HERBATA DATA CENTRE, NAAS

EIAR
VOLUME I MAIN TEXT – CHAPTER 16 CLIMATE CHANGE

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16 CLIMATE CHANGE

16.1 Introduction

This chapter of the Environmental Impact Assessment Report (EIAR) presents the findings of the environmental impact assessment (EIA) concerning the potential environmental effects of the Data Centre Application and the Substation Application (which together constitute the 'Project') on and from climate change (as described in Chapter 4, section 4.1).

Climate change in the context of EIA can be considered broadly in two parts:

- The impact of greenhouse gas (GHG) emissions caused directly or indirectly by the Project, which contribute to climate change; and
- The potential impact of changes in climate on the Project, which could affect it directly or could modify its other environmental impacts.

This chapter is supported by the following appendices contained within Volume II:

- Appendix 16.1 – Climate Change Policy Review;
- Appendix 16.2 – Climate Change Risk Assessment; and
- Appendix 16.3 – GHG Calculations.

The assessment considers the effects of the 'do nothing' scenario, where the Project is assessed as not going forwards, and then assesses the likely significant environmental effects resultant from the Project (based on the site description detailed within Chapter 4 Description of the Project, which includes details of the key components and construction). Further mitigation is then identified where necessary, and residual effects identified. This approach is further detailed within Chapter 1 of this EIAR.

16.2 Methodology

16.2.1 Planning Policy Context

A summary of relevant policy is given in this section. Full references are provided in Appendix 16.1 Climate Change Policy Review, Volume II. The Energy Policy Compliance Report (HDR, 2024a), Appendix 4.9 to this EIAR, further details the Project against Ireland's current national and local energy, climate and planning policies.

The most recent approved Climate Action Plan 2024 (Government of Ireland, 2024a) sets a course for Ireland's targets to halve emissions by 2030 and reach net zero no later than 2050. Ireland's national climate objective and 2030 targets are aligned with Ireland's obligations under the Paris Agreement, to set the long term goal to limit warming to below 2°C above pre-industrial levels, and to pursue efforts to limit the temperature increase to 1.5°C. The Plan details efforts to reduce emissions associated with large energy users (such as the Project) and address electricity demand and grid flexibility. The Plan highlights that estimated emissions reductions fall short of the level of abatement required to meet national and international targets. Corrective actions by sector are detailed, and include the acceleration of renewable electricity generation, and increased focus on the decarbonisation of cement and construction.

Ireland's Long-Term Strategy on Greenhouse Gas Reductions (Government of Ireland, 2024b) sets out indicative pathways, beyond 2030, towards achieving carbon neutrality for Ireland by 2050. The Strategy provides a pathway to a whole-of-society transformation and links shorter-term Climate Action Plans and Carbon Budgets, and the longer-term objective of the European Climate Law and Ireland's National Climate Objective. Core measures identified as necessary to deliver a net zero emissions electricity sector include significantly higher renewable power capacity (largely through onshore and offshore wind, and solar PV), and increased deployment of flexible technologies and practices that could enable the grid to function with high levels of intermittent power sources (i.e. battery storage, and storage of renewable power as gas). With regards to the built environment, the Strategy highlights the importance of promoting the use of lower carbon alternatives in construction.

Ireland's National Adaptation Framework sets out a national adaptation strategy which aims to reduce vulnerability of Ireland's economy and society to the impacts of Climate Change. It identifies that the most immediate Climate Change influenced risks to Ireland are the associated changes in extreme weather, such as floods, precipitation, and storms. The framework therefore highlights the need to develop effective emergency planning for the short-term immediate effects, whilst building long-term resilience.

The Government of Ireland developed 12 Sectoral Adaption Plans under the National Adaption Framework. The plans outline how the different sectors must prepare for and adapt to the risks associated with climate change. Plans that are currently available, and are of relevance to the Project include the Electricity & Gas Sector Climate Change Adaptation Plan, and the Communications Sector Climate Change Adaptation Plan, both of which are detailed in Appendix 16.1 Climate Change Policy Review, Volume II.

The Government's Statement on the Role of Data Centres in Ireland's Enterprise Strategy (Government of Ireland, 2022) sets out principles that should inform and guide decisions on future data centre development. Such principles include: making efficient use of the electricity grid, using available capacity and alleviating any constraints; demonstrating additionality in their use of renewables; co-location of renewable generation facilities or advanced storage alongside the data centre, supported by Corporate Power Purchase Agreements, private wire, or other arrangement; and prioritising decarbonisation pathway, to ultimately achieve net zero data services.

With regard to local policy, the Kildare County Development Plan 2023-2029 (Kildare County Council, 2023) requires data centres to include strong energy efficiency measures to reduce their carbon footprint in support of national targets towards a net zero carbon economy, through the use of sustainable sources of energy generation and the use of renewable sources of energy to power their operations. Data centre developments must also explore the potential for low carbon district heating networks. The Plan also requires development to consider the necessity of adaptation to climate change, in particular having regard to flood risks, and considering the development's location, layout and design.

The Kildare County Development Plan 2023-2029 states that all data centre developments should be signatories to The Climate Neutral Data Centre Pact (2023), a pledge in response to the European Green Deal that aims to ensure data centres are climate neutral by 2030. The pact prioritises energy efficiency, water consumption, heat recovery and the re-use and repair of servers.

The Pact aims to ensure data centres are an integral part of the sustainable future in Europe and requires the following actions to be committed to: data centres and server rooms shall meet a high standard for energy efficiency; data centres will match their electricity supply through the purchase of clean energy; data centres will meet high standards for water conservation; opportunities to connect with district heating systems should be explored.

Further local policy within the Naas Local Area Plan 2021-2028 (Kildare County Council, 2021) requires data centres to consider targeted reductions in GHG emissions, and to include measures to generate energy on site, as part of the overall development proposal.

16.2.2 Relevant Legislation and Guidance

A summary of relevant legislation and guidance is given in this section. Full references are provided in Appendix 16.1 Climate Change Policy Review, Volume II. The Energy Policy Compliance Report (HDR, 2024a), appendix 4.9 to this EIAR, further details the Project against Ireland's current national and local energy, climate and planning policies.

16.2.2.1 Legislation

The National Policy Position on Climate Action and Low Carbon Development (Government of Ireland, 2014) was published in April 2014. The policy sets a fundamental national objective to achieve a transition to a competitive, low-carbon, climate-resilient and environmentally sustainable economy by 2050. The policy states that GHG mitigation and adaptation to the impacts of climate change are to be addressed in parallel national strategies – respectively through a series of mitigation plans and climate change adaptation frameworks.

The Climate Action and Low Carbon Development Act 2015 ensures developments are lawfully compliant in pursuing the transition to a low carbon, climate resilient and environmentally sustainable economy. A key element of this act is that developments should perform in a consistent manner with:

> *"(a) the most recent approved climate action plan,*

(b) the most recent approved national long term climate action strategy,

(c) the most recent approved national adaptation framework and approved sectoral adaptation plans,

(d) the furtherance of the national climate objective, and

(e) the objective of mitigating greenhouse gas emissions and adapting to the effects of climate change in the State."

The Climate Action and Low Carbon Development (Amendment) Act 2021 builds on the aforementioned 2015 Act and provides for the establishment of carbon budgets in support of achieving Ireland's climate ambition. The carbon budget programme, comprising three five-year budgets, came into effect on 6 April 2022 for the following periods:

- Budget 1 from 2021-2025 has been set at 295 $MtCO_2e$ (Million tonnes of Carbon dioxide equivalent) representing an average of 4.8% reduction per annum for the first budget period.
- Budget 2 from 2026-2030 has been set at 200 $MtCO_2e$ representing an average of 8.3% reduction per annum for the second budget period.
- Budget 3 from 2031-2035 has been set at 151 $MtCO_2e$ representing an average of 3.5% reduction per annum for the third provisional budget.

To deliver these targets, in July 2022 the government established Sectoral Emissions Ceilings which set maximum limits on GHG emissions for each sector of the Irish economy to the end of the decade. For the commercial built environment, the 2030 ceiling is 1 $MtCO_2e$ which represents a 45% reduction on 2018 levels (2 $MtCO_2e$). Further information is detailed in the Sectoral Emissions Ceilings Summary Report (Government of Ireland, 2022).

Ireland's 2030 target under the EU's Effort Sharing Regulation (ESR) is to deliver a 30% reduction of emissions compared to 2005 levels by 2030. This target concerns sectors such as transport, buildings, agriculture and waste, but does not include electricity providers, where resultant emissions fall under the EU's Emissions Trading System (ETS).

The EU ETS places a cap on GHG emissions that can be emitted by power plants, industry factories and the aviation sector. Within the cap, companies receive or buy emission allowances, which may be traded as needed. The cap decreases every year, ensuring that total emissions fall. Over the period 2021-2030 the emissions cap will continue to decrease annually by a factor of 2.2% (European Commission, n.d.).

Ireland's Nationally Determined Contribution (NDC) under the Paris Agreement to the United Nations Framework Convention on Climate Change (UNFCCC), submitted in December 2020, commits Ireland to 40% reduction in emissions by 2030, compared to 1990 levels.

16.2.2.2 Guidance and Recommendations

The main guidance used for the assessment of GHG emissions in EIA is the Institute of Environmental Management and Assessment (IEMA) guide 'Assessing Greenhouse Gas Emissions and Evaluating their Significance' (IEMA, 2022).

The main guidance document with regard to climate risk and resilience assessment within the context of EIA is the Environmental Impact Assessment Guide to: Climate Change Resilience & Adaptation (IEMA, 2020).

Additional guidance used for the quantification of GHG emissions includes:

- the Greenhouse Gas Protocol suite of documents (World Resources Institute (WRI) and World Business Council for Sustainable Development (WBCSD), 2004);
- Sustainable Energy Authority of Ireland (SEAI) Emission Conversion Factors; and
- the European Commission (2013) Guidance on Integrating Climate Change and Biodiversity into Environmental Impact Assessment.

16.2.3 Study Area

GHG emissions have a global effect rather than directly affecting any specific local receptor. The impact of GHG emissions occurring due to the Project on the global atmospheric concentration of the relevant GHGs, expressed in CO_2-equivalents (CO_2e), is therefore considered within this assessment.

The climate change risk study area are the regional climate projections for county Kildare, which the Project site is located in.

16.2.4 Baseline Methodology

The baseline methodology is divided between the assessment of GHG emissions and climate resilience and adaptation.

The current and future baseline conditions relevant to the Project with regards to the impact of GHGs comprise the following:

- Existing and future emissions within the assessment boundary without the construction and operation of the Project, this includes any existing GHG sources or sinks from current land use; and
- The current and future baseline for grid-average intensity and natural gas has been established quantitatively through the use of published benchmarks, and qualitatively through national decarbonisation targets.

With regard to current climate, the baseline is the current local and regional climate and resulting weather patterns experienced in the area local to the site, which is accounted for within climate projection models. The future climate baseline has been informed by an ensemble of climate models collated within the Climate Impact Explorer (Climate Analytics, 2022).

16.2.5 Assessment Criteria and Assessment of Significance

16.2.5.1 Receptor Sensitivity / Value

GHG emissions have a global effect rather than directly affecting any specific local receptor to which a level of sensitivity can be assigned. The global atmospheric mass of the relevant GHGs and consequent warming potential, expressed in CO_2e, has therefore been treated as a single receptor of **high sensitivity** (given the importance of the global climate as a receptor), in line with IEMA (2022) guidance.

With regards to climate resilience, given the variability in the nature of the potential effects of climate change on the Project, receptors have been identified on a risk-specific basis, whereby all receptors relate to the continued safe and effective operation of the Project. In line with IEMA (2020) guidance, the receptor vulnerability and susceptibility have been considered in determining the severity of risk. Each risk is given a severity score between one and three, where one signifies an unlikely or low impact and three is a severe impact (see Table **16.1**).

As such, sensitivity is detailed for each identified risk within Appendix 16.2 Climate Change Risk Assessment. Of the nine risks identified, five are assessed to have an unlikely or low impact, while three are assessed as having moderate impacts. The remaining risk (relating to flood risk) is not considered given Chapter 7: Water and Hydrology of the EIAR fully considers and mitigates assessed flood risk to the Project.

16.2.5.2 Magnitude of Impact

As GHG emissions can be quantified directly and expressed based on their global warming potential (GWP) as tonnes of CO_2e emitted, the magnitude of impact is reported numerically.

With regards to the impact of climatic changes on the Project, the magnitude is the degree of a change from the relevant baseline conditions which derives from the operation of the Project. The magnitude has been expressed in Appendix 16.2 as a combination of probability and severity, which has been informed by potential future climatic changes, and degree of influence for each identified risk. Each element of the risk assessment has been scored on a scale of one to three, the scores a summed to give a total risk score. These scorings are described in Table **16.1**.

Table 16.1: Overview of Climate Risk Scoring

Factor	Score definitions
Severity: the magnitude and likely consequences of the impact should it occur.	**1 =** unlikely or low impact: for example, low-cost and easily repaired property damage, small changes in occupier's behaviour.
	2 = moderate impacts with greater disruption and/or costs.
	3 = severe impact: for example, risk to individual life or public health, widespread property damage or disruption to business.
Probability: reflects both the range of possibility of climatic parameter changes and the probability that the possible changes would cause the impact considered	**1 =** unlikely or low probability of impact, impact would occur only at the extremes of possible change illustrated in projections.
	2 = moderate probability of impact, plausible in the central range of possible change illustrated in projections.
	3 = high probability of impact, high probability of impact, likely even with the smaller changes illustrated as possible in the projections.
Influence: the degree to which design of the Project can affect the severity or probability of impacts	**1 =** no or minimal potential to influence, outside control of developer, for example reliance on national measures or individuals' attitudes/actions; or hypothetical measures would be impracticable.
	2 = moderate potential to influence, for example a mixture of design and user behaviour or local and national factors; measures may have higher costs or practicability challenges.
	3 = strong potential to influence through measures that are within the control of the developer and straightforward to implement.

16.2.5.3 Significance of Effects

Assessment guidance for GHG emissions (IEMA, 2022) describes five levels of significance for emissions resulting from a development, each based on how the Project contributes towards achieving net zero by 2050. To aid in considering whether effects are significant, the guidance recommends that resultant GHG emissions should be contextualised against pre-determined carbon budgets, or emerging policy and performance standards where a budget is not available. It is a matter of professional judgement to integrate these sources of evidence and evaluate them in the context of significance.

In accordance with the guidance, the following factors have been considered in contextualising the Project's GHG emissions:

- the magnitude of gross and net GHG emissions as a percentage of national carbon budgets;
- the consideration of any increase / reduction in absolute GHG emissions of the Project compared with current baseline scenarios, including projections for future changes in those baselines; and
- whether the Project contributes to, and is in line with, Ireland's policy for GHG emissions reductions, where these are consistent with commitments to limit global climate change to an internationally-agreed level (as determined by Ireland's NDC to the Paris Agreement).

Effects from GHG emissions are described within this chapter as adverse, negligible or beneficial based on the following definitions, as stated within the IEMA guidance (IEMA, 2022).

- **Major Adverse**: the Project's GHG impacts would not be compatible with Ireland's net zero trajectory. Its GHG impacts would not be mitigated, or would be compliant only with do-minimum standards set through regulation. The Project may not provide further emissions reductions required by existing local and national policy for projects of this type.
- **Moderate Adverse**: the Project's GHG impacts would not be compatible with Ireland's net zero trajectory. Its GHG impacts would be partially mitigated and may partially meet the applicable existing and emerging policy requirements, however it would not fully contribute to decarbonisation in line with local and national policy goals for projects of this type.
- **Minor Adverse**: the Project's GHG impacts would be compatible with Ireland's 1.5°C trajectory and would comply with up-to-date policy and 'good practice' emissions reduction measures. The Project would fully comply with, or exceed, measures necessary to achieve Ireland's net zero trajectory.

- **Negligible**: the Project would achieve emissions mitigation that goes substantially beyond existing and emerging policy compatible with the 1.5°C trajectory, and would have minimal emissions. The Project would be fully consistent with good practice design standards for projects of this type.
- **Beneficial**: the Project would result in emissions reductions from the atmosphere, whether directly or indirectly, compared to the without-project baseline. As such, its net GHG impacts would be below zero. The Project would substantially exceed net zero requirements.

Major and moderate adverse effects are both significant, and it is down to professional judgement to differentiate between the 'level' of significant adverse effects. Beneficial effects are also considered to be significant. Minor adverse and negligible effects are not considered to be significant.

In accordance with IEMA's 2020 guidance, for climate change risk and resilience or adaptation measures, a risk assessment has been undertaken, considering the hazard, potential severity of impact on the Project and its users (including their sensitivity and vulnerability), probability of that impact, and level of influence the project design can have on the risk. The approach to this risk assessment is detailed in Appendix 16.2: Climate Change Risk Assessment. A risk score of five or more (the minimum score where more than one element of the risk assessment score is above 'low') has been defined as a risk that could lead to a significant effect. By considering the measures adopted as part of the design, professional judgement is used in determining whether impacts are likely to result in significant adverse or beneficial effects.

16.2.6 Assumptions and Limitations of the Assessment

A 'Do Nothing Scenario' regarding climate risk and resilience is not considered to be necessary for either the construction or operational assessments. Within the time periods of the construction phase, variations in climatic parameters would be minimal compared to the present-day baseline. As such, the current land use (3 no. dwellings and agricultural sheds) and associated receptors (users/residents) are not considered to be sensitive to such negligible changes. No significant adverse effects are anticipated, and therefore the assessment has not been considered further. With regards to the operational phase, the future baseline provided at section 16.4.1 and detailed in Appendix 16.2: Climate Change Risk Assessment, would be applicable to the 'Do Nothing Scenario'. However, the current land use (3 no. dwellings and agricultural sheds) and associated receptors (users/residents) are not considered to be sensitive to such changes over the operational lifetime. No significant adverse effects are anticipated, and therefore the assessment has not been considered further.

As detailed within section 16.2.5.3, to aid in considering whether effects are significant, estimated GHG emissions arising from the Project have been contextualised against pre-determined national carbon budgets. These budgets are described within section 16.2.2.1 in addition to Sectoral Emissions Ceilings, which set maximum limits on GHG emissions for each sector of the Irish economy. While these Sectoral Emissions Ceilings and associated guidance (detailed within the Climate Action Plan 2024 (Government of Ireland, 2024a)) provide useful context with regards to the future baseline (i.e. providing confidence in the future decarbonisation of electricity, gas and building materials), their use to contextualise Project emissions should be treated with caution. The unique nature of the Project may mean that its emissions do not fall accurately within one sector, with associated guidance and context within Climate Action Plan 2024 (Government of Ireland, 2024a) unclear with regards to how data centres should be classified. For the purposes of this assessment, it is considered that the sector of most relevance to the Project is the commercial built environment. As such, emissions resultant from the Project have been contextualised where appropriate within this sector's Emissions Ceilings. As detailed above, this contextualisation should be treated with caution as it is unclear whether the Sectoral Emissions Ceiling for the commercial built environment appropriately encompasses all emissions resultant from the Project.

When assessing climate risks, uncertainty arises from both modelling uncertainty and natural variability in the potential magnitude of future changes in climate. Therefore, a high magnitude of change scenario and high end of probabilistic projections have been used, to provide a precautionary worst-case approach. This is further discussed in Appendix 16.2: Climate Change Risk Assessment.

At this stage in the design of the Project, material estimates have some uncertainty in terms of their quantities. As such, published benchmarks for the embodied carbon associated with data centre buildings, admin workshop and water treatment plant building, site security hut, and district heating building have been used to estimate possible emissions associated with such structures. Such benchmarks do not capture the measures specified by the Applicant to reduce construction stage emissions (detailed within section 16.3), which have

been assessed qualitatively. As such, associated values of embodied carbon presented represent a conservative estimate.

Embodied carbon associated with servers is wide-ranging with carbon intensities differing between suppliers and server types. Therefore the 'as built' final embodied carbon from the servers will be highly dependent on tenant procurement practices. The calculation of embodied carbon associated with the server fit-out takes a conservative approach, informed by a worst-case embodied carbon intensity per server given it is currently unknown what products will be specified by the future tenant.

Calculations of embodied carbon use currently available material or product emissions conversion factors, and as such do not account for the likely decarbonisation of materials and products over time. Therefore, given the likely phased approach of the data centre building delivery, the calculations of embodied carbon provide a conservative estimate.

Calculations of operational emissions resultant from the Project use current emissions factors for natural gas. Given Ireland's target for net zero by 2050 and Gas Networks Ireland's (GNI) planned decarbonisation, it is anticipated that the gas network will decarbonise over the Project's lifetime. As such, operational emissions calculated over the Project's lifetime provide a conservative estimate. A detailed assessment of possible decarbonisation scenarios is presented within the Energy Policy Compliance Report (HDR, 2024a), Appendix 4.9 to this EIAR. Given such decarbonisation scenarios are predictions, and are reliant on external factors out of the control of the Applicant, the values presented within Appendix 4.9 are not used to inform a quantitative assessment within this chapter to ensure a conservative approach. They are instead used to inform a qualitative assessment of operational effects and likely future decarbonisation.

Additionally, the phased nature of the buildings' construction may result in some having a lesser operational lifetime than others, given the overall development lifetime of 50 years. As the calculations assume all data centre buildings have an operational lifetime of 50 years, this may provide a conservative estimate of operational emissions.

The above uncertainties are integral to the assessment of climate change effects, but a precautionary approach has been taken as far as practicable to provide a reasonable worst case assessment. On the basis of the above, it is considered that limitations to the assessment have been minimised and that the results provide a robust estimate of the effects of the Project.

16.3 Characteristics of the Project

As described within Chapter 4 Description of the Project, the overall development comprises two main elements which together constitute the "Project":

- The Data Centre Application – comprising 6 no. two storey data centre buildings, an administration/management building, car parking, landscaping, energy infrastructure and other associated works. These elements are the subject of the planning application submitted to Kildare County Council (KCC).
- The Substation Application – comprising a grid substation and 110 kV transmission connection. These elements are subject of the Strategic Infrastructure Development (SID) application to An Bord Pleanála.

The construction and operation of such proposals will result in emissions of GHGs to the atmosphere. These will derive from the manufacture of materials and products used in the construction of the Project alongside GHG emissions associated with the use of energy within the buildings during their operational phase. Such emissions will contribute to the global atmospheric mass of GHGs and result in consequent warming potential.

The Project and its users will be subject to risks from local climate when operational. Such risks may include flooding, damage to building from storms, and risks to users from heightened temperatures. It is anticipated that such risks will be exacerbated into the future as a result of the impacts of climate change.

The characteristics of the Project of relevance to the GHG calculations are detailed below, and have informed the assessment of likely significant environmental effects.

Buildings

The Project comprises the following buildings, also detailed within sections 4.2.2 and 4.2.3 of Chapter 4:

- 6 no. Data Centre Buildings, each with a total internal area and height as follows:

  - Total gross internal area (GIA) – 27,261 m^2
  - Height to parapet – 18 m
  - Height to flue – 19 m
- Admin workshop and Water Treatment Plant (WTP) GIA – 818.9 m^2;
- Site security hut GIA – 42.1 m^2;
- District Heating (DH) building GIA – 340.5 m^2;
- Total of 210 no. car parking spaces comprising of 63 electric car charging spaces and 14 no. disabled car parking spaces;
- Total number of 52 no. bicycle spaces (8 per Data Centre building and 4 for the administration workshop);
- Provision of new footpath and cyclist infrastructure to connect with existing cycle path and footpath;
- Provision of a new bus stop on the R409;
- Demolition of 5 no. agricultural buildings to the centre of the site; and
- Demolition of 3 no. dwellings along the northern boundary of the site, fronting onto R409 road.

Whilst subject to internal layout requirements of end users, each Data Centre building will consist of the main data hall block with an external plant gantry and an enclosed yard to the rear encompassing the building energy infrastructure. The front of each Data Centre building will comprise of end-user client administration/office areas, plus storage areas and the loading/receiving docks.

The buildings will be steel-framed with insulated metal faced cladding panels to the façade. The rear external yard will also be also enclosed with a metal louvre system to align with the main building form and the building entrance area will have large, glazed windows.

The following elements are embedded within the design of the Project, and are considered to mitigate GHG impacts:

- The design team will seek to source goods, services, or works with a reduced environmental impact throughout their lifecycle. In this regard, tender requests will set out the policies and targets as set in the Resource and Waste Management Plan (RWMP) (HDR, 2023) which must be achieved. Tenders will be assessed and include scoring for proposals demonstrating how compliance will be achieved with the policies and targets of the RWMP (e.g. proposals for use of recycled materials rather than virgin materials, identification of resource efficient options, collaboration with supply chains).
- Materials will aim to reflect local sustainable manufacturing sources and support low carbon green initiatives, such as:
  - Timber and wood-based products will be responsibly sourced (e.g. FSC or PEFC);
  - Insulation materials and building services will be specified with low embodied environmental impact;
  - Locally sourced construction materials will be preferentially used, with priority to the use of prefabricated elements where possible to reduce construction-phase transport emissions;
  - Specification of recycled and reused materials will be a main design consideration where feasible;
  - The buildings will be ‘designed for robustness’ to ensure that damage to the building due to wear and tear, for example in areas of heavy usage, are minimised and can be repaired with minimal environmental or cost impact;
  - Construction of components off-site and use of pre-fabricated elements where feasible;
  - Concrete for certain types of foundations and preparatory foundations works can be specified with recycled aggregates where feasible; and

  - Where available, reinforcement for concrete is to be specified with 95% recycled content. Similarly, steelwork will be specified with a 95% recycled content where available.

- Energy efficiency measures to reduce energy demand, in line with national data centre guidance and policy requirements:
  - The data halls will be primarily cooled using external air, utilising Ireland's cooler climate. Further cooling required i.e. during higher summer temperatures, will be provided through adiabatic cooling systems;
  - Heat pumps to be installed to serve the data centres' office areas;
  - Admin areas housing office spaces and reception areas to face north-west and north-east to minimise solar gains and reduce cooling demand within such areas;
  - Fabric performance of the buildings to be maximised to reduce the space heating loads in winter and cooling loads in the summer; and
  - Highly efficient LED lighting to be specified to all data halls and office areas. Lighting to all other areas of the buildings to be highly efficient and incorporate occupancy sensors where applicable.
- 30% of the total energy demand will be met by renewable sources, in line with local policy requirements. This will comprise:
  - Solar photovoltaic (PV) arrays located on the roof of each of the six Data Centre buildings comprising 120 kW per data centre building to supply the admin areas, and a further 500 kW per data centre building to supply electricity to the data halls); and
  - Corporate Power Purchase Agreements (CPPA) will be used to procure renewable energy from wind / solar farms. In addition to providing energy for the Project, CPPAs will fund the construction of wind and solar farms. The Applicant has had discussions with various solar and wind renewable energy suppliers with a view to supplying energy through CPPAs, identifying sufficient capacity available from suppliers to meet the 30% operational renewable energy target. CPPAs will be finalised following a grant of permission, along with a connection agreement with Eirgrid, and will be entered into prior to operational requirements. The process and technical aspects of CPPAs are considered fully in Volume II, Appendix 1.3.

The Applicant intends to sign up to the Climate Neutral Data Centre Pact once the data campus is built. It is considered that the above design measures, and connection to the gas network (as outlined below), aligns the Project with the requirements of the Pact.

Gas Turbines

As described within Chapter 4, section 4.2.4.1, mains (Gas Networks Ireland [GNI]) connected, on-site natural gas turbines are the proposed primary energy source for the Project. Generation of electricity is proposed using gas turbines, located within a dedicated, adjoined plant area, to the rear of each Data Centre building. Each Data Centre building will comprise of 8 no. turbines.

Irrespective of energy demand from regulated or unregulated sources, remaining energy demand (that is not met by solar PV or electricity supplied through the CPPA) is to be met by such generation. This strategy is in line with recent EU and Irish Government direction on the use of gas for generation as a transition fuel.

GNI vision document 'Vision 2050' highlights their strategy to achieving zero dependence on gas from fossil fuels by increasing the provision of biomethane, abated natural gas and the use of hydrogen. As such, emissions associated with the Project's operational energy demand are anticipated to decrease alongside the decarbonisation of its source gas network. This is further detailed within the Energy Policy Compliance Report (Appendix 4.9 of this EIAR), which presents decarbonisation scenarios as informed by national plan and strategy documents.

Further, to support Net Zero strategy, the Applicant will be a strong supporter of Biomethane production from offsite Anaerobic Digestion (AD) facilities. GNI forecasts in biomethane production show significant growth in AD facilities forecasted between now and 2030. These fuels will likely provide the renewable form of feedstock for operating onsite generation. Additional information with regards to the Project's energy supply strategy is provided within Volume II, Appendix 1.3.

Battery Energy Storage Systems

As detailed within Chapter 4, section 4.2.4.3, for the purpose of providing uninterrupted and conditioned power, each Data Centre building will have a dedicated battery energy storage system (BESS) located within the adjoined plant area, to the rear of each Data Centre building. The BESS will consist of rack mounted lithium iron phosphate battery modules.

The storage capacity provides a back-up energy source and in addition adds resilience to the wider network, having the capacity to provide immediate export of energy to the national grid, or the capacity to store excess electricity generated externally, if required.

Substation

As detailed within Chapter 4, section 4.2.4.6, a 110 kV GIS is proposed to be located to the north west corner of the subject site and will provide the grid connection on site. The provision of the substation and grid connection will enable the export of energy generated onsite to the wider network. The substation will also enable the energy storage facility to be connected to the national grid and add greater capacity and resilience to the national electric energy generation capacity and the national electric grid.

16.4 Baseline

With regard to current climate, the baseline is the local and regional climate and resulting weather patterns recorded within current climate data and accounted for within climate projection models. This is in the context, however, of wider trends in global climate changes affecting the Irish climate, which at their present rates may be considered part of the known baseline. The change in baseline over time with climate change is set out in Appendix 16.2.

With regard to GHG emissions, the current baseline is the current site use: agricultural land including 3 no. dwellings and 5 no. agricultural buildings. Emissions associated with such use are likely to be negligible within the context of the scale of energy consumption from the Project, and as such have not been assessed further.

16.4.1 Future Baseline Conditions

With regard to future climate, the future baseline can be considered using ensembles of future climate models, collated within Climate Analytics' Climate Impact Explorer (Climate Analytics, 2022), which encompass the potential climatic outcomes over continental, national and subnational levels from a range of potential global emissions and climate change scenarios. Data local to the Project was used to inform the future climate within this assessment.

With regard to GHG emissions, the future baseline trend is towards the decarbonisation of the built environment. This is based on Ireland's Sectoral Emissions Ceilings (Government of Ireland, 2022), prepared in support of Ireland's Carbon Budgets, which detail a 45% reduction on 2018 levels by 2030 in the commercial built environment. Further, the electricity and industry sectors are required to reduce emissions by 75% and 35%, respectively, on 2018 levels by 2030, providing confidence in the future decarbonisation of electricity, gas and building materials

The future baseline encompasses changes in the baseline carbon intensity of factors such as electricity, heating fuel, transport fuel or energy and the embodied carbon in construction materials. All of these are expected to decrease over time in line with national decarbonisation policy goals. For the purpose of this assessment, present-day carbon intensity values have been used (appropriately representative of the construction period and initial year of operation) to be conservative. The impact of grid decarbonisation on emissions resultant from the Project has been assessed qualitatively. It is noted that notwithstanding the specific mitigation for the Project, its operational emissions from energy consumption are likely to decrease during its lifetime due to the decarbonisation of the energy networks. A detailed assessment of possible decarbonisation scenarios is provided within the Energy Policy Compliance Report (HDR, 2024a), Appendix 4.9 to this EIAR.

The future baseline GHG emissions for existing land-use without the Project are expected to remain similar, i.e. emissions from the use of 3 no. dwellings and agricultural sheds. Emissions associated with the energy use from such buildings is likely to be negligible and immaterial within the context of the scale of energy consumption from the Project. Further, such emissions are likely to decarbonisation in line with national decarbonisation targets. As such, associated emissions have not been assessed further.

16.5 Impact Assessment – Construction Effects

16.5.1 Assessment of Effects as a Result of Climate Change

Due to the relatively short construction programme, variations in climatic parameters would be minimal compared to the present-day baseline. Construction work practices are adapted to existing climate conditions and weather in Ireland. Appendix 16.2 summarises potential changes in climatic parameters further into the future. These changes are likely to occur gradually, and it is considered that construction contractors will be able to adapt working methods over time to address such changes, if necessary. For example, warmer winter conditions may extend the time certain construction activities, such as concrete pouring, can be carried out. A greater chance of summer heatwave conditions may require adaptations, such as shading work areas or increased attention to construction dust control measures.

Negligible **not significant** construction-stage effects are predicted in the construction phase as a result of climate change.

16.5.2 Assessment of Effects on Climate Change

16.5.2.1 Do Nothing Scenario

16.5.2.1.1 Magnitude of Impact

Under the 'do nothing scenario' it is assumed the Project does not go ahead. The Site would remain in its current use: agricultural land, including 3 no. dwellings and 5 no. agricultural buildings. There would be negligible emissions arising during the construction phase, associated with the operational emissions associated with the existing land use.

As stated in section 16.4, emissions associated with such use are likely to be negligible and will reduce over time in line with national decarbonisation (as detailed within the Climate Action Plan 2024).

16.5.2.1.2 Sensitivity of the Receptor

GHG emissions have a global effect rather than directly affecting any specific local receptor to which a level of sensitivity can be assigned. The global atmospheric mass of the relevant GHGs and consequent warming potential, expressed in CO_2-equivalents, has therefore been treated as a single receptor of **high sensitivity** (given the severe consequence of global climate change and the cumulative contributions of all GHG emissions sources).

16.5.2.1.3 Significance of Effect

The magnitude of impact associated with the 'do nothing scenario' is deemed to be immaterial, and is assessed as having a **negligible** effect on the highly sensitive receptor, which is **not significant** in EIA terms.

16.5.2.2 Likely Significant Environmental Effects

16.5.2.2.1 Magnitude

The manufacturing of associated materials and construction of the Project would result in both direct and indirect GHG emissions. The majority of the construction-stage impacts are 'Scope 3' (supply chain) emissions resulting from the extraction of raw materials and manufacturing of construction materials, alongside the emissions associated with their transportation to site.

Construction emissions from the Project can be split into two spheres of influence: those under the Applicant's control, and those under the future tenant control. This assessment will consider the magnitude of emissions associated with each individually and assign each a level of significance. The following items are considered within this assessment (detailed where relevant within section 16.3):

- Applicant control
    - Demolition of existing buildings on site

  - Data Centre buildings (including data halls and admin blocks)
  - Admin workshop and water treatment plant building
  - Site security hut
  - District heating building
  - Solar PV
  - Gas turbines
  - Battery Energy Storage Systems
  - Substation
  - Construction transport movements
- Tenant control
  - Server fit out

Appendix 16.3: GHG Calculations, provides detailed information regarding the below methodologies and the quantification of emissions associated with the construction of the Project. The total construction-stage emissions concluded within Appendix 16.3 is reported within Table **16.2**, below.

Demolition

The demolition of buildings currently within the site boundary (3 no. dwellings and 5 no. agricultural buildings) is unlikely to result in significant construction-stage emissions. Construction and demolition waste in Ireland is most commonly backfilled, however this reflects the large proportion of stones and soils in such waste. With regards to metals, wood, concrete and brick (the materials most likely to constitute demolition waste at the Project) the dominant method of disposal is recycling, followed by energy recovery and backfilling (Environmental Protection Agency, 2022).

As detailed within the Resource and Waste Management Plan prepared in support of the application (HDR, 2023), the existing buildings have been assessed and their materials identified as unsuitable for re-use within the Project. However, such materials may be used during construction as a base for piling rigs before final disposal. The applicant has committed to the prevention or reduction of on-site construction waste generation through re-use, and recycling and recovery. As such, it is likely that demolition materials on site will be recycled where appropriate, preventing materials from being sent to landfill and reducing the need for the extraction of primary materials. Material which cannot be recycled may be directed to energy from waste facilities or to appropriate licenced waste facilities. As such, emissions associated with such demolition are considered to be immaterial. This impact is not quantitatively assessed further.

Buildings

At this stage in the design of the Project, material estimates and have some uncertainty in terms of their quantities and product specifications. As such, published benchmarks and product Life Cycle Assessments (LCAs) have been used to inform the calculation of embodied carbon.

Published benchmarks (Royal Institute of Chartered Surveyors (RICS), 2012) have therefore been used to calculate the embodied carbon associated with all proposed buildings. The benchmark data is expressed in kg CO_2e/m^2 of floorspace as an intensity, which was scaled by the total floor area for each building. Benchmark intensities appropriate for each building use were selected, this is further detailed in Appendix 16.3. Total embodied carbon emissions for all proposed data centre buildings equal 109,464 tCO_2e (including external plant compounds). Embodied carbon emissions associated with the admin workshop and water treatment plant, site security hut, and district heating building total 757 tCO_2e, 39 tCO_2e, and 186 tCO_2e, respectively.

Solar PV

Consideration of meta-analyses[1] of published solar PV LCAs has informed the estimate of emissions associated with the proposed inclusion of solar PV panels. The primary source of emissions factors used in assessing the embodied carbon effects of the Project was NREL's (2012) 'Life Cycle Greenhouse Gas Emissions of Crystalline Silicon Photovoltaic Electricity Generation', an in-depth meta-analysis of over 397 LCAs regarding C-SI PV systems. Using the lower to upper limit ranges from the primary source (NREL, 2012) (39 – 49 gCO_2e/kWh), the projected construction stage GHG impact of the panels and associated BoS components is between 6,174 tCO_2e and 7,757 tCO_2e (lower to upper limits) when scaled by the proposed total solar PV generating capacity (3.72 MW). To provide a conservative estimate, the greater of the values has been brought forward within the assessment of embodied carbon.

Gas Turbines

The impact of the gas turbines has been calculated using an intensity for the manufacturing GWP of 23.2 $kgCO_2e$ per kVA (ABB, n.d.). This was scaled by the total energy demand of the Project, totalling 240 MW, to give an embodied carbon value of 5,568 tCO_2e. It has been assumed that this intensity accounts for all gas turbine and electrical plant associated with the data centres.

The turbines are likely to be refurbished every two years. However, given this will not result in the installation of new turbines, just the repair and servicing of the existing turbines, resultant emissions are likely to be immaterial. Additionally, given national decarbonisation requirements, it is likely that any repair work is likely to decarbonise over the Project's lifetime.

Battery Energy Storage Systems

The impact of the battery energy storage systems (BESS) has been informed by a number of LCA studies detailing emissions associated with the component materials and cell manufacture (Pell and Lindsay, 2022; Yudhistira, 2021; Emilsson and Dahllöf, 2019) (further details included within Appendix 16.3). BESS manufacture is an energy-intensive process, owing to both the mining and refining of raw materials and the energy use during their manufacture. Current LCAs detailing emissions associated with such manufacture give varying emissions intensities, resulting from differences such as energy sourced from a renewables-rich mix or fossil fuel-rich mix (which will vary with manufacture location), battery densities and structure, and the complexity of the manufacturing process. As such, a range of reported carbon intensities have been used to inform the calculation of embodied carbon to account for such uncertainty. The storage capacity (79.2 MWh) of the BESS was scaled by 52.0 $kgCO_2e/kWh$ (Pell and Lindsay, 2022) to 169 $kgCO_2e/kWh$ (Yudhistira, 2021), in addition to an estimated replacement rate of BESS over the Project's lifetime. Total embodied carbon associated with the BESS was estimated to lie between 16,474 tCO_2e and 53,539 tCO_2e. To provide a conservative estimate, the greater of the values has been brought forward within the assessment of embodied carbon.

Substation

Embodied carbon associated with the proposed substation (including all associated transformers, busbars, and other equipment) has been informed by an Environmental Product Declaration (EPD) for a 16 kVA – 1000 MVA transformer (ABB, 2003). The LCA listed a manufacturing global warming potential (GWP) of 2,190 $kgCO_2e/MVA$, this was scaled by the proposed substation's rating of 600 MVA, to give an estimated embodied emission value of 1,314 tCO_2e.

Servers

The impact of embodied carbon associated with the servers has been estimated using product LCAs for servers appropriate for data centre use. Given the server type is not yet known at this stage in the design and will be subject to tenant specification, a range of server LCAs were considered. The greatest final value of embodied carbon has been reported within this assessment to provide the most conservative estimate.

[1] A meta-analysis is a study whereby the results of multiple studies are assessed and combined, informed by statistical methods with the aim of reaching a best estimate from the combined results.

The total number of servers to be installed across the six proposed data centres was estimated by scaling the server power rating by the total proposed IT load associated with the data centres (180 MW). The lifetime of each server unit was taken into account within the calculations, and was assumed to be 4 years as specified by the product LCA (Sphera, 2021). As such, when considered within the context of the Project's 50 year lifetime, a replacement rate of 13 was established. The total number of servers was then scaled by an embodied carbon factor (1.375 tCO_2e per server) (Sphera, 2021) to give a total of 13,177,597 tCO_2e.

Vehicle Movements

Emissions associated with HGV and personnel vehicle movements during the construction of the Project have been estimated by scaling predicted number of vehicle movements per day, by an average journey distance and emissions factor (DESNZ, 2023). The resultant emissions total 33,312 tCO_2e.

Summary

Table **16.2**, below, summarises the embodied carbon associated with the materials and construction of the Project. As described above, this has been split into emissions controlled by the Applicant and by future tenants.

Table 16.2: Construction-Phase Embodied Carbon

Item	Embodied Carbon (tCO_2e)	Percentage of total embodied carbon (%)
Applicant Controlled Elements		
Data centre buildings	109,464	0.82%
Admin workshop and water treatment plant building	757	0.01%
Site security hut	39	0.00%
District heating building	186	0.00%
Solar PV	7,757	0.06%
Gas Turbines	5,568	0.04%
BESS	53,539	0.40%
Substation	1,314	0.01%
Construction transport movements	33,312	0.25%
Sub-total	211,936	1.58%
Tenant Controlled Elements		
Server fit out	13,177,597	98.42%
Total	**13,389,533**	

As detailed within section 16.3, the design team will seek to source goods, services, or works with a reduced environmental impact throughout their lifecycle. As such, the embodied carbon impact of the Project can be expected to be reduced compared to a business as usual approach.

The majority (98.42%) of the Project's embodied carbon emissions result from the server fit out within the data centre buildings. However, as detailed in section 16.2.6, embodied carbon associated with the servers is wide-ranging with carbon intensities differing between suppliers and server types. The final embodied carbon associated with the servers will be highly dependent on tenant procurement practices. The calculation of embodied carbon associated with the server fit out takes a conservative approach, informed by a worst-case embodied carbon intensity per server given it is currently unknown what products will be specified by the future tenant. As such, it can be anticipated that embodied carbon associated with the servers will likely be lower than that reported.

16.5.2.2.2 Sensitivity of the Receptor

GHG emissions have a global effect rather than directly affecting any specific local receptor to which a level of sensitivity can be assigned. The global atmospheric mass of the relevant GHGs and consequent warming potential, expressed in CO_2-equivalents, has therefore been treated as a single receptor of **high sensitivity** (given the severe consequence of global climate change and the cumulative contributions of all GHG emissions sources).

16.5.2.2.3 Significance of Effect

The nature and significance of effect has been characterised by contextualising the Project's construction stage GHG impacts within Ireland's carbon budget, and with its compliance with Ireland's net zero trajectory, local and national climate-related policy, legislation and guidance.

Carbon budgets that are relevant during the construction phase of the Project have been considered within Table 16.3. The phased delivery of the Project has been accounted for when attributing emissions to relevant carbon budgets.

Table 16.3: Construction Emissions and Carbon Budgets

Time period	2021-2025	2026-2030	2031-2035	Total*
Ireland carbon budget (tCO2e)	295,000,000	200,000,000	151,000,000	351,000,000
Applicant-controlled elements				
Project GHG impacts (tCO_2e)	2,296	139,760	69,880	211,936
Development emissions as percentage of Ireland Carbon Budget	0.001%	0.07%	0.05%	0.06%
Tenant-controlled elements				
Project GHG impacts (tCO_2e)	0	5,068,306	6,081,968	11,150,274
Development emissions as percentage of Ireland Carbon Budget	0.00%	2.53%	4.03%	3.18%

* This is the total during the budget periods, not the total for the Project's assumed lifetime.

Sectoral Emissions Ceilings that are relevant during the construction phase of the Project have been considered within Table **16.4**. The phased delivery of the project has been accounted for when attributing emissions to the relevant Sectoral Emissions Ceilings.

Table 16.4: Construction Emissions and Sectoral Emissions Ceilings

Time period	2021-2025	2026-2030	Total[1]
Sectoral Emission Ceiling – commercial built environment (tCO_2e)	7,000,000	5,000,000	12,000,000
Applicant-controlled elements			
Project GHG impacts (tCO_2e)	2,296	139,760	142,056
Project emissions as percentage of the Sectoral Emission Ceiling – commercial built environment	0.03%	2.80%	1.18%
Tenant-controlled elements			
Project GHG impacts (tCO_2e)	0	5,068,306	5,068,306
Project emissions as percentage of the Sectoral Emission Ceiling – commercial built environment	0.00%	101.37%	42.24%

[1] This is the total during the budget periods, not the total for the Project's assumed lifetime.

While the Climate Action Plan 2024 (Government of Ireland, 2024a) and Ireland's Long-term Strategy on Greenhouse Gas Emissions Reductions (Government of Ireland, 2024b) references targets to reduce embodied carbon in construction materials associated with the industry sector, it is uncertain to what extent

the national carbon budgets and Sectoral Emissions Ceilings account for embodied carbon emissions, and as such contextualisation within such budgets and emissions ceilings must be approached with caution.

The total magnitude of impact is estimated to be 211,936 tCO_2e for Applicant-controlled elements of the Project, comprising 0.06% of the total Irish carbon budget over the relevant periods. Whilst it has not been possible at this stage to quantify the emissions reduction measures specified by the Applicant (as detailed within section 16.3, and 16.2.6), which are likely to reduce carbon resultant from the construction of the Project compared to a business as usual approach, such measures have been taken into account when considering the significance of the construction stage effects. The Applicant's approach to low carbon material and product procurement, and efficient construction methods are in keeping with good practice emissions reduction measures, and current and emerging national policy regarding the transition towards net zero. In particular this approach will contribute demand for low carbon materials and support the key target to decrease embodied carbon in construction materials, as detailed within the Climate Action Plan 2024 (Government of Ireland, 2024a) and Ireland's Long-term Strategy on Greenhouse Gas Emissions Reduction (Government of Ireland, 2024b).

The embodied carbon attributed to the inclusion of gas turbines and solar PV results from measures implemented to support the operational decarbonisation of the Project and are supported within national policy and decarbonisation targets (such as the Climate Action Plan 2024 (Government of Ireland, 2024a) which promotes the design of large energy users to enable low/zero carbon demand growth), and Government Strategy on the Role of Data Centres in Ireland (Government of Ireland, 2022). The connection to a gas network and on-site generation of electricity through the gas turbines is in line with recent EU direction (the Hydrogen and Decarbonised Gas Market Package) and consequently Irish Government direction on the use of gas for generation as a transition fuel, as detailed within the Energy Policy Compliance Report (HDR, 2024a). It also means that the Project will not add any additional demands to the grid, allows for any excess power generated on-site to be exported to the grid, and enables the Project to benefit from the decarbonising gas network thereby reducing its operational emissions.

As such, the Project aligns with Ireland's national legislation and policy, and net zero trajectory; the magnitude of impact on the high sensitivity receptor would result in **minor adverse** construction-stage effect which is **not significant** in EIA terms.

The total magnitude of impact is estimated to be 13,177,597 tCO_2e for tenant-controlled elements of the Project. Over the Irish carbon budget periods, the magnitude of impact is estimated to be 11,150,274 tCO_2e, comprising 3.18% of the total Irish carbon budgets. Mitigation measures to reduce such emissions are not within the Applicant's scope and as such emissions reductions cannot yet be committed to within this assessment. As such, it cannot be concluded that resultant emissions are in line with local and national net zero aspirations. However, there is uncertainty with regards to the servers likely to be installed by the tenant – embodied carbon associated with servers is wide ranging, with final 'as built' carbon values highly dependent on tenant procurement practices (as detailed within section 16.2.6). It would be the responsibility of the tenant to ensure server equipment will be assessed for reuse, repair or recycling, in line with the Climate Neutral Data Centre Pact (2023). Therefore, to account for such uncertainty, the magnitude of impact on the high sensitivity receptor would result in a **moderate** to **major adverse** construction-stage effect, which is **significant** in EIA terms.

16.5.2.3 Mitigation

While the Project already includes extensive embodied carbon mitigation within its design and material procurement commitments within the Applicant's control (as detailed within section 16.3), the following further mitigation measures should be considered:

- The Applicant should seek to obtain product EPDs for required MEP and building services during product procurement, with the aim to procure lower carbon products where available. Through close engagement with the supply chain and greater transparency into the GHG impacts of products being specified, it can be ensured that products used in the construction of the Proposed Development are manufactured in conditions with minimal GHG impacts (e.g. via the use of renewable energy and efficient resource consumption);
- Increase commitments with regards to the recycled content of the construction materials, where supply is available; and
- The Applicant should seek to understand and influence where possible the approach taken by future tenants with regards to server procurement processes, including whether product EPDs are obtained

and lower carbon servers are preferentially specified, and what practices the tenant has in place for re-using, repairing or recycling servers (as required of signatories of the Climate Neutral Data Centre Pact).

16.5.2.4 Residual Impacts

Accounting for the above further mitigation measures on Applicant-controlled elements of the Project, the magnitude of impact from construction phase emissions on the high sensitivity receptor would result in **minor adverse** construction-stage effect which is **not significant** in EIA terms.

With regards to the embodied carbon associated with tenant-fit out of the servers, it is considered that the proposed further mitigation has the potential to greatly reduce embodied carbon, enabling such emissions to align with decarbonisation targets. As such, the magnitude of impact on the high sensitivity receptor would be considered to result in in a **minor adverse** construction-stage effect, which is **not significant** in EIA terms.

16.6 Impact Assessment – Operational Effects

16.6.1 Assessment of Effects as a Result of Climate Change

16.6.1.1 Magnitude of Impact

As detailed within section 16.2.5.2, the magnitude is the degree of a change from the relevant baseline conditions which derives from the operation of the Project. The magnitude has been expressed in Appendix 16.2 as a combination of probability and severity, which has been informed by potential future climatic changes, and degree of influence for each identified risk. These scorings are summarised in Table **16.1** within section 16.2.5.2 and full descriptive definitions of the scoring are set out in Appendix 16.2.

Of the nine risks identified, two risks scored three, four risks scored four, one risk scored five, and one risk scored six. The remaining risk is associated with flood risk, and was not quantified as the effects of this risk are fully considered within Chapter 7: Water and Hydrology of the EIAR.

16.6.1.2 Sensitivity of the Receptor

As detailed within section 16.2.5.3 the severity of effect score for each identified risk considers the potential consequences of the hazard and the sensitivity of the receptor(s) affected. Given the variability in the nature of the potential effects of climate change on the Project, receptors have been identified on a risk-specific basis, whereby all receptors relate to the continued safe and effective operation of the Project. In line with IEMA (2020) guidance, the receptor vulnerability and susceptibility have been considered in determining the severity of risk. As such, sensitivity is detailed for each identified risk within Appendix 16.2 Climate Change Risk Assessment.

16.6.1.3 Significance of Effect

Appendix 16.2 summarises the potential climatic changes in the coming decades and considers the potential consequences for the operation of the Project in a risk assessment format. The potentially significant risks identified, that have potential to be mitigated through the development's design, are mainly those associated with flooding, high ambient and extreme temperatures, and extreme weather. The risk from flooding and appropriate mitigation measures has been assessed within Chapter 7: Water and Hydrology. Appropriate flood management and resilience measures have been provided, including an allowance for climate change effects.

The risk assessment in Appendix 16.2 considers in its scoring the level of influence the design, construction and operation of the Project can have upon the risks, in addition to its severity and probability. Appendix 16.2 details guidance included within the Government of Ireland Sectoral Adaptation Plans (Government of Ireland, 2020) and the Environmental Protection Agency's (EPA) Climate Change Assessment (EPA, 2023) regarding climate risk.

With the exception of flood risks, the greatest risks to the Project due to climate change have been identified as those arising from high temperatures affecting operation, public health and energy demand for cooling, and storms or extreme weather events causing building damage.

These risks were both identified as significant (risks scores of 6 and 5, respectively) prior to resilience or adaptation measures to mitigate the risks, which would result in a **significant adverse effect.**

The following embedded mitigation measures are incorporated into the Project's design, reducing the significant adverse effect to a **negligible** effect, which is not significant in EIA terms:

- Passive design measures will minimise excessive solar gain, such as admin areas housing office spaces and reception areas being north-west and north-east facing to minimise unwanted solar gains;
- Adiabatic cooling system will be designed to allow for further water storage adjacent to each building, to accommodate higher temperatures if needed, and
- The roof of each building will be provided with a reflective finish to improve solar reflectivity.

16.6.2 Assessment of Effects on Climate Change

16.6.2.1 Do Nothing Scenario

16.6.2.1.1 Magnitude of Impact

Under the 'do nothing scenario' it is assumed the Project does not go ahead. The Site would remain in its current use: agricultural land, including 3 no. dwellings and 5 no. agricultural buildings. As stated in section 16.4, emissions associated with such use are likely to be negligible and will reduce over time in line with national decarbonisation (as detailed within the Climate Action Plan 2024).

16.6.2.1.2 Sensitivity of the Receptor

GHG emissions have a global effect rather than directly affecting any specific local receptor to which a level of sensitivity can be assigned. The global atmospheric mass of the relevant GHGs and consequent warming potential, expressed in CO_2-equivalents, has therefore been treated as a single receptor of **high sensitivity** (given the severe consequence of global climate change and the cumulative contributions of all GHG emissions sources).

16.6.2.1.3 Significance of Effect

The magnitude of impact associated with the 'do nothing scenario' is deemed to be negligible, and is assessed as having a **negligible effect** on the highly sensitive receptor, which is **not significant** in EIA terms.

16.6.2.2 Likely Significant Environmental Effects

16.6.2.2.1 Magnitude of Impact

Appendix 16.3: GHG Calculations, provides detailed information regarding the below methodologies and the quantification of emissions associated with the operation of the Project. The total operational-stage emissions concluded within Appendix 16.3 is reported within this section.

The use of the Project post-completion would result in indirect GHG emissions due to the use of electricity within the buildings. The operational energy demand has been split into regulated and unregulated energy, in addition to the GHG impacts associated with the operation of the BESS.

The energy demand associated with the Project is to be met by the onsite generation of electricity using gas turbines. This strategy is in line with recent EU and Irish Government direction on the use of gas for generation as a transition fuel, with gas being sourced from the Gas Networks Ireland (GNI) gas network. As such, all operational emissions associated with electricity consumption at the Project have been calculated by scaling relevant energy demands (broken down below), by the SEAI current natural gas emissions factor of 204 gCO_2e/kWh (summarised within Table **16.5**).

Regulated Energy

Regulated energy consumption results from the specification of controlled fixed building services and fittings, such as space heating and cooling, hot water, ventilation, and lighting. It is these regulated loads that are most able to be reduced through embedded design measures by the Applicant.

Emissions associated with the regulated energy consumption has been informed by consumption figures reported within the Energy Efficiency and Climate Change Adaptation Statement (HDR, 2024b) prepared in support of this application. The reported energy intensity associated with the office and reception areas totals 75.1 kWh/m^2. This offers a 22% reduction from 96.1 kWh/m^2 through the inclusion of the embedded energy efficiency measures detailed at section 16.3. This intensity (75.1 kWh/m^2) was scaled by the total GIA for the Project (including the admin workshop and water treatment building, site security hut, and district heating building) to give the total annual estimated energy consumption of 12,374,039 kWh per annum, offering a total annual reduction of 3,460,118 kWh per annum.

Unregulated Energy

Unregulated energy consumption is associated with systems or processes that are not controlled and do not have regulations imposed on them. Unregulated energy consumption within the Project is largely resultant from the data hall demand, where any server energy efficiency measures will be within the control of the tenant.

Emissions associated with the unregulated energy consumption has been informed by the project design – 6 no. data centre buildings, each comprising of 8 no. data halls with an electrical capacity to support up to 40 MW of IT equipment load, building services and regulated energy demand (as detailed above) in each building, totalling the maximum demand of 240 MW across the Project. To provide a conservative emissions estimate, it was assumed that the data centres would run 24 hours a day, 365.25 days a year, resulting in the total Project consumption of 2,103,840 MWh per year. Total unregulated energy consumption has been calculated by subtracting the unregulated demand (as detailed above) by the total Project energy demand, resulting in a total unregulated energy demand of 2,091,466 MWh per year.

Solar PV

3.72 MW total generation capacity of solar PV is proposed to be installed on the data centre roofs to supplement both the regulated and unregulated energy demand arising from the administration areas and offices, and data hall demand. This can be broken down into 120 kW per data centre building to supply the admin areas, and a further 500 kW per data centre building to supply electricity to the data halls. The total annual energy output of the proposed solar PV array has been calculated to total 679,285 kWh and 2,830,356 kWh per annum, associated with admin area supply (regulated) and data hall supply (unregulated) respectively. This totals an annual energy output of 3,510 MWh per annum, and 148,497 MWh over the Project's lifetime (accounting for an annual degradation factor of 0.7%).

Corporate Power Purchase Agreement

As detailed within the Herbata Data Centre Sources of Energy Report (Volume II, Appendix 1.3), 30% of the energy demand remaining following energy efficiency reduction measures will be met by renewable sources (in line with Kildare County Development Plan 2023-2029 policy requirements). Less than 1% of the Project's energy demand (both regulated and unregulated) has been calculated to be met by the onsite generation by solar PV in the first year of operation, the remainder will be met by purchased electricity via a CPPA totalling 3,032,926 kWh and 624,607,432 kWh per annum, associated with the regulated and unregulated demands respectively. This totals 627,642 MWh per annum, or 31,409,103 MWh over the Project's lifetime.

The commitment to a CPPA results in savings of 1,007 tCO_2e and 207,370 tCO_2e per annum, associated with the regulated and unregulated energy demand, respectively. This totals 52,081 tCO_2e and 10,375,742 tCO_2e when scaled over the Project's lifetime. This has been calculated by scaling the energy demand attributed to CPPAs by SEAI emissions factors for electricity (332 gCO_2e/kWh). This doesn't account for likely grid decarbonisation.

Battery Energy Storage Systems

For the purpose of providing uninterrupted and conditioned power, each data centre building will have a dedicated BESS system. The storage capacity provides a back-up energy source to the data centres, in

addition the BESS adds resilience to the wider electricity network as it will have the capacity to provide immediate export of energy to the grid, or the capacity to store excess electricity generated externally, if required.

The primary role of the BESS is to provide a back-up energy source to the data centres. Emissions associated with this activity has been accounted for within the calculation of operational emissions arising from the regulated and unregulated energy consumption. Therefore, the assessment of operational effects of the BESS focuses on their role in exporting electricity to the grid, thereby enhancing the flexibility and resilience of the wider electricity network and avoiding the use of gas-fired peaking plants.

It is likely that the BESS would be charged both from surplus electricity generated by on-site gas turbines, in addition to electricity from the grid. It is assumed that as the penetration of non-dispatchable renewable energy resources in the Irish grid increases, energy market price mechanisms will be in place to ensure that, insofar as is possible, stationary grid-scale batteries would only charge using surplus renewable energy when charging from the grid. Given wind energy constitutes the majority of renewable energy generators and is most likely to be curtailed during periods of low demand, it has been assumed that this would be the source of electricity charging the BESS from the grid. However, as it is not certain that this would be the case in all market conditions, grid electricity has been assumed to charge the BESS in the absence of renewable supply. It is likely that GHG impacts will fall within the range of emissions generated by all three scenarios.

When charged by the on-site gas turbines, the BESS would not be avoiding electricity generation by gas-fired peaking plants, and as such would result in additional emissions from such generation activities. Emissions associated with electricity provision to the grid by the BESS has been calculated by scaling the annual energy input required to charge the BESS, with Ireland's natural gas emissions factor (204 gCO_2e/MWh) (SEAI, 2023), resulting in additional emissions of 235,889 tCO_2e.

When charged from grid electricity, the BESS will enable otherwise curtailed renewable energy, resulting in total emissions avoided by the Project's proposed BESS to lie between -530,002 tCO_2e and -147,249 tCO_2e over the Project's lifetime. Negative values represent avoided GHG emissions.

The above ranges provided are anticipated to present a conservative estimate that overstates annual emissions resultant and avoided from the Project as decarbonisation of the gas grid, and electricity grid has not been accounted for. This is planned to arise through the increasing provision of biomethane, abated natural gas and hydrogen, and provision of renewable energy.

Export of energy via the substation

The proposed substation would enable surplus electricity generated by the gas turbines located on site to be exported and provide capacity to Eirgrid. Emissions intensities associated with natural gas are currently lower than Ireland's grid electricity, and as such the export of gas-generated lower carbon intensity electricity would aid in the shift away from coal and oil and reduce the overall emissions intensity of grid electricity. Emissions associated with the combustion of gas on site are likely to further decrease as gas supplier GNI aims to gradually replace natural gas with biomethane and hydrogen, resulting in further opportunities to offer low carbon electricity to the grid. Given it is not currently known to what extent the substation will export electricity, it is not possible to make a quantitative estimate of emissions that could be avoided, however it is possible to conclude that the proposed generators will result in avoided emissions by enabling the reduction of higher carbon intensity generation sources.

Transport

Operational transport emissions have not been quantitatively assessed, given they are likely to be immaterial within the context of the emissions associated with the regulated and unregulated energy demands arising from the Project. However, it must be noted that the measures listed within section 16.3 embedded within the Project design (inclusion of bicycle parking, EV charge points, provision of cycling and pedestrian infrastructure, and provision of a new bus stop) will enable emissions reductions associated with the travel of staff to the site.

Summary

Table **16.5** summarises the regulated and unregulated energy demands arising from the Project, alongside their associated emissions. Reductions resultant from the above-described energy efficiency, and renewable energy procurement are also included.

Table 16.5: Summary of operational emissions

	Regulated Energy		Unregulated Energy	
	Annual Energy Demand (kWh)	Annual Emissions (tCO_2e)	Annual Energy Demand (kWh)	Annual Emissions (tCO_2e)
No mitigation				
Total	**15,834,157**	**5,257[2]**	**2,091,466**	**694,367[2]**
Embedded emissions reduction measures				
Energy Efficiency measures	-3,460,118		n/a	
Solar PV[1]	-679,285		-2,830,356	
CPPA[1]	-3,032,926		-624,609,432	
Total	**8,661,827**	**1,767[3]**	**1,464,026,173**	**298,661[3]**
Total percentage reduction		**-66%**		**-57%**

[1]Accounting for the first year of operation only. Over the lifetime of the solar PV array panel degradation will result in reduced output. Given 30% of energy demand must be met by renewable sources, this will result in an uplift throughout the Project's lifetime in the energy demand to be met within the CPPA.
[2]Emissions have been scaled by SEAI emissions factors for electricity (332 gCO_2e/kWh)
[3]Emissions accounting for embedded emissions reduction measures have been scaled by SEAI emissions factors for natural gas (204 gCO_2e/kWh) to account for the use of gas generators in the onsite provision of electricity.

Total annual emissions resultant from the regulated energy demand of the Project were estimated to be 1,767 tCO_2 per annum, or 88,351 tCO_2 over the Project's 50 year lifetime. Total annual emissions resultant from the unregulated energy demand of the Project were estimated to be 298,661 tCO_2 per annum, or 14,933,067 tCO_2 over the Project's 50 year lifetime.

Emissions associated with the BESS are anticipated to lie between 235,889 tCO_2e and -530,002 tCO_2e over the lifetime of the Project. The true emissions resultant from the BESS will be dependent on the energy sources used to charge the system, but will likely lie within this range.

It should be noted that estimates of emissions associated with both regulated and unregulated energy consumption are likely to provide a conservative worst-case estimate. Firstly, it is unlikely that the data centres will achieve 100% power utilisation, as they generally reach a maximum of between 70% to 80% utilisation. Further, a static current natural gas emission intensity factor has been used to calculate emissions, which does not take into account gas network decarbonisation by GNI, in line with policy and legislation as Ireland moves towards its net zero 2050 target (detailed within Appendix 4.9 to this EIAR). Finally, the calculation assumes all data centres are completed and operational for the entire 50 year lifetime of the Project. As such, it can be anticipated that actual emissions resultant from the Project will be less than that estimated.

16.6.2.2.2 Sensitivity of the Receptor

GHG emissions have a global effect rather than directly affecting any specific local receptor to which a level of sensitivity can be assigned. The global atmospheric mass of the relevant GHGs and consequent warming potential, expressed in CO_2e, has therefore been treated as a single receptor of **high sensitivity** (given the consequences of global climate change and the cumulative contributions of all GHG emissions sources).

16.6.2.2.3 Significance of Effect

The Project's operational-stage emissions have been contextualised in the context of Ireland's Carbon Budgets from 2026 to 2035. The GHG impacts given within Table 16.616-4 represent carbon budget expenditures that will occur as a result of the Project's operation. The phased delivery of the Project has been accounted for when attributing emissions to relevant carbon budgets.

As described within section 16.2.6, the operational GHG figure per annum for the Project is a conservative estimate, not accounting for grid decarbonisation. As a result, the emissions reported within Table 16.616-4 below for each carbon budget period give a conservative assumption of carbon budget expenditures.

It should be noted that the operational GHG figure per annum is based on current natural gas conversion factors, providing a fixed current year estimate, which does not account for planned decarbonisation of the gas network in line with policy and legislation as Ireland moves towards its net zero 2050 target. As a result, the emissions reported within Table **16.6** below for each carbon budget period give a conservative assumption, in reality this is likely to be lower. A detailed assessment of possible decarbonisation scenarios is provided within the Energy Policy Compliance Report (HDR, 2024a), Appendix 4.9 to this EIAR. The decarbonisation trajectories are informed by relevant national plan and strategy documents, and assuming the decarbonisation of the gas network is in line with such documents, it can be expected that the Project will decarbonise completely by 2039. Further, the connection to a gas network and on-site generation of electricity through the gas turbines is in line with recent EU direction (the Hydrogen and Decarbonised Gas Market Package) and consequently Irish Government direction on the use of gas for generation as a transition fuel, as detailed within the Energy Policy Compliance Report (HDR, 2024a). As such, it is consistent with the requirements of the Climate Action Plan 2024 (Government of Ireland, 2024a) which promotes the design of large energy users to enable low/zero carbon demand growth.

Table 16.6: GHG Impacts in the Context of Ireland's Carbon Budgets

Time period	2026-2030	2031-2035	Total[1]
Ireland carbon budget (tCO_2e)	200,000,000	151,000,000	351,000,000
Regulated Emissions			
Project operational GHG impacts (tCO_2e)	4,123	8,246	12,369
Project emissions as percentage of Ireland Carbon Budget	0.002%	0.01%	0.004%
Unregulated Emissions			
Project operational GHG impacts (tCO_2e)	696,876	1,393,753	2,090,629
Project emissions as percentage of Ireland Carbon Budget	0.35%	0.92%	0. 60%
BESS Emissions			
Project operational GHG impacts (tCO_2e)	-24,733 to 11,008	-49,467 to 22,016	-74,200 to 33,025
Project emissions as percentage of Ireland Carbon Budget	-0.01% to 0.01%	-0.03% to 0.01%	-0.02% to 0.01%
Total Emissions[2]			
Project operational GHG impacts (tCO_2e)	712,008	1,424,015	2,136,023
Project emissions as percentage of Ireland Carbon Budget	0.36%	0.94%	0.61%

[1]This is the total during the budget periods, not the total for the Project's assumed lifetime.

[2]This assumes the worst case BESS scenario, with the fewest avoided emissions.

When contextualising the operational-stage emissions into the 2026 to 2030 Sectoral Emissions Ceilings for the commercial built environment (5 $MtCO_2e$), the Project's operational emissions comprise 14.24%. Considering regulated and unregulated emissions separately, these comprise 0.08% and 13.94% of the Sectoral Emissions Ceiling for the commercial built environment, respectively.

While the emissions associated with the BESS range from -74,200 to 33,025 tCO_2e over the carbon budget periods (where negative values represent avoided emissions), it is important to note that national and local policy calls for increased flexibility in the grid (including Climate Action Plan 2024 (Government of Ireland, 2024a), Ireland's Long-term Strategy on Greenhouse Gas Emissions Reduction (Government of Ireland, 2024b) and the Kildare County Development Plan 2023-2029) to increase the resilience of the electricity network. As such their inclusion is in line with national and local policy.

As detailed within section 16.6.2.1.1 above, and considering contextualisation within national carbon budgets, the emissions resulting from the operational phase of the Project are substantial. However, accounting for the extent of embedded design measures that act to reduce operational emissions (66% reduction in emissions associated with the regulated energy demand), in addition to considering the decarbonisation of the gas network leading to further operational emissions reductions and future net zero emissions in operation, the

impact of GHG emissions associated with the regulated energy consumption on the high sensitivity receptor is consistent with Ireland's national legislation and policy, and net zero targets and would result in **not significant minor adverse** effects.

Similarly, the impact of GHG emissions associated with unregulated energy consumption, accounting for the extent of embedded design measures that act to reduce operational emissions (57% reduction in emissions associated with the unregulated energy demand due to the use of gas turbines in place of grid electricity, and renewable energy demand through CPPAs and on-site solar PV), in addition to considering the decarbonisation of the gas network leading to further operational emissions reductions and future net zero emissions in operation, on the high sensitivity receptor is consistent with Ireland's national legislation and policy, and net zero targets and would result in **not significant minor adverse** effects.

16.6.2.3 Mitigation

While the Project already includes extensive embodied carbon mitigation within its design and material procurement commitments (as detailed within section 16.3), the following further mitigation measures should be considered to further reduce energy consumption and resultant emissions:

- While design measures to reduce unregulated energy consumption from the data halls lie within the scope of the tenant during the fit out of the building, the below measures are included for tenant consideration as methods by which such unregulated energy may be reduced:
    - Reduce energy losses from power distribution units by using more efficient units, and look to install those which can also monitor power usage where relevant.
    - Implement efficient air flow management measures to improve cooling efficiency. Examples may include using a hot aisle / cold aisle layout, reducing the number of aisles requiring cooling; and using curtains or panels to avoid cold air from mixing with hot exhaust air.
    - Optimise airflow management within server units to ensure air leakage and recirculation are minimised, and cool air is guided exclusively through the IT equipment.

Waste heat produced by the data centres has the potential to be used as part of a local district heating network providing low carbon heat, avoiding the use of fuels with higher carbon intensities. The development of district heating networks is supported within both national and local policy, which expect data centre developments to aid in such development of heating infrastructure. Given no heat network yet exists in the locality of the site, the Project will ensure it is ready to export heat should demand for such infrastructure grow in the future. A number of the proposed gas turbines will be linked to waste heat boilers, with waste heat pumped via heat exchangers to the perimeter of the site, enabling future nearby developments to connect on and receive heat for a range of uses. The effects of this have not been quantitatively assessed, although it could be concluded that the provision of low / zero carbon heating where delivered, would likely have a beneficial impact by using residual waste heat to heat housing and other local buildings.

16.6.2.4 Residual Impacts

Accounting for the above further mitigation measures, the magnitude of impact from operational phase emissions on the high sensitivity receptor would result in **minor adverse** construction-stage effect which is **not significant** in EIA terms.

16.7 Whole Life Effects

16.7.1 Likely Significant Environmental Effects

16.7.1.1 Magnitude of Impact

The assessment of whole life effects considers emissions resultant from both the construction and operational phases of the Project, these are summarised within Table **16.7**.

Embodied carbon from the construction phase is based on current material emissions intensities, and operational emissions are based on the current natural gas emissions intensity, and as such both do not account for decarbonisation of the construction industry and the gas grid over the Project's lifetime. Therefore, the below-reported whole life GHG impact is likely to present a conservative emissions estimate.

Table 16.7: Project Net GHG Impact

	Emissions (tCO_2e)
Construction phase emissions[1]	13,389,533
Operational phase emissions - regulated	88,351
Operational phase emissions – unregulated	14,933,067
Operational phase emissions – BESS[2]	235,889
Net emissions (lifetime)	28,646,840

[1]As the reduction in embodied carbon as a result of the implementation of the proposed mitigation measures has not been quantitatively assessed at this stage, this value does not account for the likely reductions that will be achieved.
[2]This assumes the worst case BESS scenario, with the fewest avoided emissions.

Net lifetime emissions resulting from the Project are anticipated to decrease by at least 41% when accounting for embedded design measures that reduce Project emissions. Given the planned reduction in embodied carbon as a result of lower carbon material procurement and construction methods has not been quantitatively assessed at this stage, it is likely that the reported 41% decrease in lifetime emissions is conservative and would be greater when accounting for embodied carbon reduction measures.

The reported emissions from the BESS is due to the option to charge the BESS from the on-site gas turbines, which presents a conservative estimate. Under this scenario, the BESS would not be avoiding any emissions by offsetting the use of gas-fired peaking plants (given the source of electricity would be from gas-fired turbines). However, it should be noted that the use of BESS and resultant increased flexibility of the electricity network is promoted within national policy in order ensure the resilience of the grid (Climate Action Plan 2024, National Development Plan 2021-2030, and Electricity and Gas Sector Climate Change Adaptation Plan). Additionally, such emissions are likely to over-estimate emissions arising from electricity generation, given the planned decarbonisation of the gas network has not been accounted for. As such, all lifetime emissions associated with the operational phase of the Project are likely to be reduced in reality, in comparison to those reported.

16.7.1.2 Sensitivity of the Receptor

GHG emissions have a global effect rather than directly affecting any specific local receptor to which a level of sensitivity can be assigned. The global atmospheric mass of the relevant GHGs and consequent warming potential, expressed in CO_2e, has therefore been treated as a single receptor of **high sensitivity** (given the consequences of global climate change and the cumulative contributions of all GHG emissions sources).

16.7.1.3 Significance of Effect

The nature and significance of effect has been characterised by contextualising the Project's whole life carbon GHG impacts within Ireland's carbon budget, and with its compliance with Ireland's net zero trajectory, local and national climate-related policy, legislation and guidance.

Carbon budgets that are relevant during both the construction and operational phases of the Project have been considered within Table **16.8**. The phased delivery of the Project has been accounted for when attributing emissions to relevant carbon budgets.

Table 16.8: Net Emissions and Carbon Budgets

Time period	2021-2025	2026-2030	2031-2035	Total*
Ireland carbon budget (tCO2e)	295,000,000	200,000,000	151,000,000	351,000,000
Project GHG impacts (tCO_2e)	2,296	5,920,074	7,575,862	13,498,233
Development emissions as percentage of Ireland Carbon Budget	0.001%	2.96%	5.02%	3.85%

* This is the total during the budget periods, not the total for the Project's assumed lifetime.

Sectoral Emissions Ceilings that are relevant during both the construction and operational phases of the Project have been considered within Table 16.9. The phased delivery of the project has been accounted for when attributing emissions to the relevant Sectoral Emissions Ceilings.

Table 16.9: Net Emissions and Sectoral Emissions Ceilings

Time period	2021-2025	2026-2030	Total[1]
Sectoral Emission Ceiling – commercial built environment (tCO_2e)	7,000,000	5,000,000	12,000,000
Project GHG impacts (tCO_2e)	2,296	5,920,074	5,922,370
Project emissions as percentage of the Sectoral Emission Ceiling – commercial built environment	0.033%	118.4%	49.35%

[1] This is the total during the budget periods, not the total for the Project's assumed lifetime.

Project emissions form a considerable proportion of the national carbon budgets and Sectoral Emissions Ceilings for the commercial built environment. It must be noted that the majority of whole life emissions associated with the Project arise from embodied carbon from the servers. As previously stated within sections 16.2.6 and 16.5.2.2.3, the assessment of server embodied carbon takes a conservative worst-case approach, with final 'as built' emissions dependent on product specification and the reuse, repair or recycling of servers over the lifetime of the Project. Further, while the Climate Action Plan 2024 (Government of Ireland, 2024a) and Ireland's Long-term Strategy on Greenhouse Gas Emissions reductions (Government of Ireland, 2024b) reference targets to reduce embodied carbon in construction materials associated with the industry sector, it is uncertain to what extent the national carbon budgets and Sectoral Emissions Ceilings account for embodied carbon emissions, and as such contextualisation within such budgets and emissions ceilings must be approached with caution.

While the magnitude of whole life emissions associated with the Project are considerable, even including the embedded mitigation, they should be considered within the context of the EU ETS (described within 16.2.2.1), under which a permit will be in place prior to the Project becoming operational. The EU ETS places a cap on GHG emissions that can be emitted by power plants, industry factories and other large energy users. Within the cap, companies receive or buy emission allowances, which may be traded as needed. The cap decreases every year, ensuring that total emissions fall. Over the period 2021-2030 the emissions cap will continue to decrease annually by a factor of 2.2% (European Commission, n.d.).

As a result of this, operational emissions resultant from the Project generated by on site gas generators will be required to reduce in line with ETS reductions. This will likely be enabled by the planned decarbonisation of the GNI gas network, which has a target of achieving a net zero carbon network by 2050; natural gas will be gradually replaced with biomethane and hydrogen (GNI, 2019). Such decarbonisation has not been accounted for within the assessment of emissions within this Climate Change Chapter. In reality, lifetime emissions resultant from the operational phase of the Project are likely to be lower than that reported. A detailed assessment of possible decarbonisation scenarios is provided within the Energy Policy Compliance Report (HDR, 2024a), Appendix 4.9 to this EIAR.

Given the ability to register new generation facilities under the EU ETS, there is a presumption that new facilities are anticipated to be constructed, each of which would result in associated embodied carbon emissions. Therefore, emissions associated with the Project's embodied carbon, particularly those associated with the generation infrastructure, may fall under this presumption.

Further, the reported whole life effects are likely to be conservative, given the planned decarbonisation of the gas network, and reduction in embodied carbon associated with materials used in the construction phase are not accounted for quantitatively. It is anticipated that, over the Project's lifetime, the gas used on site will be increasingly comprised of hydrogen (GNI plan to deliver a mix of hydrogen within the gas network up to 20%) and bio-methane in lieu of fossil fuel-based gas, as detailed within the Energy Policy Compliance Report (HDR, 2024a), Appendix 4.9 to this EIAR.

It is also important to note that the majority of construction-stage emissions arise from the servers to be installed within the data centre buildings (approx. 98% of total construction-stage emissions), and have been taken into account in the assessments presented in this chapter. While this is out of the Applicant's control and will be the responsibility of the tenant to reduce where possible, operation in line with the Climate Neutral Data Centre Pact (2023) will require the tenant to prioritise circular economy principles and ensure server equipment will be assessed for reuse, repair or recycling. This would greatly reduce emissions resultant from the

construction phase (which includes all server embodied carbon throughout the Project's lifetime), thereby reducing whole life emissions and contribution to carbon budgets.

Taking account both of the previously-detailed mitigation measures in place to reduce both construction- and operational-phase emissions, and the context of the EU ETS and presumption for the construction of new generation facilities, whole life effects of GHG emissions resultant from the Project on the high sensitivity receptor is aligned with Ireland's national legislation and policy, and net zero targets and have been assessed as minor adverse, which is not significant in EIA terms.

16.8 Assessment of Cumulative Effects

As stated within the relevant guidance on assessing GHG emissions (IEMA, 2022), the consideration of cumulative effects for GHGs differs from that for many EIA topics where only projects within a geographically bounded study area would be included. This is because the atmospheric concentration of GHGs and their resulting effect on climate change is affected by all sources and sinks globally, not simply those in close proximity to the Project. All developments that emit GHGs have the potential to impact the atmospheric mass of GHGs as a receptor, and so may have a cumulative impact on climate change. Therefore, the effects of GHG emissions from specific cumulative projects should not be individually assessed, as there is no basis for selecting any particular cumulative project that has GHG emissions for assessment over any other.

Consequently, cumulative effects due to other specific local development projects are not individually predicted but are taken into account when considering the impact of the Project by defining the atmospheric mass of GHGs as a **high sensitivity** receptor, in line with relevant guidance.

However, in order for the Project to receive the gas required to power its generators, a high-pressure gas pipeline will be constructed. This has been considered below.

16.8.1 High-pressure Gas Pipeline

In order for the Project to receive a gas supply, to power the on-site gas turbines, a physical connection to the GNI gas network is required. GNI will be responsible for providing the required infrastructure works to construct a new high-pressure gas distribution pipeline to the Project site boundary (on the R409), from the existing GNI Above Ground Installation (AGI) at Glebe West, Co. Kildare. The final, detailed design, consenting and construction of the required infrastructure works will be the responsibility of GNI, the Applicant cannot and will not seek consent for the gas connection. Given the functional interdependence that exists between the Project and the GNI gas connection, the effects of the gas connection on climate change should be considered. The new gas connection will likely comprise a new circa 300 mm diameter high pressure gas pipeline, largely crossing agricultural/open land over a distance of 6.5 km. Emissions associated with the installation of the pipeline will likely largely result from supply chain emissions from the extraction of raw materials and manufacturing of construction materials, alongside the emissions associated with the fuels used by vehicles and plant. No quantitative information (i.e. detailed material quantities) regarding such construction-stage emissions is yet available, which could be used to inform an assessment of construction-stage GHG emissions. As such, a qualitative assessment of the effects of the new gas pipeline on climate change has been undertaken.

Emissions arising from the construction of the gas pipeline are likely to be minimal, given the relatively limited extent of the infrastructure proposed (i.e. carbon associated with the pipeline materials). By way of comparison to the emissions arising from the Project, which are extensive due to the scale of the proposed buildings, plant, and likely server capacity, emissions arising from the gas pipeline are likely to be negligible.

The provision of such a pipeline ensures the supply of gas to the Project, enabling operational emissions reductions through avoiding the use of grid electricity only to power the Project. The gas connection would also enable the Project to benefit from GNI's decarbonisation targets (through the increasing provision of biomethane, abated natural gas, and hydrogen), in turn resulting in the reduction of operational emissions resulting from the Project over its lifetime. Emissions avoided over the Project's lifetime as a result of this (when compared to a scenario where the Project would be powered by grid electricity) will likely outweigh those emissions resulting from the construction of the pipeline, resulting in a payback.

As such, it is likely that the installation of a new gas pipeline by GNI will result in a minor adverse effect during the construction phase, which is not significant.

16.9 Interactions

IEMA guidance (2020) defines an in-combination climate impact as *'when a projected future climate impact (e.g., increase in temperatures) interacts with an effect identified by another topic and exacerbates its impact'*.

The in-combination climate impact assessment has been informed by the potential climatic conditions detailed within future climate models, collated within Climate Analytics' Climate Impact Explorer (Climate Analytics, 2022). Data local to the Project was used to inform the future climate within this assessment (fully detailed within Appendix 16.2).

An initial screening exercise for each environmental topic has been undertaken which identifies impacts reported within the technical chapters making up the EIAR and considers whether projected climate conditions will alter the sensitivity of receptors or magnitude of impact resulting in a change in significance. The significance of any effect has been re-assessed using the standard methodologies for each relevant environment topic.

Consideration has also been given to whether any new effects will arise as a result of the Project under future projected climate conditions.

The assessment of in-combination climate impacts has considered the embedded design in determining whether projected climate change affects effects on sensitive receptors. Should an effect remain significant following the above-described assessment of in-combination climate impacts, further mitigation has been presented where relevant.

The assessment of in-combination effects with climate change is provided below. The initial screening exercise identified the following main areas where there is potential for interactions:

- Chapter 11: Landscape and visual
- Chapter 5: Biodiversity
- Chapter 10: Cultural heritage
- Chapter 7: Water and hydrology
- Chapter 15: Human health

Table **16.10**16-8 identifies the impact that may be affected, the justification, effect and explanation of effect.

Table 16.10: In-combination climate impacts.

Topic	Impact	Justification	Effect	Explanation
Chapter 11: Landscape and Visual	Impact of the Project on the surrounding landscape.	Projected future climate change may impact the success of the proposed landscaping.	Not Significant	Proposed planting has been identified as resilient to projected climate change.
Chapter 5: Biodiversity	Impact of temporary and permanent habitat loss and disturbance during construction of the Project.	Projected future climate change may impact the success of the proposed planting to limit habitat loss.	Not Significant	Proposed planting has been identified as resilient to projected climate change.
Chapter 10: Cultural heritage	Recorded monument (KD019-028----)	Buried archaeological deposits, particularly those that may contain waterlogged deposits (preserved in situ) can be vulnerable to the effects of climate change, including increased cycles of wetting and drying causing changeable ground conditions. Extreme temperatures (both high and low) can have an effect on the soil structure and levels of preservation of organic remains (wood, pollen, charred remains etc.).	Not Significant	Proposed mitigation will provide for a stable ground environment via engineered project design (drainage provisions). Monitoring of ground conditions during operational phase advised.
	Archaeology found during geophysical survey	The removal (preservation by record) of these features during the construction phase will mean that they are no longer vulnerable to climate change.	Not Significant	n/a
Chapter 7: Water and Hydrology	Impact of increased flood risk arising from additional surface water runoff during operation of the Project.	The projected future increase in precipitation may result in increased flood risk.	Not Significant	The drainage design accounts for future climate change by ensuring it is able to accommodate future surface water pressures associated with climate change.
Chapter 15: Human Health	Impact of climate change on the health of Project users during its operation.	Increasing temperatures may impact those using the site during its operation.	Not Significant	The human health assessment scopes in climate change within its operational phase assessment, as a determinant of health.

16.10 Summary of Effects

The potential impact of GHG emissions due to the Project, resulting in an effect on the global atmospheric GHG concentration that contributes to climate change, has been assessed and reported in this chapter.

The construction-stage emissions total 13,389,533 tCO_2e. This can be divided into those associated with the applicant-controlled elements (211,936 tCO_2e) and the tenant server fit-out (13,177,597 tCO_2e). The Applicant has committed to embodied carbon emissions reductions through the use of recycled and re-used materials: the design team will seek to source goods, services, or works with a reduced environmental impact throughout their lifecycle. In this regard, tender requests will set out the policies and targets as set in the Resource and Waste Management Plan (RWMP) (HDR, 2023) which must be achieved. Such mitigation is consistent with national targets to promote the use of lower carbon alternatives in construction as detailed within the Climate Action Plan 2024 (Government of Ireland, 2024a) and Ireland's Long-term Strategy on Greenhouse Gas Emissions Reduction (Government of Ireland, 2024b).

Within the context of Ireland's carbon budgets, emissions associated with the applicant-controlled elements of the Project would lead to a total impact of 211,936 tCO_2e by 2035, the end of the final published carbon budget period, and account for 0.06% of carbon budget emissions. Within the context of the Sectoral Emissions Ceilings for the commercial built environment, emissions associated with the applicant-controlled elements of the Project would lead to a total impact of 142,056 tCO_2e by 2030, the end of the published Sectoral Emissions Ceilings period, and account for 1.18% of the Sectoral Emissions Ceiling. Given the inclusion of the above-described emissions reduction measures, it is considered the Project is consistent with Ireland's national legislation and policy, and net zero targets and as such has been assessed to have a **minor adverse** effect which is **not significant** in EIA terms.

Within the context of Ireland's carbon budgets, emissions associated with the tenant-controlled elements of the Project would lead to a total impact of 11,150,274 tCO_2e by 2035, the end of the final published carbon budget period, and account for 3.18% of carbon budget emissions. Within the context of the Sectoral Emissions Ceilings for the commercial built environment, emissions associated with the tenant-controlled elements of the Project would lead to a total impact of 5,068,306 tCO_2e by 2030, the end of the published Sectoral Emissions Ceilings period, and account for 42.24% of the Sectoral Emissions Ceiling. In the absence of embedded mitigation, tenant-controlled elements of the Proposed Development have been judged to result in a **significant moderat**e to **major adverse effect**.

The operational phase of the Project would result in emissions associated with the regulated and unregulated energy demand of 1,767 tCO_2e and 298,661 tCO_2e per annum, respectively. The embedded mitigation included within the Project's design (i.e. use of gas turbines, 30% energy demand to be met from renewable sources, and energy efficiency measures reducing regulated energy demand) enables the Project's operational emissions arising from regulated and unregulated demand to be reduced by 66% and 57%, respectively.

Operational emissions associated with the BESS are anticipated to lie between 235,889 tCO_2e and -530,002 tCO_2e over the lifetime of the Project. The true emissions resultant from the BESS will be dependent on the energy sources used to charge the system, but will likely lie within this range.

In accordance with the Climate Action Plan 2024 guidance on electricity demand management, the Project makes provision for on-site renewable energy production and on-site energy storage. CPPAs will also enable sustainable sources of energy generation to serve the development. The remaining energy requirement shall be met by gas, a transitionary fuel, from the national gas grid. In addition, the proposed data centre will have the flexibility to export energy to the national grid if and when required.

Within the context of Ireland's carbon budgets, emissions associated with the regulated energy demand would lead to a total impact of 12,369 tCO_2e by 2035, the end of the final published carbon budget period, and account for 0.004% of carbon budget emissions. Within the context of the Sectoral Emissions Ceilings for the commercial built environment, emissions associated with the regulated energy demand would lead to a total impact of 4,123 tCO_2e by 2030, the end of the published Sectoral Emissions Ceilings period, and account for 0.08% of the Sectoral Emissions Ceiling. Given the inclusion of the above-described emissions reduction measures, it is considered the Project is consistent with Ireland's national legislation and policy, and net zero targets and as such would result in a **not significant minor adverse** effect.

Within the context of Ireland's carbon budgets, emissions associated with the unregulated energy demand would lead to a total impact of 2,090,629 tCO_2e by 2035, the end of the final published carbon budget period, and account for 0.60% of carbon budget emissions. Within the context of the Sectoral Emissions Ceilings for the commercial built environment, emissions associated with the unregulated energy demand would lead to a

total impact of 696,876 tCO_2e by 2030, the end of the published Sectoral Emissions Ceilings period, and account for 13.94% of the Sectoral Emissions Ceiling. Given the inclusion of the above-described emissions reduction measures, it is considered the Project is consistent with Ireland's national legislation and policy, and net zero targets and as such would result in a **not significant minor adverse** effect.

Over the assumed lifetime of the Project, it will result in a total of 28,646,840 tCO_2e emissions. Within the context of the Ireland carbon budgets the net emissions expended as a result of the Project total 13,498,233 tCO2e, accounting for 3.85% of carbon budget emissions. Within the context of the Sectoral Emissions Ceilings for the commercial built environment, emissions associated with the regulated energy demand would lead to a total impact of 5,922,370 tCO_2e by 2030, the end of the published Sectoral Emissions Ceilings period, and account for 49.35% of the Sectoral Emissions Ceiling. Given the inclusion of the above-described emissions reduction measures, it is considered the Project is consistent with Ireland's national legislation and policy, and net zero targets and as such the impact of whole-life GHG emissions from the Proposed Development on the high sensitivity receptor is considered to meet the definition of a **minor adverse effect** that is **not significant**.

Of the nine potential risks to the Project as a result of climate change, two (high temperatures and extreme weather events) were considered to have a potentially significant effect. Owing to the good practice design measures that will be incorporated into the Project, these effects were determined to be negligible and not significant.

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