XLINKS' MOROCCO-UK POWER PROJECT

Environmental Statement

Volume 4, Chapter 1: Climate Change

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Glossary

Term	Meaning
Applicant	Xlinks 1 Limited
Alverdiscott Substation Connection Development	The development required at the existing Alverdiscott Substation Site, which is envisaged to include development of a new 400 kV substation, and other extension modification works to be carried out by National Grid Electricity Transmission. This does not form part of the Proposed Development, however, it is considered cumulatively within the Environmental Impact Assessment as it is necessary to facilitate connection to the national grid.
Carbon store	A carbon store (also known as a carbon stock) maintains a constant amount of carbon, as it is absorbed and stored. Examples of carbon stores include woodland, peatland, ocean, etc.
Climate Change	A change in global or regional climate patterns, in particular a change apparent from the mid to late 20th century onwards and attributed largely to the increased levels of atmospheric carbon dioxide produced by the use of fossil fuels.
Converter Site	The Converter Site is proposed to be located to the immediate west of the existing Alverdiscott Substation site in north Devon. The Converter Site would contain two converter stations (known as Bipole 1 and Bipole 2) and associated infrastructure, buildings and landscaping.
Converter Station	Part of an electrical transmission and distribution system. Converter stations convert electricity from Direct Current to Alternating Current, or vice versa.
Environmental Impact Assessment	The process of identifying and assessing the significant effects likely to arise from a project. This requires consideration of the likely changes to the environment, where these arise as a consequence of a project, through comparison with the existing and projected future baseline conditions.
Greenhouse Gas	A gas that absorbs and emits radiant energy within the thermal infrared range, causing the greenhouse effect. Examples include carbon dioxide and methane.
HVAC Cables	The High Voltage Alternating Current cables which would bring electricity from the converter stations to the new Alverdiscott Substation Connection Development.
HVAC Cable Corridors	The proposed corridors (for each Bipole) within which the onshore High Voltage Alternating Current cables would be routed between the Converter Site and the Alverdiscott Substation Site.
HVDC Cables	The High Voltage Direct Current cables which would bring electricity to the UK converter stations from the Moroccan converter stations.
Landfall	The proposed area in which the offshore cables make landfall in the United Kingdom (come on shore) and the transitional area between the offshore cabling and the onshore cabling. This term applies to the entire landfall area at Cornborough Range, Devon, between Mean Low Water Springs and the transition joint bays inclusive of all construction works, including the offshore and onshore cable routes, and landfall compound(s).
Maximum Design Scenario	The realistic worst case scenario, selected on a topic-specific and impact specific basis, from a range of potential parameters for the Proposed Development.
Moroccan generation assets	The generation assets of the Project, which are situated within Morocco. The Moroccan generation assets comprise a wind farm, solar farm and battery storage.
Offshore Cable Corridor	The proposed corridor within which the offshore cables are proposed to be located, which is situated within the United Kingdom Exclusive Economic Zone.
Onshore Infrastructure Area	The proposed infrastructure area within the Order Limits landward of Mean High Water Springs. The Onshore Infrastructure Area comprises the transition joint bays, onshore HVDC Cables, converter stations, HVAC Cables, highways

Term	Meaning
	improvements, utility diversions and associated temporary and permanent infrastructure including temporary compound areas and permanent accesses.
Order Limits	The area within which all offshore and onshore components of the Proposed Development are proposed to be located, including areas required on a temporary basis during construction (such as construction compounds).
Proposed Development	The elements of Xlinks' Morocco-UK Power Project within the UK. The Proposed Development covers all works required to construct and operate the offshore cables (from the UK Exclusive Economic Zone to Landfall), Landfall, onshore Direct Current and Alternating Current cables, converter stations, and highways improvements.
Study area	This is an area which is defined for each environmental topic which includes the Order Limits as well as potential spatial and temporal considerations of the impacts on relevant receptors. The study area for each topic is intended to cover the area within which an impact can be reasonably expected.
The national grid	The network of power transmission lines which connect substations and power stations across Great Britain to points of demand. The network ensures that electricity can be transmitted across the country to meet power demands.
Xlinks' Morocco UK Power Project (the 'Project')	The overall scheme from Morocco to the national grid, including all onshore and offshore elements of the transmission network and the generation site in Morocco (referred to as the 'Project')

Acronyms

Acronym	Meaning
ALC	Agricultural Land Classification
BEIS	The former Department for Business, Energy & Industrial Strategy
CCRA	Climate Change Risk Assessment
CO_2	Carbon Dioxide
CO_2e	Carbon Dioxide equivalent
CEMP	Construction Environmental Management Plan
DCO	Development Consent Order
Defra	Department For Environment, Food and Rural Affairs
DESNZ	The Department for Energy Security and Net Zero
EEZ	Exclusive Economic Zone
EIA	Environmental Impact Assessment
ES	Environmental Statement
GHG	Greenhouse Gas
GWP	Global Warming Potential
HGV	Heavy Goods Vehicle
HVAC	High Voltage Alternating Current
HVDC	High Voltage Direct Current
IEMA	Institute of Environmental Management and Assessment
IPCC	Intergovernmental Panel on Climate Change
LCA	Life Cycle Assessment
MOHC	Met Office Hadley Centre

Acronym	Meaning
NGET	National Grid Electricity Transmission
NPPF	National Planning Policy Framework
NPS	National Policy Statement
On-CEMP	Onshore Construction Environmental Management Plan
PEIR	Preliminary Environmental Information Report
RCP	Representative Concentration Pathway
UCH	Underwater Cultural Heritage
UK	United Kingdom
UKCP18	United Kingdom Climate Projections 2018
UNFCCC	United Nations Framework Convention on Climate Change
UXO	Unexploded Ordnance
VOC	Volatile Organic Compound
WBCSD	World Business Council for Sustainable Development
WRI	World Resources Institute

Units

Units	Meaning
%	Percentage
°C	Degrees Celsius
G	Giga
km	Kilometres
kg	Kilograms
kn	Knot
mm	Millimetre
m/s	Metres per second (speed)
MW	Megawatt
nm	Nautical mile
tCO_2e	Tonnes carbon dioxide equivalent

1 CLIMATE CHANGE

1.1 Introduction

1.1.1 This chapter of the Environmental Statement (ES) presents the findings of the Environmental Impact Assessment (EIA) undertaken for the United Kingdom (UK) elements of Xlinks' Morocco-UK Power Project (the 'Project'). For ease of reference, the UK elements of the Project are referred to in this chapter as the 'Proposed Development'. The ES accompanies the application to the Planning Inspectorate for development consent for the Proposed Development.

1.1.2 This chapter considers the potential impacts of the Proposed Development on climate change during the construction, operation and maintenance, and decommissioning phases. Specifically, it relates to the onshore and offshore elements of the Proposed Development as detailed within Volume 1, Chapter 3: Project Description of the ES.

1.1.3 The Proposed Development would connect the Moroccan generation assets (via cable infrastructure routed through Morocco, Spain, Portugal, France and UK waters) to the national grid, which would help deliver an output of 3.6 Gigawatt (GW) (see Volume 1: Chapter 1: Introduction of the ES for further details). This would contribute to:

- the UK Government's ambition to achieve Net Zero by 2050;
- securing the UK energy supply;
- delivering affordable energy for UK customers; and
- supporting the UK growth agenda.

1.1.4 The Proposed Development focuses on the UK elements of the Project, thus connecting the Moroccan generation assets to the national grid (see Volume 1, Chapter 1: Introduction of the ES for further details). Therefore, the focus of this chapter is on the impacts of the Proposed Development.

1.1.5 However, given its purpose, the Proposed Development would never operate in isolation. As such, the cumulative impacts of the Proposed Development with the Project infrastructure outside of the UK Exclusive Economic Zone (EEZ) (including cable infrastructure and the Moroccan generation assets), on the global atmospheric mass of carbon dioxide (CO_2) have been assessed.

1.1.6 The cumulative assessment also considers the anticipated development at the existing Alverdiscott Substation site (referred to as the 'Alverdiscott Substation Connection Development), which would include a new 400 kV substation and other extension modification works to be developed by National Grid Electricity Transmission (NGET). Whilst this development will form part of a separate development brought forward by NGET, it would be necessary to facilitate connection to the national grid and thus, has been considered cumulatively.

Scope of this Chapter

1.1.7 Climate change in the context of EIA can be considered broadly in three parts:

- the potential effect of greenhouse gas (GHG) emissions caused directly or indirectly by the Proposed Development, which may have the potential to contribute to climate change;
- the potential effect of changes in climate on the Proposed Development, which could affect it directly resulting in climate risk; and
- the potential effect of changes in climate on the Proposed Development, which could modify its other environmental impacts (i.e. in-combination climate change impacts).

1.1.8 In particular, this ES chapter:

- identifies the key legislation, policy and guidance relevant to climate change;
- details the EIA scoping and consultation process undertaken to date for climate change;
- confirms the study area for the assessment, the methodology used to identify baseline environmental conditions, the impact assessment methodology, and identifies any assumptions and limitations encountered in compiling the environmental information;
- sets out the existing and future environmental baseline conditions, established from desk studies and consultation;
- details the mitigation and/or monitoring measures that are proposed to prevent, minimise, reduce or offset the possible environmental effects identified in the EIA process;
- defines the project design parameters used to inform for the impact assessment;
- presents the potential environmental impacts and effects on climate change (GHG emissions) and from (risk and resilience, including in-combination climate impacts) climate change arising as a result of the Proposed Development, based on the information gathered and the analysis and assessments undertaken to date;
- identifies any cumulative, transboundary and/or inter-related effects in relation to the construction, operation and maintenance and decommissioning phases of the Proposed Development on climate change.

1.1.9 The assessment presented is informed by the following technical chapters of the ES:

- Volume 2, Chapter 1: Onshore Ecology and Nature Conservation;
- Volume 2, Chapter 5: Traffic and Transport;
- Volume 2, Chapter 8: Land Use and Recreation; and
- Volume 3, Chapter 1: Benthic Ecology.

1.1.10 This chapter draws upon information contained within the following technical reports of the ES:

- Volume 4, Appendix 1.1: Greenhouse Gas Assessment.

- Volume 4, Appendix 1.2: Climate Change Risk Assessment.

1.2 Legislative and Policy Context

Legislation

1.2.1 The Climate Change Act 2008, as amended (2019), created a framework for setting a series of interim national carbon budgets and plans for national adaptation to climate risks. The Act requires the UK government to set carbon budgets for the whole of the UK.

1.2.2 At present, the Third, Fourth, Fifth and Sixth Carbon Budgets, set through The Carbon Budget Orders 2009, 2011, 2016, and 2021 are 2.54 giga tonnes carbon dioxide equivalent ($GtCO_2e$) for 2018-2022, 1.95 $GtCO_2e$ for 2023-2027, 1.73 $GtCO_2e$ for 2028-2032 and 0.97 $GtCO_2e$ for 2033-2037 respectively. The Sixth Carbon Budget is the first Carbon Budget that is consistent with the UK's net zero target, requiring a 78% reduction in GHG emissions by 2035 from 1990 levels.

1.2.3 The UK's nationally determined contribution (HM Government, 2020) under the Paris Agreement to the United Nations Framework Convention on Climate Change (UNFCCC), submitted in December 2020, commits the UK to reducing economy-wide GHG emissions by at least 68% by 2030, compared to 1990 levels.

1.2.4 Following the 2024 UK Election, the new Government has confirmed its commitment to renewable energy. This includes a commitment to making Britain a clean energy superpower by 2030, as set out in the Great British Energy founding statement (DESNZ, 2024). The new Government are aiming for a fully decarbonised power system by 2030 and aim to become net zero by 2050.

Planning Policy Context

1.2.5 The Proposed Development will be located within the UK EEZ offshore waters (beyond 12 nautical miles (nm) from the English coast) and inshore waters, with the onshore infrastructure located wholly within Devon, England. As set out in Volume 1, Chapter 1: Introduction of the ES, the Secretary of State for the Department for Energy Security and Net Zero (DESNZ) has directed that elements of the Proposed Development are to be treated as development for which development consent is required under the Planning Act 2008, as amended.

National Policy Statements

1.2.6 There are currently six energy National Policy Statements (NPSs), three of which contain policy relevant to the Proposed Development, specifically:

- Overarching NPS for Energy (NPS EN-1) which sets out the UK Government's policy for the delivery of major energy infrastructure (DESNZ 2023a);
- NPS for Renewable Energy Infrastructure (NPS EN-3) (DESNZ 2023b); and
- NPS for Electricity Networks Infrastructure (NPS EN-5) (DESNZ 2023c).

1.2.7 **Table 1.1** sets out a summary of the policies within these NPSs, relevant to climate change.

1.2.8 The NPS EN-1 (DESNZ, 2023a) includes detailed expectations of GHG emissions assessments, requiring the completion of a whole life GHG assessment, covering the construction, operation and decommissioning GHG impacts. The assessment detailed within this chapter has been undertaken in accordance with guidance provided in the NPS EN-1, including a whole life GHG assessment of the Proposed Development (see Volume 4, Appendix 1.1: Greenhouse Gas Assessment).

Table 1.1: Summary of the NPS EN-1, NPS EN-3, and NPS EN-5 requirements relevant to this chapter

Summary of NPS Requirement	How and Where Considered within this ES
NPS EN-1 (DESNZ, 2023a)	
GHG assessments should include '*A whole life GHG assessment showing construction, operational and decommissioning GHG impacts… An explanation of the steps that have been taken to drive down the climate change impacts at each of those stages… Where there are residual 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'* (paragraph 5.3.4 of NPS EN-1)	This chapter provides an assessment of the construction, operation and maintenance, and decommissioning emissions associated with the Proposed Development (see **section 1.11, section 1.12,** and **section 1.13**). The whole life GHG assessment presented within this chapter draws upon information contained within Volume 4, Appendix 1.1: Greenhouse Gas Assessment. Mitigation measures have been considered within this chapter, including carbon reduction measures that are detailed within **Table 1.11**.
With regards specifically to mitigation, *'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'* (Paragraph 5.3.5 of NPS EN-1).	Mitigation measures to reduce emissions associated with the Proposed Development, particularly by embodied carbon reductions are detailed in **section 1.9**.
'*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'* (paragraph 5.3.6 of NPS EN-1).	The development of the outline design at the Converter Site has taken an integrated approach, considering hydrology, flood risk, landscape and ecology. This is reflected in the Design Approach Document (document reference 7.4) and Outline Landscape and Ecology Management Plan (document reference 7.10).
'*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'* (paragraph 5.3.7 of NPS EN-1).	Mitigation measures to reduce emissions associated with the Proposed Development, particularly by embodied carbon reductions are detailed in **section 1.9**. Furthermore, the Proposed Development would connect the Moroccan generation assets (via cable infrastructure routed through Morocco, Spain, Portugal, France and UK waters) to the national grid, which would help deliver an output of 3.6 Gigawatt (GW) (see Volume 1: Chapter 1: Introduction of the ES for further details). This would contribute to:

Summary of NPS Requirement	How and Where Considered within this ES
'*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'* (paragraph 5.3.9 of NPS EN-1).	• the UK Government's ambition to achieve Net Zero by 2050; • securing the UK energy supply; • delivering affordable energy for UK customers; and • supporting the UK growth agenda.
'*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'* (paragraph 5.3.8 of NPS EN-1).	This chapter considered the GHG emissions for the construction, operation and maintenance and decommissioning stages of the Proposed Development. The ES chapter has also considered the cumulative impact of the wider Project (outside of UK jurisdiction) and the Alverdiscott Substation Connection Development, which would be required for the operation of the Proposed Development.
'*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'* (paragraph 5.3.10 of NPS EN-1).	The design of the Proposed Development has incorporated nature-based solutions, where practicable, such as the development of biodiversity enhancement measures and in the outline design of the Converter Site, which has taken into account hydrology, flood risk, landscape and ecology. The purpose of the Proposed Development is to connect the Moroccan generation assets to the national grid (via subsea cabling). The cumulative climate change effects of the Proposed Development with the cumulative Project are provided in **section 1.15**. This demonstrates some construction phase emissions are unavoidable. However, the overall effect of the Proposed Development and the cumulative Project (Moroccan generation assets and cable infrastructure) together would be beneficial in terms of GHG emissions savings.
'*Operational GHG emissions are a significant adverse impact from some types of energy infrastructure which cannot be totally avoided.* *Operational emissions will be addressed in a managed, economy-wide manner, to ensure consistency with carbon budgets, net zero and our international climate commitments'* (paragraph 3.5.11 of NPS EN-1).	
'*In developing measures to support climate adaptation, Applicants should maximise the use of nature-based solutions and integrated approaches (for example, hydrology and biodiversity solutions), alongside other conventional techniques'* (paragraphs 4.10.5 of NPS EN-1).	
Applicants must consider the impacts of climate change when planning the location, design, build, operation and decommissioning of new energy infrastructure (paragraph 4.10.8 of NPS EN-1).	This chapter considers the climate change risk assessment for the relevant elements of the Proposed Development. Volume 1, Chapter 4: Need and Alternatives of the ES describes the factors considered during the site selection and design evolution process.
With regards to climate change adaptation, applicants must consider the impacts of climate change. An ES should set out how the proposal will take account of the projected impacts of climate change (paragraph 4.10.9 of NPS EN-1).	This chapter provides a climate change risk assessment for the relevant elements of the Proposed Development. Further details are provided within Volume 4, Appendix 1.2: Climate change risk assessment of the ES. The assessment is based on the latest available climate projections, as described in **paragraphs 1.7.18** to **1.7.22**.
Applicants should assess the impacts on and from their project across a range of climate	

Summary of NPS Requirement	How and Where Considered within this ES
change scenarios, in line with appropriate guidance available at the time (paragraph 4.10.10 of NPS EN-1).	Volume 4, Appendix 1.2 considers the maximum climate change scenario, informed by climate projections using the Representative Concentration Pathway (RCP) 8.5, a high-emissions scenario assuming 'business as usual' growth globally with little additional mitigation. This represents a maximum credible scenario. The chapter has been prepared taking into account the latest guidance available from IEMA.
'*Where energy infrastructure has safety critical element (for example… electricity substations, the applicant should apply a credible maximum climate change scenario'* (paragraph 4.10.12 of NPS EN-1)).	
The Secretary of State should be satisfied that applicants have taken into account the potential impacts of climate change using the latest UK Climate Projections. The Secretary of State should be satisfied that there are not features of the proposal that may be seriously affected by more radical changes to the climate beyond the latest climate projections (paragraphs 4.10.13 to 4.10.15 of NPS EN-1).	
Applicants should demonstrate that proposals have a high level of climate change resilience built in and demonstrate how proposals can be adapted to remain resilient over their lifetimes (paragraph 4.10.11 of NPS EN-1).	This chapter provides an assessment of climate risk and resilience for the Proposed Development. Consideration of onshore flood risk has been addressed within Volume 2, Chapter 3: Hydrology and Flood Risk of the ES.
Paragraphs 4.10.16 to 4.10.19 relate to adaptation measures. The Secretary of State should consider the impact of such measures and be satisfied that such measures are based on the latest climate projects and climate change allowances.	Details of proposed measures to manage flood risk are provided in Volume 2, Chapter 3: Hydrology and Flood Risk of the ES and Volume 2, Appendix 3.1: Flood Risk Assessment. The design of such measures has been based on the latest climate change allowances from the Environment Agency. The assessment of climate risk provided in this chapter is based on the latest climate change projections, as set out in **paragraphs 1.7.18** to **1.7.22**.
NPS EN-3 (DESNZ, 2023b)	
Provides the primary policy for decisions by the Secretary of State on applications they receive for nationally significant renewable energy infrastructure defined at section 1.6 of NPS EN-3.	Volume 1, Chapter 2: Policy and Legislation of the ES provides details of the policy context for the Proposed Development. Volume 1, Chapter 4: Need and Alternatives of the ES provides details of the need for the Proposed Development.
While offshore wind farms will not be affected by flooding, applicants should demonstrate that any necessary land-side infrastructure (such as cabling and onshore substations) will be appropriately resilient to climate-change induced weather phenomena (paragraph 2.4.8 of NPS EN-3).	Whilst the Proposed Development does not include offshore wind farms, this requirement has relevance to the onshore infrastructure, including cables and the converter stations. This chapter provides an assessment of climate risk and resilience for the Proposed Development. Consideration of onshore flood risk has been addressed within Volume 2, Chapter 3: Hydrology and Flood Risk of the ES.
NPS EN-5 (DESNZ, 2023c)	
Applicants must consider how the development is vulnerable to, and how it has been designed to be resilient to the increased risks of flooding, wind and storm events, heightened temperatures, and subsidence resulting from climate change (paragraph 2.3.2 of NPS EN-5).	This chapter provides an assessment of climate risk for the relevant elements of the Proposed Development. Details of this are provided within Volume 4, Appendix 1.2: Climate change risk assessment of the ES.
Paragraph 2.3.3 of NPS EN-5 cross refers to Section 4.10 of NPS EN-1.	NPS EN-1 considered above.

The National Planning Policy Framework

1.2.9 The National Planning Policy Framework (NPPF) was published in 2012 and updated in 2018, 2019, 2021, and 2023 (Department for Levelling Up, Housing and Communities, 2023). The NPPF sets out the Government's planning policies for England.

1.2.10 The NPPF has been updated and the draft version was published for consultation on 30 July 2024 with the consultation period ending on 24 September 2024 (Ministry of Housing, Communities and Local Government, 2024).

1.2.11 **Table 1.2** sets out a summary of the NPPF policies relevant to this chapter.

Table 1.2: Summary of NPPF requirements relevant to this chapter

Policy	Key provisions	How and where considered in the ES
14. Meeting the challenge of climate change, flooding and coastal change	*'The planning system should support the transition to a low carbon future in a changing climate… It should help to: shape places in ways that contribute to radical reductions in greenhouse gas emissions, minimise vulnerability and improve resilience; encourage the reuse of existing resources, including the conversion of existing buildings; and support renewable and low carbon energy and associated infrastructure.'* (paragraph 157) *'Plans should take a pro-active approach to mitigating and adapting to climate change'* (paragraph 158)	This chapter provides an assessment of the GHG emissions associated with the Proposed Development, in addition to assessing climate risk and resilience (see **section 1.11, section 1.12, section 1.13** and **section 1.15**). Mitigation measures to reduce emissions associated with the Proposed Development, particularly by embodied carbon reductions are detailed in **section 1.9**.

1.2.12 The consultation draft includes similar provisions as the designated NPPF. The consultation draft NPPF has been reviewed and there are no material updates for climate change.

1.2.13 The Planning Practice Guidance (Department for Levelling Up, Housing and Communities and Ministry of Housing, Communities and Local Government, 2023) supports the NPPF and provides guidance across a range of topic areas, including climate change. It recommends the consideration of future climate risks and promotes the implementation of suitable adaptation and mitigation strategies to manage any climate risk.

Marine Policy

South West Inshore and South West Offshore Coast Marine Plans

1.2.14 **Table 1.3** sets out a summary of the specific policies set out in the South West Inshore and South West Offshore Coast Marine Plans (MMO, 2021) relevant to this chapter.

Table 1.3: Summary of inshore and offshore marine plan policies relevant to this chapter

Policy	Key provisions	How and where considered in the ES
SW-CC-2	'*Proposals in the south west marine plan areas should demonstrate for the lifetime of the project that they are resilient to the impacts of climate change and coastal change*.' (Table 5.14, technical annex)	This chapter provides an assessment of climate risk and resilience of the Proposed Development over its lifetime (see paragraphs **1.11.33** to **1.11.36**, paragraphs **1.12.17** to **1.12.23,** and paragraphs **1.13.13** to **1.13.16**).
SW-AIR-1	'*Proposals must assess their direct and indirect impacts upon local air quality and emissions of greenhouse gases.* *Proposals that are likely to result in increased air pollution or increased emissions of greenhouse gases must demonstrate that they will, in order of preference:* *a) avoid* *b) minimise* *c) mitigate* – *air pollution and/or greenhouse gas emissions in line with current national and local air quality objectives and legal requirements*.' (Table 5.15, technical annex)	This chapter provides an assessment of CO_2 emissions and other relevant GHGs resultant from the Proposed Development in **section 1.11, section 1.12,** and **section 1.13**.

Local Planning Policy

1.2.15 The onshore elements of the Proposed Development are located within the administrative area of Torridge District Council (and Devon County Council at County level). The relevant local planning policies applicable to climate change based on the extent of the study areas for this assessment are summarised in **Table 1.4**.

Table 1.4: Summary of local planning policy relevant to climate change

Policy	Key Provisions	How and where considered?
North Devon and Torridge Local Plan 2011-2031 (Torridge District Council, 2018)		
Policy ST02: Mitigating Climate Change	The Local Plan expects new development to make a positive contribution towards the '*social, economic and environmental sustainability of northern Devon and its communities while minimising its environmental footprint by:* • *reducing greenhouse gas emissions by locating development appropriately and achieving high standards of design;* • *promoting opportunities for renewable and low-carbon energy generation whilst conserving and enhancing the natural and built environment;* • *redeveloping previously developed land and reducing, reusing and recycling resources, including construction materials, providing for*	This chapter provides an assessment of the construction, operation and maintenance and decommissioning emissions associated with the Proposed Development, at **section 1.11, section 1.12,** and **section 1.13**. Mitigation measures to reduce emissions associated with the Proposed Development, particularly by embodied carbon reductions, are detailed within **section 1.9**.

Policy	Key Provisions	How and where considered?
	more efficient use of facilities and enhanced opportunities for recycling…'	
Policy ST03: Adapting to Climate Change and Strengthening Resilience	The Local Plan details that development should be designed and constructed to '*take account of the impacts of climate change and minimise the risk to and vulnerability of people, land, infrastructure and property.'*	This chapter provides a climate change risk assessment for the relevant elements of the Proposed Development. Details of this are provided within Volume 4, Appendix 1.2: Climate Change Risk Assessment of the ES.
Policy ST05: Sustainable Construction and Buildings	The Local Plan requires that *'new major development proposals will make a positive contribution towards the creation of resilient and cohesive communities and ensure that built and environmental assets can adapt to and be resilient to climate change.'*	
Climate Adaptation Strategy for Devon, Cornwall, and Isles of Scilly 2023-27		
N/A	The strategy highlights the need to promote climate resilience and adaptation and comprises the following. • A climate change risk and opportunity assessment – the strategy highlights the potential impacts and opportunities within the region that could result from future changes in climate, providing a risk register to determine the potential severity of impacts. • A strategic adaptation plan and short term action plan – a five year strategy and action plan to highlight how resilience and adaptation can be promoted across the region.	This chapter provides a climate change risk assessment for the relevant elements of the Proposed Development. Details of this are provided within Volume 4, Appendix 1.2: Climate Change Risk Assessment of the ES.

1.3 Consultation and Engagement

Scoping

1.3.1 In January 2024, the Applicant submitted a Scoping Report to the Planning Inspectorate, which described the scope and methodology for the technical studies being undertaken to provide an assessment of any likely significant effects for the construction, operation and maintenance and decommissioning phases of the Proposed Development. It also described those topics or sub-topics which are proposed to be scoped out of the EIA process and provided justification as to why the Proposed Development would not have the potential to give rise to significant environmental effects in these areas.

1.3.2 Following consultation with the appropriate statutory bodies, the Planning Inspectorate (on behalf of the Secretary of State) provided a Scoping Opinion on 7 March 2024. Key issues raised during the scoping process specific to Climate Change are listed in **Table 1.5**, together with details of how these issues have been addressed within the ES.

Table 1.5: Summary of Scoping Responses

Comment	How and where considered in the ES
Planning Inspectorate	
'*The Inspectorate recommends that the ES should identify whether the Proposed Development has the potential for significant transboundary effects, and if so, what these are, and which EEA States would be affected. The Inspectorate will undertake a transboundary screening on behalf of the SoS in due course*.'	Transboundary effects are considered within **section 1.16** of this chapter.
'*The ES should assess impacts from climate change, including extreme weather events over the construction and decommissioning periods, where significant effects are likely to occur and describe and secure any relevant mitigation measures*.'	The vulnerability of the Proposed Development to potential climate risks during construction, operation and maintenance, and decommissioning has been assessed within this chapter and is supported by Volume 4, Appendix 1.2: Climate Change Risk Assessment of the ES.
'*In-combination climate change effects are proposed to be scoped out of the Climate Change ES chapter as they will be addressed individually within each applicable ES chapter. The Inspectorate is content with this approach. The Climate Change chapter should signpost where such effects are considered and presented in other relevant chapters*.'	In-combination climate change effects are identified and assessed as relevant within this chapter, at **section 1.17**.
'*The Climate Risk Study Area should explain in more detail why the two 25km grid cells based on the UKCP18 probabilistic projections have been chosen for the study area in the ES. Figure 9.2.1 does not make clear which of the three grid cells have been identified*.'	The climate risk study area is presented on Figure 1.1 (see Volume 4, Figures), which covers two 25 km grid cells based on the UK Climate Projections 2018 (UKCP18) probabilistic projections (Met Office Hadley Centre (MOHC), 2021). These grid cells have been selected to cover the majority of the Onshore Infrastructure Area. Further detail is provided in **section 1.4**.
'*Mitigation measures which may be required for climate change effects referenced in other topic chapters such as the water environment with respect to flood risk where mitigation will be based on the FRA findings. Mitigation measures should be clearly set out in the ES and cross referenced between relevant ES chapters as appropriate*.'	Volume 4, Appendix 1.2: Climate Change Risk Assessment cross references the Volume 2, Chapter 3: Hydrology and Flood Risk of the ES in relation to flood risk mitigation measures proposed as part of the Proposed Development.
'*The Inspectorate notes the references in the Scoping Report to professional guidance (i.e. 'Assessing Greenhouse Gas Emissions and Evaluating their Significance' (Institute of Environmental Management and Assessment (IEMA) 2022)) and IEMA's 'Environmental Impact Assessment Guide to: Climate Change Resilience and Adaptation (IEMA, 2020). The ES should set out the methodologies used to explain any departure from the proposed approach where professional judgement is applied. Outputs from other assessments should be clearly explained where these have been applied*.'	The methodology considered within the climate change assessment is consistent with the following guidance: • Institute of Environmental Management and Assessment (IEMA) Guidance on Climate Change Adaptation and Resilience (IEMA, 2020); and • IEMA guidance on 'Assessing Greenhouse Gas Emissions and Evaluating their Significance' (IEMA, 2022). Further information is provided within **section 1.6** of this chapter.
Devon County Council	
'*Regarding climate change, the proposed methodology is satisfactory as it follows IEMA's guidance. The methodology states that "This assessment will consider the avoided or 'saved' baseline GHG emissions. This will*	The methodology for the GHG assessment, with respect to the avoided or 'saved' emissions over the wider Project lifetime, utilises the DESNZ (previously BEIS) long-run marginal

Comment	How and where considered in the ES
account for energy generated from the Moroccan Onshore Scheme, and their effects, in comparison to alternative grid-connected electricity generators. This will allow for the identification of the net lifetime effects." *which we agree is necessary. However, the methodology does not state which carbon intensity factors it will use for electricity and for which year and, as a result, we suggest the applicant uses the 2023 UK grid-supplied electricity carbon intensity factor for the duration of the lifecycle assessment, as without projects of this scale the grid carbon-intensity factor will not reduce over time (as is forecast).*'	figures for the future baseline, which show a year-on-year decarbonisation. This is a worst case assessment as it would result in lower savings for the purpose of the EIA. However, a sensitivity analysis has been carried out using both the 2024 grid intensity factor and DESNZ 'non-renewable fuels' estimations. Further details are provided within Volume 4, Appendix 1.1: Greenhouse Gas Assessment of the ES. The avoided emissions and net emissions of the Proposed Development, assessed cumulatively with the wider Project, are shown in **Table 1.19** of this chapter.
'*In addition, the whole life cycle assessment needs to show that the development saves more GHG emissions than it generates to be able to evidence the green, renewable energy commitments of the project*.'	A whole life assessment has been completed. The whole life assessment is a 'cradle to grave' calculation of all embodied energy and associated GHG of capital assets across the wider project considering the mining of raw materials, manufacture, transport, construction, use, maintenance and disposal and considers the renewable energy generated in Morocco. This assessment is considered a conservative estimate at present but shows net effects of between +3,531,368 (long-run marginal) to -519,370,356 tCO_2e (non-renewables mix) over the lifetime of the Project. The range of results reflects the scenarios used. Further details are provided in **section 1.15**.
Forestry Commission	
'*With section 9.2.15 within the scoping report referring to impacts to woodland, the project should look to avoid the ancient woodland situated at Pixey Copse, Pillmouth Wood, and Thorne Wood/Bidd Copse, considering more significantly the irreplaceable ecology represented in the site rather than just GHG*.'	The design of the Proposed Development includes the sensitive routeing and siting of infrastructure to avoid disturbance to land that contains high carbon stocks, such as woodland. This is detailed within **Table 1.11** of this chapter.

Preliminary Environmental Information Report

1.3.3 The preliminary findings of the EIA process were published in the Preliminary Environmental Information Report (PEIR) on 16 May 2024. The PEIR was prepared to provide the basis for statutory public consultation under the Planning Act 2008. This included consultation with statutory bodies under section 42 of the Planning Act 2008.

1.3.4 A summary of the key items raised specific to Climate Change is presented in **Table 1.6,** together with how these issues have been considered in the production of this ES chapter.

Table 1.6: Summary of consultation relevant to this chapter

Date	Consultee and type of response	Issues raised	How and where considered in the ES
June 2024	Devon County Council, Section 42 response	After reviewing Volume 4, Chapter 1 of the PEIR. We are satisfied with the methodology used to assess the impact of the greenhouse gas emissions arising from the construction, operation and decommissioning phases alongside the cumulative effects with the avoidance of emissions from non-renewable power generation. It is extremely likely that this development will result in a significant beneficial impact on the global climate system, which should be maximised by ensuring the developer implements their proposed mitigation options.	The methodology used to assess the impact of the greenhouse gas emissions associated with the Proposed Development is detailed in **section 1.6** of this ES chapter. The mitigation measures proposed as part of the Proposed Development are detailed within **section 1.9** of this ES chapter.
June 2024	Devon County Council, Section 42 response	Devon County Council is also content that an appropriate methodology has been followed to assess the impact of climate change on the resilience of the development.	Noted. The methodology for the climate change risk assessment is included within Volume 4, Appendix 1.2: Climate Change Risk Assessment Technical Report of the ES.
July 2024	Torridge District Council, Section 42 response	Climate Change Vol 4 Chapter 1 GHG Technical Report: includes an assessment of both UK and Morocco operations so would seem to fit with yesterday's ruling/train of thought about how carbon emissions should be looked at in planning and EIA.	Noted.
July 2024	Torridge District Council, Section 42 response	Vol 4 Chapter 2 Climate Change Risk Assessment: In general would be good if this Chapter could refer to the Devon, Cornwall and Isles of Scilly Adaptation Strategy, and in particular their risk register https://www.climateresilientdcios.org.uk/view-adaptation-strategy/	Noted. Volume 4, Appendix 1.2: Climate Change Risk Assessment Technical Report includes relevant local policy and guidance, which refers to the Devon, Cornwall and Isles of Scilly Adaptation Strategy. In preparation of the climate change risk assessment, the risk register detailed within the Devon, Cornwall and Isles of Scilly Adaptation Strategy has been reviewed and considered.

Date	Consultee and type of response	Issues raised	How and where considered in the ES
July 2024	Torridge District Council, Section 42 response	Para 1.5.2 Query as to why UKCP Regional12km projections weren't used for the onshore climate projections, given these are recommended when local scales are essential – they better represent local effects due to land elevation, coastlines and surface characteristics. Would also suggest UK CP Local (2.2 km) projections should be included for the convertor site.	The probabilistic projections published at a 25 km grid cell scale are considered the most useful for the climate change risk assessment when considering the onshore elements, being designed to show a range of projection values that reflect uncertainty in modelled outcomes. The UKCP18 guidance also highlights that the probabilistic projections should be used to help characterise future climate extremes in a risk assessment. Further details on the climate change risk assessment methodology are provided within Volume 4, Appendix 1.2 of the ES.
July 2024	Torridge District Council, Section 42 response	Table 1.5 Wildfire doesn't appear to have been considered as a climate risk. Given the increasing number of incidents we are seeing in northern Devon, I think it should be included for convertor construction and operation. Note that convertors have a fire risk which will presumably be covered somewhere in the planning application (albeit not in the PEIR?) Could be 'interesting' fighting a large convertor fire given their location.	The climate change risk assessment (see Volume 4, Appendix 1.2 of the ES) considers the potential risk of impacts associated with increasing frequency and intensity of extreme weather events, including storms, drought, heat stress, wildfires, etc. In order to minimise such risks, construction activities would be undertaken in line with the On-CEMP(s), relevant health and safety guidance and in compliance with requirements of the local fire authority. The design of the converter station will comply with all relevant statutory requirements including building regulations, building control requirements and fire safety in consultation with the fire authority. Further details are provided in Volume 1, Chapter 3: Project Description of the ES.

1.4 Study Area

1.4.1 GHG emissions have a global (international) effect rather than directly affecting any specific local receptor. The impact of GHG emissions occurring due to the Proposed Development on the global atmospheric concentration of the relevant GHGs, expressed in CO_2-equivalents (CO_2e), is therefore considered within this assessment.

1.4.2 The Proposed Development climate change study area has been defined as both the onshore and offshore components of the Proposed Development (the Order Limits), alongside the global atmosphere based on established IEMA guidance (IEMA, 2022). The Order Limits is shown on Figure 1.1 (see Volume 4, Figures).

1.4.3 The climate change risk study area covers the Order Limits, as shown in Figure 1.1 (see Volume 4, Figures). The assessment of the onshore elements of the Order Limits covers two 25 km grid cells based on the UK Climate Projections 2018 (UKCP18) probabilistic projections (Met Office Hadley Centre (MOHC), 2021). The two 25 km grid cells have been used as the onshore HVDC Cable Corridor lies within the western grid cell, whilst the Converter Site and HVAC Cable Corridors lie within the eastern grid cell. Therefore, these grid cells account for the majority of the Onshore Infrastructure Area and represent a good coverage of the likely climatic variations across the Proposed Development. The assessment of the offshore elements covers Regional Sea 4 (BEIS, 2022a), which covers the area of sea to the south west of the UK.

1.4.4 With regards to the assessment of cumulative effects, all developments that emit, avoid or sequester GHGs have the potential to impact the atmospheric mass of GHGs as a receptor, and so may have a cumulative impact on climate change and upon the development. Consequently, cumulative effects due to other specific local development projects are not considered individually but are taken into account when considering the impact of the Proposed Development, and probabilistic projections used in the climate change risk assessment (CCRA) (Volume 4, Appendix 1.2: Climate Change Risk Assessment of the ES).

1.4.5 However, the potential impacts resultant from the Moroccan generation assets and cable infrastructure (as part of the overall Project) and the Alverdiscott Substation Connection Development are considered, in order to account for the potential impact of both the generation and transmission elements combined. Therefore, the study area for the assessment of cumulative impacts incorporates the Order Limits, alongside the boundaries of the overall Project (including cumulative cabling and generation assets) and the anticipated NGET development. Whole lifetime emissions (i.e. emissions resulting construction, operation and maintenance, and decommissioning) arising from the cumulative developments within the cumulative effects study area will be considered.

1.4.6 As described at **paragraph 1.4.1**, emissions have a global effect rather than affecting any specific local receptor, as such no specific study area beyond that of the Order Limits is relevant for the cumulative effects assessment of climate change.

1.5 Scope of the Assessment

1.5.1 This assessment of climate change considers both the effect of GHG emissions caused directly or indirectly by the Proposed Development, which have the potential to contribute to climate change (e.g. emissions arising from the manufacturing and installation of the Proposed Development), and the potential effect of changes in climate on the Proposed Development.

1.5.2 The assessment of climate change also considers the potential effect of changes in climate on other identified environmental impacts (in-combination climate impacts – where future climate change may exacerbate or diminish the effect of an existing environmental impact on the Proposed Development).

1.5.3 Taking into account the scoping and consultation process, **Table 1.7** summarises the issues considered as part of this assessment.

Table 1.7: Issues considered within this assessment

Activity	Potential Effects Scoped into the Assessment
Construction Phase	
Manufacturing and installation of the Proposed Development.	GHG emissions arising from such activity would contribute to global GHG emissions concentrations and climate change.
Installation of the Proposed Development.	Land use and seabed change - GHG emissions arising from such activity would contribute to global GHG emissions concentrations and climate change.
	Effect of projected future climate change on the Proposed Development (climate risk).
	Effect of projected future climate change on the vulnerability of identified receptors, which could modify its other environmental impacts (i.e., in-combination climate change impacts).
Operation and Maintenance Phase	
Consumption of materials and activities required to facilitate the operation and maintenance phase.	GHG emissions arising from such activity would contribute to global GHG emissions concentrations and climate change.
Operation and maintenance of the Proposed Development.	Land use and seabed change - GHG emissions arising from land use change would contribute to global GHG emissions concentrations and climate change.
	Effect of projected future climate change on the Proposed Development (climate risk).
	Effect of projected future climate change on the vulnerability of identified receptors, which could modify its other environmental impacts (i.e., in-combination climate change impacts).
Decommissioning Phase	
Decommissioning activities, such as use of plant, fuel and vessel use, and the recovery (or disposal) of materials.	GHG emissions arising from such activity would contribute to global GHG emissions concentrations and climate change.
Decommissioning of the Proposed Development.	Land use and seabed change - GHG emissions arising from land use change would contribute to global GHG emissions concentrations and climate change.
	Effect of projected future climate change on the Proposed Development (climate risk).

Activity	Potential Effects Scoped into the Assessment
	Effect of projected future climate change on the vulnerability of identified receptors (i.e., in-combination climate change impacts).

1.5.4 No potential effects in relation to climate change have been scoped out of the assessment.

1.6 Methodology

Desk Studies

1.6.1 Desk studies were undertaken to determine the GHG emissions resultant from the Proposed Development, in addition to the impact of climate change on the Proposed Development and on its other environmental impacts (i.e. in-combination climate impacts).

1.6.2 To determine the baseline environment for the GHG emissions assessment, information has been sourced from Volume 2, Chapter 8: Land Use and Recreation and Volume 3, Chapter 1: Benthic Ecology of the ES and cross referenced where relevant in this chapter. The geographic baseline environment is defined as areas that would be occupied by the Proposed Development throughout the construction, operation and maintenance and decommissioning phases.

1.6.3 To determine the baseline climate environment to inform both the climate change risk assessment and assessment of in-combination climate impacts, onshore climate conditions have been sourced from the Met Office observed data for Chivenor climate station, Devon. The observational data from Chivenor climate station has been collected and averaged over 30 years from 1981 to 2010 and reviewed against regional observational data averaged over the same reporting period (Met Office, 2020).

1.6.4 Baseline offshore climatic conditions have been sourced from observational data collected within the UK Offshore Energy Strategic Environmental Assessment (BEIS, 2022a) and Intergovernmental Panel on Climate Change's (IPCC) Sixth Assessment Reporting of the physical science (IPCC, 2021).

Site-specific Surveys

1.6.5 The desk studies undertaken, as well as the information sourced from relevant topic assessment (e.g. land use and recreation, onshore ecology and conservation, and benthic ecology), provide sufficient information to inform the baseline environment. Therefore, no site-specific surveys have been undertaken to inform the EIA for climate change.

Impact Assessment Methodology

Overview

1.6.6 The climate change impact assessment has followed the methodology set out in Volume 1, Chapter 5: Environmental Assessment Methodology of the ES. Specific

to the climate change impact assessment, the following guidance documents have also been considered:

- Institute of Environmental Management and Assessment (IEMA) Guidance on Climate Change Adaptation and Resilience (IEMA, 2020); and
- IEMA guidance on 'Assessing Greenhouse Gas Emissions and Evaluating their Significance' (IEMA, 2022).

1.6.7 In addition, the climate change impact assessment has considered the legislative framework as defined by:

- international climate change legislation;
- national climate change policies; and
- local planning policies.

1.6.8 In order to undertake a climate change impact assessment, information gathered in Volume 4, Appendix 1.1: Greenhouse Gas Assessment and Volume 4, Appendix 1.2: Climate Change Risk Assessment of the ES have been utilised. This information is sourced from primary calculations and secondary sources to calculate the impact of the Proposed Development on and from climate change.

1.6.9 The approach to determining the significance of effects is a two-stage process that involves defining the magnitude of the impact and the sensitivity of the receptor. This section describes the criteria applied in this chapter to assign values to the magnitude of potential impacts and the sensitivity of the receptors. The terms used to define magnitude and sensitivity are based on relevant guidance, including the IEMA guidance on 'Assessing Greenhouse Gas Emissions and Evaluating their Significance' (IEMA, 2022).

1.6.10 The criteria for determining the significance of effects have been divided into two categories:

- Assessment of the significance of the effect of the Proposed Development on climate change (GHG assessment)
- Assessment of the significance of the effect from climatic changes on the Proposed Development (CCRA).

1.6.11 The assessment methodology for each of these categories is set out below, with the impact assessment criteria for the effect of the Proposed Development on climate change defined at **paragraphs 1.6.18** to **1.6.25**, and the assessment criteria for the effect from climatic changes on the Proposed Development at **paragraphs 1.6.33** to **1.6.36**.

GHG Emissions Assessment Methodology

1.6.12 GHG emissions have been estimated by applying published factors to activities in the baseline, where relevant and to those required for the Proposed Development. The emissions factors relate to a given level of activity, or amount of fuel, energy or materials used, to the mass of GHGs released as a consequence. The GHGs considered in this assessment are those in the 'Kyoto basket' of global warming gases expressed as its global warming potential (GWP). This is denoted by carbon-dioxide-equivalent (CO_2e) units in emissions factors and calculation results. GWPs used are typically the 100-year factors in the IPCC Fifth

Assessment Report (IPCC, 2013) or as otherwise defined for national reporting under the United Nations Framework Convention on Climate Change (UNFCCC).

1.6.13 Additional guidance used for the quantification of GHG emissions includes:

- UK Government GHG Conversion Factors for Company Reporting (DESNZ, 2024); and
- The Greenhouse Gas Protocol suite of documents (World Resources Institute (WRI) and World Business Council for Sustainable Development (WBCSD), 2004).

1.6.14 GHG emissions caused by an activity are often categorised into 'scope 1', 'scope 2' or 'scope 3' emissions, following the guidance of the WRI and the WBCSD Greenhouse Gas Protocol suite of guidance documents (WRI and WBCSD, 2004).

- Scope 1 emissions: direct GHG emissions from sources owned or controlled by the company (e.g. from combustion of fuel at an installation);
- Scope 2 emissions: caused indirectly by consumption of purchased energy (e.g. from generating electricity supplied through the national grid to an installation); and
- Scope 3 emissions: all other indirect emissions occurring as a consequence of the activities of the company (e.g. in the upstream extraction, processing and transport of materials consumed or the use of sold products or services).

1.6.15 This assessment has sought to include emissions from all three scopes, where this is material and reasonably possible from the information and emissions factors available, to capture the impacts attributable most completely to the Proposed Development. These emissions shall not be separated out by defined scopes (scopes 1, 2 or 3) in the assessment.

1.6.16 The assessment has considered the GHG emissions arising from the Proposed Development. Emissions resulting from the manufacturing and construction of the Proposed Development (including, converter station, cabling etc.) have been calculated via published benchmark carbon intensities and published life-cycle assessment (LCA) literature regarding substation technology.

1.6.17 A proportion of the construction-stage GHG emissions associated with the manufacturing of components are likely to occur outside the territorial boundary of the UK and hence outside the scope of the UK's national carbon budget. However, in recognition of the climate change effect of GHG emissions (wherever occurring) and the need, as identified in national policy, to avoid 'carbon leakage' overseas when reducing UK emissions, the full life-cycle GHG emissions of the Proposed Development have been evaluated where possible when determining the significance of effects.

Receptor Sensitivity/Value

1.6.18 GHG emissions have a global effect rather than directly affecting any specific local receptor to which a level of sensitivity can be assigned. The global atmospheric mass of the relevant GHGs and consequent warming potential, expressed in CO_2e, has therefore been treated as a single receptor of high sensitivity (given the importance of the global climate as a receptor), as defined

within IEMA's 'Assessing Greenhouse Gas Emissions and Evaluating their Significance' guidance (IEMA, 2022).

Magnitude of Impact

1.6.19 In accordance with the IEMA Guidance (2022), GHG emissions can be quantified directly and expressed based on their GWP as tonnes of CO_2e emitted or saved, the magnitude of impact is reported numerically. Where a quantifiable figure is not possible this is expressed qualitatively.

Significance of Effect

1.6.20 The significance of the effect upon climate change has been determined by taking into account the sensitivity of the receptor and the magnitude of the impact.

1.6.21 In all cases, the evaluation of receptor sensitivity, impact magnitude and significance of effect has been informed by professional judgement and is underpinned by narrative to explain the conclusions reached.

1.6.22 Assessment guidance for GHG emissions (IEMA, 2022) describes five levels of significance for emissions resulting from a development, each based on whether the GHG emission impact of the development will support or undermine a science-based 1.5°C compatible trajectory towards net zero. To aid in considering whether effects are significant, the guidance recommends that GHG emissions should be contextualised against pre-determined carbon budgets, or applicable existing and emerging policy and performance standards where a budget is not available. It is a matter of professional judgement to integrate these sources of evidence and evaluate them in the context of significance.

1.6.23 Taking the guidance into account, the following have been considered in contextualising the Proposed Development's emissions:

- The magnitude of net GHG emissions as a percentage of national and local carbon budgets (where feasible).
- Whether the Proposed Development contributes to, and is in line with, the UK's policy for GHG emissions reductions, where these are consistent with science-based commitments to limit global climate change to an internationally-agreed level (as determined by the UK's nationally determined contribution to the Paris Agreement (BEIS, 2022b).

1.6.24 Effects from GHG emissions are described in this chapter as adverse, negligible or beneficial based on the following definitions, which closely follow the examples in Box 3 of the IEMA guidance (IEMA, 2022).

- Major adverse: the Proposed Development's GHG impacts are not mitigated or are only compliant with do-minimum standards set through regulation, and do not provide further reductions required by existing local and national policy for projects of this type.
- Moderate adverse: the Proposed Development's GHG impacts are partially mitigated and may partially meet the applicable existing and emerging policy requirements but would not fully contribute to decarbonisation in line with local and national policy goals for projects of this type.

- Minor adverse: the Proposed Development's GHG impacts would be reduced through measures that go well beyond existing and emerging policy requirements and good practice design standards for projects of this type.
- Negligible: the Proposed Development's GHG impacts would be reduced through measures that go well beyond existing and emerging policy and design standards for projects of this type, such that radical decarbonisation or net zero is achieved well before 2050.
- Beneficial: the Proposed Development's net GHG impacts are below zero and it causes a reduction in atmospheric GHG concentration, whether directly or indirectly, compared to the without-project baseline (the existing/future baseline in the absence of the project).

1.6.25 Major and moderate adverse effects and beneficial effects are considered to be significant in EIA terms. Minor adverse and negligible effects are not considered to be significant in EIA terms.

1.6.26 GHG emissions associated with a project are often reported as a whole life figure (net emissions) that takes account of all life stages. The net whole life figure is the key element for determining the Proposed Development's whole life impact on climate change. In addition, it is key to determining its impact within the context of the Moroccan generation assets during their operational phase, allowing the consideration of avoided emissions that the Proposed Development enable.

1.6.27 However, it is noted in the IEMA guidance (2022) that due to the nature of GHG emissions, it is good practice to include a section that reports on the whole life GHG emissions associated with a project, alongside the sections that assess construction, operation, and decommissioning effects in isolation. As such, this chapter details the assessment of effects from the construction, operation and maintenance, and decommissioning phases individually, before assessing the net whole life GHG emissions (both from the Proposed Development alone (see **sections 1.11, 1.12** and **1.13**), and alongside the Moroccan generation assets (and associated infrastructure) (see **section 1.15**).

Climate Change Risk Assessment Methodology

1.6.28 Potential climatic conditions in the 2010-2039, 2040-2069 and 2070-2099 time periods for the onshore elements of the Proposed Development have been considered based on the MOHC UKCP18 probabilistic projections (MOHC, 2024). Projections for the global emissions RCP 8.5 have been used as a worst case approach, as this is a high-emissions scenario assuming 'business as usual' growth globally with little additional mitigation to combat climate change. Baseline offshore climatic conditions have been sourced from observational data collated within the UK Offshore Energy Strategic Environmental Assessment (BEIS, 2022a) and IPCC Sixth Assessment Reporting of the physical science (IPCC, 2021).

1.6.29 Further detail of the approach and data input is given in Volume 4, Appendix 1.2: Climate Change Risk Assessment of the ES.

1.6.30 An initial screening exercise has been undertaken which has identified the relevant climate change risks on the Proposed Development. A high level assessment of such risks has been undertaken, considering the hazard, potential

severity of impact on the Proposed Development and its users, probability of that impact, and level of influence the design can have on the risk.

1.6.31 The assessment of effects has considered the measures adopted as part of the Proposed Development (embedded mitigation) in determining whether each risk poses a significant effect on the Proposed Development. Should an effect be significant after embedded mitigation, further mitigation is presented where relevant to reduce the residual effect.

1.6.32 The assessment of flood risk, including increases in rainfall rates due to climate change, has been addressed in Volume 2, Chapter 3: Hydrology and Flood Risk of the ES.

Impact assessment criteria

1.6.33 IEMA guidance (IEMA, 2020) 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'*.

1.6.34 The CCRA differs from many other EIA topics in that it considers how the resilience of a development is affected by an external factor (climate change) and not specifically how potential environmental receptors are affected by a development's impacts. Consequentially, the CCRA cannot easily be assigned significance with respect to the severity of impacts in the same way as for the other topics. Instead, a risk-analysis based approach has been used for the assessment.

1.6.35 As set out in the CCRA (Volume 4, Appendix 1.2: Climate Change Risk Assessment of the ES), a risk assessment has been undertaken, considering the hazard, potential severity of impact on the Proposed Development (including their sensitivity and vulnerability), probability of that impact, and level of influence the Proposed Development's design can have on the risk. A risk score of five or more (the minimum score where more than one element of the risk assessment score is above 'one') has been defined as a risk that could lead to significant adverse or beneficial effect in EIA terms. By considering measures adopted as part of the Proposed Development, professional judgement is used in determining whether impacts are likely to result in significant adverse or beneficial effects, or non-significant negligible effects in EIA terms.

1.6.36 The criteria for defining severity, probability and influence in this chapter are outlined in **Table 1.8** below.

Table 1.8: Severity, probability and influence factor definitions

Factor	Score definitions
Severity: the magnitude and likely consequences of the impact should it occur.	**1 =** unlikely or low impact (e.g. low-cost and easily repaired property damage; small changes in occupiers' behaviour).
	2 = moderate impacts with greater disruption and/or costs.
	3 = severe impact (e.g. risk to individual life or public health, widespread property damage or disruption to business).

Factor	Score definitions
Probability: reflects both the range of possibility of climatic parameter changes illustrated in UKCP18 projections and the probability that the possible changes would cause the impact being considered.	**1 =** unlikely or low probability impact; impact would occur only at the extremes of possible change illustrated in projections.
	2 = moderate probability of impact, plausible in the central range of possible change illustrated in projections.
	3 = high probability of impact, likely even with the smaller changes illustrated as possible in the projections.
Influence: the degree to which design of the proposed development can affect the severity or probability of impacts	**1 =** no or minimal potential to influence, outside control of developer (e.g. reliance on national measures or individuals' attitudes/actions; or hypothetical measures would be impracticable).
	2 = moderate potential to influence (e.g. a mixture of design and user behaviour or local and national factors; measures may have higher costs or practicability challenges).
	3 = strong potential to influence through measures that are within the control of the developer and straightforward to implement.

In-Combination Climate Impact Assessment Methodology

1.6.37 IEMA guidance (2020) defines an in-combination climate impact as '*when a projected future climate impact (e.g., increase in temperatures) interacts with an effect identified by another topic and exacerbates its impact*'.

1.6.38 The in-combination climate impact assessment has been informed by the potential climatic conditions during the 2010-2039, 2040-2069 and 2070-2099 time periods for the onshore elements of the Proposed Development based on the MOHC UKCP18 probabilistic projections (MOHC, 2024), consistent with **paragraph 1.6.28**. The in-combination climate impact assessment for the offshore elements of the Proposed Development has been informed by observational data collated within the UK Offshore Energy Strategic Environmental Assessment (BEIS, 2022a) and IPCC Sixth Assessment Reporting of the physical science (IPCC, 2021).

1.6.39 An initial screening exercise for each environmental topic has been undertaken which identifies impacts reported within the technical chapters making up the ES and considers whether projected climate conditions will alter the sensitivity of receptors or magnitude of impact resulting in a change in significance. The significance of any effect has been re-assessed using the standard methodologies for each relevant environment topic.

1.6.40 Consideration has also been given to whether any new effects will arise as a result of the Proposed Development under future projected climate conditions.

1.6.41 The assessment of in-combination climate impacts has considered the measures adopted as part of the Proposed Development (embedded and further mitigation) in determining whether projected climate change affects effects on sensitive receptors. Should an effect remain significant following the above-described assessment of in-combination climate impacts, further (secondary) mitigation has been presented where relevant.

Impact assessment criteria

1.6.42 The in-combination climate impact assessment applies the significance criteria developed by the relevant environmental topics and detailed within each technical chapter of the ES.

Assumptions and Limitations of the Assessment

1.6.43 A proportion of the construction stage GHG emissions associated with the manufacturing of components are likely to occur outside the territorial boundary of the UK and hence outside the scope of the UK's national carbon budget, policy and governance. However, in recognition of the climate change effect of GHG emissions (wherever occurring), and the need to avoid 'carbon leakage' overseas when reducing UK emissions, emissions associated with the construction stage have been presented within the assessment and quantification of GHG emissions as part of the Proposed Development.

1.6.44 Additionally, due to the early stage in the development design, the design of the Proposed Development (including the converter stations) has not yet been fully specified. Thus, there is a degree of uncertainty regarding the construction stage GHG emissions resulting from the manufacturing and construction of the Proposed Development. The assessment has sought to limit the impact this may have by assessing a maximum design scenario (which will result in a conservative or worst case assessment).

1.6.45 Detailed LCAs are not yet available for all items specific to electricity transmission infrastructure, as such, where not available, a conservative estimate of construction materials or fuels has been scaled by relevant emissions factors. Where used to calculate the embodied carbon associated with materials, emissions factors do not account for emissions associated with the manufacture of products, and as such may underestimate embodied carbon emissions.

1.6.46 When assessing climate risks, uncertainty arises from both modelling uncertainty and natural variability in the potential magnitude of future changes in climate. Therefore, a high magnitude of change scenario and the high end of probabilistic projections have been used, to provide a precautionary worst case approach. This is further discussed in Volume 4, Appendix 1.2: Climate Change Risk Assessment of the ES.

1.6.47 The above uncertainties are integral to the assessment of climate change effects, but a precautionary approach has been taken as far as practicable to provide a reasonable worst case assessment. On the basis of the above, it is considered that limitations to the assessment have been minimised and that the results provide a robust estimate of the effects of the Proposed Development.

1.7 Baseline Environment

Desk Study

1.7.1 Information on climate change within the study area was collected through a comprehensive review of existing studies and datasets. These are summarised at **Table 1.9**.

Table 1.9: Summary of desk study sources used

Title	Year	Author
UK Government GHG Conversion Factors for Company Reporting	2024	DESNZ
Provisional Agricultural Land Classification (ALC) England	2019	Natural England
UK Climate Averages	2020	Met Office
UK Offshore Energy Strategic Environmental Assessment: Appendix 1F: Climate & Meteorology	2022	BEIS
Climate Change 2021: The Physical Science Basis	2021	IPCC

Greenhouse Gas Emissions Assessment Baseline Environment

Onshore Baseline Environment

1.7.2 The current baseline for the onshore elements of the Proposed Development primarily comprises agricultural land. This land has been broadly categorised as Grade 3 (good to moderate) land with comparatively smaller areas of Grade 4 (poor quality) land. However, this land does not have high soil or vegetation carbon stocks (e.g. peat) that would be subject to disturbance by construction (See Volume 2, Chapter 8: Land-use and Recreation of the ES for further details).

1.7.3 The Order Limits include a small area of land at the Converter Site and onshore HVDC Cable Corridor, which is occupied by part of a permitted solar farm development, which is under construction at the time of writing (planning application 1/1057/2021/FULM). Although the Proposed Development only partially covers the permitted solar farm site, it would have potential to displace existing and potential UK-generated renewable energy that is delivered by the solar farm through the removal of existing photovoltaic panels.

Offshore Baseline Environment

1.7.4 When considering the current baseline for the offshore elements, the baseline consists of various subtidal habitats of sand, mud, rock, coarse sediment, mixed sediment, biogenic reef, and diverse benthic communities (see Volume 3, Chapter 1: Benthic Ecology of the ES). However, this land does not have high soil or vegetation carbon stocks that would be subject to disturbance by construction

Climate Change Risk Assessment Baseline Environment

Onshore Baseline Environment

1.7.5 The south west of England experiences a temperate climate, with annual average maximum and minimum temperatures of 14.46°C and 7.68°C recorded at the Chivenor climate station respectively (Met Office, 2020). During the 1981-2010 baseline period, average maximum temperatures reach 20.60°C in July, and minimum temperatures fall to an average of 2.95°C in February. This is consistent with regional climate patterns for the south west of England and South Wales. In the summer months, regional temperatures often fall between 20.11°C and 9.88°C; in the winter months, regional temperatures range between 8.34°C and 2.13°C.

1.7.6 Precipitation recorded at the Chivenor climate station is lower than that reported for the regional annual total of 1,255.22 mm, at 910.09 mm a year. However, regional precipitation in the south west of England and south Wales exceeds the UK annual average, which totals 1,142.04 mm. Therefore, the south west of England and south Wales can be considered as a region that is exposed to high rainfall in comparison to the rest of the UK.

1.7.7 Annual average wind speeds recorded at Chivenor climate station are higher than the regional annual average, equalling 10.27 (knots) kn and 9.35 kn, respectively. Furthermore, it can be predicted that the Proposed Development will be susceptible to higher wind speeds throughout the year due to its coastal location.

Offshore Baseline Environment

1.7.8 Climate data, which covers the area of sea to the south west of the UK (Regional Sea 4) (BEIS, 2022a), has been used to provide an offshore baseline environment for the Proposed Development, with regards to the climate change risk assessment.

1.7.9 Mean air temperatures range from lows of 7°C in January to 16°C in July, with surface air temperatures exceeding sea surface temperatures during the spring and summer months and falling below sea surface temperatures during the autumn and winter months (BEIS, 2022a).

1.7.10 Precipitation generally falls 15 to 22 days per month during the winter, and 9 to 13 days per month during the summer (BEIS, 2022a).

1.7.11 Higher wind speeds can be expected offshore in comparison with the onshore elements of the Order Limits due to the lack of obstructions (both man-made and natural) in open water. Wind conditions are generally south westerly and north westerly throughout the year, although north easterly winds become more frequent in late-winter and spring. During January, winds occasionally exceed 14 m/s (with 20-30% probability). In July, the chance of these higher wind speeds drops to 2% (BEIS, 2022a).

1.7.12 Mean sea level is a crucial element of climate change-related risks for renewable generation and transmission infrastructure. Global mean sea level rose by 0.2 m between 1901 and 2018, and continues to rise (IPCC, 2021). Land adjacent to the coast and estuaries within the south west has been identified as vulnerable to storms and coastal flooding (Environment Agency, 2022).

Future Baseline Conditions

1.7.13 Consideration of the future baseline conditions in the absence of the Proposed Development has been carried out and is described within this section.

GHG Emissions Assessment Future Baseline

1.7.14 The future baseline GHG emissions for the onshore land use in the absence of the Proposed Development would be expected to remain similar to the existing land use, with a decrease in agriculture-related GHG emissions over time, in line with the UK's national climate change policies. This includes the permitted solar farm application (Planning reference: 1/1057/2021/FULM), which would continue to deliver UK-generated renewable energy that would contribute to the decarbonisation of the grid.

1.7.15 The future baseline for electricity generation that would be displaced by the Proposed Development and cumulative Project depends broadly on future energy and climate policy in the UK, and more specifically (with regards to day-to-day emissions) on the demand for the operation of the Project, compared to other generation sources available; this will be influenced by commercial factors and National Grid's needs.

1.7.16 The carbon intensity of baseline electricity generation is projected to reduce over time and so too would the intensity of the marginal generation source, displaced at a given time. Additional information can be found within Volume 4, Appendix 1.1: GHG Assessment.

1.7.17 As above, the future baseline GHG emissions for the existing offshore land use (seabed) in the absence of the Proposed Development are expected to remain similar.

Climate Change Risk Assessment Future Baseline

1.7.18 In the near future, next few years to decade, variations in average temperature and precipitation will likely be the most visible year-to-year changes in climate. In subsequent decades, the anthropogenic climatic changes are expected to become more apparent, which will be relevant for the operation and maintenance, and decommissioning phases of the Proposed Development.

1.7.19 The MOHC publishes both probabilistic climate change projections and downscaled global circulation model outputs for the UK at various spatial scales. This is called the UKCP18 dataset, first published in November 2018 and at v2.9.0 (MOHC, 2024) at the time of writing. The projections are based on RCP scenarios used by the Intergovernmental Panel on Climate Change (IPCC). The RCP scenarios (four scenarios presented in the IPCC fifth Assessment report which are included within the UKCP18 database) describe different climatic futures, all of which are considered possible depending on the volume of GHGs emitted. These provide the basis for future assessments of climate change and possible response strategies, thereby giving a low-high range in potential global GHG reduction initiatives and resulting rate of climatic effects over a given period.

1.7.20 The probabilistic projections published at a 25 km grid cell scale are considered the most relevant for the climate change risk assessment when considering the onshore elements of the Proposed Development, being designed to show a range of projection values that reflect uncertainty in modelled outcomes. The CP18

Overview Report (MOHC, 2018a) and supporting factsheets (MOHC, 2018b) for the wider regional and UK context will also be drawn upon.

1.7.21 The construction phase of the Proposed Development is expected to commence in 2026 and continue through to 2033. Therefore, the Proposed Development is expected to be fully operational by 2033 (operation of Bipole 1 and Bipole 2 commences in 2031 and 2033, respectively). Following the expected lifetime identified within Volume 1, Chapter 3: Project Description (currently anticipated to be 50 years), it is currently considered that the Proposed Development will be decommissioned. However, as a key piece of energy infrastructure, the Proposed Development could also operate in the longer term through ongoing maintenance of the converter stations and associated transmission infrastructure. Therefore, climate change projections for three periods have been considered, including 2010-2039, 2040-2069 and 2070-2099. These projections have been utilised to consider the impact of climate change across all phases of the Proposed Development, including construction, operation and maintenance and decommissioning.

1.7.22 Probabilistic local climate projections consistent with those referenced above and used to illustrate future possible onshore climate trends are not available for offshore regions. Therefore, the results of marine climate projections as set out within the UKCP18 Marine Report (Palmer *et al.* 2018) and interrogated within the UK Climate Risk Independent Assessment (CCRA3), Chapter 4: Infrastructure (Jaroszweski *et al.* 2021) will be used to assess the impact of future trends for wind speed, wave height and sea levels. These projections are based on RCP8.5, with data largely available for the end of the 21st century.

1.8 Key receptors

1.8.1 **Table 1.10** identifies the receptors taken forward into the assessment.

Table 1.10: Key receptors taken forward to assessment

Receptor	Description	Sensitivity/Value
Global atmospheric mass of GHGs	GHG emissions have a global effect rather than directly affecting any specific local receptor to which a level of sensitivity can be assigned. The global atmospheric mass of the relevant GHGs and consequent warming potential, expressed in CO_2e has therefore been treated as a single receptor.	High sensitivity.
Converter Stations	Each described within Volume 1, Chapter 3: Project Description of the ES.	These receptors are assessed within the CCRA. Given the variability in the nature of the potential effects of climate change on the development, receptors have been identified on a risk-specific basis, whereby all receptors relate to the safe and effective construction, operation and decommissioning of the Proposed Development. A sensitivity/value has not been assigned to each receptor, instead the assessment reviews the severity and probability of each climate risk, and the level of influence is possible to mitigate each risk through design choices. This is further set
Onshore HVDC Cables and HVAC Cables		
Offshore HVDC Cables		

Receptor	Description	Sensitivity/Value
		out within Volume 4, Appendix 1.2: Climate Change Risk Assessment of the ES.
Geology, Hydrogeology and Ground Conditions	Described within Volume 2, Chapter 4 of the ES.	Climate change may exacerbate or conversely diminish the effect of an existing impact on the project. Receptor susceptibility and vulnerability, as well as their value/importance may change with future climatic projections. This has been assessed within the in-combination climate impacts assessment included within this chapter (see section **1.17**). Sensitive receptors included within the assessment are identified and defined within the relevant technical chapters of the ES.
Hydrology and Flood Risk	Described within Volume 2, Chapter 3 of the ES.	
Onshore ecology and nature conservation	Described within Volume 2, Chapter 1 of the ES.	
Marine Archaeology and Cultural Heritage	Described within Volume 3, Chapter 7 of the ES.	
Landscape, Seascape and Visual Resources	Described within Volume 4, Chapter 2 of the ES.	

1.9 Mitigation Measures Adopted as Part of the Proposed Development

1.9.1 For the purposes of the EIA process, the term *'measures adopted as part of the Proposed Development'* is used to include the following types of mitigation measures (adapted from IEMA, 2016). These measures are set out in Volume 1, Appendix 3.1: Commitments Register of the ES.

- Embedded mitigation. This includes the following.
  - Primary (inherent) mitigation - measures included as part of the Proposed Development design. IEMA describes these as '*modifications to the location or design of the development made during the pre-application phase that are an inherent part of the project and do not require additional action to be taken'*. This includes modifications arising through the iterative design process. These measures will be secured through the consent itself through the description of the project and the parameters secured in the DCO and/or marine licences. For example, a reduction in footprint or height.
  - Tertiary (inexorable) mitigation. IEMA describes these as '*actions that would occur with or without input from the EIA feeding into the design process. These include actions that will be undertaken to meet other existing legislative requirements, or actions that are considered to be standard practices used to manage commonly occurring environmental effects*'. It may be helpful to secure such measures through a Construction Environmental Management Plan or similar.
- Secondary (foreseeable) mitigation. IEMA describes these as '*actions that will require further activity in order to achieve the anticipated outcome'*. These include measures required to reduce the significance of environmental effects (such as lighting limits) and may be secured through environmental management plans.

1.9.2 In addition, where relevant, measures have been identified that may result in enhancement of environmental conditions. Such measures are clearly identified within Volume 1, Appendix 3.1: Commitments Register of the ES. The measures relevant to this chapter are summarised in **Table 1.11**.

1.9.3 Embedded measures that will form part of the final design (and/or are established legislative requirements/good practice) have been taken into account as part of the initial assessment presented in **section 1.11** to **1.13** below (i.e., the initial determination of impact magnitude and significance of effects assumes implementation of these measures). This ensures that the measures to which the Applicant is committed are taken into account in the assessment of effects.

1.9.4 Where an assessment identifies likely significant adverse effects, further or secondary mitigation measures may be applied. These are measures that could further prevent, reduce and, where possible, offset these effects. They are defined by IEMA as actions that will require further activity in order to achieve the anticipated outcome and may be imposed as part of the planning consent, or through inclusion in the ES (referred to as secondary mitigation measures in IEMA, 2016). For further or secondary measures both pre-mitigation and residual effects are presented.

Table 1.11: Mitigation measures adopted as part of the Proposed Development

Commitment Number	Measure Adopted	How the Measure Will be Secured
Embedded Measures		
ONS36	The design of the Proposed Development includes the routing and siting of infrastructure to minimise disturbance to land that contains high carbon stocks, such as woodland.	DCO Schedule 2, Requirement 7 (Management plans)
ONS20	The converter stations will be designed to ensure resilience to the potential impacts of future climate change, including the following: • Converter buildings, associated ancillary buildings, and electrical equipment should be designed with durable materials in line with relevant durability quality standards and guidance required in the construction contracts and by the relevant Government standards as far as reasonably practicable. • The converter stations will house auxiliary equipment e.g. appropriate cooling plant and ventilation systems to account for a range of temperature conditions, as consistently heightened temperatures could lead to efficiency losses due to overheating, or the failure of electrical equipment.	DCO Schedule 2, Requirement 4 (detailed design approval)
ONS21	An Outline Onshore Construction Environmental Management Plan (Outline On-CEMP) has been prepared as part of the application for development consent (document reference 7.7). Onshore Construction Environmental Management Plan(s) (On-CEMP(s)) will be developed to align with the Outline On-CEMP. The On-CEMP(s) will set out measures to reduce Greenhouse Gas emissions associated with the construction of the Proposed Development and will include, where reasonably practicable, the following mitigation measures: • Pre-fabricated elements delivered to the site ready for assembly, which will reduce on-site construction waste	Within the Outline On-CEMP (document reference 7.7). The final On-CEMP(s) are secured via DCO Schedule 2, Requirement 7 (document reference 3.1).

Commitment Number	Measure Adopted	How the Measure Will be Secured
	and reduce vehicle movements as part of the construction process. • Vehicles used in road deliveries of materials, equipment and waste arisings on- and off-site would be loaded to full capacity, wherever practicable, to minimise the number of journeys associated with the transport of these items. • All machinery and plant would be procured to adhere with relevant good practice emissions standards at the time of procurement and should be maintained in good repair to remain fuel efficient. • When not in use, vehicles and plant machinery involved in site operations would be switched off to further reduce fuel consumption. • The volume of waste generated would be minimised, and resource efficiency maximised, by applying the principles of the waste hierarchy throughout the construction period. Segregated waste storage should be employed to maximise recycling potential for materials. • Equipment and machinery requiring electricity would only be switched on when required for use. Procedures would be implemented to ensure that staff adhere to good energy management practices, e.g. through turning off lights, computers and heating/air conditioning units when not in use. • Temporary construction haul roads would be developed utilising recycled aggregates to minimise embodied carbon impacts.	
OFF05	An Offshore CEMP will set out the detailed approach to offshore construction activities and would implement those measures and environmental commitments identified in the EIA as far as reasonably practicable. The following measures will be included in the Offshore CEMP: marine pollution prevention; waste management; marine invasive species (via the Offshore Biosecurity Plan); and dropped object procedures. An Outline Offshore CEMP (document reference 7.9) forms part of the application for DCO (with a final Offshore CEMP finalised by the offshore contractor).	The Offshore Construction Environmental Management Plan (document ref. 7.9) is a requirement of the Deemed Marine Licence.
ONS10	An Outline Site Resource and Waste Management Plan (SRWMP) has been developed as part of the application for development consent (document reference 7.7, Appendix B). SRWMP(s) would be developed in accordance with the Outline SRWMP, which would incorporate the appropriate measures to manage waste produced by the Proposed Development and re-use materials, where reasonably practicable.	The Outline Site Resource and Waste Management Plan provided as an appendix to the Outline On-CEMP (document reference 7.7). The final On-CEMP(s) are secured via DCO Schedule 2, Requirement 7 (Management plans)
ONS05	An Outline Construction Traffic Management Plan (CTMP) has been submitted with the application for development consent (document reference 7.12). CTMP(s) will be developed in accordance with the Outline CTMP prior to commencement of construction and agreed with relevant stakeholders.	An Outline CTMP (document reference 7.12) forms part of the DCO application. The final CTMP(s) are secured via DCO

Commitment Number	Measure Adopted	How the Measure Will be Secured
	The CTMP(s) will set out reasonably practicable measures that include: • Managing the numbers and routing of HGVs during the construction phase; • Managing the movement of construction worker traffic during the construction phase; • Details of measures to manage the safe passage of HGV traffic via the local highway network; and • Details of localised road improvements if and where these may be necessary to facilitate the safe use of the existing road network.	Schedule 2, Requirement 8 (Construction Traffic Management Plan).
ONS04	An Outline Decommissioning Strategy has been submitted as part of the application for development consent (document reference 7.17), which details that onshore and offshore decommissioning plans will be prepared in accordance with the principles set out in the Outline Decommissioning Strategy, if decommissioning of the Proposed Development is required at the end of the Proposed Development's operational life. The onshore decommissioning plan(s) will be developed in consultation with the relevant authority and in line with the latest available guidance, legislation and any new technologies available at the time of the Proposed Development's decommissioning. The onshore decommissioning plan(s) will include an assessment of the need to remove above ground infrastructure and the decommissioning of below ground infrastructure and include details relevant to flood risk (e.g. maintenance/reinstatement of existing land drainage), pollution prevention and avoidance of ground disturbance. The onshore decommissioning plan(s) will also include provision for the protection (during decommissioning) of any significant archaeological remains within the Onshore Infrastructure Area which were identified and protected from harm during construction.	DCO Schedule 2, Requirement 16 (Decommissioning Strategy)
Secondary (Further) Measures		
ONS26	The following measures are to be implemented where reasonably practicable, during the construction phase to minimise greenhouse gas emissions: • Hybrid, electrical or lower carbon plant and equipment will be used. • Low energy solutions for temporary construction compounds such as renewable energy, battery storage or biofuels within generators will be considered and implemented. • Low carbon construction materials (as reported in Environmental Product Declarations) will be used subject to relevant Building Regulations and Standards or guidance in the construction contracts.	DCO Schedule 2, Requirement 7 (Management plans)

1.10 Key Parameters for Assessment

Maximum Design Scenario

1.10.1 The maximum design scenarios identified in **Table 1.12** have been selected as those having the potential to result in the greatest effect on an identified receptor or receptor group. These scenarios have been selected from the information provided in Chapter 3: Project Description of the ES. Effects of greater adverse significance are not predicted to arise should any other development scenario, based on details within the Project Design Envelope (e.g. different infrastructure layout), to that assessed here be taken forward in the final design. Therefore, this comprises a conservative assessment of a worst case scenario.

Table 1.12: Maximum design scenario considered for the assessment of impacts

Potential Impact	Phase[1]			Maximum Design Scenario	Justification
	C	O	D		
The impact of GHG emissions arising from the manufacturing and installation of the Proposed Development	✓	×	×	**Construction phase** • The greatest number of onshore vehicles for the installation of the Proposed Development (66,994 Heavy Goods Vehicles (HGVs) and 191,090 personnel vehicles). • The greatest number of vessel movements during the installation of the Proposed Development: – Jack-up barge: 120 days; – Cable vessels: 144 days; – Trenching support vessels: 457 days; – Guard vessels: 3,551 days; – Rock protection vessels: 352 days; and – Survey Vessel (route clearance): 90 days. • The greatest area of the converter stations – 130,000 m^2 total footprint of Bipole 1 and Bipole 2. • The maximum area of cables (1.2 km x 155 mm HVAC cables (12 no.), 14.5 km x 156 mm onshore HVDC cables (4 no.), and 370 km x 177.5 mm offshore HVDC cables (4 no.)) • The maximum area of fibre optic cables (onshore: 14.5 km x 40 mm (6 no.) and offshore: 370 km x 40 mm (2 no.)). • The maximum number of transition joint bays will be 2, with each TJB comprising 30 m by 5 m (150 m^2) and a cover depth of 2.5 m. Volume of excavated material per TJB is 1,875 m^3. • Within the onshore HVDC Cable Corridor, there will be up to 34 joint bays each with an area of 100 m^2 and 140 m^3 of material to be excavated per joint bay. The distance between jointing bays is up to 1,100 m.	The greatest number and size of structures and maximum length of the cables will result in the greatest consumption of fuel and materials, representing the greatest potential for GHG emissions.

Potential Impact	Phase[1]			Maximum Design Scenario	Justification
	C	O	D		
				• Within the onshore HVDC Cable Corridor, there will be up to 34 link boxes each with an area of 2.25 m^2 and 3.15 m^3 of material to be excavated per link box. The distance between link boxes is up to 1,100 m. • The greatest extent of solar panels to be removed at the permitted solar farm 1/1057/2021/FULM as a result of the construction of the converter stations equates to an installed capacity of 2.5 MW.	
The impact of GHG emissions arising from the consumption of materials and activities required to facilitate the operation and maintenance of the Proposed Development.	×	✓	×	**Operation and Maintenance Phase** • The greatest number of survey and maintenance vessels across the lifetime of the Proposed Development: 1 survey vessel to undertake yearly surveys in the initial 5 years of operation, and a survey every 5 years following this period. For repairs, there would be a survey vessel, guard vessel, trenching support vessel, cable lay vessel and rock protection vessel. • It is anticipated that each onshore HVDC Cable will have a maximum of four repairs over the Proposed Development lifetime resulting from faults, each repair covering up to 1 km per bipole (pair of cables), resulting in 8 km of cable replacement. • It is anticipated that each offshore HVDC Cable will have a maximum of four faults over the lifetime, with each repair covering up to 3 km per bipole (pair of cables), resulting in 24 km of cable replacement. Throughout the Proposed Development's lifetime, it is assumed that major converter plant equipment (e.g. transformers) would be replaced once.	The greatest number and size of structures and maximum length of the cables will result in the greatest consumption of fuel and materials representing the greatest potential for GHG emissions.
The impact of GHG emissions arising from land use change during the construction, operation and maintenance and decommissioning phases.	✓	✓	✓	**Construction, Operation and Maintenance, and Decommissioning Phases** • The greatest area of the converter stations – 130,000 m^2 total footprint of Bipole 1 and Bipole 2. • The maximum area of cables (1.2 km x 155 mm HVAC Cables (12 no.), 14.5 km x 156 mm onshore HVDC	GHG emissions arising from land use change during the construction, operation and maintenance and decommissioning phases will be considered as part of the overall GHG impact of the Proposed Development.

Potential Impact	Phase[1]			Maximum Design Scenario	Justification
	C	O	D		
				Cables (4 no.), and 370 km x 177.5 mm offshore HVDC Cables (4 no.)) • The maximum area of fibre optic cables (Onshore: 14.5 km x 40 mm (6 no.) and offshore: 370 km x 40 mm (2 no.)). • The permanent corridor width is typically 32 m along the onshore HVDC Cable Corridor. • The permanent corridor width is 30 m along the HVAC Cable Corridors (including 15 m width per bipole).	
The impact of GHG emissions arising from decommissioning works (e.g., plant, fuel and vessel use) and the recovery (or disposal) of materials.	×	×	✓	**Decommissioning Phase** • Greatest number of transport vehicles for the installation of the Proposed Development – the decommissioning sequence will generally be the reverse of the construction sequence and will involve similar types and numbers of vehicles and equipment. This totals 66,994 HGVs and 191,090 personnel vehicles. • Greatest number of vessel movements during the installation of the Proposed Development – the decommissioning sequence will generally be the reverse of the construction sequence and will involve similar types and numbers of vessels and equipment. This totals: – Jack-up barge: 120 days; – Cable vessels: 144 days; – Trenching support vessels: 457 days; – Guard vessels: 3,551 days; – Rock protection vessels: 352 days; and • Survey Vessel (route clearance): 90 days • The greatest area of the converter stations – 130,000 m^2 total footprint of bipole 1 and bipole 2. • The maximum area of cables (1.2 km x 155 mm HVAC Cables (12 no.), 14.5 km x 156 mm onshore HVDC	GHG emissions arising from decommissioning works (e.g., plant, fuel and vessel use) and the recovery (or disposal) of materials would contribute to the lifecycle total and net GHG balance of the Proposed Development

Potential Impact	Phase[1]			Maximum Design Scenario	Justification
	C	O	D		
				Cables (4 no.), and 370 km x 177.5 mm offshore HVDC Cables (4 no.)). • The maximum area of fibre optic cables (Onshore: 14.5 km x 40 mm (6 no.) and offshore: 370 km x 40 mm (2 no.)).	
The impact of climate change on the Proposed Development	✓	✓	✓	**Construction Phase** • Projections for the global emissions have used the RCP 8.5 emissions pathway to understand future climatic changes. • Consistently heightened temperatures, increased wind speeds and increased frequency of extreme events such as floods and storms may lead to heightened risk to teams involved in construction activities. **Operation and Maintenance Phase** • Projections for the global emissions have used the RCP 8.5 emissions pathway to understand future climatic changes. • Consistently heightened temperatures, changes to rainfall patterns, increased wind speeds and increased frequency of extreme events such as floods and storms could lead to efficiency losses due to overheating, the failure of electrical equipment or damage to infrastructure which would result in an increase in operation and maintenance activities. **Decommissioning Phase** • Projections for the global emissions have used the RCP 8.5 emissions pathway to understand future climatic changes. • Consistently heightened wave heights, increased wind speeds and increased frequency of extreme events such as floods and storms may lead to heightened risk to teams involved in decommissioning activities.	The emissions pathway RCP 8.5 is the most conservative maximum design scenario for the climate change projections, as it represents the most extreme modelled climate change scenario. Onshore elements of the Proposed Development will include industrial type buildings (such as the onshore converter stations), containing electrical equipment (largely self-operating) and buried cabling which are in a low-risk category with no vulnerable site users. The main climate risk to the onshore elements of the Proposed Development is flooding, which will be assessed including appropriate allowances for changes in rainfall intensity and coastal change due to climate change in Volume 2, Chapter 3: Hydrology and Flood Risk of the ES. The main non-flooding risk would be increased cooling demand for the equipment because of climate change including global temperature increases and increased risk of heatwave (MOHC, 2018a). In terms of climate risks for the offshore elements of the Proposed Development. There is anticipated to be limited risks to the buried cabling.

[1] C=construction, O=operation and maintenance, D=decommissioning

1.11 Assessment of Construction Effects

Introduction

1.11.1 The impacts of the construction of the Proposed Development in relation to climate change have been assessed. The potential impacts arising from the construction phase of the Proposed Development are listed in **Table 1.12**, along with the maximum design scenario against which each impact has been assessed.

1.11.2 A description of the potential effect on receptors caused by each identified impact is given below.

1.11.3 Further detailed consideration can be found in Volume 4, Appendix 1.1: Greenhouse Gas Assessment of the ES and Volume 4, Appendix 1.2: Climate Change Risk Assessment of the ES.

The Impact of GHG Emissions Arising From Land Use Change

Sensitivity of Receptor

1.11.4 In accordance with **paragraph 1.6.18**, the receptor (global climate) is considered to be of **high** sensitivity, as it is highly vulnerable, of low recoverability and high value.

Magnitude of Impact

1.11.5 Onshore and offshore habitat and land use within the Order Limits would be impacted for the duration of the construction (excavation for foundations, buildings, construction of access roads, installation of onshore and offshore cables and construction compounds). However, these impacts would be temporary and following construction, land utilised for construction compounds, offshore and onshore cable corridors and transition joint bays would be restored to the previous baseline environment. This excludes the Converter Site, which will house two converter stations throughout the operation and maintenance phase.

1.11.6 The land within the Order Limits primarily comprises agricultural land. This land has been broadly categorised as Grade 3 (good to moderate) land with comparatively smaller areas of Grade 4 (poor quality) land. However, this land does not have high soil or vegetation carbon stores (e.g. peat) that would be subject to disturbance by construction. The Onshore Infrastructure Area is routed around the area of Littleham Wood, however, it includes an area of woodland known as Lodge Plantation. Despite this, the primary measure to utilise trenchless methods to drill under major obstacles (including rivers, woodland and main roads) would ensure that the carbon storage of existing trees are not disturbed.

1.11.7 As detailed within **paragraph 1.7.3**, a permitted renewable energy development is partially situated within the Converter Site and onshore HVDC Cable Corridor, including the following:

- Planning application 1/1057/2021/FULM: An area of this permitted development falls within the Order Limits, and thus, land currently anticipated for solar panels would be required (and displaced) by the construction and operation and maintenance of the Proposed Development.

1.11.8 Although the Proposed Development only partially covers the existing Cleave Solar Farm and permitted application site (1/1057/2021/FULM), it has the potential to displace existing and potential UK-generated renewable energy. The extent of the solar farm to be displaced includes approximately 6 ha of the 36 MW development. As detailed within Volume 4, Appendix 1.1: GHG Assessment of the ES, this equates to an installed capacity of 2.5 MW.

1.11.9 The potential impact of the removal of the solar panels has been calculated by determining a likely worst case quantity of renewable energy output lost and the associated GHG impacts (i.e. loss of potential emissions savings) over the lifetime (40 years) of the permitted solar farm. Due to the removal of solar panels, there would be a potential loss of between 2,188.37 tCO_2e (long run marginal scenario) and 33,400.52 tCO_2e (non-renewable fuels scenario) in emissions savings over the lifetime of the solar farm. This figure is reflective of the whole life of the Project, however, it is included as a construction-stage impact rather than an operation and maintenance impact as this is when the solar panels would be removed.

1.11.10 Despite this, the Proposed Development would deliver up to 3.6 GW of renewable energy once operational, which would outweigh the impacts associated with the loss of this land (e.g. displacement of UK-generated renewable electricity).

1.11.11 In terms of the offshore environment, land use change would be constrained to the Order Limits and would not directly impact any carbon stores.

1.11.12 Aside from the removal of solar panels, no significant long-term carbon stores are directly affected by the Proposed Development and the habitat is anticipated to return back to its pre-development habitat after construction (excluding land for converter stations and road widening). The permanent removal of the solar panels would, however, would result in a potential loss of between 2,188.37 and 33,400.52 tCO_2e in emissions savings. It can be noted that whilst the Proposed Development would be theoretically reducing the capacity of the permitted solar farm, there are other factors that would impact the solar farm impact, such as irradiance levels and the maintenance of panels. The figures above present a worst-case assumption as the solar farm may not be operating at maximum capacity.

1.11.13 Overall, as the Proposed Development would facilitate the delivery of up to 3.6 GW (which would outweigh the impacts associated with the loss of this land), the change concerning the carbon storage value of the land use would be **negligible**.

Significance of the Effect

1.11.14 Overall, the magnitude of the impact is **negligible** and the sensitivity of the receptor is **high**. As detailed within **paragraph 1.6.23**, when identifying the significance of an effect it is important to consider the magnitude of impact in line with national carbon budgets (where possible) and local/national policy towards GHG reductions. Aside from the removal of solar panels, no significant long term carbon stores are directly affected by the Proposed Development and the habitat

is anticipated to return back to its pre-development habitat after construction (excluding land for converter stations and road widening).

1.11.15 Whilst the reduction of the solar farm output would have negative effects, leading to the loss of potential emissions savings, the Proposed Development would facilitate the supply of more renewable energy to the national grid. The effect will, therefore, be **negligible**, which is not significant in EIA terms.

The Impact of GHG Emissions Arising From the Manufacturing and Installation of the Proposed Development

1.11.16 This section considers the embodied carbon emissions associated with the consumption of materials and fuel required to construct the Proposed Development (onshore and offshore elements). This has included consideration of the maximum length of the onshore and offshore cables, and maximum number of converter stations representing the greatest potential for GHG emissions from the construction and installation of the Proposed Development as a conservative estimate of impact. The following items are considered within this assessment:

- Converter Stations;
- HVAC Cables;
- Onshore HVDC Cables;
- Fibre optic cables;
- Haul roads;
- joint bays and link boxes, including the transition joint bays;
- Offshore HVDC Cables;
- vessel movements; and
- vehicles movements.

1.11.17 Detailed LCA data are not available for all items specific to electricity transmission infrastructure. This includes the converter stations where detailed material information is not available at this time and as such industry benchmarks have been used. As such, a combined approach has been undertaken to calculate embodied carbon, informed in part by LCA data but also by relevant emissions factors scaled by conservative estimates of construction materials or fuels.

1.11.18 The potential impact of the converter stations has been estimated using an intensity for the manufacturing GWP of 2,190 $kgCO_2e$ per MW (ABB, 2003). This was scaled by the output of the Project, totalling approximately 3,600 MW, to give an estimated embodied carbon value of 7,884 tCO_2e. It has been assumed that this intensity accounts for all converter station elements as well as all electrical plant included.

1.11.19 The potential impact of the converter station buildings has been estimated using benchmark data expressed in $kgCO_2e/m^2$ of floorspace as an intensity. This was scaled by the total floor area for all converter station buildings. When using the RICS (2012) intensity for other industrial/utilities/specialist uses, this results in estimated embodied carbon emissions of 70,850 tCO_2e for the converter station.

1.11.20 Material quantities associated with the construction of joint bays (including the transition joint bays at the Landfall) and link boxes were estimated using the maximum design parameters detailed within Volume 1, Chapter 3: Project Description of the ES, and scaled by the relevant material intensity factor (Jones and Hammond, 2019). Total emissions were estimated at 1,310 tCO_2e.

1.11.21 A similar approach has been taken to calculate the embodied carbon associated with the fibre optic cables (both onshore and offshore). Material quantities were estimated based on the total length of each cable and informed by technical product information for fibre optic cables (Emtelle, 2020). A medium density polyethylene emissions factor was then scaled by the calculated material quantities to give an estimated embodied carbon value of 2,757 tCO_2e.

1.11.22 Material quantities associated with the HVAC cables, onshore HVDC Cables and offshore HVDC Cables were estimated based on the total length of each cable and the proportion of material components as detailed within Volume 4, Appendix 1.1: GHG Assessment of the ES. Relevant emissions factors (Jones and Hammond, 2019) for each material were then scaled by the estimated quantities. Additionally, the material quantities associated with the backfilling of cable trenches with Cement Bound Sand were estimated based on trench dimensions (see Volume 1, Chapter 3: Project Description) and corridor length. This was then scaled by the emission factors for cement and sand (Jones and Hammond, 2019). The total estimated embodied carbon for onshore and offshore cables, including trench material, was estimated at 296,706 tCO_2e.

1.11.23 Emissions associated with fuel combustion from vessel and heavy goods vehicle movements have been calculated based on the maximum number of movements proposed during the construction phase, assuming the longest journey distance travelled to reach a conservative estimate. Anticipated fuel consumption for each movement was scaled by an appropriate emissions factor to give total estimated emissions of 128,533 tCO_2e during the construction phase. It is likely that the vessel and transport movements account for the majority of the construction plant emissions albeit that details of construction plant use are not yet available at this stage in the design of the Proposed Development.

1.11.24 Embodied carbon associated with the material consumption for the construction of the haul roads has been assessed by utilising the dimensions provided within Volume 1, Chapter 3: Project Description of the ES and scaling this by the material intensity factor for recycled aggregates (Jones and Hammond, 2019). This resulted in an embodied carbon value of 509 tCO_2e.

1.11.25 The estimated GHG emissions arising from the consumption of materials to construct the Proposed Development are presented in **Table 1.13** below, which is based upon the maximum design scenario.

1.11.26 Further detailed consideration can be found in Volume 4, Appendix 1.1: Greenhouse Gas Assessment of the ES.

Table 1.13: Estimated construction stage GHG emissions for the Proposed Development

LCA Stage	Item	Proposed Development Emissions (tCO_2e)
A1-A5	Converter station plant (including transformers, etc.)	7,884
	Converter station buildings	70,850
	Power cabling (including HVAC cables, onshore HVDC cables and offshore HVDC cables)	296,706
	Fibre optic cables (onshore and offshore)	2,757
	Joint bays and link boxes	1,310
	Haul Roads	509
	Vessel movements	118,921
	Traffic movements	9,612
	Total	**508,548***

Note: this does not include the impact of land use change, relating to the removal of the solar panels. This potential loss of emissions savings is considered in **paragraphs 1.11.5** to **1.11.13**.

Sensitivity of the Receptor

1.11.27 In accordance with **paragraph 1.6.18**, the receptor (global climate) is considered to be of **high** sensitivity, as it is highly vulnerable, of low recoverability and high value.

Magnitude of impact

1.11.28 The impact is predicted to be of international spatial extent, short term duration, intermittent and low reversibility. It is predicted that the impact will affect the receptor indirectly. The magnitude is therefore, considered to be 508,548 tCO_2e for the construction period.

Significance of the effect

1.11.29 Overall, the magnitude of the impact is assessed as 508,548 tCO_2e and the sensitivity of the receptor is considered to be **high**. As detailed within paragraph **1.6.23**, when identifying the significance of an effect it is important to consider the magnitude of impact in line with national carbon budgets (where possible) and local/national policy towards GHG reductions. The construction stage GHG emissions represent 0.024% of relevant UK carbon budgets across 2026-2033. At this stage it is not possible to make strong commitments towards low carbon materials and fuel efficiency measures, as such, the effect will be of **moderate adverse** effect, which is significant in EIA terms. As set out in **section 1.1**, this assessment relates to the Proposed Development alone as the Moroccan generation assets and cable infrastructure will be consented separately. However, given their purpose, the Proposed Development would never operate in isolation. As such, the cumulative impacts of the Proposed Development with the Moroccan generation assets and cable infrastructure have been assessed and are presented in **section 1.13**.

Further Mitigation and Residual Effect

1.11.30 A moderate adverse effect is predicted for GHG emissions produced as a result of construction activity associated with the Proposed Development. This is significant in EIA terms.

1.11.31 Further mitigation would be implemented in accordance with the Outline On-CEMP (document reference 7.7), where reasonably practicable, during the construction phase to minimise greenhouse gas emissions:

- Hybrid, electrical or lower carbon plant and equipment will be used.
- Low energy solutions for temporary construction compounds such as renewable energy, battery storage or biofuels within generators will be considered and implemented.
- Low carbon construction materials (as reported in Environmental Product Declarations) will be used subject to relevant Building Regulations and Standards or guidance in the construction contracts.

1.11.32 However, these measures would not be sufficient alone to reduce the significance of effect which would remain as **moderate adverse**, which is significant in EIA terms.

The Impact of Climate Change on the Proposed Development During Construction

1.11.33 The risks identified in Volume 4, Appendix 1.2: Climate Change Risk Assessment of the ES, are summarised in this section in relation to their impact upon the construction of the Proposed Development in accordance with the following assessment criteria (as detailed in **Table 1.8**):

- severity of the impacts;
- probability of the potential impacts; and
- influence factor.

1.11.34 Three key risks are associated with the construction of the onshore elements of the Proposed Development and are associated with increased frequency of flood events, increased temperatures and severity of storm events impacting worker safety during construction activities, as well as causing possible delays to construction schedules.

1.11.35 Risks associated with construction of offshore elements of the Proposed Development are largely associated with increased temperatures and severity of storm events impacting worker safety undertaking construction activities.

1.11.36 When accounting for measures adopted as part of the Proposed Development (embedded mitigation) in determining the significance of each identified risk, the CCRA concluded that the effect of climate change on the construction of the Proposed Development is **negligible** with no risk score exceeding 4.

1.12 Assessment of Operational Effects

Introduction

1.12.1 The impacts of the operation and maintenance of the Proposed Development in relation to climate change have been assessed. The potential impacts arising from the operation and maintenance phase of the Proposed Development are listed in **Table 1.12**, along with the maximum design scenario against which each impact has been assessed.

1.12.2 A description of the potential effect on receptors caused by each identified impact is given below.

The Impact of GHG Emissions Arising From Land Use Change

Sensitivity of the Receptor

1.12.3 In accordance with **paragraph 1.6.18**, the receptor (global climate) is considered to be of **high** sensitivity, as it is highly vulnerable, of low recoverability and high value.

Magnitude of Impact

1.12.4 Following construction, the existing baseline environment, which is not currently believed to be a significant carbon store, would be restored along the Offshore Cable Corridor and onshore HVDC Cable Corridor. Therefore, onshore habitat and land use impacts would be limited to the proposed Converter Site, which would house two converter stations with a combined footprint of 130,000 m^2.

1.12.5 The majority of the land at the Converter Site is made up of agricultural land, which does not represent significant carbon stores. Whilst there are patches of woodland on some boundaries of these areas, the Proposed Development would be designed to avoid the woodland. Furthermore, the Proposed Development also includes part of the permitted solar farm development (1/1057/2021/FULM) and would require the removal of the solar panels. However, the impacts (loss of output and associated GHG emissions savings) have been presented and considered as part of the construction impacts as this is the point in which the solar panels would be lost (see **section 1.11.7** to **1.11.15**). Therefore, these land use impacts are not considered further.

1.12.6 As such, the magnitude of change owing to land use and seabed change across the operation and maintenance phase of the Proposed Development is considered to be **negligible**.

Significance of the Effect

1.12.7 Overall, the magnitude of the impact is **negligible** and the sensitivity of the receptor is **high**. As detailed within **paragraph 1.6.23**, when identifying the significance of an effect it is important to consider the magnitude of impact in line with national carbon budgets (where possible) and local/national policy towards GHG reductions.

1.12.8 The impacts associated the removal of solar panels for the permitted solar farm (1/1057/2021/FULM) are considered in the construction land use change effects as this is the stage at which the panels would be lost and thus, are not considered further in this section. Therefore, as no significant long term carbon stores are directly affected by the Proposed Development during operation and maintenance, the effect will be **negligible**, which is not significant in EIA terms.

The Impact of GHG Emissions Arising From the Consumption of Materials and Activities Required to Facilitate the Operation and Maintenance of the Proposed Development.

1.12.9 Emissions during the operation and maintenance phase of the Proposed Development refer to activities contributing to maintenance. Maintenance can be divided into preventative maintenance and corrective maintenance.

- Preventative maintenance includes the proactive repair to, or replacement of, known wear components based on routine inspections or monitoring systems.
- Corrective maintenance includes the reactive repair or replacement of failed or damaged components.

1.12.10 The maintenance activities for the Proposed Development largely involve inspection, remote monitoring, repainting, removal of marine growth, reburial of cables and geophysical surveys. Emissions associated with such activities are negligible and immaterial, and as such have not been assessed further.

1.12.11 Emissions associated with the maintenance vessel movements have been captured, alongside emissions associated with the embodied carbon of onshore and offshore cables, and converter station material replacements over the Proposed Development's assumed 50-year lifetime. Conservative assumptions for material replacement rates were used to provide a maximum design scenario. The methodology to calculate emissions associated with such maintenance activities follows the methodology set out in **paragraphs 1.11.16** to **1.11.24**.

1.12.12 The estimated GHG emissions arising from the consumption of materials and activities required to facilitate the operation and maintenance of the Proposed Development are presented in **Table 1.14** below.

1.12.13 Further detailed consideration can be found in Volume 4, Appendix 1.1: Greenhouse Gas Assessment of the ES.

Table 1.14: Estimated operation and maintenance stage GHG emissions

LCA Stage	Item	Proposed Development Emissions (tCO_2e)
B1-B5	Converter station electrical plant replacement	7,884
	Cable replacement	5,641
	Vessel movements	32,409
	Total	**45,935**

Sensitivity of the Receptor

1.12.14 In accordance with **paragraph 1.6.18**, the receptor (global climate) is considered to be of **high** sensitivity, as it is highly vulnerable, of low recoverability and high value.

Magnitude of impact

1.12.15 The impact is predicted to be of international spatial extent, long term duration, continuous and low reversibility. It is predicted that the impact will affect the receptor directly. The magnitude is considered to be 45,935 tCO_2e.

Significance of the effect

1.12.16 Overall, the magnitude of the impact is assessed as 45,935 tCO_2e and the sensitivity of the receptor is considered to be **high**. As detailed within **paragraph 1.6.23**, when identifying the significance of an effect it is important to consider the magnitude of impact in line with national carbon budgets (where possible) and local/national policy towards GHG reductions. The operation and maintenance stage GHG emissions represent 0.001% of relevant carbon budgets across 2031-2037. The effect will, therefore, be **minor adverse**, which is not significant in EIA terms. As set out in **section 1.1**, this assessment relates to the Proposed Development alone as the Moroccan generation assets will be consented separately. However, given their purpose, the Proposed Development would never operate in isolation. As such, the cumulative impacts of the Proposed Development with the Moroccan generation assets and cable infrastructure have been assessed and are presented in **section 1.15**.

The Impact of Climate Change on the Proposed Development During Operation and Maintenance

1.12.17 The risks identified in Volume 4, Appendix 1.2: Climate Change Risk Assessment of the ES, are summarised in this section in relation to their impact upon the operation and maintenance of the Proposed Development in accordance with the following assessment criteria (as detailed in **Table 1.8**):

- severity of the impacts;
- probability of the potential impacts; and
- influence factor.

1.12.18 Volume 4, Appendix 1.2: Climate Change Risk Assessment of the ES summarises the potential climatic changes in the coming decades and considers the potential consequences for the Proposed Development in a risk assessment format. The most significant risk from climate change to the Proposed Development is likely to arise from flooding. This is assessed separately in detail in Volume 2, Chapter 3: Hydrology and Flood Risk of the ES and appropriate flood management and resilience measures have been taken into account, including an allowance for climate change effects. No further consideration and inclusion of flooding risk is presented in this assessment.

1.12.19 The risk assessment in Volume 4, Appendix 1.2: Climate Change Risk Assessment of the ES considers in its scoring the level of influence the design of

the operation and maintenance and decommissioning activities can have upon the remaining risks, in addition to its severity and probability. Those risks over which the Applicants have little or no influence are therefore not typically considered significant effects, save where the severity and/or probability are highest.

1.12.20 With the exception of flood risk, the greatest risks to the operation of onshore elements of the Proposed Development due to climate change have been identified as those arising from high temperatures affecting operational equipment and storms affecting power transmission or building/structure damage.

1.12.21 Consistently heightened temperatures, changes to rainfall patterns, and increased frequency of extreme events such as floods and storms could lead to efficiency losses due to overheating, the failure of electrical equipment or damage to infrastructure which would result in an increase in operations and maintenance activities. It is noted, however, that the converter stations include built-in safety measures, including monitoring, to prevent this happening and therefore the probability is very low.

1.12.22 In terms of climate risks for the offshore elements of the Proposed Development, there is anticipated to be limited risk to the buried cabling.

1.12.23 When accounting for measures adopted as part of the Proposed Development (embedded mitigation) in determining the significance of each identified risk, the CCRA concluded that the effect of climate change on the operation and maintenance of the Proposed Development is **negligible** with no risk score exceeding 4.

1.13 Assessment of Decommissioning Effects

The Impact of GHG Emissions Arising From Land Use Change

Sensitivity of the Receptor

1.13.1 In accordance with **paragraph 1.6.18**, the receptor (global climate) is considered to be of **high** sensitivity, as it is highly vulnerable, of low recoverability and high value.

Magnitude of Impact

1.13.2 Through the decommissioning process it is anticipated that the existing baseline environment, which is not currently believed to be a significant carbon store, would be restored. There would be no additional loss of habitat or land resulting from the decommissioning phase of the Proposed Development. As such, the magnitude of change owing to land use and sea bed change across the whole life of the Proposed Development is considered to be **negligible**.

Significance of the Effect

1.13.3 Overall, the magnitude of the impact is **negligible** and the sensitivity of the receptor is **high**. As detailed within **paragraph 1.6.23**, when identifying the significance of an effect it is important to consider the magnitude of impact in line with national carbon budgets (where possible) and local/national policy towards

GHG reductions. As no significant long term carbon stores are directly affected by the Proposed Development the effect will, therefore, be **negligible**, which is not significant in EIA terms.

The Impact of GHG Emissions Arising From Decommissioning Works (e.g., Plant, Fuel and Vessel Use) and the Recovery (or Disposal) of Materials.

1.13.4 The majority of emissions during this phase relate to the use of plant, as well as vehicle and vessel movements, for Proposed Development decommissioning, disassembly, transportation to a waste site and ultimate disposal and/or recycling of the equipment and other site materials.

1.13.5 It is anticipated that the offshore and onshore cables will be left *in situ* or removed via joint bays. No new excavation is anticipated. The remaining elements will be dismantled and removed for recycling and disposal.

1.13.6 According to Volume 1, Chapter 3: Project Description of the ES, it is likely that this operational lifetime could be extended through refurbishment and the replacement of equipment, rather than decommissioning. However, if the operation of the Proposed Development does not continue beyond 50 years, the proposed converter stations would be decommissioned. As a worst case approach, the assessment has assumed full decommissioning of the Converter Site. The components of the converter stations are considered to be highly recyclable. When disposing of such elements, recycling is the preferred solution. This not only prevents the materials from being sent to landfills, but also reduces the need for the extraction of primary materials. Material which cannot be recycled might be incinerated or used to produce energy from waste. As such, emissions associated with the disposal of materials at the end of their lifetime is considered to be immaterial and may even result in future avoided emissions. This impact is not assessed further.

1.13.7 Carbon emissions associated with use of plant and fuel are expected to have achieved good levels of decarbonisation at the decommissioning phase of the Proposed Development. As such, the below quantified emissions are anticipated to be a worst case estimate.

1.13.8 The estimated GHG emissions arising from the consumption of fuel required to facilitate the decommissioning of the Proposed Development are presented in **Table 1.15**, below. As comprehensive transport movements and plant use are not yet available for the decommissioning phase, movements associated with the construction phase have been applied to provide a conservative estimate of decommissioning activities. However, it would be likely that a reduced volume of vessels would be required for the activities associated with the decommissioning of offshore cables. As such, this is considered a conservative approach for the purpose of the EIA.

1.13.9 Further detailed consideration can be found in Volume 4, Appendix 1.1: Greenhouse Gas Assessment of the ES.

Table 1.15: Estimated decommissioning stage GHG emissions

LCA Stage	Item	Proposed Development Emissions (tCO_2e)
C1-C4	Vessel and traffic movements	128,533
	Total	**128,533**

Sensitivity of the Receptor

1.13.10 In accordance with **paragraph 1.6.18**, the receptor (global climate) is considered to be of **high** sensitivity, as it is highly vulnerable, of low recoverability and high value.

Magnitude of impact

1.13.11 The impact is predicted to be of international spatial extent, short term duration, intermittent and low reversibility. It is predicted that the impact will affect the receptor indirectly. The magnitude is therefore, assessed to be 128,533 tCO_2e.

Significance of the effect

1.13.12 Overall, the magnitude of the impact is assessed to be 128,533 tCO_2e and the sensitivity of the receptor is considered to be **high**. As detailed within **paragraph 1.6.23**, when identifying the significance of an effect it is important to consider the magnitude of impact in line with national carbon budgets (where possible) and local/national policy towards GHG reductions. As the decommissioning phase lies outside of the current carbon budgets this would not be possible at this stage. It is likely that reduced volume of vessels would be required in addition to improvements in lower carbon fuel for the activities associated with the decommissioning of offshore cables. Carbon management during decommissioning would be considered in the development of an offshore decommissioning plan at the appropriate time. The effect will, therefore, be of **minor adverse** effect, which is not significant in EIA terms.

The Impact of Climate Change on the Proposed Development During Decommissioning

1.13.13 The risks identified in Volume 4, Appendix 1.2: Climate Change Risk Assessment of the ES, are summarised in this section in relating to their impact upon the decommissioning of the Proposed Development in accordance with the following assessment criteria (as detailed in **Table 1.8**):

- severity of the impacts;
- probability of the potential impacts; and
- influence factor.

1.13.14 Few risks are associated with the decommissioning of the onshore elements of the Proposed Development and are largely associated with increased temperatures and severity of storm events impacting worker safety during decommissioning activities.

1.13.15 Risks associated with decommissioning of offshore elements of the Proposed Development are largely associated with increased temperatures and wave heights impacting worker safety undertaking decommissioning activities.

1.13.16 When accounting for measures adopted as part of the Proposed Development (embedded mitigation) in determining the significance of each identified risk, the CCRA concluded that the effect of climate change on the decommissioning of the Proposed Development is **negligible** with no risk score exceeding 4.

1.14 Net Whole Life GHG Emissions and Context

1.14.1 As set out in **paragraph 1.6.26**, consideration of the Proposed Development's whole life impact is an important consideration when assessing the Proposed Development's impacts and subsequent effects on climate change. As such, the consideration of the Proposed Development's net emissions in the context of existing and emerging policy commitments and UK Carbon budgets is important.

1.14.2 The lifetime GHG emissions arising from the consumption of materials and activities required to facilitate the construction, operation and maintenance and decommissioning of the Proposed Development are presented in **Table 1.16** below.

Table 1.16: Net Whole Life GHG Emissions

LCA Stage	Item
A1-A5	510,737*
B1-B5	45,935
C1-C4	128,533
Total	**685,204**

*Construction stage emissions include the estimated emissions associated with construction of the Proposed Development (508,548 tCO_2e) and the potential loss of emissions savings due to the removal of solar panels (2,188 tCO_2e).

1.14.3 The Proposed Development's net emissions performance can be considered with the following context:

- it contributes to carbon budget expenditure at a local and national level; and
- it is in keeping with local and UK energy and climate policy.

1.14.4 The Proposed Development's net emissions accounting for both construction and operation and maintenance phases up to the end of the Sixth Carbon Budget are detailed in **Table 1.17** below.

Table 1.17: GHG Impacts in the context of the UK's Carbon Budgets

LCA Stage	2028-2032	2033-2037	Total
UK Carbon Budget (tCO_2e)	1,725,000,000	965,000,000	2,690,000,000
Proposed Development GHG Impacts (tCO_2e)	515,907.45	8,297.32	524,204.77
Percentage contribution toward UK carbon budget (%)	0.03%	0.0009%	0.0194%

1.14.5 When considering the above magnitude of emissions across the whole life time of the Proposed Development and the **high** sensitivity of the climate as a receptor,

the Proposed Development would have a **moderate adverse** net effect which would be significant in EIA terms.

1.14.6 As set out in Volume 1, Chapter 4: Need and Alternatives of the ES, the Proposed Development would connect the Moroccan generation assets to the national grid, contributing to:

- delivering much needed investment and securing construction and operations jobs in the UK;
- securing our energy supply; and
- the UK's response to the climate change crisis.

1.14.7 Therefore, delivery of the Proposed Development is in line with the NPS EN-1 principle of supporting new renewable and low carbon energy developments, including their associated infrastructure (i.e., electricity transmission infrastructure such as onshore converter stations, cabling etc), in order to contribute to reductions in GHG emissions. By facilitating the expansion of renewable energy supply, the Proposed Development would assist the UK Government target of achieving a fully decarbonised power system by 2035 and aim to become net zero by 2050. This is fully explored within **section 1.15**, in considering the cumulative effects of the Proposed Development with the Moroccan generation assets and associated infrastructure (the Project outside of the UK EEZ).

Future Monitoring

1.14.8 No monitoring to test the predictions made within the impact assessment is considered necessary. Construction phase emissions shall be monitored through the Onshore Construction Environmental Management Plan(s) (On-CEMP) including site deliveries, energy consumption and waste. Operational emissions shall be monitored through regular site inspections and monitoring of generation capacity contributions to the grid. Decommissioning phase emissions shall be monitored through the Offshore Decommissioning Plan(s) and Onshore Decommissioning Plan(s), including energy consumption and waste.

1.14.9 Throughout the construction, operation and maintenance, and decommissioning phases, where opportunities to reduce emissions are viable these will be explored.

1.15 Assessment of Cumulative Effects

Introduction

1.15.1 The cumulative effects assessment (CEA) takes into account the impact associated with the Proposed Development together with the Alverdiscott Substation Connection Development, as well as the Moroccan generation assets and associated infrastructure, which forms the Project outside of the UK EEZ.

1.15.2 As detailed within **paragraph 1.4.4**, no other projects have been considered within the climate change CEA as all developments that emit, avoid or sequester GHGs have the potential to impact the atmospheric mass of GHGs as a receptor, and so may have a cumulative impact on climate change and upon the development. Consequently, cumulative effects due to other specific local development projects are not considered individually but are taken into account when considering the impact of the Proposed Development by defining the

atmospheric mass of GHGs as a high sensitivity receptor in accordance with IEMA GHG Guidance (IEMA, 2022).

Scope of Cumulative Effects Assessment

1.15.3 The cumulative effects presented and assessed in this section have been based on the Project Design Envelope set out in Volume 1, Chapter 3: Project Description of the ES as well as the information available on other projects and plans. The maximum design scenario as described for the Proposed Development (see **Table 1.12**) has been assessed cumulatively with the following other projects/plans:

1.15.4 The CEA has considered the Proposed Development, alongside the wider Project (outside the UK EEZ) and the NGET substation (Alverdiscott Substation Connection Development) to be developed at the existing Alverdiscott Substation Site. The assessed design of substation has been based upon a combination of reasonable worst case parameters, as detailed within Volume 1, Chapter 3: Project Description of the ES. The development area for the NGET substation would comprise up to 3.8 ha of land. Within that area it is assumed that the substation itself will occupy a footprint of approximately 2.8 ha, with a maximum height of 15 m, excluding connecting tower structures. If further information is available for the proposal before the Proposed Development receives development consent, the Applicant will review the information and provide any update needed to the CEA.

Cumulative Effects Assessment

Introduction

1.15.5 A description of the significance of cumulative effects upon climate change receptors arising from each identified impact is given below.

1.15.6 Further detailed consideration can be found in Volume 4, Appendix 1.1: Greenhouse Gas Assessment of the ES.

Alverdiscott Substation Connection Development

1.15.7 The potential impact of the Alverdiscott Substation Connection Development has followed the methodology highlighted in **paragraphs 1.11.18** and **1.11.19**. The intensity for the manufacturing GWP of 2,190 $kgCO_2e$ per MW (ABB, 2003) was scaled by the output of the Project, totalling approximately 3,600 MW, to give an estimated embodied carbon value of 7,884 tCO_2e. The anticipated maximum floorspace of the substation (28,000 m^2) was scaled by the carbon intensity of 545 $kgCO_2e/m^2$ (RICS, 2012), resulting in estimated embodied carbon emissions of 15,260 tCO_2e for the Alverdiscott Substation Connection Development building.

1.15.8 To summarise, the estimated GHG emissions associated with the Alverdiscott Substation Connection Development would be 31,028 tCO_2e.

1.15.9 However, the Proposed Development forms one element of the wider Project, which includes solar and wind electricity generation, together with battery storage (Moroccan generation assets). The Proposed Development enables the renewable energy generated by the Project to be transmitted to the national grid,

contributing to national electricity decarbonisation. As such, the cumulative effects of the Moroccan generation assets with the Proposed Development on the global atmospheric mass of CO_2e have been assessed.

The Project – Outside of the UK Exclusive Economic Zone

1.15.10 The Project is in line with the NPS EN-1's principle of supporting new renewable and low carbon energy developments and their infrastructure in order to contribute to reductions in GHG emissions.

1.15.11 The generation of such renewable energy from onshore wind and solar is supported by national energy and climate change policy (including the National Infrastructure Strategy, Sixth Carbon Budget and Net Zero Strategy) which highlight the need for an end to the use of unabated fossil fuel generation, whilst also significantly ramping up electricity generation capacity in order to meet the demands of increased electrification of transport, heat and industry. As such, government policy dictates that large-scale deployment of renewable energy generators are necessary in order to meet GHG reduction targets.

1.15.12 The Proposed Development will enable the connection to the national grid of a total output of 3.6 GW from the Moroccan generation assets, as detailed within Volume 1, Chapter 1: Introduction of the ES, which will help contribute to the achievement of regional and national carbon reduction targets.

1.15.13 By facilitating the expansion of renewable energy supply, the Proposed Development would assist the UK Government target of achieving a fully decarbonised power system by 2030 and aim to become net zero by 2050.

Net whole life GHG emissions

Sensitivity of the Receptor

1.15.14 In accordance with **paragraph 1.6.18**, the receptor (global climate) is considered to be of **high** sensitivity, as it is highly vulnerable, of low recoverability and high value.

Magnitude of Impact

1.15.15 The Proposed Development will enable the abatement of fossil fuel generation within the national grid, through the transmission of renewable energy generated by the Project, specifically the Moroccan generation assets.

1.15.16 Embodied carbon calculations for the construction, operation and decommissioning phases of the Project have been carried out, following the methodologies detailed within **paragraphs 1.11.16** to **1.11.24**.

1.15.17 Furthermore, the primary purpose of the operational stage of a wind and solar farm is to generate electricity which avoids the need for fossil fuel generated electricity and reduces the national grid carbon intensity, once exported to the national grid. Therefore, the avoided emissions associated with the displacement of projected marginal generation of the national grid has been considered in combination with impact of GHG emissions arising from the construction, operation and decommissioning of the Project.

1.15.18 It should be noted that as the UK moves towards the 2050 net zero carbon target, the marginal source of electricity generation will likely become a combination of renewables (predominately solar and wind) and energy storage. By the time the Project is anticipated to be fully operational, the UK is expected to have made significant progress towards a low-carbon electricity grid, with the current UK Government policy target year of 2035 (BEIS, 2021). It is important to note therefore that from circa 2035 onwards, long-run marginal projections assume that there is no unabated fossil fuel generation, in line with UK Government policy.

1.15.19 However, the UK Government has highlighted that some 'transition' fossil fuels will continue to play a part in the UK's energy supply (DESNZ, 2023c). Further, the use of the long-run marginal projections may not present a true 'without development' future baseline and does not account for uncertainty in the national grid carbon intensity as a result of annual fluctuation due to changes in the energy market. Therefore, it is likely that the true value of the avoided emissions displaced as a result of the Project's contribution to the national grid would be dependent upon various market factors.

1.15.20 This has been summarised within **Table 1.18**. Further details are provided within Volume 4, Appendix 1.1: Greenhouse Gas Assessment Technical Report, of the ES. The range of avoided emissions accounts for a sensitivity analysis. Avoided emissions for the Moroccan generation assets have been calculated using the DESNZ long-run marginal carbon, current national grid average, and 'non-renewable fuels' carbon intensities.

Table 1.18: Cumulative net emissions from the Project outside of the UK EEZ

Project	Total Embodied Carbon (tCO_2e)	Avoided Emissions Scenario	Avoided Emissions (tCO_2e)	Net Emissions (tCO_2e)
The Morocco-UK Power Project (outside of the UK EEZ)	10,033,617	DESNZ Long-run marginal avoided emissions	7,218,481	2,815,136
		Current national grid average avoided emissions	316,259,212	-306,225,595
		DESNZ 'non-renewable fuels' avoided emissions	530,120,206	-520,086,588

1.15.21 As detailed in **Table 1.18**, the cumulative Project i.e. the renewable energy generation in Morocco represents a significant benefit to carbon emissions (savings) ranging from c. 7.2 million tCO_2e to 530 million tCO_2e depending on which grid intensity scenario is used. The lowest figure is considered to be a conservative assessment of the benefits that will accrue from renewable energy generated in Morocco. Further context is provided in **paragraphs 1.15.22** to **1.15.24** below. The true avoided emissions value for the Project is likely to lie between the upper and lower limits shown in **Table 1.18** (between 7.2 million tCO_2e and 530 million tCO_2e).

1.15.22 Making a comparison against the 'DESNZ long run marginal' carbon intensity figures provides the most conservative estimate of carbon savings because the metric is dynamic. It assumes year-on-year decarbonisation of national grid towards the UK's committed net zero 2050 pledge, i.e. it assumes that deployment of renewable energy generation is linear and in line with current UK policy. The 'long run marginal' carbon intensity figures account for variations over time for both generation and consumption reflecting the different types of power plants generating electricity across the day and over time, each with different

emissions factors. However, the 'long run marginal' figures are projections, and cannot be taken with absolute certainty. Furthermore, the 'long run marginal' metric includes assumed abatement of fossil fuel generation sources within the national grid. As such, it is likely that the true value of the avoided emissions displaced as a result of the Moroccan generation assets' contribution to the national grid would be higher than the avoided emissions as calculated using the DESNZ 'long run marginal' carbon intensities scenario. Therefore, it is likely that the avoided emissions (benefits) will be greater than the conservative estimate of 7.2 million tCO_2e.

1.15.23 The current grid intensity scenario called 'national grid average' and the DESNZ 'non-renewable fuels' scenario both conclude a greater level of avoided emissions (benefits) ranging from 316 million tCO_2e to 530 million tCO_2e. Whilst these are static baselines and do not account for future national grid decarbonisation, they nevertheless give an indication of the scale of potential benefits offered by renewable energy developments such as this Project. This is because the 'non-renewable fuels' grid intensity metric represents precisely those fuels which renewable energy developments such as this Project will displace from the national grid.

1.15.24 The magnitude of calculated avoided emissions over the lifetime of the Moroccan generation assets, as reported within each climate change assessment, results in significant avoided emissions. Such avoided emissions over the lifetimes are likely to far exceed the net lifetime emissions associated with the Proposed Development when comparing to the 'non-renewable fuel' scenario, as set out within **Table 1.19**. Furthermore, it should be noted that the 'long run marginal' grid intensity scenario underestimates the avoided emissions from the Moroccan generation assets because it accounts for projected future increases in renewable generation in the national grid without considering construction embodied carbon emissions in the development of such projects.

Table 1.19: Cumulative net effects

Project	DESNZ long-run marginal	Current national grid average	DESNZ 'non-renewable fuels'
Proposed Development (tCO_2e)	685,204		
Alverdiscott Substation Connection Development (tCO_2e)	31,028		
Xlinks' Morocco-UK Power Project (tCO_2e)	2,815,136	-306,225,595	-520,086,588
Total (tCO_2e)	3,531,368	-305,509,363	-519,370,356
Payback Period (from 2031, operation of Bipole 1)	No Payback	3 years	2 years

1.15.25 As such, it can be seen that the emissions associated with the construction, operation and maintenance, and decommissioning of the Proposed Development are far exceeded by the avoided emissions from the Moroccan generation assets they enable when considering the displacement of current and future fossil fuel contributions to the national grid. The range of net whole life emissions are presented in **Graph 1.1**, which shows the overall emissions (taking into account cumulative effects) resulting from the different grid intensity scenarios.

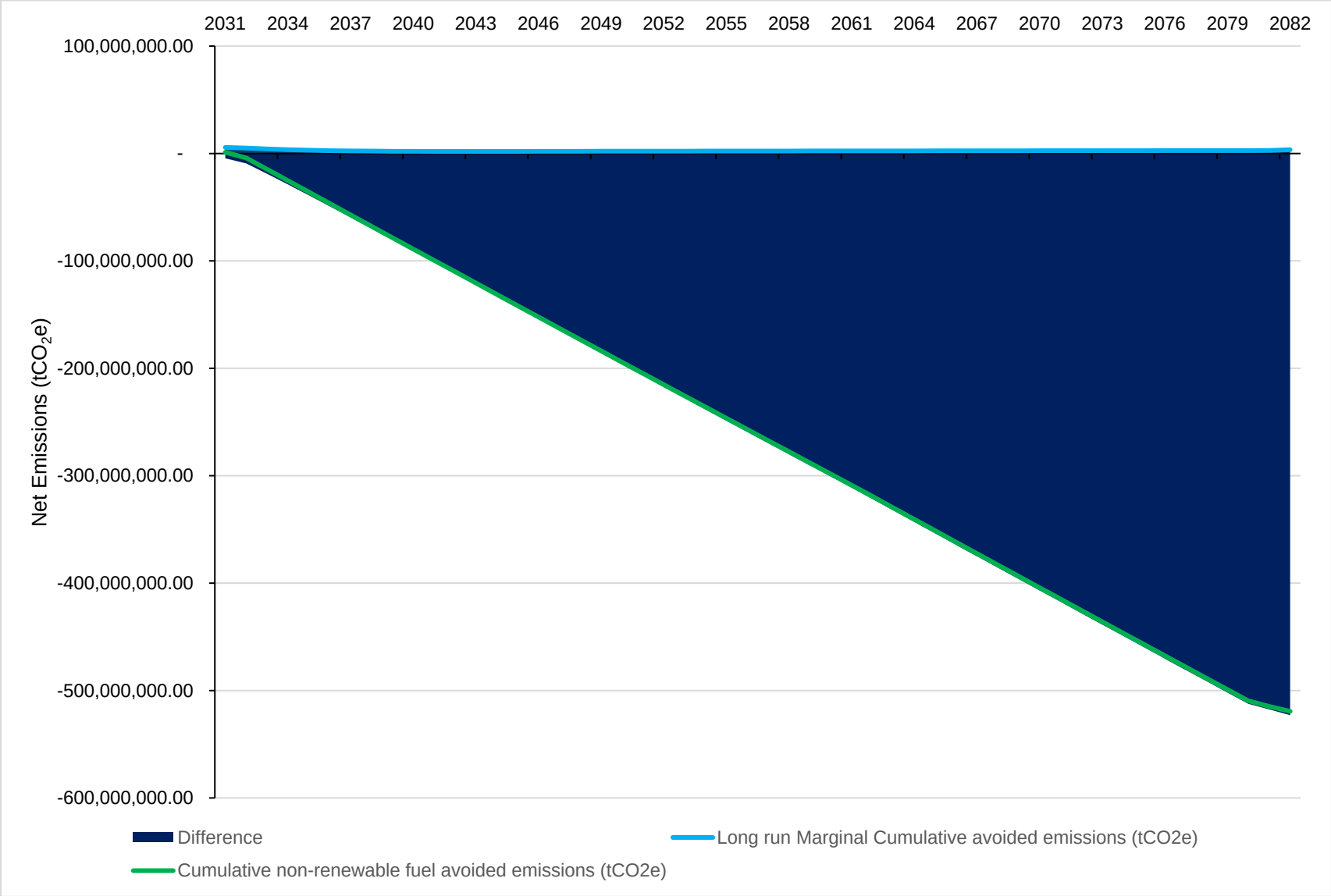
1.15.26 The Project would have a carbon payback period of 2 years (at the earliest) when accounting for construction, operation and maintenance and decommissioning phase emissions (see **Table 1.19**). As discussed in paragraph **1.15.21**, the true

avoided emissions value is likely to lie between these upper and lower values as detailed in **Graph 1.1**. Given the operation of the Project would avoid the need for fossil fuel generators through the provision of renewable electricity, the associated avoided emissions would likely be greater than those presented in the conservative case (i.e. when using the long-run marginal projections) resulting in a reduction to the conservative net effect scenario presented above.

1.15.27 The range in net GHG emissions arises from the calculation of operational avoided emissions using both the 'long run marginal', and 'non-renewable fuels' carbon intensities. Given the nature of the 'long run marginal' carbon intensities (i.e. comparing alike scenarios where renewable generation sources become business as usual, and which may not present a true 'without development' future baseline), calculated avoided emissions are naturally lower and do not exceed emissions arising from construction, operation and maintenance, and decommissioning. Furthermore, given that the 'long run marginal' carbon intensities do not account for emissions arising from the construction, and decommissioning of generation assets, the comparison of whole life GHG emissions arising from a renewable generation project with the long run marginal intensities is unlikely to present avoided emissions or a carbon payback.

1.15.28 To provide further context, the following electricity generation carbon intensity has been calculated by the relevant operation and maintenance stage emissions and energy generated over the respective whole project's lifetime. The calculated intensity for the whole project is 2.94 gCO_2e/kWh.

1.15.29 This intensity is lower than the current grid average (207 gCO_2e/kWh), fossil fuel generation (437 gCO_2e/kWh) and the Climate Change Committee's electricity emissions intensity targets for 2030 (50 gCO_2e/kWh) and 2035. As such, it can be concluded that the Project will contribute to future decarbonisation of the national grid in line with UK policy commitments (i.e. net zero).



Graph 1.1: Net whole life emissions - based upon the range of grid intensity scenarios

Significance of Effect

1.15.30 As detailed within **paragraph 1.6.23**, when identifying the significance of an effect it is important to consider the magnitude of impact in line with national carbon budgets (where possible) and local/national policy towards GHG reductions. The Proposed Development will enable the abatement of fossil fuel generation within the national grid, through the transmission of renewable energy generated by the Moroccan generation assets.

1.15.31 Overall, the combined magnitude of impact has been assessed quantitatively, accounting for the net emissions associated with the Proposed Development, in addition to the avoided emissions resulting from the Moroccan generation assets.

1.15.32 It should be noted that the majority of the CEA emissions are associated with international emissions boundaries and not constrained to national policy considerations such as the UK Carbon Budgets. Within the context of national policy, the purpose of the Project is to provide a source of renewable energy that is connected to the national grid, thereby contributing to the UK climate change policy goals and associated renewable energy targets. In addition, National Grid modelling anticipates an increase in annual electricity demand across the UK to between 570 TWh and 726 TWh per year by 2050, compared to 286 TWh per year in 2022 (National Grid ESO, 2023). By facilitating the expansion of renewable energy supply, the Project would assist the UK Government target of achieving a fully decarbonised power system from 2030, and the UK Government's aim to become net zero by 2050.

1.15.33 The total effect will, therefore, be a **beneficial** effect, which is significant in EIA terms.

Further Mitigation and Residual Effect

1.15.34 No further mitigation is required.

Future Monitoring

1.15.35 No monitoring to test the predictions made within the impact assessment is considered necessary.

1.16 Transboundary Effects

1.16.1 A screening of transboundary impacts has been carried out and any potential for significant transboundary effects with regard to climate change from the Proposed Development upon the interests of other states has been assessed as part of the ES. The potential transboundary impacts are assessed within Volume 1, Appendix 5.2: Transboundary Screening of the ES.

1.16.2 All developments which emit GHGs have the potential to impact the atmospheric mass of GHGs as a receptor, and so may have a transboundary impact on climate change. Consequently, transboundary effects due to other specific international development projects are not individually identified but would be taken into account when considering the impact of the Proposed Development by defining the atmospheric mass of GHGs as a high sensitivity receptor. Each country has its own policy and targets concerning carbon and climate change

which are intended to limit GHG emissions to acceptable levels within that county's defined budget and international commitments.

1.16.3 It is noted that over the lifetime of the Proposed Development, when considered cumulatively with the Moroccan generation assets and cable infrastructure as part of the rest of the Project outside of the UK EEZ, potential transboundary impacts and resulting effects will be beneficial.

1.17 Inter-Related Effects (In-Combination Climate Impacts)

1.17.1 Inter-relationships are the impacts and associated effects of different aspects of the Proposed Development on the same receptor. These are as follows.

- Project lifetime effects: Assessment of the scope for effects that occur throughout more than one phase of the Proposed Development (construction, operation and maintenance), to interact to potentially create a more significant effect on a receptor than if just assessed in isolation in these three phases (e.g., construction noise effects from piling and operational substation noise).
- Receptor led effects: Assessment of the scope for all effects (including inter-relationships between environmental topics) to interact, spatially and temporally, to create inter-related effects on a receptor. As an example, all effects on climate change, such as direct habitat loss or disturbance, may interact to produce a different, or greater effect on this receptor than when the effects are considered in isolation. Receptor-led effects may be short term, temporary or transient effects, or incorporate longer term effects.

1.17.2 The assessment of inter-related effects with climate change – in-combination climate impacts – is detailed below. The main areas where there is potential for inter-related effects, subject to assessment, are considered to be:

- Volume 2, Chapter 1: Onshore Ecology and Nature Conservation of the ES;
- Volume 2, Chapter 3: Hydrology and Flood Risk of the ES;
- Volume 2, Chapter 4: Geology, Hydrogeology and Ground Conditions of the ES;
- Volume 4, Chapter 2: Landscape, Seascape and Visual Resources of the ES; and
- Volume 3, Chapter 7: Marine Archaeology and Cultural Heritage of the ES.

1.17.3 During the initial screening exercise a number of environmental topics were identified for further assessment as effects identified within relevant chapters may be altered when also considering the impact of future climate change. Relevant topics and impacts are detailed within **Table 1.20**, alongside the likely interaction with climate change.

Table 1.20: In-combination climate impacts

Topic	Impact	Justification	Effect
Hydrology and flood risk (Volume 2, Chapter 3 of the ES)	The impact of increased flood risk arising from additional surface water runoff as a result of operation of the Converter Site.	The increased frequency and intensity of rainfall events may result in increased flood risk.	Not significant.
	The impact of increased flood risk arising from additional surface water runoff from the onshore HVDC Cable Corridor.	The increased frequency and intensity of rainfall events may result in increased flood risk.	Not significant.
Geology, Hydrogeology and Ground Conditions (Volume 2, Chapter 4 of the ES)	Impact of Accidental Release or Spillage of Contaminants during Construction.	Increase in surface water run-off mobilising contaminants during construction due to increased intensity of extreme precipitation events/ increase in wettest months rainfall. Environmental measures are in place during construction to ensure appropriate storage and handling of materials and products. A spillage control procedure would be implemented to ensure that any spillages are contained and removed.	Not significant.
	Impact of Existing Areas of Contamination to End and Adjacent Site Users during Operation.	Potential for increased volatilisation of volatile organic compound (VOC) contamination under warmer temperatures. No significant sources of VOC contamination have been identified through desk top study.	Not significant.
Onshore ecology and nature conservation (Volume 2, Chapter 1 of the ES)	Impact of temporary and permanent habitat loss and disturbance during construction and operation and maintenance of the Proposed Development.	Projected future climate change may exacerbate habitat loss. Future climate change may also impact the success of the planting mitigation at the Converter Site as selected species may not be suitable for future climate conditions.	Not significant.
Landscape, seascape and visual resources (Volume 4, Chapter 2 of the ES)	The impact of the Proposed Development on landscape character.	Projected future climate change may impact the success of the Landscape and Ecological Management Plan to be developed primarily in relation to the landscape proposals at the Converter Site, but also to reinstate hedgerows through which the onshore HVDC Cable Corridor passes.	Not significant.
Marine Archaeology and Cultural Heritage (Volume 3, Chapter 7 of the ES)	Permanent degradation or loss of Underwater Cultural Heritage (UCH) receptors.	Increased frequency and severity of storm events may uncover UCH that was previously stabilised within protective, fine-grained sediments.	Not significant.
		Increasing ocean acidification of seawater will destabilise wreck fabrics, including iron, and other archaeological materials.	
		Increasing distribution and impact of invasive species, particularly marine borers that degrade organic material, as waters warm.	

1.17.4 The environmental topics and relevant impacts identified above have been assessed as follows with regard to in-combination climate impact effects. There is no change in the significance of effects reported in each topic chapter of the ES and as such no further mitigation is required:

- The assessment of flood risk, including increases in rainfall rates due to climate change, has been addressed in Volume 2, Chapter 3: Hydrology and Flood Risk of the ES, ensuring the drainage design is able to accommodate increasing volumes of surface water runoff associated with the effects of climate change. As such, there will be no change in the reported significance of effect when assessed in-combination with climate impacts.
- The assessment of Volume 2, Chapter 4: Geology, Hydrogeology and Ground Conditions of the ES considers the potential impact of climate change on the mobilisation of contaminants due to increased intensity of extreme precipitation events and increased rainfall during the wettest months. However, best practice measures will be detailed within an On-CEMP to manage any environmental risks during construction (e.g. appropriate handling and storage of materials). As such, there will be no change in the reported significance of effect when assessed in-combination with climate impacts.
- The assessments of Volume 2, Chapter 1: Onshore Ecology and Nature Conservation of the ES and Volume 4, Chapter 2: Landscape, Seascape and Visual Resources of the ES consider future climate projections when determining appropriate mitigation measures to be implemented to manage the visual and ecological effects of the Proposed Development. When developing detailed mitigation, climate resilient plant species will be specified in order to ensure the success of the planned mitigation over the Proposed Development's lifetime. Such species will be detailed within the Landscape and Ecology Management Plan (LEMP), which will be developed in accordance with the Outline LEMP (document reference 7.10). As such, there will be no change in the reported significance of effect when assessed in-combination with climate impacts.
- The assessment of Volume 3, Chapter 7: Marine Archaeology and Cultural Heritage of the ES considers the potential impact of climate change on the indirect disturbance of archaeological assets from scour due to more intense physical and chemical processes. The predicted scale of potential scour associated with Operational Phase structures (Volume 3, Chapter 8: Physical Processes of the ES) is very small. There are no other anticipated Operational phase pathways for potential impact on UCH receptors that might have an inter-related effect with climate change impacts. The Proposed Development includes mitigation measures to minimise potential direct and indirect disturbance including micro-routing measures to avoid known sites of archaeological significance and preservation by recording remains prior to, during, or after impact. Detailed archaeological review of geophysical survey data and borehole cores has informed the ES assessment and the Outline Offshore Archaeological Written Scheme of Investigation (which is presented as Volume 3, Appendix 7.5 of the ES) sets out the framework for appropriate and considerate offshore working with respect to marine archaeology. Therefore, there will be no change in the reported significance of effect when assessed in-combination with climate impacts.

1.18 Summary of Impacts, Mitigation Measures and Monitoring

1.18.1 Information on climate change within the study area was collected through desktop review.

1.18.2 The potential impact of GHG emissions due to the Proposed Development, resulting in an effect on the global atmospheric GHG concentration that contributes to climate change, has been assessed and reported in this chapter. The impacts of climate change on the Proposed Development have also been assessed and reported.

1.18.3 **Table 1.21** presents a summary of the potential impacts and residual effects in respect to climate change. The impacts assessed include the following.

- The impact of GHG emissions arising from the manufacturing and installation of the Proposed Development.
- The impact of GHG emissions arising from the consumption of materials and activities required to facilitate the operations and maintenance of the Proposed Development.
- The impact of GHG emissions from decommissioning works (plant, fuel and vessel use) and recovery or disposal of materials.
- The impact of GHG emissions arising from land use and sea bed change.
- The impact of the effects of climate change on the Proposed Development's onshore and offshore infrastructure over the operation and decommissioning phases.

1.18.4 Overall, it is concluded that there will be the following significant effects arising from the Proposed Development during the construction, operation and maintenance or decommissioning phases.

- Construction phase: emissions from the manufacturing of the Proposed Development would result in emissions of up to 508,548 tCO_2e. This would be a significant **moderate adverse** effect (in EIA terms).

1.18.5 **Table 1.22** presents a summary of the potential cumulative impacts, mitigation measures and residual effects. The cumulative impacts assessed include the following.

- The impact of avoided GHG emissions on the atmospheric concentration of GHGs from the operation and maintenance phase of the Moroccan generation assets, enabled by the Proposed Development.

1.18.6 Overall, it is concluded that there will be the following significant cumulative effects from the Proposed Development alongside other projects/plans.

- Operation and maintenance phase: the avoided emissions resulting from the displacement of higher emitting electricity generation sources, are enabled by the Proposed Development. This would result in a significant beneficial effect in EIA terms.

1.18.7 It is noted that over the lifetime of the Proposed Development, when considered cumulatively with the Moroccan generation assets, potential transboundary impacts and resulting effects will be beneficial.

Table 1.21: Summary of environmental effects

Description of Impact	Phase[a]			Embedded Mitigation	Sensitivity of receptor	Magnitude of impact	Significance of Effect	Further Mitigation	Residual Effect	Proposed Monitoring
	C	O	D							
The impact of GHG emissions arising from land use change during the construction, operation and maintenance and decommissioning phase.	✓	✓	✓	ONS36 (see **Table 1.11**).	C: High O: High D: High	C: Negligible O: Negligible D: Negligible	C: Negligible O: Negligible D: Negligible (not significant)	None proposed beyond existing commitments.	C: Negligible O: Negligible D: Negligible (not significant)	N/A
The impact of GHG emissions arising from the manufacturing and installation of the Proposed Development.	✓	×	×	ONS21, OFF05, ONS10, and ONS05 (see **Table 1.11**).	C: High	C: 508,548 tCO_2e.	C: Moderate Adverse (significant)	ONS26.	C: Moderate Adverse (significant)	N/A
The impact of GHG emissions arising from the consumption of materials and activities required to facilitate the operation and maintenance of the Proposed Development.	×	✓	×	None proposed.	O: High	O: 45,935 tCO_2e	O: Minor Adverse (not significant)	None proposed beyond existing commitments.	O: Minor Adverse (not significant	N/A
The impact of GHG emissions arising from decommissioning works (e.g., plant, fuel and vessel use) and the recovery (or disposal) of materials.	×	×	✓	ONS04 (see **Table 1.11**).	D: High	D: 128,533 tCO_2e	D: Minor Adverse (not significant)	None proposed beyond existing commitments.	O: Minor Adverse (not significant	N/A

Table 1.22: Summary of cumulative environmental effects

Description of Impact	Phase[a]			Embedded Mitigation	Sensitivity of receptor	Magnitude of impact	Significance of Effect	Further Mitigation	Residual Effect	Proposed Monitoring
	C	O	D							
Net Whole Life GHG Emissions – (including Proposed Development, cumulative Project and Alverdiscott Substation Connection Development).	✓	✓	✓	N/A	High	3,531,368 tCO_2e (long run marginal) to -519,370,356 tCO_2e (non-renewable fuels)	Beneficial (significant)	None proposed beyond existing commitments.	Beneficial (significant)	N/A

1.19 References

ABB (2003) Environmental Product Declaration: Power transformer TrafoStar 500 MVA. [Online] https://library.e.abb.com/public/566748ad75116903c1256d630042f1af/ProductdeclarationStarTrafo500.pdf. Accessed: July 2024

DESNZ (2024) UK Government GHG Conversion Factors for Company Reporting. Available at: https://www.gov.uk/government/collections/government-conversion-factors-for-company-reporting Accessed: July 2024.

Committee on Climate Change (2020) The Sixth Carbon Budget: The UK's path to Net Zero. Available: https://www.theccc.org.uk/wp-content/uploads/2020/12/The-Sixth-Carbon-Budget-The-UKs-path-to-Net-Zero.pdf. Accessed: July 2024.

Department for Business, Energy and Industrial Strategy (BEIS) (2022a). UK Offshore Energy Strategic Environmental Assessment: Appendix 1F: Climate & Meteorology. Available: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/504559/OESEA3_A1f_Climate___Meteorology.pdf Accessed July 2024

Department for Business, Energy and Industrial Strategy (BEIS) (2022b) United Kingdom of Great Britain and Northern Ireland's Nationally Determined Contribution. Available: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1109429/uk-nationally-determined-contribution.pdf Accessed July 2024.

Department for Communities and Local Government (2014). National Planning Policy Guidance [Online]. Available at: https://www.gov.uk/guidance/national-planning-policy-framework Accessed: July 2024.

Department for Energy Security and Net Zero (DESNZ) (2023a) Overarching National Policy Statement for Energy (EN-1). Available at: https://assets.publishing.service.gov.uk/media/655dc190d03a8d001207fe33/overarching-nps-for-energy-en1.pdf Accessed: July 2024.

Department for Energy Security and Net Zero (DESNZ) (2023b) National Policy Statement for Renewable Energy Infrastructure (EN-3). Available at: https://assets.publishing.service.gov.uk/media/655dc352d03a8d001207fe37/nps-renewable-energy-infrastructure-en3.pdf Accessed: July 2024.

Department for Energy Security and Net Zero (DESNZ) (2023c) National Policy Statement for Electricity Networks Infrastructure (EN5). Available at: https://assets.publishing.service.gov.uk/media/655dc25e046ed400148b9dca/nps-electricity-networks-infrastructure-en5.pdf Accessed: July 2024.

DESNZ (2024) Great British Energy Founding Statement. Available at: https://www.gov.uk/government/publications/introducing-great-british-energy (Accessed September 2024).

Department for Levelling Up, Housing and Communities (2023) National Planning Policy Framework. Available at: https://www.gov.uk/guidance/national-planning-policy-framework Accessed: July 2023.

Department for Levelling Up, Housing and Communities and Ministry of Housing, Communities and Local Government (2023) Planning Practice Guidance. https://www.gov.uk/government/collections/planning-practice-guidance Accessed: July 2024

Emtelle (2020) Emtelle DI Traditional Cable. Available at: https://www.emtelle.com/solutions-library/di-traditional-cable/ (Accessed: July 2024).

Environment Agency. (2022). The South West River Basin District Flood Risk Management Plan 2021 to 2027. Available: https://assets.publishing.service.gov.uk/media/6391da57e90e07662c378585/South-West-FRMP-2021-2027.pdf (Accessed: July 2024).

Highways England, Transport Scotland, Welsh Government, Department for Infrastructure (2020) Design Manual for Roads and Bridges (DMRB) LA 104, Environmental assessment and monitoring, Revision 1. Available: https://www.standardsforhighways.co.uk/dmrb/search/0f6e0b6a-d08e-4673-8691-cab564d4a60a. Accessed: July 2024.

HM Treasury (2020) National Infrastructure Strategy 2020 Available: https://www.gov.uk/government/publications/national-infrastructure-strategy Accessed: July 2024.

IEMA (2016) Environmental Impact Assessment. Guide to Delivering Quality Development. Available: https://www.iema.net/download-document/7014. Accessed: July 2024.

IEMA (2020) Guidance on climate change adaptation and resilience. Available: https://www.iema.net/articles/guidance-on-climate-change-adaptation-and-resilience. Accessed: July 2024.

IEMA (2022) Environmental Impact Assessment Guide to: Assessing Greenhouse Gas Emissions and Evaluating their Significance. 2nd Edition. [Online] Available: https://www.iema.net/resources/blog/2022/02/28/launch-of-the-updated-eia-guidance-on-assessing-ghg-emissions Accessed: July 2024.

IPCC (2013) Climate Change 2013: The Physical Science Basis. Available: https://www.ipcc.ch/report/ar5/wg1/ Accessed: July 2024

IPCC. (2021). Climate Change 2021: The Physical Science Basis. Available: https://www.ipcc.ch/report/ar6/wg1/downloads/report/IPCC_AR6_WGI_FullReport.pdf accessed: July 2024

Jaroszweski, D., Wood, R., and Chapman, L. (2021) Infrastructure. In: The Third UK Climate Change Risk Assessment Technical Report. [Betts, R.A., Haward, A.B., Pearson, K.V. (eds)] Prepared for the Climate Change Committee, London

Jones, C. and Hammond, G. (2019) ICE (Inventory of Carbon and Energy). Available: https://circularecology.com/embodied-carbon-footprint-database.html. Accessed July 2024.

Met Office Hadley Centre (2018a). UKCP18 Science Overview Report. Available: https://www.metoffice.gov.uk/pub/data/weather/uk/ukcp18/science-reports/UKCP18-Overview-report.pdf. Accessed: July 2024.

Met Office Hadley Centre (2018b). UKCP18 Factsheets. Available: https://www.metoffice.gov.uk/research/collaboration/ukcp/factsheets. Accessed: July 2024.

Met Office Hadley Centre (2024). UK Climate Projections User Interface v2.9.0. Available: https://ukclimateprojections-ui.metoffice.gov.uk/ui/home. Accessed: July 2024.

Met Office. (2020). UK Climate Averages. Available: https://www.metoffice.gov.uk/research/climate/maps-and-data/uk-climate-averages. Accessed: July 2024.

Ministry of Housing, Communities and Local Government (2024) National Planning Policy Framework: Consultation Draft. Available at: Proposed reforms to the National Planning Policy Framework and other changes to the planning system - GOV.UK (www.gov.uk) (Accessed: September 2024).

MMO (2021) South West Inshore and South West Offshore Marine Plan.

National Grid ESO (2023). *Future Energy Scenarios.* Available at: https://www.nationalgrideso.com/future-energy/future-energy-scenarios Accessed on: 03 February 2024.

Natural England (2019) Provisional Agricultural Land Classification (ALC) (England). Available: https://naturalengland-defra.opendata.arcgis.com/datasets/5d2477d8d04b41d4bbc9a8742f858f4d_0/explore?location=53.769762%2C-2.798150%2C11.61. Accessed: July 2024.

North Devon Council and Torridge District Council (2018). The North Devon and Torridge Local Plan 2011-2031 [Online]. Available at: https://www.torridge.gov.uk/localplan

RICS (2012) RICS Professional Information, UK Methodology to calculate embodied carbon of materials https://www.igbc.ie/wp-content/uploads/2015/02/RICS-Methodology_embodied_carbon_materials_final-1st-edition.pdf Accessed: July 2024.

The Planning Inspectorate (2017) Advice Note Ten, Habitat Regulations Assessment relevant to Nationally Significant Infrastructure Projects. Version 8. Available: https://infrastructure.planninginspectorate.gov.uk/legislation-and-advice/advice-notes/advice-note-ten/. Accessed: July 2024.

WRI and WBSCD (2004) A Corporate Accounting and Reporting Standard [online] available at: https://ghgprotocol.org/sites/default/files/standards/ghg-protocol-revised.pdf Accessed: July 2024.