Appendix 7B

Greenhouse Gas Report

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Proposed OCGT Development

Environmental Impact Assessment Report

Volume II – Appendices

Appendix 7B: Greenhouse Gas Emissions

GLOSSARY OF ABBREVIATIONS AND DEFINITIONS

Abbreviation	Description
BEIS	Department for Business, Energy and Industrial Strategy
CH_4	Methane
CO_2	Carbon dioxide
CO_{2e}	Carbon dioxide equivalent
Defra	Department for the Environment, Food and Rural Affairs
EIA	Environmental Impact Assessment – a term used for the assessment of environmental consequences (positive or negative) of a plan, policy, program or project prior to the decision to move forward with the proposed action.
ES	Environmental Statement - A report in which the process and results of an Environment Impact Assessment are documented.
EU	European Union
FGT	Flue gas treatment
GHG	Greenhouse gas
GHGs	Greenhouse gas emissions
HFCs	Hydrofluorocarbons
HGV	Heavy Goods Vehicle
ICE	Inventory of Carbon & Energy
IEMA	Institute of Environmental Management and Assessment
IPCC	Intergovernmental Panel on Climate Change
kWh	Kilowatt hours
MJ	Megajoule
Mt	Megatonnes
MW	Megawatt
NF_3	Nitrogen trifluoride
N_2O	Nitrous oxide
PFCs	Perfluorocarbons
PAS	Publicly Available Specification
SEAI	Sustainable Energy Authority of Ireland
SF_6	Sulphur hexafluoride
t	Tonnes
UK	United Kingdom
WBCSD	World Business Council for Sustainable Development
WRI	World Resources Institute

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1.0 INTRODUCTION

1.1 Overview and Approach

1.1.1 This appendix presents an assessment of the impacts of the Proposed Development on the climate as a result of greenhouse gas emissions (GHGs) during construction, operational life (including maintenance) and decommissioning. It defines the study area; the methodology used for developing the baseline and impact assessment; provides a description of the baseline environment in relation to climate; and presents the findings of the impact assessment.

1.1.2 The planning application is being submitted for the Proposed Development which will comprise a 350MW Open Cycle Gas Turbine (OCGT) plant, acoustic barriers, secondary fuel storage and unloading facility, distillate fuel gantry, water storage tanks, surface water drainage system, gas AGI and sub-station electrical connection and all associated ancillary development, site works and services on land to the north of Tynagh CCGT Power Station in Derryfrench, Loughrea, Co. Galway.

1.1.3 The plant will operate as a 'peaking plant', spending most of its time on standby, and will be run to compliment renewable power generation technology. The objective of the project is to help maintain security of supply and facilitate the continued expansion of Ireland's renewable generation capacity, by providing support to the electricity network during periods when there is a gap between renewable power generation and power demand.

1.1.4 Full details of the Proposed Development are presented in Chapter 5 of the Environmental Impact Assessment Report (EIAR), Volume I.

1.1.5 To meet the requirements of the European Union (Planning and Development) (Environmental Impact Assessment) Regulations 2018 (S.I. No. 296 of 2018), and to align with guidance from the Institute of Environmental Management and Assessment (IEMA) for climate change mitigation (IEMA, 2022), this report provides a GHG impact assessment and Climate Change Resilience Assessment:

- **Lifecycle GHG Assessment** - The assessment considers impacts on the climate from GHGs arising from the Proposed Development, including how the Proposed Development would affect the ability of the Republic of Ireland government to meet its carbon reduction plan targets.
- **Climate Change Resilience Assessment** – The assessment considers the resilience of the Proposed Development to climate change, including how the plant design will be adapted to take account of the projected impacts of climate change.

2.0 LEGISLATION, POLICY AND GUIDANCE

2.1 Introduction

2.1.1 This Section identifies and briefly describes the legislation, policy, and guidance of relevance to the assessment of potential climate impacts associated with the construction, operation and eventual decommissioning of the Proposed Development.

2.1.2 Legislation, policy and other relevant guidance has been considered on an international, national and local level. The following is relevant to the GHG assessment as it has either influenced the sensitivity of receptors and requirements for mitigation or the scope and/ or methodology of the assessment.

2.2 International Legislation and Policy Guidance

2.2.1 EIA Directive 2014/52/EU (Official Journal of the European Union, 2014) amending Directive 2011/92/EU: on the assessment of the effects of certain public and private projects on the environment. Annex IV specifically requires that EIAs require information to be included on "*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".*

2.2.2 Kyoto Protocol: An international agreement linked to the United Nations Framework Convention on Climate Change (UNFCCC), which commits its Parties by setting internationally binding emission reduction targets. Ireland is a Party to the Kyoto Protocol and its emission reductions targets are now binding. Under Article 4 of the Kyoto Protocol, the EU created an Effort Sharing Regulation that requires the setting of individual binding GHG emission reduction targets for each of its Member States. The current Effort Sharing Decision (ESD) commits Ireland to a 39% reduction in GHG emissions for the period 2021 to 2030 (Department of Communications, Climate Action & Environment, 2019).

2.2.3 Paris Agreement (Conference of the Parties No.21, 2016): A legally-binding agreement within the UN framework convention on climate change which requires all signatories to strengthen their climate change mitigation efforts to keep global warming to below 2°C this century (UNFCCC, 2016), and to pursue efforts to limit global warming to 1.5°C.

2.2.4 EU Emissions Trading System (Directive 2003/87/EC (as amended)). The EU Emissions Trading System (EU ETS) is a GHG trading scheme that covers industrial installations with a thermal capacity greater than 20 Megawatts. Participating installations work under a 'cap and trade' principle. Industrial installations receive a free allocation of allowances based on historic activity levels and a number of other factors, but electricity generators no longer receive a free allowance but must purchase at auction sufficient allowances to cover their annual emissions. From 2021, the overall European emissions cap will reduce by an annual rate of 2.2%.

2.2.5 European Green Deal: Policy initiatives by the European Commission aiming to make Europe GHG neutral by 2050 (European Commission, 2019). A key pillar of the Green Deal requires decarbonising energy systems.

2.2.6 EU Effort Sharing Legislation: Establishes binding annual greenhouse gas emission targets for Member States for the periods 2013–2020 and 2021–2030. These targets

concern emissions from most sectors not included in the EU Emissions Trading System (EU ETS), such as transport, buildings, agriculture, and waste.

2.3 International Guidance and Information

2.3.1 This assessment to identify the significance of GHGs from the Proposed Development has been undertaken in line with Guidance published by IEMA originally in 2017, and up-dated in 2022. This provides a framework for the consideration of GHGs in the EIA process, in line with the 2014 EU Directive. The guidance sets out how to:

- Identify the GHGs 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 GHGs and evaluate their significance; and
- Consider mitigation in accordance with the hierarchy for managing project related GHGs (eliminate, reduce, substitute and compensate).

2.3.2 The World Resources Institute (WRI) and World Business Council for Sustainable Development (WBCSD) GHG Protocol (2004) provides overarching guidance on developing GHG inventories.

2.3.3 Publicly Available Specification (PAS) 2080 (2016): Carbon Management in Infrastructure Verification provides specific guidance on measuring and managing GHGs from infrastructure.

2.3.4 Guidance for the Calculation of Land Carbon Stocks (European Commission, 2010) provides a methodology for calculating carbon stocks from land use.

2.3.5 Greenhouse Gas emission factors have been sourced from:

- Sustainable Energy Authority of Ireland (SEAI), 2022, provide GHG emission factors for energy sources which have been used within the GHG emissions calculation methodology.
- Department for Business, Energy and Industrial Strategy (BEIS), UK, 2022, provide GHG emission factors (BEIS, 2022), which have been used within the GHG emissions calculation methodology, as described in the 'Methodology for Determining Construction Effects' section of this EIAR. These will be used as a proxy for absent Irish emission factors to quantify GHG emissions to convert the activity data into emissions.
- The Inventory of Carbon and Energy (ICE) (Version 3), Bath University, UK (2019): The ICE Database is the world's leading source of embodied energy and carbon data. This database has been used to source appropriate carbon factors to estimate the embodied carbon of materials used for demolition and remediation works of the Proposed Development.

2.4 National Legislation, Policy and Guidance

2.4.1 The European Union (Planning and Development) (Environmental Impact Assessment) Regulations 2018 (S.I. No. 296 of 2018). Schedule 6 to the Planning and Development Regulations 2001-2021 specifically requires an environmental impact assessment report to assess (Irish Statute Books, 2018):

"*the impact of the proposed development on climate (for example the nature and magnitude of greenhouse gas emissions) and the vulnerability of the proposed development to climate change*"

2.4.2 The Climate Action and Low Carbon Development (Amendment) Bill 2021, passed by the Oireachtas in April 2021, commits Ireland to becoming a carbon-neutral economy by no later than 2050. To reach this milestone a series of five-year carbon budgets, setting out a carbon reduction trajectory for Ireland, are to be embedded into law. The first two budgets must demonstrate a 51% reduction against a 2018 baseline by 2030. A key component of meeting this reduction target is the decarbonisation of electricity generation in Ireland. To drive this change Ireland has set a target to generate 70% of grid electricity from renewable sources by 2030.

2.4.3 The Climate Action Plan (Government of Ireland 2022) was published December 2022 and sets out of the roadmap for achieving these carbon budgets (Table 2.1) and halving emissions by 2030 and reaching net zero by 2050. Amongst the strategy, Chapter 12 considers the measures required to support the country's transition to renewable electricity. This includes the acknowledgement of flexible gas generation to replace coal and oil generation in the interim.

Table 2.1: Carbon Budgets

	2021-2025	2026-2030	2031-2035
Carbon Budget (Mt CO2e)	295	200	151

2.4.4 In addition, there are Sectoral Emissions Ceilings for key sectors, including electricity generation. The electricity sector has a sectoral ceiling for 2023 of 3MtCO_2e (Government of Ireland 2022).

2.4.5 National Energy and Climate Plan (NECP) 2021-2030 (Department of Communications, Climate Action and Environment, 2020a). The 2020 NECP incorporates all planned energy and climate policies and measures identified up to the end of 2019. It sets out in detail Ireland's objectives regarding the five EU energy dimensions (Decarbonisation (GHG emissions and removals, renewable energy), energy efficiency, energy security, internal energy market and research, innovation and competitiveness) together with planned policies and measures to ensure that these objectives are achieved. This strategy acknowledges the increasing role of natural gas in the energy mix for heat, transport and power generation including as a back up to intermittent power generation.

2.4.6 'Ireland's Transition to a Low Carbon Energy Future 2015-2030' (Department of Communications, Climate Action and Environment, 2020b). This White Paper considers Ireland's complete energy policy and European and International climate change objectives and agreements, as well as Irish social, economic and employment priorities. The paper confirms the need to enhance energy security and to provide a reliable supply of gas to meet demand as part of a sustainable energy transition to a low carbon future.

2.4.7 National Mitigation Plan (Department of Communications, Climate Action and Environment, 2017). Ireland's first national mitigation plan sets out the Government's shared approach to reducing greenhouse gas emissions.

2.4.8 National Adaptation Framework (Government of Ireland, 2018a). Ireland's first national strategy "*to reduce the vulnerability of the country to the negative effects of climate change and to avail of the positive impacts."*

2.4.9 National Planning Framework (Government of Ireland, 2018b). The national planning framework is a planning framework to guide development and investment over the coming years. It does not provide every detail for every part of the country; but empowers each region to lead in the planning and development of their communities, containing a set of national objectives and key principles from which more detailed and refined plans will follow.

2.4.10 National Development Plan 2021 – 2030 (Government of Ireland 2021). The national development plan (NDP) states the urgency of the climate and biodiversity emergency, through a systematic climate and environmental assessment of all capital expenditure plans. This included impact on GHG emissions, contribution to climate resilience, water and air quality, waste, biodiversity and employment. The NDP states that every public investment project with a value above €20 million must conduct a full analysis on all the potential costs and benefits associated with that project. Each cost benefit analysis is required to incorporate a quantitative assessment of the net impact on greenhouse gas emissions.

2.5 Local Policy

2.5.1 The Galway County Climate Adaptation Strategy (Galway County Council, 2019) outlines the risks and opportunities of climate change to the region, as well as expectations of cities and local regions to implement changes to increase resilience and mitigate effects of climate change. The key focus areas are the impacts of - increased temperatures, increased rainfall, natural ecosystems, sea-level risk and ocean warming.

2.5.2 The Galway County Development Plan 2022-2028 (Galway County Council, 2022) sets a vision for County Galway to achieve economic growth with '*a high-quality sustainable environment for all'.* Key strategic aims relevant to the proposed development include Environmental Protection and Climate Change Adaptation.

- Chapter 14; Climate change, Energy and Renewable Resource - sets out County Galway's approach "*to reduce the carbon footprint by integrating climate action into the planning system in support of national targets, support indigenous renewable sources in order to reduce dependence on fossil fuels and improve security of supply and the move to a competitive low carbon economy".*

2.5.3 The Loughrea Local Area Plan 2012-2022 (Galway County Council, 2012) sets out a strategic vision for the town to be "a sustainable, self-sufficient, vibrant, socially inclusive and innovative growth centre within the County" and a commitment to *"contribute to the national commitment to limit the impact of climate change and reduce energy consumption and greenhouse gas emissions".*

3.0 METHODOLOGY

Greenhouse Gas Assessment

3.1 Determination of Assessment Scenarios

3.1.1 The GHGs assessment of the Proposed Development includes an assessment of two scenarios, the baseline and the project (Proposed Development) scenario. The baseline scenario or 'Do Nothing' scenario is where the Proposed Development is not progressed.

3.1.2 The alternative scenario is a 'Do Something' scenario associated with the delivery of the Proposed Development, which includes construction and operation, and the eventual decommissioning, as described in Chapter 5: The Proposed Development of this EIAR (refer to EIAR Volume I).

3.2 Study Area

3.2.1 The GHG study area includes all GHGs from within the Site arising during the construction, operation and decommissioning of the Proposed Development. It also includes emissions arising from offsite activities which are directly related to the onsite activities associated with the Proposed Development, such as embodied carbon in materials for construction and operation, transport of materials and waste, treatment of waste disposal.

3.3 Sensitive Receptors

3.3.1 The identified receptor for the GHG assessment is the global climate. As the effects of GHGs are not geographically constrained all development has the potential to result in a cumulative effect on GHGs. To assess the magnitude of the impact of the Proposed Development on this receptor, GHG emissions from the Proposed Development have been compared to Ireland's most recent GHG inventory.

3.4 GHG Calculation Methodology

3.4.1 Currently there are no published thresholds for assessing the significance of a proposed development impact on climate for EIA. As per IEMA (2022) guidance, the GHG emissions from all projects will contribute to climate change. Therefore, any GHG emissions, that contribute to exceedance of the global emission budget that defines a level of dangerous climate change or threatens efforts to stay within it, can be considered as significant. Each project is evaluated according to its individual characteristics.

3.4.2 A lifecycle approach to calculating the GHGs has been used. This approach considers specific timescales and emissions from different lifecycle stages of a proposed development: product stage (construction materials), construction process stage, operational stage and decommissioning.

3.4.3 Expected GHGs arising from the construction and operational activities, and embodied carbon in materials of the Proposed Development, have been quantified using a calculation-based methodology as per the following equation below as stated in the Defra emissions factors guidance (Defra, 2020):

Activity data x GHG emissions factor = GHG emissions value

3.4.4 Emission factors and calculation methods have been sourced from publicly available sources, such as BEIS, SEAI, IPCC, and the Bath University ICE.

3.4.5 The potential impacts of the Proposed Development on the climate through GHGs during construction are calculated in line with the GHG Protocol (WRI & WBCSD, 2004) and the GHG 'hot spots' (i.e. sources and activities likely to generate the largest amount of GHGs) are identified, as listed in Table 3.1. This has enabled priority areas for mitigation to be identified. This approach is consistent with the principles set out in IEMA guidance.

3.4.6 In line with the GHG Protocol (WRI & WBCSD, 2004), when defining potential impacts, the seven Kyoto Protocol GHGs have been considered, specifically:

- carbon dioxide (CO_2);
- methane (CH_4);
- nitrous oxide (N_2O);
- sulphur hexafluoride (SF_6);
- hydrofluorocarbons (HFCs);
- perfluorocarbons (PFCs); and
- nitrogen trifluoride (NF_3).

3.4.7 These gases are broadly referred to in this report under an encompassing definition of 'GHGs', with the unit of tCO_2e (tonnes CO_2 equivalent) or $MtCO_2e$ (mega tonnes of CO_2 equivalent).

3.4.8 Where data has not been available (i.e. decommissioning), a qualitative approach to addressing GHG impacts has been followed, in line with the IEMA guidance (2022). As details of the activities required for decommissioning are not available at this stage of the Proposed Development, the GHGs associated with this phase of the Proposed Development are qualitatively assessed.

3.4.9 Table 3.1 summarises the GHG activity sources that are potentially relevant to the baseline (Do Nothing) scenario. These sources are considered for their presence and materiality in the baseline environment assessment (Section 5.0).

3.4.10 Table 3.2 summarises the GHG activity sources that are potentially relevant to the project (Do Something) scenario of this Proposed Development. These sources are considered for their presence and materiality in the project scenario assessment (Section 5.2).

Table 3.1: Potential Sources of GHGs relevant to the Baseline

STAGE	ACTIVITY	PRIMARY EMISSIONS SOURCES
Baseline	Existing land use	Carbon stocks and emissions from above- and below-ground biomass

STAGE	ACTIVITY	PRIMARY EMISSIONS SOURCES
	Existing power station	Emissions from existing CCGT power station

Table 3.2: Potential Sources of GHGs Relevant to the Proposed Development

STAGE	ACTIVITY	PRIMARY EMISSIONS SOURCES
Product Manufacture, Site Enabling and Construction	Pre-construction activity within Site	Fuel consumption from construction plant and vehicles, generators, and construction worker commuting.
	Site clearance works	Loss of carbon stocks.
	Raw material extraction and manufacturing	Embodied GHGs in the materials used for construction of the Proposed Development as a result of the excavation, processing and transportation.
	Transport to Site	Fuel used for transportation of construction materials to Site.
	Construction activity within the Site	Energy (electricity, fuel, etc.) consumption from plant, vehicles, and generators.
	Transport of construction workers	Fuel consumption for transportation of construction workers to/ from Site.
Operation	Operation of the Proposed Development	Operational energy use in buildings (e.g. any liquid fuels, gases and purchased electricity). Combustion of fuel (gas and distillate fuel) to produce energy.
	Building/ infrastructure maintenance	Maintenance of buildings and infrastructure/ assets in operational stage.
Decommissioning	Activities within the Site	Fuel consumption from the use of plant and vehicles.
	Waste transport	Transporting decommissioning waste to licenced facilities.
	Waste treatment and disposal	Treatment and disposal of solid and liquid waste.
	Transport of workers	Fuel consumption for transportation of construction workers.

3.5 GHG Significance Criteria

3.5.1 The significance of GHG emissions impact has been assessed in line with IEMA guidance on Assessing Greenhouse Gas Emissions and Evaluating their Significance (IEMA, 2022). Originally published in 2017, the guidance has been updated to account for changes in legislation and policy.

3.5.2 In the revised guidance, mitigation is no longer an element to be considered towards the later stage of EIA process. Instead, mitigation should be considered from the outset and throughout the project's lifetime whilst also helping to deliver proportionate EIAs. Once the magnitude of emissions has been determined, mitigation measures should be proposed. Any mitigation measures that are committed to within a proposed development need to be included within the assessment.

3.5.3 The updated guidance describes five distinct levels of significance which are not solely based on whether a project emits GHG emissions alone, but how the project makes a relative contribution towards achieving a science-based 1.5°C aligned transition towards net zero.

3.5.4 Table 3.3. presents the IEMA significance levels.

Table 3.3. Significance of Effects for GHGs Impact Assessment (adopted from IEMA (2022)

Significance level	Effect	Description	Example in the guidance
Significant adverse	Major adverse	A project that follows a 'business-as-usual' or 'do minimum' approach and is not compatible with the UK's net zero trajectory, or accepted aligned practice or area based transition targets. It is down to the practitioner to differentiate between the 'level' of significant adverse effects e.g., 'moderate' or 'major' adverse effects.	The project's GHG impacts are not mitigated or are only compliant with do-minimum standards set through regulation, and do not provide further reductions required by existing local and national policy for projects of this type. A project with major adverse effects is locking in emissions and does not make a meaningful contribution to the UK's trajectory towards net zero.
	Moderate adverse		The project's GHG impacts are partially mitigated and may partially meet the applicable existing and emerging policy requirements but would not fully contribute to decarbonisation in line with local and national policy goals for projects of this type. A project with moderate adverse effects falls short of fully contributing to the UK's trajectory towards net zero.
Not significant	Minor adverse	A project that is compatible with the budgeted, science based 1.5°C trajectory (in terms of rate of emissions reduction) and which complies with up-to-date policy and 'good practice'	The project's GHG impacts would be fully consistent with applicable existing and emerging policy requirements and good practice design standards for projects of this type. A project with minor adverse

Significance level	Effect	Description	Example in the guidance
		reduction measures to achieve that. It may have residual emissions but is doing enough to align with and contribute to the relevant transition scenario, keeping the UK on track towards net zero by 2050 with at least a 78% reduction by 2035 and thereby potentially avoiding significant adverse effects.	effects is fully in line with measures necessary to achieve the UK's trajectory towards net zero.
	Negligible	A project that achieves emissions mitigation that goes substantially beyond the reduction trajectory, or substantially beyond existing and emerging policy compatible with that trajectory and has minimal residual emissions. This project is playing a part in achieving the rate of transition required by nationally set policy commitments.	The project's GHG impacts would be reduced through measures that go well beyond existing and emerging policy and design standards for projects of this type, such that radical decarbonisation or net zero is achieved well before 2050. A project with negligible effects provides GHG performance that is well 'ahead of the curve' for the trajectory towards net zero and has minimal residual emissions.
Significant Beneficial	Beneficial	A project that causes GHG emissions to be avoided or removed from the atmosphere. Only projects that actively reverse (rather than only reduce) the risk of severe climate change can be judged as having a beneficial effect.	The project's net GHG impacts are below zero and it causes a reduction in atmospheric GHG concentration, whether directly or indirectly, compared to the without-project baseline. A project with beneficial effects substantially exceeds net zero requirements with a positive climate impact.

3.5.5 It is down to the practitioner's professional judgement on how best to contextualise a project's GHG impact. In GHG accounting, it is considered good practice to contextualise emissions against pre-determined carbon budgets.

3.5.6 For the purpose of this assessment the Ireland carbon budgets have been used to provide content (Table 3.4).

Table 3.4: Carbon Budgets (Climate Change Advisory Council, 2022)

	2021-2025	2026-2030	2031-2035
Carbon Budget (Mt CO2e)	295	200	151

3.5.7 The first two budgets must demonstrate a 51% reduction against a 2018 baseline by 2030. Additionally, Ireland have committed to net zero by 2050.

3.5.8 The 2018 baseline for Ireland is approximately 60MtCO_2e (SEAI, 2022). A 51% reduction by 2030 equates to ca. 30MtCO_2e. Ireland's latest GHG inventory (2020) is approximately 56 MtCO_2e (SEAI, 2022).

3.5.9 In addition, there are Sectoral Emissions Ceilings for key sectors, including electricity generation. The electricity sector has a sectoral ceiling for 2023 of 3MtCO_2e (Government of Ireland 2022).

Climate Change Resilience (CCR) Assessment

3.6 Study Area (CCR assessment)

3.6.1 The study area for the CCR assessment is the Site of the Proposed Development i.e. it covers all assets and infrastructure which constitute the Proposed Development, during construction, operation (including maintenance) and decommissioning.

3.7 Determining the baseline (CCR assessment)

3.7.1 For the purposes of the CCR assessment, the baseline conditions are based upon historic climate change data obtained from Met Éireann recorded by the closest meteorological station to the Proposed Development (Birr, approximately 40 km east from the Site).

3.8 Sensitive receptor (CCR assessment)

3.8.1 The sensitive receptors for the CCR assessment include the Proposed Development during its lifetime. Receptors include both the building and operation of the assets as well as construction works, construction workers and operational staff.

3.9 Approach (CCR assessment)

3.9.1 The CCR assessment has considered the strategic aims and objectives encompassed within the Government's planning strategy and policy, which has the overarching aim of minimising the adverse impacts of climate change, whilst requiring new developments to take climate change considerations into account within design. This assessment of CCR is undertaken for the Proposed Development to identify potential climate change impacts, and to consider their potential consequence and likelihood of occurrence, taking account of the measures incorporated into the design of the Proposed Development.

3.9.2 For the operational phase of the Proposed Development, potential climate change impacts have been identified using relevant projections and conclusions from the EPA (2020) and considers their potential consequence to receptors and likelihood of occurrence, taking account of the measures incorporated into the design of the Proposed Development. Operational phase receptors may include the Proposed Development assets and their operation, maintenance and refurbishment (i.e., pavements, structures, earthworks and drainage, technology assets, etc.); and end-users (i.e., staff and commercial operators etc).

3.9.3 The potential climate change impacts identified in the CCR assessment are determined based on the EPA projections. The scope of the CCR assessment is set out in Table 3.5.

Table 3.5: Scope of the CCR Assessment

CLIMATE PARAMETER	SCOPED IN OR OUT	DECISION RATIONALE
Extreme weather event	In	The Proposed Development may be vulnerable to extreme weather events such as storm damage to structures and assets.
Precipitation	In	The Proposed Development may be vulnerable to changes in precipitation, for example, damage to structures and drainage systems during periods of heavy precipitation.
Temperature	In	Increased temperatures may increase cooling requirements of the Proposed Development and could impact on structural integrity of buildings and materials.
Sea level rise	Out	The Site is not located in an area that is susceptible to sea level rise.
Sea temperature	Out	The Proposed Development is not likely to be affected by the small increase in sea temperature during its operational life.
Wind	In	The Proposed Development may be affected by increases in wind velocity.

3.9.4 Consideration of climate change impacts within EIARs is an area of emerging practice. The approach outlined below is aligned with existing guidance such as that of IEMA (IEMA, 2020). The CCR assessment identifies potential climate change impacts and considers their potential consequence to receptors and likelihood of occurrence.

3.9.5 The following key terms and definitions relating to the CCR assessment have been used:

- Climate hazard – a weather or climate related event, which has potential to do harm to environmental or community receptors or assets, for example, increased winter precipitation;
- Climate change impact – an impact from a climate hazard which affects the ability of the receptor or asset to maintain its function or purpose; and
- Consequence – any effect on the receptor or asset resulting from the climate hazard having an impact.

3.9.6 The types of receptors considered vulnerable to climate change, are:

- Construction phase receptors (i.e., workforce, plant and machinery);
- The Proposed Development assets and their operation, maintenance and refurbishment (i.e., pavements, structures, earthworks and drainage, technology assets, etc.); and
- End-users (i.e., staff and commercial operators etc).

3.9.7 The assessment includes all infrastructure and assets associated with the Proposed Development. It assesses the resilience against both gradual climate change and the risks associated with an increased frequency of severe weather events as per the EPA climate change projections.

3.9.8 For the operational phase of the Proposed Development, once potential impacts have been identified, the likelihood and consequence of each impact occurring to each receptor (where relevant) are assessed for the selected future time frame for operation. Criteria used to determine the likelihood of an event occurring, based on its probability and frequency of occurrence, are detailed in Table 3.6.

Table 3.6: Description of Likelihood for Climate Change Hazard

LIKELIHOOD CATEGORY	DESCRIPTION (PROBABILITY AND FREQUENCY OF OCCURRENCE)
Very likely	90-100% probability that the hazard will occur
Likely	66-90% probability that the hazard will occur
Possible, about as likely as not	33-66% probability that the hazard will occur
Unlikely	0-33% probability that the hazard will occur
Very unlikely	0-10% probability that the hazard will occur

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

3.9.9 The consequence of an impact has been measured using the criteria detailed in Table.

Table 3.7: Measure of Consequence for CCR

CONSEQUENCE OF IMPACT	DESCRIPTION
Very high	Permanent damage to structures/ assets; Complete loss of operation/ service; Complete/ partial renewal of infrastructure; Serious health effects, possible loss of life; Extreme financial impact; and Exceptional environmental damage.
High	Extensive infrastructure damage and complete loss of service; Some infrastructure renewal; Major health impacts; Major financial loss; and Considerable environmental impacts.
Medium	Partial infrastructure damage and some loss of service; Moderate financial impact; Adverse effects on health; and Adverse impact on the environment.
Low	Localised infrastructure disruption and minor loss of service; No permanent damage, minor restoration work required; and Small financial losses and/ or slight adverse health or environmental effects.
Very low	No damage to infrastructure; No impacts on health or the environment; and No adverse financial impact.

3.9.10 Engagement is undertaken with relevant environmental disciplines and the engineering design team to discuss the CCR assessment and identify mitigation measures for incorporation into the design of the Proposed Development. Measures to adapt the Proposed Development are identified where potential climate change consequences are identified as being significant and would be reported in the EIAR.

3.9.11 The significance is determined by:

Likelihood of climate hazard occurring × consequence to receptor if climate hazard occurs

3.9.12 The identification of likely significant effects on receptors has been undertaken using professional judgement by combining the measure of likelihood with the predicted consequence of impact, as shown in Table 3.8.

Table 3.8: Significance Criteria for CCR Resilience Assessment

		LIKELIHOOD OF THE CLIMATE CHANGE HAZARD OCCURRING				
		Very unlikely	**Unlikely**	**Possible**	**Likely**	**Very likely**
Consequence of Climate Change Hazard Occurring (Table 3.7)	**Very Low**	Negligible	Negligible	Negligible	Negligible	Negligible
	Low	Negligible	Minor	Minor	Minor	Minor
	Medium	Negligible	Minor	Moderate	Moderate	Moderate
	High	Negligible	Minor	Moderate	Major	Major
	Very High	Negligible	Minor	Moderate	Major	Major

3.9.13 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.

3.9.14 The assessment also identifies and accounts for existing CCR measures either already in place or in development for infrastructure and assets, for example, mitigation measures for potential flooding impacts on the Proposed Development.

4.0 LIMITATIONS AND ASSUMPTIONS

4.1 Limitations (Greenhouse Gas Assessment)

4.1.1 Assumptions made as part of the GHG assessment are stated in section 6.1. Working with the design team we have captured all significant aspects of the Proposed Development. Where any ancillary elements have been excluded, it is not anticipated that this will have a significant impact in the context of the overall footprint.

4.2 Limitations (Climate Change Resilience Assessment)

4.2.1 Limitations associated with the approach to be taken for the climate resilience assessment relate to uncertainties inherent within Irish climate projections (EPA, 2015). By its very nature, climate change is associated with a range of assumptions and limitations.

4.2.2 The CCR review of construction impacts assumes that the measures outlined within the Development Design and Impact Avoidance section of this Chapter would be incorporated into the design of the Proposed Development. These measures are considered standard best practice that are usually applied across construction sites in the UK and ROI. No additional mitigation has been identified as necessary for the construction phase of the Proposed Development.

4.2.3 While modelled climate change projections represent anticipated average weather conditions, they do not capture the full range of possible future severe weather events (i.e. droughts, heatwaves and prolonged heavy rainfall).

4.2.4 The CCR review is limited to the availability of data and information at this stage of the assessment.

4.3 Assumptions, Inclusions and Exclusions

4.3.1 General assumptions relating to this assessment are listed below. Specific scenario assumptions are listed in Sections 5.0 and 5.2.

- The baseline scenario calculations are based upon the activities within the Site as outlined in Chapter 4: Existing Conditions;
- The construction and operations scenario are based upon the activities detailed in Chapter 5: The Proposed Development;
- Construction of the Proposed Development will take 18-24 months (the GHG assessment is based on 22 months of construction);
- The operational design life of the Proposed Development will be at least 25 years; and
- Decommissioning activities are described qualitatively only due to the absence of information regarding these activities at this stage of the design.

5.0 BASELINE ENVIRONMENT

5.1 Greenhouse Gas Baseline

5.1.1 As discussed in Section 4, the baseline scenario was determined to be the activities within the Site that will lead to carbon emissions or carbon sinks if the Proposed Development does not go ahead.

5.1.2 The primary source of carbon emissions on the existing site derives from the natural gas burnt within the proposed Power Station.

5.1.3 A carbon stock is defined as a quantity of carbon stored within the area, usually in the form of soils and biomass.

5.1.4 The Site is located adjacent to the existing CCGT Power Station Site, which comprises a 400MW Combined Cycle Gas Turbine (CCGT) peaking plant. In 2020, the existing Tynagh CCGT power station exported 1,697GWh, and released 675,450 tonnes of carbon dioxide.

5.1.5 The GHGs that would be associated with the baseline scenario have been calculated using the methodology described in Section 4, and the results are based upon the assumptions listed below:

- The Proposed Development area covers 8.3 hectares of industrial and brownfield land.
- The area is fully under hardstanding and brownfield.

5.1.6 The Proposed Development includes 1 no. Flue Gas Stack which will be the emissions point of the new (OCGT) gas fired generation firing primarily on natural gas. However, the OCGT will also have the functionality to fire on distillate fuel (stored on site) in the exceptional event of a loss of pressure in the gas supply to the site and when other generation methods are unable meet demand. The components that make up the Proposed Development are presented in Chapter 5: Proposed Development.

5.1.7 Table 4.1 provides the baseline CO2 intensity for electricity generation in Ireland.

Table 4.1: Electricity CO2 intensity per fuel source

GENERATION SOURCE BY FUEL TYPE	EMISSIONS (TONNES OF CO_2 PER GWH OF ELECTRICITY SUPPLIED)
Gas (SEAI, 2022)	188
All fuels, ROI grid average (including nuclear and renewables) (SEAI, 2022)	296

5.2 Climate Change Resilience Baseline

Current Baseline

5.2.1 The current baseline for the CCR review is based on historic climate data obtained from Met Éireann (2021) recorded by the closest meteorological station to the Proposed Development (Birr, approximately 40 km east from the Site) for the period 1979-2008. This data is listed in Table 5.1.

Table 5.1: Historic 30-year averages for temperature and rainfall

CLIMATIC VARIABLE	MONTH	VALUE
Average annual maximum daily temperature (°C)	-	9.8
Warmest month on average (°C)	July	15.6
Coldest month on average (°C)	January	5.1
Mean annual rainfall levels (mm)	-	845.7
Wettest month on average (mm)	October	94.2
Driest month on average (mm)	April	55
Months with lowest average number of days with less than 0.2 mm of rainfall (days)	April	15
Month with greatest number of days with gales (days)	January/ February	0.2

5.3 Future Climate Resilience Baseline

5.3.1 The future baseline will be used to determine the likely future climate change impacts on the Proposed Development and where potential climate adaption measures are required. The EPA (EPA, 2020) on the regional climate model projections for Ireland presents the following climate change projections for RCP8.5, mid-century (2041-2060), against a baseline period of 1981-2000:

- Temperature projections suggest an increase in mean annual temperatures of 1.3-1.6°C;
- Mean winter temperature projections indicate an increase of 1.2°C in Ireland;
- Mean summer temperature projections indicate an increase of 1.5°C in Ireland;
- Average annual rainfall is projected to decrease;
- Rainfall projections indicate a significant decrease in average precipitation levels for summer. “Likely” reductions in summer rainfall of 2% to 17% are anticipated;
- Projections for average winter precipitation show only small projected changes;
- “Likely” increases in the number of ‘wet days’ and ‘very wet days’ for winter and autumn months of between 5 and 19%;
- The number of extended dry periods (defined as at least 5 consecutive days for which the daily precipitation is less than 1 mm) is also expected to increase over the year, particularly in summer and autumn, with “likely” values ranging from a 11% to 48% increase;
- Storms affecting Ireland are anticipated to decrease in frequency, but increase in severity, increasing the risk of damage to infrastructure;
- Wind energy is projected to decrease in spring, summer and autumn, while projected increases in wind energy in the winter were found to be statistically insignificant.

6.0 CONSTRUCTION IMPACTS AND EFFECTS

6.1 Greenhouse Gas Assessment

6.1.1 To assess the magnitude of the climate change impacts through GHGs associated with construction of the Proposed Development, the emissions that would be associated with the project activities have been calculated and listed in Table 6.1 based on the assumptions listed below:

- Construction activities will take 18-24 months. The GHG assessment is based on 22 months, with approximately 572 working days). This figure is based on construction activities being undertaken from Monday to Saturday;
- Construction works would typically take place during the hours of 0700hrs to 1900hrs (Monday to Friday) and 0700hrs to 1300hrs (Saturday) with the exception of commissioning and specific engineering works (e.g., concrete pours) which could take place outside these hours;
- Construction workers and vehicle numbers are as per the Traffic chapter (refer to EIAR Volume I, Chapter 14).
- The materials and consumables required during construction have been assumed to be sourced from an average of 50 km from Site;
- Additional components (gas turbine, generator and transformer block) have been assumed to be imported from an average of 1000km from Site (likely from Europe).
- Emissions from electricity estimated based on average load of 1MW during construction period, are expected to be supplied by existing CCGT plant;
- Emissions from fuel use estimated based on average number of plant on Site over construction period, operating for the duration of construction hours at an average power rating of 200kW;
- Volumes of materials for the emissions stack was estimated based on height and diameter provided and embodied carbon calculated (assumed steel, diameter of 9m, 15mm wall thickness and 40m high).
- Estimated weights of each key component – gas turbine (350 tonnes), generator (425 tonnes), transformer bank (322 tonnes) - were provided and embodied carbon calculated (assumed steel).
- Volumes of materials for the acoustic barrier was estimated on height (10m) and length (approx. 115m) and assumed to be made of concrete.
- As part of the earthworks, 21,000m^3 of imported fill will be required.
- Working with the design team we have captured all significant embodied carbon associated with the Proposed Development. Where any ancillary elements have been excluded, it is not anticipated that this will have a significant impact in the context of the overall footprint.

6.1.2 Calculated in line with the methodology stated in Section 3, the total GHGs from constructing the Proposed Development are estimated to be 8,484 tCO_2e (Table 6.1).

Table 6.1: Construction GHG emissions (OCGT)

LIFECYCLE STAGE	PROJECT ACTIVITY/ EMISSIONS SOURCE	EMISSIONS (TCO_2E)	% OF CONSTRUCTION PHASE EMISSIONS
Product Stage	Embodied carbon of materials and products	3,235	38%
	Materials and product transport	193	2%
Construction Stage	Electricity usage	2,047	24%
	Fuel usage onsite	2,988	35%
	Waste disposal	5	0.1%
	Worker commute	14	0.2%
TOTAL		**8,484**	**100%**

6.1.3 As stated in Section 4.5, all emissions can be considered significant (IEMA, 2022). To contextualise the level of significance, emissions are compared to the Irish carbon budgets. Emissions from the construction of the Proposed Development contribute considerably less than 1% of any carbon budget (Table 6.1).

Table 6.1: Construction GHG emissions (OCGT)

CARBON BUDGET	TOTAL BUDGET (MTCO2E)	ANNUAL BUDGET (MTCO2E)	PROJECT ANNUAL EMISSIONS ($MTCO_2E$)	% OF CONTRIBUTION OF CONSTRUCTION EMISSIONS
2021-2025	295	59	0.0046	0.01%

6.1.4 A Proposed Development is compatible with the budgeted, science based 1.5°C trajectory in terms of rate of emissions reduction and the GHG impacts from the Proposed Development would be fully consistent with applicable existing and emerging policy requirements and good practice design standards for projects of this type. Therefore, using significance levels as per Table 3.3, the significance of effects is considered as 'minor adverse' and therefore not significant. A project with minor adverse effects is fully in line with measures necessary to achieve the Ireland's trajectory towards net zero. These emissions do reflect the unavoidable emissions that are required to construct the Proposed Development. However, the construction period is relatively short duration (18-24 months).

6.2 Climate Change Resilience Assessment

Construction Impacts and Effects

6.2.1 During construction, receptors such as the construction work force, construction plant, vehicles, materials and workplan may be vulnerable to a range of climate risks. These could include;

- Inaccessible construction Site due to severe weather event (flooding, snow and ice, storms) restricting working hours and delaying construction;
- Health and safety risks to the workforce during severe weather events;
- Unsuitable conditions (due to very hot weather or very wet weather, for example) for certain construction activities; and
- Damage to construction materials, plant and equipment, including damage to temporary buildings/ facilities within the Site boundary, such as offices, compounds, material storage areas and worksites, for example as a result of stormy weather.

6.2.2 As per section 4, we applied a qualitative approach to review climate change resilience. Climate change resilience impacts during construction are expected to be minimal. Any impacts will be minimised during construction through a Construction Environmental Management Plan (CEMP). An Outline CEMP is included in EIAR Appendix 5A (refer to EIAR Volume II).

7.0 OPERATIONAL IMPACTS AND EFFECTS

7.1 Greenhouse Gas Assessment

Operational Emissions

7.1.1 With regard to the operational phase, it is envisaged that the Proposed Development will have a design life of at least 25 years. For the purpose of the environmental assessment, the lifetime of the Proposed Development is estimated as 25 years and this is based on the design life of the equipment proposed. The operational requirements of the Proposed Development will inevitably change during its design life and it will be subject to regular reviews to identify potential modifications and amendments that would allow the asset to have a future sustainable use beyond 25 years.

7.1.2 At the end of the design life, the Proposed Development would either be decommissioned, or the lifetime could potentially be extended. Decommissioning or extension of the lifetime of the asset would therefore be expected to commence at some point after 2052.

7.1.3 To assess the magnitude of the climate change impacts through GHGs associated with operating and maintaining the Proposed Development, the GHGs that would be associated with the project's operational activities have been calculated and listed in Table 7.3 based on the assumptions listed below:

- Operational activities will be undertaken for 25 years. As a peaking plant, the plant is expected to run for approximately 1,500 working hours a year.
- There is no land use change taking place;
- Approximately three staff members on site at any one time and two shifts per day;
- Electricity requirements will be taken from directly from the Tynagh Power Station during operation. Outside of operation electricity will be supplied by the Irish National Grid. The site requires 1MW continuous supply on standby; assuming 1,500 hours a year operating hours, 7,260 hours on stand-by, equates to 7,260 MWh per year;
- Additional fuels used at the Proposed Development include distillate fuel which is tested for 1.5 hours per month;
- Natural gas is supplied via pipeline and AGI. Backup fuels have been assumed to be available an average of 50 km from Site;
- Replacement of a limited number of capital parts will be required during the operational life. Embodied carbon data of these parts is not available and has not been included in the calculation, however is expected to be immaterial;
- The plant will burn approximately 130,366,060 m^3 of natural gas per year, and create an average electrical output of 521 GWh (maximum);

7.1.4 Calculated in line with the methodology stated in Section 3, the gross GHGs from operating the Proposed Development over its 25-year life are estimated to be 9,203,947 tCO_2e. Annual emissions are expected to be approximately 368,158 tCO_2e (Table 7.1).

Table 7.1: Gross operational GHGs (assumes 1 x 350 MW)

LIFECYCLE STAGE	PROJECT ACTIVITY/ EMISSIONS SOURCE	EMISSIONS (TCO_2E) ANNUAL	EMISSIONS (TCO_2E) 25 YEAR TOTAL	% OF OPERATIONAL EMISSIONS
Operational	Fuel usage onsite: natural gas	360,414	9,010,338	98%
	Fuel usage onsite: other fuels	7,733	193,331	2%
	Worker commute	11	278	-
	Water	0.01	0.23	-
TOTAL		**368,158**	**9,203,947**	**100%**

7.1.5 All emissions could be considered significant (IEMA, 2022). Emissions from the operation of the Proposed Development are presented in the context of the carbon budgets, 2026-2035 in Table 7.2 and the 2030 sectoral emissions ceiling for the electricity sector.

Table 7.2: Operational GHG emissions (OCGT)

CARBON BUDGET	TOTAL BUDGET (MTCO2E)	ANNUAL BUDGET (MTCO2E)	PROJECT ANNUAL EMISSIONS ($MTCO_2E$)	% OF CONTRIBUTION OF OPERATIONAL EMISSIONS
2026-2030	200	40	0.3682	0.92%
2031-2035	151	30.2	0.3682	1.22%

7.1.6 The electricity sector has a sectoral ceiling for 2023 of $3MtCO_2e$ (Government of Ireland 2022). Against this ceiling operation of the Proposed Development equates to 12% of the budget.

7.1.7 The carbon intensity of electricity generated by the Proposed Development is 692 tCO_2e per GWh. This has been calculated based on the plant burning approximately 130,366,060 m3 of natural gas per year, to generate an average electrical output of 521 GWh.

7.1.8 The Proposed Development would provide additional peak power generation capacity, which would contribute to providing a secure energy supply to the national grid. A key component of ROI's decarbonisation strategy is to target 70% renewable electricity by 2030. To allow this uptake of renewable energy to happen it is necessary to have in place sources of energy generation that can be efficiently dispatched to cover any imbalances in supply and demand. As the use of coal and peat for electricity generation is reduced, natural gas has been identified as a relatively lower-carbon option to provide security of supply.

7.1.9 The GHG assessment demonstrates that in comparison with ROI average gas power stations, the Proposed Development produces an additional 475 tonnes of CO_2e per GWh of electricity generated. This is to be expected as the Proposed Development is a peaking plant to be used for short periods of time, only operating for approximately 1,500 hours per annum and is therefore likely to be less efficient than the grid average or average gas power stations (the latter including a number that operate as base load and which can therefore be more efficient).

7.1.10 The Proposed Development is due to be operational until 2052, at which point would either be decommissioned, or the lifetime could potentially be extended.

7.1.11 Using the criteria set out in Table 3.3, the Proposed Development can be defined as 'moderate adverse' effect. The plant will continue to operate beyond 2050 and therefore falls short of fully contributing to ROI's net zero trajectory

7.1.12 However, it is also acknowledged that whilst the ROI is moving towards decarbonising the grid, gas-fired peaking plant power stations are required as an important part of the overall transition fuel mix in order to ensure the ROI's energy security. As previously stated, the operational requirements of the Proposed Development will inevitably change during its design life and it will be subject to regular reviews to identify potential modifications and amendments to enable continued alignment with ROI climate goals.

7.2 Climate Change Resilience Assessment

7.2.1 The key potential climate change impacts on the Proposed Development and the adaptation methods to increase the resilience of the Proposed Development are detailed in Table 7.3.

Table 7.3. Potential Climate Change Impacts and Relevant Adaptation / Resilience Measures

Climate Hazard Type	Climate Hazard Projection	Sensitive Receptor	Description of Potential Impact	Embedded Design Measure	Likelihood of Impact Occurring	Consequence of Impact Occurring	Resilience Risk Level	Significant?	Additional Mitigation or Monitoring Measures
Increase in annual temperature	Likely	Built terrestrial assets, staff facilities and access routes to sites	See- Increase in summer temperature	See- Increase in summer temperature	Possible	Low	Minor	No	None Required
Increase in summer temperature	Likely	Assets, facilities, roads	Overheating of electrical equipment Heat damage, deformation, cracking and thermal expansion of building surfaces and pavements	• Electrical connections would be buried underground, insulating against overheating in times of heatwaves. • All buildings would be designed to Irish standards and specifications.	Very Unlikely	Medium	Negligible	No	None Required
		Staff, visitors on-site	Impacts on the thermal comfort of building users Increase in ambient temperature of buildings, leading to higher air conditioning requirements and impacts on the	• Detailed design of air conditioning units for offices would include an allowance for future rise in ambient temperature. • All buildings would be designed to Irish standards and specifications.	Very Unlikely	Low	Negligible	No	None Required

Climate Hazard Type	Climate Hazard Projection	Sensitive Receptor	Description of Potential Impact	Embedded Design Measure	Likelihood of Impact Occurring	Consequence of Impact Occurring	Resilience Risk Level	Significant?	Additional Mitigation or Monitoring Measures
			thermal comfort of building users						
		Function of facility	Reduced efficiency of CCGT operations- An increase in summer temperature could impact the base load plant efficiency	• The power plant is designed to operate over a large range of ambient conditions and the plant efficiency difference is less than 1%, therefore Temperature changes would not have a noticeable impact.	Likely	Low	Minor	No	None Required
Increase in winter temperature	Likely	Built terrestrial assets, staff facilities and access routes to sites	None considered	None considered	Very Unlikely	Very Low	Negligible	No	None Required
Decrease in annual rainfall	Likely	Assets, facilities, roads	See- Decrease in summer rainfall	See- Decrease in summer rainfall	Very Unlikely	Medium	Negligible	No	None Required
Decrease in summer rainfall	Likely	Assets, facilities, roads	Water shortages Drying out of pavement structures Deterioration of structures or	• The Power Plant utilises air cooled heat exchangers rather than use of cooling water.	Very Unlikely	Low	Negligible	No	None Required

Climate Hazard Type	Climate Hazard Projection	Sensitive Receptor	Description of Potential Impact	Embedded Design Measure	Likelihood of Impact Occurring	Consequence of Impact Occurring	Resilience Risk Level	Significant?	Additional Mitigation or Monitoring Measures
			foundations due to decrease in soil moisture levels Insufficient water for plant cooling	• Buildings would utilise water efficient fixtures • All buildings would be designed to Irish standards and specifications					
Increase to winter rainfall	Possible	Built terrestrial assets, staff facilities and access routes to sites Staff, contractors, and visitors	Surface water flooding and standing waters Deterioration of structures or foundations due to increase in soil moisture levels Damage to building surfaces/ exposed utilities from increased drying/ wetting and increase frost penetration Loss or damage to materials	• The FRA considers climate change considerations of the 'mid-range' and 'high end' future scenarios including increases in extreme rainfall, flood flow and flash flood times	Unlikely	Medium	Minor	No	None Required
Increase to heat waves	Possible	Staff, visitors on-site	See- Increase in summer temperature	See- Increase in summer temperature	Very Unlikely	Low	Negligible	No	None Required

Climate Hazard Type	Climate Hazard Projection	Sensitive Receptor	Description of Potential Impact	Embedded Design Measure	Likelihood of Impact Occurring	Consequence of Impact Occurring	Resilience Risk Level	Significant?	Additional Mitigation or Monitoring Measures
		Function of facility	See- Increase in summer temperature	See- Increase in summer temperature	Likely	Low	Minor	No	None Required
Increase droughts	Likely	Assets, facilities, roads	See- Decrease in summer rainfall	See- Decrease in summer rainfall	Very Unlikely	Low	Negligible	No	None Required
Increase in storm frequency	Very Unlikely	Flooding on site	Increase to rainfall leading to increases in fluvial flows Greater storm surge generation Surface water flooding and standing waters Deterioration of structures or foundations due to increase in soil moisture levels Damage to building surfaces/ exposed utilities from increased drying/ wetting and increase frost penetration .	• The FRA considers climate change considerations of the 'mid-range' and 'high end' future scenarios including increases in extreme rainfall, flood flow and flash flood times • All buildings would be designed to Irish standards and specifications	Very Unlikely	Medium	Negligible	No	None Required

Climate Hazard Type	Climate Hazard Projection	Sensitive Receptor	Description of Potential Impact	Embedded Design Measure	Likelihood of Impact Occurring	Consequence of Impact Occurring	Resilience Risk Level	Significant?	Additional Mitigation or Monitoring Measures
Increase in storm intensity	Likely	Built terrestrial assets, staff facilities and access routes to sites Staff, contractors, and visitors	Increase to rainfall leading to increases in fluvial flows Greater storm surge generation Surface water flooding and standing waters Deterioration of structures or foundations due to increase in soil moisture levels Damage to building surfaces/ exposed utilities from increased drying/ wetting and increase frost penetration.	• The FRA considers climate change considerations of the 'mid-range' and 'high end' future scenarios including increases in extreme rainfall, flood flow and flash flood times • All buildings would be designed to Irish standards and specifications	Possible	Medium	Moderate	No	None Required

8.0 DECOMMISSIONING IMPACTS AND EFFECTS

8.1 Greenhouse Gas Assessment

8.1.1 Activities associated with the decommissioning phase of this Proposed Development are listed in Table 3.2.

8.1.2 At this stage of the design process, details regarding decommissioning activities have not been developed. However, decommissioning is likely to be undertaken in a timeframe and scale that is similar to construction activities. In comparison to the construction emissions there will be no materials (which typically account for ca.70-90% of construction emissions; emissions associated with waste and transport will be higher but not significant). Emission factors for the disposal of wastes are generally lower than the emissions factors for the production of the same materials (the embodied carbon).

8.1.3 Decommissioning will therefore emit GHGs, however the emissions are expected to be less than those calculated for the construction phase and therefore not likely to be significant in terms of the ROI's national GHG inventory or the ability of the ROI to meet its carbon budgets.

8.2 Climate Change Resilience Assessment

8.2.1 During decommissioning, receptors such as the construction work force, construction plant, vehicles, materials and workplan may be vulnerable to a range of climate risks. These could include;

- Inaccessible construction Site due to severe weather event (flooding, snow and ice, storms) restricting working hours and delaying construction;
- Health and safety risks to the workforce during severe weather events;
- Unsuitable conditions (due to very hot weather or very wet weather, for example) for certain construction activities; and
- Damage to construction materials, plant and equipment, including damage to temporary buildings/ facilities within the Site boundary, such as offices, compounds, material storage areas and worksites, for example as a result of stormy weather.

8.2.2 As per section 4, a qualitative approach was applied to review climate change resilience. Impacts will be minimised during construction through the Decommissioning Environmental Management Plan.

9.0 CUMULATIVE IMPACTS

9.1 Greenhouse Gas Assessment

9.1.1 The GHG assessment has been considered in the context of Ireland's national GHG emissions, thereby demonstrating the cumulative effect at a country level. Due to the global nature of GHG emissions it is not appropriate to limit a cumulative impact assessment to local developments. However, a cumulative impact assessment has been carried out for the combined impacts at Tynagh Power Station.

9.1.2 The Site is located adjacent to the existing CCGT Power Station Site, which comprises a 400MW Combined Cycle Gas Turbine (CCGT) peaking plant. In 2020, the existing CCGT power station exported 1,697GWh, and released 675,450 tonnes of carbon dioxide.

9.1.3 In addition, the Tynagh power Station site will include, for assessment purposes, the Approved Development planning application Ref. 21/2192 (which is unable to be developed by the Applicant but is included to ensure a robust assessment as it has a valid planning consent) estimated annual emissions of 237,146 tCO_2e.

9.1.4 Annual emissions for the Proposed Development covered in this Chapter are expected to be approximately 368,158 tCO_2e (Table 7.1).

9.1.5 As stated, all emissions could be considered significant (IEMA, 2022). Emissions from the operation of the Proposed Development are presented in the context of the carbon budgets, 2026-2035 in Table 9.1 and the sectoral ceiling for the electricity sector.

9.1.6 The cumulative GHG assessment accounts for less than 5% of Ireland's carbon budgets.

Table 9.1: Cumulative GHG emissions (existing CCGT, OCGT and the Proposed Development OCGT)

CARBON BUDGET	TOTAL BUDGET (MTCO2E)	ANNUAL BUDGET (MTCO2E)	CUMULATIVE ANNUAL EMISSIONS ($MTCO_2E$)	% OF CONTRIBUTION OF CONSTRUCTION EMISSIONS
2026-2030	200	40	1.2808	3%
2031-2035	151	30.2	1.2808	4%

9.1.7 The cumulative GHG assessment accounts for 42.7% of the 2030 sectoral ceiling for the electricity sector.

10.0 CONCLUSIONS

10.1 Greenhouse Gas Assessment

10.1.1 The total GHGs from construction of the Proposed Development are estimated to be 8,484 tCO_2e.

10.1.2 The gross GHGs from operating the Proposed Development over its (at least) 25-year life are estimated to be 9,203,947 tCO_2e. Annual emissions are expected to be approximately 368,158 tCO_2e.

10.1.3 The Proposed Development would provide additional peak power generation capacity, which would contribute to providing a secure energy supply to the national grid. A key component of ROI's decarbonisation strategy is to target 70% renewable electricity by 2030. To allow this uptake of renewable energy to happen it is necessary to have in place sources of energy generation that can be efficiently dispatched to cover any imbalances in supply and demand. As the use of coal and peat for electricity generation is reduced, natural gas has been identified as a relatively lower-carbon option to provide security of supply.

10.1.4 The Proposed Development can be defined as 'moderate adverse' effect. The plant will continue to operate beyond 2050 and therefore falls short of fully contributing to ROI's net zero trajectory.

10.1.5 However, it is also acknowledged that whilst the ROI is moving towards decarbonising the grid, gas-fired peaking plant power stations are required as an important part of the overall transition fuel mix in order to ensure the ROI's energy security. As previously stated, the operational requirements of the Proposed Development will inevitably change during its design life and it will be subject to regular reviews to identify potential modifications and amendments to enable continued alignment with ROI climate goals.

10.2 Climate Change Resilience Assessment

10.2.1 Climate change resilience impacts during construction are expected to be minimal. Any impacts will be minimised during construction through a Construction Environmental Management Plan (CEMP).

10.2.2 The key potential climate change impacts on the Proposed Development during operation are deemed to be small, and the adaptation methods to increase the resilience of the Proposed Development have been identified.

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