Rampion 2 WIND FARM

Rampion 2 Wind Farm

Category 6: Environmental Statement

Volume 2, Chapter 29: Climate change (clean)

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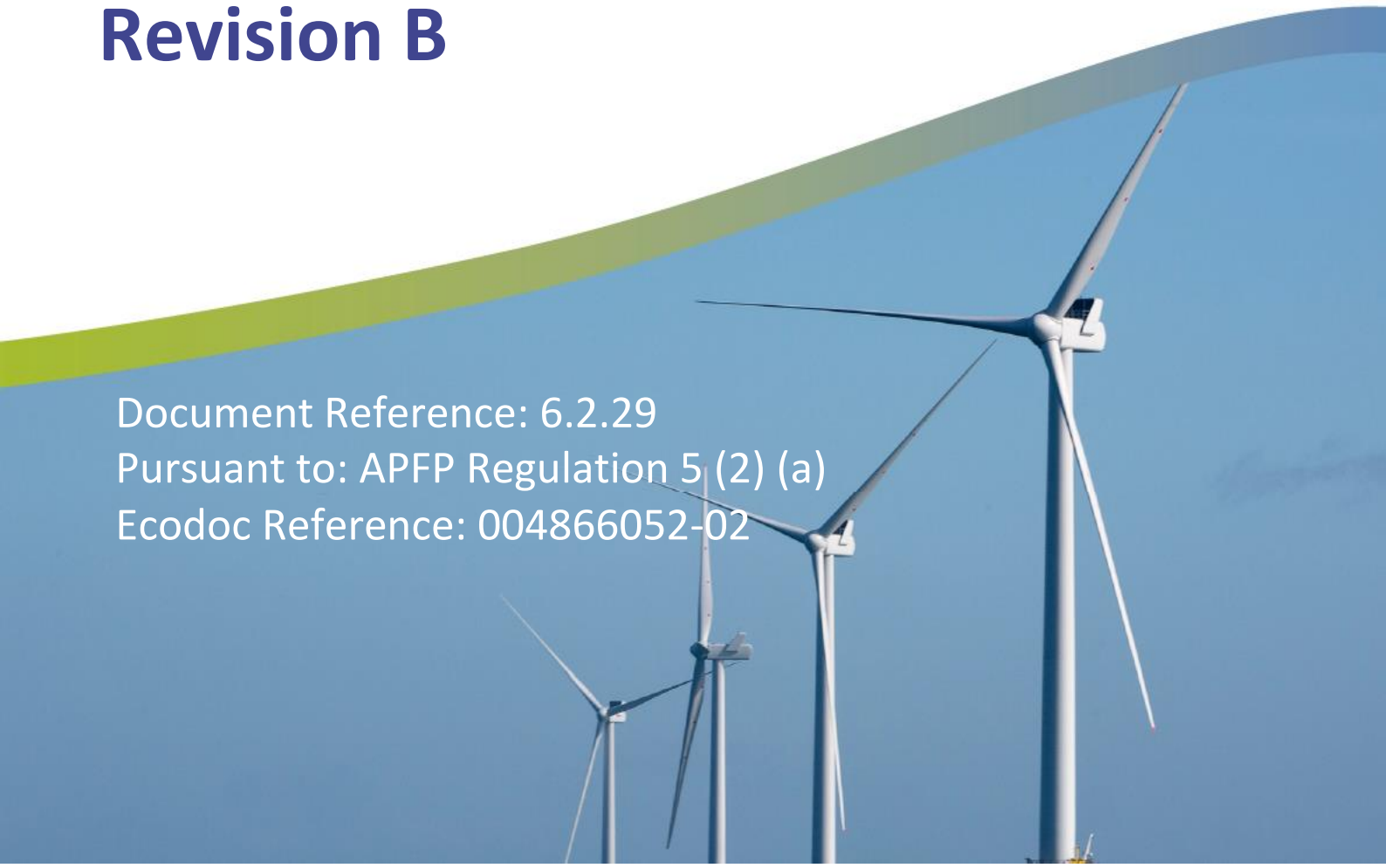

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Executive Summary

This chapter of the Rampion 2 Environmental Statement (ES) presents the assessment of likely significant effects of the Proposed Development with respect to climate change.

It presents the results of the assessment of the likely significant effects of Rampion 2 with respect to emissions of greenhouse gases (GHGs). It also contains a Climate Change Resilience (CCR) assessment which examines the likely significant effects that may be experienced by the Proposed Development as result of climate change.

Assessment of GHG emissions from the construction, operation and maintenance, and decommissioning phases of the Proposed Development has been undertaken and considers the following two scenarios:

- a do-minimum scenario where the Proposed Development is not built; and
- a do-something scenario where the Proposed Development with embedded environmental measures is built.

Through comparison of these two scenarios, the assessment concludes the Proposed Development has a lifetime GHG emissions saving of 35,901ktCO_2e. The assessment also contextualises these savings against UK carbon budgets. The Proposed Development will contribute up to 0.04 percent of the UK's carbon budget for the fourth carbon budget of 1,950MtCO_2e between 2023 to 2027. GHG emissions avoided will equate to a 0.19 percent offset of the UK's fifth carbon budget of 1,725MtCO_2e between 2028 and 2032 and up to a 0.64 percent offset of the sixth carbon budget of 965MtCO_2e for 2033 to 2037. The Proposed Development will continue to offset GHG emissions until 2050 assuming a 30-year operational life, and therefore make a positive contribution the UK Government target to reach net zero emissions in 2050.

In this context it is concluded that the GHG impact of the Proposed Development will have beneficial impact. It also concludes that the Proposed Development will 'pay back' the GHG emissions emitted during its lifetime in less than a year (approximately 10 months). After this, it will of course continue to save GHG emissions throughout its lifetime contributing to the decarbonisation of the UK economy and the UK's net zero target.

The CCR assessment focuses on the resilience of both the onshore and offshore elements of the Proposed Development to the impact of climate change throughout the construction, operation and maintenance and decommissioning phases. Three groups of receptors were considered: building and infrastructure receptors; human health receptors; and environmental receptors.

Met office UKCP18 data (Met Office, 2018a), supplemented by literature review, was used to establish the current baseline and the climate trends of the future baseline.

A vulnerability assessment, which evaluated the sensitivity and exposure of the receptors to future climate changes, was used to identify impacts with potential significant effects on the Proposed Development.

The identified impacts were taken forward for the CCR assessment for the construction, operation and decommissioning phases of the Proposed Development. An assessment of

the likelihood and magnitude of the climate change impact was made in order to conclude whether any significant effects are likely.

The interface with CCR and the other Environmental Impact Assessment (EIA) aspects is captured in the In-Combination Climate Impacts (ICCI) assessment. The ICCI assessed how the effects of climate change could exacerbate potential environmental effects or affect the efficacy of the proposed environmental measures identified in other EIA aspect assessments.

The CCR and ICCI assessment both concluded that there are likely to be no significant effects remaining following the assessment of climate change impacts on the construction, operation and maintenance and decommissioning phases of the Proposed Development.

29. Climate Change

29.1 Introduction

29.1.1 This chapter of the Environmental Statement (ES) presents the assessment of likely significant effects of the Proposed Development with respect to climate change.

29.1.2 The 2017 Environment Impact Assessment (EIA) Regulations require consideration of the impact of the Proposed Development on climate (for example the nature and magnitude of greenhouse gas (GHG) emissions) and the vulnerability of the Proposed Development to climate change (Climate Change Resilience (CCR)).

29.1.3 The assessment in this chapter considers climate change in two ways:

- GHG emissions assessment: which determines the GHG emissions arising from the construction, operation and maintenance and decommissioning phases of the Proposed Development. These calculations are used to inform assessment of the extent to which the Proposed Development would affect the ability to achieve national, regional and local targets for decarbonisation; and
- CCR assessment: which assesses the effects of a changing climate on the vulnerability of the Proposed Development, including how the design will mitigate the anticipated impacts of climate change.

29.1.4 This chapter should be read in conjunction with the description of the Proposed Development provided in **Chapter 4: Description of Proposed Development, Volume 4** of the ES (Document Reference: 6.2.4).

29.1.5 The remainder of this chapter is as follows:

- **Sections 29.2** to **29.10:** GHG emissions assessment and;
- **Sections 29.11** to **29.23:** CCR assessment.

29.1.6 A glossary of terms and abbreviations for this Chapter as a whole is provided in **Section 29.24: Glossary of terms and abbreviations**; and a references list is provided in **Section 29.25: References.**

29.1.7 The GHG emissions assessment is supported by **Appendix 29.1: Supporting data for the GHG assessment, Volume 4** of the ES (Document Reference 6.4.29.1).

29.1.8 A change request **[AS-046]** to the DCO Application was accepted by the Examining Authority on 24 July 2024 **[PD-018]**. These changes included minor reductions to the proposed DCO Order Limits (onshore only) where adjacent to areas of Ancient Woodland to provide a 25m buffer from these features. Further localised reductions to the extent of Works 9 and 19 were also made, assigning these areas to a class of work with lower impacts from those previously assessed as cable installation. The changes made result in no new or different effects from those reported in this chapter of the ES.

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GHG Emissions Assessment

29.2 GHG Overview

29.2.1 This section of the climate change chapter of the ES presents the results of the assessment of the likely significant effects of Rampion 2 with respect to emissions of greenhouse gases (GHGs). It should be read in conjunction with the description of the Proposed Development provided in **Chapter 4: The Proposed Development, Volume 2** of the ES (Document Reference: 6.2.4).

29.2.2 Rampion Extension Development Limited (RED) submitted a Scoping Report (RED, 2020) and request for a Scoping Opinion to the Secretary of State (SoS) for Business, Energy and Industrial Strategy (BEIS) (administered by the Planning Inspectorate) on 2 July 2020 (RED, 2020). A Scoping Opinion was received on 11 August 2020 (Planning Inspectorate, 2020). In paragraph 3.3.22 of the Scoping Opinion, the following comment was received in relation to climate change:

> *"The ES should include a description and assessment (where relevant) of the likely significant effects the Proposed Development has on climate (for example having regard to the nature and magnitude of greenhouse gas emissions) and the vulnerability of the project to climate change. Where relevant, the ES should describe and assess the adaptive capacity that has been incorporated into the design of the Proposed Development. This may include, for example, alternative measures such as changes in the use of materials or construction and design techniques that will be more resilient to risks from climate change."*

29.2.3 In response to paragraph 3.3.22 of the Scoping Opinion (Planning Inspectorate, 2020), this Chapter provides a description and assessment of the effects the Proposed Development has on climate with regards to GHG emissions during the construction, operation and maintenance, and decommissioning phases of the Proposed Development.

29.2.4 GHG emissions are used as a measure and indicator of the Proposed Development's impact on climate. The increase in concentration of GHGs in the atmosphere is causing a change in climatic conditions and creating climate change impacts. Any GHG emissions arising as a result of the Proposed Development will therefore have an impact on climate change.

29.2.5 The approach to assessing GHG emissions from the construction, operation and maintenance, and decommissioning phases of the Proposed Development has been undertaken in line with Institute of Environmental Management and Assessment (IEMA) guidance for assessing GHG emissions - 2nd Edition (IEMA, 2022) and therefore considers the following two scenarios:

- a do-minimum scenario where the Proposed Development is not built; and
- a do-something scenario where the Proposed Development is built.

29.2.6 The GHG Emissions Assessment includes the following sections:

- **Section 29.3: Relevant legislation, planning policy and other documentation**;
- **Section 29.4**: **Consultation and stakeholder engagement**;
- **Section 29.5**: **Embedded environmental measures**;
- **Section 29.6**: **Estimation of GHG emissions**;
- **Section 29.7**: **Assessment of GHG emissions**;
- **Section 29.8: Cumulative effects**;
- **Section 29.9: Transboundary effects**; and
- **Section 29.10: Inter-related effects**.

29.2.7 The GHG emissions assessment is supported by **Appendix 29.1: Supporting data for the GHG assessment, Volume 4** of the ES (Document Reference 6.4.29.1).

29.3 Relevant legislation, planning policy and other documentation

Legislative context

29.3.1 Key legislation relevant to the GHG emissions assessment, and which may influence the type of environmental measures that could be incorporated into the Proposed Development during the construction, operation, and maintenance, and/or decommissioning phases includes:

- *Climate Change Act 2008 (2050 target amended)* is the core legislation that is of relevance to this assessment. The Act sets a target to ensure that the net UK carbon account for the year 2050 is at least 100 percent lower than the 1990 baseline ('the UK carbon target'). The UK carbon target is now often referred to as 'net zero'.
  - The Climate Change Act 2008 also created a framework for setting a series of interim national carbon budgets and plans for national adaptation to climate risks. The Third, Fourth and Fifth Carbon Budgets, set through The Carbon Budget Orders 2009, 2011 and 2016 (Department for Business, Energy & Industrial Strategy (BEIS), 2021a), are 2.54 gigatonnes of carbon dioxide equivalent[1] ($GtCO_2e$) for 2018-2022, 1.95 $GtCO_2e$ for 2023-2037 and 1.73 $GtCO_2e$ for 2028-2032. Recommendations endorsed by the UK

[1] GHG emissions are quantified as carbon dioxide equivalent (CO_2e) which is a term for describing different GHGs in a common unit. For any quantity and type of GHG, CO_2e represents the amount of CO_2 which would have the equivalent global warming impact. In published literature and policy documents, GHG emissions are sometimes referred to as "carbon emissions" by shorthand. In this assessment, this term has been avoided and GHG emissions refer to CO_2e emissions while CO_2 emissions refer only to CO_2.

Government and accompanying legislative/policy requirements to meet the carbon budgets have been factored into the GHG assessment.

  - The Climate Change Committee (2020a) set the Sixth Carbon Budget (965 megatonnes of CO_2e ($MtCO_2e$) for 2033 to 2037) which it states, "*would decisively commit the UK to the transition to Net Zero emissions in 2050*" (BEIS et al., 2021). This target was enshrined in law in 2021 and has therefore been included in the ES GHG assessment.

- The *Energy Act* (2013) outlines the UK's commitment to a low carbon energy industry and investment in low carbon electricity generation. The Energy Act (2013) establishes the legislative framework to enable secure, affordable and low carbon energy. It includes provisions for: decarbonisation, allowing the Secretary of State to set a 2030 decarbonisation target range for electricity in secondary legislation; and Electricity Market Reform (EMR), with measures to attract investment that encourage low carbon electricity generation.
- *Infrastructure Planning (Environmental Impact Assessment) Regulations 2017*. These regulations transposed the requirements of the EIA Directive 2014/52/EU into UK law. This introduced climate as a topic for environmental assessment, including a description of the likely significant effects resulting from the impact of the Proposed Development on climate (for example the nature and magnitude of GHG emissions).

Planning policy context

29.3.2 There are a number of policies and guidance documents at an international, national and local level that are relevant to the GHG assessment, listed in **Table 29-1**.

Table 29-1 Planning policy issues relevant to the GHG assessment

Reference	Policy issue
International planning policies	
The United Nations Framework Convention on Climate Change (UNFCCC) Paris Agreement (UNFCCC, 2015)	The UNFCCC is the major international body responsible for managing climate change and GHG emissions. In 2015, it adopted the Paris Agreement, the aims of which are stated as: "*This Agreement, in enhancing the implementation of the Convention, including its objective, aims to strengthen the global response to the threat of climate change, in the context of sustainable development and efforts to eradicate poverty, including by: (a) Holding the increase in the global average temperature to well below 2 °C above pre-industrial levels and to pursue efforts to limit the temperature increase to 1.5 °C above pre-industrial levels, recognizing that this would significantly reduce the risks and impacts of climate change; and (b) Increasing the ability to adapt to the adverse impacts of climate change and foster climate resilience and low greenhouse gas*

Reference	Policy issue
	emissions development, in a manner that does not threaten food production" (Art. 2). The agreement sets targets for countries' GHG emissions, but these are not legally binding or enforceable. The UK's Nationally Defined Contribution (NDC) commits the UK to reducing economy-wide GHG emissions by at least 68 percent by 2030, compared to 1990 levels (BEIS, 2020). This target has been built upon in the Sixth Carbon Budget, which aims to achieve a 78 percent reduction in GHG emissions by 2035. This budget was enshrined in UK law in 2021 and is used for contextualisation in the GHG assessment.
UNFCCC Kyoto Protocol (UNFCCC, 1997)	The Kyoto Protocol was adopted in December 1997 and there are currently 192 Parties to the Kyoto Protocol. It commits industrialised countries and economies to transition to limit and reduce GHG emissions in accordance with agreed individual targets. These have been strengthened in more recent international agreements culminating in the Paris Agreement (UNFCCC, 2015), as described above. The Kyoto Protocol contains a list of six categories of GHGs to be reported, which remain relevant in the Paris Agreement, namely: carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), F-gases (hydrofluorocarbons (HFCs) and perfluorocarbons (PFCs)), sulphur hexafluoride (SF_6), and nitrogen trifluoride (NF_3). In this GHG assessment, these six GHGs are collectively considered "GHG emissions" and reported as carbon dioxide equivalent (CO_2e) GHG emissions.
National planning policies	
National Policy Statement for Energy EN-1 (Department for Energy and Climate Change (DECC), 2011a)	The National Policy Statement for Energy (NPS EN-1) sets out the national policy for energy infrastructure. NPS EN-1 describes the energy sector's role in delivering the UK Government's climate change objectives "*by clearly setting out the need for new low carbon energy infrastructure to contribute to climate change mitigation*". It should be noted that at the time of writing NPS EN-1, the UK's climate commitment was a target of 80 percent reduction relative to the 1990 baseline but this has since been updated to 100 percent.
Draft overarching National Policy Statement for energy (Draft NPS EN-1) (Department for Energy Security	The Draft NPS EN-1 (2023a) includes the same principles relating to the GHG assessment as NPS EN-1 (DECC, 2011a), accounting for updates to carbon reduction targets. Draft NPS EN-1 (2023a) acknowledges that to achieve net zero by 2050 "*We will need to dramatically increase the volume of*

Reference	Policy issue
and Net Zero, 2023a)	*energy supplied from low carbon sources and reduce the amount provided by fossil fuels*". Draft EN-1 (2023a) also notes that the ES should include a whole life carbon assessment. The assessment in this appendix ensures compliance with this requirement.
National Planning Policy Framework (NPPF) (Ministry of Housing, Communities and Local Government (MHCLG), 2021)	The NPPF acts as policy for local planning authorities and decision-makers, both for developing plans and making decisions about planning applications. It is applicable to onshore developments rather than offshore and has been used to guide the GHG assessment for the Proposed Development. However, the policy related to low-carbon development has been used to inform the GHG assessment and design of the entirety Proposed Development. In Paragraph 152, the NPPF states: "*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* […] *and support renewable and low carbon energy and associated infrastructure*". In Paragraph 154, it requires that new development should be planned for in ways that "*can help to reduce greenhouse gas emissions, such as through its location, orientation and design*". In Paragraph 151, it comments that to help increase the use and supply of renewable and low carbon energy and heat, plans should: "*a) provide a positive strategy for energy from these sources, that maximises the potential for suitable development, while ensuring that adverse impacts are addressed satisfactorily (including cumulative landscape and visual impacts); b) consider identifying suitable areas for renewable and low carbon energy sources, and supporting infrastructure, where this would help secure their development* ". In Paragraph 157, it is stated that local planning authorities should expect new development to: "*a) comply with any development plan policies on local requirements for decentralised energy supply unless it can be demonstrated by the applicant, having regard to the type of development involved and its design, that this is not feasible or viable; and b) take account of landform, layout, building orientation, massing and landscaping to minimise energy consumption*."
The Ten Point Plan for a Green Industrial	This plan sets out the UK Government's approach to "build back better" following the impacts of the COVID-19 pandemic in 2020. It includes details of how the UK Government intends to

Reference	Policy issue
Revolution (BEIS et al, 2020)	accelerate the path to net zero in line with the commitment made in the Climate Change Act 2008 (amended). *"Advancing Offshore Wind"* is Point one of the 10 Point Plan, commenting that offshore wind is a critical source of renewable energy for the UK's growing economy, and stating that *"By 2030 we plan to quadruple our offshore wind capacity* […] *by 2030, we aim to produce 40GW of offshore wind"*. The plan also makes reference to the Energy White Paper and the Offshore Transmission Network Review, which set out strategies to connect offshore wind in a clean and cost-effective way to onshore networks, and the need for smart technologies and additional development of network infrastructure. This plan is therefore relevant to the contextualisation of the GHG assessment within the national policy context.
Net Zero Strategy: Build Back Greener (BEIS, 2021b)	This strategy sets out sectoral policies and proposals for decarbonising all sectors of the UK economy to meet the coming carbon budgets, the NDC and the net zero target by 2050. It aims to enable the delivery of the objectives set out in the Ten Point Plan for a Green Industrial Revolution (BEIS et al., 2020)
The National Infrastructure Strategy (HM Treasury, 2020)	The National Infrastructure Strategy, published on 25 November 2020, sets out actions that the UK Government will take to build infrastructure needed to achieve net zero GHG emissions by 2050. One of the key measures identified in the strategy for decarbonising the economy and adapting to climate change, includes making a significant investment in offshore wind. Consistent with the target to achieve 40GW of offshore wind by 2030, the Government expects that around 65 percent of electricity generated in Great Britain to come from renewable sources by 2030. This strategy is therefore relevant to the contextualisation of the GHG assessment within the national policy context.
UK Marine Policy Statement – 2020 Update (Department for Environment, Food & Rural Affairs (Defra), 2020)	In Paragraph 2.6.7.6, the Marine Policy Statement states that marine planning including offshore renewables "*has an important role to play in facilitating climate change mitigation".* In Paragraph 3.3.4, the Policy states that decision makers examining and determining applications for energy infrastructure should take into account "*the positive wider environmental, societal and economic benefits of low carbon electricity generation … as key technologies for reducing carbon dioxide emissions"*.
Clean Growth Strategy (BEIS, 2017)	Provides the strategy for the UK's future clean growth to allow Carbon Budgets required by the Climate Change Act 2008 (amended) to be met and support economic growth. The

Reference	Policy issue
	strategy sets out policies and targets out to 2050 for reducing GHG emissions across a number of sectors. The strategy focuses on accelerating clean growth, improving business and industry inefficiency, improving the energy efficiency of homes, rolling out low carbon heating, accelerating the shift to low carbon transport, delivering clean, smart, flexible power, enhancing the benefit and value of our natural resources and leading in the public sector and government. This plan is therefore relevant to the contextualisation of the GHG assessment within the national policy context.
Local planning policies (onshore)	
Adopted Arun Local Plan 2011-2031 (Arun District Council, 2018)	The Arun Local Plan 2018 sets out a spatial vision, objectives and a sustainable strategy for delivering the needed growth of the Arun District over the period 2011- 2031. In the Plan, the Council comments that it will support proposals which contribute to both mitigating and adapting to climate change and to meeting the national targets to reduce GHG emissions, although it is noted that policies in the Local Plan on Climate Change, Energy Efficiency and Renewable Energy will primarily relate to the onshore elements of the Proposed Development. The Local Plan includes Policy ECC DM1 Renewable Energy, which states that *"The Council will support renewable energy development subject to the criteria in this Policy. Schemes will be expected to contribute to the social, economic and environmental development and overall regeneration of the District."* This Plan is therefore relevant to the contextualisation of the GHG assessment within the local policy context.
Horsham District Planning Framework 2015 (Horsham District Council, 2015)	The Horsham District Planning Framework identifies key objectives to fulfil the vision for the Horsham District, which includes Spatial Objective 12: "*Ensure that new development minimises carbon emissions, adapts to the likely changes in the future climate and promotes the supply of renewable, low carbon and decentralised energy.*" This is supported by Strategic Policy 35: Climate Change, which includes the following statements: "*Development will be supported where it makes a clear contribution to mitigating and adapting to the impacts of climate change and to meeting the district's carbon reduction targets as set out in the Council's Acting Together on Climate Change Strategy, 2009.*" *"Measures which should be used to mitigate the effects of climate change include: 1. Reduced energy use in construction*". This Plan is therefore relevant to the contextualisation of the GHG assessment within the local policy context.

Reference	Policy issue
Draft Horsham District Local Plan 2021-2038 (Horsham District Council, 2021)	The Draft Horsham District Local Plan includes Strategic Policy 36 - Climate Change which states that proposals will only be supported if they include measures which contribute to achieving net zero carbon emissions by 2050. This Plan is therefore relevant to the estimation of the GHG emissions within the GHG assessment.
Mid-Sussex District Plan 2014-2031 (Mid-Sussex District Council, 2018)	The Mid-Sussex District Plan provides a framework for new development, employment growth, infrastructure, and measures to ensure the protection of the countryside. The Plan includes a Strategic Objective *"To promote development that makes the best use of resources and increases the sustainability of communities within Mid Sussex, and its ability to adapt to climate change"*. This Plan is therefore relevant to the estimation of the GHG emissions within the GHG assessment.
South Downs National Park Local Plan (South Downs National Park, 2019)	The South Downs National Park Local Plan covers the entire South Downs National Park and gives consideration to the impact of climate change on the National Park. Strategic Policy 48: Climate Change and Sustainable Use of Resources of the South Downs National Park Local Plan calls for new developments to incorporate sustainable design features. Strategic Policy 51: Renewable Energy supports development proposals for renewable energy schemes that "*contribute towards reducing greenhouse gas emissions and moving towards a carbon neutral National Park"*. This Local Plan is therefore relevant to the estimation of the GHG emissions within the GHG assessment.
Local planning policies (offshore)	
South Inshore and South Offshore Marine Plan (Defra, 2018)	The South Inshore and South Offshore Marine Plan provides a framework that will shape and inform decisions over how the areas' waters are developed, protected and improved over the next 20 years. The South Inshore and South Offshore Marine Plan covers an area of around 20,000 km^2 of inshore and offshore waters across 1,000 km of coastline from Folkestone to the river Dart. Objective 7 of the plan is "*to support the reduction of the environmental, social and economic impacts of climate change, through encouraging the implementation of mitigation and adaptation measures"*. This Marine Plan is therefore relevant to the estimation of the GHG emissions within the GHG assessment.

Other documentation

29.3.3 **Table 29-2** lists other documentation which are relevant to the GHG assessment.

Table 29-2 Technical guidance relevant to the GHG assessment

Guidance	Relevance
Carbon management standards and guidance	
The Greenhouse Gas Protocol a Corporate Accounting and Reporting Standard (GHG Protocol) (World Business Council for Sustainable Development (WBCSD) and World Resources Institute (WRI), 2014)	Provides standards and guidance for preparing a GHG emissions inventory. This guidance has been followed in developing the assessment methodology for the GHG assessment.
Publicly Available Standard (PAS 2080): 2016 – Carbon Management in Infrastructure (British Standards Institution (BSI), 2016)	Provides an approach to management of reduction of GHG emissions from infrastructure projects, working with stakeholders throughout the project lifecycle. This guidance has been followed in developing the assessment methodology for the GHG assessment.
Environmental Impact Assessment Guide to: Assessing Greenhouse Gas Emissions and Evaluating their Significance – 2nd Edition (IEMA, 2022)	IEMA (2022) provides guidance on GHG emissions assessment, mitigation and reporting within an EIA context and this is the primary source of guidance for assessing GHG emissions. The 2022 guidance provides detail on the application of the five IEMA Principles on Climate Change Mitigation and EIA: 1."*The GHG emissions from all projects will contribute to climate change, the largest inter-related cumulative environmental effect.* *2. The consequences of a changing climate have the potential to lead to significant environmental effects on all topics in the EIA Directive (e.g. human health, biodiversity, water, land use, air quality).* *3. The UK has legally binding GHG reduction targets – EIA must therefore give due consideration to how a project will contribute to the achievement of these targets.* *4. GHG emissions have a combined environmental effect that is approaching a scientifically defined environmental limit, as such any GHG emissions or reductions from a project might be considered to be significant.* *5. The EIA process should, at an early stage, influence the location and design of projects to*

Guidance	Relevance
	optimise GHG performance and limit likely contribution to GHG emissions." This guidance has been followed in developing the assessment methodology for the GHG assessment and considered in the assessment of GHG emissions.
Guidance from government statutory bodies	
Committee on Climate Change (CCC), Net Zero. The UK's contribution to stopping global warming (CCC, 2019)	The report responds to a request from the UK Government to provide updated advice on the UK's long-term GHG emission target, including the possibility of setting a "net-zero" target, following Intergovernmental Panel on Climate Change (IPCC) reports (IPCC, 2018). The report suggests that the UK "*should set and vigorously pursue an ambitious target to reduce greenhouse gas emissions (GHGs) to 'net-zero' by 2050*". The report comments that many of the changes to continue reducing electricity GHG emissions will occur on the supply side (for example, more deployment of offshore wind). It suggests that strong deployment of low-carbon generation will be needed in order to quadruple low-carbon supply by 2050 (for example, including at least 75 GW of offshore wind). It also highlights the need for the transmission network capacity to keep pace with developments on generation (such as large-scale offshore wind) and interconnections, and with the need to ensure that peak demand can be met reliably in all areas on still days as well as on windy days. This report is therefore relevant to the contextualisation of the GHG assessment within the national policy context.
Committee on Climate Change: Reducing UK emissions 2022 Progress Report to Parliament (CCC, 2022)	This report sets out the UK's progress against GHG emissions reduction targets to 2050. The Progress Report is updated annually. The report confirms that power sector plans are advancing in line with the large scale required for the net-zero target, including acknowledgement that the Government's ambition for offshore wind generation by 2030 has increased from 30 GW to 50 GW. This plan is therefore relevant to the contextualisation of the GHG assessment within the national policy context.
CCC Sixth Carbon Budget Report – Electricity Generation (CCC, 2020a)	This document contains a summary of content for the electricity generation sector from the CCC's Sixth Carbon Budget Advice.

Guidance	Relevance
	The CCC's recommended carbon budget sector allocations for the electricity generation sector are: • remaining third carbon budget, 2022 only, 48.48 $MtCO_2e$; • fourth carbon budget, 2023 to 2027, 189.16 $MtCO_2e$; • fifth carbon budget, 2028 to 2032, 92.57 $MtCO_2e$; and • sixth carbon budget, 2033 to 2037, 35.74 $MtCO_2e$.

29.4 Consultation and stakeholder engagement

Statutory Consultation exercises

First Statutory Consultation exercise – July to September 2021

29.4.1 Rampion 2's first Statutory Consultation exercise ran from 14 July to 16 September 2021, a period of nine weeks. The Preliminary Environmental Report (PEIR) (RED, 2021) was published as part of first Statutory Consultation exercise which provided preliminary information on greenhouse gas assessment within Appendix 5.2: Greenhouse gas assessment.

29.4.2 **Table 29-3** provides a summary of the issues raised in the first Statutory Consultation exercise in 2021 regarding the GHG emissions assessment, and confirmation of how these have been considered within the ES assessment. A full list of all comments received during the first statutory consultation exercise in 2021 and the responses to those comments is provided in the **Consultation Report** (Document Reference: 5.1).

Table 29-3 Summary of issues raised in the first statutory consultation exercise (July – September 2022) regarding GHG emissions

Consultee	Issue raised	Response
West Sussex County Council (WSCC)	WSCC commented that they would like to see more assurance that efforts are being undertaken to mitigate all possible carbon from all phases and aspects of the Proposed Development, and	Embedded environmental measures to minimise GHG emissions have been included in **Table 29-5** of this Chapter.

Consultee	Issue raised	Response
	in particular, the construction phase.	
WSCC	WSCC stated that it was difficult to get a full representation of how the Proposed Development has considered carbon across the aspects. There are opportunities to improve this and make it easier for the reader, therefore WSCC expects this to be presented in more detail in the ES.	Clarification added in **Chapter 5: Approach to the EIA, Volume 2** of the ES (Document Reference 6.2.5). Text added to **Section 5.8.6** and **Table 5-8** to provide greater clarity on how carbon is considered in this chapter.
Brighton and Hove City Council	Brighton and Hove City Council commented that the impact on carbon capture and sequestration in seabed sediment, due to construction and general disturbance of sediment, should be included.	In **paragraph 6.6.8** of **Chapter 6: Coastal processes, Volume 2** of the ES (Document Reference: 6.2.6) it is stated that the seabed is dominated by coarse-grained sediments (sands and gravels). It is therefore considered that there is a natural regime of sediment transport and disturbance and low carbon storage potential.
Living Coast Biosphere	Living Coast Biosphere responded stating that they would like to understand the impacts of the development on carbon emissions and carbon capture and storage through disturbances of sediment and soils.	In **Chapter 20: Soils and agriculture, Volume 2** of the ES (Document Reference: 6.2.20) it is stated that sensitive areas including woodlands are being avoided through the use of trenchless crossing techniques. This will avoid the need to excavate soils and disturb sediment within the wooded areas as temporary construction compounds will be located outside of these areas. All other soils will be handled in accordance with a site-specific Soil Management Plan based on soil information obtained from a soil and Agricultural Land Classification (ALC) survey.
South Downs National Park Authority (SDNPA)	The SDNPA commented that due to carbon being locked up in forest soils, the methodology should incorporate the right interventions to minimise emissions of GHGs, such as carbon dioxide, due to damage to soils.	
Royal Yachting Association (RYA)	The RYA noted that the Proposed Development would result in increased vessel displacement and an increase in journey times and distances for affected third-party vessels. They asked if it	In **Chapter 13: Shipping and navigation, Volume 2** of the ES (Document Reference: 6.2.13) it is noted that there may be an increase in emissions from third-party vessels in the construction phase. It is also

Consultee	Issue raised	Response
	was reasonable to assume that emissions from powered craft will also increase.	possible that there will be an increase in such emissions during the operational phase. However, this is likely to be minimal in comparison with emissions from vessel movements from construction, and operation and maintenance and will have a temporary effect. Therefore, this increase is not considered significant material for the GHG assessment.

29.4.3 Following feedback to the first Statutory Consultation exercise in 2021 and after further analysis, it was identified that some coastal residents did not receive consultation leaflets as intended. Therefore, the first Statutory Consultation was reopened between 7 February 2022 to 11 April 2022 for a further nine weeks. No feedback or comments were received from the reopened first Statutory Consultation in relation to the greenhouse gas assessment.

Second Statutory Consultation exercise – October to November 2022

29.4.4 The second Statutory Consultation exercise was undertaken from 18 October 2022 to 29 November 2022. This was a targeted consultation which focused on updates to the onshore cable route proposals which were being considered following feedback from consultation and further engineering and environmental works. As part of this second Statutory Consultation exercise, RED sought feedback on the potential changes to the onshore cable route proposals to inform the onshore design taken forward to DCO Application.

29.4.5 No issues raised in the second Statutory Consultation exercise in 2022 regarding the GHG emissions assessment.

Third Statutory Consultation exercise – February to March 2023

29.4.6 The third Statutory Consultation exercise was undertaken from 24 February 2023 to 27 March 2023. This was a targeted consultation which focused on a further single onshore cable route alternative being considered following feedback from consultation and further engineering and environmental works. As part of this third Statutory Consultation exercise, RED sought feedback on the potential changes to the onshore cable route proposals to inform the onshore design taken forward to DCO Application. Fourth Statutory Consultation exercise – April to May 2023.

29.4.7 There were no key themes emerging from Rampion 2's fourth Statutory Consultation exercise in April 2023 specifically relating to climate change.

29.4.8 A full list of all comments received during the fourth Statutory Consultation exercise in 2023 and the responses to those comments is provided in the **Consultation Report** (Document Reference: 5.1).

Fourth Statutory Consultation exercise – April to May 2023

29.4.9 The fourth Statutory Consultation exercise was undertaken from 28 April 2023 to 30 May 2023. This was a targeted consultation which focused on the proposed extension works to the existing National Grid Bolney substation to facilitate the connection of the Rampion 2 onshore cable route into the national grid electricity infrastructure. As part of this fourth Statutory Consultation exercise, RED sought feedback on the proposed substation extension works to inform the onshore design taken forward to the DCO Application. Assessment Methodology.

29.4.10 There were no key themes emerging from Rampion 2's fourth Statutory Consultation exercise in April 2023 specifically relating to climate change.

29.4.11 A full list of all comments received during the fourth Statutory Consultation exercise in 2023 and the responses to those comments is provided in the **Consultation Report** (Document Reference: 5.1).

Introduction

29.4.12 This section outlines the methodology used to quantify GHG emissions and assess the likely significant effects of the Proposed Development for the identified scenarios during the construction, operation and maintenance, and decommissioning phases.

29.4.13 The approach to determining the scale of GHG emissions associated with the Proposed Development has been undertaken in line with IEMA guidance (2022) for assessing GHG emissions and the principles defined in the Publicly Available Specification (PAS) 2080: Carbon Management in Infrastructure (BSI, 2016).

29.4.14 To meet the requirements of the IEMA guidance (2022), and in line with the EIA Regulations 2017, two assessment scenarios have been presented:

- the do-minimum where the Proposed Development is not built and the latest equivalent data for the UK grid average generation intensity is consumed; and
- the do-something scenario where the Proposed Development with embedded environmental measures is built. The expected policy impacts of the do-minimum scenario also underpin this do-something scenario.

29.4.15 The key assumptions and results of calculations of GHG emissions from each of these scenarios are described further throughout this chapter and **Appendix 29.1: Supporting data for the GHG assessment, Volume 4** of the ES (Document Reference: 6.4.29.1).

29.4.16 The assessment of GHG emissions also includes a calculation of a carbon payback period (in **Section 29.7**). The carbon payback period represents the time required before the Proposed Development has saved more GHG emissions, relative to electricity production by other means, than will be produced by the construction, operation and maintenance, and decommissioning phases.

Spatial scope and receptor

29.4.17 The Study Area for GHG emissions associated with the Proposed Development includes GHG emissions arising from the construction, operation and maintenance, and decommissioning phases within the proposed DCO Order Limits, as well as the GHG emissions associated with material processing and transportation of materials and labour outside of the proposed DCO Order Limits.

29.4.18 This Study Area is appropriate as it captures the GHG emissions from the Proposed Development's construction, operation and maintenance, and decommissioning phases, and materials usage as well as GHG emissions from staff travel and movements associated with materials.

29.4.19 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 climate is the only receptor for the climate change assessment.

29.4.20 Given the global impacts of climate change and the globally recognised requirement to limit GHG emissions to maintain global average temperature increase below 1.5 - 2°C, as laid out in the Paris Agreement (UNFCCC, 2015), the receptor is considered highly sensitive to GHG emissions (IEMA, 2022).

Temporal scope

29.4.21 The temporal scope of the GHG assessment considers GHG emissions across the lifetime of the Proposed Development. For the purpose of the GHG assessment, timescales for the construction, operation and maintenance, and decommissioning phases of the Proposed Development have been assumed to be between 2025 and 2065 based on information presented in **Chapter 4: The Proposed Development, Volume 2** of the ES (Document Reference 6.2.4).

- construction – 2025-2030;
- operation and maintenance – 2030-2060; and
- decommissioning – 2060-2065.

Estimation of GHG emissions

29.4.22 GHG emissions have been estimated by applying published GHG emissions factors to activities in the baseline (do-minimum scenario) and to those required for the Proposed Development (do-something scenario). The GHG emissions factors relate a given level of activity, or amount of fuel, energy or materials used, to the mass of GHGs released as a consequence.

29.4.23 The GHG emissions sources considered in this assessment span the whole lifetime of the Proposed Development and include:

- Materials – GHG emissions associated with the materials used to construct the Proposed Development including wind turbine generators (WTGs), foundations, onshore and offshore cables, onshore and offshore substations, scour protection and concrete transition joint bays;

- Transport of materials to site and onshore labour movements – GHG emissions associated with the transport of materials, vessels, equipment and workers to onshore and offshore sites by road and sea routes;
- Construction and installation processes – GHG emissions associated with the installation works including onshore on-site plant equipment, and GHG emissions associated with ships used for installation of offshore works, and helicopters associated with offshore worker movements;
- Operation and maintenance GHG emissions – GHG emissions associated with operation and maintenance activities including the embodied carbon of raw materials required for replacement, and offshore vessel and helicopter movements required for operation and maintenance activities;
- Decommissioning activities – GHG emissions associated with onshore and offshore decommissioning activities. This is assumed to generally be the reverse of the construction sequence. Offshore this will involve similar types and numbers of vessels and equipment as construction. Likewise, onshore this will involve a similar labour force, equipment and number of transport movements as with some materials left in-situ, as described below; and
- Avoided GHG emissions – the GHG emissions avoided from fossil fuel-based energy generation as a result of the Proposed Development.

29.4.24 Estimated GHG emissions have been calculated as per the equation below:

- Activity data x GHG emissions factor = GHG emissions value.

29.4.25 All GHG emissions have been reported as kilo-tonnes of carbon dioxide equivalent ($ktCO_2e$), accounting for the six GHGs included in the Kyoto Protocol (UNFCCC, 1997).

29.4.26 Activity data (material type, quantities required, progress rates, etc.) for each GHG emission source has been primarily based on the details within the design of the Proposed Development. Where this information was not available due to the design stage, information has been sourced from relevant specialists within the design team and literature studies of comparable projects (including the Rampion 1 offshore wind farm) (see **Appendix 29.1: Supporting data for the GHG assessment, Volume 4** of the ES (Document Reference: 6.4.29.1)).

29.4.27 A proportionate approach has been taken to ensure that undue attention is not placed on GHG emissions sources that have very limited impact on the overall scale of GHG emissions. GHG emission sources that contribute <1 percent of GHG emission inventories and require onerous data collection have been excluded from the assessment. Details regarding exclusions have been included within **Appendix 29.1: Supporting data for the GHG assessment, Volume 4** of the ES (Document Reference: 6.4.29.1).

Construction phase

29.4.28 The quantification of GHG emissions arising from the construction phase of the Proposed Development, also referred to as 'construction carbon', was calculated in line with PAS 2080:2016 Carbon management in Infrastructure (BSI, 2016) and GHG emission factors from the sources presented in **Appendix 29.1: Supporting**

data for the GHG assessment, Volume 4 of the ES (Document Reference: 6.4.29.1) (i.e. Inventory of Carbon and Energy (ICE) database (ICE, 2019)).

29.4.29 The do-minimum (baseline) scenario assumes that there will be no construction activity.

29.4.30 Based on knowledge of offshore wind farm projects (ClimateXChange, 2015), the largest GHG emissions from the Proposed Development (do-something scenario) are likely to be related to embodied carbon. The embodied carbon describes the carbon footprint of a material, allowing for the sum of the energy required in resource extraction, and any processing required, as well as the transport and supply logistics to the factory gate (prior to transport to the Proposed Development for use), to be accounted for within the overall GHG estimation. Using the estimated material quantities and types, the embodied carbon of the construction material assets is calculated, giving its contribution to the overall GHG emissions from the construction phase.

29.4.31 Onshore construction traffic has been calculated using estimations of vehicle types and numbers from the transport aspect (**Chapter 23: Transport, Volume 2** of the ES (Document Reference: 6.2.23) and **Chapter 32: ES Addendum, Volume 2** of the ES (Document Reference 6.2.32 and **[REP5-038]**, updated at Deadline 6)), assumptions on distances travelled and application of emissions factors (BEIS, 2023).

29.4.32 All materials for the offshore works are assumed to be transported to the site by marine vessel. The location of the Marshalling Yard/Pre-Assembly Harbour has been assumed as the base for installation vessels, transport vessels and cable laying vessels. It is assumed to be based in Northern Europe (UK, Netherlands or Germany).

29.4.33 Energy use from onshore construction processes has been estimated as 0.12 percent of the GHG emissions from embodied carbon associated with the Proposed Development. This value is based on recent lifecycle carbon assessments for offshore wind farms and is in lieu of more detailed information for construction processes on site which will not be available until later in the design process.

29.4.34 GHG emissions for the marine vessels have been calculated using the following approach:

- $GHG\ emissions\ (kgCO_2e) = C\ \left(\frac{kgCO2e}{l}\right) \times SFC\ \left(\frac{l}{kWh}\right) \times P\ (kW) \times t\ (h)$

29.4.35 A range of marine vessels are required for offshore construction and installation activities. For each broad category, example vessels based on those used for the existing Rampion 1 project have been used to inform the effective power (effective power including all efficiency losses) of vessel engines. Technological advances in marine vessels mean that this is considered a worse-case scenario approach. The quantity of time spent on each activity has been generated from a literature review.

Operation and maintenance phase

29.4.36 The do-minimum scenario is represented by the existing GHG emissions from the proposed DCO Order Limits prior to construction and operation of the Proposed

Development or by the GHG emissions arising from an alternative project design and assumptions. Since there is no physical development and activity at the location of the Proposed Development in the do-minimum scenario, the GHG emissions from the ES assessment prior to construction and operation will be zero. Therefore, for this assessment, the use of other alternative electricity generation methods has been considered.

29.4.37 The GHG emissions associated with the do-something scenario is calculated based on the GHG intensity of the Proposed Development (CO_2e/kWh) which measures the GHG emissions of the Proposed Development, measured in CO_2e, relative to the total predicted generation of the Proposed Development, measured in kWh. Operation and maintenance phase GHG emissions of the Proposed Development relate to activities including vessel and helicopter movements, staff commuting journeys, and material requirements.

29.4.38 The annual energy generation from the Proposed Development during the operation and maintenance phase has been calculated using a high-level approach advocated by Renewables UK (Renewables UK, 2021). The installed total offshore wind farm capacity (estimated at 1,200MW) has been multiplied by the number of hours in the year (8,760, based on 365 days per year) and by the appropriate load or capacity factor for the Proposed Development. An annual availability factor, which accounts for downtime for troubleshooting, maintenance and major corrective works, has been specified.

29.4.39 The load factor provides an indication of the ratio of electricity that will realistically be generated as a proportion of the total generating capacity. The load factor will be heavily influenced by weather conditions (i.e. wind speeds). Load factors have been taken from the Digest of United Kingdom Energy Statistics (DUKES) 2022 report (BEIS, 2022b) which considers offshore wind farms in the UK that were generating electricity over the whole period of 2020 outlining a value of 37.5 percent. Current operational offshore wind farms suggest load factors from 39 percent to 47 percent (BEIS, 2019).

29.4.40 It is recognised that there is potential for improved load factors of offshore wind farms in the UK as future technologies become commercially viable. In particular, deployment of next generation offshore WTGs (with capacity equal to or greater than 10MW), together with other technology and operational improvements, are anticipated to result in higher load factors. BEIS (2021e) provides an anticipated load factor for offshore wind developments delivered between 2028 and 2029 of 63.1 percent. This is due to a combination of improved the use of larger turbines, improved turbine technology, developments in windfarm design and the refinement of operation and maintenance strategies (BEIS, 2019). This load factor (63.1 percent) has therefore been used in the GHG assessment as representative of the Proposed Development.

29.4.41 The average annual availability factor for the Proposed Development is dependent on the model of WTGs selected at detailed design stage. For the Proposed Development, the WTG type is associated with an availability factor of 98.5 percent, based on parameters confirmed by Rampion Extension Development Limited (RED).

Decommissioning phase

29.4.42 The decommissioning phase of the Proposed Development is assumed to include the decommissioning and removal of all structures above the seabed or ground level. Following the approach set out in **Chapter 4: The Proposed Development, Volume 2** of the ES (Document Reference: 6.2.4), it has been assumed for the GHG assessment that the wind farm array and offshore export cables are removed, although this will be determined at the time of decommissioning.

29.4.43 Decommissioning will occur far into the future and therefore attempting to account for the fate of materials and the activity required for the end-of-life phase are associated with significant uncertainty. GHG emissions are therefore estimated on the assumption that decommissioning will be based on reverse installation. Offshore assumptions about numbers of vessels and equipment are therefore the same as described for the construction phase of the Proposed Development. For onshore it is anticipated that the onshore electrical cables will be left in-situ with ends cut, sealed and buried to minimise environmental effects associated with removal. Should the onshore substation need to be decommissioned fully, however, the decommissioning works are likely to be undertaken in reverse to the sequence of construction works and involve similar levels of equipment.

Assessment criteria

29.4.44 Current IEMA (2022) guidance states that:

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

29.4.45 GHG emissions from the Proposed Development have been quantified and expressed as $ktCO_2e$ per annum for the do-minimum and do-something scenarios. The difference between the two scenarios has been calculated to provide the evidence of the impact of the Proposed Development on climate from GHG emissions produced during its construction, operation and maintenance, and decommissioning phases. The information presented has demonstrated the levels of GHG emissions predicted during construction, operation and maintenance, and decommissioning against the UK Government's published carbon budgets.

29.4.46 The significance of GHG emissions associated with the Proposed Development will be evaluated based on the extent to which the Proposed Development materially affects the ability to achieve national targets for decarbonisation. The primary basis of contextualisation will be UK carbon budgets (see **Table 29-2**).

29.4.47 The significance of the GHG emissions from the Proposed Development is determined based on the criteria in **Table 29-4** developed from the IEMA guidance (IEMA, 2022). Major or moderate adverse effects and beneficial effects are considered to be **Significant**. Minor adverse and negligible effects are considered to be **Not Significant**.

Table 29-4 Significance criteria

Significance	Significance criteria
Major Adverse	The Proposed Development does not make a meaningful contribution to the UK Government meeting their carbon budgets / targets. Adverse GHG impacts are not mitigated / do-minimum and are not compliant with requirements of national, regional and local policy.
Moderate Adverse	The Proposed Development falls short of fully contributing to the UK Government meeting their carbon budgets / targets. Adverse GHG impacts are partially mitigated and partially meet the requirements of national, regional and local policy.
Minor Adverse	The Proposed Development is fully in line with the trajectory of the UK Government meeting their carbon budgets / targets. Adverse GHG impacts are mitigated with good practice design standards and meet the requirements of national, regional and local policy.
Negligible	The Proposed Development has minimal residual GHG emissions and is 'ahead of the curve' for the trajectory of the UK Government meeting their carbon budgets / targets. GHG impacts are mitigated through measures that go beyond good practice design standards and the requirements of national, regional and local policy.
Beneficial	The Proposed Development has net GHG emissions below zero, causing a direct or indirect reduction in atmospheric GHG emissions which has a positive impact on the UK Government meeting their carbon budgets / targets.

Key assumptions and limitations

29.4.48 It is not known exactly which form of conventional electricity generation the Proposed Development will replace. The assessment of GHG emissions considers the carbon payback period of the Proposed Development relative to coal, gas, all fossil fuels and all fuels (including nuclear and renewables) generation mechanisms.

29.4.49 There are currently no plans or requirements to mitigate GHG emissions for Rampion 2 through offsetting schemes (i.e., peatland restoration, tree planting). It is expected that this will continue to be the case for the Proposed Development, so offsetting has not been considered in the assessment.

29.4.50 The approach presented in this Appendix does not represent a full life-cycle assessment. At the ES stage, some specific elements of the Proposed Development design elements that will result in GHG emissions have yet to be defined. This includes the WTG make and model, the foundation design, the vessels to be used and the source of many materials. To address these uncertainties, the GHG assessment therefore utilises details from published literature, expert judgement and project-specific aspects where available in the

design. These assumptions are set out in this appendix and **Appendix 29.1: Supporting data for the GHG assessment, Volume 4** of the ES (Document Reference: 6.4.29.1).

29.4.51 As WTG technology is continually evolving, it is difficult to definitively predict the generating capacity and model of WTG that will be commercially available at the point of procurement for construction. As such, the size and capacity of the WTG for the Proposed Development will be determined during the final project design stage prior to construction. The final WTG design will be selected in accordance with the parameters set out in the DCO.

29.4.52 Given that the WTG will be determined during the final project design, high-level sensitivity testing, given available data, has been performed on anticipated GHG emissions for smaller and larger turbines scenarios. The sensitivity testing showed that the smaller turbine scenario is associated with greater GHG emissions from embodied carbon due to greater material volumes being required for the greater number of turbines (and foundations, scour protection and maintenance) and a greater number of marine transport trips. Nonetheless, GHG emissions for the Proposed Development are likely to be of a similar magnitude, within the margin of error of the assessment, regardless of the final turbine design. The GHG assessment is based on maximum assessment assumptions described for the maximum design scenario as described in **Chapter 4: The Proposed Development, Volume 2** of the ES (Document Reference: 6.2.4) and is therefore based on the smaller turbine size.

29.4.53 Worst-case scenarios for all other maximum assessment assumptions required for the Proposed Development (i.e., not related to the wind turbine design) have been used in the assessment as per the description in **Chapter 4: The Proposed Development, Volume 2** of the ES (Document Reference: 6.2.4).

29.4.54 At present, best-in-class WTG design has a maximum generating capacity of 14MW. Based on results of a literature review, a linear relationship is found between WTG total material balance and key parameters of WTGs, including generating capacity, rotor blade diameter and tower height (Arvesen et al, 2014; Chapman, 2015; Xodus Group 2012; IRENA, 2018; DTU Library, 2013). This scaling has been used to estimate approximate material quantities for turbines considered in the GHG assessment based on available data from Siemens Gamesa SG222 14MW WTG. Material quantities used are presented in **Appendix 29.1: Supporting data for the GHG assessment, Volume 4** of the ES (Document Reference: 6.4.29.1).

29.4.55 Details of estimated materials required for the components of the onshore substation have been provided for the purposes of the GHG assessment. These are detailed in **Appendix 29.1: Supporting data for the GHG assessment, Volume 4** of the ES (Document Reference: 6.4.29.1).

29.4.56 All other assumptions made within the GHG assessment are consistent with those stated in **Chapter 4: The Proposed Development, Volume 2** of the ES (Document Reference: 6.2.4) and used in the other assessments. Where necessary these are noted in **Appendix 29.1: Supporting data for the GHG assessment, Volume 4** of the ES (Document Reference: 6.4.29.1).

29.5 Embedded environmental measures

29.5.1 A range of environmental measures have been embedded into the Proposed Development as outlined in the **Commitments Register** (Document Reference: 7.22). **Table 29-5** outlines how these embedded environmental measures influence the GHG emissions assessment.

Table 29-5 Summary of the embedded environmental measures relevant to GHG

Commitment Reference	Embedded measures	Proposed compliance mechanism
C- 248	Embodied Carbon: There are embodied GHG emissions associated with the raw materials used to construct the Proposed Development. Where possible, choice of local sourcing of construction should be encouraged. Circular economy principles will be considered and deployed where possible. Carbon measuring and reporting would be undertaken.	**Draft Development Consent Order (DCO)**, Schedule 1, Part 3, Requirement 22 Code of construction practice (CoCP) (4)
C- 243	Fuel and energy consumption: Energy efficient and well-maintained plant equipment should be used, as should mains electricity, if available, rather than diesel-fuelled portable generators. This will reduce GHG emissions from fuel and energy consumption.	**Draft DCO**, Schedule 1, Part 3, Requirement 22 CoCP (4)
C-244	There are GHG emissions from construction traffic. Deliveries will be consolidated where possible and there should be 'no idling' vehicles. Sustainable modes of travel for the construction workforce will be encouraged.	**Draft DCO**, Schedule 1, Part 3, Requirement 22 CoCP (4) (h) **Draft DCO**, Schedule 1, Part 3, Requirement 24 (1) (a) and (b) Construction traffic

Commitment Reference	Embedded measures	Proposed compliance mechanism
		management plan
C-51	A Vessel Management Plan will be developed pre-construction which will determine vessel routeing to and from construction areas and ports to minimise, as far as reasonably practicable, encounters with marine mammals. It will also consider vessel codes of conduct provided by WiSe Scheme, Scottish Marine Wildlife Watching Code (MWWC) and the Nature Scot "Guide to best practice for watching marine wildlife".	Deemed marine licence, Schedule 11, Part 2, Condition 11 (1) (n) (iv) & Schedule 12, Part 2, Condition 11 (1) (n) (iv)
C-69	Construction strategies will be implemented that will seek to maximise: • the reuse of excavated clean materials from the onshore cable construction corridor where practicable and feasible. Prior to a stage of construction, a Materials Management Plan (MMP) will be developed that outlines where excavated non-waste materials will be reused in line with the CL:AIRE (2011) Definition of Waste Code of Practice (DoWCoP). A declaration will be made to CL:AIRE by a Qualified Person that the MMP has been completed in accordance with the DoWCoP and that best practice is being followed; and • the reuse of excavated minerals from the onshore cable construction corridor as a resource, where they remain available following backfill and where their use is practicable and feasible. Prior to the stage of construction, a MMP will developed which includes a specific minerals section which outlines how minerals will be identified, extracted and stored, and re-used.	**Draft DCO**, Schedule 1, Part 3, Requirement 22 CoCP (4) (c), (d)

29.6 Estimation of GHG emissions

Introduction

29.6.1 The Proposed Development will have a generating capacity in excess of 100MW with current estimated capacity of 1,200MW. The "GHG intensity" of electricity is a measure of how much GHG emissions are produced per kilowatt hour (kWh) of electricity consumed. The GHG intensity of the Proposed Development is estimated as per the methodology described in **Section 29.4.9** and **Table 29-6** as 12.7 gCO_2e/kWh. This is comparable to a published GHG intensity for offshore wind farms that range from 7 to 23gCO_2e/kWh, following a harmonisation procedure (ClimateXChange, 2015). The GHG intensity of gas- or coal-fired conventional generation plants are typically estimated to be around 500 and 1,000gCO_2e/kWh respectively (ClimateXChange, 2015).

Table 29-6 Calculation of the GHG intensity of the Proposed Development

Detail	Value
Total generation capacity of the Proposed Development	Current estimated capacity of 1,200MW
Load factor	63.1%
Availability factor	98.5%
Predicted annual generation of the Proposed Development	6,533,576MWh/yr
Predicted lifetime generation of the Proposed Development	196,007,278MWh
GHG footprint of the Proposed Development	2,494 $ktCO_2e$
GHG intensity of the Proposed Development	12.7gCO_2e/kWh

Note: 1 MW is equal to 1,000kW.

29.6.2 Annual energy generated by the Proposed Development is estimated to be approximately 6,533,576MWh per year, and 196,007,278MWh over the lifespan of the Proposed Development of around 30 years.

Do-minimum scenario

29.6.3 Energy statistics produced by BEIS and published in DUKES 2022 (BEIS, 2022b) have been used to calculate GHG emissions associated to the do-minimum scenario. Based on data from 2022, estimated CO_2 emissions per unit of electricity generated by all fuel types in the UK grid electricity mix (based substantially on fossil-fuelled generation) are 196tCO_2/GWh.

29.6.4 If the power output of the Proposed Development (up to 1,200MW/yr) over the course of the project lifetime, were delivered instead by the current UK grid

electricity generation mix, the estimated CO_2 emissions would be approximately 35,323ktCO_2. This is a conservative assumption, given that it is likely that the renewable energy, like that provided by the Proposed Development, will displace electricity generation by fossil fuels throughout the lifetime of the project.

29.6.5 National Statistics data estimates that CO_2 emissions from power generation represent around 92 percent of UK total GHG emissions from power generation (BEIS, 2022c). Therefore, it has been estimated that the lifetime emissions in the do-minimum situation of 35,323ktCO_2, will be equivalent to approximately 38,395ktCO_2e.

Do-something scenario

29.6.6 The key assumptions and results of calculations of GHG emissions from each of the construction, operation and maintenance, and decommissioning activities included within the GHG assessment are described further throughout **Section 29.6** .This section estimates the GHG emissions associated with materials, transport of materials and labour to site, construction and installation processes, operation and maintenance, and decommissioning activities.

29.6.7 Projected GHG emissions associated with the Proposed Development have been estimated to be approximately 2,494ktCO_2e. The breakdown of estimated GHG emissions by the different sources is described in **Table 29-7** and Table 29-8 and further information has been included in **Appendix 29.1: Supporting data for the GHG assessment, Volume 4** of the ES (Document Reference 6.4.29.1).

Table 29-7 Estimation of GHG emissions associated with the Proposed Development

Phase	GHG emission source	Activity	Estimated GHG emissions (ktCO_2e)
Construction	Materials	WTGs	414.5
		WTG foundations	414.1
		Offshore substations	22.4
		Offshore scour protection for WTG and offshore substations	15.2
		Offshore cable protection including cable crossings	139.2
		Inter-array cables	9.8

Phase	GHG emission source	Activity	Estimated GHG emissions ($ktCO_2e$)
		Export cables	16.6
		Onshore cable	12.2
		Onshore substation	8.5
		Onshore Joint Bays	1.8
	Transport of materials to site and onshore labour movements	Offshore vessel movements	125.4
		Onshore HGV movements	4.0
		Onshore LGV movements (commuting)	0.4
	Construction and installation processes	Installation offshore vessel movements and operations	43.5
		Installation onshore transport movements	0.02
		Onshore energy use	1.3
Operation and maintenance	Operation and maintenance activities	Operation and maintenance energy requirements from offshore vessels	993.9
		Operation and maintenance offshore materials	94.4
		Offshore operation and maintenance commuting road journeys	1.9
Decommissioning	Decommissioning activities	Offshore and onshore	174.7

Phase	GHG emission source	Activity	Estimated GHG emissions ($ktCO_2e$)
TOTAL			2,493.8

29.7 Assessment of GHG emissions

29.7.1 This section presents the assessment of the effect of the Proposed Development on GHG emissions arising from the construction, operation and maintenance, and decommissioning phases of the Proposed Development based on the design available at the time of ES publication.

29.7.2 At this stage of the design of the Proposed Development, it has not been possible to carry out a full life cycle GHG inventory analysis, as detailed specifications of the Proposed Development elements are required to complete such an exercise. Such detail is only expected at detailed design and will not be available until post-DCO consent.

29.7.3 Using current design knowledge, expert judgement and published literature studies, an indication of the nature and magnitude of GHG emissions associated with the Proposed Development has been estimated in this section and described in more detail within **Appendix 29.1: Supporting data for the GHG assessment, Volume 4** of the ES (Document Reference: 6.4.29.1).

29.7.4 Within the construction phase, the embodied carbon associated with the use of materials is the biggest contributor to the GHG emissions associated with the Proposed Development. Material assets such as steel and fibreglass can have high embodied carbon contents (depending on the specifications and energy used in their production).

29.7.5 **Table 29-8** contains the breakdown and comparison of GHG emissions from each assessed GHG source during the construction, operation and maintenance, and decommissioning phase of the Proposed Development.

Table 29-8 Estimation of GHG emissions associated with the Proposed Development

Phase	GHG emission source	Estimated GHG emissions ($ktCO_2e$)	Percentage of the estimated GHG emissions
Construction	Materials	1054	42.3%
	Transport of materials and labour to site	130	5.2%
	Construction and installation processes	45	1.8%

Phase	GHG emission source	Estimated GHG emissions ($ktCO_2e$)	Percentage of the estimated GHG emissions
Operation and maintenance	Operation and maintenance activities	1090	43.7%
Decommissioning	Decommissioning activities	175	7.0%

29.7.6 As outlined in **Table 29-8** the total GHG emissions over the life cycle of the Proposed Development (construction phase plus 30 years operation and maintenance phase, and decommissioning phase) is estimated at approximately 2,494$ktCO_2e$.

Comparison against relevant UK carbon budget

29.7.7 In line with IEMA guidance (IEMA, 2022), **Table 29-9** provides an assessment of the Proposed Development's GHG emissions impact against the UK Government's five-year carbon budgets.

29.7.8 The GHG assessment has considered GHG emissions from the Proposed Development in three separate phases: construction, operation and maintenance, and decommissioning.

29.7.9 The construction of the Proposed Development will be a short-term activity that runs from approximately 2025 to 2030. GHG emissions from the construction phase will therefore fall within the fourth (2023 to 2027) and fifth (2028 to 2032) carbon budgets (BEIS, 2021a). GHG emissions from the operation and maintenance phase of the Proposed Development will fall into the fifth (2028 to 2032) and sixth (2033 to 2037) and subsequent future budgets once set from 2038 onwards (CCC, 2015; CCC, 2020b).

29.7.10 **Table 29-9** presents the net $ktCO_2e$ associated with the construction, operation and maintenance, and decommissioning phases of the Proposed Development during each of the legislated carbon budget periods. Net GHG emissions are also contextualised within the sixth carbon budget period based on UK Government legislation to set the budget at the level recommended by the CCC, which was enshrined in UK law in 2021.

Table 29-9 Estimated GHG emissions from the Proposed Development in comparison to relevant carbon budgets

Proposed Development phases	Estimated total GHG emissions from the Proposed Development ($ktCO_2e$) (do-something scenario)	Net GHG emissions from the Proposed Development ($ktCO_2e$) (do-something-do-minimum)	Net Proposed Development GHG emissions per relevant carbon budget ($ktCO_2e$)		
			4th (2023 to 2027)	5th (2028 to 2032)	6th (2033 to 2037)
Construction	1,229	1,229	737	492	-
Operation and maintenance	1,090	-37,305	-	-3,730	-6,217
Decommissioning	175	175	-	-	-
Total	2,497	-35,901	737	-3,239	-6,217

29.7.11 The estimated lifetime GHG emissions saving of 35,901$ktCO_2e$ is substantial relative to the current UK grid electricity mix (based substantially on fossil-fuelled generation), clearly illustrating the GHG emissions savings that result from offshore wind electricity generation.

29.7.12 Operation and maintenance phase GHG emissions calculated for the years within each carbon budget period include the average annual GHG emissions associated with operation and maintenance energy use.

29.7.13 This assessment has established that during the period when GHG emissions from the Proposed Development will be at their highest level (short- and near-term construction activity), the Proposed Development will contribute up to 0.04 percent of the UK's carbon budget for the fourth carbon budget of 1,950$MtCO_2e$ between 2023 to 2027). The Proposed Development GHG emission savings will equate to a 0.19 percent offset of the UK's fifth carbon budget of 1,725$MtCO_2e$ between 2028 and 2032 and up to a 0.64 percent offset of the sixth carbon budget of 965$MtCO_2e$ for 2033 to 2037. The Proposed Development will continue to offset GHG emissions throughout its operational life, and therefore make a positive contribution the UK Government target to reach net zero emissions in 2050.

29.7.14 In this context, according to IEMA guidance (2022) it is concluded that the GHG effect of the Proposed Development is **Beneficial** (**Significant**). This is because the Proposed Development has net GHG emissions below zero, causing an indirect reduction in atmospheric GHG emissions which has a positive impact on the UK Government meeting their carbon budgets / targets.

Carbon payback period

29.7.15 The carbon payback period represents the time required before displaced GHG emissions equal the life cycle GHG emissions for the Proposed Development, (i.e.,

the Proposed Development has saved more GHG emissions relative to electricity production by other means than will be produced by its construction, operation and maintenance, and decommissioning).

29.7.16 Relative to GHG emissions produced through electricity generated via fossil fuel plants (estimated to be 474gCO_2e/kWh), the electricity generation from Rampion 2 saves approximately 461gCO_2e/kWh electricity generated. This means that after approximately 5,409GWh generated, the Proposed Development will have saved the carbon that will be emitted during its lifecycle, (i.e., including the construction, operation and maintenance, and decommissioning phases). This generation will be achieved after approximately 2.76 percent of its operational lifetime of around 30 years, or around 10 months.

29.7.17 It should be noted that wind power will not replace all forms of conventional electricity generation equally and the true GHG emission displacement will depend on a combination of factors including the type of power generation being replaced and changes in efficiency of conventional power plants. While it is anticipated that wind power will displace fossil fuel electricity generation, the carbon payback period of other electricity generation forms is shown in **Table 29-10**.

Table 29-10 Calculation of the carbon payback period of the Proposed Development relative to other forms of electricity generation

Generation type	Coal	Gas	All fossil fuels	All fuels (including nuclear and renewables)	BEIS Energy and Emission Projections 2040 all power generation
Estimated GHG emissions (CO_2e) per GWh of electricity	1,095	407	474	196	67
Carbon payback period of the Proposed Development (GWh)	2,305	6,332	5,409	13,617	45,952
Carbon payback period of the Proposed Development (months)	5	12	10	26	85

29.7.18 Over the lifetime of the Proposed Development there is potential for changes in energy mix, efficiency improvements and new technologies (such as carbon capture and storage). Such changes will have the impact of reducing the GHG emission intensity for UK electricity generation.

29.7.19 Projections for future GHG emission intensity for all power producers in Great Britain (excluding some auto-generation) have been produced by BEIS Energy and Emissions Projections (EEP) 2019 (BEIS, 2020c). In 2040, the latest year

projections are available for, GHG emission intensity of electricity is anticipated to be 67gCO_2e/kWh. The carbon payback for the Proposed Development against this GHG emission intensity is also shown in **Table 29-10**. It should be noted that this calculation has been performed at a high-level for representation purposes only and does not represent a projection of carbon payback of the Proposed Development under a future scenario with evolving energy intensity. The calculation assumes the lower GHG emission intensity for power production throughout the lifetime of the Proposed Development.

29.7.20 It is concluded in the assessment of GHG emissions, that the Proposed Development will 'pay back' the GHG emissions emitted during its lifetime in less than a year (approximately 10 months) on the assumption that it displaces electricity generation by fossil fuels. After this, it will of course continue to save GHG emissions throughout its lifetime contributing to the decarbonisation of the UK economy and the UK's net zero target.

29.8 Cumulative effects

29.8.1 The approach to cumulative effects assessment (CEA) for GHGs differs from the approach described in **Chapter 5: Approach to the EIA**, **Volume 2** of the ES (Document Reference 6.2.5). All global cumulative GHG sources are relevant to the effect on climate change, and this is taken into account in defining the receptor as being of 'high' sensitivity'. Effects of GHG emissions from specific cumulative projects are not assessed, as there is no basis for selecting any particular (or more than one) cumulative project that has GHG emissions for assessment over any other. Additionally, the contextualisation of GHG emissions, by its nature, incorporates the cumulative contributions of other GHG sources which make up that context. Therefore, it has not been necessary to carry out a separate CEA of GHG emissions as part of this ES.

29.9 Transboundary effects

29.9.1 Transboundary effects arise when impacts from a development within one European Economic Area (EEA) states affects the environment of another EEA state(s). No transboundary effects are anticipated on the basis that climate change effects and impacts are specific to the development and will not result in impacts to an adjacent state.

29.10 Inter-related effects

29.10.1 The inter-related effects assessment considers likely significant effects from multiple impacts and activities from the construction, operation and maintenance and decommissioning phases of Rampion 2 on the same receptor, or group of receptors.

29.10.2 The information provided in this ES chapter is intended to demonstrate that the potential GHG effects will be managed and reduced through the application of embedded environmental measures to ensure there are no significant effects as the result of the Proposed Development. As there are no significant effects relating

to GHG after consideration of the embedded environmental measures, no assessment of inter-related effects has been undertaken.

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29.11 Climate Change Resilience Assessment Overview

29.11.1 This section of the Climate Change chapter of the ES presents the results of the assessment of the likely significant effects on the Proposed Development due to climate change. It should be read in conjunction with the description of the Proposed Development provided in **Chapter 4: The Proposed Development, Volume 2** of the ES (Document Reference 6.2.4).

29.11.2 CCR interfaces with other aspects of an EIA and as such, should be considered alongside these; namely:

- **Chapter 8: Fish and shellfish ecology, Volume 2** of the ES (Document Reference 6.2.8);
- **Chapter 9: Benthic, subtidal and intertidal ecology, Volume 2** of the ES (Document Reference 6.2.9);
- **Chapter 12: Offshore and intertidal ornithology, Volume 2** of the ES (Document Reference 6.2.12);
- **Chapter 15: Seascape, landscape and visual impact assessment, Volume 2** of the ES (Document Reference 6.2.15);
- **Chapter 16: Marine archaeology, Volume 2** of the ES (Document Reference 6.2.16);
- **Chapter 18: Landscape and visual impact, Volume 2** of the ES (Document Reference 6.2.18);
- **Chapter 19: Air quality, Volume 2** of the ES (Document Reference 6.2.19);
- **Chapter 20: Soils and agriculture, Volume 2** of the ES (Document Reference 6.2.20);
- **Chapter 22: Terrestrial ecology and nature conservation, Volume 2** of the ES (Document Reference 6.2.22);
- **Chapter 24: Ground Conditions, Volume 2** of the ES (Document Reference 6.2.24); and
- **Chapter 26: Water environment, Volume 2** of the ES (Document Reference 6.2.26); and
- **Appendix 26.2: Flood Risk Assessment, Volume 4** of the ES (Document Reference 6.4.26.2).

29.11.3 The interface with CCR and the other EIA aspects identified above is captured in the In-Combination Climate Impacts (ICCI) assessment, which represents the CCR approach to assessing cumulative effects. The ICCI assessment considers the extent to which climate change exacerbates the identified effects on identified receptors resulting from the Project, and also considers whether climate change

effects the efficacy of proposed environmental measures. It is the combination of effects from both the Project and climate change on environmental receptors.

29.11.4 The CCR assessment describes:

- the legislation, planning policy and other documentation that has informed the CCR assessment (**Section 29.12: Relevant legislation, planning policy, and other documentation**);
- the outcome of consultation and engagement that has been undertaken to date, including how climate change resilience within Statutory Consultation have been addressed (**Section 29.13: Consultation and engagement**);
- the spatial and temporal scope of the CCR assessment and the receptors considered (**Section 29.14: Scope of the assessment**);
- the methods used for the baseline data gathering (**Section 29.15: Methodology for baseline data gathering**);
- the climate baseline (**Section 29.16: Baseline conditions**);
- Embedded Environmental Measures **(Section 29.17);**
- the assessment methods used for the CCR (**Section 29.18: Methodology for ES assessment**);
- the assessment of effects, including the Vulnerability Assessment, impacts scoped out and the Climate Change Risk Assessment (**Section 29.19**);
- In Combination Climate Impact Assessment (ICCI) (**Section 29.20**);
- Transboundary effects (**Section 29.21**);
- Inter-related effects (**Section 29.22**); and
- Significance conclusions (**Section 29.23**).

29.12 Relevant legislation, planning policy and other documentation

Introduction

29.12.1 This section identifies the legislation, policy and other documentation that has informed the CCR Assessment. Further information on policies relevant to the EIA and their status is provided in **Chapter 2: Policy and legislative context, Volume 2** of the ES (Document Reference 6.2.2).

Legislation and national planning policy

29.12.2 **Table 29-11** lists the legislation relevant to the CCR assessment.

Table 29-11 Legislation and Policy relevant to climate change resilience

Legislation description	Relevance to assessment
Legislation	
Climate Change Act (2008)	Commits the UK to producing a Climate Change Risk Assessment (CCRA) at no longer than five yearly intervals. To date, three CCRAs have been produced (Department of Environment, Food and Rural Affairs (Defra), 2012; 2017; 2022). The 2022 CCRA identified significant risks to infrastructure from flooding, rising sea levels and increases in the frequency and severity of extreme weather. It also obligates the Secretary of State to prepare the National Adaptation Programme (NAP). The most recent NAP, produced in 2018 (Defra, 2018a), sets out key actions for a five-year period to adapt to the challenges of climate changes in the UK.
United Nations Framework Convention on Climate Change (UNFCCC) Paris Agreement (UNFCCC, 2015)	The United Nations Framework Convention on Climate Change (UNFCCC) is the major international body responsible for managing climate change and carbon emissions. In 2015, it adopted the Paris Agreement, the aims of which include: "Increasing the ability to adapt to the adverse impacts of climate change and foster climate resilience and low greenhouse gas emissions development, in a manner that does not threaten food production" (Article 2, (1)) (UNFCCC, 2015)
UNFCCC Glasgow Climate Pact (UNFCCC, 2021)	The Glasgow Pact emphasised the urgency of the scaling up of climate action and support to reduce the vulnerability to climate change by enhancing adaptive capacity and strengthening resilience.

29.12.3 **Table 29-12** lists the national planning policy relevant to the CCR assessment.

Table 29-12 National policy relevant to climate change resilience

Policy description	Relevance to assessment
The National Policy Statement (NPS) for Renewable Energy Infrastructure (EN-3) (Department of Energy and Climate Change (DECC), 2011b)	The NPS includes considerations for renewable energy infrastructure such that it is resilient to climate change. Section 2.3 of NPS EN-3 addresses climate change adaptation for renewable energy infrastructure, specifically in relation to the Proposed Development, it states that *"Offshore and onshore wind farms are less likely to be affected by flooding, but applicants should particularly set out how the proposal would be resilient to storms".*

Policy description	Relevance to assessment
	This Chapter includes an assessment of changes in storm conditions that may impact the Proposed Development, and these climate projections have been considered to date in the design process.
Overarching National Policy Statement (NPS) for Energy (EN-1) (DECC, 2011a)	Generic considerations to ensure electricity networks infrastructure is resilient to climate change. In particular, NPS EN-1 requires the ES to *"set out how the proposal will take account of the projected impacts of climate change"* (paragraph 4.8.5). This has been included in this chapter. Paragraph 4.8.6 states that "*the IPC should be satisfied that applicants for new energy infrastructure have taken into account the potential impacts of climate change using the latest UK Climate Projects available*." Paragraph 4.6.7 sets out that applicants should apply as a minimum, the emissions scenario that the Independent Committee on Climate Change suggests the world is currently most closely following – and the 10%, 50% and 90% estimate ranges. These stipulations have informed the Baseline and Methodology of this CCR assessment.
The National Policy Statement (NPS) for National Policy Statement for Electricity Networks Infrastructure (EN-5) (DECC, 2011c)	Section 2.4 of EN-5 considers climate change adaptation and states that the applicant should in particular set out the *"extent the proposed development is expected to be vulnerable, and, as appropriate, how it would be resilient to:* • *flooding, particularly for substations that are vital for the electricity transmission and distribution network;* • *effects of wind and storms on overhead lines;* • *higher average temperatures leading to increased transmission losses; and* • *earth movement or subsidence caused by flooding or drought (for underground cables)."* The CCRA in this chapter assesses the resilience of the Proposed Development to the climate change trends highlighted
National Planning Policy Framework (NPPF)	The NPPF sets out In paragraph 153 that Local Plans: "*should take a proactive approach to mitigating and*

Policy description	Relevance to assessment
(Ministry of Housing, Communities & Local Government (MHCLG), 2021)	*adapting to climate change, taking into account the long-term implications for flood risk, coastal change, water supply and changes to biodiversity and landscape, and the risk of overheating from rising temperatures*". Paragraph 154 states that: "*New developments should be planned for in ways that: a) avoid increased vulnerability to the range of impacts arising from climate change. When new development is brought forward in areas which are vulnerable, care should be taken to ensure that risks can be managed through suitable adaptation measures, including through the planning of green infrastructure*". The supporting Environment Agency (2022) planning practice guidance, Flood Risk Assessments: Climate Change Allowances, contains the percentage uplifts for climate change to be added to assessments. The CCR assessment in this chapter assesses the resilience of the Proposed Development to the climate change trends highlighted in the NPPF (MHCLG, 2021) and sets out embedded adaptation in place. Environment Agency guidance is used in the Flood Risk Assessment and referenced in this chapter.
UK Marine Policy Statement (HM Government, 2011)	The framework for preparing Marine Plans and taking decisions which impact the UK marine environment. It aims to contribute to the sustainable development in the United Kingdom marine area and includes. It states that consideration will need to be given to how the marine environment can adapt to the impacts of climate change in marine planning and decision making. The CCR assessment in this chapter assesses the resilience of the Proposed Development to the climate change trends highlighted. It also states that Marine plan authorities should take account of the latest set of UK Climate Projections. These stipulations have informed the Baseline and Methodology of this CCR assessment.]

29.12.4 The UK Government published draft NPS EN1-EN5 (Department for Energy Security and Net Zero (DESNZ), 2023a; DESNZ, 2023b; DESNZ, 2023c) for consultation in September 2021 and subsequently in March 2023 with further amendments. The 2011 NPSs remain in force until the review is approved (designated) and under proposed transitional arrangements the 2023 amendments will only have effect in relation to applications for development consent accepted for examination after designation. However, the draft emerging NPSs can potentially be relevant considerations. Therefore, Rampion 2 has kept abreast of the potential changes to the energy NPSs and incorporated any updates where required in the ES.

29.12.5 The following emerging national policies are relevant to the assessment of the effects on CCR receptors:

- Draft Overarching National Policy Statement for Energy (EN-1), (DESNZ, 2023a);
- Draft National Policy Statement for Renewable Energy Infrastructure (EN-3), (DESNZ, 2023b); and
- Draft National Policy Statement for Electricity Networks Infrastructure (EN-5), (DESNZ, 2023c).

29.12.6 There are no emerging expectations or changes relevant to the assessment of the effects on CCR from the current Overarching NPS EN1 for Energy (DECC, 2011b), NPS EN-3 for Renewable Energy Infrastructure (DECC, 2011a) and NPS EN5 for Electricity Networks Infrastructure (DECC, 2011c) listed in **Table 29-12**.

Local planning policy

29.12.7 **Table 29-13** lists the local planning policy relevant to the CCR assessment.

Table 29-13 Local planning policy relevant to climate change resilience

Policy description	Relevance to assessment
Local Planning Policies (Onshore)	
Arun Local Plan 2011-2031 (Arun District Council, 2018)	In the Arun Local Plan, the Council comments that it will support proposals which contribute to both mitigating and adapting to climate change, although it is noted that policies in the Local Plan on Climate Change, Energy Efficiency and Renewable Energy will primarily relate to the onshore elements of the Proposed Development. The Local Plan includes Policy ECC SP1 Adapting to climate change, which states that *"The Council will support development which is located and appropriately designed to adapt to impacts arising from climate change such as the increased probability of tidal and fluvial flooding; water stress; health impacts as a result of extreme*

Policy description	Relevance to assessment
	temperatures and a decline in the quality of habitats and richness of biodiversity". This plan has been used to support the identification of climate hazards that may affect the Proposed Development. These potential climate hazards and have been considered in the design to build in resilience to climate change.
Horsham District Planning Framework 2015 (Horsham District Council, 2015)	The Planning Framework identifies key objectives to fulfil the vision for the Horsham District, which includes Spatial Objective 12: "*Ensure that new development minimises carbon emissions, adapts to the likely changes in the future climate and promotes the supply of renewable, low carbon and decentralised energy*." This is supported by Strategic Policy 35: Climate Change, which includes the following statements: "*Development must be designed so that it can adapt to the impacts of climate change, reducing vulnerability, particularly in terms of flood risk, water supply and changes to the district's landscape.*" This plan has been used to support the identification of climate hazards that may affect the Proposed Development. These potential climate hazards and have been considered in the design to build in resilience to climate change.
Mid-Sussex District Plan 2014-2031 (Mid-Sussex District Council, 2018)	The District Plan includes a Strategic Objective "*To promote development that makes the best use of resources and increases the sustainability of communities within Mid Sussex, and its ability to adapt to climate change*". This plan is therefore relevant to the Proposed Development as the design has considered potential impacts of climate change build in resilience to climate change.
South Downs National Park Local Plan (South Downs National Park, 2019)	The South Downs Local Plan covers the entire South Downs National Park and gives consideration to the impact of climate change on the National Park. The Vision for the National Park includes "*adapting well to the impacts of climate change*". This plan is therefore relevant to the Proposed Development as the design has considered potential

Policy description	Relevance to assessment
	impacts of climate change build in resilience to climate change.
Local Planning Policies (Offshore)	
South Inshore and South Offshore Marine Plan (Defra, 2018b)	The South Inshore and South Offshore Marine Plan covers an area of around 20,000 km2 of inshore and offshore waters across 1,000 km of coastline from Folkestone to the river Dart. Objective 7 of the plan is "*to support the reduction of the environmental, social and economic impacts of climate change, through encouraging the implementation of mitigation and adaptation measures that …. Reduce vulnerability, improve resilience to climate and coastal change*". This plan is therefore relevant to the Proposed Development as the design has considered potential impacts of climate change build in resilience to climate change.

29.12.8 **Table 29-14** lists the emerging local planning policy relevant to the CCR assessment.

Table 29-14 Emerging local planning policy relevant to climate change resilience

Policy description	Relevance to assessment
Emerging Local Planning Policies (Onshore)	
Draft Horsham District Local Plan 2021-2038 (Horsham District Council, 2021)	The Draft Local Plan includes Strategic Policy 36 – Climate Change proposing measures that will be required for developments to adapt to the potential impacts of climate change, including: "*Development will only be supported if it includes site and building level measures to adapt to the future impacts of climate change and reduce vulnerability, particularly in terms of the comfort, health and wellbeing of current and future occupiers. Flood risk, water supply, overheating and changes to the District landscape should also be considered*". This plan has been used to support the identification of climate hazards that may affect the Proposed Development. These potential climate hazards and have been considered in the design build in resilience to climate change.

Other relevant information and guidance

29.12.9 A summary of the relevant technical guidance for the CCR assessment is given in **Table 29-15.**

Table 29-15 Technical guidance relevant to climate change resilience

Guidance document	Context
UKCP18 projections (Met Office, 2018)	UK Climate Projections 2018 (UKCP18) has been produced by the Met Office and provides the latest set of climate change projections for the UK. It includes projections of how climate variables could change in the coming decades, as well as forecasts for sea level rise. UKCP18 projections are used in the CCR assessment.
1. UKCP18 technical notes including: Science Overview Report (Lowe, J. A., et al., 2018). **2. UKCP18 Land projection s: Science Report (Murphy et al., 2018)** **3. UKCP18 Marine Report (Palmer et al., 2018)** **4. UKCP18 Factsheets:** **Precipitation (Met Office, 2018e)** **Wind (Met Office, 2018f)** **Snow (Met Office, 2018g)**	The UKCP18 Climate Projections were issued with a suite of accompanying scientific reports. The Overview Report, Land Projections and Marine Report give a summary of the anticipated climate change trends found within the projection data, evaluating the projection pathways, and provide direction on the use of the data in terms of the nature and degree of consistency within the modelling results. The Factsheets are available as a short qualitative overview of the UKCP18 results for the climate parameters. The reports will be used in developing the future baseline and climate trends used in the vulnerability assessment.
European Commission Notice – Technical guidance on the climate proofing of infrastructure in the period 2021 – 2027 (European Commission, 2021)	This note gives technical guidance on the climate proofing of infrastructure, which includes the adaptation to climate change (climate change resilience). The note contains guidance on the methodology of assessments, include the role within Environmental Impact Assessments (EIAs). The methodology for the CCR vulnerability assessment detailed draws from principles within this guidance.
ISO14091:2021 Adaptation to climate change – Guidelines on vulnerability, impacts and risk assessment (International Organisation for Standardisation, 2021)	This international standard provides guidelines on approaches to assessing climate change-related risks. It highlights the role of risk assessments in improving climate change adaptation planning and informing climate change adaptation activities from their implementation through to monitoring.
EIA Guide to: Climate Change Resilience and Adaptation 2020 (IEMA, 2020)	This IEMA guidance provides a framework for the effective consideration of climate change resilience and adaptation in the EIA process. This has informed the methodology of the CCR assessment in this chapter.

Guidance document	Context
Environment Agency Guidance Flood Risk Assessments: Climate Change Allowances (Environment Agency, 2022)	The supporting Environment Agency planning practice guidance, “Flood risk assessments: climate change allowances”, contains guidance on how to make allowances for climate change when preparing flood risk assessments to minimise vulnerability of Projects to flooding and coastal change. The allowances are for potential future increases in river flood flows, extreme rainfall intensity and sea level rise. The potential increases in these parameters should be taken in account for over the development’s expected lifetime. It also provides guidance on sensitivity testing of these assessments.
UK Climate Risk Independent Assessment (Betts, R.A. & Brown, K, 2021) and UK Climate Change Risk Assessment 2022 (Department of Environment, Food and Rural Affairs (Defra), 2022).	The UK Government Third CCRA fulfils the requirement under the Climate Change Act 2008 for the UK Government to produce a five-yearly assessment of the risks for the UK of the current and predicted impacts of climate change. The CCR assessment highlights key climate risks and opportunities that have been used to inform the assessment within this chapter.

29.13 Consultation and engagement

Overview

29.13.1 Consultation and engagement exercises that were undertaken, and responses that are relevant to the climate change resilience of the Proposed Development are detailed in this section.

Scoping Opinion

29.13.2 Rampion Extension Development Limited (RED) submitted a Scoping Report (RED, 2020) and request for a Scoping Opinion to the Secretary of State (administered by the Planning Inspectorate) on 2 July 2020. A Scoping Opinion (Planning Inspectorate, 2020) was received on 11 August 2020. **Table 29-16** sets out the comment received in Section 3 of the Planning Inspectorate (2020) Scoping Opinion ‘ES Approach’ and how this have been addressed in this ES. A full list of the Planning Inspectorate Scoping Opinion comments and responses is provided in **Appendix 5.2: Response to the Scoping Opinion, Volume 4** of the ES (Document Reference 6.4.5.2).

Table 29-16 PINS Scoping Opinion responses – Climate Change Resilience

Planning Inspectorate ID number	Scoping Opinion comment	How this is addressed in this ES
3.3.22	In paragraph 3.3.22 of the Scoping Opinion, the following comment was received in relation to climate change: "The ES should include a description and assessment (where relevant) of the likely significant effects the Proposed Development has on climate (for example having regard to the nature and magnitude of greenhouse gas emissions) and the vulnerability of the project to climate change. Where relevant, the ES should describe and assess the adaptive capacity that has been incorporated into the design of the Proposed Development. This may include, for example, alternative measures such as changes in the use of materials or construction and design techniques that will be more resilient to risks from climate change" (Planning Inspectorate, 2020).	In response to paragraph 3.3.22 of the Scoping Opinion (Planning Inspectorate, 2020), this chapter includes the policy requirements of relevance to the resilience of the Proposed Development to climate change. It also includes a Climate Change Resilience Assessment (CCRA) containing existing and future baseline data and current understanding with regards to climate and extreme weather impacts. It also details the commitments to embedded environmental measures which increase the resilience of the Proposed Development to climate change. There is also an In-Combination Climate Impacts (ICCI) assessment which assesses how the effects of climate change could exacerbate or ameliorate potential environmental effects or affect the efficacy of the proposed environmental measures in other topics chapters.

Statutory Consultation

29.13.3 The Proposed Development's first Statutory Consultation exercise under Section 42 of the Planning Act 2008 ran from 14 July to 16 September 2021, a period of nine weeks. The Preliminary Environmental Information Report (PEIR) (Rampion Extension Development Ltd (RED), 2021) was published as part of first statutory consultation exercise which provided preliminary information on climate change resilience within Appendix 5.5: Vulnerability to climate change – policy and baseline (RED, 2021).

29.13.4 **Table 29-17** provides a summary of the key issues raised in the feedback received during the first Statutory Consultation exercise in relation to climate change resilience and outlines how the feedback has been considered in this ES chapter.

Table 29-17 Formal consultation feedback

Stakeholder	Issue	How this is addressed in this ES
West Sussex County Council (WSCC)	WSCC stated that it was difficult to get a full representation of how the Proposed Development has considered climate change resilience across the aspects. There are opportunities to improve this and make it easier for the reader, therefore WSCC expects this to be presented in more detail in the ES.	The approach has been extending from that presented at both the scoping stage and at PEIR (RED, 2021), to include a full CCRA. Included in this, **Section 29.20** contains an In-combination Climate Impact (ICCI) assessment. This includes an assessment of the significance of the impacts of the climate change trends outlined in **Section 29.16**, on the effects and measures included within other relevant topic chapters.
WSCC	WSCC stated that when cross checking chapters that were listed as relevant to climate change in this Appendix at PEIR (RED, 2021), it was often difficult to find evidence of how climate change had been considered within those chapters.	
Natural England	Natural England stated that Additional baseline parameters should be assessed in the Chapter 6: Coastal processes, Volume 2 including coastal frontage variability under a range of coastal management and climate change scenarios.	**Appendix 6.1: Coastal processes technical report: Baseline description, Volume 4** of the ES (Document Reference 6.4.6.1) includes information about coastal frontage variability under a range of coastal management and climate change scenarios.

29.13.5 Following feedback to the Statutory Consultation in 2021 and after further analysis, it was identified that some coastal residents did not receive consultation leaflets as intended. Therefore, the Statutory Consultation was reopened between 7 February 2022 to 11 April 2022 for a further nine weeks. The original PEIR (RED, 2021) published as part of the Statutory Consultation in 2021 was unchanged and re-provided alongside the reopened Statutory Consultation in early 2022. No further comments were received in relation to CCR.

29.13.6 In addition to the first Statutory Consultation exercise in 2021, RED undertook three further Statutory Consultation exercises:

- Second Statutory Consultation exercise – October to November 2022: This was a targeted consultation which focused on updates to the onshore cable route proposals which were being considered following feedback from consultation and further engineering and environmental works.
- Third Statutory Consultation exercise – February to March 2023: This was a targeted consultation which focused on a further single onshore cable route

alternative being considered following feedback from consultation and further engineering and environmental works.

- Fourth Statutory Consultation exercise – April to May 2023: This was a targeted consultation which focused on the proposed extension works to the existing National Grid Bolney substation to facilitate the connection of the onshore cable route into the national grid electricity infrastructure.

29.13.7 As part of the second, third and fourth Statutory Consultation exercises, RED sought feedback on the potential changes to the onshore cable route proposals and the proposed existing National Grid substation extension works to inform the onshore design taken forward to Development Consent Order (DCO) Application.

29.13.8 For CCR, no feedback was received in the second, third and fourth Statutory Consultation exercises.

29.13.9 A full list of all comments received during the Statutory Consultation exercises and the responses to those comments is provided in the **Consultation Report** (Document Reference: 5.1).

29.14 Scope of the assessment

Overview

29.14.1 This section sets out the scope of the ES assessment for CCR.

Spatial scope and Study Area

29.14.2 The Study Area for the CCR assessment is defined by the spatial extent of the Proposed Development, illustrated as the proposed DCO Order Limits in **Figure 1.1, Volume 3** of the ES (Document Reference 6.3.1). and described in **Chapter 4: The Proposed Development, Volume 2** of the ES (Document Reference 6.2.4).

29.14.3 The CCR assessment considers the Proposed Development receptors within the proposed DCO Order Limits. This includes receptors onshore and offshore which are outlined in **Table 29-18.**

Temporal scope

29.14.4 The temporal scope of the CCR assessment is the entire lifetime of the Proposed Development. The temporal scope has informed the climate periods used to form the future climate baseline for the CCR assessment. As such, the future baseline is used to set out general climatic conditions that would be experienced through the construction, operation and maintenance, and decommissioning phases:

- The overall duration of the construction phase is anticipated to be up to 5 years and is expected to be fully commissioned by 2029. The construction phase is considered within the climate period 2030s (2020 – 2039).
- The operational lifetime of the Proposed Development is assumed to be around 30 years. This is the assumption for the purposes of the EIA, but it is

acknowledged that the operational lifetime could be longer. The operation of the Proposed Development is therefore considered within the climate periods 2030s (2020 – 2039), 2050s (2040-2059) and 2070s (2060-2079).

- Decommissioning would take place at the end of the operational lifetime. The period in which decommissioning would take place is considered within the climate period 2070s (2060–- 2079).

Potential receptors

29.14.5 The spatial and temporal scope of the assessment enables the identification of receptors which may be impacted by climate change. The receptors identified that may experience likely significant effects from climate change are outlined in **Table 29-18**.

Table 29-18 Receptors requiring assessment for climate change resilience

Receptor group	Receptors included within group
Building and infrastructure receptors	The Proposed Development assets, both temporary and permanent, throughout the lifecycle of the Proposed Development
Human health receptors	Construction workers, operational and maintenance staff
Environmental receptors	Habitats and species associated with direct activities of the Proposed Development

29.14.6 The potential receptors under consideration for the CCR assessment were collated based on the Proposed Development design details. The asset design life for each asset was also ascertained.

29.14.7 The receptors of the ICCI assessment reflect the environmental receptors associated with the technical chapters under consideration.

29.15 Methodology for baseline data gathering

Overview

29.15.1 Baseline data collection was undertaken to obtain information over the Study Areas described in **Section 29.14: Scope of the assessment**. The current climate change resilience baseline conditions presented in **Section 29.16: Baseline conditions** sets out data currently available information from the Study Area.

Desk study

29.15.2 Data that informed the current and future climate change resilience baselines was obtained from desk studies. No surveys were required to establish the baselines.

29.15.3 Climate variables that are considered relevant to the climate change resilience of the Proposed Development are:

- changes to wind speed and direction;
- changes to significant wave height (a term used to define characteristic height of typical ocean waves);
- changes to air and sea surface temperatures;
- changes to precipitation;
- changes in lightning strikes; and
- changes in sea level and storm surges.

29.15.4 The data sources that were identified and used to inform this climate assessment are summarised in **Table 29-19**.

Table 29-19 Data sources used to inform the climate change resilience ES assessment

Source	Date	Summary	Coverage of Study Area
Met Office (Met Office, 2016)	2016	Southern England: Climate (Met Office, 2016) data set	Full coverage of Study Area
Met Office UK Climate Projections 2018	2018	UK Climate Projections 2018 (UKCP18) (Met Office, 2018a) have been produced by the Met Office and provides the latest set of climate change projections for the UK. It includes projections of how key climate parameters could change in the coming decades, as well as forecasts for sea level rise. UKCP18 projections are used as the basis of future baseline assessment. UKCP18 are the de facto projections for use in climate change impact and adaptation assessment in the UK.	Full coverage of Study Area
Science Overview Report (Lowe, J. A., et al., 2018).	2018	The UKCP18 Climate Projections were issued with a suite of accompanying scientific reports.	Full coverage of Study Area

Source	Date	Summary	Coverage of Study Area
UKCP18 Land projections: Science Report (Palmer, M. et al., 2018a) **UKCP18 Marine Report (Palmer, M. et al., 2018b)** **4. UKCP18 Factsheets: Precipitation (Met Office, 2018e) Wind (Met Office, 2018f) Snow (Met Office, 2018g)**	2018 2018 2018	The Overview Report, Land Projections and Marine Report give a summary of the anticipated climate change trends found within the projection data, evaluating the projection pathways, and provide direction on the use of the data in terms of the nature and degree of consistency within the modelling results. The Factsheets are available as a short qualitative overview of the UKCP18 results for the climate parameters. The reports are used in developing the future baseline and climate trends used in the vulnerability assessment.	Full coverage of onshore portion of the Study Area Full coverage of offshore portion of Study Area Full coverage of onshore portion of Study Area
UK CCRA 2021, Chapter 4: Infrastructure (Jaroszweski, D., et al., 2021)	2021	This chapter provides an assessment of risks and opportunities associated with climate change on infrastructure, such as energy, and includes an assessment of offshore infrastructure.	Full coverage of the Study Area.
International Council for the Exploration of the Sea (ICES) Ecosystem Overviews: Greater North Sea Ecoregion	2018	The ICES provide overviews of the characteristics of sea ecoregions, including the Greater North Sea (the ecoregion which includes the English Channel where the Proposed development is situated). This information has been used to develop the current offshore baseline.	Full coverage of offshore portion of Study Area
Report Card 2020 (Marine Climate Change Impacts Partnership (MCCIP), 2020)	2020	This provides scientific understanding of climate change impacts on UK coasts and Seas. It is used in developing the offshore future baseline and climate trends used in the vulnerability assessment.	Full coverage of offshore portion of Study Area

29.15.5 In order to supplement the above data sources, peer-reviewed scientific literature (Moemken et al., 2018; Rädler et al., 2019; Pryor et al, 2020; Tinker and Howes,

2020; Pickering et al., 2012) and expert reports (Copernicus Climate Change Service, 2019) were used to establish a robust baseline.

Data limitations

29.15.6 The CCR assessment is associated with a range of assumptions and limitations including:

- uncertainties with climatic trends and how they are presented at the regional scale. For the CCR assessment, a range of projections are used from UKCP18;
- design information was gathered as it became available to be able to refine the scope of the CCR assessment; and
- limited quantitative climate data is available for offshore locations in a format applicable to the CCR assessment.

29.16 Baseline conditions

Current baseline

Onshore

29.16.1 The current baseline is the existing representative climatic conditions with respect to the proposed DCO Order Limits. This is used to provide context of the changes in climate and conditions and their impacts throughout the construction, operation and maintenance, and decommissioning phases of the Proposed Development.

29.16.2 The current climate for the area within which the onshore elements of the Proposed Development are located is described in the report '*Met Office Southern England: Climate*' (Met Office, 2016). This report provides a regional climate summary for land conditions in southern England (Met Office, 2016) with a focus on the 30-year averaging period of 1981–- 2010:

- mean annual temperature along the south coast of England is approximately 11.5°C, with mean maxima are close to 21°C along the south coast;
- January is the coldest month with daily minimum temperatures of about 3°C. In contrast, maximum temperatures occur in July or August and are typically associated with heat waves lasting several days;
- coastal regions can be affected by sea breezes which result in lower maximum temperatures than further inland from late spring through the summer and milder temperatures in winter;
- annual rainfall totals vary from 550 – 950 mm. Periods of prolonged rainfall can lead to widespread flooding, especially in winter and early spring when soils are usually near saturation; and
- Southern England is one of the more sheltered parts of the UK. Mean wind speed and gusts (short duration peak values) are strongest in winter from December to February.

29.16.3 The nearest weather station with observable data available through the Met Office is at Bognor Regis. Key data relevant to the CCR assessment is contained in **Table 29-20**.

Table 29-20 Baseline climate data 1981-2010 (Met Office, 2022b)

Climate Period (1981-2010)	Nearest weather station: Bognor Regis	Regional: Southern England	National: England
Monthly average rainfall (mm)	60.43	65.95	70.82
Days of rainfall > 1mm (days)	111.54	126.72	133.01
Minimum annual average temperature (°C)	7.95	6.15	5.85
Maximum annual average temperature (°C)	14.11	13.99	13.46
Maximum summer average temperature (°C)	20.99	21.60	20.94
Mean wind speed at 10m (knots)	(data unavailable)	8.14	8.44
Air frost (days)	24.7	46.27	49.70

Offshore

29.16.4 The offshore elements of the Proposed Development, situated in the English Channel, fall in the sub-region of the Greater North Sea. The Greater North Sea is strongly influenced by the inflow of oceanic water from the Atlantic Ocean, wind and tidal events. The English Channel specifically, is influenced by the movements of the Atlantic Ocean to the west and North Sea water to the east., as well as the action of the tide. These elements mean that the English Channel is characterised by a complex current and tidal system, which in the presence of strong winds, can result in rough seas. (ICES, 2018).

29.16.5 Its oceanography is characterized by a permanently thermally mixed water column. The temperature of the near-surface water layer, averaged over the Greater North Sea ecoregion, reaches approximately 16°C in summer and a falls to 6°C in late winter. (ICES, 2018).

Future baseline

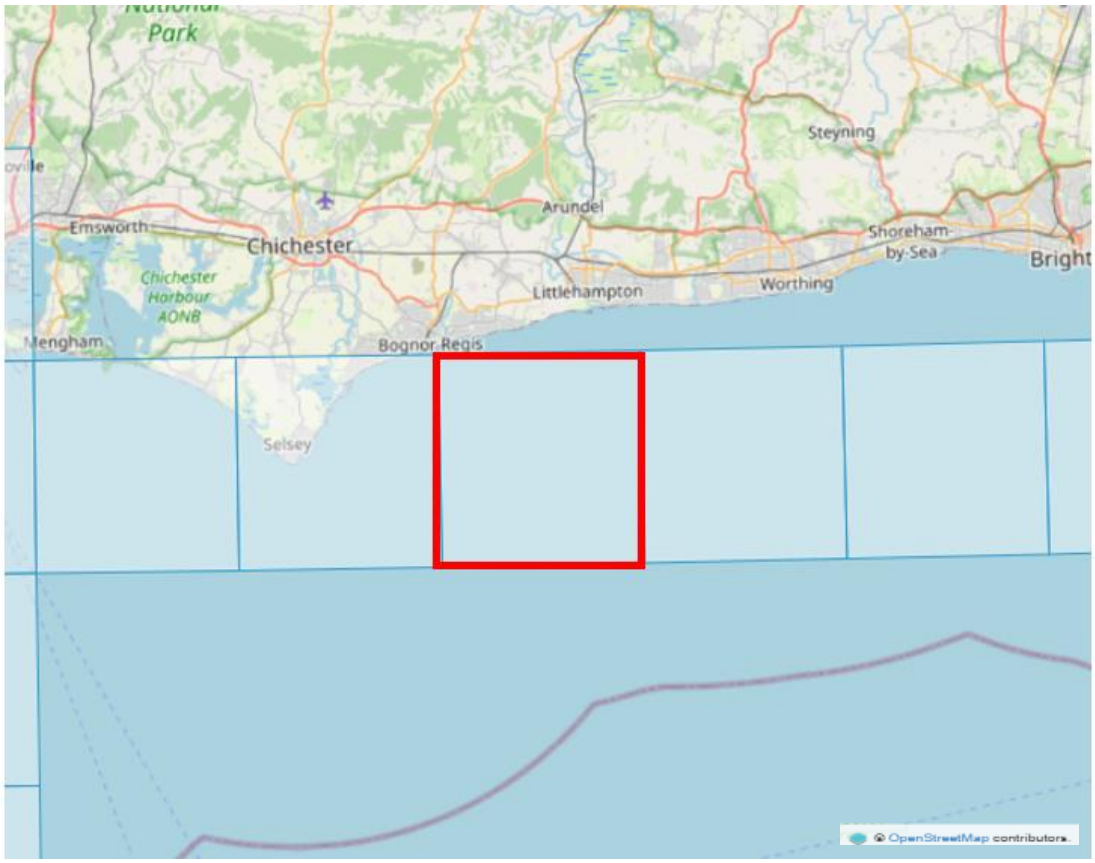
29.16.6 The UK Climate Projections 2018 (UKCP18) (Met Office, 2018a) are used as the basis of future baseline assessment. UKCP18 projections are generally used in climate change resilience assessment in the UK.

29.16.7 The most relevant UKCP18 grid square for the Proposed Development was used to download the relevant climate data to represent the spatial scope of the future baseline. This is either a 25km^2 or marine grid square (Met Office, 2018a), based on the information required.

29.16.8 The grid square for onshore elements of the Proposed Development is shown in **Graphic 29-1**. The grid square for UKCP18 marine projections, is shown in **Graphic 29-2**. Although parts of the offshore elements of the Proposed Development may cover several marine grid squares, the square outlined in **Graphic 29-2** has been chosen as representative given that the majority of offshore infrastructure will be located within its boundary.

Graphic 29-1 Onshore Study Area for UKCP18 data extraction

Graphic 29-2 Study Area for marine UKPC18 projections



29.16.9 The potential effects of climate change are projected to increase over time. The changes in climate variables have been assessed for the '2030s' (2020 – 2039), the '2050s' (2040 – 2059) and the '2070s' (2060-2079) in line with the anticipated construction, operation and maintenance, and decommissioning phases of the Proposed Development.

29.16.10 Climate scenarios and pathways provide plausible representations of future states of the climate system, incorporating socio-economic, technological demographic and environmental development. Representative Concentration Pathways (RCP) were developed for the Fifth Assessment Report (AR5) by the Intergovernmental Panel on Climate Change (IPCC) (IPCC, 2014).

29.16.11 The future baseline considers RCPs to understand changes in climate variables under a high emissions scenario (RCP8.5). RCP8.5 is a potential future pathway which is slow to transfer to a low-carbon energy provision. RCP8.5 is considered a possible, but conservative, emission scenario suitable for evaluating the climate resilience of long-lifetime projects.

29.16.12 In accordance with NPS EN-1 (DECC, 2011b), the 10 percent, 50 percent and 90 percent probability levels will be considered in the CCR assessment as a minimum. Probabilistic climate projections, such as UKCP18, assign a probability to climate change outcomes based on a probability distribution function (PDF), which shows the possible range of climate change with the 50 percent probability level the median value.

29.16.13 Where data is available, climate variables for future climate conditions have been downloaded directly from UCKP18, relative to a 1981-2010 baseline.

29.16.14 Where information is not directly available, climate risks have been assessed using a combination of variables and/or sources and information outside of UKCP18, or from technical guidance provided alongside UKCP18.

29.16.15 The anticipated direction of change for different climate variables under climate change scenarios RCP8.5 is also shown in **Table 29-21**. The table includes an indication of the direction of change based on latest scientific understanding in terms of increases, decreases, or no distinguishable change, high uncertainty in the expected trend, or negligible change.

29.16.16 The future baseline is based on an anomaly change (i.e. the expected change relative to baseline conditions using the baseline period of 1981-2010 (Met Office, 2016) or suggested trend.

29.16.17 On land, the key trend is towards warmer, wetter winters and hotter, drier summers (Met Office, 2019). Offshore warming seas, reduced oxygen, ocean acidification and sea-level rise are described as key risks for the future baseline in UK seas (MCCIP, 2020).

Onshore

29.16.18 The climate data was extracted from UKCP18 over the Study Area. This data is tabulated in **Table 29-21**.

Table 29-21 Future climate projections for the Study Area from UKCP18 – onshore

Climate Variable		Time Slice and Projected Change			Trend line
		2030s (2020-2039)	2050s (2040-2059)	2070s (2060-2079)	
Mean temperature change (Summer) (°C)	10% 50% 90%	0.37 1.38 2.38	1.15 2.58 4.04	1.87 4.03 6.19	↑ ↑ ↑
Mean temperature change (Winter) (°C)	10% 50% 90%	0.01 0.90 1.77	0.49 1.62 2.85	0.88 2.46 4.22	↑ ↑ ↑
Maximum temperature anomaly (Summer) (°C)	10% 50% 90%	0.20 1.53 2.85	0.96 2.83 4.79	1.70 4.42 7.21	↑ ↑ ↑
Minimum winter temperature, (°C)	10% 50% 90%	0.50 0.94 1.95	0.41 1.73 3.21	0.73 2.65 4.79	↑ ↑ ↑

Climate Variable		Time Slice and Projected Change			Trend line
Mean precipitation change (Winter) (%)	10% 50% 90%	-5.91 9.35 26.17	-3.63 15.48 37.79	-4.00 22.26 53.63	↑ ↑ ↑
Mean precipitation change (Summer) (%)	10% 50% 90%	-32.09 -6.75 18.89	-47.90 -18.27 11.69	-59.20 -26.79 8.54	↓ ↓ ↓
5-day total summer precipitation (mm)	10% 50% 90%	68.87 74.77 81.25	66.09 74.63 84.11	62.03 74.63 88.39	↓ ↓ ↑
5-day total winter precipitation (mm)	10% 50% 90%	88.87 84.97 89.70	81.70 87.44 94.54	82.47 90.76 100.99	↓ ↑ ↑

Temperature

29.16.19 Climate projections show trends towards warmer temperatures over land.

29.16.20 Projections suggest a trend towards warmer winter temperatures and hotter summer temperatures (Met Office, 2018b).

Precipitation

29.16.21 Climate projections suggests that mean winter precipitation is likely to increase in the future.

29.16.22 Climate projections suggest a shift towards warmer, wetter winters and hotter, drier summers over the 21st century. Natural variation in the climate system means that some dry winters and some wet summers will still occur. Summer rainfall reductions tend to be the largest in the south of England compared to the rest of the UK (Met Office, 2018e).

Wind speed and wind direction

29.16.23 Although future climate projections are associated with significant uncertainty, recent research has suggested evidence of increased wind speeds in Europe over the 21st century (Rädler et al., 2019; Pryor et al, 2020). Data from UKCP18 (Met Office, 2018a) indicates an increase in surface wind speeds over the UK for the second half of the 21st century during the winter season, where more significant impacts of wind are experienced. The frequency of winter storms would increase, and this may be accompanied by a modest increase in wind speeds (Met Office, 2018f).

29.16.24 Wind gusts (associated with wind speeds of over 25m/s) are also anticipated to increase in intensity over the 21st century (Rädler et al., 2019; Moemken et al., 2018).

Lightning

29.16.25 Climate projections suggest an increase in the occurrence of lightning strikes across Europe over the 21st century (Rädler et al., 2019).

Offshore

29.16.26 Data from UKCP18 marine projections (Met Office, 2022) were extracted and tabulated in **Table 29-22.**

Table 29-22 Future climate projections for the Study Area from UKCP18 – offshore

Climate Variable		Time Slice and Projected Change			
		2030	2050	2070	Trend line
Mean sea level rise (m)	10%	0.13	0.23	0.36	↑
	50%	0.16	0.30	0.48	↑
	90%	0.20	0.38	0.61	↑

Sea level

29.16.27 In the Study Area, a mean sea level rise of 0.48m could be experienced by 2070 (RCP8.5, 50 percent). Sea level rise over the considered time periods of the Proposed Development is expected to affect tidal characteristics substantially (Met Office, 2018d).

29.16.28 The marine projections also consider that there is no significant additional increase in the statistics of extreme water levels associated with atmospheric storminess only (Met Office, 2018d).

29.16.29 The projections for the 21st century suggest a general reduction in wave heights and extreme waves in the order of 10-20 percent, however this is specific to the location and some coastal regions may remain dominated by local weather variability.

29.16.30 UKCP18 does not provide information on changes to coastal water properties, such as sea surface temperature and acidification (Met Office, 2018d).

29.16.31 Sea level rise may affect tidal characteristics although the contribution to storm surges is unlikely to change (Met Office, 2018d). Changes to tidal characteristics may include a change in tidal range, increases in wavelength and wave depth (Pickering et al., 2012).

Significant wave height and storm surges

29.16.32 Although associated with uncertainty, there are links between climate change and wind, wave and storm activity around the UK. Models and observations suggest there has been an increase in the most severe storms and significant wave heights in recent decades since 1950s in UK waters (MCCIP, 2020).

29.16.33 Climate scenarios project wave height to reduce slightly over the 21st century. While there is a general tendency towards lower wave heights there is no agreement in the direction of change (i.e., an increasing or decreasing signal) among model projections (Met Office, 2018c) and the most severe waves could increase in height (MCCIP, 2020).

29.16.34 UKCP18 data presents no significant change in future storm surges as a result of climate change. It is unknown if storm surges will become more severe, less severe or remain the same over the 21st century (Met Office, 2018d). The chance of severe storms reaching the UK may increase if tropical cyclones become more intense and their region of origin expands northwards due to sea temperature rise, although there is low confidence in these projections (MCCIP, 2020).

Sea temperatures

29.16.35 Projections of increases in sea surface temperatures over the 21st century are accompanied by a decline in sea ice formation. Most models suggest an increase of between 0.25°C and 0.4°C per decade. The Greater North Sea, within which the Proposed development is located, is anticipated to experience greater warming compared to other regions of the UK (MCCIP, 2020).

pH Levels

29.16.36 Ocean pH is declining indicating that seas globally are becoming more acidic. This trend lowers the chemical stability of mineral forms of calcium carbonate and is strongly linked to rising atmospheric CO_2 levels. It is projected, with virtual certainty that this process of ocean acidification means that the future surface open ocean will experience further pH drops (IPCC, 2019).

29.17 Embedded environmental measures

29.17.1 As part of the Proposed Development's design process, a number of embedded environmental measures have been adopted. A number of these measures reduce the potential for impacts on the Proposed Development due to climate change. These embedded environmental measures have evolved over the development process as the EIA has progressed and in response to consultation.

29.17.2 These embedded environmental measures also include those that have been identified as good or standard practice and include actions that would be undertaken to meet existing legislation requirements. As there is a commitment to implementing these embedded environmental measures, and also to various standard sectoral practices and procedures, they are considered inherently part of the design of the Proposed Development and are set out in this ES.

29.17.3 **Table 29-23** sets out the relevant embedded environmental measures within the design and how these affect the climate assessment.

Table 29-23 Relevant climate embedded environmental measures

ID	Environmental measure proposed	Project phase measure introduced	How the environmental measures will be secured	Relevance to climate vulnerability
C-11	During construction, topsoil and subsoil will be stored within the temporary working corridor of the onshore cable. The topsoil and subsoil will be segregated and stored in line with Defra 2009 Construction Code of Practice for the Sustainable Use of Soils on Construction Sites PB13298, including guidance on utilising separate stockpiles and giving due consideration to adverse weather conditions. Any suspected or confirmed contaminated soils will be separated, contained and tested before removed.	Scoping	**Draft Development Consent Order (DCO)**, Schedule 1, Part 3, Requirement 22 Code of construction practice (CoCP) (4) (e)	This measure will ensure that construction works concerning stockpiles will consider adverse weather conditions.
C-24	Best practice air quality management measures will be applied as described in Institute of Air Quality Management (IAQM) (2024) guidance on the Assessment of Dust from Demolition and Construction 2024, version 2.2.	Scoping	**Draft DCO**, Schedule 1, Part 3, Requirement 22 CoCP (4) (h)	This measure will ensure that during increased dry periods, construction works do not create dust which impacts on the health of construction workers and the failure of machinery and equipment.
C-73	Drainage design to manage, attenuate and, if necessary, treat surface water run-off will be included in all elements of temporary and permanent infrastructure. These will be	Scoping	**Draft DCO**, Schedule 1, Part 3, Requirements 17 (1) and 18 (1) Surface and foul water drainage	This measure will ensure the onshore drainage design will include consideration

ID	Environmental measure proposed	Project phase measure introduced	How the environmental measures will be secured	Relevance to climate vulnerability
	designed in accordance with Sustainable Drainage (SuDS) principles including allowances for climate change and discharged at pre-development rates. Where the development intersects overland flow pathways or areas of known surface water flooding appropriate measures will be embedded into the design.		**Draft DCO**, Schedule 1, Part 3, Requirement 22 CoCP (4) (b)	for climate change over its design lifetime.
C-75	Construction and permanent development in flood plains will be avoided wherever possible. Where this is not possible, environmental measures will be developed to ensure the works are National Policy Statement compliant, including a sequential approach to siting of infrastructure and passing the Exception Test where appropriate.	Scoping	**Draft DCO**, Schedule 1, Part 3, Requirement 22 CoCP	This measure will ensure construction and permanent development in flood plains will be avoided wherever possible ensuring a sequential approach to siting of infrastructure.
C-116	The basis of the structural design for the proposed onshore cable corridor and onshore substation and National Grid Bolney substation extension infrastructure will be completed in general accordance with design standards to minimise the risk of structural or geotechnical instability. The structural design of onshore substation buildings will give due consideration to minimum design requirements for	PEIR	**Draft DCO**, Schedule 1, Part 3, Requirement 8 Detailed design approval onshore substation (2), Requirement 9 Detailed design approval – extension to National Grid substation (2)	This measure will ensure the design of the onshore substation buildings will be resilient to climate change over its design lifetime.

ID	Environmental measure proposed	Project phase measure introduced	How the environmental measures will be secured	Relevance to climate vulnerability
	ambient design temperatures, wind pressures and snow loads, including climate change allowances where appropriate.			
C-118	Emergency Response Plans (ERPs) for flood events will be prepared for all construction activities, working areas, access and egress routes in floodplain areas (tidal and fluvial).	PEIR	**Draft DCO**, Schedule 1, Part 3, Requirement 22 CoCP (4) (i)	This measure will ensure that the onshore construction activities include consideration for flooding.
C-184	The contractor(s) for construction, operation and maintenance and decommissioning will use a short to medium range weather forecasting service from the Met Office, or other approved meteorological data and weather forecast provider, to inform short to medium-term programme management of activities, including implementation of necessary environmental control and/or impact mitigation measures with respect to climate conditions and extreme weather events. The contractor(s) will register with the Environment Agency's flood warning service in areas of flood risk. The contractor(s) will use this information to ensure that relevant measures, including those within the Code of Construction Practice and an Environmental Management System (EMS), are	PEIR	**Draft DCO**, Schedule 1, Part 3, Requirement 22 CoCP (4) (i)	This measure will ensure that processes and activities undertaken by contractor(s) for construction, operation and maintenance and decommissioning include consideration for severe weather events.

ID	Environmental measure proposed	Project phase measure introduced	How the environmental measures will be secured	Relevance to climate vulnerability
	implemented and, as appropriate, consider additional measures to ensure the resilience of the programme during extreme weather events.			
C-185	A high-level risk assessment of severe weather impacts on the construction, operation and maintenance and decommissioning process will be produced by the contractor(s) to inform mitigations. Any receptors and/or construction, operation and decommissioning related activities potentially sensitive to severe weather events, including projections for climate change, should be considered in the risk assessment.	PEIR	**Draft DCO**, Schedule 1, Part 3, Requirement 22 CoCP (4) (i) **Draft DCO**, Schedule 1, Part 3, Requirement 27 and 28 Operation Phase Maintenance (2) (c)	This measure will ensure that processes and activities undertaken by contractor(s) for construction, operation and maintenance and decommissioning include consideration for severe weather events.
C-187	All aspects of the Proposed Development will be finished to a high standard of design with appropriate material selection, utilising best practice guidance and relevant standard including consideration for potential impacts of climate change. Concepts within relevant international and national guidance for embedding climate change into technical standards will be embedded within the further design of all assets e.g. CEN/CENELEC GUIDE 32: Guide for addressing climate change adaptation in standards (2016). This will ensure the	PEIR	**Draft DCO**, Schedule 1, Part 3, Requirement 8 Detailed design approval onshore substation, Requirement 9 Detailed design approval – extension to National Grid substation	This measure will ensure that all aspects of the Proposed Development will be designed with consideration for potential impacts of climate change. This will ensure the design is resilient to climate change during the lifetime of the Proposed Development.

ID	Environmental measure proposed	Project phase measure introduced	How the environmental measures will be secured	Relevance to climate vulnerability
	design is resilient to climate change and able to withstand all foreseeable weather conditions during the operational life of the project. The design will use quality materials that are resilient to climate change to avoid deterioration and minimise the need for maintenance.			
C-190	The Proposed Development will be designed incorporating the current wind loading standards, which incorporate site specific criteria based on a number of factors including wind direction, altitude and topography. Wind Turbine Generator (WTG) foundations, towers and other components will be designed at detailed design stage to withstand expected changes in climate conditions during the operational life of the Proposed Development.	PEIR	**Draft DCO**, Schedule 11, Part 2, Condition 11 (a) (i)	This measure will ensure the Proposed Development is resilient to extreme weather conditions for winds and changes in climatic conditions.
C-193	Replacement planting will be characteristic of the area and resilient to climate change. Plant species will be selected carefully at detailed design stage with appropriate management and maintenance techniques established to support the development of these species in line with the environmental requirements.	PEIR	**Draft DCO**, Schedule 1, Part 3, Requirement 12 Provision of landscaping (1), Requirement 13 Implementation and maintenance of landscaping (1)	This measure will ensure that replacement planting for the Proposed Development is resilient to climate change
C-233	Construction activities will be planned through use of a Risk Assessment Method	ES	**Draft DCO**, Schedule 1, Part	This measure will ensure that processes and

ID	Environmental measure proposed	Project phase measure introduced	How the environmental measures will be secured	Relevance to climate vulnerability
	Statement (RAMS) alongside safety bulletins as part of the CoCP. Safety bulletins will include alerts for upcoming hot spells, rainfall events and high winds or storm events. The RAMS will put in place procedures in the case of extreme weather (high temperatures, extreme winds, flooding, wildfire risk). This may include altering the construction programme to delaying affected activities, changing shift patterns, Personal Protective Equipment (PPE), toolbox talks and alternative trackmatting for sensitive sections of construction areas.		3, Requirement 22 CoCP (4)	activities undertaken by contractor(s) for construction include consideration for severe weather events
C-237	Risk Assessment Method Statement (RAMS) will be used as part of operating procedures to plan operation and maintenance activities. For example, the RAMS will include measures for working in increasingly high temperatures, prolonged wet weather and set out adequate planning for extreme weather events such as flooding and wildfire.	ES	**Draft DCO**, Schedule 1, Part 3, Requirement 27and 28 Operation phase maintenance (2) (c)	This measure will ensure that processes and activities undertaken as part of the operation and maintenance phase include consideration for severe weather events.
C-240	It is anticipated that similar environmental measures to those embedded into the Project design for the construction phase would be implemented at the decommissioning phase. This would include planning for extreme weather and material	ES	**Draft DCO**, Schedule 1, Part 3, Requirement 34 Onshore decommissioning (2)	This measure will ensure that processes and activities undertaken by contractor(s) for decommissioning include consideration

ID	Environmental measure proposed	Project phase measure introduced	How the environmental measures will be secured	Relevance to climate vulnerability
	selection in accordance with climate conditions at that time. The decommissioning phase would be subject to a written phase of decommissioning for approval by the local planning authority.			for severe weather events.

29.17.4 Further detail on the environmental measures in **Table 29-23** is provided in the **Commitments Register** (Document Reference: 7.22) which sets out how and where particular environmental measures will be implemented and secured.

29.18 Methodology for ES assessment

Introduction

29.18.1 The project-wide generic approach to assessment is set out in **Chapter 5: Approach to the EIA, Volume 2** of the ES (Document Reference: 6.2.5). However, whilst this has informed the approach that was used in the CRR Section of this Chapter, it is necessary to set out how this methodology was applied, and adapted as appropriate, to address the specific needs of the CCR assessment.

29.18.2 The assessment methodology for the CCR was set out into two stages. The first stage was the Climate Vulnerability Assessment which evaluated the vulnerability of the identified receptors to climate change across the Proposed Development's lifetime. The vulnerability of the receptors depends on the sensitivity and exposure of the receptors to climate trends identified within the future baseline. The outcome of the vulnerability assessment identified potential significant effects where there are receptors of 'medium' or 'high' vulnerability to climate impacts to be taken forward to the CCR assessment. Any receptors considered to be of 'low' vulnerability were scoped and not taken forward for full assessment.

29.18.3 The second stage was the Climate Change Risk Assessment (CCRA), used to assess the likelihood and the consequence (magnitude of climate change impacts) to determine the significance of the effect.

29.18.4 The CCR and ICCI assessments were undertaken by climate change aspect specialists in collaboration with relevant design teams and aspect specialists (such as ecologists, design engineers, etc.).

Stage 1: Climate Vulnerability Assessment

29.18.5 The future baseline presented in **Section 29.16** was analysed to provide an understanding of the climate trends that have the potential to affect the Proposed

Development. The climate variables were assessed for the time periods across the Proposed Development's lifetime.

29.18.6 The vulnerability assessment is the outcome of an assessment of the sensitivity and exposure of the receptors to the climate trends. This is used to identify those impacts with a potential significant effects to be carried forward for a full assessment.

Sensitivity of the receptor to the climate impact

29.18.7 The sensitivity of a receptor can be defined by International Organisation for Standardization (ISO), (2021) ISO14091 as "*the degree to which a system or species is affected, either adversely or beneficially, by climate variability or change*".

29.18.8 The definitions of the levels of sensitivity experienced by a receptor to the climate impact are contained within **Table 29-24**.

Table 29-24 Definitions of levels of sensitivity of the receptor to the climate impact

Level of Sensitivity	Definition
High	The receptor has no ability to withstand / not be substantially altered by the projected climate impacts. It will lose much of its original function and form.
Moderate	The receptor has some limited ability to withstand / not be altered by the projected climate impacts. It can retain elements of its original function and form.
Low	The receptor has the ability to withstand / not be altered much by the projected climate impacts. It can retain much of its original function and form.

Exposure of the receptor to the climate impact

29.18.9 The exposure assessment assesses the degree to which the receptor would be affected by the climate impact. The definition of exposure used within ISO14091 (ISO, 2021) is the "*presence of people, livelihoods, species or ecosystems, environmental functions, services, resources, infrastructure, or economic, social or cultural assets in places and settings that could be affected*".

29.18.10 The construction phase was assessed as exposure of the construction assets to climate trends of the '2030s' (2020 – 2039), and the operational phase used analysis from the '2030s', '2050s' and '2070s' where it is likely that the level of exposure will increase over time. The decommissioning phase also used 2070s (2060 – 2079). Definitions of increasing levels of exposure are contained within **Table 29-25.**

Table 29-25 Definitions of levels of exposure of the receptor to the climate impact

Level of Exposure	Definition
High	The receptor is highly affected by the climate impact and is only able to tolerate a very limited variation in climate conditions.
Medium	The receptor is able to tolerate a range of climate conditions but is affected by the climatic impact.
Low	The receptor is influenced very little by the climate impact.

Vulnerability of the receptor

29.18.11 The vulnerability of a receptor to climate impacts is defined as the "*propensity or predisposition to be adversely affected*" (IPCC, 2014).

29.18.12 The exposure and sensitivity of the receptor to climate impacts were assigned a level of vulnerability, as shown in **Table 29-26**.

Table 29-26 Matrix showing vulnerability of receptors to climate impacts

Sensitivity	Exposure		
	Low	**Medium**	**High**
Low	Low Vulnerability	Low Vulnerability	Low Vulnerability
Moderate	Low Vulnerability	Medium Vulnerability	Medium Vulnerability
High	Low Vulnerability	Medium Vulnerability	High Vulnerability

29.18.13 Where the vulnerability of the receptor to a climate impact was assessed to be 'medium' or 'high', this was considered as a likely significant effect and was scoped in to the full CCR risk assessment to be presented in the ES.

Stage 2: Climate Change Risk Assessment

The second stage was the Climate Change Risk Assessment (CCRA), used to assess the likelihood and the consequence (magnitude) of climate change impacts identified as having medium or high vulnerability. This was used to determine the significance of the effect.

Likelihood

29.18.14 The likelihood of the climate change impact on the receptor occurring takes into account the climate change trends and the anticipated exposure of the receptor to the trend. An indicative scale used for assessing the likelihood of the climate change impact on the receptor is contained in **Table 29-27**.

Table 29-27 Indicative scale for assessing the likelihood of a climate change impact on the receptor

Likelihood category	Description (probability and frequency of occurrence)
Very likely	The impact is almost certain to occur during the phase of the Proposed Development considered.
Likely	The impact is considered likely to occur during the phase of the Proposed Development considered.
Possible	The impact is as likely as not to occur during the phase of the Proposed Development considered.
Unlikely	The impact is unlikely to occur during the phase of the Proposed Development considered, but still could occur at least once.
Very unlikely	The impact is high unlikely to occur during this phase of the Proposed Development considered and is considered rare.

Consequence

29.18.15 The consequence if the climate change impact occurs is the magnitude of change felt by the receptor. The vulnerability of the receptor to the climate change impact is considered when assessing the consequence level by incorporating the sensitivity analysis in the Vulnerability Assessment. An indicative scale used for assessing the consequence of the climate change impact on the receptor is contained within **Table 29-28**.

Table 29-28 Indicative scale for assessing the consequence (magnitude of change) of a climate change impact on the receptor

Consequence category	Consequence criteria
Catastrophic	The impact could lead to complete shutdown of operations, loss of the asset, or collapse. There could be single or multiple fatalities and significant harm to the environment with limited prospect of full recovery. Social implications could lead to community protests and high financial implications.

Consequence category	Consequence criteria
Major	The impact could lead to disruption to activities lasting more than one week. There could be major or multiple injuries which could be permanent. Environmental damage could be significant with recovery times over a year and non-compliance with regulations and consents. National and long-term social impacts could be endured. The impact would require extensive mitigation actions.
Moderate	The impact could lead to disruption to activities lasting more than one day but less than one week. There could be moderate environmental damage with wider effects and recovery of up to a year. Moderate cost and social implications which are localised yet long-term. This could lead to a serious injury requiring lost time. The impact would require emergency mitigation actions to be in place.
Minor	The impact could lead to disruption to activities lasting less than one day. There could be localised environmental impact within the site boundary, localised and temporary social or reputational impacts, and a minor cost implication. This could lead to a minor injury requiring medical treatment. The impact could be rectified through additional mitigation actions to be put in place.
Minimal	The impact could lead to disruption to an isolated section of activity with limited social, economic and environmental consequences. It could equate to a minor first aid case. The impact could be rectified through usual activity.

Significance of residual effects

29.18.16 The level of the risk on the Proposed Development is concluded in this risk assessment as a function of the likelihood and magnitude of the climate change impacts. This will identify any significant potential residual effects and where further mitigation and adaptation measures will be required, shown as significant effects within the matrix in **Table 29-29**.

Table 29-29 Significance of CCR residual effects

Likelihood	Magnitude				
	Minimal	**Minor**	**Moderate**	**Major**	**Catastrophic**
Very unlikely	Negligible (NS)	Negligible (NS)	Minor (NS)	Moderate (S)	Moderate (S)
Unlikely	Negligible (NS)	Minor (NS)	Minor (NS)	Moderate (S)	Major (S)
Possible	Minor (NS)	Minor (NS)	Moderate (S)	Major (S)	Major (S)
Likely	Moderate (S)	Moderate (S)	Major (S)	Major (S)	Major (S)
Very likely	Moderate (S)	Major (S)	Major (S)	Major (S)	Major (S)

Note: (S) denotes a significant or potentially significant effect, (NS) denotes a non-significant effect.

ICCI Assessment

29.18.17 The ICCI assessment is the assessment of how the effects of climate change could exacerbate or ameliorate potential environmental effects or affect the efficacy of the proposed environmental measures in the future. The methodology for the ICCI assessment therefore employs the methodologies set out by each individual topic chapter.

29.19 Assessment of effects

Vulnerability Assessment

29.19.1 In line with the EIA Regulations 2017, the EIA for the Proposed Development considered those impacts where there is a risk of a likely significant effect only. The following section draws on industry experience and expertise to identify those effect-receptor pathways that may potentially lead to a significant impact. Where experience and available evidence indicates an effect-receptor pathway will not lead to a significant impact with regards to the EIA Regulations 2017 the pathway is scoped out from assessment. This is done through the vulnerability assessment as described in this Section.

29.19.2 Those climate change impacts assessed in the Vulnerability Assessment as having a ‘medium’ or ‘high’ vulnerability to the projected climate change trends have been included in the likely significant CCR effects summarised in **Table 29-30**, **Table 29-31** and **Table 29-32** for construction, operation and decommissioning phases, respectively.

29.19.3 The vulnerability assessment is based on a combination of the Proposed Development definition, embedded environmental measures, understanding of the baseline conditions at this stage, the evidence base for CCR impacts on the operability and lifespan of the assets, and professional judgement.

29.19.4 The identification of likely significant effects is used here as a tool aimed at delivering a proportionate approach to the EIA. In doing so, it sets out a high-level assessment of all potential effects, significant or not. The basis for scoping out certain effects is presented after the table, supported by the evidence base.

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Construction phase

Table 29-30 Vulnerability assessment – Construction phase

Climate trend	Embedded environmental measures	Impact	Proposed Approach	Receptor	Vulnerability
Onshore					
Increased annual mean temperatures, especially in the summer months, and an increase in the frequency and intensity of hot spells.	C-184, C-185, C-233	Increased heat stress or heat exhaustion experienced by the construction workforce.	Scoped in.	Human health	Medium Vulnerability
	C-184, C-185, C-233	Restriction of certain construction activities during hot weather, for example, the pouring of concrete in higher temperatures could reduce the strength and durability of the finished product, and the laying of asphalt could become difficult as it fails to maintain profile during compaction. This could cause programme delay and increased costs.	Scoped out	Building and infrastructure assets	Low Vulnerability
Increased annual mean temperatures and frequency	C-24, C-184, C-185, C-233	Increased dust creation from construction activities, leading to impacts on the health of construction workers and the	Scoped out	Human health	Low Vulnerability

Climate trend	Embedded environmental measures	Impact	Proposed Approach	Receptor	Vulnerability
and intensity of hot spells, coupled with decreased summer precipitation.		failure of machinery and equipment.			
	C-184, C-185, C-233	Risk of wildfires affecting the construction workforce.	Scoped out	Human health	Low Vulnerability
Decrease in summer precipitation leading to drought conditions	C-184, C-185, C-233	Drought conditions impacting water available to use during construction (e.g. for dust suppression).	Scoped out	The natural environment	Low Vulnerability
Increase in precipitation resulting in tidal, fluvial or pluvial flooding.	C-117 C-184, C-185, C-233	Wet weather leading to increased possibility of slips, trips and falls.	Scoped out	Human health	Low Vulnerability
	C-75, C-117, C-184, C-185, C-233	Flooding of construction site access roads causing delays to construction programme.	Scoped in.	Building and infrastructure assets	Medium Vulnerability
	C-75, C-117 C-184, C-185, C-233	Water ingress to equipment or machinery related to construction activities or permanent assets in place during construction, leading to equipment failures or damage.	Scoped in.	Building and infrastructure assets	Medium Vulnerability

Climate trend	Embedded environmental measures	Impact	Proposed Approach	Receptor	Vulnerability
	C-75, C-184, C-185, C-73, C-233	Overwhelming of the construction site drainage system causing flooding across the site.	Scoped in.	Building and infrastructure assets	Medium Vulnerability
Increased in frequency and intensity of storm events.	C-184, C-185, C-233	There is an increased risk of disruption to construction work, such as cranes unable to operate in high winds.	Scoped in.	Building and infrastructure assets	Medium Vulnerability
Offshore					
Increased annual mean temperatures, especially in the summer months, and an increase in the frequency and intensity of hot spells.	C-184, C-185, C-233	Increased heat stress or heat exhaustion experienced by the construction workforce.	Scoped in.	Human health	Medium Vulnerability
	C-184, C-185, C-233	Restriction of certain construction activities during hot weather, for example, the pouring of concrete in higher temperatures could reduce the strength and durability of the finished product, and the laying of asphalt could become difficult as it fails to maintain profile during compaction. This could cause programme delay and increased costs.	Scoped out.	Building and infrastructure assets	Low Vulnerability

Climate trend	Embedded environmental measures	Impact	Proposed Approach	Receptor	Vulnerability
Increased frequency and intensity of storm events and wave heights	C-184, C-185, C-233	Extreme storminess leading to increased unsafe working environments and delays to construction programme.	Scoped in.	Human health	Medium Vulnerability
	C-184, C-185, C-233	There is an increased risk of disruption to construction work, such as cranes / barges / rigs unable to operate in high winds.	Scoped in.	Building and infrastructure assets	Medium Vulnerability

Operation and maintenance phase

Table 29-31 Vulnerability assessment – Operation and maintenance phase

Climate trend	Embedded environmental measures	Impact	Proposed Approach	Receptor	Vulnerability (worst case across lifetime)
Onshore					
Sea level rise.	C-75	Risk to the onshore infrastructure, such as onshore substation, from coastal flooding and erosion.	Scoped in.	Building and infrastructure	High Vulnerability

Climate trend	Embedded environmental measures	Impact	Proposed Approach	Receptor	Vulnerability (worst case across lifetime)
Increase in precipitation resulting in tidal, fluvial or pluvial flooding.	C-73, C-75	Risk to the onshore infrastructure, such as onshore substation, from river, surface water and groundwater flooding.	Scoped in.	Building and infrastructure	High Vulnerability
	N/A	Undermining tree roots leading to additional faults due to falling trees.	Scoped out.	Building and infrastructure	Low Vulnerability
	C-73, C-75, C-118	Restriction of access during flood events, preventing maintenance activities.	Scoped in.	Building and infrastructure	Medium Vulnerability
Fluctuations in mean rainfall across the year, coupled with an increase in mean temperatures, resulting in changes to soil moisture.	C-116	Risk from subsidence to subterranean and surface infrastructure, such as onshore cables and onshore substation.	Scoped in.	Building and infrastructure	Medium Vulnerability

Climate trend	Embedded environmental measures	Impact	Proposed Approach	Receptor	Vulnerability (worst case across lifetime)
Decrease in summer precipitation, leading to drought conditions.	C-187	Changes in water content of soil has an adverse effect on soil resistivity leading to a reduction in cable ratings and the effectiveness of earthing systems at substations.	Scoped in.	Building and infrastructure	Medium Vulnerability
	N/A	Drought conditions undermining tree roots leading to damage to infrastructure due to falling trees.	Scoped out	Building and infrastructure	Low Vulnerability
Increased annual mean temperatures, especially in the summer months, and an increase in the frequency and intensity of hot spells.	C-187	Overheating of mechanical and electrical (M&E) assets such as onshore substation, leading to a decrease in asset performance and rating and/or requiring additional electricity demand for mechanical cooling units.	Scoped in	Building and infrastructure	Medium Vulnerability

Climate trend	Embedded environmental measures	Impact	Proposed Approach	Receptor	Vulnerability (worst case across lifetime)
	C-184, C-185, C-233	Increased heat stress or heat exhaustion experienced by the operational and maintenance workforce.	Scoped in	Human health	High Vulnerability
	C-187	Underground cable systems affected by the increase in ground temperatures, reducing cable ratings.	Scoped in	Building and infrastructure	Medium Vulnerability
	N/A	Extended growing season leading to encroachment of vegetation in substations.	Scoped out	Building and infrastructure	Low Vulnerability
	N/A	Wildfire affecting electrical infrastructure.	Scoped in.	Building and infrastructure	Medium Vulnerability
Low temperatures and cold snaps could still occur.	C-187	Cold weather leading to ice accretion causing damage to the infrastructure.	Scoped in.	Building and infrastructure	Medium Vulnerability

Climate trend	Embedded environmental measures	Impact	Proposed Approach	Receptor	Vulnerability (worst case across lifetime)
Increased frequency and intensity of storm events.		Lightning causing physical damage, fire, power surge, and shock wave at grid connection points.	Scoped in.	Building and infrastructure	Medium Vulnerability
	C-187, C-190	Increased wind loading on substation equipment and security fencing leading to damage.	Scoped in.	Building and infrastructure	Medium Vulnerability
	C-184, C-185, C-233	Wind-blown debris leading to risk to maintenance personnel.	Scoped in.	Human health	Medium Vulnerability
Offshore					
Increased frequency and intensity of storm events and wave heights	C-187, C-190	Destabilisation or degradation of Wind Turbine Generators mechanical systems and structures.	Scoped in.	Building and infrastructure	Medium Vulnerability
	C-187	Loading and sediment transport across seabed leading to loss of integrity of	Scoped in.	Building and infrastructure	Medium Vulnerability

Climate trend	Embedded environmental measures	Impact	Proposed Approach	Receptor	Vulnerability (worst case across lifetime)
		foundations from scour and exposure.			
	C-187	Loading and sediment transport across seabed leading to loss of integrity of cabling systems from scour and exposure.	Scoped in.	Building and infrastructure	Medium Vulnerability
	C-75, C-237	Impeded access for maintenance and inspection.	Scoped in.	Building and infrastructure	Medium Vulnerability
Increased annual mean temperatures, especially in the summer months, and an increase in the frequency and intensity of hot spells.	C-187	Overheating of M&E assets such as offshore substations, leading to a decrease in asset performance and rating and/or requiring additional electricity demand for mechanical cooling units.	Scoped in.	Building and infrastructure	Medium Vulnerability
Low temperatures	C-187	Cold weather leading to ice accretion affecting the efficiency	Scoped in.	Building and infrastructure	Medium Vulnerability

Climate trend	Embedded environmental measures	Impact	Proposed Approach	Receptor	Vulnerability (worst case across lifetime)
and cold snaps could still occur.		and performance of turbines.			
Increase sea surface temperatures and ocean acidification	C-187	Increased corrosion of the structures.	Scoped in.	Building and infrastructure	Medium Vulnerability

Decommissioning phase

Table 29-32 Vulnerability assessment – Decommissioning phase

Climate trend	Embedded measures	Impact	Proposed Approach	Receptor	Vulnerability
Onshore					
Increased annual mean temperatures, especially in the summer months, and an increase	C-240	Increased heat stress or heat exhaustion experienced by the workforce associated with decommissioning.	Scoped in.	Human health	High Vulnerability

Climate trend	Embedded measures	Impact	Proposed Approach	Receptor	Vulnerability
in the frequency and intensity of hot spells.					
Increased annual mean temperatures and frequency and intensity of hot spells, coupled with decreased summer precipitation.	C-240	Increased dust creation from decommissioning activities, leading to impacts on the health of workers and the failure of machinery and equipment.	Scoped in.	Human health	Medium Vulnerability
	C-240	Risk of wildfires affecting the workforce.	Scoped in.	Human health	Medium Vulnerability
Decrease in summer precipitation leading to drought conditions		Drought conditions impacting water available to use during decommissioning (e.g. for dust suppression).	Scoped in.	The natural environment	Medium Vulnerability
Increase in precipitation	C-240	Wet weather leading to increased possibility of slips, trips, and falls.	Scoped in.	Human health	Medium Vulnerability

Climate trend	Embedded measures	Impact	Proposed Approach	Receptor	Vulnerability
resulting in tidal, fluvial or pluvial flooding.	C-240	Flooding of the site access roads causing delays to decommissioning programme.	Scoped in.	Building and infrastructure assets	Medium Vulnerability
	C-240	Water ingress to equipment or machinery related to decommissioning activities, leading to equipment failures or damage.	Scoped in.	Building and infrastructure assets	Medium Vulnerability
	C-240	Overwhelming of the site drainage system causing flooding across the site.	Scoped in.	Building and infrastructure assets	Medium Vulnerability
Increased in frequency and intensity of storm events.	C-240	There is an increased risk of disruption to decommissioning work, such as cranes unable to operate in high winds.	Scoped in.	Building and infrastructure assets	Medium Vulnerability
Offshore					
Increased annual mean temperatures, especially in the summer months, and an increase in the frequency	C-240	Increased heat stress or heat exhaustion experienced by the workforce associated with decommissioning.	Scoped in.	Human health	High Vulnerability

Climate trend	Embedded measures	Impact	Proposed Approach	Receptor	Vulnerability
and intensity of hot spells.					
Increased frequency and intensity of storm events and wave heights	C-240	Extreme storminess leading to increased unsafe working environments and delays to decommissioning programme.	Scoped in.	Human health	Medium Vulnerability
	C-240	There is an increased risk of disruption to decommissioning work, such as cranes unable to operate in high winds.	Scoped in.	Building and infrastructure assets	Medium Vulnerability

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Impacts scoped out of assessment

29.19.5 A number of potential impacts have been scoped out from further assessment, resulting from a conclusion of no likely significant effect through the vulnerability assessment. These conclusions have been made through the Climate Change Vulnerability Assessment, based on the knowledge of the baseline environment, the nature of planned works and professional judgement on the potential for impact from such projects more widely. The conclusions follow (in a site-based context) existing best practice. Each scoped out impact is considered in turn below.

29.19.6 The climate change impacts considered at the construction stage focus on projected climate trends for the 2030s and therefore the assessment of exposure and sensitivity to the climate trends takes into account that there is a minimal change from the baseline, as shown in **Table 29-21** and **Table 29-22**. As a result of this, some climate impacts during construction have been scoped out, as detailed below.

29.19.7 The impact of increased dust creation from construction activities and the effect on the health of construction workers resulting from increasing temperatures was scoped out due to the exposure on the construction workers assessed as being a minimal change in the 2030s from the baseline. This is based on the results of the future baseline presented in **Table 29-21** showing the minimal change in exposure, for instance the mean summer temperature is anticipated to increase by 1.38°C coupled with an anticipated 6.75 percent decrease in summer precipitation for the 50th percentile in the 2030s. The sensitivity of the receptor to changes in dust creation was also considered to be low.

29.19.8 Similarly, the impact of drought conditions on the water available for use during construction is of low exposure in the 2030s (i.e. the 6.75 percent decrease in summer precipitation), in addition to the low sensitivity of the activity due to alternatives for sourcing water for dust suppression. Therefore, this was scoped out.

29.19.9 The increase in precipitation in winter resulting in an increased possibility of slips, trips and falls during construction was scoped out due to the exposure being of minimal change from the baseline (9.35 percent increase in winter precipitation from the baseline) coupled with the sensitivity of increased precipitation on the possibility of on-site incidents is low.

29.19.10 The sensitivity of the construction workforce to the risk of wildfire was assessed as high, however the exposure of this risk due to increasing temperatures and decreased summer precipitation is low. This results in a low vulnerability and was therefore scoped out of the assessment.

29.19.11 The minimal change in average summer temperatures in the 2030s from the baseline (1.38°C) was also considered in the exposure assessment of certain construction activities during hot weather, such as pouring concrete.

29.19.12 Due to the anticipated climate trend projections across the lifetime of the Proposed Development and the vulnerability of the assets to changes, the majority of the operational impacts were scoped in for further assessment. Although this means receptors will experience an increase in exposure of climate change trends, in

some instances the sensitivity of the receptor remains low, resulting in an overall low vulnerability. The exposure to changes in precipitation levels is increasing (22.26 percent increase in winter precipitation by 2070 and decreased summer precipitation by 26.79 percent by 2070), the sensitivity of mature vegetation to these gradual changes resulting in subsequent failure and damage to above ground equipment remains low resulting in the climate impact to be scoped out. Similarly, the effect of vegetation growth resulting from longer growing seasons was scoped out due to the low sensitivity of the assets, such as substations, to encroaching vegetation.

29.19.13 All likely significant effects identified were considered at further stages of the assessment as more detail regarding the design becomes available and greater levels of baseline data are collected and analysed.

Climate Change Risk Assessment

29.19.14 An assessment of CCR effects has been undertaken for the construction, operation and maintenance and decommissioning phases of the Proposed Development, as shown in **Table 29-33**, **Table 29-34** and **Table 29-35**, respectively. The assessment includes those impacts for which receptors are considered to experience medium or high vulnerability, as shown in **Table 29-30**, **Table 29-31** and **Table 29-35**. Following the implementation of embedded environmental measures an assessment of the likelihood and magnitude of the climate change impact is made using the methodology set out in **Section 29.18**, to conclude any likely significant effects.

Table 29-33 Assessment of likely significant effects – Construction phase

				Residual risk and significance		
Climate trend	**Receptor**	**Potential climate change impact**	**Proposed procedures and/or environmental measures**	**Likelihood of impact**	**Consequence of impact**	**Significance**
Onshore						
Increased annual mean temperatures, especially in the summer months, and an increase in the frequency and intensity of hot spells.	Human Health	Increased heat stress or heat exhaustion experienced by the construction workforce.	The contractor(s) will ensure that relevant measures from the **Outline CoCP** (Document Reference: 7.2) will be implemented. Meteorological data and the Environment Agency flood warning service will inform short to medium-term programme management of activities (see C-184), a high-level risk assessment of severe weather impacts on construction activities should be produced and all construction activities will be planned through use of a Risk Assessment Method Statement (RAMS) alongside issued safety bulletins such as alerts for upcoming hot spells. The RAMS will identify measures such as altering shift patterns to cooler times of the day, additional rest breaks and PPE. All staff will undergo toolbox talks	Possible	Minor	**Minor** (**Not Significant**)

				Residual risk and significance		
Climate trend	**Receptor**	**Potential climate change impact**	**Proposed procedures and/or environmental measures**	**Likelihood of impact**	**Consequence of impact**	**Significance**
			regarding working in hot weather see C-185 and C-233).			
Increase in precipitation resulting in tidal, fluvial or pluvial flooding.	Building and infrastructure assets	Flooding of construction site access roads causing delays to construction programme.	The Contractor(s) will ensure that the relevant measures within the **Outline CoCP** (Document Reference: 7.2) (implemented via a DCO requirement) and health and safety procedures are implemented. This includes commitments that Emergency Response Plans (ERPs) for flood events will be prepared for all construction activities, working areas, access and egress routes in floodplain areas, both tidal and fluvial (see commitment C-118). In addition, construction and permanent development in flood plains will be avoided wherever possible. Where this is not possible (for example, the landfall location) environmental measures will be developed to ensure the works are National Policy Statement compliant, including a sequential approach to siting of	Unlikely	Minor	**Minor** (**Not Significant**)

				Residual risk and significance		
Climate trend	**Receptor**	**Potential climate change impact**	**Proposed procedures and/or environmental measures**	**Likelihood of impact**	**Consequence of impact**	**Significance**
			infrastructure and passing the Exception Test where appropriate (see commitment C-75).			
	Building and infrastructure assets	Water ingress to equipment or machinery related to construction activities or permanent assets in place during construction, leading to equipment failures or damage.	Construction in flood plains will be avoided wherever possible and drainage design to manage, surface water run-off will be included in all elements of temporary and permanent infrastructure (see commitment C-75). These will be designed in accordance with Sustainable Drainage (SuDS) principles including allowances for climate change and discharged at pre-development rates. Where the development intersects overland flow pathways or areas of known surface water flooding appropriate measures will be embedded into the design (see commitment C-73). The Environment Agency flood warning service will inform short to medium-term programme	Unlikely	Minimal	**Negligible** (**Not Significant**)

				Residual risk and significance		
Climate trend	**Receptor**	**Potential climate change impact**	**Proposed procedures and/or environmental measures**	**Likelihood of impact**	**Consequence of impact**	**Significance**
			management of activities, a high-level risk assessment of severe weather impacts on the construction process. This will allow for mobile construction equipment to be moved to avoid flood damage in response to any potential flooding events (see commitment C-184).			
	Building and infrastructure assets	Overwhelming of the construction site drainage system causing flooding across the site.	The **Appendix 26.2 Flood Risk Assessment, Volume 4** of the ES (Document Reference: 6.4.26.2) assesses the flood risk from more frequent flooding events across the construction timeframe. The hydrological design of the drainage scheme areas has been based on a 1 in 100 year (1% Annual Exceedance Probability (AEP)) event with a 10% allowance for climate change.	Unlikely	Minor	**Negligible** (**Not Significant**)
Increased in frequency and intensity of storm events.	Building and infrastructure assets	There is an increased risk of disruption to construction work, such as	As stipulated in the **Outline CoCP** (Document Reference: 7.2), all construction activities will be planned through use of a RAMS alongside issued safety bulletins such as	Possible	Minimal	**Minor** (**Not Significant**)

				Residual risk and significance		
Climate trend	**Receptor**	**Potential climate change impact**	**Proposed procedures and/or environmental measures**	**Likelihood of impact**	**Consequence of impact**	**Significance**
		cranes unable to operate in high winds.	alerting to upcoming high winds or storm events (see commitment C-233). The RAMS will identify measures such as identifying wind speeds in which cranes will not operate or are restricted, delaying the activity and making the site safe ahead of storm events.			
Offshore						
Increased annual mean temperatures, especially in the summer months, and an increase in the frequency and intensity of hot spells.	Human health	Increased heat stress or heat exhaustion experienced by the construction workforce.	The contractor(s) will ensure that relevant measures from the **Outline CoCP** (Document Reference: 7.2) will be implemented. Meteorological data and the Environment Agency flood warning service will inform short to medium-term programme management of activities, a high-level risk assessment of severe weather impacts on the construction process should be produced and all construction activities will be planned through use of a RAMS alongside issued safety bulletins such as alerts	Possible	Minor	**Minor** (**Not Significant**)

				Residual risk and significance		
Climate trend	**Receptor**	**Potential climate change impact**	**Proposed procedures and/or environmental measures**	**Likelihood of impact**	**Consequence of impact**	**Significance**
			for upcoming hot spells. The RAMS will identify measures such as altering shift patterns to cooler times of the day, additional rest breaks and PPE. All staff will undergo toolbox talks regarding working in hot weather (see commitments C-184, C-185 and C-233).			
Increased frequency and intensity of storm events and wave heights	Human health	Extreme storminess leading to increased unsafe working environments and delays to construction programme.	The contractor(s) will ensure that relevant measures from the **Outline CoCP** (Document Reference: 7.2) will be implemented. Meteorological data will inform short to medium-term programme management of activities and implementation of necessary environmental control and/or impact mitigation measures with respect to climate conditions and extreme weather events. A high-level risk assessment of severe weather impacts on the construction process will be produced by the Contractor(s) to inform mitigations (see commitments C-184 and C-185).	Unlikely	Minor	**Minor** (**Not Significant**)

				Residual risk and significance		
Climate trend	**Receptor**	**Potential climate change impact**	**Proposed procedures and/or environmental measures**	**Likelihood of impact**	**Consequence of impact**	**Significance**
			Construction activities will be planned through use of a RAMS. The RAMS will put in place procedures in the case of extreme weather (including intense storms). The RAMS will identify measures such as checking of lightning risk when working near existing assets. Where lightning risk is identified, the activity will be delayed (see commitment C-233).			
	Building and infrastructure assets	There is an increased risk of disruption to construction work, such as cranes / barges / rigs unable to operate in high winds.	As stipulated in the **Outline CoCP** (Document Reference: 7.2), all construction activities will be planned through use of a RAMS alongside issued safety bulletins such as alerting to upcoming high winds or storm events. The RAMS will identify measures such as identifying wind speeds in which cranes, barges will not operate or are restricted, delaying the activity and making the site safe ahead of storm events (see commitments C-184 and C-233).	Possible	Minimal	**Minor** (**Not Significant**)

Table 29-34 Assessment of likely significant effects – Operation and maintenance phase

				Residual risk and significance		
Climate trend	**Receptor**	**Potential climate change impact**	**Proposed procedures and/or environmental measures**	**Likelihood of impact**	**Consequence of impact**	**Significance**
Onshore						
Sea level rise	Building and infrastructure	Risk to the onshore infrastructure at landfall and in coastal areas from coastal flooding and erosion	A sequential approach for the siting of the landfall location has been taken so development is diverted to an area of the lowest flood risk, considering future sea level rise and the impacts of climate change. At landfall, the transition joint bay at the landfall location will be resilient to flooding and the cable will be trenchless (Horizontal Directional Drill (HDD)) to minimise risk of future erosion and exposure (see commitment C-73).	Possible	Minimal	**Minor** (**Not Significant**)
Increase in precipitation resulting in tidal, fluvial or pluvial flooding	Building and infrastructure	Risk to the onshore infrastructure, such as onshore substation, from river, surface water and	A sequential approach has been taken for the siting of the onshore substation, the only element of new, permanent onshore infrastructure at risk of flooding, to divert development to area of lowest flood risk. For fluvial flooding, the onshore substation will be designed for a one in	Unlikely	Minor	**Minor** (**Not Significant**)

				Residual risk and significance		
Climate trend	**Receptor**	**Potential climate change impact**	**Proposed procedures and/or environmental measures**	**Likelihood of impact**	**Consequence of impact**	**Significance**
		groundwater flooding	1000 year event plus an allowance for climate change. In addition, the National Grid target standard of protection for substations will be followed using the 0.1% AEP event plus climate change (see commitment C-75 and **Design and Access Statement** (Document Reference: 5.8)). For surface water, as outlined in the drainage strategy which accompanies the **Outline Operational Drainage Plan** (Document Reference: 7.1) surface water flowpaths intersecting the onshore substation site will be intercepted at the onshore substation site boundary and managed using a variety of SuDS features (see commitments C-73 and C-75).			
	Building and infrastructure	Restriction of access during flood events, preventing	The existing National Grid Bolney substation extension works access lies outside of Environment Agency flood zones. The access to Oakendene substation is coincident with a surface	Unlikely	Minor	**Minor** (**Not Significant**)

				Residual risk and significance		
Climate trend	**Receptor**	**Potential climate change impact**	**Proposed procedures and/or environmental measures**	**Likelihood of impact**	**Consequence of impact**	**Significance**
		maintenance activities.	water flowpath and within the one in 1,000yr (0.1% AEP). However, the proposed layout and drainage plan is anticipated to suitably manage this flowpath, such that the access road would be outside of the 1% AEP plus climate change flood extent. Exact sizing and design of the drainage features will be determined at detailed design phase (post consent), which may incorporate detailed modelling (see commitments C-73 and C-75). RAMS will be used to plan maintenance activities. For example, the RAMS will include measures for working in increasingly prolonged wet weather and set out adequate planning for extreme weather events (see commitment C-237).			
Fluctuations in mean rainfall across the year, coupled	Building and infrastructure	Risk to subterranean and surface infrastructure from	The basis of the structural design for the proposed onshore cable corridor and onshore substation infrastructure will be completed in general accordance with best practice UK and European design	Very unlikely	Moderate	**Minor** (**Not Significant**)

				Residual risk and significance		
Climate trend	**Receptor**	**Potential climate change impact**	**Proposed procedures and/or environmental measures**	**Likelihood of impact**	**Consequence of impact**	**Significance**
with an increase in mean temperatures, resulting in changes to soil moisture.		subsidence, such as onshore cables and onshore substation	standards to minimise the risk of structural or geotechnical instability. Due consideration will be given to minimum design requirements for ambient design temperatures, wind pressures and snow loads, including climate change allowances where appropriate (see commitment C-116).			
Decrease in summer precipitation, leading to drought conditions.	Building and infrastructure	Changes in water content of soil has an adverse effect on soil resistivity leading to a reduction in cable ratings and the effectiveness of earthings at the onshore substation.	All cable installation works will be installed with the prevailing best practice UK and European standards as appropriate. These standards will account for a range of long-term variations in soil resistivity. In addition, soil resistivity modelling will be undertaken to inform design and ensure earthing effectiveness. The design will also consider this risk and monitoring will be undertaken during the operation and maintenance phase (see commitment C-116).	Very unlikely	Minor	**Negligible** (**Not Significant**)
Increased annual mean temperatures,	Building and infrastructure	Overheating of M&E assets such as onshore	At detailed design stage the appointed contractor will ensure that onshore assets, including the onshore substation,	Very unlikely	Minor	**Negligible** (**Not Significant**)

				Residual risk and significance		
Climate trend	**Receptor**	**Potential climate change impact**	**Proposed procedures and/or environmental measures**	**Likelihood of impact**	**Consequence of impact**	**Significance**
especially in the summer months, and an increase in the frequency and intensity of hot spells.		substations, leading to a decrease in asset performance and rating and/or requiring additional electricity demand for mechanical cooling units.	will be designed utilising the prevailing best practice UK and European standards as appropriate. These standards will ensure appropriate materials are selected that are fit for purpose. Procurement and specifications will follow a basis of design that considers a range of temperatures during operation, which will ensure that the infrastructure is unlikely to be affected by changes to ambient temperature. Adaptative capacity will be built into the operation of the Proposed Development, for example, maintenance will highlight any heat-related deterioration and replacement requirements (see C-187).			
	Human health	Increased heat stress or heat exhaustion experienced by the operational and	Operation and maintenance activities will be planned through use of a RAMS. The RAMS will include mitigation for working in hot weather, including delaying the routine maintenance activity or altering shift patterns for emergency	Unlikely	Minor	**Minor** (**Not Significant**)

				Residual risk and significance		
Climate trend	**Receptor**	**Potential climate change impact**	**Proposed procedures and/or environmental measures**	**Likelihood of impact**	**Consequence of impact**	**Significance**
		maintenance workforce.	maintenance. Weather warnings are issued to all workforce to help with adequate planning. As a result of climate change, maintenance works may become delayed or interrupted more frequently (see commitments C-184, C-185 and C-233).			
	Building and infrastructure	Underground cable systems affected by the increase in ground temperatures, reducing cable ratings.	The onshore cabling and installation will be designed at detailed design stage by the appointed Contractor. Materials will be selected to perform as required for the project lifespan and the design of the Electrical System shall comply with prevailing national legislation and European and international conventions. It will include a range of operating tolerances which are unlikely to be affected by changes to ground temperatures with climate change (see commitments C-116 and C-187.	Very unlikely	Minor	**Negligible** (**Not Significant**)
	Building and infrastructure	Wildfire affecting electrical infrastructure.	In order to mitigate the risk of wildfire, a maintenance team will inspect the onshore cable route at regular intervals	Unlikely	Minor	**Minor** (**Not Significant**)

				Residual risk and significance		
Climate trend	**Receptor**	**Potential climate change impact**	**Proposed procedures and/or environmental measures**	**Likelihood of impact**	**Consequence of impact**	**Significance**
			and will ensure dry vegetation is clear of the route. In the event of wildfires, the depth (minimum 1.2m from the top of the conduit to ground level) at which the cable is buried will ensure that any negative effects on the onshore cable will be minimised.			
Low temperatures and cold snaps could still occur.	Building and infrastructure	Cold weather leading to ice accretion causing damage to the infrastructure.	The structural design of onshore substation buildings will give due consideration to minimum design requirements for ambient design temperatures, wind pressures and snow loads, including climate change allowances where appropriate. The onshore cabling and installation will be designed at detailed design stage by the appointed Contractor. Materials will be selected at that stage to perform as required for the project lifespan. The design will include a range of operating tolerances which are unlikely to be	Unlikely	Minimal	**Negligible** (**Not Significant**)

				Residual risk and significance		
Climate trend	**Receptor**	**Potential climate change impact**	**Proposed procedures and/or environmental measures**	**Likelihood of impact**	**Consequence of impact**	**Significance**
			affected by reductions in ground temperatures due to cold snaps. Substation infrastructure above ground will be designed in accordance with industry design standards. Anti-icing methodologies will be adopted, and any new technologies will be incorporated in the design process considerations and monitoring to reduce ice accretion will be undertaken during at risk periods. Therefore, the substation is unlikely to be affected by the changes in temperatures associated with climate change due to the current tolerances (see C-187).			
Increased frequency and intensity of storm events.		Lightning causing physical damage, fire, power surge, and shock wave at grid connection points.	Onshore substation design will include mitigation measures against lightning strikes as necessary. The appointed contractor will undertake a design assessment for lightning measures and will provide appropriate equipment if determined to be required (see C-184 and C-185).	Very unlikely	Minor	**Negligible** (**Not Significant**)

				Residual risk and significance		
Climate trend	**Receptor**	**Potential climate change impact**	**Proposed procedures and/or environmental measures**	**Likelihood of impact**	**Consequence of impact**	**Significance**
		Increased wind loading on substation equipment and security fencing leading to damage.	The appointed contractor will design the onshore substation in accordance with the prevailing and best practice specifications and standards. These design standards include the consideration of wind loading on superstructure and ensure that the design of substation can withstand the loading resulting from extreme storm conditions (see commitments C-187 and C-190).	Very unlikely	Minimal	**Negligible** (**Not Significant**)
		Wind-blown debris leading to risk to maintenance personnel.	Operation and maintenance activities will be planned through use of a RAMS. The RAMS will include mitigation for working in storm conditions including delaying the activity. Weather warnings are issued to all workforce to help with adequate planning. As a result of climate change, routine maintenance works may become delayed or interrupted more frequently. Emergency works would be undertaken where safe to do so and following RAMS. In addition, equipment will be stored at locations to avoid risk of being blown as	Unlikely	Minor	**Minor** (**Not Significant**)

				Residual risk and significance		
Climate trend	**Receptor**	**Potential climate change impact**	**Proposed procedures and/or environmental measures**	**Likelihood of impact**	**Consequence of impact**	**Significance**
			debris. Operating procedures will govern site management processes. Maintenance plans will have clear guidelines that govern the methodology of storm response (see commitments C-184 and C-185).			
Offshore						
Increased frequency and intensity of storm events and wave heights	Building and infrastructure	Destabilisation or degradation of WTGs mechanical systems and structures.	Wind Turbine Generators (WTGs) will be built to international standards (International Electrotechnical Commission (IEC), 2005) (IEC61400) and average wind speed, extreme 50-year gust, and turbulence will determine the choice of turbine. Foundations are designed and certified in accordance with DNV-ST-0126. Under these standards foundations are designed to be resilient to storm events within the design using 50-year return periods, which factors in forecasted climate change (including, changes in sea state and wind conditions).	Very unlikely	Moderate	**Minor** (**Not Significant**)

				Residual risk and significance		
Climate trend	**Receptor**	**Potential climate change impact**	**Proposed procedures and/or environmental measures**	**Likelihood of impact**	**Consequence of impact**	**Significance**
			For both turbines and foundations, Site Conditions / Environmental Loads are established according to DNV-ST-0437. The site conditions will be established and documented in the project Site Conditions Assessment and will factor these extreme events and forecasted climate change within the lifetime of the Proposed Development. The combination of these measures will ensure that offshore infrastructure will withstand the loading resulting from extreme storm conditions and any increase in wave heights (see commitments C-187 and C-190).			
	Building and infrastructure	Loading and sediment transport across seabed leading to loss of integrity of foundations	Scour protection will be used where required to protect WTG foundations. Scour types currently being considered are rock filter layers with a rock armour layer or rock / stone filled geotextile bags. A Scour Management Plan will be developed including details of the need, type and quantity of scour protection and	Unlikely	Minor	**Minor** (**Not Significant**)

				Residual risk and significance		
Climate trend	**Receptor**	**Potential climate change impact**	**Proposed procedures and/or environmental measures**	**Likelihood of impact**	**Consequence of impact**	**Significance**
		from scour and exposure.	agreed with the relevant stakeholders (see commitments C-39, C-44).			
	Building and infrastructure	Loading and sediment transport across seabed leading to loss of integrity of cabling systems from scour and exposure.	Cable protection will be installed around inter-array cables as they transition from the seabed to enter a WTG. The exact amount of cable protection required will depend on burial depths achieved by assessment of the scour and movement that could occur during the operating life. The exact form of cable protection used will depend upon local ground conditions, hydrodynamic processes and the selected cable protection contractor. The final choice of cable protection will include one or more of the following: concrete 'mattresses'; rock placement; geotextile bags filled with stone, rock or gravel; polyethylene or steel pipe half shells, or sheathes; and/or bags of grout, concrete, or another substance that cures hard over time (see commitment C-45).	Unlikely	Minor	**Minor** (**Not Significant**)

				Residual risk and significance		
Climate trend	**Receptor**	**Potential climate change impact**	**Proposed procedures and/or environmental measures**	**Likelihood of impact**	**Consequence of impact**	**Significance**
	Building and infrastructure	Impeded access for maintenance and inspection.	The WTG and offshore balance of plant (including foundations) is designed with the objective to minimise maintenance and inspections through the lifetime of the Proposed Development. Any residual regular and periodic scheduled maintenance shall be planned / conducted in summer months and periods with the least onerous weather conditions to improve accessibility / safety. Any access out of season shall be planned and only conducted when a suitable weather window exists (see commitment C-237).	Possible	Minimal	**Minor** (**Not Significant**)
Increased annual mean temperatures, especially in the summer months, and an increase in the frequency and intensity of hot spells.	Building and infrastructure	Overheating of M&E assets such as offshore substations, leading to a decrease in asset performance and rating and/or requiring	Offshore substations will be constructed to international standards, IEC61400. Under these standards, the extreme temperature range is between -20°C and +50°C. The likely increase in temperatures in the English Channel is, therefore, not likely to be sufficient to have an impact on offshore infrastructure, such as offshore substations, during the	Very unlikely	Minor	**Negligible** (**Not Significant**)

				Residual risk and significance		
Climate trend	**Receptor**	**Potential climate change impact**	**Proposed procedures and/or environmental measures**	**Likelihood of impact**	**Consequence of impact**	**Significance**
		additional electricity demand for mechanical cooling units.	design life of the Proposed Development (see commitment C-187).			
Low temperatures and cold snaps could still occur.	Building and infrastructure	Cold weather leading to ice accretion affecting the efficiency and performance of WTGs.	A Site Conditions Assessment (in accordance with DNV-ST-0126 and Site Conditions / Environmental Loads according to DNV-ST-0437) will be undertaken. If this assessment determines that it is required, the WTG foundations can be designed factoring ice accretion. This includes factoring additional loading and in extreme cases addition of ice cones to the structures with respect to sea ice. WTGs will be built to IEC61400 standards (International Electrotechnical Commission (IEC), 2005), which prescribe an extreme temperature range for the standard class of WTGs with a minimum of -20°C (see C-187).	Very unlikely	Minor	**Negligible** (**Not Significant**)

				Residual risk and significance		
Climate trend	**Receptor**	**Potential climate change impact**	**Proposed procedures and/or environmental measures**	**Likelihood of impact**	**Consequence of impact**	**Significance**
Increased sea surface temperatures and ocean acidification	Building and infrastructure	Increased corrosion of the structures.	Offshore infrastructure will be designed in accordance with international design codes which allow for a sea temperature range which exceeds those that are to be found at the site. The design of corrosion protection of WTG foundations, in accordance with design codes, DNV-RP-0416, DNV-RP-B401, ISO 20340, NORSOK M-501, currently allow for 15-20 years of lifetime. However, the permissible lifetime of coating systems is likely to increase in the design life of the proposed development, with lifetimes of 25-35 years likely (see commitment C-187).	Unlikely	Minor	**Minor** (**Not Significant**)

Table 29-35 Assessment of likely significant effects – Decommissioning phase

				Residual Risk and significance		
Climate trend	**Receptor**	**Potential climate change impact**	**Proposed procedures and/or measures**	**Likelihood of impact**	**Consequence of impact**	**Significance**
Onshore						
Increased annual mean temperatures, especially in the summer months, and an increase in the frequency and intensity of hot spells.	Human health	Increased heat stress or heat exhaustion experienced by the workforce associated with decommissioning.	All decommissioning activities are assumed to be planned through use of a RAMS alongside issued safety bulletins such as alerts for upcoming hot spells. The RAMS will identify measures such as altering shift patterns to cooler times of the day, additional rest breaks and Personal Protective Equipment (PPE). All staff will undergo toolbox talks regarding working in hot weather (see commitments C-184, C-185 and C-233).	Possible	Minor	**Minor** (**Not Significant**)
Increased annual mean temperatures and frequency and intensity of hot spells, coupled with decreased	Human health	Increased dust creation from decommissioning activities, leading to impacts on the health of workers and the failure of machinery and equipment.	All decommissioning activities are assumed to be planned through use of a RAMS alongside issued safety bulletins such as working in hot and dry conditions. The RAMS will identify measures such as dust management and dampening down, alongside appropriate PPE. All staff will undergo toolbox talks regarding	Unlikely	Minimal	**Negligible** (**Not Significant**)

				Residual Risk and significance		
Climate trend	**Receptor**	**Potential climate change impact**	**Proposed procedures and/or measures**	**Likelihood of impact**	**Consequence of impact**	**Significance**
summer precipitation.			working in dry weather. Plant and machinery will be routinely inspected (see commitments C-24 and C-233).			
	Human health	Risk of wildfires affecting the workforce.	All decommissioning activities are assumed to be planned through use of a RAMS alongside issued safety bulletins such as alerts to upcoming rainfall events. The RAMS will identify measures for wildfire events such as delaying the activity (see commitment C-184, C-185 and C-233).	Unlikely	Moderate	**Minor** (**Not Significant**)
Decrease in summer precipitation leading to drought conditions	The natural environment	Drought conditions impacting water available through abstraction licenses to use during decommissioning (e.g., for dust suppression).	The requirement of any abstraction for decommissioning activities would be assessed at the point of decommissioning and will be in consultation with key stakeholders, such as the Environment Agency. The import of water via tankers would be investigated but the re-use of water will take place wherever possible (for example, treated runoff for use in activities such as dust	Possible	Minimal	**Minor** (**Not Significant**)

				Residual Risk and significance		
Climate trend	**Receptor**	**Potential climate change impact**	**Proposed procedures and/or measures**	**Likelihood of impact**	**Consequence of impact**	**Significance**
			suppression) (see commitments C-184, C-185 and C-133).			
Increase in precipitation resulting in tidal, fluvial or pluvial flooding.	Human health	Wet weather leading to increased possibility of slips, trips and falls.	All decommissioning activities are assumed to be planned through use of a RAMS alongside issued safety bulletins such as alerts to upcoming rainfall events. The RAMS will identify measures such as signing up to the Environment Agency's flood risk warning system, appropriate PPE, and delaying the activity (see commitments C-184, C-185 and C-233).	Unlikely	Minimal	**Negligible** (**Not Significant**)
	Building and infrastructure assets	Flooding of the site access roads causing delays to decommissioning programme.	Decommissioning of the onshore substation would utilise operational access roads. Extreme precipitation events are assumed to be managed through RAMS and weather warnings to delay activities (see commitments C-118, C-184, C-185 and C-233).	Very unlikely	Minor	**Negligible** (**Not Significant**)
	Building and infrastructure assets	Water ingress to equipment or machinery related	Extreme precipitation events are assumed to be managed through RAMS and weather warnings to	Unlikely	Minor	**Minor** (**Not Significant**)

				Residual Risk and significance		
Climate trend	**Receptor**	**Potential climate change impact**	**Proposed procedures and/or measures**	**Likelihood of impact**	**Consequence of impact**	**Significance**
		to decommissioning activities, leading to equipment failures or damage.	delay activities (see commitments C-73, C-75, C-184, C-185 and C-233).			
	Building and infrastructure assets	Overwhelming of the site drainage system causing flooding across the site.	Extreme precipitation events are assumed to be managed through RAMS and weather warnings to delay Activities (see commitments C-73, C-75, C-184, C-185 and C-233).	Unlikely	Minor	**Minor** (**Not Significant**)
Increased in frequency and intensity of storm events.	Building and infrastructure assets	There is an increased risk of disruption to decommissioning work, such as cranes unable to operate in high winds.	All decommissioning activities are assumed to be planned through use of a RAMS alongside issued safety bulletins such as alerting to upcoming lightning or storm events. The RAMS will identify measures such as checking of lightning risk when working near existing assets. Where lightning risk is identified, the activity will be delayed (see commitments C-184, C-185 and C-233).	Unlikely	Minor	**Minor** (**Not Significant**)

				Residual Risk and significance		
Climate trend	**Receptor**	**Potential climate change impact**	**Proposed procedures and/or measures**	**Likelihood of impact**	**Consequence of impact**	**Significance**
Offshore						
Increased annual mean temperatures, especially in the summer months, and an increase in the frequency and intensity of hot spells.	Human health	Increased heat stress or heat exhaustion experienced by the workforce associated with decommissioning.	All decommissioning activities are assumed to be planned through use of a RAMS alongside issued safety bulletins such as alerts for upcoming hot spells. The RAMS will identify measures such as altering shift patterns to cooler times of the day, additional rest breaks and PPE. All staff will undergo toolbox talks regarding working in hot weather (see commitments C-184, C-185 and C-233).	Possible	Minor	**Minor** (**Not Significant**)
Increased frequency and intensity of storm events and wave heights	Human health	Extreme storminess leading to increased unsafe working environments and delays to decommissioning programme.	Decommissioning activities will be planned through use of a RAMS. The RAMS will put in place procedures in the case of extreme weather (including intense storms). The RAMS will identify measures such as checking of lightning risk when working near existing assets. Where lightning risk is identified, the activity will be delayed (see commitments C-184, C-185 and C-233).	Unlikely	Minor	**Minor** (**Not Significant**)

				Residual Risk and significance		
Climate trend	**Receptor**	**Potential climate change impact**	**Proposed procedures and/or measures**	**Likelihood of impact**	**Consequence of impact**	**Significance**
	Building and infrastructure assets	There is an increased risk of disruption to decommissioning work, such as cranes unable to operate in high winds.	All decommissioning activities are assumed to be planned through use of a RAMS alongside issued safety bulletins such as alerting to upcoming lightning or storm events. The RAMS will identify measures such as checking of lightning risk when working near existing assets. Where lightning risk is identified, the activity will be delayed (see commitments C-184, C-185 and C-233).	Possible	Minor	**Minor** (**Not Significant**)

29.20 In Combination Climate Impact Assessment (ICCI)

Approach

29.20.1 The ICCI assessment is provided within **Table 29-36** and considers the extent to which climate change exacerbates the effects and receptors resulting from the Proposed Development which are identified in other topic chapters in this ES. It also considers whether climate change affects the efficacy of proposed environmental measures within other technical aspect chapters. It is the combination of effects from both the Proposed Development and climate change on environmental receptors.

29.20.2 The assessment of significance is consistent with the methodologies contained within each technical aspect chapter. In the majority of cases, the methodology is consistent with the methodology presented in this chapter, where significance is the product of likelihood of impact and consequence of impact. Where the assessment of technical aspect chapters differs from this approach this has been clearly stated within **Table 29-36**.

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Table 29-36 ICCI assessment

Climate trend	Discipline	Potential effects / proposed environmental measures	Potential ICCI	Embedded measures	Likelihood of impact (unless stated)	Consequence of impact (unless stated)	Significance
Change in seawater temperature	**Chapter 8: Fish and Shellfish Ecology, Volume 2** of the ES (Document Reference 6.2.8)	Direct disturbance resulting from maintenance within the array area and the offshore cable corridor	Change in seawater temperature exacerbating the loss of habitat and negative pressure on native species composition or local extinction.	N/A	Unlikely	Moderate	**Minor** (**Not Significant**)
Sea level rise	**Chapter 8: Fish and shellfish ecology, Volume 2** of the ES (Document Reference 6.2.8)	Direct disturbance resulting from maintenance within the array area and the offshore cable corridor	Sea level rise increasing the pressures on intertidal habitats and native species composition or exacerbating local extinction.	N/A	Unlikely	Moderate	**Minor** (**Not Significant**)
Increase in storm surge	**Chapter 8: Fish and shellfish ecology, Volume 2** of the ES (Document Reference 6.2.8)	Direct disturbance resulting from maintenance within the array area and the offshore cable corridor	Increase in storm surge exacerbating the loss of habitat/spawning ground substrates and negative pressure on native species composition or local extinction.	N/A	Unlikely	Moderate	**Minor** (**Not Significant**)
Greater wave energy	**Chapter 8: Fish and shellfish ecology, Volume 2** of the ES (Document Reference 6.2.8)	Direct disturbance resulting from maintenance within the array area and the offshore cable corridor	Greater wave energy exacerbating the loss of habitat / spawning ground substrates and negative pressure on native species composition or local extinction.	N/A	Unlikely	Moderate	**Minor** (**Not Significant**)
Increase in sea temperature	**Chapter 11: Marine mammals, Volume 2** of the ES (Document Reference 6.2.11)	Changes to prey availability	The range shift of marine mammals and prey species is expected to increase with an apparent northward shift in warmer water cetacean species around the UK e.g., pilot whales leading to introduction of different species across the	For range shift of prey species, regulations on fisheries can be increased to mitigate for resource depletion. Commitments to communicate with fishermen is formalised in C-47, C-90 and C-91.	Unlikely	Minor	**Minor** (**Not significant**)

Climate trend	Discipline	Potential effects / proposed environmental measures	Potential ICCI	Embedded measures	Likelihood of impact (unless stated)	Consequence of impact (unless stated)	Significance
			Projects operational lifetime				
Increase in storm surge and greater wave energy	**Chapter 16: Marine Archaeology, Volume 2** of the ES (Document Reference 6.2.16)	Removal of sediment containing undisturbed archaeological contexts during seabed preparation ahead of construction activities.	Increase in storm surge and greater wave energy in combination with sediment removal may contribute to direct impacts resulting in an increased rate of degradation of heritage receptors through physical factors.	Embedded environmental measure C-60 will ensure that direct impacts as a result of sediment removal during the construction phase of Rampion 2 on all known and located marine heritage receptors are avoided. The commitment to undertake further archaeological works as detailed in embedded environmental measures C-57, C-58 andC-59 throughout the life of the project will be a requirement under the Marine Written Schemes of Investigation (WSI), and associated documents as per embedded environmental measure.	Sensitivity: Negligible to very high.	Magnitude: Negligible	**Not Significant**
Increase in sea temperatures and/or decrease in pH levels	**Chapter 16 Marine Archaeology, Volume 2** of the ES (Document Reference 6.2.16)	Disturbance of sediment containing potential marine heritage receptors (material and contexts) during construction activities.	Increase in sea temperatures and/or decrease in pH levels in combination with sediment disturbance may contribute to an increased rate of degradation of exposed marine heritage receptors through chemical and biological factors.	Embedded environmental measure C-60 will ensure that direct impacts as a result of sediment disturbance during the construction phase of Rampion 2 on all known and located marine heritage receptors are avoided. The commitment to undertake further archaeological works as detailed in embedded environmental measures C-57, C-58 and C-59 throughout the life of the project will be a requirement under the Marine Written Schemes of Investigation (WSI), and associated documents as per embedded environmental measure.	Sensitivity: Negligible to very high.	Magnitude: Negligible	**Not Significant**
Increase in storm surge and greater wave energy	**Chapter 16 Marine Archaeology, Volume 2** of the ES (Document Reference 6.2.16)	Operation: Indirect impact: Scour effects caused by the presence of WTG substation foundations and the exposure of inter-array and export cables or the use of cable protection measures.	Increase in storm surge and greater wave energy in combination with scour effects may contribute to direct impacts resulting in an increased rate of degradation of heritage receptors through physical factors.	Embedded environmental measure C-60 will ensure that direct impacts as a result of sediment removal during the operation and maintenance phase of Rampion 2 on all known and located marine heritage receptors are avoided. The commitment to undertake further archaeological works as detailed in embedded environmental measures C-	Sensitivity: Negligible to very high.	Magnitude: Negligible	**Not Significant**

Climate trend	Discipline	Potential effects / proposed environmental measures	Potential ICCI	Embedded measures	Likelihood of impact (unless stated)	Consequence of impact (unless stated)	Significance
				57, C-58 and C-59 throughout the life of the project will be a requirement under the Marine Written Schemes of Investigation (WSI), and associated documents as per embedded environmental measure.			
Increase in storm surge and greater wave energy	**Chapter 16 Marine Archaeology, Volume 2** of the ES (Document Reference 6.2.16)	Scour effects in the operation phase caused by the presence of WTG substation foundations and the exposure of inter-array and export cables or the use of cable protection measures.	Increase in storm surge and greater wave energy in combination with scour effects may contribute to direct impacts resulting in an increased rate of degradation of heritage receptors through physical factors.	Embedded environmental measure C-60 will ensure that direct impacts as a result of sediment removal during the operation and maintenance phase of Rampion 2 on all known and located marine heritage receptors are avoided. The commitment to undertake further archaeological works as detailed in embedded environmental measures C-57, C-58 and C-59 throughout the life of the project will be a requirement under the Marine Written Schemes of Investigation (WSI), and associated documents as per embedded environmental measure.	Sensitivity: Negligible to very high.	Magnitude: Negligible	**Not Significant**
Increase in sea temperatures and/or decrease in pH levels	**Chapter 16 Marine Archaeology, Volume 2** of the ES (Document Reference 6.2.16)	Penetration, compression and disturbance effects of jack-up barges and anchoring of decommissioning vessels. In the event that the foundations are removed, effects may include the destabilisation of archaeological sites and contexts, and exposing such material to natural, chemical, and biological processes, causing or accelerating loss of the same.	Increase in sea temperatures and/or a decrease in pH levels in combination with destabilisation may contribute to an increased rate of degradation of exposed marine heritage receptors through chemical and biological factors.	Embedded environmental measure C-60 will ensure that direct impacts as a result of sediment disturbance during the decommissioning phase of Rampion 2 on all known and located marine heritage receptors are avoided. The commitment to undertake further archaeological works as detailed in embedded environmental measures C-57, C-58 and C-59 throughout the life of the project will be a requirement under the Marine Written Schemes of Investigation (WSI), and associated documents as per embedded environmental measure.	Sensitivity: Negligible to very high.	Magnitude: Negligible	**Not Significant**
Decrease in summer precipitation	**Chapter 18: Landscape and visual impact,**	Impact on new planting proposed associated with the substations to reduce	Drought conditions across the operational lifetime of the Proposed	Any new habitats created will be designed to ensure resilience to climate change. This commitment is formalised in	Unlikely	Moderate	**Minor** (**Not Significant**)

Climate trend	Discipline	Potential effects / proposed environmental measures	Potential ICCI	Embedded measures	Likelihood of impact (unless stated)	Consequence of impact (unless stated)	Significance
resulting in drought conditions.	**Volume 2** of the ES (Document Reference 6.2.18)	the potential impact upon landscape character and visual amenity.	Development causing failure of the proposed planting impacting on visual amenity and landscape character	embedded environmental measure C-193 and is secured in the **Outline Landscape and Ecology Management Plan** (Document Reference: 7.10).			
Increased frequency and intensity of storm events.	**Chapter 18: Landscape and visual impact, Volume 2** of the ES (Document Reference 6.2.18)	Impact on new planting proposed associated with the substations to reduce the potential impact upon landscape character and visual amenity.	Increase in storm conditions during the operational lifetime of the Proposed Development can cause failure of the proposed planting at the substations and other onshore assets impacting on visual amenity and landscape character	Any new habitats created will be designed to ensure resilience to climate change. This commitment is formalised in embedded environmental measure C-193 and is secured in the **Outline Landscape and Ecology Management Plan** (Document Reference: 7.10).	Unlikely	Moderate	**Minor** (**Not Significant**)
Decrease in summer precipitation	**Chapter 19: Air quality, Volume 2** of the ES (Document Reference 6.2.19)	Increase in dust emissions and adverse effects on human receptors during construction.	Increased dust emissions (frequency or magnitude) due to increased drought conditions.	**Outline Air Quality Management Plan** (Document Reference: 8.62 [REP5-113]), **Appendix E of the Outline Code of Construction Practice** (Document Reference: 7.2 [REP5-064]) updated at Deadline 6 includes standard dust management measures. These measures may need to be employed more frequently as a result of worsening conditions due to climate change.	Possible	Minimal	**Minor** (**Not Significant**)
Decrease in summer precipitation coupled with an increased frequency and intensity of storm events.	**Chapter 20: Soils and agriculture, Volume 2** of the ES (Document Reference 6.2.20)	Soil erosion due to inappropriate storage and/or construction activities	Increased occurrence of weather events with potential to cause or exacerbate soil erosion (during the construction phase). Affects soil resources and agricultural land quality.	Embedded measures in the **Outline Soil Management Plan (SMP)** (Document Reference: 7.4) to protect land drainage during soil handling and stockpiling and reinstatement and seeding of soil stockpiles to protect soils from erosion, and ongoing management of soil stockpiles. No increase in magnitude of change or significance expected.	High receptor sensitivity	Low magnitude of change	**Moderate Adverse** (**Not Significant**)
Increase in precipitation resulting in fluvial or pluvial flooding	**Chapter 20: Soils and agriculture, Volume 2** of the ES (Document Reference 6.2.20)	Soil erosion due to inappropriate storage and/or construction activities	Increased occurrence of weather events with potential to cause or exacerbate soil erosion (during the construction phase). Affects soil	Embedded measures in the **Outline Soil Management Plan (SMP)** (Document Reference: 7.4) to protect land drainage during soil handling and stockpiling and reinstatement, and seeding of soil stockpiles to protect soils from erosion,	High receptor sensitivity	Low magnitude of change	**Moderate Adverse** (**Not Significant**)

Climate trend	Discipline	Potential effects / proposed environmental measures	Potential ICCI	Embedded measures	Likelihood of impact (unless stated)	Consequence of impact (unless stated)	Significance
			resources and agricultural land quality.	and ongoing management of soil stockpiles. No increase in magnitude of change or significance.			
Decrease in summer precipitation coupled with an increased frequency and intensity of storm events.	**Chapter 20: Soils and agriculture, Volume 2** of the ES (Document Reference 6.2.20)	Damage to (agricultural) land drainage systems due to construction activities, including physical damage to clay / other drains and changes to soil structure affecting land drainage	Potential for higher loads on drainage systems (during the construction phase) due to flood events, which could in turn increase damage to soils and agricultural land if drains are damaged or cannot cope with volumes of flood water.	With the embedded measures for protection and maintenance of land drainage systems detailed in the **Outline SMP** (Document Reference: 7.4), no increase in magnitude of change or significance expected.	High receptor sensitivity	Very low to Low magnitude of change	**Minor Adverse** (**Not Significant**)
Increase in precipitation resulting in fluvial or pluvial flooding.	**Chapter 20: Soils and agriculture, Volume 2** of the ES (Document Reference 6.2.20)	Damage to (agricultural) land drainage systems due to construction activities, including physical damage to clay / other drains and changes to soil structure affecting land drainage	Potential for higher loads on drainage systems (during the construction phase) due to flood events, which could in turn increase damage to soils and agricultural land if drains are damaged or cannot cope with volumes of flood water.	With the embedded measures for protection and maintenance of land drainage systems detailed in the **Outline SMP** (Document Reference: 7.10), no increase in magnitude of change or significance expected.	High receptor sensitivity	Very low to Low magnitude of change	**Minor Adverse** (**Not Significant**)
Increased annual temperatures, especially in summer months, and an increase in the frequency and intensity of hot spells.	**Chapter 20: Soils and agriculture, Volume 2** of the ES (Document Reference 6.2.20)	Temporary removal of topsoil during construction, potential for topsoil degradation e.g., due to mixing of topsoil with subsoil or other material (non-soil), impacts from pollutants / invasive plants. Potential for permanent loss of soil functions / damage to soil health, topsoil resource could be rendered unsuitable for reuse	Increased temperatures will affect plant growth, soil biodiversity and soil health. Effects are likely to be localised and are difficult to predict.	The process of soil excavation, storage and restoration will affect soil biodiversity and soil health, however the **Outline SMP** (Document Reference: 7.10) requires stockpiled soils to be managed and for reinstated soils, an aftercare period is included where soil health will be monitored and remedial actions can be taken. Therefore, no increase in magnitude of change or significance is expected taking into account the ICCI for the construction phase.	High receptor sensitivity	Low magnitude of change	**Moderate Adverse** (**Not Significant**)
Increased annual temperatures,	**Chapter 20: Soils and agriculture, Volume 2**	Temporary loss of, or damage to, agricultural	Increased temperatures will result affect crop growth, soil biodiversity	The process of soil excavation, storage and restoration will affect soil biodiversity and soil health, however the **Outline**	High receptor sensitivity	Low magnitude of change	**Moderate Adverse** (**Not Significant**)

Climate trend	Discipline	Potential effects / proposed environmental measures	Potential ICCI	Embedded measures	Likelihood of impact (unless stated)	Consequence of impact (unless stated)	Significance
especially in summer months, and an increase in the frequency and intensity of hot spells.	of the ES (Document Reference 6.2.20)	land – potential for ALC grade to be lowered	and soil health. Effects are likely to be localised and are difficult to predict, and agricultural land can be managed to mitigate.	**SMP** (Document Reference: 7.10) requires stockpiled soils to be managed and for reinstated soils, an aftercare period is included where soil health will be monitored and remedial actions can be taken. Therefore, no increase in magnitude of change or significance is expected taking into account the ICCI.			
An increased frequency and intensity of storm events.	**Chapter 24: Ground conditions, Volume 2** of the ES (Document Reference 6.2.24)	Impacts related to accidental spillages and leaks in construction	Increase in risk of accidental fuel spillages and leaks coinciding with more frequent heavy rainfall events resulting in increased risks of groundwater and surface water pollution.	C-8, C-76 and C-167 are specific measures to ensure that good practice is implemented for the storage and handling of fuels, oils and other chemicals during the construction phase including the requirements for containment bunding and siting of storage and refuelling away from rivers. C-233 is a specific measure to ensure that the contractor's RAMS also include good working practices taking into account changes in weather conditions.	Low	Low	**Not Significant**
An increased frequency and intensity of storm events.	**Chapter 24: Ground conditions, Volume 2** of the ES (Document Reference 6.2.24)	Impacts related to accidental spillages and leaks in decommissioning	Increase in risk of accidental fuel spillages and leaks coinciding with more frequent heavy rainfall events resulting in increased risks of groundwater and surface water pollution.	C-8, C-76 and C-167 are specific measures to ensure that good practice is implemented for the storage and handling of fuels, oils and other chemicals during the construction phase including the requirements for containment bunding and siting of storage and refuelling away from rivers. C-233 is a specific measure to ensure that the contractor's risk assessments and method statements (RAMS) also include good working practices taking into account changes in weather conditions.	Low	Low	**Not Significant**
Decrease in summer precipitation	**Chapter 24: Ground conditions, Volume 2** of the ES (Document Reference 6.2.24)	Impacts related to windblown dusts during the construction phase	Increased risk of soil erosion from exposed soils during construction or decommissioning resulting in increased risks of health effects for human health	The **Outline CoCP** (Document Reference: 7.2) includes measures such as C-113 for minimising the area and duration of soil exposure, seeding of stockpiles present for long durations and	Low	Low	**Not Significant**

Climate trend	Discipline	Potential effects / proposed environmental measures	Potential ICCI	Embedded measures	Likelihood of impact (unless stated)	Consequence of impact (unless stated)	Significance
			receptors through wind-blown dust.	timely reinstatement to reduce soil exposure / erosion. C-11 is a specific measure designed to ensure adverse weather conditions are considered in planning stockpiling. C-24 is a specific measure to ensure that best practice air quality management measures will be applied during the construction phase. C-233 is a specific measure to ensure that the contractor's RAMS also include good working practices taking into account changes in weather conditions.			
Decrease in summer precipitation	**Chapter 24: Ground conditions, Volume 2** of the ES (Document Reference 6.2.24)	Impacts related to windblown dusts during decommissioning	Increased risk of soil erosion from exposed soils during construction or decommissioning resulting in increased risks of health effects for human health receptors through wind-blown dust	The **Outline CoCP** (Document Reference: 7.2) includes measures such as C-113 for minimising the area and duration of soil exposure, seeding of stockpiles present for long durations and timely reinstatement to reduce soil exposure / erosion. C-11 is a specific measure designed to ensure adverse weather conditions are considered in planning stockpiling. C-24 is a specific measure to ensure that best practice air quality management measures will be applied during the construction phase. C-233 is a specific measure to ensure that the contractor's RAMS also include good working practices taking into account changes in weather conditions.	Low	Low	**Not Significant**
Increased annual mean temperatures, especially in the summer	**Chapter 24: Ground conditions, Volume 2** of the ES (Document Reference 6.2.24)	Impacts related to migration of vapours in construction	Increased risk of mobilisation of soil vapours and landfill gases from land affected by contamination resulting in	C-6 represents a specific measure to avoid potentially contaminated sites, including landfills, which reduces the risks of construction work being able to	Low	Low	**Not Significant**

Climate trend	Discipline	Potential effects / proposed environmental measures	Potential ICCI	Embedded measures	Likelihood of impact (unless stated)	Consequence of impact (unless stated)	Significance
months, and an increase in the frequency and intensity of hot spells			increased risks of health effects for human health receptors	generate or mobilise soil vapours and landfill gases.			
Increase in precipitation resulting in fluvial or pluvial flooding	**Chapter 24: Ground conditions, Volume 2** of the ES (Document Reference 6.2.24)	Impact of aggressive ground conditions on new infrastructure in the operational phase	Increased incidence of flooding could lead to increased infiltration changing the severity of aggressive ground conditions.	C-116 represents a specific measure for the operation and maintenance phase. It states that the structural design of onshore substation buildings will give due consideration to minimum design requirements and will include climate change allowances where appropriate.	Low	Low	**Not Significant**
Increase in precipitation resulting in fluvial or pluvial flooding	**Chapter 24: Ground conditions, Volume 2** of the ES (Document Reference 6.2.24)	Impacts related to geohazards in the operational phase	Increased incidence of flooding could lead to an increase in ground instability	C-116 represents a specific measure for the operation and maintenance phase. It states that the structural design of onshore substation buildings will give due consideration to minimum design requirements and will include climate change allowances where appropriate.	Low	Low	**Not Significant**
An increased frequency and intensity of storm events	**Chapter 24: Ground conditions, Volume 2** of the ES (Document Reference 6.2.24)	Impact of aggressive ground conditions on new infrastructure in the operational phase	Increased frequency and intensity of storm events could lead to increased infiltration changing the severity of aggressive ground conditions	C-116 represents a specific measure for the operation and maintenance phase. It states that the structural design of onshore substation buildings will give due consideration to minimum design requirements and will include climate change allowances where appropriate.	Low	Low	**Not Significant**
An increased frequency and intensity of storm events	**Chapter 24: Ground conditions, Volume 2** of the ES (Document Reference 6.2.24)	Impacts related to geohazards in the operational phase	Increased frequency and intensity of storm events could lead to an increase in ground instability	C-116 represents a specific measure for the operation and maintenance phase. It states that the structural design of onshore substation buildings will give due consideration to minimum design requirements and will include climate change allowances where appropriate.	Low	Low	**Not Significant**
Increase in precipitation resulting in fluvial or pluvial flooding.	**Chapter 26: Water environment, Volume 2** of the ES (Document Reference 6.2.26)	Changes to watercourse hydromorphology and flow conveyance arising from the presence of new or modified temporary	Increase in precipitation rates associated with extreme weather exacerbating geomorphological impacts	All Environment Agency Main Rivers and Water Framework Directive (WFD) reportable waterbodies crossings would be trenchless crossings, involving no in channel works.	Receptor Value - Low	Negligible	**Negligible (Not Significant)**

Climate trend	Discipline	Potential effects / proposed environmental measures	Potential ICCI	Embedded measures	Likelihood of impact (unless stated)	Consequence of impact (unless stated)	Significance
		watercourse crossings during construction	on the watercourse resulting from the temporary watercourse crossings.	Minor watercourses (where open cut techniques are proposed for the permanent cable crossings) will also have temporary crossings for the haul road to provide vehicular access along the route. A mixture of culverts and / or clear span bridges could be employed based on crossing specific requirements (size of watercourse and flood risk). These will be subject to permits and consents with the Environment Agency and Lead Local Flood Authority (LLFA). For temporary watercourse crossings, where culverts are to be used, these will be appropriately sized to maintain existing flow conveyance. Where existing culverts already exist nearby, similarly sized culverts may be suitable. Crossings of South Downs National Park Authority (SDNPA) designated Chalk streams will be designed to be less intrusive, for example by using a clear span bridge instead of a culvert to support the haul road or via use of trenchless crossing techniques. Details of the cable crossing methodologies at each watercourse can be found within the **Appendix 4.1: Crossing schedule, Volume 4** of the ES (Document Reference 6.4.4.1) with further information on haul road crossings being provided in the **Outline CoCP** (Document Reference: 7.2). The culverts would be removed, and all watercourses would be reinstated on completion of the works for which they were required. Each of the above measures will help avoid a cumulative effect of any			

Climate trend	Discipline	Potential effects / proposed environmental measures	Potential ICCI	Embedded measures	Likelihood of impact (unless stated)	Consequence of impact (unless stated)	Significance
				morphological changes due to changes in channel flows with extreme weather events.			
Increase in precipitation resulting in fluvial or pluvial flooding.	**Chapter 26: Water environment, Volume 2** of the ES (Document Reference 6.2.26)	Deterioration in the water quality by accidental spillage/release of pollutants, which may affect the viability of an abstraction in the operation and maintenance phase	Increased winter precipitation and extreme rainfall events resulting in the introduction of contaminants through surface water run-off from the operational substations, leading to increased frequency or extent of environmental pollution.	The proposed embedded measures to prevent surface water pollution are mitigated through the development and implementation of **Outline Operational Drainage Plan** (Document Reference: 7.1) for the onshore substation at Oakendene and the existing National Grid Bolney substation extension works which sets out measures to ensure the protection of the water environment whilst taking into account changing precipitation rates with climate change.	Receptor Value - Low	Negligible	**Negligible** (**Not significant**)

29.21 Transboundary effects

29.21.1 Transboundary effects arise when impacts from a development within one European Economic Area (EEA) states affects the environment of another EEA state(s). The CCR assessment assesses the effects of climate change on the Proposed Development as a receptor. No transboundary effects are anticipated on the basis that climate change adaptation effects and impacts are specific to the development and will not result in impacts to an adjacent state.

29.22 Inter-related effects

29.22.1 The inter-related effects assessment considers likely significant effects from multiple impacts and activities from the construction, operation and maintenance and decommissioning phases of Rampion 2 on the same receptor, or group of receptors.

29.22.2 The information provided in this ES chapter is intended to demonstrate that the potential climate change resilience effects will be managed and reduced through the application of embedded environmental measures to ensure there are no significant effects as the result of the Proposed Development. As there are no significant effects relating to climate change resilience after consideration of the embedded environmental measures, no assessment of inter-related effects has been undertaken.

29.23 Significance conclusions

29.23.1 The CCR and ICCI assessments have concluded that there are likely to be no significant effects remaining following the assessment of climate change impacts on the construction, operation and maintenance and decommissioning phases of the Proposed Development. This is because all relevant and implementable environmental measures have been embedded into the Proposed Development and are likely to be effective and deliverable to address the likely significant effects of the Proposed Development.

29.24 Glossary of terms and abbreviations

Table 29-37 Glossary of terms and abbreviations

Term	Description
Adaptation	The process of adjustment in a design or operational procedure to respond to the projected impacts of climate change, in order to moderate harm or exploit beneficial opportunities.
AR5	Fifth Assessment Report published by the Intergovernmental Panel on Climate Change (2014) providing an overview of the scientific knowledge of climate change.
AR6	Sixth Assessment Report published by the Intergovernmental Panel on Climate Change (2022) providing contributions from three Working Groups and a Synthesis Report, Special Reports and updates to the latest Methodology Report.
Availability factor	Factor to account for downtime of an offshore wind farm development for troubleshooting, maintenance and major corrective works.
BSI	British Standards Institution
Capacity factor (also known as load factor)	Provides an indication of the ratio of electricity that will realistically be generated as a proportion of the total generating capacity. The capacity factor for offshore wind farms will be heavily influenced by weather conditions (i.e. wind speeds).
Carbon	'Carbon' is used as shorthand to refer to the basket of six greenhouse gases (GHGs) recognised by the Kyoto Protocol (UFCCC, 2015). GHGs are converted to carbon dioxide equivalents (CO_2e) based on their global warming potential per unit as compared to one unit of CO_2.
Carbon dioxide equivalent (CO_2e)	Carbon dioxide equivalent (CO_2e) is a term for describing different GHGs in a common unit. For any quantity and type of GHG, CO_2e represents the amount of carbon dioxide (CO_2) which would have the equivalent global warming impact.
Carbon payback period	The period of time required before displaced GHG emissions equal the life cycle GHG emissions for the Proposed Development.
CCC	Committee on Climate Change

Term	Description
CH_4	Methane
Climate	Climate is usually defined as the average weather over a period of time ranging from months to thousands or millions of years. The classical period for averaging these variables is 30 years, as defined by the World Meteorological Organization. Weather factors often considered in climate are surface variables such as temperature, precipitation and wind.
Climate change	The United Framework Convention on Climate Change (UNFCCC), in its Article 1, defines climate change as: *'a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods'* (UNFCCC, 1992). While climate change can be attributable to natural causes, the UNFCCC distinguish climate change as related to human activities altering the atmospheric composition and climate variability.
Climate Change Resilience (CCR)	The ability to successfully withstand the impacts of climate change.
Climate Change Risk Assessment (CCRA)	An assessment considering UK-wide climate risks and opportunities across multiple sectors of the economy (Defra, 2022).
CO_2	Carbon dioxide
Department for Business, Energy & Industrial Strategy (BEIS)	The Government department formerly responsible for business; industrial strategy; science; research and innovation; energy and clean growth; and climate change.
Development Consent Order (DCO)	This is the means of obtaining permission for developments categorised as Nationally Significant Infrastructure Projects, under the Planning Act 2008.
Do-minimum scenario	A scenario where the Proposed Development is not built and the latest equivalent data for the UK grid average generation intensity is consumed.
Do-something scenario	A scenario where the Proposed Development with embedded environmental measures is built. The expected policy impacts of the do-minimum scenario also underpins this do-something scenario.

Term	Description
Digest of United Kingdom Energy Statistics (DUKES)	An annual publication providing an essential source of energy information.
Environmental Impact Assessment (EIA)	The process of evaluating the likely significant environmental effects of a proposed project or development over and above the existing circumstances (or 'baseline').
Embodied carbon	The embodied carbon describes the carbon footprint of a material, allowing for the sum of the energy required in resource extraction, and any processing required, as well as the transport and supply logistics to the factory gate (prior to transport to the Proposed Development for use), to be accounted for within the overall GHG estimation.
EMR	Electricity Market Reform
Environmental Statement (ES)	The written output presenting the full findings of the Environmental Impact Assessment.
European Union (EU)	An economic and political union between 27 European countries.
Extreme weather event	A weather event that is as rare as or rarer than the 10th or 90th percentile of a probability density function estimated from observations for a specific place and time of year. By definition the characteristics of what is called extreme weather may vary from place to place in an absolute sense.
gCO_2e	Grams (g) of carbon dioxide equivalent (CO_2e).
GHG	Greenhouse gas
GHG emission factor	The GHG emissions factors relate a given level of activity, or amount of fuel, energy or materials used, to the mass of GHGs released as a consequence. It is measured in the amount of GHG emissions (in gCO_2e, tCO_2e, $ktCO_2e$, $MtCO_2$, etc.) relative to the activity unit (e.g. tonnes, km, kgs etc.)
GHG intensity	Measures the GHG emissions of different types of electricity generation relative to the intensity of the electricity generation. It is measured in emissions of CO_2e or CO_2 (e.g. gCO_2e, tCO_2 etc.), relative to an energy unit e.g. kWh, GWh, etc.
Greater North Sea	The Greater North Sea is located on the continental shelf of north-west Europe. It opens into the Atlantic Ocean to the north and to the south-west, via the English Channel. It is connected to the Baltic sea to the east.

Term	Description
Greenhouse Gas (GHG) emissions	GHG emissions are determined by the Kyoto Protocol (1997) to include six categories of gases: carbon dioxide, methane, nitrous oxide, F-gases (hydrofluorocarbons and perfluorocarbons), sulphur hexafluoride and nitrogen trifluoride. To provide consistent reporting of these gases, each is weighted by its global warming potential and converted to a carbon dioxide equivalent (CO_2e).
GtCO_2e	Giga-tonnes (Gt) of carbon dioxide equivalent (CO_2e).
GW	Gigawatts
Heatwave	A heatwave is an extended period of hot weather relative to the expected conditions of the area at that time of year, which may be accompanied by high humidity. A UK heatwave threshold is met when a location records a period of at least three consecutive days with daily maximum temperatures meeting or exceeding the heatwave temperature threshold. In East Sussex, the threshold value is 27°C.
HFC	Hydrofluorocarbon
HGV	Heavy Goods Vehicle
ICE	Inventory of Carbon and Energy
Institute of Environmental Management and Assessment (IEMA)	International membership organisation for environment and sustainability professionals.
Intergovernmental Panel on Climate Change (IPCC)	The United Nations body for assessing the science relating to climate change.
Joint Bay (JB)	Terminology used to describe the structure in which cables are joined.
ktCO_2e	Kilo-tonnes (kt) of carbon dioxide equivalent (CO_2e).
LGV	Light Goods Vehicle
Low carbon activity	Low carbon activities are those that generate products or services which themselves deliver low carbon outputs.
Marine Intergovernmental Panel on Climate Change (IPCC)	The United Nations body for assessing the science relating to marine climate change.

Term	Description
$MtCO_2e$	Mega-tonnes (Mt) of carbon dioxide equivalent (CO_2e).
MW	Megawatts
NAP	National Adaptation Programme
N_2O	Nitrous oxide
Net zero GHG emissions	Net-zero GHG emissions are achieved when GHG emissions to the atmosphere are balanced by anthropogenic removals.
NF_3	Nitrogen trifluoride
NPPF	National Planning Policy Framework
NPS	National Policy Statement
PFC	Perfluorocarbons
Planning Inspectorate	The Planning Inspectorate deals with planning appeals, national infrastructure planning applications, examinations of local plans and other planning-related and specialist casework in England and Wales.
Preliminary Environmental Information Report (PEIR)	The written output of the Environmental Impact Assessment undertaken to prior to this ES for the Proposed Development. It was developed to support Statutory Consultation and presented the preliminary findings of the assessment to allow an informed view to be developed of the Proposed Development, the assessment approach undertaken, and the preliminary conclusions on the likely significant effects of the Proposed Development and environmental measures proposed.
Proposed Development	The development that is subject to the application for development consent, as described in **Chapter 4: The Proposed Development, Volume 2** of the ES (Document Reference: 6.2.4).
Receptor	These are as defined in Regulation 5(2) of The Infrastructure Planning 'Environmental Impact Assessment' Regulations 2017 and include population and human health, biodiversity, land, soil, water, air, climate, material assets, cultural heritage and landscape that may be at risk from exposure to direct and indirect impacts as a result of the Proposed Development.
RCP8.5	High/worst-case emissions scenario. This scenario uses a Representative Concentration Pathway defined by the Intergovernmental Panel on Climate Change's latest 5th

Term	Description
	Assessment Report (2014). Representative Concentration Pathway 8.5 specifies the concentration of greenhouse gases that would result in 8.5 W/m2 radiative forcing at the top of the atmosphere by 2100, relative to pre-industrial levels. The increase of global mean surface temperature by the end of the 21st century (2081–2100) relative to 1986–2005 is likely to be 2.6°C to 4.8°C under RCP8.5.
RED	Rampion Extension Development Limited (the Applicant)
Representative Concentration Pathway (RCP)	Future pathways based on emissions and concentrations of greenhouse gases. Each RCP provides only one of many possible scenarios that could lead to specific forcing mechanisms.
RICS	Royal Institution of Chartered Surveyors
Scoping Opinion	A Scoping Opinion is the written response to a Scoping Report for a Proposed Development from the Secretary of State of the Department of Business, Environment and Industrial Strategy for offshore wind farms. The Scoping Opinion provides guidance on the scope and level of detail of information to be provided by the Applicant in their Environmental Statement submitted as part of an application for development consent.
Scoping Report	A report provided to the Secretary of State by the Applicant that presents the findings of an initial stage in the Environmental Impact Assessment process. The Scoping Report should contain details on the Proposed Development with a description of environmental issues and potential impacts.
Secretary of State	The Minister for Department for Energy Security and Net Zero (DESNZ).
SF_6	Sulphur hexafluoride
SuDs	Sustainable drainage systems
UK	United Kingdom
UK Carbon Budget	The UK Carbon budgets were introduced under the Climate Change Act (2008). Each carbon budget provides a five-year, statutory cap on total GHG emissions, which should not be exceeded, in order to meet the UK's emission reduction commitments. So far, five carbon budgets have been set in law, covering the period from 2008 to 2032.These limit UK GHG emissions from all sources, excluding international aviation and shipping. Draft legislation for the sixth carbon

Term	Description
	budget was submitted to Parliament and legislated in April 2021.
UKCP18	UK Climate Change Projections 2018. UK Climate Projections 2018 is the most up-to-date assessment of how the climate of the UK may change over the 2^{1st} century, recently updated in 2018. UK Climate Projections 2018 uses climate science to provide observations and climate change projections for the UK and globally until 2100.
United Nations Framework Convention on Climate Change (UNFCCC)	A United Nations framework ultimately aiming to prevent dangerous human interference with the climate system.
Vulnerability	The propensity or predisposition of a system or receptor to be adversely affected. This encompasses the sensitivity of the system or receptor and its capacity to cope and adapt.
WBCSD	World Business Council for Sustainable Development
Weather	Short term variations in the state of the atmosphere at a particular place and time in regard to heat, cloudiness, dryness, sunshine, winds, rain, etc.
WRI	World Resources Institute
WTG	Wind Turbine Generator

29.25 References

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Rampion 2
WIND FARM