Environmental Impact Assessment Report Addendum - Updated Chapter 12: Climate

Premier Periclase Ltd
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Premier Periclase Ltd
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12.1 Introduction

This Chapter has been prepared to assess the potential for effects on climate from the Proposed Development during the construction and operational phases at the Premier Periclase Ltd. (PPL) Site at Boyne Avenue, Newtownstalaban, Drogheda, Co. Louth. This chapter should be read in conjunction with *Chapter 2 Description of Proposed Development* of the Environmental Impact Assessment Report (EIAR) enclosed with the planning application.

This Chapter has been updated within this EIAR Addendum in response to a third-party appeal from An Taisce (the appellant), dated 24th July 2025, against the decision of the planning authority to grant planning permission for the Proposed Development.

12.1.1 Global Climate Change

The global climate is rapidly changing and is transforming the world due to the effect of Greenhouse Gases (GHG). A GHG is any gas in the atmosphere that absorbs and re-emits heat which results in the planet's atmosphere being warmer than it otherwise would be.

While GHGs naturally occur in the Earth's atmosphere, increasing global temperatures are being propelled by increases in GHGs caused by human activities such as burning of fossil fuels to power industrial processes. Carbon dioxide (referred to as 'CO_2' or 'carbon') is the most common GHG emitted by human activities, in terms of the quantity released and the total impact on global warming. As a result, collective GHGs are measured in units of CO_2 equivalent (CO_2e) which is a metric used to compare the emissions from various GHGs on the basis of their global-warming potential (GWP), by converting amounts of other gases to the equivalent amount of carbon dioxide with the same global warming potential.

12.1.2 Climate Impact Assessment

Premier Periclase Limited (PPL) are applying for permission for the proposed redevelopment of the PPL industrial facility at Newtownstalaban, Drogheda, Co. Louth into a Sustainably Powered Enterprise Campus known as 'CORE'. CORE will offer low carbon energy solutions to mixed use tenants in alignment with the Irish Government's sustainable economic development and industrial decarbonisation objectives. The Proposed Development to which this planning application relates is collectively known as 'Phase 1 CORE' and will comprise an Energy Centre (EC) and related infrastructure including Battery Storage, 3 MW of solar Photo Voltaic (PV) arrays, a 25.5 MW (operating capacity electrical load) Data Centre (DC) Building, and all associated and ancillary development.

The site is currently occupied by the PPL magnesia and magnesium hydroxide production facility which represents a highly carbon intensive industrial process.

The innovative energy solutions proposed on site involves the use of a connection to the national electricity grid (referred to hereinafter as 'the grid') alongside onsite solar generation, on-site flexible generation and large-scale battery energy storage system (BESS), to deliver digital services and infrastructure with minimum carbon intensity, and with a clear pathway to net-zero DC operations. This Proposed Development will act to actively support the electricity grid as opposed to other conventional large energy users whose operations tend to put a significant strain on the grid.

The Proposed Development represents an evolution of the existing industrial heritage on the site; with PPL making a transition to become a leader in industrial decarbonisation and provide sustainable economic development for the community and the country for the next 60 years.

In accordance with the requirements of the European Union (Planning and Development) (Environmental Impact Assessment) Regulations 2018 (S.I. No. 296 of 2018) and the

Environmental Impact Assessment Directive (EIA Directive) (2014/52/EU) this Chapter assesses the likely significant effects, if any, on climate and the environment resulting from both the:

- Effect of the Proposed Development on climate (GHG Emissions Assessment of the nature and magnitude of GHG emissions including Embodied Carbon Assessment and Operational Carbon Assessment); and
- Vulnerability of the Proposed Development to climate change (Climate Change Resilience Assessment).

This approach aligns with the recent guidance from the Institute of Environmental Management and Assessment (IEMA) *Environmental Impact Assessment Guide to: Assessing Greenhouse Gas Emissions and Evaluating their Significance* (IEMA, 2022).

An embodied carbon assessment has been completed by AtkinsRéalis for the Proposed Development and is summarised within this Chapter. All information relating to the embodied carbon assessment presented herein has been provided by AtkinsRéalis.

Energy and emissions modelling of the Proposed Development has been completed by Gyrogy Ltd. in co-operation with Baringa Partners LLP and is described in detail in the Energy and Emissions Modelling Report (EEMR) which accompanied the planning application[1]. The energy and emissions modelling is summarised within this Chapter as appropriate. Included in the response to the request for Further Information (FI) in May 2025 was a peer review of the EEMR carried out by KPMG Sustainable Futures[2].

In accordance with the IEMA (2022) Guidance, this Climate Impact Assessment assesses:

- The extent to which the trajectory of GHG emissions from the project aligns with Ireland's GHG trajectory to net zero by 2050. For the purposes of this assessment, the Carbon Budgets and Sectoral Emission Ceilings set out for Ireland in the *Climate Action Plan 2025* (CAP25) under the *Low Carbon Development (Amendment) Act 2021* (refer to Section 12.3 of this Chapter) have been used to provide context for the assessment where appropriate.
- The level of mitigation taking place.

Demonstration of the Proposed Development's compliance with Section 15 of the *Low Carbon Development (Amendment) Act 2021* is also assessed throughout this chapter as appropriate and is further developed in Attachment 12.1 of the EIAR which accompanied the planning application and which was updated as part of the response to the FI request.

12.2 Characteristics of the Proposed Development

The Proposed Development to which this planning application relates is the first phase of CORE, and will consist of extensive works that will transform the ca. 35.6 hectare site and set it on a path that will result in it becoming a sustainably powered enterprise campus.

The Proposed Development consists of:

- The demolition of existing buildings, structures, and services associated with the PPL facility, as well as site clearance and remediation works.
- The careful sequestering of the licensed (inert) landfill onsite in accordance with all ongoing and future requirements of the EPA.
- A number of existing buildings and structures will be maintained as part of the Proposed Development, such as a Workshop Building, part of a Crane Store structure, 3 no. Lime Silos and water tanks and infrastructure, all of which have been incorporated into the design where beneficial and appropriate.
- The construction of a three storey Energy Centre (EC) building, a three storey Data Centre (DC) building, a single storey Facility Operations Centre (FOC) building, a single storey Pump

[1] Gyrogy (2024). Premier Periclase Ltd. CORE Enterprise Campus, Energy and Emissions Modelling Report, Issue B
[2] KPMG Sustainable Futures (2025). Premier Periclase. Energy & Emissions Modelling Report (EEMR) Review

and Filtration Building, a single storey Security Gatehouse and a Security Kiosk at the main site entrance of the site.

- The provision of a Battery Energy Storage System (BESS) Compound, an ESB Substation, a Cooling Compound, a Thermal Store Compound, a Pump and Filtration System, other ancillary structures including a Firewater Tank, a Fire Fighting Water Pump Building, a Control Building, a Maintenance Yard and Waste Management facilities. Ground-mounted solar Photo Voltaic (PV) arrays will also be provided on the existing licensed landfill and stockpile no. 3, along with 3 no. compact substations.
- The provision of all associated works including access arrangements, internal roadways and footpaths, car and cycle parking, boundary treatments, landscaping and services, and all ancillary works.

A detailed description of the Proposed Development is included in *Chapter 2 Description of Proposed Development* of the EIAR, which includes details of the demolition works required, details of the construction of the new buildings and structures, and details of the various elements that will make up the Proposed Development when it will be operational.

The following subsections provide details of the various phases of the Proposed Development which have the potential to give rise to effects on climate.

12.2.1 Construction Phase (including Demolition)

As listed above, the Proposed Development will include the demolition of most of the main existing industrial structures on site, site clearance and remediation works, and the construction of the first phase of a new commercial and technology development on the overall landholding.

Some existing infrastructure at the existing site will be retained for the purpose of respecting the architectural heritage of the site and additionally, to facilitate the new, cleaner activities onsite where appropriate, including via the improvement of that existing infrastructure where beneficial and appropriate. Existing resources available on site will be utilised such as the 38 KV electricity connection, 4 bar gas connection from the Gas Networks Ireland 70 Bar line running through the site, and private water systems to support the Proposed Development.

12.2.2 Operational Phase

The proposed upgrades to existing infrastructure, alongside the integration of renewable energy sources and advanced energy storage systems will provide a new infrastructure line-up at the sustainably powered enterprise campus which will have significantly decarbonised (trending towards fully decarbonised) electrical and heat networks. The first tenant and Large Energy User (LEU) for the campus will be the 32 MW DC which is included in the Proposed Development to which this application relates.

The CORE EC will play a pivotal role in supporting sustainable and regenerative energy systems both within the campus itself, and also within the wider community. The campus will adopt a number of technologies to both limit energy consumption and maximise sustainable energy generation. The proposal includes a significant solar photovoltaic (PV) array on the DC Building roof and southern façade, EC roof and on grade at capped Stockpile no. 3 and the Landfill.

Where fossil fuels are required, the scheme will seek to minimise the environmental effects through the use of less carbon-intensive natural gas engines, instead of more widely used diesel generators.

The key sustainability goals for the Proposed Development are listed in *Chapter 2 Description of Proposed Development* of the EIAR and all contribute to a holistic approach to sustainability for the project covering a broad range of sustainability drivers.

The proposed DC Building will include data halls and associated support spaces (plant and built space). Eight data hall modules are distributed onto three floors; on each floor, additional office and storage spaces will also be provided, with further administrative and loading spaces on the ground floor.

Proposed Energy Infrastructure

Gyrogy are an energy technology and services company with particular expertise in the supply of significantly decarbonised energy to large energy users. Gyrogy's strategic focus revolves around the creation of distributed energy infrastructure, allowing LEUs to significantly decarbonise their own operations, actively contributing to energy transition, rather than hindering it.

Gyrogy has developed a patented energy controls system (Patent Pending: PCT/EP2021/059979) and a deployment strategy for those assets that make up that system that enables the supply of class leading sustainable power, flexible generation and potential electricity grid support services.

The proposed CORE EC will include innovative energy technology solutions such as Gyrogy energy technology or equivalent technology solutions, with the aim of reducing carbon emissions in real-time, facilitating the integration of higher levels of renewable energy on the electricity grid, and providing resilient and conditioned power for industrial and digital infrastructure.

The CORE EC operates at Medium Voltage (MV) and incorporates power electronics and switchgear that operate as the manifold for the flows of electricity from all assets on site (a mix of onsite renewable generation, energy storage, gas generation) and the grid. This system makes possible the provision of power conditioning services and the balancing of energy imports from the gas grid, off-site additional renewable energy power purchase agreement (PPA), and electricity grid imports. PPL will optimise the import, storage and production of energy, based on real-time emissions constraints to significantly decarbonise industrial and commercial operations, and provide real-time flexibility to the energy systems.

The CORE EC can be considered as a "Grid-Edge" Asset with the ability to potentially provide power quality and power export services to the electricity network, which would provide a valuable balancing service to the electricity grid. It will augment the grid-supply to provide significantly decarbonised conditioned power to the proposed on-campus DC. This results in infrastructure that is more sustainable and cost effective, while being more resilient, fault-tolerant and concurrently maintainable. This extra reliability could also be afforded to the grid itself through the aforementioned grid power quality, capacity and balancing services the system can provide.

The Proposed Development will operate both as a Consumer and Producer of electricity. Electricity will be consumed when the grid's fuel-mix is predominantly renewable and electricity demand on the grid is low which will usually occur at night. At peak electricity demand, the grid is most vulnerable and at its highest carbon intensity due to the increased demand requiring older more carbon intense national energy generators to be switched on to provide the necessary extra power to meet demand. At these times, the Proposed Development will provide a flexible demand response and support the loads with its own assets.

The CORE EC, coupled with renewable electricity generation, will enable the reduction/elimination of emissions in real-time (hour-for-hour) on the campus. The CORE EC also has the ability to potentially provide a comprehensive set of grid services enabling deeper penetration of renewable energy supporting the decarbonisation of Ireland's grid.

An overview of the proposed technologies to be employed at the Proposed Development is illustrated in Figure 12.1.

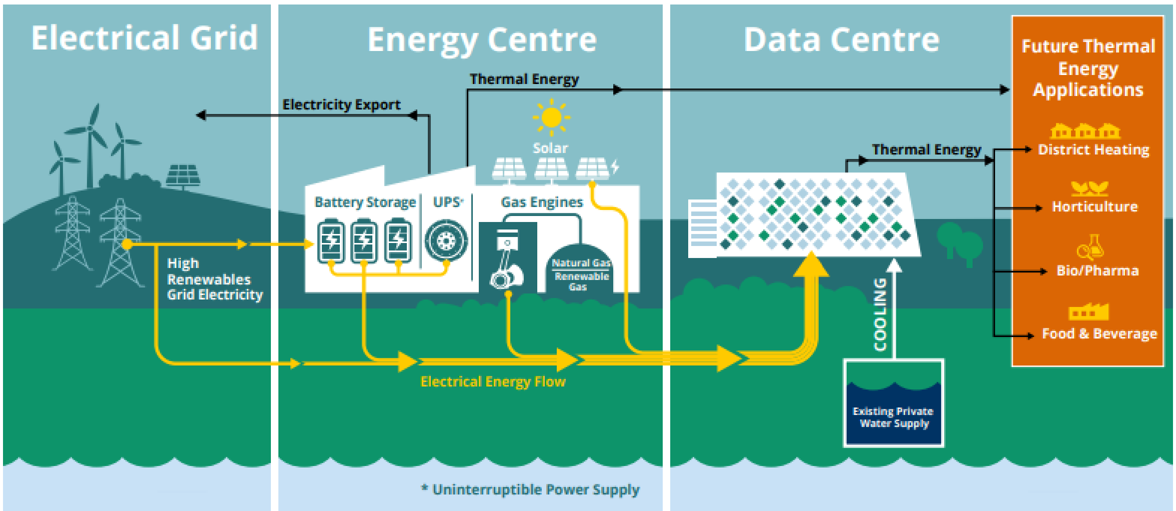

Figure 12.1: Overview of the Energy Technology to be employed at the Proposed Development

Electrical Grid Connection

In the north-west corner of the site, the intention is to utilise the existing entrance on the L2307 road to facilitate access to the site with a separate access gate for the ESB to access the on-site substation. This substation will be powered by the existing Newtownstalaban sub-station via a cable that the ESB will run along the L2307. The substation itself consisting of two separate transformers will step down the 38kV incoming power to 20kV, which will be the voltage rating for the on-site MV system consisting of the CORE EC and associated energy infrastructure. The compound that houses the substation will be segregated with one side accessible to ESB and one side for site staff. The substation control room within the compound will be similarly segregated.

Sections 4 and 5 of the *Energy and Emissions Modelling Report* describe in detail how the Proposed Development will import and electricity to the grid depending on grid emissions intensity and market conditions (with the potential to also export electricity should there be agreement in place with the Systems Operator to do so) as follows:

- Contracted renewable electricity (PPA) will be imported to the campus through the public grid.
- This will be supplemented by imports from the electricity market when the grid's carbon intensity is lower than that of the energy sources available at the Proposed Development.
- Otherwise, the CORE EC will rely on its on-site energy resources and reduce the demand on the grid.
- If the grid comes under stress or has very high emissions intensity; the CORE EC will have the ability to export power (and grid services as required) to assist.

Operating in this way, the Proposed Development will act to actively alleviate strain on the electricity grid.

On-Site Solar Generation

The site has high solar potential relative to other locations in Ireland and is south facing and inclined towards the south. There is a land-use balance to be maintained when using industrial zoned land for solar generation; however the Proposed Development will optimise the use of roofs and facades for solar electricity generation. 3 MW of solar PV arrays are included with the Proposed Development. There are two stockpile areas on the campus that are unsuitable for development (the landfill to the east of the site and Stockpile number 3) and can be utilised for ground mounted solar. Further information is provided in Sections 2.6.4 and 2.6.5 in *Chapter 2 Description of Proposed Development* of the EIAR.

On-Site Kinetic Energy Storage & Power Quality (Primary Reserve)

Central to the power electronics line-up for the CORE EC is a Medium Voltage (MV) Rotary Uninterruptible Power Supply (UPS) system with a capacity of 37.8 MW coupled to a Rotary Kinetic Energy Storage system (or equivalent systems). This parallel array will provide protection from a broad spectrum of utility voltage events and will supply continuous clean power to the protected load with enough autonomy to support it for 20 seconds.

The power characteristics and inertia of this rotating machine will ensure smooth transitions between the various energy generation and storage systems that support the load including: solar generation; gas generation; battery energy storage; and the grid itself.

As well as protecting the load, it is also configured to potentially protect the Grid. Many of the frequency containment services that can be exported to the grid are delivered through the power electronics of the UPS System.

On-Site Battery Energy Storage System (BESS) (Secondary Reserve)

The BESS is a 36 MW grid-scale lithium-ion battery array that will act as a secondary reserve to the UPS system. For load protection, it will take over from the UPS system within 150-200 ms which preserves 99% autonomy of the UPS and will support the load for up to 3 hours.

The BESS System has a central role in displacing real-time emissions. It will store renewable electricity from the grid when available and discharge during periods of higher grid emissions intensity. Time-shifting of electricity consumption (emissions) is a key element of the demand response characteristics of the site.

It could also provide a comprehensive range of grid services (frequency containment and restoration) and could potentially displace conventional generators that provide these services. Due to its quicker response, it could provide these services without taking up the capacity that “must-run” generators do, and significantly decarbonise the operation of the grid itself.

Generally, the BESS batteries will charge at night when electricity demand on the grid is low and are discharged in the following evening peak, when demand is high, to help reduce peak demand on the grid.

On-Site Gas Engines (Tertiary Reserve)

Tertiary reserve will be provided from nine 4.5 MW (electrical output) reciprocating gas engines allowing a gradual hand-off of load from the batteries. This configuration overcomes the load acceptance limitations of gas engines while out-performing diesel engines for emissions and overall efficiency.

The reciprocating gas engines can accept 100% load in less than 5 minutes which preserves 98% autonomy of the BESS and will allow the load to be supported for hours/days.

The engines are constrained to operate only if they outperform the marginal generator on the grid for emissions intensity. They are used for demand response but could potentially export at times when there is a scarcity of generation on the grid should there be an agreement in place with the Systems Operator to provide such services.

When the campus can produce its own electricity at lower emissions than the grid, it will do so. This is central to the real-time emissions strategy of the EC and reducing the load on the grid at peak times.

As a future phase, the campus will aim to secure a long-term supply of biomethane to reduce dependence on natural gas. The engines have also been tested at full-load on 100% Hydrogen, ensuring that as zero emission gases become available in future, the campus can keep ahead of the energy transition as it proceeds to 2050. These future measures are not relied on in the climate impact assessment for the Proposed Development as set out in Section 12.9.1 of this Chapter.

Corporate Power Purchase Agreements (cPPA)

Prior to the commencement of DC operations, the applicant shall provide the Planning Authority with written evidence of having in place 60 MW Annual Wind corporate power purchase agreements (PPA) or, one or more cPPA delivering an equivalent combined supply.

Current industry practice assumes that a 60MW Wind PPA would generate enough renewable energy annually to match the DC's yearly electricity consumption. While this is reflective of the approach often proposed in respect of a typical DC, it is an approach that overlooks periods when no wind energy is produced and when renewable energy is curtailed due to an excess of wind power on the system. Annual accounting allows surplus wind energy generated at one time to offset periods with no wind energy, masking real-time imbalances between energy production and consumption.

In contrast, this Proposed Development will prioritise the mitigation of real-time emissions by aligning renewable energy production with the DC's hourly consumption.

Any remaining hours not covered by the renewable energy PPA will be mitigated using other sources of energy within the EC, which includes solar, batteries, and gas engines and grid imports when the grid's carbon intensity is lower than that of the gas engines. In addition, CHP (Combined Heat and Power) will enable the heat from the DC and the EC operations to be recovered for future applications.

While corporate PPAs remain a key element for driving sustainability efforts, their effectiveness is maximised when combined with onsite renewable energy sources and demand-side flexibility technologies designed to manage emissions in real-time. This approach ensures a more immediate and effective reduction of direct and indirect greenhouse gas emissions, compared to relying solely on a corporate PPA as the primary means of annual offset.

A corporate PPA for the supply of renewable power will be entered into between the generator/supplier and the demand customer / operator of the proposed DC, which can only take place after a grant of permission for the Proposed Development and an agreement for a lease of the proposed DC is in place.

For this reason, it is proposed that this mitigation shall be required prior to the commencement of operations rather than the commencement of development, which will allow for an appropriate period for discussions between the prospective lessee of the DC and renewable energy developers and suppliers to ensure the cPPA aligns with the final requirements of the DC.

It is envisaged that this would support the continuous reduction of emissions associated with energy demand, ensure the provision of additional sustainable energy for the future, and contribute to the proper planning and sustainable development of the area.

Electricity Production and Consumption

In terms of electricity consumption, the campus will require 223,380 MWh of electricity (from all energy sources, including on-site infrastructure) per year, for the first phase of CORE. Through the use of the site UPS, BESS, solar PV array and gas engines, the reliance on the grid will be minimised as much as possible. The target site electricity production (solar PV array and gas engines) will contribute at least 35,000 MWh per year by 2030 to the DC's energy requirements. The use of PPAs will further reduce reliance on the grid. Further details are provided later in this chapter as well as in the *Energy and Emissions Modelling Report* which accompanied the planning application and the KPMG *EEMR Review Report* which accompanied the FI request response.

Gas Connection and Storage

Gas Networks Ireland's (GNI) Drogheda Transmission Station is located adjacent to the PPL site and operates at 70 bar, which in-turn provides a 4 bar connection to an existing Above-Ground Installation (AGI) on the PPL site to serve the site gas requirements. The on-site gas distribution AGI will be modified and upgraded to suit the new operations on site. A new natural gas ring main will be constructed in order to provide a gas supply to the EC for the engines via a manifold.

Heat Network, Thermal Storage and the Cooling System

Key to assessing the suitability of the site for the project is the ability to couple large electricity users with large thermal users.

The Proposed Development will have a closed secondary loop system with low temperature hot water and medium temperature hot water storage collecting waste heat from DC operations and electricity generation. It may be possible to reuse this waste heat which will be a consideration of any potential future development at the site.

DC and EC heat will be rejected using a conventional cooling tower system. This system will have the capacity to provide all cooling requirements, supplemented with some local direct expansion (DX) cooling (i.e. refrigerant based), except during peak summer temperatures where a peak assistance chilled water storage back up system will be required. For most of the year the cooling tower operates as a dry cooler, with no requirement for evaporative cooling, and therefore no freshwater requirements. During peak summer temperatures, evaporative cooling is required, with up to 240m^3/day of freshwater consumed. This freshwater will be sourced from the EPA registered Littlegrange/Mell quarry abstraction regime and will be within the limits of the existing registered abstraction volumes. The water used will be released by evaporation from the cooling towers. There will be no requirement to use the public water supply for this cooling system.

Control System and MV Operation

The single harmonised Energy and Power Management System (EPMS) is the overarching Supervisory Control and Data Acquisition (SCADA) system for the electrical generation and distribution system within the CORE EC. It will be the operator interface for control of the network and will provide all the automated sequencing to manage the transition between the operating scenarios. It will aggregate and manage data and provide the gateway to external supervision and control systems. It will provide the flexibility forecasting and commercial optimisation required for the CORE EC.

The CORE EC itself will operate at Medium Voltage (20 kV). Medium Voltage switchgear and control systems are more resilient than low voltage systems as well as being more efficient.

Real-Time Sustainable Operation

A dedicated energy services team will be established to operate and maintain all energy services and utilities on the campus with the core objective of providing safe, reliable energy and utility services to campus consumers on their behalf.

It is anticipated that the energy services team will:

- Manage all health, safety, environmental and regulatory aspects of the on-site systems on behalf of PPL. The campus DC tenant will have the contract with the energy utilities for energy supply including electricity and gas from the respective grids.
- Arrange all of the off-site energy resources including gas and electricity grid via energy retailers and any future wind/solar PPA or gas PPA imports to be held by tenant.
- Ensure that service levels for availability and reliability of systems are exceeded by operating and maintaining the fault-tolerant and concurrently maintainable systems on the campus. This means that the campus will not be affected by grid faults because it will be able to provide its own power and that all systems on site are arranged such that taking any element of the system down for maintenance does not mean the campus energy system has to shut down.

The key performance metric for the energy services team will be the real-time carbon emissions intensity of energy on the campus for both heat and electricity, in every hour, for the lifetime of the facility. The Emissions and Energy Modelling Report which accompanied the planning application provides a detailed description of how the proposed technology at the campus will be operated to achieve a lower carbon emissions than the national grid based on the grid electricity demand, and the energy intensity of the grid at any given time due to environmental conditions.

12.3 Relevant Guidelines, Policy and Legislation

12.3.1 Climate Agreements

UNFCCC and The Paris Agreement

The UN Framework Convention on Climate Change (UNFCCC) was adopted in 1992 as part of a global response to the problem of climate change and has the objective of preventing *'dangerous anthropogenic interference with the climate system'*. It provides a framework to combat climate change by reducing GHG emissions and building capacity to adapt to its negative impacts. Ireland ratified the UNFCCC in 1994 and the Kyoto Protocol, which operationalises the UNFCCC, in 2002. The UNFCCC mediates negotiations in relation to GHGs reductions and technical issues such as Emission Trading and burden sharing.

The UNFCCC and the Paris Agreement adopted on 12 December 2015 under the UNFCCC ("the Paris Agreement") provides the international legal framework for addressing climate change.

The Paris Agreement entered into force on 4 November 2016. Its 196 Parties have agreed to hold the increase in the global average temperature well below 2 °C above pre-industrial levels and to pursue efforts to limit the temperature increase to 1.5 °C above pre-industrial levels. The agreement aims to limit global GHG emissions to 40 gigatonnes as soon as possible and to achieve *'a balance between anthropogenic emissions by sources and removals by sinks of greenhouse gases in the second half of this century'*.

The Paris Agreement requires each Party to prepare, communicate and maintain a Nationally Determined Contribution (NDC) that it intends to achieve. NDCs are submitted every five years to the UNFCCC.

Ireland has contributed to the Agreement through the NDC tabled by the European Union (EU) on behalf of Member States in 2020, which commits to a 55% reduction in EU-wide GHG emissions by 2030 compared to 1990 through the European Green Deal.

The *Emissions Gap Report 2024* published by the United Nations Environment Programme (UNEP) finds that reversing global emissions growth now requires urgent efforts to substantially reduce fossil fuel use and deforestation, make ambitious efforts to reduce non-carbon dioxide (non-CO_2) GHG emissions and to reduce end-use energy demand where possible.

The Conference of the Parties (COP28), which was held in Dubai, United Arab Emirates in November and December 2023marked the conclusion of the first *'global stocktake'*, the main mechanism for assessing progress under the Paris Agreement. The results showed that progress was too slow across all areas of climate action – from reducing GHG emissions, to strengthening resilience to a changing climate, to getting the financial and technological support to vulnerable nations. Countries responded with a decision on how to accelerate action across all areas by 2030. This includes a call on governments to speed up the transition away from fossil fuels to renewables such as wind and solar power in their next round of climate commitments.

The most recent COP (COP 29) was held in Baku, Azerbaijan in November 2024. A key focus of COP 29 was on financing the response to the climate crisis. Trillions of dollars are needed for climate action globally, including to tackle the root causes of the climate crisis, and to prepare and respond to its impacts on communities, people's health and livelihoods, and national economies. COP 29 included discussion of how climate funding will be secured and prioritised.

The European Green Deal

The European Green Deal aims to transform the EU into a modern, resource-efficient and competitive economy, ensuring no net emissions of GHGs by 2050. It also increases the EU-wide GHG emissions reduction target to at least 55% for 2030 to limit warming to 1.5˚C and align with the goal of the Paris Agreement. A key pillar of the Green Deal requires decarbonising energy systems.

In 2021, under "*Fit for 55*", the European Commission proposed an upward revision of the RED II target to a 40% binding EU target for energy from renewable sources in overall gross final energy consumption (commonly referred to as overall 'RES') by 2030. Then in May 2022 the EU Commission published '*REPowerEU*.' It proposed, among other measures, that the EU 'boost' its RES targets and seek to deliver them more quickly than previously planned. Part 2 was entitled '*Pillar 2: accelerate delivery of European Green Deal*'. The express aim of this pillar was to act quickly to achieve diversification of gas supplies and reduction of EU fossil fuel dependency. To support this objective, legislative amendments were planned in addition to those proposed within '*Fit for 55'*. This led to amendment of the Renewable Energy Directive, Energy Efficiency Directive, and the Energy Performance of Buildings Directive, all within the text of RED III. RED III was published in the Official Journal of the EU (OJEU) on 31 October 2023 and entered into force on 20 November 2023. Under RED III, the EU RES target has now been increased to 42.5% with a stated aim that Member States will collectively achieve 45%.

Council Regulation (EU) 2018/1999 of 11 December 2018 on the Governance of the Energy Union and Climate Action, OJ L 328 (Energy Union Governance Regulation) set a range of administrative measures including a binding requirement that Member States 'pledge' their contribution to the 2030 RES target, and submit detailed integrated national energy and climate plans (NECPs) to the Commission stating how they will achieve this pledge. These can be modified periodically, but only to reflect an increased overall ambition as regards the 2030 targets for energy and climate. Ireland submitted a NECP in December 2018 and Ireland's updated *NECP 2021 – 2030* was submitted to the European Commission on 22 July 2024.

European Union Emissions Trading System

Ireland also participates in the European Union (EU) Emissions Trading System (EU ETS), a tool for reducing GHG for the relevant sectors covered by this system as required under the European Commission (EC) (GHG Emissions Trading) Regulations 2012, (S.I. No. 490 of 2012) and amending Regulations. The trading scheme applies to certain types of activity which produce GHGs. The types of activities which require a GHG permit are listed in Annex I of the EU ETS Directive 2003/87/EC. The overall volume of GHG that can be emitted by sectors covered by the EU ETS is limited by a 'cap' on the number of emission allowances. Within the cap, companies receive or buy emission allowances, which they can trade as needed. The cap decreases every year, ensuring that total emissions fall.

The EU ETS is operated in phases, with the current Phase running from 2021 to 2030. The EU wide emissions cap is set to reduce by an annual rate of 2.2% for the period 2021 to 2025. From 2026 onwards this annual reduction rate will increase as the EU acts to meet more ambitions emissions reduction targets. The annual reduction targets are binding on the EU traded sector as a whole, and not on any one individual installation.

12.3.2 Climate Action and Low Carbon Development (Amendment) Act 2021

In 2021, Ireland signed its Climate Action and Low Carbon Development (Amendment) Act (No. 32/2021) into law, updating the Climate Action and Low Carbon Act 2015 (No. 46/2015) to provide a legally binding framework for achieving our international and EU climate targets. This law aims to set out a path to net-zero emissions by no later than 2050, and through carbon budgets, to provide a 51% reduction in GHG emissions by 2030 (relative to 2018). It is noted that unlike the EU target, this national climate target is an economy wide target, which includes the ETS and Land Use, Land-use Change and Forestry (LULUCF) related GHG emissions. The national Climate Act puts in place a rigorous governance structure, including a system of carbon budgeting, sectorial emissions ceilings, annual Climate Action Plans, and Long-term Climate Action Strategies to be updated at least once every five years, to ensure Ireland achieves its national, EU and international climate commitments in the near and long-term.

The *'national climate objective'* included in the Act is as follows: *'The State shall so as to reduce the extent of further global warming, pursue and achieve, by no later than the end of the year 2050, the transition to a climate resilient, biodiversity rich, environmentally sustainable and climate neutral economy'*. A climate neutral economy is a sustainable economy and society where GHG emissions are balanced or exceeded by the removal of GHGs.

Section 15 of the National Climate Act states that *'a relevant body shall, in so far as practicable, perform its functions in a manner consistent 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 relevant plans and documents relating to the items listed in Section 15 of the Climate Action and Low Carbon Act 2015 as amended in 2021 are set out below and compliance of the Proposed Development with same is assessed under Sections 12.8 and 12.9 of this EIAR Chapter.

Demonstration of the Proposed Development's compliance with Section 15 of the *Low Carbon Development (Amendment) Act 2021* is summarised in Attachment 12.1 of the EIAR which accompanied the planning application and which was updated as part of the response to the FI request.

12.3.3 Climate Action Plan 2025

The Department of the Environment, Climate and Communications approved the most recent Climate Action Plan 2025 (CAP25) in April 2025 under the Climate Action and Low Carbon Development (Amendment) Act 2021.

The publication notice for CAP25 states that "*Climate Action Plan 2025 builds upon last year's Plan by refining and updating the measures and actions required to deliver the carbon budgets and sectoral emissions ceilings and it should be read in conjunction with Climate Action Plan 2024. The Plan provides a roadmap for taking decisive action to halve Ireland's emissions by 2030 and achieve climate neutrality by no later than 2050, as committed to in the Climate Action and Low Carbon Development (Amendment) Act 2021.*"

CAP25 states that transformational policies, measures and actions, and societal change are required to increase the deployment of renewable energy generation, strengthen the electricity grid, and meet the demand and flexibility needs required for the challenges of:

- Increasing renewable generation to supply 80% of demand by 2030 through the accelerated expansion of onshore wind and solar energy generation, developing offshore renewable generation, and delivering additional grid infrastructure;
- Developing micro- and small-scale generation, as well as community projects, through actions such as grant funding and enabling small-scale production to participate in energy markets;
- Transforming the flexibility of the electricity system by improving system services and increasing storage capacity; and
- Delivery of at least 2 GWs of new flexible gas-fired generation.

<u>Carbon Budgets – Ireland</u>

A carbon budget represents the total amount of emissions, measured in tonnes of CO_2e, that may be emitted by a country or region during a specific time period. Under the Climate Action and Low Carbon Development (Amendment) Act 2021, carbon budgets have been set by the Climate Change Advisory Council (CCAC) for the periods 2021-2025; 2026-2030 with the aim of achieving the 51% reduction in GHG emissions by 2030. The CAP25 also includes the provisional carbon budget programme for 2031 to 2035 currently being finalised by the CCAC. Refer to Table 12.1.

Table 12.1: Ireland's Carbon Budgets (Source: CAP25)

Budget Period	2021 - 2025	2026 – 2030	2031 – 2035 (provisional)
$MtCO_2$	295	200	151
Annual Average Reduction	4.8%	8.3%	3.5%

Sectoral Emission Ceilings and Key Performance Indicators (KPIs)

Sectoral emissions ceilings set out the maximum amount of GHG emissions that are permitted in different sectors of the Irish economy during a budget period. In July 2022, the government approved the sectoral emissions ceilings for the first two carbon budget periods (2021-2025 and 2026-2030)[3].

The sectoral emissions ceiling set for the budgeting periods for the following Sectors relevant to the Proposed Development are presented in Table 12.2[4]:

- Industry (current use of site and possible use as part of future phases),
- Electricity (applicable energy usage supplied from the grid), and
- Built Environment – Commercial (applicable to the combustion of fuels by DCs).

Table 12.2: Sectoral Ceilings and Carbon Budgets (Source: CAP25 and Sectoral Emissions Ceilings Report 2022)

Sector	Sectoral Carbon Budget 2021 to 2025 $MtCO_2$	Sectoral Carbon Budget 2026 to 2030 $MtCO_2$	Emissions in Final Year of 2026 – 2030 carbon budget period ($MtCO_2$)
Industry	30	24	4
Electricity	40	20	3
Built Environment - Commercial	7	5	1

CAP25 also includes a number of key targets required to achieve the carbon abatement reductions for each sector in each of the successive carbon budgets. The 2025 and 2030 key targets for the Electricity and Industrial sectors from CAP25 are summarised in Table 12.3.

[3] Government of Ireland, "*Sectoral Emissions Ceilings*", September 2022, https://www.gov.ie/en/publication/76864-sectoral-emissions-ceilings/, accessed 13 May 2024.

[4] Direct consultation was carried out with the EPA in August 2025 which confirmed the appropriate sectors to use for the Proposed Development

Table 12.3: Summary of 2025 and 2030 Key Targets for the Industry and Electricity Sectors from CAP25

Target		2025	2030
Sector: Industry (Section 12 of CAP25)			
Carbon Neutral Heating		50- 55% share of carbon neutral heating.	70 – 75% share of carbon neutral heating.
Decrease Embodied Carbon in Construction Materials		Decrease by 10% for materials produced and used in Ireland.	Decrease by 30% for materials produced and used in Ireland.
Reduce Fossil Fuel Demand through Energy Efficiency		Reduce fossil fuel demand by 7% through energy efficient measures.	Reduce fossil fuel demand by 10% through energy efficient
Sector: Electricity (Section 11 of CAP25)			
Renewable Energy Generation	Renewable Electricity Share	50%	80%
	Onshore Wind Capacity	6 GW	9 GW
	Solar PV Capacity	Up to 5 GW	8 GW
	Offshore Wind Capacity	-	At least 5 GW
New Flexible Gas Plant		-	At least 2 GW
Demand Side Flexibility		15 – 20%	20 – 30%

CAP25 does not include any specific 2025 and 2030 targets for the Built Environment – Commercial sector (applicable to the combustion of fuel by DCs); however it does state that at the time of publication of CAP25, the roadmap for long-term decarbonisation of this sector is currently being finalised by the Department of Enterprise, Trade and Employment.

12.3.4 Ireland's Long Term Strategy on GHG Emissions Reductions 2024

Ireland's Long-term Strategy on Greenhouse Gas Emissions Reductions 2024[5] is prepared under the Climate Action and Low Carbon Development (Amendment) Act 2021 and sets out Ireland's 2050 climate action targets and describes sector-specific pathways to reaching those targets. The Strategy provides a pathway to a whole-of-society transformation and serves as a vital link between shorter-term Climate Action Plans and Carbon Budgets and the longer-term objective of the European Climate Law and Ireland's National Climate Objective.

The Long-term Strategy covers, with a perspective of at least 30 years:

[5] Department of the Environment, Climate and Communications (2024), "*Long-term Strategy on Greenhouse Gas Emissions Reductions*", https://www.gov.ie/en/publication/e4e81-long-term-strategy-on-greenhouse-gas-emissions-reductions/, accessed 21 August 2024.

- total greenhouse gas emission reductions and enhancements of removals by sinks;
- emission reductions and enhancements of removals in individual sectors, including electricity, industry, transport, the heating and cooling and buildings sector (residential and tertiary), agriculture, waste and land use, land-use change and forestry (LULUCF);
- expected progress on transition to a low greenhouse gas emission economy, including greenhouse gas intensity, CO_2 intensity of gross domestic product, related estimates of long-term investment, and strategies for related research, development and innovation;
- the expected socio-economic effect of the decarbonisation measures, including aspects related to macro-economic and social development, health risks and benefits and environmental protection; and
- links to other national long-term objectives, planning and other policies and measures, and investment.

In relation to sectoral emission ceilings and the CAP24, the Long Term Strategy states:

‘The management of electricity demand will be a central part of our approach to achieving emissions reductions. Similarly, unlocking the flexibility of large electricity demand users will be a key challenge as the electricity system is decarbonised. Energy demand, including data centres, will be expected to operate within sectoral emissions ceilings and further signals will be required to locate demand where existing or future electricity grid is available and close to renewable energy generation. Research and development in energy storage and flexibility (such as a science challenge to industry) will be required to put Ireland on a pathway to net zero-carbon data centres.’

In relation to the pathway to climate neutrality by sector, the Long Term Strategy states the following in relation to the **Electricity Sector**;

‘Accelerating the deployment of wind and solar power is a central pillar of long-term decarbonisation of the electricity system which aligns with Ireland’s EU commitment’s and support for the RePowerEU Plan. Deployment of renewable electricity presents challenges, as production is variable, and electricity is not easily stored as energy in a liquid or gaseous form. Therefore, Ireland will focus on a variety of actions set out in the Climate Action Plan to increase the flexibility of Ireland’s electricity system. Electricity will be a key enabler in decarbonising other sectors of our economy, primarily through the increased electrification of the transport and built environment sectors.

To reach Ireland’s climate neutral target, the power sector will need to deliver its own reduction in emissions and support the decarbonisation of multiple other sectors and enduses. The electrification of transport, built environment, and certain industry uses is expected to double electricity demand by 2050, which makes it extremely challenging to continue to deliver increasing rates of renewable penetration. . . .

. . .The pathway outlined above will require market mechanisms that support intermittent energy sources, as well as provision of capacity and effective market signals to produce a reliable demand-side response.’

In relation to the pathway to climate neutrality by sector, the Long Term Strategy states the following in relation to the **Built Environment (including Commercial) Sector**;

‘*The pathway to decarbonisation will include the continuation and expansion of the measures from the Climate Action Plan, including the retrofit of existing housing stock and electrification of heat across residential, commercial, and public buildings. All buildings will need to switch to technologies such as heat pumps or district heating by 2050, meaning that the gas grid will no longer supply existing homes and commercial premises.*

Ireland will be required to establish a National Building Renovation Plan which must set out the national strategy to decarbonise the building stock and how to address remaining barriers, such as financing, training and attracting more skilled workers.

The recast Energy Performance of Buildings Directive will also make zero-emission buildings the standard for new buildings.

Ireland will also have to ensure that new buildings are solar-ready, meaning that they have to be fit to host rooftop photovoltaic or solar thermal installations. Installing solar energy installations will become the norm for new buildings.'

In relation to the pathway to climate neutrality by sector, the Long Term Strategy states the following in relation to the **Industry Sector**;

'Full decarbonisation of the industry sector poses significant challenges. There is no known way to deliver complete decarbonisation in some industry sub-sectors, such as cement. This means that the sector will need to reduce emissions as much as possible and use negative emissions to offset these remaining emissions. Delivering this pathway will require integrated action amongst industrial players, the power sector and Government. . .

Achieving a fully decarbonised industry sector will require; driving material efficiency in construction to reduce embodied energy in materials; employing heat pumps for low-temperature heat and zero emissions gas/ bioenergy for high-temperature heat; fully switching fuel used for cement (e.g., waste, bioenergy) and alumina; and utilising Carbon Capture and Storage (CCS) and innovative binders in cement.'

12.3.5 National Adaption Framework 2024

In June 2024, the Department of the Environment, Climate and Communications published an update to the 2018 National Adaption Framework (NAF)[6] developed under the Climate Action and Low Carbon Development Act 2015.

Climate adaptation refers to action that helps reduce vulnerability to, and avail of potential benefits from expected impacts of climate change. In Ireland extreme weather events include flooding, drought, loss of biodiversity, sea level rise and increased temperatures.

The NAF sets out the national strategy to reduce the vulnerability of the country to the negative effects of climate change and to avail of positive impacts. It requires local authorities to integrate climate resilience into their policies, strategies, and plans. This includes ensuring that climate adaptation is a central consideration in decision making processes, resource allocation and regulatory frameworks. The NAF also requires the private sector, including businesses and industry to implement climate resilient practices within its operations, supply chains, and infrastructure.

At a more granular level, the NAF highlights the importance of EIARs for relevant development projects to provide clarity on whether climate resilience has been appropriately considered in the design and implementation of a development scheme.

12.3.6 Louth County Development Plan 2021 to 2027

The Louth County Development Plan 2021 to 2027 (LCDP) states the aim of Louth County Council 'to promote, support and direct effective climate action policies and objectives that seek to improve climate outcomes across the settlement areas and communities of County Louth helping to successfully contribute and deliver on the obligations of the State to transition to low carbon and climate resilient society through the encouragement and integration of appropriate mitigation and adaptation considerations and measures into all development.'

The LCDP refers to the high-level goals included in the "Louth Climate Change Adaptation Strategy 2019-2024" which identify the desired outcomes anticipated through the effective implementation of the climate change adaptation strategy. These high-level goals have been integrated into the LCDP as objectives in order to mitigate and adapt to climate change.

In the LCDP, the Council recognises the range of new and developing technologies that can contribute to minimising GHG emissions, providing a secure and stable energy supply and securing

[6] Department of the Environment, Climate and Communications (2024), *"National Adaption Framework*", https://www.gov.ie/en/publication/fbe331-national-adaptation-framework/, accessed 22 Aug 2024

a greater proportion of our energy from renewable sources. And also, the significant contribution that wind, solar and biomass energy can make as a clean sustainable solution to energy requirements and its vital role in helping achieve national targets in relation to fossil fuel reductions and consequently GHG emissions.

The LCDP includes the following policy objective:

CA6 *To capitalise on the economic opportunities for County Louth that arise in association with the environmental and technological advances required to support the transition to a low carbon and climate resilient economy and in particular, opportunities arising from the implementation and translation of the European Green Deal and the post COVID-19 recovery plan Next Generation EU, to national policy.*

The *LCDP* also includes policy objectives to support the achievement of the targets set out in the Climate Action Plan 2019 and subsequent revisions of the CAP including the following which are relevant to the Proposed Development:

IU 56 *To encourage the development of wind energy, in accordance with Government policy and guidance and the 'Wind Energy Development Guidelines' (2006) or any revisions thereof which may be issued during the lifetime of the Plan.*

IU 60 *To support the development of off shore windfarm developments subject to normal planning considerations, including in particular the impact on areas of environmental or landscape sensitivity.*

IU 64 *To support the development of solar energy infrastructure in the County including commercial scale ground mounted solar PV “Solar Farms” subject to environmental safeguards and the protection of natural and built heritage features, biodiversity and views and prospects.*

IU 49 *To support international, national and County initiatives for limiting and reducing emissions of greenhouse gases through energy efficiency and the development of renewable energy sources at suitable locations, utilising the natural resources of the County, in an environmentally acceptable manner subject to normal proper planning considerations including in particular the impact on areas of environmental or landscape sensitivity.*

IU 50 *To co-operate with the appropriate authorities both north and south of the border in the provision of all-island renewable energy.*

IU 51 *To support initiatives aimed at reducing the level of energy consumption within the County.*

IU 70 *Facilitate and promote District Heating installation where practical through the County, while protecting residential amenity.*

HOU 30 *To encourage building design and layout that maximises daylight and natural ventilation and incorporates energy efficiency and conservation measures that will improve the environmental performance of buildings in line with best practice.*

IU 75 *To promote and facilitate the development of small-scale electricity generation installations and green technologies which do not negatively impact on environmental quality, landscape, wildlife and habitats and residential amenities.*

IU 78 *To support and facilitate the reinforcement and development of enhanced electricity and gas supplies, and associated networks, to serve the existing and future needs of the County and Region. This will include the delivery of the necessary integration of transmission network requirements facilitating linkages of renewable energy proposals to the electricity and gas transmission grid, in a sustainable and timely manner, subject to appropriate environmental assessment and the planning process.*

12.3.7 Louth County Council Climate Action Plan 2024 – 2029

The Louth County Council (LCC) Climate Action Plan 2024-2029 is a five-year plan to outline the actions which will be taken by LCC to support the national policy. The Plan will guide LCC in how it works across its services and functions and its partnerships with government agencies, businesses, communities, public sector, and other stakeholders, to help deliver on national climate obligations at the local level.

12.4 Assessment Methodology

The Climate Impact Assessment including GHG assessment and Climate Change Resilience Assessment was carried out in accordance with the following relevant guidance documents:

- BS EN 15978:2011, “Sustainability of construction works, Assessment of environmental performance of buildings – Calculation method”;
- European Commission (2013) “Guidance on Integrating Climate Change and Biodiversity into Environmental Impact Assessment”;
- European Commission (2017) “Environmental Impact Assessment of Projects – Guidance on the preparation of the Environmental Impact Assessment Report”;
- Environmental Protection Agency (EPA) (2022) “Guidelines on the Information to be Contained in Environmental Impact Assessment Reports”;
- Institute of Environmental Management and Assessment (IEMA) (2020), “Climate Change Resilience and Adaptation”;
- IEMA (2022) “Guidance Note Assessing Greenhouse Gas Emissions and Evaluating their Significance” (Referred to as the IEMA (2022) Guidance);
- London Energy Transformation Initiative (LETI) (2020) “Embodied Carbon Primer ” (Referred to as the LETI (2020) Guidance).
- Royal Institute of Chartered Surveyors (RICS) Professional Statement Version 1 (2017), “Whole life carbon assessment for the built environment” (Referred to as the RICS (2017) Guidance);
- Transport Infrastructure Ireland (TII) (2022), “Climate Guidance for National Roads, Light Rail, and Rural Cycleways (Offline & Greenways) - Overarching Technical Document, PE-ENV-01104 ” (Referred to as the TII (2022) Guidance);
- The Green Construction Board (2023) “PAS2080:2023 Carbon management in buildings and infrastructure”.

12.4.1 GHG Assessment

The IEMA (2022) Guidance states that a GHG emissions assessment should incorporate the following steps into any climate assessment:

1. Set the scope and boundaries of the GHG assessment;
2. Develop the baseline;
3. Decide upon the emissions calculation methodologies;
4. Data collection;

5. Calculate/determine the GHG emissions inventory; and
6. Consider mitigation opportunities and repeat steps 4 & 5.

The following sections detail the specific methods utilised in order to complete the assessment in accordance with the IEMA (2022) Guidance.

Assessment Scenarios

Two scenarios are included in the GHG Emissions Assessments as follows in Table 12.4:

Table 12.4: Explanation of the Baseline (Business as Usual) and Proposed Development Assessment Scenarios Used for the GHG Emissions Assessments

	Embodied Carbon Assessment	Operational Carbon Assessment
Business-As-Usual (BAU)	An alternative basic project design for a development of this type with no carbon saving initiatives included.	Current operations at the site which consist of limited production of magnesium hydroxide suspension only (refer to Section 12.6.3 of this Chapter).
Proposed Development	Proposed Development with carbon saving initiatives included to reduce embodied carbon.	Proposed Development including energy technology to reduce operational carbon.

Study Area

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

Sensitive Receptor

The global climate / global atmosphere is the receptor for the GHG assessment. The receptor has a high sensitivity, given the severe consequences of global climate change and the cumulative contributions of all GHG emission sources. To assess the magnitude of the effects of the Proposed Development on this receptor, estimated GHG emissions from the Proposed Development have been compared to Ireland's relevant key performance targets, carbon budgets and sectoral emission ceilings as set out in the CAP25, where appropriate. This is in line with the IEMA (2022) and TII (2022) Guidance.

GHG Calculation Methodology

<u>Construction Phase - Embodied Carbon Assessment</u>

AtkinsRéalis have completed an embodied carbon assessment for the Proposed Development in line with the *PAS2080 Carbon Reduction Strategy*[7] using the OneClickLCA Carbon tool. OneClickLCA is an industry wide recognised life cycle assessment software and is third-party verified for EN 15978, ISO 21931–1, ISO 21929–1 and for input data for ISO 14040/44 and EN 15804 standards.

The aim of the embodied carbon assessment was to estimate and reduce the embodied carbon effect of the Proposed Development. To achieve this, a number of low-carbon design measures and carbon reduction opportunities have been considered and incorporated into the design.

[7] The Green Construction Board (2023) *PAS2080 Carbon management in buildings and infrastructure.*

BS EN 15804:2019 specifies that all GHGs that cause damage to the atmosphere (including carbon dioxide, methane, nitrous oxide etc.) can be expressed as a carbon dioxide equivalent (CO_2e) over 100 years. This environmental effect indicator is known as the Global Warming Potential (GWP). GWP are used to convert GHGs into a CO_2e by multiplying emissions in mass terms by their respective GWP factors. In a whole life cycle assessment of a building, the CO_2e include all the emission sources associated with the construction and the use of the building over its life (refer to Figure 12.2).

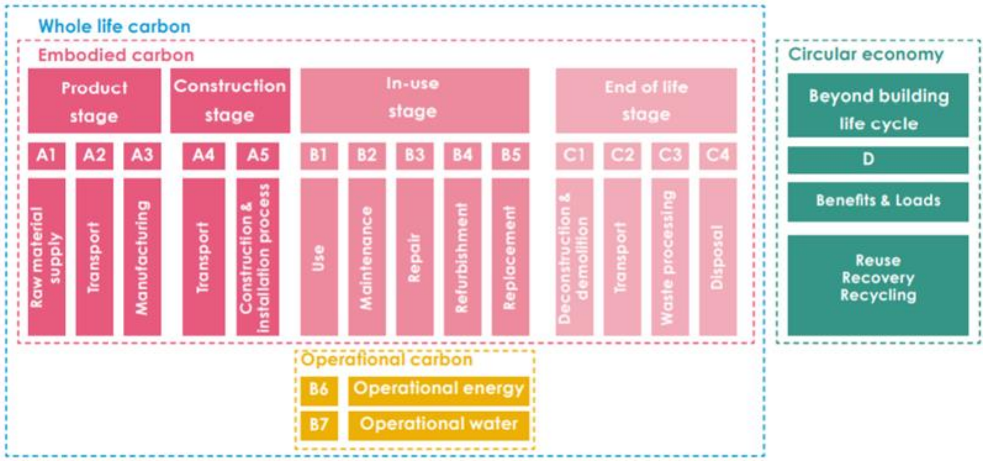

Figure 12.2: System Boundary – Display of Modular Information for the Different Stages of the Building Assessment: (EN 15978:2011) (LETI Embodied Carbon Primer)

Emissions, arising from both upfront embodied carbon and operational carbon generated throughout the developments design life, are attributed to four "Lifecycle Stages" as specified in EN 15978:2011. These are as follows:

1. **Construction Process: A1-5 (Upfront carbon emissions)**

   a) Product Manufacture: A1-3

   Carbon emissions generated from extracting the raw materials from the ground, their transport to a point of manufacture and then the primary energy used (and the associated carbon effects that arise) from transforming the raw materials into construction products.

   b) Construction: A4-5

   Carbon emissions generated from transporting the construction products to site, and their subsequent processing and assembly into the building.

2. **In Use: B1-7**

   This covers a wide range of sources from the carbon emissions associated with the maintenance, repair, and replacement over a 60-year assessment period.

   It is noted the operation of the building (heating, domestic hot water, cooling, ventilation, lighting, auxiliary energy used for pumps, control, and automation) normally reported under modules B6 and B7 are not included in the embodied carbon assessment. This is assessed separately under Operational Carbon within this Chapter.

3. **End of Life: C1-4**

   The eventual deconstruction and disposal of the existing building at the end of its life takes account of the on-site activities of the deconstruction contractors.

4. **Beyond system boundary: D**

   Any carbon savings that would be a benefit as a result to reusing, recovering and recycling materials.

The embodied carbon assessment completed by AtkinsRéalis follows the classification set out within the BS EN 15978: 2011 (*Sustainability of Construction Works – Assessment of*

Environmental Performance of Buildings – Calculation Method) for the lifecycle modules and the building elements classification provided by the RICS (2017) Guidance. The assessment includes all the elements that were appropriate, in line with the recommended inclusions as per the LETI (2020) Guidance. A list of assumptions and the excluded elements from the assessment is outlined in Section 12.5 and Tables 12.5 and 12.6 of this Chapter.

The embodied carbon assessment for the Proposed Development was categorised into four groups as follows:

- The EC
- The DC
- The Bio-Solar Façade (DC)
- The External Works (Landscaping/Campus)

Individual embodied carbon models were completed for each group.

Table 12.5 outlines the Life Cycle modules included, and Table 12.6 outlines the building elements that were part of the assessment.

Table 12.5: Scope of the Embodied Carbon Assessment Based on the Life Cycle Modules Outlined in BS EN 15978: 2011 (provided by AtkinsRéalis)

Lifecycle Stage	EN 15978 Modules	In Scope
Product Stage	A1 Raw material supply A2 Transport A3 Manufacturing	✓
Construction Stage	A4 Transport	✓
	A5 Construction Energy	✓
	A5 Construction Waste	✓
In-Use Stage	B1 Use	✓
	B2 Maintenance	✓
	B3 Repair	✓
	B4 Replacement	✓
	B5 Refurbishment	✓
Operational Carbon	B6 Operational Energy use	×
	B7 Operational Water Use	×
End of Life	C1 Deconstruction / demolition C2 Transport C3 Waste processing C4 Disposal	✓
Supplementary Information beyond the Building Lifecycle	D Reuse, Recovery, Recycling Potential	×

Table 12.6: Building Categories Included In the Assessment (provided by AtkinsRéalis)

Code	Building Category	Building element	In Scope
	Demolition	0.1 Toxic/Hazardous/Contaminated Material treatment 0.2 Major Demolition Works	×
0	Facilitating Works	0.3 and 0.5 Temporary/Enabling Works 0.4 Specialist groundworks	×
1	Substructure	1.1 Substructure	✓
2	Superstructure	2.1 Frame 2.2 Upper floors incl. balconies 2.3 Roof 2.4 Stairs and ramps	✓
	Superstructure – façade	2.5 External Walls 2.6 Windows and External Doors	✓
	Superstructure- Internal Layout	2.7 Internal Walls and Partitions 2.8 Internal Doors	✓
3	Finishes	3.1 Wall finishes 3.2 Floor finishes 3.3 Ceiling finishes	✓
4	Fittings, furnishings & equipment (FF&E)*	4.1 Fittings, Furnishings & Equipment incl. Building-related and non-building-related	×
5	Building services/MEP	5.1–5.14 Services inc. building-related and non-building-related	✓
6	Prefabricated Buildings and Building Units	6.1 Prefabricated Buildings and Building Units	×
7	Work to Existing Building	7.1 Minor Demolition and Alteration Works	×
8	External works	8.1 Site preparation works. 8.2 Roads, Paths, Paving and Surfacing 8.3 Soft landscaping, Planting, and Irrigation Systems 8.4 Fencing, Railings and Walls 8.5 External fixtures 8.6 External drainage 8.7 External Services 8.8 Minor Building Works and Ancillary Buildings	✓

****Temporary works,** including data equipment, are not included in this assessment. Additionally, there is insufficient information available to accurately estimate the carbon emissions associated with them.*
***Note**: In line with the RICS Guidance, Temporary Works are not anticipated to be included as part of the embodied carbon assessment at this stage. As the design develops towards the construction stage, there may be additional benefit identified in measuring this element, in which case the scope and granularity of the carbon assessment will be reviewed.*

As part of the design progression of the Proposed Development, several workshops were conducted with the design teams to explore opportunities for integrating broader sustainability aspects into the design, including avenues for carbon reduction. A minimum carbon reduction target of 10% for upfront carbon emissions from the BAU scenario was set for the project based on the CAP25 key target for Industry to decrease embodied carbon in construction materials produced and used in Ireland through product substitution by 10% before 2025. Upfront carbon emissions are GHG emissions associated with materials and construction processes up to practical completion (modules A0–A5 in Figure 12.2) and are seen to make up the majority of the total embodied carbon in the study.

The carbon reduction strategies implemented in the Proposed Development primarily relate to material specifications and have been integrated into the design. The reduction strategies predominantly target structural elements which were demonstrated to be the hot spots for carbon emissions in the study. Details of the carbon emissions reduction enhancements identified include:

- Concrete Specification: The Business as Usual (BAU) carbon model assumes a Portland cement concrete mix (CEM I) with no cement replacement content – in line with market average mixes in Ireland. The Proposed Development will specify a concrete mixture with 10% Cement replacement for foundations and beams (CEMII/A-V) and 60% Cement replacement for structural elements (CEMIII/A), equivalent to a saving of 23 kgCO_2e per m^3 of concrete for foundations and beams, and 137 kgCO_2e per m^3 for concrete slabs and frame elements.
- Steel Rebar Specification: Currently, the BAU carbon model assumes steel rebar that has not been recycled. The Proposed Development will specify the use of rebar which is made of 95% recycled steel, or equivalent.
- Design Efficiency: As part of the effort to reduce carbon emissions by minimising materials usage, one enhancement proposal included in the Proposed Development involves improving design efficiency to decrease steel tonnage by 10%. This initiative is expected to yield significant carbon reduction, considering that each tonne of steel typically accounts for 2.5 tCO_2

- PV Panels Specification: Currently, the BAU carbon model assumes PV panels which are procured from China with 77% recycled content. The Proposed Development will specify the use of PV panels with 89% recycled content (assumed to be procured from Europe).

<u>Operational Phase - Operational Carbon</u>

The nature and magnitude of GHG emissions associated with the operational phase of the Proposed Development are presented within this Chapter based on the *Energy and Emissions Modelling Report* which accompanied the planning application. The modelling has been completed by Gyrogy in co-operation with Baringa (leading energy consultancy experts in energy system analysis) as described in Section 2 of the Energy and Emissions Modelling Report.

Energy models of the Integrated Single Electricity Market (ISEM) for Ireland and Northern Ireland were prepared to simulate the performance of the energy infrastructure and energy technology solutions included in the Proposed Development. The energy modelling was completed with the use of PLEXOS, a modelling software designed for intricate energy system simulations.

To enable this modelling Gyrogy have provided details of the equipment, its capabilities, how it will be connected and controlled as a system and the logic and strategy of how it is intended the system will operate. Baringa's simulations of the performance of Gyrogy's technology on the Irish electricity system has been ongoing for 4 years, helping to optimise the assets and fuel/energy mix that can make the biggest impact on decarbonisation. The model is updated periodically to reflect the changes (retirements and new entrants) on the Irish grid as well as the evolving market conditions for gas, wholesale electricity, carbon pricing etc. The model represents European markets and actual dispatch with an hourly resolution out to the year 2060.

To address the specificities of emissions-based dispatch and operational scheduling for the proposed on-site energy technologies, the model was augmented with a custom simulation for the Proposed Development. The energy modelling of the proposed development technology solutions provides an understanding of how it will be utilised in order to identify the ideal running scenarios for the various energy assets that make up the system at the Proposed Development.

<u>Decommissioning Phase Carbon</u>

Considering the design life of the Proposed Development (assumed to be at least 60 years), future technological advancement, accelerated future carbon reduction and increase in uptake of circular economy principles in Ireland, it is not possible to predict when the decommissioning of the Proposed Development would occur and what carbon emissions this would generate.

In addition, emissions from the decommissioning stage cannot be accurately quantified at this stage as a result of future uncertainty in methods of construction, deconstruction and decarbonisation across the industry.

As the required data to allow a quantitative GHG emissions estimate of the decommissioning phase is not available at this stage, the GHG emissions are qualitatively assessed.

A qualitative description of GHG emissions expected from the decommissioning activities when the Proposed Development has reached the end of life has been included. This approach is in line with IEMA (2022) Guidance which states 'a *high-level or qualitative GHG assessment for certain project elements or activities can be carried out as long as it is justified'.*

GHG Significance Criteria

The IEMA (2022) *Guidance on Assessing Greenhouse Gas Emissions and Evaluating their Significance* has been used for the GHG significance criteria in the climate impact assessment.

When assessing significance, the 2010 *IEMA Principles Series on Climate Change Mitigation & EIA* (IEMA, 2010) describes three overarching principles which are particularly relevant in considering the aspect of significance:

- GHG emissions from all projects will contribute to climate change, the largest interrelated cumulative environmental effect.

- The consequences of a changing climate have the potential to lead to significant environmental effects on all topics in the Environmental Impact Assessment (EIA) Directive (e.g. human health, biodiversity, water, land use, air quality).
- GHG emissions have a combined environmental effect that is approaching a scientifically defined environmental limit; as such any GHG emissions or reductions from a project might be considered to be significant.

The IEMA (2022) Guidance builds on those principles with the following three points:

- When evaluating significance, all new GHG emissions contribute to a negative environmental effect; however, some projects will replace existing development or baseline activity that has a higher GHG profile. The significance of a project's emissions should therefore be based on its net effect over its life time, which may be positive, negative or negligible.
- Where GHG emissions cannot be avoided, the goal of the EIA process should be to reduce the project's residual emissions at all stages.
- Where GHG emissions remain significant, but cannot be further reduced, approaches to compensate the project's remaining emissions should be considered.

The IEMA (2022) Guidance states that "the crux of significance therefore is not whether a project emits GHG emissions, nor even the magnitude of GHG emissions alone, but whether it contributes to reducing GHG emissions relative to a comparable baseline consistent with a trajectory towards net zero by 2050".

In accordance with the IEMA (2022) Guidance and the TII (2022) Guidance, the Climate Practitioner must assess:

- The extent to which the trajectory of GHG emissions from the project aligns with Ireland's GHG trajectory to net zero by 2050.
- The level of mitigation taking place.

Table 12.7 illustrates the significance matrix included in the TII (2022) Guidance that has been based on the significance criteria set out in the IEMA (2022) Guidance and which is also used in this assessment.

Table 12.7: GHG Impact Assessment Significance Criteria, (Source: Table 6.7 of Transport Infrastructure Ireland (TII) (2022), *Climate Guidance for National Roads, Light Rail, and Rural Cycleways)*

Effects	Significance Level	Description
Significant adverse:	Major adverse	– The project's GHG impacts are not mitigated. – The project has not complied with do-minimum standards set through regulation, nor provide reductions required by local or national policies; and – No meaningful absolute contribution to Ireland's trajectory towards net zero.
	Moderate adverse	– The project's GHG impacts are partially mitigated. – The project has partially complied with do-minimum standards set through regulation, and have not fully complied with local or national policies; and – Falls short of full contribution to Ireland's trajectory towards net zero.
Not Significant:	Minor adverse	– The project's GHG impacts are mitigated through *'good practice'* measures. – The project has complied with existing and emerging policy requirements; and – Fully in line with measures necessary to achieve Ireland's trajectory towards net zero.
	Negligible	– The project's GHG impacts are mitigated beyond design standards. – The project has gone well beyond existing and emerging policy requirements; and – Well *'ahead of the curve'* for Ireland's trajectory towards net zero and has minimal residual emissions.
Beneficial	Beneficial	– A project's net GHG impacts are below zero and it causes a reduction in atmospheric GHG concentration. – The project has gone well beyond existing and emerging policy requirements; and – Well *'ahead of the curve'* for Ireland's trajectory towards net zero, provides a positive climate impact.

The IEMA (2022) Guidance also states *"it is down to the practitioner's professional judgement on how best to contextualise a project's GHG impact."* An example of good practice approach outlined in the guidance is comparison of the Proposed Development's carbon footprint against various sectoral, local or national carbon budgets.

For the purposes of this assessment, the Carbon Budgets and Sectoral Emission Ceilings set out for Ireland in the CAP25 under the Low Carbon Development (Amendment) Act 2021 (refer to Section 12.6.1 of this Chapter) have been used to provide context for the assessment where appropriate.

12.4.2 Climate Change Resilience Assessment

Risk Assessment Method

The aim of the Climate Change Resilience Assessment is to identify and minimise the vulnerability of the Proposed Development to climate change.

The assessment is based on the approach set out in the guidance documents by the European Commission (2013) "Guidance on Integrating Climate Change and Biodiversity into Environmental Impact Assessment" and IEMA (2020) "Climate Change Resilience and Adaptation".

The approach to the assessment is based on the following steps:

- Identify potential climate change risk to a project;
- Assess these risks (potentially prioritising to identify the most severe); and
- Formulate mitigation actions to reduce the impact of the identified risks.

The Met Éireann "*New Climate Projections 2020*"[8] and the EPA's Climate Ireland website[9] have been used as the most up to date information to define the potential climate change hazards and disruptive weather conditions for the Proposed Development. The assessment assesses the resilience of the Proposed Development against both gradual climate change and the risks associated with an increased frequency of severe weather events as per the EPA climate change projections. The scope of the assessment includes the following climate hazards:

- Extreme Heat/Increasing Temperatures including increase in Annual Temperature;
- Extreme Cold/Low Temperatures;
- Flooding/Increases in Rainfall;
- Decreases in Rainfall/Drought;
- Extreme Wind / Increase in Storm Intensity and Frequency
- Sea Level Increases;
- Biodiversity Loss.

The Climate Change Resilience Assessment completed in this Chapter takes cognisance of the climate adaption and mitigation measures included in the NAF and the LCDP.

A Climate Change Resilience Risk Assessment has been completed to identify potential climate change impact hazards which may affect the operational phase of the Proposed Development, and considers their potential consequences and likelihood of occurrence. Appropriate control/mitigation measures have been identified and incorporated into the design of the Proposed Development to reduce these hazards.

Potential climate change impact risks associated with climate hazards, likelihood of occurrence and potential consequence of each impact is assessed using the risk framework provided in the *TII Climate Guidance for National Roads, Light Rail, and Rural Cycleways (2022)* which is based on the framework detailed in the *European Union Technical Guidance on climate proofing (2021).* The likelihood analysis, consequence analysis, mitigation measures that are included in the Proposed Development where relevant and risk matrix are provided in Appendix C of the EIAR submitted with the planning application.

The Gross risk associated with the climate change hazards and impacts identified is determined by:

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

The identification of likely significant effects on receptors has been undertaken using professional judgement by combining the measure of likelihood with the predicted consequence of impact in a risk matrix, as shown in Table C.4 of Appendix C of the EIAR submitted with the planning application.

Proposed and existing adaptation / mitigation measures have been included in Table C.4 to reduce the significant effects/severity of the risks where relevant.

[8] Met Éireann (2020) "*New Climate Projections 2020*" https://www.met.ie/epa-climate-projections-2020 , accessed 05 May 2024

[9] Climate Ireland, https://www.climateireland.ie/#!/tools/sectors/coastalAreas , accessed 02 May 2024

Study Area

The study area for the climate change resilience assessment is the site of the Proposed Development. It covers all assets and infrastructure that constitute the Proposed Development, during construction, operation and decommissioning.

Sensitive Receptors

Sensitive receptors for the construction phase of the Proposed Development include the construction workforce, equipment, vehicles, materials and workplace which may be vulnerable to a range of climate risks.

The sensitive receptor for the operation phase climate resilience assessment is the Proposed Development during its lifetime (assumed to be 60 years). The buildings, spaces, infrastructure, services, biodiversity and operational workers are considered receptors.

12.4.3 Potential Cumulative Effects

The (IEMA, 2010) Guidance states that GHG emissions from all projects will contribute to climate change, the largest interrelated cumulative environmental effect.

The IEMA (2022) Guidance explains that when considering the cumulative assessment: *'All global cumulative GHG sources are relevant to the effect on climate change, and this should be taken into account in defining the receptor (the atmospheric concentration of GHGs) as being of 'high' sensitivity to further emissions.*

Effects of GHG emissions from specific cumulative projects therefore in general should not be individually assessed, as there is no basis for selecting any particular (or more than one) cumulative project that has GHG emissions for assessment over any other.'

On this basis, it is not appropriate to limit a cumulative impact assessment to local developments. Instead, the GHG assessment addresses the cumulative effect at a national level by considering the Proposed Development in the context of Ireland's national GHG emissions and national carbon reduction targets for the construction and operational phases of the project. This contextualisation of GHG emissions by its nature incorporates the cumulative contributions of other GHG sources which make up that context.

In addition, the IEMA (2022) Guidance states that *'all new GHG emissions contribute to a negative environmental effect; however, some projects will replace existing development or baseline activity that has a higher GHG profile. The significance of a project's emissions should therefore be based on its net effect over its life time, which may be positive, negative or negligible.'*

There is the possibility that PPL will return to peak production of magnesia products in the 'Do Nothing' Scenario (refer to Section 12.7.1 of this Chapter). As discussed in Section 12.7.2 of this Chapter, it is also considered possible that a 'Do-Nothing' scenario alternative to the proposed CORE project would involve a redevelopment of the site for a new use that is similarly aligned with the zoning and development objectives for the site.

As a conservative approach the baseline activity for the purposes of this impact assessment has been assumed to be the current operations at the site which consist of limited production of magnesium hydroxide suspension only (refer to Section 12.6.3 of this Chapter).

As described in *Chapter 2 Description of Proposed Development* of the EIAR, the Proposed Development to which this planning application relates is the first stage of CORE.

Potential Future Phases of CORE

Potential future phases of CORE will be subject to separate planning applications and environmental impact assessment. Future phases of the development may require additional mitigation measures to ensure the mitigation of potential effects on Climate. These measures will be identified and detailed as part of the EIAR for any additional respective phases of the development to ensure the potential future phases do not have any significant adverse effects with respect to Climate.

12.4.4 Potential Indirect Effects

Article 3(1) of the EIA Directive 2011/92/EU as revised by Directive 2014/52/EU provides that the EIA shall identify, describe and assess in an appropriate manner and in the light of each individual case, the direct and indirect significant effects of a project on the following factors… An 'effect' is something that is caused or likely to be caused by the Proposed Development if permission is granted and the development is carried out. It is acknowledged that such indirect effects can arise 'off-site' and even at some remove from the Proposed Development for which permission is sought. Nonetheless, EIA is not an open-ended process and therefore, there are some parameters around the assessment of indirect effects of a proposed project, which have been discussed in several significant cases including those discussed here. In summary, it is considered that an assessment of the effects of the supply of electricity from renewable energy projects that would be the subject of one or more cPPA is beyond the scope of the EIA to be carried out for this Proposed Development.

The most recent decision of the UK Supreme Court in *Finch* [2024] UKSC 20, is distinguishable from the circumstances of this case. In that case, the Proposed Development for which consent was sought, and in respect of which an EIA was required, was a proposed oil well to extract oil from a site in England. The GHG emissions chapter of the EIAR for that project scoped out any emissions that would arise as a consequence of burning of that oil for energy or other purposes. The Supreme Court found that this was not consistent with Article 3(1) of the EIA Directive or the corresponding provisions of the EIA Regulations in the UK. The Supreme Court found that the emissions from the burning of the oil extracted from the Proposed Development constituted the indirect effects of that Proposed Development, for several reasons:

- The Court found a direct causal link between the extraction of the oil and its inevitable burning – notwithstanding any intervening steps such as processing at a refinery, there was no doubt whatsoever that the burning of the oil would occur, and that emissions would arise.
- The Court also found that there was broad agreement that the emissions from burning of the oil were calculable based on established methodology, and that a precise emissions figure could be derived from the volume of oil extracted that would be burned.
- Given the nature of GHG emissions, it was irrelevant whether the oil was burned in the UK or in another jurisdiction, as the emissions to atmosphere would be the same.
- It was also irrelevant to the question of whether EIA is required that the developer of the oil well would have no control over or ability to mitigate those emissions at the point at which they are burned, or that there are no mitigation measures that can be applied at the point of extraction.
- The Court took into account that, by scoping out these emissions the project developer had prepared an EIAR which concluded that GHG emissions from the Proposed Development would be insignificant, whereas had those emissions been scoped in the conclusion would have been that such emissions were very significant, and therefore this was a significant effect of the Proposed Development that ought to have been considered as part of the EIA process for the Proposed Development.

In reaching its conclusions, the UK Supreme Court had regard to several key judgments including a judgment of the Irish Supreme Court in *An Taisce* [2022] IESC 8. Mr Justice Hogan had found that the indirect effects of dairy farming did not need to be assessed as part of the EIA of a proposed cheese factory that would be supplied by a large number of dairy farms across Ireland, because the connection between the emissions from those farms and the proposed cheese factory development were too remote and uncertain. This decision was informed by the fact that the proposal was that the milk supply would come from existing sources and would therefore not cause *additional* milk production, accordingly whilst there was a large gross GHG emissions calculation done, the conclusion was that the net GHG emissions would not be significant. The Supreme Court accepted the argument that the diversion of 4.5% of the national milk production towards this one factory could result in a driving upwards of milk production to meet other demands, with corresponding risk of increased emissions to air and water, but found that there was no clear evidence of such increase or the likely effects of same.

Hogan J nonetheless observed that there may be "special and unusual cases where the causal connection between certain off-site activities and the operation and construction of the project itself is demonstrably strong and unbreakable" and the UK Supreme Court in Finch relied on this exception in support of its position that there as such a demonstrably strong and unbreakable connection between the proposed oil well and the burning of the oil to be extracted from that well if permission is granted.

There is no such 'demonstrably strong and unbreakable' connection between the Proposed Development, and any renewable energy projects that would be the subject of the cPPA, which is beyond the scope of the EIA to be carried out for this Proposed Development. The "but for" test is not satisfied, as it could not be argued that "but for" the Proposed Development, such renewable energy projects would not come into existence by some other means (e.g. via a cPPA with a different corporate buyer), and there are no identifiable environmental effects or emissions that are likely to be caused by such projects that would not be caused "but for" the Proposed Development.

In *Finch* the UK Supreme Court identified the need for an EIA to be based on evidence of significant effects, and that such evidence is necessary to underpin the "reasoned conclusion" that must be reached by the competent authority in determining whether to grant consent for the proposed project. An EIA cannot be based on speculation or conjecture, according to the Court, and notably the Court in *Finch* confined its judgment on the requirement to assess the indirect effects of burning the oil to those effects that are "likely" and, based on evidence, capable of being calculated and assessed.

There are no identifiable effects that can be said to be "likely" to arise from the purchase of a specified quantum of electricity via a virtual cPPA, or the development of renewable energy projects that would generate such supply. Such effects (if any) would depend on the nature, scale and location of any such projects, and the effectiveness of the environmental controls and mitigations that would be put in place to avoid and minimise any such effects. The likely significant effects in *Finch* and *An Taisce* were much more clearly identifiable and calculable, and indeed were calculated insofar as they related to GHG emissions. There is no such established methodology for assessing the effects of a renewable energy project, the nature, scale and location of which have not been identified.

Finally, the Irish High Court in *Coyne* [2023] IEHC 412 acknowledged in paragraph 138 and footnote 265, stating that it is entirely understandable and perhaps even inevitable that a cPPA would not be in place prior to a grant of permission for the proposed DC in that case. The Court further noted that it was entirely appropriate for the Board (now the Commission) to conduct its climate impact assessment of the Proposed Development based on the national fuel mix, rather than on a vague ambition or intention of the developer who had stated in correspondence to the Board that it was 'actively considering options' to source renewable energy for the DC.

In the present application, the developer is proposing that a condition be imposed which would ensure that a cPPA is in place prior to the commencement of operations. Compliance with such condition could delay the commencement of operations, and it is not inevitable (per *Finch*) that certain environmental effects would be likely to occur as a consequence of any renewable energy project being developed for the purposes of supplying electricity pursuant to such cPPA, nor are any such effects capable of being calculated in accordance with any accepted methodology. There is no "*demonstrably strong and unbreakable*" connection between the Proposed Development and any such renewable energy project (per *An Taisce*) such as would necessitate an assessment of the indirect effects of such renewable energy project on the environment as part of the EIA for the Proposed Development. Accordingly, any such effects (the existence of which is not apparent) are scoped out of this Chapter of the EIAR.

12.5 Limitations and Assumptions

12.5.1 GHG Assessment

Embodied Carbon Assessment

The embodied carbon assessment has been completed by AtkinsRéalis based on information provided by the design team in the form of: design plans and drawings material take-offs; information provided by the design team; and bill of quantities provided by the project cost consultant.

Where information was not available assumptions were made in line with industry averages to allow for an initial baseline setting. An additional safety factor of 10% was included to account for smaller elements of the Proposed Development that were not covered by the assessment. All significant aspects of the Proposed Development are considered to have been captured.

A list of specific material assumptions made in the embodied carbon models and a full breakdown of the materials and their associated quantities included in the assessment as provided by AtkinsRéalis is included in Appendix D of the EIAR.

The embodied carbon assessment completed by AtkinsRéalis includes the following general assumptions:

<u>Building Area</u>

The Gross Internal Area (GIA) used in the embodied carbon models was provided by the design team as:

- EC: 6,755 m^2
- DC: 26,496 m^2

<u>Building Life Cycle</u>

The project life expectancy has been designed for 60 years, in line with the RICS (2017) Guidance recommended Reference Study Period and actual project aspirations. actual project aspirations.

<u>Transport Distances</u>

Due to unavailability of this data at this stage of the project, the transport distances adopted were in line with the RICS Professional Statement guidance:

- Locally manufactured = 50 km
- Nationally manufactured = 300 km
- European Manufactured = 1,500 km
- Globally manufactured = 200 km by road + 10,000 km by sea

<u>On-Site Construction Impacts</u>

On-site construction impacts (Module A5a) were assumed in line with the RICS (2017) Guidance, equal to 1,400 kgCO_2e / €100k of project value. The value for the Proposed Development. Construction works was equal to:

- DC: €73 m
- EC: €82 m

<u>Construction Waste factors</u>

Waste factors (Module A5w) were assumed in line with industry market averages, recommended by the carbon software OneClickLCA.

Contingency Factors

Due to the current design stage of the Proposed Development, the cost plan was not sufficiently detailed to carry out a coverage exercise. Therefore, a contingency factor of 10% has been incorporated into the carbon assessment estimate to accommodate elements not included in the assessment and to address uncertainties in the carbon model. This aligns with RICS (2017) Guidance and accounts for uncertainties related to Material Variability, Data Availability, Design Changes, Technological Advancements, and Regulatory Changes that may affect the embodied carbon assessment.

Module B emissions

Due to unavailability of specific information regarding replacement cycles, Module B emissions were kept at default values provided by the carbon tool OneClickLCA. These values should be updated to more accurate values once more information is available regarding maintenance and refurbishment cycles.

Refurbishment and Materials Service Life (Module B4)

The materials' service life was kept to the default figures suggested by the OneClickLCA carbon tool, which are based on general RICS (2017) Guidance and materials data. These assumptions will need to be reviewed for greater accuracy that reflects the actual replacement cycles once the procurement route for materials is established, as they might influence the carbon emissions included in Module B.

End of Life Scenarios (Module C1)

End-of-life emissions associated with deconstruction and decommissioning were estimated using an average carbon factor of 3.4 $kgCO_2e$ / m^2 of built area.

Exclusions

The carbon assessments undertaken for the Proposed Development exclude a number of elements, due to the unavailability of accurate information or data at the current stage of the project design. Some elements will be further refined at a more detailed design stage of the project, when contractors and tenants are selected for the Proposed Development. These will need to be included at later stages when the design progresses and more information becomes available. The excluded items are:

- Mechanical, Electrical, and Plumbing (MEP) Refrigerants emissions (Module B1), a key aspect of DCs with a primary cooling load has been excluded due to unavailability of information at this stage. These should be added to the assessment once this information is available. However, it is noted that the design has specified that R290 will be used as the refrigerant, given its lower GWP and greater environmental friendliness compared to other refrigerant options.
- Data Equipment and servers.
- Demolition impacts. This would typically require input from a contractor regarding demolition energy usage, which is not available at this stage.
- Quantum of retained structures.

Operational Carbon Assessment

Energy

Detailed assumptions relevant to the Baringa energy modelling presented in this Chapter are included in the Emissions and Energy Modelling Report which accompanied the planning application.

Pending planning permission, the Proposed Development is expected to begin operations no earlier than 2028. For the purposes of the impact assessment, emissions in the year 2030 are focused on as this is the last year of Ireland's current carbon budgets (set out in Section 12.3 of this Chapter) which are used to contextualise the operational emissions of the Proposed Development.

Water

Due to the nature and design of the Proposed Development consumption of mains water supply will be minimal. This will be for sanitary use for the approx. 50 no. operational staff at the facility.

Some of the freshwater sourced from the EPA registered Littlegrange/Mell quarry abstraction regime at the site will be used for processes at the Proposed Development as follows:

- DC and EC Cooling System water: there will be no requirement to use the public water supply for the cooling system employed at the DC and EC. For most of the year the conventional cooling tower system to be used will operate as a dry cooler therefore there are no freshwater requirements. Freshwater will be required for the cooling system only during peak summer temperatures when evaporative cooling is required, with up to 240 m^3/day of freshwater consumed. This freshwater will be sourced from the EPA registered Littlegrange/Mell quarry abstraction regime and will be within the limits of the existing registered abstraction volumes. The water used will be released by evaporation from the cooling towers.
- Firewater: It is proposed to utilise the freshwater from the Mell quarry as a source for firewater supply. The supply from the quarry will go to 270 m^3 static firefighting storage tank for storage, ensuring one hour of firefighting at 4,500 l/min. The freshwater supply, once it has filled the static tank, will overflow and be diverted to the existing outfall discharge to sea to the east of the site.

As the water to be used for the processes outlined above is to be sourced from the existing freshwater source from the EPA registered Littlegrange/Mell quarry abstraction regime, there is no additional carbon emissions associated with the use of this water.

There are no GHG emissions generated from the production or treatment of this freshwater required before using in the cooling tower system/firefighting tank. The electricity (and associated GHG emissions) required for the water abstraction system and for the cooling tower system is already accounted for in the operational energy carbon assessment above. In addition, there is no water discharged from the closed towers system which would require treatment as all water used in the system is evaporated. The cooling tower does not have a blowdown requirement, but will be cleaned once a year during the cooling tower’s ‘dry’ season. This is just to descale and clean where necessary.

Based on the above it is considered that GHG emissions associated with water consumption during the operational phase of the development will be less than 1 % of total operational carbon emissions and are therefore excluded from further assessment in accordance with the IEMA (2022) Guidance.

Decommissioning Carbon Assessment

As described in Section 12.4.1 of this Chapter, a qualitative description of GHG emissions expected from the decommissioning activities when the Proposed Development has reached the end of life has been included. This approach is in line with IEMA (2022) Guidance.

12.5.2 Climate Change Resilience Assessment

There are a range of assumptions and limitations associated with projected climate change. There are inherent uncertainties within the predicted climate change patterns for Ireland included in the climate change resilience assessment.

12.5.3 General Assumptions, Inclusions and Exclusions

This section lists general assumptions, inclusions and exclusions relating to the GHG assessment and the climate change resilience assessment. Where relevant, specific assumptions, inclusions and exclusions are stated throughout this report.

- The construction phase of the Proposed Development is described within *Chapter 2 Description of Proposed Development* of the EIAR.

- The Proposed Development operations are described within *Chapter 2 Description of Proposed Development* of the EIAR
- The construction phase including demolition will take approx. 38 months in total. The service life of the Proposed Development is 60 years.

12.6 Baseline Environment

12.6.1 GHG Emissions in Ireland

The EPA produces national GHG emission projections on an annual basis.

It is noted that a recently published EPA report[10] suggests that the 2021 – 2025 and 2026 – 2030 Carbon budgets will be difficult to comply with. Likewise, the report suggests that the 2021 – 2025 and 2026 – 2030 sectoral emission ceilings will also be difficult to comply with although in relation to the electricity sector the report projects that it is likely to achieve the first sectoral emission ceiling target:

"*The sectoral ceilings projected to be achieved in the first budget period (2021-25) are in the Electricity, Buildings and 'Other' sectors*"

The report also confirms that over the period 2023 to 2030, electricity under the WEM (with existing measures) scenario will reduce from 7.845 to 4.4 Mt CO_2eq whilst under the WAM (with additional measures) scenario will reduce from 7.845 to 3.4 Mt CO_2eq. The report states:

"There was a significant drop in emissions from the Energy Industries sector between 2022 and 2023 (down 2.1 Mt CO_2eq or 21.4%). This reduction in emissions was partly due to a 12-fold increase in the amount of imported electricity (9.5% of electricity supply in 2023), in combination with an increase in the share of renewable energy from 38.6% in 2022 to 40.7% in 2023. This step change in interconnector behaviour is projected to increase to 22% in WEM and 19% in WAM by 2030"

The report does note, however, that currently it is projected that the electricity sector is unlikely to achieve the second sectoral emission ceiling period (2026-2030) target.

A more recent EPA report[11] has reported that the 2024 energy industries GHG emissions have decreased again from 7.8 Mt in 2023 to 7.16 Mt in 2024.

In the Sustainable Energy Authority of Ireland's (SEAI) report *National Energy Projections 2024*, the key conclusions for the electricity sector are as follows:

- In 2023, Ireland saw a record level of net electricity imports, reducing the need for domestic fossil fuel generation, leading to a notable reduction in GHG emissions from the electricity sector. This trend has increased further in 2024, where the level of net imports in the first half of 2024 has already exceeded all of 2023. Consequently, the sectoral emissions ceiling for electricity for the first carbon budget period will be much closer to being achieved than previously projected.
- The sum of variable renewable energy (onshore wind, offshore wind, solar) is the largest input to electricity generation by 2030, overtaking natural gas.
- A delay in the roll-out of all types of variable renewables, e.g. onshore wind, solar PV, and particularly offshore wind, poses large risks. While imports may somewhat aid in mitigating this delay from a national emissions perspective, there is little to no mitigation for our European renewable energy targets.

[10] EPA (2025) "*Ireland's Greenhouse Gas Emissions Projections 2024-2055*", https://www.epa.ie/publications/monitoring--assessment/climate-change/air-emissions/irelands-greenhouse-gas-emissions-projections-2024-2055.php, accessed 07 August 2025.
[11] EPA (2025) "*EPA Provisional GHG Emissions 1990 – 2024*", https://www.epa.ie/publications/monitoring--assessment/climate-change/air-emissions/irelands-provisional-greenhouse-gas-emissions-1990-2024.php, *accessed 07 August 2025.*

CAP25 states the following in relation to the actions required by Ireland in order to meet its decarbonisation targets:

"*A renewables-led system is at the core of Ireland's plan to radically reduce emissions in the electricity sector, protect our energy security, and ensure our economic competitiveness. This requires the accelerated and increased deployment of new renewable electricity generation capacity and related infrastructure*."

Progress in implementing this renewables-led system is evidenced by several recent initiatives including:

- Permitting of new renewable generation connections ramping up in accordance with RED III[12]
- Permitting of new and repowered renewables, including battery storage and grid, to be ramped up in accordance with RED III (S.I. 274 of 2025: European Union (Planning and Development) (Renewable Energy) Regulations 2025)
- An Coimisiún Pleanála is reporting monthly on renewables applications received and decided[13]

12.6.2 Operational Baseline Scenario

This section describes the existing PPL production facility when the site was fully operational.

The site of the Proposed Development has an extensive industrial heritage, originally established in the 1930s as a cement production facility by Cement Ltd. This operation transitioned to a magnesia and magnesium hydroxide production facility in the 1970s under the ownership PPL.

PPL holds a current Industrial Emissions (IE) Licence (Reg No. P0376-02) licence for the *'production of lime in a kiln'* and *'recovery or disposal of waste'* at the subject site.

The facility also has a GHG permit (Reg. No. IE-GHG045-10366-4) which authorises the following named activities resulting in emissions of Carbon Dioxide from the listed emission sources at the site:

- 'Production of lime or calcination of dolomite or magnesite in rotary kilns or in other furnaces with a production capacity exceeding 50 tonnes per day;
- Combustion of fuels in installations with a total rated thermal input exceeding 20 MW (except in installations for the incineration of hazardous or municipal waste)'.

The existing magnesia and magnesium hydroxide production facility represents a highly carbon intensive industrial process, housed within a facility that precipitates a significant negative impact on the locality in terms of visual impact, air quality, and amenity.

At approximately 215,900 tCO_2 emissions during peak production[14], and significant Sulphur Dioxide (SO_x) and Nitrogen Dioxide (NO_x) emissions, PPL is one of Ireland's most emissions intense industrial facilities representing a significant share of Ireland's industrial sector emissions. Industrial emissions are mainly attributable to the lime-production on the site.

The process requires the burning of 1,000 tonnes of limestone per day in kilns. This requires the combustion of ~15,000 tonnes/year of high-sulphur petroleum coke, a large volume of natural gas as well as substantial electricity consumption.

[12] CRU (2024). *CRU Publishes New Generation Connections Policy - New policy provides twice yearly 'batches' through EirGrid and ESB Network*. Available at: https://www.cru.ie/about-us/news/cru-publishes-generation-connections-policy/ [accessed August 2025]

[13] An Coimisiún Pleanála (2025). Renewable Data Decided and Received July 2025. Available at: https://www.pleanala.ie/getmedia/9e3b35f4-d085-482e-9d46-85104b78ce5b/Renewable-Data-Decided-and-Received-July-2025_2.pdf?ext=.pdf [accessed August 2025]

[14] For the purposes of this assessment and report, the GHG emissions figures from production operations (process emissions, petroleum coke combustion, natural gas combustion and electricity consumption) were typical of a high production year (2014).

The process emissions of CO_2 from the lime production are also very significant as limestone is a compound of calcium, carbon and oxygen ($CaCO_3$). When this is burned to produce lime (CaO), CO_2 is produced as a bi-product and accounts for approximately half of the process carbon emissions.

Carbon emissions are also generated from the wet end process where sulphuric acid is used to remove carbonates from seawater which then releases CO_2 into the atmosphere.

The SO_x and NO_x emissions which rise from the combustion of fuels including petroleum coke have a significant effect on air quality. NO_x can further react to form N_2O which has a GWP 265 times greater than CO_2 and has a lifespan of approx. 100 years.

While there is only limited production occurring at the facility currently (production of Magnesium Hydroxide (Mg(OH)2) suspension), the facilities remain in place to recommence production of Magnesia products at the site.

In the case where the Proposed Development does not receive planning permission, it is possible that PPL will return to full scale production, which would generate > 200,000 tCO_2 from the facility annually.

12.6.3 Existing Baseline Scenario

This section describes the current existing operations GHG emissions at the PPL site.

In recent years, the existing PPL facility has faced economic challenges due to escalating energy costs. Due to this production at the PPL facility has been ramped down in recent years with a corresponding reduction in GHG emissions, and SO_x and NO_x emissions. Production of lime at the facility and the required thermal operations were suspended at the end of Q2, 2022. Currently operations at the site consist of limited production of magnesium hydroxide (Mg(OH)2) suspension only which in 2024 resulted in ca. 278 tCO_2 annually.

12.6.4 Climate Change Resilience Baseline

Future baseline conditions are used to determine the likely future climate change impacts on the Proposed Development.

In 2020, research carried out by the Irish Centre for High-End Computing on behalf of the EPA was published, which included a new set of mid-21st-century (2041-2060) high-resolution climate projections for Ireland. The Met Éireann website[15], summarises these climate projections as follows:

- “temperatures are projected to increase by 1–1.6°C compared with the reference period (1981–2000), with an east-west gradient and with the largest increases in the east;
- warming will be enhanced at the extremes, with summer daytime and winter night-time temperatures projected to increase by 1–2.4°C;
- the number of frost and ice days will decrease by approximately 50%;
- summer heatwave events are expected to occur more frequently;
- precipitation is expected to become more variable, with substantial projected increases in the occurrence of both dry periods and heavy precipitation events;
- snowfall is projected to decrease substantially across the country;
- specific humidity is projected to increase substantially, while relative humidity is projected to increase slightly for all seasons except summer;
- mean 10-m wind speeds are projected to decrease for all seasons;

[15] Met Éireann (2020) “*New Climate Projections 2020*” https://www.met.ie/epa-climate-projections-2020 , accessed 05 May 2024

- an overall reduction of ~10% in the numbers of storms affecting Ireland, with an eastward extension of the more severe wind storms over Ireland and the UK;
- an increase in the length of the growing season of between 12% and 16%;
- the energy content of the 120-m wind is projected to decrease, while a small decrease in solar photovoltaic (PV) power is projected."

With regard to rainfall, projections indicate a substantial increase in the frequency of heavy precipitation events in Winter and Autumn (approx. 20%)[16]. In addition, climate projections for Ireland indicate that water resources will become depleted both in terms of water supply and quality and this is against a background of increasing demand due to, amongst others, increased irrigation requirements[9].

By the end of the 21st century, global mean sea level is expected to rise. With the increased warming of the ocean, the frequency of coastal storms is expected to increase and in combination, these changes are expected to exacerbate existing problems of coastal erosion and flooding[17].

Climate change can have direct impacts upon biodiversity by shifting species or the timing of key life cycle events. Biodiversity changes can improve or worsen the impacts of climate change through altering surface characteristics and the benefit of the terrestrial carbon sink.

In Ireland, the main impacts of climate change on species and habitats have been changes in species abundance and distribution, phenology, community composition, and habitat structure and ecosystem processes. It is noted that these changes are in addition to significantly larger impacts on Ireland's biodiversity and habitats arising from other direct human interventions[18]. The conservation status of 10% of Irelands known species has been assessed and found that one in every fifth species is threatened with extinction here[19].

According to the EPA's Climate Ireland website[20], Ireland's geographical features and prevailing climate mean that the key climatic hazards of concern are:

- Coastal erosion: rising sea levels will put Ireland's soft coastlines at increased risk form coastal erosion.
  - Projected changes in sea level in combination with projected increase in the severity of coastal storms is expected to exacerbate coastal erosion risk.
  - Areas of the north east coast of Ireland are likely to experience a coastal erosion rate of 2.2-3.7 mm per year.
- Inland flooding: changes in patterns of precipitation will increase flood risk and will put new areas at risk.
  - Areas already at risk of flooding can be expected to be at increased flood risk while areas currently not prone to flood risk may become more prone to flooding in the future.
  - Overall, modelling results indicate that increased precipitation will result in substantial increases in winter and spring stream flow for all of the catchments assessed and, as a result, an elevated risk of flooding.
  - Coastal flooding: sea level rise will put coastal areas at increased risk of flooding.
  - Sea levels will continue to rise for the coming century while the magnitude and intensity of coastal storms are expected to increase.

[16] EPA (2023), "*What Impact Will Climate Change Have on Ireland*" , https://www.epa.ie/environment-and-you/climate-change/what-impact-will-climate-change-have-for-ireland/#:~:text=Ireland's%20climate%20is%20changing%20in,depending%20on%20the%20emissions%20trajectory, accessed 02 May 2024
[17] Climate Ireland, https://www.climateireland.ie/#!/tools/sectors/coastalAreas, accessed 02 May 2024
[18] Government of Ireland (2023), "*Ireland's Climate Change Assessment, Vol 1 Climate Science – Ireland in a Changing World*", https://www.epa.ie/publications/monitoring--assessment/climate-change/ICCA_Volume-1.pdf, accessed 30 May 2024
[19] Biodiversity Ireland, *"Intergovernmental Panel on Biodiversity and Ecosystem Service (IPBES) and Ireland's biodiversity crisis"*, available at https://biodiversityireland.ie/ipbes-irelands-biodiversity-crisis/, accessed 02 May 2024
[20] Climate Ireland, https://www.climateireland.ie/impact-on-ireland/climate-hazards/, accessed 02 May 2024

- Water scarcity: increased temperatures and decreased summer rainfall may result in increased drought risk.
  - Projections indicate an overall decrease in levels of precipitation during the summer months and this will lead to significant decreases in annual effective runoff and the availability of water supply for all sectors.

12.7 Potential Effects – Do Nothing Scenario

In the case where the Proposed Development does not receive planning permission, there are two realistic potential 'Do Nothing' scenarios.

12.7.1 Potential 'Do Nothing' Scenario – Return to Full Scale Production

Firstly, it is possible that PPL will return to full scale production.

As discussed in Section 12.6.3 above, the existing PPL facility has faced economic challenges in recent years. Due to this production at the PPL facility has been ramped down in recent years, but at no point did activities cease on site. A key factor in the scaling back of operations on site was the extreme rises in the price of gas resulting from Russia's invasion of Ukraine. Gas prices have now fallen from their 2022 peak[21] and are stabilising, meaning that a return to full scale production on site within the terms of the existing IE licence would be economically viable into the future. There is also continued strong demand for the type of products produced on the PPL site.

Construction Phase (including Demolition)

In this scenario the Proposed Development would not proceed as planned, there would be no construction carbon emissions associated with the Proposed Development.

Therefore, this scenario can be considered **neutral and imperceptible** effect on climate due to the carbon emissions associated with the construction phase.

Operational Phase

As described above, should the Proposed Development not go ahead, PPL could envisage a return to peak production of magnesia products at the facility.

In this scenario production would ramp up steadily to peak production which would generate approximately 215,900 tCO_2e from the facility annually.

PPL have considered the use of solid recoverable fuel (SRF) waste to displace petroleum coke and some natural gas if returning to the production of magnesia products at the site. However this transition would require a review of the site's IE Licence and would still lead to significant GHG emissions being generated by the facility.

Therefore, this scenario can be considered to have a **negative, significant, and long-term** effect on climate due to the carbon emissions associated with the operation of the existing facility at peak production.

12.7.2 Additional 'Do Nothing' Scenario – Redevelopment of Site for an Alternative Use

In light of queries raised by third party submissions on the planning application and in order to assist the planning authority in its assessment of the 'Do-Nothing' Scenario, additional descriptive information on the range of consequences that are reasonably likely to occur should the Proposed Development not proceed was provided in a separate EIAR Addendum submitted to LCC on 12 May 2025 (PM Group Report No. IE0313391-22-RP-0005) as part of a response to a Further Information (FI) request. To ensure that all relevant information is presented, the PM Group report analysis is summarised in this updated Chapter.

Due to the nature of the site and its zoning in the County Louth Development Plan 2021-2027 (i.e. E1 – General Employment), it is considered possible that any 'Do-Nothing' scenario alternative to

[21] SEAI Average gas prices to business (seai.ie)

the proposed CORE project would involve a redevelopment of the site for a new use that is similarly aligned with the zoning and development objectives for the site.

The following is therefore considered to be a suitable and likely alternative 'Do-Nothing' scenario to be considered:

- PPL, or any future owner of the site, will implement the EPA-approved Decommissioning Management Plan (DMP) and manage the landfill aftercare in accordance with the EPA-approved Closure, Restoration and Aftercare Management Plan (CRAMP). The decommissioning of the PPL facility will require planning permission as it involves works that are not exempted development.
- Redevelopment of the site for a new use that is similarly aligned with the zoning and development objectives for the site (further details provided below), and which makes appropriate use of the existing onsite electricity, gas, water and other infrastructure in accordance with the principles of proper planning and sustainable development of the area. Any such proposed development would need to be aligned with the requirements of the CRAMP and the continuing aftercare of the landfill, and would require planning permission.

The E1 zoning pertaining to the site includes a range of generally permitted uses, with a primary focus on employment and industry (but also including a range of other uses including educational, vehicle sales, and wholesale warehouse uses). Based on the site's physical and infrastructural characteristics it is considered that an employment use is the most likely long-term use for the lands in the absence of the Proposed Development proceeding.

The E1 zoning includes generally permitted uses such as 'High Technology Manufacturing', 'Industry Light', 'Warehousing', 'Logistics', and 'Science and Technology Based Enterprise'. The site would be suitable to accommodate any of (or a mix of) these permissible uses, and could also be suited to an 'Industry, Heavy' use which is identified as open for consideration under the zoning.

The use of the lands for other uses such as 'Vehicle Sales Outlet' or 'Cash and Carry' is considered less likely having regard to the characteristics of the site.

Given the works and capital expenditure required to make the site ready for a new employment use, it is considered that future development on site would likely focus on higher value industrial use / high technology uses, in the absence of the Proposed Development proceeding (i.e. in the 'do nothing' scenario).

Additional 'Do Nothing' Scenario - Construction Phase (including Demolition)

Similar to the assessment described in this EIAR Chapter for the Proposed Development following planning approval, an assessment of the potential effects during the demolition works is excluded for this additional "Do-Nothing" scenario as such an assessment would typically require input from a contractor regarding demolition energy usage, which is not available at this stage (refer to Section 12.5.1 of this Chapter).

With respect to the potential embodied carbon effects during the construction of the additional "Do-Nothing" scenario, they would vary depending on the exact volume and nature of the development that would occupy the site. However it is expected that the potential effects would be in line with what would be expected from the construction of developments that are aligned with the zoning and development objectives for the site. It is also expected that any future developments would be built with the appropriate materials and in a manner to ensure that it would comply with all relevant guidelines, policies, targets and legislation that would be in place at the time of construction.

Therefore it is expected that any potential effects during the construction of the developments that would occupy the site would be in line with those described in Section 12.8.1 of this Chapter, i.e. not significant.

Additional 'Do Nothing' Scenario - Operational Phase

The potential Climate effects during the operational phase of this additional "Do-Nothing" scenario would vary depending on the exact nature of the development that would occupy the site.

Included in the FI response in May 2025 was a review carried out by KPMG Sustainable Futures[22] of the Emissions and Energy Modelling Report which accompanied the planning application. As part of this review, KPMG performed a high-level assessment regarding which types of industries could utilise the infrastructure available at the CORE site if it were redeveloped for an alternative use. Potential alternative large energy users include dairies, biotech, pharmaceuticals, and glass manufacturing facilities amongst others, all of which would consider the electrical, gas, water and transport infrastructure available at the site attractive. High level analysis shows that such facilities in Ireland and the UK have a high temperature heat load currently met by natural gas, notwithstanding ambitions to electrify over the long term, and such facilities currently have EU ETS emission profiles in the range of 25,000 to 130,000 tonnes of CO_2 per annum.

As discussed previously, the zoning and development objectives for the site permit a wide variety of potential uses for the site, including development which would not come under the classification of large energy users, e.g. ‘Industry Light’, ‘Warehousing’, ‘Logistics’, and ‘Science and Technology Based Enterprise’. Although not quantified by the KPMG report, it is expected that the emission profiles of such facilities would be less than those quoted above for large energy users.

As stated in Section 12.9 of this Chapter, the Proposed Development is expected generate emissions of 17,750 tonnes of CO_2 per annum in the mitigated scenario.

Therefore depending on the specific alternative use, and the scale of the alternative facility, the additional “Do-Nothing” scenario may generate emissions lower than those predicted for the Proposed Development or higher than those predicted for the Proposed Development.

12.8 Potential Construction Effects of the Proposed Development

12.8.1 Embodied Carbon

The construction phase of the Proposed Development will give rise to GHG emissions. To assess these GHG emissions, the embodied carbon associated with the construction phase of the Proposed Development has been estimated according to the methodology described in Section 12.4.1.

The results of the embodied carbon assessment completed by AtkinsRéalis are presented here, first the full embodied carbon results for the four groups (EC, DC, Bio-Solar Façade, and External Works) assessed and then as a summary of the total upfront carbon emissions (modules A1 – A5 only) for the Proposed Development.

Table 12.8 illustrates the overall results of the embodied carbon assessment for the EC.

[22] KPMG Sustainable Futures (2025). Premier Periclase. Energy & Emissions Modelling Report (EEMR) Review

Table 12.8: EC Embodied Carbon Assessment Results by Life Cycle Module for Business as Usual Model and Proposed Development (Enhancements) Model (as provided by AtkinsRéalis)

Building Life Cycle	Module	BAU		Enhanced	
		$KgCO_2e$	$KgCO_2e$ / m^2 GIA	$KgCO_2e$	$KgCO_2e$ / m^2 GIA
Carbon Sequestration		-	-	-	-
Product Stage	A1-A3	7,832,945	1,177.0	4,929,190	740.7
Transport	A4	621,542	93.4	617,168	92.7
Construction	A5w	481,883	72.4	360,192	54.1
	A5a	1,258,488	189.1	1,258,488	189.1
Upfront Carbon (Excluding Sequestration)	**A1-A5**	**10,194,858**	**1,531.9**	**7,165,037**	**1,076.6**
In-Use Phase	B1-B5	2,695,637	405.1	2,224,621	334.3
End-Of-Life Phase	C1-C4	315,830	47.5	315,323	47.4
Total – Life Cycle Embodied Carbon (Including Sequestration)	**A-B-C**	**13,206,325**	**1,984.4**	**9,704,982**	**1,458.3**

Table 12.9 illustrates the overall results of the embodied carbon assessment for the DC.

Table 12.9: DC Embodied Carbon Assessment Results by Life Cycle Module for Business as Usual Model and Proposed Development (Enhancements) Model (as provided by AtkinsRéalis)

Building Life Cycle	Module	BAU		Enhanced	
		$KgCO_2e$	$KgCO_2e$ / m^2 GIA	$KgCO_2e$	$KgCO_2e$ / m^2 GIA
Carbon Sequestration		(276,098)	-10	(276,098)	-10
Product Stage	A1-A3	38,086,634	1,435	29,518,072	1,112
Transport	A4	1,280,675	48	1,274,390	48
Construction	A5w	1,728,216	65	1,347,819	51
	A5a	1,126,510	42	1,126,510	42
Upfront Carbon (Excluding Sequestration)	**A1-A5**	**42,222,035**	**1,590**	**33,266,791**	**1,253**
In-Use Phase	B1-B5	11,726,046	442	11,454,209	431
End-Of-Life Phase	C1-C4	1,575,840	59	1,555,992	59
Total – Life Cycle Embodied Carbon (Including Sequestration)	**A-B-C**	**55,247,824**	**2,081**	**46,000,895**	**1,733**

Table 12.10 illustrates the overall results of the embodied carbon assessment for the External Works included as part of the Proposed Development. It is noted that no enhancements providing carbon reductions have yet been agreed for the external works at this stage of the project design and therefore only the BAU results are provided here.

Table 12.10: External Works Embodied Carbon Assessment Results by Life Cycle Module for Business as Usual Model (as provided by AtkinsRéalis)

Building Life Cycle	Module	Carbon Emissions
		tCO_2e
Carbon Sequestration		
Product Stage	A1-A3	6,121
Transport	A4	3,228
Construction	A5w	2,314
	A5a	
Upfront Carbon (Excluding Sequestration)	**A1-A5**	11,663
In-Use Phase	B1-B5	8,820
End-Of-Life Phase	C1-C4	15
Total – Life Cycle Embodied Carbon (Including Sequestration)	**A-B-C (Excl B6-B7)**	20,498

Table 12.11 illustrates the overall results of the embodied carbon assessment for the Bio-Solar Façade on the southern face of the DC Building.

Table 12.11: Bio-Solar Façade Embodied Carbon Assessment Results by Life Cycle Module for Business as Usual Model and Proposed Development (Enhancements) Model (as provided by AtkinsRéalis)

Building Life Cycle	Module	BAU	Enhanced
		$KgCO_2e$	$KgCO_2e$
Carbon Sequestration		-	-
Product Stage	A1-A3	1,081,439	919,500
Transport	A4	27,147	17,083
Construction*	A5w	37,980	30,721
	A5a*	Incl. in Data Centre	
Upfront Carbon (Excluding Sequestration)	**A1-A5**	**1,146,566**	**967,304**
In-Use Phase	B1-B5	359,000	320,336
End-Of-Life Phase	C1-C4	17,148	17,131
Total – Life Cycle Embodied Carbon (Including Sequestration)	**A-B-C**	**1,522,715**	**1,304,772**

**The cost associated with the construction of the bio-solar façade was included as part of the overall Data Hall costs. Therefore, the A5a emissions associated with the Bio-Solar Wall are already accounted for under the A5a emissions of the Data Centre and were not listed separately to avoid double counting.*

Table 12.12 and Figure 12.3 provide a summary of the total tonnage of upfront carbon emissions associated with the business as usual scenario and the Proposed Development scenario for each group included in the study.

Table 12.12: Total Upfront Carbon Emissions for the Different Sections Within the Proposed Development and the total A1-A5 emissions (as provided by AtkinsRéalis)

	Upfront Carbon A1-A5 (tCO2e)	
	BAU	**Enhanced**
Energy Centre	10,194.9	7,165.0
Data Centre	42,222.0	33,266.8
BioSolar Wall	1,146.6	967.3
External Works	11,663.0	11,663.0
Total	65,226.5	53,062.1

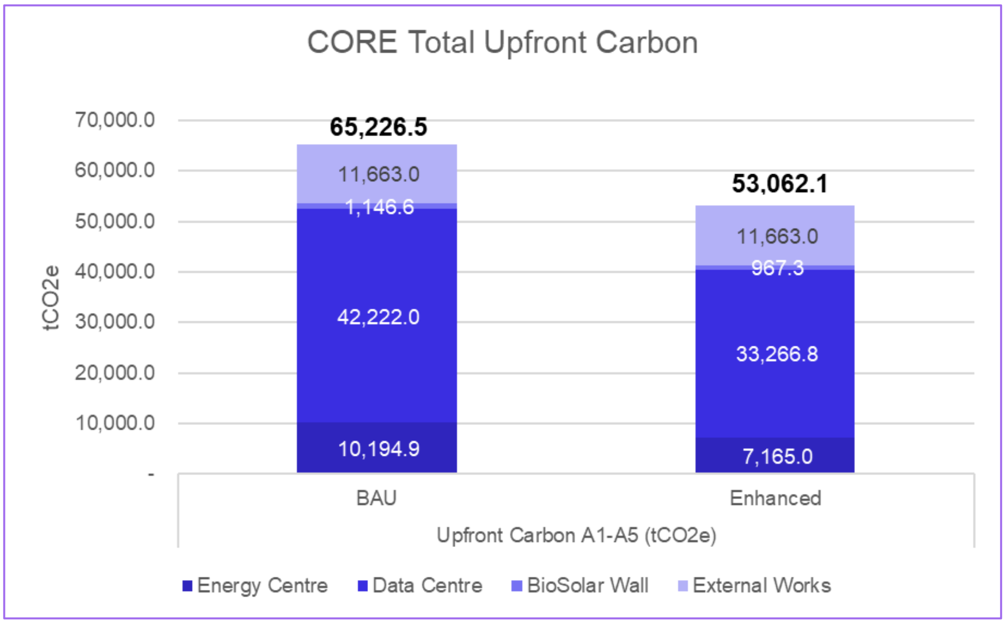

Figure 12.3: Total Upfront Carbon Emissions for the Different Sections within the Proposed Development and the total A1 – A5 emissions (as provided by AtkinsRéalis)

As can be seen from Table 12.12, EC BAU upfront carbon emissions are 10,195 tCO_2 [A1-A5], and when incorporating the carbon reduction enhancements, the upfront carbon estimate for the Proposed Development (enhanced) EC is reduced by 30% to 7,165 tCO_2.

The DC BAU upfront carbon emissions are 42,222 tCO_2 [A1-A5], and when incorporating the carbon reduction enhancements, the upfront carbon estimate for the Proposed Development (enhanced) DC is reduced by 21% to 33,267 tCO_2.

In relation to the Bio-Solar Façade on the southern face of the DC, BAU upfront carbon emissions are 1,147 tCO_2 [A1-A5], and when incorporating the carbon reduction enhancements, the upfront carbon estimate for the Proposed Development (enhanced) Bio-Solar Façade is reduced by 16% to 967 tCO_2.

As noted earlier, there have been no carbon reduction enhancements yet agreed for the External Works at this stage of project design and therefore there is no reduction from the BAU scenario to the Proposed Development scenario.

Overall the enhancements included in the Proposed Development demonstrate a notable 19% reduction in carbon emissions compared to the BAU model. These reductions have been achieved as a result of the carbon reduction strategies which have been incorporated into the design of the Proposed Development as detailed in Section 12.4.1 of this Chapter.

Alignment with the Climate Action and Low Carbon Development (Amendment) Act 2021 and CAP25:

As described in Section 12.3.3 of this Chapter, the following key targets have been set for the Industrial Sector in relation to embodied carbon in construction materials:

- By 2025: Decrease by 10% for materials produced and used in Ireland.
- By 2030: Decrease by 30% for materials produced and used in Ireland.

It is noted that the Proposed Development does not fall under the Industrial Sector. Section 13 Built Environment (including Commercial) of CAP25 states that "Embodied GHG emissions (emissions embodied in construction materials, construction processes, etc.) are reported in the industrial sector." Therefore these targets for the Industrial sector have been used for the construction phase embodied carbon assessment of the Proposed Development.

While the key targets have been set for the Industrial Sector as a whole and are not mandatory targets on a specific project basis, these reduction targets have been used as a guidance to set the upfront carbon emissions reduction target of 10% for the Proposed Development.

As illustrated in Table 12.12, the carbon reduction strategies for the Proposed Development will result in a 19% reduction in upfront carbon emissions from the BAU scenario. This reduction is attributable to concrete specification, steel rebar fabrication, structural steel enhancements and recycled content of PV panels.

It is noted that the use of recycled steel will be required to be sourced from outside of Ireland as it is not currently manufactured here. In addition the PV panels included in the Proposed Development will not be manufactured in Ireland. Therefore reductions of upfront carbon achieved due to the carbon reductions made in relation to steel and the PV panels will not contribute directly to the Carbon Budget targets set out for a reduction of embodied carbon from materials produced and used within Ireland. However, the Proposed Development will increase the demand for recycled steel and PV panels within Ireland therefore contributing positively to the CAP25 key targets for the reduction of embodied carbon associated with the Industrial Sector.

Alignment with Ireland's Sectoral Emissions Ceilings

As the majority of the construction phase of the Proposed Development is likely to take place between the years 2026 - 2028, the embodied carbon associated with the Proposed Development is compared against Ireland's defined carbon budget period of 2026 to 2030. Set out in Section 12.3 and Table 12.2 of this Chapter are the Sector Carbon Budgets for this period for the various sectors that are applicable to the Proposed Development.

Table 12.13 compares the various elements of the upfront carbon emissions (as provided in Table 12.12) against the relevant Sector Carbon Budget for 2030 (as provided in Table 12.2).

Table 12.13: Summary of Upfront Carbon Emissions and Comparison to Applicable Sectoral Ceilings and Carbon Budgets (Source: CAP25 and Sectoral Emissions Ceilings Report 2022)

Sector	Sectoral Carbon Budget 2026 to 2030 $MtCO_2$	Elements of Project related to Sector (Table 12.12)	Upfront Emissions associated with Proposed Development (tCO_2)	Contribution of Proposed Development Upfront Emissions to Carbon Budget
Electricity	20	Energy Centre, BioSolar Wall	8,132.3	0.04%
Built Environment - Commercial	5	Data Centre	33,266.8	0.67%
Industrial	24	External Works	11,663	0.05%

In reality the contribution of the Proposed Development to embodied carbon emissions in Ireland will be less than this as the results for the total upfront embodied carbon calculated for the Proposed Development include carbon emissions which will be produced outside of Ireland for the recycled steel and the PV panels: emissions associated with the excavation, processing of raw materials and manufacture (life cycle stages A1-A3) of these materials.

Therefore, this element of the upfront embodied carbon associated with the Proposed Development will not contribute to Ireland's carbon budgets as these budgets are based on the emissions directly produced in Ireland. This aligns with the approach in the TII (2022) Guidance.

The results of the embodied carbon assessment demonstrate tangible carbon savings achieved through selected carbon reduction interventions, paving the way for a more sustainable development. The project is committed to meeting carbon reduction targets set by industry benchmarks underscoring its dedication to environmental stewardship and responsible construction practices.

As demonstrated above, the Proposed Development is firmly aligned with direction of national and local policy including the Climate Action and Low Carbon Development (Amendment) Act 2021, CAP25, Ireland's Long Term Strategy on GHG reductions 2024, the NAF, Ireland's national climate objective, and the LCDP 2021 - 2027.

Acknowledging the volume of GHG emissions associated with the embodied carbon of the Proposed Development and considering the global science based 1.5°C trajectory (in terms of rate of emissions reduction), consideration was given to the Proposed Development being found to have a '*moderate adverse'* effect in accordance with the criteria set out in Table 12.7, Section 12.4.1 '*GHG Significance Criteria'*.

However, in considering this effect, it is relevant to acknowledge;

- firstly, that practical implementation of reductions of embodied carbon in Irish construction materials is at a very early stage given that Ireland's Climate Action Plans as statutory instruments have only recently begun to influence this sector, thus as the industry adapts it is likely further reductions in the Proposed Development's contribution to Ireland's carbon emissions will be possible.
- and, secondly the applicant is committed to targeting achievement of at least the 10% reduction in embodied carbon for upfront carbon emissions associated with the Proposed Development which aligns with the CAP25 Industry Sector key targets (applicable to the Built Environment (including Commercial) sector as per CAP25). Tracking of progress towards the KPI reduction target will be completed throughout the remaining design and construction stages of the development as the required information becomes available.

- Additionally, it's noteworthy that there are significant carbon savings from the project that have not been quantified in this report. This includes the reuse of existing infrastructure and the retention of multiple structures, such as the Workshop Building, 3 no. silos, Partial Crane Shed, and seawater tanks.
- As the development progresses, ongoing monitoring and optimisation will be crucial to ensuring continued alignment with carbon reduction goals and industry standards. The procurement stage has a very big influence on the actual embodied carbon impacts arising from the development, and therefore extra care should be given to this stage.

For these reasons, and having regard to the overall reductions of embodied carbon for the project, we consider the Proposed Development will have a '*minor adverse'* impact as the initiatives being implemented by the applicant represent industry best practice and support the achievement of reduction in the total embodied carbon in the Industry (including the Built Environment – Commercial) Sector and "*Ireland's trajectory towards net Zero*".

In addition, it is noted that the embodied carbon emissions will be once-off and unavoidable carbon emissions associated with development. Therefore, it is considered the overall effects of the total embodied carbon emissions, having regard to national industry carbon targets set-out in the CAP25 are considered '*minor adverse'* and therefore '*not significant'* in accordance with the criteria set out in Table 12.7, Section 12.4.1 '*GHG Significance Criteria'*.

12.8.2 Climate Change Resilience Assessment

Examples of climate risks associated with the construction phase of the Proposed Development include:

- Health and Safety risks to workforce in severe weather events;
- Obstruction of access to the construction site due to consequences of a severe weather event (storms, flooding, snow, ice);
- Delays caused by unsuitable conditions for certain construction activities due to extremes of hot, wet or cold weather;
- Damage of construction equipment, plant, materials and temporary construction buildings/facilities due to stormy weather.

The above climate change resilience effects during construction are expected to be potentially negative but imperceptible and short term (in accordance with the impact assessment criteria provided in Section 3.7.3 of the EPA (2022) Guidance) if correctly managed by the Construction Management Team.

12.9 Potential Operational Effects of the Proposed Development

12.9.1 Operational Carbon

The operation of the Proposed Development will generate GHG emissions in the following ways:

- The operation of the tertiary reserve gas engines;
- Indirect GHG emissions from electricity imported from the national grid;
- Consumption of water (excluded from calculation due to minimal use, refer to Section 12.5.1).

As described in Section 12.2.2 of this Chapter, the proposed CORE EC will provide a mix of on-site renewable generation, off-site renewable energy PPAs, gas generation, and power conditioning. As part of Phase 1 CORE, the only user of electricity on the site will be the proposed DC which will be the first tenant of the campus.

The campus will consume electricity when the grid's fuel-mix is predominantly renewable. At peak electricity demand, the grid is most vulnerable and at its highest carbon intensity due to the increased demand requiring older more carbon intense national energy generators to be switched on to provide the necessary extra power to meet demand. At these times, the proposed campus will provide a demand-response (reduces its grid electricity demand to near zero and provides its own power), leaving the energy market and supporting the loads with its own assets enabling the reduction/elimination of emissions in real-time (hour-for-hour) on the campus.

The flexible operation of the CORE EC by the energy services will achieve the lowest carbon intensity generation of power for the site depending on real time circumstances.

For example:

- In windy conditions, the BESS batteries will charge at night, increasing demand and reducing night-time curtailment. The batteries will then discharge during the evening peak to ensure no load on the system. There is no requirement to run gas engines in these conditions.
- In moderate wind conditions, the gas engines and the batteries will outperform the grid during the day reducing load on the grid (referred to as 'demand response'). At night-time, with low emissions intensity, the site would become a consumer again and also recharge its batteries during the night.
- In calm conditions, and when renewables on the system are scarce, the site could potentially export power to the national grid from the gas engines, reducing the overall load on the system.
- On-site solar generation will also reduce demand during day-time.

A detailed analysis of the operating modes of the Proposed Development both as a consumer and producer of electricity dependent on real time grid GHG emissions is set out in the Energy and Emissions Modelling Report which accompanied the planning application.

Mitigation and offsetting of operational GHG emissions is an inherent part of the design of the Proposed Development. The EPA (2022) Guidance clarifies the distinction between mitigation measures and compensation measures, with offsetting being considered a compensation measure rather than mitigation.

As described in detail in the Energy and Emissions Modelling Report which accompanied the planning application, the Proposed Development follows a decarbonisation pathway to net-zero GHG emissions from operations that aligns with the EPA (2022) Guidelines in relation to mitigation and offsetting of operational GHG emissions. A summary of this decarbonisation pathway set out in the Energy and Emissions Modelling Report is presented here.

The Proposed Development has firstly included mitigation as part of the development design, systematic (cumulative) decarbonisation second, and finally will look to offset or compensate for the remaining operational GHG emissions through the use of PPA's as required.

The key decarbonisation mitigation/ offsetting steps included as part of the Proposed Development and potential further measures envisaged for the campus in the future (not considered as part of the assessment in this chapter) are illustrated/summarised in Figure 12.4.

For the purposes of this updated Chapter, the operational baseline emissions from the PPL site have been excluded and replaced by the existing baseline emissions (as described in Section 12.6.3 of this Chapter) in the steps described below.

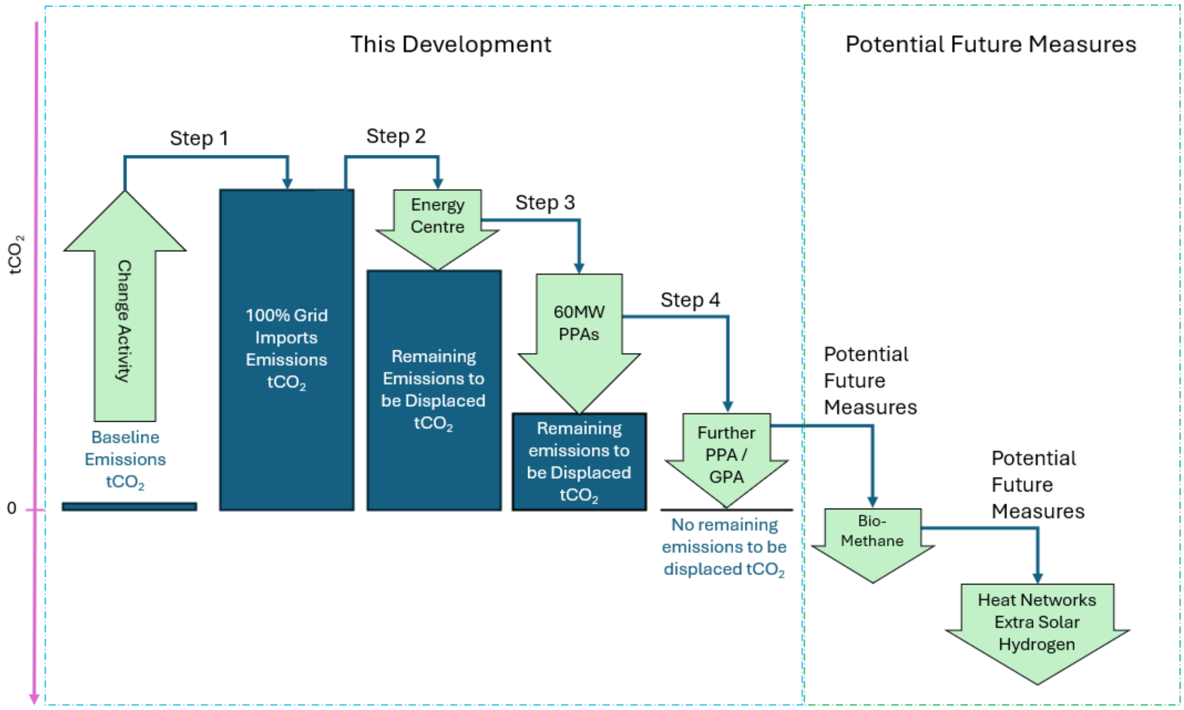

Figure 12.4: Decarbonisation pathway included with Proposed Development including mitigation and offsetting measures (Not to Scale)

The sequential approach to decarbonisation and associated mitigation measures outlined in Steps 1 to 4 of Figure 12.4 are described below in detail.

Future mitigation measures envisaged for the campus are discussed in Section 12.12 '*Potential Residual Effects'* of this Chapter in accordance with the IEMA (2022) Guidance. **However, for the avoidance of any doubt, it is noted that these future measures are not relied on in the climate impact assessment for the Proposed Development as set out in this section.** Only measures included with the Proposed Development (up to step 4 in Figure 12.4) are included in the assessment of potential operational effects on climate.

Step 1: Change of Activity

In the EIAR that was submitted with the planning application, the first step in the decarbonisation journey for the existing PPL site was the change of activity from the current carbon intensive production of magnesia products (as described in detail in Section 12.6.2 of this Chapter). In the first 'Do Nothing Scenario' described in Section 12.7.1 of this updated Chapter, PPL would return to full operations at the site giving rise to significant GHG emissions of approximately 215,900 tCO_2 per year as a worst case. In the Additional 'Do Nothing Scenario' described in Section 12.7.2 of this updated Chapter, the PPL site would be redeveloped for a purpose consistent with the 'E1' zoning objective for the site.

The Proposed Development represents a significant investment by PPL to identify the most appropriate alternative site use to mitigate its effect on climate by permanently changing its core activities, thereby, avoiding or eliminating very significant GHG emissions. However, for the purposes of assessing the climate impacts of the Proposed Development, this updated chapter assumes the 'baseline' to be the current operations on site which consist of limited production of magnesium hydroxide suspension only (as described in detail in Section 12.6.3 of this Chapter).

The predicted GHG emissions due to the change of activities on the site from the current operations to a conventional DC importing 100% of its annual energy requirement from the grid is ca. 66,300 tCO_2. As is detailed in Steps 2 - 4 below, the Proposed Development will go much further than that and achieve much greater emissions reductions.

The breakdown of emissions reductions possible compared to the emissions associated with importing the required electricity from the grid in the year 2030 is given below as the focus year for the operational carbon assessment.

Electricity Demand (or Load): The electricity load is modelled as a flat steady load of 25.5 MW required for DC operations representing about 70% of the DC design load (32 MW). This represents a total annual electricity consumption of 223,380 MWh that will be provided by all the energy sources available to the CORE EC. It is noted that DC operations encompass both IT and non-IT equipment, as well as the ancillary systems supporting these operations. In reality this load fluctuates with Information Technology (IT) operational activity and energy requirements for cooling. New generation IT loads associated with artificial intelligence or high performance computing can be much more variable, which may present more flexible demand opportunities in years to come.

Grid Intensity: The grid intensity of the modelling is based on a number of detailed assumptions as described in detail in the Emissions and Energy Modelling Report which accompanied the planning application.

Step 2: Mitigation of Imported Electricity Emissions Using On-Site Assets

As part of Step 2 of its decarbonisation journey, PPL have used on-site renewable generation via solar PV panels, energy storage via batteries, and electricity generation by gas engines included as part of the Proposed Development to augment the grid-supply to provide significantly decarbonised, conditioned power to the proposed on-campus DC. This energy infrastructure allows PPL to mitigate the cumulative effects of the energy use required for operation of the DC in every hour during the lifetime of the plant.

As described in Section 12.2.2, the Proposed Development will provide a flexible demand response and support the load of the DC with its on-site assets when the carbon intensity of the grid is higher than the carbon intensity of the on-site assets. This will be managed by the dedicated energy services team whose key focus is the safe and reliable operation of the site with a mission to decarbonise operational GHG emissions as quickly and effectively as possible.

The minimum GHG emissions mitigation results which can be realised through the use of the proposed energy infrastructure are presented in Figure 12.5. The breakdown of emissions reductions possible compared to the emissions associated with importing 100% of the required electricity from the grid in the year 2030 is given below as the focus year for the operational carbon assessment. Figure 12.5 also illustrates the energy modelling results for future years in the decarbonisation journey for the Proposed Development with the use of the proposed on-site energy infrastructure.

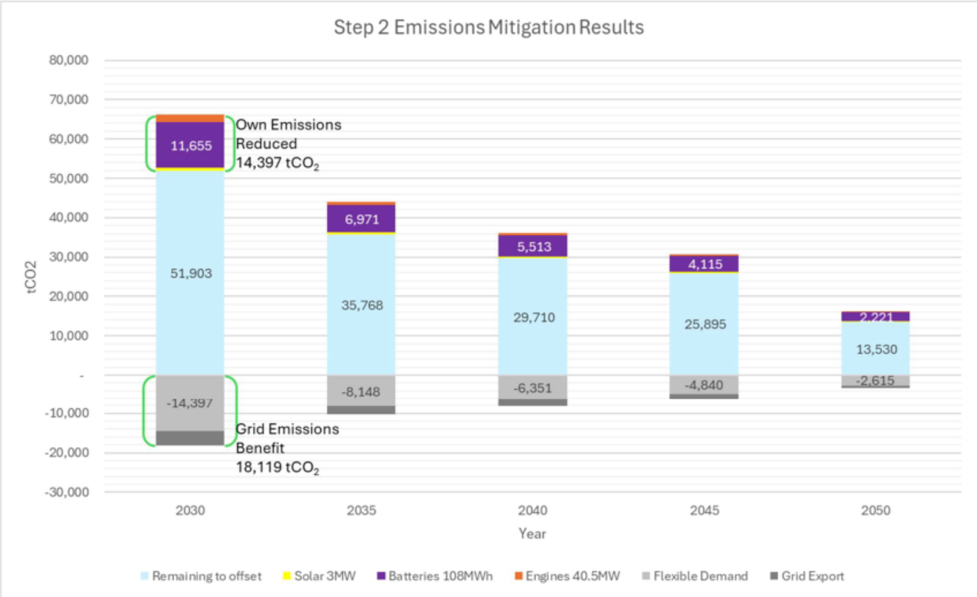

Figure 12.5: Reduction in GHG Emissions at the PPL Site Possible Through Use of On-Site Assets as part of the Proposed Development

Flexible Demand Response - Own Emissions Reduction

Load: The load is modelled as a flat steady load of 25.5 MW required for DC operations representing about 70% of the DC design load (32 MW): 223,380 MWh. In reality this fluctuates with IT operational activity and energy requirements for cooling. It is noted that new generation IT loads associated with artificial intelligence or high performance computing can be much more variable, which may present more flexible demand opportunities in years to come.

Grid Intensity: The grid intensity of the modelling is based on a number of detailed assumptions as described in detail in the Emissions and Energy Modelling Report which accompanied the planning application. It is noted that GHG emissions associated with the electricity consumption from the grid will reduce in future. This is because the grid will get 'greener': the GHG emissions associated with power generated for the grid will reduce with the increase in grid power supplied from renewable and green technologies in future[23].

Solar: An on-site solar PV panel array of 3 MW was modelled at a 10.6% capacity factor. As this is renewable generation behind the meter[24], it will always be consumed by the DC ahead of electricity grid imports. In the year 2030, the model predicts that the on-site solar PV will generate 2,794 MWh electricity for use by the DC which equates to 747 tCO_2 of displaced grid GHG emissions when compared with the GHG emissions associated with getting this power from the grid. It is noted from Figure 12.5 that as the grid itself gets greener in future, the solar PV array will still produce the same energy, but will displace less emissions because with greener assets supplying energy to the grid there are fewer emissions to displace.

Batteries: 108 MWh capacity battery storage was modelled with 1% degradation per cycle and a refresh limit of 75%. While the system can support the design load for 3 hours (maximum discharge 36 MW over 3 hours), the operational load which requires a slightly lower rate of discharge can be supported for over 4 hours. Some energy is always reserved to be able to support the load and provide grid power conditioning support services. The remainder is modelled to store off-peak

[23] Coal is no longer part of the fuel mix for electricity generation in Ireland and the proportion electricity generated by renewables energies has increased to just under a third in July 2025 (Eirgrid (2025). Renewables provide a third of electricity as July marks first month of new coal-free era for Ireland's power system [accessed August 2025])
[24] 'behind the meter' refers to energy systems located on the customer's side of the utility meter. This does not include 'private wire'

energy and discharge to the DC during the evening peak. This reduces the load on the grid and avoids typically higher emission grid imports at these times. In the year 2030, this equates 26,093 MWh and 11,655 tCO_2 of displaced grid emissions when compared with the GHG emissions associated with getting power from the grid at these times.

Gas Engines: Nine 4.5 MW reciprocating gas engines with 46% efficiency were modelled using 100% natural gas fuel. The engines are only utilised by the model when they outperform the marginal generators on the grid for emissions intensity. They are to be used mostly for demand response but could also export electricity at times when there is a scarcity of generation on the grid. Based on this model for the year 2030, the gas engines would run for 597 hours per year for demand response which would generate 18,465 MWh electricity and would displace 1,995 tCO_2 of grid emissions when compared with the GHG emissions associated with getting this power from the grid.

Remaining to Offset: Combined, the use of the on-site solar PV panel array, batteries and gas engines in 2030 will supply 47,352 MWh to the DC and gives a total reduction of GHG emissions of 14,397 tCO_2 **(22 % reduction)** compared to that which would be associated with 100% electricity grid imports (66,300 tCO_2).

This leaves 51,903 tCO_2 from emissions associated with electricity imported from the grid and use of the gas engines on site to be further mitigated or offset in the year 2030. As this is the minimal GHG emissions mitigation results which can be realised through the use of the proposed energy infrastructure as part of the Proposed Development, this represents the worst case scenario in terms of GHG emissions associated with the operational phase of the Proposed Development.

Grid Emissions Benefit

The light grey section of the bars in Figure 12.5 is used to illustrate the flexible demand response achieved from the grid's perspective where the grid did not have to produce energy as it was generated and/or stored by on-site assets at a lower carbon intensity than that of the grid (as described in the section above). In the year 2030, this accounts for 47,352 MWh and a 14,397 tCO_2 reduction compared to emissions that would have been produced if this power was consumed 100% from the grid.

Additionally there is the possibility for a further reduction in grid emissions by 3,722 tCO_2 (represented by the dark grey) as a result of the possible export of surplus low carbon electricity onto the grid from the batteries (7,385 MWh exported giving 3,500 tCO_2 reduction) and gas engines running for 126 hours (3,879 MWh exported giving a 222 tCO_2 reduction) at the site in the year 2030.

Therefore the potential total benefit of reduced GHG emissions on the grid in the year 2030 as a result of the flexible demand response and export of power from the Proposed Development is 18,119 tCO_2.

Step 3: Further Mitigation of Imported Electricity Emissions Using PPA's in Real-Time

As described above and illustrated in Figure 12.5, in 2030, the remaining GHG emissions to be further mitigated or offset after the use of on-site assets to provide electricity at a lower carbon intensity than that of the grid is 51,903 tCO_2.

To offset more of these remaining GHG emissions, a PPA can be used to purchase renewable power generated by a wind farm or solar farm.

While the energy services team may arrange the wind PPA as the energy broker, the tenants of the campus will ultimately be the counterparty in the PPA renewables contract as is the case for any energy supply to the site including electricity and gas from their respective grids. The tenant will have the contract with the energy utilities. PPL as the GHG permit holder are responsible for GHG emissions related to the energy operations. As the end user of the energy, the tenants decisions in relation to PPA's for wind or solar will directly impact emissions. It will be a condition of tenancy that tenants bring an appropriately sized PPA (wind or solar) that will offset GHG emissions generated from tenant's operations and give the same decarbonisation effect as outlined here.

Figure 12.6 illustrates the effect of using a 60 MW wind PPA in addition to the on-site assets as described in Step 2. In theory, a 60 MW wind PPA should be enough to displace the remaining GHG emissions generated by electricity required for DC operations at the Proposed Development (51,903 tCO_2). However, the results from the energy model for Step 3 predict that only approximately 35,344 tCO_2 will be mitigated in this scenario. This is because the model is projecting how much power from the PPA realistically will have generation and demand alignment in real time.

The breakdown of emissions reductions possible compared to the emissions associated with importing 100% of the required electricity from the grid in the year 2030 is given below as the focus year for the operational carbon assessment. Figure 12.6 also illustrates the energy modelling results for future years in the decarbonisation journey for the Proposed Development the use of the proposed on-site energy infrastructure and the incorporation of a 60 MW wind PPA.

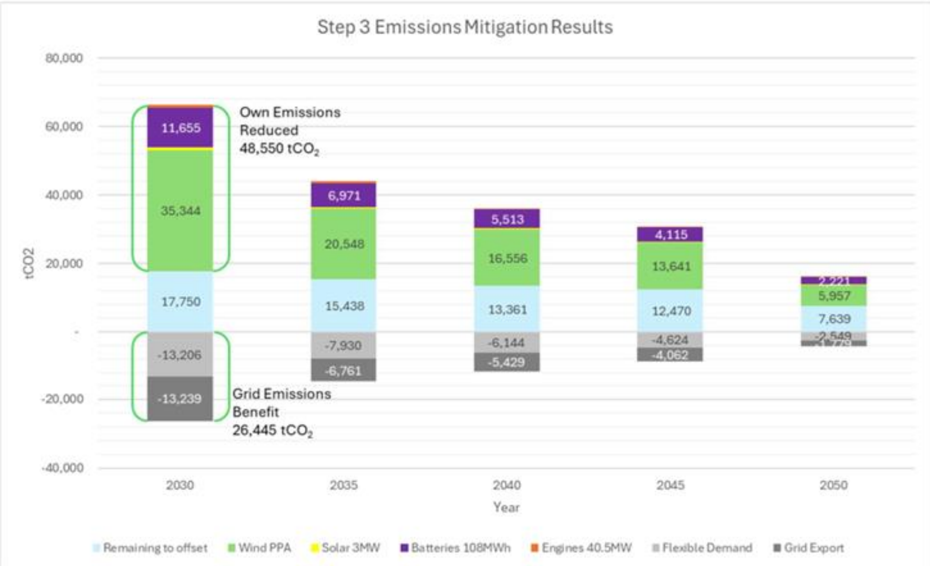

Figure 12.6: Reduction in GHG Emissions at the PPL Site Possible Through Use of On-Site Assets as part of the Proposed Development and a 60MW Wind PPA

Flexible Demand Response - Own Emissions Reduction

In this model, the parameters for load, grid intensity, batteries and the solar PV panel array remain as per described in Step 2.

In the year 2030, the model predicts that the use of the batteries will store and discharge 26,093 MWh of electricity and displace 11,655 tCO_2 of grid GHG emissions. The use of the solar PV panel array will generate 2,794 MWh electricity and displace 747 tCO_2 GHG emissions that would have been produced if this electricity was consumed 100% from the grid.

Gas Engines: In the year 2030, the addition of the wind PPA reduces the required running time of the gas engines down to 457 hours. This is because the energy provided by the wind PPA is less carbon intense than the engines and so they are required to run less. This reduces the power supplied from running the gas engines in the model to 9,772 MWh and as a result the emissions reduction achieved in running the engines versus importing electricity from the grid from a 1,995 tCO_2 reduction (in Step 2) to an 804 tCO_2 reduction.

Combined, the use of the on-site assets (solar PV panel array, batteries and gas engines) will account for a 13,206 tCO_2 reduction in emissions in the year 2030 versus the emissions which would arise from importing electricity from the grid.

Wind PPA: In the year 2030, the model predicts that the addition of the wind PPA will provide 144,369 MWh to the DC which equates to 35,344 tCO_2 of displaced grid GHG emissions.

In addition, there will be a further offset of displaced GHG emissions as a result of the export of renewable electricity onto the grid from surplus wind energy[25] as described under ***Grid Emissions Benefit*** below.

It is noted from Figure 12.6 that as the grid gets greener into the future, the wind PPA becomes less effective at displacing emissions because there is a lower intensity of emission on the grid than can be displaced.

Remaining to Offset: Combined, the use of the on-site solar PV panel array, batteries, gas engines and a 60 MW wind PPA in 2030 will supply 183,028 MWh of electricity to the DC and gives a total reduction of grid GHG emissions of 48,550 tCO_2 (73% reduction) compared to the that which would be associated with 100% electricity grid imports (66,300 tCO_2).

This leaves 17,750 tCO_2 residual GHG emissions associated with electricity imported from the grid and use of the gas engines on site to be further mitigated or offset.

Grid Emissions Benefit

The light grey section of the bars in Figure 12.6 represents the flexible demand response from the grid's perspective where the grid did not have to produce energy as it was generated and/or stored by the on-site assets at a lower carbon intensity than that of the grid (as described in the section above). This accounts for the 13,206 tCO_2 reduction in emissions compared to emissions that would have been produced if this power came from 100% electricity grid import alone in the year 2030.

Additionally there is a potential further reduction 13,239 tCO_2 on the grid in the year 2030 represented by the dark grey as a result of the possible export of lower carbon electricity onto the grid from the batteries (7,835 MWh exported giving a 3,500 tCO_2 reduction), gas engines running for 97 hours (2,079 MWh exported giving a 115 tCO_2 reduction), and export of surplus wind energy[26] (39,312 MWh exported giving a 9,624 tCO_2 reduction).

Therefore the potential total benefit of reduced GHG emissions on the grid in the year 2030 as a result of the flexible demand response and possible export of power from the Proposed Development is 26,445 tCO_2.

Step 4: Further Mitigation to Eliminate all GHG Emissions

It has already been stated in this Chapter that prior to the commencement of DC operations, the applicant shall provide the Planning Authority with written evidence of having in place 60 MW Annual Wind corporate power purchase agreements (cPPA) or, one or more cPPA delivering an equivalent combined supply. In addition, PPL commits to a further mitigation measure whereby any remaining residual GHG emissions will be offset by delivering an increased volume of renewable energy procured through a cPPA and/or Gas Purchase Agreement (GPA).

[25] This will occur when the energy generated by the wind farm associated with the PPA exceeds the energy requirements of the site in any hour. This energy will be made available to the rest of the grid through trading in the balancing market and will displace more carbon intensive generators.
[26] This would occur when the energy generated by the wind farm associated with the PPA exceeds the energy requirements of the site in any hour. This energy would be made available to the rest of the grid through trading in the balancing market and would negate national generators having to be switched on.

Alignment With the Climate Action and Low Carbon Development (Amendment) Act 2021 and CAP25:

The site is currently in industrial use and the 'E1' zoning of the site would facilitate other industrial activities on site should potential future phases of CORE be realised.

Chapter 12 of the EIAR as originally submitted with the planning application assessed the Proposed Development against the Industrial sectoral emission ceiling of 24 $MtCO_2$ for the period 2026-2030.

On further enquiry the EPA has confirmed that "All emissions from the combustion of fuels by data centres will be reported under the Commercial sector". Therefore, as Phase 1 of CORE, to which this planning application relates, does not consist of any activities that would be considered under the Industrial sector, this updated Chapter uses the Built Environment - Commercial sectoral emission ceiling for the assessment of GHG emissions associated with the use of the gas engines on site. Any GHG emissions associated with electricity to be imported from the grid is assessed against the Electricity sectoral emission ceiling.

However, as discussed above, following implementation of Steps 2 - 4 of the site's Decarbonisation Pathway, the site will offset all residual GHG emissions. Therefore the Proposed Development will not use any of the carbon budgets for the Built Environment – Commercial and Electricity sectors.

CAP25 Chapter 11: Electricity

CAP25 states that achieving further emissions reductions between now and 2030 requires a major step up across the following 3 measures for the Electricity Sector:

1. accelerate and increase the deployment of renewable energy to replace fossil fuels;
2. deliver and accelerate a flexible system to support renewable energy by improving system services and increasing storage capacity; and
3. manage demand.

The impact/contribution of the Proposed Development on these measures is described here.

1. Accelerate Renewable Energy Generation

The Proposed Development will help to strengthen the electricity system by using the existing grid infrastructure (38kV) to deliver renewable generation from solar as well as energy storage.

The Proposed Development will support a number of grid services (enhanced frequency response, reserve power, and voltage support) required under Eirgrid's *Delivering a Secure, Sustainable Electricity System* (DS3) program which are required to address the inherent challenges posed by high penetration of renewable energy sources into the grid. The DS3 program aims to ensure that Ireland's electricity grid can handle a high penetration of renewable energy, maintaining a secure, reliable, and sustainable electricity system.

The BESS, UPS and gas engines (which will have the ability to export power to the grid to assist should there be an agreement in place with the SO to do so), included as part of the Proposed Development supports the DS3 power security and conditioning services that require the most rapid response with the UPS ability to react to a broad spectrum of utility voltage events instantaneously with the ability to support the load for over 20 seconds. The batteries come online in 150-200 ms continuing to provide further grid support until the engines became available after 4.5 minutes. The batteries can continue support then for 3 hours and the engines can continue support for as long as they are needed.

Due to the overlap in capabilities of each technology, the level of service that can be delivered as a demand side unit (DSU) will be capped at the maximum export connection (MEC) Level. The capability of delivering such a comprehensive service with significantly decarbonised assets could bring significant value to the safe and sustainable operation of the grid.

2. Deliver a Flexible System

The Proposed Development will deliver 40.5 MW of new flexible gas-fired distributed generation. This presents a substantial opportunity for transitioning to decentralised generation on a large scale. The Proposed Development will produce its own electricity on-site when it can out-perform the carbon intensity of centralised power plants supplying the national grid.

Moreover, the Capacity Market's inability to attract new centralised plants, coupled with declining capacity factors, highlights the potential role of LEUs as part-time or occasional generators.

The proposed CORE EC has been designed to have the ability to deliver the full gambit of grid services to provide the potential for power generation from low or zero carbon sources and will be available to displace existing carbon heavy energy sources by the expected opening year, pending planning permission. The gas engines running on natural gas can generate electricity more efficiently and with lower GHG emissions than all centralised peat, oil and open cycle gas turbine (OCGT) national generators suppling the grid.

The campus will deliver fully flexible demand response with distributed generation and storage that will facilitate demand flexibility and provide flexibility to support the system operation and local network congestion management. It could potentially also provide voltage and frequency correction support.

3. Manage Electricity Demand Growth

Managing Ireland's growing electricity demand effectively will necessitate greater demand flexibility, enhanced infrastructure, and supportive policies. A crucial strategy will involve limiting peak demand during times when renewable resources are scarce, emphasising the importance of improved flexibility and demand management techniques. In the immediate and medium term, the expanding demand from LEUs, like DCs, will need to be carefully managed to safeguard the security of supply and align with established carbon budget initiatives.

The Proposed Development supports the DC as a LEU to achieve carbon-free demand in Ireland so that electricity decarbonisation, demand efficiency and flexibility, and enterprise growth can go hand in hand. This will contribute to the CAP targets to achieve 20% to 30% Demand flexibility by 2030.

The proposed EC will operate on a real-time basis and gas engines will have the ability to export power to the grid to assist should there be an agreement with the System Operator to do so. It is set to optimise its storage and generation against the emissions of the grid in each hour, and not firstly on a commercial margin basis.

The Proposed Development will export surplus lower carbon electricity onto the grid when possible. Therefore, there is a significant benefit of reduced GHG emissions associated with power on the grid achieved as a result of the flexible demand response and export of power from the Proposed Development. Therefore, the Proposed Development will act to actively support the electricity grid as opposed to other conventional large energy users whose operations tend to put a significant strain on the grid.

CAP25 Chapter 13: Built Environment (including Commercial)

The implementation of the various mitigation steps as set out in Steps 2 to 4 of the site's decarbonisation pathway show significant reductions in GHG emissions which can be achieved by the use of the on-site assets in a flexible demand response compared to importing electricity from the grid.

The Proposed Development operations will allow the DC to be more energy efficient than conventional DCs through the follows design measures:

- Electrical Performance: The proposed CORE EC is to be configured as a medium voltage 10 kV network; allowing all generation, storage and power conditioning to take place more efficiently at this higher voltage. Paralleling of these systems allows for more efficient distribution of DC Information Technology (IT) power to servers with less stranding of the loads.

- Thermal Performance: The more impactful measure of energy efficiency relates to the DC cooling. For this aspect, the proposed cooling tower system which employs dry cooling for most of the year and water-based evaporative cooling during peak summer temperatures will allow more efficient cooling and is reflected in a lower Power Utilisation Effectiveness (PUE).
- Onsite Renewable Electricity: The proposed campus maximises on-campus solar generation on building roofs and facades; and pockets of land not suitable for development (Landfill and capped Stockpile 3).

As demonstrated in this Section, the Proposed Development is firmly aligned with national and local policy including the Climate Action and Low Carbon Development (Amendment) Act 2021, CAP25, Ireland’s Long Term Strategy on GHG reductions 2024, the NAF, Ireland’s national climate objective, and the LCDP 2021 - 2027. This is because the proposed infrastructure has been designed to achieve low to no carbon power consumption in real-time allowing PPL to become a leader in industrial decarbonisation. The Proposed Development will have a positive effect in helping Ireland to reduce GHG emissions in both the Electricity and Built Environment – Commercial sectors.

Therefore, using significance levels as per Table 12.7 of this Chapter, the significance of operational GHG emissions from the Proposed Development is considered as ‘*negligible*’ and therefore *‘not significant’*. A project with ‘*negligible*’ effects has: GHG impacts which are mitigated beyond design standards, gone well beyond existing and emerging policy requirements; and is well *‘ahead of the curve’* for Ireland’s trajectory towards net zero.

12.9.2 Climate Change Resilience Assessment

Climate resilience for the operational phase of the Proposed Development has been assessed in the form of a Climate Change Resilience Risk Assessment which can be found in Appendix C of the EIAR.

The risk assessment identifies project specific climate risks, considers the implications for the buildings and workers; spaces; infrastructure; services and biodiversity, sets out the magnitude of this risk, and measures which have been adopted in the design of the Proposed Development to avoid or reduce these risks, where applicable.

A summary of the risk assessment including the net risk for identified hazards is included in Table 12.14.

Table 12.14: Summary of Climate Resilience Risk Assessment

Risk ID No.	Climate Hazard	Net Risk *Refer to Likelihood and Severity Categories and Risk Matrix*		
		Likelihood (L)	Magnitude of consequence (M)	Risk Rating (R)
1.	Extreme Heat / Increasing Temperatures	**2**	**2**	**Low**
2.	Extreme Cold / Low Temperatures	**2**	**2**	**Low**
3.	Flooding / Increases in Rainfall	**2**	**2**	**Low**
4.	Decreases in Rainfall / Drought	**2**	**2**	**Low**
5.	Extreme Wind / Increase in Storm Intensity and Frequency	**2**	**2**	**Low**
6.	Sea Level Increases	**2**	**2**	**Low**
7.	Biodiversity Loss	**2**	**2**	**Low**

As demonstrated in Table 12.14, the net risk for identified hazards in the climate resilience risk assessment is considered to be low for all climate hazards following the integration of controls in the design of the Proposed Development where relevant to mitigate climate variable risk. The Proposed Development meets the requirements of national and local policy regarding climate adaptation and resilience as set out in the NAF and LCDP 2021 - 2027.

Therefore, it is considered that the impact of climate change on the operational phase of the Proposed Development will be neutral, non-significant and long-term in accordance with the impact assessment criteria provided in Section 3.7.3 of the EPA (2022) Guidance.

12.10 Potential Decommissioning Effects

12.10.1 GHG Assessment

The design life for the proposed facility is considered to be in the order of 60 years.

Individual plant components will be upgraded or replaced as required during this time and these could extend the operational life of the facility substantially longer. Given its location and the pattern of development in the area, it is reasonable to assume the lands will continue to provide employment based land uses well beyond the design life of the Proposed Development. These could be in the form of continuance as a DC and EC facility or adaption to some other form of high-technology industrial or employment based activity. It is not possible to accurately predict what future long-term changes and or which adaptions would occur at the site.

It is considered decommissioning would be undertaken in a timeframe and scale similar to that of the construction activities. However, there will be no embodied carbon emissions associated with decommissioning, only potential GHG emissions associated with the decommissioning activities on site and that of the waste materials generated.

Appropriate disposal of waste materials will be based on relevant waste management legislation in place at that time and will follow the waste management hierarchy as Irish Governments move towards a circular economy in order to ensure GHG emissions from the waste are minimised as much as possible.

Decommissioning will be undertaken in compliance with relevant national and local climate policy at the time.

Based on the above, it is considered that the potential GHG emissions to be generated from the decommissioning of the Proposed Development will be 'negligible' and therefore 'not significant' in accordance with the IEMA (2022) Guidance significance criteria set out in Table 12.7 of this Chapter.

12.10.2 Climate Change Resilience Assessment

Key works required in the event of the Proposed Development being entirely decommissioned include:

- All above ground structures and equipment will be dismantled and removed from site, with the area substantially reinstated and the site will be rendered safe with regards to the potential for environmental pollution.
- Concrete sumps/foundations and underground cables will likely remain in-situ as there would be more of an environmental impact in their removal.

Decommissioning activities will be somewhat similar to the construction activities but will not involve excavation or in-ground works.

Receptors including the construction workforce, equipment, vehicles, materials and workplace may be vulnerable to a range of climate risks during the decommissioning phase. Examples of these climate risks include:

- Health and Safety risks to workforce in severe weather events;
- Obstruction of access to the construction site due to consequences of a severe weather event (storms, flooding, snow, ice);
- Delays caused by unsuitable conditions for certain construction activities due to extremes of hot, wet or cold weather;
- Damage of construction equipment, plant, materials and temporary construction buildings/facilities due to stormy weather.

The above climate change resilience effects during decommissioning are expected to be potentially negative but imperceptible and short term in accordance with the impact assessment criteria provided in Section 3.7.3 of the EPA (2022) Guidance. They will be managed by the Construction Management Team with appropriate measures as dictated by weather forecasts during the decommissioning phase.

12.11 Mitigation Measures and Monitoring

12.11.1 Construction Phase

Embodied Carbon Mitigation Measures

Following the LETI (2020) Guidance, the approach for the Proposed Development has considered and will continue to implement the following six key aims in relation to reducing embodied carbon:

- Build less: Refurb and re-use
- Build light: Consider the building structure.
- Build wise: Longevity and local context.
- Build low carbon: Review material specifications.

- Build for the future: Assess end of life and adaptability.
- Build collaboratively: Involve the whole team.

The Proposed Development has focused on retention of existing buildings and infrastructure on site where possible including the Workshop Building, 3 no. silos, Partial Crane Shed, seawater tanks and existing pump houses. This has resulted in saving of carbon emissions which would have been generated from complete demolition of the existing site and construction of new buildings/infrastructure. This will result in significant carbon savings which are not quantified within this Chapter.

A number of carbon reduction strategies have been incorporated into the design of the Proposed Development as detailed in Section 12.4.1 of this Chapter. The strategies relate to concrete specification, steel rebar and structural steel enhancements, and PV panel recycled content.

The energy consumption associated with the construction phase of the Proposed Development will be minimised through the implementation of energy conservation measures where possible.

Contractors will be required to complete; pre-construction checks on vehicles; pre-start checklists for daily checks; and service of plant and machinery to ensure there is no excessive pollution from plant and machinery.

The construction project contractor will operate a continuous incentive scheme to encourage car-pooling and lift sharing by all construction staff, with eligibility for the incentive scheme based on a minimum vehicle occupancy rate of two construction staff per vehicle.

Embodied Carbon Monitoring

As the design of the Proposed Development progresses, ongoing monitoring and optimisation of embodied carbon emissions will be implemented to ensure continued alignment with the projects carbon reduction goals and industry standards. The procurement stage has a very big influence on the actual embodied carbon impacts arising from the development, and therefore extra care should will be given to this stage. The procurement stage will focus on implementing the following elements:

- Responsibly sourced materials with certificates to prove their sustainable supply chain credentials;
- Materials with higher recycled content;
- Any re-useable/repurposed materials;
- Favouring products with Environmental Product Declarations (EPDs) to allow a clear comparison between different products, giving priority to products with a lower embodied carbon impact.

Contractors will be required to monitor and report energy usage during construction including fuel, water, and transport emissions for materials and staff commuting to and from the site.

Climate Change Resilience Assessment Mitigation Measures

Climate change resilience impacts during the construction phase are expected to be short-term and negligible if correctly managed by the Construction Management Team with appropriate measures as dictated by weather forecasts during the construction phase. Examples of these measures include:

- Restricting access to site or working hours due to a severe weather event (storms, flooding, snow, ice);
- Postponement of planned activities during unsuitable conditions for certain construction activities due to extremes of hot, wet or cold weather.
- All contractors must have an Environmental Management System (EMS) in place which will consider all measures deemed necessary to manage extreme weather events.

- All contractors must have emergency preparedness and contingency procedures in place for an extreme weather event on the construction site or within the supply chain as appropriate.
- All construction method statements must consider extreme weather events as appropriate.

Climate Change Resilience Assessment Monitoring

No specific monitoring is proposed at this time as mitigation measures for climate hazards will only be implemented in a severe weather event.

12.11.2 Operational Phase

Operational Carbon Mitigation Measures

The mitigation measures implemented to ensure complete offset of GHGs from the operation of the Proposed Development are included as part of the design of the proposed energy infrastructure at the site and are described in detail under Section 12.2.2 and 12.9.1 of this Chapter.

These sections include details on the measures included in the design of the Proposed Development with the aim of achieving net-zero emissions on an hourly basis.

In addition, an Energy Use Intensity (EUI) reduction, in comparison to the Building Regulations (Part L Amendment) Regulations (S.I. No. 538 of 2017), is being targeted for the Data Centre.

The total rated thermal input (MW_{th}) from the proposed gas engines will exceed 20 MW_{th} and therefore the CORE campus will require a GHG permit which will control the emissions of CO_2 from this plant under the European Commission (EC) (Greenhouse Gas Emissions Trading) Regulations 2012, (S.I. No. 490 of 2012) and amending Regulations.

In addition, the following measures are included in the Proposed Development in relation to reducing water usage and therefore mitigating carbon emissions from water usage:

- Use of dry cooling for most of the year and water-based evaporative cooling only during peak summer temperatures allows for a more efficient cooling system contributing to reduction in freshwater use;
- Existing freshwater abstraction point from Littlegrange/Mell Quarry will be utilised for Fire Water supply and DC Cooling on site;
- The proposed Landscape Plan includes planting that does not require irrigation systems post establishment;
- Low flow and flush fixtures and fittings will be included during detailed design stages for the Proposed Development.

As described previously as Step 3 of the site's Decarbonisation Pathway, prior to the commencement of DC operations, the applicant shall provide the Planning Authority with written evidence of having in place 60 MW Annual Wind corporate power purchase agreements (cPPA) or, one or more cPPA delivering an equivalent combined supply. In addition, and as described in Step 4 of the site's Decarbonisation Pathway, PPL commits to a further mitigation measure whereby any remaining residual GHG emissions will be offset by delivering an increased volume of renewable energy procured through a cPPA and/or Gas Purchase Agreement (GPA).

Operational Carbon Monitoring

- As a GHG permit holder, PPL will be required to monitor GHG emissions generated from the operation of the proposed gas engines at the site and report this on an annual basis to the EPA;
- > 90% of regulated energy use will be targeted to be metered. The remaining quantity of energy consumed will be monitored;

- Estimated energy consumption of each fuel will be identified, with 100% of all fuel types being continually monitored in real time;
- Unregulated energy such as this will form part of the overall energy campus efficiency.
- Water usage during the operation of the Proposed Development will be monitored through water metering.

Climate Change Resilience Assessment Mitigation Measures

The Climate Change Resilience Risk Assessment will be reviewed and updated as necessary to include any additional design-related adaptation measures that have been implemented.

Climate Change Resilience Assessment Monitoring

The Climate Change Resilience Risk Assessment will be reviewed and updated as necessary to ensure that any design-related adaptation measures have been implemented.

12.11.3 Decommissioning Phase

No mitigation measures are proposed for the decommissioning phase at this time.

12.12 Potential Residual Effects

12.12.1 Construction Phase

The mitigation measures outlined in Section 12.11.1 ensure the development contributes positively to the achievement of the key targets for the Industrial Sector from CAP25 to decrease embodied carbon for materials produced and used in Ireland as it will create a demand for lower carbon materials thereby encouraging producers to work towards the supply of such materials.

As the design of the Proposed Development progresses, the Design Team will explore alternative options aimed at enhancing efficiency, such as minimising the use of materials in the building. This approach will render the building more environmentally friendly and further mitigate the carbon emissions associated with its development.

However, given the current estimated embodied carbon associated with the Proposed Development, the residual effect on climate change from the Proposed Development is deemed to be ‘*minor adverse’* and therefore ‘*not significant’* in accordance with the criteria outlined in Section 12.4.1 *'GHG Significance Criteria*' of this Chapter.

12.12.2 Operational Phase

The mitigation measures implemented to ensure minimal generation of GHGs from the operation of the Proposed Development are included as part of the design of the proposed energy infrastructure at the site and are described in detail under Section 12.2.2 and 12.9.1 of this Chapter.

With the implementation of the mitigation/offsetting of carbon emissions as set out in Section 12.9.1 of this Chapter, the residual effect of the operational phase of the Proposed Development would be ‘*negligible’* and therefore ‘*not significant’* in accordance with the criteria outlined in Section 12.4.1 ‘*GHG Significance Criteria*’ of this Chapter. A project with ‘negligible’ effects has: GHG impacts which are mitigated beyond design standards, gone well beyond existing and emerging policy requirements; and is well ‘*ahead of the curve’* for Ireland’s trajectory towards net zero.

In addition, the IEMA (2022) Guidance[27] states:

“Where there is embedded mitigation in the form of project commitments to GHG reductions but the details are not secured within the project design at the time of assessment, further detail of the potential mitigation measures to achieve that commitment can also be considered within the additional mitigation section and assessment of residual effects.”

[27] Institute of Environmental Management & Assessment (IEMA) (2022) “*Guide: Assessing Greenhouse Gas Emissions and Evaluating their Significance”*

Potential future mitigation measures envisaged for the campus as outlined in Figure 12.4 include the use of biomethane or hydrogen to fuel the gas engines at the campus as described in Section 8 of the *Energy and Emissions Modelling Report* which accompanied the planning application. The proposed CORE EC is equipped with reciprocating gas engines that have been tested and proven to run on natural gas, biomethane or hydrogen to future-proof the proposed infrastructure for the future scenarios when these clean fuels can be obtained.

These measures are described in detail in the *Emissions and Energy Modelling Report*. An overview is provided here.

It is noted that these future measures are not relied on in the climate impact assessment for the Proposed Development as set out in Section 12.9.1 of this Chapter.

Mitigate through displacement of natural gas with biomethane (Potential Future Mitigation)

Potential future mitigation at the site could consist of replacing natural gas fuel in the gas engines with use of biomethane. As biomethane is a carbon neutral fuel[28], this would eliminate the remaining GHG emissions associated with running the gas engines.

While the occupier will be required to engage in a wind / solar PPA in respect of the Proposed Development, in line with the Government Statement on Data Centres, it will be a commercial decision for campus tenants whether (or when) they are willing to pay a premium for biomethane over natural gas. Some tenants may wish to, and be prepared to mitigate all their emissions by 2030, others may be satisfied to partially mitigate in the interim and achieve 100% by 2040 or 2050. The increasing cost of voluntary carbon credits and future updates in government climate policy associated with achieving future further reduced carbon budgets will further incentivise and influence tenants to avail of this and other measures made available at the site.

Full mitigation of emissions from the operation of the gas engines with indigenous biomethane will be made possible through PPL's collaboration with a local supplier to ensure biomethane gas resources sufficient to fully decarbonise gas engine operation will be available at the site. There are also other options where cheaper biomethane can be purchased on the European Gas grid.

The breakdown of emissions reductions possible compared to the emissions associated with importing 100% of the required electricity from the grid in the year 2030 is given below as the focus year for the operational carbon assessment. Figure 12.7 also illustrates the energy modelling results for future years in the decarbonisation journey for the Proposed Development with the use of the proposed on-site energy infrastructure, the incorporation of a 60 MW wind PPA and the use of biomethane to fuel the gas engines.

It is noted once again that the use of biomethane has not been used for the purposes of the impact assessment in this Chapter.

[28] Biomethane is considered a carbon neutral fuel because it is produced from feedstocks that absorb CO_2 as they grow.

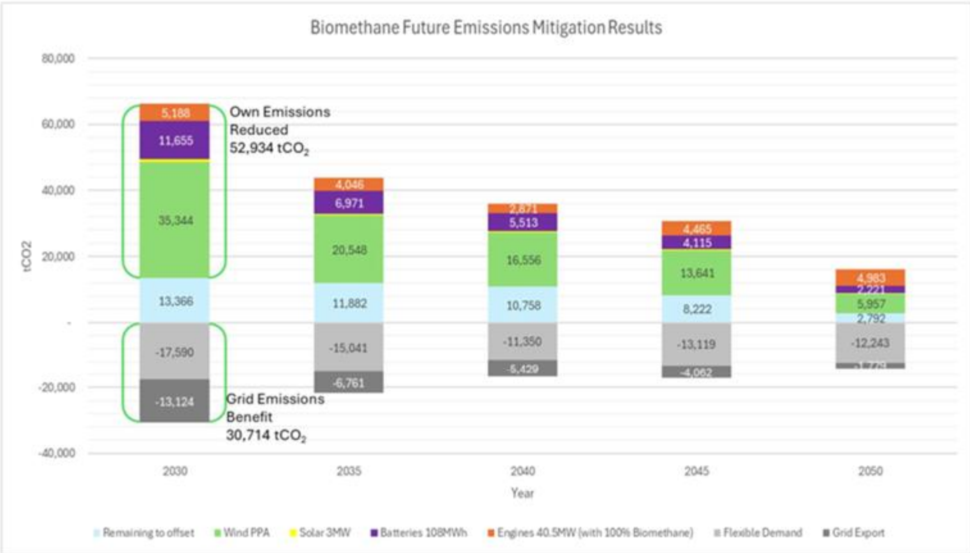

Figure 12.7: Reduction in GHG Emissions at the PPL Site Possible Through Use of On-Site Assets as part of the Proposed Development and Biomethane PPAs to fuel the Gas Engines

Flexible Demand Response - Own Emissions Reduction

In this model, the parameters for load, grid intensity, solar, batteries, and the 60 MW wind PPA remain as per described in Step 3.

In the year 2030, the model predicts that the use of the batteries will store and discharge 26,093 MWh of electricity and displace 11,655 tCO_2 of grid GHG emissions. The use of the solar PV array will generate 2,794 MWh electricity and displace 747 tCO_2 GHG emissions that would have been produced if this electricity was consumed 100% from the grid. The model also includes the use of the 60 MW Wind PPA described in step 3 which will provide 144,369 MWh and will displace 35,344 tCO_2 grid emissions. In addition, there will be a further offset of displaced GHG emissions as a result of the export of renewable electricity onto the grid from surplus wind energy as described under ***Grid Emissions Benefit*** below.

Gas Engines Using Biomethane: In the year 2030, the operational hours for the gas engines are kept the same as Step 3 at 457 hours. Based on these running hours the gas engines would produce 9,772 MWh of electricity for the DC. The addition of the biomethane PPA to supply all of the fuel for the gas engines reduces the emissions related to the running of the gas engines to zero tCO_2. This achieves a total displacement of 5,188 tCO_2 grid emissions – made up of an 804 tCO_2 reduction in emissions from using the gas engines vs. importing electricity from the grid (as per Step 3) and a further 4,384 tCO_2 reduction in emissions from using biomethane as fuel for the gas engines instead of natural gas.

Remaining to Offset:

Combined, the use of the on-site assets (solar PV array, batteries and gas engines fuelled by biomethane) as well as a 60 MW Wind PPA for grid imports will supply 183,028 MWh to the DC and gives a total reduction of GHG emissions of 52,934 tCO_2 (80% reduction) compared to the that which would be associated with 100% electricity grid imports alone (66,300 tCO_2).

This leaves 13,366 tCO_2 from emissions associated with the electricity imported from the grid on site to be further mitigated or offset.

Grid Emissions Benefit

The light grey section of the bars in Figure 12.7 represents the flexible demand from the grid's perspective where the grid did not have to produce energy as it was generated and/or stored by the on-site assets at a lower carbon intensity than that of the grid (as described in the section above).

This accounts for a 17,590 tCO_2 reduction compared to emissions that would have been produced if this power came from 100% electricity grid imports.

Additionally there is a potential further reduction of 13,124 tCO_2 on the grid represented by the dark grey as a result of the possible export of surplus lower carbon electricity onto the grid from batteries (7,835 MWh exported giving a 3,500 tCO_2 reduction) and the potential export of surplus wind energy (39,312 MWh exported giving a 9,624 tCO_2 reduction). While the gas engines fuelled with biomethane could be used to export decarbonised power to the grid in this scenario also, this is not projected to be viable because the projected high price of biomethane means that it would not be expected to be possible to produce energy at a price that would be competitive on the Irish single electricity market (ISEM).

Therefore the potential total benefit of reduced GHG emissions on the grid as a result of the flexible demand response and possible export of power from the Proposed Development is 30,714 tCO_2 pending further steps on the decarbonisation pathway as detailed in Section 8 of the Energy and Emissions Monitoring Report which accompanied the planning application.

Mitigation through displacement of natural gas with hydrogen (Potential Future Mitigation)

As the energy transition in Ireland progresses towards 2050 there is the potential for hydrogen to become part of the fuel mix within the national gas grid and as such the emissions intensity of the gas in the grid will reduce. As the use of biomethane will be a commercial decision made by the tenant the mix of fuel used in the gas engines is not set at this stage but the inclusion of hydrogen in the grid gas mix offers a further opportunity for the decarbonisation of the operation of the gas engines.

<u>Potential Future Phases of CORE</u>

Given the upgrade plans for existing infrastructure at the site, alongside the integration of renewable energy sources and advanced energy storage systems via the proposed EC, it is envisaged that the site will be able to accommodate LEUs such as further DCs on the electrical side and Food/Beverage/Biopharma on the thermal side. A new ring main will be constructed in order to provide a gas supply to the EC included in the Proposed Development for the engines via a manifold.

CORE will have significantly decarbonised (trending towards fully decarbonised) electrical and heat networks. Coupled with PPL's private water systems, the Proposed Development will ensure that new industry can be attracted to Drogheda to support sustainable economic growth.

The following mitigation measures are envisaged for the campus in future phases of the CORE development which will be subject to planning permission:

Mitigation through the reuse of waste heat generated on-site in heat networks (Potential Future Mitigation)

Another key decarbonisation feature of the Proposed Development is the possible reuse of waste heat as low/medium temperature hot water for future tenants. The Proposed Development includes for the construction of the base infrastructure to allow this. However, it cannot be utilised until there are future tenants which are industrial heat-users on the site and/or a local district heat system has been developed.

It is considered that this will be a much more cost-effective method of decarbonising than switching to biomethane alone for the following reasons:

1.A lower gas engine emissions profile will enable them to run for more hours of the year (even on natural gas) allowing them to displace more grid emissions, more often.

2.DC waste heat is already fully decarbonised and therefore if use is made of this waste heat then it will have a substantial potential to offset the remaining GHG emissions from the operation of the Proposed Development.

It is not possible to model these future scenarios envisaged without knowing the heat-use and characteristics of the thermal consumers. However it is clear that these options would significantly decarbonise the operations of future thermal energy users.

Mitigation through additional solar development (Potential Future Mitigation)

There is abundant space within the PPL site for additional solar PV arrays.

Given the publication of the Irish Government's Private Wire Policy Statement[29] in July 2025, there will be a strong potential to increase the solar PV arrays (subject to further planning permission) at the site.

12.12.3 Decommissioning Phase

No residual impacts are foreseen for the decommissioning phase at this time.

12.13 Difficulties Encountered During Preparation of this Chapter

There were some difficulties encountered when preparing this Chapter due to unavailable information at this stage of the design process. These are described under Section 12.5 of this Chapter.

Due to the stage of design of the Proposed Development, data utilised in the GHG assessment are conservative estimates. It is important to note that further embodied carbon minimisation may be possible as the design of the Proposed Development progresses.

There are inherent uncertainties included in the energy modelling also related to future carbon intensity of the grid. These are described in detail within the Energy and Emissions Modelling Report which accompanied the planning application.

[29] Localised electricity grids connected to the local distribution networks but linked to privately-owned central plant which produces electricity.