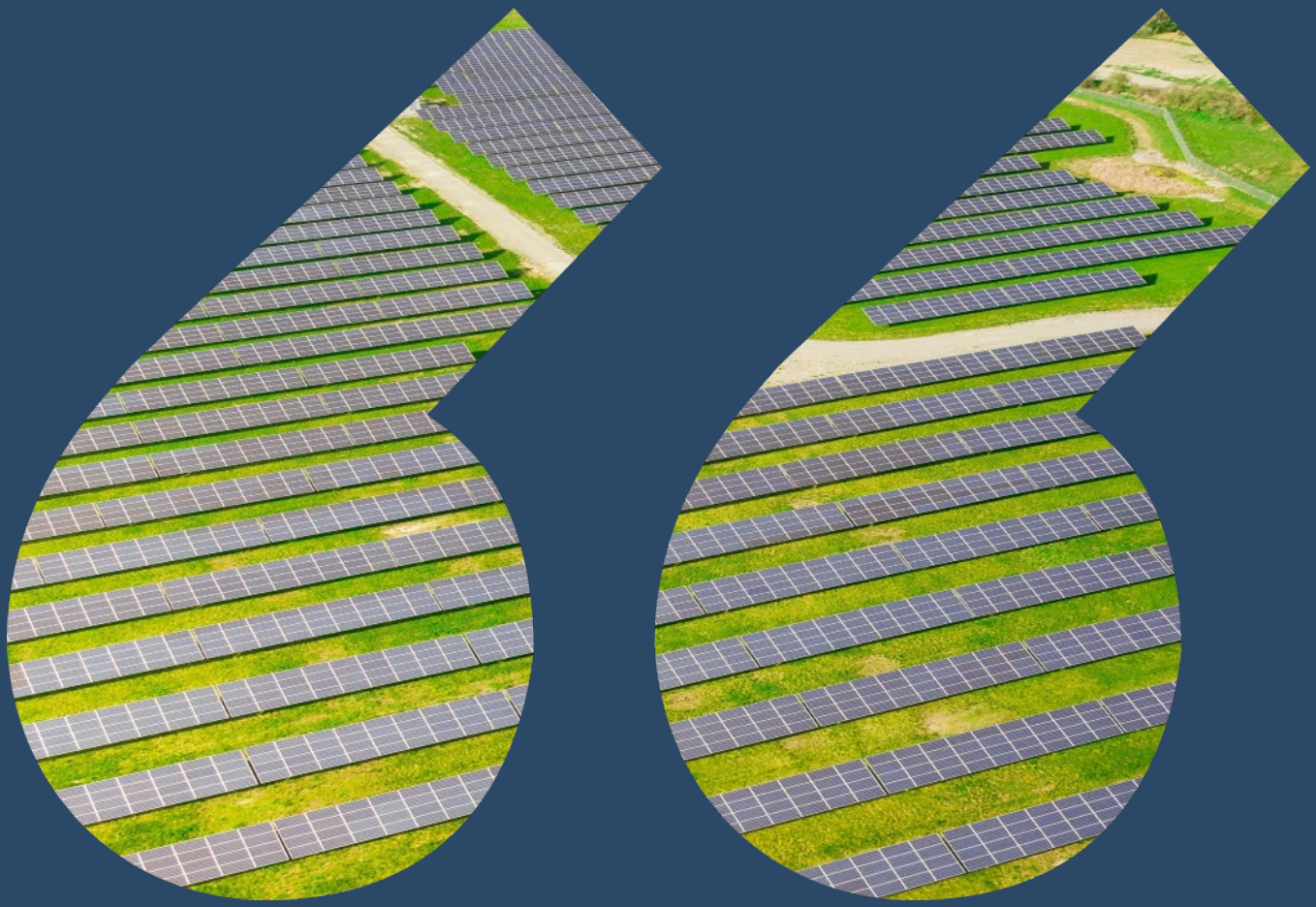

MERIDIAN SOLAR FARM
PEIR VOLUME I CHAPTER 5: CLIMATE CHANGE

Meridian Solar

5. Climate Change

5.1. Introduction

5.1.1. This chapter of the Preliminary Environmental Information Report (PEIR) presents the preliminary findings of the assessment of potential Climate Change effects associated with the Scheme. Specifically, the chapter assesses the vulnerability of the Scheme to physical Climate Change risks, the effect of green house gas (GHG) emissions associated with the development of the Scheme, and effects of Climate Change on relevant environmental receptors within the study area.

5.1.2. This chapter should be read in conjunction with the Scheme description provided in PEIR Volume I Chapter 2: The Scheme. Additionally, elements of Climate Change interface with the water environment and as such, should be considered alongside PEIR Volume I Chapter 8: Hydrology, Flood Risk and WFD.

5.1.3. This chapter is supported by the following technical appendices:

- PEIR Volume III Appendix 6-1: Climate Change Risk Assessment; and
- PEIR Volume III Appendix 6-2: In-Combination Climate Change Impact Environmental Technical Discipline Risk Assessment.

5.1.4. In line with the requirements of The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017[1], consideration has been given to the following aspects of Climate Change assessment:

- Lifecycle GHG impact assessment: the climate impact of GHG emissions arising from the Scheme over its design life;
- Climate Change Risk Assessment (CCRA): the resilience of the Scheme to future Climate Change impacts, including damage to the Scheme as a result of Climate Change; and
- In-Combination Climate Change Impact (ICCI) assessment: an ICCI assessment identifies how the resilience of receptors in the surrounding environment are affected by the combined impact of future climate conditions and the Scheme. Relevant technical disciplines have identified potential receptors, such as workforce, biodiversity and local communities.

[1] His Majesty's Stationary Office (HMSO) (2017). *The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017*. Available at:https://www.legislation.gov.uk/uksi/2017/572/contents/made.

5.2. Legislation, Policy and Guidance

Legislation

Climate Change Act 2008[2]

5.2.1. The Climate Change Act 2008[2] established a binding target for the UK to reduce greenhouse gas emissions by at least 80% from 1990 levels by 2050.

The Carbon Budgets Order 2009[3]*, 2011*[4]*, 2016*[5] *and 2021*[6]

5.2.2. This target is reinforced by a series of legally binding five-year "carbon budgets" that limit GHG emissions over specific periods, with oversight by an independent advisory body, the Climate Change Committee (CCC).

The Glasgow Climate Pact 2021[7]

5.2.3. The Glasgow Climate Pact[7] was agreed at the 26th United Nations Climate Change Conference of the Parties (COP26) in 2021, building on the Paris Agreement. It called for accelerated actions from signatories to limit global temperature rise to 1.5°C, with a focus on phasing down coal and fossil fuel subsidies, ramping up adaptation efforts, and doubling climate finance to support developing nations in adaptation and mitigation.

UK Nationally Determined Contribution (2020, updated September 2022)[8]

5.2.4. In 2020, the UK submitted an updated Nationally Determined Contributions (NDC[8]**Error! Bookmark not defined.**) to the United Nations Framework Convention on Climate Change (UNFCCC), committing to a reduction of GHG emissions by at least 68% by 2030 relative to 1990 levels.

The Infrastructure Planning (Environmental Impact Assessment (EIA)) Regulations 2017: Section 5(2) and Schedule 4, clauses 4 and 5[9]

5.2.5. The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017: Section 5(2) and Schedule 4, clauses 4 and 5[9] sets out that an EIA should describe and assess (in an appropriate manner and in light of each individual case) the direct and indirect significant effects of the Scheme on the climate.

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[2] *Climate Change Act 2008*. Available at: https://www.legislation.gov.uk/ukpga/2008/27/contents.

[3] HMSO (2009). *The Carbon Budgets Order 2009*. Available at: https://www.legislation.gov.uk/uksi/2009/1259/contents/made.

[4] HMSO (2011). *The Carbon Budget Order 2011*. Available at: https://www.legislation.gov.uk/uksi/2011/1603/made.

[5] HMSO (2016). *The Carbon Budget Order 2016*. Available at: https://www.legislation.gov.uk/uksi/2016/785/contents/made.

[6] HMSO (2021). *The Carbon Budget Order 2021*. Available at: https://www.legislation.gov.uk/uksi/2021/750/contents/made.

[7] UNFCCC (2021) The Glasgow Climate Pact 2021. Available at: https://unfccc.int/process-and-meetings/the-paris-agreement/the-glasgow-climate-pact-key-outcomes-from-cop26

[8] UNFCCC (2022). *UK's Nationally Determined Contribution*. Available at: https://unfccc.int/sites/default/files/NDC/2022-09/UK%20NDC%20ICTU%202022.pdf.

[9] *The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017*. Available at: https://www.legislation.gov.uk/uksi/2017/572/contents/made.

National Policy

Overarching National Policy Statement for Energy (EN-1) (November 2023)[10]

5.2.6. Regarding Climate Change Adaptation and Resilience, the overarching National Policy Statement for Energy (EN-1)[10], outlines within paragraph 4.10.5, that "*In certain circumstances, measures implemented to ensure a scheme can adapt to climate change may give rise to additional impacts, for example as a result of protecting against flood risk, there may be consequential impacts on coastal change. In preparing measures to support climate change adaptation applicants should take reasonable steps to maximise the use of nature-based solutions alongside other conventional techniques.*"

5.2.7. Furthermore, paragraph 4.10.6 states that "*Integrated approaches, such as looking across the water cycle, considering coordinated management of water storage, supply, demand, wastewater, and flood risk can provide further benefits to address multiple infrastructure needs, as well as carbon sequestration benefits.*"

5.2.8. Paragraph 4.10.7 outlines that, "*In addition to avoiding further GHG emissions when compared with more traditional adaptation approaches, nature-based solutions can also result in biodiversity benefits and net gain, as well as increasing absorption of carbon dioxide from the atmosphere.*"

5.2.9. Paragraph 4.10.8 continues that, "*New energy infrastructure will typically need to remain operational over many decades, in the face of a changing climate. Consequently, applicants must consider the direct (e.g. site flooding, limited water availability, storms, heatwave and wildfire threats to infrastructure and operations) and indirect (e.g. access roads or other critical dependencies impacted by flooding, storms, heatwaves or wildfires) impacts of climate change when planning the location, design, build, operation and, where appropriate, decommissioning of new energy infrastructure.*"

5.2.10. Paragraph 4.10.9 outlines that "*The ES should set out how the proposal will take account of the projected impacts of climate change, using government guidance and industry standard benchmarks such as the Climate Change Allowances for Flood Risk Assessments, Climate Impacts Tool, and British Standards for climate change adaptation, in accordance with the EIA Regulations.*"

5.2.11. Paragraph 4.10.10 continues that "*Applicants should assess the impacts on and from their proposed energy project across a range of climate change scenarios, in line with appropriate expert advice and guidance available at the time.*"

5.2.12. Paragraph 4.10.11 continues that "*Applicants should demonstrate that proposals have a high level of climate resilience built-in from the outset and should also demonstrate how proposals can be adapted over their predicted lifetimes to remain resilient to a credible*

[10] Department for Energy Security and Net Zero (2023) Overarching National Policy Statement for energy (EN-1) (E03028327). London: HMSO Available at: *https://assets.publishing.service.gov.uk/media/65bbfbdc709fe1000f637052/overarching-nps-for-energy-en1.pdf*

maximum climate change scenario. These results should be considered alongside relevant research which is based on the climate change projections."

5.2.13. Paragraph 4.10.12 reiterates that "*Where energy infrastructure has safety critical elements, the applicant should apply a credible maximum climate change scenario. It is appropriate to take a risk-averse approach with elements of infrastructure which are critical to the safety of its operation.*"

5.2.14. Paragraph 4.10.13 outlines that "*The Secretary of State should be satisfied that applicants for new energy infrastructure have taken into account the potential impacts of climate change using the latest UK Climate Projections and associated research and expert guidance (such as the EA's Climate Change Allowances for Flood Risk Assessments or the Welsh Government's Climate change allowances and flood consequence assessments available at the time the ES was prepared to ensure they have identified appropriate mitigation or adaptation measures. This should cover the estimated lifetime of the new infrastructure, including any decommissioning period.*"

5.2.15. Paragraph 4.10.14 continues that "*Should a new set of UK Climate Projections or associated research become available after the preparation of the ES, the Secretary of State (or the Examining Authority during the examination stage) should consider whether they need to request further information from the applicant.*"

5.2.16. Paragraph 4.10.15 confirms that "*The Secretary of State should be satisfied that there are not features of the design of new energy infrastructure critical to its operation which may be seriously affected by more radical changes to the climate beyond that projected in the latest set of UK climate projections, taking account of the latest credible scientific evidence on, for example, sea level rise (for example by referring to additional maximum credible scenarios – i.e. from the Intergovernmental Panel on Climate Change or EA) and that necessary action can be taken to ensure the operation of the infrastructure over its estimated lifetime.*"

5.2.17. Paragraph 4.10.16 goes on to state that "*If any adaptation measures give rise to consequential impacts (for example on flooding, water resources or coastal change) the Secretary of State should consider the impact of the latter in relation to the application as a whole and the impacts guidance set out in Part 5 of this NPS.*"

5.2.18. Paragraph 4.10.17 continues "*Any adaptation measures should be based on the latest set of UK Climate Projections, the government's latest UK Climate Change Risk Assessment, when available, and in consultation with the EA's Climate Change Allowances for Flood Risk Assessments or the Welsh Government's Climate change allowances and flood consequence assessments.*"

5.2.19. Paragraph 4.10.18 states that "*The Secretary of State may take into account reporting authorities' reports (see paragraph 4.10.3 above) to the Secretary of State when considering adaptation measures proposed by an applicant for new energy infrastructure.*"

5.2.20. Paragraph 4.10.19 concludes that "*Adaptation measures should be required to be implemented at the time of construction where necessary and appropriate to do so. However, where they are necessary to deal with the impact of climate change, and that measure would have an adverse effect on other aspects of the project and/or surrounding environment (for*

example coastal processes), the Secretary of State may consider requiring the applicant to keep the need for the adaptation measure under review, and ensure that the measure could be implemented should the need arise, rather than at the outset of the development (for example increasing height of existing, or requiring new, sea walls)."

5.2.21. Regarding Greenhouse Gas Emissions, paragraph 5.3.4 states that "*All proposals for energy infrastructure projects should include a GHG assessment as part of their ES (See Section 4.3). This should include:*

- *A whole life GHG assessment showing construction, operational and decommissioning GHG impacts, including impacts from change of land use;*
- *An explanation of the steps that have been taken to drive down the climate change impacts at each of those stages.*
- *Measurement of embodied GHG impact from the construction stage;*
- *How reduction in energy demand and consumption during operation has been prioritised in comparison with other measures.*
- *How operational emissions have been reduced as much as possible through the application of best available techniques for that type of technology.*
- *Calculation of operational energy consumption and associated carbon emissions.*
- *Whether and how any residual GHG emissions will be (voluntarily) offset or removed using a recognised framework.*
- *Where there are residual emissions, the level of emissions and the impact of those on national and international efforts to limit climate change, both alone and where relevant in combination with other developments at a regional or national level, or sector level, if sectoral targets are developed."*

5.2.22. Regarding mitigation, paragraph 5.3.5 states "*A GHG assessment should be used to drive down GHG emissions at every stage of the proposed development and ensure that emissions are minimised as far as possible for the type of technology, taking into account the overall objectives of ensuring our supply of energy always remains secure, reliable and affordable, as we transition to net zero.*"

5.2.23. Paragraph 5.3.6 goes onto state "*Applicants should look for opportunities within the proposed development to embed nature-based or technological solutions to mitigate or offset the emissions of construction and decommissioning.*"

5.2.24. Paragraph 5.3.7 continues that "*Steps taken to minimise and offset emissions should be set out in a GHG Reduction Strategy, secured under the Development Consent Order. The GHG Reduction Strategy should consider the creation and preservation of carbon stores and sinks including through woodland creation, hedgerow creation and restoration, peatland restoration and through other natural habitats.*"

5.2.25. Paragraph 5.3.8 indicates that "*The Secretary of State must be satisfied that the applicant has as far as possible assessed the GHG emissions of all stages of the development.*"

5.2.26. Paragraph 5.3.9 further implies that "*The Secretary of State should be content that the applicant has taken all reasonable steps to reduce the GHG emissions of the construction and decommissioning stage of the development.*"

5.2.27. Paragraph 5.3.10 continues that "*The Secretary of State should give appropriate weight to projects that embed nature-based or technological processes to mitigate or offset the emissions of construction and decommissioning within the proposed development. However, in light of the vital role energy infrastructure plays in the process of economy wide decarbonisation, the Secretary of State must accept that there are likely to be some residual emissions from construction and decommissioning of energy infrastructure.*"

5.2.28. Paragraph 5.3.11 states that "*Operational GHG emissions are a significant adverse impact from some types of energy infrastructure which cannot be totally avoided (even with full deployment of CCS technology). Given the characteristics of these and other technologies, as noted in Part 3 of this NPS, and the range of non-planning policies that can be used to decarbonise electricity generation, such as the UK ETS (see Section 2.4), government has determined that operational GHG emissions are not reasons to prohibit the consenting of energy projects or to impose more restrictions on them in the planning policy framework than are set out in the energy NPSs (e.g. the CCR requirements). Any carbon assessment will include an assessment of operational GHG emissions, but the policies set out in Part 2, including the UK ETS, can be applied to these emissions.*"

5.2.29. Paragraph 5.3.12 concludes that "*Operational emissions will be addressed in a managed, economy-wide manner, to ensure consistency with carbon budgets, net zero and our international climate commitments. The Secretary of State does not, therefore need to assess individual applications for planning consent against operational carbon emissions and their contribution to carbon budgets, net zero and our international climate commitments.*"

National Policy Statement for Renewable Energy Infrastructure (EN-3) (November 2023)[11]

5.2.30. The National Policy Statement for Renewable Energy Infrastructure (EN-3)[11] provides the primary policy for decisions by the Secretary of State on applications received for nationally significant renewable energy infrastructure, including solar PV generation. EN-3 contains the following provisions specific to Climate Change within the context of the Scheme:

5.2.31. Paragraph 2.4.11 states "*Solar photovoltaic (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."*

[11] *Department for Energy Security and Net Zero (2023) National Policy Statement for Renewable Energy Infrastructure (EN-3) (E03028327). London: HMSO Available at: https://assets.publishing.service.gov.uk/media/65a7889996a5ec000d731aba/nps-renewable-energy-infrastructure-en3.pdf*

National Policy Statement for Electricity Networks Infrastructure (EN-5) (November 2023)[12]

5.2.32. The National Policy Statement for Electricity Networks Infrastructure (EN-5)[12] provides the primary policy for decisions by the Secretary of State on applications received for nationally significant electricity networks infrastructure, and contains the following with regards to Climate Change:

5.2.33. Paragraph 2.3.2 states that "As climate change is likely to increase risks to the resilience of some of this infrastructure, from flooding for example, or in situations where it is located near the coast or an estuary or is underground, applicants should in particular set out to what extent the proposed development is expected to be vulnerable, 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.*

5.2.34. Paragraph 2.3.3 concludes that "*Section 4.10 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). Consideration should also be given to coastal change (see sections 5.6 in EN1).*"

National Planning Policy Framework[13]

5.2.35. The NPPF[13] outlines the Government's planning policies for England and provides guidance on their implementation. Paragraphs 150 and 153 address reducing carbon dioxide (CO_2) emissions through effective design and minimized energy use, while Paragraphs 155 to 165 focus on climate projections, flood risks, and adaptation strategies.

UK Climate Change Risk Assessment (2022)[14]

5.2.36. The UK Climate Change Risk Assessment (CCRA)[14] provides an assessment of current and future climate risks to the UK, detailing priorities for action. Development proposals

[12] *Department for Energy Security and Net Zero (2023) National Policy Statement for electricity networks infrastructure (EN-5) (E03028327). London: HMSO Available at: https://assets.publishing.service.gov.uk/media/65a78a5496a5ec000d731abb/nps-electricity-networks-infrastructure-en5.pdf*

[13] *National Planning Policy Framework (2024).* Available at: https://assets.publishing.service.gov.uk/media/675abd214cbda57cacd3476e/NPPF-December-2024.pdf

[14] DEFRA (2022) *UK Climate Change Risk Assessment*. Available at: https://www.gov.uk/government/publications/uk-climate-change-risk-assessment-2022.

should evaluate potential risks identified in the CCRA relevant to the project location and design and incorporate climate adaptation measures essential for climate resilience.

Net Zero Strategy: Build Back Greener (2020)[15]

5.2.37. The Net Zero Strategy[15] sets out policies and proposals for decarbonising all sectors of the UK economy, providing a roadmap for achieving the UK's net-zero 2050 target. One of the key policies is for the UK to be entirely powered by clean energy sources (predominantly solar and wind) by 2035.

Energy white paper: Powering our Net Zero future (2020)[16]

5.2.38. The Energy White Paper: Powering Our Net Zero Future[16] emphasises the role of renewable energy, setting the foundation for an affordable and resilient energy system by transitioning to low-carbon energy.

National Infrastructure Strategy (2020)[17]

5.2.39. In addition, the National Infrastructure Strategy[17] emphasizes the need for sustainable infrastructure that helps meet the UK's climate goals, supporting economic recovery, decarbonization, and resilience.

Powering Up Britain: Net Zero Growth Plan (2023)[18]

5.2.40. Powering Up Britain: Net Zero Growth Plan[18] specifically addresses the climate agenda by focusing on accelerating net-zero transition through renewable energy investments, energy security, and carbon reduction in line with legally binding targets.

The Seventh Carbon Budget[19]

5.2.41. In February 2025, the Climate Change Committee published The Seventh Carbon Budget, statutory report which provides advice to the UK Government on the level of the Seventh Carbon Budget (2038 to 2042).

Local Policy

- South East Lincolnshire Local Plan (SELLP) 2011-2036[20];
- Lincolnshire County Council (2020) Initial Action Plan 2020-2025[21];

[15] Department for Business, Energy and Industrial Strategy (BEIS) (2021). *Net Zero Strategy: Build Back Greener.* Available at: https://www.gov.uk/government/publications/net-zero-strategy
[16] DESNZ (2020) *Energy white paper: Powering our Net Zero future*. Available at: https://www.gov.uk/government/publications/energy-white-paper-powering-our-net-zero-future
[17] *National Infrastructure Strategy (2020).* Available at: https://www.gov.uk/government/publications/national-infrastructure-strategy
[18] DESNZ (2023) *Powering Up Britain: Net Zero Growth Plan*. Available at: https://www.gov.uk/government/publications/powering-up-britain/powering-up-britain-net-zero-growth-plan
[19] Climate Change Committee (2025). The Seventh Carbon Budget. Available at: https://www.theccc.org.uk/publication/the-seventh-carbon-budget/
[20] Lincolnshire County Council (2019) *South East Lincolnshire Local Plan 2011-2036.* Available at: https://southeastlincslocalplan.org/media/21941/South-East-Lincolnshire-Local-Plan-2011-2036/pdf/Local-Plan-text-March 2019.pdf?m=1720710748483.
[21] Lincolnshire County Council (2020) *Initial Action Plan 2020-2025*. Available at: https://www.lincolnshire.gov.uk/green-masterplan/initial-plan-2020-2025/1.

- Lincolnshire County Council (2021) Green Masterplan[22]; and
- Lincolnshire County Council (2019) Carbon Management Plan[23].

5.2.42. The SELLP[20] contains Policy 4: Approach to flood risk, Policy 5: Meeting Physical Infrastructure and Service Needs, Policy 31: Renewable and Low Energy Carbon. These policies identify the need to consider and, where appropriate, mitigate GHG emissions associated with new development. They specify that new development should aim for reduced or zero-carbon development by incorporating renewable or low-carbon energy sources and maximising energy efficiency where practicable and should build in resilience to projected Climate Change impacts.

5.2.43. Where required, relevant Neighbourhood Plans and Supplementary Planning Documents (SPDs)/Guidance (SPGs) have been considered within this Chapter. This includes the Lincolnshire County Council Initial Action Plan 2020-2025[21]; Lincolnshire County Council Green Masterplan[22]; and Lincolnshire County Council Carbon Management Plan[23].

Guidance

- Climate Change Planning Practice Guidance[24];
- Paris Agreement 2015[25];
- World Business Council for Sustainable Development and World Resources Institute GHG Protocol guidelines[26];
- Net Zero Strategy (2021)[27];
- Institute of Environmental Management and Assessment (IEMA) (2022) Environmental Impact Assessment Guide to: Assessing Greenhouse Gas Emissions and Evaluating their Significance[28];
- IEMA (2020) Environmental Impact Assessment Guide to: Climate Change Resilience and Adaptation[29]; and

[22] Lincolnshire County Council (2021) *Green Masterplan*. Available at: https://www.greaterlincolnshirelep.co.uk/documents/dan-clayton-lincolnshire-county-council-green-master-plan-09062021.
[23] Lincolnshire County Council (2019) *Carbon Management Plan*. Available at: https://lincolnshire.moderngov.co.uk/documents/s62396/Appendix+A+Carbon+Management+Plan+4+Final+version+1.1.pdf.
[24] Ministry of Housing, Communities and Local Government (2018). *Planning Practice Guidance for Climate Change (2019 update).* Available at: https://www.gov.uk/guidance/climate-change.
[25] UNFCCC (2015). *The Paris Agreement*. Available at: https://unfccc.int/sites/default/files/english_paris_agreement.pdf.
[26] World Business Council for Sustainable Development and World Resources Institute GHG Protocol guidelines. Available at: https://ghgprotocol.org/sites/default/files/standards/ghg-protocolrevised.pdf.
[27] Department for Business, Energy and Industrial Strategy (BEIS) (2021). *Net Zero Strategy: Build Back Greener*. Available at: https://www.gov.uk/government/publications/net-zero-strategy.
[28] IEMA (2022). *Environmental Impact Assessment Guide to: Assessing Greenhouse Gas Emissions and Evaluating their Significance – Second Edition*
[29] IEMA (2020). *Environmental Impact Assessment Guide to: Climate Change Resilience and Adaptation.* Available at: https://www.iema.net/resources/reading-room/2020/06/26/iema-eia-guideto-climate-change-resilience-and-adaptation-2020.

- Publicly Available Specification (PAS) 2080 (2023) Carbon Management in Buildings and Infrastructure[30].

5.2.44. The Climate Change Planning Practice Guidance[24] describes how to identify suitable mitigation and climate adaptation measures to incorporate into the planning process. The Paris Agreement[25], established within the UNFCCC, provides a global framework aimed at reducing greenhouse gas (GHG) emissions, adapting to climate impacts, and securing financing for these efforts. The World Business Council for Sustainable Development and World Resources Institute GHG Protocol[26] provides globally recognized standards for GHG accounting and reporting.

5.2.45. PAS 2080:2023[30] is a global standard for managing infrastructure carbon. It emphasizes reducing both carbon emissions and costs through intelligent design, construction, and operational practices. The entire value chain of a project is considered to optimise carbon reductions and economic efficiency.

5.2.46. The IEMA Environmental Impact Assessment Guide to: Assessing Greenhouse Gas Emissions and Evaluating their Significance[28] provides the latest guidance on evaluating and mitigating GHG emissions within EIA. IEMA Environmental Impact Assessment Guide to: Climate Change Resilience and Adaptation[29] provides a framework for the consideration of Climate Change resilience and adaptation in EIA and includes case studies of emerging good practice.

5.3. Scoping Opinion and Additional Consultation

5.3.1. To establish the methodology and approach to assessment for the Scheme, a scoping exercise was completed in Spring 2024. The results of this were formally presented within the Scoping Report submitted to the Planning Inspectorate on 30 May 2024. A summary of the Scoping Report, relevant to Climate Change, is provided in Table 5-1 below.

[30] BSI (2023). *Guidance Document for PAS 2080.* Available at: https://www.ice.org.uk/media/vm0nwehp/2023-03-29pas_2080_guidance_document_april_2023.pdf.

Table 5-1 Scope of Assessment in relation to Climate Change

Construction	Operation	Decommissioning
Scoped In Lifecycle GHG Impact Assessment The construction of the Scheme is likely to result in carbon emissions through various construction related activities. The assessment will consider embedded carbon, and emissions associated with construction site activities, waste disposal and transport. **Scoped Out** Climate Change Risk Assessment and In-Combination Climate Impacts The construction phase Climate Change adaptation effects are scoped out due to the short-term nature of the construction period, and the impacts of Climate Change not being anticipated to have significant effects in such a short period of time. In addition, any potential impacts would to be mitigated via measures included in other assessment chapters and the implementation of a Construction Environmental Management Plan. The CEMP will be submitted as part of the DCO application.	**Scoped In** Lifecycle GHG Impact Assessment For the operational phase of the Scheme, GHG emissions will arise from regulated and unregulated energy use of the Scheme, repair/refurbishment over the lifetime of the Scheme and associated infrastructure. GHG emission calculations will account for offset through the production of cleaner renewable energy compared to the grid average. Climate Change Risk Assessment and In-Combination Climate Impacts The Scheme will need to adapt and be resilient to the changing climate, including through nature-based solutions, as future climate conditions may cause significant effects in relation to risks from extreme weather (short and long term), temperature changes, precipitation, drought wind alterations and flooding. Scheme impacts of Climate Change in relation to water availability during the operational phase will be considered. **Scoped Out** Lifecycle GHG Impact Assessment Once operational, traffic generated by the Site is expected to be minimal and so associated impacts such as GHG emissions do not represent a significant risk and have therefore been scoped out.	**Scoped In** Lifecycle GHG Impact Assessment The decommissioning of the Scheme is likely to result in carbon emissions through various activities. The assessment has considered embedded carbon, emissions associated with decommissioning site activities, waste disposal and transport. **Scoped Out** Climate Change Risk Assessment Resilience and In-Combination Climate Impacts The decommissioning phase Climate Change adaptation effects are scoped out due to the short-term nature of the decommission period, and the impacts of Climate Change not being anticipated to have significant effects in such a short period of time. In addition, any potential impacts would be mitigated via measures included in other assessment chapters and the implementation of a Decommission Environmental Management Plan. The DEMP will be submitted as part of the DCO application.

5.3.2. A Scoping Opinion was received from the Planning Inspectorate on 10 July 2024. A full review of all comments raised in the Scoping Opinion is provided in Table 5-2 below. This also outlines how the Scoping Opinion comments have been addressed within this PEIR or will be addressed within the ES.

Table 5-2 Responses to EIA Scoping in relation to Climate Change

Summary of Response to EIA Scoping	Response/Action
Planning Inspectorate: As the Scoping Opinion has identified limited vehicle movements associated with the operational and maintenance phase, the Inspectorate agrees the matter can be scoped out of further assessment. However, the ES description of development should confirm operational vehicle types and numbers (with reference to thresholds within guidance) to justify this position.	Anticipated operational vehicle types and numbers are presented in Chapter 13: Traffic and Access and it is not anticipated that any air quality/emission modelling will be required as the traffic volumes do not meet the thresholds (see Air Quality as part of PEIR Volume I Chapter 14: Other Environmental Topics). If details of the Scheme change that would result in a higher volume of traffic, this position would be reviewed.
Planning Inspectorate: The Inspectorate agrees the assessment of Climate Change Adaptation and Resilience during the Construction and Decommissioning Phase can be scoped out on the basis an outline CEMP (inclusive of health and safety plans for construction and decommissioning activities to account for potential climate change impacts on workers such as flooding and heatwaves) is submitted with the DCO application.	The ES will include a CEMP and DEMP which will include measures to address Climate Change risks during construction and decommissioning.
Planning Inspectorate: The Scoping Report states sources of emissions that are not expected to result in a material contribution to the Scheme have been excluded from further assessment. The ES should be explicit as to what is considered to be a material contribution with consideration given to the potential for cumulative effects of the excluded sources to add up to a material consideration.	At the PEIR stage, a benchmarking exercise has been carried out to determine the project emissions. Therefore, at this stage, no specific emissions have been excluded. A life cycle GHG assessment will be completed at the ES stage. A proportionate approach will be taken to the consideration of cumulative effects. Professional judgement informed by corresponding best practice guidance will be used as to establish whether excluded sources add up to a material consideration when considering baseline data and the location of receptors.
Deeping St Nicholas Parish Council challenge the assertion that solar panels significantly contribute to mitigating climate change.	The chapter considers the potential benefits/limitations and net-positives/negatives of the Scheme. The assessment reviews the carbon saving (relative to other forms of energy generation) that the Scheme will likely incur as a result of its operation, and how these will potentially offset the emissions

Summary of Response to EIA Scoping	Response/Action
	generated during the construction and operation of the Scheme. The benefits and limitations of the assets, such as the PV panels and the battery storage facility, will be considered from a climate resilience, adaptation and carbon emission perspective within the ES chapter.
The England Biodiversity Strategy published by Defra establishes principles for the consideration of biodiversity and the effects of climate change. The ES should reflect these principles and identify how the development will embed Nature Based Solutions, maintain ecological networks and build resilience to climate change. The ES should also incorporate the policies as set out in NPS EN-1 relating to climate change. The NPPF also requires that the planning system should contribute to the enhancement of the natural environment 'by establishing coherent ecological networks that are more resilient to current and future pressures' (NPPF Para 180), which should be demonstrated through the ES.	At the PEIR stage, the assessment includes a preliminary in-combination Climate Change impact assessment which considers the impacts of Climate Change on biodiversity. This assessment will be more comprehensive during the ES stage once more in-depth consultations have taken place. The assessment will follow the Defra England Biodiversity Strategy and will recommend how to build Climate Change resilience into nature-based solutions.

Additional Engagement

5.3.3. Additional engagement has not been undertaken since the Scoping Report was prepared as there was not a need for any further information from stakeholders. The PEIR outcomes will inform further consultation with relevant bodies as required.

5.4. Assessment Methodology

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

Study Area

Lifecycle GHG Impact Assessment

5.4.2. The Study Area for the GHG impact assessment covers all direct GHG emissions arising from activities undertaken within the Site during the construction, operation and decommissioning stages of the Scheme. It also includes indirect emissions arising outside of the Site, for example emissions embedded within the production of construction materials, as well as emissions arising from the transportation of materials, waste and construction workers.

5.4.3. The Study Area also includes activities that may be avoided or displaced as a result of the Scheme, such as other alternative grid electricity production activities. The carbon

savings will be considered as part of the operational phase of the Scheme and will be accounted for in the entire Scheme's lifecycle GHG assessment.

5.4.4. This approach aligns with industry best practice and follows methodologies used in comparable solar PEIRs. The assessment framework is structured to provide a comprehensive evaluation of the Scheme's contribution to GHG emissions while recognising that the ultimate receptor of these emissions is the global climate system rather than a specific geographic area.

Climate Change Risk Assessment

5.4.5. The Study Area for the CCRA is the area within the Site, i.e., it covers the operation of all assets and infrastructure which constitute the Scheme. As this assessment is about the resilience of the activities and infrastructure of the Scheme, areas beyond the Site are not included.

In-Combination Climate Change Impact Assessment

5.4.6. The Study Area for the ICCI assessment has been defined taking into account the environmental assessments reported within the PEIR. This includes all environmental receptors identified within the assessment undertaken and reported within the PEIR. The sensitive receptors for the ICCI assessment are those identified by each discipline in their assessment.

5.4.7. The Study Area for the ICCI assessment is identified by each discipline for their individual assessments. The methodology used by the environmental disciplines to identify ICCIs is described in Section 1.4. At the PEIR stage, preliminary consultation with other disciplines has taken place; however, a comprehensive assessment will be undertaken during the ES stage, once detailed assessments are complete and cross-disciplinary interactions are better understood. These are summarised in PEIR Volume III Appendix 5-2: In-Combination Climate Change Impact Risk Assessment.

Assessment Methodology

5.4.8. This section should be read in conjunction with PEIR Volume I Chapter 4: Overview of the EIA Process which sets out relevant information on the design parameters, information that has informed the PEIR assessment, and how various aspects of the assessment have been approached.

5.4.9. For the Climate Change assessment, the relevance of design optionality has been reviewed in relation to GHG emissions, climate resilience, and vulnerability to climate risks. Where design choices have the potential to significantly alter emissions (e.g., material use, transport, construction processes) or influence exposure to climate risks (e.g., flood risk on underground or overground cables), these variations have been considered within the assessment, assessing the worst-case scenario. Where optionality does not materially impact the assessment findings, this has been stated.

5.4.10. The assessment methodology follows that as stated within Scoping Report and is outlined below.

Lifecycle GHG Impact Assessment

5.4.11. At the PEIR stage, the design is still evolving and is not fixed. Therefore, this assessment has carried out a benchmarking exercise against other similar schemes to provide an estimation of emissions for the construction, operation and decommissioning phases of the Scheme. The assessment has been carried out using reasonable assumptions and professional judgement in the absence of data.

5.4.12. The GHG assessment has followed a project lifecycle approach to calculate estimated GHG emissions arising from the construction, operation, and decommissioning phases of the Scheme and to identify GHG 'hot spots' (i.e. emissions sources likely to generate the largest amount of GHG emissions). This enables the identification of priority areas for mitigation in line with the principles set out in IEMA guidance[28].

5.4.13. The GHG assessment has been reported as tonnes of carbon dioxide equivalent (tCO_2e). Carbon dioxide equivalent is a measure used to represent many gases by converting the gases global warming potential (GWP) to the equivalent amounts of carbon dioxide. The assessment has considered the following gases:

- Carbon dioxide (CO2);
- Methane (CH4);
- Nitrous oxide (N2O);
- Sulphur hexafluoride (SF6);
- Hydrofluorocarbons (HFCs);
- Perfluorocarbons (PFCs); and
- Nitrogen trifluoride (NF3)

5.4.14. These GHGs are broadly referred to in this chapter under an encompassing definition of 'GHG emissions', with the unit of tCO_2e (tonnes CO_2 equivalent) or $MtCO_2e$ (Mega tonnes of CO_2 equivalent).

5.4.15. Table 5-3 summarises the key anticipated GHG emissions sources associated to the Scheme by lifecycle stage, in line with Publicly Available Standard (PAS) 2080:2023 – carbon management infrastructure[31].

[31] BSI (2016). Guidance document for PAS 2080. Available at: https://www.ice.org.uk/download-centre/guidance-document-pas-2080

Table 5-3 Potential Sources of GHG Emissions

Lifecycle Stage	Activity	Primary Emission Sources
Production Phase	Raw material extraction and manufacturing of products required to build the equipment for the Scheme.	Embodied GHG emissions from energy use in extraction of materials and manufacture of components and equipment. Emission of potent GHGs during manufacture, such as sulphur hexafluoride (SF_6).
	Transportation of materials for processes/manufacturing (where available).	GHG emissions from transportation of products and materials during their processing and manufacture. Due to the nature of the equipment, this could require shipment of certain aspects over significant distances. Transport of materials to the Site is included under construction phase where it is not included in embodied GHG emissions.
Construction Phase	On-site construction activity including emissions from construction compounds.	Energy (electricity, fuel, etc.) consumption from plant and vehicles, generators on-site, and construction worker commuting.
	Transportation of construction materials to the Site. Due to the nature of the equipment required, this could require shipment of certain aspects over significant distances.	GHG emissions from transportation of materials to and from Site.
	Transportation of construction workers to and from the Site.	GHG emissions from transportation of workers to and from Site.
	Disposal of any waste generated by the construction phase.	GHG emissions from disposal and transportation of waste.
	Land use change.	GHG emissions from net loss/gain of carbon sink.
	Water use.	Provision of potable water, and treatment of wastewater.
Operation and Maintenance Phase	Operation and maintenance phase of the Scheme.	GHG emissions from energy consumption, provision of potable water, treatment of wastewater, and transportation effects for worker travel. These operational aspects are expected to be negligible in the context of overall GHG emissions of the Scheme's lifecycle. Leakage of potent GHGs during the operation and maintenance phase, such as SF_6 (derived from certain electric items such as gas-insulated switchgear and gas-insulated transformers during the production and operation and maintenance phases through leakage, and dismantling), if used.
	Maintenance of the Scheme.	GHG emissions from energy consumption, transportation of maintenance workers and materials, material use and waste generation as a result of site maintenance.
Decommissioning Phase	On-site decommissioning activities	Energy (electricity, fuel, etc.) consumption from plant, vehicles and generators within the Site Boundary.
	Transportation and disposal of waste materials.	GHG emissions from disposal and transportation of waste.
	Transportation of workers.	GHG emissions from transportation of workers to and from the Site.

5.4.16. At the ES stage, expected GHG emissions arising from construction and decommissioning phases, embodied carbon in materials and operation and maintenance emissions of the Scheme, as well as baseline emissions, will be quantified using a calculation-based methodology as per the following equation, and aligned with the GHG Protocol[32].

Activity x GHG Emissions Factor = GHG Emissions

5.4.17. Residual GHG emissions (following mitigation) will be compared against the statutory UK carbon budgets in order to view the project's GHG contribution in the context of this.

5.4.18. IEMA guidance (IEMA, 2022)[33] considers that, based upon the judgement of the practitioner, the likely significance of the effect can be assessed against whether the Scheme is compatible with the achievement of a science-based target, as described below. Given no thresholds for significance exist, it is based upon the relationship between the sensitivity of the receptor and the net change of residual GHG emissions. This is, therefore, a robust and industry accepted approach.

5.4.19. A carbon budget places a restriction on the total amount of GHGs that can be emitted over a defined period of time. In the UK, carbon budgets cover a period of five years (Table 5-5). They have been set up to the seventh carbon budget, which covers the period between 2038 and 2042. For each budget, GHG emission levels are reduced (e.g. from 535 MtCO2e for the seventh carbon budget compared to 965 MtCO2e for the sixth budget (2033- 2037))[34]. The receptor is the global climatic system (more specifically, the contribution to carbon budget during which the emissions occur, underpinning science-based targets). The receptor is of a high sensitivity in relation to the carbon budgets; to reflect how close globally we are to the scientifically defined limit.

5.4.20. According to the IEMA GHG Guidance[28] "*the crux of significance therefore is not whether a project emits GHG emissions, nor even the magnitude of GHG emissions alone, but whether it contributes to reducing GHG emissions relative to a comparable baseline consistent with a trajectory towards net zero by 2050.*"

5.4.21. The assessment of GHGs does not include identification of local sensitive receptors, as GHG emissions do not directly affect specific locations but lead to indirect effects by contributing to Climate Change. The sensitive receptor with respect to GHG emissions is therefore the atmosphere (which is always of high sensitivity), where GHGs contribute to increasing atmospheric temperatures and resultant Climate Change effects.

[32] World Resources Institute, & World Business Council for Sustainable Development. (2004). The Greenhouse Gas Protocol: A Corporate Accounting and Reporting Standard. Available at: https://ghgprotocol.org/sites/default/files/standards/ghg-protocolrevised. pdf.

[33] IEMA (2022). Environmental Impact Assessment Guide to: Assessing Greenhouse Gas Emissions and Evaluating their Significance – Second Edition. Available at: https://www.iema.net/resources/blogs/2022/02/28/iema-launch-of-the-updated-eia-guidance-on-assessing-ghg-emissions-february-2022/.

[34] HMSO (2021). Carbon Budget Order 2021. Available at: https://www.legislation.gov.uk/uksi/2021/750/contents/made.

5.4.22. With regards to the magnitude of change, unlike the other assessments, there are no impact descriptors for GHG emissions.

5.4.23. To establish the likely significance of GHG emissions from a scheme therefore requires assessment of:

- Their consistency with policy requirements, since these have been specified to ensure the economy decarbonises in line with the UK's net zero target;
- The degree to which the development has sought to mitigate its emissions; and
- Examining each of these dimensions allows the assessment to make a professional judgement on the likely significance of effects based on a set of significance criteria established in the IEMA GHG Guidance, summarised in Table 5-4.

Table 5-4 GHG Significance Criteria

Lifecycle Stage	Activity	Primary Emission Sources
Major Adverse (Significant)	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.	The project's net GHG impacts: • are not mitigated or are only compliant with do-minimum standards set through regulation; and • do not provide further reductions required by existing local and national policy for projects of this type.
Moderate Adverse (Significant)	A project with moderate adverse effects falls short of fully contributing to the UK's trajectory towards net zero.	The project's net GHG impacts: • are partially mitigated; and • may partially meet the applicable existing and emerging policy requirements but would not fully contribute to decarbonisation in line with local and national policy goals for projects of this type.
Minor Adverse (Not Significant)	A project with minor adverse effects is fully in line with measures necessary to achieve the UK's trajectory towards net zero.	The project's net GHG impacts: • are fully consistent with applicable existing and emerging policy requirements; and • are in line with good practice design standards for projects of this type.
Negligible (Not Significant)	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.	The project's net GHG impacts: • are reduced through measures that go well beyond existing and emerging policy; and • are better than good practice design standards for projects of this type, such that radical decarbonisation or net zero is achieved well before 2050.
Beneficial (Significant)	A project with beneficial effects substantially exceeds net zero requirements with a positive climate impact.	The project's net GHG impacts: • are below zero; and • cause a reduction in atmospheric GHG concentrations, whether directly or indirectly, compared to the without-project baseline.

5.4.24. Table 5-5 shows the statutory UK carbon budgets up to 2042 (i.e., the Seventh Carbon Budget)**Error! Bookmark not defined.**, which highlights a decline in the amount of GHG emissions that the UK can legally emit in the future. This means that sources of emissions that make an increased contribution to the UK's carbon inventory will adversely impact upon the ability of the UK to meet its carbon budgets in the future. The appropriate carbon budget will be used for the assessment at the ES stage, for both the construction and operational phase of the Scheme to assess the contribution and subsequent likely significance of effect. Relevant sectoral carbon budgets will also be used for the appropriate assessment at the ES stage.

Table 5-5 Relevant Carbon Budgets for the Assessment

Carbon Budget	UK Total Budget (MtCO2e)
5th (2028-2032)	1,725
6th (2033-2037)	965
7th (2038-2042)	535

Climate Change Risk Assessment

5.4.25. For the PEIR, design and construction information is yet to be sufficiently defined to carry out a detailed CCRA. However, a high level CCRA has been carried out based on currently available data.

5.4.26. The CCRA considers the resilience of the Scheme itself to the physical impacts of Climate Change during operation. Construction and decommissioning impacts are scoped out of this assessment due to the short-term nature of the activities associated with the construction and decommissioning period, and that notable changes in climate will not manifest over the timeframe. In addition, any potential impacts are likely to be mitigated via mitigation measures included in other assessments and the implementation of a CEMP and a DEMP.

5.4.27. IEMA guidance 'Climate Change Resilience and Adaption'[29], defines Climate Change resilience as the '*ability to respond to changes in climate. If a receptor or 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*'.

5.4.28. The CCRA differs from many other EIA topics in that it considers how the resilience of a scheme is affected by an external factor (Climate Change) not how environmental receptors are affected by a scheme development's impacts. Consequently, the Climate Change effects cannot be assigned significance with respect to the severity of effects in the same way as for the other environmental topics. Instead, a risk-analysis approach has been used for the PEIR CCRA and will be developed in greater detail at the ES stage.

5.4.29. The risk assessment uses a combination of likelihood of climate impacts occurring and the potential consequence of those impacts to determine the significance of risk. Any

impacts determined to be of significant risk have been identified as requiring additional mitigation.

5.4.30. The assessment utilises the UKCP18 Met Office Climate Projections[35] to inform the historic baseline and future baseline. Projections up to the 2080s timeline has been chosen as this corresponds to the design life of this Scheme. This includes the projection data sets at time horizons 2020-2049 and 2050-2079. This is in accordance with the IEMA guidance 'Climate Change Resilience and Adaption'[29], which states that "*Recommended best practice is to use the higher emissions scenario (RCP 8.5 in the latest UKCP18 projections) at the 50th percentile, for the 2080s timelines, unless a substantiated case can be made for not doing this (e.g. anticipated lifespan of the project is shorter than 2080s)*". The project is predicted to be decommissioned in the late 2060s/2070s and so therefore falls within the time horizon of the 2050-2079 dataset.

5.4.31. The methodology for the CCRA is as follows (and is consistent with the IEMA 2020 guidance[29]):

- Identify the receptors (e.g. assets and asset groups) within the Scheme that will be potentially at risk from Climate Change impacts;
- Identify Climate Change hazards (e.g. floods, heatwaves, droughts) that may affect the geographical location of the Scheme;
- Determine the likelihood of Climate Change hazards (e.g. floods, heatwaves, droughts) occurring in the future, based on the future Climate Change projections;
- Determine the likelihood of the hazard having a Climate Change impact on the receptors, noting that:
    - the likelihood of each impact will be determined based on the definitions in Table 5-6 below;
    - the assessment will be qualitative, using expert judgement and in discussion with the design team, except for flood risk, for which quantitative assessments will be carried out by the flood risk team;
    - existing or embedded mitigation and enhancement measures will be taken into account in the assignment of a likelihood category;
- Determine the consequence of each impact based on the definitions in Table 5-6 below; and
- Determine the risk level and thus significance of effect on receptors based on a combination of likelihood and consequence, as shown in Table 5-7. The

[35] UKCP18 (2018). Met Office Climate Projections. Available at: https://www.metoffice.gov.uk/research/approach/collaboration/ukcp

assessment is qualitative and uses expert judgement based on knowledge of similar Schemes, engagement with the wider project team and a review of relevant literature.

Table 5-6 Criteria to Assess Likelihood of Climate Change Impact

Level of Likelihood	Definition of Likelihood
Very Unlikely	0–10% probability that the hazard will occur.
Unlikely	10–33% probability that the hazard will occur.
Possible, about as likely as not	33–66% probability that the hazard will occur.
Likely	66–90% probability that the hazard will occur.
Very Likely	90–100% probability that the hazard will occur.

5.4.32. Following identification of climate hazards, the consequences of climate impacts have been assessed according to Table 5-6. For example, permanent damage to electrical equipment from heatwaves causing complete loss of operation. The categories and descriptions provided below are based on IEMA guidance 'Climate Change Resilience and Adaption'[29].

Table 5-7 Criteria Used to Assess Consequence of a Climate Change Impact

Level of Consequence of a Climate Risk Occurring	Definition of Consequence
Very Large	Permanent damage to structures/assets; complete loss of operation/service; Complete renewal of infrastructure; exceptional environmental damage; and/or extreme financial impact.
Large	Extensive damage to structures/assets; partial loss of operation/service over a broad area or critical function; partial renewal of infrastructure; large adverse effect on the environment, requiring remediation; and/or Major financial impact.
Moderate	Some infrastructure damage and partial loss of service over localised area; minor infrastructure renewal; adverse impact on the environment; and/or moderate financial impact.
Minor	Localised infrastructure disruption and minor loss of service; no permanent damage, minor restoration work required; Slight adverse environmental effects; and/or small financial losses.
Negligible	No damage to infrastructure; no impacts on the environment; no adverse financial impact.

5.4.33. The significance in the CCRA is determined as a function of the likelihood of a Climate Change hazard occurring (Table 5-6) and the consequence to the receptor if the hazard occurs. The significance is detailed in Table 5-8, in line with the example matrix set out in IEMA guidance 'Climate Change Resilience and Adaption'[29]. The assessment takes into account confirmed design and embedded mitigation measures.

Table 5-8: Significance of Effects Matrix

Consequence of Climate Change Impact	Likelihood of Climate Change Impact				
	Very Unlikely	Unlikely	Possible	Likely	Very Likely
Negligible	Low (Not significant)	Low (Not significant)	Medium (Not significant)	Medium (Not significant)	Medium (Not significant)
Minor	Low (Not significant)	Low (Not significant)	Medium (Not significant)	High (Significant)	High (Significant)
Moderate	Low (Not significant)	Medium (Not significant)	High (Significant)	High (Significant)	Very High (Significant)
Large	Medium (Not significant)	High (Significant)	High (Significant)	Very High (Significant)	Very High (Significant)
Very Large	Medium (Not significant)	High (Significant)	Very High (Significant)	Very High (Significant)	Very High (Significant)

5.4.1. Step 7 of the IEMA Guidance[29], highlights the need for adaptive management with regards to climate resilience and adaption. Adaptive management is the process that enables uncertainty to be included in operational decision-making. By taking an adaptive management approach, additional mitigation can be introduced if the Scheme's impact is starting to cause unacceptable effects on the receiving environment. This will be included at the ES stage.

In-Combination Climate Change Impacts

5.4.1. The ICCI assessment assesses the extent to which Climate Change exacerbates an effect on an environmental receptor considered in other technical assessments. The ICCI assessment methodology has been developed in line with IEMA guidance[29]. The ICCI assessment considers the impacts and significance identified by each of the assessment topics, but with the added consideration of future Climate Change projections. The assessment considers the historical baseline and projected climate conditions and the extent to which the identified receptors will be affected by the change.

5.4.2. The PEIR ICCI assessment aims to screen out any impacts that are considered too unlikely to occur, e.g. the Climate Change hazard does not influence the impact identified

by the topic, and therefore they do not require further assessment. Future Climate Change projections have been reviewed and the sensitivity of identified sensitive receptors to these hazards examined. Project risks to receptors are examined together with climate hazards to understand if the impact is exacerbated. The influence of Climate Change combined with potential impacts from the operation of the Scheme on sensitive receptors has been assessed. Embedded mitigation has been considered in the assessment which may reduce the significant of the impact.

5.4.3. The effect of an ICCI will be considered significant if:

- an effect which was previously not significant due to Climate Change becomes significant against the significance criteria used by the technical discipline (e.g. an increase in consequence of effect or an increase in scale of change); and/or
- an existing significant effect due to Climate Change is exacerbated against the significance criteria used by the technical discipline (e.g. a further increase in the consequence of effect or a further increase in scale of change).

5.4.4. If an effect was not previously significant and any exacerbation by Climate Change does not change this, the ICCI effect is determined as not significant.

5.4.5. The Climate Change hazards considered in the assessment to potentially cause impact to the environmental receptors include:

- Heatwaves;
- Drought;
- Flooding and high levels of precipitation; and
- Extreme weather (storms).

5.4.6. The ICCI assessment only considers impacts on receptors during the operation stages of the Scheme. Construction and decommissioning impacts are scoped out of this assessment due to the short-term nature of the activities associated with the construction and decommissioning period, and the impacts of Climate Change not being anticipated to have significant effects in such a short period of time. In addition, any potential impacts are likely to be mitigated by measures included in the CEMP and DEMP.

5.4.7. At the PEIR stage, the assessment includes a preliminary assessment of the potential risks and impacts in other technical chapters that Climate Change may exacerbate. In-depth consultation will take place once assessments are finalised with the other chapters at the ES stage, and as such the preliminary ICCI assessment was informed by professional judgement and solar farm scheme design related to Climate Change impacts on the relevant receptors. Using the information available at this stage, the assessment is considered preliminary and will be revised at the ES stage once consultations are carried out and more information can be gathered on the other technical disciplines and receptors. At the next stage the assessment will consider further information such as the other technical assessments mitigations, formalised embedded mitigation measures and

the ES design. Significance of the impacts on the receptors and required mitigation measures will be finalised.

Confidence in Prediction of the Significance of Effect

5.4.8. Following on from identification of whether an effect is considered to be significant or non-significant, the confidence in prediction of significance of effects is given a rating of high, moderate or low and a justification provided. Definitions of high, moderate and low confidence levels are provided in Table 5-9.

Table 5-9: Significance of Effects Matrix

Confidence Level	Definition
High confidence	A high level of confidence in the prediction of significance effects could be justified through: • The consideration of, and routeing and/or siting of the Proposed Project away from, designated features and high sensitivity receptors; • Complete baseline data to inform the prediction; • The application of committed mitigation; and • A thorough understanding of Proposed Project activities.
Moderate confidence	A moderate level of confidence in the prediction of significance effects could be justified through: • Particular surveys or assessments are incomplete at this stage, but it is possible to extrapolate results; • Mitigation measures will continue to be developed up to the submission of the application for consent; and • A general understanding of the Proposed Project activities being undertaken and the associated impacts based on other projects, while more detailed information will be provided later.
Low confidence	A low level of confidence in the prediction of significance effects could be justified through: Only extremely limited baseline data is available at this stage; Exact Proposed Project activities are unknown; and Where this is the case, a precautionary, worst-case approach is taken.

Assessing Cumulative Effects

5.4.9. The assessment of cumulative effects does not apply to the GHG assessment as the assessment is inherently cumulative. This is because:

- The environmental impact arising from GHGs is the increased concentration of GHGs within the global atmosphere, which is the main receptor. A single activity may result in minor or insignificant impact, but when combined with many other activities, the cumulative impact could be significant; and

- The location of the emissions source is not relevant to the impact arising from it; any development leading to GHG emissions have the same impact whether it is located near to the Scheme or in another region/country as the Climate Change impacts on a given location arise from the aggregated GHG levels in the atmosphere, not from the magnitude of GHG emissions in the local area.

5.4.10. As such it is not possible to define a Study Area for the assessment of cumulative effects on GHG emissions nor to undertake a cumulative effects assessment, as the identified receptor is the global atmosphere, and effects are therefore not geographically constrained. Consequently, consideration of the effects of the Scheme together with other committed developments on GHG emissions is not considered to be applicable.

5.4.11. As the CCRA is only concerned with the potential impacts of Climate Change on the activities and assets of the Scheme, and a broader consideration of existing interdependent infrastructure, a cumulative assessment is not required.

5.4.12. The ICCI assessment is, by nature, a cumulative assessment, prepared to consider intra-project cumulative effects of Climate Change resilience between different topics, and any effects are detailed in PEIR Volume III Appendix 5-2: In-Combination Climate Change Impact Risk Assessment. This is a preliminary assessment that has been prepared using professional judgement to propose potential effects. These have been reviewed in terms of the future climate scenarios' ability to affect both the sensitivity of the receptor and the magnitude of the change. The assessment will be revised and validated at the ES stage through consultations with other technical disciplines.

5.5. Assumptions and Limitations

5.5.1. Where detailed information is not available regarding energy use, types and quantities of materials used, or the embodied carbon of key features of the assets, precautionary assumptions have been made based on industry approximations and professional good practice.

5.5.2. All assumptions and limitations, including any exclusions, together with assumptions for choices and criteria leading to exclusion of input and output data will be documented as part of the assessment reported in the ES.

5.5.3. Details relating to a programme for the replacement of components during the operational phase is in development and will be reported and assessed as part of the ES. It is currently anticipated that BESS Units across the PV Area could be replaced approximately 20 years into the 40-year operational phase.

Lifecycle GHG Impact Assessment

5.5.4. For this assessment, it has been estimated that the Scheme will be based on a conservative capacity factor of 10% and assumes that is operated '24/7', which represents a worst-case scenario given the limited information currently available, and

the actual capacity factor and annual yield may be higher once more detailed design and operational data are available.

5.5.5. The operation and maintenance of the Scheme is intended to be 40 years, after which it would be decommissioned, meaning degradation rates of 2% for year 1 and 0.45% annual thereafter have been applied to the solar panels, to inform the calculations below. Battery storage capacity is yet to be confirmed.

5.5.6. The UK carbon budgets are currently only available to 2042 (7th carbon budget). Where further carbon budgets are not available (specifically, the 8th, 9th and 10th carbon budget periods), these will be projected based on data published by the Climate Change Committee (CCC). Totals for these periods have not been approved or ratified and are not legally binding, but indicative figures can provide valuable context at this stage.

5.5.7. The largest single source of GHG emissions from the Scheme is likely to result from the manufacture and transport of solar PV panels, with a large remaining portion made up by the battery units. The panel manufacturer has not yet been confirmed; therefore, for the purposes of estimating the GHG impact of the Scheme, it has been assumed that the solar PV panels will be sourced from China[36] (or a country of similar distance from the UK). This realistic worst-case assumption is consistent with other utility-scale UK solar schemes, though lower embodied and transport emissions could be expected from solar PV panels sourced from Europe.

5.5.8. Emissions from backup diesel generators, which are assumed on a worst-case basis to be used for up to a maximum of eight hours in any one year, have not been quantified at this stage. However, the expected power generation, when multiplied by diesel emissions factors, and multiplied by the 40-year design life of the Scheme, is expected to account for less than 1% of the overall Scheme emissions. Following the IEMA GHG Assessment Guidance[28], the emissions from the diesel generators have been excluded since they account for less than 1% of the total emissions from the Scheme.

Climate Change Risk Assessment

5.5.9. There is inherent uncertainty in climate projection data. The data collected to inform this assessment are estimations of ways that the climate might change in the particular region to the year 2080, which corresponds to the climate conditions projected by the UKCP18 dataset, representing the end of the Scheme's design life.

5.5.10. At this PEIR stage, assumptions have been made about the impacts that will be identified in other technical chapters. At the ES stage, inter-disciplinary collaboration will refine the assessment to capture all the identified potential risks and mitigation measures for the Scheme.

[36] International Renewable Energy Agency (IRENA). (2021). *Renewable Capacity Statistics 2021*. IRENA. Available at: https://www.irena.org/publications/2021/March/Renewable-Capacity-Statistics-2021.

5.6. Baseline Conditions

5.6.1. The baseline for the lifecycle GHG Impact, CCRA and ICCI has been evaluated at a Scheme level and includes the PV area, Grid Connection Corridor and Inter-Array Areas.

Current Baseline – Lifecycle GHG Impact Assessment

5.6.2. For the GHG assessment, the current baseline is a 'no-development' scenario whereby the Scheme is not implemented. The sensitive receptor in this case will be the global atmosphere. The baseline considers GHG emissions that would be emitted or sequestered in the existing Site. Agriculture is the predominant land use within the Site area; arable land, with small numbers of buildings associated with nearby villages/farms. Trees are present individually in some areas, as well as in rows and within small woodland areas. The abundance of vegetation within the Site suggests a relatively high carbon sink potential.

Baseline agricultural GHG emissions are dependent on the types of soil and vegetation present, and fuel use for the operation of vehicles and machinery. There are also emissions associated with the existing road network within the Site, though this is expected to be minor based on the rural location. The existing Site emissions will be calculated on the basis of energy use and transport.

5.6.3. A full assessment of the baseline 'no-development' scenario will be undertaken within the ES. Where this data is not yet available at PEIR stage, the net change in GHG emissions has been measured against a realistic worst-case baseline of zero emissions.

Future Baseline – Lifecycle GHG Impact Assessment

5.6.4. The future baseline for the GHG assessment is a business-as-usual position whereby the Scheme is not implemented. This includes the operation and maintenance emissions from the generation of grid electricity that would occur should the Scheme not go ahead, but which will be displaced in the case of the Scheme being delivered. It is noted that the future profile of the UK grid is not fixed and as such it is difficult to make a robust assumption without knowledge of all future electricity generating schemes. However, in the absence of a more robust approach, the above approach assumes that the business-as-usual position will be in keeping with the Defra's updated energy and emissions projections 2021-2040.

5.6.5. The current predominantly agricultural activities within the Site will have minor levels of associated GHG emissions, with minor carbon sequestration from extant vegetation. Therefore, for the purpose of the GHG assessment, embodied emissions are considered zero in the future baseline.

Current Baseline - Climate Change Risk Assessment and In-Combination Climate Change Impact Assessment

5.6.1. The historic baseline for the CCRA and ICCI assessments is the average climate at the Site for the 30-year historical period of 1981 to 2010 (the standard baseline for climate data). Historic climate data recorded by East Midlands regional data for the 30-year period of 1981 to 2010 was obtained from the Met Office website and is summarised in Table 5-9.

Future Baseline - Climate Change Risk Assessment and In-Combination Climate Change Impact Assessments

5.6.2. The future baseline is expected to differ from the present-day baseline described above. UKCP18[35] provides probabilistic Climate Change projections for pre-defined 30-year periods for annual, seasonal and monthly changes to mean climatic conditions over land areas.

5.6.3. For the purpose of the assessment, UKCP18 probabilistic projections for East Midlands[35], based on RCP8.5, for the pre-defined 30-year periods have been obtained for the following climatic variables:

- Temperature;
- Precipitation; and
- Wind speed.

5.6.4. Projected temperature and precipitation variables presented in UKCP18[35] probabilistic projection have been analysed for the East Midlands administration region within which the Scheme is located. These figures are expressed as temperature and precipitation anomalies in relation to the 1981 to 2010 baseline.

5.6.5. UKCP18[35] uses a wide range of possible scenarios, classified as Representative Concentration Pathways (RCPs), to inform differing future emission trends. These RCPs specify "the concentrations of greenhouse gases that will result in total radiative forcing increasing by a target amount by 2100, relative to preindustrial levels". RCP8.5 has been used for the purposes of this assessment as a worst-case as this predicts a high emissions of 'business-as-usual' scenario. As the design life of the Scheme is 40 years, the CCRA has considered the RCP8.5 scenario that reflects a high level of GHG emissions at a 50% probability up to the year 2079 to assess the impact of Climate Change over the assessed design life of the Scheme.

5.6.6. Climate variables impacting the operation phase of the Scheme have been assessed in Table 5-10 below against RCP 8.5 2020-2049 and 2050- 2079 projection data. The time horizons selected for the data sets are best practice and even though the end timeline of 2079 extends beyond the Scheme's predicted decommissioning date in the late 2060s, the assessment is still appropriate and does not impact the overall significant effects identified.

5.6.7. When assessing the effects of Climate Change on the engineering and design and in a technical PEIR/ES chapter, the data presented in the proceeding tables have been used as the basis.

Temperature

5.6.8. Table 5-10 presents the projected air temperature data for East Midlands up until 2079, in 30-year time slices, from 2020. The data presents future summers to be hotter and winters to be warmer, with the annual temperature steadily increasing.

5.6.9. As the assessment considers both construction and future year operational phases, different time slices will be considered. When developing adaptive mitigation measures, consideration will be given to the appropriate time to implement these measures based on the temperature increase at each time slice.

5.6.10. The data are presented for annual mean, maximum and mean Summer temperatures, and minimum and mean Winter temperatures for each time slice.

Precipitation

5.6.11. Table 5-10 presents the predicted percentage change in precipitation levels relative to the 1980-2010 baseline. In line with the Met Office predictions, the data presents future summers to be drier and winters to be wetter. The data also predicts that annual precipitation will reduce marginally up to 2079.

5.6.12. When developing adaptive mitigation measures, consideration has been given to the appropriate time to implement these measures based on the precipitation change at each time slice. The data are presented for the seasonal extremes of Winter and Summer, as well as an annual projection for each time slice.

Wind Speed

5.6.13. The projections for wind speed are varied and uncertain and as such it is not appropriate to use the projected wind speed figures in the assessment. However, general trends can be utilised to give likely scenarios for the purposes of the climate assessment. For example, an increase in near surface wind speeds and wind gusts for the second half of the 21st century for the winter season. This is accompanied by an increase in frequency of winter storms over the UK. It is therefore assumed for the purposes of the operational phase that there will be more future storm events within the 2050-2079 time slice compared to current day, and without adaptation, the damage and associated economic losses from extreme winds will rise due to increasing asset values.

Summary

Table 5-10 Climate Change Baseline and Projection Data

Climate Variable	Baseline Absolute (1981-2010)	Climate Change Projection Anomaly RCP 8.5 (2020-2049)	Climate Change Projection Anomaly RCP8.5 (2050-2079)
Temperature (°C)			
Mean annual temperature	9.59°C	+1.06°C	+2.4°C
Mean summer maximum daily temperature	20.50°C	+1.45°C	+3.4°C
Mean winter minimum daily temperature	1.07°C	+0.93°C	+2.2°C
Summer Max (°C) (50th percentile)	22.49°C	+1.47°C	+3.38°C
Winter Min (°C) (50th percentile)	-1.43°C	+0.91°C	+2.2°C
Rainfall (mm)			
Mean annual rainfall	692.49mm	-0.1%	-2.3%
Mean summer rainfall	180.15mm	-7%	-20.2%
Mean winter rainfall	167.20mm	+4.4%	+11.5%
Summer Max (50th percentile)	334.95mm	-6.96%	-20.48%
Winter Min (50th percentile)	99.47mm	+4.14 %	+10.85%
Extreme Events			
	Baseline	**Projections**	
Heatwaves	The Spalding area, like much of the UK, has experienced a number of significant heatwaves in recent years. Among the most extreme was the heatwave in July 2022, which saw record-breaking temperatures across Lincolnshire. Coningsby, near Spalding, recorded a UK-high of 40.3°C.	Under a high emissions scenario, it is estimated that by the end of the 21st Century, all areas of the UK are projected to be warmer with hotter, drier summers and heatwaves likely to become more common and intense.	
Storms	The Storm of 2007 caused widespread damage across southern England, including the East	Storms and wind patterns are difficult to predict and there is high variation and uncertainty in the	

Climate Variable	Baseline Absolute (1981-2010)	Climate Change Projection Anomaly RCP 8.5 (2020-2049)	Climate Change Projection Anomaly RCP8.5 (2050-2079)
	Midlands. It brought hurricane-force winds, leading to fallen trees, damaged buildings, and power outages in many areas	projections. However, there is a general trend of an expected increase in near surface wind speeds and wind gusts for the second half of the 21st century for the winter season. This is accompanied by a possible increase in frequency of winter storms over the UK.	
Flooding	The heavy rainfall in August 2022 resulted in widespread flooding across Spalding and Holbeach, particularly affecting low-lying areas. The intense downpour caused significant submersion of both properties and roads, leading to extensive damage to homes, infrastructure, and transport networks.	Flooding may be exacerbated with the projected increase in winter rainfall, leading to increases in surface water and fluvial flooding.	
Drought	The summer of 2018 was marked by an extended dry period that affected many areas in England, including Lincolnshire. The hot and dry weather led to warnings about drought conditions, affecting crop production and water resources.	The Met Office has projected a trend towards drier summers on average, with the trend being stronger under a high GHG emission scenario compared to a low one. However, it is the distribution of rainfall throughout the seasons that will determine UK drought risk.	

5.6.14. Based on the above UKCP data, information regarding the key Climate Change hazards for the East Midlands during construction is given below:

- Increase in the number of extremely hot days; and
- Climate changes in the 2020-2049 time-period, and increased probability of extreme weather events such as increased temperature and increased rainfall. This period will see Climate Change effects much less pronounced than those outlined in the operational phase of the Scheme.

5.6.15. Consideration has been given to the following Climate Change hazards for the Scheme's operational phase:

- Increased number of extremely hot days;
- Increased frequency of flooding from river, surface and ground sources;
- Increased risk of drought; and
- Increase in the frequency and intensity of wind storms.

5.7. Embedded Mitigation

5.7.1. The Scheme would be designed to avoid and mitigate the foreseeable impacts of Climate Change and these would be embedded into the design and planning of the Scheme. Embedded measures are driven by risk management, design codes, legislative requirements and/or best practice.

5.7.2. Embedded measures would be included as commitments within the CEMP and DEMP. At the PEIR stage, these plans are not yet drafted; however, this chapter outlines key embedded measures that have reduced the significance of the Climate Change effects. The assessment will be revisited and amended accordingly at the ES stage once further design information is available.

Measures Embedded into the Scheme Design

Lifecycle GHG Impact Assessment

5.7.3. Design and material choices embedded in the Scheme mitigate GHG emissions that would otherwise arise from the Scheme. The following best practice GHG mitigation measures would be included within the Scheme design:

- Where practicable, the use of materials with lower embodied GHG emissions such as locally sourced products and materials with a higher recycled content;
- Low carbon design specifications, such as energy-efficient lighting and durable construction materials to reduce maintenance and replacement cycles;
- Although the Scheme will have beneficial impacts on the global climate, further embedded mitigation measures will be secured through environmental management plans such as the CEMP and DEMP. These will be developed at the ES stage. These documents identify various mitigation measures to be embedded within the Scheme to reduce GHG impact, including:
    - Adopting the Considerate Constructors Scheme (CCS) to assist in reducing pollution, including GHGs, from the Scheme by employing good industry practice measures which go beyond statutory compliance;
    - Promote construction to use lower carbon modes of transport where practical by identifying and communicating local bus and rail connections and pedestrian and cycle access routes to/from the Scheme. This will be outlined in a Green Travel Plan;
    - Switching vehicles and plant off when not in use and ensuring construction vehicles conform to European Union (EU) vehicle emissions standards for the types of plant vehicles to be used;
    - Increasing recyclability by segregating construction waste to be reused and recycled where reasonably practicable;

- Designing, constructing and implementing the Scheme in such a way as to minimise the creation of waste; and
- Where practicable, maximise the use of materials with lower embodied carbon such as locally sourced products and materials with a higher recycled content.

Climate Change Risk Assessment

5.7.4. The assessment considers the following best practice embedded measures in order to carry out a practical risk assessment. These embedded mitigation measures are further detailed in PEIR Volume III Appendix 6-1: Climate Change Risk Assessment.

5.7.5. Construction and decommissioning impacts have been scoped out of this assessment due to the short-term nature of these activities and that notable changes in the climate will not manifest over the timeframe. Even so, extreme weather events may occur and therefore any potential impacts are likely to be mitigated via measures included in the other assessments and the implementation of a CEMP and DEMP.

5.7.6. Climate Change mitigation measures that would be embedded as part design of the Scheme include:

- Permanent flooding prevention and drainage measures to minimise disruption and damage to the Site during periods of heavy rainfall and/or flooding (the Flooding/Drainage Strategy will include this mitigation);
- Drainage design which would capture surface water runoff during extreme rainfall events (the Flooding/Drainage Strategy will include this mitigation); and
- Locating key equipment sensitive to flooding in areas that are not susceptible to flooding or by implementing measures to reduce the risk of flooding to that equipment.

5.7.7. Climate Change mitigation measures embedded within the Scheme during the construction phase would be incorporated into the CEMP and includes:

- Siting materials, equipment, welfare cabins, temporary access routes (etc) outside of areas that are prone to flooding, where practical;
- Temporary flood prevention and drainage design is implemented on Site to protect areas of work and also workers during any periods of heavy rainfall or flooding (the surface water drainage design will include this mitigation). This can include storm drains, water pumps, soakaways and temporary flood barriers;
- Consideration would be taken during periods of heatwaves to mitigate against the risks posed to workers and construction. To protect workers, measures include air-conditioned welfare cabins, appropriately shaded areas erected throughout the Site, increased breaks, water availability and adjusted working hours (the Health and Safety Plan would include these mitigations). Further to this, dust can become a significant issue during heatwaves and periods of

drought. The use of dust suppressers would be increased during these periods. Certain construction processes can be hindered by high temperatures. Higher temperatures speed up the concrete curing process, however, can cause issues with strength leading to potential cracks in foundations/structural elements. To prevent this, activities would be scheduled to occur outside of the window of the heatwave; and

- Appointing a H&S Manager that is responsible for monitoring weather forecasts, weather warnings and alerts and plans the construction works accordingly to minimise risks to the workforce, damage to equipment and delays to the construction programme. The Scheme would establish an extreme weather emergency response plan and toolbox talks would be carried to ensure all workers are aware of the risks and mitigations.

5.7.8. Climate Change mitigation measures embedded within the Scheme during the operational phase would be carried forward to the Operational Environmental Management Plan (OEMP) and include:

- Monitoring of weather forecasts, weather warning and alerts and accordingly plan any emergency response that is required; and
- Carrying out inspections on equipment and structures to inspect for any signs of damage or weakness that may be caused by extreme weather. This may include wind damage to the mounting structures, flooding of areas causing erosion around foundations, or heat/sun damage to electrical equipment decreasing the efficiency.

5.7.9. Climate Change mitigation measures embedded within the Scheme during the decommissioning phase would be incorporated into the DEMP. The DEMP measures with regards to climate adaptation will be largely similar to the CEMP; however, the impacts of the particular risks may be more significant as the timeline of decommissioning will be in the 2070s when the climate hazards may be exacerbated. The mitigations would need to be appropriately scaled to account for the increase in significance of impact.

5.7.10. It is anticipated that the above measures for the construction, operation and decommissioning phases will be included as embedded measures in the designs and associated management plans. However, this assessment will be revised at the ES stage to confirm the final embedded measures and identify any additional mitigation requirements.

5.8. Preliminary Assessment of Likely Significant Effects

5.8.1. This lifecycle GHG assessment considers the Scheme as a whole rather than splitting it into the Scheme components used elsewhere in this PEIR, i.e., PV Area, Grid Connection and Inter-Array Areas. This is due to the benchmarking being carried out at a Scheme level rather than at an asset level at this stage.

Construction Phase

Lifecycle GHG Impact Assessment

5.8.2. The greatest GHG impacts of the Scheme would arise during the construction phase from the manufacture of required materials and components. The manufacture of the BESS battery containers and the manufacture of the PV panels would have the greatest embodied carbon. For a similar scheme, Gate Burton Energy Park (Environment Statement Volume 1, Chapter 6: Climate Change)[37], the GHG assessment emissions from the manufacture of products and materials were projected to make up 93.5% of construction phase emissions. Transportation of these products were projected to contribute a further 4.9%, while the remaining 1.6% would come from worker commuting, waste, and fuel and water use. These figures can be used as preliminary indications to benchmark the Scheme's assessment emission sources.

5.8.3. Other sources of emissions during the construction phase include water, energy, and fuel use for construction activities such as fuel consumed by construction plant and machinery, fuel use for the transportation of construction materials to and from the Site, transportation of construction workers to and from the Site, and the transportation and disposal of waste.

5.8.4. The projected total GHG emission from the construction phase of a number of utility-scale solar farms are presented in Table 5-11 below. These schemes are all Nationally Significant Infrastructure Projects (NSIPs) that have been granted consent (or in the case of East Yorkshire Solar Farm accepted by the Planning Inspectorate for examination, with that examination now having concluded). Annual construction emissions (tCO2e) have been combined with opening year installed capacity measured in Megawatt-hour (MWh) for each Scheme to establish an average of 0.36 tCO2e MWh. This benchmark has been applied to the Scheme to provide estimated emissions during the construction phase.

[37] Gate Burton Energy Park (2023). *DCO Application*. Available at: https://www.gateburtonenergypark.co.uk/documents/dco-application/.

Table 5-11 Construction GHG Emission Projections

Scheme	Annual Construction Emissions (tCO_2e)	Opening year MWh	Benchmark (tCO_2e/MWh)
Gate Burton Energy Park[38]	189,343	479,790	0.39
Sunnica Energy Farm[39]	226,008	643,361	0.35
Longfield Solar Farm[40]	184,565	356,475	0.52
East Yorkshire Solar Farm[41]	83,939	433,709	0.19
Average			**0.36**

5.8.5. By comparison to the above, and as discussed in paragraph 5.5.3, the projected total GHG emissions for the Scheme have been based on a conservative capacity factor of 10% and assumes that is operated '24/7'. Hence the annual construction emissions from the Scheme have been estimated at 238,162.5 tCO2e. Based on a conservative construction period of 36 months, total emissions from the construction phase are estimated at 714,487.5 tCO2e. This therefore presents a reasonable worst-case scenario.

5.8.6. Construction phase emissions have been calculated using the average tCO2e/kWh benchmark multiplied by the annual MWh of the Scheme, as provided by the Applicant.

5.8.7. Projected GHG emissions from the construction phase have been assessed against the carbon budget period during which they are expected to arise, i.e., the 5th UK carbon budget. Assessment against relevant sectoral budgets will be provided in the ES.

5.8.8. The annual emissions of each phase have been compared to the relevant annualised carbon budgets to enable assessment of the phases individually.

[38] Gate Burton Energy Park (2023). *DCO Application*. Available at: https://www.gateburtonenergypark.co.uk/documents/dco-application/.
[39] Planning Inspectorate (2024). *Sunnica Energy Farm*. Available at: https://national-infrastructure-consenting.planninginspectorate.gov.uk/projects/EN010106/documents.
[40] Planning Inspectorate (2024). *Longfield Solar Farm.* Available at: https://national-infrastructure-consenting.planninginspectorate.gov.uk/projects/EN010118/documents.
[41] Planning Inspectorate (2024). *East Yorkshire Solar Farm*. Available at: https://national-infrastructure-consenting.planninginspectorate.gov.uk/projects/EN010143/documents.

Table 5-12 UK Carbon Budget Relevant to Construction Phase

Relevant UK Carbon Budget	UK Carbon Budget (CO_2e)	Total Construction Phase Emissions During Carbon Budget Period (tCO_2e)	Construction Phase Emissions as a Proportion of UK Carbon Budget (%)
5th Carbon Budget (2028 to 2032)	17,250,000,000	714,489	0.0041

5.8.9. Annual emissions from the construction phase of the Scheme (and their magnitude) are compared to the significance definitions outlined in Table 5-4. In line with IEMA criteria for assessing the significance of GHG impacts, construction of the Scheme can be assumed to be consistent with applicable existing and emerging policy requirements. Emissions from the construction phase are determined to be minor adverse and therefore not significant.

Operational Phase

Lifecycle GHG Impact Assessment

5.8.10. For the operation and maintenance phase of the Scheme, this GHG assessment includes the effects of the physical presence of the energy infrastructure, and its operation and maintenance.

5.8.11. GHG emissions sources during the operation phase include operational energy use (i.e. for auxiliary services and standby power) and fuel used for the transportation of workers to the Scheme and maintenance activities. Maintenance and transportation cover the following:

- Embodied carbon in replacement parts;
- Plant and machinery requirements;
- Fuel and water use during maintenance activities;
- Transportation of materials, waste and workers (including maintenance workers) to and from the Site; and
- Waste management activities.

5.8.12. Operation emissions would predominantly be from the replacement of panels and the associated embodied carbon in the materials, and therefore occur at regular intervals, rather than ongoing, constant emissions. It is therefore anticipated that the majority of these emissions would be focussed on the maintenance, refurbishment and replacement of the PV panels and BESS, which have an assumed design life of 20 years. The expected emissions for replacement of parts will be expanded upon in the ES once the maintenance regime is determined further.

5.8.13. The waste section as part of PEIR Volume I Chapter 14: Other Environmental Topics provides a review of expected design life and replacement frequency for key components of the Scheme. As outlined in this section as part of PEIR Volume I Chapter 14, the Scheme is anticipated to generate Waste Electrical and Electronic Equipment

(WEEE) during the operational phase where maintenance is required, and during the decommissioning phase, including PV arrays, BESS and substation equipment, and supporting electrical infrastructure, including within the Inter-Array Areas and Grid Connection Corridor. WEEE would be collected and treated by a re-processor who holds relevant authorisation, using the best available collection, treatment, recovery and recycling techniques as required by the WEEE Regulations 2013.

5.8.14. There is an emerging industry for recycling solar panels in the UK, for example the P/V cycle scheme, which provides a network of suppliers who can collect and recycle PV panels. The Scheme would aim, wherever practical, to have all Solar PV panels and batteries reused or recycled during the operational phase. Table 14-3-7 of the waste section on PEIR Volume I Chapter 14: Other Environmental Topics considers all components relating to the PV area, Inter-array area and Grid-connection corridor to be recyclable.

5.8.15. Projected total GHG emissions from the operation phase of other utility-scale solar farms are presented in Table 5-13, along with their average annual MWh production. From these Schemes, an annualised benchmark of 0.012 tCO2e/MWh has been calculated.

Table 5-13 Project Operational Phase GHG Emissions

Scheme	Average Annual Operational Phase Emissions (tCO2e)	Opening year MWh	Benchmark (tCO2e/MWh)
Gate Burton Energy Park	7,573	479,790	0.016
Sunnica Energy Farm	5,220	643,361	0.008
Longfield Solar Farm	7,770	356,475	0.022
East Yorkshire Solar Farm	1,633	433,709	0.004
Average			**0.012**

5.8.16. The projected total GHG emissions for the Scheme have been based on a conservative capacity factor of 10% and assumes that it is operated '24/7'. On this basis and in comparison with the above, the annual operation and maintenance emissions from the Scheme have been estimated at 8,123.77 tCO2e. The design life of the Scheme, as outlined in PEIR Volume I Chapter 4: Alternatives and Design Evolution, will be 40 years, hence the total operation and maintenance GHG emissions are estimated at 324,950.8 tCO2e. Operation and maintenance emissions have been calculated using benchmarking data available, multiplied by the annual generation (MWh) of the Scheme.

5.8.17. Emissions from the backup diesel generator for the on-Site substation have been estimated to contribute to less than 1% of the overall emissions from the Scheme and have therefore been left out of the total operational emissions. This assumption will be refined and confirmed at the ES stage.

5.8.18. The Scheme is expected to be operational by 2029, as stated in PEIR Volume I Chapter 2: Scheme. Therefore, the Scheme operation and maintenance emissions up to 2042 will fall under the 6th and 7th UK carbon budgets, beyond which point no carbon budgets have yet been legislated for. Table 5-14 presents the estimated operation and maintenance emissions against the carbon budget periods during which they arise.

5.8.19. It should be noted that Lincolnshire County Council's and South Holland District Council's proposed budgets beyond 2037 have not been formally adopted by the Government or legislated for by Parliament. Therefore, they can only be used as an indicative measure to contextualise the Scheme's progress toward the national net-zero trajectory.

Table 5-14 UK Carbon Budget Relevant to Operational Phase

Relevant UK Carbon Budget	UK Carbon Budget (tCO2e)	Total Annual Operational Phase Emissions During Carbon Budget Period (tCO2e)	Operation Phase Emissions as a Proportion of South Holland District Carbon Budgets (%)
5th Carbon Budget (2028 to 2032)	1,725,000,000	32,495	0.002%
6th Carbon Budget (2033 to 2037)	965,000,000	40,619	0.004%
7th Carbon Budget (2038 to 2042)	535,000,000	251,837	0.047%

5.8.20. Annual emissions from the operation of the Scheme (and their magnitude) are compared to the significance definitions outlined in Table 5-4. As stated in the IEMA guidance[28] on assessing GHG emissions "*the crux of significance therefore is not whether a project emits GHG emissions, nor even the magnitude of GHG emissions alone, but whether it contributes to reducing GHG emissions relative to a comparable baseline consistent with a trajectory towards net zero by 2050*". The Scheme's operational phase indirectly causes a reduction in atmospheric GHG concentration compared to the without-Scheme baseline, aligns with a trajectory towards net zero and plays a role in achieving the rate of transitions required by national set policy commitments. The operational carbon intensity of the Scheme remains below that of a gas-fired generating facility throughout its design life. The without-project baseline alternative of a gas-fired generating facility would result in substantially higher GHG emissions. As stated in the latest IEMA guidance[28] "*a project that causes GHG emissions to be avoided or removed from the atmosphere has a beneficial effect that is significant*".

5.8.21. The GHG impact of the operational phase is therefore considered to be beneficial and significant when compared to the future baseline 'business-as-usual' scenario.

Carbon Intensity of the Operational Phase of the Scheme

5.8.22. Based on a capacity factor of 10% (and assuming the Scheme will operate '24/7'), renewable energy generation from the Scheme during the first full year has been estimated based on the Scheme description and layout plan contained within PEIR Volume I Chapter 2: Scheme. Taking into consideration an assumed industry standard of 2% reduction[42] in Solar PV Panel performance during the first year and applying a 0.45% degradation factor for each subsequent year, the total energy generation has been estimated over the assessed 40-year Scheme design life.

5.8.23. A carbon intensity value represents how many grams of CO2 are released to produce a kilowatt hour (kWh) of electricity. Dividing the lifetime total energy generation figure into the lifetime emissions total of 1,065,330 tCO2e gives a total carbon intensity value for the Scheme of 45.11 gCO2e /kWh.

5.8.24. The current UK grid carbon intensity is 207 gCO2e /kWh[43]; however, these figures cannot be directly compared as the published UK grid carbon intensity figure only takes into account operation and maintenance emissions from the generation of electricity, overwhelmingly from the fossil fuels used to power gas-fired and occasionally coal-fired power stations. For a meaningful comparison to be made between the Scheme and the UK grid, the operation and maintenance carbon intensity of the Scheme must only include emissions from the ongoing operation and maintenance of the Scheme and exclude emissions from construction and decommissioning phases.

5.8.25. Combining lifetime generation figures and operational and maintenance emissions figures gives an operation and maintenance carbon intensity value of 13.76g CO2e /kWh.

5.8.26. Comparing the Scheme against a gas-fired generating facility, currently the most carbon-efficient fossil-fuelled technology available, a representative figure for the carbon intensity of a gas-fired facility is 350 gCO2e /kWh[44]. The operational intensity of the Scheme is therefore 95% lower than that of the gas-fired facility. Each kilowatt hour of electricity generated by the Scheme will emit 340g CO2e less than if it was generated by a gas-fired.

5.8.27. Combining this figure with the estimated lifetime output from the Scheme indicates an overall lifetime carbon reduction, relative to the counterfactual gas-fired facility, of over 8 million tCO2e. Given that the construction and decommissioning phase emissions for the Scheme would be 350,843 tCO2e, the breakeven period for emissions without the

[42] IRENA (2016). *The Power of Transformation: Wind, Sun and the Economics of Flexible Power Systems*. IRENA, 2016. Available at: https://www.irena.org/Publications.
[43] GOV.UK, *Greenhouse gas reporting: conversion factors 2024*, Accessed at: https://www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2024.
[44] Adina Popa et al. (2011) *Carbon capture considerations for combined cycle gas turbine*. Available at: https://www.sciencedirect.com/science/article/pii/S1876610211003195#:~:text=As%20emissions%20levels%20for%20new,operate%20without%20CCS%20beyond%202030.

BESS area would be under 1.5 years of operation and would be less with the BESS area (taking into the additional carbon savings from the use of the BESS area outlined below). There would, however, be emissions associated with the replacement and repair of the BESS (as well as the PV panels and substation elements) and this will be expanded upon in the ES once the maintenance regime is determined further.

5.8.28. The figures calculated are indicative only to demonstrate the possible carbon reductions from the Scheme. The figures will be refined and re-calculated when further design information is available, and assumptions validated, at the ES stage.

Additional Carbon Savings from the Use of BESS

5.8.29. Use of the BESS area provides additional carbon saving opportunities. Relatively fast response power sources such as battery storage have an important role to play in helping to balance supply and demand within the electricity grid. This grid balancing function is often performed using high carbon intensity power sources such as open cycle gas turbines (OCGT), so the use of a battery charged from solar PV generation can deliver a direct carbon saving relative to an OCGT.

5.8.30. The design of the Scheme's BESS area is still evolving. Each BESS unit is assumed to have storage capacity between approximately 2MW/4MWh, as storage technology advances, this per-unit capacity may increase. A design process will be undertaken for the BESS, exploring several configurations while maintaining flexibility to account for the readily developing technology that could be available at the time of procurement and construction. For the purposes of the assessment, each compound is anticipated to have a footprint of up to approximately 150m by 150m. The configuration and layout of equipment within each BESS and on-Site substation compound is still to be determined. It is anticipated that up to approximately 175 BESS container units would be located across the PV Area, split between the four BESS and on-Site substation compounds. However, until the specific BESS technologies are selected, including the battery cells, Heating, Ventilation and Air Conditioning (HVAC) system, switchgear, and fire suppression systems, the capacity of the BESS Area is therefore currently unknown. As such, no robust calculations of the likely reduction in GHG emissions from the use of the BESS Area are possible at this stage. This may be adjusted at ES stage when further information will be available.

5.8.31. However, carbon savings from BESS can be illustrated using some typical efficiency values and benchmarking from other similar Schemes. Should the BESS area be charged from the Scheme, and discharged back into the grid once each day, at a typical round-trip efficiency of 85% and an overall lifetime degradation rate of 80%, it will be able to supply energy to the electricity grid over its 40-year design life. For example, the Gate Burton Energy Park Scheme calculated that the BESS would be able to supply 7,446,000 MWh to the electricity grid over its 60 year operational lifetime. The operation and maintenance carbon intensity of the Meridian Scheme is 13.76 gCO2e/kWh or 0.013 tCO2e/MWh and the comparable figure for an OCGT is 0.460 tCO2e/MWh. These figures illustrate the use of the BESS area for grid balancing purposes would potentially

result carbon savings over its design life. The Gate Burton Energy Park, for example, calculated the overall carbon reduction when the BESS is used for a daily charge-discharge cycle of around 10.3 million tCO2e.

5.8.32. These figures are inevitably subject to a degree of uncertainty given the stage of design of the BESS , but they illustrate the fact that the use of the BESS, when used for grid balancing purposes, is likely to result in significant additional carbon savings over its design life. Given the projected emissions figures for the BESS area are not available at this stage, a worst case scenario approach has been applied whereby these additional carbon savings from use of the BESS for grid balancing are not factored into the overall GHG assessment.

5.8.33. Considering the likely potential overall carbon savings of the project illustrated above, it confirms the assessment that the GHG impact of the operational phase is considered to be beneficial and significant when compared to the future baseline 'business-as-usual' scenario. The specific level of significance of the carbon savings will be defined at ES stage when further BESS design information is available to fully understand the savings that can be attributed to the Scheme, however at this stage it is likely that the effect is beneficial.

Climate Change Risk Assessment

5.8.34. The climate adaptation and resilience risks during the operational phase are assessed in PEIR Volume III Appendix 5-1: Climate Change Risk Assessment.

5.8.35. The operational risks were assessed for PV area, Grid Connection Corridor and Inter-Array Areas (separately for overhead and underground scenarios) under the RCP8.5 climate projection scenario to the year 2079. It is predicted that there will be an increase in mean annual temperatures, with an increase in the frequency of extremely hot days and droughts. There is an increased likelihood of flooding due to extreme weather events (high rainfall and wind).

PV Area

5.8.36. The key impacts associated with the climate hazards in the PV area are related to damages to assets, increased risk of fire, decrease in workforce safety and welfare, as well as long-term operational efficiency.

5.8.37. The assessment has considered embedded mitigation (as set out above in Section 5.7) which would be included as part of the design and operation of the Scheme, following best practice. This includes plans such as the Operational Environmental Management Plan, the surface water drainage design and H&S Plan. Due to this, no significant (low-medium) Climate Change risks during the operation phase have been identified.

Grid Connection Corridor

5.8.38. The key impacts associated with the climate hazards in this area are related to damages to assets and long-term operational efficiency.

5.8.39. The embedded mitigation includes measures included in design, operation and maintenance of the Scheme, following best practice. This includes plans such as the Operational Environmental Management Plan, the surface water drainage design and site design. As a consequence, no significant (low-medium) Climate Change risks during the operational phase have been identified.

Inter-Array Areas, Scenario 1: Overhead

5.8.40. This scenario considers the impact associated with climate hazards associated to damage to overhead cables and their long-term operational efficiency.

5.8.41. This would be addressed through embedded mitigation measures which would include designing overhead cables and structures with heat-resistant materials to withstand extreme temperatures. The cables and structures would also be reinforced to endure extreme wind speeds and storms. Due to this, no significant (low-medium) Climate Change risks during the operational phase have been identified.

Inter-Array Areas, Scenario 2: Underground

5.8.42. Differently from the previous scenario, this scenario explores the impact associated with climate hazards related to damage to underground cables from flooding and soil movement and to their long-term operational efficiency.

5.8.43. Mitigation measures include soil assessments and reinforced protective encasements to prevent soil instability. Flooding risks are managed through waterproof insulation.. Overheating is mitigated with high-temperature-resistant insulation.

5.8.44. No significant (low-medium) Climate Change risks have been identified during the operational phase following the implementation of these measures.

5.8.45. This assessment will be refined at the ES design stage and any potential additional or residual risks and mitigation measures can be established if required.

In-Combination Climate Change Impact Assessment

5.8.46. The in-combination Climate Change impacts during the operational and maintenance phase are assessed in PEIR Volume III Appendix 5-2: In-Combination Climate Change Impact Risk Assessment. The preliminary assessment has been undertaken at a Scheme level rather than an asset level. This will be carried out at the ES stage when the other technical disciplines assessments are further advanced.

5.8.47. The operational risks were assessed under the RCP8.5 climate projection scenario to the year 2079. It is predicted that there would be an increase in mean annual temperatures, with an increase in the frequency of extremely hot days and droughts. There is an increased likelihood of flooding due to extreme weather events (high rainfall and wind).

5.8.48. The key impacts associated with these climate hazards are related to biodiversity, air quality, flooding and water resources. Climate Change has the potential to exacerbate the significance of the effects identified by other technical chapters.

5.8.49. The assessment has considered embedded mitigation measures which would be included as part of the design and operation of the Scheme, following best practice. Due to this, no significant in-combination Climate Change risks during the operational phase have been identified. This assessment will be refined at the ES stage when the other technical disciplines assessments are further advanced.

Decommissioning Phase

Lifecycle GHG Impact Assessment

5.8.50. For the assessment, these effects will be taken to be those for which the source begins and ends during the decommissioning phase. This covers sources of effects such as traffic, noise and vibration from decommissioning activities, dust generation, site runoff, mud on roads, risk of fuel/oil spillage, and the visual intrusion of plant and machinery on-Site, for example. As with construction phase effects, some aspects of decommissioning would endure for longer than others.

5.8.51. The greatest GHG impact during the decommissioning phase is often due to transportation/disposal of materials and waste. Other sources of emissions during decommissioning within the scope of the GHG emissions assessment include water use for decommissioning activities, fuel use on-site, and worker commuting.

5.8.52. Projected total GHG emissions from the decommissioning phase of a number of solar NSIPs are presented in Table 5-15, along with their average annual MWh production. From these Schemes, an annualised benchmark of 0.020 tCO2e/MWh has been calculated.

5.8.53. The projected total GHG emissions for the Scheme have been based on a conservative capacity factor of 10% and assumes that it is operated '24/7'. Through comparison of other Schemes, the annual decommissioning emissions from this Scheme have been estimated at 12,946 tCO2e. As the decommissioning phase of this Scheme is expected to take two years, total emissions from decommissioning are estimated at 25,892 tCO2e. As with the construction and operational figures, a decommissioning benchmark has been used and multiplied by the annual generation of the Scheme.

Table 5-15 Projected Decommissioning Phase GHG Emissions

Scheme	Average Annual Decommissioning Emissions (tCO2e)	Opening year (MWh)	Benchmark (tCO2e/MWh)
Gate Burton Energy Park	11,324	479,790	0.024
Sunnica Energy Farm	15,185	643,361	0.024
Longfield Solar Farm	5,534	356,475	0.016
East Yorkshire Solar Farm	6,978	433,709	0.016
Average			**0.020**

5.8.54. As above for the operational phase, the decommissioning GHG footprint is considered to reflect a robust worst-case scenario as the calculations have been carried out using current emissions factors. By the decommissioning phase in 2070, GHG emissions associated with energy generation, transportation, operation of plant, and waste disposal throughout the supply chain are anticipated to be much lower as a result of grid decarbonisation, and machinery and vehicle electrification, in line with the UK's net zero carbon emissions target for 2050.

5.8.55. While there are expected to be GHG emissions associated with the decommissioning phase of the Scheme, actual emissions are anticipated to be lower as the figures presented in Table 5-15, which represents a robust worst-case scenario. Therefore, the magnitude of impact is considered low.

5.8.56. GHG emissions from the decommissioning phase are therefore considered to have a minor adverse, not significant effect on Climate Change. A negligible effect is not possible where any GHG emissions are released to the atmosphere. However, while there are residual emissions, the Scheme is doing enough to align with and contribute to the relevant transition scenario, keeping the UK on track towards net zero by 2050 and thereby avoiding significant adverse effects per IEMA guidance[28].

5.9. Additional Mitigation and Enhancement Measures

5.9.1. Additional mitigation measures or enhancement measures are required where significant adverse effects are identified after considering the embedded mitigation measures. No significant adverse effects have been identified in the preliminary GHG assessment, CCRA or ICCI assessment therefore no additional mitigation or enhancement measures are identified at this stage. This will be reviewed at the ES stage once the assessments and appropriate identified measures will be applied to the Scheme, if required.

5.10. Likely Significant Residual Effects

Lifecycle GHG Impact Assessment

5.10.1. In light of UK's climate objective to achieve net zero carbon by 2050, and in line with IEMA guidance on Assessing Greenhouse Gas Emissions and Evaluating their Significance, the UK's Fifth, Sixth and Seventh Carbon Budgets have been used to contextualise emissions from the Scheme. In relation to the results presented in Table 5-11, Table 5-13 and Table 5-15 the use of the 0.36 tCO2e /MWh benchmark average would not have changed the significance of effects of the GHG emissions associated with the construction, operation and maintenance, and decommissioning phases of the Scheme.

5.10.2. As the Scheme directly supports the UK policy environment of decarbonising electricity generation, as laid out in the CCC's Sixth Carbon Budget Advice, Methodology and Policy reports, it can be considered to be aligned with the UK's overall trajectory to net zero.

The National Grid cannot and will not decarbonise without investments in low carbon electricity generation like the Scheme.

5.10.3. The Scheme results in some operational and maintenance emissions associated with maintenance and worker travel. However, the benefits of generating renewable energy from the Scheme significantly outweigh the associated emissions. The Scheme will offset a greater amount of GHG emissions through the input of renewable energy into the grid than the GHG emissions embedded within the Scheme during construction phase. Therefore, the Proposed Scheme will contribute to the UK's aims to reduce carbon emissions and achieve its ambitious GHG emissions reduction targets.

5.10.4. The GHG savings achieved throughout the design life of the Scheme demonstrate the role of solar energy generation in the transition to, and longer-term maintenance of, a low carbon economy. Without low-carbon energy generation projects such as the Scheme, the average grid GHG intensity will not decrease as is projected, which would adversely affect the UK's ability to meet its carbon reduction targets.

5.10.5. The Scheme demonstrates an indirect reduction in atmospheric GHG concentration and avoidance of emissions; therefore, it is overall beneficial and has a positive impact on climate which is considered significant.

5.10.6. The GHG impact of construction and decommissioning phases are anticipated to result in minor adverse, non-significant effects on the climate and would also be balanced by the beneficial effect during operation (Table 5-13). Therefore, the residual effect remains not significant.

Climate Change Risk Assessment

5.10.7. The climate adaptation and resilience risks during the operational and maintenance phase are assessed in PEIR Volume III Appendix 5-1: Climate Change Risk Assessment.

5.10.8. The operational risks have been assessed under the RCP8.5 climate projection scenario to the year 2079. It is predicted that there would be an increase in mean annual temperatures, with an increase in the frequency of extremely hot days and droughts. There is an increased likelihood of flooding due to extreme weather events (high rainfall and wind).

5.10.9. The key impacts associated with these climate hazards are related to damages to assets (e.g. flooding and heatwaves), workforce exposure to dangerous conditions and long-term operational efficiency.

5.10.10. In the preliminary Climate Change risk assessment, no adverse significant risks have been identified and therefore no significant effects are anticipated. The assessment considers the embedded measures as mitigation to the risks and are deemed sufficient to address the risks. The assessment will be refined at the ES stage.

In-Combination Climate Change Impact Assessment

5.10.11. The in-combination Climate Change impacts during the operational phase are assessed in PEIR Volume III Appendix 5-2: In-Combination Climate Change Impact Risk Assessment

5.10.12. The operational risks have been assessed under the RCP8.5 climate projection scenario to the year 2079. It is predicted that there would be an increase in mean annual temperatures, with an increase in the frequency of extremely hot days and droughts. There is an increased likelihood of flooding due to extreme weather events (high rainfall and wind).

5.10.13. The key impacts associated with these climate hazards are related to biodiversity, air quality, flooding and water resources.

5.10.14. The assessment has considered embedded mitigation measures which would be included as part of the design and operation of the Scheme, following best practice. As a result, no significant in-combination Climate Change risks during the operational phase have been identified.

5.11. Cumulative Effects

5.11.1. As explained in paragraph 5.4.9 the assessment of cumulative effects does not apply to the GHG assessment because its impacts are inherently global and cumulative, with emissions affecting the overall atmosphere rather than a specific receptor. The CCRA focuses on Climate Change impacts on the Scheme's assets and activities, without considering broader cumulative effects, so no cumulative assessment is needed. The ICCI assessment already accounts for intra-project cumulative effects of climate resilience, and as the global climate is the ZoI, cumulative effects are not relevant.

5.12. Conclusions and Next Steps

5.12.1. The information provided within the PEIR is preliminary, with the ES reporting the final assessment of likely significant effects. This preliminary assessment has been completed based on worse-case parameters against a series of assumptions and limitations. The final assessment within the ES will be refined in respect of any revision to the Scheme as a result of the design process, comments and information received through stakeholder engagement.

5.12.2. The preliminary assessment has found an overall beneficial significant effect from the GHG assessment, no significant effects in the CCRA, and no significant effects in the ICCI assessment.

5.12.3. During the ES phase, the GHG assessment will be completed with project specific data from the design team as it becomes available, following the methodology as outlined in this chapter. This should remove the need to benchmark from other Schemes and will

provide more accurate estimates for the Scheme. However, the significance of residual effects is not predicted to change from those presented in this chapter.

The CCRA and ICCI assessments will be refined with further design information and embedded mitigation measures to better understand the combined effects of Climate Change and the Scheme on surrounding sensitive receptors. However, the significance of the effects is not predicted to change from those presented in this chapter.

Table 5-16 Summary of Likely Significant Residual Effects

Receptor	Development Phase	Environmental Effect	Nature of the Effect	Embedded Mitigation	Classification of Effect	Additional Mitigation Requirements	Significance of Residual Effect	Confidence level (high, medium, low)
Global Climate	Operation	Impact of GHG emissions arising during operation activities	Long term	None required	Beneficial (significant)	N/A	Beneficial (significant)	Medium