Apatura Energy - P108
Currie – Wester Hermiston

Energy Statement

Apatura Energy

Job No:	1047041
Doc Ref:	ADC-CDL-XX-XX-T-SY-70220
Revision:	P01
Revision Date:	28/11/2025

Project title	Apatura Energy - P108 Currie – Wester Hermiston	Job Number
Report title	Energy Statement	1035082

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)

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

[redacted]

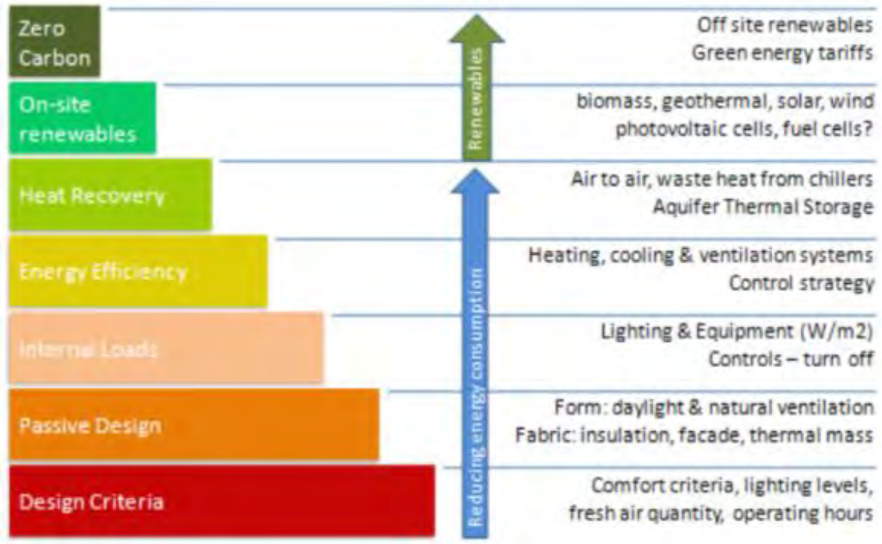
Executive Summary

This document outlines the energy strategy for the proposed Wester Hermiston Data Centre Campus in Edinburgh. It details how the development intends to meet the national and local sustainability policies, with a particular focus on energy-related requirements, as defined in Scotland's Fourth National Planning Framework (NPF4) and Edinburgh City Plan 2030, respectively. The outlined energy strategy sets out design considerations recommended for further exploration in subsequent project stages, with the aim of achieving compliance with Building Regulations Section 6 (Energy) and aligning with operational energy targets appropriate for this building type, as defined by the emerging UK Net Zero Carbon Building Standard (UK NZCBS).

The strategy aims to reduce 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.

The proposed energy strategy for the scheme will follow Cundall's 'Steps to Low Carbon Methodology', which aligns directly with the industry-recognised Energy Hierarchy 'Be Lean', 'Be Clean', 'Be Green'.

Steps to Net Zero Carbon



Reducing demand for energy (Be Lean)

- **High thermal efficiency across the building envelope and solar gain control**

  Low U-values, low air permeability, and appropriate glazing areas and specifications will limit unwanted heat losses and gains due to the fabric. This 'fabric first' approach ensures energy demand is minimised prior to the application of any heating and cooling systems.
- **High efficiency heating and cooling systems**

  The admin/office areas will be served via Air Source Heat Pumps (ASHPs), while free-cooling air-cooled chillers with variable speed compressors will be specified for the data hall areas.
- **Mechanical ventilation with Heat Recovery**

  High efficiency Air Handling Units (AHUs) will be utilised to provide fresh air in the admin/office areas.
- **High efficiency lighting**

  High efficacy LED luminaires, in combination with daylight and occupancy dimming will be utilised (where appropriate) to ensure lighting energy is kept to a minimum across the site.

Energy efficient systems (Be Clean)

- **District heating network**

  The potential for the proposed development to export recovered waste heat from the data halls (that would otherwise be rejected) to a future district heating network (once available) has been investigated and will be further explored in subsequent project stages.

Low and Zero Carbon Generating Technologies (Be Green)

- **Air Source Heat Pumps (ASHPs)**

  ASHPs will be specified for meeting the space and cooling demand of the admin and office areas within the proposed buildings.
- **On-site renewable energy generation**

  The potential for incorporating rooftop solar Photovoltaics (PVs) above the admin and office areas of the proposed buildings will be further explored in subsequent project stages. This technology is considered a viable option for meeting a portion of the development's electricity demand. The feasibility and size of solar PV installation will be assessed as the project progresses, with the aim of maximising generation in line with local policy requirements.

Contents

1.0

Introduction

1.0 Introduction

This report has been prepared to present the energy strategy for the proposed Wester Hermiston Data Centre Campus in Edinburgh. It outlines how the development's proposed energy strategy aligns with relevant national and local policies as defined in Scotland's Fourth National Planning Framework (NPF4) and Edinburgh City Plan 2030, respectively.

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 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.

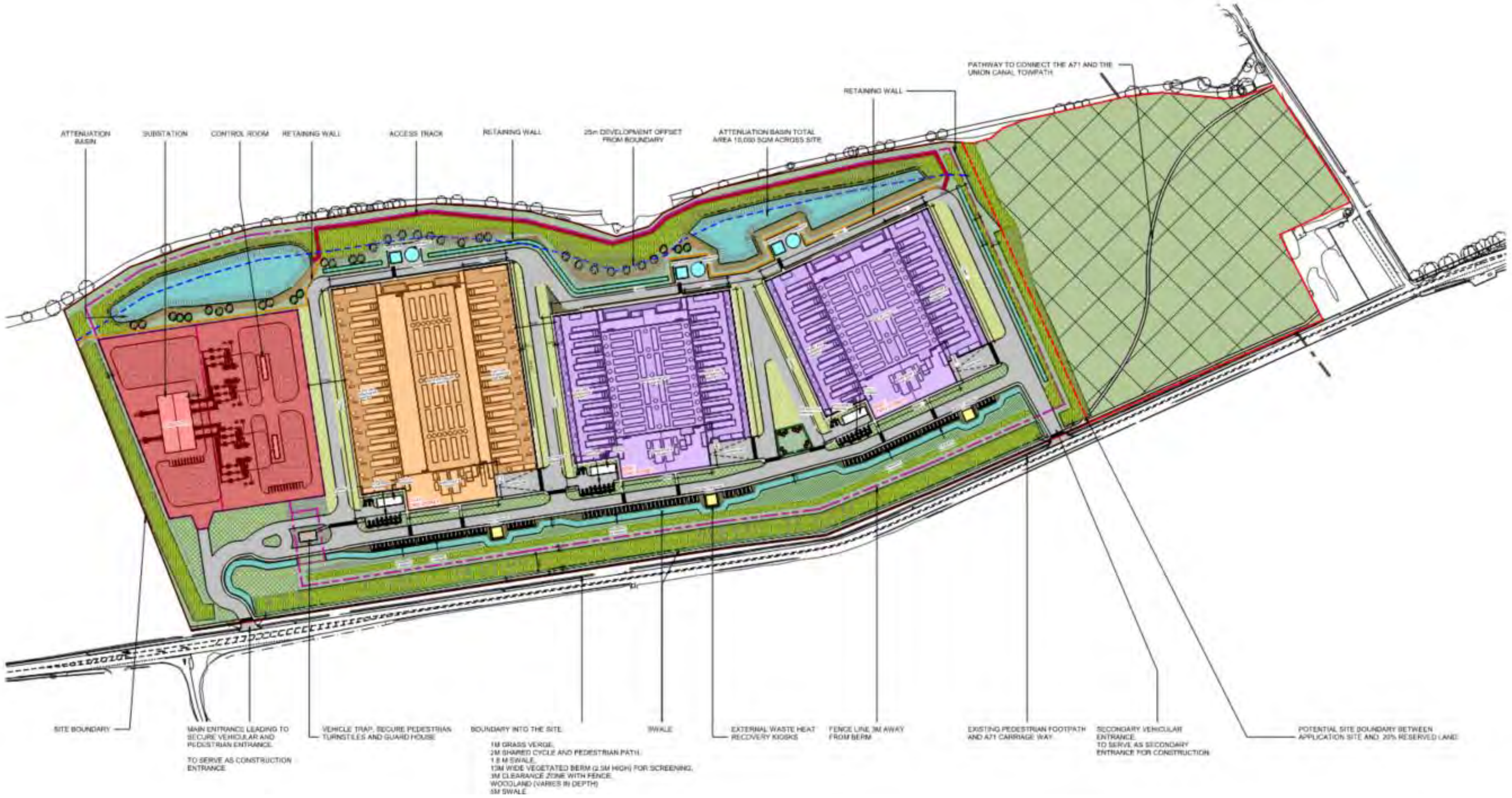


Figure 1-2: Proposed site plan

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 currently planned to accommodate 136 car parking spaces (including EV charging points), 15 accessible parking spaces, 8 motorcycle spaces, and 131 cycle parking spaces, however this will be subject to detailed review during design development at subsequent project stages.

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.

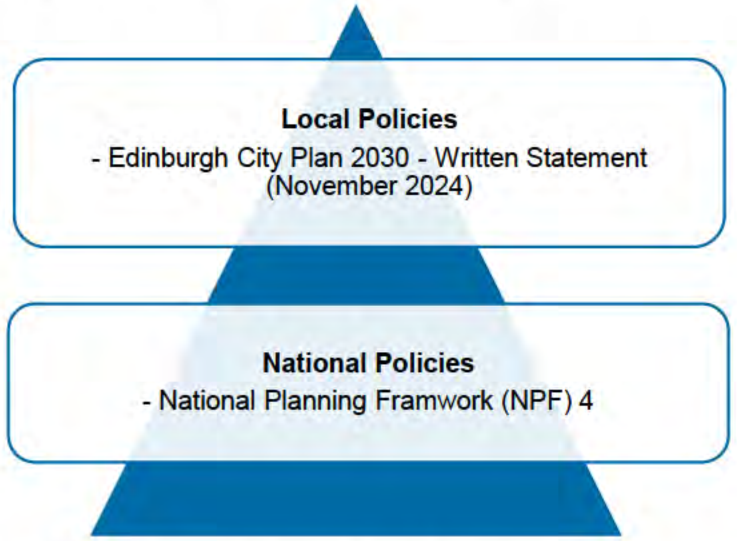


Figure 2-1: Scottish hierarchy of national and local planning policies

This sustainability strategy 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 first key outcome of the NPF4 focuses on the development of a **national spatial strategy for Scotland 2045** detailing 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)

Figure 2-3: NPF4 Sustainable Development Goals

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 (document reference: ADC-CDL-XX-XX-T-SY-70221).

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.

2.2 Local Policy – Edinburgh City Plan 2030

Figure 2-4 Edinburgh City Plan 2030 (Written Statement)

The 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 8: New Sustainable Buildings

To make sure that new buildings are:

i. sustainable and play their part in addressing the Climate Emergency; and
ii. exceed the current carbon dioxide emissions targets with at least half of this target met through the use of **low and zero carbon generating technologies**.

Proposals must demonstrate the following:

a) All reasonably practicable measures, predominantly through ultra-high fabric energy efficiency, have been taken to achieve a **'net zero' level of operational greenhouse gas emissions.**

   Operational emissions, in the context of this policy, refers to the use of heating, hot water, lighting, ventilation, and cooling systems.

   New developments require to embed ultra-high fabric energy efficiency into their design and construction, with the optimal approach being for them to be built to Passivhaus standards.

   To ensure that they can meet or exceed the net zero requirement, the incorporation of low and zero carbon generating technologies is also supported. The ability to achieve net zero greenhouse gas emissions should be evidenced by a statement submitted with applicable applications.

b) Where appropriate, green roofs have been provided where new roofs are of a pitch capable of supporting these and that these roofs provide wildlife habitat and waster attenuation.

c) Provision is made for facilities for the separate collection of dry recyclable waste and food waste.

Policy Inf 16: Sustainable Energy and Heat Networks

Development of low and zero carbon energy schemes, including small-scale wind turbine generators, solar panels, ground and air source heat pumps, water source heat pumps, heat and/or power networks (where energy comes from a renewable/low carbon source), and energy storage schemes that help support low and zero carbon energy schemes will be supported provided the proposals:

a) do not cause significant harm to the local environment; and

b) will not unacceptably affect the amenity of neighbouring and future occupiers or users of open space by reason of, for example, noise emission or visual dominance.

All new developments located within or adjacent to an area containing a heat network that is accepting new connections should connect to that network. If the development site falls partially or wholly within, or adjacent to, a planned heat network, then development proposals within or adjacent to such an area will only be supported where they are designed and constructed to allow for cost-effective connection to a future heat network at a later date.

Any developments that are not heated through heat networks must demonstrate they are **future proofed to allow future connections to heat networks to be made and all buildings to be readily able to be connected to a heat network when one becomes available**.

3.0

Energy Strategy

3.0 Energy Strategy

The energy strategy proposed for the Wester Hermiston Data Centre Campus will contribute to meeting the project's targeted sustainability credentials and achieving environmental excellence in terms of design, construction, and building operations for a new building.

The proposed Wester Hermiston Data Centre Campus will be designed to reduce its annual energy consumption, deliver energy in an environmentally friendly way, and minimise its annual carbon footprint. The energy strategy outlined in the following sections aims not only to achieve compliance with relevant national and local policies and regulation, but also to support the development in aligning with industry benchmarks and its meeting operational energy targets.

The proposed energy strategy will adopt Cundall's "Steps to Net Zero Carbon" methodology, as seen in *Figure 3-1*, which provides a structured pathway to reducing both energy demand and emissions over the life of the development.

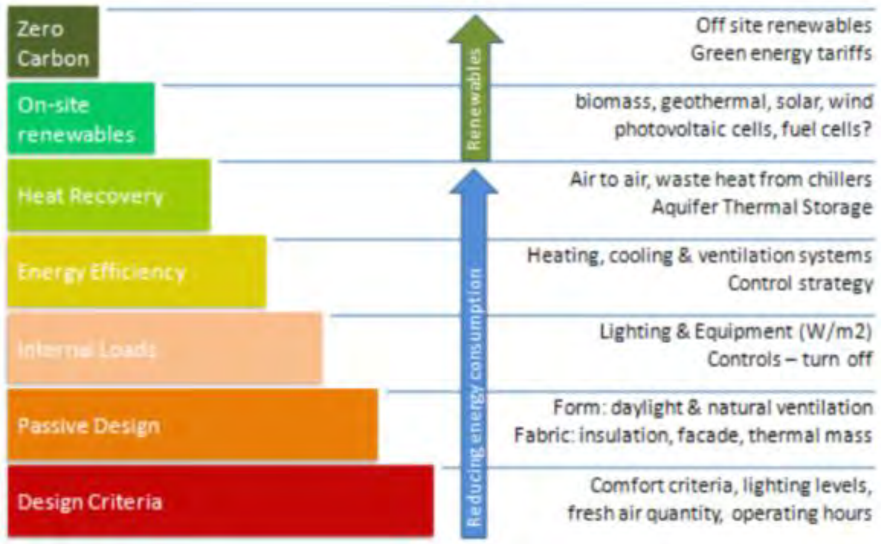


Figure 3-1: Steps to low carbon methodology diagram

The "Steps to Net Zero Carbon" methodology aligns directly with the industry-recognised Energy Hierarchy "Be Lean", "Be Clean", "Be Green", as follows:

- **Reduce demand for energy ('Be Lean')**
  The design will consider the building form, fabric performance, and glazing areas and specifications to provide a highly efficient envelope to drive down the energy demand from heating and cooling. Once the fabric efficiency has been optimised as far as practical, the building's operational energy consumption and associated carbon emissions will be further reduced by selecting efficient mechanical, electrical, and control systems.
- **Supply Energy Efficiently ("Be Clean")**:
  The design will review potential solutions for generating and providing heat energy to the scheme efficiently and cleanly.
- **Use Low and Zero Carbon Generating Technologies ("Be Green")**:
  The remaining energy demand of the development will be met through low and zero carbon energy sources.

For clarity, this report presents the development's proposed energy strategy in accordance with the energy hierarchy over two sections. Section 3.0 will continue with addressing reducing energy demand and supplying energy efficiently, while Section 4.0 explores opportunities for the design to incorporate Low and Zero Carbon Generating Technologies (LZCGTs).

3.1 Eliminate fossil fuels

Over the last few years, the UK's electrical grid has undergone intense decarbonisation through large scale switch from coal and gas-fired power plants to renewables such as wind turbines. The result of the lower electricity carbon factor, along with the higher efficiencies of electrical technologies, is that electrical systems are no longer at a disadvantage compared to natural gas. Furthermore, combustion-based technologies such as boilers also produce other emissions that are more harmful to humans in the immediate vicinity and short term, such as Nitrogen Oxide (NOx). A fundamental step towards reducing harmful emissions is to eliminate the use of fossil fuels on building projects. Replacing natural gas especially, with cleaner electricity, from both decarbonising the national grid and provision of on-site renewables will be central for this scheme.

3.2 Reducing demand for energy (Be Lean)

Substantial reductions in energy usage for the scheme, together with improved occupancy comfort, will be achieved largely through consideration of the passive elements of the design. The design team will implement passive design measures through optimising building envelope performance and solar gains as described in Sections 3.2.1 - 3.2.4.

Once the fabric efficiency has been optimised as far as practical, the project will aim to further reduce the building's operational energy consumption and associated carbon emissions by selecting efficient mechanical, electrical, and control systems. The proposed development will adopt a fully electric strategy, featuring no on-site combustion for heating, cooling, and Domestic Hot Water (DHW) provision, thus negating any negative impact on the local air quality (please refer to Sections 3.2.5 - 3.2.10).

3.2.1 Building Fabric

Passive design measures will be employed to create a continuous, well insulated, and airtight envelope with minimised thermal bridging and optimised thermal massing. High performance glazing will provide a positive energy balance whilst improving thermal comfort. Thermal bridges will be reduced or eliminated as far as practical through careful detailing at junctions and consideration of any necessary penetrations through the insulation envelope. Robust design, detailing, and construction processes on site will help ensure this is achieved in practice.

The thermal insulation levels of the new data centre buildings are proposed to exceed the minimum standards set out in Building Regulations Section 6 (Energy), thereby reducing heat loss through the building fabric and supporting compliance with Edinburgh City Plan 2030 Policy Env 8: New Sustainable Buildings. This policy requires new buildings to achieve net-zero operational emissions by incorporating ultra-high fabric energy efficiency into their design and construction, with the optimal approach being for them to be built at Passivhaus standards (for further details, please refer to Section 2.2 of this report).

Following a 'fabric first' approach and improving the thermal insulation beyond the Building Regulation standards will help reduce the annual carbon emissions associated with the building's heating and cooling systems by limiting the heat transfer through the building's fabric. This improvement has a significant impact on the overall reduction of the electrical consumption annually.

Given the operational characteristics of the equipment and the predominantly unoccupied nature of the data halls, the external wall insulation requirements in these areas can be relaxed compared with those of the admin/office spaces. However, solar gain control is critical for the data hall areas to minimise cooling load requirements (please refer to Section 3.2.2).

3.2.2 Passive Solar Design

Data halls are predominantly cooling-led spaces that are considered unoccupied, releasing and exporting heat as part of their normal operation. To minimise thermal conduction and solar gains, the use of windows in these areas will be limited. This principle is applied to all data hall and industrial spaces. Incorporating this passive design measure will help reduce cooling loads and support effective heat rejection during operation.

For spaces other than the data halls, such as the admin/office areas, window g-values will be carefully selected to achieve a balance between providing sufficient natural daylight for occupant comfort and wellbeing and minimising solar heat gains that could increase cooling demand.

3.2.3 Air Permeability

Good levels of air tightness can be achieved by prefabrication of key building components under factory conditions, robust detailing of junctions, reducing the breathability of the fabric, and good building practices on site. Please refer to *Table 3-1* for air permeability rate targets and comparison between Building Regulations Section 6 backstop and notional building values as well as with Net Zero Carbon (NZC) aspirational targets.

3.2.4 Fabric Performance Summary

Table 3-1 outlines fabric performance targets for consideration in subsequent project stages of the proposed Wester Hermiston Data Centre development. It includes the backstop values to ensure compliance with Building Regulations Section 6, notional building values, and NZC aspirational targets, based on guidance from the Low Energy Transformation Initiative (LETI) Climate Emergency Design Guide and the Passivhaus Standard. Please see below for further details:

- *Section 6 Non-domestic Limiting Standard:* Maximum allowable U-values for new-builds as included within *Clause 6.2.1 (Table 6.3)* and *Clause 6.2.11* of the Scottish Building Regulations (Non-Domestic Technical Handbook, applicable to works from 1st January 2025 onwards).

- *Section 6 Non-domestic Notional Building*: Fabric performance values applied to the notional building model for compliance calculations, as defined within *Clause 6.1.4 (Table 6.1)* of the Scottish Building Regulations (Non-Domestic Technical Handbook, applicable to works from 1st January 2025 onwards).
- *NZC aspiration*: Indicative aspirational fabric performance targets aligning with net-zero carbon design principles and industry guidance such as the Low Energy Transformation Initiative (LETI) Climate Emergence Guide for commercial offices and the Passivhaus Standard, in response to Policy Env 8 (a) from the Edinburgh City Plan 2030 on embedding ultra-high fabric energy efficiency into new developments.

Element	Section 6 Non-domestic		NZC aspiration	
	Limiting Standard	Notional Building	LETI (offices)	Passivhaus
Exposed floor U-value, W/m².K	0.18	0.13	0.10 - 0.12	0.10 - 0.12
External wall U-value, W/m².K	0.21	0.15	0.12 - 0.15	0.10 – 0.15
Roof U-value W/m².K	0.16	0.11	0.10 - 0.12	0.10 - 0.12
Pedestrian door U-value, W/m².K	1.40	1.20	1.20	0.80
Glazing U-value, W/m².K	1.60	1.20	1.20	0.80 (whole window)
Glazing g-value, %	-	50	30 - 40	50 - 60
Glazing Visible Light Transmittance (VLT), %	-	77	-	-
Air Permeability (m³/(h.m²)@50Pa)	7.00 [1]	4.00	<1.00	≤ 0.60

Table 3-1: Building fabric performance values

[1] Whilst no maximum value is set for air permeability for new construction, it is recommended that buildings are designed to achieve a value of not more than 7 m³/(h.m²)@50Pa, to allow a balanced approach to managing building heat loss.

3.2.5 Mechanical

The proposed space heating and cooling energy strategy put forward by the design team has considered several factors including operational carbon, whole-life carbon, and associated capital and running costs.

The predominant cooling system for the three buildings is free-cooling air-cooled chillers with variable speed compressors, which provide chilled water to Computer Room Air Handler (CRAH) units serving the data halls. The Front of House (FoH) office and admin areas will be served via Air Source Heat Pumps (ASHPs) to provide low temperature hot water and chilled water for heating and cooling via Fan Coil Units (FCUs). Ventilation will be provided by dedicated Air Handling Units (AHUs), which will be sized in line with BCO design criteria.

The data centre development is also likely to produce large amounts of waste energy in the form of heat from the data halls. Waste heat recovery is a unique benefit for this campus development. The proposal is for recovered waste heat energy to be exported to an external district heating network in the future, enabling beneficial use of heat that would otherwise be rejected.

The heating and cooling systems shall be appropriately zoned, with local fast responding controls.

Demand control ventilation is proposed to be considered for the FOH admin and office spaces. This method is useful to maintain indoor air quality that automatically adjusts the ventilation rate provided to a space in response to changes in conditions such as occupancy fluctuation.

3.2.6 Electrical

Natural light should be maximised, where practicable and applicable, with appropriate glazing design to the admin office areas. Data Halls are generally unoccupied and would not require daylight added to the fact that solar gain into this type of space through glazing would result in higher cooling loads. Optimised daylight to office areas will allow electric lighting consumption to be reduced during daylight hours, reducing running costs and CO_2 emissions.

Installing efficient low energy light fittings internally and externally can significantly reduce a building's overall lighting load hence lowering its annual carbon emissions. The development will reduce the energy consumption by the specification of LED fixtures in all office and data hall areas.

Daylight and occupancy sensors are proposed in occupied spaces such as the admin area of the data centre buildings where required. A Digital Addressable Lighting Interface (DALI) system has been proposed for the data halls to provide controls for the lighting systems in these areas.

3.2.7 Building Energy Management System

Where appropriate, Building Energy Management System (BEMS) using information technology (IT) should be used to promote, facilitate, and support energy demand management (e.g., a system that recognises real-time room conditions by temperature sensors and/or the optimal operation of lighting and air-conditioning responding to the room condition). A combination of energy saving control techniques, such as optimum start with communication and information systems will allow active management of the building services and the capability to achieve and maintain a high level of energy efficiency.

A full BEMS system is recommended to be installed for the proposed development and linked to central control systems. The systems should be easily accessible by the onsite team with automatic monitoring, targeting and automatic alarms for out-of-range values.

3.2.8 Energy Metering

Separate metering systems of the energy uses within the development will help the building users and tenants identify areas of excessive consumption and highlight potential energy-saving measures for the future. This will enable on-going reduction of annual carbon emissions from these systems.

3.2.9 Fixed Building Services Summary

Efficiencies of fixed building services will be designed to meet or exceed Scottish Building Regulations Section 6 (Energy) limiting standards as detailed within the Non-Domestic Technical Handbook (applicable to works from 1st January 2025 onwards).

Table 3-2 outlines fixed building services efficiency targets for consideration in subsequent project stages of the proposed Wester Hermiston Data Centre development. It includes the backstop values to ensure compliance with Building Regulations Section 6, notional building values, and NZC aspirational targets. Please see below for further details:

- *Section 6 Non-domestic Limiting Standard*: Maximum allowable fixed building service equipment efficiencies as included within the 2022 Non-domestic Building Services Compliance Guide for Scotland (Version 1.1, applicable to works from 1st February 2023 onwards).
- *Section 6 Non-domestic Notional Building*: Building service efficiency values applied to the notional building model for compliance calculations, as defined within Clause 6.1.4 (Table 6.1) of the Scottish Building Regulations (Non-Domestic Technical Handbook, applicable to works from 1st January 2025 onwards).
- *NZC aspiration*: Indicative performance levels representing best-practice or "net zero-enabled" system efficiency, intended to support future low-carbon operations.

HVAC Equipment Parameter	Section 6		NZC aspiration
	Limiting standards	Notional Building	
Space heating efficiency, SCoP Admin spaces only	2.50	3.00	>2.85
DHW efficiency (applicable to all heat pump types)	2.00	2.70	>2.85
Space cooling efficiency, SEER (applicable to Split/multi-split, VRF) Admin spaces	5.00	6.40	>5.50
Space cooling efficiency, SEER (applicable to Air-cooled chillers, above 400kW) Data Halls	4.50	6.40	>5.50
Central ventilation maximum SFP, W/l/s	2.00	1.80	1.40
Heat recovery, % (Plate heat exchanger/ thermal wheel/ run-around coil)	50/ 65 / 45	76.0	>75%
Pressure sensing: Variable speed with multiple pressure sensors	Recommended	Yes	Yes

Table 3-2: Fixed building services specifications

3.2.10 Unregulated Energy

Unregulated energy includes those end uses that fall outside the typical scope of building regulations. These can include energy used through cooking, computers, external lighting, and other 'plug loads', which are typically under the control of the occupant.

Addressing these loads, which often form a significant portion of a building's overall energy consumption, is key to reducing energy consumption to levels required to be net zero ready.

In the admin and FOH areas, equipment loads will be managed through the specification of energy-efficient white goods, lifts, and other appliances. Central control of small plug loads will also enable these loads to be switched-off during unoccupied hours in these areas.

IT equipment loads in the data hall spaces are critical due to their high density and continuous operation, resulting in substantial heat generation. While these loads will vary in response to the number and intensity of active processes, our initial operational energy calculations assume a constant 24/7 running load. In line with the American Power Conversion guidance, the average data centre is assumed to operate at approximately 65% of its maximum design IT equipment capacity. For further details, please refer to Cundall's Operational Energy Statement (document reference: ADC-CDL-XX-XX-T-SY-70222).

3.3 Energy Efficient Systems (Be Clean)

'Be Clean' refers to the means by which heat energy is generated and supplied to the scheme. Consideration has been given to the potential for district heating networks. The potential of the proposed Wester Hermiston Data Centre development to connect to a district heating network and export recovered waste heat from the data halls that would otherwise be rejected has been investigated and will be further explored in subsequent project stages.

Currently, there are no existing district heating networks in proximity to the proposed data centre campus available for connection. The City of Edinburgh Council has, nevertheless, identified the nearby Heriot-Watt University campus as a potential location for a future district heating scheme, which may provide an opportunity for future integration.

In line with Edinburgh City Plan 2030 Policy Env 16 Sustainable Energy and Heat Networks, the design of the new data centre development will enable future connection to any heat network that becomes available in the local area, with all buildings being designed to be readily capable for connection when such a network is available.

For further details on Policy Env 16 and the potential for the proposed development to connect to a future district heat network, please refer to Sections 2.2 and 4.1.3 of this report, respectively.

The figure below displays heat demand levels in close proximity to the site of the proposed Wester Hermiston Data Centre Campus. Most of the Hermiston and Heriot-Watt University campus area show low to moderate heat demand in range of <25,000 to 100,000 kWh/year. There are a few areas indicating higher heat demand zones (darker purple).

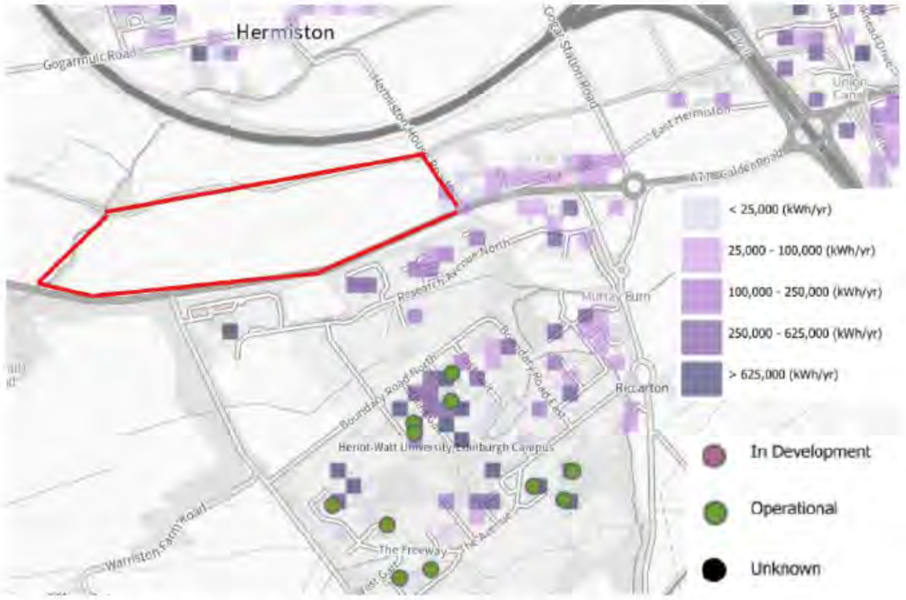


Figure 3-2: Heat demand close to the site (screenshot for Scotland's Heat Map)

3.4 Operational Energy Assessment

A preliminary operational energy assessment for the proposed West Hermiston Data Centre development has been conducted by Cundall to define targets for the admin/office and data hall areas.

The Energy Use Intensity (EUI) target selected for the Office/Admin area is 106 kWh/m², which is representative of a net zero aligned office building with extended operating hours that is starting operations in 2030. The Power Usage Effectiveness annualised (PUE) target for the data centre has been selected as 1.17 for the data hall area which is representative of a net zero aligned data centre building starting its operations in 2030.

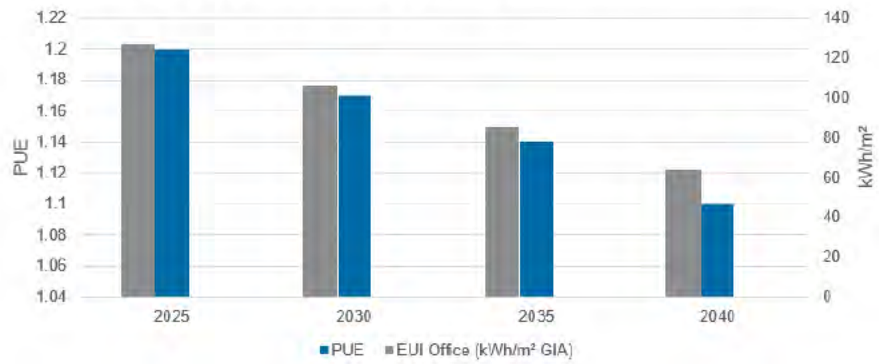


Figure 3-3: Operational energy targets for the proposed development based on the UK NZCBS.

Targets align with the emerging UK Net Zero Carbon Building Standard (UK NZCBS). For further details, please refer to the Operational Energy Statement prepared by Cundall (document reference: ADC-CDL-XX-XX-T-SY-70222).

4.0

Low and Zero Carbon Energy Review

4.0 Low and Zero Carbon Energy Review

The proposed Wester Hermiston Data Centre Campus will be designed to reduce its annual energy consumption, provide energy in an environmentally friendly way, and minimise its annual carbon footprint through alignment with national and local policy targets and pursuit of industry-led sustainability targets, as summarised in Section 3.0 of this report.

In line with Edinburgh City Plan 2030 Policy Env 8 New Sustainable Buildings, new buildings shall improve upon the current carbon dioxide emissions targets with at least half of this target met through the use of Low and Zero Carbon Generating Technologies (LZCGTs) (for further details, please refer to Section 2.2).

The potential for the introduction of a range of LZCGTs targeting heating, cooling, and hot water provision is summarised in the following sections.

4.1 Low and Zero Carbon Generating Technologies (Be Green)

The development will look to deploy clean energy onsite with LZCGTs. These may include renewable energy sources such as solar panels and micro-wind as well as heat pumps, combined heat and power, district heating infrastructure, with the latter two technologies using fossil fuels but resulting in significantly lower carbon dioxide emissions compared to conventional heating systems such as gas-fired boilers.

4.1.1 Combined Heat and Power (CHP)

Combined Heat and Power (CHP), also known as cogeneration, is an energy system capable of producing both useful heat and electricity simultaneously in a single process. It allows for optimum use of the energy available from the fuel used.

The efficient use of CHP typically depends on finding a use for the heat generated by the process. Issues to consider include:

- If heat is not used, then the system is just an electricity generator and electricity will be greener and cheaper if sourced from the national grid.
- If excess electricity is generated on site, this can be exported (sold) back to the grid whereas excess heat needs to be rejected (wasted). Exported electricity can count towards reducing the site’s carbon emissions.

Exported electricity will typically not be financially attractive as exports tend to coincide with low demand periods on the national grid so the cost of producing the electricity on site can be more than the prices received for the exported electricity.

The use of CHP is not considered an appropriate technology for the proposed development as the carbon benefit from electricity generated is negligible due to the rapid decarbonisation of the electricity grid. Furthermore, flue gases from the gas-fired CHP can lead to a reduction in local air quality.

4.1.2 District Heating Networks

A district heating or cooling scheme comprises of a network of insulated pipes used to deliver heating or cooling, normally in the form of hot or chilled water from the point of production to an end user. A heating network can be utilised to provide low carbon heat to both water-based systems: space heating, and domestic hot water supplies. In a development with high heating and DHW loads, such as residential or leisure centre developments, a heating network can deliver significant carbon savings potential. In an office or data centre-based development, where heating requirements are relatively minimal, the heating network carbon savings potential is not as significant.

4.1.3 Exporting to District Heating Networks

The data centre development is likely to produce large amounts of waste energy in the form of heat from the data halls. Waste heat recovery is a unique benefit for this campus development. The proposal is for recovered waste heat energy to be exported to an external district heating network in the future, acting as an energy provider rather than an energy consumer, enabling beneficial use of heat that would otherwise be rejected.

There are currently no existing district heating networks in proximity to the Wester Hermiston Data Centre Campus. However, the Heriot-Watt University campus has been identified by The City of Edinburgh Council as a potential location for a future district heating scheme. As such, while there is no immediate connection opportunity, the design has incorporated provision for future heat export should a network be brought forward nearby.

4.1.4 Biomass Heating

Biomass in the form of logs, wood chips and wood pellets are classified as a renewable source of energy because the carbon dioxide emitted when the biomass is burned has been taken out of the atmosphere by the growing plants. Even allowing for emissions of carbon dioxide in planting, harvesting, processing, and transporting the fuel they will typically reduce net carbon emissions by over 90%. Biomass boilers are large pieces of plant that require substantial areas and volumes of space for the boiler, the fuel storage and the waste. A delivery area for trucks frequently supplying and removing fuel and waste would also need to be factored in.

Biomass boilers are not suited to meeting a fluctuating daily heating demand, especially a relatively low load as is the case in a Data Centre development. Additionally, the NOx emissions produced by biomass boilers would impact local air quality significantly more than other available technologies.

4.1.5 Solar Hot Water Collectors

Solar thermal collectors utilise solar radiation to heat water for use in buildings. The radiation is converted using a solar collector, of which there are two main types: Flat plate and Evacuated tube collectors. Evacuated type systems occupy a smaller area and are more efficient but also generally more expensive. The optimum orientation for a solar collector in the UK is a south-facing surface, tilted at an angle of 30º from the horizontal.

Solar collectors are typically designed to meet a development’s base heat load, associated with its domestic hot water requirements, with a second system meeting the remainder of the load.

There is minimal hot water demand for the building, therefore, solar thermal collectors are not proposed for inclusion in the development.

4.1.6 Wind Turbines

The output from wind turbines is highly sensitive to wind speed. Hence it is essential that turbines should be sited away from obstructions, with a clear exposure, or fetch, for the prevailing wind.

While the Wester Hermiston Data Centre Campus benefits from a relatively open site with fewer nearby obstructions, on-site wind generation is not well aligned with the operational characteristics of a data centre, which requires a continuous, high-reliability power supply. Wind generation is intermittent and would contribute only a small proportion of the site’s total electrical demand, offering limited carbon savings relative to the infrastructure, maintenance, and grid-connection requirements.

4.1.7 Air Source Heat Pumps (ASHPs)

Air source heat pumps (ASHPs) exchange heat between the outside air and a building’s internal spaces to provide space heating in winter and cooling in the summer. The efficiency of these systems is inherently linked to the ambient air temperatures. Heat pumps supply more energy than they consume, by extracting heat from their surroundings. Heat pump systems can supply as much as 4kW of heat output for just 1kW of electrical energy input.

Typically, there are two main types of air source heat pump systems, one which is refrigerant-based system (VRF) and one which is water-based system (Air to water heat pumps).

VRF systems transfer heat from one location to another using refrigerant. The volume or flow rate of refrigerant is accurately matched to the required heating or cooling loads, thereby saving energy, and providing more accurate control of temperatures and energy consumption.

The admin blocks of the Wester Hermiston Data Centre Campus will utilise an ASHP system for space heating and cooling. In the context of a data centre development, heat pumps may utilise heat that is extracted from the data halls via the cooling system, as opposed to ambient air. This means that there is a relatively constant and warm air supply to extract heat from and transfer to other spaces which require it.

4.1.8 Water Source Heat Pumps (WSHPs)

Water source heat pumps (WSHPs) operate in a similar way to ASHPs but instead of air, WSHPs exchange heat from water. The water source can be an open source such as a river or lake, or a closed-loop system.

For the development, WSHPs are not proposed as the primary heating solution for the admin blocks. This is primarily due to the lack of suitable nearby water bodies to serve as a viable heat source or sink. Additionally, implementing a standalone WSHP system would require substantial additional infrastructure.

4.1.9 Ground Source Heat Pumps (GSHPs)

Ground sourced heat pumps (GSHPs) differ from ASHPs in that they extract heat from the ground and pump it into a building to provide space heating and to pre-heat domestic hot water. In the summer months, this process can be reversed, rejecting heat to the ground, to meet the cooling requirements of a building. GSHPs rely on the stable temperature of the ground of between 10-14^{o}C. In winter when the ambient air temperatures are below this ground source heat pumps have higher efficiencies than air source heat pumps (as there is more thermal energy in the ground and it provides a more stable year-round temperature).

Due to the groundwork and infrastructure required for a GSHP system, these are more complicated to install and maintain than other heating systems. As there is a minimal anticipated heating load associated this development, the installation of a GSHP is not considered to be feasible.

4.1.10 Photovoltaics (PV) panels

Photovoltaic solar cells convert solar energy directly into electricity. The cells consist of two layers of silicon with a chemical layer between. The incoming solar energy charges the electrons held within the chemical. The energised electrons move through the cell into a wire creating an electrical current. Once the photovoltaics cells are installed, they require minimal maintenance over their operational life and have no primary fuel requirements.

A high-level review of the feasibility of onsite electricity generation has been undertaken. The site offers the potential for the installation of PV panels due to the roof space available above the office and admin areas of the proposed buildings. A solar PV system could be installed, potentially in conjunction with a form of storage as a means of utilising renewable electricity on site and offsetting some of the development's electrical demand. *Figure 4-1* indicates potential areas for PV installation, covering approximately 850 m² on each of the roofs of DC01 and DC02, and 700 m² on DC03. Roof areas will be further assessed for PV installation as the design progresses, taking into account MEP plant installations.

Figure 4-1: Potential rooftop locations for PV installation

A detailed operational energy model will help understand the number of PV panels required in order for the project to achieve its specific sustainability targets and align with national and local policy requirements. Although maximising renewable energy generation from PVs is highly recommended, this should be assessed alongside the available roof area to allow for sufficient space between panel arrays for any maintenance works required.

4.1.11 LZCGTs Summary

It should be noted that all options listed for the proposed data centre development at this stage are high-level solutions only for the purpose of this initial energy strategy and the final solution for the development will be reviewed in more detail as the design develops.

The review of a range of possible LZCGT options for the proposed development indicated that the ASHPs and solar PVs would likely be the most feasible technologies for installation on site to help the project achieve its own targets and align with national and local policy requirements.

5.0

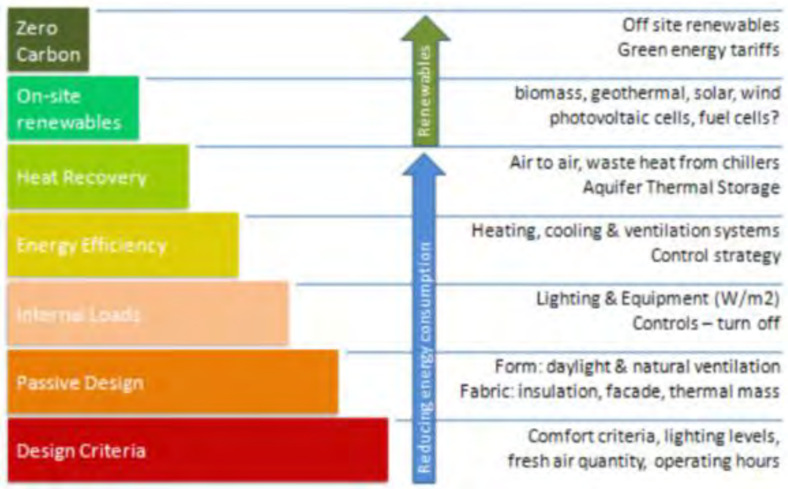
Conclusions

5.0 Conclusions

The energy strategy for the proposed Wester Hermiston Data Centre Campus in Edinburgh has been set out with a clear focus on sustainability, energy efficiency, through alignment with Scotland's NPF4 and Edinburgh City Plan 2030. The energy strategy outlines design considerations recommended for further exploration in subsequent project stages, with the aim of achieving compliance with Building Regulations Section 6 (Energy) and aligning with operational energy targets appropriate for this building type, as defined by the emerging UK NZCBS.

Through the application of Cundall's 'Steps to Net Zero Carbon' methodology, the energy strategy aligns directly with the industry-recognised Energy Hierarchy of 'Be Lean', 'Be Clean', and 'Be Green'.

Steps to Net Zero Carbon



Reducing demand for energy (Be Lean)

- **High thermal efficiency across the building envelope and solar gain control**

Low U-values, low air permeability, and appropriate glazing areas and specifications will limit unwanted heat losses and gains due to the fabric. This 'fabric first' approach ensures energy demand is minimised prior to the application of any heating and cooling systems.

- **High efficiency heating and cooling systems**

The admin/office areas will be served via Air Source Heat Pumps (ASHPs), while free-cooling air-cooled chillers with variable speed compressors will be specified for the data hall areas.

- **Mechanical ventilation with Heat Recovery**

High efficiency Air Handling Units (AHUS) will be utilised to provide fresh air in the admin/office areas.

- **High efficiency lighting**

High efficacy LED luminaires, in combination with daylight and occupancy dimming will be utilised (where appropriate) to ensure lighting energy is kept to a minimum across the site.

Energy efficient systems (Be Clean)

- **District heating network**

The potential for the proposed development to export recovered waste heat from the data halls (that would otherwise be rejected) to a future district heating network (once available) has been investigated and will be further explored in subsequent project stages.

Low and Zero Carbon Generating Technologies (Be Green)

- **Air Source Heat Pumps (ASHPs)**

ASHPs will be specified for meeting the space and cooling demand of the admin and office areas within the proposed buildings.

- **On-site renewable energy generation**

The potential for incorporating rooftop solar Photovoltaics (PVs) above the admin and office areas of the proposed buildings will be further explored in subsequent project stages. This technology is considered a viable option for meeting a portion of the development's electricity demand. The feasibility and size of solar PV installation will be assessed as the project progresses, with the aim of maximising generation in line with local policy requirements.

Overall, the proposed energy strategy positions the Wester Hermiston Data Centre Campus to achieve a best-practice operational energy performance, reductions in carbon emissions, and support future net zero carbon ambitions. The design provides allowance for integrating emerging low-carbon technologies, enabling the development to remain resilient and aligned with evolving sustainability standards over its operational life.

CUNDALL

Asia Australia Europe MENA UK and Ireland
www.cundall.com

ZERO CARBON DESIGN 2030