



Energy & Carbon Statement

Chaldicott Barns Northern Expansion Chaldicott Barns, Semley, Shaftesbury, SP7 9AW

Prepared for:
Thomas Wilde & Partners

Date:
September 2026

Project Issue Number:
SOL_26_S107_TWP

VERSION CONTROL RECORD			
Contract/Proposal Number:		SOL_26_S107_TWP	
Authors Name:		S.Bakry	
Signature:			
Issue	Description of Status	Date	Reviewer Initials
1	FIRST ISSUE	11 th September 2026	SVH
2	Project name updated	11 th September 2026	SVH
3	Clients Comments & updated Plan and GIA	21 st September 2026	SVH
4	Updated Site Plan – Rev K	22 nd September 2026	SVH
5	Project Description update	28 th September 2026	SVH

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1. EXECUTIVE SUMMARY

Sol Environment Ltd ('Sol' hereafter) were engaged by Thomas Wilde & Partners (TWP) on behalf of the applicant Chaldicotts Ltd ('the Applicant' hereafter) to undertake an assessment of energy use and produce an energy strategy for the proposed new industrial unit with associated car parking, access, and landscaping on the existing Industrial Estate at Chaldicott Barns, Semley, Shaftesbury.

This report has been prepared by Sol Environment Ltd in cooperation with the applicant and in accordance with the following policies and guidance:

- National Planning Policy Framework (Published August 2026)
- Building Regulations Part L 2021 (Adopted 2022)
- Wiltshire Core Strategy (Adopted January 2015)

1.1 Energy Strategy Summary

The energy assessment and subsequent strategy has been prepared such that it is aligned with the Energy Hierarchy, with particular focus on sustainable building design (reduction of energy consumption at source), provision of energy efficiency measures, and the installation of building-integrated low and zero carbon (LZC) technologies.

Table 1.1: Proposed Building Design Values

Building Fabric Performance Values		Building Services & Renewable/LZC Technologies	
Walls – Storage Area	0.23 W/m ² K	Heating/Cooling	Air Source Heat Pump System (435% Efficiency)
Walls – Testing Area	0.20 W/m ² K		
Roof	0.16 W/m ² K	Lighting	100% LED (100lm/W)
Floor	0.15 W/m ² K	Hot Water	Instantaneous Electric DHW (100% efficiency)
Glazing	-	Building Management	BMS with automated controls and monitoring
Doors	1.4 W/m ² K	Renewable/LZC Technology	300kWp integrated PV array
Vehicle Access Doors	1.3 W/m ² K		
Air Permeability	5m ³ /(hr.m ²)		

The conclusion of the energy strategy is that, based on planning stage calculations and implementation of the Energy Hierarchy, the proposed development achieves a reduction in CO₂ emissions when compared with a Building Regulations Part L (2021) compliant development, hence meeting the requirements of Policy 41 of the Wiltshire Core Strategy. Compliance with Policy 41 also requires all proposals demonstrate the achievement of a BREEAM 'Excellent' rating. To achieve this, a significant saving beyond the Building Regulations Part L Target Emission Rate and Target Primary Energy Rate must be demonstrated, which has been determined following an energy modelling exercise.

A summary of the savings in energy and CO₂ emissions based on the energy modelling outcomes is detailed in the table below.

Table 1.2: Energy Assessment Results

Scenario	Energy Demand (kWh/year)	Energy saving achieved (%)	Regulated CO ₂ Emissions (kgCO ₂ /year)	Saving achieved in CO ₂ emissions (%)
2021 Part L Compliant Benchmark Building	387,817	-	36,197	-
Be Lean (improved building fabric and M&E services)	371,730	4%	34,037	6%
Be Clean	371,730	-	34,037	-
Be Green (300kWp PV array)	115,221	69%	11,768	65%
Total Savings in Energy and Emissions	272,597	70%	24,429	67%

2. INTRODUCTION

2.1 Background

Sol Environment Ltd ('Sol' hereafter) were engaged by Thomas Wilde & Partners (TWP) on behalf of the applicant Chaldicotts Ltd ('the Applicant' hereafter) to undertake an assessment of energy use and produce an energy strategy for the proposed new industrial unit with associated car parking, access, and landscaping on the existing Industrial Estate at Chaldicott Barns, Semley, Shaftesbury.

This Energy & Carbon Statement has been formulated to provide a sustainable energy solution for the proposed development in support of a full planning application, and to detail recommendations to improve energy efficiency and reduce carbon emissions.

Proprietary energy demand calculations for the proposed development have been undertaken by Sol Environment using approved SBEM modelling software. Part L of the current Building Regulations (2021) has been used as the minimum benchmark standard for this assessment in terms of Primary energy use and regulated carbon emissions associated with heating, lighting, and ventilation.

2.2 Proposed Development

The proposed development comprises the erection of a building amounting to 7,448m² GIA (Use Class B2) with associated facilities, access with security, parking, hard and soft landscaping, drainage and associated works.

A schedule of the overall site information is provided in Table 2.1 below.

Table 2.1: Proposed development

Building Use Type	Number of Units	Gross Floor Building Area (m ²)
Use Class B2	1	7,448
Total	1	7,448

A site plan showing the proposed development is provided overleaf.

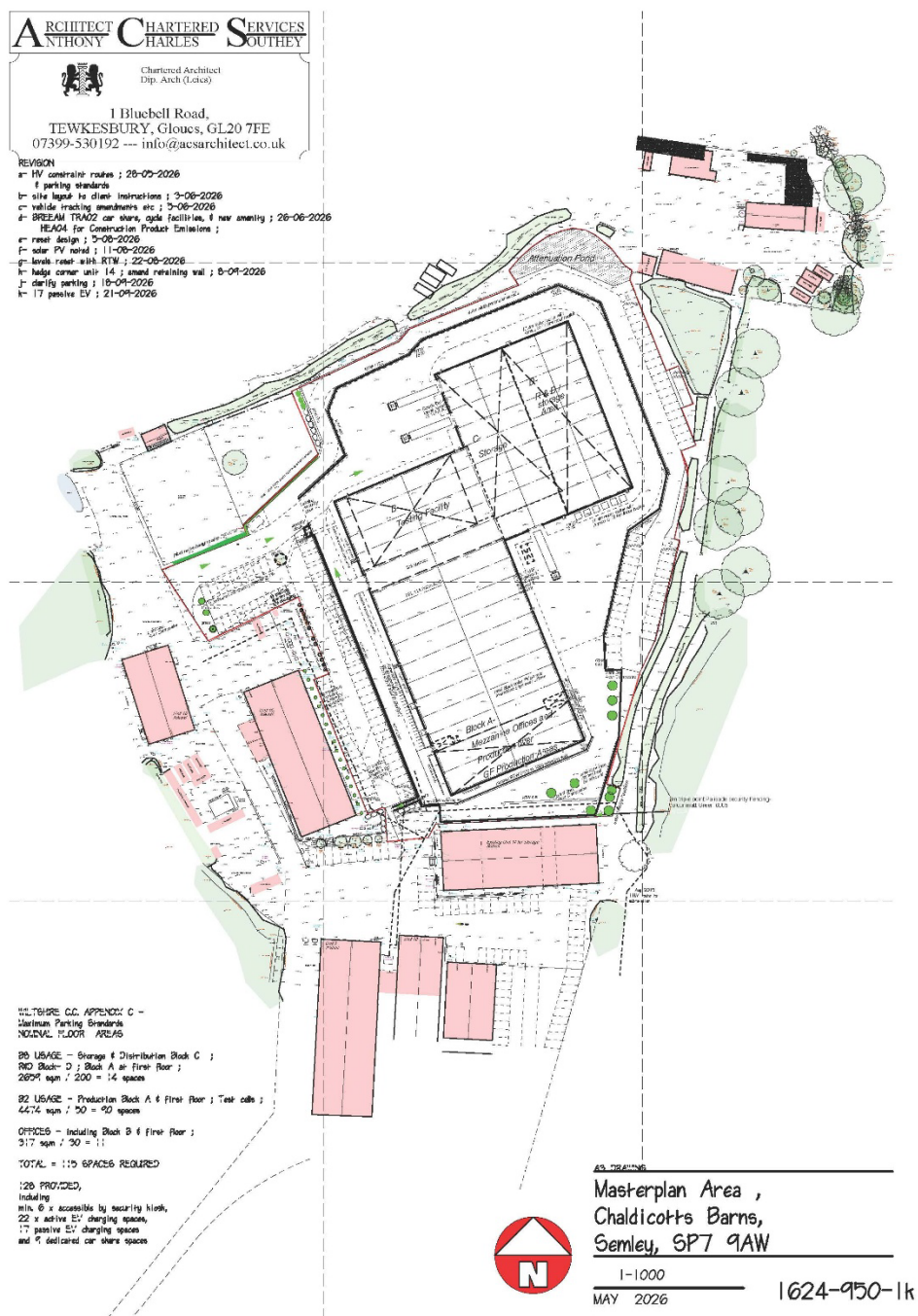


Fig 2.1: Proposed Site Plan prepared by Anthony Charles Southey

3. POLICY

This energy statement has been prepared for the development to show how the proposed scheme is compliant with the current relevant national and local policies and guidance as detailed within this section. Where relevant, these policies have informed the Energy & Carbon Statement and subsequent strategy.

3.1 National Policy

The following policies at a national level are considered to be relevant to the development.

3.1.1 National Planning Policy Framework (Published August 2026)

The National Planning Policy Framework ('NPPF') sets out the Government's planning policies for England and how they are expected to be applied. It sets out a framework that aims to achieve sustainable development throughout the planning system with three overarching objectives – economic, social and environmental.

Chapter 4 of the NPPF requires Local Authorities, as part of any plan-making or decision-making, to adhere to policies with the objective of meeting development needs through sustainable patterns of development.

At the heart of the NPPF is a 'presumption in favour of sustainable development', which requires Local Authorities to apply the presumption when making decisions regarding development proposals.

The NPPF sets out how to deliver sustainable development under 20 chapters. Chapter 5 of the NPPF outlines how the planning system should support the transition to net zero by 2050 and to shape places in ways which are more resilient to the effects of climate change. It does this by setting out policies to shape places in ways that contribute to radical reductions in greenhouse gas emissions and adapt to the full range of current and potential impacts of climate change, by minimising vulnerability and improving resilience.

3.1.2 Building Regulations Part L (2021)

Part L of the Building Regulations in England sets the standards for the energy performance of new and existing buildings and includes the specification of both minimum (benchmark) and notional (best practice) performance standards relating to building fabric, HVAC, and lighting.

The previous Building Regulations Part L (2013) was updated in July 2022 following the Future Building Standards consultation document published by the government in January 2021. This document set out the changes to regulations as a step towards the aim to deliver Zero Carbon ready buildings.

Local planning policies typically refer to Part L standards in order to set a minimum percentage improvement beyond the Part L benchmark in relation to carbon emissions. The recent changes to Part L require all new (non-residential) developments to produce around 27% less carbon emissions than was previously acceptable by Part L 2013 minimum standards. Additionally, a new metric must now be achieved related to Primary Energy Rate (TPER/BPER), measured in kWh/m²/year.

3.2 Local & Regional Policy

Local policies included in the Wiltshire Core Strategy (adopted January 2015)

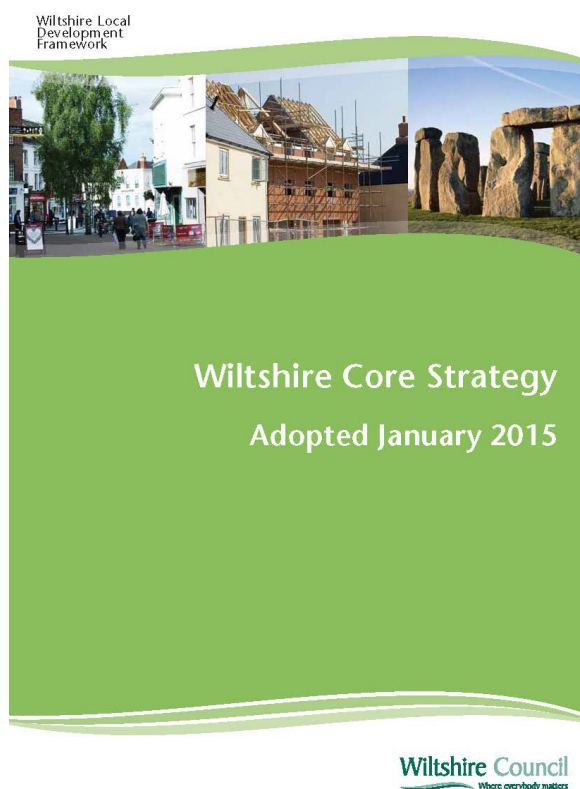


Fig 3.1: Local Plan Cover Sheet

3.2.1 Wiltshire Core Strategy (Adopted January 2015)

Core Policy 41: Sustainable Construction and low-carbon energy

Climate change adaptation

New development, building conversions, refurbishments and extensions will be encouraged to incorporate design measures to reduce energy demand. Development will be well insulated and designed to take advantage of natural light and heat from the sun and use natural air movement for ventilation, whilst maximising cooling in the summer.

Sustainable Construction

All non-residential development will be required to achieve the relevant BREEAM 'Very Good' Standards, rising to the relevant BREEAM 'Excellent' standards from 2019.

Renewable and low Carbon Energy

All proposals for major development will be required to submit a Sustainable Energy Strategy alongside the planning application outlining the low-carbon strategy for the proposal.

In all cases, including those listed above, proposals relating to historic buildings, listed buildings and buildings within conservation areas and world heritage sites should ensure that appropriate sensitive approaches and materials are used. Safeguarding of the significance of heritage assets should be in accordance with appropriate national policy and established best practice.

In all cases the impact of these requirements on the viability of development will be taken into consideration.

3.3 Policy Review

A summary of the policy drivers relevant to energy use and carbon emissions for the proposed development are as follows:

The current local plan stipulates that developments are encouraged to incorporate design measures to reduce energy demand. Development of renewable and low carbon energy generation will be encouraged and permitted, providing there are no significant adverse impacts upon residential and visual amenity, landscape character, designated heritage assets, and biodiversity.

Policy 41 stipulates the development achieve a BREEAM 'Excellent' rating. To achieve this, the building must achieve a minimum of 4 credits under the BREEAM Ene 01 assessment issue. Credits are achieved by demonstrating a calculated improvement in overall energy performance over a baseline building. This calculation factors in CO₂ emissions, primary energy consumption and building energy demand.

Building Regulations Part L guidance requires the development to meet a Target Emission Rate (TER) and Target Primary Energy Rate (TPER).

This report shall demonstrate compliance with the above energy policy requirements, where feasible. A separate BREEAM Pre-Assessment report will be submitted with the planning application to cover the relevant policy requirements.

4. METHODOLOGY

4.1 The Energy Hierarchy

The Energy Hierarchy adopts a set of principles to guide design development and decisions regarding energy, balanced with the need to optimise environmental and economic benefits. The Hierarchy, which is a widely accepted approach amongst many Local & County Councils, seeks to ensure that developments incorporate energy efficiency through the approach outlined in Figure 4.1.



Fig 4.1: The Energy Hierarchy

It is considered that the Energy Hierarchy principles for carbon reduction form the most appropriate approach from both a practical and financial perspective. The industry is broadly in agreement that energy efficiency and low carbon technologies have the greatest impact in offsetting CO₂ emissions. Therefore, it is logical to encourage enhanced mitigation through energy efficiency and low carbon technologies in the first instance, as opposed to applying renewables as a first option at a significantly greater cost.

4.1.1 Be Lean

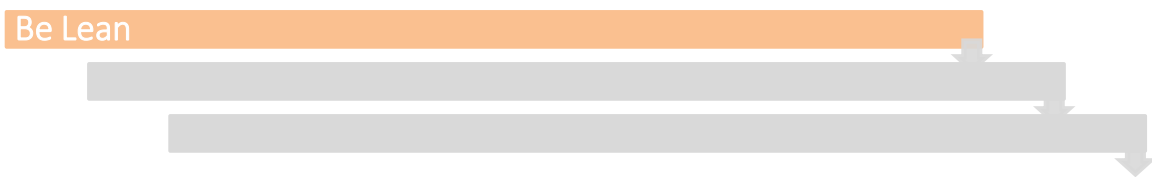


Fig 4.2: The Energy Hierarchy – Be Lean

The first measure within the Energy Hierarchy is aimed at using less energy and managing energy demand during operation through enhanced building fabric and services performance, and the incorporation of flexibility measures.

It is stated within Part L of the 2021 Building Regulations that *‘measures to make the building energy efficient must be incorporated within the scheme design’*. Typically, passive design and energy efficiency measures can ensure Building Regulations minimum standards are achieved in new build projects.

Passive design measures manage internal heating through solar gain and as such, reduce heating and cooling loads. Therefore, buildings that are aligned in a north-south orientation are observed to maximise daylight and sunlight (i.e., solar gain), subsequently reducing energy consumption associated with excessive heating and lighting requirements.

4.1.2 Be Clean



Fig 4.3: The Energy Hierarchy – Be Clean

The 'Be Clean' stage of the Energy Hierarchy is aimed at ensuring an efficient and clean source of heat and power is supplied to developments, which typically relates to local sources on a decentralised network. This supports a more effective and efficient use of energy by reducing primary energy demand and minimising the amount of energy that is ultimately wasted within the network.

Most commonly, this step of the Energy Hierarchy can be achieved through installation of Combined Heat and Power (CHP) units or connection to a Decentralised Energy Network (DEN). CHP generates both heat and power efficiently and can be supplied to individual buildings or a network. A DEN is a way of distributing the heat energy generated from a range of sources and offers an efficient and competitive solution for heating buildings in urban areas with high heat density, providing the added benefit of enabling the use of secondary energy or waste heat sources.

4.1.3 Be Green

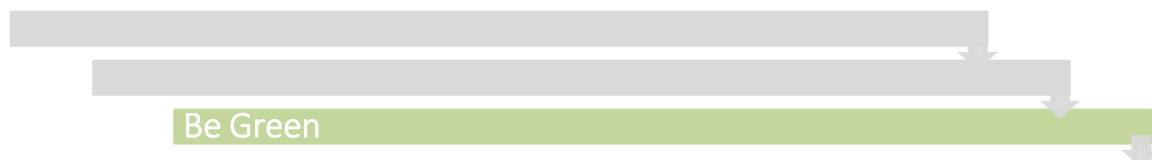


Fig 4.4: The Energy Hierarchy – Be Green

Once energy demand has been reduced as far as possible, the feasibility of on-site renewable energy generation should be considered. Priority should be given to renewable energy technologies with no polluting emissions i.e., electric heat pumps or Solar PV. Opportunities should be maximised for producing, storing, and using renewable energy on-site.

4.2 Energy Modelling

To determine compliance with policy requirements, a baseline modelling and assessment exercise was undertaken using DesignBuilder SBEM modelling software. Proprietary energy demand calculations were prepared using Building Regulations Part L (2021) to define the minimum benchmark standard for the assessment for regulated energy and associated CO₂ emissions (heating, lighting, and ventilation).

Upon calculation of a baseline, a remodelling exercise was then performed to account for the various stages of the Energy Hierarchy and subsequently demonstrate a reduction in energy use and CO₂ emissions for the proposed development.

As the calculations are based on assumptions, figures are indicative only, and changes may occur during detailed design. This includes, but is not limited to, building airtightness which will require verification through an air permeability test, the auxiliary load which may be significantly reduced when specification of items such as presence detection (PIR) sensors are finalised, and building services efficiencies and specifications.

4.3 BREEAM V7

BREEAM is the world's first and leading sustainability assessment and certification scheme for the built environment. It is an international standard that is locally adapted, operated and applied to developments. Through its application, BREEAM recognises and reflects the value in higher performing assets and aims to inspire and empower change by rewarding and motivating sustainability across the life cycle of master-planning projects, infrastructure and buildings.

The proposed development will be assessed under the BREEAM UK New Construction V7 scheme with a targeted rating of BREEAM 'Very Good'. In order to achieve this rating, the design team will be required to meet a number of credits across all 9 categories (Management, Health and Wellbeing, Energy, etc.). This report will outline features and measures that have been considered and implemented within the design in order to achieve credits under Ene 01, Ene 02 and Ene 04, under the Energy category as set out below.

4.3.1 ENE 01 – Energy and Carbon Performance for Regulated Energy Uses

The aim of this assessment issue is to minimise primary energy consumption and carbon emissions from regulated energy uses and to maximise the use of low carbon energy sources. The assessment criteria are split into two parts: Calculated Energy performance (Up to 9 credits), and Beyond Zero Net Regulated Carbon (Up to 3 exemplary credits). This energy statement will outline the number of credits achievable by the proposed development for this issue at design stage.

In order to determine the number of credits achievable by the development the Energy Performance Ratio (EPR) is calculated within BREEAM projects and compared with the BREEAM benchmarks for corresponding credits. The higher the EPR the more credits the development can achieve up to 9 credits.

4.3.2 ENE02 – Prediction of operational energy and carbon

The aim of this assessment issue is to encourage and reward the use of detailed energy modelling to explore the impact of occupancy and use patterns, encourage design choices that mitigate risks relating to underperformance in use and generate a realistic prediction of operational energy consumption and carbon emissions in use to facilitate comparison with benchmarks. The assessment criteria are split into two parts: Predictive Energy Modelling Process (Up to 5 credits) and Predicted Operational Energy Performance Score (Up to 7 credits). The Predictive Energy Modelling Process issue is split into a further three parts: Energy Strategy (1 credit), Predictive Energy Modelling (3 credits), and Risk Assessment and Mitigation (1 credit). This report shows compliance with the 1st credit under the Predictive Energy Modelling Process criteria 'Energy Strategy'. Additional credits under Predictive Energy Modelling Process criteria will require TM54 Operational Energy Modelling to be undertaken during the detailed design stage.

In order to achieve the Energy Strategy credit, an energy strategy for the building must be defined during concept design stage that describes qualitatively how the operational energy and carbon performance of the building will be minimised. This report defines an Energy Strategy for the development, outlining both the fabric performance

specification and energy servicing strategy following the Energy Hierarchy principles, and describes both qualitatively and quantitatively the reduction in operational energy and carbon emissions achieved beyond the Building Regulations Part L Compliant Benchmark building, attributed to each stage of the hierarchy. This report has been developed in support of the planning application and therefore lies within RIBA Stage 2 (Concept Design Stage).

4.3.3 ENE04 - Low Carbon Design

This issue aims to encourage the adoption of design measures which reduce building energy demand and encourage the installation of local low and zero carbon energy generation technologies to reduce carbon emissions. The assessment criteria are split into three parts: Building Form Optimisation (1 credit), Fabric Performance Optimisation (Up to 2 credits) and Low and Zero Carbon Energy Generation Technologies (Up to 2 credits). Section 5 of this report will highlight features and measures used within the development which demonstrate compliance with the criteria.

In order to achieve the Building Form Optimisation credit, analysis of the development must be undertaken during concept design stage, using appropriate early design stage energy modelling tools or calculation methods, to explore the effect of building form on energy demand and identify opportunities for implementation within the design. This report includes a Building Form Optimisation Analysis, and has been developed in support of the planning application, and therefore lies within RIBA Stage 2 (Concept Design Stage). Building Form Optimisation measures implemented within the development must lead to a reduction in in-use building energy consumption of the development. The analysis must be specific to the site location, weather and microclimate and should take account of the expected building occupancy. As a minimum, the Building Form Optimisation analysis should consider alternative design options that consider each of the following factors:

1. Building layout
2. Building orientation
3. Building form
4. Daylighting strategy
5. Ventilation strategy

Up to a further two credits are achievable where a Fabric Performance Optimisation analysis is conducted to explore the impact of alternative fabric specifications on the building's demand for heating and cooling. In order to determine the number of credits achievable by the development, fabric performance measures must be implemented to result in a reduction in overall building heating and cooling energy demand by $\geq 5\%$ (one credit) or $\geq 10\%$ (two credits) when compared to minimum values set by building regulations. Alternatively, two credits can be achieved where it is demonstrated that the fabric specification has minimised the demand for heating and cooling, and a change in the value of any of the fabric parameters in either direction would lead to an increase in the total heating and cooling demand. This report will quantify the savings in heating and cooling energy demand achieved by the implementation of fabric performance measures, over a building with Part L limiting values.

The Low and Zero Carbon technologies (LZC) credit can be achieved where one or more eligible LZC energy generation technologies have been installed by competent installers, and the energy generated by these meets the following targets:

- a) Where photovoltaic (PV) panels are the only LZC energy generation technology installed, the electricity generated must either; be equal to, or exceed, that generated by reference PV panels covering 50% of the ground floor area, or account for $\geq 60\%$ of the building's annual electricity consumption.
- b) Where only LZC energy generation technologies other than PV panels are installed, the energy generated must either; be equal to, or exceed, 137 kWh/year/m² of ground floor area, or meet $\geq 60\%$ of the building's annual demand for the relevant energy source.
- c) Where the installed LZC energy generation technologies include both PV panels and other LZC energy generation technologies, selected generation targets as above should be used in conjunction scaled proportionally to the amount of electricity generated by each technology.

This report includes an LZC Feasibility Study which should influence the chosen LZC technologies strategy for the development and quantifies their estimated electricity generation.

4.3.4 Summary of BREEAM Energy credits

Table 4.1 below outlines the BREEAM Energy credits covered within this report.

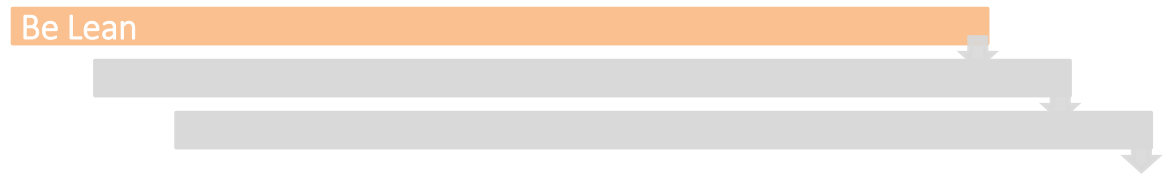
Table 4.1: BREEAM credits

BREEAM Credit	Sub Credit	Credits Available	Credits Achieved
Ene 01: Energy and carbon performance for regulated energy uses	Calculated Energy Performance	Up to 9 credits	9 credits
Ene 02: Prediction of operational energy and carbon	Energy Strategy	1 credit	1 credit
Ene 04: Low carbon design	Building Form Optimisation	1 credit	1 credit
	Fabric Performance Optimisation	Up to 2 credits	1 credit
	Low and Zero Carbon Energy Generation Technologies	Up to 2 credits	2 credits

5. RESULTS

5.1 The Energy Hierarchy

5.1.1 Be Lean



The measures in this section are prioritised to ensure that energy demand is reduced through enhanced building fabric and services performance, and the incorporation of flexibility measures.

In summary, the development will be designed to utilise a well-insulated and air tight building fabric, high efficiency internal lighting, limit excessive solar gains through massing and location of internal facilities, and use an Air Source Heat Pump system for heating & cooling to achieve a CO₂ emissions reduction of **6%**, therefore demonstrating compliance with Policy 41 of the Wiltshire Core Strategy as per the policy review in Section 3.3 of this report.

An integrated building management and monitoring system will be installed to ensure that operational energy data is readily available and building systems control is automated, aiming to eliminate the performance gap of the development and conserve energy use.

Table 5.1 below details the ‘Be Lean’ design strategies for the proposed development associated with this stage of the Energy Hierarchy

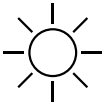
Table 5.1: Passive Design Measures and Energy Efficiency	
Site Features 	Site Location The site is located in Semley, a town in Wiltshire. Site Weather To ensure accuracy of energy modelling, the weather location file for <u>SWINDON</u> has been used in accordance with convention 2.04 SBEM Weather Locations of the ‘Non-Domestic Conventions for England & Wales Issue 7.1’ Microclimate There are no considerations with regards to microclimate (such as significant overshadowing or large waterbodies) that would prevent any passive design measures from being implemented.
Passive Design Principles 	Building Form Due to the type of facility being provided the building’s form is predetermined by the large steel structure. There is no glazing present in the development due to the high security nature of the development.

Table 5.1: Passive Design Measures and Energy Efficiency

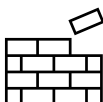
	Building Layout The layout of the building shall provide some minor benefits in relation to the solar orientation of internal facilities. Welfare spaces are located to the south of the building to maximise heat gains through the façade. Minimising Overshadowing Areas that do not require conditioning or mechanical heating shall be located to the north of the building. Therefore, maximising the utilisation of heat gains through the fabric to subsequently lower residual energy consumption. Building Orientation Where orientation provides favourable conditions and no physical restrictions are imposed by surrounding buildings, the building shall be orientated to maximise heat gains through building fabric.																										
Building Fabric 	Fabric Performance Consideration will be given to design the envelopes of the development to utilise materials that not only provide high insulation values, but also have high thermal mass. The Part L limiting fabric values and proposed fabric values for the new building are summarised below: U-Values –Building Fabric Elements <table><tr><th rowspan="2">Component</th><th colspan="2">U-Value (W/m²K)</th></tr><tr><th>Part L Limiting Value</th><th>Proposed Value</th></tr><tr><td>Walls</td><td>0.26</td><td>0.20 (testing area) 0.23 (storage area)</td></tr><tr><td>Roof</td><td>0.18</td><td>0.16</td></tr><tr><td>Floor</td><td>0.18</td><td>0.16</td></tr><tr><td>Doors</td><td>1.6</td><td>1.4</td></tr><tr><td>Windows</td><td>1.6</td><td>-</td></tr><tr><td>High Use Entrance Doors</td><td>1.6</td><td>1.3</td></tr><tr><td>Vehicle Access Doors</td><td>1.3</td><td>1.3</td></tr></table> Air Permeability The elements of the building shall be designed and constructed to achieve a maximum air permeability of 5m³/(hr.m²)*, which can be achieved through the following measures: • Adequate sealing between openings/windows and panels • Adequate sealing of ceiling-to-wall joints • Provision of a continuous air barrier over ceiling areas and adequate sealing of service ducts and penetrations • High specification openings	Component	U-Value (W/m²K)		Part L Limiting Value	Proposed Value	Walls	0.26	0.20 (testing area) 0.23 (storage area)	Roof	0.18	0.16	Floor	0.18	0.16	Doors	1.6	1.4	Windows	1.6	-	High Use Entrance Doors	1.6	1.3	Vehicle Access Doors	1.3	1.3
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Windows	1.6	-																									
High Use Entrance Doors	1.6	1.3																									
Vehicle Access Doors	1.3	1.3																									

Table 5.1: Passive Design Measures and Energy Efficiency

- Where a brick/block construction is specified, the application of wet plastering / parging / dry lining will be required.

**Part L limiting Air Permeability rate is 8m³/(hr.m²)*

Thermal Bridging

A thermal bridge (sometimes referred to as a cold bridge) is an area of construction which has higher heat transfer than the surrounding materials. It typically occurs where there is a break in insulation, less insulation or insulation is penetrated by an element or material with higher thermal conductivity (such as a metal cladding bracket). Where these thermal bridges occur, there is additional heat loss from the fabric resulting in increased heating requirements and, in some cases surface condensation. Careful and simplified construction details are required to ensure the junctions do not create unnecessary heat loss paths. Thermal bridges are potentially one of the main sources of unquantified thermal losses in low energy buildings.

Accredited construction details will therefore be followed in order to minimise the impact of thermal bridges.

Thermal Mass

High thermal mass can help to moderate indoor temperature fluctuations by absorbing heat during the day to release when temperatures drop. This works vice versa to absorb cold during the night to be released the next day to cool the internal space. The proposed development has minimal thermal mass, due to the prefabricated panel structure proposed.

Fabric Performance - Reduction in building energy demand

A fabric performance optimisation study has been undertaken to explore the impact of alternative fabric specifications on the building's demand for heating and cooling. Results are summarised below:

Fabric performance optimisation

Scenario	Heating and Cooling Energy Demand (MJ/m ²)	Saving achieved (%)
Benchmark building (Part L limiting U-values and airtightness of 8m ³ /(hr.m ²))	138.51	-
Proposed Building (improved U-values, airtightness of 5m ³ /(hr.m ²))	130.80	5.57%

Table 5.1: Passive Design Measures and Energy Efficiency

Building Use Characteristics 	Occupancy Intermittent-use building areas will conserve energy with PIR and occupancy sensing controls, linked to lighting systems. A building management system (BMS) shall be fitted and integrated with AMR energy display devices for the provision of half hourly energy consumption data. The BMS will also provide simple and automated control of building systems including lighting, heating, and ventilation, in order to minimise excessive energy use and reduce the performance gap.											
Daylight and Lighting 	Daylighting No windows to be provided within the development due to the high security nature of the proposed development. Solar Gain No windows to be provided within the development due to the high security nature of the proposed development. Internal Lighting Specifying highly efficient lighting systems throughout will reduce energy consumption at source and reduce the heat output from luminaires, which as a result will lower energy use associated with cooling systems. Lighting controls such as presence detection will limit unnecessary use and shall at least be provided in zones with intermittent use characteristics. Internal lighting for the new building shall achieve the initial luminous efficacy as detailed in the table below: Lighting Performance <table><tr><th rowspan="2">Lighting</th><th colspan="2">Luminous Efficacy (Lumens / Circuit Watt)</th></tr><tr><th>Part L Notional Value</th><th>Proposed Value</th></tr><tr><td>General</td><td>95</td><td>100</td></tr><tr><td>Display</td><td>80</td><td>80</td></tr></table>	Lighting	Luminous Efficacy (Lumens / Circuit Watt)		Part L Notional Value	Proposed Value	General	95	100	Display	80	80
Lighting	Luminous Efficacy (Lumens / Circuit Watt)											
	Part L Notional Value	Proposed Value										
General	95	100										
Display	80	80										
Ventilation 	Natural Ventilation Natural ventilation strategies tend to use significantly less energy than mechanical ventilation systems, however, due to the depth of the building’s footprint and building requirements for no windows, it is not possible to provide an effective and compliant natural ventilation solution and would compromise internal air quality and thermal comfort. Mechanical Ventilation											

Table 5.1: Passive Design Measures and Energy Efficiency

	To maintain good indoor air quality while supporting energy efficiency, mechanical ventilation systems will be specified in line with Part L 2021 requirements, using high efficiency fans and low specific fan powers. The development will benefit from a mechanical ventilation heat recovery (MVHR) system throughout the development. Where feasible, passive design principles such as zoning and thermal mass will support natural or hybrid ventilation.
Space Heating 	Heating System The development will be serviced by an Air Source Heat Pump (ASHP) system, selected for high efficiency characteristics and the use of electricity to deliver a lower carbon heat than fossil fuel alternatives. The ASHP will feed an air distribution heating system, offering improved thermal comfort through responsive air distribution systems. The system is specified with a COP of at least 4.35. Passive building design measures following the Energy Hierarchy, including good thermal insulation, exposed thermal mass, and airtightness, will ensure that heating demand is reduced.
Domestic Hot Water 	Domestic Hot Water Due to the low water demand of the development, point-of-use electric water heater with an efficiency of 100% has been selected. A system of this type is able to deliver hot water directly without suffering energy losses associated with centralised hot water storage or distribution pipework.
Cooling 	Cooling Hierarchy The cooling hierarchy guides the design process to ensure that cooling demand is addressed in the most energy-efficient way. The hierarchy prioritises passive and low-energy measures before resorting to mechanical or active systems, summarised as follows: • Minimise internal heat generation (i.e. reduce the demand for cooling) • Reduce the heat entering the building in summer • Manage heat within the building • Passive ventilation • Mechanical ventilation • Active cooling systems (including the use of FCU's / Comfort cooling) In accordance with this hierarchy, the proposed development incorporates several passive design features to reduce the need for active cooling: • A high thermal mass concrete floor slab is used to absorb and store excess internal heat during the day when the facility is occupied, helping to reduce cooling loads. • No glazing is specified, eliminating solar heat gains • Efficient LED lighting is specified to limit heat gains.

Table 5.1: Passive Design Measures and Energy Efficiency

	Cooling System Residual cooling demands are able to be met using the building's ASHP system. Cooling is also delivered via an air distribution cooling network, supporting thermal comfort in areas with high heat gains. The system operates with a high COP of at least 4.4, ensuring energy efficiency.
Adaptation to Climate Change >>>	Overheating Risk Heating and cooling to the building's internal spaces is zoned to allow for greater control and prevent unnecessary operation in underused areas of the building. Optimising Solar Gains No glazing is specified within the development, eliminating solar heat gains. Thermal Mass The building's design features blockwork walls used for internal wall build-ups to help moderate internal temperatures and provide an eliminant of thermal mass. Building Adaptability The building's services feature modular design and will be installed in an external plant compound, allowing systems to be easily upgraded in the future if required to respond to the needs of climate change. The building's cladding system on the external walls and roof is designed to support the building's heating and cooling systems to maintain indoor thermal comfort, and can be easily removed and adapted in the future if the building is altered for different uses. A PV array has been specified on the roof and is sized appropriately for the current needs of the development. This system has the potential to be upgraded in the future if necessary to benefit from technology improvements or higher building energy demand from higher cooling needs.

Following implementation of the strategy detailed in Table 5.1 above for the proposed new development, the carbon emission reduction associated with the first stage of the Energy Hierarchy is shown in the graphical representation provided in Figure 5.1 below:

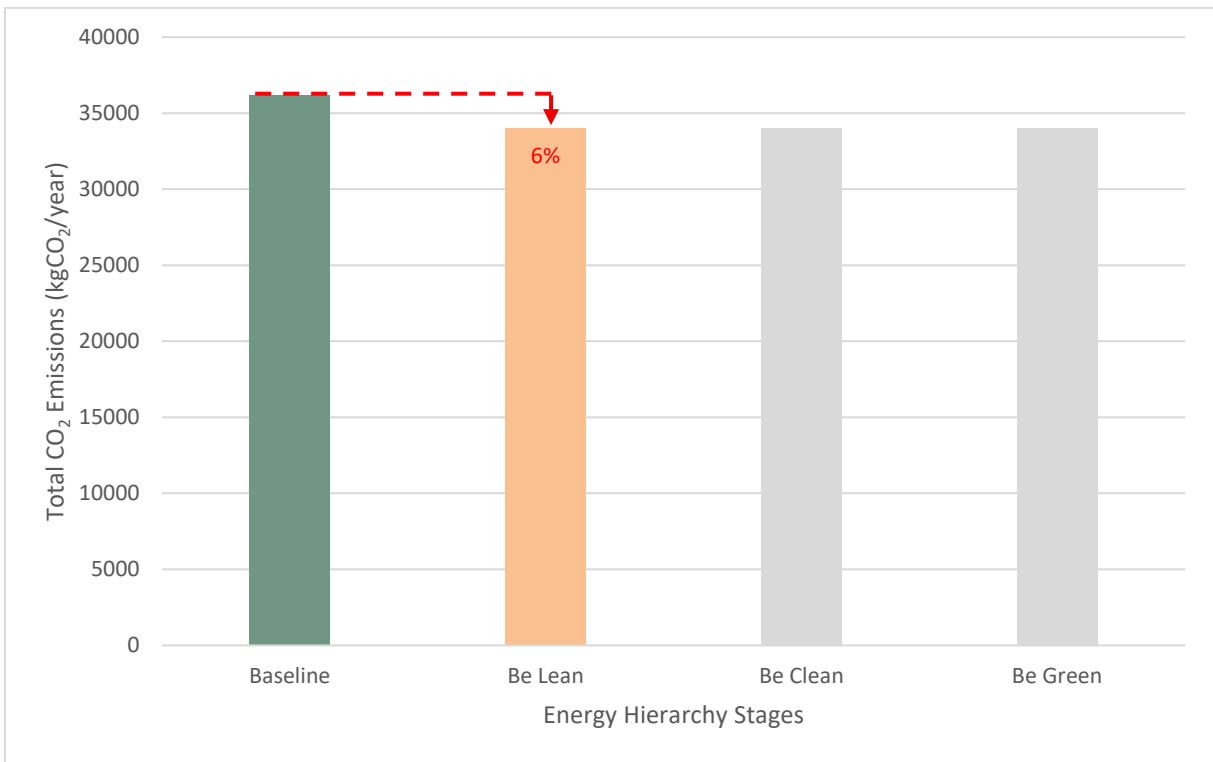


Fig 5.1: Be Lean CO₂ emissions reduction.

5.1.2 Be Clean



The feasibility of incorporating clean infrastructure and energy supply measures into the proposed development has been reviewed to determine if measures can be implemented to lead to potential savings in CO₂ emissions.

The results of the feasibility assessment are detailed in Table 5.2 below.

Table 5.2: Clean Energy Infrastructure Measures	
 Combined Heat and Power	Combined Heat and Power (CHP) comprises the combination of the generation of electricity for general consumption, with the recovery of exhaust heat energy (otherwise emitted from power stations/generators as waste heat) which can be used to provide heating for domestic and industrial processes. CHP plants are typically 75% - 80% efficient, significantly more than a typical oil/gas fired power station (35% - 45% efficient), even when used in combination with fossil fuels such as gas and diesel. In addition, transmission losses (typically 5% when consuming grid electricity) are minimised by on-site generation and, as such, gas-fired CHP presents an opportunity to deliver cleaner energy than is available from the National Grid.

Table 5.2: Clean Energy Infrastructure Measures

	Feasibility for this development The specification of CHP would lead to a reliance on non-renewable fuel sources as the site's limited footprint is unlikely to allow for suitable storage of biofuels. As such, CHP has been discounted from the assessment.
 Decentralised Energy Networks	Decentralised Energy Networks (DEN) are networks where energy is generated off the main grid, closer to the site of energy consumption. This can include energy from waste plants, combined heat and power, district heating and cooling, and geothermal, biomass, or solar energy. Feasibility for this development The latest heat network maps confirm there are not any decentralised energy networks in proximity to the site, nor are there any planned networks to support this application. Therefore, Decentralised Energy Networks are not a feasible source of clean energy for the development.

There are therefore no savings in carbon emissions attributable to this stage of the Energy Hierarchy, as detailed in Figure 5.2 below.

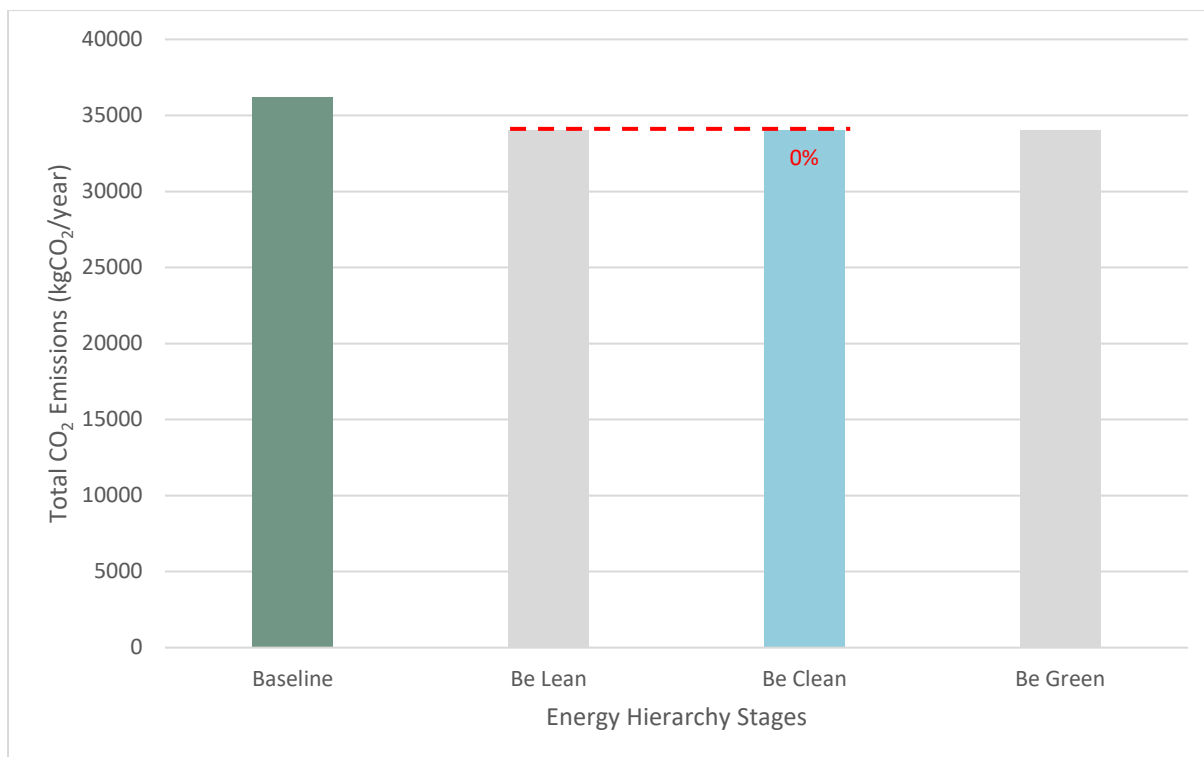
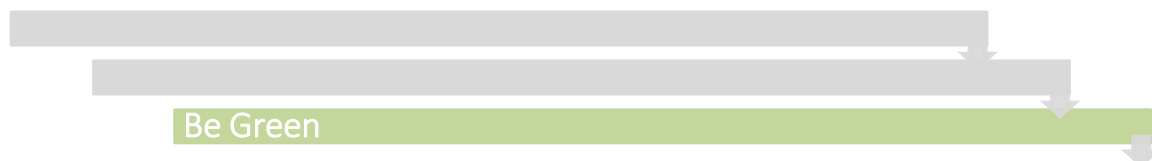


Fig 5.2: Be Clean CO₂ emissions reduction.

5.1.3 Be Green



A high-level feasibility study has been conducted to ascertain the viability of appropriate renewable and low zero carbon technologies based on the proposed development's energy demand, location, and features of the site including ground conditions and provision of space.

Table 5.3: Renewable and LZC Feasibility Study

 Solar Thermal Heating / Hot Water	Solar thermal panels are typically used in order to provide supplementary heat for the purposes of space heating or domestic hot water (DHW). These systems consist of solar collectors, a pump, a control unit, connecting pipes, hot water tank, and a conventional heat source (gas / oil fired boiler). The collectors are usually mounted on the roof and provide heat to a fluid circulated between the collectors and a water storage tank. The efficiency of solar collector panels depends on a number of factors, including the type of collector, correct installation, location, and orientation. Installing solar thermal heating panels could reduce energy consumption and carbon impacts through significant reductions in gas / oil supply. A well-designed system should satisfy 70-80% of the hot water demand in the summer and 20-30% in the winter. Typically, solar collectors would produce approximately 500-600kWh/(m² of solar thermal panel). Evacuated tube systems are about 30% more efficient but have a corresponding increased capital outlay. A collector area of 4-5m² will normally save approximately 230kg of CO₂ emissions per year. Feasibility for this development The provision of supplementary DHW heating via the installation of a solar thermal system is not considered suitable for this development due to the very limited domestic hot water requirement.
 Ground Source Heat Pumps	Ground Source Heat Pumps (GSHPs) operate by the removal of residual heat from the ground by using various 'loops' containing water and glycol fluid mix. Heat from the ground is absorbed into this fluid and is pumped through a heat exchanger in the heat pump. Low grade heat passes through a compressor and is concentrated into a higher temperature gas capable of heating water for DHW and central heating systems. There are a number of configurations for GSHP systems. A vertical collector system is considered to be the most appropriate in the context of the proposed development given the large scale of the system and limited area available for horizontal collectors. Vertical

Table 5.3: Renewable and LZC Feasibility Study

	collectors can be between 15 – 180m deep and minimum spacing between adjacent boreholes should be maintained at 5 – 15m to prevent thermal interference. The heat yielded from GSHPs is relatively small (collecting approximately 14 – 20Wth per metre of collector loop), therefore the adequacy of the accompanying heat exchanger is vital in ensuring greater heat transfer (although more efficient exchangers have a significantly larger capital cost). The performance of a GSHP system is entirely dependent on the appropriateness of the ground condition (i.e., depth of soil cover, the type of soil or rock, ground temperature, and thermal conductivity), which would be established subject to a ground survey. ‘Reversible’ heat pump systems are also available that give the potential for the provision of space cooling if required. Groundwater can also be used to cool buildings where a suitable source exists provided that abstraction and discharge permissions can be obtained from the Environment Agency and test bores are favourable. Feasibility for this development Installation of GSHPs as a supplementary heating system for the building is not considered to be feasible due to the significant amount of groundworks that would be required for this development.
 Air Source Heat Pumps	Air Source Heat Pumps (ASHPs) absorb heat from ambient air in order to provide heat for the purposes of space heating and domestic hot water. ASHPs work on a similar principle to a fridge, extracting heat from the inside. An evaporator coil mounted outside absorbs heat; a compressor unit then drives refrigerant through the heat pump and compresses it to the right level to suit the heat distribution system. A heat exchanger then transfers the heat from the refrigerant for use, which can be provided in two forms depending on the type of system: • Air to air – produces warm air which is circulated by a network of ducts and fans • Air to water – uses heat to warm water which is circulated as it would be in a conventional boiler system using heat emitters. Heat pumps heat water to a lower temperature than a standard boiler system, and are therefore better suited to underfloor systems than to radiator systems due to the greater surface area required to distribute the heat effectively. The efficiency of ASHPs is measured by a Coefficient of Performance (COP) i.e., the amount of heat produced compared to the amount of electricity needed for them to operate. ASHPs have a relatively low heat yield compared with traditional boilers, therefore buildings must be well insulated and draught-proofed to ensure that the heating system is effective. Due to the required electrical load of ASHPs, consideration must be given to the source of grid electricity when determining the potential carbon savings they can deliver. Therefore, the purchase of ‘cleaner’ grid electricity (i.e., renewable or CHP tariffs) results in increased carbon savings from ASHPs.

Table 5.3: Renewable and LZC Feasibility Study

	ASHPs are often a more popular and technically/financially viable alternative to GSHPs due to lack of requirement for extensive excavation, requiring far less space and an easier installation. Feasibility for this development An ASHP system is considered the most feasible and appropriate option for LZC technology within the proposed development. All space heating requirements are considered to be able to be met through the utilisation of an ASHP system.
 Refrigeration Heat Recovery	A Refrigeration Heat Recovery (RHR) scheme works in a similar way to Mechanical Ventilation Heat Recovery (MVHR) Systems by capturing heat normally rejected from the refrigeration units in order to provide heat for the purposes of space heating. The RHR scheme works by feeding into the heating flow and return pipework. During periods of low heating loads, the system can potentially meet the heating demand of the development. Feasibility for this development A RHR system is not considered feasible for the development, due to there not being any refrigeration units installed within the development.
 Biomass Boilers	Biomass boilers replace conventionally powered boilers with an almost carbon neutral fuel (such as wood pellets). Although many biomass burners will meet Clean Air Act requirements, combustion of woody biomass releases higher quantities of NOx compared to a comparable system fuelled by natural gas. As a consequence, many local authorities, particularly in urban areas have concerns about the potential impact on air quality that the widespread uptake of biomass boilers would have. When linked to a large-scale CHP unit, as opposed to being used for individual boilers, biomass is generally approved as a viable LZC technology. Feasibility for this development The use of biomass is not considered feasible due to both air quality issues and the significant storage and handling areas required for a biomass system to run smoothly. Based on the latest available data map, there are not currently any existing or proposed large scale CHP units within the vicinity of the proposed development site to provide further support for this application.

Table 5.3: Renewable and LZC Feasibility Study

 Photovoltaic Cells	Solar Photovoltaics (PVs) are solar panels which generate electricity through photon-to-electron energy transfer, which takes place in the dielectric materials that make up the cells. The cells comprise of layers of semi-conducting silicon material which, when illuminated by the sun, produces an electric field which generates an electrical current. PVs can generate electricity even on overcast days, as they require daylight rather than direct sunlight. This makes them viable even in the UK, although peak output is obtained at midday on a sunny summer's day. PVs offer a simple, proven solution to generating renewable electricity. Feasibility for this development Due to the large roof space available on the proposed development, it is considered suitable and feasible to install a integrated monocrystalline array, totalling 300kWp. This report will assume modest overshadowing on the PV panels to provide a conservative estimate of energy generation.
 Micro Wind Turbines	Large wind turbines are an established means of capturing wind energy and converting it into usable electricity. Wind turbines come in various sizes depending on the location and electrical load of a particular site. A wind turbine usually consists of a nacelle containing a generator connected, sometimes via a gearbox, to a rotor consisting of three blades. Feasibility for this development Wind turbines are likely to have a significant visual impact on the local environment, as well as health and safety implications for occupiers or site users on-site and on adjacent areas as a result of noise and shadow flicker. Local planning policy requires renewable technologies to be considerate of these impacts, and therefore wind turbines are not considered to be feasible.
 On-Site Battery Storage	Although not technically a form of renewable energy, supporting battery storage infrastructure on site could provide a financial saving on the energy bill as well as reducing the peak energy demand. The batteries will charge when the National Grid has surplus power and deliver the stored power back to the National Grid at times of peak demand. In addition to grid balancing, battery storage can also be coupled with renewable energy generation such as wind or solar PV to store the energy generated when the sun is shining, or wind is blowing and allow the energy to be available for use when it is needed, 24hrs a day all year round. Battery storage is most beneficial when the development has uses at times when the grid's demand and renewable energy availability are both low. Feasibility for this development On site battery storage is considered a viable option for the proposed development due to the large integrated PV array proposed.

Table 5.3: Renewable and LZC Feasibility Study	
	Surplus energy generated throughout the day can then be stored in the batteries to be used overnight when the facility is running but no renewable energy is being generated.

5.1.4 Feasibility Assessment Summary (Be Green)

Following the high-level feasibility study on ‘Be Green and Be Clean’ measures from the Energy Hierarchy scheme, it can be seen that the proposed development can benefit from the use of a 300kWp Solar PV array.

Through implementation of the above LZC and renewable technologies, an estimated carbon equivalent emission saving of approximately 22.3 tonnes per annum is achievable, as demonstrated in Figure 5.3 below.

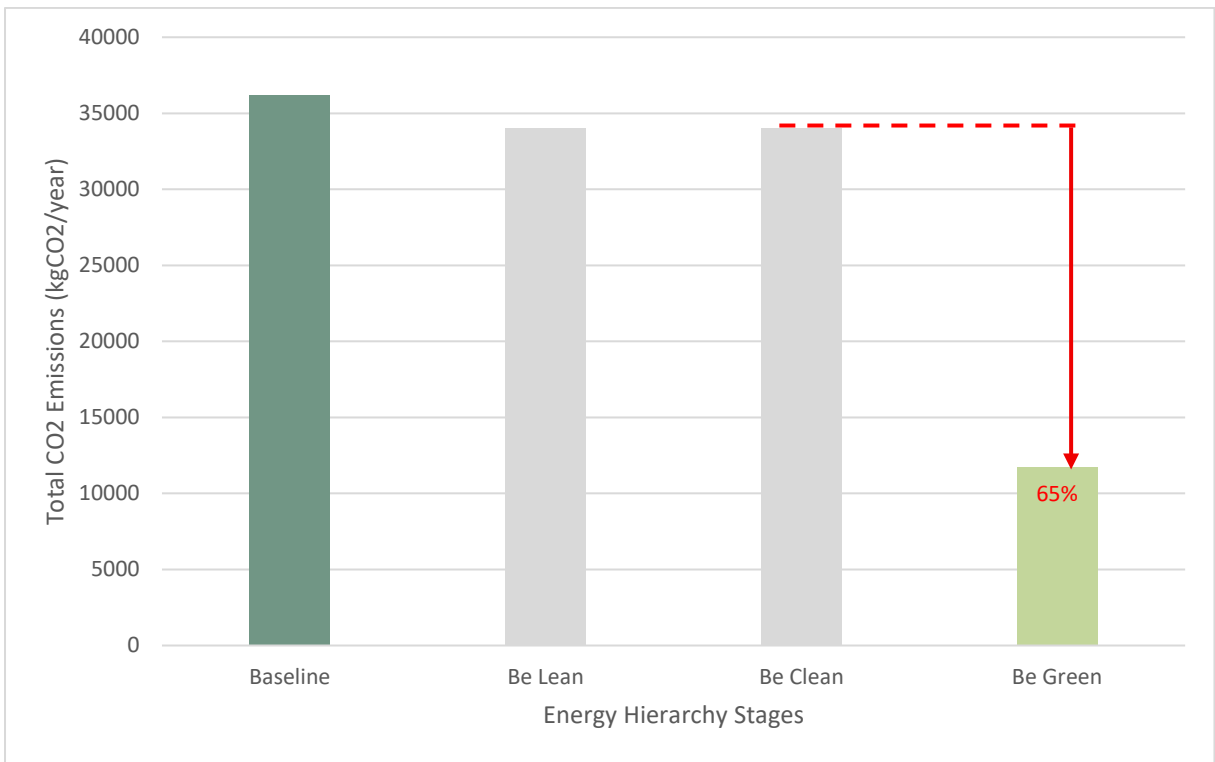


Fig 5.3: Be Green CO₂ emissions reduction.

5.2 Modelling Results

The conclusion of the energy strategy is that, based on planning stage calculations and implementation of the Energy Hierarchy, the proposed development achieves a reduction in CO₂ emissions when compared with a Building Regulations Part L (2021) compliant development, hence meeting the requirements of Policy 41 of the Wiltshire Core Strategy. Compliance with Policy 41 also requires all proposals to demonstrate the achievement of a BREEAM ‘Excellent’ rating. To achieve this, a significant saving beyond the Building Regulations Part L Target Emission Rate and Target Primary Energy Rate must be demonstrated, which has been determined following an energy modelling exercise.

A breakdown of the results of the Energy Assessment in accordance with the Energy Hierarchy is provided in Table 5.4 below.

Table 5.4: Energy Assessment Results

Scenario	Energy Demand (kWh/year)	Energy saving achieved (%)	Regulated CO ₂ Emissions (kgCO ₂ /year)	Saving achieved in CO ₂ emissions (%)
2021 Part L Compliant Benchmark Building	387,817	-	36,197	-
Be Lean (improved building fabric and M&E services)	371,730	4%	34,037	6%
Be Clean	371,730	-	34,037	-
Be Green (300kWp PV array)	115,221	69%	11,768	65%
Total Savings in Energy and Emissions	272,597	70%	24,429	67%

The savings in CO₂ emissions across all stages of the Energy Hierarchy are demonstrated in figure 5.4 below.

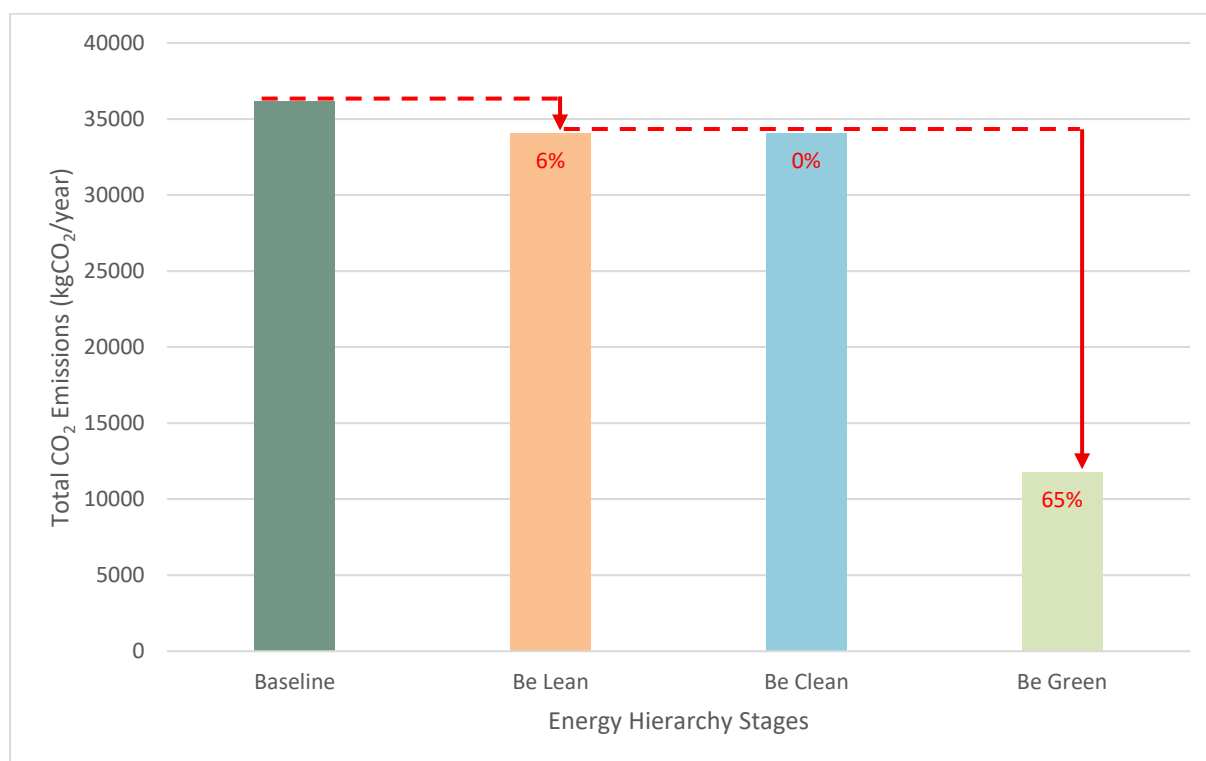


Fig 5.4: Energy Strategy CO₂ emissions reduction.

6. CONCLUSION

In conclusion, the proposed development will utilise sustainable design measures in accordance with the Energy Hierarchy to reduce energy consumption and CO₂ emissions. The proposed development has achieved a total predicted energy consumption saving of 272,597kWh/year and a predicted CO₂ emissions reduction of 24,429kgCO₂/year when compared to a Building Regulations Part L 2021 compliant development.

The CO₂ emissions saving, representing 67% over the Building Regulations Part L 2021 compliant development, has been achieved through the implementation of a well-insulated and airtight building fabric, high efficiency M&E systems, and the specification of renewable technologies (300kWp PV). The savings demonstrated are in accordance with Policy 41 of the Wiltshire Core Strategy, requiring the development to minimise energy demand.

6.1 BREEAM Compliance

Table 6.1 provides a summary of credits achieved by the development based on the Energy credits covered in this report, as outlined in Section 4.3. Full details on how each criterion has been achieved by the development is outlined in Appendix A.

Table 6.1: BREEAM Energy credits achieved

BREEAM Credit	Sub Credit	Credits Available	Credits Achieved
Ene 01: Energy and carbon performance for regulated energy uses	Calculated Energy Performance	Up to 9 credits	9 credits
Ene 02: Prediction of operational energy and carbon	Energy Strategy	1 credit	1 credit
Ene 04: Low carbon design	Building Form Optimisation	1 credit	1 credit
	Fabric Performance Optimisation	Up to 2 credits	1 credit
	Low and Zero Carbon Energy Generation Technologies	Up to 2 credits	2 credits

APPENDIX A: BREEAM Credits

Ene 01 - Calculated Energy Performance

An EPR_{NC} of 0.965 has been determined for this development based on the SBEM outputs, indicating 9 credits can be achieved, providing the outlined energy strategy is implemented within the as-built development.

Energy modelling has been carried out by Sol Environment, who, as a company, meet the BRE definition of an accredited energy assessor. DesignBuilder SBEM software has been used; to determine the savings, which is an approved building energy calculation software.

A summary is provided in Table A.1 below:

Table A.1: Ene 01 - Calculated Energy Performance Compliance		
Criterion 1: EPR_{NC} calculated based on BRUKL or .inp file upload to the BREEAM Platform.	Y	EPR_{NC} of 0.965 equivalent to 9 BREEAM credits.
<i>Energy Modelling Methodology</i>		
Energy modelling carried out using approved building energy calculation software		DesignBuilder SBEM
Energy modelling undertaken by a suitably qualified member of the design team?		Sol Environment has carried out all energy modelling and as a company: - Have over four years' experience in undertaking assessments and designs of low and zero carbon solutions in the commercial buildings sector and has undertaken formal training in <i>DesignBuilder</i> software. - Is a registered CIBSE Low Carbon Consultant (certification no. 206892) and non-domestic energy assessor.

Ene 02 – Energy Strategy

This report has defined an Energy Strategy for the building within Section 5.1 which outlines the fabric performance specification and the energy servicing strategies for the building and describes how these will contribute to reducing operational energy consumption in use. The energy strategy also includes a feasibility study for the use of local low and zero carbon technologies, and recommends technologies for implementation.

The proposed development has achieved a total predicted energy consumption saving of 272,597kWh/year and a predicted CO₂ emissions reduction of 24,429kgCO₂/year when compared to a Building Regulations Part L 2021 compliant development.

Therefore, 1 credit can be achieved under Ene 02 (Energy Strategy). A summary is provided in Table A.2 below:

Table A.2: Ene 02 – Energy Strategy

Criterion 1: An energy strategy has been defined for the building at the concept design stage and describes qualitatively how the operational energy and carbon performance of the building will be minimised?	Y	Section 5.1 within this report includes a passive design analysis, and clean infrastructure and renewable and LZC Feasibility Studies which define the building's energy strategy. The report has been completed prior to the end of RIBA Stage 2.
<i>Energy Strategy Methodology</i>		
<i>Fabric performance specification and the energy servicing strategies</i>		Section 5.1.1 defines a fabric performance specification for the building, including U-values and an air permeability target. Measures are defined to achieve the air permeability target, reduce thermal bridging, and to maximise the thermal benefits created by the proposed exposed thermal mass. Section 5.1.1 also defines the lighting, ventilation, space heating and cooling, and domestic hot water servicing strategy for the building.
<i>Describes how the strategy minimises the operational energy and carbon performance of the building in-use?</i>		Section 5.1 describes qualitatively how the operational energy and carbon performance of the building will be minimised. In summary, the regulated energy consumption of the building will be minimised through the introduction of enhanced building fabric and services performance, and the incorporation of flexibility measures. The development will be designed to utilise a well-insulated and airtight building fabric to reduce unwanted heat transfer via fabric. High-efficient internal lighting and efficient servicing equipment is proposed which will reduce the additional heat produced by services. The building will limit excessive solar gains through massing and location of internal facilities. A 300kWp PV array is proposed to reduce grid electricity reliance and reduce carbon emissions. In addition to the content of Section 5.1, unregulated energy is recommended to be reduced by specifying efficient small power equipment and implementing appropriate management and regular maintenance routines.
<i>LZC considered and specified, where feasible</i>		A renewable and LZC Feasibility Study is included within Section 5.1.3 of this report. A 300kWp PV array is proposed.
<i>Energy related performance targets set</i>		The following Building Regulations Part L targets have been set based on the planning stage modelling: Target CO ₂ Emission Rate (TER) – 4.86 kgCO ₂ /m ² .year Target Primary Energy Rate (TPER) – 52.07 kWh _{PE} /m ² .year

Ene04 - Building Form Optimisation

This report has included a passive design analysis in Section 5.1 to summarise measures appropriate to the development that can be used to reduce energy demand for space heating, space cooling, ventilation and lighting. This section of the report was informed by correspondence with the design team during concept design stage. As part of the consultation with the design team, a discussion around building form optimisation was held to review their process, calculation methods, and outcomes of the analysis that has influenced the building form to reduce energy demand for space heating, space cooling, ventilation, and lighting.

A summary of the outcomes provided by the design team and other key information to address the requirements of the criteria, demonstrating that 1 credit can be achieved under Ene 04 (Building Form Optimisation), is included in Table A.3 below:

Table A.3: Ene 04 - Building Form Optimisation Compliance		
Criterion 1: Building form optimisation analysis undertaken during concept design stage?	Y	The passive design analysis contained within this report includes a building form optimisation analysis, and has been completed prior to the end of RIBA Stage 2. The project team has also completed a building form optimisation process during early feasibility and concept design stages for the project.
Criterion 2: Has the building form analysis influenced the building form to reduce energy demand for space heating, space cooling, ventilation and lighting?	Y	As detailed below, it has been demonstrated that the building form optimisation has led to design choices that will lead to a reduction in building energy consumption in use, through reductions in heating, cooling, and ventilation energy loads.
<i>Building Form Optimisation Methodology</i>		
<i>BREEAM Building form optimisation analysis minimum points:</i>		Information provided by the project team is included below.
<i>Building Layout</i>		The welfare areas are shallow plan and kept to the perimeter of the building to give opportunities for heat gains through the building fabric, to reduce energy use from heating systems. These areas are also grouped together for efficiency of services distribution, which has freed up the large testing and assembly area without any perimeter interruptions.
<i>Building Orientation</i>		The wider site features existing buildings and access points, therefore providing some restrictions on the orientation of the development. The new building entrance must face the existing site entrance.

Table A.3: Ene 04 - Building Form Optimisation Compliance

	The layout of internal spaces has been planned around the orientation of the building to avoid any detrimental impacts to energy use.
<i>Building Form</i>	The building form is relatively regular, to suit the industrial metal portal frame structure. The Storage/Research and development unit are offset from the main production and testing unit to allow for external entrance doors into each separate unit.
<i>Daylighting Strategy</i>	Due to the high security nature of the development no windows are proposed for the development. Therefore a daylight strategy has not been developed for the proposed development. Artificial lighting will be used to simulate natural light within the development.
<i>Ventilation Strategy</i>	Due to the high security nature of the development, no windows are proposed, therefore the development must incorporate a mechanical ventilation system to provide adequate indoor air quality and building regulation compliance ventilation levels. A MVHR system has been proposed throughout the development, with extract only in WC areas.
<i>Has building form analysis been carried out by a suitably qualified member of the design team with experience in building form analysis?</i>	The building form analysis has been carried out by the lead sustainability consultant on the project, Samuel Hunt of Sol Environment, who has a more than three years' relevant experience designing and carrying out building form analysis.

Ene 04 – Fabric performance optimisation

This report has included a passive design analysis within Section 5.1 to establish fabric performance measures that will reduce the building's demand for heating and cooling. Based on the energy modelling results, an estimated 5.57% saving in the building's demand for heating and cooling is achievable providing the proposed fabric specification measures are installed.

Therefore, at this stage 1 credit can be achieved under Ene 04 (Fabric Performance Optimisation). This will be revisited at a later design stage to further explore where additional credits and fabric improvements can be achieved.

A summary is provided in Table A.4 below:

Table A.4: Ene 04 – Fabric Performance Optimisation Compliance

Criterion 3: Fabric performance optimisation analysis undertaken to explore the impact of alternative fabric specifications on the building's demand for heating and cooling?	Y	Section 5.1.1 contained within this report includes a building fabric optimisation analysis, and has been completed prior to the end of RIBA Stage 2.
Criterion 5 or 7: Fabric performance measures implemented which reduce the overall building heating and cooling energy demand by $\geq 5\%$ or $\geq 10\%$ compared to minimum values set by building regulations?	Y	Refer to Section 5.1.1 to see the fabric performance measures proposed. The overall building heating and cooling energy demand has been reduced by 5.57% when compared to minimum values set by building regulations. This figure exceeds the 5% saving required, therefore 1 credit is achievable. Refer to Section 5.1.1 to see detailed calculations. Fabric Performance will be revisited at a later stage in the development to further explore where additional credits and improved performance could be achieved.
Criterion 9: Demonstrate that the fabric specification has minimised the demand for heating and cooling.	N/A	Criterion 9 not assessed as Criterion 5 achieved .
<i>Fabric Performance Optimisation Methodology</i>		
<i>BREEAM Fabric performance optimisation analysis minimum points</i>		See Table 5.1. Passive design analysis covers: • Fabric insulation • Thermal mass to store heat or coolth • Airtightness • Solar gains
<i>Energy modelling carried out using tools that take account of heat transfer characteristics, solar gains and the effect of thermal mass and other types of fabric thermal storage on heating and cooling?</i>		DesignBuilder SBEM
<i>Building form analysis carried out by a suitably qualified member energy modelling engineer or accredited professional?</i>		Sol Environment has carried out all energy modelling and as a company: • Have over four years' experience in undertaking assessments and designs of low and zero carbon solutions in the commercial buildings sector and has undertaken formal training in <i>DesignBuilder</i> software.

Table A.4: Ene 04 – Fabric Performance Optimisation Compliance

	Is a registered CIBSE Low Carbon Consultant (certification no. 206892) and non-domestic energy assessor.
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Ene 04 - Low and Zero Carbon Energy Generation Technologies

A feasibility assessment to consider incorporating LZC and renewable technologies has been undertaken as per Section 5.1.3 of this report. The assessment recommends LZC energy generation technologies for installation. The table below quantifies the energy generation from these technologies, aligned with the methodology outlined in the BREEAM V7 manual.

The energy generated by the LZC technologies meets the targets outlined in the BREEAM V7 manual, and therefore, 2 credits can be achieved under Ene 04 (Low and Zero Carbon Energy Generation Technologies). A summary is provided in Table A.5 below:

Table A.5: Ene 04 – Eligible LZC Energy Generation Technologies Compliance

Criterion 10: One or more eligible LZC energy generation technologies will be installed	Y	300kWp PV array proposed
Criterion 12.a: Energy Generated from PV Energy Source meets the targets	Y	See Criterion 12.a.ii
Criterion 12.a.i: Be equal to, or exceed, that generated by reference PV panels covering 50% of the ground floor area.	N/A	Not Assessed, Criterion 12.a.ii achieved
Criterion 12.a.ii: PV Accounts for ≥ 60% of the building's annual electricity consumption.	Y	Annual Electricity Consumption: 33.36 kWh/m ² PV Electricity generation: 23.46kWh/m ² PV Accounts for 70.3%
<i>Has Building form analysis been carried out by a suitably qualified member of the design team with relevant experience in building energy modelling?</i>		Sol Environment has carried out all energy modelling and as a company: - Have over four years' experience in undertaking assessments and designs of low and zero carbon solutions in the commercial buildings sector and has undertaken formal training in <i>DesignBuilder</i> software. - Is a registered CIBSE Low Carbon Consultant (certification no. 206892) and non-domestic energy assessor.