Energy Statement

Ramada South Ruislip

Stroma Reference: OP-A817
Date: 19/12/2025
Prepared for: ROK Planning Limited

STROMA
BUILT ENVIRONMENT
A PHENNA GROUP COMPANY

1. Executive Summary

This Energy Statement has been produced on behalf of ROK Planning Limited to support the planning application for the proposed development on the existing Ramada site in South Ruislip. The proposals consist of a proposed extension to the existing Ramada hotel and 114no new build apartments split across 4no blocks.

In accordance with Building Regulations Approved Document Part L Volumes 1 and 2 (2021), predicted Carbon Dioxide (CO_2) emissions have been determined using Government approved SAP 10 and Design Builder SBEM software by trained and accredited Assessors. The London Borough of Hillingdon has sustainability targets in relation to CO_2 emissions for all developments. The Hillingdon Local Plan (Adopted November 2012) states that development proposals must meet or exceed London Plan targets.

This statement has been based upon the energy hierarchy outlined within The London Plan (2021). As part of this statement, a calculation of predicted energy consumption and associated Carbon Dioxide (CO_2) emissions has been undertaken. The resulting strategy incorporates a fabric first approach, communal ASHPs and Solar Photovoltaics (PV) to achieve the required percentage CO_2 savings.

1.1. Results Summary

	Carbon Dioxide Emissions for Residential Buildings (Tonnes CO_2 per annum)	
	Regulated	Unregulated
Baseline: Part L 2021 of the Building Regulations Compliant Development	103.7	130.8
After energy demand reduction (be lean)	92.7	130.8
After heat network connection (be clean)	92.7	130.8
After Renewable energy (be green)	33.1	130.8

Table 1. Domestic annual CO_2 emissions reduction summary.

	Regulated residential carbon dioxide savings	
	Tonnes CO_2 per annum	% Reduction
Be Lean: Savings from energy demand reduction	11.0	11%
Be Clean: Savings from heat network	0.0	0%
Be Green: Savings from renewable energy	59.6	57%
Cumulative on-site savings	**70.6**	**68%**
Annual savings from off-set payment	33.1	-

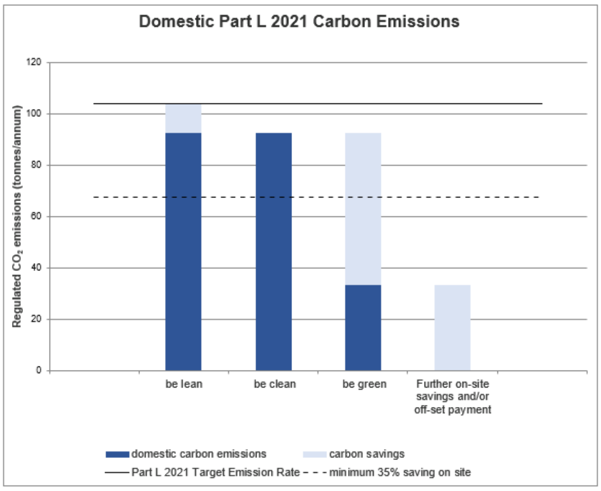
Table 2. Domestic annual CO_2 emissions saving.

	Carbon Dioxide Emissions for Non-Residential Buildings (Tonnes CO_2 per annum)	
	Regulated	**Unregulated**
Baseline: Part L 2021 of the Building Regulations Compliant Development	14.1	4.6
After energy demand reduction (be lean)	12.6	4.6
After heat network connection (be clean)	12.6	4.6
After Renewable energy (be green)	11.0	4.6

Table 3. Non-Domestic annual CO_2 emissions reduction summary.

	Regulated non-residential carbon dioxide savings	
	Tonnes CO_2 per annum	**% Reduction**
Be Lean: Savings from energy demand reduction	1.5	10%
Be Clean: Savings from heat network	0.0	0%
Be Green: Savings from renewable energy	1.6	11%
Cumulative on-site savings	**3.1**	**22%**
Annual savings from off-set payment	11.0	-

Table 4. Non-Domestic annual CO_2 emissions.



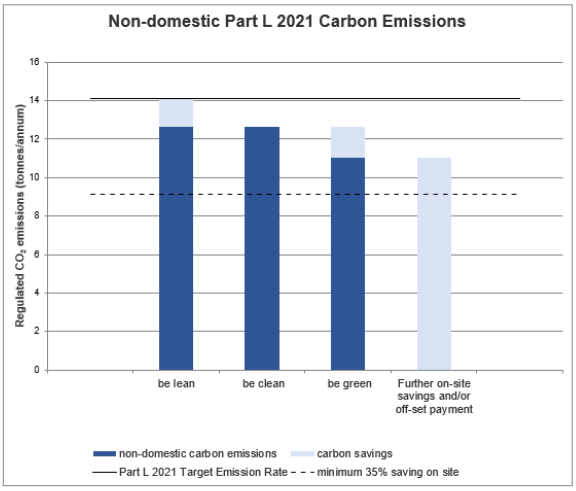


Figure 1. Graphical representation of CO_2 savings through the Energy Hierarchy.

Contents

2. Quality Management

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ES1	First Issue		-

3. Introduction

Stroma Built Environment has been commissioned by ROK Planning Limited to support the planning application for the proposed development on the existing Ramada site in South Ruislip

The proposed development is located within the London Borough of Hillingdon and will therefore need to meet the requirements of the Hillingdon Local Plan (Adopted November 2012), which outlines the sustainable design standards for this borough.

The London Plan (2021) will also need to be followed which stipulates that all major developments must achieve at least a 35% reduction against a Part L: 2021 compliant baseline. Policy SI 2 of The London Plan has been followed to show how this target can be achieved via the Mayor's Energy Hierarchy (Figure 2). This tiered approach addresses fabric performance first, before possible connection to existing heat networks, and then finally renewable energy technology.
The energy strategy for the proposed development is as follows:

1. Be Lean: Use less energy and manage demand during operation through fabric and servicing improvements and the incorporation of flexibility measures.
2. Be Clean: Exploit local energy resources (such as secondary heat) and supply energy efficiently and cleanly by connecting to district heating networks.
3. Be Green: Maximise opportunities for renewable energy by producing, storing and using renewable energy site.
4. Be Seen: Monitor, verify and report on energy performance through the Mayor's Post Construction Monitoring Platform.

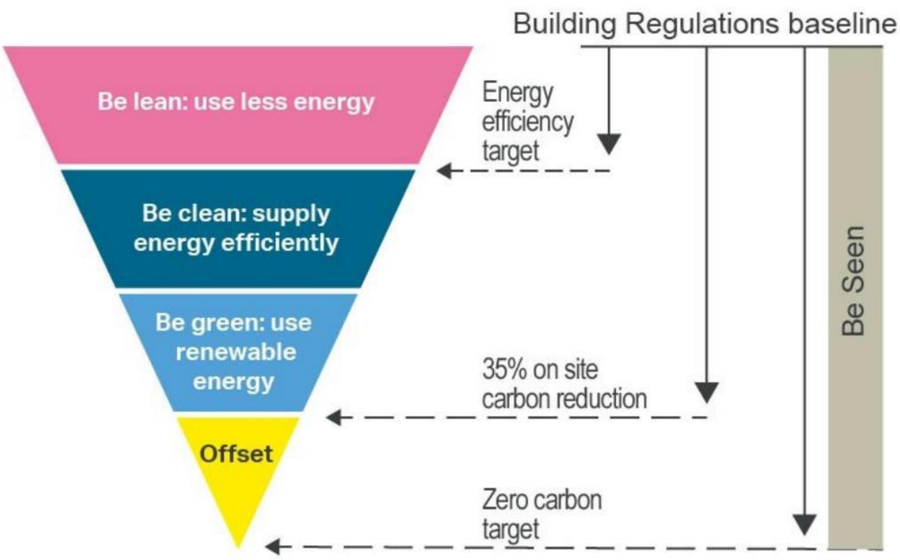

Figure 2. London Plan Energy Hierarchy

4. Development Site

The development site is based on the existing Ramada site on Long Drive, Station Approach, South Ruislip, HA4 0HG. The proposal consists of an extension to the existing Ramada hotel and 114no new build apartments split across 4no blocks with associated car and cycle parking, landscaping, highway works and associated infrastructure.

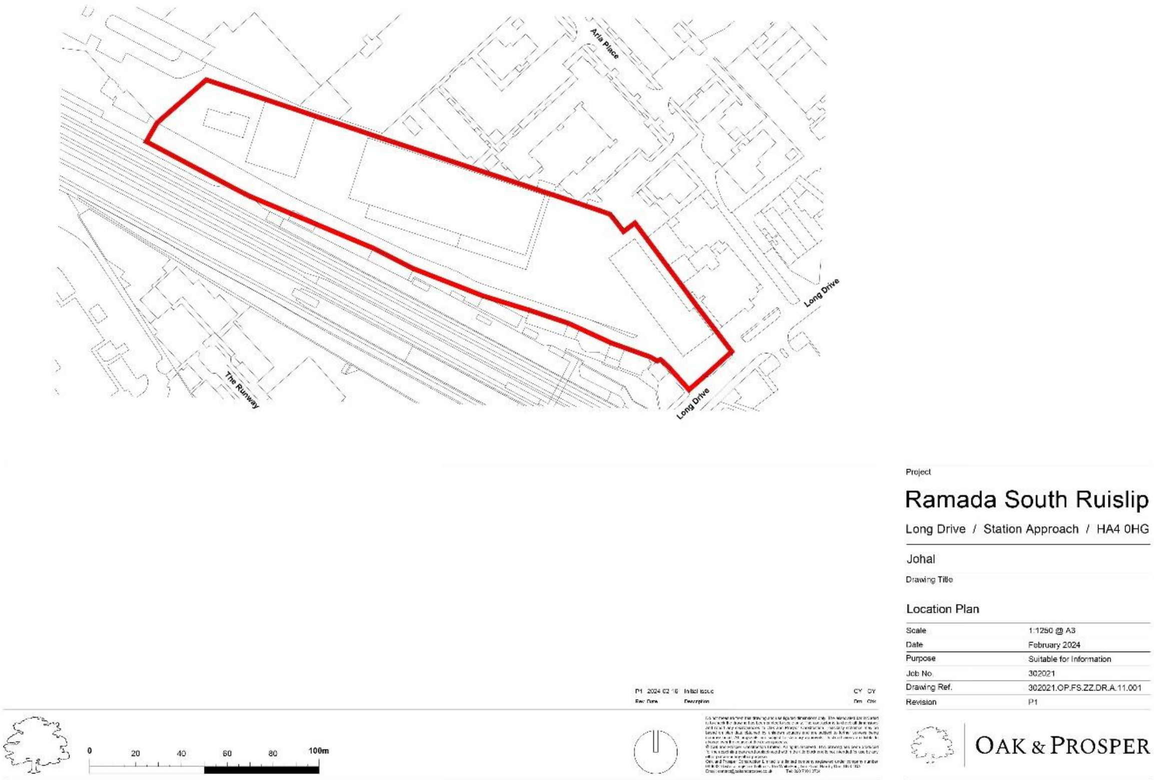

Figure 3. Proposed Location Plan

5. Planning Policy

There are a wide range of energy-related planning policies that impact upon the design and construction of new developments. The National Planning Policy Framework (NPPF) 2021, indicates a presumption in favour of sustainable development. The regional policy 'The London Plan 2021', sets out a requirement to assess energy demand, adopt energy efficiency measures, and make use of decentralised energy and renewable technology where feasible.

The Hillingdon Local Plan (Adopted November 2012) follows the requirements of the London Plan (2021) and requires development to demonstrate how the principles of the London Plan have been followed.

5.1. London Plan Policy SI 2 Minimising Greenhouse Gas Emissions

This policy requires that all developments meet set targets for CO_2 emissions. These targets are set in the context of the Building Regulations UK Part L 2021.

The target under the London Plan is for zero net regulated emissions or 'zero carbon'. To achieve this target, carbon reduction should be maximised on site where possible, with the remaining emissions offset via a 'payment in lieu', to fund energy efficiency improvement measures elsewhere in the Borough.

The London Plan details an 'energy hierarchy' to be followed as noted in chapter 3. This is to ensure that poorly designed buildings cannot be offset by renewable energy alone.

To demonstrate compliance with the policy it is necessary to assess the energy demand and emissions in detail, and to demonstrate how the energy hierarchy is being followed and how the emissions targets will be met using efficiency measures (Be Lean), decentralised energy systems (Be Clean), renewable energy technologies (Be Green) as appropriate. Finally, the in-use energy consumption needs to be monitored, verified and reported (Be Seen).

Zero Carbon status is then demonstrated through offsetting the balance of regulated CO2 emissions via a financial contribution to the respective borough. This carbon off-set payment will contribute to a fund which is then invested into other projects where equivalent CO2 savings can be realised.

A minimum on-site reduction of at least 35% beyond Building Regulations is required for major development. Residential development should achieve 10%, and non-residential development should achieve 15% through energy efficiency measures.

5.2 London Plan Policy SI 3 Energy Infrastructure

Major developments with Heat Network Priority Areas (HNPA's) are required to investigate the feasibility of efficient heating infrastructure, in accordance with the following hierarchy:

1. Connection to an existing or planned heating or cooling network
2. Implementation of a communal heating system, using zero-carbon or local secondary heat sources (in conjunction with heat pump, if required), which is designed to allow a cost-connection to a future network if one becomes available.
3. Individual heating systems (low-density individual housing only).

5.2. London Plan Policy SI 4 Managing Heat Risk

The Mayor seeks to reduce the impact of the urban heat island effect in London and encourages the design of spaces to avoid overheating. Major development proposals must reduce potential overheating and reliance on air conditioning systems in accordance with the cooling hierarchy:

1. Reducing the amount of heat entering the building through orientation, shading, high albedo materials, fenestration, insulation, and the provision of green infrastructure.
2. Minimise internal heat generation through energy efficient design
3. Manage the heat within the building through exposed thermal mass and high ceilings
4. Provide passive ventilation
5. Provide mechanical ventilation
6. Provide active cooling systems.

A separate overheating assessment has been submitted with this application following the above hierarchy.

5.3. Local Policy – London Borough of Hillingdon

The Hillingdon Local Plan (Adopted November 2012), contains frameworks for sustainable design and carbon reduction. The energy strategy must address the following policies.

5.3.1. Policy DMEI 2: Reducing Carbon Emissions

A) All developments are required to make the fullest contribution to minimising carbon dioxide emissions in accordance with London Plan targets.
B) All major development7 proposals must be accompanied by an energy assessment showing how these reductions will be achieved.
C) Proposals that fail to take reasonable steps to achieve the required savings will be resisted. However, where it is clearly demonstrated that the targets for carbon emissions cannot be met onsite, the Council may approve the application and seek an off-site contribution to make up for the shortfall.

5.3.1. Policy DMEI 3: Decentralised Energy

A) All major developments are required to be designed to be able to connect to a Decentralised Energy Network (DEN).

B) Major developments located within 500 metres of an existing DEN, and minor new-build developments located within 100 metres, will be required to connect to that network, including provision of the means to connect to that network and a reasonable financial contribution to the connection charge, unless a feasibility assessment demonstrates that connection is not reasonably possible.

C) Major developments located within 500 metres of a planned future DEN, which is considered by the Council likely to be operational within 3 years of a grant of planning permission, will be required to provide a means to connect to that network and developers shall provide a reasonable financial contribution for the future cost of connection and a commitment to connect via a legal agreement or contract, unless a feasibility assessment demonstrates that connection is not reasonably possible.

D) The Council will support the development of DENs and energy centres in principle, subject to meeting the wider policy

6. Building Regulations - England

6.1. Approved Document L Volume 1 Domestic

Approved Document L Volume 1 Conservation of Fuel and Power sets the standard for carbon emissions for new dwellings and was last revised in June 2022 (Part L: 2021). The properties will need to comply with the criteria set out in the document, as follows:

1. The predicted Dwelling Emission Rate of CO2 emissions from dwellings (DER) are not greater than the Target Emission Rate (TER).
2. The fabric energy efficiency rates for the building shall be no greater than the target fabric energy efficiency rate
3. The primary energy rate for the building shall be no greater than the target primary energy rate
4. That the performance of dwellings as built comply with the DER values achieved, including site testing that the 'air permeability' rate achieved is as per that specified, or better.
5. The necessary provisions for energy efficient operation of dwellings are put in place, including operation and maintenance instructions aimed at achieving economy in the use of fuel and power in a way that householders can understand.

6.2. Approved Document L Volume 2 Non-Domestic

Approved Document L Volume 2 Conservation of Fuel and Power sets the standard for carbon emissions for new non-domestic buildings and was last revised in June 2022 (Part L: 2021). The properties will need to comply with the criteria set out in the document, as follows:

1. The predicted Building Emission Rate (BER) of CO_2 emissions from non-domestic buildings are not greater than the Target Emission Rate (TER).
2. The predicted primary energy rate (BPER) from non-domestic buildings is no greater than the target primary energy rate (TPER).
3. The performance of the individual fabric elements and the fixed building services of the building should achieve reasonable overall standards of energy efficiency.
4. Demonstration that the building has appropriate passive control measures to limit solar gain.
5. The performance of the building, as built, should be consistent with the BER.
6. The necessary provisions for enabling energy-efficient operation of the building should be put in place.

Compliance with the Approved Document Part L Volumes 1 and 2 should be demonstrated at detailed design stage, prior to construction.

7. Assessment Methodology

The Energy Assessment undertaken follows the detailed methodology set out within the Greater London Authority (GLA) guidance document "Energy Assessment Guidance – Greater London Authority guidance on preparing energy assessments as part of planning applications (June 2022)''.

The 'Baseline' case for emissions was determined by using the 'Target Emission Rate' (TER) from the compliance calculations. The emissions saving from energy efficiency proposals (BE LEAN) was determined by comparing the total emissions from the 'baseline' figures, with the predicted 'Building Emission Rate' (BER), based on the proposed specification. The potential emission savings from the district heat network (BE CLEAN) and renewable energy (BE GREEN) proposals, were then appraised, in line with the GLA requirements.

It should also be noted that the compliance methodology was produced with the sole intention of demonstrating compliance with the Building Regulations Part L. As such, standardised assumptions are made regarding building occupancy, use, conditioning setpoints etc. It is therefore important to note that they are intended to be used on a comparable scale, rather than give accurate predictions of real energy use. The results herein are provided solely for the purposes of demonstrating compliance and are not intended as an accurate prediction of operational energy use.

7.1. Domestic (SAP)

The Standard Assessment Procedure (SAP) is the Government's approved methodology for assessing the predicted energy consumption and carbon dioxide emissions of new dwellings. Results are derived in respect of floor area and consider energy use (kWh/m^2/yr) and associated CO_2 emissions (kg.CO_2/m^2/yr) from the following:

- Space heating
- Domestic hot water
- Ventilation
- Lighting
- Ancillary pumps and fans
- Energy generating technology

SAP is compliant with the EU Energy Performance of Buildings Directive and is carried out using approved software. A trained and accredited Elmhurst Energy Assessor has used Elmhurst Design SAP 10 software (Version 2.21.10 ERC v1.7.50) to assess compliance and generate the necessary results data.

SAP calculations have been undertaken for a representative sample residential dwellings and results have been used to determine the predicted energy consumption and CO_2 emissions for the entire development. Supporting SAP calculations will be provided in the Appendix.

An indicative fabric and systems specification has been based upon information provided by the Design Team and is outlined further in Section 8. Development of the specification has been ongoing throughout the assessment process; therefore, the thermal model was produced to incorporate the most recent information available at the time.

7.2. Non-Domestic (SBEM)

Predicted annual energy consumption has been determined using Simplified Building Energy Model (SBEM). In each case, calculations have been undertaken using Government approved software by a trained and accredited assessor. Results are derived in respect of floor area and consider energy use ($kWh/m^2.yr$) and associated CO_2 emissions ($kg.CO_2/m^2.yr$) from the following:

- Space heating
- Domestic hot water
- Ventilation
- Lighting
- Ancillary pumps and fans
- Energy generating technology

SBEM for the hotel extension has been produced for the development using Design Builder SBEM software to determine the predicted annual energy consumption and CO2 emissions. A specification has been provided by the design team to demonstrate compliance with Approved Document Part L Volume 2 (2021).

An indicative fabric and systems specification has been based upon information provided by the Design Team and is outlined further in Section 8. Development of the specification has been ongoing throughout the assessment process; therefore, the thermal model was produced to incorporate the most recent information available at the time.

BE LEAN

Use Less Energy

8. Be Lean

This section outlines the proposals for specifying building fabric and services beyond the requirements of Building Regulations (the baseline).

At an early stage, the design team have explored a range of energy efficiency measures including enhanced U-values and the use of efficient mechanical ventilation systems. The London Plan target under the 'Be Lean' policy is to report an improvement on the baseline case with energy efficiency measures alone, as below:

1. Domestic developments should achieve at least a 10 per cent improvement on Building Regulations from energy efficiency
2. Non-domestic developments should achieve at least a 15 per cent improvement on Building Regulations from energy efficiency.

So that the improvements from energy efficiency alone can be properly understood, aspects of the proposals that relate to efficient supply of energy (energy centre proposals) or renewable energy generation, have not been included at this stage.

Fundamental to achieving energy efficiency in any new building is the specification of a thermally efficient building envelope. Passive design features such as high levels of insulation, designing to maximise solar gain and limiting heat loss through reduced air leakage and enhanced thermal bridging are all proven techniques to reduce energy consumption and emissions.

8.1. Building Fabric - Residential

Assumptions have been made by the Design Team on this development in order to meet the fabric efficiency targets for Building Regulations 2021.

Compliance has been attained by targeting values surpassing the notional u-values set out within *'Table 1.1: Summary of notional dwelling specification for new dwelling'*, Approved Document L Volume 1. The Target Fabric Energy Efficiency (TFEE) has been achieved by incorporating a combination of enhanced U-values of the External walls, roofs and floors, high performance glazing, enhanced thermal bridging and airtightness.

Table 5 shows the proposed building fabric specification applied to the SAP calculations with respect to the upper limits stipulated by Part L: 2021. It can be seen that the values represent in some areas a significant bettering of the mandatory requirements set out in the current Building Regulations (2021).

Element	ADL (vol1): 2021 Limiting U-value	Proposed U-value	Improvement (%)
Ground Floor	0.18	0.13	28%
Exposed Floor	0.18	0.13	28%
External Walls	0.26	0.16	38%
Communal Walls	0.26	0.26	-
Party Walls	0.20	0.00	100%
Main Roof	0.16	0.13	19%
Solid Doors	1.60	1.00	38%
Windows/Glazed Doors	1.60	1.00 0.40 g-value	38%
y-value (thermal bridging)	0.20	Variable	Variable
Air permeability ($m^3/h.m^2$ @ 50 Pa)			
All dwellings (tested separately)	8.00	3.0	63%

Table 5. Building fabric specification (residential)

It should also be noted that all specification is subject to review, and as such U-Values, G-Values and thermal bridging details will be investigated further throughout the design stage, with the aim of limiting heat loss, and to reduce emissions as much as practically possible.

As the detailed design for the proposed development is not currently known this assessment utilises notional thermal bridging values used in the notional SAP specification. The TER calculation utilises these values along with other specification elements to produce target emissions and energy criterion. Utilising notional thermal bridging here will not benefit the assessment nor significantly hinder modelled emissions as the TER calculation (baseline) incorporates the exact same figures. Thermally broken balcony connectors are to be used and the remaining heat loss junction are to be thermally modelled at the earliest opportunity.

8.2. Building Services - Residential

Space heating and domestic hot water (DHW) will be provided by communal air source heat pumps (ASHPs). Individual heating controls will be installed in each dwelling which will incorporate a programmer with independent time and temperature zone controls.

Following the Energy Hierarchy, the emissions savings from the ASHPs will not be accounted for in the 'Be Lean' stage.

Ventilation to all Dwellings will be via Mechanical Ventilation Heat Recovery Units (MVHR) which will have a low Specific Fan Power (SFP) and high heat recovery efficiency. These units will also incorporate summer bypass of the heat recovery.

Low energy lighting will be specified throughout, exact fittings are not known at this stage however reasonable assumptions have been made for this assessment.

It should also be noted the specification is subject to review, and as such a HVAC specialist should be appointed at the earliest opportunity to confirm the space heating, water heating and ventilation will be investigated further throughout the design stage, with the aim to reduce emissions as much as practically possible.

Element	Specification (Apartments)
Space Heating	Communal ASHP, SCOP: 2.80 Distribution heat losses assumed at 50%
Heating emitter	Underfloor heating – pipes in screed above insulation.
Heating control	Time and temperature zone control for all dwellings.
Domestic Hot Water (DHW)	From main heating system via Heat Interface Unit (HIU), no storage.
Water consumption	≤125 litres/person/day, instantaneous electric showers, 1 bath per dwelling.
Internal fixed lighting	100% low energy. 8.3W Fittings, 80.5 Lm/W (SAP LED default fittings)
Ventilation	Mechanical Extract Ventilation with Heat Recovery–Nuaire MRXBOXAB-ECO2 indicative unit used.

Table 6. Building services specification (residential)

8.3. Building Fabric – Commercial

Assumptions have been made by the Design Team on this development in order to meet the fabric efficiency targets for Building Regulations 2021.

The following table outlines the proposed fabric specification applied to the SBEM calculation. It can be seen that the values represent significant bettering of the mandatory requirements set out in the current Building Regulations.

In accordance with information received; windows are taken to have a solar g-value of 0.50, calculated frame factor and a Visible Light Transmittance (VLT) of 70%.

Element	ADL (vol2): 2021 Limiting U-value	Proposed U-value	Improvement (%)
Ground Floor	0.18	0.13	28%
Walls	0.26	0.16	38%
Roof	0.16	0.13	19%
Solid Doors	1.60	1.00	38%
Windows/Glazed Doors	1.60	1.00	38%
Air permeability ($m^3/h.m^2$ @ 50 Pa)			
Commercial Units	8.00	5.0	38%

Table 7. Building fabric specification (commercial)

8.4. Building Services – Commercial

It is envisaged that the proposed non-domestic units on site will be 'shell and core'. No HVAC/fit out specification will be provided. Rather future occupiers providing the equipment to meet their specific needs and uses. Space provision and service outlets will be provided for future fit out works (TBC).

For this assessment, a notional specification will be applied to the non-domestic units to provide an energy usage scenario, this is outlined in Table 8 below.

Element	Specification
Heating	HVAC VRF CoP 3.2, SCoP 3.14 EER of 3.78, SEER 5.52 SFP 1.1, 85% heat recovery
Hot Water	DHW ASPH Scop 3.40, Storage loss factor 0.015 kWh/litre per day
Background (and display) Lighting	LED lighting throughout with average luminous efficacy 100 lm/Cw)
Lighting Controls	Manual switching in rooms and presence detection in the corridor areas
Ventilation	HVAC VRF, SFP: 1.1 W/l/s, Heat recovery: 85%
Power Factor correction (PFC)	A Power Factor Correction device has not/will not be installed, as such a default factor of <0.90 will be applied.

Table 8. Building services specification (commercial)

8.5. Results Summary – Be Lean

	Carbon Dioxide Emissions for Residential Buildings (Tonnes CO_2 per annum)	
	Regulated	Unregulated
Baseline: Part L 2021 of the Building Regulations Compliant Development	103.7	130.8
After energy demand reduction (be lean)	92.7	130.8

	Regulated residential carbon dioxide savings	
	Tonnes CO_2 per annum	% Reduction
Be Lean: Savings from energy demand reduction	11.0	11%

Table 9. Domestic CO_2 emissions and savings after 'Be Lean' measures

	Carbon Dioxide Emissions for Non-Residential Buildings (Tonnes CO_2 per annum)	
	Regulated	Unregulated
Baseline: Part L 2021 of the Building Regulations Compliant Development	14.1	4.6
After energy demand reduction (be lean)	12.6	4.6

	Regulated non-residential carbon dioxide savings	
	Tonnes CO_2 per annum	% Reduction
Be Lean: Savings from energy demand reduction	1.5	10%

Table 10. Non-domestic CO_2 emissions and savings after 'Be Lean' measures

	Total regulated emissions (Tonnes CO_2 / year)	CO_2 Savings (Tonnes CO_2 / Year)	Percentage Savings (%)
Part L 2021 Baseline	117.8	-	-
Be Lean	105.3	12.5	11%

Table 11. Whole site CO_2 emissions after 'Be Lean' measures

8.6. Summertime Overheating

Effects of overheating have been well documented over recent years, often cited to result from climate change and modern construction techniques. Although guidance exists across the industry to forecast the risk of overheating, design considerations are often required at concept stage to provide adequate mitigation.

Common Causes

The Zero Carbon Hub state three factors most commonly associated with overheating risk to be; location, building design and occupational usage.

Location

The climate or, microclimate is subject to the geographic site location. Sun, wind and rain intensity are dependent upon where the development is situated and as such the design approach will vary accordingly - for example, average summertime temperatures are higher in the South-East of England compared to the North-East therefore, increasing ventilation levels to combat high internal temperatures in the South-East has a diminished effect.

Dense urban development with minimal open green space may present risk associated with the 'urban heat island' effect. This comprises of heat absorbed by heavy man-made structures which is then radiated at night increasing the local temperature. This can be avoided by increasing green space and the use of solar reflective material and coatings.

Building Design

There are several elements of building design that effect overheating performance. The orientation of a building together with the proportion and location of glazing areas will determine the level of transmitted solar gain. Where solar gain cannot be absorbed or, extracted, internal temperatures will increase. Although there is benefit in utilising 'free' solar energy to heat a building, the amount of this energy must be controlled.

Due to increasing energy efficiency standards, modern structures are often well insulated and constructed to high levels of air tightness. In addition to lower levels of thermal mass, this often results in a reduced ability to absorb or, purge heat compared to that of older buildings.

Occupants

Although the exact occupant use cannot generally be controlled for new construction projects, the setting out of a building should consider the impact of room use type and location in the context of solar and other incident heat gains. Overheating risk is affected by both the occupant density and anticipated activity type in a zone. For example, glazed perimeter rooms occupied predominantly in the afternoon may be best suited to east facing locations where the sun will have already passed.

8.6.1. Mitigation

For new-build construction projects, design considerations to reduce an overheating risk should be made at the earliest possible opportunity. Although performance measures can be incorporated at later stages, the most robust and effective techniques are often inherent to a buildings design.

The 'cooling hierarchy', defined within the London Plan and often referred to by other regions indicates the preferred approach to reducing overheating risk and a reliance upon mechanical cooling. The hierarchal steps are as follows;

1. Minimise heat generation through energy efficient design.
2. Reduce the amount of heat entering a building in summer through orientation, shading, albedo, fenestration, insulation and green roofs and walls.
3. Manage the heat within the building through exposed thermal mass and high ceilings.
4. Passive ventilation.
5. Mechanical cooling.

Further to appropriate siting and orientation, there are several properties or, functions that influence overheating performance.

Glazed proportion and specification

The location, proportion and specification of glazing should balance the benefits of natural light and 'free heat' though also ensure that levels of gain are not excessive. Glass manufacturers offer a broad variety of products including solar control coatings to enable the level of transmitted solar gain (denoted by the 'g-value') to be reduced with minimal impact upon visual performance. Certain glass specifications may be more appropriate for certain orientations, e.g. a lower g-value to a south façade than the north.

Solar shading

In a similar vein to solar control glass coatings, external solar shading can be used to prevent the direct transmission of solar gain whilst enabling glazed areas to be maintained or, maximized. Horizontal overhangs are usually more appropriate for south facing windows due to higher sun angles. Conversely, vertical fins are more appropriate for east and west facing windows.

Figure 4. External solar Shading[1]

Thermal Mass

Thermal mass is a physical property which defines the ability of an object or, construction to absorb heat energy, the greater the mass, the greater the potential heat absorption. Higher thermal mass construction enables heat to be absorbed during the day then released at night. This can reduce daytime temperatures and improve the thermal stability of a building. However, as greater energy is also then required to 'heat' the fabric, overall energy consumption can also increase in certain cases. Therefore, as with all of these approaches, a balance must be struck. Thermal mass can be increased by exposing dense fabric or increasing the physical connection between finishing materials, e.g. plaster, and the structural core, e.g. blockwork.

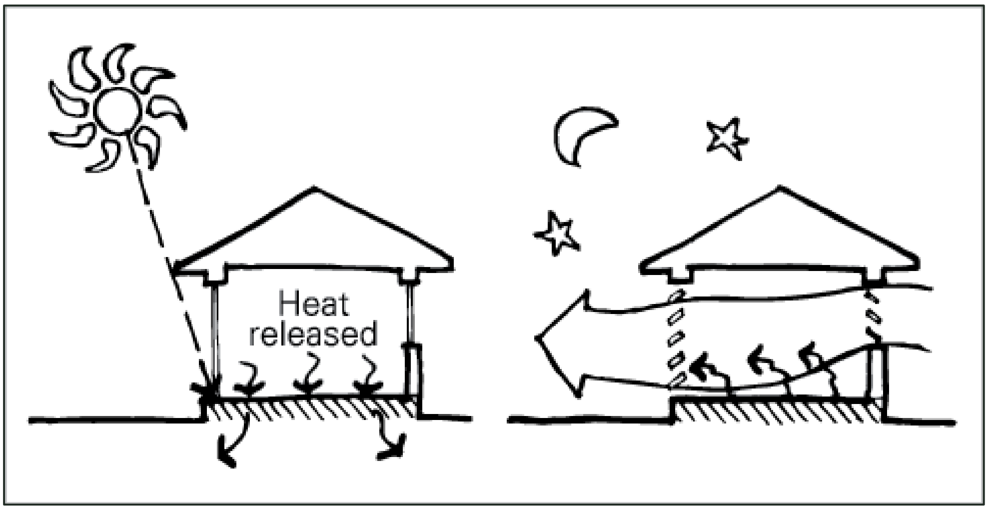

Figure 5. Principles of thermal mass[2]

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[1] http://levolux.com/tag/timber-fins/
[2] http://levolux.com/tag/timber-fins/

Ventilation

The ventilation strategy is critical to overheating performance. Background ventilation levels are low compared to the rates generally required to purge heat. Therefore, the ventilation strategy must enable the greatest volume of air to be moved should the requirement arise. The potential rate of ventilation is determined by a number of factors including;

- Opening type, size and duration.
- Building height and exposure.
- The number of storeys and opportunity for cross-ventilation.

Ventilation openings should enable the greatest possible opening for the greatest duration without compromising security and water ingress protection.

8.6.2. Quantifying Overheating Risk

Several guidance documents exist which define overheating risk assessment and acceptable thresholds. These include CIBSE Guide A, BB101, TM52 and TM59. These methods require a Dynamic Simulation Modelling (DSM) exercise to be undertaken to calculate predicted internal temperatures. Predicted temperatures are compared against recommended limits to determine whether they are acceptable or excessive.

BE CLEAN

Supply Energy Efficiently

9. Be Clean

This section outlines the suitability – or otherwise – of clean energy supply solutions such as district heating within the proposed development.

9.1. District Heating

Where site location and development permits; the opportunity for connection to existing district heating networks or the creation of new district heating networks should be considered. District heating networks have the potential to offer significant energy, carbon and cost savings over localised alternatives. District heating networks often utilise low-carbon energy generation/harnessing technologies such as Anaerobic Digestion (AD), Combined Heat and Power (CHP) and waste heat recovery. District networks also enable heat loads to be balanced between sites and therefore plant to operate more continuously and efficiently.

Figure 6. District heating pipework[3]

Clearly, district energy networks are only generally feasible where there is a high density of heat demand. Capital costs and distribution losses must be relatively insignificant to support their viability. Where an opportunity exists, the network operator should be contacted to assess the viability and costs of current or, future connection.

In London, there is a desire to generate at least 25% of heat and power through localised decentralised energy systems by 2025. As such, the London Boroughs were commissioned to identify the energy loads and energy densities within their region. This information has been used to develop The London Heat Map which shows the potential, proposed and existing district heat networks.

The **London Heat Map** has been investigated for the development site (see figure 7). This shows there to be no existing (red) district heating networks within the vicinity of the development. The closest being the DGV Energy Centre near Hayes located approx 7.0km from the development site. The nearest proposed network (purple) will be either the Hillingdon - Uxbridge and Brunel Uni or Hillingdon Hospital networks.

[3] https://www.vitalenergi.co.uk/technologies/district-heating-and-cooling/

9.2. Network Creation

The proposed development is relatively high density and comprises of 114 no. domestic units. It is proposed that a heat network will be created to fulfil the energy requirements of the development with the capacity for future connection to a wider heat network in the future.

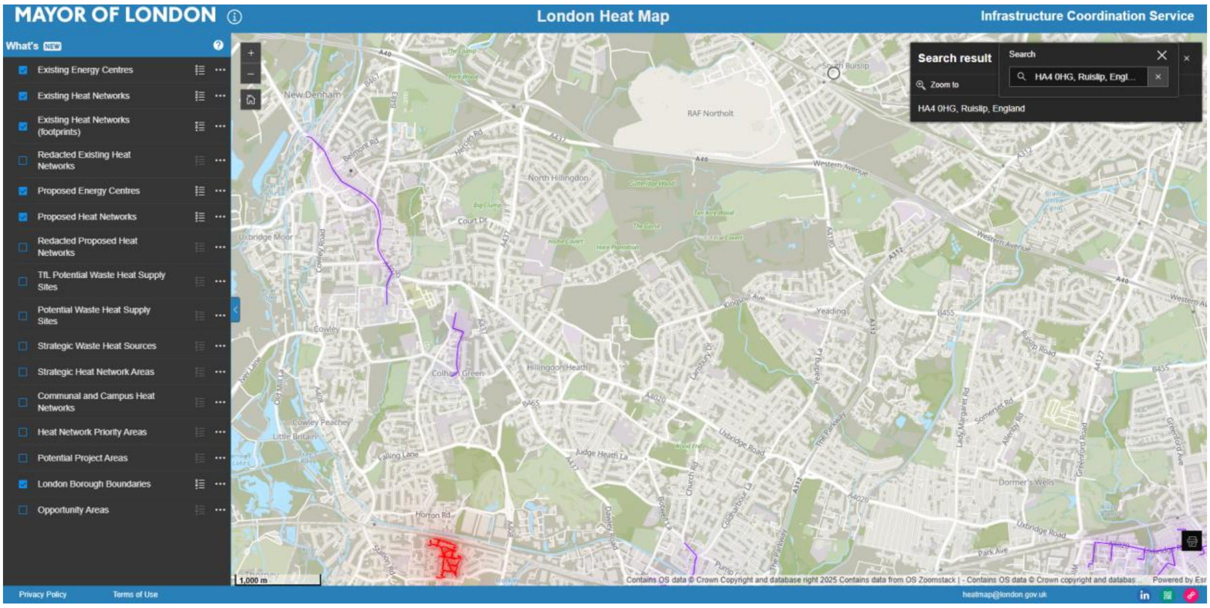

Figure 7. London Heat Map for the site region (https://apps.london.gov.uk/heatmap/)

9.3. Summary

There are no existing or proposed networks within the vicinity of the development site, The development map confirms the heat density within the region to be low; therefore, connection to an existing network is not an option. Space heating and domestic hot water (DHW) will be provided by communal air source heat pumps (ASHPs) with future connection viable for a future offsite network.

In the event that a local off site heat network becomes available and viable for connection, the scheme will be able to connect with minimum disruption. Future connection of flow and return pipe connections to the main central plant areas on site will be made accessible in the proposed design for a single point of connection to the district heating network. This will reduce friction of any future local heat network 'plugging into' the onsite heat network proposed. This future provision will be secured within a S106 Agreement.

9.4. Results Summary – Be Clean

	Carbon Dioxide Emissions for Residential Buildings (Tonnes CO_2 per annum)	
	Regulated	Unregulated
Baseline: Part L 2021 of the Building Regulations Compliant Development	103.7	130.8
After energy demand reduction (be lean)	92.7	130.8
After heat network connection (be clean)	92.7	130.8

	Regulated residential carbon dioxide savings	
	Tonnes CO_2 per annum	% Reduction
Be Lean: Savings from energy demand reduction	11.0	11%
Be Clean: Savings from heat network	0.0	0%

Table 12. Domestic CO_2 emissions after 'Be Clean' measures.

	Carbon Dioxide Emissions for Non-Residential Buildings (Tonnes CO_2 per annum)	
	Regulated	Unregulated
Baseline: Part L 2021 of the Building Regulations Compliant Development	14.1	4.6
After energy demand reduction (be lean)	12.6	4.6
After heat network connection (be clean)	12.6	4.6

	Regulated non-residential carbon dioxide savings	
	Tonnes CO_2 per annum	% Reduction
Be Lean: Savings from energy demand reduction	1.5	10%
Be Clean: Savings from heat network	0.0	0%

Table 13. Non-domestic CO_2 emissions after 'Be Clean' measures.

	Total regulated emissions (Tonnes CO_2 / year)	CO_2 Savings (Tonnes CO_2 / Year)	Percentage Savings (%)
Part L 2021 Baseline	117.8	-	-
Be Lean	105.3	12.5	11%
Be Clean	105.3	0	0%

Table 14. Whole site CO_2 emissions after 'Be Clean' measures.

BE Green

Use Renewable Energy

10. Be Green

The CO_2 emissions after 'Be Lean' and 'Be Clean' measures have been assessed against the baseline CO_2 emissions. Reductions have been recorded after each stage in the energy hierarchy; this will help demonstrate the impact that renewable energy generation has on whole site CO_2 emissions.

10.1. Air Source Heat Pumps (ASHP)

Air source heat pumps (ASHP) extract heat from ambient air via a reversed refrigeration cycle. Heat is absorbed into an evaporator (outdoor unit) and increased via compression. This useful heat is transferred to the building via a refrigerant to provide space and/or water heating.
Although the system uses electricity, high Coefficient of Performances (COP) can be achieved resulting in overall CO_2 emissions and running costs below that of an efficient gas-fired boiler. The COP is a function of the difference between ambient air (source) temperature and output (flow) temperature. Therefore, systems are most efficient when used in conjunction with low surface temperature emitters, e.g. underfloor heating, ceiling panels. Systems can be cascaded to generate domestic hot water at 60+°C though efficiencies are significantly reduced.

Whilst heat pumps can provide good levels of performance, they have practical limitations. Firstly, to be effective, the units must be located externally, which can impact acoustically as well as on visual amenity and space. In addition, as heat pumps collect heat from the air, their efficiency is intrinsically linked to air temperature. Therefore, when the demand for heat is at its peak, the efficiency of the system is at its lowest. Furthermore, as the system relies on grid-produced electricity to operate, its real carbon emissions will be heavily linked to the variable carbon intensity of the national grid.

The introduction of SAP10 carbon emission factors has, in most cases, resulted in heat pumps being the only viable option to reduce carbon emissions in line with London Plan target requirements.

Heat pumps provide a low carbon energy source with zero on site NOx emissions and have been selected for the development. The challenge for the design team is how to incorporate this technology where it can operate at its most efficient capacity.

10.2. Solar Photovoltaics (PV)

Solar Photovoltaic (PV) panels comprise a number of inter-connected cells that utilise semi-conductor technology to convert solar energy into electricity. High voltage, direct current is converted to alternating current and phased into the mains supply via an inverter. PV panels are most effective where mounted on exposed, south-facing areas, at an inclination close to 30° from the horizontal.

The technology is well proven and requires little maintenance; most panels are designed to be self-cleaning when mounted at appropriate angles and the design life of a panel typically exceeds the likely pay-back period by a considerable margin. PV has the significant advantage of reducing energy use and costs on site for residents whilst also reducing demand from the national grid and even contributing to grid energy. This can save significant carbon dioxide emissions by reducing the relatively inefficient and fossil-fuel heavy heat generation in the national infrastructure.

10.3. Technology Analysis – Solar Photovoltaics (PV)

The potential for CO_2 savings from solar PV has been assessed using the Governments approved SAP 10 (Standard Assessment Procedure) methodology. This methodology considers UK solar irradiance data, collector pitch, orientation and over-shading to determine the expected annual energy yield.

Early design review shows approx 900m2 available roof space across the 4no residential blocks for PV which based on 1kWp per 6m2 equates to a maximum total installed PV capacity of 150kWp (kilo-Watt peak). A PV installer shall need to be appointed at the earliest opportunity to verify that these savings are achievable and a roof plan showing the array should be provided once this is confirmed. This will account for any space between panels and overshading requirements which may lower the amount of space available.

10.4. Results Summary – Be Green

	Carbon Dioxide Emissions for Residential Buildings (Tonnes CO_2 per annum)	
	Regulated	Unregulated
Baseline: Part L 2021 of the Building Regulations Compliant Development	103.7	130.8
After energy demand reduction (be lean)	92.7	130.8
After heat network connection (be clean)	92.7	130.8
After Renewable energy (be green)	33.1	130.8

	Regulated residential carbon dioxide savings	
	Tonnes CO_2 per annum	% Reduction
Be Lean: Savings from energy demand reduction	11.0	10%
Be Clean: Savings from heat network	0.0	0%
Be Green: Savings from renewable energy	59.6	57%

Table 15. Domestic CO_2 emissions and savings after 'Be Green' measures

	Carbon Dioxide Emissions for Non-Residential Buildings (Tonnes CO_2 per annum)	
	Regulated	Unregulated
Baseline: Part L 2021 of the Building Regulations Compliant Development	14.1	4.6
After energy demand reduction (be lean)	12.6	4.6
After heat network connection (be clean)	12.6	4.6
After Renewable energy (be green)	11.0	4.6

	Regulated non-residential carbon dioxide savings	
	Tonnes CO_2 per annum	% Reduction
Be Lean: Savings from energy demand reduction	1.5	10%
Be Clean: Savings from heat network	0.0	0%
Be Green: Savings from renewable energy	1.6	11%

Table 16. Non-domestic CO_2 emissions and savings after 'Be Green' measures.

	Total regulated emissions (Tonnes CO_2 / year)	CO_2 Savings (Tonnes CO_2 / Year)	Percentage Savings (%)
Part L 2021 Baseline	117.8	-	-
Be Lean	105.3	12.5	11%
Be Clean	105.3	0	0%
Be Green	44.1	61.2	52%

Table 17. Whole site CO_2 emissions after 'Be Green' measures.

Seen

Monitor, verify and report

11. Be Seen

11.1. Introduction

Policy SI 2 of the New London Plan contains a requirement for post construction monitoring and reporting of energy use, known as 'Be Seen'. The process for meeting this starts at the planning stage and continues for at least 5 years after occupation of a development.

At the planning stage three actions are required:

- Provide data on the development regarding its nature and predicted energy use figures via the 'Be Seen' web-based portal.
- Indicate the predicted dates for the completion of the subsequent stages of the 'Be Seen' process. In particular the predicted date of completion and of 1 year post occupancy.
- Provide confirmation that metering plans are in place that will enable the in-use energy performance reporting.

11.2. Performance Indicators

The performance indicators fall into five groups which are described in the following table. The specific indicators that should be reported at each stage of the monitoring process (i.e. from planning to as-built to in-use) and are described in the subsequent sections and tailored according to whether the development is residential or non-residential.

Performance Indicator Group	Description
Contextual Data	Applicants will be expected to provide contextual data relating to the development's reportable units (RUs). This includes non-energy information such as data on location and typology of buildings.
Building Energy Use	Applicants will be expected to report on the energy and fuel imports into each RU of a development. This includes data from national energy grids (e.g. electricity, gas etc.) and district heating connections. This information will enable the building owner to report on the amount of energy being consumed on-site for distinct building uses.
Renewable Energy	Applicants will be expected to report on the renewable energy generation within the development to identify how much energy is being generated on-site and where this is used.
Energy Storage Equipment	Applicants will be expected to report on building energy storage equipment data.
Plant Parameters	Applicants will be expected to report on parameters that relate to the performance of heat or cooling generation plant within energy centres that form part of a development. This will include energy inputs and outputs of energy centres, energy use and contribution of heating and cooling technologies, and network efficiency data to monitor losses in district and communal energy networks.
Carbon Emissions	Applicants will be expected to report on the development's estimated carbon emissions at planning stage based on the appropriate carbon emission factors, as set out in the GLA's Energy Assessment Guidance. When on-site carbon

	reductions have been maximised, but a carbon shortfall still exists, applicants will be expected to report on and confirm the carbon offsetting contribution to the relevant local authority's fund in line with the net zero carbon target.

Table 18. Performance indicator group descriptions for 'Be Seen' Framework.

11.3. Reporting Units

In terms of reporting after the 'As Built' stage the development will be divided into 'Reportable Units' (RUs) with each RU reported separately. However, at the planning stage all information is provided at a development overview level.

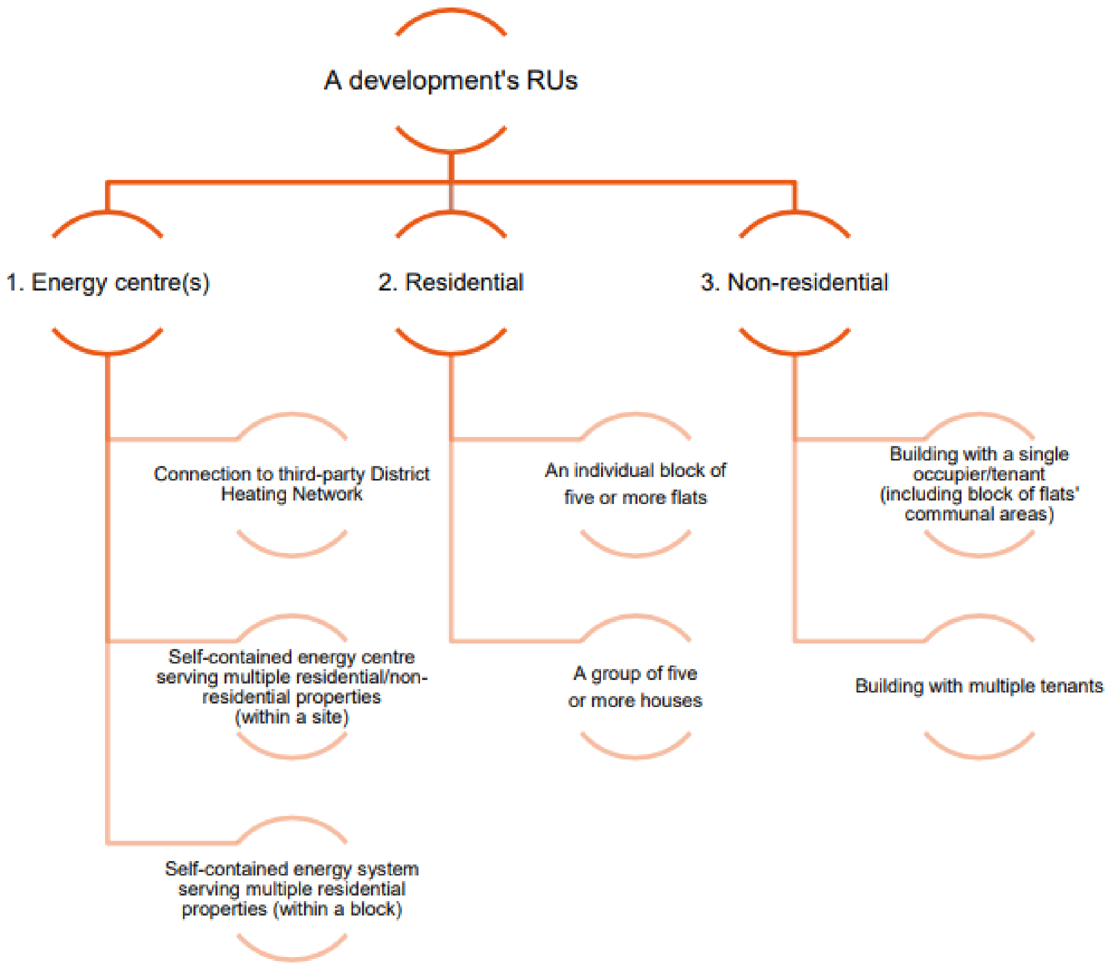

Figure 9. Visual representation of reportable units from the Be Seen Energy Monitoring Guidance (September 2021).

11.4. Energy Use Prediction Methods

The method for predicting energy use at the planning stage differs for residential and non-residential units. In addition, two different methods are used for non-residential units as explained below:

Aspect	Methodology
Residential	The methodology for reporting energy consumption (kWh/m2) and carbon emissions (tonnes CO2/m2) estimates should follow a Building Regulations Part L compliant methodology using the Standard Assessment Procedure (SAP) tool. This is as per current planning calculation and reporting methodologies.
Non-Residential (Option 1)	Submit the Building Regulations Part L compliant figures, in line with London's existing planning approach. These should be the same as the data included in the GLA's Energy Assessment Guidance.
Non-Residential (Option 2)	CIBSE TM54 analysis, which recommends using a tailored Part L model for the estimates of regulated and unregulated loads, should be undertaken and its findings should be reported in the 'be seen' spreadsheet. A TM54 analysis gives more accurate predictions of a building's energy use.

Table 19. Methodologies for 'Be Seen' framework.

Compliance for construction monitoring and reporting of energy use will be agreed and secured in the S106 agreement which will be submitted to the London Borough of Hillingdon.

12. Carbon Offset

It is a requirement of the London Plan policy SI 2 that all major residential development must achieve the Zero Carbon Standard. This is done by meeting a minimum onsite CO2 reduction of 35% against a Building Regulations Part L baseline and then offsetting the remaining emissions via a cash in lieu contribution to the relevant borough.

Contributions to the carbon off-set fund are to be spent within the vicinity of the named development and used for retrofitting existing buildings, decentralised energy networks, renewable energy or any other programme that achieves a calculable reduction in carbon emissions.

Further to the passive savings, the only viable addition to reducing grid-sourced energy consumption and CO_2 emissions at this stage is through the application of solar PV. Solar PV has been applied to available roof areas offering good solar access totalling 150kWp, to surpass the minimum requirement for a 35% reduction in carbon emissions, in line with the London Plan 2021, Zero Carbon requirement.

The development would also need to provide a cash in lieu contribution to offset all remaining on-site emissions, Table 20 shows a summary of this calculated carbon offset cost.

It must be noted that this assessment is only an estimate of site wide to establish site wide emissions with the design information available at the time. The final payment required will be subject to change once a complete set of SAP calculations are undertaken during the detailed design stage.

	Residential	Non-Residential
Cumulative savings for off-set payment (tonnes CO_2)	993	330
Cash in-lieu contribution (£)	94,303	31,389

Table 20. Residential CO_2emissions including carbon offset.

13. Conclusions

This Energy Statement has outlined the proposed specification for the development and the resulting savings against each stage of the energy hierarchy.

13.1. Be Lean – Energy Efficiency

A high-performance building envelope has been specified comprising of low U-values, thermally efficient construction details and low air permeability. Performance values demonstrate improvement against that of the 2021 Notional building used for comparison in compliance assessment.

13.2. Be Clean – Decentralised Energy

There are currently no existing or proposed district heating networks in the vicinity of the site. The development size and type offer the opportunity for providing a new heat network for the site with the capacity/provision for future connection to a future proposed network.

The design team confirms that possible future local heat networks will be accommodated on site with a future proofed site heat network design, to facilitate compatible connections.

13.3. Be Green Low & Zero Carbon Technology

Early design review shows approx 900m2 available roof space across the 4no residential blocks for PV which based on 1kWp per 6m2 equates to a total installed PV capacity of 150kWp (kilo-Watt peak). A PV installer shall need to be appointed at the earliest opportunity to verify that these savings are achievable and a roof plan showing the array should be provided once this is confirmed. This will account for any space between panels and overshading requirements which may lower the amount of space available.

14. Summary

This statement has set out how the development will incorporate an energy efficient design which exceeds Part L 2021 regulations and, with the integration of PV arrays to the roof, can achieve a 63% reduction in regulated carbon dioxide emissions.

	Total regulated emissions (Tonnes CO_2 / year)	CO_2 Savings (Tonnes CO_2 / Year)	Percentage Savings (%)
Part L 2021 Baseline	117.8	-	-
Be Lean	105.3	12.5	11%
Be Clean	105.3	0.0	0%
Be Green	44.1	61.2	52%
Total Savings	-	73.7	63%

Table 21. Predicted regulated annual CO_2 emissions and savings.

Appendices

Appendix 1: SAP Worksheets

Appendix 2: BRUKL Reports

Appendix 3: GLA Emissions Reporting Spreadsheet