Bellrock Offshore Wind Farm

Wind Farm Development Area

Environmental Impact Assessment Report - Volume IV

Appendix 18.2: Climate Vulnerability Assessment

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Glossary of Terminology

Term	Definition
Applicant	Bellrock Offshore Wind Farm Limited, the legal entity submitting Section 36 Consent and Marine Licence applications for the Bellrock Wind Farm Development Area.
Bellrock Offshore Wind Farm (Bellrock Project)	An offshore wind farm capable of exporting up to 1.8 GW of renewable energy to the National Electricity Transmission System. The Wind Farm Development Area is located 120 km east of Stonehaven, and will connect to the National Electricity Transmission System at the proposed SSEN Transmission Hurlie substation, west of Stonehaven in Aberdeenshire. The Bellrock Offshore Wind Farm comprises of the following Development Areas: ▪ Wind Farm Development Area; ▪ Offshore Transmission Development Area; and ▪ Onshore Transmission Development Area.
Cable protection	Protective measure to minimise the effects of scour and hazards along the inter-array cables, and protecting these cables at infrastructure crossing points.
Climate	The general weather conditions prevailing over a long period of time at a location. Climate change will result in long-term change in global climate patterns such as seasonal averages and extremes.
Climate Change Impact	The resulting impact from a climate hazard which affects the ability of the receptor to achieve or maintain its functions or purpose.
Climate Hazard	A weather or climate-related event or trend in climate conditions, which has potential to do harm to receptors.
Development Area	For consenting purposes, the area for which separate consents and/or Marine Licences will be sought by the Applicant, comprising: ▪ Wind Farm Development Area; ▪ Offshore Transmission Development Area; and ▪ Onshore Transmission Development Area.
Floating offshore unit	The combined wind turbine generator and floating substructure.
Floating substructure	A floating structure which provides buoyancy and, in conjunction with the station keeping system, supports a superstructure (e.g. wind turbine generator or offshore substation), and maintaining its position within the structure's excursion limit.
Inter-array cable	Armoured cable containing electrical and fibre optic cores, which link the wind turbine generators to each other and to the subsea cable hubs and/or the offshore substations and include dynamic inter-array cable and static inter-array cable sections.
Inter-array cables	Armoured cable containing electrical and fibre optic cores, which link the wind turbine generators to each other and to the subsea cable hubs and/or the offshore substations and include dynamic inter-array cable and static inter-array cable sections.
Scour protection	Protective material positioned around anchors to avoid sediment being eroded as a result of the flow of water.

Term	Definition
SSEN Transmission Hurlie substation	The onshore substation to be developed by SSEN Transmission, which will receive renewable electricity from the Bellrock Project onshore substation and allow supply of renewable electricity from the wind farm to the National Electricity Transmission System.
Station keeping system	The system (including mooring lines and anchors) used to hold a floating offshore unit within its excursion limit and maintain the intended orientation of the floating offshore unit.
Weather	Meteorological conditions prevailing at a specific time and location such as temperature and precipitation.
Wind Farm Development Area	The boundary within which the Wind Farm Infrastructure will be constructed, operated and maintained, and decommissioned.
Wind Farm Infrastructure	Infrastructure located within the Wind Farm Development Area including wind turbine generators; floating substructures, station keeping systems and associated scour protection; inter-array cables and associated cable protection; subsea cable hubs; and ancillary infrastructure including buoys (including activities associated with the Wind Farm Infrastructure construction, operation and maintenance, and decommissioning).
Wind turbine generator	A wind turbine generator converts wind energy into electrical energy. The main components include rotor assembly (composed of three blades and a hub); nacelle (containing the generator, shaft and gearbox, power electronic converter and transformer); and a tower (containing lifting equipment and switchgear).

Glossary of Abbreviations

Term	Definition
DP	Decommissioning Programme
DSLP	Development Specification and Layout Plan
EIA	Environmental Impact Assessment
ERCoP	Emergency Response Cooperation Plan
H&S	Health and safety
ISEP	Institute of Sustainability and Environmental Professionals
MCA	Maritime and Coastguard Agency
NLB	Northern Lighthouse Board
O&M	Operation and Maintenance
OMP	Operation and Maintenance Plan
s.36	Section 36
WFDA	Wind Farm Development Area
WTG	Wind turbine generator

1 Introduction

1. This Climate Vulnerability Assessment is an appendix to **Chapter 18: Climate Change Risk (Volume II)** of the Bellrock Wind Farm Development Area (WFDA) Environmental Impact Assessment (EIA) Report.

2. The purpose of this Appendix is to present the climate vulnerability assessment, which forms Step 3 of the four-step Climate Change Risk assessment (as detailed in **Chapter 18: Climate Change Risk (Volume II)**).

3. The climate vulnerability assessment is used to determine the potential for climate change impacts, and to ensure that only impacts with a potential for likely significant effects are taken forward to the detailed climate risk assessment (Step 4 in **Chapter 18: Climate Change Risk (Volume II)**). Climate change impacts are defined as 'the resulting impact from a climate hazard which affects the ability of the receptor to achieve or maintain its functions or purpose to the Bellrock WFDAs receptors (identified in Step 1 of the Climate Change Risk assessment in **Chapter 18: Climate Change Risk (Volume II)**).

4. The climate vulnerability assessment is presented for each phase of the Bellrock WFDA, including:

   - Construction (**Table 1.1**);
   - Operation and maintenance (O&M) (**Table 1.2**); and
   - Decommissioning (**Table 1.3**).

5. The degree of climatic change up to and during the construction phase, as distinct from standard weather fluctuations, is not likely to result in significant changes from present-day conditions. These risks are primarily extreme weather risks rather than climate change risks. However, these have been included due to their potential to harm human or infrastructure receptors. In contrast, the operational and decommissioning and decommissioning timeframe is more likely to experience changes in climate hazards due to long-term climate change.

6. A total of 18 potential climate change impacts have been identified and assessed in the climate change vulnerability assessment.

7. Of the 18 potential climate change impacts, 14 impacts were determined to have a low vulnerability rating based on the implementation of embedded mitigation measures, which are listed in **Section 18.7.3** of **Chapter 18: Climate Change Risk (Volume II)**, and therefore they have been screened out from further assessment. A non-significant effect in EIA terms has been concluded for these impacts.

8. There are four climate change impacts which were determined to have a moderate vulnerability rating and therefore were taken forward to a detailed climate risk assessment, as presented in **Section 18.8.4** of **Chapter 18: Climate Change Risk (Volume II)**.

9. A breakdown of the potential climate change impacts over different phases is provided below:

   - One climate change impact was taken forward for further assessment during the construction phase with six climate change hazards identified; and
   - Three climate change impacts were taken forward for further assessment during the decommissioning phase with four climate change hazards identified.

10. Eight climate change hazards are identified during the O&M phase; however, no impacts were taken forward for further assessment.

11. All mitigation measures considered in **Table 1.1** to **Table 1.3** are detailed in **Appendix 5.1: Mitigation and Monitoring Register (Volume IV)**.

Table 1.1: Climate Change Vulnerability Assessment – Construction Phase

Climate Hazard	Receptor	Potential Climate Change Impact	Proposed Embedded Mitigation Measure	Exposure	Sensitivity	Vulnerability	Proposed Approach
▪ Increased frequency and severity of heatwaves; and ▪ Increase in average temperatures.	Offshore construction personnel.	Heatwaves and increased average temperatures can lead to increased risk of heat stroke and exhaustion among the workforces.	WFDA-42 in Table 18.14 in **Chapter 18: Climate Change Risk (Volume II)** and **Appendix 5.1: Mitigation and Monitoring Register (Volume IV).** Development of, and adherence to, a Emergency Response Cooperation Plan (ERCoP). The ERCoP will detail protocols that will be undertaken in the event of an emergency, including occupational health and safety (H&S), and set out clear roles and responsibilities, emergency contacts and reporting and escalation pathways. Protocols for extreme weather events will also be included. The ERCoP will mitigate the risk of climate change impacts on construction site personnel, plant and equipment and other assets and the risk of delays to the construction programme due to extreme weather events, which are becoming more frequent and intense due to climate change. The ERCoP will ensures the implementation of response protocols in the event of emergencies for offshore activities. Extreme high temperatures can be managed by altering shift patterns to cooler times during the day and providing additional rest breaks.	Low	Low	Low	Further assessment not required. (Not significant)

Climate Hazard	Receptor	Potential Climate Change Impact	Proposed Embedded Mitigation Measure	Exposure	Sensitivity	Vulnerability	Proposed Approach
	Condition and performance of Wind Farm Infrastructure.	High temperatures may reduce the strength and durability of construction materials used during installation of Wind Farm Infrastructure and affect the flexibility and integrity of cables during laying of the inter-array cables.	WFDA-38 in Table 18.14 in **Chapter 18: Climate Change Risk (Volume II)** and **Appendix 5.1: Mitigation and Monitoring Register (Volume IV).** Development of and adherence to a Development Specification and Layout Plan (DSLP). A DSLP will be developed post-consent to finalise the Bellrock WFDA layout in consultation with the Maritime and Coastguard Agency (MCA) and Northern Lighthouse Board (NLB) in accordance with s.36 and Marine Licence requirements. Specifically in relation to climate change risk, the assessment accounts for the technical requirements of the Wind Farm Infrastructure, design specifications and operational strategy which are built upon best practice engineering codes and standards in the offshore wind sector, and standard H&S procedures outlined in relevant management plans. Where likely significant effects are predicted, additional mitigation will be identified from available literature sources and in collaboration with the engineering team to ensure the Wind Farm Infrastructure is resilient to impacts arising from current extreme weather events and climatic conditions. Accounting for uncertainties in longer-term climate change projections and their implications for the Bellrock Wind Farm Infrastructure, adaptive management measures will also be reviewed in line with Institute of Sustainability and Environmental Professionals (ISEP) guidance (2020) to	Low	Low	Low	Further assessment not required. (Not significant)

Climate Hazard	Receptor	Potential Climate Change Impact	Proposed Embedded Mitigation Measure	Exposure	Sensitivity	Vulnerability	Proposed Approach
			ensure mitigation is implemented where and when appropriate. The DSLP will ensure that climate change resilience is built into the design from the outset to mitigate the risk of climate change impacts on the conditions and performance of the Wind Farm Infrastructure during the operational lifetime.				
▪ Increase in storm intensity (wind speed); ▪ Increase in frequency of storm conditions; ▪ Increase in extreme wave height; and ▪ Change in storm patterns, e.g. wind direction.	Marine vessels and offshore plant and equipment.	High winds and waves during extreme storm events can result in physical damage to marine vessels and plant and equipment.	WFDA-42 in Table 18.14 in **Chapter 18: Climate Change Risk (Volume II)** and **Appendix 5.1 Mitigation and Monitoring Register (Volume IV).** Development of, and adherence to, an ERCoP. The ERCoP will detail protocols that will be undertaken in the event of an emergency, including occupational H&S, and set out clear roles and responsibilities, emergency contacts and reporting and escalation pathways. Protocols for extreme weather events will also be included. The ERCoP will mitigate the risk of climate change impacts on construction site personnel, plant and equipment and other assets and the risk of delays to the construction programme due to extreme weather events, which are becoming more frequent and intense due to climate change. The ERCoP will ensures the implementation of response protocols in the event of emergencies for offshore activities.	Low	High	Low	Further assessment not required. (Not significant)
	Offshore construction personnel.	Extreme storminess can lead to unsafe working conditions.		Moderate	Moderate	Moderate	Further assessment required.

Climate Hazard	Receptor	Potential Climate Change Impact	Proposed Embedded Mitigation Measure	Exposure	Sensitivity	Vulnerability	Proposed Approach
			Extreme storm events can be managed by designating safe shelter on board vessels for personnel, securing loose equipment and stored materials during periods of high winds and waves and determining safe limits for working conditions above which vessel activities and crane and rig operations would be halted.				
Increased frequency and/or severity of all types of extreme weather event, including heatwaves, storms and wave heights.	Offshore construction personnel, marine vessels and plant and equipment.	Increased risk of disruption to offshore construction activities during extreme weather events can lead to programme delays and associated cost implications. Prolonged or successive disruptions can result in impacts to the Bellrock WFDA overall construction programme.	WFDA-42 in Table 18.14 in **Chapter 18: Climate Change Risk (Volume II)** and **Appendix 5.1: Mitigation and Monitoring Register (Volume IV).** Development of, and adherence to, an ERCoP. The ERCoP will detail protocols that will be undertaken in the event of an emergency, including occupational H&S, and set out clear roles and responsibilities, emergency contacts and reporting and escalation pathways. Protocols for extreme weather events will also be included. The ERCoP will mitigate the risk of climate change impacts on construction site personnel, plant and equipment and other assets and the risk of delays to the construction programme due to extreme weather events, which are becoming more frequent and intense due to climate change. The ERCoP will ensures the implementation of response protocols in the event of emergencies for offshore activities.	Low	Low	Low	Further assessment not required. (Not significant)

Table 1.2: Climate Change Vulnerability Assessment – Operation and Maintenance Phase

Climate Hazard	Receptor	Potential Climate Change Impact	Proposed Embedded Mitigation Measure	Exposure	Sensitivity	Vulnerability	Proposed Approach
Change in various environmental conditions (e.g. increase in average sea surface temperatures, salinity, strong waves and sea level rise) can increase water damage and corrosion risks.	Condition and performance of Wind Farm Infrastructure.	Exposure to strong waves, increasing sea salinity and surface temperatures, compounded by sea level rise, storm surges and tidal changes, can increase the risk of water damage and saltwater corrosion to submerged structures. This may result in physical damage and deterioration and decline in operational performance.	WFDA-38 in Table 18.14 in **Chapter 18: Climate Change Risk (Volume II)** and **Appendix 5.1: Mitigation and Monitoring Register (Volume IV).** Development of and adherence to a DSLP. A DSLP will be developed post-consent to finalise the Bellrock WFDA layout in consultation with the MCA and NLB in accordance with s.36 and Marine Licence requirements. Specifically in relation to climate change risk, the assessment accounts for the technical requirements of the Wind Farm Infrastructure, design specifications and operational strategy which are built upon best practice engineering codes and standards in the offshore wind sector, and standard H&S procedures outlined in relevant management plans. Where likely significant effects are predicted, additional mitigation will be identified from available literature sources and in collaboration with the engineering team to ensure the Wind Farm Infrastructure is resilient to impacts arising from current extreme weather events and climatic conditions. Accounting for uncertainties in longer-term climate change projections and their implications for the Bellrock Wind Farm Infrastructure, adaptive management measures will also be reviewed in line with ISEP guidance (2020) to ensure mitigation is implemented where and when appropriate.	Low	Low	Low	Further assessment not required. (Not significant)

Climate Hazard	Receptor	Potential Climate Change Impact	Proposed Embedded Mitigation Measure	Exposure	Sensitivity	Vulnerability	Proposed Approach
			The DSLP will ensure that climate change resilience is built into the design from the outset to mitigate the risk of climate change impacts on the conditions and performance of the Wind Farm Infrastructure during the operational lifetime. WFDA-61 in Table 18.14 in **Chapter 18: Climate Change Risk (Volume II)** and **Mitigation and Monitoring Register (Volume IV).** Regular and periodic inspections and maintenance of all components of the Wind Farm Infrastructure will be undertaken over their operational lifetime to identify and remediate any damage and deterioration and maintain good working conditions. These will be included in the Operation and Maintenance Plan (OMP). Monitoring of site-specific weather and metocean conditions, recent extreme weather events and up-to-date climate change projection data will be undertaken to provide a dynamic risk assessment of climate change impacts and inform operation and maintenance planning. The OMP will mitigate the risks of climate change impacts on the conditions and performance of the Wind Farm Infrastructure and ensures that it is adaptable to future climate conditions and remains resilient over its operational life. The O&M strategy will be adaptive, with the frequency of maintenance, repair and replacement activities being adjusted based on need (i.e. increasing				

Climate Hazard	Receptor	Potential Climate Change Impact	Proposed Embedded Mitigation Measure	Exposure	Sensitivity	Vulnerability	Proposed Approach
			planned O&M visits for components with higher deterioration rates than anticipated).				
Change in frequency of ice conditions.	Condition and performance of wind turbine generators (WTGs).	Cold weather can lead to ice accretion on WTGs and therefore decreasing their operational performance.	WFDA-38 in Table 18.14 in **Chapter 18: Climate Change Risk (Volume II)** and **Appendix 5.1: Mitigation and Monitoring Register (Volume IV).** Development of and adherence to a DSLP. A DSLP will be developed post-consent to finalise the Bellrock WFDA layout in consultation with the MCA and NLB in accordance with s.36 and Marine Licence requirements. Specifically in relation to climate change risk, the assessment accounts for the technical requirements of the Wind Farm Infrastructure, design specifications and operational strategy which are built upon best practice engineering codes and standards in the offshore wind sector, and standard H&S procedures outlined in relevant management plans. Where likely significant effects are predicted, additional mitigation will be identified from available literature sources and in collaboration with the engineering team to ensure the Wind Farm Infrastructure is resilient to impacts arising from current extreme weather events and climatic conditions. Accounting for uncertainties in longer-term climate change projections and their implications for the Bellrock Wind Farm Infrastructure, adaptive management measures will also be reviewed in line with	Moderate	Low	Low	Further assessment not required. (Not significant)

Climate Hazard	Receptor	Potential Climate Change Impact	Proposed Embedded Mitigation Measure	Exposure	Sensitivity	Vulnerability	Proposed Approach
			ISEP guidance (2020) to ensure mitigation is implemented where and when appropriate. The DSLP will ensure that climate change resilience is built into the design from the outset to mitigate the risk of climate change impacts on the conditions and performance of the Wind Farm Infrastructure during the operational lifetime. WFDA-61 in Table 18.14 in **Chapter 18: Climate Change Risk (Volume II)** and **Mitigation and Monitoring Register (Volume IV).** Regular and periodic inspections and maintenance of all components of the Wind Farm Infrastructure will be undertaken over their operational lifetime to identify and remediate any damage and deterioration and maintain good working conditions. These will be included in the OMP. Monitoring of site-specific weather and metocean conditions, recent extreme weather events and up-to-date climate change projection data will be undertaken to provide a dynamic risk assessment of climate change impacts and inform operation and maintenance planning. The OMP will mitigate the risks of climate change impacts on the conditions and performance of the Wind Farm Infrastructure and ensures that it is adaptable to future climate conditions and remains resilient over its operational life. The O&M strategy will be adaptive, with the frequency of maintenance, repair and replacement activities being				

Climate Hazard	Receptor	Potential Climate Change Impact	Proposed Embedded Mitigation Measure	Exposure	Sensitivity	Vulnerability	Proposed Approach
			adjusted based on need (i.e. increasing planned O&M visits for components with higher deterioration rates than anticipated).				
Increase in frequency and intensity of extreme precipitation events.	Condition and performance of WTGs.	An increase in precipitation and moisture can result in physical damage and deterioration of WTGs due to blade edge erosion and decline in operational performance.	WFDA-38 in Table 18.14 in **Chapter 18: Climate Change Risk (Volume II)** and **Appendix 5.1: Mitigation and Monitoring Register (Volume IV).** Development of and adherence to a DSLP. A DSLP will be developed post-consent to finalise the Bellrock WFDA layout in consultation with the MCA and NLB in accordance with s.36 and Marine Licence requirements. Specifically in relation to climate change risk, the assessment accounts for the technical requirements of the Wind Farm Infrastructure, design specifications and operational strategy which are built upon best practice engineering codes and standards in the offshore wind sector, and standard H&S procedures outlined in relevant management plans. Where likely significant effects are predicted, additional mitigation will be identified from available literature sources and in collaboration with the engineering team to ensure the Wind Farm Infrastructure is resilient to impacts arising from current extreme weather events and climatic conditions. Accounting for uncertainties in longer-term climate change projections and their implications for the Bellrock Wind Farm Infrastructure, adaptive management measures will also be reviewed in line with	Low	Moderate	Low	Further assessment not required. (Not significant)

Climate Hazard	Receptor	Potential Climate Change Impact	Proposed Embedded Mitigation Measure	Exposure	Sensitivity	Vulnerability	Proposed Approach
			ISEP guidance (2020) to ensure mitigation is implemented where and when appropriate. The DSLP will ensure that climate change resilience is built into the design from the outset to mitigate the risk of climate change impacts on the conditions and performance of the Wind Farm Infrastructure during the operational lifetime. WFDA-61 in Table 18.14 in **Chapter 18: Climate Change Risk (Volume II)** and **Mitigation and Monitoring Register (Volume IV).** Regular and periodic inspections and maintenance of all components of the Wind Farm Infrastructure will be undertaken over their operational lifetime to identify and remediate any damage and deterioration and maintain good working conditions. These will be included in the OMP. Monitoring of site-specific weather and metocean conditions, recent extreme weather events and up-to-date climate change projection data will be undertaken to provide a dynamic risk assessment of climate change impacts and inform operation and maintenance planning. The OMP will mitigate the risks of climate change impacts on the conditions and performance of the Wind Farm Infrastructure and ensures that it is adaptable to future climate conditions and remains resilient over its operational life. The O&M strategy will be adaptive, with the frequency of maintenance, repair and replacement activities being				

Climate Hazard	Receptor	Potential Climate Change Impact	Proposed Embedded Mitigation Measure	Exposure	Sensitivity	Vulnerability	Proposed Approach
			adjusted based on need (i.e. increasing planned O&M visits for components with higher deterioration rates than anticipated).				
▪ Increase in storm intensity (wind speed).; ▪ Increase in frequency of storm conditions; and ▪ Change in storm patterns, e.g. wind direction.	Condition and performance of WTGs.	Extreme storm events can result in physical damage and deterioration of WTGs and decline in operational performance due to shutdowns.	WFDA-38 in Table 18.14 in **Chapter 18: Climate Change Risk (Volume II)** and **Appendix 5.1: Mitigation and Monitoring Register (Volume IV).** Development of and adherence to a DSLP. A DSLP will be developed post-consent to finalise the Bellrock WFDA layout in consultation with the MCA and NLB in accordance with s.36 and Marine Licence requirements. Specifically in relation to climate change risk, the assessment accounts for the technical requirements of the Wind Farm Infrastructure, design specifications and operational strategy which are built upon best practice engineering codes and standards in the offshore wind sector, and standard H&S procedures outlined in relevant management plans. Where likely significant effects are predicted, additional mitigation will be identified from available literature sources and in collaboration with the engineering team to ensure the Wind Farm Infrastructure is resilient to impacts arising from current extreme weather events and climatic conditions. Accounting for uncertainties in longer-term climate change projections and their implications for the Bellrock Wind Farm Infrastructure, adaptive management measures will also be reviewed in line with	Moderate	Low	Low	Further assessment not required. (Not significant)

Climate Hazard	Receptor	Potential Climate Change Impact	Proposed Embedded Mitigation Measure	Exposure	Sensitivity	Vulnerability	Proposed Approach
			ISEP guidance (2020) to ensure mitigation is implemented where and when appropriate. The DSLP will ensure that climate change resilience is built into the design from the outset to mitigate the risk of climate change impacts on the conditions and performance of the Wind Farm Infrastructure during the operational lifetime. WFDA-61 in Table 18.14 in **Chapter 18: Climate Change Risk (Volume II)** and **Mitigation and Monitoring Register (Volume IV).** Regular and periodic inspections and maintenance of all components of the Wind Farm Infrastructure will be undertaken over their operational lifetime to identify and remediate any damage and deterioration and maintain good working conditions. These will be included in the OMP. Monitoring of site-specific weather and metocean conditions, recent extreme weather events and up-to-date climate change projection data will be undertaken to provide a dynamic risk assessment of climate change impacts and inform operation and maintenance planning. The OMP will mitigate the risks of climate change impacts on the conditions and performance of the Wind Farm Infrastructure and ensures that it is adaptable to future climate conditions and remains resilient over its operational life. The O&M strategy will be adaptive, with the frequency of maintenance, repair and replacement activities being				

Climate Hazard	Receptor	Potential Climate Change Impact	Proposed Embedded Mitigation Measure	Exposure	Sensitivity	Vulnerability	Proposed Approach
			adjusted based on need (i.e. increasing planned O&M visits for components with higher deterioration rates than anticipated).				
▪ Increase in storm intensity (wind speed); ▪ Increase in extreme wave height; ▪ Increase in frequency of storm conditions; and ▪ Change in storm patterns (e.g. wind direction).	Offshore O&M personnel	Extreme storm events can lead to unsafe working conditions and disrupt O&M activities.	WFDA-42 in Table 18.14 in **Chapter 18: Climate Change Risk (Volume II)** and **Appendix 5.1: Mitigation and Monitoring Register (Volume IV).** Development of, and adherence to, an ERCoP. The ERCoP will detail protocols that will be undertaken in the event of an emergency, including occupational H&S, and set out clear roles and responsibilities, emergency contacts and reporting and escalation pathways. Protocols for extreme weather events will also be included. The ERCoP will mitigate the risk of climate change impacts on construction site personnel, plant and equipment and other assets and the risk of delays to the construction programme due to extreme weather events, which are becoming more frequent and intense due to climate change. The ERCoP will ensures the implementation of response protocols in the event of emergencies for offshore activities. WFDA-38 in Table 18.14 in **Chapter 18: Climate Change Risk (Volume II)** and **Appendix 5.1: Mitigation and Monitoring Register (Volume IV).** Development of and adherence to a DSLP. A DSLP will be developed post-consent to	Low	Low	Low	Further assessment not required. (Not significant)

Climate Hazard	Receptor	Potential Climate Change Impact	Proposed Embedded Mitigation Measure	Exposure	Sensitivity	Vulnerability	Proposed Approach
			finalise the Bellrock WFDA layout in consultation with the MCA and NLB in accordance with s.36 and Marine Licence requirements. Specifically in relation to climate change risk, the assessment accounts for the technical requirements of the Wind Farm Infrastructure, design specifications and operational strategy which are built upon best practice engineering codes and standards in the offshore wind sector, and standard H&S procedures outlined in relevant management plans. Where likely significant effects are predicted, additional mitigation will be identified from available literature sources and in collaboration with the engineering team to ensure the Wind Farm Infrastructure is resilient to impacts arising from current extreme weather events and climatic conditions. Accounting for uncertainties in longer-term climate change projections and their implications for the Bellrock Wind Farm Infrastructure, adaptive management measures will also be reviewed in line with ISEP guidance (2020) to ensure mitigation is implemented where and when appropriate. The DSLP will ensure that climate change resilience is built into the design from the outset to mitigate the risk of climate change impacts on the conditions and performance of the Wind Farm Infrastructure during the operational lifetime. WFDA-61 in Table 18.14 in **Chapter 18: Climate Change Risk (Volume II)** and				

Climate Hazard	Receptor	Potential Climate Change Impact	Proposed Embedded Mitigation Measure	Exposure	Sensitivity	Vulnerability	Proposed Approach
			Mitigation and Monitoring Register (Volume IV). Regular and periodic inspections and maintenance of all components of the Wind Farm Infrastructure will be undertaken over their operational lifetime to identify and remediate any damage and deterioration and maintain good working conditions. These will be included in the OMP. Monitoring of site-specific weather and metocean conditions, recent extreme weather events and up-to-date climate change projection data will be undertaken to provide a dynamic risk assessment of climate change impacts and inform operation and maintenance planning. The OMP will mitigate the risks of climate change impacts on the conditions and performance of the Wind Farm Infrastructure and ensures that it is adaptable to future climate conditions and remains resilient over its operational life. The O&M strategy will be adaptive, with the frequency of maintenance, repair and replacement activities being adjusted based on need (i.e. increasing planned O&M visits for components with higher deterioration rates than anticipated).				
▪ Increased tidal range; and ▪ Increase in extreme wave height.	Condition and performance of Wind Farm Infrastructure.	Increased wave and tidal activities can increase loading and sediment transport across the seabed, resulting in physical damage and deterioration of	WFDA-38 in Table 18.14 in **Chapter 18: Climate Change Risk (Volume II)** and **Appendix 5.1: Mitigation and Monitoring Register (Volume IV).** Development of and adherence to a DSLP. A DSLP will be developed post-consent to finalise the Bellrock WFDA layout in	Low	Low	Low	Further assessment not required. (Not significant)

Climate Hazard	Receptor	Potential Climate Change Impact	Proposed Embedded Mitigation Measure	Exposure	Sensitivity	Vulnerability	Proposed Approach
		submerged structures and decline in operational performance due to scour and erosion.	consultation with the MCA and NLB in accordance with s.36 and Marine Licence requirements. Specifically in relation to climate change risk, the assessment accounts for the technical requirements of the Wind Farm Infrastructure, design specifications and operational strategy which are built upon best practice engineering codes and standards in the offshore wind sector, and standard H&S procedures outlined in relevant management plans. Where likely significant effects are predicted, additional mitigation will be identified from available literature sources and in collaboration with the engineering team to ensure the Wind Farm Infrastructure is resilient to impacts arising from current extreme weather events and climatic conditions. Accounting for uncertainties in longer-term climate change projections and their implications for the Bellrock Wind Farm Infrastructure, adaptive management measures will also be reviewed in line with ISEP guidance (2020) to ensure mitigation is implemented where and when appropriate. The DSLP will ensure that climate change resilience is built into the design from the outset to mitigate the risk of climate change impacts on the conditions and performance of the Wind Farm Infrastructure during the operational lifetime. WFDA-61 in Table 18.14 in **Chapter 18: Climate Change Risk (Volume II)** and				

Climate Hazard	Receptor	Potential Climate Change Impact	Proposed Embedded Mitigation Measure	Exposure	Sensitivity	Vulnerability	Proposed Approach
			Mitigation and Monitoring Register (Volume IV). Regular and periodic inspections and maintenance of all components of the Wind Farm Infrastructure will be undertaken over their operational lifetime to identify and remediate any damage and deterioration and maintain good working conditions. These will be included in the OMP. Monitoring of site-specific weather and metocean conditions, recent extreme weather events and up-to-date climate change projection data will be undertaken to provide a dynamic risk assessment of climate change impacts and inform operation and maintenance planning. The OMP will mitigate the risks of climate change impacts on the conditions and performance of the Wind Farm Infrastructure and ensures that it is adaptable to future climate conditions and remains resilient over its operational life. The O&M strategy will be adaptive, with the frequency of maintenance, repair and replacement activities being adjusted based on need (i.e. increasing planned O&M visits for components with higher deterioration rates than anticipated).				
Increased frequency and/or severity of all types of extreme weather event or climate hazard, including heatwaves, storms, wave height,	Condition and performance of Wind Farm Infrastructure.	Major damage and/or increased rate of deterioration in condition due to extreme weather events could require more frequent repairs and replacements, raising	WFDA61 in Table 18.14 in **Chapter 18: Climate Change Risk (Volume II)** and **Mitigation and Monitoring Register (Volume IV).** Regular and periodic inspections and maintenance of all components of the Wind Farm Infrastructure will be undertaken over	Low	Moderate	Low	Further assessment not required. (Not significant)

Climate Hazard	Receptor	Potential Climate Change Impact	Proposed Embedded Mitigation Measure	Exposure	Sensitivity	Vulnerability	Proposed Approach
precipitation, lightning, tidal range, coastal erosion and changes in marine environmental conditions.		O&M costs and disrupting activities.	their operational lifetime to identify and remediate any damage and deterioration and maintain good working conditions. These will be included in the OMP. Monitoring of site-specific weather and metocean conditions, recent extreme weather events and up-to-date climate change projection data will be undertaken to provide a dynamic risk assessment of climate change impacts and inform operation and maintenance planning. The OMP will mitigate the risks of climate change impacts on the conditions and performance of the Wind Farm Infrastructure and ensures that it is adaptable to future climate conditions and remains resilient over its operational life. The O&M strategy will be adaptive, with the frequency of maintenance, repair and replacement activities being adjusted based on need (i.e. increasing planned O&M visits for components with higher deterioration rates than anticipated).				

Table 1.3: Climate Change Vulnerability Assessment – Decommissioning Phase

Climate Hazard	Receptor	Potential Climate Change Impact	Proposed Embedded Mitigation Measure	Exposure	Sensitivity	Vulnerability	Proposed Approach
▪ Increased frequency and severity of heatwaves; and ▪ Increase in average temperatures.	Offshore decommissioning personnel.	Heatwaves and increased average temperatures can lead to increased risk of heat stroke and exhaustion among the workforces.	WFDA-47 in Table 18.14 in **Appendix 5.1: Mitigation and Monitoring Register (Volume IV).** Development of, and adherence to, a Decommissioning Programme (DP). The DP will set out the framework for the safe, orderly, and environmentally acceptable decommissioning and removal of the Bellrock Wind Farm Infrastructure, in the interests of safety and environmental protection. Climate change risk measures will be included in the DP to be developed prior to the commencement of construction and will include a review of site-specific weather and metocean conditions, recent extreme weather events and up-to-date climate change projection data will be undertaken to ensure risk assessments, H&S protocols and guidelines on safe working practices are suitable for future climate conditions at the time of decommissioning works. The DP will be refreshed prior to decommissioning activities commencing. The DP will mitigate the risk of climate change impacts on decommissioning site personnel, plant and equipment and other assets and the risk of delays to the decommissioning programme due to extreme weather events, which are becoming more frequent and intense due to climate change.	Low	High	Low	Further assessment not required. (Not significant)

Climate Hazard	Receptor	Potential Climate Change Impact	Proposed Embedded Mitigation Measure	Exposure	Sensitivity	Vulnerability	Proposed Approach
▪ Increase in storm intensity (wind speed); ▪ Increase in frequency of storm conditions; ▪ Increase in extreme wave height; and ▪ Change in storm patterns (e.g. wind direction).	Marine vessels and offshore plant and equipment.	High winds and waves during extreme storm events can result in physical damage to marine vessels and plant and equipment.	WFDA-47 in Table 18.14 in **Appendix 5.1: Mitigation and Monitoring Register (Volume IV).** Development of, and adherence to, a DP. The DP will set out the framework for the safe, orderly, and environmentally acceptable decommissioning and removal of the Bellrock Wind Farm Infrastructure, in the interests of safety and environmental protection. Climate change risk measures will be included in the DP to be developed prior to the commencement of construction and will include a review of site-specific weather and metocean conditions, recent extreme weather events and up-to-date climate change projection data will be undertaken to ensure risk assessments, H&S protocols and guidelines on safe working practices are suitable for future climate conditions at the time of decommissioning works. The DP will be refreshed prior to decommissioning activities commencing. The DP will mitigate the risk of climate change impacts on decommissioning site personnel, plant and equipment and other assets and the risk of delays to the decommissioning programme due to extreme weather events, which are becoming more frequent and intense due to climate change.	Moderate	High	Moderate	Further assessment required.
	Offshore decommissioning personnel.	Extreme storminess can lead to unsafe working conditions.		Moderate	Moderate	Moderate	Further assessment required.

Climate Hazard	Receptor	Potential Climate Change Impact	Proposed Embedded Mitigation Measure	Exposure	Sensitivity	Vulnerability	Proposed Approach
Increased frequency and/or severity of all types of extreme weather event, including heatwaves, storms and wave heights.	Offshore decommissioning personnel, marine vessels and plant and equipment.	Increased risk of disruption to offshore decommissioning activities during extreme weather events can lead to programme delays and associated cost implications. Prolonged or successive disruptions can result in impacts on the Bellrock WFDA Decommissioning Programme.	WFDA-47 in Table 18.14 in **Appendix 5.1: Mitigation and Monitoring Register (Volume IV).** Development of, and adherence to, a DP. The DP will set out the framework for the safe, orderly, and environmentally acceptable decommissioning and removal of the Bellrock Wind Farm Infrastructure, in the interests of safety and environmental protection. Climate change risk measures will be included in the DP to be developed prior to the commencement of construction and will include a review of site-specific weather and metocean conditions, recent extreme weather events and up-to-date climate change projection data will be undertaken to ensure risk assessments, H&S protocols and guidelines on safe working practices are suitable for future climate conditions at the time of decommissioning works. The DP will be refreshed prior to decommissioning activities commencing. The DP will mitigate the risk of climate change impacts on decommissioning site personnel, plant and equipment and other assets and the risk of delays to the decommissioning programme due to extreme weather events, which are becoming more frequent and intense due to climate change.	Moderate	High	Moderate	Further assessment required.

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