Bowdun Offshore Wind Farm, Onshore EIA Report

Volume 1, Chapter 15: Climate Change

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15.1 Introduction

15.1.1 This chapter presents the assessment of the likely significant effects related to climate change as a result of the construction, operation and maintenance (O&M) and decommissioning of the Proposed Development. The following aspects of climate change are relevant to the assessment:

- Emissions of greenhouse gases (GHGs, often referred to as 'carbon') associated with the Proposed Development (i.e. the potential impact of the Proposed Development on the atmospheric concentrations of GHGs and their potential influence on global climate change).
- Climate change related impacts on the Proposed Development (i.e. the vulnerability of the Proposed Development to climate change, often referred to as climate change resilience).

15.1.2 The assessment presented is supported by the following technical appendices:

- Volume 2, Appendix 15.1: Greenhouse Gas Assessment; and,
- Volume 2, Appendix 15.2: Climate Change Risk Assessment.

15.1.3 The assessment presented has also been informed, where relevant, by the following technical chapters and appendices:

- Volume 1, Chapter 6: Land Use, Agriculture and Public Access;
- Volume 1, Chapter 10: Geology and Ground Conditions;
- Volume 1, Chapter 11: Water Quality and Flood Risk; and
- Volume 2, Technical Appendix 6.1: Forestry and Arboriculture Techncial Report.

15.2 Climate Change Study Area

15.2.1 GHG emissions have a global effect rather than directly affecting any specific local receptor. The assessment of GHG emissions therefore focuses on the impact on the global climate and there is no defined geographical Study Area. Instead, the assessment considers relevant potential sources of GHG emissions resulting from activities to deliver the Proposed Development, regardless of where they occur in the UK. These emissions are then considered in the context of Government commitments to manage and reduce GHG emissions over time, as defined with national carbon budgets (both for Scotland and the UK). Emissions of relevant GHGs are expressed throughout this chapter in tonnes of carbon dioxide-equivalent (tCO_2e).

15.2.2 The temporal extent of the GHG emissions assessment is the full lifetime of the Proposed Development, (i.e. construction, O&M and decommissioning phases). Construction is anticipated to commence in 2031 and last 48 months, with first powering occurring in 2035 and full operation in 2036. The operational lifetime of the Proposed Development is anticipated to be 30 years, and at the end of the operational lifetime of the Proposed Development, it will be decommissioned.

15.2.3 For the assessment of vulnerability of the Proposed Development to climate change (referred to as the 'climate change risk assessment' (CCRA)) during the O&M phase (anticipated to be 2036 to 2065), the relevant receptors are predominantly the infrastructure assets which form part of the Proposed Development (including physical infrastructure and equipment/plant). As such, the CCRA Study Area comprises the PPP Application Boundary. The CCRA Study Area is shown in Figure 15.1 (Annex – Figures).

15.3 Legislative and Policy Context

15.3.1 The overarching legislation and policy applicable to the Proposed Development is presented in Volume 1, Chapter 1: Introduction. The principal legislation applicable to climate change in Scotland is the Climate Change (Scotland) Act 2009 (Scottish Government, 2019a) and subsequent amendments, the Climate Change (Emissions Reduction Targets) (Scotland) Act 2019 (Scottish Government, 2019b) and the Climate Change (Emissions Reduction Targets) (Scotland) Act 2024 (Scottish Government, 2024a). The Climate Change Act 2008 is also relevant as it includes carbon reduction targets for the United Kingdon (UK) (UK Government, 2019).

15.3.2 Policy specific to climate change is contained in the National Planning Framework 4 (NPF4) (Scottish Government, 2023a) and on a regional level in the Aberdeenshire Local Development Plan 2023 (ALDP) (Aberdeenshire Council, 2023). Climate change is a priority focus of the NPF4 with the reduction in GHG emissions appearing as a major cross-cutting theme throughout many policies. The ALDP sets out a spatial strategy and vision for the future development of Aberdeenshire.

15.3.3 A summary of the legislative provisions relevant to climate change are provided in Table 15.1, with relevant planning policy provisions set out in Table 15.2.

Table 15.1: Summary of Legislation Relevant to Climate Change

Summary of Relevant Legislation	How and Where Considered in the EIA Report
Climate Change (Scotland) Act 2009, Climate Change (Emissions Reduction Targets) (Scotland) Act 2019 and Climate Change (Emissions Reduction Targets) (Scotland) Act 2024. **These set a 'net-zero emissions target' for GHG emissions in Scotland by 2045 (i.e. a 100% reduction in emissions compared to the 1990 baseline) and set out the legislative framework for setting interim 5-year carbon budgets up to 2045 (Scottish Government, 2024a).** **The proposed carbon budgets, as set out in the draft The Climate Change (Scotland) Act 2009 (Scottish Carbon Budgets) Amendment Regulations 2025, being voted on by the Scottish Parliament in Autumn 2025, are based on reductions in national GHG emissions compared to 1990 levels of 57% for 2026 – 2030 (175 MtCO2e), 69% for 2031 – 2035 (126 MtCO2e), 80% for 2036 – 2040**	This chapter sets out a Whole Life Carbon Assessment (WLCA) to enable potential changes in GHG emissions from the Proposed Development to be quantified. This facilitates the GHG emissions to be assessed in the context of the UK and Scottish Government carbon budgets and associated net zero targets. Further details of the WLCA are provided in Volume 2, Appendix 15.1: Greenhouse Gas Assessment. Although the proposed Scottish carbon budgets are yet to be adopted by the Scottish Government, these have been considered in this assessment on a precautionary basis.

Summary of Relevant Legislation	How and Where Considered in the EIA Report
(81 MtCO2e) and 94% for 2041 – 2045 (81 MtCO2e) for Carbon Budgets 1 to 4, respectively (Scottish Government, 2025a).	
The Climate Change Act 2008 (amended 2019), commits the United Kingdom (UK) to reducing carbon emissions to net zero by 2050. It also requires the Secretary of State to set legally binding carbon budgets over five-year periods and to ensure that net UK carbon emissions do not exceed these budgets. The fifth carbon budget (2028 – 2032) is 1,725 MtCO2e, a 57% reduction on 1990 levels and sixth carbon budget (2033 – 2037) is 965 MtCO2e, a 78% reduction on 1990 levels.	
Climate Change (Scotland) Act 2009 (Scottish Government, 2019a) addresses vulnerability to climate change and requires the preparation of strategic programmes for climate change adaptation, as soon as reasonably practicable after each round of UK Climate Change Risk Assessment.	This chapter sets out a Climate Change Risk Assessment (CCRA) to understand the potential risks to the Proposed Development from climate change. Further details of the CCRA are provided in Volume 2, Appendix 15.2: Climate Change Resilience Assessment.

Table 15.2: Summary of Planning Policy Relevant to Climate Change

Summary of Relevant Policy	How and Where Considered in the EIA Report
National Planning Framework 4 (Scottish Government, 2023a). ***Policy 1 – Tackling the climate and nature crises.*** **When considering all development proposals, significant weight will be given to the global climate and nature crises.** **Local Development Plans must address the global climate emergency and nature crisis by ensuring the spatial strategy will reduce emissions and adapt to current and future risks of climate change by promoting nature recovery and restoration in the area.**	This chapter sets out a WLCA to enable potential changes in GHG emissions from the Proposed Development to be assessed and determine the likely significant effects on climate. Further details of the WLCA are provided in Volume 2, Appendix 15.1: Greenhouse Gas Assessment. The Proposed Development will support the transition to renewable energy, thereby contributing to the UK's response to the global climate emergency. A CCRA has also been undertaken to understand the risks from climate change to the Proposed Development and is presented in this chapter. Further details of the CCRA are provided in Volume 2, Appendix 15.2: Climate Change Resilience Assessment.
National Planning Framework 4 (Scottish Government, 2023a). ***Policy 2 – Climate mitigation and adaption.*** **Development proposals will be sited and designed to minimise lifecycle GHG emissions as far as possible.**	A WLCA has been undertaken in this chapter to determine the likely significant effects of the Proposed Development on climate. The WLCA can be used to identify hotspots in carbon. Carbon reduction was embedded in the design of the Proposed Development (see Section 15.9), with additional mitigation proposed (see Section 15.10) to reduce emissions from

Summary of Relevant Policy	How and Where Considered in the EIA Report
Development proposals will be sited and designed to adapt to current and future risks from climate change.	identified carbon hotspots as far as reasonably practicable. A CCRA has been undertaken to understand the risks from climate change to the Proposed Development. These risks were factored into the design where practicable at this stage (see Section 15.10), supporting adaptation to future risks from climate change.
National Planning Framework 4 (Scottish Government, 2023a). ***Policy 11 – Renewable energy development.*** **Development proposals for all forms of renewables, low-carbon and zero emissions technologies will be supported.** **Significant weight will be placed on the contribution of the proposal to renewable energy generation targets and on GHG emissions reduction targets.**	A WLCA has been undertaken in this chapter to determine the likely significant effects of the Proposed Development on climate. This enabled potential changes in GHG emissions to be assessed in the context of the proposed Scottish Government carbon budgets and associated net zero target (see Sections 15.10 and 15.12). The benefit of installing this source of renewable energy is demonstrated in terms of reducing GHG emissions when compared to other higher carbon energy solutions using fossil fuels (as shown in Section 15.12). The Project therefore contributes towards achieving the UK's and Scotland's net zero targets and responds to Policy 11 of the NPF4.
Aberdeenshire Local Development Plan 2023 (Aberdeenshire Council, 2023). ***Policy C1 Using Resources in Buildings.*** **Sets out the requirement for all developments to be designed in the context of sustainable development and climate change.** **The policy also sets out requirements for Scottish building regulations Target Emissions Rate and achieving sustainability ratings for carbon dioxide reduction and energy efficiency. It also sets out requirements for the provision of an Energy Statement at the planning application stage.**	A WLCA has been undertaken in this chapter to determine the likely significant effects of the Proposed Development on climate. The WLCA can be used to identify hotspots in carbon emissions. Policy C1 will be addressed through embedded carbon mitigation efforts in the detailed design and construction/operation of the Proposed Development, where practicable, to reduce emissions. Additional mitigation measures have been suggested for reducing the carbon emissions associated with the design and construction of the Proposed Development, this would include consideration of relevant buildings (see Section 15.10).
Aberdeenshire Local Development Plan 2023 (Aberdeenshire Council, 2023). ***Policy C2 Renewable Energy.*** **States that the council will support renewable energy developments.** **Assessment of the acceptability of such developments will take account of any effects on greenhouse gas emissions and carbon rich soils (as well as several other aspects).**	A WLCA has been undertaken in this chapter to determine the likely significant effects of the Proposed Development on climate resulting from GHG emissions. The assessment has also considered whether there would be any potential impact of GHG emissions from the disturbance of high-carbon peat rich soils. The presence of high-carbon peat rich soils within the PPP Application Boundary is discussed in Section 15.6.

Summary of Relevant Policy	How and Where Considered in the EIA Report
Aberdeenshire Local Development Plan 2023 (Aberdeenshire Council, 2023). ***Policy C3 Carbon Sinks and Stores.*** **Sets out intention to protect carbon sinks and stores, such as woodland and high-carbon peat rich soils (defined by Scottish Natural Heritage's Carbon and Peatland map 20167 as Class 1, 2 and 5, and greater than 0.5m depth), from disturbance or destruction. Development proposals that may result in the loss of, or disturbance to, peat will only be permitted if tools such as the "Carbon Calculator" demonstrate that the development will, within its lifetime, have no net effect on CO_2. Removal of woodland will only be permitted if an equal area is replanted, preferably as part of the open space requirement and as part of the green-blue network in the settlement, so as to maintain the carbon balance.**	A WLCA has been undertaken in this chapter to determine the likely significant effects of the Proposed Development on climate. The assessment has considered the potential impact on GHG emissions from the disturbance or destruction woodland and high-carbon peat rich soils was considered by reviewing the presence of these within the PPP Application Boundary. Where these were likely to have an impact on GHG emissions they were taken forward to the quantification stage of the assessment. This is discussed in Section 15.6. The Proposed Development takes place on land that is currently occupied by woodland. Embedded Mitigation (see Section 15.9) is included to ensure that the felling of woodland is reduced where possible and that any permanent losses are replanted in an equal volume elsewhere. More information on the mapping and management of woodlands in the Study Area can be found in Volume 2, Technical Appendix 6.1: Forestry and Arboriculture Techncial Report.
Aberdeenshire Local Development Plan 2023 (Aberdeenshire Council, 2023). **Policy C4 Flooding.** **Sets out requirements for all developments to consider flood risks and promote sustainable flood management, including allowances for freeboard and climate change.**	A CCRA has been undertaken to determine the likely significant effects of climate change (i.e. understand the risks to the Proposed Development from climate change) and is presented in this chapter. Further details of the CCRA are provided in Volume 2, Appendix 15.2 Climate Change Resilience Assessment. The assessment included the potential impact of increased flooding as a result of climate change. Appropriate embedded mitigation is included with regard to sustainable flood management (see Section 15.9), and more information on flood risk can be found in Volume 1 Chapter 11: Water Quality and Flood Risk.

15.3.4 Although not planning policies, other relevant policies and plans from the UK and Scottish Governments which set out further context on climate change are briefly discussed below:

- The Scottish National Adaptation Plan (Scottish Government, 2024b) was launched in 2024 and outlines how Scotland is preparing for the impacts of climate change over the period from 2024 – 2029. The Scottish National Adaptation Plan is a requirement of the Climate Change (Scotland) Act 2009 and addresses the risks set out in the third UK Climate Change Risk Assessment (Defra, 2022), published under Section 56 of the UK Climate Change Act 2008. It aims to promote climate-ready development that is resilient to the potential impacts of climate change.
- The Scottish Government's Climate Change Plan (Scottish Government, 2020), in which the decarbonisation of electricity supply and the expansion of offshore wind is a priority. Work is also underway on

development of the next climate change plan, for 2026 to 2040. This will be published in draft following receipt of advice from the Climate Change Committee, and Carbon Budget levels being set through secondary legislation.

- The Scottish Government also published accompanying monitoring reports to the Climate Change Plan on an annual basis (Scottish Government, 2025b), in which it is reiterated that Scotland will continue to benefit from investment and growth in electricity generation capacity and support for technologies that will deliver on decarbonisation goals.
- The UK Government's Build Back Greener report (Department for Business, Energy & Industrial Strategy (BEIS), 2021) outlines the UK Government's Net Zero Strategy and includes policies and proposals to decarbonize across all sectors of the economy in order to achieve the 2050 net zero target and interim milestones. This document encourages the shift towards low carbon sources of energy and an acceleration of deploying low-cost renewable generation, including wind energy.
- The Draft Energy Strategy and Just Transition Plan was published by the Scottish Government in 2023 (Scottish Government, 2023b). It outlines Scotland's roadmap toward a net zero energy system, focusing on affordability, resilience, and clean energy for households, businesses, and communities.
- The British Energy Security Strategy (BEIS, 2022), is designed to ensure future energy security in Britain, and includes the target to deploy a capacity of 50 GW for offshore wind development by 2030, of which 5 GW will be floating wind, (increased earlier in 2022 from 40 GW by 2035).
- The Clean Power 2030 action plan (Department for Energy Security and Net Zero (DESNZ), 2024) is the UK government's strategy to have at least 95% of electricity generation to come from clean sources (renewables, nuclear, gas with carbon capture and storage, and hydrogen-to-power) by 2030. It aims to reduce greenhouse gas emissions to combat climate change and reduce the carbon intensity of electricity generation to well below 50 gCO_2e/kWh (0.05 tCO_2e/MWh) by 2030.
- The Climate Change Committee (CCC) has set out the Seventh Carbon Budget in the UK (the CCC, 2025), which is the most recent and covers the period 2038-2042 and aims to reduce emissions to 87% below 1990 levels in this time (a total emission of 535 $MtCO_2e$). It provides a pathway for the UK to meet its net zero target by 2050. Relevant to this assessment, it is stated that *"Electrification and low-carbon electricity supply make up the largest share of emissions reductions in our pathway, 60% by 2040'* and that '*The investments, infrastructure, and land use changes required to deliver the Seventh Carbon Budget must be designed to be well-adapted to current and future climate change".* Whilst the 'recommended' seventh carbon budget is yet to be adopted by the UK government, it has been considered in this assessment on a precautionary basis.

15.3.5 Although not planning policies, other relevant policies and plans which set out further context on climate change from Aberdeenshire Council are briefly discussed below:

- The Route Map (Aberdeenshire Council 2022a) sets out the Aberdeenshire Council's approach to reaching its own target of a 75% reduction in emissions by 2030 and for reaching net zero by 2045. This document also reiterates Aberdeenshire Council's objective to work with others across the region to ensure that Aberdeenshire reaches net zero by 2045.
- Climate Ready Aberdeenshire is a voluntary cross-sector network to create and coordinate Aberdeenshire's climate change adaptation and mitigation strategy, and its page on the Aberdeenshire Council website includes its vision and climate priority areas (Aberdeenshire Council, 2022b). Of relevance to this chapter, the climate priority area of "*mitigation and net zero*" aims towards "*reducing or preventing greenhouse gas emissions while delivering a transition towards Net Zero that prioritises fairness and tackles inequality and injustice across Aberdeenshire*".

15.4 Consultation

15.4.1 The approach to consultation for the Proposed Development is set out in Chapter 4: Stakeholder Engagement and Consultation. A summary of the issues raised during consultation activities undertaken to date specific to climate change is presented in Table 15.3.

Table 15.3: Summary of key consultation issues raised during consultation activities undertaken for the Proposed Development relevant to climate change

Date	Consultee and Type of Consultation	Summary of Issue(s) Raised	Response to Issue Raised and/or Where Considered in this Chapter
Oct 2024	2024 Bowdun Scoping Opinion (Aberdeenshire Council, 2024a)	No specific issues were raised on climate change in response to the Scoping Report dated September 2024.	N/A
July 2024	Pre Application Advice (Aberdeenshire Council, 2024b)	SEPA set out specific requirements in relation to carbon rich soils and peat (demonstrating that assessment has informed design, avoiding impacts, submission of a peat management plan if impacts cannot be avoided).	The presence of peat is discussed in Section 15.6 of this chapter and in Volume 1, Chapter 10: Geology and Ground Conditions.
August and October 2025	2025 Pre-Application Consultation (PAC) Events	Support for renewable energy and meeting net zero targets.	The Proposed Development which relates to the onshore infrastructure of the Bowdun Offshore Wind Farm is classified as a National

Date	Consultee and Type of Consultation	Summary of Issue(s) Raised	Response to Issue Raised and/or Where Considered in this Chapter
			Development in NPF4 and will contribute to achieving net zero emission targets. An assessment of the proposed development against national and local policy is contained in the Planning Statement which accompanies the PPP application.

15.5 Data Sources

15.5.1 A variety of topic specific information has been reviewed and analysed to inform the baseline for the assessment of GHG emissions and the CCRA.

15.5.2 No site-specific surveys have been undertaken to inform the EIA for climate change. This is because the receptor for assessing GHG emissions is the global climate and all other information required for the baseline (e.g. land use/forestry) is available from desktop studies or informed by surveys undertaken by other topics. Similarly, for the CCRA, the receptors are the Proposed Development itself and baseline information (e.g. climate data and climate projections) are available from desktop studies.

Desktop Study

15.5.3 For the assessment of GHG emissions, information on the existing land use within the PPP Application Boundary, specifically the broadleaved, mixed and coniferous woodland, was collected through a detailed desktop review of existing studies and datasets which are summarised in Table 15.4. These data were collected for the assessment presented in Volume 1, Chapter 6: Land Use, Agriculture and Public Access, but were also used to estimate the magnitude of carbon stored within and potential future carbon sequestration of existing woodland within the PPP Application Boundary.

15.5.4 To inform the CCRA, the existing and future climate baseline was obtained, based on a review and processing of existing datasets which are summarised in Table 15.4.

15.5.5 The GHG emissions assessment technical report (Volume 2, Appendix 15.1: Greenhouse Gas Assessment) and CCRA technical report (Volume 2, Appendix 15.2: Climate Change Risk Assessment) include full details of the data used and analysis undertaken to inform the climate change baselines for each respective assessment.

Table 15.4: Summary of Key Data Sources

Title	Source	Extent	Year	Author
National Forest Inventory Scotland 2021	https://www.data.gov.uk/dataset/3c98f46e-432d-4a3e-8afd-72bd8f49550d/na	Cable construction corridor	2025 (last updated)	Forestry Commission, 2025

Title	Source	Extent	Year	Author
	tional-forest-inventory-scotland-2021			
HadUK-Grid Gridded Climate Observations	https://dx.doi.org/10.5285/45d40c035f9a48b997821b6b92194b75	UK wide (25 km grid square centred on E 387500 N 787500)	2018 (data for baseline period 1981 – 2010)	Met Office Hadley Centre, 2025
UK Climate Projections 2018 (UKCP18)	https://catalogue.ceda.ac.uk/uuid/9f8dfaf790644dbcb2c3f69f409a70d6	UK wide (25 km grid square centred on E 387500 N 787500)	2018 (projections for 30 year periods 2030 – 2059 and 2060 – 2089	Met Office Hadley Centre, 2018

15.6 Methodology for Assessment of Effects

Overview

15.6.1 Although broadly consistent with the overall approach to assessment set out in Volume 1, Chapter 3: EIA Methodology, the assessment of the likely significant effects relating to climate change (consisting of the assessment of GHG emissions and the assessment of climate change risks to the Proposed Development), has followed the methods set out in the following guidance documents:

- The Institute of Environmental Management and Assessment (IEMA) Guide to Assessing Greenhouse Gas Emissions and Evaluating Their Significance (IEMA, 2022); and
- EIA Guide to Climate Change Resilience & Adaptation (IEMA, 2020).

15.6.2 Appropriate carbon calculation methods, models and techniques were used to quantify the GHG emissions for the construction, O&M and decommissioning phases of the Proposed Development as part of the WLCA. Full details of the WLCA and associated GHG calculations are set out in the GHG emissions assessment technical report (Volume 2, Appendix 15.1: Greenhouse Gas Assessment). In summary, an estimate has been made of carbon emissions which are likely to be generated during the construction phase for the following activities:

- Embodied carbon emissions associated with raw material supply, transport and manufacturing of the required materials and assets (product stage (WLCA life cycle stages A1–A3)) (Royal Institute of Chartered Surveyors (RICS), 2023).
- Transport of materials to the construction site (construction process stage (WLCA life cycle stage A4)), including the return trip of the HGV.
- Transport of construction workers and on-site staff to and from the construction site (construction process stage (WLCA life cycle stageA5)).
- Operation of construction plant and on-site activities (construction process stage (WLCA life cycle stage A5)).
- Emissions associated with changes in land use from the release of carbon stored in woodlands and change in carbon sequestration during the construction phase (assigned under WLCA life cycle stage A5).

15.6.3 The WLCA also includes an estimate of carbon emissions which are likely to be generated during the O&M phase as a result of the following activities:

- Fuel use associated with preventative and corrective maintenance activities.
- Changes in emissions associated with the altering of the carbon sequestration potential of woodland removed during the construction phase.

15.6.4 The WLCA also includes an estimate of carbon emissions which are likely to be generated during the decommissioning phase as a result of the following activities:

- Operation of plant and on-site decommissioning activities.
- Transport of the disassembled components and waste from the site.
- Transport of workers and on-site staff to and from the site

15.6.5 Key technical guidance or tools which were used to inform the WLCA are set out below:

- RICS 2023 Whole life carbon assessment for the built environment: Professional standard, global 2nd edition (RICS, 2023);
- National Highways carbon emissions calculation tool and associated guidance (National Highways, 2025).

Criteria for Assessment

GHG Emissions

15.6.6 When determining the significance of effects, a process is usually used which involves defining the magnitude of the potential impacts and the sensitivity of the receptors. These are then combined in a matrix to determine the significance of the effect. However, the approach for assessing GHG emissions differs to the standard approach as the receptor is the global climate, which the IEMA guidance (2022) assigns as having a high sensitivity.

15.6.7 There is no set significance threshold for changes in emissions of GHGs (i.e. there is no value of emissions above which it is automatically considered to be a significant effect). IEMA guidance (2022) indicates that the crux of significance is not whether a development emits GHGs, nor even the magnitude of GHG emissions, but whether the development contributes to reducing GHG emissions relative to a comparable baseline consistent with a trajectory towards net zero by 2050.

15.6.8 The UK and Scottish governments have adopted or proposed carbon budgets to meet the goals of the Paris Agreement (United Nations Framework Convention on Climate Change, 2016) and the target of net zero by 2050 and 2045, respectively. Thus, a proposed development which is compatible with the net zero targets and interim carbon budgets is consistent with the approach to addressing the adverse effects of climate change. This aligns with the approach to significance set out in the IEMA guidance (2022).

15.6.9 Considering the above, an assessment has been made, based on professional judgement, as to whether changes in GHG emissions as a result of the Proposed

Development could have a material impact on the ability of the UK and Scottish Governments to meet their respective carbon reduction targets.

15.6.10 Table 15.5 provides significance of effect descriptions from the IEMA (2022) guidance which have been used to assist the judgement of significance. In line with the IEMA guidance, effects that are deemed to be 'significant' are those where the magnitude is moderate or major adverse. Magnitudes of minor adverse or negligible are considered to represent an effect which is 'not significant'. The determination of magnitude has included contextualising estimated GHG emissions against the UK and proposed Scottish Government carbon budgets. The IEMA (2022) guidance states that "*A project that causes GHG emissions to be avoided or removed from the atmosphere has a beneficial effect that is significant.*"

Table 15.5: Significance Criteria for GHG Emissions

Significance of effect	Assessment Criteria
Major Adverse	A project's carbon impacts are not mitigated or are only compliant with do-minimum standards set through regulation, and do not provide further reductions required by existing local and national policy for such types of projects. A project with major adverse effects is locking-in emissions and does not make a meaningful contribution to the UK's trajectory towards net zero.
Moderate Adverse	A project's carbon impacts are partially mitigated and may partially meet the applicable existing and emerging policy requirements but would not fully contribute to decarbonisation in line with local and national policy goals for such types of projects. A project with moderate adverse effects falls short of fully contributing to the UK's trajectory towards net zero.
Minor Adverse	A project's carbon impacts would be fully consistent with applicable existing and emerging policy requirements and good practice design standards for such types of projects. A project with minor adverse effects is fully in line with measures necessary to achieve the UK's trajectory towards net zero.
Negligible	A project's carbon impacts would be reduced through measures that go well beyond existing and emerging policy and design standards for such types of projects, such that radical decarbonisation or net zero is achieved well before 2050. A project with negligible effects provides performance that is well 'ahead of the curve' for the trajectory towards net zero and has minimal residual emissions.
Beneficial	A project's net carbon impacts are below zero, compared to the without-project baseline. A project with beneficial effects substantially exceeds net zero requirements with a positive climate impact.

Climate Change Risk Assessment

15.6.11 When determining the significance of effects for the vulnerability of the Proposed Development to climate change, this adopts a process of determining the likelihood of a climate change impact occurring to the receptors (in this case, the Proposed Development itself) and the consequence of that impact, should it occur. These are then combined in a matrix to determine the significance of effect. This is based on good practice CCRA examples provided in the IEMA guidance (2020). Full details and description of the assessment criteria and tables are provided in the CCRA technical report (Volume 2, Appendix 15.2: Climate Change Risk Assessment). However, for ease of

reference, the likelihood, consequence and significance of effect tables are reproduced below in Table 15.6, Table 15.7, and Table 15.8 respectively.

Table 15.6: Definition of Terms relating to Likelihood

Likelihood	Definition
High	The event/impact occurs multiple times during the expected operational life (e.g. annually).
Medium	The event/impact occurs several times during the expected operational life (e.g. approximately every 3 – 5 years).
Low	The event/impact occurs a limited number of times during the expected operational life (e.g. approximately every 10 – 15 years).
Negligible	The event/impact is unlikely to occur during the expected operational life.

Table 15.7: Definition of Terms relating to Consequence

Consequence	Definition
Large	Acute impact to functionality; or A large measurable decrease in receptor lifespan following the occurrence of a climate impact; or Major increase in the need for maintenance and repairs; or Wide scale disruption to operation of the project or loss of function and usability that is long-term (e.g. greater than one week).
Moderate	Measurable decrease in receptor performance or lifespan; or Large increase in necessary maintenance and repairs following the occurrence of a climate impact; or Localised disruption to operation of the project or loss of function and usability that is medium-term (up to one week).
Minor	A small measurable impact to a receptor's performance or lifespan due to a chronic effect; or Small but measurable increase in necessary maintenance and repairs following the occurrence of a climate impact; or Minimal disruption to operation of the project or loss of function and usability that is short-term (less than one day).
Negligible	Very small or no quantifiable impact to a receptor's performance following acute impact, or No measurable deterioration of a receptor's lifespan due to a chronic impact; or No measurable increase in necessary maintenance and repairs; or No disruption in function and usability of the project.

15.6.12 The likelihood and the consequence of the climate change impact are combined when determining the significance of the effect upon the CCRA receptors. The particular method employed for this assessment is presented in Table 15.8.

15.6.13 The EIA Regulations require the identification and reporting of significant environmental effects. For the purposes of this assessment:

- a level of moderate or more will be considered a 'significant' effect in terms of the EIA Regulations; and
- a level of minor or less will be considered 'not significant' in terms of the EIA Regulations.

Table 15.8: Matrix Used for the Assessment of the Significance of the Effect

Consequence	Likelihood			
	Negligible	**Low**	**Medium**	**High**
Negligible	Not Significant (Negligible)	Not Significant (Negligible)	Not Significant (Minor Adverse)	Not Significant (Minor Adverse)
Minor	Not Significant (Negligible)	Not Significant (Minor Adverse)	Not Significant (Minor Adverse)	**Significant (Moderate Adverse)**
Moderate	Not Significant (Minor Adverse)	Not Significant (Minor Adverse)	**Significant (Moderate Adverse)**	**Significant (major adverse)**
Large	Not Significant (Minor Adverse)	**Significant (Moderate Adverse)**	**Significant (Major Adverse)**	**Significant (Major Adverse)**

15.7 Key Parameters for Assessment

Maximum Design Scenario

15.7.1 The Maximum Design Scenario (MDS) identified in Table 15.9 are those parameters expected to have the potential to result in the greatest effect on an identified receptor or receptor group. Any other development scenario within the Project Design Envelope (PDE), will result in the same, or less, level of environmental effect. The scenario has been selected from the details provided in Volume 1, Chapter 2: The Proposed Development.

Table 15.9: Maximum Design Scenario Considered for Each Potential Impact as Part of the Assessment of Likely Significant Environmental Effects on Climate Change

Potential Impact	Phase			Maximum Design Scenario
	C	O&M	D	
GHG emissions (construction phase - manufacturing and installation)	✓	×	×	The construction phase MDS parameters are set out below: • Maximum construction duration (48 months), within construction occurring in 2031 – 2035. • The substation constitutes a 400/275 kV transformer and associated enabling elements as stated in the PDE. • The substation will contain a maximum of three buildings with indicative dimensions: 85 m x 25 m, 95 m x 25 m, and 38 m x 17 m mounted on reinforced concrete pads with thickness 0.4 m. Maximum height of main building is 15m and maximum height of other structures are 12.5m. Other substation components will be mounted on reinforced concrete pads of 0.4 m thickness, with combined area of 5,561 m^2). These will be contained within a wider substation footprint no larger than 473 m x 280 m. • There will be 9 onshore 220/275 kV export cables (3 cable circuits and 3 cables per circuit) which have a maximum length of 22 km each. Therefore, a total length of 198 km of 220/275 kV cable, cable ducting and cable protection. • There will be 9 x 400 kV grid connection cables with a length of 1.2 km. Therefore, a total length of 11 km of 400 kV cable, cable ducting and cable protection. • There will be 33 access points each with a bellmouth of the dimensions of 30 m at road and 10 m distance from road to access track. • There will be 3 Transition Joint Bays of dimensions 20 m x 4 m. • There will be a maximum of 3 horizontal directional drilling (HDD) crossings at Landfall, with a maximum length of 760 m. • There will be a maximum of 63 concrete joint bays with dimensions of 14.5 m x 4 m x 2.3 m each. • There will be a maximum of 63 concrete link boxes of the dimensions 2 m x 2 m x 2 m each.

Potential Impact	Phase			Maximum Design Scenario
	C	O&M	D	
				• There will be a maximum of 18 HDD crossings for the Onshore Export Cable, with 9 associated ducts, each with a length of 120 m. There will be no HDD crossings for the grid connection cable. • The greatest number of Heavy Goods Vehicles (HGVs) deliveries for the installation of the Proposed Development is 41,300, with average daily construction workforce of 93.3 workers, as provided from traffic modelling outputs and assumptions.
GHG emissions (O&M phase - materials and activities)	×	✓	×	O&M phase: • The greatest number of maintenance vehicles across the lifetime of the Proposed Development assuming one round trip per month over the 30 year O&M phase (360 no. total round trips). • No replacement of the Onshore Export Cable or 400kV Cable has been assumed.
GHG emissions (decommissioning phase – activities, including transport of recovered materials)	×	×	✓	As per the parameters listed for the construction phase - manufacturing and installation.
GHG emissions (land use change – all phases)	✓	✓	✓	• Onshore 220/275 kV export cables which have a maximum length of 22 km. • 400 kV grid connection cables with a length of 1.2 km. • Onshore 220/275 kV export cable corridor temporary width of 50 m, permanent unplanted easement of 35 m. • 400 kV grid connection cable corridor temporary width of 35 m, permanent unplanted easement of 15 m. • Assumed that all trees will be felled within woodland management compartments within Mearns Forest which are within the indicative Substation Search Area (with the exception of remote sections of the compartments separated by land outside of the PPP Application Boundary) (see Volume 2, Technical Appendix 6.1: Forestry and Arboriculture Technical Report for details of the woodland management compartments). Replanting

Potential Impact	Phase			Maximum Design Scenario
	C	O&M	D	
				of these on completion of construction will exclude the permanent area of the Substation (423 m x 230 m).
Vulnerability of the Proposed Development to climate change	×	✓	×	Not applicable – the parameters that the assessment of vulnerability to climate change is based on are fixed (i.e. there are no reported design options) or they do not affect the level of impact to the Proposed Development. For example, the Onshore Export Cable is proposed to be buried in cable trenches and there is no design option for surface mounted cables which could potentially increase the likelihood or consequence of a climate change-related impact. The assessment is not affected by the potential variation in, for example, the length of the Onshore Export Cable route, width of Cable Corridors, the number of Joint Bays and Horizontal Directional Drilling locations or the number and size of Substation buildings.

Impacts Scoped Out of the Assessment

15.7.2 On the basis of the baseline environment and the Project Description outlined in Volume 1, Chapter 2: The Proposed Development, one impact was scoped out of the assessment for climate change at the project scoping stage as reported in the Scoping Report. No concerns were raised by key consultees within the Scoping Opinion in relation to the proposed approach to climate change therefore the assessment herein has been prepared in line with the Scoping Opinion.

15.7.3 The impact scoped out is outlined together with justification for scoping it out in Table 15.10.

Table 15.10: Impact Scoped Out of the Assessment for Climate Change (Tick Confirms the Impacts is Scoped Out)

Potential Impact	Phase			Justification
	C	O&M	D	
Vulnerability of the Proposed Development to climate change	✓	×	✓	The Proposed Development is unlikely to experience significant changes in climate during construction compared to the baseline given the shorter timeframe. A range of standard good practice construction phase weather resilience measures for managing extreme events including high rainfall events and flood risks will be implemented at the construction sites, along with measures for protecting workers and equipment from extreme weather conditions and temperatures. These measures will be outlined in the Construction Environmental Management Plan (CEMP). The decommissioning phase was also scoped out as variations in climatic parameters during the decommissioning phase are not anticipated to be significant. Changes in climate are expected to occur gradually and will be more understood at the time of decommissioning. Contractors will be able to adapt working methods over time to protect the decommissioning activities from climate change-related adverse weather.

Note: Proposed Development phase refers to construction (C), operation and maintenance (O&M) and decommissioning (D)

15.7.4 The EIA Scoping Report stated that an in-combination climate impact (ICCI) assessment was to be scoped out of the assessment presented in this chapter, and to be addressed within the relevant technical chapters. However, for clarity the ICCI assessment has been included in this chapter (see Section 15.11).

15.8 Baseline Environment

Overview of Baseline Environment

15.8.1 The following sections provide a summary of the climate change baseline environment. The GHG assessment technical report, Volume 2, Appendix 15.1: Greenhouse Gas Assessment, and CCRA technical report, Volume 2, Appendix 15.2: Climate Change Risk Assessment, include further details of the analysis undertaken to develop the climate change baseline.

Existing Baseline

GHG emissions

15.8.2 The current baseline environment for the GHG assessment was informed through consideration of the site-specific baseline. This included review of the existing land uses with the potential to be affected by construction activities, with particular reference to any areas of carbon-rich habitats, such as peaty soils and woodlands.

15.8.3 As noted in Volume 1, Chapter 10: Geology and Ground Conditions and shown on Figure 10.1, the PPP Application Boundary is broadly underlain by soils with no or limited peat content (referred to as 'Class 0' and 'Class 4' soils). There is a relatively small area of 'Class 5' soils (areas of high-carbon and deep soil but no peatland habitat recorded) within the Onshore Cable Corridor to the south of the Substation. It is assumed that the cable route could avoid this area in line with relevant embedded mitigation of siting the Proposed Development on poorer quality land avoiding areas of peat (see Table 10.14 of Volume 1, Chapter 10: Geology and Ground Conditions). Volume 1, Chapter 10: Geology and Ground Conditions also notes that relatively thin deposits of peat (up to a maximum of 0.5m in thickness) were identified at 15 locations in the Substation Search Area. Given the limited presence of peaty soils, Volume 1, Chapter 10: Geology and Ground Conditions concluded that the impact on peat due to soil sealing at the Substation Search Area would be of minor adverse significance. On this basis, the impact of peat disturbance was scoped out of the assessment of GHG emissions.

15.8.4 Therefore, the GHG emissions baseline is based only on the presence of woodlands. The removal of woodland during construction would alter emissions (e.g. emissions from the cutting down of the trees and subsequent loss of stored carbon and changes to ongoing carbon sequestration during the O&M phase due to their removal).

15.8.5 The areas of woodland within the areas of the PPP Application Boundary are summarised in Section 1.2 Study Area of the Volume 2, Technical Appendix 6.1: Forestry and Arboriculture Techncial Report. The main area of woodland is the Fetteresso Forest (part of the larger Mearns Forest). There is a mix of woodland types across the Cable Corridors and Substation Search Area, which includes coniferous forest and broadleaved woodland. The total area of woodland within the PPP Application Boundary is 162.5 ha.

15.8.6 As set out in Volume 2, Technical Appendix 6.1: Forestry and Arboriculture Techncial Report, a scenario was developed to determine a more realistic area of woodland within a representative 'Construction Scenario' area. For the Onshore Export Cable Corridor, this would be a maximum 50 m wide corridor and for the 400 kV Cable Corridor, this would be a maximum 35 m wide corridor. For the Substation, it was assumed that woodland management compartments within Mearns Forest in which the indicative Substation Search Area is situated, will be felled to facilitate construction. This results in a total woodland area of 46.95 ha (i.e. the total area of woodland that would be felled and cleared). For the purposes of this assessment, the representative 'Construction Scenario' has

been used to determine the baseline and potential impacts from land use change.

Climate Change Risk Assessment

15.8.7 Climate change can result in changes in key climate parameters such as temperature and precipitation and lead to more frequent occurrences of extreme climate events, such as flooding and droughts. This section provides a brief summary of the observed climate for the existing baseline period (1981 – 2010). It sets out the existing key baseline climate parameters against which future projections of climate parameters are compared in order to understand the potential scale of future climate changes which are used to represent the future baseline conditions.

15.8.8 Full details of the existing climate baseline and data sources are provided in Volume 2, Appendix 15.2: Climate Change Risk Assessment. In summary, the CCRA Study Area experiences a temperate climate. The annual average temperature in the baseline period was 7.9°C, with summer (June, July and August) averages of 13.1°C and winter (December, January and February) averages of 3.1°C. In general, the CCRA Study Area is slightly colder in summer than the East Scotland region average and slightly warmer than the region in winter.

15.8.9 The annual average rainfall across the CCRA Study Area was 871 mm, which is slightly lower than reported for the East Scotland region of 1,165 mm. The summer and winter precipitation averages were recorded at 194 mm and 216 mm, respectively. The precipitation averages for the driest summer month (June) and wettest winter month (December) were 62 mm and 79 mm, respectively.

Future Baseline Scenario

15.8.10 The EIA Regulations require that "*a description of the relevant aspects of the current state of the environment (baseline scenario) and an outline of the likely evolution thereof without implementation of the project as far as natural changes from the baseline scenario can be assessed with reasonable effort, on the basis of the availability of environmental information and scientific knowledge*" is included within the EIA Report. Consideration of the 'without development' future baseline conditions, assuming the Proposed Development does not come forward, has been carried out and is described within this section.

GHG Emissions

15.8.11 In the absence of the Proposed Development, the existing land use in terms of woodland areas and composition is assumed to remain as reported above for the existing baseline. Although Fetteresso Forest is a commercial forest and some felling and replanting would occur, it was assumed that this would not affect the existing baseline.

15.8.12 Section 4.2 of the GHG emissions assessment technical report (Volume 2, Appendix 15.1: Greenhouse Gas Assessment) provides a detailed description of the future baseline for electricity generation that would be displaced by the

Project (i.e. the Proposed Development and the Offshore Infrastructure). The amount of energy displaced and associated GHG emissions depends on a number of factors, including future energy and climate policy, demand, availability of other electricity generation sources and will be influenced by commercial factors and the National Electricity System Operator's (NESO's) needs.

15.8.13 However, the carbon intensity of baseline electricity generation is projected to reduce over time as renewable energy sources, such as this Project, are implemented, and fossil fuel energy sources are phased out in response to energy and climate policies. The GHG emissions assessment technical report (Volume 2, Appendix 1651: Greenhouse Gas Assessment) provides information on projections of the carbon intensity of electricity generation for the 30-year O&M phase (2036 to 2065). Of relevance are the long-run marginal electricity generation emission factors (which reflect the GHG emissions impact of electricity generation to meet a small, incremental change in electricity demand) (DESNZ, 2023).

15.8.14 The future grid long-run marginal projections have been used in Section 15.12 to estimate the Project's potential avoided emissions over the O&M phase of the Project's lifetime (2036 to 2065). This gives a range of carbon emission factors from 0.017 tCO2e/MWh in 2036 to 0.001 tCO2e/MWh (DESNZ, 2023). However, it should be noted that the use of such factors will potentially underestimate avoided emissions, as these emission factors effectively rely on an assumed increase in the number of renewable energy projects, such as the Project, being implemented over time. There is also uncertainty in the pace of innovation, demand and technical feasibility inherent within these emission factors, and as such these are indicative projections rather than prescriptive forecasts. In addition, the DESNZ projections are for the operational carbon intensity of generation sources only, and do not account for embodied carbon (i.e. construction phase emissions for the generation asset) and the full life-cycle effects.

15.8.15 As, historically, fossil fuel energy sources such as combined cycle gas turbine power plants have provided a large proportion of UK electricity generation, avoided emissions have also been calculated based on the Project solely displacing these fossil fuel-based energy sources, which are represented by the emission factor for all non-renewable fuels (DESNZ, 2025b). The current grid average carbon emission factor has also been used to provide additional context regarding potentially avoided emissions (i.e. assuming the Project displaces energy generation based on the current grid average emissions intensity for the duration of the Project O&M phase) (DESNZ, 2025a). The different carbon emission factors used are summarised in Table 15.11.

Table 15.11: Carbon emission intensities considered to determine potentially avoided GHG emissions during O&M phase

Emission factor type	Carbon emission factor	Description
All non-renewable fuels	0.448 tCO_2e/MWh	Average factor for electricity generation from all non-

Emission factor type	Carbon emission factor	Description
		renewable fuel sources (DESNZ, 2025b)
Grid average (2025)	0.223 tCO_2e/MWh	The UK grid average factor for electricity generation for 2025 (including the 'Scope 3' emissions of extraction, refining and transportation of primary fuels before their use in the generation of electricity) (DESNZ, 2025a)

Climate Change Risk Assessment

15.8.16 Within the last two decades, annual average temperature and precipitation records have been consistently set in the UK relative to the preceding baseline period. These natural variations are likely to continue to be the most visible year-to-year changes in climate over the next decade, amplifying over this century, but in subsequent decades over the operating lifetime of the Proposed Development, the anthropogenic climate changes are expected to become more apparent.

15.8.17 Climate projection data have been reviewed to understand the potential changes in climate over the lifetime of the Proposed Development. Two 30-year periods have been considered, which cover the anticipated O&M phase (2030 – 2059 (the 2040s) and 2060 – 2089 (the 2070s)). Full details of the climate projections are provided in the CCRA technical report (Volume 2, Appendix 15.2: Climate Change Risk Assessment).

15.8.18 Generally, the climate projections indicate that temperatures are projected to increase across all seasons by 2070s, up to 2.5°C on an annual average basis and up to 3.9°C for the hottest month maximum temperature (based on the median values i.e. the 50th percentile).

15.8.19 Total precipitation rates are anticipated to increase on an annual basis. By the 2070s, precipitation is expected to decrease in summer (up to -18%) and increase in winter (up to 23%), with a slight increase on an annual basis (up to 5%) (based on the median values).

15.8.20 Available projections indicate that winter windstorms will increase slightly in number and intensity over the UK (i.e. more winter storms), however there is limited confidence in this projection due to inconsistent results from different climate models.

Data Limitations and Assumptions

15.8.21 The operational lifetime of the electricity infrastructure is currently considered to be 30 years. For the purposes of this assessment, the Proposed Development is expected to become fully operational by 2036 and have an initial 30-year operating lifetime. The assessment, and associated baseline data, is limited to this temporal extent. Further assessment and analysis of future baseline data may be required should the operating lifetime be extended beyond 30-years.

15.8.22 As noted above, there are uncertainties in the projections of carbon emissions factors for the long-run marginal electricity generation and that these inherently rely on an increasing number of similar Projects, being implemented over time. Other carbon emission factors have therefore been considered to provide a broader, more representative interpretation of the range in magnitude of potentially avoided GHG emissions.

15.8.23 As discussed above, for the assessment of GHG emissions from land use change, a representative 'Construction Corridor' was developed to understand the areas of woodland that would be potentially impacted by the Proposed Development. This approach was adopted as it would be unrealistic to assume that all woodland within the PPP Application Boundary would be removed to facilitate construction of the Cable Routes and Substation. Further details of this are provided in Volume 2, Technical Appendix 6.1: Forestry and Arboriculture Techncial Report. It is unlikely that development of different Cable Routes within the PPP Application Boundary would significantly alter the GHG emissions associated with land use change.

15.8.24 There is uncertainty in future climate projections. However, using the RCP8.5 scenario from the latest UKCP18 climate projections (Met Office Hadley Centre, 2018) is considered to provide a suitably conservative approach for the CCRA. This 'high emissions' scenario assumes global GHG emissions continue to rise uncontrolled with annual average temperature increases exceeding 4°C by the end of the century.

15.9 Embedded Measures and Mitigation

GHG Emissions

15.9.1 As part of the Proposed Development design process, Embedded Mitigation measures have been proposed to reduce the potential for likely significant effects on climate change. As there is a commitment to implementing these measures, where relevant and appropriate to do so, these have been considered in the assessment presented in Section 15.10(i.e. the determination of magnitude (i.e. quantification in terms of GHG emissions)_and significance assumes implementation of these measures). Where relevant, this would normally include mitigation measures that are considered standard industry practice for this type of development. However, as this application is at PPP stage, the specific mitigation measures are not yet fully developed or cannot be quantified. The effectiveness of these to reduce GHG emissions has not been

considered in the estimation of GHG emissions but would expected to reduce GHG emissions.

15.9.2 The Embedded Mitigation measures for GHG emissions are set out in Table 15.12.

Table 15.12: Embedded Mitigation Measures Adopted as Part of the Proposed Development – GHG emissions

Ref.	Embedded Measures Adopted as Part of the Proposed Development	Justification
GEN1	Avoidance of areas of forestry, where feasible, and planting proposals	The PPP Application Boundary has been designed, where possible, to avoid areas of forestry and woodland. Where areas of forestry are unavoidable, the applicant will carry out replacement planting and for areas of permanent loss will carry out compensatory planting to comply with Scottish Government Policy on Control of Woodland Removal. A Felling and Planting Plan is proposed as set out in Volume 1, Appendix 2.2 Outline Construction Environmental Management Plan (GEN1).
GEN3	Sustainable waste management	A commitment to follow the principles of sustainable waste management during the construction of the Proposed Development and to minimise waste where possible (see Volume 2, Appendix 2.2 Outline Construction Environmental Management Plan). Note, the effectiveness of this was not considered in the GHG emissions calculations undertaken for the WLCA.

Climate Change Risk Assessment

15.9.3 As part of the design process, a number of embedded mitigation measures have also been incorporated or proposed to reduce the potential for impacts of climate change on the Proposed Development (see

15.9.4 Table 15.13). As there is a commitment to implement these measures, where relevant and appropriate to do so, these have been considered in the assessment presented in Section 15.10(i.e. the determination of likelihood/consequence and therefore significance assumes implementation of these measures). Where relevant, this includes embedded measures that are considered standard industry practice for this type of development.

Table 15.13: Embedded Mitigation Measures Adopted as Part of the Proposed Development – Vulnerability to Climate Change

Ref.	Embedded Measures Adopted as Part of the Proposed Development	Justification
GEN1	Use of buried cables	Buried cables have lower vulnerability to both extreme weather events and changing climate trends.
	Substation design	Design of Substation and components in line with appropriate design standards and with reference to projected temperature rises, with appropriate safety margin. Key components would be enclosed and therefore protected against extreme weather events. Consideration of the potential impacts from trees being felled by high winds (e.g. appropriate stand-off distance for replanting around the Substation or, where visual screening is required, planting with native broadleaves and appropriate species which are less prone to wind throw). Flexible operation and maintenance strategy.
	Temperature sensing on cables	Fibre-optic cables would have temperature sensing, providing an indication of any potential overheating risk which would potentially be exacerbated by climate change.
	Design and location of ground level infrastructure at Landfall	Design and location of ground level infrastructure (e.g. Transition Joint Bays) to be designed to remain operational and accessible during extreme flood events
	Drainage Design	Suitable attenuation and drainage design to manage flood risk. This includes: - Implementation of sustainable drainage systems (SuDS) measures (i.e. settlement and storage ponds) to manage and treat surface water runoff. - Appropriate sizing and positioning of drainage infrastructure to accommodate predicted rainfall events, including allowances for climate change. - Consideration of ground levels and landscaping to direct surface water away from critical infrastructure.

15.10 Assessment of Significance

15.10.1 An assessment of the likely significance of the effects of the Proposed Development on the relevant climate change receptors during the construction, O&M and decommissioning phases is given below.

GHG Emissions

Proposed Development Whole Life Carbon Assessment

15.10.2 This section sets out the estimated GHG emissions for the construction, O&M and decommissioning phases of the Proposed Development, taking into account the embedded design mitigation and standard good practice measures, where relevant. The estimated GHG emissions are shown in Table 15.14. Further details and breakdown of the estimated GHG emissions and relevant details of the approaches and methods used to undertake the GHG emissions calculations are provided in the GHG emissions assessment technical report (Volume 2, Appendix 15.1: Greenhouse Gas Assessment).

Table 15.14: Estimate of GHG Emissions for the Proposed Development

Activity	GHG emissions (tCO_2e)
Construction	129,640
O&M	35
Decommissioning	13,952
Total	**143,627**

Contextualising Emissions Against Carbon Budgets

15.10.3 Estimated net changes in GHG emissions for all relevant phases associated with the Proposed Development are compared to UK carbon budgets in Table 15.15. This includes consideration of the recommended seventh carbon budget (the proposed limit for UK net emissions of GHGs over the years 2038 to 2042) (Climate Change Committee, 2025). Whilst the 'recommended' seventh carbon budget is yet to be adopted by the UK government, it has been considered in this assessment on a precautionary basis.

Table 15.15: Estimated Total Proposed Development GHG Emissions Compared to UK Carbon Budgets

Project phase	Total estimated net change in GHG emissions over carbon budget periods (tCO_2e)	Estimated net change in GHG emissions with the Project within relevant UK carbon budget period (tCO_2e) (and as % of relevant carbon budget)		
		Fifth carbon budget (2028–2032)	Sixth carbon budget (2033–2037)	Recommended seventh carbon budget (2038–2042)
Construction	129,640	48,615 (0.003%)	81,025 (0.008%)	- (0%)
O&M	8	- (0%)	2 (<0.001%)	6 (<0.001%)
Decommissioning	0	- (0%)	- (0%)	- (0%)
Total	129,649	48,615 (0.003%)	81,028 (0.008%)	6 (<0.001%)

Note totals may not sum due to rounding

15.10.4 The results in Table 15.15 indicate that estimated changes in GHG emissions as a result of the Proposed Development are relatively small in comparison to the UK carbon budgets. The largest contribution occurs in the sixth carbon budget period, when the majority of construction phase emissions are anticipated to occur. However, GHG emissions associated with the Proposed Development are considered unlikely to have a material impact on the ability of the UK Government to meet its carbon reduction targets.

15.10.5 Estimated net changes in carbon emissions for the Proposed Development are also compared to the proposed Scottish Government carbon budgets (Scottish Government, 2024a) as shown in Table 15.16.

Table 15.16: Estimated Total Proposed Development GHG Emissions Compared to Recommended Scottish Carbon Budgets

Project phase	Total estimated net change in GHG emissions over carbon budget periods (tCO_2e)	Estimated net change in GHG emissions with the Project within relevant Scottish Government carbon budget period (tCO_2e) (and as % of relevant carbon budget)		
		Carbon Budget 2 (2031–2035)	Carbon Budget 3 (2036–2040)	Carbon Budget 4 (2041–2045)
Construction	129,640	129,640 (0.103%)	- (0%)	- (0%)
O&M	12	- (0%)	6 (<0.001%)	6 (<0.001%)
Decommissioning	0	- (0%)	- (0%)	- (0%)
Total	129,652	129,640 (0.103%)	6 (<0.001%)	6 (<0.001%)

15.10.6 The results in Table 15.16 indicate that estimated changes in GHG emissions as a result of the Proposed Development are relatively small in comparison to relevant recommended Scottish carbon budgets. The construction phase emissions form 0.1% of Carbon Budget 2 and therefore make a noticeable contribution (approximately one thousandth of the targeted emissions for Scotland). However, this is unlikely to have a material impact on the ability of the Scottish Government to meet its carbon reduction targets.

Determination of Significance

- When considered in isolation (i.e. onshore infrastructure alone) and based on the current level of embedded mitigation included within the assessment, the Proposed Development is not fully in line with relevant climate change policy regarding the transition towards net zero. The analysis presented above indicates that the Proposed Development will account for GHG emissions which are up to 0.008% and 0.103% of the UK carbon budgets and recommended Scottish Government carbon budgets, respectively. Therefore, and in accordance with the significance criteria in

15.10.7 Table 15.8, estimated changes in GHG emissions associated with the Proposed Development would fall short of fully contributing to the UK's trajectory towards

net zero, and the Proposed Development is assessed to have a **Moderate Adverse** significance of effect. This is deemed to be **Significant** in EIA terms.

15.10.8 However, the Proposed Development would not operate in isolation, as it is part of the Project and enables the electricity generated by the Offshore Generation Assets to be transmitted to the National Grid. The comparison of the Proposed Development GHG emissions to the UK and Scottish Government Carbon Budgets in isolation does not consider the GHG emissions for the construction, O&M and decommissioning phases of the Offshore Infrastructure. It also does not consider the beneficial impacts of the potentially avoided GHG emissions due to the Project providing renewable electricity in place of other more carbon-intensive forms of electricity generation using fossil fuels. These impacts are considered in Section 15.12: Cumulative Effects Assessment.

Additional Mitigation and Residual Effect

15.10.9 To reduce emissions to as low as reasonably practicable, supporting carbon reduction and aligning with the trajectory towards net zero, additional mitigation for the Proposed Development is considered necessary. It is proposed that a Carbon Management Plan (CMP) (Mitigation reference CC1) in line with the carbon reduction hierarchy and consistent with the principles of PAS2080:2023 (British Standards Institution, 2023) would be prepared and implemented during the construction phase.

15.10.10 It should be noted that the earliest stages in design have the greatest potential to mitigate for the impact of a project on climate change. Therefore, opportunities for reduction will be integrated throughout the detailed design process and will follow the carbon mitigation hierarchy (British Standards Institution, 2023) as shown in Plate 15.1.

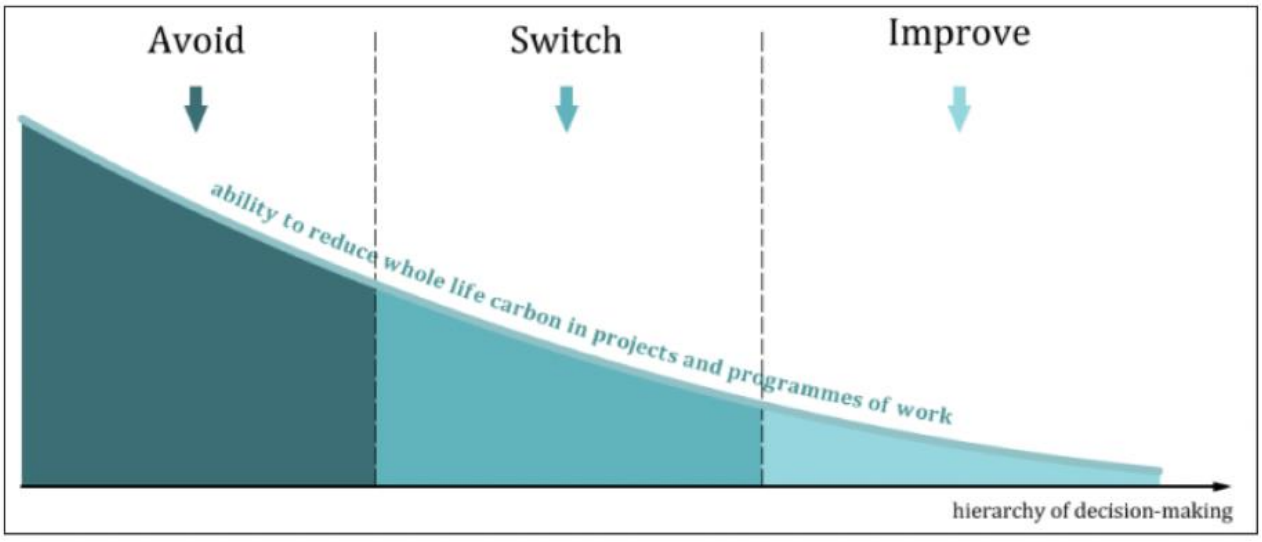

Plate 15.1: PAS2080:2023 Carbon management hierarchy

15.10.11 The CMP would contain measures to reduce GHG emissions as far as reasonably practicable during construction, for example:

- Avoiding the construction of any elements unless necessary or selecting the leanest design within the parameters of the Project Design Envelope as set out in Volume 1, Chapter 2: The Proposed Development.

- Switching to using lower carbon products and materials where possible, for example replacing steel and concrete with lower carbon steel and concrete products or alternatives. This will focus on carbon hotspots such as the cable materials and Substation/Substation base and comprise procurement initiatives and supply chain engagement.
- Improving the construction activities and processes through a number of measures, including optimising the consumption of fuel on-site by efficient design of the construction phasing, using efficient plant and machinery and use of lower carbon fuels or electric plant and machinery. This could also include optimising transport methods to, from, and within the site, for example ensuring full capacity of vehicles for deliveries and waste outgoings, optimising transport to and from site for site workers through car-sharing and facilitating or incentivising use of active travel and electric vehicles. Some of these elements could be captured by other topic mitigation, for example, those set out in Volume 1, Chapter 14: Traffic and Transport. These include a Construction Traffic Management Plan (GEN3), Construction Logistics Plan (GEN3) and construction specific Travel Plan (GEN3).
- The CMP would be supported by holding a sustainability challenge workshop with design engineers and other relevant stakeholders to discuss proposed amendments and their incorporation into design.
- With the additional mitigation in place, it is considered that the impact of GHG emissions during construction would be reduced as far as reasonably practicable, and the Proposed Development would be in line with local and national policy aimed at reducing carbon on a trajectory towards net zero. In accordance with the criteria in

15.10.12 Table 15.8, the residual effect is therefore assessed to be **Minor Adverse**, which is **Not Significant** in EIA terms.

Climate Change Risk Assessment

15.10.13 The assessment of climate change on the Proposed Development is set out in full in Volume 2, Appendix 15.2: Climate Change Risk Assessment. A summary of the CCRA is provided in this section.

15.10.14 A number of potential impacts were identified to the Proposed Development receptors due to climate change hazards. The main hazards were related to projected increases in average and extreme temperatures, changes in rainfall patterns, including increased rainfall in winter months, flooding and increased frequency of flood events and extreme weather events including storms. Other hazards included increases in wind speed or occurrence of windstorms, however these are less pronounced and more uncertain projections than temperature and rainfall projections.

15.10.15 The key Proposed Development receptors potentially affected by the climate change hazards were the Substation (and associated electrical equipment), cabling and other onshore infrastructure.

15.10.16 The risk assessment identified that with the embedded mitigation measures in place the likelihood of impacts ranged from negligible to low and the consequence was identified as moderate. Therefore, the significance of climate change effects ranged from Negligible to **Minor Adverse** and were therefore considered to be **Not Significant**.

15.11 Inter-Related Effects

15.11.1 There are no likely inter-related effects (receptor led) arising from the Proposed Development on climate change as the receptors considered in this assessment are not impacted by any other environmental topics. No topics have indirect impacts to the global atmosphere and its influence on climate change. For the assessment of climate change vulnerability, the receptors are the Proposed Development assets and components and these are not receptors in any of the other environmental topics.

15.11.2 Inter-related effects (Proposed Development lifetime effects) have been assessed as part of the main assessment set out above, and considers the combined effects of GHG emissions across all phases of the Proposed Development. These were concluded to be not significant and not considered further within this section.

In-Combination Climate Impacts

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

Screening

15.11.4 An initial screening exercise for each environmental topic has been undertaken which identifies impacts reported within the technical chapters (Volume 1, Chapters 6 to 16 of the Onshore EIA Report) and considers whether projected climate conditions will alter the sensitivity of receptors or magnitude of impact resulting in a change of significance. The significance of any effect has been reassessed using the standard methodologies for each relevant environment topic. Consideration has also been given to whether any new effects will arise as a result of the Proposed Development under future projected climate conditions.

15.11.5 Several environmental topics were identified for further assessment as effects identified within relevant chapters may be altered when also considering the impact of future climate change. The ICCI screening exercise identified that there is potential for ICCIs with the following topics:

- Volume 1, Chapter 8: Landscape and Visual Impact Assessment;
- Volume 1, Chapter 9: Cultural Heritage;
- Volume 1, Chapter 10: Geology and Ground Conditions;
- Volume 1, Chapter 11: Water Quality and Flood Risk; and
- Volume 1, Chapter 13: Noise and Vibration.

Method

15.11.6 The ICCI assessment has considered the measures adopted as part of the Proposed Development (embedded and additional mitigation) in determining whether the projected changes in change (see Section 15.6) alters the significance of effects on sensitive receptors. Should an effect remain significant following the above-described assessment of in-combination climate impacts, additional mitigation would be proposed where relevant.

15.11.7 The ICCI assessment applies the significance criteria developed by the relevant environmental topics and detailed within each technical chapter of the Onshore EIA Report (Volume 1) for those topics which were screened in (see above).

15.11.8 Similar to the CCRA, the impacts assessed in this ICCI assessment only consider the O&M phase of the Proposed Development. This is because there is unlikely to be significant changes in the climate conditions during the 48-month construction phase which would affect topic environmental assessments. The decommissioning phase of the Proposed Development has not been considered as detailed information is limited and therefore a meaningful assessment of decommissioning is not possible. In line with Volume 2, Appendix 2.1: Schedule of Mitigation, a Decommissioning Plan will be prepared and agreed with Aberdeenshire Council prior to decommissioning works being undertaken and subsequent to obtaining PPP. Where appropriate, this would include required mitigation based on an updated understanding of the detailed design, proposed decommissioning activities and the impacts of climate change on environmental topics at the time of writing.

15.11.9 As for the CCRA, climate projections for two 30-year periods were considered for the ICCI assessment (2030 – 2059 and 2060 – 2089) which cover the anticipated 30-year O&M phase of 2036 – 2065.

15.11.10 The assessment of inter-related effects with climate change, in-combination climate impacts, is summarised below in Table 16.17. There is no change in the significance of effects reported in each topic chapter of the Onshore EIA Report and as such no additional mitigation is required.

Table 15.17: In-Combination Climate Impact Assessment (O&M Phase)

Onshore EIA Topic	Potential Impact	Potential ICCI Identified	Consideration of potential ICCI with embedded mitigation / good practice measures	Likely Significance of ICCI and additional mitigation proposals
Landscape and visual (Chapter 8)	Impacts on landscape character	Predicted higher temperatures and changing rainfall patterns may affect forestry (with associated changes in growth of forestry). This could potentially impact the intervisibility of landscape character types, landscape designations and visual receptors (settlements, roads, rail lines, paths and viewpoints) with the cable corridor and substation as well as the success of the mitigation planting through drought.	Cable route designed to reduce removal, and limit damage to, existing landscape features such as native woodland, tree belts, hedgerows, fences or stone dykes. The construction will be managed such that the loss of any existing woodland, scrub, heath, mire, grassland vegetation, marshland, swamps and isolated trees and shrubs not affected by the permanent works is reduced where practicable. The landscaping design and planting proposals once established, will reduce visual effects of the substation from the landscape and visual receptors. A Landscape Management Plan would be developed primarily in relation to the landscape proposals at the substation site. This will ensure appropriate measures are in place at Matters Specified in Conditions stage. It is anticipated this would include provision for appropriate species which are resilient to the projected changes in climate to ensure these continue to provide effective screening.	With the embedded mitigation and good practice measures in place, there will be no change in reported significance of effect when assessed in-combination with climate change. The effects remain as Not Significant.
	Visual impacts on residential receptors			With the embedded mitigation and good practice measures in place, there will be no change in reported significance of effect when assessed in-combination with climate change. The effects remain as Not Significant for all receptors at Year 12, except for the viewpoint receptor at Hill of Swanley, Fetteresso Forest, which will remain at Moderate significance of effect, which is Significant. .
Cultural Heritage (Chapter 9)	Impact on the setting of designated heritage assets and non-designated assets of national importance.	Predicted higher temperatures and changing rainfall patterns may affect forestry (with associated changes in growth of forestry or establishment of planting to screen visible assets	Substation location has been selected to reduce visibility and a maximum height of 15 m imposed on buildings as designs constraint. The landscaping design for the Substation once mature will screen the proposed Substation from view from designated cultural heritage assets. A Landscape and	With the embedded mitigation and good practice measures in place, there will be no change in reported significance of effect when assessed in-combination with climate change. All effects are assessed as Not Significant.

Onshore EIA Topic	Potential Impact	Potential ICCI Identified	Consideration of potential ICCI with embedded mitigation / good practice measures	Likely Significance of ICCI and additional mitigation proposals
		from nearby assets). This could potentially impact the intervisibility of heritage assets and the Substation as well as the success of the mitigation planting through drought.	Habitat Management Plan / Woodland Management Plan developed primarily in relation to the landscape proposals at the Substation sites will ensure appropriate measures are in place at Matters Specified in Conditions stage. Where relevant, the planting proposals will adopt appropriate tree species that are resilient to the projected changes in temperatures and rainfall.	
Geology and Ground conditions (Chapter 10)	Impact of accidental spillage leading to potential contamination migrating from the ground surface to the groundwater and impacting on groundwater quality.	The projected future increase in precipitation may result in changes to groundwater flows and levels and could therefore potentially alter the migration of contamination to the groundwater.	Good operational and management practices to prevent or contain spillages (designated areas for refuelling where spillages can be easily contained, storage of chemicals in secure designated areas in line with appropriate regulations and guidelines, double skinning of pipes and tanks containing hazardous substances, and storage of these substances in impenetrable bunds with adequate capacity to contain potential leakages)	With the embedded mitigation and good practice measures in place, there will be no change in reported significance of effect when assessed in-combination with climate change. Effects will remain as Not Significant.
Water Quality and Flood Risk (Chapter 11)	Impact of increased flood risk arising from additional surface water runoff during operation of the Substation.	The projected future increase in precipitation may result in increased flood risk at the Proposed Development and surrounding areas	Surface water drainage strategy to include appropriate SuDS measures to manage surface water runoff from the permanent infrastructure. Onshore Infrastructure Operational Drainage Scheme to include measures to ensure existing land drainage is reinstated and/or maintained, and including measures to limit discharge rates and attenuate flows at the Substation.	With the embedded mitigation and good practice measures in place, there will be no change in reported significance of effect to the Proposed Development or surrounding areas when assessed in-combination with climate change as this has been considered within the main assessment and would be incorporated into the substation drainage design and SuDS. Flood risk will remain as minor adverse significance (i.e. Not Significant).

Onshore EIA Topic	Potential Impact	Potential ICCI Identified	Consideration of potential ICCI with embedded mitigation / good practice measures	Likely Significance of ICCI and additional mitigation proposals
	Impact of increased flood risk along the Cable Corridor, particularly at major watercourse crossings (Bervie Water, Forthie Water, and Carron Water) during operation and maintenance.	The projected future increase in precipitation may exacerbate river flooding risks, potentially impacting the buried cable infrastructure and associated maintenance activities for the Proposed Development or leading to increased flood risk for surrounding areas.	Flood Evacuation and Response Plan for maintenance activities. Critical above-ground infrastructure designed to remain operational during extreme flood events (up to 1 in 1000-year flood). Regular inspection and maintenance of cable infrastructure, particularly near watercourse crossings. The buried cable infrastructure will not alter existing drainage patterns.	With the embedded mitigation and good practice measures in place, there will be no change in reported significance of effect to the Proposed Development or surrounding areas when assessed in-combination with climate change. The buried cable infrastructure is considered flood-resilient and will not alter the existing drainage patterns to the surrounding area. The proposed mitigation measures account for potential increases in flood risk. Flood risk will remain as minor adverse significance (i.e. Not Significant).
Noise and vibration (Chapter 13)	The impact of noise generated during operation and maintenance of the Substation on human receptors.	Projected temperature increases may result in increased cooling demand within Substation buildings, leading to increased noise generated by cooling plant.	The Substation is proposed to be designed to encapsulate the noise sources in a building. Whilst the final design has not yet been undertaken, the building will be a maximum of 15 m in height and will be capable of reducing the noise emissions from the Substation.	With the embedded mitigation and good practice measures in place, there will be no change in reported significance of effect when assessed in-combination with climate change. With the proposed encapsulation of the substation, the effect remains as Not Significant.

15.12 Cumulative Effects Assessment

15.12.1 The Cumulative Effects Assessment (CEA) assesses the impact associated with the Proposed Development together with other relevant projects and activities. Cumulative effects are defined as the effect of the Proposed Development in combination with the effects from a number of different projects, on the same receptor or resource. Further details on CEA methodology are provided in Volume 1, Chapter 3: EIA Methodology.

GHG Emissions

15.12.2 No separate assessment of potential cumulative effects with different projects is considered necessary for GHG emissions for the following reasons:

- GHG emissions (carbon) are different to other environmental aspects in that the spatial location of the effect is not important, as any GHG emission will have the same effect on the receptor of concern (i.e. the global climate), no matter where it is released.
- Because of the above, there is no basis for selecting any particular project or projects that have GHG emissions for cumulative assessment over any other.
- The assessment presented is inherently cumulative in that the carbon budgets presented in this chapter, and against which estimated GHG emissions associated with the Proposed Development are compared, represent expected emissions of carbon from all sectors of the UK or Scotland economy over the relevant time period.

15.12.3 However, the Proposed Development comprises the Onshore Transmission Assets for the Project and would not operate in isolation. The Proposed Development enables the renewable energy generated by the Offshore Generation Assets to be transmitted to the National Grid, contributing to national electricity decarbonisation. As such, the cumulative effects of the Offshore Infrastructure with the Proposed Development on emissions of GHGs have been assessed.

15.12.4 While there is no relevant geographical study area in the context of cumulative effects for climate change in EIA, the onshore elements (the Proposed Development) of the Project are intrinsically linked to its offshore elements (the Offshore Infrastructure). This has been presented in Figure 15.3 (Annex – Figures), which represents the climate change CEA Study Area for this purpose.

15.12.5 GHG emissions from the Offshore Infrastructure have been calculated using MDS information available at the time of submission. The relevant MDS information is provided in the GHG emissions technical report (Volume 2, Appendix 15.1 Greenhouse Gas Assessment), which includes information for both onshore and offshore elements of the Project.

15.12.6 The offshore MDS parameters are set within the application for the Offshore Infrastructure. The cumulative assessment presented below has been carried out using a precautionary approach (and likely to be based on GHG emissions which are overestimates of those which would occur in practice). The net GHG emissions at the Project level will be presented in further detail in subsequent

applications as required or relevant based on the status of the Project at that time.

Project Whole Life GHG Emissions

15.12.7 The Project would export electricity to the National Grid that is zero-carbon at the point of generation (i.e. although there are GHG emissions to construct, operate and maintain the Project, there are no direct GHG emissions from the electricity generation itself), thereby displacing other generating sources that would provide energy in the absence of the Project. As such, the Project enables the replacement/avoidance of fossil fuel electricity generation within the National Grid.

15.12.8 This results in 'avoided' GHG emissions. Determining the magnitude of impact and significance of changes in GHG emissions from the Project as a whole should consider the avoided emissions based on how much electricity generation the Project will displace from other (potentially more carbon-intensive) forms of electricity generation. A sensitivity test has been undertaken to determine a potential range of avoided emissions for the Project for assessment purposes. This included determining avoided emissions for three different scenarios assuming the same amount of electricity was produced based on the following carbon intensity factors:

- DESNZ long-run marginal factors (DESNZ, 2023); factors specified for each year for the period 2036 – 2065, ranging from 17 gCO_2e/kWh to 1 gCO_2e/kWh (0.017 tCO_2e/MWh to 0.001 tCO_2e/MWh).
- Current grid average factor (DESNZ, 2025a); a fixed value of 223 gCO_2e/kWh (0.223 tCO_2e/MWh) specified for 2025.
- DESNZ 'all non-renewable fuels' factor (DESNZ, 2025b); a fixed value of 448 gCO_2e/kWh (0.448 tCO_2e/MWh) specified for 2024 (the latest year of data available).

15.12.9 The marginal source displaced (i.e. the source of electricity generation that is meeting the additional electricity demand) may in practice vary from moment to moment depending on the operation of the capacity market, (i.e. led by commercial considerations and NESO's needs at any given time). For the purpose of this assessment, longer-term trends (annual averages) have been used as it is not possible to predict shorter-term variations with confidence. It should be noted that as the UK and Scotland move towards their respective 2050 and 2045 net zero carbon targets, the marginal source of electricity generation will likely become a combination of renewables (predominately solar and wind) and storage. It is important to note therefore that from circa 2030 onwards, long-run marginal projections assume that there is no unabated fossil fuel electricity generation, in line with UK Government policy. As such, comparing the Project's GHG impacts with the marginal source of generation is likely to represent an underestimation of its true avoided emissions.

15.12.10 Full details of the calculation of the avoided emissions are set out in the Volume 2, Appendix 15.1 Greenhouse Gas Assessment. The avoided emissions for the Project based on the projected annual electricity generation rates during the O&M phase (2036 – 2065), with estimated total 30-year electrical generation of

83,836,607 MWh, are shown in Table 15.18. It is likely that the true value of avoided emissions would lie within the ranges presented for these three approaches.

Table 15.18: Total Project Avoided Emissions Sensitivity Test

Factor	Avoided Emissions (tCO_2e)
DESNZ long-run marginal	337,423
Current national grid average (2025)	18,608,051
DESNZ 'All non-renewable fuels' (2024)	37,399,762

15.12.11 The total cumulative Project GHG emissions, when taking into account the potentially avoided emissions during the O&M phase are set out in Table 15.19. Full details of the GHG calculations for the Offshore Infrastructure are provided in Volume 2, Appendix 15.1: Greenhouse Gas Assessment.

Table 15.19: Total Project GHG Emissions

Stage	Area	Resulting Emissions (tCO_2e)
Construction	**Onshore**	129,640
	Offshore	1,533,291
	Subtotal	**1,662,931**
O&M	**Onshore**	35
	Offshore	596,146
	Avoided	-37,399,762 to -337,423
	Subtotal	**-36,803,580 to 258,758**
Decommissioning	**Onshore**	13,952
	Offshore	109,629
	Subtotal	**123,581**
Total net emissions		**-35,017,068 to 2,045,270**

15.12.12 Emissions arising from the construction stage of the Offshore Infrastructure amount to 1,662,931 tCO_2e. These emissions primarily arise from the embodied carbon of Wind Turbines and associated cables (Interconnector Cables, Inter-Array Cables and Offshore Export Cable), as well as transport and vessel movements, and the loss of blue carbon. During the O&M phase, emissions arise from vessel movements and material replacements, totalling 596,181 tCO_2e. These emissions, assessed in conjunction with the operational avoided emissions (as detailed in Table 15.18) result in total operational emissions in the range of -36,803,580 tCO_2e to 258,758 tCO_2e. Emissions during the decommissioning phase total 123,581 tCO_2e. Therefore, the total Project emissions are 2,382,693 tCO_2e. When including the potential for avoided emissions, this leads to total net GHG emissions for the Project of -35,017,068 tCO_2e, -16,225,358 tCO_2e, and 2,045,270 tCO_2e based on the 'all non-renewable fuels', grid average and long-run marginal carbon intensity factors, respectively.

Further detail on the methodology followed to calculate the emissions is provided in Volume 2, Appendix 15.1: Greenhouse Gas Assessment.

15.12.13 Based on the projected long-run marginal carbon emission factors for 2036 to 2065, the estimated avoided GHG emissions are -337,423 tCO_2e, which indicates that the total Project GHG emissions remain higher than the potentially avoided emissions, with a net total of 2,045,270 tCO_2e. However, as noted in Section 15.6, there are several issues with determining the avoided emissions using these factors. For example, these are likely to underestimate the potential avoided emissions as they rely on an increasing number of renewable energy projects, such as the Project, being implemented and they do not include all the GHG emissions from constructing, operating or decommissioning the energy generating sources. There is also uncertainty in these projections. Consequently, less weight has been given to these estimates in determining the magnitude of effect and significance of the GHG emissions for the Project, as they are unlikely to represent a true 'without development' future baseline.

15.12.14 If this amount of electricity was generated using more carbon intensive sources (represented by the carbon intensity from electricity supplied for 'all non-renewable fuels'), the net GHG emissions are estimated to be -35,017,068 tCO_2e (i.e. the Project would avoid substantially more GHG emissions than those required to construct, operate and decommission it). If using the 2025 national grid average factor, this indicates avoided GHG emissions of -16,225,358 tCO_2e, which also indicates a large amount of avoided emissions. On this basis, this would indicate that the Project would have a payback period, in terms of GHG emissions, of 2 years to 3 years, respectively.

15.12.15 To provide further context, the electricity generation carbon intensity for the Project has been calculated, informed by the O&M phase emissions and projected energy generated over the whole Project's lifetime. The net Project energy generation intensity is calculated to be 7.1 gCO_2e/kWh. This intensity is considerably lower than the current grid average (223 gCO_2e/kWh), fossil fuel generation (448 gCO_2e/kWh), and the Climate Change Committee's balanced net zero pathway electricity emissions intensity projection for 2035 (10 gCO_2e/kWh), but higher than the 2050 projection (2 gCO_2e/kWh) (CCC, 2020). However, the reported O&M emissions for the Project are based on conservative assumptions on replacement of components, and do not include any mitigation to reduce emissions from the associated activities (i.e. vessel movements and material replacement) in line with the UK's planned decarbonisation of the manufacturing and transport sectors. Therefore, it can be expected that the actual carbon intensity of the Project will be lower than that reported above, and would more closely align with the Climate Change Committee's electricity emissions target of 2 gCO_2e/kWh by 2050. On this basis, it can be concluded that the electricity to be generated by the Offshore Generation Assets enables and aids national grid decarbonisation.

15.12.16 The Project's net whole life carbon intensity (informed by construction, O&M and decommissioning emissions and the energy generated over the Project's lifetime) has been calculated to be 28.5 gCO_2e/kWh. Although there are no directly applicable existing benchmarks to compare this figure against, it

demonstrates that even with all GHG emissions considered for construction, O&M and decommissioning, it is considerably lower than the use of fossil fuels to generate electricity (represented by the carbon intensity factor of 448 gCO_2e/kWh).

Determination of Significance

15.12.17 Overall, the Project (including the Proposed Development) is in line with relevant climate change policy and supports the decarbonisation of the electricity grid, for example, the UK Governments policy of a low-carbon electricity grid by 2030 (DESNZ, 2024). The Project is also consistent with the UK and Scottish Government's net zero targets of 2050 and 2045, respectively. The analysis presented above, which assumes that the Project will displace electricity production from fossil fuel sources (to a greater or lesser extent), is likely to result in an overall reduction of GHG emissions against that future baseline. On this basis, and in accordance with the significance criteria in

15.12.18

15.12.19

15.12.20 Table 15.8, the cumulative effect of Project is assessed to be **Beneficial**, which is deemed to be **Significant** in EIA terms.

15.12.21 However, it is acknowledged that there are relatively high GHG emissions associated with the construction phase, particularly for the construction of the Offshore Infrastructure. These could have a measurable impact on the Scottish Government's ability to meet the proposed Carbon Budget 2 (2031 – 2035), as 1,662,931 tCO_2e would exceed 1% of the 5-year carbon budget of 126 $MtCO_2e$. As noted in the GHG emissions assessment technical report (Volume 2, Appendix 15.1: Greenhouse Gas Assessment), the calculated GHG emissions represent a Maximum Design Scenario with regard to the manufacturing and construction of the Wind Turbines, which form most of the construction phase GHG emissions. It is likely that improvements in wind turbine and associated infrastructure design and refinements to design assumptions would result in lower GHG emissions. Appropriate embedded or additional mitigation for the Offshore Infrastructure would be implemented (for example, by adopting a similar approach to carbon reduction as set out for the Proposed Development in Section 15.9 and Section 15.10, including measures such as those summarised in paragraph 15.10.11) to support carbon reduction during the construction phase and to reduce emissions to as low as reasonably practicable.

Climate Change Risk Assessment

15.12.22 Potential inter-project cumulative effects may arise from other developments, which have the potential to directly exacerbate the vulnerability of the Proposed Development to the effects of climate change. Predominantly, this would include other projects which may give rise to increased flood risk within the CCRA Study Area during the O&M phase as there would be limited potential for other projects to directly alter the relevant climate parameters considered for the assessment. Chapter 10: Water Quality and Flood Risk, considers the potential cumulative effects on flood risk at the Proposed Development during the O&M phase from other projects. If required, it is envisaged that the

embedded measures and mitigation set out in Section 15.9could be amended to address any potential increased flood risk.

15.12.23 No cumulative effects with the Offshore Infrastructure are envisaged as the physical presence of the Offshore Infrastructure has no direct influence on the climate change related risks at the Proposed Development.

15.13 Summary of Impacts, Mitigation, Likely Significant Environmental Effects and Monitoring

15.13.1 The assessed likely significant effects relating to climate change were as follows:

- GHG emissions from the construction, O&M and decommissioning of the Proposed Development.
- The climate change related impacts on the Proposed Development (the climate resilience of the Proposed Development to climate change).

GHG Emissions

15.13.2 Overall, it was concluded that there are potentially significant effects (a Moderate Adverse magnitude of effect which is Significant in EIA terms) if the proposed development is considered in isolation rather than as part of the full Project. Given the importance of reducing GHG emissions on a trajectory towards net zero by 2045 (in Scotland) and 2050 (in the UK), additional mitigation is proposed to reduce emissions to as low as reasonably practicable during construction. Monitoring is also proposed to ensure GHG emissions are reduced throughout the construction of the Proposed Development. With the additional mitigation in place, the magnitude of effect is reduced to Minor Adverse, and Not Significant in EIA terms.

15.13.3 It is expected that the cumulative impact of the Proposed Development with the remaining components of the Project (i.e. the Offshore Infrastructure) will be Beneficial in the long-term for GHG emissions for Scotland and the UK. This is because the energy generated from the Offshore Generation Assets is expected to displace energy generation from fossil fuel sources, supporting the transition to renewable energy sources and achievement of net zero targets.

15.13.4 A key concern is that construction emissions of the Offshore Infrastructure are estimated to be high, which inhibits the beneficial effect of the Project, resulting in short-term adverse impact on climate change. It is expected that additional mitigation measures would be implemented to reduce the associated GHG emissions as part of the separate consenting for the Offshore Infrastructure.

15.13.5 It should be noted that at this early stage, estimates of GHG emissions have a high level of uncertainty, which will improve as the Project progresses, and given the MDS approach presented here, are likely to be overestimates of the GHG emissions that would occur in practice.

Climate Change Risk Assessment

15.13.6 The Proposed Development is expected to have a relatively low vulnerability to climate change hazards. The assessment shows that, when combined with

embedded mitigation, no significant effects are expected. No additional mitigation is required and there are no significant cumulative effects.

15.13.7 Monitoring is proposed to ensure that the Proposed Development manages the effects of climate change throughout the O&M phase.

In-Combination Climate Change Impacts

15.13.8 The assessment of ICCIs also concluded no change to the significance of effects for other environmental topics, which were not significant, except for one landscape and visual receptor where there was no change to magnitude of effect, but which remained as significant.

References

Aberdeenshire Council (2022a). Route Map 2030 and Beyond. Available at: https://aberdeenshire.moderngov.co.uk/Data/Aberdeenshire%20Council/20220929/Agenda/14%20Aberdeenshire%20Council%20Route%20Map%202030%20and%20Beyond%20Update.pdf. (Accessed September 2025).

Aberdeenshire Council (2022b). Climate Ready Aberdeenshire. Available at: https://www.aberdeenshire.gov.uk/environment/green-living/climate-ready-aberdeenshire/. (Accessed August 2025).

Aberdeenshire Council. (2023). *Aberdeenshire Local Development Plan 2023*. Available at: https://www.aberdeenshire.gov.uk/planning/plans-and-policies/ldp-2023/. (Accessed September 2025).

Aberdeenshire Council. (2024a). *EIA Scoping Opinion for Onshore Development at Bowdun Offshore Wind Farm*, 24 October 2024. (Accessed August 2025).

Aberdeenshire Council. (2024b). *Pre-Application Advice Onshore Transmission Infrastructure for Bowdun Offshore Wind Farm Including Formation of Onshore Landfall Point, Laying of Underground Cables, Erection of 400/275kv Substation and Associated Works to connect to the Transmission Grid at Land at Benholm to The South of Gourdon Connecting to Fetteresso Forest, Stonehaven, Aberdeenshire*, 25 July 2024.

British Standards Institution. (2023). *PAS 2080:2023 Carbon Management in Infrastructure and the Built Environment*. British Standards Institution, London. (Accessed September 2025).

Climate Change Committee. (2020). *The Sixth Carbon Budget. Electricity Generation.* Available at: https://www.theccc.org.uk/wp-content/uploads/2020/12/Sector-summary-Electricity-generation.pdf. (Accessed September 2025).

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

Department for Business, Energy & Industrial Strategy (BEIS) (2021) Net Zero Strategy: Build Back Greener. London: HM Government. Available at: https://www.gov.uk/government/publications/net-zero-strategy/. (Accessed September 2025).

Department for Business, Energy & Industrial Strategy (BEIS) (2022). British energy security strategy. Available at: https://www.gov.uk/government/publications/british-energy-security-strategy. (Accessed September 2025).

Department for Environment, Food & Rural Affairs (Defra) (2022). *UK Climate Change Risk Assessment 2022*. Available at: https://www.gov.uk/government/publications/uk-climate-change-risk-assessment-2022. (Accessed August 2025).

Department for Energy Security and Net Zero (DESNZ) (2023). *Valuation of Energy Use and Greenhouse Gas: Supplementary guidance to the HM Treasury Green Book*. Available at: https://www.gov.uk/government/publications/valuation-of-energy-use-and-greenhouse-gas-emissions-for-appraisal. (Accessed August 2025).

DESNZ. (2024). *Clean Power 2030 Action Plan: A new era of clean electricity*. Available at: https://www.gov.uk/government/publications/clean-power-2030-action-plan. (Accessed September 2025).

DESNZ (2025a). *Greenhouse gas reporting: conversion factors 2025*. Available at: https://www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2025. (Accessed September 2025).

DESNZ (2025b). *Digest of UK Energy Statistics (DUKES): Electricity.* Available at: https://www.gov.uk/government/statistics/electricity-chapter-5-digest-of-united-kingdom-energy-statistics-dukes. (Accessed August 2025).

Forestry Commission. (2025). *National Forest Inventory Scotland 2021*. Available at: https://www.data.gov.uk/dataset/3c98f46e-432d-4a3e-8afd-72bd8f49550d/national-forest-inventory-scotland-2021. (Accessed September 2025).

IEMA. (2020*). Environmental Impact Assessment Guide to Climate Change Resilience and Adaptation*. [Now ISEP] Available at: https://www.iema.net/media/mabhqino/iema-eia-climate-change-resilience-june-2020.pdf. (Accessed August 2025).

IEMA. (2022). *IEMA Guide to: Assessing Greenhouse Gas Emissions and Evaluating Their Significance 2nd Edition*. [Now ISEP] Available at: https://www.iema.net/media/xmgpoopk/2022_iema_greenhouse_gas_guidance_eia.pdf. (Accessed September 2025)..

Met Office Hadley Centre. (2018). *UKCP18 Probabilistic Projections on a 25km grid over the UK for 1961-2100*. Available at: https://catalogue.ceda.ac.uk/uuid/9f8dfaf790644dbcb2c3f69f409a70d6. (Accessed September 2025).

Met Office Hadley Centre. (2025). *HadUK-Grid Gridded Climate Observations on a 25km grid over the UK.* Available at: https://catalogue.ceda.ac.uk/uuid/45d40c035f9a48b997821b6b92194b75/. (Accessed September 2025).

National Highways. (2025). *National Highways Carbon Tool v2.7.* Available at: https://nationalhighways.co.uk/suppliers/design-standards-and-specifications/carbon-emissions-calculation-tool/. (Accessed August 2025).

Scottish Government (2019a). *Climate Change (Scotland) Act 2009*. Available at: https://www.legislation.gov.uk/asp/2009/12/contents. (Accessed September 2025).

Scottish Government (2019b). *Climate Change (Emissions Reduction Targets) (Scotland) Act 2019.* Available at: https://www.legislation.gov.uk/asp/2019/15. (Accessed September 2025).

Scottish Government (2020). *Climate Change Plan: Third Report on Proposals and Policies 2018-2032 – Update.* Edinburgh: Scottish Government. Available at: https://www.gov.scot/policies/climate-change/. (Accessed August 2025).

Scottish Government (2023a). *National Planning Framework (NPF4)*. Available at: https://www.gov.scot/publications/national-planning-framework-4/. (Accessed September 2025).

Scottish Government (2023b) Draft Energy Strategy and Just Transition Plan. Edinburgh: Scottish Government. Available at: https://www.gov.scot/publications/draft-energy-strategy-transition-plan/. (Accessed September 2025).

Scottish Government. (2024a). *Climate Change (Emissions Reduction Targets) (Scotland) Act 2024.* Available at: https://www.legislation.gov.uk/asp/2024/15/enacted. (Accessed September 2025).

Scottish Government (2024b). *Scottish National Adaptation Plan 2024 – 2029.* Available at: https://www.gov.scot/publications/scottish-national-adaptation-plan-2024-2029-2/. (Accessed August 2025).

Scottish Government (2025a). *The Climate Change (Scotland) Act 2009 (Scottish Carbon Budgets) Amendment Regulations 2025.* Available at: https://www.legislation.gov.uk/sdsi/2025/9780111063286/contents. (Accessed September 2025).

Scottish Government (2025b) *Climate Change Plan: Monitoring Report 2025*. Edinburgh: Scottish Government. Available at: https://www.gov.scot/publications/climate-change-plan-monitoring-report-2025/. Accessed September 2025.

UK Government (2019). *Climate Change Act 2008*. Available at: https://www.legislation.gov.uk/ukpga/2008/27/contents. Accessed November 2025

United Nations Framework Convention on Climate Change (UNFCCC) (2016). *Paris Agreement*. Available at: https://treaties.un.org/doc/Treaties/2016/02/20160215%2006-03%20PM/Ch_XXVII-7-d.pdf. Accessed November 2025

RICS. (2023). *Whole life carbon assessment for the built environment*. Available at: https://www.rics.org/content/dam/ricsglobal/documents/standards/Whole_life_carbon_assessment_PS_Sept23.pdf. Accessed September 2025.

Annex – Figures

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A957
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Toddie Brae
Cowie
Stonehaven
Brae of Glenbervie
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Drumlithie
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Auchenblae
Causeywell Brae
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B966
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Fordoun
B967
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B967
A92
Inverbervie
A90
Laurencekirk
Gourdon
Whitewater Moss
Brawleymuir Plantation
Craighead Plantation
B9120
B9120
Spy Brae
Johnshaven
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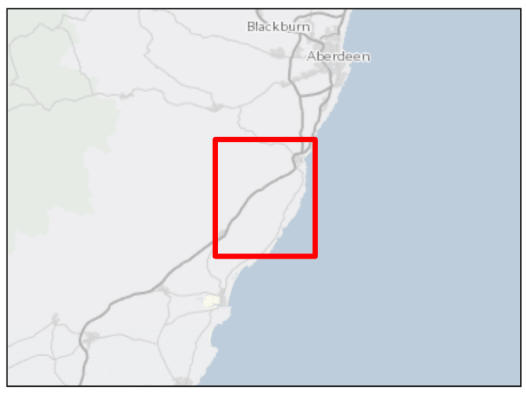
5
km

Legend

CCRA Study Area - Onshore



Jacobs

Client: THISTLE WIND PARTNERS

Project: Bowdun Offshore Wind Farm
Onshore EIA Report

Drawing Title: Climate Change
CCRA Study Area - Onshore

Rev.	Date	Purpose of revision	Drawn	Check'd	Rev'd	Appr'd
03	NOV 25	FINAL	TM	AW	SB	GG
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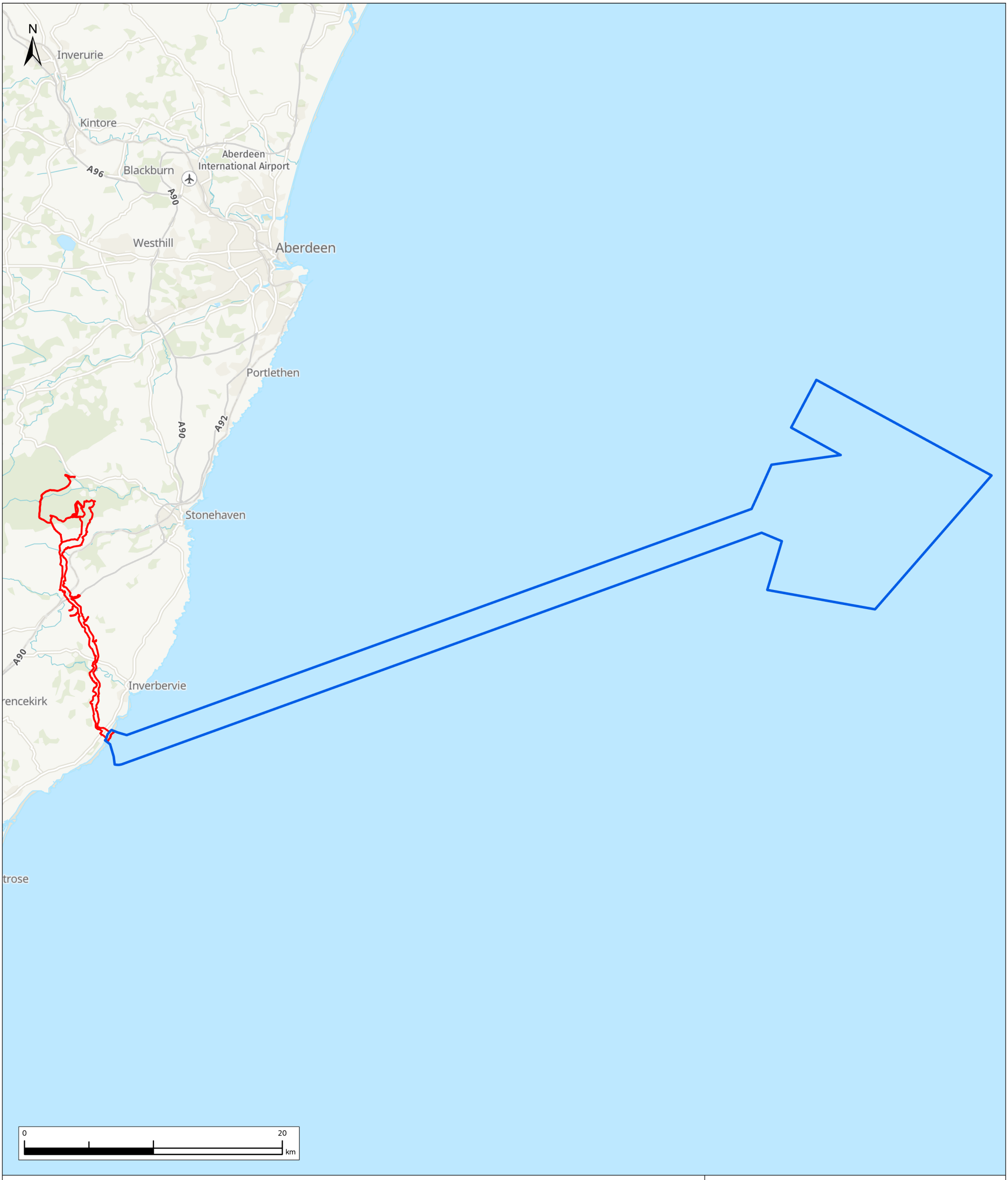
Drawing Status: FINAL

Figure 15.1



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PPP Application Boundary

Marine Application Boundary

Rev.	Date	Purpose of revision	Drawn	Check'd	Rev'd	Appr'd
03	NOV 25	FINAL	TM	AW	SB	GG
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Jacobs No.		B2487500				

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Client: THISTLE WIND PARTNERS

Project: Bowdun Offshore Wind Farm
Onshore EIA Report

Drawing Title: Climate Change
CEA Study Area

Aconnex Number	Drawing Status
TWP-BOW-JCB-ONE-DWG-00031	FINAL

Figure 15.2