Bowdun Offshore Wind Farm, Offshore EIA Report

Volume 3, Technical Appendix 22.3: In-Combination Climate Change Impact Assessment

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Contents

List of Tables

Glossary

Defined term	Definition
Additional Mitigation	Also referred to as secondary mitigation which is defined by The Institute of Sustainability and Environmental Professionals (ISEP) (formerly Institute of Environmental Management and Assessment (IEMA)) as: Actions that will require further activity in order to achieve the anticipated outcome. These may be imposed as part of the planning consent, or through inclusion in the Environmental Impact Assessment (EIA) Report (sic).
Applicant (the)	Bowdun Offshore Wind Farm Limited (BOWFL).
Array Area	The Array Area is the area in which the Offshore Generation Assets will be located.
Benthic	Living on or in the seabed.
Bowdun Offshore Wind Farm Limited (BOWFL)	A Special Purpose Vehicle (SPV) (legal entity) for the purpose of developing the Project. BOWFL are the Applicant for the Offshore Application.
Embedded Mitigation	Measures that are adopted as part of the Proposed Development and therefore assessed within the EIA. The proposed approach for the EIA for the Proposed Development is that Embedded Mitigation includes both primary mitigation and tertiary mitigation. These are defined by the ISEP as follows: Primary: Modifications to the location or design of the development made during the pre-application phase that are an inherent part of the project, and do not require additional action to be taken. Tertiary: Actions that would occur with or without input from the EIA feeding into the design process. These include actions that will be undertaken to meet other existing legislative requirements, or actions that are considered to be standard practices used to manage commonly occurring environmental effects.
Environmental Impact Assessment (EIA)	Process for the assessment of likely significant environmental effects of a project on the physical, biological and human environment during construction, Operation and Maintenance (O&M) and decommissioning.
Environmental Impact Assessment Regulations (EIA Regulations)	Terminology used in this Offshore EIA Report to refer to three sets of regulations: • The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017; • The Marine Works (Environmental Impact Assessment) (Scotland) Regulations 2017; and • The Marine Works (Environmental Impact Assessment) Regulations 2007.
Export Cable Corridor	The area seaward of MHWS which connects the Array Area with the Landfall within which the Offshore Export Cables will be installed.
Impact	A change caused by an action that occurs during a project's lifetime.
Inter-Array Cables (IAC)	Cables which link the Wind Turbines to each other and with the OSPs.
Inter-Related Effects	The potential effects of multiple impacts from the construction, O&M and decommissioning of the Project, affecting one receptor.

Defined term	Definition
Interconnector Cables	Cables which will connect individual OSPs to each other to provide redundancy against cable failure elsewhere.
Landfall	The area in which the Offshore Export Cables make landfall and is also the transitional area between the Offshore Transmission Assets and the Onshore Transmission Assets. Located in the Intertidal Area at Benholm.
Mitigation	Measures to avoid, prevent, reduce or control effects on the environment. See also definitions for Embedded Mitigation and Additional Mitigation.
Offshore Application	Term used to refer to the applications associated with the Proposed Development. The Applicant will apply for: • A Section 36 Consent under the Electricity Act 1989; and • Marine Licence(s) under Marine Scotland Act 2010 and Marine and Coastal Access Act 2009.
Offshore Environmental Impact Assessment (EIA) Report (hereafter, 'Offshore EIA Report')	Document prepared to report the findings of the EIA for the Proposed Development and produced in accordance with the EIA Regulations. The Offshore EIA Report is submitted to support the Offshore Application for the Proposed Development, and to comply with EIA Regulations.
Offshore Export Cables	Subsea cables used to transmit electricity generated offshore by the Wind Turbines from the OSPs to shore. The Transition Joint Bay (TJB) is the location where the Offshore Export Cables terminate, and the onshore cabling begins.
Offshore Substation Platform(s) (OSPs)	OSPs comprise the support structure, topside and electrical components used for collecting and/or converting electricity generated by the Wind Turbines for transmission by the Offshore Export Cables.
Operation and Maintenance (O&M)	The phase of the Proposed Development following completion of construction. This phase of development includes routine inspections, repairs and replacement of infrastructure and equipment (including Interconnector Cables and IACs), Scour Protection replenishment or replacement, major component replacement, painting and/or other coating works, removal of marine growth, and replacement of access ladders.
Project (the)	An overarching term for the Bowdun Offshore Wind Farm (Bowdun OWF) comprising the offshore and onshore infrastructure required to generate and transmit electricity from the Array Area to the onshore GCP. The Project includes the Offshore Generation Assets, the Offshore Transmission Assets and the Onshore Transmission Assets.
Project Design Envelope (PDE)	A description of the range of possible elements that make up the design options for the Proposed Development under consideration when the exact engineering parameters are not yet known.
Proposed Development	Term used to define the Offshore Infrastructure associated with the Project seaward of MHWS for which consent is being sought. Further details of the parameters are included in Volume 1, Chapter 3: Project Description.
Thistle Wind Partners (TWP)	Company established for the development of the Project.
Wind Turbines	Structures comprising of a tubular tower, rotor blades, and a nacelle which houses the Wind Turbine generator.

Acronyms

Acronym	Definition
CBRA	Cable Burial Risk Assessment
CCRA	Climate Change Risk Assessment
EIA	Environmental Impact Assessment
ERCoP	Emergency Response and Cooperation Plan
ICCI	In combination Climate Impact
IEMA	Institute of Environmental Management and Assessment
INNS	Invasive Non-Native Species
ISEP	The Institute of Sustainability and Environmental Professionals
MCA	Maritime and Coastguard Agency
MSL	Mean Sea Level
O&M	Operation and Maintenance
SAR	Search and Rescue
SSC	Suspended Sediment Concentration
UK	United Kingdom

Table of Units

Units	Definition
km	Kilometre
km²	Square kilometre
nm	Nautical mile

1 Introduction

1.1.1 The In Combination Climate Change Impact (ICCI) technical report presents the detailed baseline characterisation of climate impacts in combination with topics presented in Volume 2, Chapters 7 to 23 relative to the offshore elements of the Bowdun Offshore Wind Farm (OWF) Project (hereafter referred to as the Proposed Development). The Proposed Development covers the Option Lease Area that is located in the E3 Plan Option Area, detailed in the Sectoral Marine Plan for Offshore Wind Energy (Scottish Government, 2020), and the Export Cable Corridor. The Array Area is located approximately 38 km off the Aberdeenshire coast at the closest point, covering an area of 187 km^2. The Proposed Development will comprise of Wind Turbines (fixed foundations), Inter-Array Cables, Offshore Substation Platforms, Interconnector Cables and any necessary scour/cable protection. The Export Cable Corridor will include a maximum of three High Voltage Alternating Current (HVAC) Offshore Export Cables, each with a length of up to 70 km and will make Landfall at Benholm, Aberdeenshire. Further information on the Proposed Development can be found in Volume 1, Chapter 3: Project Description.

1.1.2 This technical report considers the likely significant environmental effects of the Proposed Development in the context of anticipated future climate conditions on environmental receptors. These predicted likely significant environmental effects on future climate change are the climate risks described in Volume 3, Technical Appendix 22.1: Climatic Change Risk Assessment (CCRA) Technical Report, Table 5.2 (and Table 3.1 below) and are considered relative to each assessed environmental receptor within the Offshore Environmental Impact Assessment (EIA) Report (Volume 2, Chapters 7 to 23). This information has allowed for an assessment to be carried out on the likely significant environmental effects of the Proposed Development in combination with likely significant environmental effects of future climate change on each environmental receptor/topic group to create potential ICCIs. This assessment has been undertaken in accordance with The Institute of Sustainability and Environmental Professionals (ISEP) (formerly the Institute of Environmental Management and Assessment (IEMA)) EIA Guide to: Climate Change Resilience and Adaptation (ISEP, 2020).

1.1.3 Table 3.1 in this technical report presents the receptor groups, the potential climate risks associated with the future climate and whether the receptors are considered sensitive and therefore assessed within this technical report. Table 3.1 considers the extent to which anticipated future climate change might exacerbate the likely significant environmental effects of the Proposed Development on an identified environmental receptor group (ISEP, 2020).

1.1.4 A summary assessment for each receptor considered sensitive to future climate change is included in Table 4.1 which sets out:

- climate risks as described in Volume 3, Technical Appendix 22.1: Climatic Change Risk Assessment Technical Report, Table 5.2 for the assessment of the Proposed Development for the Climatic Change Study Area defined in Section 2 of the same technical report;
- receptors that are likely to be sensitive to the projected climate risks during the construction, Operation and Maintenance (O&M) and decommissioning phases of the Proposed Development, as screened in Table 3.1, based on professional judgement and/or literature reviews as noted in Volume 2, Chapters 7 to 23. The receptors are those within the study area defined for each EIA topic in Volume 2, Chapters 7 to 23;
- a qualitative description of the identified potential ICCIs;
- a statement on whether the ICCI is likely to have a significant environmental effect on the receptors based on expert judgement (i.e. whether the predicted climate change risk exacerbates the likely significant environmental effects on an environmental receptor to such a degree that likely significant environmental effects identified in topic-specific assessment as not significant are now considered to be potentially significant, or likely significant environmental effects identified in the topic-specific assessment as significant are found to have an exacerbated significance); and
- an explanation of the approach to Additional Mitigation measures for predicted likely significant environmental effects arising from the ICCI.

2 Methodology

2.1.1 Topic leads have assessed if the climate risks listed in Volume 3, Technical Appendix 22.1: Climatic Change Risk Assessment Technical Report could impact receptors within their topic chapters. If the receptor is likely to have an ICCI with one of the stated climate risks it has been shaded orange in Table 3.1, with no ICCI being shaded green. Impacts listed as either ‘a’ or ‘b’ show that although the climate risk will impact the receptor group, the main ICCI comes from climate risks 2 or 4 respectively. Any indirect (or secondary) impacts have been labelled ‘c’ and shaded orange.

3 Screening

3.1.1 Note: sensitivity has been determined with reference to the baseline conditions of relevance to the Proposed Development baseline and the impacts assessed in the topic chapters.

Table 3.1: Screening of EIA Receptor Groups Likely to be Sensitive to Projected Future Climate Risks – Offshore[1]

Reference	Climate Risk[2]	Physical Processes	Benthic Ecology	Fish and Shellfish Ecology	Marine Mammals	Offshore Ornithology	Offshore Bats	Commercial Fisheries	Shipping and Navigation	Aviation and Radar	Infrastructure and Other Users	Major Accidents and Disasters	Socio-Economics, Tourism and Recreation	Marine Archaeology	Seascape, Landscape and Visual Impacts	Cultural Heritage
1	Increases in average and extreme air temperatures, both in winter and summer		a		a				b							
2	Increases in sea surface temperatures and ocean acidification				Indirect c	Indirect c			b							
3	Changes to rainfall patterns, leading to increased annual precipitation								b							
4	Increased frequency and intensity of extreme weather (i.e. storms)			Indirect c	Indirect c											
5	Increased wind speeds and changes to wind patterns		b	Indirect c	Indirect c				b		b					
6	Increase in Mean Sea Level (MSL)															
7	Increased wave height		b								b					
8	Changes in the tidal range										b					

[1] Green: receptor is not likely sensitive to impact pathway identified (i.e. screened out); orange: receptor is likely to be sensitive to the impact pathway identified (i.e. screened in).

[2] As identified in Volume 3, Technical Appendix 22.1: Climatic Change Risk Assessment Technical Report.
a) The sensitivity of this receptor group to indirect effects resulting from increased sea temperatures is captured under climate risk 2;
b) The sensitivity of this receptor group to indirect effects resulting from increased occurrence of adverse weather is captured under climate risk 4; and
c) Related to secondary effects due to impacts on habitats or prey.

4 In Combination Climate Change Impact Assessment

Table 4.1: Consideration of ICCIs

Climate Hazard	Sensitive Topic and High Level Receptor	In Combination Climate Impacts (ICCI)	ICCI Significance	Mitigation Measures
Increased frequency and intensity of extreme weather (i.e. storms) **Increased wind speeds and changes to wind patterns** **Increase in MSL** **Increased wave height** **Changes in the tidal range**	Physical Processes (Stratification)	Potential ICCI from increased storm intensity and frequency; increased wind speeds; rising sea levels; increased wave height; and changes in tidal range that may compound the impacts of the influence of the Proposed Development and alter the extent and frequency of stratification. The impact of the Proposed Development on the wind field, wave climate and tidal regime is considered in Section 7.10, Volume 2, Chapter 7: Physical Processes. Physical processes receptors were considered to have low to negligible sensitivity. The Proposed Development is not expected to change the wave or tidal regime and to have only a very limited effect on stratification and mixing though the water column. These highly localised effects of minor adverse significance are not likely to be increased or combine to result in an effect of greater significance. There is very limited potential for significant in combination effects. This potential ICCI effect is not significant.	Not significant	No Additional Mitigation measures are required in addition to those measures adopted as part of the Proposed Development set out in Section 7.9, Volume 2, Chapter 7: Physical Processes.
Increased frequency and intensity of extreme weather (i.e. storms) **Increase in MSL** **Increased wave height** **Changes in the tidal range**	Physical Processes (Sediment Transport Regimes)	Potential ICCI from increased storm intensity and/or stronger waves and/or rising sea levels, increased wave height and changes in tidal range that compound the impacts of the influence of the Proposed Development and resultant impacts and may affect sediment transport regimes. Changes to Suspended Sediment Concentrations (SSCs) and associated deposition and sediment transport are considered in Section 7.10, Volume 2, Chapter 7: Physical Processes. The magnitude of the increase in SSCs and associated deposition is anticipated to be low (and of negligible adverse significance) and occur only during extreme storm conditions. An increase in SSCs can be expected with the projected increased frequency and intensity of extreme weather i.e. storms. As the effect is temporally isolated (as any increase in SSCs would occur intermittently for short durations of the tidal cycle, before returning to ambient values) there is very limited potential for significant in combination effects. This potential ICCI effect is not significant.	Not significant	No Additional Mitigation measures are required in addition to those measures adopted as part of the Proposed Development set out in Section 7.9, Volume 2, Chapter 7: Physical Processes.
Increases in sea surface temperatures and ocean acidification	Benthic Ecology (Invasive Non-Native Species (INNS) (Subtidal and Intertidal))	Potential ICCI from INNS which could become more prevalent in increasing sea temperatures. This, in combination with the colonisation of hard structures may lead to native species being out competed and alter local ecology. This impact will be managed as far as practicably possible via procedures to prevent the introduction of INNS, including the development of, and adherence to an Environmental Management Plan (Volume 4, Appendix 24: Outline Environmental Management Plan) which will require that vessels associated with the Proposed Development to comply with the standards set out by International Convention for the Prevention of Pollution from Ships. As this impact will be controlled through Embedded Mitigation adopted as part of the Proposed Development, likely significant environmental effects of minor	Not significant	No Additional Mitigation measures are required in addition to those measures adopted as part of the Proposed Development set out in Section 8.9, Volume 2, Chapter 8: Benthic Ecology.

Climate Hazard	Sensitive Topic and High Level Receptor	In Combination Climate Impacts (ICCI)	ICCI Significance	Mitigation Measures
		adverse significance would not combine with climate risks to result in an effect of greater significance. This identified ICCI effect is not significant.		
Increases in sea surface temperatures and ocean acidification	Benthic Ecology – Subtidal (Habitat Loss)	Impacts on benthic subtidal ecology relating to long term habitat loss and disturbance are considered in Section 8.10, Volume 2, Chapter 8: Benthic Ecology. For all phases, the magnitude of impacts for all receptors (including all Important Ecological Features) is predicted to be low, resulting in effects of minor adverse significance. This impact results in measurable, but minor long term loss of and alteration to areas of seabed. Given the low footprint of long term habitat loss and disturbance (a total of 2.25 km^2) in the context of the North Sea as a whole, and widespread availability of alternative habitat, the Proposed Development is not considered to contribute a significant, or measurable contribution to an ICCI effect. This potential ICCI effect is not significant.	Not significant	No Additional Mitigation measures are required in addition to those measures adopted as part of the Proposed Development set out in Section 8.9, Volume 2, Chapter 8: Benthic Ecology.
Increased frequency and intensity of extreme weather (i.e. storms) **Increased wind speeds and changes to wind patterns** **Increased wave height**	Benthic Ecology (Increased SSC (Subtidal and Intertidal))	Potential ICCI from projected climate hazards that result in increased SSC in the water environment (e.g. increased frequency and intensity of extreme weather i.e. storms; and/or, increased wind speeds and changes to wind patterns and/or increased wave heights (larger waves)) which increase the risk of smothering and abrasions. These could exacerbate species mortality and injury impacts resulting from the Proposed Development. The likely significant environmental effects of increased SSCs and associated deposition are discussed in Section 8.10, Volume 2, Chapter 8: Benthic Ecology. For all phases, likely significant environmental effects of minor adverse significance are predicted given the small, isolated quantities of material with potential to be disturbed and the unlikely potential for changes to the overall sediment transport regime; likely significant environmental effects would be restricted to the Benthic Ecology Study Area only. Seabed scouring from movement of cabling on the seabed during storm events will be limited due to the ongoing sediment transport processes. It is not expected therefore that increases in SSC associated with the climate projections would amount to a significant ICCI effect. This potential ICCI effect is not significant.	Not significant	No Additional Mitigation measures are required in addition to those measures adopted as part of the Proposed Development set out in Section 8.9, Volume 2, Chapter 8: Benthic Ecology.
Increases in sea surface temperatures and ocean acidification	Fish and Shellfish Ecology (Prey Species)	Potential ICCI from projected warming trends and increased frequency of acute climate events that create unfavourable/intolerable conditions that affect distribution, abundance, health, reproductive success and species resilience (directly and indirectly via impacts to prey species). Impacts on fish and shellfish ecology are considered in Volume 2, Chapter 9: Fish and Shellfish Ecology. The Proposed Development may result in pressures on some species, such as activities resulting in the temporary subtidal habitat loss/disturbance intermittently throughout the construction phase. Impacts of minor (construction) or negligible (O&M) adverse significance are predicted to occur intermittently and recover quickly. The potential for ICCI is uncertain, as the degree to which receptors may tolerate or acclimatise, or adapt to variations is unknown. However, community scale declines in prey are not anticipated within the construction window (not more than five years) for the Proposed Development and impacts from the Proposed Development may be offset in the longer term by fishing management measures (e.g. spatial closures) in the region. Given the minor significance of the inter-related effects from the Proposed Development, the	Not significant	No Additional Mitigation measures are required in addition to those measures adopted as part of the Proposed Development set out in Section 9.9, Volume 2, Chapter 9: Fish and Shellfish Ecology.

Climate Hazard	Sensitive Topic and High Level Receptor	In Combination Climate Impacts (ICCI)	ICCI Significance	Mitigation Measures
		likely significant environmental effects would not combine to result in an effect of greater significance. This identified ICCI effect is not significant.		
Increased frequency and intensity of extreme weather (i.e. storms) **Increased wind speeds and changes to wind patterns** **Increased wave height**	Fish and Shellfish Ecology (Habitat Loss/Disturbance and/or SSC)	Potential ICCI from projected climate hazards (e.g. increased frequency and intensity of extreme weather i.e. storms; and/or, increased wind speeds and changes to wind patterns and/or increased wave heights (larger waves)) which increase incidences of habitat disturbance/loss and/or SSC in the water which could compound the negative impacts predicted for the Proposed Development. Impacts on fish and shellfish ecology are considered in Volume 2, Chapter 9: Fish and Shellfish Ecology. Likely significant environmental effects of minor or negligible adverse significance are predicted in all phases, with any in combination impacts predicted to occur intermittently and recover quickly. ICCI could manifest if the climate predictions set out in The Physical Science Basis and United Kingdom Climate Projections 2018 Marine Report play out. However, given the minor significance of the inter-related effects from the Proposed Development, the Proposed Development is not considered to contribute a significant, or measurable contribution to an ICCI effect. This potential ICCI effect is not significant.	Not significant	No Additional Mitigation measures are required in addition to those measures adopted as part of the Array set out in Section 9.9, Volume 2, Chapter 9: Fish and Shellfish Ecology.
Increases in sea surface temperatures and ocean acidification **Increased frequency and intensity of extreme weather (i.e. storms)** **Increased wind speeds and changes to wind patterns**	Marine Mammals (Prey Distribution and Availability, Impacts to Breeding and Foraging Success)	Potential ICCI related to warming trends that result in direct exposure to higher sea surface temperatures and adverse changes in living environments (pH, salinity and dissolved oxygen levels and sediment and nutrient loads). These changes represent additional stresses that reduce species resilience. Increased sea water temperature could also influence the distribution of fish and other prey (plankton, squid, etc.), resulting in reduced foraging that could combine with the predicted likely significant environmental effects of the Proposed Development set out in Volume 2, Chapter 10: Marine Mammals. Impacts on marine mammals including consideration of the future baseline scenario are considered in Volume 2, Chapter 10: Marine Mammals. It is known that climatic changes may compound anthropogenic pressures, although predicting future trajectories of marine mammal populations without comprehensive data is challenging. The potential for ICCI is acknowledged, however, is expected to occur incrementally during the lifetime of the Proposed Development, when construction impacts are past. Any reduction in prey species could potentially be offset in the long term by increases in species that benefit from warming, fishing or management measures (e.g. spatial closures) in the vicinity or the aggregation effect of infrastructure (reef effect). However, these factors are not relied upon as part of the assessment. Due to the adaptive capacity and tolerance of marine mammals to a high range of variations and given the minor adverse significance of the inter-related effects from the Proposed Development in all phases (which are limited by designed in measures for the Proposed Development), the Proposed Development is not expected to contribute a significant, or measurable contribution to an ICCI effect. This finding has been considered in view of the potential for ICCI on fish and shellfish (as prey species). This potential ICCI effect is not significant.	Not significant	No Additional Mitigation measures are required in addition to those measures adopted as part of the Proposed Development set out in Section 10.9, Volume 2, Chapter 10: Marine Mammals

Climate Hazard	Sensitive Topic and High Level Receptor	In Combination Climate Impacts (ICCI)	ICCI Significance	Mitigation Measures
Increases in average and extreme air temperatures, both in winter and summer **Increases in sea surface temperatures and ocean acidification** **Changes to rainfall patterns, leading to increased annual precipitation** **Increased frequency and intensity of extreme weather (i.e. storms)** **Increased wind speeds and changes to wind patterns** **Increase in MSL** **Increased wave height** **Changes in the tidal range**	Offshore Ornithology (Prey Distribution and Availability, Impacts to Breeding and Foraging Success, and Reduced Habitat Availability)	Potential ICCI from projected climate hazards (e.g. increases in average and extreme air temperatures (both in winter and summer), increases in sea surface temperatures and ocean acidification, changes in rainfall patterns, leading to increases annual precipitation and increased frequency and intensity of extreme weather i.e. storms) could represent additional stresses that reduce species resilience. When combined with indirect effects of climate change, such as reduced prey distribution and availability, and reduced habitat availability, this can critically affect chick survival (Oswald *et al.*, 2008; Hakkinen *et al.,* 2002). ` Changes in sea temperature have the potential to affect fish at all biological levels (cellular, individual, population, species, community and ecosystem) both directly and indirectly. As sea temperatures rise, species adapted to cold water (e.g. mackerel, sandeel and herring) will begin to decline in numbers as they migrate to colder waters, whilst warm water adapted species will become established. These changes will lead to changes in prey distribution and availability, which in turn will affect the seabird species that prey on these fish species. These impacts are considered in combination with the likely significant environmental effects of the Proposed Development. Strong winds and heavy rainfall during the breeding season can result in widespread breeding failures of seabird species such as kittiwake and common guillemot (Mallory *et al.*, 2009; Mitchell *et al.,* 2020). Greater energy expenditure might be required to fly and dive under high wind speeds (Kogure *et al.*, 2016), which could reduce foraging success of seabird species such as gannet and common guillemot. Heavy rain and storm surges can flood or wash away nests, and high winds can damage or destroy nests. Additionally, rising sea levels may reduce the habitat availability of low-lying nesting species, such as terns (Ratcliffe *et al.*, 2008). Furthermore, prey availability at the sea surface may be reduced during storm conditions or potentially be more difficult to see by seabirds due to increased turbidity. This can contribute to mass mortality events. Such impacts could combine with the impacts from the Proposed Development. The impact of the influence of the Proposed Development on offshore ornithology receptors is considered in Volume 2, Chapter 11: Offshore Ornithology. Climate change is considered to be the likely primary cause of decline in seabird populations in the future (Davies *et al.,* 2023). The potential for a degree of ICCI is acknowledged, however, the climate hazards are external to the Proposed Development and would likely occur irrespective of its implementation. The Proposed Development does not introduce new climate stressors, nor does it amplify existing ones in a way that would materially affect ornithological receptors. Therefore, predicted likely significant environmental effects are not considered to contribute a significant, or measurable contribution to an ICCI effect, or likely to amount to a significant ICCI. Furthermore, many of the key seabird species affected are wide-ranging and exhibit behavioural adaptability, allowing them to adjust to shifting prey distribution and availability. Given that the Proposed Development's design incorporates Embedded Mitigation, and that baseline assessments have accounted for current and emerging population trends, any climate-related shifts are not expected to substantially alter the overall magnitude, extent or duration of the predicted effects. Therefore, the significance of the effect is not expected to increase and remains not significant. The absence of the Proposed Development would further delay the transition of the UK from reliance on fossil fuels and therefore further contribute	Not significant	No Additional Mitigation measures are required in addition to those measures adopted as part of the Proposed Development set out in Section 11.9, Volume 2, Chapter 11: Offshore Ornithology.

Climate Hazard	Sensitive Topic and High Level Receptor	In Combination Climate Impacts (ICCI)	ICCI Significance	Mitigation Measures
		towards climate change impacts and declining seabird populations. This potential ICCI effect is not significant.		
Increases in average and extreme air temperatures both in winter and summer **Changes to rainfall patterns, leading to increased annual precipitation** **Increased frequency and intensity of extreme weather** **Increased wind speeds and changes to wind patterns**	Offshore Bats (All relevant impacts)	Increases in air temperature may cause shifts in migration patterns, exposing migrating bats to extreme changes in prey availability and cold temperature exposure reducing survival rates. Species which are adapted to colder temperatures may experience increased energy expenditure in migrations with higher air temperatures than average (Bat Conservation Trust, 2025; National Park Service, 2025; Sapir *et al*., 2024). Changes in rainfall could reduce prey availability, while shifts in humidity may impact echolocation efficiency and thermoregulation. Furthermore, an increase in heavy storms could elevate the energy expenditure of migrating bats (Bat Conservation Trust, 2025; National Park Service, 2025). An increase in extreme weather events can raise energy expenditure and disorient bats, thereby increasing collision risk. Such conditions may also cause displacements from traditional routes or blow bats off course during migration (Bat Conservation Trust, 2025; National Park Service, 2025). Changes in wind patterns and speeds could alter flight efficiency and paths, making bats more susceptible to collision risks. This is particularly concerning when visibility is low, making turbine foundations harder to evade (Brabant *et al*., 2021; Sapir *et al*., 2024; National Park Service, 2025). Extreme winds may also cause displacement on bats migratory routes, increasing energy expenditure. The potential influence of the Proposed Development on offshore bat receptors is considered in Volume 2, Chapter 12: Offshore Bats. Climate change is anticipated to be a key driver of changes in bat migration behaviour and population dynamics in the future. While some degree of ICCI (In-Combination Climate Impact) is recognised, the predicted likely significant environmental effects of the Proposed Development are assessed as minor or negligible and are not expected to result in a significant or measurable ICCI effect. In the absence of the Proposed Development, continued reliance on fossil fuels would likely exacerbate climate change impacts, which could further affect bat migration routes, prey availability, and survival rates. Therefore, the potential ICCI effect associated with the Proposed Development is considered not significant.	Not Significant	No Additional Mitigation measures are required in addition to those measures adopted as part of the Proposed Development set out in Section 12.9, Volume 2, Chapter 12: Offshore Bats
Increases in sea surface temperatures and ocean acidification	Commercial Fisheries (Reduced Fishing Grounds)	Increases in sea surface temperatures and ocean acidification could cause potential ICCI likely significant environmental effects to occur if restrictions on access to the Array Area during the O&M phase are compounded by climate-driven geographical shifts in fish species distributions, thereby increasing the relative importance of the Northern North Sea as a fishing ground. Temperature changes could also affect abundance of fish and shellfish stocks in the Commercial Fisheries Study Areas. For white fish fisheries, such as haddock or cod, climate change could have an impact via warming seas which in turn may reduce the area within the North Sea that is suitable for these fish species. This could cause fish to migrate to the Northern North Sea, making these areas more important as a	Not significant	No Additional Mitigation measures are required in addition to those measures adopted as part of the Proposed Development set out in Section 13.9, Volume 2, Chapter 13: Commercial Fisheries.

Climate Hazard	Sensitive Topic and High Level Receptor	In Combination Climate Impacts (ICCI)	ICCI Significance	Mitigation Measures
		fishery. Changes in the distribution of target species could potentially affect commercial fishing activity in the Regional and Local Commercial Fisheries Study Areas over the long term; for example, altering fishing methods, targeted grounds and seasonal patterns in activity. The absence of the Proposed Development would further delay the transition of the UK from reliance on fossil fuels and therefore further contribute towards climate change impacts. If climate change continues unchecked, fish stocks may undergo substantial shifts in their geographical distribution or collapse, with significant consequences for fisheries management and the long term sustainability of the fishing industry. However, these factors are not relied upon as part of the assessment. This potential increase in importance of the Northern North Sea fishery may exacerbate the likely significant environmental effects from the Proposed Development (restricted areas) on fisheries. However, it is considered there will be no change to the residual significance conclusion of the Proposed Development-alone impact assessment is predicted. Overall, the rate of change in relevant climate variables is considered very low. Furthermore, Embedded Mitigation measures will remain appropriate for any increase in climate likely significant environmental effects. Consequently, climate change is anticipated to have minimal additional impact on commercial fisheries receptors over the lifetime of the Proposed Development. Further consideration of climate change is provided in Volume 2, Chapter 22: Climatic Change.		
Increased frequency and intensity of extreme weather (i.e. storms)	Commercial Fisheries (Limits to Fishing Access)	Increased frequency and intensity of extreme weather (i.e. storms) could lead to ICCI where fishers cannot access the Array Area during the operational phase, combined with an increase in storm events, limiting fishing opportunities. Storms may directly impact fishing activity in the Commercial Fisheries Study Areas, with changes with seasonal fishing patterns in response to changes in weather and periods of safe fishing conditions. This potential increase in storm events may exacerbate the potential impacts from the Proposed Development (restricted areas) on fisheries. Overall, the rate of change in relevant climate variables is considered very low and will take place over a number of years. Furthermore, Embedded Mitigation measures will remain appropriate for any increase in climate likely significant environmental effects. Consequently, climate change impacts are expected to have minimal additional impact on commercial fisheries receptors over the lifetime of the Proposed Development as any reduction in current fishing stock could potentially be offset in the long term by increases in species that benefit from warming, fishing or management measures (e.g. spatial closures) in the vicinity or the aggregation effect of Offshore Infrastructure (reef effect). However, these factors are not relied upon as part of the assessment. Further consideration of climate change is provided in Volume 2, Chapter 22: Climatic Change.	Not significant	No Additional Mitigation measures are required in addition to those measures adopted as part of the Proposed Development set out in Section 13.9, Volume 2, Chapter 13: Commercial Fisheries.
Increased frequency and intensity of extreme weather (i.e. storms)	Shipping and Navigation (All Relevant Impacts)	Increased frequency and intensity of extreme weather events will cause vessel to use adverse weather routes more frequently. This can lead to increased deviation of commercial vessels, increased collision risk, and may lead to increased risk of contact/allision with Wind Turbines if vessels are transiting close to Wind Turbines or within the Array Area.	Not significant	No Additional Mitigation measures are required in addition to those measures adopted as part of the Proposed Development set out in Section 14.9, Volume 2, Chapter 14: Shipping and Navigation.

Climate Hazard	Sensitive Topic and High Level Receptor	In Combination Climate Impacts (ICCI)	ICCI Significance	Mitigation Measures
Increased wind speeds and changes to wind patterns		Storms may also lead to reduced effectiveness of Search and Rescue (SAR) capability. Impacts to shipping and navigation receptors from the Proposed Development are discussed in Volume 3, Technical Appendix 14.1: Shipping and Navigation Navigational Risk Assessment. The Maritime and Coastguard Agency (MCA) will be consulted during the post-consent development of the Emergency Response and Cooperation Plan (ERCoP) Embedded Mitigation which would consider SAR requirements by the relevant authority, including practical implementation of SAR during storms and adverse weather events. Wind Turbine layout designs are required to meet design standards that can withstand extreme weather events (including wave height) and allow for a factor of safety in design. Anchoring by commercial vessels during adverse weather will be managed through the Embedded Mitigation measures that require appropriate cable burial depths informed by a Cable Burial Risk Assessment (CBRA). The CBRA will be prepared as a post-consent commitment and will use longer-period data to define burial requirements and any necessary protection measures. Cable burial depth monitoring would seek to ensure minimum cable burial depth is maintained throughout the Project lifecycle. Smaller vessels are more susceptible to wave motions, and navigating within the Array Area or in closer proximity to Wind Turbines would be less frequent given the location of the Array Area off the coast which would reduce the number of vessel subject in that location. Overall, the rate of change in relevant climate variables is considered very low. Furthermore, Embedded Mitigation measures will remain appropriate for any increase in climate likely significant environmental effects. Consequently, climate change is anticipated to have minimal additional impact on shipping and navigation receptors over the lifetime of the Proposed Development. Further consideration of climate change is provided in Volume 2, Chapter 22: Climatic Change.		
Increased wave height	Shipping and Navigation (All Relevant Impacts)	Increased wave height may cause vessels that are more susceptible to wave motions (such as ferries) to use adverse weather routes more frequently. This can lead to increased deviation of commercial vessels, increased collision risk, and may lead to increased risk of contact/allision with Wind Turbines if vessels are transiting close to Wind Turbines or within the Array Area. Increased wave height would lead to reduced effectiveness of SAR capability. Increased adverse weather can lead to a reduction of small vessel activity near the Array Area, which is further from shore and local safe havens. Impacts to shipping and navigation receptors from the Proposed Development are discussed in Volume 3, Technical Appendix 14.1: Shipping and Navigation Navigational Risk Assessment. The MCA will be consulted during the post-consent development of the ERCoP Embedded Mitigation which would consider SAR requirements by the relevant authority, including practical implementation of SAR during storms and adverse weather events.	Not significant	No Additional Mitigation measures are required in addition to those measures adopted as part of the Proposed Development set out in Section 14.9, Volume 2, Chapter 14: Shipping and Navigation.

Climate Hazard	Sensitive Topic and High Level Receptor	In Combination Climate Impacts (ICCI)	ICCI Significance	Mitigation Measures
		Wind Turbine layout designs are required to meet design standards that can withstand extreme weather events (including wave height) and allow for a factor of safety in design. Anchoring by commercial vessels during adverse weather would be mitigated through existing Embedded Mitigation measures for required burial depth informed by detailed CBRA utilising longer period data would be undertaken during the development of the CBRA post-consent. Cable burial depth monitoring would seek to ensure minimum cable burial depth is maintained throughout the Project lifecycle. Smaller vessels are more susceptible to wave motions and navigating within the Array Area or in closer proximity to Wind Turbines would be less frequent given the location of the Array Area off the coast which would reduce the number of vessel subject in that location. Overall, the rate of change in relevant climate variables is considered very low. Furthermore, Embedded Mitigation measures will remain appropriate for any increase in climate likely significant environmental effects. Consequently, climate change is anticipated to have minimal additional impact on shipping and navigation receptors over the lifetime of the Proposed Development. Further consideration of climate change is provided in Volume 2, Chapter 22: Climatic Change.		
Increases in average and extreme air temperatures, both in winter and summer **Changes to rainfall patterns, leading to increased annual precipitation** **Increased frequency and intensity of extreme weather (i.e. storms)** **Increased wind speeds and changes to wind patterns** **Increased wave height** **Changes in the tidal range**	Infrastructure and Other Users (Increased Displacement)	Potential ICCI from changes in weather patterns (in average and extreme air temperatures, both in winter and summer (heat wave frequency and decreases in summer precipitation and wind speeds)) that affect public behaviour and patterns of use leading to potential changes in recreational use and pressure on the available sea space (either intermittent, short-term influxes or a long term trend). These effects have the potential to lead to increased displacement of recreational sailing, cruising and recreational fishing (boat angling) in combination with the Proposed Development. Impacts on recreational sailing, cruising and recreational fishing are considered in Volume 2, Chapter 16: Infrastructure and Other Users, with vessel routeing in adverse weather conditions addressed in Volume 2, Chapter 14: Shipping and Navigation. Automatic Identification System data for recreational craft identifies vessels transiting predominantly in a parallel direction to the coastline, with tracks to the west of the Array Area departing or arriving at the major harbours of Peterhead, Aberdeen or Arbroath. Motor cruising areas do not extend to the Array Area. From May 2025 to April 2025, 310 transits by recreational vessels were recorded within 10 nm of the Proposed Development, with the majority recorded within 5 nm of the shore. In view of this baseline and the small, localised displacement (of minor adverse significance) predicted for the Proposed Development, the effect is not considered likely to be increased to significant ICCI. This identified ICCI effect is not significant.	Not significant	No Additional Mitigation measures are required in addition to those measures adopted as part of the Proposed Development set out in Section 16.9, Volume 2, Chapter 16: Infrastructure and Other Users.
Increases in average and extreme air temperatures, both in winter and summer **Increased frequency and intensity of extreme weather (i.e. storms)** **Increased wind speeds and changes to wind patterns**	Infrastructure and Other Users (Enhanced Risk to Cable/Pipeline Infrastructure)	Potential ICCI from increases in average and extreme air temperatures, both in winter and summer (heatwaves); increased frequency and intensity of extreme weather (i.e. storms); increased wind speeds and changes to wind patterns and increased wave heights that could combine with the likely significant environmental effects of the Proposed Development, representing an enhanced risk to cable and/or pipeline infrastructure resulting in enhanced requirements for repairs (such as cable repair/reburial activities) as well as disruptions to commercial operations and personnel.	Not significant	No Additional Mitigation measures are required in addition to those measures adopted as part of the Proposed Development set out in Section 16.9, Volume 2, Chapter 16: Infrastructure and Other Users.

Climate Hazard	Sensitive Topic and High Level Receptor	In Combination Climate Impacts (ICCI)	ICCI Significance	Mitigation Measures
Increased wave height **Changes in the tidal range**		Activities associated with all phases may lead to the reduction or restriction of access to these assets by cable operators. This is assessed in Section 16.10, Volume 2, Chapter 16: Infrastructure and Other Users. The effect is predicted to be of minor adverse significance. This impact will be controlled through Embedded Measures adopted as part of the Proposed Development; cable and pipeline crossing proximity agreements will be developed and implemented with each relevant cable and/or pipeline operator to reduce the potential for any impact and seek to ensure close communication and planning between the affected parties to seek to ensure disruption of activities is reduced. As a result, the likely significant environmental effects of minor adverse significance would not combine to result in an ICCI of greater significance. This identified ICCI effect is not significant.		
Increases in average and extreme air temperatures, both in winter and summer **Increases in sea surface temperatures and ocean acidification** **Changes to rainfall patterns, leading to increased annual precipitation** **Increased frequency and intensity of extreme weather (i.e. storms)** **Increased wind speeds and changes to wind patterns** **Increase in MSL** **Increased wave height** **Changes in the tidal range**	Major Accidents and Disasters	No reasonable Major Accidents and Disasters risk events were identified within Section 17.10, Volume 2, Chapter 17: Major Accidents and Disasters. Additionally, the future baseline conditions associated with these climate hazards have been considered within Section 17.10, Volume 2, Chapter 17: Major Accidents and Disasters, and associated Chapters. For this reasoning, there is no potential for ICCI from the climate hazards identified and they have been screened out of the assessment.	Not significant	No Additional Mitigation measures are required in addition to those measures adopted as part of the Proposed Development set out in Section 17.9, Volume 2, Chapter 17: Major Accidents and Disasters.
Increases in average and extreme air temperatures, both in winter and summer **Increases in sea surface temperatures and ocean acidification** **Changes to rainfall patterns, leading to increased annual precipitation** **Increased frequency and intensity of extreme weather (i.e. storms)** **Increased wind speeds and changes to wind patterns** **Increase in MSL**	Socio-Economics, Tourism and Recreation	No reasonable Socio-Economics, Tourism and Recreation risk events were identified within Section 18.10, Volume 2, Chapter 18: Socio-Economics, Tourism and Recreation. Additionally, the future baseline conditions associated with these climate hazards have been considered within Section 18.10, Volume 2, Chapter 18: Socio-Economics, Tourism and Recreation, and associated Chapters. For this reasoning, there is no potential for ICCI from the climate hazards identified and they have been screened out of the assessment.	Not significant	No Additional Mitigation measures are required in addition to those measures adopted as part of the Proposed Development set out in Section 18.9, Volume 2, Chapter 18: Socio-Economics, Tourism and Recreation.

Climate Hazard	Sensitive Topic and High Level Receptor	In Combination Climate Impacts (ICCI)	ICCI Significance	Mitigation Measures
Increased wave height **Changes in the tidal range**				
Increases in sea surface temperatures and ocean acidification **Increased frequency and intensity of extreme weather (i.e. storms)** **Increase in MSL** **Increased wave height** **Changes in the tidal range**	Marine and Intertidal Archaeology (All Relevant Impacts)	Potential ICCI related to higher temperatures, ocean acidification and/or more turbulent seas that have the potential to exacerbate existing vulnerabilities and threats, particularly physical, chemical and biological deterioration. The current marine archaeology baseline as described in Section 19.6 of the marine archaeology chapter (Volume 2, Chapter 19: Marine Archaeology) should be considered as a snapshot of gradually changing marine archaeology receptors within a dynamic environment. All marine archaeology receptors will be subject to natural processes; physical, chemical and biological, and so will deteriorate over time. The likely significant environmental effects of climate change on the marine environment may cause impacts on marine (and intertidal) archaeology receptors in the mid to long term. The potential for this ICCI is acknowledged. However, the Proposed Development is not expected to contribute to an ICCI effect, such that likely significant environmental effects could combine to a significant ICCI in any phase. This identified ICCI effect is not significant.	Not significant	No Additional Mitigation measures are required in addition to those measures adopted as part of the Proposed Development set out in Section 19.9, Volume 2, Chapter 19: Marine Archaeology.
Increase in MSL **Increased wave height** **Changes in the tidal range**	Seascape, Landscape and Visual Impact (Seascape Character)	Direct impact on Seascape and Landscape Character resulting from increase in MSL, increased wave height or changes to tidal range. Potential for direct impacts or changes to Seascape Character resulting from MSL changes and/or erosion because of increased wave height/tidal range influencing or changing current Seascape Character. The current Seascape, Landscape and Visual Impact baseline is described in Section 20.6, Volume 2, Chapter 20: Seascape, Landscape and Visual Impact. The likely significant environmental effects of climate change on the seascape and landscape receptors may cause visual impacts on the viewpoints listed within Volume 2, Chapter 20: Seascape, Landscape and Visual Impacts in the mid to long term. The potential for this ICCI is acknowledged. However, the Proposed Development is not expected to contribute to a ICCI effect, such that likely significant environmental effects could combine to a significant ICCI in any phase. This identified ICCI effect is not significant.	Not significant	No Additional Mitigation measures are required in addition to those measures adopted as part of the Proposed Development set out in Section 20.9, Volume 2, Chapter 20: Seascape, Landscape and Visual Impacts

Climate Hazard	Sensitive Topic and High Level Receptor	In Combination Climate Impacts (ICCI)	ICCI Significance	Mitigation Measures
Increases in average and extreme air temperatures, both in winter and summer **Increases in sea surface temperatures and ocean acidification** **Changes to rainfall patterns, leading to increased annual precipitation** **Increased frequency and intensity of extreme weather (i.e. storms)** **Increased wind speeds and changes to wind patterns** **Increase in MSL** **Increased wave height** **Changes in the tidal range**	Cultural Heritage	No reasonable Cultural Heritage risk events were identified within Section 21.10, Volume 2, Chapter 21: Cultural Heritage. Additionally, the future baseline conditions associated with these climate hazards have been considered within Section 21.10, Volume 2, Chapter 21: Cultural Heritage, and associated Chapters. For this reasoning, there is no potential for ICCI from the climate hazards identified and they have been screened out of the assessment.	Not significant	No Additional Mitigation measures are required in addition to those measures adopted as part of the Proposed Development set out in Section 21.9, Volume 2, Chapter 21: Cultural Heritage

5 Summary

5.1.1 An ICCI assessment has been undertaken for the Proposed Development. The potential ICCI do not result in any greater likely significant environmental effects than assessed in the relevant topic chapters of the respective Offshore EIA Reports or have been assessed as not being significant.

References

Davies, J.G., Humphreys, E.M., Evans, T., Ohara-Murray, R., Pearce-Higgins, J.W. (2023), Seabird abundances projects to decline in response to climate change in Britain and Ireland. Mar Ecol Prog Ser 725: 121-140

Hakkinen, H., Petrovan, S.O., Sutherland, W.J., Dias, M.P., Ameca, E.I., Oppel, S., Ramírez, I., Lawson, B., Lehikoinen, A., Bowgen, K.M. and Taylor, N.G. (2022). *Linking climate change vulnerability research and evidence on conservation action effectiveness to safeguard European seabird populations*. Journal of Applied Ecology, 59(5), pp.1178-1186.

The Institute of Sustainability and Environmental Professionals(ISEP) (formally IEMA) (2020). *IEMA EIA Guide to: Climate Change Resilience and Adaptation (2020)*. Available at: IEMA - IEMA EIA Guide to: Climate Change Resilience and Adaptation (2020). Accessed on: 24 November 2025.

Kogure, Y., Sato, K., Watanuki, Y., Wanless, S. and Daunt, F. (2016). *European shags optimize their flight behavior according to wind conditions*. Journal of Experimental Biology, 219, pp.311-318.

Mallory, M.L., Gaston, A.J. and Gilchrist, H.G. (2009). *Sources of breeding season mortality in Canadian Arctic seabirds*. Arctic, pp.333-341.

Mitchell, I., Daunt, F., Frederiksen, M. and Wade, K. (2020). *Impacts of climate change on seabirds, relevant to the coastal and marine environment around the UK*. In book: MCCIP Science Review 2020: 382-399.8.

Oswald, S.A., Bearhop, S., Furness, R.W., Huntley, B. and Hmer, K.C. (2008). *Heat stress in a high-latitude seabird: effects of temperature and food supply on bathing and nest attendance of great skuas* Catharacta skua. Journal of Avian Biology, 39(2), pp.163-169.

Ratcliffe, N., Schmitt, S., Mayo, A., Tratalos, J. and Drewitt, A. (2008). *Colony habitat selection by little terms Sternula albifrons in East Anglia: implications for coastal management*. Seabird, 21, pp.55-63.

Scottish Government. (2020). *Sectoral Marine Plan for Offshore Wind Energy — Plan Options (E3 Plan Option Area)*. Available at: https://www.gov.scot/binaries/content/documents/govscot/publications/strategy-plan/2020/10/sectoral-marine-plan-offshore-wind-energy/documents/sectoral-marine-plan-offshore-wind-energy/sectoral-marine-plan-offshore-wind-energy/govscot%3Adocument/sectoral-marine-plan-offshore-wind-energy.pdf. Accessed on: 22 January 2026.