to withstand the projected increases in rainfall and associated fluvial flooding events.

Magnitude

5.5.18 For each receptor and each identified change in climate, the magnitude of effect has been determined. The magnitude is "*the degree of a change from the relevant baseline conditions which derives from the construction and operation of a development*" [xxv]. The IEMA Climate Change Resilience Guidance explains that this is based on a combination of:

i) *"Probability, which would take into account the chance of the effect occurring over the lifespan of the development, if the risk is not mitigated; and*
ii) *Consequence, which would reflect the scale or complexity of the effect, considering degree of harm, duration, frequency and reversibility of effect."*

5.5.19 A combination of probability and consequence has been used to reach a reasoned conclusion on the magnitude of effect using professional judgement. Where a probability and / or consequence of the effect is high then the magnitude of effect would also be high. Descriptors of negligible, small, medium and large have been used to define the magnitude of impact in line with the following examples in relation to fluvial flooding:

i) A negligible magnitude of change may be used to describe a scenario where there is a low probability of a fluvial flooding occurring, the receptor is not within or close to a flood zone, and the consequence of flooding is low, for example the damage caused by fluvial flooding of a non-BMV agricultural field is minimal and reversible;

ii) A small magnitude of change may be used to describe a scenario where there is a low probability of a fluvial flood occurring, i.e. the receptor is not within a flood zone, but there is a higher consequence of risk, for example a residential property may undergo a small amount of damage. A small magnitude of change could also be used to describe a scenario where there is a high probability of fluvial flooding, but the consequence is low, for example the damage caused by flooding of a non-BMV agricultural field is minimal and reversible;

iii) A medium magnitude of change may be used to describe a scenario where there is some probability of a fluvial flood event occurring, if the receptor is within a flood zone, and there is some consequence to a flood, for example a residential property may undergo some amount of damage; and

iv) A large magnitude of change may be used to describe a scenario where there is a high probability of a fluvial flood event occurring, if the receptor is within a flood zone particularly close to a river, and there is a likely consequence to a flood, for example a residential property may undergo significant damage.

Significant Effects

5.5.20 The level of effect is then determined, taking into account the sensitivity for each receptor and the magnitude for each climate change effect using professional judgement. Table 5-8 provides an example of how the sensitivity of receptor and magnitude of effect can be used to determine the significance of the effect.

Table 5-8 – Climate Change Receptors – Significance of Effect

Sensitivity of receptor	Magnitude of effect descriptors			
	Negligible	Small	Medium	Large
Low	Negligible	Negligible	Negligible	Slight
Medium	Slight	Slight	Moderate	Substantial
High	Moderate	Moderate	Substantial	Substantial

5.5.21 Where a level of effect is defined as Substantial then the effect is likely to be considered significant. Professional judgment is used in determining whether an effect is significant, and this is consistent with the other chapters in the ES.

GHG Emissions

Study Area

5.5.22 The GHG emissions assessment is not restricted by geographical area but instead includes any increase or decrease in GHG emissions as a result of the Proposed Development, wherever that may be.

Scope of Assessment

5.5.23 The impact of GHG emissions is on a global scale rather than affecting one localised area. Therefore, all GHG emissions arising over the course of the Proposed Development have been assessed within the GHG Assessment. Direct emissions from activities taking place within the Order Limits, indirect emissions from activities outside the Order Limits in support of the Proposed Development, and embodied carbon within construction materials are all considered as part of the study area for the GHG Assessment.

5.5.24 The scope of the GHG assessment, in accordance with **ES Vol 2 Appendix 1-2: Planning Inspectorate Scoping Opinion [EN010153/DR/6.2]** is provided in Table 5-9. Please note additional items have been scoped in due to the information being readily available.

Table 5-9 – Scope of the GHG assessment.

Topic	Construction	Operation	Decommissioning
GHG emissions associated with raw material extraction and manufacturing of products required for the Proposed Development and transportation of raw materials to the place of manufacturing	Scoped in	-	-
GHG emissions associated with the transportation of manufactured equipment and materials to the Proposed Development	Scoped in	-	-
GHG emissions associated with the transportation of construction materials (where not included in the product-stage embodied GHG emissions)	Scoped in	-	-
GHG emissions associated with on-site construction activities	Scoped in	-	-
GHG emissions associated with the travel of construction workers	Initially scoped out but has been scoped in following the scoping opinion.	-	-
GHG emissions associated with the loss of peat	Scoped in (qualitatively assessed)	-	-
GHG emissions associated with the energy consumption from the provision of clean water and treatment of wastewater during construction	Initially scoped out but has been scoped in following the scoping opinion.		
GHG emissions associated with the creation of the NBBMA.	Initially scoped out but has included as additional information is now available		

Topic	Construction	Operation	Decommissioning
GHG emissions associated with the energy consumption from the provision of clean water and treatment of wastewater during operation	-	Initially scoped out but has been scoped in following the scoping opinion.	-
GHG emissions associated with leakage of GHGs	-	Scoped in (qualitatively considered)	-
GHG emissions associated with energy generated	-	Scoped in	-
GHG emissions from the energy consumption, material and waste generation from ongoing maintenance on-site (including replacement activities)	-	Initially scoped out but it has been scoped in as the information is available.	-
GHG emissions associated with the transport of workers during operation	-	Initially scoped out but has been scoped in following the scoping opinion.	-
GHG emissions associated with the on-site decommissioning activities – emissions from plant vehicles and generators	-	-	Scoped in
GHG emissions associated with the transportation and disposal of waste materials	-	-	Scoped in
GHG emissions associated with the travel for workers during decommissioning	-	-	Initially scoped out but has been scoped in following the scoping opinion.
GHG emissions associated with the energy consumption from the provision of clean water and treatment of wastewater during decommissioning	-	-	Initially scoped out but has been scoped in following the scoping opinion.

Assessment Methodology

5.5.25 The IEMA GHG Guidance acknowledges that there are many different methods available for measuring and quantifying GHG emissions. However,

the guidance provides a framework of six steps that have been incorporated into the assessment, as follows:

i) **Set the scope and boundaries of the assessment**. These include system boundaries and temporal boundaries.
ii) **Develop the baseline**. This includes the current, future and alternative baselines.
iii) **Decide upon the assessment methodologies**. The methodology should result in a relevant, complete, consistent, transparent and accurate assessment of the reasonable worst case.
iv) **Data collection**. Activity data for the Proposed Development and GHG emissions factors should be collated.
v) **Calculate the GHG emissions inventory**. Although the quantification of GHG emissions for an EIA may vary in methodology and approach between projects, it is expected that in almost all cases, a calculated (not measured) approach is taken because these are completed in advance of the Proposed Development commencing. It is recommended that the following structure should be used to calculate GHG emissions: GHG emission/removal = GHG emission factor × activity data. Both annual and lifetime GHG emissions should be calculated and reported. In addition, as part of this inventory, uncertainty should be considered.
vi) **Mitigation opportunities**. Once the magnitude of emissions has been determined, mitigation measures should be considered.

5.5.26 The approach to assessing emissions follows the different stages of the Proposed Development i.e. the Construction Phase, Operational Phase and Decommissioning Phase.

5.5.27 The Applicant has provided data and information that underpins the lifecycle GHG Emissions Assessment, which has been evaluated using the methodology and emission factors have been used from appropriate sources. The sources of the data used have been referenced within **ES Vol 2 Appendix 5-1: GHG Assessment [EN010153/DR/6.2]**.

Assessment of Significance / Assessment Criteria

5.5.28 In terms of significance, the IEMA GHG Guidance states that:

"When evaluating significance, all new GHG emissions contribute to a negative environmental impact; 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".

5.5.29 The key goal of EIA is "*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.

5.5.30 The crux of a significant effect occurring is not whether a project emits GHG emissions, nor even the magnitude of GHG emissions alone, but whether it contributes to reducing GHG emissions relative to a comparable baseline consistent with a science-based 1.5°C transition towards net zero which the UK government has committed to achieve by 2050. The IEMA GHG Guidance sets out the significance criteria as 'major adverse', 'moderate adverse', 'minor adverse', 'negligible', and 'beneficial', with examples to distinguish significance listed as follows:

i) **Major adverse**: the project's GHG impacts are not mitigated or are only compliant with do-minimum standards set through regulation, and do not provide further reductions required by existing local and national policy for projects of this type. A project with major adverse effects is locking in emissions and does not make a meaningful contribution to the UK's trajectory towards net zero.
ii) **Moderate adverse**: the project's GHG impacts are partially mitigated and may partially meet the applicable existing and emerging policy requirements but would not fully contribute to decarbonisation in line with local and national policy goals for projects of this type. A project with

moderate adverse effects falls short of fully contributing to the UK's trajectory towards net zero.

iii) **Minor adverse**: the project's GHG impacts would be fully consistent with applicable existing and emerging policy requirements and good practice design standards for projects of this type. A project with minor adverse effects is fully in line with measures necessary to achieve the UK's trajectory towards net zero.

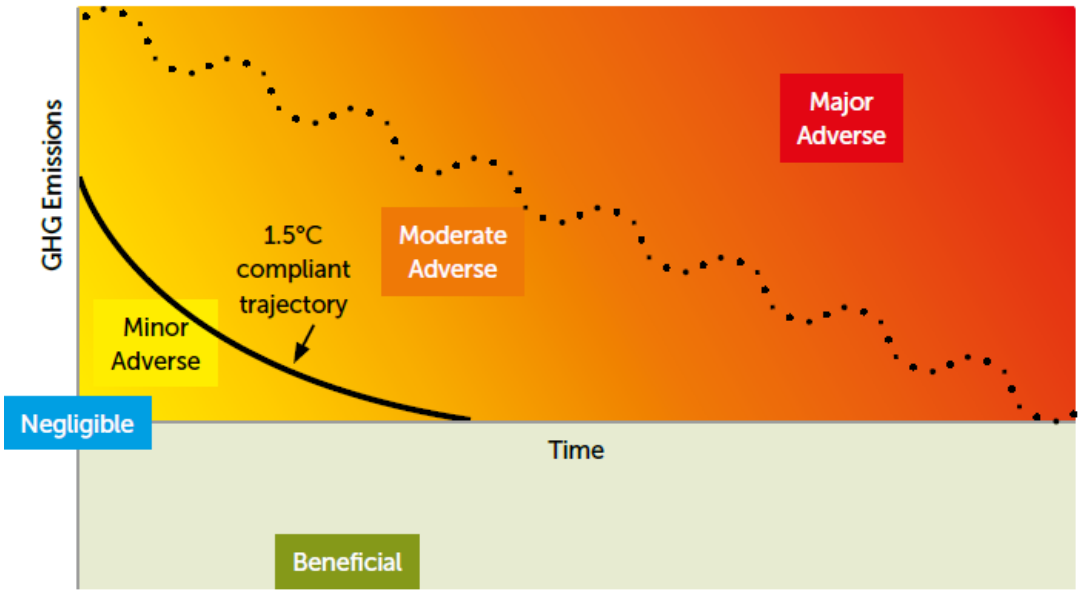
iv) **Negligible**: the project's GHG impacts would be reduced through measures that go well beyond existing and emerging policy and design standards for projects of this type, such that radical decarbonisation or net zero is achieved well before 2050. A project with negligible effects provides GHG performance that is well 'ahead of the curve' for the trajectory towards net zero and has minimal residual emissions.

v) **Beneficial**: the project's net GHG impacts are below zero and it causes a reduction in atmospheric GHG concentration, whether directly or indirectly, compared to the without-project baseline. A project with beneficial effects substantially exceeds net zero requirements with a positive climate impact.

5.5.31 Major or moderate adverse effects and beneficial effects are considered to be significant. Minor adverse and negligible effects are not considered to be significant.

5.5.32 Accordingly, an assessment of the contribution of the Proposed Development towards the net zero trajectory (in accordance with the budgeted, science based 1.5 C trajectory) and the significance of the contribution has been undertaken and presented within this assessment. Image 5-1 is displayed in the IEMA GHG Guidance as a visualisation of how to determine the significance of the GHG emissions from the Proposed Development in the context of the net zero trajectory. The 'wavy' line indicating the distinction between a moderate adverse and major adverse effect.

Image 5-1 – Net zero trajectory context from IEMA GHG Guidance



5.5.33 The IEMA GHG Guidance states that: *"a modification to this approach is required for the very largest-scale developments, those that in themselves have magnitudes of GHG emissions that materially affect the UK's or a devolved administration's total carbon budget. An indicative threshold of 5% of the UK or devolved administration carbon budget in the applicable time period is proposed, at which the magnitude of GHG emissions irrespective of any reductions is likely to be significant".* This approach has also been considered within this assessment, in addition to the previously described approach to determining likely significant effects.

5.5.34 The IEMA GHG Guidance sets out 'good practice' approaches to contextualising a projects carbon emissions by comparing to sector-based, local, and / or national carbon budgets, policy goals and / or performance standards. Based on this, the emissions associated with the Proposed Development have been compared to the fourth, fifth, sixth and seventh UK carbon budgets covering the periods 2023-2027, 2028-2032, 2033-2037 and 2038-2042 respectively. It must be noted the seventh carbon budget has been recommended by the CCC but has not yet been legislated. Although the seventh carbon budget only reaches 2042, future continuation in the reduction of these budgets is expected in order to reach net zero by 2050. Whilst not

required by law (as set out in case law), the emissions associated with the Proposed Development have also been compared to the local carbon budget produced by the Tyndall Carbon Budget Tool[xxx] up to 2042 to align with the UK carbon budget comparison. The Tyndall Carbon Budget Tool generates reports that recommended climate change commitments for UK local authority areas that are aligned with the commitments in the United Nations Paris Agreement, informed by the latest science on climate change and defined by science-based carbon budget setting. Tyndall's carbon budget report for Cheshire West and Cheshire informed CWaCC's Climate Emergency Response Plan.

5.6 Baseline Conditions

Climate Resilience

Current baseline

5.6.1 The current climate baseline at the Site has been determined based on Met Office historical climate averages data from the period 1991-2020, from the closest meteorological station with this historical data, Hawarden (approximately 22 km to the south west of the Site in a straight line) and Met Office UK regional climate summaries from the same time period for North West England & the Isle of Man.

5.6.2 Full details of the baseline climate are provided in **ES Vol 2 Appendix 5-2: Climate Baseline Report [EN010153/DR/6.2]** and summarised in Table 5-10.

Future baseline

5.6.3 The future baseline has been calculated by taking the UKCP18 predictions based on the predictions for the administrative area of the North West England. The predicted changes to baseline climate are detailed within **ES Vol 2 Appendix 5-2: Climate Baseline Report [EN010153/DR/6.2]**.

5.6.4 There are uncertainty and variability in projections but generally climate change is projected to lead to hotter summers and warmer winters, and generally wetter winters and drier summers. Projections indicate there will be an increase in near surface wind speeds over the UK and more significant impacts of wind will be experienced in the winter months, including an increase in frequency of winter storms.

5.6.5 A summary of the current and future baseline climate is provided in Table 5-10 applying the central estimate which is considered to be the level at which as much evidence points to a lower outcome as a higher one. The 10th and 90th percentiles reflect the lowest and highest 10% of the model runs – the value at which 10% of the model runs fall at or below (10th percentile) or at

and above (90th percentile) fall at or above. These have been considered where the direction of change is predicted to vary at each level.

Table 5-10 – Future baseline climate conditions

Item	Units	Baseline (Hawarden 1981-2010)	Predicted Change (UKCP18)	Future Baseline (Hawarden 2060-2079)
Central (50th percentile) estimate				
Mean annual temperatures	°C	10.3	2.50	12.8
Mean winter temperatures	°C	5.2	2.10	7.3
Mean summer temperatures	°C	15.9	3.10	19.0
Mean in winter precipitation	mm	62.0	16.0%	72.0
Mean summer precipitation	mm	61.0	-23.0%	47.0
Central (90th percentile) estimate				
Mean summer precipitation	mm	61.0	2.0%	62.0
Central (90th percentile) estimate				
Mean summer precipitation	mm	62.0	-3.0%	60.0

GHG Emissions

5.6.6 The goal of establishing a baseline is being able to assess and report the net GHG emission associated with the Proposed Development.

5.6.7 The IEMA GHG Emissions Guidance defines the baseline as a reference point against which the impact of a project can be compared against (sometimes referred to as 'business as usual' or 'BaU', where assumptions are made on current and future GHG emissions). The baseline can be in the form of:

i) GHG emissions within the boundary of the GHG quantification but without the proposed project; or
ii) GHG emissions arising from an alternative project design and/or BaU for a project of this type.

5.6.8 Option i) has been chosen to establish the baseline for the purpose of this assessment as this information is known for this calculation and an alternative project design has not been suggested.

5.6.9 The GHG emissions baseline is made up of two aspects:

i) Quantification GHG emissions on-site if the Proposed Development was not to occur; and
ii) Quantification GHG emissions produced and / or avoided if the Proposed Development was not to occur.

Current baseline

5.6.10 The current baseline is a 'no-development' scenario whereby the Proposed Development is not implemented.

5.6.11 The Site currently comprises a mixture of agricultural and drained marsh land, approximately half of which comprises former Manchester Ship Canal Dredging Deposit Grounds. Agricultural land undergoes farming practices necessitating machinery and fertilisers which releases GHGs into the atmosphere. The amount of GHGs released into the atmosphere is dependent on the soil, vegetation type present and the fuel use of vehicles and other agricultural machinery. For the purpose of the GHG Emissions Assessment it is assumed that the baseline GHG emissions for the Site are zero. This is a conservative approach as any savings as a result of not using fertilisers on the land is not allowed for.

5.6.12 The Proposed Development will export electricity which would otherwise need to be generated by other sources. Renewable energy generation sources (such as solar) currently displace baseload gas fired CCGT. In recognition of recent NSIP decisions, the assessment has also used the current grid mix as an alternative comparator to provide a range for the offset emissions.

Future Baseline

5.6.13 For the assessment, the future baseline is that the Proposed Development is not implemented, and the Site will be continued to be used as a mixture of agricultural and drained marsh land for the 40-year operational lifetime of the Proposed Development. It is considered that this is the most likely scenario

given the location of the Site adjacent to the M56 and residential areas which will need continued protection from flood levels. It has been assumed the future baseline GHG emissions from the land use is zero. This is a conservative approach as any savings as a result of not using fertilisers on the land is not allowed for.

5.6.14 The Proposed Development will generate electricity which will offset the burden of producing electricity using other methods. Currently the electricity generated by solar displaces gas-fired power stations for which the displacement factor is 375 gCO_2e/kWh. It is acknowledged that the UK grid mix will change and decarbonise over time, but this will occur due to the Proposed Development and other projects like the Proposed Development. Therefore, it is considered reasonable to assess the benefits using the marginal technology at the current time (CCGT) as the comparator. However, in recognition of recent SoS decisions, the assessment has also used the current grid mix as an alternative comparator to provide a range of offset emissions.

Carbon Budgets

5.6.15 The 'UK carbon budget' reflects the UK government's commitments to net zero and as such are considered to represent the future anticipated baseline GHG emissions for the UK. The carbon budgets for the UK are set out in **Table 5-11**.

Table 5-11 – UK carbon budgets

Budget Period	UK Carbon budget (Mt CO_2e)	% reduction from 1990 levels
2023-2027	1,950	52%
2028-2032	1,725	58%
2033-2037	965	78%
2038-2042	535	86%

Source: Carbon Budget Order 2011, 2016 and 2021.

5.6.16 The UK carbon budgets have not yet been set beyond 2037. The seventh carbon budget, covering the period 2038 to 2042, has been recommended by the CCC, but has not yet to be legislated. The budgets will gradually reduce with the aim of achieving net zero by 2050.

5.6.17 The Tyndall Carbon Budget Tool presents recommended climate change commitments for UK local authority areas that are aligned with the commitments in the United Nations Paris Agreement. The carbon budgets using the tool for Cheshire West and Chester are set out in Table 5-12.

Table 5-12 – Cheshire West and Chester carbon budgets

Budget Period	UK Carbon budget (Mt CO_2e)
2023-2027	8.1
2028-2032	3.8
2033-2037	1.8
2038-2042	0.8

Source: The Tyndall Carbon Budget Tool for Cheshire West and Chester.

5.7 Incorporated Mitigation and Enhancement Measures

5.7.1 The assessment of effects takes into account any mitigation and design measures that have been specifically incorporated into the Proposed Development to reduce environmental effects. They are assumed to be implemented and are therefore factored into the determination of residual significant effects.

5.7.2 The following mitigation measures have been incorporated into the design of the Proposed Development to mitigate the effects of climate change. Note the following mitigation measures are not an exhaustive list.

Construction

5.7.3 The following measures have been incorporated into the **oCEMP [EN010153/DR/7.5]**. Post-consent, this outline plan will be developed into a full plan which must be in substantial accordance with the outline, and the Proposed Development must be constructed in accordance with that detailed plan. This is secured via a Requirement in Schedule 2 of the draft DCO.

i) Weather conditions would be monitored.
ii) Risk Assessment Method Statements (RAMS) would be used (RAMS are important health and safety document that are completed to identify the steps to be undertaken to carry out a specific activity or task in a safe manner such as manual handing and inspection of the solar PV modules).
iii) Staff would all have the correct personal protective equipment (PPE), be trained in site health and safety and be informed about protecting themselves from the dehydration and the sun.
iv) Construction materials would be covered when stored.
v) Pro-active planning would be undertaken that accounts for the possibility of extreme weather events, including the use of extreme weather alert systems.
vi) Health and safety plans developed for construction activities would be required to account for potential climate change impacts on workers, such

as flooding and heatwaves. To include measures such as toolbox talks on training on dangers of extreme weather conditions.

vii) The Proposed Development would be designed, constructed, and operated in such a way as to minimise the creation of waste and maximise the use of alternative materials with lower embodied carbon, such as locally sourced products and materials with a higher recycled content where feasible.

viii) Suitable infrastructure and resources already available within the Site would be reused where possible to minimise the use of natural resources and unnecessary materials (e.g., reusing excavated soil for fill requirements).

ix) Recyclability would be increased by segregating construction waste to be re-used and recycled where reasonably practicable.

x) The Considerate Constructors Scheme (CCS) would be adopted to assist in reducing pollution, including GHGs, from the Proposed Development by employing good industry practice measures such as optimising the use of resources and minimising carbon throughout the value chain.

xi) The Applicant's has committed to exploring the provision of staff minibuses where appropriate during peak periods of construction activity.

xii) Vehicles would be switched off when not in use and construction vehicles would be checked to ensure they conform to current UK emissions standards.

xiii) Regular planned maintenance of the construction plant and machinery would be carried out to optimise efficiency.

xiv) Materials used in the construction would be selected to be resilient to expected climatic extremes with British Standards applicable for most materials to ensure that extreme climatic conditions are accounted for.

Operation

5.7.4 The following measures have been incorporated into the **oOEMP [EN010153/DR/7.6]** and where relevant the **Outline Landscape and**

Ecology Management Plan (oLEMP) [EN010153/DR/7.13]. Post-consent, this outline plan will be developed into a full plan which must be in substantial accordance with the outline, and the Proposed Development must be operated in accordance with that detailed plan. This is secured via a Requirement in Schedule 2 of the draft DCO.

i) The operational equipment has been chosen as they withstand the range of climatic conditions that incorporate the climatic conditions predicted to occur in the future:
    a) The ventilation systems for the electrical systems are designed to withstand a range of temperatures greater than the currently experienced temperatures to account for climate change.
    b) The BESS will likely have a temperature controlled forced air-cooling system which will be used to stabilise temperature and humidity to maintain a stable minimum temperature optimising performance. The BESS will likely be designed to operate safely between -30°C and 50°C.
    c) The operating temperature for the candidate solar PV modules is between -40°C and 85°C.
    d) The solar PV substructure is likely to be made of galvanised steel with piles driven into the ground. Galvanized steel mounting support can withstand very large range in temperatures of ~-50°C to 100°C.
    e) The operating temperature range for the PCU is likely to be between -30°C and 60°C.
    f) The operating temperature range for the PCS is likely to be between -25°C and 45°C.
    g) The installation temperature range for the cables is likely to be between 0°C and 80°C and the operating temperature range is between -15°C and 90°C.
ii) Fire water storage tanks will be provided to reduce the reliance on a fixed supply.

iii) New planting across the Site includes the following approximate areas of habitat:

a) Approximately 36.1 ha of public access/biodiversity enhancement zones, comprising enhancement of existing vegetation (trees and scrub, grassland and wetland) and provision of new vegetation.

b) Creation/enhancement of approximately 132 ha of other neutral grassland.

c) Creation of approximately 75.7 ha of modified grassland.

d) Specific habitat creation and enhancement measures within Items a-c above including:

- Approximately 2.2 ha of new native woodland.
- Approximately 0.87 ha of new native mixed scrub, and enhanced management of approximately 1.43 ha of existing scrub.
- Enhancement of approximately 6.4km of existing hedgerows and hedgerow with trees.
- Approximately 2.5 km of new native hedgerow, and approximately 5 km of new belts of native trees and shrubs.
- Approximately 1 ha of new ponds, approximately 335 m of new ditches, and approximately 2.1 ha of new reedbed. Enhanced management of approximately 0.9 ha of existing ponds, approximately 10.9 km of existing ditches and approximately 12.1 ha of existing reedbed.

e) NBBMA including:

- Approximately 53.51 ha suitable for new and enhanced habitats (wetland and other neutral grassland) to benefit wetland birds.
- Approximately 13.19 ha of additional grassland habitat.

f) Skylark Mitigation Plot, comprising 5.58 ha of other neutral grassland creation.

iv) The **oLEMP [EN010153/DR/7.13]** includes measures to safeguard the landscaping scheme from climate change, including climate resilient planting and regular monitoring to identify success/failure and allow replacement planting.

v) The Flood Risk Assessment (FRA) has outlined the following mitigation measures in respect to climate change (secured through the Design Parameters Document).

a) In the eastern half of the Site, within areas of the Site falling within Flood Zone 3a, all electrical infrastructure which would be vulnerable to flooding would be raised to a height of 6.52m AOD. This includes the Power Conversion Units (PCUs), standalone Inverters and Transformers, String Inverters and Junction Boxes. The base of the modules would therefore be raised to a height of approximately 2.0m above ground level, raising all of the electrical infrastructure above the design flood level and therefore enabling the Proposed Development to be resilient in the event of a 'design' flood. The Frodsham Solar Substation and BESS (both options) are sequentially located in the higher western extent of the Site and are flood free in all considered events.

b) As the proposed solar arrays will be elevated above the ground on steel frames and above flood levels, flood flows will be allowed to move freely beneath the modules and so no impediment to flood flows as a result of the Proposed Development.

c) Access roads will be formed by removing topsoil, organic soils, and filling with engineered fill. The access roads stone surface will be marginally higher than the surrounding ground, however no ground raising is proposed to facilitate the access roads. The access roads will therefore have negligible impact on flood risk.

vi) A **Framework Flood Warning & Evacuation Plan** (Appendix M of **ES Vol 2 Appendix 9-1: Flood Risk Assessment and Drainage Strategy [EN010153/DR/6.2]**) has been prepared that sets out measures for evacuating on-site workers within the Site. Post-consent, this outline plan

will be developed into a detailed plan which must be in substantial accordance with the framework. This is secured via a Requirement in Schedule 2 of the draft DCO.

Decommissioning

5.7.5 Measures to minimise the effects at the decommissioning phase are likely to be similar to those described for the Construction phase and are included in the **oDEMP [EN010153/DR/7.7]**. A full DEMP would be produced by the selected contractors that would decommission the development. This is secured via a Requirement in Schedule 2 of the draft DCO and would be prepared prior to the start of decommissioning. The DEMP would be in substantial accordance with the **oDEMP [EN010153/DR/7.7]**.

5.8 Assessment of Likely Impacts and Effects

Climate Resilience

5.8.1 The resilience to climate change has been assessed for the following vulnerable receptors during the Operational Phase of the Proposed Development:

i) Operational equipment (solar PV modules, BESS, PCS, substation, and cabling)
ii) Vehicular access to Site;
iii) On-site workers;
iv) Members often public accessing the permissive paths within the Site; and
v) Habitats.

5.8.2 The following climate change effects have been assessed:

i) Increase in winter precipitation;
ii) Decrease in summer precipitation;
iii) Increase in summer temperatures;
iv) Increased frequency and magnitude of wind and storms;
v) Changes in cloud cover; and
vi) Sea level rise.

5.8.3 Full details of the assessment for each receptor can be found in **ES Vol 2 Appendix 5-3: Climate Change Resilience [EN010153/DR/6.2]**. For each receptor and climate change effect the following has been provided:

i) a description of how the projected change in climate could affect the receptor;
ii) the sensitivity of the receptor to the effect taking into account the value, susceptibility and vulnerability;

iii) the magnitude of the impact taking into account the probability of the projected change in climate, and the consequence taking account of any mitigation measures in place; and

iv) the resultant significance of the effect.

5.8.4 A summary of this analysis is provided in Table 5-13.

Table 5-13 – Summary of climate resilience assessment

Predicted change in climate	Effect	Value	Vulnerability	Susceptibility	Sensitivity	Probability	Magnitude of effect	Overall Significance
Increased winter precipitation								
Operational equipment	Flood damage to operational equipment	High	Moderate	Low	Medium	Low	Small	Slight
Vehicular access to Proposed Development	Flood damage resulting in disruption to access	High	Moderate	Low	Medium	Medium	Small	Slight
On-site workers	Not likely to affect receptor	-	-	-	-	-	-	-
Members of the public accessing permissive paths on-site	Dangerous conditions	High	Moderate	Low	Medium	Low	Small	Slight
Habitats	Damage to and loss of habitat	Medium	Moderate	Low	Medium	Low	Small	Slight
Decreased summer precipitation								
Operational equipment	Cleaning of operational equipment	High	Low	Low	Low	Low	Small	Negligible
Vehicular access to Proposed Development	Not likely to affect receptor	-	-	-	-	-	-	-
On-site workers	Not likely to affect receptor, water supplier include mitigation to ensure a supply for welfare facilities	-	-	-	-	-	-	-
Members of the public accessing permissive paths on-site	Not likely to affect receptor	-	-	-	-	-	-	-
Habitats	Damage to and loss of habitat	Medium	Moderate	Moderate	Medium	Medium	Small	Slight
Increases in summer temperatures								
Operational equipment	Damage to equipment	High	Moderate	Low	Low	Low	Small	Negligible
Vehicular access to Proposed Development	Not likely to affect receptor	-	-	-	-	-	-	-
On-site workers	Dangerous working conditions	High	Moderate	Low	Medium	Low	Small	Slight
Members of the public accessing permissive paths on-site	Not likely to affect receptor	-	-	-	-	-	-	-
Habitats	Damage to and loss of habitat	Medium	Moderate	Moderate	Medium	Medium	Small	Slight
Increased frequency and magnitude of wind and storms								
Operational equipment	Damage to equipment	High	Moderate	Moderate	Medium	Low	Small	Slight

Predicted change in climate	Effect	Value	Vulnerability	Susceptibility	Sensitivity	Probability	Magnitude of effect	Overall Significance
Vehicular access to Proposed Development	Fallen trees resulting in disruption to access	High	Moderate	Low	Medium	Medium	Small	Slight
On-site workers	Increased risk of hazards and dangerous working conditions	High	Moderate	Low	Medium	Low	Small	Slight
Members of the public accessing permissive paths on-site	Dangerous conditions	High	Moderate	Low	Medium	Low	Small	Slight
Habitats	Not likely to affect receptor	-	-	-	-	-	-	-
Changes in cloud cover								
Operational equipment	Damage to equipment	High	Low	Low	Medium	Medium	Small	Slight
Vehicular access to Proposed Development	Not likely to affect receptor	-	-	-	-	-	-	-
On-site workers	Dangerous working conditions	High	Moderate	Low	Medium	Low	Small	Slight
Members of the public accessing permissive paths on-site	Not likely to affect receptor							
Habitats	Not likely to affect receptor	-	-	-	-	-	-	-
Sea level rise								
Operational equipment	Flood damage to operational equipment	High	Moderate	Low	Medium	Low	Small	Slight
Vehicular access to Proposed Development	Flood damage resulting in disruption to access	High	Moderate	Low	Medium	Low	Small	Slight
On-site workers	Not likely to affect receptor	-	-	-	-	-	-	-
Members of the public accessing permissive paths on-site	Dangerous conditions	High	Moderate	Low	Medium	Low	Small	Slight
Habitats	Not likely to affect receptor	-	-	-	-	-	-	-

5.8.5 This analysis shows that the overall effect of climate change is negligible to slight, which is not significant. Therefore, it is considered that the Proposed Development is resilient to the effects of climate change.

GHG Emissions

5.8.6 Full details of the inputs into the GHG emissions calculation can be found in **ES Vol 2 Appendix 5-1: GHG Assessment [EN010153/DR/6.2]**. The calculated GHG emissions over the lifetime of the Proposed Development are shown in Table 5-14.

Table 5-14 – GHG emissions over the lifetime of the Proposed Development

Source of GHG emissions	Value (tCO_2e)
Construction	
1. Raw material extraction and manufacturing of products required for the Proposed Development and transportation of raw materials to the place of manufacturing	154,225
2. Transportation of manufactured equipment and materials to the Proposed Development	10,002
3. Transportation of construction materials (where not included in the product-stage embodied GHG emissions)	500
4. On-site construction activities	2,352
5. Travel of construction workers	334
6. Loss of peat	-
7. Energy consumption from the provision of clean water and treatment of wastewater during construction	1.03
Total Construction Phase	**167,414**
Operation	
1. Energy consumption from provision of clean water and treatment of wastewater during operation	2.24
2. Leakage of GHGs	-
3. Energy generated	-
4. Energy consumption, replacement of equipment and material and waste generation from ongoing maintenance on-site	234,001
5. Travel of workers during operation	1,097
Total Operational Emissions	**235,100**
Decommissioning	

Source of GHG emissions	Value (tCO_2e)
1. On-site decommissioning activities	683
2. Transportation and disposal of waste materials	1,358
3. Travel for workers during decommissioning	334
4. Energy consumption from the provision of clean water and treatment of wastewater during decommissioning	1.03
Total Decommissioning Phase	**2,377**
Total lifetime emissions	**404,891**

5.8.7 As shown, the total emissions over the lifetime of the Proposed Development are predicted to be 404,891 tCO_2e.

Carbon Budgets

5.8.8 The GHG emissions from the Proposed Development have been compared to the carbon budgets for the UK and for Cheshire West and Chester. Table 5-15 provides a summary of the calculated direct GHG emissions for the Proposed Development in relation to the budget of Cheshire West and Chester and Table 5-16 provides a summary of the calculated GHG emissions for the Proposed Development in relation to the UK's carbon budgets. In both tables, the GHG emissions have been calculated for each budget period and compared to the budget. This does not include any offset due to the displacement of alternative forms of electricity generation.

Table 5-15 – Comparison of net direct GHG emissions with Cheshire West and Chester Carbon Budgets

Budget period	Budget (Mt CO_2e)	Calculated net direct emissions associated with the Proposed Development in budget period	
		t CO_2e	as % of budget
2023-2027	8.1	66,966	0.83%
2028-2032	3.8	105,940	2.79%
2033-2037	1.8	7,844	0.44%
2038-2042	0.8	26,231	3.28%
Note: 1 Mt = 1,000,000 tonnes.			

Table 5-16 – Comparison of net GHG emissions with the UK's Carbon Budgets

Budget period	Budget (Mt CO_2e)	Calculated net emissions associated with Proposed Development in budget period	
		t CO_2e	as % of budget
2023-2027	1,950	66,966	0.0034%
2028-2032	1,725	105,940	0.0061%
2033-2037	965	7,844	0.0008%
2038-2042	535	26,231	0.0049%
Note: 1 Mt = 1,000,000 tonnes.			

5.8.9 As shown, the Proposed Development makes up a very small contribution (0.0034%) of the UK carbon budget for 2023 to 2027 and 0.83 % of the Cheshire West and Chester carbon budget predominantly due to the embodied emissions during construction. Given that the Proposed Development is to provide low carbon electricity to the UK and not just the local area it is considered more appropriate to compare the GHG emissions to the UK carbon budgets. It is also noted that the GHG emissions associated with the Decommissioning Phase are uncertain. The GHG emissions associated with recycling and landfill of the equipment have been taken as the current levels, but it is likely that these will reduce as energy decarbonises because energy emissions make up a great proportion of these GHG emissions.

5.8.10 The above analysis does not consider that when operating (from 2029), i.e. following the first carbon budget (2023-2027), the Proposed Development will produce low carbon electricity which will offset alternative forms of electricity generation. Therefore, the Proposed Development will have beneficial impacts which have not been captured in the above analysis.

Offset GHG emissions

5.8.11 The offset GHG emissions from the Proposed Development will range depending on what method of electricity generation the Proposed Development is displacing.

5.8.12 Displacement of gas-fired power stations has been considered as electricity generated by solar currently displaces electricity generated from gas-fired

power stations (Emission factor of 375 gCO_2e/kWh from the Fuel Mix Disclosure Table) (i.e. the current long-run marginal electricity generation in the UK) and the purpose of the Proposed Development is to support government policy by replacing fossil fuel power stations.

5.8.13 As gas-fired power stations only make up a proportion of the grid mix, the reported GHG intensity of the grid from the government's Fuel Mix Disclosure Table[xxxi] for the period April 2023 to March 2024 (Emission factor of 171 gCO_2e/kWh) has also been considered as a comparator to calculate the offset emissions over the lifetime of the Proposed Development.

5.8.14 Based on the generating capacity of 147 MW, the Proposed Development is expected to produce 7,549,802 MWh electricity for export to the local distribution network or local businesses via the Private Wire Connection over its lifetime. The GHG emissions offset over the lifetime of the Proposed Development has been calculated using each comparator as outlined in Table 5-17.

Table 5-17 – Offset emissions

Comparator	Emission factor (gCO_2e/kWh)	Offset over lifetime (tCO_2e)
Gas-fired power station (current long-run marginal generator)	375	2,831,176
Grid average – 2023/2024	171	1,291,016

5.8.15 As shown, the Proposed Development will offset between ~1,291,016 and ~2,831,176 tCO_2e over its lifetime, depending upon the displacement factor applied.

5.8.16 Whilst current planning policy (NPS EN-1) requires new commercial scale combustion power stations to be constructed Carbon Capture Ready, this does not apply to existing combustion power stations. Furthermore, the need to construct a power station Carbon Capture Ready does not guarantee that the infrastructure would be in place for carbon capture to be undertaken at all

new facilities by 2035. The reality is that in the opening year and by 2035 it is likely that unabated CCGT plants will still be operating, so new renewable generating schemes which become operational from 2035 (or earlier) would displace the power these unbated CCGTs generate. As such comparison to unabated CCGT is of relevance, when looking at the opening year of the Proposed Development and the near future.

5.8.17 Table 5-17 provides comparisons against the predicted future grid mix to set the GHG emissions from the Proposed Development in the context of the likely grid mix over the Proposed Development's lifetime. However, in reality this is not reporting offset CO_2 as the Proposed Development is part of the solution to achieving the policy outcome of reaching a future decarbonised grid.

GHG Intensity

5.8.18 The GHG intensity has been calculated for the lifetime of the Proposed Development and the Operational Phase of the Proposed Development for comparison with published values.

5.8.19 As the Proposed Development is expected to produce 7,549,802 MWh electricity for export to the national grid or private wire, the GHG intensity of the electricity generated over the lifetime of the Proposed Development is 53.6 gCO_2e/kWh. Table 5-18 sets out the GHG intensity of other forms of electricity generation from the CCCs report titled: *"Reducing the UK's carbon footprint"*[xxxii]. This includes the full life-cycle GHG emissions associated with each type of technology. This differs from the DESNZ fuel mix disclosure table as this is associated with GHG emissions associated with the production of power i.e. not the full lifecycle GHG emissions.

Table 5-18 – Comparison of energy intensities of various forms of energy generation

Form of energy generation	GHG Intensity (gCO_2e/kWh)
Combined Cycle Gas Turbine (CCGT) – current long-run marginal generator	380 to 500
Gas with carbon capture and storage (CCS)	90 to 245

Form of energy generation	GHG Intensity (gCO_2e/kWh)
Nuclear	5 to 55
Offshore wind	5 to 24
Onshore wind	7 to 20
Solar PV	20 to 85

5.8.20 As shown, the GHG intensity of the Proposed Development is in line with the estimates from the literature and has a much lower GHG intensity than the current long-run marginal generator, which the electricity generated by the Proposed Development will displace. Additionally, the Proposed Development has a much lower GHG intensity than CCGT with CCS, despite CCS capturing carbon dioxide from the combustion process.

5.8.21 To enable a comparison with the GHG intensity of the current grid (only considering operational emissions i.e. not full life-cycle GHG emissions) and the DESNZ Green Book projections, the average operational GHG intensity of the Proposed Development has been calculated by dividing the total operational GHG emissions by the total energy generation of the Proposed Development. The operational GHG intensity of the Proposed Development is 0.000297 gCO_2e/kWh which is well below the 2024 GHG intensity of the current grid (171 gCO_2e/kWh) as per the UK government's Fuel Mix Disclosure Table for the period April 2023 to March 2024 and well below the projected GHG intensity of the grid over the whole operational life of the Proposed Development as per the long-run marginal generation-based electricity emission factors from DESNZ. For example, the long-run marginal generation-based electricity emission factor from DESNZ at 2070 (the decommissioning year within the assessment) is 2 gCO_2/kWh which is still well above the calculated operational GHG intensity of the Proposed Development. It must be noted that construction, replacement of parts, and decommissioning has not been included within this calculation to allow for a like-for-like comparison with the UK Government's Fuel Mix Disclosure Table

and DESNZ's long-run marginal generation-based electricity emission factors which only relate to generator emissions in the operational phase.

5.8.22 Both the GHG intensity of the Proposed Development and the GHG intensity of the Operational Phase of the Proposed Development show that low-carbon energy generation projects such as the Proposed Development, are essential to reduce the GHG intensity of the grid in line with the projections.

Change in land use

5.8.23 The Proposed Development will cause the land use to change. The Site currently comprises a mixture of agricultural (both arable and grazing) and drained marsh land, approximately half of which comprises former Manchester Ship Canal Dredging Deposit Grounds. The Works Area is 2.6 ha will be impermeable but, the majority of the Site will remain permeable, with land beneath the solar PV modules retained as grassland. A report from Natural England titled: "*Carbon Storage and Sequestration by Habitat 2021 (NERR094)*"[xxxiii] (hereafter referred to as the 'Natural England Report 2021') shows that the net carbon of undisturbed semi-natural grassland under long-term management is negligible whereas agricultural land has a net carbon burden. The drained marshland would have a similar negligible net carbon burden as semi-natural grassland under long-term management. Therefore, the land use change associated with the Proposed Development will be an additional net carbon benefit.

Summary of GHG Assessment

5.8.24 The Proposed Development has a predicted carbon burden during the construction phase of ~167,414 tCO_2e, with greatest emissions associated with the embodied emissions (i.e. those resulting from the raw material extraction and manufacturing of products required for the Proposed Development and transportation of raw materials to the place of manufacturing), contributing 0.0034% to the UK's carbon budget for 2023 to 2027 and 0.83% of the Cheshire West and Chester carbon budget.

5.8.25 The Proposed Development produces ~235,100 tCO_2e during the operational phase, with greatest emissions associated with the energy consumption, replacement of equipment and material and waste generation from ongoing maintenance on-site. The operational phase will contribute 0.0061%, 0.0008%, and 0.0049% to the UK's carbon budget for 2028-2032, 2033-2037, and 2038-2042 respectively; and 2.79%, 0.44%, and 3.28% of the Cheshire West and Chester carbon budget for 2028-2032, 2033-2037, and 2038-2042 respectively. The Proposed Development has a greater contribution to the 7th carbon budget because, during this period, there is a scheduled replacement of the batteries on-site. However, the Proposed Development will offset between ~1,291,016 and ~2,831,176 tCO_2e over its lifetime.

5.8.26 The Proposed Development has a predicted carbon burden during the decommissioning phase of ~2,377 tCO_2e, with greatest emissions associated with the transport and disposal of waste materials.

5.8.27 The land use change from agricultural and drained marshland to undisturbed semi-natural grassland will be an additional net carbon benefit that has not been quantified to the Proposed Development.

5.8.28 The lifetime GHG intensity of the electricity generated is in line with the values stated in literature for other solar projects. The average operational GHG intensity of the Proposed Development is much lower than the GHG intensity of electricity generation using fossil fuels, the current grid mix and the projected grid mix.

5.8.29 The Proposed Development provides low carbon electricity to the national grid and supports the UK Governments goal for all electricity to come from low carbon sources by 2035, and indeed the incoming government's plan that this is achieved by 2030. Without low-carbon energy generation projects such as the Proposed Development, the GHG intensity of the grid will not be able to decrease in line with the projections. Therefore, the Proposed Development is fully consistent with existing and emerging policy requirement and fully in line with measures necessary to achieve the UK's trajectory towards net zero.

As such the Proposed Development is considered to have a beneficial effect. This is a significant effect.

5.9 Additional Mitigation, Enhancement and Monitoring

Climate Resilience

5.9.1 This assessment has identified the Proposed Development is resilient to the effects of climate change therefore no additional mitigation is required.

GHG Emissions

5.9.2 This assessment has identified that the Proposed Development is considered to have a beneficial effect and is fully in line with measures necessary to achieve the UK's trajectory towards net zero and therefore no additional mitigation is required.

5.10 Residual Effects

Climate Resilience

5.10.1 The resilience of the Proposed Development to the effects of climate change has been considered with reference to the effects on operational equipment; vehicular access to Site; on-site workers; members of the public using permissive paths within the Site; and habitats. The level of effect has been assessed to be negligible to slight, which is not significant. Therefore, it is considered that the Proposed Development is resilient to the effects of climate change.

GHG Emissions

5.10.2 The GHG emissions from the Proposed Development have been calculated within the GHG Assessment. The Proposed Development has a net carbon benefit over its lifetime and is fully consistent with existing and emerging policy requirements and fully in line with measures necessary to achieve the UK's trajectory towards net zero. Therefore, it is considered the Proposed Development has a beneficial effect on climate change. This is a significant effect.

5.11 In-Combination Climate Change Impacts

5.11.1 The ICCI consider the extent to which climate change exacerbates or ameliorates the potential effects identified within each of the technical assessments presented in each of the following technical chapters:

i) **ES Vol 1 Chapter 6: Landscape and Visual Amenity [EN010153/DR/6.1]**;
ii) **ES Vol 1 Chapter 7: Terrestrial Ecology [EN010153/DR/6.1]**;
iii) **ES Vol 1 Chapter 8: Ornithology [EN010153/DR/6.1]**;
iv) **ES Vol 1 Chapter 9: Flood Risk, Drainage and Surface Water [EN010153/DR/6.1]**;
v) **ES Vol 1 Chapter 10: Ground Conditions [EN010153/DR/6.1]**;
vi) **ES Vol 1 Chapter 11: Cultural Heritage [EN010153/DR/6.1]**; and
vii) **ES Vol 1 Chapter 12: Tourism and Recreation [EN010153/DR/6.1]**.

5.11.2 The ICCI Assessment is presented in **ES Vol 2 Appendix 5-4: In-combination Climate Change Impacts Assessment [EN010153/DR/6.2]**.

5.11.3 The ICCI Assessment found climate change has the potential to exacerbate and/or ameliorate the potential effects identified within the technical chapters. However, the mitigation measures outlined in the technical chapters remain effective in the context of anticipated climate change scenarios.

5.12 Cumulative Effects

5.12.1 In terms of cumulative effects with other developments, the Proposed Development's resilience to climate change will not be impacted by other projects, on the basis that climate change adaptation effects and impacts are specific to the Proposed Development and will not result in impacts to neighbouring development. This position is supported by the IEMA Climate Change Resilience Guidance.

5.12.2 In terms of cumulative effects with other developments, as the impact of GHG emissions is on a global scale rather than affecting one localised area, the approach to cumulative assessment differs from that for many other environmental topics. Therefore, rather than assessing impacts in combination with other local developments, the Proposed Development's contribution to carbon budgets has been determined instead as set out in Section 5.8. This position is supported by the IEMA GHG Guidance and case law as an appropriate approach. This demonstrates that the Proposed Development will make a very minor contribution to the local and UK's carbon budgets and would provide low carbon electricity which would displace more carbon intensive forms of electricity generation.

5.13 Conclusions

5.13.1 This climate change assessment has been produced as part of the ES for the Proposed Development. The assessment has considered the resilience of the Proposed Development to the projected changes in climate, the impact of the Proposed Development on climate change and measures taken to mitigate the impacts.

5.13.2 The resilience of the Proposed Development to the effects of climate change has been assessed to be negligible to slight, which is not significant. Therefore, it is considered that the Proposed Development is resilient to the effects of climate change and no additional mitigation measures are recommended.

5.13.3 The Proposed Development has a beneficial effect on climate change which is a significant effect. This is because the Proposed Development's net GHG impacts are below zero as it causes a reduction in atmospheric GHG concentration indirectly through offsetting other more carbon intensive methods of electricity generation. Additionally, the Proposed Development substantially exceeds net zero requirements and has a positive climate impact.

5.14 References

[i] United Nations (1998). *Kyoto Protocol to the United Nations Framework Convention on Climate Change.* Available at: https://unfccc.int/resource/docs/convkp/kpeng.pdf [Last Accessed: 16 September 2024]

[ii] United Nations (2015). *The Paris Agreement*. Available at: https://unfccc.int/process-and-meetings/the-paris-agreement. [Last Accessed: 16 September 2024]

[iii] H.M Government (2017). *The Infrastructure Planning (Environmental Impact Assessment (EIA) Regulations 2017*. Available at: https://www.legislation.gov.uk/uksi/2017/571/contents/made [Last Accessed: 16 September 2024]

[iv] H.M Government (2008). *Climate Change Act 2008*. Available at: https://www.legislation.gov.uk/ukdsi/2019/9780111187654#:~:text=The%20 amendment%20 in%20 this%20 Order,from%2080%25%20 to%20100%25 [Last Accessed: 16 September 2024]

[v] H.M Government (2008). *Climate Change Act 2008 (2050 Target Amendment) Order 2019*. Available at: https://www.legislation.gov.uk/ukdsi/2019/9780111187654 [Last Accessed: 16 September 2024]

[vi]H.M Government (2009). *The Carbon Budgets Order 2009*. Available at: https://www.legislation.gov.uk/uksi/2009/1259/contents/made [Last Accessed: 16 September 2024]

[vii] H.M Government (2011). *The Carbon Budget Order 2011*. Available at: https://www.legislation.gov.uk/uksi/2011/1603/made#:~:text=This%20Order%20sets%20the%20carbon,the%20Climate%20Change%20Act%202008 [Last Accessed: 16 September 2024]

[viii] H.M. Government (2016). *The Carbon Budget Order 2016*. Available at: https://www.legislation.gov.uk/uksi/2016/785/contents/made. [Last Accessed: 16 September 2024]

[ix] H.M Government (2021) *The Carbon Budget Order 2021*. Available at: https://www.legislation.gov.uk/ukdsi/2021/9780348222616. [Last Accessed: 16 September 2024]

[x] Climate Change Committee. (2019*). Net Zero – The UK's contribution to stopping global warming*. Available at: https://www.theccc.org.uk/publication/net-zero-the-uks-contribution-to-stopping-global-warming/ [Last Accessed: 16 September 2024]

[xi] Climate Change Committee. (2025). *The Seventh Carbon Budget Advice for the UK Government.* Available at: https://www.theccc.org.uk/publication/the-seventh-carbon-budget/ [Last Accessed: 23 April 2025].

[xii] Climate Change Committee. (2024). Independent Assessment of the Third National Adaptation Programme. Available at: https://www.theccc.org.uk/publication/independent-assessment-of-the-third-national-adaptation-programme/ . [Last Accessed: 16 September 2024].

[xiii] Department for Energy Security & Net Zero (2023). *Overarching National Policy Statement for Energy (EN-1)*. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1147380 /NPS_EN-1.pdf. [Last Accessed: 16 September 2024]

[xiv] Department for Energy Security & Net Zero (2023). *National Policy Statement for Renewable Energy Infrastructure (EN-3)*. Available at:

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1147382/NPS_EN-3.pdf. [Last Accessed: 16 September 2024]

[xv] Department for Energy Security & Net Zero (2023). *National Policy Statement for Electricity Networks Infrastructure (EN-5)*. Available at: https://assets.publishing.service.gov.uk/media/65a78a5496a5ec000d731abb/nps-electricity-networks-infrastructure-en5.pdf. [Last Accessed: 16 September 2024]

[xvi] Department for Levelling Up, Housing and Communities (2025). *National Planning Policy Framework*. Available at: https://assets.publishing.service.gov.uk/media/67aafe8f3b41f783cca46251/NPPF_December_2024.pdf [Last Accessed: 24 March 2025]

[xvii] Department for Levelling Up, Housing and Communities and Ministry of Housing, Communities & Local Government (2019). *Planning Practice Guidance for Climate Change* (2019 update). Available at: https://www.gov.uk/guidance/climate-change. [Last Accessed: 16 September 2024]

[xviii] Cheshire West and Chester Council (2015). *Cheshire West and Chester Local Plan (Part One) Strategic Policies*. Available at: https://consult.cheshirewestandchester.gov.uk/kse/event/24907/section/3252243 [Last Accessed: 16 September 2024]

[xix] Cheshire West and Chester Council (2019). *Cheshire West and Chester Local Plan (Part Two) Land Allocations and Detailed Policies.* Available at: https://consult.cheshirewestandchester.gov.uk/kse/event/34617/section/s1561545628426#s1561545628426 [Last Accessed: 16 September 2024]

[xx] Cheshire West and Chester Council (2024). *Cheshire West and Chester Climate Emergency Response Plan (2024 update).* Available at: https://www.cheshirewestandchester.gov.uk/asset-library/the-climate-emergency/appendix-2-cwc-climate-emergency-response-plan-2024-update.pdf [Last Accessed: 04 April 2024]

[xxi] Cheshire West and Chester Council (2023). *Cheshire West and Chester Review of Progress against the Climate Emergency Response Plan and Carbon Management Plan meeting minutes.* Available at: https://www.cheshirewestandchester.gov.uk/asset-library/the-climate-emergency/climate-change-council-annual-report-2023.pdf [Last Accessed: 16 September 2024]

[xxii] Ince Neighbourhood 2023-2030 (2023). *Ince Neighbourhood Plan.* Available at: https://consult.cheshirewestandchester.gov.uk/kse/event/37582 [Last Accessed: 04 April 2024]

[xxiii] Frodsham Neighbourhood Plan 2024. *Frodsham Neighbourhood Plan*

[xxiv] IEMA (2022). *Assessing Greenhouse Gas Emissions and Evaluating their Significance*. Available at: https://www.iema.net/preview-document/assessing-greenhouse-gas-emissions-and-evaluating-their-significance. [Last Accessed 16 September 2024].

[xxv] IEMA (2020). *Environmental Impact Assessment Guide to Climate Change Resilience and Adaption*. [Last Accessed 16 September 2024].

[xxvi] Met Office (2023). *UK Climate Averages: Hawarden*. Available at: https://www.metoffice.gov.uk/research/climate/maps-and-data/uk-climate-averages [Last Accessed: 16 September 2024

[xxvii] Met Office (2016). *North West England and the Isle of Man: climate*. Available at: https://www.metoffice.gov.uk/binaries/content/assets/metofficegovuk/pdf/weather/learn-about/weather/regional-climates/north-west-england--isle-of-man_-climate-met-office.pdf. [Last Accessed: 16 September 2024].

[xxviii] Institute of Circular Ecology (2024). *Embodied Carbon Database v4.0*. Available at: https://circularecology.com/embodied-carbon-footprint-database.html [Last Accessed: 18 April 2025]

[xxix] DESNZ. (2024). *Greenhouse gas reporting: conversion factors 2024*. Available at: https://www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2024 [Last Accessed 16 September 2024].

[xxx] The University of Manchester, Tyndall Centre for Climate Change Research. (2024*). Tyndall Carbon Budget Reports.* Available at: https://carbonbudget.manchester.ac.uk/ [Last Accessed 02 September 2024].

[xxxi] DESNZ. (April 2025). Fuel mix disclosure data table. Available at: https://www.gov.uk/government/publications/fuel-mix-disclosure-data-table/fuel-mix-disclosure-data-table [Last Accessed: 24 April 2025].

[xxxii] Committee on Climate Change. (2013). *Reducing the UK's carbon footprint*. Available at: https://www.theccc.org.uk/wp-content/uploads/2013/04/Reducing-carbon-footprint-report.pdf [Last Accessed: 13 September 2024].

[xxxiii] Natural England. (2021). *Carbon Storage and Sequestration by Habitat 2021 (NERR094).* Available at: https://publications.naturalengland.org.uk/publication/5419124441481216 [Last Accessed 02 September 2024].