Apatura Energy - P108
Currie – Wester Hermiston

Greenhouse Gas Emissions report

Apatura Energy

Job No:	1047041
Doc Ref:	ADC-CDL-XX-XX-T-SY-70224
Revision:	P01
Revision Date:	28/11/2025

Project title	Apatura Energy - P108 Currie – Wester Hermiston	**Job Number**
Report title	Greenhouse Gas Emissions report	1047041

Document Revision History

Revision Ref	Issue Date	Purpose of issue / description of revision
P01	28 November 2025	Draft issue for comment

Document Validation (latest issue)

28/11/2025	28/11/2025	28/11/2025
[redacted]		
Principal author	Checked by	Verified by
[redacted]		

Executive Summary

The following Whole Life Cycle Carbon Assessment (WLCA) has been developed for the new Data Centre in West Hermiston for Apatura Energy.

An early design stage WLC assessment at RIBA Stage 2 was carried out using the following information:

- Design information at the given time, as supplied by the design team.
- Default material baseline, as recommended by the RICS Professional Statement (PS) 2nd Edition.
- Component life spans, as recommended by RICS PS 2nd Edition.

This established the project's 'carbon baseline' (referred to as 'Initial early design') allowing the identification of areas with great carbon impacts. The main objectives are:

- To assess the current carbon footprint position.
- To integrate embodied carbon thinking into the project design and construction.

For this exercise, the Cundall Carbon Calculator Tool was used to calculate the Whole-Life Carbon emissions results. The assessment tool aligns with BS EN 15978: 2011 and RICS Professional Statement: Whole Life Carbon assessment for the built environment 2023 2nd Edition.

The recent update to the Climate Change Act requires that the minimum percentage by which the net UK carbon account for the year 2050 must be lower than the 1990 baseline, is increased from 80% to 100%.

Whole Life-Cycle Material Carbon Summary

The total whole life-cycle material carbon emissions (excluding operational emissions) of the development amount to 92,877 tonnes CO_2e, with 65,278 tonnes associated with the initial construction and 27,273 tonnes over the 60-year life cycle of the building. This breakdown of the development is summarised in the following table

TOTAL	Carbon Results	
	tCO_2e	$kgCO_2e/m^2$
Carbon at completion (A1-A5)*	65,278	1,423
Carbon Over life cycle (B to C exc. B6, B7)*-	27,069	590
Whole life embodied carbon (A, B, C exc. B6, B7)**	**92,877**	**2,025**
Module D (excluded from total figures)	*-12,399*	*-270*

Whole life-cycle material carbon emissions breakdown, including demolition (exc. sequestration; ** inc. sequestration)*

The operational carbon emissions corresponding with life-cycle module B6 are estimated to amount to 139,147 tonnes CO_2e in 2029 in the first year of operation, contributing to 1,899,685 tonnes of CO_2e over the 60-year life cycle of the development. This total figure accounts for the projected grid carbon factors reducing year on year as the grid decarbonises.

The refrigerant emissions have also been calculated but due to the proposed use of low GHG refrigerants such as R1234ze the lifecycle emissions associated are negligible at <3.5 tonnes CO_2e equivalent over the design life.

Contents

1.0

Introduction

1.0 Introduction

This report has been prepared to present the Whole Life Greenhouse Gas (GHG) Emissions for the proposed Wester Hermiston Data Centre Campus in Edinburgh. It outlines how the development's approach to GHG emissions aligns with relevant national and local policies.

The proposed strategy aims to limit the site's contribution to the causes of climate change by reducing its need for energy and minimising its CO_2 emissions using low carbon and renewable energy sources.

Please note that a separate report has been prepared by Cundall to address the development's broader sustainability considerations, including its approach to whole-life embodied carbon, waste management, water consumption, health and wellbeing, biodiversity, and transportation (document reference: ADC-CDL-XX-XX-T-SY-70221).

1.1 Proposed development

The proposed 77-acre site is located to the north of Heriot-Watt University, west of Hermiston and the City Bypass, and will connect to the Currie Substation to the south. The site lies within the green belt and is bordered by the canal and the M8 to the north. To the south, it is bounded by the A71 and a number of non-residential buildings.

Figure 1-1: Proposed Wester Hermiston site

The site's strategic location and strong grid connectivity make it well suited to meeting Scotland's increasing demand for secure, high-capacity digital infrastructure. Its proximity to major research, education, and innovation hubs further enhances its potential to contribute to Scotland's digital economy.

The proposed development encompasses a 200MW data centre campus with a total building footprint of approximately 54,690 m^2. Data halls will be located in low-profile buildings set back from site boundaries, with ancillary plant, equipment yards, and secure parking positioned to maintain efficiency and minimise visual impact.

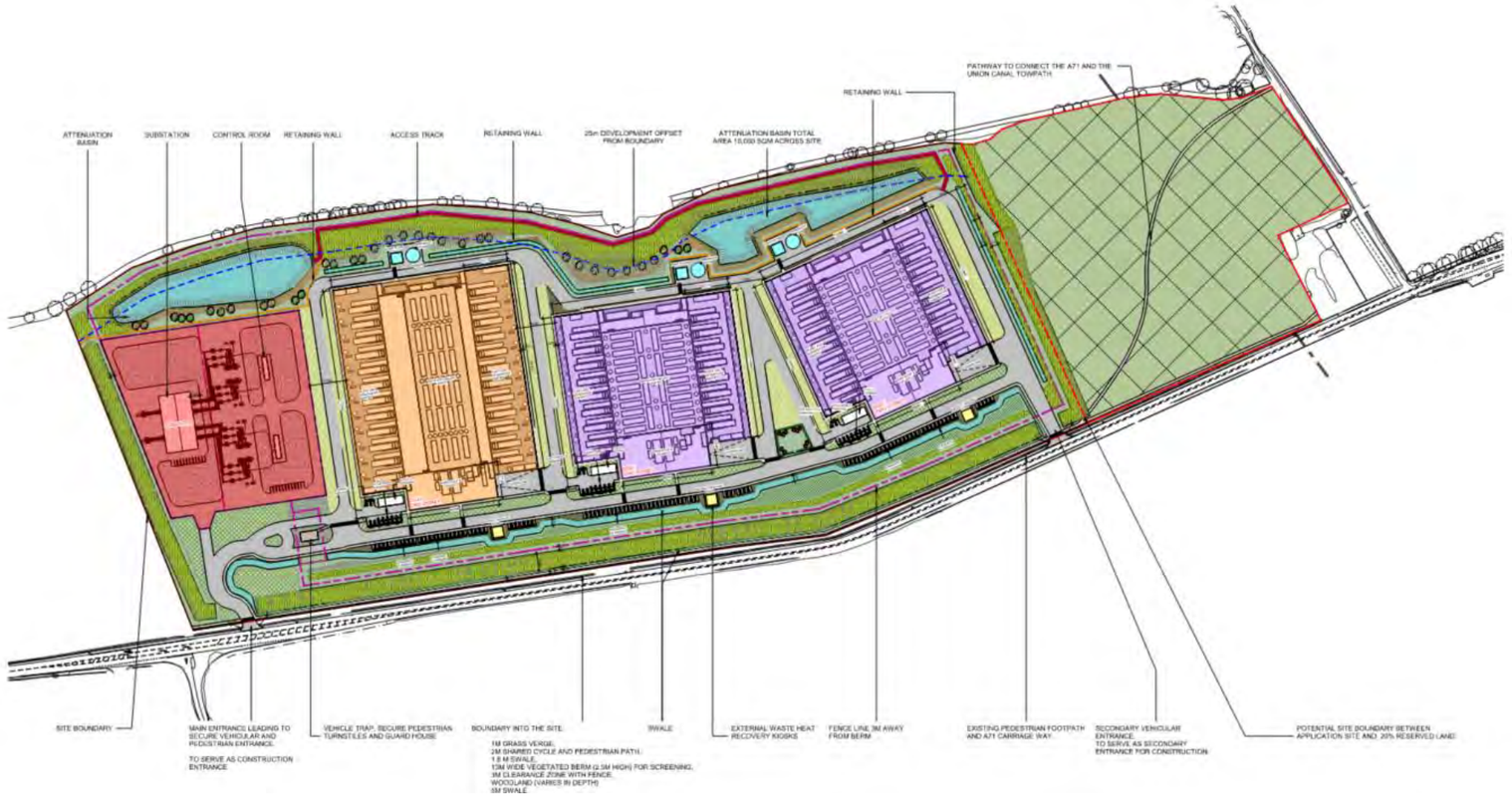


Figure 1-2: Proposed site plan

As shown in Figure 1-2, the proposed development will include two identical two-storey 48 MW data centre buildings (DC01 and DC02, coloured purple on the plan) and one single-storey 36 MW data centre building (DC03, coloured orange). The buildings will also include office facilities, covering a total floor area of approximately 6,300 m^2. The campus is planned to accommodate 136 car parking spaces (including EV charging points), 15 accessible parking spaces, 8 motorcycle spaces, and 131 cycle parking spaces.

2.0

Planning Policy

2.0 Planning Policy

Sustainable, inclusive growth is a priority in Scotland. The planning system aims to facilitate it through the creation of high-quality developments, which deliver long-term benefits for the public whilst protecting and enhancing natural resources. This is supported by a number of national and local development policies, as summarised below (please refer to Figure 2-1). Planning in Scotland has undergone major transformation and now contains a number of new policies which favour sustainable development.

Figure 2-1:Scottish hierarchy of national and local planning policies

This GHG emissions report presents the aspects of the design that are considered important to achieving the goal of a sustainable development. It sets out the relevant policies and outlines how the requirements of each of these policies will be met by the proposed Wester Hermiston Data Centre Campus.

2.1 National Planning Framework

In February 2023, the Scottish Government adopted the Scotland's Fourth National Planning Framework (NPF4), which replaced the previous NPF3 and the Scottish Planning Policy (SPP) 2014 and removed the need for the development of regional policies (Strategic Development Plans), where such matters are now covered by the NPF4.

NPF4 comprises Scottish Government's long-term spatial strategy to 2045, including national planning policy on a range of topics such as energy, climate change, biodiversity, local living, digital and other infrastructure. It also embeds the UN Sustainable Development Goals and Scotland's National Outcomes.

NPF4 is driven by an overarching goal to address climate change and the nature crisis but has four key outcomes in support of this as illustrated in Figure 2-2.

Figure 2-2: NPF4 Key Outcomes

The **National spatial strategy for Scotland 2045** (Key Outcome 1) details how Scotland will plan its future places in line with six spatial principles as follows:

Just transition: empower people to shape their places and ensure the transition to net zero is fair and inclusive.

Conserving and recycling assets: make productive use of existing buildings, places, infrastructure, and services, locking in carbon, minimising waste, and building a circular economy.

Local living: support local liveability and improve community health and wellbeing by ensuring people can easily access services, greenspace, learning, work, and leisure locally.

Compact urban growth: limit urban expansion, thus optimising the use of land to provide storage, flood risk management, blue and green infrastructure, and biodiversity.

Rebalanced development: target development to create opportunities for communities and investment in areas of past decline and manage development sustainably in areas of high demand.

Rural revitalisation: encourage sustainable development in rural areas, recognising the need to grow and support urban and rural communities together.

By applying the above six spatial principles, Scotland aims to support the planning and delivery of:

Sustainable Places: where we reduce emissions, restore, and better connect biodiversity (NPF4 Key outcome 2)

Liveable Places: where we can all live better, healthier lives (NPF4 Key outcome 3)

Productive Places: where we have a greener, fairer, and more inclusive wellbeing economy (NPF4 Key outcome 4)

The specific NPF4 policies addressed in this document are outlined below. Please note that policies relevant to broader sustainability considerations such as whole life embodied carbon, waste management, transportation, biodiversity, and water consumption are covered separately within the Sustainability Statement report prepared by Cundall for the proposed Wester Hermiston Data Centre Campus.

Policy 1 – Tackling the climate and nature crises

This policy intends to encourage, promote and facilitate development that addresses the global climate emergency and nature crisis.

- When considering all development proposals significant weight will be given to the global climate and nature crises.

Policy 2 – Climate mitigation and adaptation

This policy intends to encourage, promote and facilitate development that minimises emissions and adapts to current and future impacts of climate change. This is achieved by ensuring that:

a) Development proposals will be sited and designed to minimise lifecycle greenhouse gas emissions as far as possible.

b) Development proposals will be sited and designed to adapt to current and future risks from climate change.

Policy 19 – Heat & Cooling

This policy intends to encourage, promote and facilitate development that supports decarbonised solutions to heat and cooling demand and ensure adaptation to more extreme temperatures. This is achieved by ensuring that:

a) Where a heat network is planned but not yet in place, development proposals will only be supported where they are designed and constructed to allow for cost-effective connection at a later date.

b) National and major developments that will generate waste or surplus heat and which are located in areas of heat demand, will be supported providing wider considerations, including residential amenity, are not adversely impacted. A Heat and Power Plan should demonstrate how energy recovered from the development will be used to produce electricity and heat.

c) Development proposals for buildings that will be occupied by people will be supported where they are designed to promote sustainable temperature management, for example by prioritising natural or passive solutions such as siting, orientation, and materials.

The UN Sustainable Development Goals (SDGs) provide a global framework for addressing environmental, social, and economic challenges. NPF4 promotes greenhouse gas reporting and sustainability.

Figure 2-3: UN Sustainable Development Goals

The following SDGs are particularly relevant and align with key elements of NPF4.

SDG 9 – Industry, Innovation and Infrastructure
Build resilient infrastructure, promote inclusive and sustainable industrialization, and foster innovation.

SDG 12 – Responsible Consumption and Production
Ensure sustainable consumption and production patterns.

SDG 13 – Climate Action
Take urgent action to combat climate change and its impacts.

2.2 Local Policy – Edinburgh City Plan 2030

Figure 2-4 Edinburgh City Plan 2030 Front Cover

Edinburgh City Plan 2030 is the statutory local development plan for Edinburgh, formally adopted in November 2024. It sets out policies and proposals relating to the development and use of land in the Edinburgh area, and where new infrastructure and community facilities are required. Central to the plan is the implementation of environmental policies focused on climate change mitigation and adaptation, protecting green spaces, enhancing biodiversity, supporting physical and mental wellbeing, reducing flood risk, and improving air quality. The main policies that the proposed Wester Hermiston Data Centre Campus aims to encompass in its design are listed below.

Policy Env 7 – Sustainable Developments

All detailed proposals involving the construction, redevelopment or change of use of one or more buildings must incorporate all reasonably practicable measures to address the Climate Emergency and contribute to sustainable living. This must be demonstrated through a Sustainability Statement, which for the proposed data centre will show that:

a) The proposal integrates measures to both mitigate and futureproof the building against the effects of the climate emergency, particularly with regard to the increased frequency and severity of extreme temperature and storm/ rainfall/flooding events as well as sea level rise and erosion.
b) For developments involving new buildings the statement shall set out how the development has been designed to be of long-life construction and to allow future adaptation for different uses as well as utilising construction materials that have low or negative embodied greenhouse gas emissions and are local and/or sustainably sourced and/or recycled and capable of re-use at the end of a building's lifecycle as far as reasonably practicable.

Policy Env 8: New Sustainable Buildings

New buildings must be sustainable, play their part in addressing the Climate Emergency and exceed the current carbon dioxide emissions target with at least half of this target met through the use of low and zero generating technologies. Development proposals must demonstrate that:

c) **Net zero operational greenhouse gas emissions** will be achieved, predominantly through ultra-high fabric energy efficiency measures applied to the building envelope and systems. Operational emissions, in the context of this policy, refers to the use of heating, hot water, lighting, ventilation, and cooling systems. Note that the power requirements of the servers and datahalls are excluded from the above.
d) All new development requires to embed ultra-high fabric energy efficiency into its design and construction, with the optimal approach being for it to be built to Passivhaus standards. To ensure that new development can meet or exceed the net zero requirement, the incorporation of low and zero carbon generating technologies into the new development is also supported.

The ability to achieve the above should be evidenced, where applicable, through the submission of a Sustainability Statement as required through Policy Env 7. Thereafter the above will be ensured by attaching a relevant condition to all planning permissions to which this policy applies.

This policy applies to all development involving one or more new buildings, with criterion (a) specifically applying only in cases where a Building Warrant is required for the development. The purpose of this policy is to help reduce greenhouse gas emissions, ensure development is resilient to the impacts of climate change, reduce resource use and moderate the impact of development on the environment.

3.0

Operational Carbon Emissions

3.0 Operational Carbon Emissions

3.1 Scope and Definition

Operational carbon emissions refer to the greenhouse gas (GHG) emissions generated during the use phase of the data centre, primarily from energy consumed to power IT equipment, cooling systems, lighting, and other building services. These emissions are expressed in terms of carbon dioxide equivalent (CO_2e) and are calculated based on the energy demand and the carbon intensity of the electricity supply.

The scope of operational carbon assessment for this development follows the principles set out in the **Greenhouse Gas Protocol** and UK guidance on carbon reporting. Emissions associated with operational emissions are reflecting Scope 2:

- **Scope 2:** Indirect emissions from purchased electricity used to operate the facility. This is the dominant source of operational emissions for data centres, given their high electrical demand for servers and cooling infrastructure.

For this report, operational carbon emissions are assessed in accordance with **UK Green Building Council (UKGBC) Net Zero Carbon Framework** and relevant planning policy requirements. The calculation considers:

- Annual energy consumption for IT load and building services.
- Cooling and ventilation energy demand.
- Grid electricity emission factors based on the latest UK Government conversion factors.

3.2 Operational Energy

The operational energy demand for the proposed data centre has been derived from performance assumptions based on data in the UK Net Zero Carbon building standard (UKNZCBS). The estimate incorporates IT load, cooling systems, and ancillary services, applying the specified Power Usage Effectiveness (PUE) to reflect overall facility efficiency. The calculation assumes continuous operation (24/7) and accounts for redundancy in cooling and electrical systems. Energy consumption is based on 65% of maximum installed IT capacity.

The tables below show the Gross Internal Area (GIA) of each building as well as the estimated Energy Use Intensity by floor area for each building.

Element	DC01 & DC02	DC03
Total Area (m²)	16,680	11,442
Data hall area (m²)	13,180	9,642
FoH area (m²)	3,500	1,800

Table 3-1 Proposed building areas

Element	DC01 & DC02	DC03
Data Hall energy intensity (kWh/m² GIA)	24,262	24,874
Office/Admin block energy intensity (kWh/m² GIA)	106	106
Whole Building energy intensity (kWh/m² GIA)	19,193	20,977
Site Average for three Data Centres (kWh/m² GIA)	19,469	

Table 3-2 Summary of the energy intensity results for Apatura DC

More information on the operational energy can be found in Cundall's separate Operational Energy Statement (ADC-CDL-XX-XX-T-SY-70224).

3.3 Operational Carbon

Operational carbon emissions have been calculated by applying the latest UK Government GHG Conversion Factor for grid electricity to the estimated annual energy demand.

The assessment boundary includes all regulated loads within the facility, covering IT equipment, cooling, and building services, while excluding tenant-specific unregulated loads. The resulting emissions are expressed in tonnes of CO_2e per year and will be integrated into the whole-life carbon analysis presented in Section 5.

The DEZNZ carbon factors used for the whole life operational project the grid carbon emissions for future years to account for the grid decarbonising. It should be noted that the carbon factor associated with the grid is projected to reduce by 84% which will drastically reduce the operational carbon over the life of the building.

Element	DC01 & DC02	DC03
Data Hall energy intensity (tonnes of CO_2e/year in 2029	2.67	2.73
Office/Admin block energy intensity (tonnes of CO_2e/year in 2029)	0.01	0.01
Whole Building energy intensity (tonnes of CO_2e/year in 2029)	2.139	

Table 3-3 Summary of the operational carbon emission results for Apatura DC

Later section in this report will look at the whole life operational energy which looks at emissions associated for 60 year lifespan of building.

4.0

Embodied Carbon Emissions

4.0 Embodied Carbon Emissions

4.1 Overview

The WLC assessment covered all modules A, B, C and D as set out in BS EN 15978 and the RICS Professional Statement: Whole Life Carbon assessment for the built environment 2023 2nd Edition (referred to as the RICS PS V2 for the remainder of this document). in the life of a typical project described as life-cycle modules. The reference study period (i.e., the assumed building life expectancy) for the purposes of the assessment is 60 years.

To provide a holistic view of the GWP, the whole life carbon assessment accounts for all components relating to the project during all life stages. Embodied Carbon emissions are attributed to four main categories taken from BS EN 15978. The categories are:

Module A: Upfront

- **Product Stages (modules A1 to A3):** The carbon emissions generated at this stage arise from extracting the raw materials from the ground, their transport to the point of manufacture and then the primary energy used (and the associated carbon impacts that arise) from transforming the raw materials into construction products.
- **Construction (modules A4 to A5):** These carbon impacts arise from the transportation of construction products and all construction processes, including wastage, up to project completion. Module A5 also includes any on-site demolition or strip-out works required at the beginning of the project.

Module B: In use

- **In-Use Stages (modules B1 to B5):** This covers a wide range of sources from the embodied carbon emissions associated with the operation of the building, including the materials used during maintenance, repair and replacement. Module B5 covers any refurbishment or change in the asset's performance (e.g., retrofit/refurbishment or extension) planned at the outset of the project, which will occur at some point after construction is completed.
- **Operational** (**Module B6 & B7**): refer to operational emissions for energy and water and Module B8 refer to any user activities, which were not currently included in this assessment. B6 emissions are covered in section 2.

Module C: End of life

- **End of Life Stages (modules C1 to C4):** The eventual deconstruction and disposal of the existing building at the end of its life takes account of the on-site activities of the demolition contractors. No 'credit' is taken for any future carbon benefit associated with the reuse or recycling of a material into new products.
- **Benefits and loads beyond the system boundary (modules D1 and D2):** Any potential benefit from the reuse, recovery and recycling potential of a building or a building product, as well as any potential carbon benefits of any utilities exported from the asset. Module D1 has been included within the assessment scope of this study, but excluded in the final results. Module D2 has not been included in the assessment.

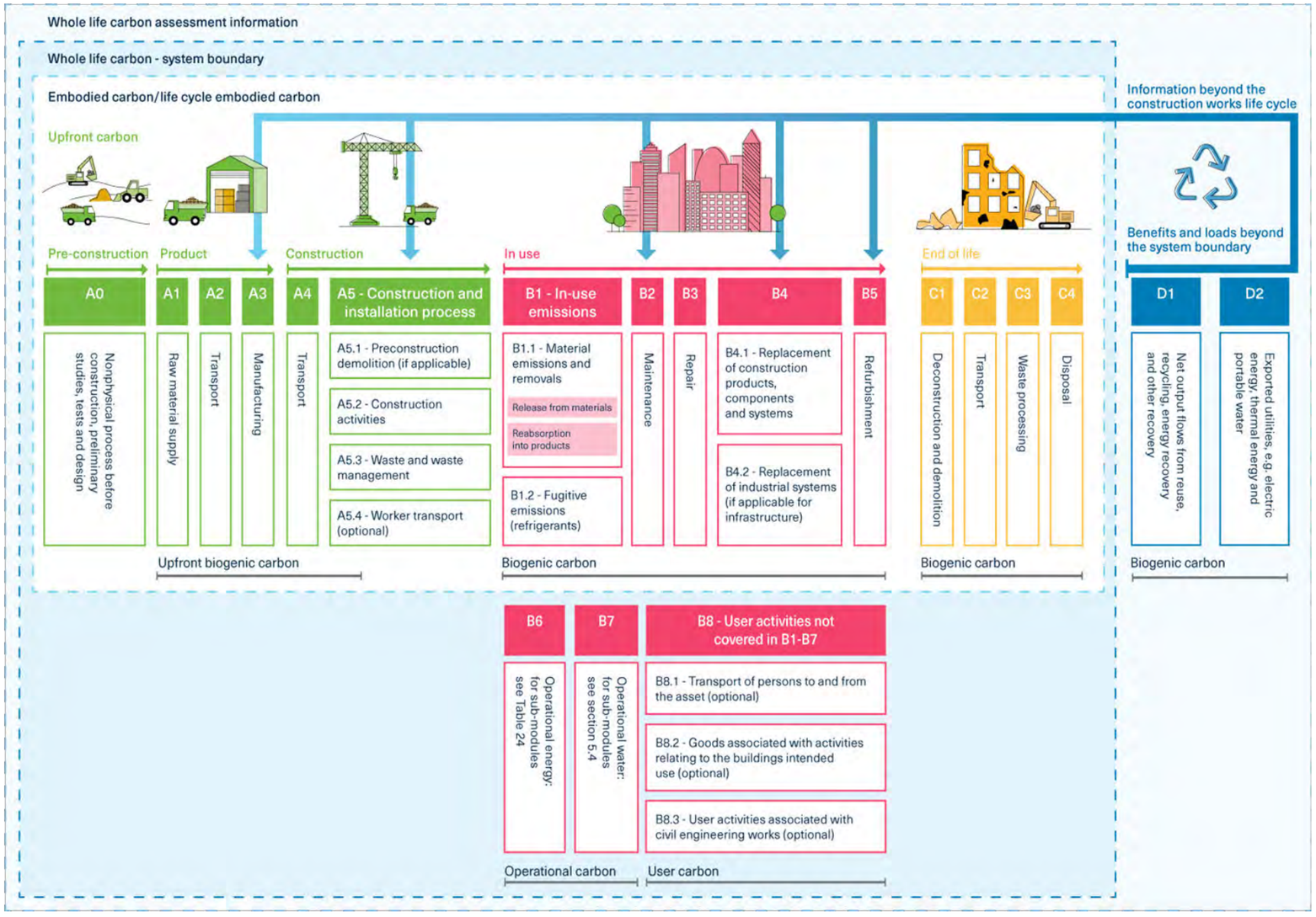


Figure 4-1: Life Cycle Modules as per BS EN 15978

4.2 Methodology

The assessment follows BS EN 15978: 2011: (Sustainability of construction works — Assessment of environmental performance of buildings — Calculation method).

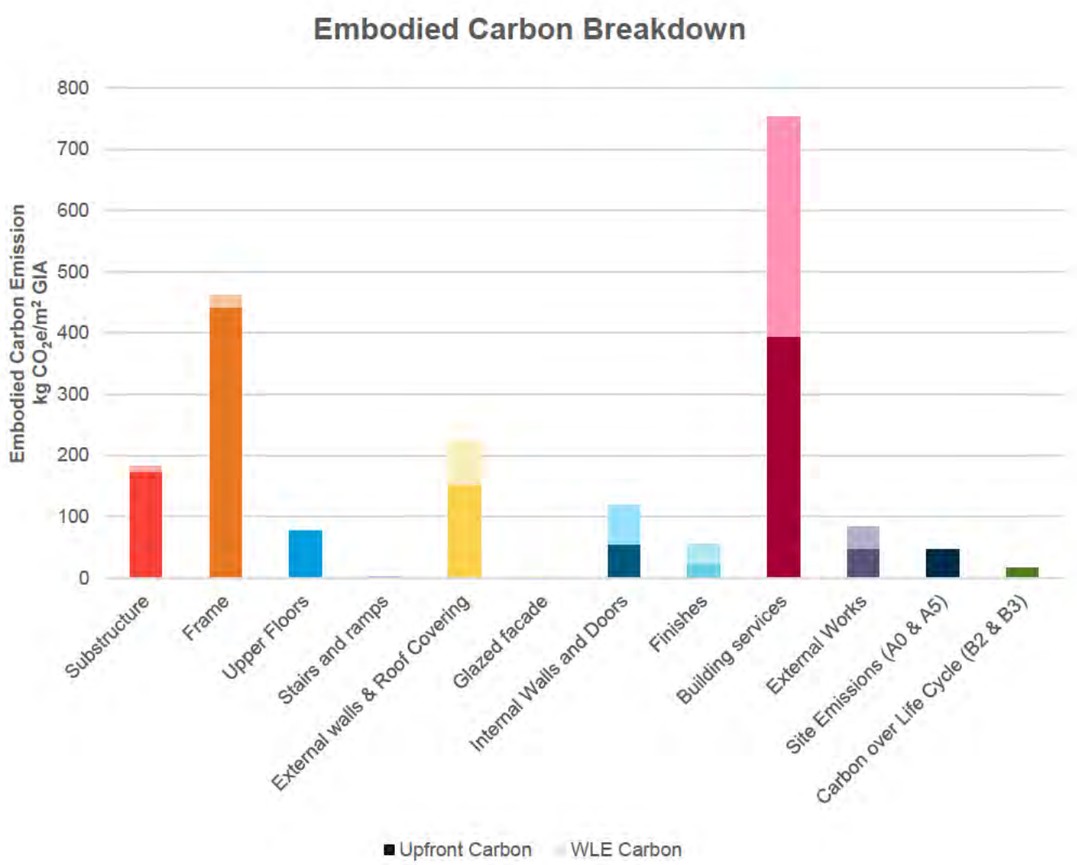
Underpinning BS EN 15978 is the RICS Professional Statement: Whole Life Carbon assessment for the built environment 2023 2nd Edition (RICS PS V2). The RICS PS V2 serves as a guide to the practical implementation of the BS EN 15978 principles. It sets out technical details and calculation details and so was used as the methodology for the assessment.

4.3 Embodied Carbon results

The embodied carbon figures below also account for the estimated refrigerant use in the heating and cooling systems. Low GHG refrigerants have been specified ensuring that the emissions associated with I use refrigerants and yearly loss are nominal. The total emissions are 7 tonnes over the 60 year life. This is due to the use of R1234ze refrigerants which have a negligible GHG emissions in comparison to more standard refrigerants such as R32 which is 677 times higher in comparison.

The embodied carbon assessment for the proposed data centre in Edinburgh indicates upfront embodied carbon emissions of 1,423 kgCO_2e/m² GIA. The analysis highlights the primary contributors as the structural frame and MEP systems, which together account for approximately 65% of the upfront embodied carbon. Envelope elements, including façade and roofing systems, represent 11%. The findings will inform the whole-life carbon assessment in Section 5.0.

Embodied Carbon over Life Cycle (TCO_2e)		Upfront Carbon (exc. c/seq)	Carbon Sequestration	Life cycle impacts	End of life impacts	Whole Life Carbon (inc. c/seq)	Benefits Beyond Boundary
		[A0-A5]	[A0-A5]	[B1-B5]	[C1-C4]	[A1-C4]	[D1-D2]
Substructure		7,997	0	265	122	8,384	109
Superstructure	Frame	20,317	0	829	0	21,146	0
	Upper Floors	3,569	0	45	11	3,624	0
	Stairs and ramps	88	0	1	5	95	-36
	External Envelope and Roof Finishes	7,004	-9	3,027	176	10,198	-11,729
	Windows and External Doors	28	0	51	0	80	0
	Internal Walls and Doors	2,574	-201	2,992	54	5,419	-631
Finishes		1,308	-23	1,443	24	2,752	-121
Building Services (MEP)		18,063	0	16,438	0	34,501	0
External Works		2,218	0	1,228	371	3,817	11
Construction Activities (A5.2)		2,110	0	0	0	2,110	0
[B1] Refrigerant GHG		0	0	7	0	7	0
[B2] Standard Maintenance Emission (per GIA)		0	0	630	0	630	0
[B3] Repairs Emission (per GIA)		0	0	112	0	112	0
Total Embodied Carbon		**65,278**	**-234**	**27,069**	**764**	**92,877**	**-12,399**
Embodied Carbon intensity (kg CO2e/m2 GIA)		**1,423**	**-5**	**590**	**17**	**2,025**	**-270**



5.0

Whole Life Carbon

5.0 Whole Life Carbon

5.1 Whole Life Carbon Emissions

Whole life carbon emissions account for both the embodied and operational carbon combined over the 60-year life span. The table below summarises the results.

This breakdown of the development is summarised in Table 5-1:

TOTAL	Results	
	TCO_2e	$kgCO_2e/m^2$
Carbon at completion (A1-A5)*	65,069	1,423
Embodied Carbon Over life cycle (B to C)*	27,828	607
B6 – Operational Energy (Decarbonised Grid)	1,899,685	41,585
Whole life embodied carbon (A, B, C)*	1,992,582	43,618
Module D (excluded from total figures)	*-12,399*	*-270*

Table 5-1: Whole life-cycle material carbon emissions breakdown

The operational carbon is the most significant contributor to the Whole life carbon emissions. These emissions with 95% of the life cycle emissions arising from the operational energy. The above figures have been based on the grid carbon factors that reduce over time as the grid decarbonises.

These emissions could vary greatly depending on a number of factors. It would depend on the ultimate capacity and usage of servers in the datacentres. The Power Usage effectiveness (PUE) should reduce over coming years as technology and equipment improve in datacentres. The UK Net Zero Carbon Building Standard sets targets for the PUE to reduce from 1.17 to 1.1 between 2025 and 2040.

5.2 Conclusions and Recommendations

The embodied carbon, in use carbon from refrigerants and operational energy have all been assessed for the datacentre in West Hermiston. The results have been collated to show the whole life carbon green house gas emissions for the project over a 60 year life span.

The calculations show that the majority of the emissions, 95%, arise from the operational energy due to heavy energy demand from the data hall IT equipment and associated cooling.

Alongside calculating the baseline figures there are a range of recommendations to reduce the carbon associated with the project over the design life of the building. These are detailed in the operational and embodied carbon reports associated with this report.

The whole life carbon emissions will be monitored during the design of the building. Cundall will work with the design team to review and explore low carbon designs can be incorporated into the design. Ways to reduce the baseline carbon figures will tracked across the design stages and updated as the design develops.

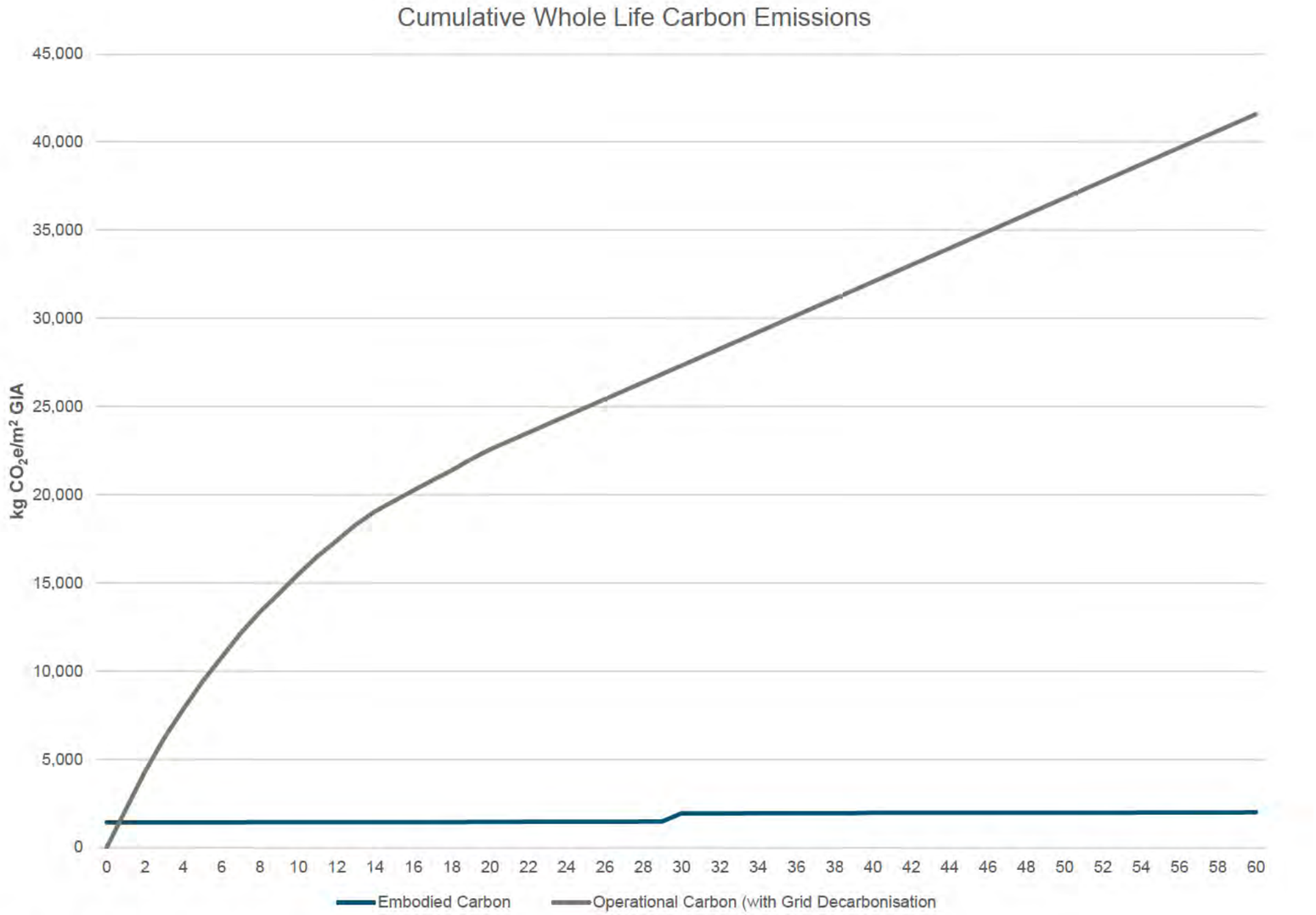


Figure 5-1 - Whole life carbon emissions, Embodied and operational

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ZERO CARBON DESIGN 2030