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15. SUSTAINABILITY AND CLIMATE CHANGE

15.1 Introduction

15.1.1 This chapter of the Preliminary Environmental Information (PEI) Report addresses the potential effects of the proposed Open Cycle Gas Turbine (OCGT) power station (hereafter referred to as the 'Proposed Development') with regards to sustainability and climate change.

15.1.2 As required by the the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (the EIA Regulations), all Environmental Impact Assessments (EIAs) submitted under the EIA Regulations need to consider; *“the impact of the project on climate (for example the nature and magnitude of greenhouse gas emissions) and the vulnerability of the project to climate change”*, along with the impacts resulting from the interaction of identified environmental impacts of the project with climate change.

15.1.3 This chapter consists of the following separate aspects:

- A Lifecycle greenhouse gas (GHG) Impact assessment - to understand the impact of the project on the climate;
- Consideration of the project’s resilience to climate change - to understand the impacts of climate change on the development itself; and
- A summary of sustainability impacts identified by all environmental disciplines.

15.1.4 An assessment of in-combination impacts has been scoped out of this assessment as the principal aspect of climate change considered to be relevant for the Proposed Development is the risk of extreme events and sea level rise including flood risk. The risks and impacts associated with this issue (including accounting for worsening impacts through climate change) are covered in the Flood Risk Assessment (Appendix 12A PEI Report Volume III). Other aspects of in-combination climate impacts are not considered likely to be significant.

Table 15.1: In-combination Impacts Scoped Out

| In-combination impact considered | Rationale for being scoped out |
|----------------------------------|---|
| Impacts of temperature change | The Proposed Development is unlikely to affect the ability of receptors in the surrounding environment to adapt to the impacts of temperature change. |
| Impacts of increased wind | The impacts of wind on receptors in the surrounding environment are scoped out as these are likely to be no worse relative to baseline conditions. |

15.2 Legislation and Planning Policy Context

Legislative Background

EIA Directive 2014/52/EU

- 15.2.1 The EIA Directive 2014/52/EU states that as of May 2017, an environmental impact assessment (where relevant) must include assessment of the impact of a proposed development on climate change (for example, the nature and magnitude of GHG emissions), 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 (vulnerability appraisal).

Climate Change Act 2008

- 15.2.2 The Climate Change Act 2008 sets a legally binding target for the UK to reduce its greenhouse gas emissions from 1990 levels by at least 80% by 2050. This overall target is supported by a system of binding five-year 'carbon budgets' as well as an independent body to monitor progress, the Committee on Climate Change.

Planning our electric future: a White Paper for secure, affordable and low carbon electricity, 2011

- 15.2.3 The Planning our electric future White Paper (Ref 15-1) identifies a number of 'unprecedented' challenges to power generation in the UK including threats to security of supply (as existing coal-fired power stations close). A strategy has been put forward and includes the introduction of an Emissions Performance Standard (EPS) for UK power generation proposed to be set as an annual limit equivalent to 450 grams of carbon dioxide (CO₂) per kilowatt hour at baseload.

Planning Policy Context

National Policy Statements for Energy Infrastructure

- 15.2.4 National Policy Statement (NPS) EN-1 (Ref 15-3) emphasises the importance of a diverse mix of energy generating technologies, including renewables, nuclear and fossil fuels, to avoid over-dependence on a single fuel type and so ensure a more secure energy supply. The policy states that developers should consider opportunities for combined heat and power (CHP) and that all commercial scale (at or over 300 MW) fossil fueled generating stations have to be 'carbon capture ready'.
- 15.2.5 NPS EN-2 (Ref 15-4) covers fossil fuel generating stations and the impacts specifically associated with these types of power generation, including land use, transport infrastructure, water resources and grid connection. Carbon capture readiness and CHP criteria are provided in this NPS.

National Planning Policy Framework (2018)

- 15.2.6 The revised National Planning Policy Framework (NPPF) (Ref 15-2) was published in July 2018 and sets out the Government's planning policies for England and how these are expected to be applied. The revised NPPF replaces the previous NPPF adopted in March 2012.

- 15.2.7 Paragraph 5 of the NPPF makes clear that the document does not contain specific policies for determining applications for nationally significant infrastructure projects; these are to be determined in accordance with the decision making framework set out in the Planning Act and relevant National Policy Statements, as well as any other matters that are considered both '*important and relevant*'.
- 15.2.8 Policies of particular relevance to the scope of the climate change and sustainability assessment as presented herein include those achieving sustainable development (paragraphs 7-14) and meeting the challenge of climate change, flooding and coastal change (paragraphs 148-169).
- 15.2.9 Paragraphs 150 and 152 of the NPPF specifically set out how planning authorities are to promote the use and supply of renewable and low carbon energy – a central pillar of sustainable development.

Local Planning Policy

North Lincolnshire Local Development Framework

- 15.2.10 The Local Development Framework sits alongside and in some cases replaces the North Lincolnshire Local Plan which was adopted in May 2003 and is used to make planning decisions.
- 15.2.11 The Core Strategy (Ref 15-5), which was adopted in June 2011, sets out the long term vision for North Lincolnshire and provides a blueprint for managing growth and development in the area up to 2026. The following policy relates to sustainability and climate change.
- 15.2.12 Policy CS18 sets out measures for Sustainable Resource Use and Climate Change stating that the council will actively promote development that utilises natural resources as efficiently and sustainably as possible. This will include:
- Meeting required national reductions of predicted CO₂ emissions by at least 34% in 2020 and 80% in 2050 by applying the following measures on development proposals. Requiring all industrial and commercial premises greater than 1000 square metres to provide 20% of their expected energy demand from on site renewable energy until the code for such buildings is applied nationally. Where developers consider these codes and targets cannot be met on the basis of viability they will be required to provide proof through open book discussions with the council at the planning application stage;
 - Ensuring development and land use helps to protect people and the environment from unsafe, unhealthy and polluted environments, by protecting and improving the quality of the air, land and water;
 - Supporting renewable sources of energy in appropriate locations, where possible, and ensuring that development maximises the use of combined heat and power, particularly at the South Humber Bank employment site and where energy demands for more than 2MW are required for development; and
 - Supporting new technology and development for carbon capture and the best available clean and efficient energy technology, particularly in relation to the heavy industrial users in North Lincolnshire, to help reduce CO₂ emissions.

Other Guidance

15.2.13 In the absence of any widely accepted guidance on assessing the significance of the impact effect of GHG emissions, the EIA Guidance published by the Institute of Environmental Management and Assessment (IEMA) in 2017 has been followed. (Ref 15-6) This provides a framework for the consideration of greenhouse gas emissions in the EIA process, in line with the EIA Directive 2014/52/EU. The guidance sets out how to:

- Identify the GHG emissions baseline in terms of GHG current and future emissions;
- Identify key contributing GHG sources and establish the scope and methodology of the assessment;
- Assess the impact of potential GHG emissions and evaluate their significance; and
- Consider mitigation in accordance with the hierarchy for managing project related GHG emissions (avoid, reduce, substitute, and compensate).

15.2.14 The IEMA Guidance for assessing climate change resilience and adaptation in EIA (Ref 15-7) has also been followed. It provides guidance for consideration the impacts of climate change within project design. The guidance sets out how to:

- Define climate change concerns and environmental receptors vulnerable to climate factors;
- Define the environmental baseline with changing future climate parameters; and
- Determine the resilience of project design and define appropriate mitigation measures to increase resilience to climate change.

15.3 Assessment Methodology and Significance Criteria

Impact Assessment and Significance Criteria

Lifecycle GHG Assessment

15.3.1 The GHG assessment adopts a lifecycle approach to calculate GHG emissions associated with the Proposed Development and to identify GHG 'hot spots' i.e. emission sources likely to generate the largest amount of GHG emissions – as shown in Table 15.2. This approach enables priority areas for mitigation to be identified and is consistent with the principles set out in IEMA guidance (Ref 15-6).

15.3.2 It is anticipated that whilst the Proposed Development has a design life in practice, the Proposed Development will be maintained beyond this timeframe through maintenance and further upgrade works, and therefore including the GHG emissions associated with its demolition and decommissioning is not realistic or relevant at this time.

15.3.3 Where activity data has allowed, GHG emissions have been quantified using a calculation-based methodology as per the following equation as stated in the Department for Environment, Food and Rural Affairs (DEFRA) 2018 emissions factors guidance (Ref 15-8):

$$\text{Activity data} \times \text{GHG emissions factor} = \text{GHG emissions value}$$

15.3.4 In line with the GHG Protocol, A Corporate Accounting and Reporting Standard (Ref 15-9) when defining potential impacts (or ‘hotspots’), the seven Kyoto Protocol GHGs as far as feasible have been accounted for:

- Carbon dioxide (CO₂);
- Methane (CH₄);
- Nitrous oxide (N₂O);
- Sulphur hexafluoride (SF₆);
- Hydrofluorocarbons (HFCs);
- Perfluorocarbons (PFCs); and
- Nitrogen trifluoride (NF₃).

15.3.5 These GHGs are broadly referred to in this Chapter under an encompassing definition of ‘GHG Emissions’, with the unit of tCO₂e (tonnes of CO₂ equivalent) or MtCO₂e (Megatonnes of CO₂ equivalent).

15.3.6 The key anticipated GHG sources which will be scoped into the assessment are summarised in Table 15.2 below.

Table 15.2: Key Anticipated GHG emission sources

| Lifecycle stage | Activity | Primary emission sources | Assumption |
|------------------------|--|--------------------------|---|
| Pre-construction stage | Enabling works | Land clearance | Assumption: The Proposed Development Site (the ‘Site’) is situated in the vicinity of the existing VPI CHP plant and east of the Lindsey Oil Refinery. No significant excavation waste is anticipated. |
| | Land clearance – removal of vegetation and trees | Loss of carbon sink | Assumption: Land is predominantly agricultural and will be returned to its use immediately following construction. No downgrade is anticipated. |

| Lifecycle stage | Activity | Primary emission sources | Assumption |
|-----------------------------------|--|---|--|
| Product stage | Raw material extraction and manufacturing of products required to build the Proposed Development | Embodied carbon | Assumption: A qualitative statement is made on the embodied carbon of the Proposed Development. |
| Construction process stage | Transport of workforce | GHG emissions from vehicles | Assumption: Car and LGV journeys for approximately 150 full-time members of staff (based on peak construction). |
| | Transport of construction materials | GHG emissions from HGVs | Assumption: Maximum of 26 two-way HGV movements per day (based on peak construction). |
| | Waste disposal | GHG emissions from waste disposal route | Assumption: Scoped out as deemed negligible. |
| Operation stage | Fuel combustion and energy use | GHG emissions from natural gas combustion and energy use | Assumption: An OCGT peaking plant of up to 299MW electrical output. |
| | | GHG emissions from diesel generator | Assumption: Scoped out as deemed negligible. |
| | Transport of workforce | GHG emissions from vehicles | Assumption: Car journeys for approximately 15 full-time members of staff. |
| | Transport of operational and maintenance equipment | GHG emissions from HGVs | Assumption: Maximum of 3 two-way HGV movements per day. |
| | Waste disposal | GHG emissions from waste disposal route | Assumption: Scoped out as deemed negligible. |
| | The gas supply | GHG emissions from the AGI and fugitive emissions from the gas pipeline | Assumption: Emissions are expected to be minimal from a new pipeline and AGI based on good design. |
| | | | |
| Decommissioning Stage | Removal of plant | GHG emissions from vehicles, energy use and material re-use/waste disposal routes | Assumption: At this stage, it is unknown what the impact and effects of decommissioning will be in relation to climate change and sustainability. |

Construction of the Proposed Development

15.3.7 The global climate has been identified as the receptor for the purposes of the GHG emissions impact assessment. However, to enable significance evaluation of the estimated GHG emissions arising from the construction of the Proposed Development, the UK GHG inventory and specifically the UK National Carbon Budgets have been used as a proxy for the global climate. The sensitivity of the receptor, the UK Carbon Budget (as a proxy for the global climate) has been defined as high. The rationale is as follows:

- Any additional GHG impacts could compromise the UK’s ability to reduce its GHG emissions and therefore meet its future carbon budgets; and
- The extreme importance of limiting global warming to below 2°C this century, as broadly asserted by the International Paris Agreement (Ref 15-10) and the climate science community.

15.3.8 Due to the absence of any defined industry guidance for assessing the magnitude of GHG impacts for EIA, standard GHG accounting and reporting principles will be followed to assess impact magnitude.

15.3.9 In GHG accounting, it is common practice to consider exclusion of emission sources that are <1% of a given emissions inventory on the basis of a de minimis contribution. Both Department of Energy and Climate Change (DECC) (Ref 15-11) and the Publically Available Specification (PAS) 2050 (2011) specification (Ref 15-12) allow emissions sources of <1% contribution to be excluded from emission inventories, and these inventories to still be considered complete for verification purposes. This would therefore suggest that a development with emissions of <1% of the UK inventory and relevant carbon budget would be minimal in its contribution to the wider national GHG emissions. A further reference is that the International Finance Corporation (IFC) includes a reporting threshold for projects that it contributes funding to of over 25,000 tCO₂e in any year (Ref 15-13). These will be used to assess the magnitude of the GHG impact and the associated criteria are outlined in Table 15.3 below.

Table 15.3: Magnitude criteria for GHG Impact Assessment - Construction

| Magnitude | Magnitude criteria |
|-----------|--|
| High | GHG emissions represent more than 1% of total emissions from the relevant 5 year National Carbon Budget in which they arise or more than 25,000 tCO ₂ e in any single year. |
| Low | GHG emissions represent less than 1% of total emissions from the relevant 5 year National Carbon Budget in which they arise or less than 25,000 tCO ₂ e in any single year. |

15.3.10 The UK carbon budgets are in place to restrict the amount of greenhouse emissions the UK can legally emit in a five year period (Ref 15-14). The UK is currently in the 3rd carbon budget period, which runs from 2018 to 2022.

15.3.11 Construction of the Proposed Development will be undertaken during the 3rd carbon budget (2018-2022).

15.3.12 Table 15.4 shows the current and future UK carbon budgets up to 2033, which require a decline in the amount of greenhouse gas the UK can legally emit going into the future. This means that any source of emissions contributing to the UK's carbon inventory is going to have a more significant impact on the UK carbon budgets in the future.

Table 15.4: Relevant carbon budgets for this assessment

| Carbon budget | Total budget (MtCO ₂ e) |
|-----------------------------|------------------------------------|
| 3 rd (2018-2022) | 2,544 |
| 4 th (2023-2027) | 1,950 |
| 5 th (2028-2032) | 1,725 |

15.3.13 The significance of effects of the construction of the Proposed Development will be determined using the matrix in Table 15.5. This differs from the criteria presented in Chapter 2: Assessment Methodology by omitting the 'Very Low' and 'Medium' categories for sensitivity and omitting the 'Very Low' and 'Medium' categories for magnitude. This is because the sensitivity of the receptor (global climate) to increases in GHG emissions is always high, and the magnitude of the impact is determined by a boundary of less than or more than 1% of the Carbon Budgets or more than 25,000 tCO₂e in any year. This is in line with the IEMA guidance, which states that the application of the standard EIA significance criteria is not considered to be appropriate for climate change mitigation assessments.

Table 15.5: Significance of effects matrix for GHG Impact Assessment - Construction

| Magnitude | Sensitivity |
|--|-------------|
| | High |
| Low (<1% of carbon budget or less than 25,000 tCO ₂ e in any year) | Minor |
| High (>1% of carbon budget or less than 25,000 tCO ₂ e in any year) | Major |

Operation of the Proposed Development

15.3.14 The impact and significance of operational effects will be compared against a baseline of emissions from the existing UK power station.

15.3.15 Table 15.6 presents the carbon intensity of national averages for 2017 UK power stations sourced from the Digest of United Kingdom Energy Statistics (Ref 15-15). The intensity figures stated above comprise carbon intensity associated with the combustion of the primary fuel source (e.g. coal, natural gas) *i.e.* Scope 1 emissions

only, and do not include other elements of the carbon footprint such as transport or primary fuel electricity use on site.

Table 15.6: Carbon intensities of different UK power stations 2017

| Nature of power station | Carbon intensity of electricity supplied (tCO ₂ e/GWh) scope 1 only |
|--|--|
| UK Coal power station 2017 | 918 |
| Average UK power station 2017 - fossil fuels only | 460 |
| Average UK Gas power station 2017 | 357 |
| Average UK power station 2017 – including nuclear and renewables | 225 |

Climate Change Resilience Assessment

- 15.3.16 The EIA Regulations require the inclusion of information on the vulnerability of the project to climate change. Consequently a high level review of climate change resilience for the Proposed Development has been conducted which identifies potential climate change impacts, and considers their potential magnitude, likelihood of occurrence, and potential impacts on the Proposed Development.
- 15.3.17 The assessment has included all infrastructure and assets associated with the Proposed Development. It covers resilience against both gradual climate change, and the risks associated with an increased frequency of extreme weather events as per the UK Climate Projections 2009 (UKCP09) climate change projections (Ref 15-16).
- 15.3.18 The assessment of potential impacts and the Proposed Development's vulnerability takes into account the mitigation measures that have been designed into the Proposed Development.
- 15.3.19 The review also identifies and accounts for existing resilience adaption measures for each risk either already in place or in development for infrastructure and assets.

Sustainability

- 15.3.20 The sustainability assessment provides a mechanism for considering the sustainability of the project as a whole and for integrating sustainability considerations throughout the lifecycle of the Proposed Development. It summarises the features and attributes of the Proposed Development that will contribute to or affect each of the sustainability criteria, including:
- Minimising use of material resources in construction materials;
 - Minimising use of greenfield land;
 - Minimising water use;

- Impacts on ecology;
- Impacts on air quality;
- Impacts on transport;
- Impacts on job creation; and
- Impacts on flood protection and water quality.

15.3.21 It sets out actions which could be taken during the design, construction and operation that would further assist in delivering sustainability benefits for the local and wider area.

Extent of Study Area

15.3.22 The study area for the lifecycle GHG assessment is set by the redline boundary of the Proposed Development, but also encompasses a wider extent to include GHG emissions arising outside of this boundary, including the embodied GHG emissions from construction materials, and GHG emissions associated with the transportation of materials and workers to the site, as well as the disposal of waste arising from the construction and operational stages.

15.3.23 For the climate change resilience assessment, the study area is the the Proposed Development itself. This uses data available at a local and regional scale as applicable.

15.3.24 The sustainability assessment covers the site plus the likely effects on the surrounding local environment.

Sources of Information/Data

15.3.25 Activity data will be sourced where possible for the lifecycle GHG assessment, and this assessment will be included in the final ES.

15.3.26 Historic climate data for the climate change resilience assessment was obtained from the Met Office website (Ref 15-17). Future climate projections were sourced from the UKCP09 (UKCP09) which have been developed by the UK Climate Impacts Programme (UKCIP) (Ref 15-16).

15.3.27 Many of the sustainability issues are discussed within other specific chapters, due to overlap between subject areas, and therefore chapters are referenced as relevant.

15.4 Consultation

15.4.1 A summary of comments raised via the formal scoping opinion is summarised in Table 15.7 below.

Table 15.7: Scoping opinion summary table

| Consultee | Date (method of consultation) | Summary of consultee comments | Summary of response/ how comments have been addressed |
|--------------------------|-------------------------------|--|---|
| Secretary of State (SoS) | July 2018 (Scoping Opinion) | The Scoping Report states that the ES will incorporate an assessment of the design against “established sustainability criteria”. The ES must define what these criteria are, providing references to standards and guidance where relevant. | The sustainability assessment methodology is set out in this Section 15.3 of this PEIR chapter. |
| | | Outputs of the climate based assessments are proposed to be submitted as a standalone CCIR. The Inspectorate considers that this report should be appended to, and form part of, the ES, where it is relevant to the assessment of likely significant climate effects. | The full CCIR highlighting any significant effects will be appended in the full ES where appropriate. |
| | | No methodology is provided regarding the assessment of effects of impacts due to the Proposed Development’s effect on the local area’s climate resilience. As a result the Inspectorate is unable to provide any comment on the suitability of the approach. | The methodology for the climate change resilience assessment is set out in Section 15.3 of this PEIR. |
| | | Regarding lifecycle GHG impacts climate change resilience, except for a high level outline of the proposed assessment content, no specific methodology is proposed. The methodology for the assessment must be clearly set out in the ES, explaining the significance criteria used to identify any significant climate effects. The Applicant should clearly state the range of any climate projections used for the purposes of adaptation or resilience assessments. | The assessment methodology and significance criteria for the lifecycle GHG assessment and the climate change resilience assessment are set out in Section 15.3 of this PEIR chapter. Climate projections for the climate change resilience assessment are included in this PEIR. |
| | | No information has been provided in the Scoping Report on the decommissioning activities or whether the Applicant intends to assess effects arising from decommissioning. The Inspectorate considers that decommissioning impacts should be addressed and the assessment in the ES must also justify the approach taken to identifying all emissions (including those that are direct or indirect) and considered within the assessment. | The impacts of decommissioning have been considered in this assessment. However, at this stage, it is unknown what the impact and effects of decommissioning will be in relation to climate change and sustainability. |

15.5 Baseline Conditions

Existing Baseline

Lifecycle GHG Assessment

- 15.5.1 The Proposed Development Site is located in the vicinity of the existing CHP plant and east of the Lindsey Oil Refinery in North Killingholme, Lincolnshire. In addition, a new natural gas pipeline is proposed to tie into an existing pipeline to supply fuel to the Proposed Development via the infrastructure described in Chapter 3: Site Description.

Climate Change Resilience

- 15.5.2 The existing baseline for the climate change resilience assessment is the current climate in the location of the Proposed Development. Historic climate data obtained from the Met Office website (Ref 15-17) recorded by the closest meteorological station to the Proposed Development (Cleethorpes Station) for the 30 year climate period of 1981-2010 is summarised in Table 15.8 below.

Table 15.8: Met Office data (Cleethorpes Station) for the 30 year climate period of 1981-2010

| Climatic Factor | Month | Climate Figure |
|---|---------------|----------------|
| Average annual maximum daily temperature (°C) | - | 13.6 |
| Warmest month on average (°C) | July & August | 20.7 |
| Coldest month on average (°C) | January | 1.7 |
| Mean annual rainfall levels (mm) | - | 587.9 |
| Wettest month on average (mm) | November | 60.2 |
| Driest month on average (mm) | February | 38.0 |

- 15.5.3 The Met Office baseline climate averages for the North England region identify gradual warming between 1961 and 2010, as well as increased rainfall. Information on mean maximum annual temperatures (°C) and mean annual rainfall (mm) is summarised in Table 15.9 below.

Table 15.9: Climate Variations from 1961 to 2010 in the North England region

| Climate Period | Climate Variables | |
|----------------|---------------------------------------|---------------------------|
| | Mean maximum annual temperatures (°C) | Mean annual rainfall (mm) |
| 1961-1990 | 11.8 | 942.2 |
| 1971-2000 | 12.1 | 946.5 |
| 1981-2010 | 12.4 | 969.8 |

15.5.4 Examples of extreme weather event that have taken place in the past ten years include, but are not limited to (Ref 15-18):

- Severe flooding in 2012, 2013 and 2015;
- High impact cold weather events in 2004, 2009 and 2018;
- High temperatures and heatwaves in 2003, 2012, 2015, 2017 and 2018; and
- Storm and high wind events in 2013 and 2014.

Sustainability

15.5.5 For sustainability, this chapter summarises and assesses the findings of a number of other assessments within this PEIR. Baseline information can be found in the relevant chapters referenced throughout this assessment.

Future Baseline

Lifecycle GHG Assessment

15.5.6 The future baseline for the GHG impact assessment is a business as usual scenario whereby the Proposed Development does not go ahead, for those lifecycle stages that have been scoped into the assessment. The current carbon intensity of different types of UK power stations is used as a benchmark to compare the Proposed Development to.

Climate Change Resilience

15.5.7 The future baseline is expected to differ from the present day baseline described above. The UKCP09 have been developed by the UK Climate Impacts Programme (UKCIP) to provide projections for future climate scenarios and trends (Ref 15-16). UKCP09 is one of the most advanced future climate datasets in the world and reflects leading scientific understanding of how the climate system operates and how it might change in the future. The UKCP09 data is the most robust source of information on the UK's future climate and will continue to be so until the release of UK Climate Projections 2018 data and resources expected later in 2018.

15.5.8 UKCP09 provides climate change projections for pre-defined 30-year periods (for example 2010-2039, 2040-2069, and 2070-2099), at annual and seasonal levels for changes to mean climatic conditions over land areas. For the purpose of the proposed development, UKCP09 projections for the following average climate variables have been obtained and analysed:

- Mean summer temperature;
- Mean winter temperature;
- Mean summer precipitation; and
- Mean winter precipitation.

- 15.5.9 A range of possible scenarios, selected from the Intergovernmental Panel on Climate Change (IPCC) Special Report on Emissions Scenarios (SRES) (Ref 15-19) have been used by UKCP09 to inform differing future emission trends. The three scenarios – low, medium and high – account for the uncertainties that exist about future global trends and behaviour, such as population growth, technological progress, and socio-economic development. IPCC provides evidence to suggest that current global population and urbanisation trends, slow uptake of renewable energy sources, delay in nuclear power growth, and slow development of international climate change policy means that it is most likely that global emissions will follow the predicted high emissions scenario.
- 15.5.10 Taking into account the expected design life of the project, the UKCP09 high emissions scenario projections for 2050s period were applied to the Yorkshire and Humberside region, summarised in Table 15.10.

Table 15.10: Summary of 2050s period Climate Projections for the Yorkshire and Humberside Region

| Climate Variable | | 2050s period projection |
|---|------------------------------------|-------------------------|
| Change in mean winter temperature (°C) | 50% probability (central estimate) | +2.5 |
| | Range | +1.4 to +3.7 |
| Change in mean summer temperature (°C) | 50% probability (central estimate) | +2.6 |
| | Range | +1.2 to +4.4 |
| Change in mean winter precipitation (%) | 50% probability (central estimate) | +12% |
| | Range | +2% to +27% |
| Change in mean summer precipitation (%) | 50% probability (central estimate) | -18% |
| | Range | -38% to +3% |

Sustainability

- 15.5.11 This chapter summarises and assesses the findings of a number of other assessments within this PEI Report. Future baseline information can be found in the relevant chapters referenced throughout this assessment.

15.6 Development Design and Impact Avoidance

- 15.6.1 The consideration of alternatives and design evolution is being undertaken with the aims of preventing or reducing adverse environmental effects, including those

related to sustainability and climate change, whilst maintaining operational efficiency and cost effectiveness. The design continues to evolve in response to consultation feedback and the ongoing surveys and technical studies.

15.6.2 The Proposed Development design is based on Best Available Techniques (BAT) for OCGT plants, which act to minimise impacts on air quality, emissions, and energy and water use.

15.6.3 The plant will also be subject to regular planned maintenance in order to optimise the efficiency of the equipment on site.

15.7 Likely Impacts and Effects

15.7.1 The following sections describe the likely impacts and effects of the Proposed Development on climate change and the vulnerability of the Proposed Development to climate change in both the construction and operational phases. Decommissioning has been scoped out of this assessment as previously outlined.

Construction

Lifecycle GHG Assessment

15.7.2 The primary GHG emissions sources from the construction stage and the breakdown of the calculated GHG emissions are shown in Table 15.11 below.

15.7.3 A qualitative assessment will be provided in the ES for the embodied carbon of the Proposed Development relative to the five year carbon budget in which these emissions will arise.

15.7.4 At this stage in the design, the emissions associated with the transport in the construction stage are estimated to equal 530 tCO₂e. This number is conservative, based on peak construction figures.

15.7.5 At this stage it is not possible to provide an accurate comparison to annualised carbon budgets as data is not available to calculate the embodied carbon emissions. However, it is likely that even when included, when the emissions from the three year construction period are compared to the annualised UK 3rd carbon budget of 509 MtCO₂e (spanning the time period 2018 - 2022), it will be less than 1% of this and less than 25,000 tCO₂e in any year of construction.

Table 15.11: Construction GHG emissions

| Lifecycle stage | Project activity / Emissions source | Total construction GHG emissions over design life (tCO ₂ e) |
|-----------------|-------------------------------------|--|
| Construction | Transport | 530 |
| | Total | 530 |

Sustainability***Reducing the Use of Natural Resources in Construction Materials***

- 15.7.6 In accordance with policy requirements, through the ongoing design, the Applicant would seek to ensure that the Proposed Development is designed, constructed and implemented to minimise the creation of waste and maximise the use of recycled materials. A primary principle of sustainable procurement is to question the need/requirement for the commodity in question.
- 15.7.7 To minimise the use of natural resources and unnecessary materials suitable infrastructure already associated with the Site should be re-used where possible; for example, the Site access routes, internal roadways and existing gatehouse.
- 15.7.8 A Construction Environmental Management Plan (CEMP) would be prepared prior to commencing construction works on site; this will identify all best practice procedures, including environmental best practice such as the processing and re-use of all recovered materials onsite where practical. A framework CEMP will be submitted with the DCO application.
- 15.7.9 Following implementation of the above design measures, the Proposed Development is expected to result in no significant adverse effects due to the use of natural resources in construction materials.

Minimising use of Greenfield land

- 15.7.10 The Proposed Development is situated in the vicinity of the existing VPI CHP plant and east of the Lindsey Oil Refinery in North Killingholme, Lincolnshire and constitutes brownfield land

Flood Protection and Water Quality

- 15.7.11 Chapter 12: Surface Water, Flood Risk and Drainage states that site staff will be trained on procedures and guidance, including pollution plans, to reduce the risk of water pollution during construction works. It will be a contractual requirement of the contractor to ensure that runoff from the Site does not cause pollution or flooding.
- 15.7.12 Flood resilience measures will be incorporated into the Proposed Development to minimise damage and reduce recovery time. Measures have been identified for inclusion at construction stage to protect the Proposed Development in the event of flooding during operation – see the Operation section below for further details.
- 15.7.13 Chapter 12: Surface Water, Flood Risk and Drainage of this PEI Report sets out the conclusions of the Flood Risk Assessment (FRA) (which is included at Appendix 12A (PEI Report Volume III), as well as water quality impacts. The FRA for the Proposed Development concludes that development of the Site would not increase the risk of flooding from fluvial, tidal, groundwater or overland flow sources.
- 15.7.14 During construction, there is an elevated risk of leakage or accidental spillage of construction materials and potential pollutants used on Site, migrating to nearby surface watercourses.

15.7.15 Following implementation of various mitigation measures (see Chapter 12: Surface Water, Flood Risk and Drainage), including implementation of a CEMP, the likelihood of water contamination is low. Potential impacts on water quality, water supply, recreation and biodiversity in the water environment are found to be of low magnitude with minor adverse or negligible effects (not significant).

Transport

15.7.16 The traffic and transport assessment is considered in Chapter 7: Traffic and Transport. The air quality and noise assessments in Chapter 6: Air Quality and Chapter 8: Noise and Vibration also consider how transport affects air quality and noise receptors.

15.7.17 Chapter 7: Traffic and Transport confirms that change in total traffic associated with the Proposed Development is 26 two-way HGV movements and 85 construction staff car/LGV two-way movements per day during peak construction.

15.7.18 During the construction phase, the following mitigation measures will be applied to manage construction traffic:

- A Construction Worker Travel Plan (CWTP) will be prepared prior to construction to identify measures and procedures to reduce single-occupancy car use and encourage more sustainable forms of transport; and
- A Construction Traffic Management Plan (CTMP) will be prepared to identify measures to control the routing and impact that HGVs will have on the local road network during construction.

Ecology

15.7.19 Chapter 9: Ecology considers the potential impacts and associated effects of the Proposed Development, on ecological receptors. Surveys have identified expected disturbance, air quality and habitat loss effects as a result of the Proposed Development.

15.7.20 The Proposed Development will result in no significant effects on qualifying wintering bird species of the Humber Estuary SPA/ Ramsar as a result of noise or visual disturbance to functionally linked habitat adjacent to the Site. There will be no adverse air quality or surface water quality effects on any statutory or non-statutory designation.

15.7.21 A Landscape and Biodiversity Strategy will be prepared to support the DCO application, including setting out biodiversity and enhancement and management prescriptions.

Job creation

15.7.22 As well as environmental demands, sustainable development also considers the social and economic demands. The Proposed Development will result in the creation of jobs during site enabling, construction, operation and decommissioning phases. It is anticipated to provide around 150 temporary jobs at the peak of the

construction period. Further details of socio-economic impacts are presented in Chapter 14: Socio-Economics.

Operation and Maintenance

Lifecycle GHG Assessment

15.7.23 Annually, the operational GHG emissions from fuel combustion of natural gas and transportation emissions equates to approximately 275,307 tCO₂e.

15.7.24 When compared to the carbon intensities of different electricity supplies in Table 15.12, the Proposed Development will outperform the average UK fossil fuel power station, current UK coal power stations and an equivalent current UK gas power station. The impact of GHG emissions from the operation of the Proposed Development is therefore minor in comparison to existing UK power stations, and not significant.

Table 15.12: Operation GHG emissions

| Lifecycle stage | Project activity / Emissions source | Annual GHG emissions (tCO ₂ e) |
|-----------------|-------------------------------------|---|
| Operation | Energy and fuel | 274,776 |
| | Transport | 35 |
| | Total | 275,307 |

Table 15.13: Carbon intensities for the Proposed Development and other existing power stations

| Nature of power station | Carbon intensity of electricity supplied (tCO ₂ e/GWh) scope 1 only |
|--|--|
| UK Coal power station 2017 | 918 |
| Average UK power station 2017 - fossil fuels only | 460 |
| UK Gas power station 2017 | 357 |
| Average UK power station 2017 – including nuclear and renewables | 225 |
| Proposed Development, Scope 1 OCGT only (38% thermal efficiency) | 536 |

15.7.25 The Proposed Development will outperform existing average UK coal power stations, although it would have a higher emissions intensity than current average UK gas power stations, this is to be expected as the Proposed Development is a peaking plant to be used for short periods of time and is likely to be less efficient.

Climate Change Resilience

15.7.26 Potential impacts associated with climate change which could affect the vulnerability of the Proposed Development are presented in Table 15.14 together with an appraisal of the likelihood that these would affect the Proposed Development, taking into consideration the mitigation measures embedded within the scheme design.

Table 15.14: Potential climate impacts and resilience measures

| Climate variable projections | Potential Impacts on the Proposed Development | Appraisal/ Mitigation Measures |
|--|--|---|
| Projected increase in mean summer and winter temperatures | Overheating of equipment in summer months | This is not likely to cause overheating but may result in a loss of efficiency as the unit will be air cooled. However, as the unit will only operate intermittently, this is not likely to result in significant effect on performance |
| Projected increase in winter precipitation | <ul style="list-style-type: none"> • Vulnerability to higher river flows, requiring higher maintenance of the plant • Flooding of site; resulting in possible generation unit shutdown, water damage to infrastructure, and pipeline fracture due to erosion. • Flooding of access routes to site resulting in commodity supply disruption; increased staff shifts; insufficient staff to maintain safe plant operation; partial or complete shutdown | The area is protected by flood defences that were designed with climate change effects in mind. Flooding risk (tidal, fluvial and pluvial) will be taken into account in detailed design |
| Projected decrease in mean summer precipitation | Reduced fresh water availability | Water demands will be minimal |
| Extreme weather events (such as heavy and/or prolonged precipitation and storm events) | Damage to installations | Risk of pluvial flooding will be included in the design |

Sustainability

Minimising Use of Water

15.7.27 The Proposed Development will consider measures to conserve water during operation, which increases the Proposed Development's resilience to future temperature rises and potential droughts as a result of climate change.

Flood Protection and Water Quality

- 15.7.28 Chapter 12: Surface Water, Flood Risk and Drainage sets out the conclusions of the FRA (which is included at Appendix 12A (PEI Report Volume III)) as well as measures to minimise water pollution. The FRA concludes that development of the Site would not increase the risk of flooding from fluvial, tidal, groundwater or overland flow sources.
- 15.7.29 The operator's Environmental Management System (EMS) will include impact avoidance measures such as accidental pollution plans and provision of spillage kits, and containment measures such as bunds.
- 15.7.30 An Outline Drainage Strategy has been produced as part of the FRA; this will be developed through detailed design and will incorporate features such as:
- Greenfield runoff rate restriction for surface water discharge from the Proposed Development achieved by on-site attenuation of surface water runoff;
 - Use of soil interceptors where appropriate; and
 - Use of SuDS techniques including swales, permeable paving and soakaways to attenuate flow of water will be considered at the detailed design stage.
- 15.7.31 Following the implementation of the above design measures, the likelihood of water contamination is low. Potential impacts on water quality, water supply, recreation and biodiversity in the water environment are found to be of low magnitude with minor adverse or negligible effects (see Chapter 12: Surface Water, Flood Risk and Drainage).
- 15.7.32 Flood resilience measures will be incorporated into the Proposed Development to minimise damage and reduce recovery time. Consideration has been given to the effect of climate change on river levels. Flood proofing measures such as resistant building materials and emergency response procedures have also been identified as possible options for inclusion, subject to detailed design.

Air Quality

- 15.7.33 The Proposed Development will comply with the European Industrial Emissions Directive (IED). This means minimisation of the impact of emissions to air, soil, surface and ground water, to the environment and human health.
- 15.7.34 Chapter 6: Air Quality assesses the effect of emissions from the Proposed Development on short- and long-term human health receptors, ecological receptors, and annual critical levels.
- 15.7.35 The effect of emissions from the Proposed Development is negligible for most receptors, with the worst affected receptor being assessed as minor (E9 Station Road Fields LW – ecological receptor). No significant effects on soil, surface water or groundwater are identified in Chapters 12: Surface Water, Flood Risk and Drainage and 11: Ground Conditions and Hydrogeology.

Transport

- 15.7.36 The traffic and transport assessment is considered in Chapter 7: Traffic and Transportation.
- 15.7.37 Chapter 7: Traffic and Transportation confirms that once operational there will be approximately 15 permanent staff and an anticipated maximum of 3 HGVs per day. The overall effects during operation, maintenance and planned outages are therefore considered to be negligible adverse (not significant).

Ecology

- 15.7.38 Chapter 9: Ecology considers that there are no significant operational effects predicted and therefore there is no requirement for mitigation.

Job Creation

- 15.7.39 As well as environmental demands, sustainable development also considers the social and economic demands. It is estimated that the total net employment for the site is 15 employees. Temporary and contractor employees associated with maintenance activities will also be employed as required.

Decommissioning

- 15.7.40 The plant is capable of a life expectancy of 40 years or more, depending on running hours. Eventually decommissioning would involve the removal of the plant. The gas and electricity connections would be disconnected and made safe. The OCGT could either be removed as a unit for reuse elsewhere (depending on its condition) or alternatively dismantled on site and removed.
- 15.7.41 At this stage, it is unknown what the impact and effects of decommissioning will be in relation to climate change and sustainability.

15.8 Mitigation and Enhancement Measures

- 15.8.1 Embedded mitigation measures have been incorporated within the design of the Proposed Development or are standard practice measures that have been committed to are summarised earlier in this Chapter.
- 15.8.2 As the output capacity of the Proposed Development is less than 300MW, the power station does not fall under the provisions of the Carbon Capture Readiness (Electricity Generating Stations) Regulations 2013 (the CCR Regulations). Therefore, no space allocation for future retrofit of carbon capture technology has been included within the Site.

15.9 Limitation or Difficulties

- 15.9.1 At this stage of design and before any detailed design takes place, the absence of available data is a limitation. Where data has not been available, estimates (using professional judgment and knowledge from similar developments) or a qualitative assessment have been used / made.

- 15.9.2 Limitations associated with the approach taken for the climate change resilience assessment relate to uncertainties inherent within UKCP09 data (Ref 15-18).
- 15.9.3 By its very nature, climate change is associated with a range of assumptions and limitations. To overcome these issues, leading climate change data and science has been incorporated into the assessment and proven effective approaches undertaken for similar project types have been replicated.
- 15.9.4 The UKCP09 are currently the leading climate change projections for the UK; however these are undergoing a major upgrade to make sure decision-makers have the most up-to-date information on the future of our climate. The UKCP18 project will update the UKCP09 projections and will be available from November 2018.

15.10 Residual Effects and Conclusions

- 15.10.1 Due to the nature of an OCGT power station, there will be residual effects no matter the level of mitigation measures implemented. This includes unavoidable GHG emissions resulting from all phases of the Proposed Development, as a result of the combustion of fuel and required materials and transport.
- 15.10.2 The NPS place value on the importance of a diverse mix of energy generating technologies, drawing attention to the urgent national need for new electricity generating capacity. The NPPF also encourages the move to a low carbon future, and planning new development to reduce greenhouse gas emissions. The Proposed Development will meet existing shortfall as other less efficient power stations are going off line, and will provide a secure energy supply to the national grid.
- 15.10.3 Climate change resilience outputs demonstrate that the effects of increases in mean summer and winter temperatures, as well as changes in precipitation on the Proposed Development have been considered through consideration of material lifetime, maintenance regimes and flood risk attenuation measures.
- 15.10.4 The Proposed Development has several characteristics incorporated into its design, construction and management which meet the key sustainability requirements as set out in national, regional and local policy.

15.11 References

- Ref 15-1 DECC (2011) Planning our electric future: a White Paper for secure, affordable and low carbon electricity.
- Ref 15-2 National Planning Policy Framework
- Ref 15-3 Department of Energy and Climate Change (2011), *Overarching National Policy Statement for Energy* (EN-1), July 2011
- Ref 15-4 Department of Energy and Climate Change (2011), *National Policy Statement for Fossil Fuel Electricity Generating Infrastructure* (EN-2)
- Ref 15-5 North Lincolnshire Council (2011) The North Lincolnshire Framework: Core Strategy Adopted [Available at: <http://www.planning.northlincs.gov.uk/planningreports/corestrategy/adopteddppd/FullCoreStrategy.pdf> accessed October 2018]

- Ref 15-6 IEMA (2017) Environmental Impact Assessment Guide to: Assessing Greenhouse Gas Emissions and Evaluating their Significance
- Ref 15-7 IEMA (2017) Environmental Impact Assessment Guide to: Climate Change Resilience and Adaptation
- Ref 15-8 DEFRA (2018) 2018 Emissions Factors. *[Available at <https://www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2018> accessed September 2018]*
- Ref 15-9 World Resources Institute (WRI) and World Business Council for Sustainable Development (WBCSD) (2015) Greenhouse Gas Protocol Corporate Accounting and Reporting Standard
- Ref 15-10 United Nations Framework Convention on Climate Change (UNFCCC) (2015) Paris Agreement
- Ref 15-11 DECC (2013) Guidance on Annual Verification for emissions from Stationary Installations
- Ref 15-12 British Standards Institution (2011) PAS 2050:2011 Specification for the assessment of the life cycle greenhouse gas emissions of goods and services
- Ref 15-13 IFC (2011) Guidance Note 3 *[Available at: https://www.ifc.org/wps/wcm/connect/ea62170048855838bf5cff6a6515bb18/2007%2BUdated%2BGuidance%2BNote_3.pdf?MOD=AJPERES accessed September 2018]*
- Ref 15-14 Committee on Climate Change (2017) UK Carbon Budgets
- Ref 15-15 BEIS (Department for Business, Energy and Industrial Strategy) (2018) Digest of UK Energy Statistics (DUKES). *[Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/736148/DUKES_2018.pdf accessed September 2018]*
- Ref 15-16 UK Climate Impacts Programme (UKCIP) (2009) UK Climate Projections
- Ref 15-17 Met Office, Cleethorpes Climate. *[Available at: <https://www.metoffice.gov.uk/public/weather/climate/gcx4kb837> accessed September 2018]*
- Ref 15-18 Met Office (2018) Past weather events. *[Available at: <https://www.metoffice.gov.uk/climate/uk/interesting> accessed September 2018]*
- Ref 15-19 The Intergovernmental Panel on Climate Change (IPCC) (2000) Special Report on Emissions Scenarios (SRES)