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11.0 CLIMATE CHANGE AND SUSTAINABILITY

11.1 Introduction

- 11.1.1 This Chapter of the Preliminary Environmental Information Report (PEI Report) assesses the potential effects of the construction, operation (including maintenance) and decommissioning of the Proposed Project in terms of Climate Change and Sustainability. As well as considering potential effects arising from the Proposed Project, this assessment also considers the potential impact of projected future climate change on the Proposed Project and the surrounding environment.
- 11.1.2 Many of the sustainability issues considered in this chapter refer to other topic specific chapters of this PEI Report; therefore, relevant chapters are referenced herein where appropriate.
- 11.1.3 In addition to a wider review of sustainability, in accordance with the requirements of The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017, guidance from the Institute of Environmental Management and Assessment (IEMA) for climate change mitigation and adaptation has been applied. This Chapter addresses two main aspects:
- **Lifecycle greenhouse gas (GHG) assessment** - potential GHG emissions arising from the Proposed Project, including how the Proposed Project would affect the ability of the government to meet its carbon reduction targets.
 - **Climate change resilience (CCR) assessment** – the resilience of the Proposed Project to anticipated climate change, including how the Proposed Project design would be adapted to take account for the probable impacts of climate change.
- 11.1.4 The assessment of cumulative effects on sustainability associated with the Proposed Project and other committed developments in the vicinity are described in *Chapter 13: Effect Interactions* (PEI Report Volume 1).
- 11.1.5 As part of this assessment, the Proposed Project has been considered against several key sustainability themes. This includes a consideration of the methods which will be employed to minimise impacts on several themes such as ecology and air quality, thus contributing to the wider sustainability of the Proposed Project.

11.2 Legislation and Planning Policy

- 11.2.1 This section identifies and describes legislation, policy, and guidance of relevance to the assessment of the potential sustainability and climate impacts associated with the construction, operation (including maintenance) and decommissioning of the Proposed Project. Legislation, policy, and other relevant guidance has been considered on an international, national, and local level.

International Legislation, Guidance and Agreements

EIA Directive 2014/52/EU

- 11.2.2 The EIA Directive 2014/52/EU states that as of May 2017, an Environmental Impact Assessment (EIA) (where relevant) must include an assessment of the impact of a project on climate change (mitigation assessment), an assessment of the interaction between environmental impacts and climate change (in-combination assessment), and information on the vulnerability of the project to climate change. This requirement is addressed in Section 11.8.

Kyoto Protocol

- 11.2.3 An international agreement linked to the United Nations Framework Convention on Climate Change (UNFCCC), which commits its Parties by setting internationally binding emission reduction targets. Under Article 4 of the Kyoto Protocol, the EU created an Effort Sharing Regulation that requires the setting of individual binding GHG emission reduction targets for each of its Member States. The current Effort Sharing Decision (ESD) commits the UK to a 37% reduction in GHG emissions for the period 2021 to 2030.

Paris Agreement

- 11.2.4 At the Conference of the Parties (CoP) 21 in 2015, an agreement (the “Paris Agreement”) was reached under the UNFCCC and came into force in November 2016 (0). It pledges long-term temperature goals to keep the increase in global average temperature to well below 2°C above pre-industrial levels and to pursue efforts to limit the increase to 1.5°C. Parties to the agreement also aim to achieve a balance between anthropogenic emissions by sources and removals by sinks of Greenhouse Gases’ (GHGs) in the second half of the century.

Guidance on Integrating Climate Change and Biodiversity into Environmental Impact Assessment

- 11.2.5 This Guidance aims to help EU Member States improve the way in which climate change and biodiversity are integrated in EIAs undertaken across the EU. Despite the fact that the UK is no longer a Member State of the EU, this guidance is still considered relevant in the context of EIAs undertaken in respect of developments in the UK.

EC Non-paper Guidelines for Project Managers: Making Vulnerable Investments Climate Resilient

- 11.2.6 These Guidelines aim to help developers of physical assets and infrastructure incorporate resilience to current climate variability and future climate change within their projects. Similarly, as above, this guidance is still considered relevant in the context of EIAs undertaken in respect of developments in the UK.

National Legislation

Climate Change Act 2008 / Climate Change Act (2050 Target Amendment Order 2019)

- 11.2.7 The Climate Change Act 2008 (hereafter referred to as the ‘Act’) provides a framework to meet its GHG emission reduction goals through legally binding national carbon emission caps within five-year periods. The Act was amended in 2019 to revise the previous 80% reduction target and legislate for a net zero emissions by 2050 (UK Government, 2019). The UK has declared its 6th carbon budget up until 2037.
- 11.2.8 This Act defines ‘net zero’ carbon as “the amount of net UK emissions of targeted greenhouse gases for a period adjusted by the amount of carbon united, credited or debited for the year 2050”. This means that by 2050, emissions will have to be avoided completely or offset by removal from the atmosphere and/or traded in carbon units.
- 11.2.9 The existing UK carbon budgets are used to determine significance of GHG emissions from the Proposed Project, as described in Section 11.3.

The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017

- 11.2.10 The 2017 Regulations state that an EIA (where relevant) must include an assessment of the impact of a project on climate change (mitigation assessment) and information on the vulnerability of the project to climate change.

UK Nationally Determined Contribution

- 11.2.11 Under Article 4 of the Paris Agreement, parties are required to communicate their intended domestic GHG mitigation targets. In 2020, the UK communicated its new Nationally Determined Contribution to the UNFCCC. Within this, the UK has committed to reducing GHG emissions by at least 68% by 2030 compared to 1990 levels.

Overarching National Policy Statement for Energy (EN-1)

- 11.2.12 Published by the Department of Energy and Climate Change, this describes the national policy for energy infrastructure in relation to climate impacts and adaptation; adverse effects and benefits; in relation to the EU Directive and Environmental Statement (ES) requirements; in relation to adaptation measures in response to climate projections; in relation to climate projections, flood risk and the importance of relevant mitigation.

Draft Overarching National Policy Statement for Energy (EN-1).

- 11.2.13 Released in September 2021 for consultation, Part 4.7 considers combined heat and power, and details that using less fuel to generate the same amount of heat and power reduces emissions, in particular CO₂. The Government is committed to the reduction of CO₂ emissions.

Draft National Policy Statement for Renewable Energy Infrastructure (EN- 3)

- 11.2.14 Draft published in September 2021 by Department of Energy and Climate Change, denotes the importance of an increase in low carbon electricity generation, with most of this likely to come from renewables, including biomass and EfW.

The National Planning Policy Framework

- 11.2.15 The revised National Planning Policy Framework (NPPF) sets out the Government's planning policies for England and how these are expected to be applied. Policies of relevance to climate change and sustainability assessment as presented herein include those achieving sustainable development and meeting the challenge of moving to a low carbon economy, climate change, flooding, and coastal change. This Framework states that the planning systems should support this transition by supporting low carbon energy and associated infrastructure.

National Planning Policy Guidance on Climate Change

- 11.2.16 Guidance published by the Ministry of Housing, Communities and Local Government describes how to identify suitable mitigation and climate adaptation measures to incorporate into the planning process. Stating “*effective spatial planning is an important part of a successful response to climate change as it can influence the emission of greenhouse gases... Planning can also help increase resilience to climate change impact through the location, mix and design of development.*”

Local Strategies and Plans

- 11.2.17 Local strategies and plans identify the need to consider and, where appropriate, mitigate GHG emissions associated with new development. New development should aim for reduced or zero carbon development by incorporating renewable or low carbon energy sources and maximising energy efficiency where practicable and should build in resilience to projected climate change impacts.

Slough's Climate Change Strategy and Action Plan

- 11.2.18 The council has published proposals on how to eliminate the borough's contribution to climate change and how to achieve it over the next 20 years. The plans are to tackle five key areas including what the council and other stakeholders in the borough can do and focuses on the following:

- reducing emissions from our estate and operations
- reducing energy consumption and emissions by promoting energy efficiency measures, sustainable construction, renewable energy sources, and behaviour change
- reducing emissions from transport by promoting sustainable transport, reducing car travel and traffic congestion, and encouraging behaviour change
- reducing consumption of resources, increasing recycling, and reducing waste

- supporting council services, residents, and businesses to adapt to the impacts of climate change

Slough's Climate Change Strategy Vision

11.2.19 The council has set a target of borough-wide carbon neutrality by 2040, with an ambitious stretch target of 2030. This target complies with the UK's national target of net zero emissions by 2050 and a reduction of 78% of emissions by 2035 relative to 1990.

11.3 Assessment Methodology

Determination of the Baseline

GHG Emissions Impact Assessment

- 11.3.1 For the purposes of the GHG emissions impact assessment, the baseline conditions are also defined as a 'Do Nothing' scenario, where the Proposed Project does not go ahead but the Consented Development is built out and operational.
- 11.3.2 The baseline comprises of carbon stocks and sources of GHGs within the Site. The methodology for calculating GHG emissions and removals is consistently used across the baseline, construction, and operational phases of the Proposed Project.
- 11.3.3 In line with ISO14064 and principles of the GHG Protocol, the GHG emissions have been calculated by multiplying activity data by its relevant emission factor:
- Activity data x GHG emissions factor = GHG volume
- 11.3.4 Activity data is a quantifiable measure of activity, such as operating hours or volumes of fuels used. Emission factors convert the activity data into GHG volumes. Activity data has been sourced from client data (21st January). Where specific data is not available, a mix of assumptions and industry benchmarks have been used to fill data gaps. Where this is not possible, then a qualitative approach to assessing the GHG impacts has been followed, in line with the IEMA guidance.
- 11.3.5 Emission factors have been sourced from publicly available sources, Defra, and the Bath University Inventory of Carbon and Energy (ICE). Carbon emissions and sinks through land use change have been calculated by using the EU Commission's Guidelines for Land Carbon Stocks.
- 11.3.6 In line with the ISO standard 14064 and the principles of the GHG Protocol when calculating GHG emissions, the seven Kyoto Protocol GHGs have been considered, specifically:
- Carbon dioxide (CO₂);
 - Methane (CH₄);
 - Nitrous oxide (N₂O);
 - Sulphur hexafluoride (SF₆);

- Hydrofluorocarbons (HFCs);
- Perfluorocarbons (PFCs); and
- Nitrogen trifluoride (NF₃).

11.3.7 These gases are broadly referred to in this report under an encompassing definition of 'GHGs', with the unit of tCO₂e (tonnes CO₂ equivalent) or MtCO₂e (mega tonnes of CO₂ equivalent).

CCR Assessment

11.3.8 The current baseline for the CCR assessment is based on historic climate data obtained from the Met Office recorded by the closest meteorological station to the Proposed Project (Heathrow Airport, approximately 8 miles from the Proposed Project) for the period 1981-2010).

11.3.9 The future baseline for the CCR assessment is based on future UK Climate Projections 2018 (UKCP18). This projection data provides probabilistic indications of how global climate change is likely to affect areas of the UK using pre-defined climate variables and time periods.

11.3.10 For the CCR assessment, UKCP18 probabilistic projections for pre-defined 20-year periods for the following average climate variables have been obtained and will be further analysed:

- mean annual temperature;
- mean summer temperature;
- mean winter temperature;
- maximum summer temperature;
- minimum winter temperature;
- mean annual precipitation;
- mean summer precipitation; and
- mean winter precipitation;

11.3.11 UKCP18 probabilistic projections have been analysed for the 25km grid square within which the Proposed Project is located. These figures are expressed as temperature/precipitation anomalies in relation to the 1981-2000 baseline. This baseline was selected as it provides projections for 20-year time periods (e.g., 2020-2039) for the parameters analysed within the assessment compared to the 30-year land-based projections that would be generated from the 1981 - 2010 baseline.

11.3.12 UKCP18 uses a range of possible scenarios, classified as Representative Concentration Pathways (RCPs), to inform differing future emission trends. These RCPs '... specify the concentrations of greenhouse gases that will result in total

radiative forcing increasing by a target amount by 2100, relative to preindustrial levels'. RCP8.5 is considered to be the worst-case global scenario with the greatest concentration of GHGs in the atmosphere and has been used as the purposes of this assessment as a worst-case scenario.

Project Environment

- 11.3.13 The alternative environment is a 'Do Something' scenario with the delivery of the Proposed Project, which includes the construction, operation and decommissioning of the Proposed Project.

Scope of Assessments

GHG Emissions Impact Assessment

- 11.3.14 The scope of the assessment includes activities that will emit GHGs as a part of the Proposed Project and are detailed in Table 11.1

Table 11.1: Potential Sources of GHG Emissions

<i>Lifecycle stage</i>	<i>Activity</i>	<i>Primary emission sources</i>
Product Stage	Use of products and/or materials required to build the proposed extension works	Embodied GHG emissions within the construction materials
Construction process stage	On-site construction activity including emissions from construction compounds. Water Use Travel of construction workers Disposal of waste materials generated by the construction process.	GHG emissions from grid electricity use during construction. GHG emissions from fuel consumed by construction vehicles and plant use. GHG emissions from the provision and treatment of water. GHG emissions arising from the fuel use for vehicles transporting workers to the construction site. Emissions arising from the treatment of waste. Emissions arising from the transportation of the waste to the place of treatment.
Operation stage	Operation and maintenance of the Proposed Project	Emissions arising from fuel consumed by maintenance vehicles and plant. Residue recycling. Embodied GHG emissions within the materials used for maintenance.

		Grid electricity use during operation of the development (lighting/signs)
Decommissioning stage	On-site decommissioning activity. Worker travel Transportation and disposal of waste materials.	Energy (electricity, fuel, etc.) consumption from plant and vehicles, generators on site, and workers commuting. GHG emissions from fuel consumption for transportation of workers GHG emissions from energy use and from fuel consumption for transportation of waste

CCR Assessment

11.3.15 The scope of the CCR assessment includes climatic variables that have the potential to impact the Proposed Project itself. The CCR assessment includes both slow and rapid onset climate hazards as per the UKCP18 dataset.

11.3.16 The scope of the CCR assessment is detailed within Table 11.2.

Table 11.2: Scope of the CCR Assessment

<i>Parameter</i>	<i>Scoped In/Out</i>	<i>Rationale for Scoping Conclusion</i>
Extreme weather events	In	The Proposed Project may be vulnerable to extreme weather events such as storm damage to structures and assets.
Increased average temperatures and incidence of heatwaves	In	Extremes in temperatures may result in heat stress of materials and structures.
Increased frequency of heavy precipitation events	In	The Proposed Project may be vulnerable to changes in precipitation, for example, land subsidence and damage to structures and drainage systems during periods of heavy rainfall.
Increase in strong wind events	Out	The Proposed Project is not expected to alter the wind environment and therefore to not have significant impact upon receptors identified by other environmental disciplines.
Sea level rise	Out	The Proposed Project is not located in an area that is susceptible to sea level rise.

11.3.17 The identification and assessment of climate change resilience within EIA is an area of emerging practice. There is no single prescribed format for undertaking

such assessments; therefore, the approach adopted to undertaking and reporting the assessment has drawn on good practice from other similar developments and studies and is aligned with existing guidance such as that of IEMA.

11.3.18 The methodology for the CCR assessment is summarised in Plate 11.1 below.

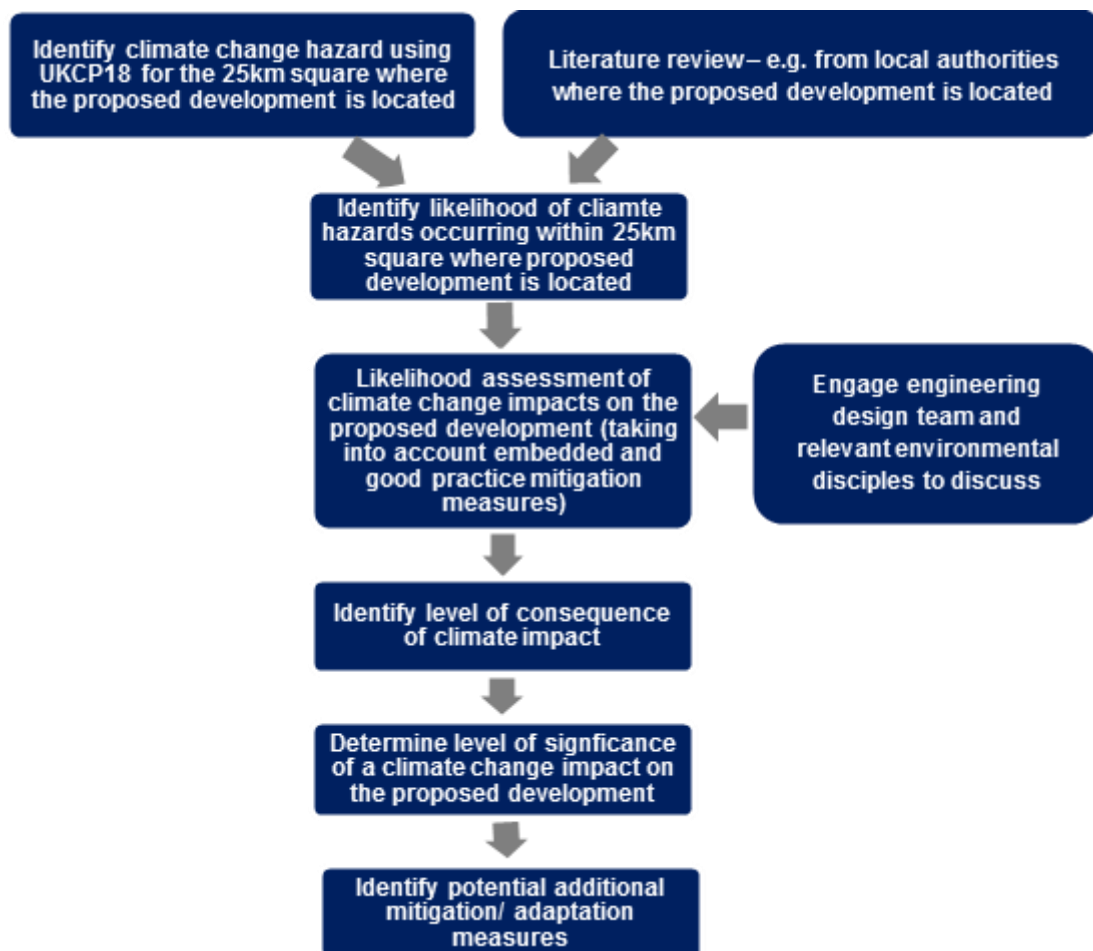


Plate 11.1 Summary of the CCR Assessment Methodology

11.3.19 For the operational phase of the Proposed Project, once potential impacts have been identified, the likelihood and consequence of each impact occurring to each receptor (where relevant) are assessed for the selected future time frame for operation.

11.3.20 Criteria used to determine the likelihood of an event occurring, based on its probability and frequency of occurrence, are detailed in Table 11.3.

Table 11.3: CCR Assessment – Definition of Likelihood for Climate Change Hazard

<i>Level of Likelihood</i>	<i>Definition of Likelihood</i>
Very likely	90-100% probability that the hazard will occur
Likely	66-90% probability that the hazard will occur
Possible, about as likely as not	33-66% probability that the hazard will occur
Unlikely	0-33% probability that the hazard will occur.
Very Unlikely	0-10% probability that the hazard will occur.

**The event is defined as the climate event (such as heatwave) and the hazard (such as overheated electrical equipment) occurring in combination*

11.3.21 The consequence of an impact has been measured using the criteria detailed in Table 11.4 below.

Table 11.4: CCR Assessment - Description of Likelihood for Climate Change Hazard

<i>Consequence of Impact</i>	<i>Description</i>
Very high	Permanent damage to structures/assets; Complete loss of operation/service; Complete/partial renewal of infrastructure; Serious health effects, possible loss of life; Extreme financial impact; and Exceptional environmental damage.
High	Extensive infrastructure damage and complete loss of service; Some infrastructure renewal; Major health impacts; Major financial loss; and Considerable environmental impacts.
Medium	Partial infrastructure damage and some loss of service; Moderate financial impact; Adverse effects on health; and

	Adverse impact on the environment.
Low	Localised infrastructure disruption and minor loss of service; No permanent damage, minor restoration work required; and Small financial losses and/or slight adverse health or environmental effects.
Very low	No damage to infrastructure; No impacts on health or the environment; and No adverse financial impact.

11.3.22 Engagement will be undertaken with relevant environmental disciplines and the engineering design team to discuss the CCR assessment and identify mitigation measures for incorporation into the design of the Proposed Project where applicable.

11.3.23 Measures to adapt the Proposed Project are identified where potential climate change consequences are identified as being significant and will be reported in the ES where applicable.

Study Area

GHG Emissions Impact Assessment

11.3.24 The GHG Study Area includes all GHG emissions from within the Site boundary arising during all stages of the construction, operation and decommissioning of the Proposed Project. It will also include emissions arising from offsite activities which are directly related to the onsite activities, such as transport, and treatment of materials and waste disposal.

CCR Assessment

11.3.25 The Study Area for the CCR review is the Proposed Project Site itself.

11.4 Stakeholder Engagement

- 11.4.1 An EIA Scoping Report was prepared by AECOM and submitted to the Planning Inspectorate in November 2021. The EIA Scoping Report sets out the proposed approach to the EIA and is intended to facilitate discussions regarding the scope of the EIA.
- 11.4.2 In response to the EIA Scoping Report, the Planning Inspectorate prepared a Scoping Opinion document. Specific comments raised by the Planning Inspectorate in relation to climate change are listed in Table 11.5.
- 11.4.3 These comments have been incorporated into this PEI Report.

Table 11.5: Comments raised by the Planning Inspectorate in the Scoping Opinion

<i>ID</i>	<i>Applicant's proposed matters to scope out</i>	<i>Inspectorate's comments</i>	<i>Addressed in PEI Report</i>
3.5.1	Climate change resilience assessment – temperature change.	Table 11.3 of the Scoping Report sets out that when using Representative Concentration Pathway (RCP) 8.5, temperatures are projected to rise between the years of 2060 and 2089 in all climate variable scenarios. The Scoping Report does not set out whether any operational changes would be required to accommodate the temperature increases. For example, it is not clear whether the output of the pumps associated with Cooling Tower 8 would need to be increased during periods of higher temperatures which could lead to greater noise levels and effects on receptors. It is also unclear what effect the higher temperatures will have on ecological receptors. Additionally, Table 11.6 of the Scoping Report provides no evidence explaining whether the materials and machinery in the operational phase of the Proposed Project will be able to operate in higher temperatures. Therefore, at this stage the Inspectorate cannot agree to scope this matter out	The scope of the CCR assessment is detailed within Table 11.2 and includes temperature change.
3.5.2	Climate change resilience assessment – sea level rise.	Table 11.6 of the Scoping Report asserts that the site is not located in an area that is susceptible to sea level rise. The Inspectorate agrees that sea level rise can be scoped out of the in-	The scope of the CCR assessment is detailed within Table 11.2, sea level rise is scoped out.

combination climate change assessment on this basis.

3.5.3	Climate change resilience assessment – precipitation change.	The justification provided in Table 11.6 for scoping out this matter is that no significant effects are likely to arise as “the flow of precipitation to ground will not be significantly hindered”. The Inspectorate notes that the Flood Risk Assessment (FRA) provided for the consented scheme concluded that the site layout had been designed to accommodate surface water from storms plus climate change. On this basis and that an FRA will be submitted as part of the DCO application from the Proposed Development, the Inspectorate agrees that this matter can be scoped out.	The scope of the CCR assessment is detailed within Table 11.2: and includes precipitation change. Precipitation has been included to allow for a Flood Risk Assessment (FRA). The reference to scoping out of precipitation in the scoping report was associated with an in-combination climate change impact (ICCI) assessment which was scoped out in its entirety.
3.5.4	Climate change resilience assessment – wind.	It is noted that the external massing of the Proposed Project will be that of the Consented Development, on this basis the Inspectorate considers that further consideration of wind impacts may be scoped out.	The scope of the CCR assessment is detailed within Table 11.2: and wind is scoped out.
3.5.5	Climate Change Resilience Review- sea level rise.	Table 11.7 of the Scoping Report asserts that the site is not located in an area that is susceptible to sea level rise. The Inspectorate agrees that sea level rise can be scoped out of the climate resilience review assessment.	Noted.

11.5 Baseline Conditions

GHG Emissions Impact Assessment

- 11.5.1 The Proposed Project Site is described in *Chapter 2: Proposed Project* (PEI Report Volume 1). The Proposed Project Site is located within the Slough Heat and Power CHP site and includes the Consented Development.

CCR Assessment

- 11.5.2 The current climatic baseline (1991 to 2020) for the location is listed in Table 11.6.

Table 11.6: Historic Climate Data

<i>Climatic Variable</i>	<i>Month</i>	<i>Value</i>
Average annual maximum daily temperature (°C)	-	15.67
Warmest month on average (°C)	July	23.89
Coldest month on average (°C)	February	2.65
Mean annual rainfall levels (mm)	-	614.98
Wettest month on average (mm)	November	66.63
Driest month on average (mm)	March	38.78

11.5.3 The Met Office historic 30-year averages for the ‘South England’ region identify gradual warming between 1961 and 2020, with increased rainfall also. Information on mean maximum annual temperatures and mean annual rainfall is summarised in Table 11.7

Table 11.7: Historic 30-year Averages for Temperature and Rainfall for England South

<i>Climate Period</i>	<i>Climatic Variable</i>	
	<i>Mean Maximum Annual Temperatures (°C)</i>	<i>Mean Annual Rainfall (mm)</i>
1961 - 1990	13.30	761.15
1971 - 2000	13.63	776.02
1981 - 2010	13.99	791.41
1991 - 2020	14.36	808.04

11.5.4 Projected variables are presented in Table 11.8 and Table 11.9.

Table 11.8: Projected Changes in Temperature Variables (°C), 50% Probability (10% and 90% Probability in Parenthesis)

<i>Climate Period</i>	<i>Time Period</i>	
	2020 - 2039	2030 - 2049
Mean annual air temperature anomaly at 1.5m (°C)	+1.0 (+0.3 to +1.7)	+1.3 (+0.6 to +2.2)
Mean summer air temperature anomaly at 1.5m (°C)	+1.2 (+0.4 to +2.0)	+1.5 (+0.4 to +2.6)
Mean winter air temperature anomaly at 1.5m (°C)	+0.9 (0 to +1.9)	+1.3 (0.1 to +2.5)
Maximum summer air temperature anomaly at 1.5m (°C)	+1.2 (+0.2 to +2.4)	+1.6 (+0.3 to +3.0)
Minimum winter air temperature anomaly at 1.5m (°C)	+0.9 (-0.1 to +1.9)	+1.2 (0 to +2.5)

Table 11.9: Projected Changes in Precipitation Variables (%), 50% Probability (10% and 90% Probability in Parenthesis)

<i>Climate Period</i>	<i>Time Period</i>	
	2020 - 2039	2030 - 2049
Annual precipitation rate anomaly (%)	+1.7 (-3.0 to +6.7)	-0.3 (-4.8 to +4.6)
Summer precipitation rate anomaly (%)	-4.9 (-24.4 to +15.4)	-8.8 (-29.5 to +12.0)
Winter precipitation rate anomaly (%)	+3.7 (-5.3 to +13.6)	+4.7 (-4.6 to +14.6)

- 11.5.5 Using the climate variable likelihood data for future baselines and the definitions for likelihood, the likelihood of occurrence of potential climate hazards are detailed in Table 11.10.

Table 11.10: Potential Climate Hazards /and Likelihood of Occurrence (from UKCP18 Projections)

<i>Climate Period</i>	<i>Potential Hazard</i>	<i>Time Period</i>	
		<i>2020 - 2039</i>	<i>2030 - 2049</i>
Mean annual air temperature anomaly at 1.5m (°C)	Increase in mean annual air temperature	Very Likely	Very Likely
Mean summer air temperature anomaly at 1.5m (°C)	Increase in mean summer air temperature	Very Likely	Very Likely
Mean winter air temperature anomaly at 1.5m (°C)	Increase in mean winter air temperature	Very Likely	Very Likely
Maximum summer air temperature anomaly at 1.5m (°C)	Increase in maximum summer air temperature	Very Likely	Very Likely
Minimum winter air temperature anomaly at 1.5m (°C)	Increase in minimum winter air temperatures	Likely	Very Likely
Annual precipitation rate anomaly (%)	Decrease in annual precipitation rate	Likely	Possible
Summer precipitation rate anomaly (%)	Decrease in summer precipitation rate	Possible	Likely

- 11.5.6 The entire Proposed Project and surrounding area in the immediate vicinity of the Site is located within Flood Zone 1. Flood Zone 1 is land assessed as having a less than 1 in 1000 annual probability of flooding from rivers or the sea (<0.1% Annual Exceedance Probability or AEP). The flood risk is discussed further in **Chapter 4: Existing Site Conditions** (PEI Report Volume 1).
- 11.5.7 Under RCP 8.5 a rise in mean annual air temperature increase of 1.3°C by the period 2030–2049 is predicted and therefore it is **very likely** the Proposed Project will be subject to an increase in mean annual air temperature by 2050. This impact, along with that of increased storms and extreme weather events will be analysed further within the ES.

11.6 Embedded Design Mitigation

- 11.6.1 This section describes the embedded and good practice mitigation that has been incorporated into the Proposed Project design or assumed to be in place before undertaking the assessment.
- 11.6.2 The Proposed Project will incorporate the mitigation measures outlined in the CEMP which was approved for the Consented Development. The CEMP details the measures that would be undertaken during construction to mitigate the temporary effects on the water environment.
- 11.6.3 The CEMP comprises good practice methods that are established and effective measures to which the development will be committed. The measures within the CEMP focus on managing the risk of pollution to surface waters and the groundwater environment. It also considers the management of activities within floodplain areas (i.e., kept to a minimum and with temporary land take required for construction to be located out of the floodplain as far as reasonably practicable).
- 11.6.4 Given the implementation of the CEMP, as is standard practice, it is considered that there would be adequate mitigation for potential effects on the surface and groundwater environment, and so construction effects are scoped out of further assessment.

11.7 Assessment Assumptions and Limitations

GHG Impact Assessment

- 11.7.1 The current GHG assessment is limited to the availability of data and information. The inclusions and exclusions of data will be included in the ES as appropriate.

CCR Assessment

- 11.7.2 While modelled climate change projections represent anticipated changes to average weather conditions, they cannot predict the frequency and severity of acute events such as droughts, heatwaves and prolonged heavy rainfall. Therefore, the CCR assessment is based upon UKCP18 predictions for general changes in climate conditions, and only a high-level assessment of acute events is included in this assessment.
- 11.7.3 The CCR assessment is limited to the availability of data and information at this stage of the assessment. The full assessment results will be detailed in the ES.
- 11.7.4 All assumptions, limitations, and exclusions (including exclusion criteria applied to input and output data) will be documented as part of the assessment.

11.8 Assessment of Likely Impacts and Effects

Construction Phase Effects

- 11.8.1 The works associated with the Proposed Project are predominately within the boiler house and turbine hall, and a single pipe which will be elevated above ground on external pipe runs alongside other pipes between the two buildings on pipe racks being installed as part of the Consented Development currently under construction. Therefore, no new ground will be broken as part of the works and there will be no change to the consented building envelope. For this reason, the impact of the works is anticipated to be negligible compared to the baseline for climate change resilience. Furthermore, on the basis that the level of additional equipment is relatively small compared to the existing facility we have also considered that the construction related GHG emissions would also be considered to be relatively minimal.
- 11.8.2 There will be a slight increase in construction traffic (but the peak for the Consented Development will not be exceeded), however this increase is considered to be negligible (see Chapter 7 Transport and Access, of this PEIR). Construction emissions will be calculated in the final ES using the activity data.
- 11.8.3 It is expected that the construction of the Proposed Project will be completed in parallel with the Consented Development for a duration of two months. However, there is the possibility of this being extended beyond the completion of the and retrofitted after the Consented Development is complete and tested. This is worst-case scenario and due to the nature and context of the proposal, it is not anticipated to significantly impact the emissions associated with the Proposed Development and any mitigation measures that may be required would be as per the approved Consented Development CEMP.

Operational Phase Effects

Greenhouse Gas Impacts

- 11.8.4 The Proposed Project is anticipated to increase the electricity exported but will not demand any increase in input waste derived fuel (WDF) compared to the Consented Development and there will be no change in emissions from combustion of WDF as a result.
- 11.8.5 The impact of using grid electricity, based on the latest 2021 BEIS/Defra grid electricity value of 0.212kgCO₂e/kWh, would be 10,695tCO₂e per year. This can therefore represent a saving, as there is no change in GHG emissions from the Consented Development, but a saving in GHG emitted per tonne of fuel input.
- 11.8.6 Total GHG emissions associated with the Proposed Project do not exceed 1% of the corresponding UK carbon budget limits. Therefore, the GHG emissions are considered as having a 'Low' magnitude and therefore are of minor beneficial significance.

Climate Change Resilience

- 11.8.7 The Proposed Project is not likely to have any potential water environment impacts while operational, over or above those assessed within the Consented Development.
- 11.8.8 Cooling Tower (CT) 8 and its associated pumps will be utilised by the Proposed Project. This is the same as for the Consented Development, but with the difference that it will now be solely connected to and utilised by the Proposed Project rather than operated as shared infrastructure (to other energy generating activities on the SHP site). The amount of CT blowdown/evaporation will be unchanged or less in comparison to the Consented Development because the Proposed Project will be using more of the heat to generate electricity. Therefore, the potable water demand will be the same or less than is associated with the Consented Development. A modern design of CT packing should also reduce water usage. In addition, the Proposed Project will have the ability to reuse approximately 15% of the CT blowdown water as part of the process (ash quenching and furnace water spray/cleaning) to avoid using potable water.
- 11.8.9 On the basis that it is expected that potential water environment impacts will be unchanged or less than the Consented Development, operational effects are therefore scoped out. It is not proposed that a Drainage Strategy is required as part of the DCO application either.
- 11.8.10 Morphological impacts to watercourses are scoped out due to the distance of any surface watercourse from the Proposed Project. As such, there will be no direct physical impacts to any watercourse.
- 11.8.11 An allowance for increased rainfall and storm intensity due to climate change will be accounted for in the ES. This will be in line with the upper end estimation of potential peak rainfall and storm intensity increase due to climate change anticipated for the 2080s. However, an increase in rainfall is not expected to have an impact on the pipe during operation, as it is weatherproof and thus able to tolerate a change to precipitation.
- 11.8.12 On the basis that the equipment indoors and the external pipe is already exposed to very high temperatures due to its nature and purpose of use, it is considered that a change to the global temperature will be a negligible impact on its ability to cope to a slight change to ambient temperatures, and therefore will have no influence on its effectiveness.
- 11.8.13 A CCR Review will be undertaken in the ES.

11.9 Additional Mitigation and Enhancement Measures

- 11.9.1 The management of GHG emissions and CCR impacts, and the application of mitigation/adaption measures during construction will be enforced through the existing CEMP.
- 11.9.2 It is not anticipated that there will be a need for additional mitigation/adaption or enhancement measures during operation and decommissioning of the Proposed Project.

11.10 Residual Effects and Conclusions

- 11.10.1 A summary of the current estimate of GHG emissions produced during the lifespan of the Proposed Project has been detailed in Section 11.8.
- 11.10.2 At this stage, there are no residual CCR impacts identified.
- 11.10.3 There will be residual GHG emissions, however as set out in the assessment of likely impacts, the increased gross generation from 50MWe to 60MWe will represent a saving in GHG emissions, as there is no change in GHG emissions from the Consented Development, however a saving in GHG emissions emitted per tonne of fuel input.
- 11.10.4 The receptor for the GHG assessment is the global climate but using the corresponding UK Carbon Budgets as a proxy. Total GHG emissions associated with the Proposed Project do not exceed 1% of the corresponding UK carbon budget limits. Therefore, the GHG emissions are considered as having a 'Low' magnitude and therefore are of minor beneficial significance.
- 11.10.5 Using climate projections, a number of changes to climate variables have been identified as at least 'likely' and 'very likely' during the lifespan of the Proposed Project. These changes include increases in temperatures, reductions in summer rainfall, increases in winter rainfall, extreme weather events, sea level and sea temperature rise.
- 11.10.6 Appropriate mitigation measures to limit or potentially remove the effects described above have been outlined, and these will be refined in the next stage of the EIA assessment.

11.11 Cumulative Effects

- 11.11.1 The identified receptor is the global climate and all development results in GHG emissions. Effects are not geographically constrained which means all development has the potential to result in a cumulative effect on GHG emissions. For this reason, it is not possible to define a study area and carry out a cumulative effects assessment for GHG emissions.

- 11.11.2 As a result, consideration of the effects of the Proposed Development, together with other developments on GHG emissions, is considered to be negligible or beneficial and therefore no cumulative effects are anticipated in respect of the Climate during the construction and operational phases.

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