Meridian Solar

Meridian Solar Farm

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Volume 6

Environmental Statement

6.3 ES Appendix 7-2: Climate Change Risk Register

APFP Regulation 5(2)(a)

Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009

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1. Climate Change Risk Register

1.1. Overview

1.1.1. This appendix presents the complete climate change risk register completed as part of the Climate Change Risk (CCR) assessment for the Scheme. For full details of the CCR assessment refer to **ES Chapter 7: Climate Change** (Doc Ref. 6.1).

1.1.2. The construction phase risks presented in Table 1 are assessed against the RCP8.5 climate change scenario for the period 2020-2049. The operational phase risks presented in Table 1 are assessed against the RCP8.5 climate change scenario for the period 2050-2079. For more information on the methodology utilised in this assessment refer to **ES Chapter 7: Climate Change** (Doc Ref. 6.1).

Table 1: Climate Change Risk Register

Risk ID	Climate Hazard	Impact	Embedded Mitigation	Likelihood	Consequence	Significance
Construction						
1	Increase in summer maximum temperatures	Increased summer maximum temperatures may lead to overheating of construction equipment, delaying the programme and damaging assets.	The **Outline Construction Environmental Management Plan** (OCEMP) (Doc Ref. 7.10) details measures to monitor weather forecasts and plan works accordingly, protecting workers and resources from any extreme weather conditions.	Unlikely	Minor	Low (Not Significant)

Risk ID	Climate Hazard	Impact	Embedded Mitigation	Likelihood	Consequence	Significance
2	Increase in frequency and intensity of extreme storm events	Increased winter precipitation can increase the likelihood of fluvial flooding in the site location, with the potential to wash out the construction site, damaging materials and delaying the programme.	The **OCEMP** (Doc Ref. 7.10) requires flood defence measures to be implemented during construction to provide adequate protection to the worksite and workers.	Moderate	Minor	Medium (Not Significant)
3	Increase in frequency and intensity of extreme storm events	Increased winter precipitation may lead to surface water flooding, preventing access to site and delaying construction.	The **OCEMP** (Doc Ref. 7.10) requires flood defence measures to be implemented during construction to provide adequate protection to the worksite and workers.	Moderate	Minor	Medium (Not Significant)
4	Increase in frequency and intensity of extreme storm events	Extreme storm events accompanied by heavy rainfall and strong winds have the potential to damage construction	As set out within the **OCEMP** (Doc Ref. 7.10), the Contractor will monitor weather forecasts, utilising the Met Office - Long-range forecast for operational planning, protecting workers and construction	Moderate	Minor	Medium (Not Significant)

Risk ID	Climate Hazard	Impact	Embedded Mitigation	Likelihood	Consequence	Significance
		equipment and building materials.	resources from extreme weather conditions.			
5	Increase in mean winter precipitation	Increased winter precipitation may lead to surface water flooding, preventing access to site and causing operational delays	Access roads would aim to be located in areas that are not susceptible to flooding. Where this is not possible, flooding management measures would be designed for the Site to protect key access routes. For example, drainage ditches will be placed alongside access routes where required, as set out within the Outline Drainage Strategy (**ES Appendix 11-4** (Doc Ref. 6.3)). Emergency access routes would be established as part of operational management procedures, in accordance with the **Outline Operational Environmental Management Plan (OOEMP)** (Doc Ref. 7.11).	Unlikely	Minor	Low (Not Significant)
6	Increase in the frequency and severity of heatwaves	Frequent and severe heatwaves have the potential to delay the construction programme through unsafe working conditions	As set out within the **OCEMP** (Doc Ref. 7.10), the Contractor will monitor weather forecasts, utilising the Met Office - Long-range forecast for operational planning, protecting workers and construction resources from extreme weather conditions.	Unlikely	Minor	Low (Not Significant)

Risk ID	Climate Hazard	Impact	Embedded Mitigation	Likelihood	Consequence	Significance
7	Reduced summer precipitation	Reduced precipitation and drought conditions may lead to water unavailability for construction activities and workforce.	The **OCEMP** (Doc Ref. 7.10) includes the requirement for Contractors to define measures for sustainable water use during construction.	Rare	Insignificant	Low (Not Significant)
Operation						
Solar Development Area						
8	Increase in annual mean temperatures	Increased average annual temperatures may lead to faster degradation of the solar PV panels, resulting in lower energy generation over time.	Solar PV module design specification generally ensures optimal operation up to 25°C. Loss of efficiency has been accounted for in energy generation calculations, with replacement due after 25 years.	Moderate	Minor	Medium (Not Significant)
9	Increase in annual mean temperatures	Increased average annual temperatures may lead to decreased energy generation, as efficiency of solar panels is	Solar PV module design specification generally ensures optimal operation up to 25°C. Loss of efficiency has been accounted for in energy generation calculations, with replacement due after 25 years.	Unlikely	Minor	Low (Not Significant)

Risk ID	Climate Hazard	Impact	Embedded Mitigation	Likelihood	Consequence	Significance
		temperature dependant.				
10	Increase in mean and maximum summer temperatures / increase in heatwave frequency	Increased maximum summer temperatures may increase in risk of fire in Battery Energy Storage Systems (BESS) due to overheating.	The **Outline Battery Safety Management Plan (OBSMP)** (Doc Ref. 7.18) includes measures to reduce the risk of fire. This includes battery selection and design, storage environment, implementation of a battery management system (fire detection systems) and adjacent water storage tanks and / or hydrants. Water storage tanks and hydrants would be provided for the BESS and On-Site Substation Compound and would have an individual storage volume to allow a discharge rate for firefighting of approximately 1,500 litres per minute for 4 hours.	Unlikely	Moderate	Medium (Not Significant)
11	Increased winter precipitation	Increased precipitation during winter can lead to extended periods of saturated ground conditions. Foundations of solar PV arrays may be	PV module mounting structures would be either mounted via galvanised steel poles driven into the ground, or on 'feet' supported on concrete footings. If via poles driven into the ground, this would be to a depth up to approximately 3.5m, depending on ground conditions. If on feet, concrete pads would be installed at a	Moderate	Minor	Medium (Not Significant)

Risk ID	Climate Hazard	Impact	Embedded Mitigation	Likelihood	Consequence	Significance
		negatively impacted due to changes in the soil moisture levels.	depth below ground level up to approximately 0.3m. No concrete footings will be installed in areas of Flood Zone 3a and 3b.			
12	Increased mean winter precipitation	Increased winter precipitation may lead to surface water flooding, preventing access to site and causing operational delays	Access roads would aim to be located in areas that are not susceptible to flooding or suitably designed in accordance with the Outline Drainage Strategy (**ES Appendix 11-4** (Doc Ref. 6.3)), with the **OOEMP** (Doc Ref. 7.11) detailing emergency plans in the event of flooding.	Moderate	Minor	Medium (Not Significant)
13	Increased mean winter precipitation	Increasing winter precipitation may increase the risk of fluvial flooding from the nearby River Welland, and other surface water flooding this has the potential to damage infrastructure and suspend operation.	Solar panels located in areas with higher potential for flooding will have the minimum height of the panel raised to 1.3 m above ground. In areas susceptible to flooding, plinths will be used to ensure solar station remain above flood level. The maximum height of any plinths used to raise solar stations above flood depths will be 800mm, except for Parcel D-1, where this would be extended to 1,350mm. If the plinths do not raise the solar stations above the worst-case flood depths and provide 300mm freeboard (or 600mm freeboard	Moderate	Minor	Medium (Not Significant)

Risk ID	Climate Hazard	Impact	Embedded Mitigation	Likelihood	Consequence	Significance
			in the case of Parcel D-1), the solar stations will either be bunded or a flood defence wall will be provided. The heights of bunds or the flood defence wall will vary, depending on the worst-case flood depths at each location. The maximum height of a bund is anticipated to be 2.3m. This would require a maximum width for the bund of 21m. Where required, the On-Site Substation Compounds and CSECs have also been specified to be bunded, as described within **ES Chapter 2: The Scheme** (Doc Ref. 6.1). The Outline Drainage Strategy (**ES Appendix 11-4** (Doc Ref. 6.3)) sets out the design principles for surface water drainage. The design will ensure compliance with planning policy with runoff from the Scheme to be attenuated to ensure no increase in surface water discharge rates and to provide water quality treatment of runoff water. Attenuation in the form of SuDS has been incorporated to control any increase in the rate of flow towards the receiving			

Risk ID	Climate Hazard	Impact	Embedded Mitigation	Likelihood	Consequence	Significance
			watercourses. Where possible, surface water will drain from the Scheme's drainage system to local receiving watercourses via a new ditch, or the piped section will be shortened and the last 10 m section of the outfall route will be open ditch unless this affects maintenance of the channel by the Internal Drainage Board. The drainage strategy has been designed considering the following variables: • 1% AEP (1 in 100 year) plus 13% / 28% climate change (depending on the catchment) scenario for the Scheme Design with 300mm freeboard. • 1% AEP plus 28% climate change scenario for the Credible Maximum Scenario from the River Welland; and also • 0.1% AEP (1 in 1000) year plus 28% climate change scenario for the breach event level from the Welland to consider if additional mitigation is required for certain infrastructure.			

Risk ID	Climate Hazard	Impact	Embedded Mitigation	Likelihood	Consequence	Significance
14	Increase in frequency and intensity of extreme storm events	The increase in frequency and intensity of extreme storm events has the potential to bring extreme wind speeds, threatening structures and PV arrays.	The solar PV modules would be designed to withstand extreme wind speeds, and other storm-related factors. This includes appropriate foundations and connections between solar panels. Piling for PV substructure is committed to a minimum depth of 3.5m. A geotechnical pull-test will also be completed prior to construction to confirm strength of foundations.	Unlikely	Moderate	Medium (Not Significant)
15	Decrease in mean summer rainfall	Reduced summer precipitation can lead to drier conditions with increased dust generation, which may obscure the PV panels and decrease efficiency	Dust management would be included as part of operational management procedures, as set out within the **OOEMP** (Doc Ref. 7.11). This could include water bowsers on site or carrying out early grass seeding to minimise extent of bare earth within the Scheme.	Unlikely	Minor	Low (Not Significant)
16	Decrease in mean summer rainfall	Reduction in summer precipitation may lead to periods of low water availability, limiting	The **OOEMP** (Doc Ref. 7.11) includes a requirement to review measures to manage water scarcity and drought conditions, with alternative water sources designated.	Unlikely	Minor	Low (Not Significant)

Risk ID	Climate Hazard	Impact	Embedded Mitigation	Likelihood	Consequence	Significance
		the ability to clean PV panels				
Grid Connection Route						
17	Increase in summer maximum temperatures	Increasing maximum temperatures may lead to thermal expansion of cables, which can cause strain on the infrastructure, leading to sagging or tension problems. Prolonged heat can also degrade cable insulation more quickly, increasing the likelihood of electrical faults or short circuits.	Overhead cables would be designed to meet industry standards which account for climatic conditions. Vegetation management practices, such as clearing dry vegetation and creating defensible space around cables, would help reduce risk of fire.	Unlikely	Moderate	Medium (Not Significant)
18	Increased winter precipitation	Increased precipitation during winter can lead to extended periods of saturated ground conditions.	Each leg of the tower will be supported by tower foundations. Depending on ground conditions, this may comprise either a pad and column foundation or a piled foundation, as set out within **ES Chapter 2: The Scheme** (Doc Ref. 6.1).	Moderate	Minor	Medium (Not Significant)

Risk ID	Climate Hazard	Impact	Embedded Mitigation	Likelihood	Consequence	Significance
		Foundations of pylons may be negatively impacted due to changes in the soil moisture levels.	Access road crossings in the Grid Connection Route will allow for continued water flow during heavy precipitation events.			
19	Increase in frequency and intensity of extreme storm events	Extreme storms can be accompanied by strong winds, resulting in flying debris could cause physical damage to cables or supporting structures, leading to power outages or disruptions in service. Lightning can also directly damage the cables or their insulation, causing electrical surges or even fires.	Cables and other structures would be designed to withstand extreme wind speeds, and other storm-related factors. This includes reinforcement of cable supports and using water-resistant materials. Also, surge protection systems and grounding would be implemented to reduce the effects of lightning strikes.	Unlikely	Moderate	Medium (Not Significant)
20	Increase in annual mean temperatures	Consistent higher temperatures can lead to significantly elevated ground	Insulation with sufficient temperature resilience would be used for underground cables where required.	Moderate	Minor	Medium (Not Significant)

Risk ID	Climate Hazard	Impact	Embedded Mitigation	Likelihood	Consequence	Significance
		temperatures, impacting the operational capacity of underground cables due to increased heat dissipation requirements.				
21	Increase in extreme rainfall	Increases in the likelihood of extreme precipitation events can lead to flooding, inundating underground cable trenches and causing damage through water intrusion and potential buoyancy issues.	To reduce flooding impacts on underground cables, waterproof cable insulation would be used and well-sealed joints, and waterproof ducts considered in flood-prone areas.	Moderate	Minor	Medium (Not Significant)
22	Increase in extreme rainfall	Increased rainfall and soil instability due to climate change can trigger land movements,	Land and soil movements caused by increased rainfall and soil instability can displace or damage cables. To prevent this, soil assessments would be conducted before installation, as set out within the	Unlikely	Moderate	Medium (Not Significant)

Risk ID	Climate Hazard	Impact	Embedded Mitigation	Likelihood	Consequence	Significance
		which may disrupt underground cables by displacing them or damaging their protective coverings.	**OCEMP** (Doc Ref. 7.10), and protective encasements would be used if required.			
Inter-Array Connections between Parcel C and D - Overhead						
23	Increase in summer maximum temperatures	Increasing maximum temperatures may lead to thermal expansion of cables, which can cause strain on the infrastructure, leading to sagging or tension problems. Prolonged heat can also degrade cable insulation more quickly, increasing the likelihood of electrical faults or short circuits. Additionally, higher temperatures can	Overhead cables would be designed to meet industry standards which account for climatic conditions. Vegetation management practices, such as clearing dry vegetation and creating defensible space around cables, would help reduce risk of fire.	Unlikely	Moderate	Medium (Not Significant)

Risk ID	Climate Hazard	Impact	Embedded Mitigation	Likelihood	Consequence	Significance
		lead to the risk of fire.				
24	Increase in frequency and intensity of extreme storm events	Extreme storms can be accompanied by strong winds, resulting in flying debris could cause physical damage to cables or supporting structures, leading to power outages or disruptions in service. Lightning can also directly damage the cables or their insulation, causing electrical surges or even fires.	Cables and other structures would be designed to withstand extreme wind speeds, and other storm-related factors. This includes reinforcement of cable supports and using water-resistant materials. Also, surge protection systems and grounding would be implemented to mitigate the effects of lightning strikes.	Unlikely	Moderate	Medium (Not Significant)
Inter-Array Areas between Parcel A and B- Underground						
25	Increase in annual mean temperatures	Consistent higher temperatures can lead to significantly elevated ground temperatures, impacting the	Insulation with sufficient temperature resilience would be used for underground cables where required.	Moderate	Minor	Medium (Not Significant)

Risk ID	Climate Hazard	Impact	Embedded Mitigation	Likelihood	Consequence	Significance
		operational capacity of underground cables due to increased heat dissipation requirements.				
26	Increase in extreme rainfall	Increases in the likelihood of extreme precipitation events can lead to flooding, inundating underground cable trenches and causing damage through water intrusion and potential buoyancy issues.	To reduce flooding impacts on underground cables, waterproof cable insulation would be used and well-sealed joints, and waterproof ducts considered in flood-prone areas.	Moderate	Minor	Medium (Not Significant)
27	Increase in extreme rainfall	Increased rainfall and soil instability due to climate change can trigger land movements, which may disrupt underground cables	Land and soil movements caused by increased rainfall and soil instability can displace or damage cables. To prevent this, soil assessments would be conducted before installation, as set out within the	Unlikely	Moderate	Medium (Not Significant)

Risk ID	Climate Hazard	Impact	Embedded Mitigation	Likelihood	Consequence	Significance
		by displacing them or damaging their protective coverings.	**OCEMP** (Doc Ref. 7.10), and protective encasements would be used if required.			