AQUIND Limited

PEIR CHAPTER 27

Carbon and Climate Change

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APPENDICES

27 CARBON AND CLIMATE CHANGE

27.1 SCOPE OF THE ASSESSMENT

27.1.1 INTRODUCTION

27.1.1.1 This chapter provides preliminary information regarding environmental impacts on climate change as a result of the Proposed Development.

27.1.1.2 The requirement to consider climate change results from the 2014 amendment to the EIA Directive (2014/52). The Directive has been fully transposed into UK law in the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 and came into force in the UK on the 16 May 2017. The Directive requires:

"*A description of the likely significant effects of the [Proposed Development] on climate (for example the nature and magnitude of GHG emissions) and the vulnerability of the [Proposed Development] to climate change*."

27.1.1.3 As such there are two components to the climate assessment - Greenhouse Gas ('GHG') emissions and climate resilience. This PEIR chapter includes a summary of the Proposed Development's vulnerability to climate change (the impact of the climate on the Proposed Development). The full climate vulnerability assessment can be found in Appendix 27.1.

GHG Emissions

27.1.1.4 The GHG assessment for the Proposed Development (the impact of the Proposed Development on the environment in terms of climate change), is outlined in this chapter. It sets out the proposed assessment methodology for climate and identifies those impacts that are scoped out of the EIA.

27.1.1.5 The climate change assessment will consider the potential impacts associated with the following activities:

- Carbon emissions resulting from the construction of the onshore and marine elements of the Proposed Development, including the extraction and manufacture of materials, deliveries to site, and construction activities;
- Carbon emissions associated with the operation of the onshore and marine elements of the Proposed Development, including electricity consumption, maintenance and refurbishment / replacement; and
- Carbon emissions, or avoided emissions associated with the transfer of electricity between the United Kingdom and France.

Climate Resilience

27.1.1.6 The vulnerability of the Proposed Development to climate change is identified in this chapter. The high-level vulnerability of the Proposed Development to changes in climate variables (including change in seasonal temperature and rainfall, changes to extreme temperature and rainfall, changes to storminess and changes to soil moisture) is assessed.

27.1.1.7 The outcome of the vulnerability assessment is a list of climate variables which the Proposed Development is deemed to be vulnerable to and which are scoped in for further, more detailed risk assessment at ES.

27.1.2 STUDY AREA

GHG Emissions

27.1.2.1 The GHG assessment is not restricted by geographical area but instead includes any increase or decrease in emissions as a result of the Proposed Development, wherever that may be – for example if the emissions occur on the road network around the Proposed Development due to transport of materials.

Climate Resilience

27.1.2.2 The study area for the resilience assessment comprises the Proposed Development (as indicated by the Site Boundary), as it is an assessment of the potential impacts of a changing climate on the Proposed Development itself. The assessment of resilience is informed by regional scale information on historic and projected change in climate variables.

27.1.2.3 The assessment is informed by climate projections for the UK at the administrative region scale. Projections at this scale provide sufficiently detailed information about the future climate that the Proposed Development will experience and allow a proportionate assessment to be undertaken. The Proposed Development falls within the South-East England region.

27.2 LEGISLATION, POLICY AND GUIDANCE

27.2.1.1 This assessment has taken into account the current legislation, policy and guidance relevant to climate change. These are outlined below.

27.2.2 LEGISLATION

- The UK is a member of the United Nations Framework Convention on Climate Change ('UNFCCC') (United Nations Framework Convention on Climate Change) which drives international action on climate change. The UK has pledged to reduce emissions under the 'Paris Agreement', as a part of a joint pledge by members of the EU. This provides an overarching commitment by the UK.

- The Climate Change Act (2008) (HM Government, 2008) established a legal requirement for an 80% reduction in the GHG emissions of the UK economy by 2050 in comparison to the 1990 baseline. The Climate Change Act also created the Committee on Climate Change, with responsibility for setting 5-year Carbon Budgets covering successive periods of emissions reduction to 2050. Defra Contaminated Land Statutory Guidance (2012). In respect of climate change adaptation, the act includes a requirement for Government to report, at least every five years, on the risks to the UK of climate change, and to publish a programme setting out how these will be addressed. The Act also introduced powers for Government to require public bodies and statutory undertakers to carry out their own risk assessment and make plans to address those risks. The Act also created the Committee on Climate Change and the Adaptation Sub-Committee who advise Government on adaptation matters. In 2013, the UK Government published the Infrastructure Carbon Review (2013), aiming to "*release the value of lower carbon solutions and to make carbon reduction part of the DNA of infrastructure in the UK*".
    - The review provided increased emphasis on 'capital carbon' (GHG emissions associated with raw materials, activities and transport for construction, repairs, replacement, refurbishment and de-construction of infrastructure) while acknowledging that 'operational carbon' (associated with energy consumption for the operation and use of infrastructure) will continue to dominate overall emission to 2050 and beyond.
    - The Infrastructure Carbon Review highlighted the need to assess GHG emissions early in the lifecycle of an infrastructure project when there is the greatest carbon reduction potential. It also led to the publication of a Publicly Available Specification on infrastructure carbon management: PAS2080:2016.

27.2.3 PLANNING POLICY

National Policy

National Policy Statements

- The National Policy Statement for Energy (EN-1) (2011) Department of Energy and Climate Change, outlines the planning policy for the energy sector. In particular, it discusses:
    - The transition to a low carbon economy, and the energy sector's role in achieving that end;
    - The challenge of meeting energy security and carbon reduction objectives (set out in the Climate Change act, and Energy Act);
    - The aim of reducing demand through energy efficiency; and

- The role of smart technologies to balance supply and demand and therefore result in carbon savings.

National Planning Policy Framework

- The National Planning Policy Framework (2018) (Ministry of Housing, Communities and Local Government, 2018) includes in the definition of the environmental objective 'mitigating and adapting to climate change, including moving to a low carbon economy' (paragraph 8).
  - In line with the objectives and provisions of the Climate Change Act (2008), Chapter 14 of the NPPF: Meeting the Challenge of Climate Change, Flooding and Coastal Change, establishes that Local Planning Authorities

"*should take a proactive approach to mitigating and adapting to climate change, taking into account the long-term implications for flood risk, coastal change, water supply, biodiversity and landscapes, and the risk of overheating from rising temperatures. Policies should support appropriate measures to ensure the future resilience of communities and infrastructure to climate change impacts, such as providing space for physical protection measures, or making provision for the possible future relocation of vulnerable development and infrastructure*".

27.2.4 GUIDANCE

27.2.4.1 The GHG assessment has been based on the following guidance:

- IEMA's EIA Guide to Assessing GHG Emissions and Evaluating Their Significance (Institute of Environmental Management and Assessment, 2017); and
- PAS 2080:2016 Carbon Management in Infrastructure (BSI, 2016).

27.2.4.2 The Resilience assessment is based on the following guidance:

- EIA guide to Climate Change Resilience and Adaptation (IEMA 2015);
- Guidance on Integrating Climate Change and Biodiversity into Environmental Impact Assessment (European Commission 2013);
- Climate Change and Major Projects (European Commission 2016);
- Non-paper Guidelines for Project Managers: Making vulnerable investments climate resilient. European Commission (undated); and
  Climate Change Adaptation for settlements and infrastructure – a risk based approach Standards Australia (2013).

27.3 SCOPING OPINION AND CONSULTATION

27.3.1 SCOPING OPINION

27.3.1.1 As detailed within Chapter 1 Introduction, a Scoping Opinion was received by the Applicant from PINS (on behalf of the SoS) on 07 December 2018. Responses to this scoping opinion are presented below in Table 27.1.

27.3.1.2 Appendix 5.3 provides a complete set of responses in the PEIR to the contents of the Scoping Opinion.

Table 27.1 - PINS Scoping Opinion Responses

Scoping Opinion Reference	Summary of Comment Received	How this has been addressed by the Applicant
Table 30.5 and Appendix C Table C1	Construction - land use, land use change and forestry The Inspectorate does not agree to scope this matter out on the basis that the Scoping Report does not confirm the area of land use likely to be required, particularly for the converter station and connection to the existing sub-station at Lovedean and also whether this would include forestry/woodland habitat. The ES should consider emissions associated with the change in land use and loss of forestry, where significant effects could occur.	It is considered unlikely that emissions from land use change will be significant given the scale of likely land take required for the Proposed Development. If the final design does include significant land take of forested areas, which will be presented in the final ES based on the design to be assessed, an assessment of land use change emissions will be included within the ES.
Paragraph 30.3.12, Table 30.5 and Appendix C table C1	Decommissioning - deconstruction The effects of climate change during the decommissioning of the Proposed Development have been excluded due to uncertainty of requirements and processes at the Proposed Development's end of life. The Inspectorate agrees that decommissioning can be scoped out of the assessment on the basis that decommissioning activities are unknown at this stage. The Applicant's attention is, however,	No response required.

	directed to the comments in Section 2.3 (paragraph 2.3.7) of this Opinion and the need to provide more information with regards to the design life of the Proposed Development and likely decommissioning activities, including timescales. Should further detail become available regarding decommissioning to enable an assessment of climate change at this life cycle stage, an assessment should be presented in the ES where significant effects are considered to be likely.	
Paragraph 30.2.7	Assessment – Climate projections The Inspectorate notes the application of the UKCP09 climate projections within the Scoping Report. The ES should take into account the potential impacts of climate change using the latest UKCP, which are the UKCP18 projections as recently published.	In November 2018 updated climate projections for the UK were published, UKCP18. At the time of writing this PEIR chapter, the only information from UKCP18 on projected change in climate variables at the administrative region scale was a series of static maps. Data at the administrative region scale was not available for download. Information on projected climate in this chapter and the Appendix, is taken from UKCP18 where available, supplemented with information from UKCP09 and peer reviewed literature. In November 2018 updated climate projections for the UK were published (UKCP18) but probabilistic projections at the administrative region scale were not available from UKCP18 at the time of writing this PEIR chapter.

Table 30.10	Assessment methodology – assessment of significance The Inspectorate notes the climate risk assessment matrix presented in Table 30.10. The Carbon and Climate Change aspect chapter of the ES should define what level of impact is deemed to be significant, where this differs from the overarching assessment methodology.	Table three of the climate resilience Appendix 27.1 of the PIER addresses the significance of resilience and risk ratings.

27.3.2 CONSULTATION

27.3.2.1 No consultation was undertaken for the climate change portion of the assessment as there is no single statutory consultee with a remit for climate change.

27.4 METHODS OF ASSESSMENT

27.4.1 GHG EMISSIONS

27.4.1.1 No assessment of GHGs has been undertaken to produce this PEIR Chapter. However, guidance from IEMA (Institute of Environmental Management and Assessment, 2017) PAS2080 (BSI, 2016), best practice carbon management practices and professional judgement has been used in considering predicted impacts.

Construction

27.4.1.2 A qualitative assessment of predicted emissions has been undertaken based on Proposed Development information and is presented in section 27.6.

Operation

27.4.1.3 A qualitative assessment of predicted emissions has been undertaken based on Proposed Development information and publicly available information and is presented in section 27.6.

Significance Criteria

27.4.1.4 The significance of impacts will be assigned in the ES in-line with best practice. Current best practice assesses significance with reference to the magnitude of emissions, their context – including this UK carbon Budgets (

27.4.1.5 Table 27.2), guidance from IEMA (Institute of Environmental Management and Assessment, 2017), and professional judgement. As climate change impacts are global in nature, and it is not possible to link a specific project with a specific environmental impact, the sensitivity of receptors is not used to assess significance.

Table 27.2 – UK Carbon Budgets

Carbon Budget Period	UK Carbon Budget
Third: 2018-2022	2,544 $MtCO_2e$
Fourth: 2023-2027	1,950 $MtCO_2e$
Fifth: 2028-2032	1,725 $MtCO_2e$

Climate Resilience

CONSTRUCTION

27.4.1.6 The methodology for the climate resilience assessment consists of four stages and is based on a Climate Risk and Vulnerability Assessment ('CRVA') approach, the guidance described in Appendix 27.1 and professional experience of carrying out similar assessments. Initially a vulnerability assessment is undertaken to identify climate variables to which the Proposed Development is vulnerable to. A more detailed risk assessment is then undertaken to assess the level of risk associated with hazards caused by the climate variables.

27.4.1.7 Full details of the five-step method can be found in Appendix 27.1 but in summary, the steps are:

- Step 1 – identify receptors;
- Step 2 – vulnerability assessment;
- Step 3 – risk assessment;
- Step 4 – mitigation actions; and
- Step 5 – significance.

27.4.1.8 The results of Steps 1 and 2 (the identification of receptors and vulnerability assessment) are reported in this PEIR and the more detailed risk assessment (Steps 3, 4 and 5) will be reported in the ES.

OPERATION

27.4.1.9 The method to be used to assess operation is the same as the method presented above to assess construction.

27.4.2 SIGNIFICANCE CRITERIA

27.4.2.1 The final step listed in 27.4.1.6 above (Step 5) is to determine the significance of climate impacts. This is defined based on the risk rating (pre-mitigation) and the resilience rating (post-mitigation) for each impact, as shown in Table 27.3. Further details about the methodology for the vulnerability and risk assessment, including assessment of significance, can be found in Appendix 27.1, Note that the vulnerability assessment which is reported in this PEIR chapter (Steps 1 and 2) does not include a measure of significance. The output of the vulnerability

assessment is a list of climate variables scoped in for further consideration and risk assessment in the ES.

Table 27.3 – Determination of significance

Risk rating	Resilience rating		
	High	**Medium**	**Low**
Extreme	Significant	Significant	Significant
High	Not significant	Significant	Significant
Medium	Not significant	Not significant	Significant
Low	Not significant	Not significant	Not significant

27.4.3 ASSUMPTIONS AND LIMITATIONS

27.4.3.1 This chapter of the PEIR provides preliminary information as it relates to the Proposed Development to date and to data currently available and gathered at this point of the assessment process.

27.4.3.2 The information contained herein is intended to inform consultation responses at this stage. A more detailed assessment of potential significant impacts as a result of the Proposed Development on identified sensitive receptors will be undertaken at subsequent stages to inform the ES.

27.4.3.3 Any gaps in information identified at this PEIR stage will be considered and addressed along with specific mitigation measures as part of the assessments for the production of the ES.

27.4.3.4 This PEIR chapter does not quantify GHG emissions given the ongoing refinement of the design. These emissions will be quantified in the ES assessment.

27.4.3.5 This PEIR chapter does not conclude on the likely significance of the impact of the Proposed Development, the significance of impacts will be assigned in the ES. Currently, the significance of GHG emissions is assigned with reference to the magnitude of emissions, their context, guidance from IEMA (Institute of Environmental Management and Assessment, 2017), and professional judgement, as such there is some uncertainty regarding the assignment of significance.

27.4.3.6 Should further detail become available regarding decommissioning, to enable an assessment of climate change at this life cycle stage, an assessment would be presented in the ES where significant effects are considered to be likely.

27.5 BASELINE ENVIRONMENT

27.5.1 GHG EMISSIONS

27.5.1.1 Under baseline conditions (without the Proposed Development), there would not be any emissions from project construction, maintenance, refurbishment/replacement, and on-site energy consumption. However, there would be emissions in both the UK and France to generate electricity, which would be impacted by the transfer of electricity between the UK and France. The UK residual carbon intensity was 367 gCO_2/kwh in 2017, and the French residual carbon intensity was 57 gCO_2/kwh in 2017 (Association of Issuing Bodies, 2018). A breakdown of absolute emissions in the UK is presented below in Table 27.4.

Table 27.4 – UK Emissions

Year	National ($ktCO_2$)
A. Industry and Commercial Electricity	51,532
B. Industry and Commercial Gas	35,973
C. Large Industrial Installations	32,466
D. Industrial and Commercial Other Fuels	17,658
E. Agriculture	5,382
Industry and Commercial Total	**143,010**
F. Domestic Electricity	31,442
G. Domestic Gas	60,202
H. Domestic 'Other Fuels'	10,788
Domestic Total	**10,2432**
I. Road Transport (A roads)	54,351
J. Road Transport (Motorways)	28,032
K. Road Transport (Minor roads)	41,483
L. Diesel Railways	2,151
M. Transport Other	2,036
Transport Total	**128,053**
N. LULUCF Net Emissions	-16,026

Year	National ($ktCO_2$)
Grand Total	357,469
Population ('000s, mid-year estimate)	65,648
Per Capita Emissions (t)	5

27.5.2 CLIMATE RESILIENCE

27.5.2.1 Information on the baseline climate (current and projected) is presented in Appendix 27.1, under Step 2 – vulnerability assessment (exposure).

27.5.2.2 In November 2018 updated climate projections for the UK were published, UKCP18. At the time of writing this PEIR chapter, the only information from UKCP18 on projected change in climate variables at the administrative region scale was a series of static maps. Data at the administrative region scale was not available for download. Information on projected climate in the Appendix and summarised below, is taken from UKCP18 where available, supplemented with information from UKCP09 and peer reviewed literature. The current climate of the Study Area is warm and dry compared to the UK average. Features of the current climate include:

- Rainfall is well-distributed throughout the year with an autumn/early winter maximum.
- Rainfall tends to be associated with Atlantic depressions (autumn and winter) or with convection (summer).
- Little snow - less than 10 days of lying snow per year.
- Warmer than UK average – July is the warmest month, February is the coldest month.
- Extreme maximum temperatures can occur in July or August - usually associated with heat waves lasting several days.
- One of the more sheltered parts of the UK - strongest winds are associated with the passage of deep areas of low pressure close to or across the UK particularly between December and February.

27.5.2.3 Climate projections indicate that the region will become hotter and drier in summer and warmer and wetter in winter with more extreme rainfall and temperature events. Headline messages from the UKCP18 projections for the South East England in 2080 under a high emissions scenario (RCP8.5) include:

- Wetter winter – increase in mean winter precipitation in the 2080s up to 30% (50th percentile).
- Drier summers – decrease in mean summer precipitation in the 2080s up to 40% (50th percentile).
- Warmer winters - increase in mean winter temperature between 2 and 3ºC (50th percentile).

- Hotter summers – increase in mean summer temperature between 3 and 4ºC (50th percentile).
- More extreme rainfall events and extreme temperature events (heatwaves).
- Rising sea levels.

27.5.3 FUTURE BASELINE

27.5.3.1 Future baseline in relation to climate change (projected climate) is presented in Appendix 27.1 and summarised above. Future energy emissions without the Proposed Development will be provided in the ES as part of the assessment of GHG.

27.6 PREDICTED IMPACTS

27.6.1 GHG EMISSIONS

Construction

27.6.1.1 During construction, GHG emissions are anticipated from the production of materials, the transport of materials to site, the transport and disposal of waste/arisings and the use of plant on site. The magnitude and significance of these emissions will be determined and reported in the ES.

Operation

27.6.1.2 During operation, GHG emissions (and reduction) are anticipated from maintenance activities, the replacement of Project elements that have reached the end of their life, use of energy on site, transmission losses across the Proposed Development's infrastructure, and from transmitting energy between the UK and France with differing carbon intensities. The transmission of energy with differing carbon intensities has the potential to change the carbon intensity of electricity consumed in a particular jurisdiction. For example, if low carbon electricity is imported to the UK from France, then the intensity of electricity in the UK will fall. In addition, if low carbon power is imported to either country at a time where there is little domestic low carbon generation capacity available (for example due to weather condition). Then instead of using higher carbon generation options (such as fossil fuel generation capacity) to meet demand, the interconnector could be used to transmit low carbon power. This could lead to a reduction in carbon intensity across both jurisdictions. The magnitude and significance of these emissions will be determined and reported in the ES.

27.6.2 CLIMATE RESILIENCE

27.6.2.1 The results of the vulnerability assessment are summarised in Table 27.5. Climate variables which have been assessed as high or medium vulnerability will be taken forward for more detailed risk assessment in the ES. Risks associated with the following variables will be assessed further in the ES:

- Sea level rise;
- Storm surge and storm tide;
- Drought;
- Extreme precipitation events;
- Extreme temperature events;
- Gales and extreme wind;
- Storms (including lighting and hail);
- Soil moisture; and
- Soil stability.

Table 27.5 – Vulnerability Assessment Results

Variable	Type	Sensitivity	Exposure	Vulnerability
Sea	Sea level rise	High	High	High
	Storm surge and storm tide	High	High	High
Precipitation	Change in annual average	Low	Moderate	Low
	Drought	Moderate	Moderate	Medium
	Extreme precipitation events (flooding)	High	High	High
	Snow and ice	Low	Low	Low
Temperature	Change in annual average	Low	Moderate	Low
	Extreme temperature events	Moderate	High	Medium
	Solar radiation	Low	Moderate	Low
Wind	Gales and extreme wind events	Moderate	Moderate	Medium
	Storms (inc. lightning, hail)	High	Moderate	Medium

Humidity	Change in annual average	Low	Moderate	Low
Water quality and soils	Soil moisture	Moderate	Moderate	Medium
	Salinity/pH	Low	High	Low
	Soil stability	Moderate	Moderate	Medium
	Runoff	Low	Moderate	Low

27.6.2.2 Risks associated with the variables listed above will be assessed further in the ES, based on an assessment of the likelihood and consequence of occurrence. An initial summary of potential risks associated with changes in climate variable is shown in Table 27.6.

Table 27.6 – Potential risks for the Proposed Development associated with changes in climate variables

Climate variable	Potential risks – construction	Potential risks - operation
Sea level rise and storm surge	Flooding of the site and construction compounds	Flooding of the site Flooding of electrical substations and supporting infrastructure. Damage to cables, cable joints and the transition joint bay Reduced earthwork stability More rapid deterioration of materials Power outages and threats to business continuity
Higher rainfall (winter)	Flooding of the site and construction compounds More run-off from site Destabilise piles of materials Longer drying times for materials	Flooding of the site – damage to infrastructure Potential for reduced earthwork stability More rapid deterioration of materials. High ground water levels may also cause pollutants in the soil to be mobilised
Lower rainfall	Increase in dust	Drying out and cracking of soils and/or the aquifer may affect structural stability

(summer)		Cracking of surfaces and more rapid deterioration of materials.
Snow and ice	Delays to construction Unsafe working conditions	Damage to above-ground infrastructure, including roofs, external plant and equipment
High temperatures	Unsafe working conditions – heatstroke and UV exposure	Higher temperatures over prolonged periods could lead to overheating of infrastructure - electronic and ICT equipment and substations are particularly sensitive Greater demand for cooling. Operational impacts if supporting equipment is damaged or working conditions are unsafe More rapid deterioration of materials Increased temperature of rivers used for cooling -
Wind and storms	Risk to cranes and working at height – delays to programme Dust	Affect the stability of above-ground infrastructure More rapid material degradation - wind-driven rain infiltration into plant, building materials and surfaces Lightning strike can cause fire as well as power surges and shock waves which can destabilise energy systems and damage equipment
Relative humidity	Uncomfortable working conditions	Increase condensation, mould growth, mildew, staining and the corrosion and decay of metal surfaces Poor performance of insulation
Soil moisture		Greater water volumes can increase the mobilisation of pollutants in soil Water scarcity can increase the accumulation of chemicals and pollutants which may cause increased salinity and acidification.

27.6.3 CUMULATIVE EFFECTS

GHG emissions

27.6.3.1 The receptor for the GHG assessment is the global atmosphere. There are no common receptors between the GHG assessment and other disciplines.

27.6.3.2 The impacts of GHGs emissions, in terms of their contribution to climate change, are global and cumulative in nature, with every tonne contributing to impacts on natural and human systems. The potential impacts of the Proposed Development therefore contribute to this global issue along with all other projects and human activities, and as such, the assessment of emissions is inherently an assessment of cumulative effects.

Climate resilience

27.6.3.3 Climate change could exacerbate environmental impacts identified by other disciplines, including:

- Sea level rise could exacerbate impacts on marine and intertidal ecology (fish, mammals, birds), marine archaeology, shipping and commercial fishing.
- Changes in temperature and precipitation patterns could exacerbate impacts on terrestrial species and contribute to habitat change, potentially also affecting landscape.
- Increase in winter rainfall and more extreme rainfall events exacerbate flood risk identified in the Water Resources and Flood Risk chapter (Chapter 19). The Flood Risk Assessment would take account of climate change.
- Decrease in summer rainfall could exacerbate water quality impacts as pollutants become more concentrated during low flows.
- Decrease in summer rainfall could exacerbate impacts on buried archaeology as soils may dry out.
- Increase in winter rainfall and more extreme rainfall events could exacerbate soil erosion as identified in the Soils and Agricultural Land Use chapter (Chapter 17).
- Changes in temperature and precipitation patterns could exacerbate changes in ground conditions due to waterlogging or drying.
- Extreme temperature events (heatwaves) may exacerbate poor air quality.
- Higher summer temperatures and more extreme temperature events could affect people's health and wellbeing during both construction and operation (workforce).

27.6.3.4 The potential impacts from climate change identified in this chapter could be exacerbated by other developments in the vicinity of the Proposed Development:

- Flood risk as a result of climate change (wetter winters and more extreme rainfall events) could be exacerbated by other developments in the vicinity if

they lead to an increase in impermeable area (surface water flooding) or affect fluvial flood risk upstream of the Proposed Development.
- The impacts of higher temperatures could be magnified as a result of urban heat island effect if there are multiple developments in close proximity.

27.7 PROPOSED MITIGATION

27.7.1 GHG EMISSIONS

27.7.1.1 The ES will include a full list of proposed mitigation for the Proposed Development. The following proposed mitigation is outlined at this stage based on an initial assessment of the Proposed Development.

27.7.1.2 Potential mitigation and enhancement measures which may be available as the Proposed Development progresses through detailed design and into construction and operation include:

- Design optimisation to reduce the requirement for construction materials;
- Specification of materials and products with reduced embodied GHG emissions including through material substitution, recycled or secondary content and from renewable sources;
- Recovery and re-use / recycling of site arisings (ideally, on-site);
- Selection and engagement of materials suppliers and construction contractors taking into account their proximity to the Proposed Development, as well as policies and commitments to reduction of GHG emissions, including embodied emission in materials;
- Consider the use of efficient plant, including hybrid and electric plant as appropriate;
- The implementation of a detailed CEMP incorporating a Site Waste Management Plan ('SWMP') and Materials Management Plan ('MMP') will act as a monitoring tool for the reduction of GHG emissions during the Construction Stage. The CEMP will provide a review, monitoring and audit mechanism to determine the effectiveness of and compliance with environmental control measures, which include the consideration of manufacture, transport and supply of materials; and
- Designing and maintaining equipment to minimise maintenance, repair and replacement as well as the accidental release of gases with high global warming potentials.

27.7.2 CLIMATE RESILIENCE

27.7.2.1 The ES will include a full list of proposed mitigation for the Proposed Development. The following proposed mitigation is outlined at this stage based on an initial assessment of the Proposed Development.

27.7.2.2 The resilience of the Proposed Development during construction can be improved through the following measures:

- Ensuring site and compound drainage infrastructure has sufficient capacity and that silt traps are in use / regularly emptied and maintained.
- Storing chemicals, hazardous materials and plant on high ground or protecting with bunds / flood barriers.
- Using pumps to ensure water levels in excavations do not exceed critical levels.
- Allowing extra time for materials to dry out in the programme of works.
- Reducing the area of impermeable surface e.g. permeable paving.
- Using vegetation to slow down the movement of surface water.
- Dust control measures e.g. water spraying, covering spoil heaps.
- Using rainwater recycling to support other facilities (e.g. washing of machinery etc.).
- Ensuring welfare facilities are available and sufficiently cool. Ensure rest breaks are taken, particularly during the hottest part of the day (generally, 11am – 3pm).
- Provide shade for workers in exposed areas.
- Using personal protective equipment ('PPE') to reduce exposure to ultra violet ('UV') radiation – light coloured, long sleeved tops, sun cream, hats etc.
- Reviewing wind speed before commencing work at height.
- Ceasing work at height during storms.
- Installing lightening protection for site buildings.
- Using mould inhibiting paint.
- Reducing the size of spoil heaps.

27.7.2.3 The resilience of the Proposed Development during operation can be improved through the following measures:

- Ensuring drainage infrastructure is designed with capacity to accommodate projected rainfall levels.
- Regularly clearing and maintenance of drainage infrastructure to prevent blockage.
- Reducing area of impermeable surface e.g. use permeable paving
- Using vegetation to slow down the movement of surface water
- Using green infrastructure to bind soil and slow infiltration (e.g. deep-rooted, drought resistant vegetation).
- Consider projected change in soil moisture when specifying foundation depth – potentially need deeper foundations.
- Dust control measures e.g. water spraying of the carriageway during droughts.
- Specifying appropriate materials (e.g. asphalt, concrete mix) to take account of higher average temperatures.
- Enforcing speed restrictions during high winds.

- Using mould inhibiting paints as part of regular maintenance and updating.
- Using slope stabilisation measures.

27.8 SUMMARY AND CONCLUSIONS

27.8.1 GHG EMISSIONS

27.8.1.1 The quantification of emissions will be described in the ES, as such no quantification, or assessment of significance has been described within this PEIR. However, the scope of the assessment, principle methods, limitations, and initial mitigation measures have now been outlined.

27.8.1.2 As presented in the scoping report, the assessment form as part of the EIA and will consider embodied emissions within the materials to be used in the Proposed Development, emissions from transporting materials to site, emissions from plant on site during construction (where data is available), materials, transport, and the escape of fugitive gasses during operation, and emissions (or avoided emissions) from the transfer of electricity between the UK and French electricity grids.

27.8.1.3 The quantification of emissions will be undertaken in line with PAS2080 (BSI, 2016) and best practice carbon management practices. Significance will be assessed with reference to the magnitude of emissions, their, guidance from IEMA (Institute of Environmental Management and Assessment, 2017), and professional judgement. This will provide a robust assessment of the impact of the Proposed Development.

27.8.1.4 Mitigation measures have been proposed, including the use of the carbon reduction hierarchy (reducing material requirements, specifying low carbon materials, using low carbon plant etc). Further mitigation measures will be proposed based on the assessment undertaken for the ES.

27.8.2 CLIMATE RESILIENCE

Baseline

27.8.2.1 The current climate of the Study Area is warm and dry compared to the UK average. Projections of climate change for the UK (UKCP18) suggest that in future, the region will experience: warmer, wetter winters; hotter, drier summers; more extreme temperature and rainfall events; and rising sea levels.

Assessment

27.8.2.2 A vulnerability assessment has been carried out to identify climate variables to which the Proposed Development is vulnerable. This assessment is based on the sensitivity of the Proposed Development to climate variables and the exposure of the Proposed Development to changes in these variables over the 21st century.

Mitigation

27.8.2.3 Measures to improve the resilience of the Proposed Development to climate change have been identified and are summarised in Section 27.7.

Conclusion

- The climate variables to which the Proposed Development has been assessed as being vulnerable to are: Sea level rise;
- Storm surge and storm tide;
- Drought;
- Extreme precipitation events;
- Extreme temperature events;
- Gales and extreme wind;
- Storms (including lighting and hail);
- Soil moisture; and
- Soil stability.

27.8.2.4 Risks to the Proposed Development from changes in these variables will be assessed further in the ES.

27.9 ASSESSMENTS AND SURVEYS STILL TO BE UNDERTAKEN

27.9.1 GHG EMISSIONS

27.9.1.1 Desk studies will be undertaken to determine the magnitude and significance of emissions sources associated with the Proposed Development and will be completed prior to the submission of the ES.

27.9.1.2 The following matters will be included in the ES:

- an assessment and quantification of construction emissions;
- an assessment and quantification of operational and maintenance emissions;
- an assessment and quantification of the change in emissions due to the transfer of electricity between the United Kingdom and France; and
- a conclusion on the likely effects of the Proposed Development.

27.9.2 CLIMATE RESILIENCE

27.9.2.1 This PEIR chapter has reported the results of the vulnerability assessment (Steps 1 and 2 of the method). A list of climate variables to be taken forward to detailed risk assessment has been generated. The following variables are scoped in:

- Sea level rise;
- Storm surge and storm tide;
- Drought;
- Extreme precipitation events;
- Extreme temperature events;
- Gales and extreme wind;
- Storms (including lighting and hail);
- Soil moisture; and
- Soil stability.

27.9.2.2 At the next stage of assessment, a risk assessment for these variables will be undertaken following the method set out in Steps 3 and 4 (see Appendix 27.1). The risk assessment will consider hazards associated with each of the climate variables in scope in terms of the likelihood and consequence of occurrence. Actions to mitigate these risks will be described and the level of resilience of the Proposed Development to each of the climate risks will be identified.

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