TWIN EARTH

ENERGY STATEMENT

TAVIS HOUSE
TE0636

Prepared for:
Tempus Realty Holdings 1 (Jersey) Ltd
26 MARCH 2024

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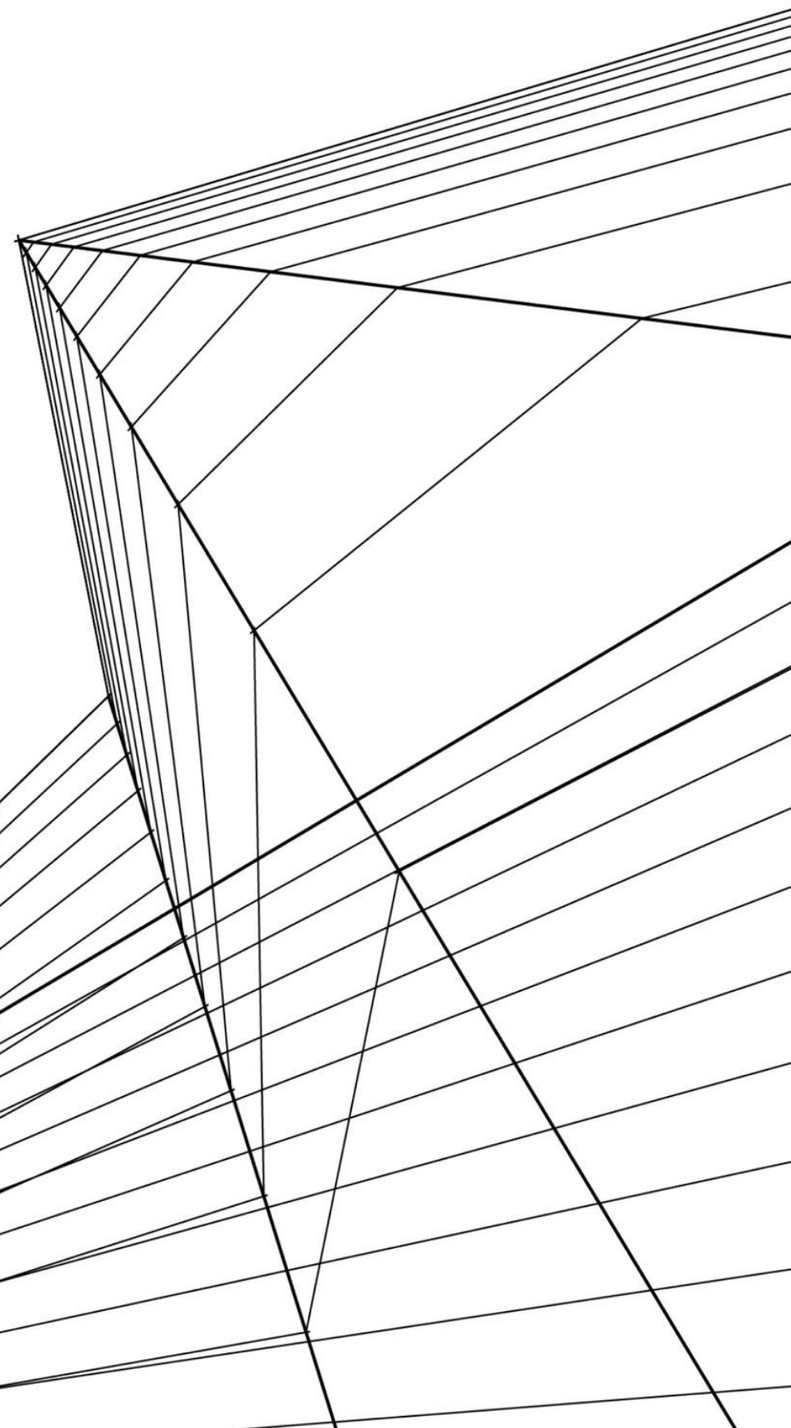

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ABOUT TWIN & EARTH

Twin & Earth provides independent engineering solutions with sustainability at its core.

Our vision is to seamlessly integrate sustainability into the entire construction process, without it being seen as an afterthought or inconvenience. From the initial concept, through planning, construction and operation, we will ensure sustainability is woven into the process and a priority for all stakeholders.

We listen and respond to our customers. We are open and flexible to their needs and concerns, breaking down complex concepts into simple solutions that work both on paper and in practice. Our consultants take a holistic view of each proposal, focusing on responsible and technical strategies that are pragmatic and inspiring.

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GLOSSARY

CO_2	Carbon dioxide emissions – released as a result of burning fossil fuels
ASHP	Air Source Heat Pump – Electrically powered heating and cooling system that transfers heat from the outside air to the inside, and vice versa when in cooling mode
VRF	Variable Refrigerant Flow – Electrically powered heating and cooling system that uses refrigerant as the heating/cooling medium
PV	Photovoltaic Panel – Device that converts the sun's energy into useful electrical energy
kWp	Kilowatt Peak – The peak (maximum) power that can be generated by a system
SAP10	Standard Assessment Procedure – Methodology used to assess the carbon emissions of dwellings, and also sets the carbon emission intensity of grid supplied electricity and natural gas
CHP	Combined Heat and Power – System that generates electricity and heat, usually via the combustion of natural gas in an engine.
DSY	Design Summer Year – Standard weather tape produced by CIBSE. Includes weather tape representing different summers (DSY1 – Moderately warm summer, DSY2 – Short, intense warm spell, DSY3 – Long, less intense warm spell)
CIBSE	Chartered Institute of Building Services Engineers
COP	Coefficient of Performance – Energy efficiency of a heating system at 100% output
SCOP	Seasonal Coefficient of Performance – Average energy efficiency of a heating system over a year, accounting for part load operation
EER	Energy Efficiency Ratio – Energy efficiency of a cooling system at 100% output
SEER	Seasonal Energy Efficiency Ratio – Average energy efficiency of a cooling system over a year, accounting for part load operation
TM52	Methodology for assessing the overheating risk in non-domestic buildings
TM54	Methodology for evaluating operational energy use at the design stage
TM59	Methodology for assessing the overheating risk in domestic buildings
HIU	Heat Interface Unit – Device that connects individual dwellings to a communal heating system
Green lease	A lease that includes clauses whereby the owner and occupier undertake specific responsibilities/obligations with regards to sustainable operation of a building
BRUKL	Building Regulation Part L calculation – The BRUKL document summarises the performance of the building against the Part L regulations
NCM	National Calculation Methodology – Government methodology for assessing the carbon emissions of non-domestic buildings
Sensible gain	Heat that causes a change in temperature of the surroundings
Latent gain	Heat that results from an increase in the amount of moisture in the air
BSRIA	Building Services Research and Information Association
PFC	Power Factor Correction - Power Factor Correction equipment is a technology which when installed allows the consumer to reduce their electricity bill by maintaining the level of reactive power consumption.
LTHW	Low Temperature Hot Water - Water circulated for space and hot water heating at less than 90°C

EXECUTIVE SUMMARY

“All cities must face up to the reality of climate change and the need to limit their future contribution to this major global problem” (The London Plan – March 2021).

This report summaries the proposed Energy Strategy for the redevelopment of Tavis House (‘the Site’) within the London Borough of Camden (‘LBC’).

1 EXECUTIVE SUMMARY

This report summarises the proposed Energy Strategy for the redevelopment of Tavis House ('the Site') within the London Borough of Camden ('LBC').

1.1 The Site

The proposed development comprises of the refurbishment and extension of Tavis House, a building originally built for the Ministry of Labour and National Service. The building sits within Bloomsbury Conservation Area, within sub area group 6: Bloomsbury Square/Russell Square/Tavistock Square and is located within the Central Activities Zone (CAZ).

Planning permission was approved on 1 December 2023 under reference 2021/6105/P for the:

"Refurbishment and extension of the existing building to provide new entrances, a new roof top pavilion, roof top plant equipment and enclosures, rear extension and cycle parking associated with Class E use together with new hard and soft landscaping and other ancillary works"

1.2 Proposed Development

The proposals include the variation of Condition 2, 9, 13 and 15 approved under planning permission reference 2021/6105/P on 1 December 2023 for the *'Refurbishment and extension of the existing building to provide new entrances, a new roof top pavilion, roof top plant equipment and enclosures, rear extension and cycle parking associated with Class E use together with new hard and soft landscaping and other ancillary works'.* NAMELY amendments to external rear facades, rooftop plant and other associated works

Figure 1 Tavis House, proposed development CGI. Source: Gort Scott Architects

This S73 application has been submitted to allow the building to be used for flexible lab-enabled space resulting in changes to the rear façade and roof top level to allow for additional plant associated with laboratories.

1.3 Energy Strategy

The Energy Strategy has been developed in accordance with the GLA's 'Be Lean', 'Be Clean', 'Be Green' and 'Be Seen' energy hierarchy and has been assessed against Part L of the Building Regulations 2021, which was introduced in June 2022.

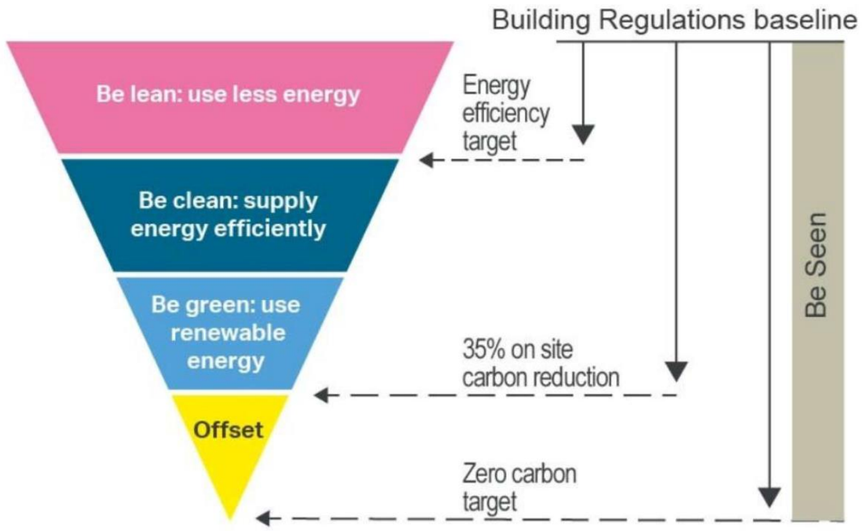

Figure 2 The London Plan Energy Hierarchy

1.3.1 Be Lean

The following measures are proposed for the development to use less energy and manage demand during operation:

- For the new build extension, high levels of insulation and high-performance glazing will be incorporated, going beyond Part L 2021 targets and notional building specifications, in order to reduce the demand for space conditioning.
- Provision of openable windows providing natural ventilation enabling a mixed mode strategy within the office areas.
- Improved air tightness as the new build portions will target low air permeability rates.
- Low energy lighting will be provided throughout.

1.3.2 Be Clean

The scale of the proposed development does not lend itself to incorporation of a centralised heat network, therefore a VRF system has been proposed to meet space heating and cooling demand.

1.3.3 Be Green

The following measures are proposed in order to maximise the opportunities for renewable energy production, storage and use on site:

- Air source heat pumps providing space heating and cooling to office and laboratory areas.
- Air source heat pumps will provide DHW to the showers and end of journey facilities located in the basement.
- Renewable on-site generation will be provided by highly efficient PV panels on the roof providing 6.6 kW peak.

1.3.4 Summary of Results

Based on the above, the development is predicted to achieve on-site carbon savings of at least 36% over Part L of the Building Regulations 2021. The Site Wide Carbon Emissions and Savings for the development are summarised in the table below:

Site Wide - 2021	Carbon Dioxide Emissions (Tonnes CO_2 per annum)	Regulated Carbon Dioxide Savings (Tonnes CO_2 per annum)	Percentage Carbon Dioxide Savings (%)
Baseline	124.6		
Be Lean	83.8	40.9	33%
Be Clean	83.8	0.0	0%
Be Green	79.2	4.5	4%
Total Savings	-	45.4	36%
	CO_2 savings off-set (Tonnes CO_2)		
Offset for new built areas		2,377.2	

Table 1 Site Wide Carbon Emissions and Savings under Part L 2021

The site wide carbon saving against the previous methodology under Part L 2013 for SAP 10.0 figures are presented below, purely for comparative purposes:

Site Wide - 2013	Carbon Dioxide Emissions (Tonnes CO_2 per annum)	Regulated Carbon Dioxide Savings (Tonnes CO_2 per annum)	Percentage Carbon Dioxide Savings (%)
Baseline	216.4		
Be Lean	180.2	36.1	17%
Be Clean	180.2	0.0	0%
Be Green	120.0	60.2	28%
Total Savings	-	96.3	45%

Table 2 Site Wide Carbon Emissions and Savings under Part L 2013

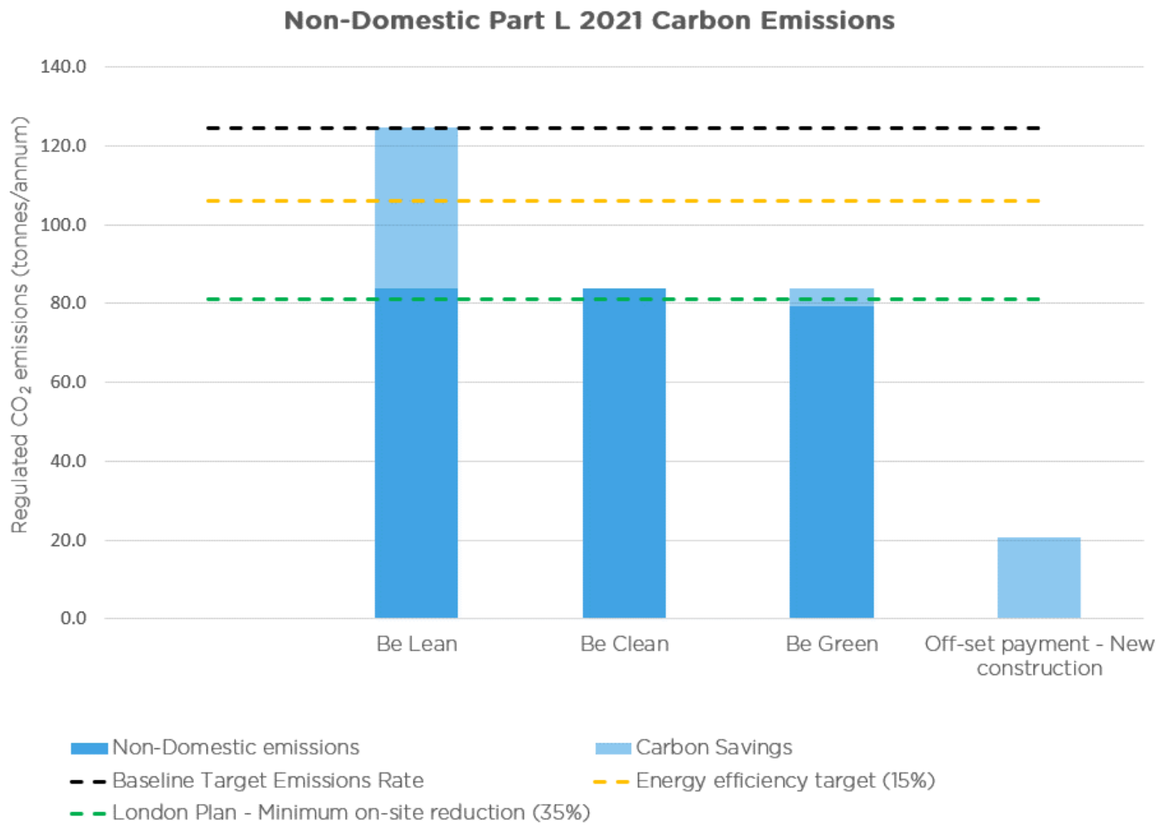

Figure 3 Site Wide Carbon Savings throughout the energy hierarchy (Part L 2021)

1.3.5 Minimising the Risk of Overheating

The cooling hierarchy has been applied during the development of the building proposal and a TM52 dynamic overheating assessment using CIBSE guidance has been undertaken to quantify the risk of overheating. The servicing strategy of the building varies, with the office areas using a mixed mode system which includes natural ventilation and active cooling, but the laboratory areas have a sealed façade.

The analysis demonstrates that although active cooling systems are required to futureproof the building and mitigate the risk of overheating when accounting for climate change, the development has maximised passive measures to reduce the cooling demand.

1.3.6 Part L Compliance

The development is a major refurbishment and extension of the existing office building, and will be designed to meet and exceed, where possible, all the minimum standards for existing buildings as described and defined within the relevant section of Approved Document L, Conservation of fuel and power, Volume 2: Buildings other than dwellings, 2021 edition incorporating 2023 amendments.

As the proposed building does not fall under the new building definition as per the requirements set out in section 10.7 of ADL2021, the extension is required to meet the guidance in paragraphs 10.8 to 10.11. The alternative approach detailed in section 10.11 of ADL2021 has been followed and compliance demonstrated.

INTRODUCTION

Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs.

This section introduces the Tavis House development.

2 INTRODUCTION

This section introduces the Tavis House development.

2.1 Introduction

This Energy Statement has been prepared by Twin & Earth on behalf of Tempus Realty Holdings ('the Applicant') in support of an application for Tavis House, 1-6 Tavistock Square, London, WC1H 9NA. This report sets out the energy strategy for the development.

2.2 The Site

The development comprises of the refurbishment and extension of Tavis House, a building originally for the Ministry of Labour and National Service. The building sits within Bloomsbury Conservation Area, within sub area group 6: Bloomsbury Square/Russell Square/Tavistock Square and is located within the Central Activities Zone (CAZ). Planning permission was approved on 1 December 2023 under reference 2021/6105/P for the:

"Refurbishment and extension of the existing building to provide new entrances, a new roof top pavilion, roof top plant equipment and enclosures, rear extension and cycle parking associated with Class E use together with new hard and soft landscaping and other ancillary works".

Figure 4. Tavis House, proposed development CGI. Source: Gort Scott Architects

2.3 The Proposal

The proposals include the Section 73 for the:

"Variation of condition 2, 9, 13 and 15 approved under planning permission reference 2021/6105/P on 1 December 2023 for 'Refurbishment and extension of the existing building to provide new entrances, a new roof top pavilion, roof top plant equipment and enclosures, rear extension and cycle parking associated with Class E use together with new hard and soft landscaping and other ancillary works".

PLANNING POLICY

“The planning system should support the transition to a low carbon future in a changing climate. It should help to shape places in ways that contribute to radical reductions in greenhouse gas emissions and support renewable and low carbon energy” (NPPF, 2021)

This section summarises the relevant national and local planning policy and applicable regulations to the development, which form the basis of the proposed energy and carbon reduction strategy.

3 PLANNING POLICY

This section summarises the relevant national and local planning policy and applicable regulations to the development, which form the basis of the proposed energy and carbon reduction strategy.

3.1 APPLICABLE POLICIES

3.1.1 Adopted Planning Policy Framework

The following planning policy has been adopted by the London Borough of Camden (LBC):

- The London Plan (2021)
- Camden Local Plan (2017)

Other relevant documents which will form a material consideration in the determination of the planning application include the following:

- National Planning Policy Framework (NPPF)
- National Planning Practice Guidance (NPPG)

There are also a number of additional Supplementary Planning Guidance (SPG) and Supplementary Planning Documents (SPD) which provide guidance on standards for development proposals, including:

- GLA Energy Assessment Guidance (2022)
- Camden Energy efficiency and adaptation planning guidance (2021)

3.1.2 Draft Planning Policy

The Draft New Camden Local Plan (January 2024) has been subject to consultation. The draft new Camden Local Plan sets out our vision for future development in Camden for the next 15 years and includes the planning policies and site allocations to help achieve this. It identifies how many new homes and jobs are needed to support Camden's population, and where and how they should be provided. The Local Plan also has an important role in shaping how Camden's places look and feel, promoting inclusion, reducing inequality, enhancing the environment, tackling climate change and securing sustainable neighbourhoods.

The Plan underwent consultation between 17th January 2024 and 13th March 2024.

3.2 NATIONAL PLANNING POLICY FRAMEWORK (NPPF)

The NPPF stipulates that the purpose of the planning system is to contribute to the achievement of sustainable development. At a very high level, the objective of sustainable development can be summarised as meeting the needs of the present without compromising the ability of future generations to meet their own needs.

The National Planning Policy Framework (NPPF) was first published on 27 March 2012 and revised most recently in December 2023 as a key part of Government reforms to make the planning system less complex and more accessible, to protect the environment and to promote sustainable growth. The revised NPPF emphasises the delivery of new homes, and for the design community to put design quality at the heart of the system. The Government have also published a series of National Planning Practice Guidance covering different topics to support the framework.

3.3 THE LONDON PLAN 2021

The London Plan (March 2021) is the overall strategic plan for London which sets out an integrated economic, environmental, transport and social framework for the development of London over the next 20–25 years.

The plan brings together the geographic and locational (although not site specific) aspects of the Mayor's other strategies including those dealing with: Transport, Economic Development, Housing, Culture, Social issues and Environment including climate change (adaptation and mitigation), air quality, noise and waste.

3.4 LONDON BOROUGH OF CAMDEN

3.4.1 LBC's Local Plan (2017)

The specific policies that have been considered when developing the energy strategy for the development are listed below.

Policy CC1: Climate change mitigation

The Council will require all development to minimise the effects of climate change and encourage all developments to meet the highest feasible environmental standards that are financially viable during construction and occupation. We will:

a. promote zero carbon development and require all development to reduce carbon dioxide emissions through following the steps in the energy hierarchy;
b. require all major development to demonstrate how London Plan targets for carbon dioxide emissions have been met;
c. ensure that the location of development and mix of land uses minimise the need to travel by car and help to support decentralised energy networks;
d. support and encourage sensitive energy efficiency improvements to existing buildings;
e. require all proposals that involve substantial demolition to demonstrate that it is not possible to retain and improve the existing building; and
f. expect all developments to optimise resource efficiency.

For decentralised energy networks, we will promote decentralised energy by:

a. working with local organisations and developers to implement decentralised energy networks in the parts of Camden most likely to support them;
b. protecting existing decentralised energy networks (e.g. at Gower Street, Bloomsbury, King's Cross, Gospel Oak and Somers Town) and safeguarding potential network routes; and

c. requiring all major developments to assess the feasibility of connecting to an existing decentralised energy network, or where this is not possible establishing a new network.

To ensure that the Council can monitor the effectiveness of renewable and low carbon technologies, major developments will be required to install appropriate monitoring equipment.

Policy CC2: Adapting to climate change

The Council will require development to be resilient to climate change. All development should adopt appropriate climate change adaptation measures such as:

a. the protection of existing green spaces and promoting new appropriate green infrastructure;
b. not increasing, and wherever possible reducing, surface water runoff through increasing permeable surfaces and use of Sustainable Drainage Systems;
c. incorporating bio-diverse roofs, combination green and blue roofs and green walls where appropriate; and
d. measures to reduce the impact of urban and dwelling overheating, including application of the cooling hierarchy.

Any development involving 5 or more residential units or 500 sqm or more of any additional floorspace is required to demonstrate the above in a Sustainability Statement.

Sustainable design and construction measures

The Council will promote and measure sustainable design and construction by:

a. ensuring development schemes demonstrate how adaptation measures and sustainable development principles have been incorporated into the design and proposed implementation;
b. encourage new build residential development to use the Home Quality Mark and Passivhaus design standards;
c. encouraging conversions and extensions of 500 sqm of residential floorspace or above or five or more dwellings to achieve “excellent” in BREEAM domestic refurbishment; and
d. expecting non-domestic developments of 500 sqm of floorspace or above to achieve “excellent” in BREEAM assessments and encouraging zero carbon in new development from 2019.

3.4.2 LBC’s Planning Guidance – Energy efficiency and adaptation (2021)

The Camden Planning Guidance (CPG) has been produced to establish more detailed guidance on the application of policies within the Local Plan and any neighbourhood plans that may come into effect.

The specific policies that have been considered when developing the energy strategy for the development are listed below.

Energy Hierarchy – key messages

- All development in Camden is expected to reduce carbon dioxide emissions by following the energy hierarchy in accordance with Local Plan policy CC1.
- Energy strategies are to be designed following the steps set out in the energy hierarchy.

Making buildings more energy efficient – key messages

- Natural ‘passive’ measures should be prioritised overactive measures to reduce energy.
- Major residential development to achieve 10%, and non-residential development to achieve 15% reduction (beyond part L Building regulations), in accordance with the new London Plan, through on-site energy efficient measures (Be lean stage).

Decentralised energy – key messages

All new major developments in Camden are expected to assess the feasibility of decentralised energy network growth (paragraph 8.25 Local Plan).

Renewable energy technologies

- There are a variety of renewable energy technologies that can be installed to supplement a development’s energy needs.
- Developments are to target a 20% reduction in carbon dioxide emissions from on-site renewable energy technologies.

Energy statements – key messages

- Energy statements are required for all developments involving 5 or more dwellings and/or more than 500sqm of any (gross internal) floorspace.
- Energy statements should demonstrate how a development has been designed following the steps in the energy hierarchy.
- The energy reductions should accord with those set out in the Chapter below ‘Energy reduction’.

Energy reduction – key messages

- All development in Camden is expected to reduce carbon dioxide emissions through the application of the energy hierarchy.
- All new build major development to demonstrate compliance with London Plan targets for carbon dioxide emissions.
- Deep refurbishments (i.e. refurbishments assessed under Building Regulations Part L2B/L2B) should also meet the London Plan carbon reduction targets for new buildings.
- All new build residential development (of 1 – 9 dwellings) must meet 19% carbon dioxide reduction; and
- Developments of five or more dwellings and/or more than 500sqm of any gross internal floorspace to achieve 20% reduction in carbon dioxide emissions from on-site renewable energy generation

Energy efficiency in existing buildings – key messages

- All developments should demonstrate how sustainable design principles have been considered and incorporated.
- Sensitive improvements can be made to historic buildings to reduce carbon dioxide emissions.
- Warm homes and buildings are key to good health and wellbeing. As a guide, at least 10% of the project cost should be spent on environmental improvements.
- The 20% carbon reduction target (using on-site renewable energy technologies) applies for developments of five or more dwellings and/or more than 500 sqm of any gross internal floorspace (see Chapters 2 and 4).

Sustainable design and construction – key messages

- All developments involving 5 or more residential units or 500 sqm or more of any additional floorspace should address sustainable design and construction measures (proposed in design and implementation) in a Sustainability Statement (Local Plan policy CC2).
- Active cooling (air conditioning) will only be permitted where its need is demonstrated and the steps in the cooling hierarchy are followed (Local Plan policy CC2).

- Development is expected to reduce overheating risk through following the steps in the cooling hierarchy. All new development should submit a statement demonstrating how the cooling hierarchy has been followed (Local Plan policy CC2).
- All developments should seek opportunities to make a positive contribution to green space provision or greening.

ENERGY STRATEGY

“The purpose of an energy assessment is to demonstrate that the proposed climate change mitigation measures comply with London Plan energy policies, including the energy hierarchy. It also ensures energy remains an integral part of the development’s design and evolution” (Energy Assessment Guidance, June 2022).

This section summarises how the development has been designed to meet energy and carbon reduction policies, based on the guidance contained in Energy Assessment Guidance (June 2022).

4 ENERGY STRATEGY

This section summarises how the development has been designed to meet energy and carbon reduction policies, based on the guidance contained in Energy Assessment Guidance (June 2022).

4.1 Introduction

This section summarises the considerations made, and technologies proposed to reduce the energy consumption of the building and to minimise carbon emissions associated with the development's operational energy.

The strategy has been developed following the 'Be Lean', 'Be Clean', 'Be Green' and 'Be Seen' energy hierarchy as stated in Policy SI2 in the London Plan (March 2021) which ensures that sustainability is integrated within the building design rather than achieved via "add-on" features and systems. In addition to this, consideration has also been made of the influence of the behavioural patterns and operation of the building on its "in-use" performance and measures have been proposed to raise awareness and facilitate management such as extensive sub-metering.

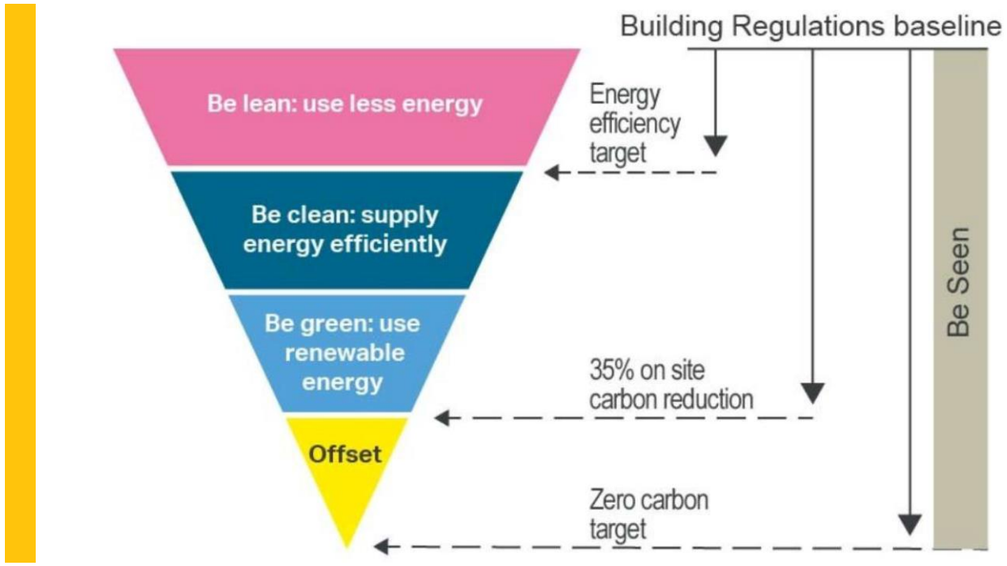

Figure 5 The London Plan energy hierarchy

4.2 Energy Modelling Tools

Performance evaluation has been undertaken by a certified CIBSE Energy Assessor using government approved Dynamic Simulation Modelling software IES virtual Environment 2023 which can assess compliance against Part L 2021 and the National Calculation Methodology (NCM).

The following images show the energy model developed for proposed development.

- Blue represents the existing areas.
- Red represents the new extension.
- White represents the party wall.

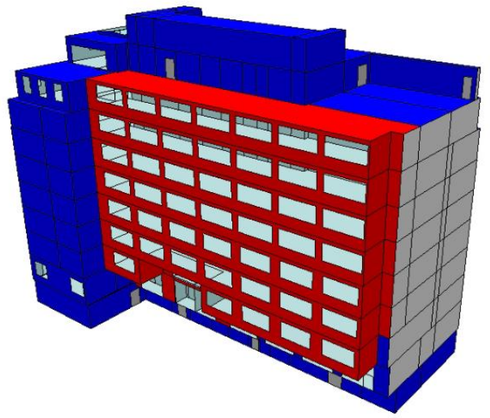

Figure 6 IES VE Model – North

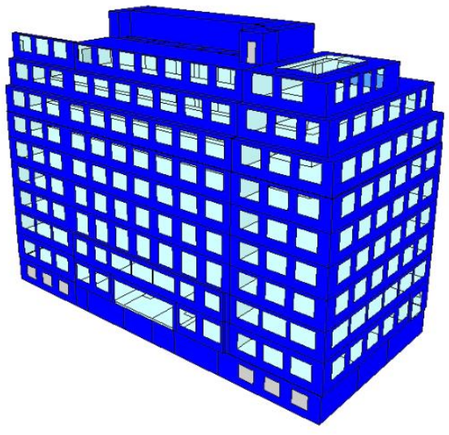

Figure 7 IES VE Model – South

4.3 Use Less Energy (Be Lean)

4.3.1 Building Envelope & Glazing Performance

The passive design strategy has been developed to incorporate high thermal performance building fabric and balance the requirements for daylight with overheating and heat loss considerations.

High thermal performance fabric is proposed for the new build areas which significantly improves upon the requirements of Part L of the Building Regulations 2021, as shown in the following table:

Building Element	Part L 2021 Limiting Parameters	Proposed Building Fabric – Non-Domestic
External walls	0.26 W/m^{2}K	0.15 W/m^{2}K
Roof	0.16 W/m^{2}K	0.1 W/m^{2}K
Floor	0.18 W/m^{2}K	0.1 W/m^{2}K
Opaque Door	1.6 W/m^{2}K	1.2 W/m^{2}K
Windows (u-value)	1.6 W/m^{2}K	1.20 W/m^{2}K
Windows (g-value)	-	0.40
Windows (Light transmittance)	-	70%
Air tightness	8 m^3/m^2.h @ 50Pa	3 m^3/m^2.h @ 50Pa
Thermal bridging	-	Default

Table 3. Proposed thermal performance of new build areas

To compare the existing building with the proposed refurbishment, Appendix 3 of the Energy Assessment Guidance (June 2022) has been used to establish a consistent baseline. The table below details the specifications used.

Building Element	Appendix 3 Specification – Non-Domestic
External walls (cavity insulation)	0.55 W/m^{2}K
Roof (flat roof)	0.18 W/m^{2}K
Floor	0.25 W/m^{2}K
Windows (u-value)	1.40 W/m^{2}K
Windows (g-value)	0.40
Air tightness	25 m^3/m^2.h @ 50Pa
Thermal bridging	Default

Table 4 Appendix 3 thermal performance

4.3.2 Proposed Heating & Cooling and DHW Services

Priority has been given to minimising the cooling demands, as detailed section 4.2.1 as well as section 5, which covers minimising the risk of overheating.

It is proposed that Variable Refrigerant Flow (VRF) systems will provide heating and cooling to the laboratory and office areas. For back of house areas, it is proposed that Air Handling Units will provide tempered air from VRF units and then heater batteries with refrigerant will provide trimming at the room level.

A fan coil system is proposed to serve the 8th floor Winter Garden to meet peak heating and cooling requirements.

It is proposed that domestic hot water for the showers will come from a high efficiency heat pump. Domestic hot water for the office and laboratory areas will be provided by point of use generators due to the necessity to keep water separate from the potable water supply.

4.3.3 Ventilation

Within the perimeter zones of the office areas, a mixed mode strategy is being proposed, which will reduce the energy consumption related to ventilation and cooling. The laboratory spaces will not have openable windows due to the necessity to maintain a controlled environment within the areas, as such windows will remain fixed for these spaces.

Mechanical ventilation will be supplied to occupied spaces via dedicated AHUs with heat recovery which will provide fresh air at 14 l/s/person to the office spaces and 6 ach to the laboratory spaces. Due to the anticipated use of the winter garden located on the 8th floor, it is proposed that the space will be served via a dedicated AHU.

Fume cupboards will be served by strobic fans which are located on the ninth floor.

Demand control ventilation

Demand control ventilation (DCV) is a feedback control method to maintain indoor air quality that automatically adjusts the ventilation rate provided to a space in response to changes in conditions such as occupant numbers or indoor pollutant concentration.

The control strategy is well suited for reducing the energy used by heating, cooling and ventilation systems, and is therefore proposed to be installed in laboratory, office and reception areas.

Ventilation	Office Use	Laboratory Use
Duct air leakage standard	Default	Default
AHU air leakage standard	Default	Default
AHU SFP (W/l/s)	1.6	1.6
AHU Heat recovery (HR%)	75	75
Demand Control Ventilation	CO_2 sensors + speed control	CO_2 sensors + speed control

Table 5 Mechanical ventilation inputs

4.3.4 Lighting

All lighting will comprise high efficiency LED lamps and luminaires to maximise the efficacy of the light fittings. The efficacy targets and expected level of lighting control (daylight/occupancy control) proposed for the development have been summarised in the table below:

Space Type	Minimum lighting efficacy	Daylight control (perimeter zones)	Occupancy control
Office	100	Yes	Presence detection
Laboratory	100	Yes	Presence detection
Plant Rooms	100	No	Manual on / auto off
Circulation, toilets, changing facilities, cycle storage, store rooms, refuse area	100	No	Presence detection

Space Type	Minimum lighting efficacy	Daylight control (perimeter zones)	Occupancy control
Display lighting	80	No	N/A

Table 6. Proposed lighting efficacies and lighting control

4.3.5 Metering and controls

Extensive sub-metering and controls will be provided to all areas which will:

- Enable monitoring of energy consumption by the facilities management team and tenants to help deliver ongoing energy efficiency improvements and provide early identification of system issues.
- Provide a suitable degree of zoning to enable independent control of different areas.
- Reduce the energy consumption by avoiding system operation during unoccupied periods and by reducing the demand when natural sources of energy are available, such as daylight.
- The metering and monitoring systems will be specified to comply with the Mayor of London's 'Be Seen' energy monitoring guidance.

Please refer to section 4.8.1 for further information.

4.3.6 Summary Results

The carbon emissions performance of the development was tested using dynamic energy modelling, with Government-compliant software for assessing Part L (IES VE 2023). Carbon emissions and cash in-lieu contributions have been calculated with the GLA's Carbon Emissions Reporting Spreadsheet.

Based on the above strategy, the following 'Be Lean' results can be achieved:

OFFICE - REFURBISHED	Carbon Dioxide Emissions (Tonnes CO_2 per annum)	Regulated Carbon Dioxide Savings (Tonnes CO_2 per annum)	Percentage Carbon Dioxide Savings (%)
Baseline	99.8		
Be Lean	62.5	37.3	37%

Table 7 Non-Domestic Carbon Emissions for the refurbished spaces -Be Lean

OFFICE - EXTENSION	Carbon Dioxide Emissions (Tonnes CO_2 per annum)	Regulated Carbon Dioxide Savings (Tonnes CO_2 per annum)	Percentage Carbon Dioxide Savings (%)
Baseline	24.9		
Be Lean	21.3	3.6	14%

Table 8 Non-Domestic Carbon Emissions for extension spaces - Be Lean

SITE-WIDE	Carbon Dioxide Emissions (Tonnes CO_2 per annum)	Regulated Carbon Dioxide Savings (Tonnes CO_2 per annum)	Percentage Carbon Dioxide Savings (%)
Baseline	124.6		
Be Lean	83.8	40.9	33%

Table 9 Non-Domestic Carbon Emissions Site-Wide – Be Lean

4.5 Energy Efficient Supply (Be Clean)

The space heating and domestic hot water system has been selected in accordance with the hierarchy of the London Plan, which should prioritise connection to local existing or planned heat networks.

Heating Hierarchy:
a) connect to local existing or planned heat networks
b) use zero-emission or local secondary heat sources (in conjunction with heat pump, if required)
c) use low-emission combined heat and power (only where there is a case for it to enable the delivery of an area-wide heat network, meet the development's electricity demand and provide demand response to the local electricity network)
d) use ultra-low nitrogen oxides (NOx) gas boilers

Table 10 The Heating Hierarchy, GLA Energy Assessment Guidance (June2022)

4.5.1Connect to existing or planned heat networks

According to the Camden heat network map, there is an existing heat network located in close proximity to the proposed development, the Bloomsbury Heat & Power network. This network provides electricity and heat to a number of college buildings and is unlikely to have additional capacity for new developments to be connected. It is understood that this heat network is served by a gas fired CHP plant, which at the time of installation resulted in fewer carbon emissions compared to an electric system. However, as the national grid undergoes decarbonisation, it would prove more carbon intensive to connect to the centralised network as opposed to utilising electric heat pumps.

According to the London Heat map, there is a proposed heat network running along Euston Road, with the nearest connection point approximately 330m away. This network was expected to begin phase 1 in 2022, with the completion of the first phase anticipated to be in 2029, which would be after the proposed development is already in operation. Additionally, it is unclear if works have begun on the extension of the proposed heat network at the time of writing this report.

Based on the scale of the development, a centralised heat network has not been deemed feasible. Connection to a future heat network, or future proofing for one, is therefore considered not possible for Tavis House, further substantiated by the constrained plant space available within the existing building which makes the provision of space for the retrofit of heat exchangers in the future unfeasible.

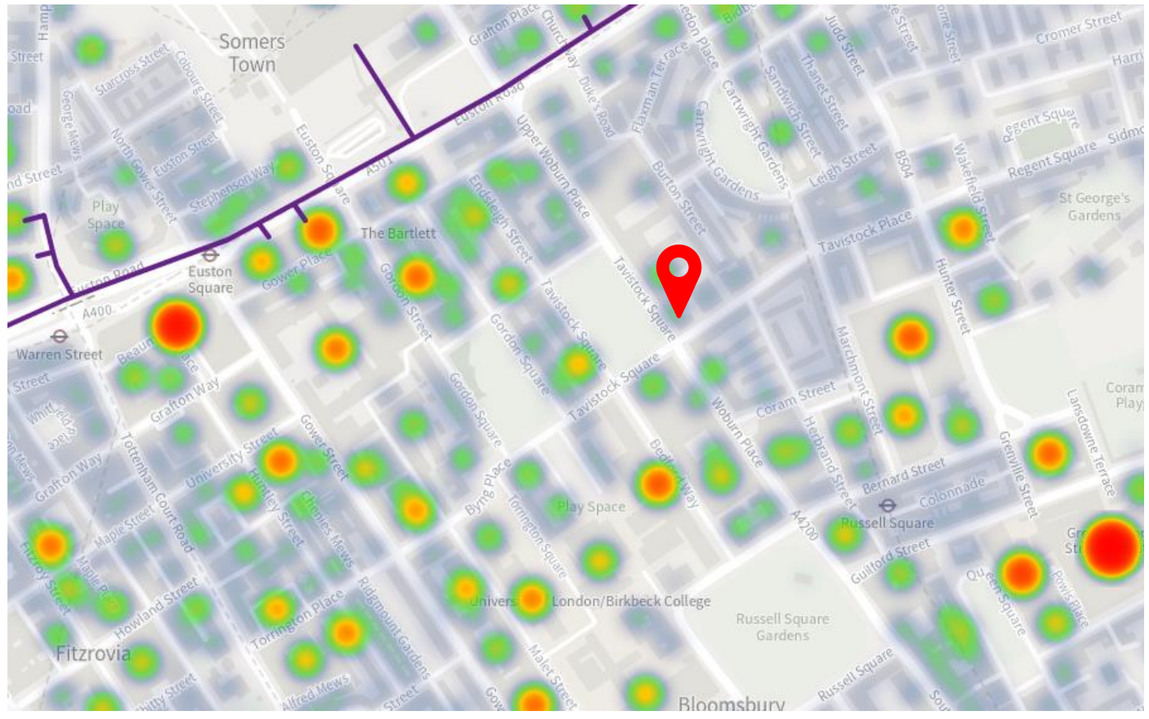

Figure 8 London heat network map

4.5.2 Summary Results

The following tables therefore show no change in the carbon emissions as a result of the 'Be Clean' Stage.

OFFICE - REFURBISHED	Carbon Dioxide Emissions (Tonnes CO_2 per annum)	Regulated Carbon Dioxide Savings (Tonnes CO_2 per annum)	Percentage Carbon Dioxide Savings (%)
Baseline	99.8		
Be Lean	62.5	37.3	37%
Be Clean	62.5	0.0	0%

Table 11 Non-Domestic Carbon Emissions for the refurbished spaces - Be Clean

OFFICE - EXTENSION	Carbon Dioxide Emissions (Tonnes CO_2 per annum)	Regulated Carbon Dioxide Savings (Tonnes CO_2 per annum)	Percentage Carbon Dioxide Savings (%)
Baseline	24.9		
Be Lean	21.3	3.6	14%
Be Clean	21.3	0.0	0%

Table 12 Non-Domestic Carbon Emissions for extension spaces - Be Clean

SITE-WIDE	Carbon Dioxide Emissions (Tonnes CO_2 per annum)	Regulated Carbon Dioxide Savings (Tonnes CO_2 per annum)	Percentage Carbon Dioxide Savings (%)
Baseline	124.6		
Be Lean	83.8	40.9	33%
Be Clean	83.8	0	0%

Table 13 Non-Domestic Carbon Emissions Site-Wide – Be Clean

4.6 Renewable Energy (Be Green)

A feasibility study has been undertaken to evaluate the viability of incorporating low and zero carbon technologies within the development.

The suitability of each technology for the development has been evaluated based on the technical viability, considering spatial requirements, suitability for the development's demand profile and potential for carbon emissions savings.

Appendix D provides details of each technology and the appropriateness to the development. The following table summarises the feasibility of each technology.

Technology	Feasibility	Recommended?	Proposed?
Photovoltaic panels (PV)	The proposed development has unshaded flat roofs which are suitable for the installation of roof mounted PV panels. Although limited area is available due to the extensive requirements for plant space.	**Yes**	**Yes**
Solar hot water (SHW)	SHW collectors would compete with PV panels for the available roof space. PV panels are anticipated to result in higher carbon emissions savings and are deemed more suitable for the development therefore SHW collectors are not recommended.	**No**	**N/A**
Heat Pumps	Air Source Heat Pumps (ASHP) can provide low carbon solution for the provision of space heating, domestic hot water and cooling. Owing to their high efficiency, ASHPs are feasible and proposed for heating, cooling and DHW production within the development.	**Yes**	**Yes**
Wind Turbines	Due to the site constraints and urban location, wind turbines would need to be roof mounted. Roof mounted turbines are likely to cause building vibrations that are undesirable for domestic use.	**No**	**N/A**
Biomass Heating	The development cannot accommodate the storage required for biomass. In addition, biomass produces high levels of particulates and NOx, potentially causing issues with local air quality.	**No**	**N/A**

Table 14 Low and zero carbon energy - technical feasibility summary table

4.6.1Heat Pumps

It is proposed that heating and cooling will be provided via VRF air source heat pumps (AHSP) located at roof level. Additionally, a water source heat pump (WSHP) will be provided for domestic hot water generation.

4.6.2 Photovoltaics

The size of the array was calculated based on the available roof area. An array totalling 6.6kWp is proposed to be connected to the development, which will be mounted at roof level. This is equivalent to approximately 20 x 330Wp panels (size 1 x 1.6m) arranged as follows:

- Panels will be installed Southwest facing and with a tilt angle of 10°.
- All panels will be arranged in a landscape layout.
- Separation between panels will be sufficient to allow access for maintenance purposes as well as to avoid overshadowing.

Please see Appendix D for proposed panel layout and indicative specification.

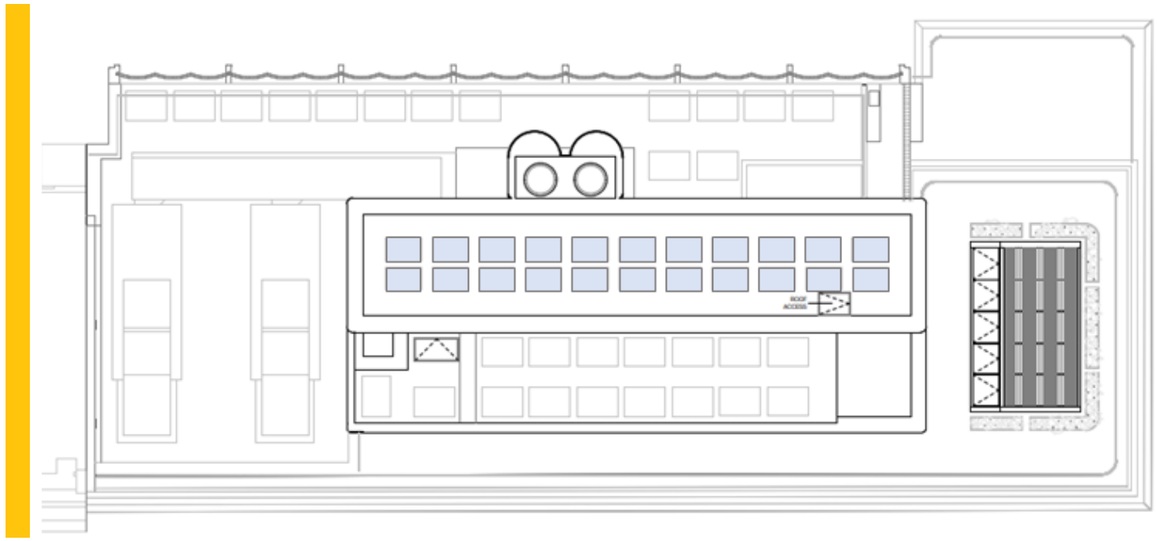

Figure 9 Indicative panel arrangement

4.6.3 Summary Results

Based on the above strategy, the following 'Be Green results can be achieved:

OFFICE - REFURBISHED	Carbon Dioxide Emissions (Tonnes CO_2 per annum)	Regulated Carbon Dioxide Savings (Tonnes CO_2 per annum)	Percentage Carbon Dioxide Savings (%)
Baseline	99.8		
Be Lean	62.5	37.3	37%
Baseline	62.5	0.0	0%
Be Green	58.5	4.0	4%

Table 15 Non-Domestic Carbon Emissions and Reduction for refurbished spaces – Be Green

OFFICE - EXTENSION	Carbon Dioxide Emissions (Tonnes CO_2 per annum)	Regulated Carbon Dioxide Savings (Tonnes CO_2 per annum)	Percentage Carbon Dioxide Savings (%)
Baseline	24.9		
Be Lean	21.3	3.6	14%
Be Clean	21.3	0.0	0%
Be Green	20.8	0.5	2%

Table 16 Non-Domestic Carbon Emissions and Reduction for extension spaces – Be Green

SITE-WIDE	Carbon Dioxide Emissions (Tonnes CO_2 per annum)	Regulated Carbon Dioxide Savings (Tonnes CO_2 per annum)	Percentage Carbon Dioxide Savings (%)
Baseline	124.6		
Be Lean	83.8	40.9	33%
Be Clean	83.8	0	0%
Be Green	79.2	4.5	4%

Table 17 Non-Domestic Carbon Emissions Site-Wide – Be Green

4.8 Monitor, Verify and Respond (Be Seen)

4.8.1 Sub metering / Building Energy Management

The sub-metering strategy is to be developed further during the detailed design stages; however, the development will incorporate energy meters in line with the GLA's Energy Monitoring Guidance (September 2021) to enable performance in use to be monitored and optimised. This will include the use of open protocol systems that allow devices to be connected without having to use proprietary systems.

A Building Energy Management System (BEMS) will be provided to operate, control and monitor the mechanical services installations. The BEMS will allow remote, off-site monitoring of faults and alarms, also allowing set-point adjustment and analysis of performance.

Each meter will be connected to an automatic data retrieval system and billing will be administered by the Client or their appointed management company. All heat meters in plant areas will be equipped with M-bus or similar interfaces and will be monitored.

Comprehensive metering will allow performance and load monitoring of complete systems and also individual items of plant, including low and zero carbon technologies. Electricity sub-meters will be installed on/at the following systems and locations as a minimum:

- Mechanical services plant
- Air source heat pumps
- PV arrays
- Split distribution boards – lighting and small power

Flexibility achieved through	Yes/No	Details
Electrical energy storage (kWh) capacity	No	Due to existing site constraints, it is expected that all energy generated by on-site PV will be used by the development.
Heat energy storage (kWh) capacity	Yes	Thermal stores will be provided in the form of buffer vessels and thermal stores in order to reduce peak heat pump and electrical load for domestic hot water.
Renewable energy generation (load matching)	No	The site constraints limit the amount of on-site renewable energy generation (provided by PVs) to a level which is insufficient to justify a load match.
Gateway to enable automated demand response	No	The provision of a gateway will be investigated in the future should dynamic pricing signals become available.
Smart systems integration	Yes	It is proposed that a landlord smart building system will be developed which will enable secure energy meter reading and allow tenant integration.
Other initiative	No	Additional initiatives will be explored during later design stages.

Table 19 Summary of interventions for achieving flexibility

4.8.2 Demand Side Response

The potential for configurable gateways, allowing for automated Demand Side Response (DSR) will be reviewed during the detailed design stage through dialogue with DSR aggregators and to ensure that any DSR approaches are suitable for the building uses.

4.8.3 Electricity Capacity

Early conversations have been held with the DNO by Hoare Lea, project engineers, including the electrical utility application based on an initial load assessment.

	Electrical
Estimate peak demand (MW)	1002 kVA
Available capacity (MW)	1452 kVA
Flexibility potential (MW)	450 kVA

Table 18 Summary of site wide peak demand, capacity and flexibility potential

4.8.4 Flexibility Potential

Opportunities to reduce the peak heating and electricity demand of the development have been considered and the following has been concluded:

4.9 Summary of Carbon Emissions and Savings

The following tables summarise the carbon emissions and reduction performance for the Whole Site. Carbon offset contributions have been calculated based on the London Plan (2021) target for Net Zero and a carbon offset price of £95 per tonne of carbon over a 30-year period.

The results have been compared also against the previous methodology under Approved Document Part L 2013 for Sap 10.0 carbon factors for information only.

4.9.1 Non-Domestic Carbon Emissions and Savings – Part L 2021

The following tables demonstrate the performance of the development against the appropriate baseline for the development as described within GLA's Energy Assessment Guidance (June 2022)

SITE WIDE DEVELOPMENT	Carbon Dioxide Emissions (Tonnes CO_2 per annum)	
	Regulated	Unregulated
Baseline	124.6	39.5
After energy demand reduction (Be Lean)	83.8	39.5
After heat network connection (Be Clean)	83.8	39.5
After renewable energy (Be Green)	79.2	39.5

Table 20 Non-Domestic Carbon Dioxide Emissions after each stage of the Energy Hierarchy

SITE WIDE DEVELOPMENT	Regulated Carbon Dioxide Savings	
	(Tonnes CO_2 per annum)	(%)
Be Lean: Savings from energy demand reduction	40.9	33%
Be Clean: Savings from heat network	0.0	0%
Be Green: Savings from renewable energy	4.5	4%
Cumulative on-site savings	45.4	36%

Table 21 Non-Domestic Regulated Carbon Dioxide Savings from each stage of the Energy Hierarchy

Cash-in-lieu contribution (£)

The cash-in-lieu contribution (£) for the new construction/ extension floors has been calculated based on the New London Plan target of Net zero and a carbon offset price of £95/tCO_2.

NEW EXTENSION	(Tonnes CO_2)
Cumulative savings for offset payment for new built areas	623
Cash-in-lieu contribution (£)	59,196

Table 22 Cash-in-lieu contribution

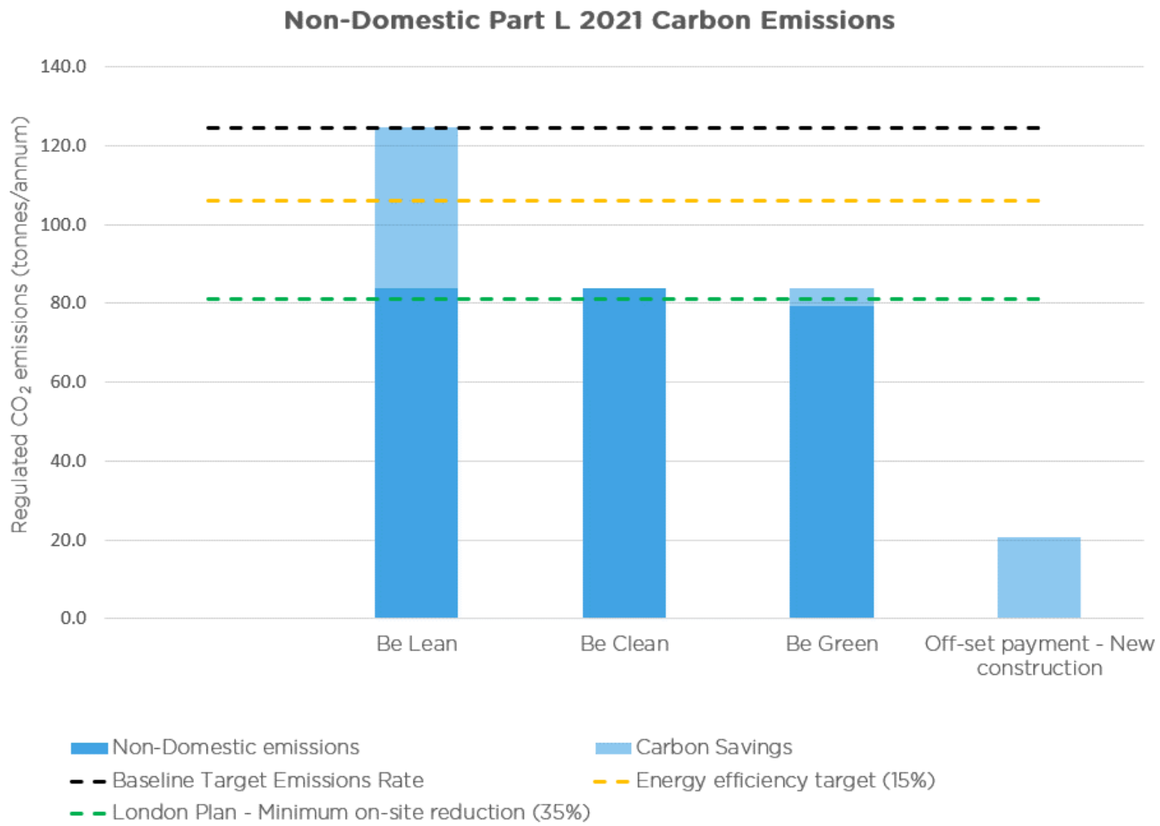

Figure 10 Non-domestic – Regulated annual CO_2 emissions after energy efficiency, energy efficient supply and renewables. Part L 2021

The modelling shows a total **36%** carbon emissions reduction against the GLA's Baseline (A Part L 2021 compliant development for new construction and the GLA's Baseline for existing areas) after demand reduction (Be Lean), energy efficient supply (Be Clean) and incorporation of renewable technologies (Be Green).

4.9.2 Non-Domestic Carbon Emissions and Savings – Part L 2013

The following tables demonstrate the performance of the proposed development under the previous GLA methodology, which uses modelling under Approved Document Part L 2013 for Sap 10.0 carbon factors. These results are purely for comparative purposes.

SITE WIDE DEVELOPMENT	Carbon Dioxide Emissions (Tonnes CO_2 per annum)	
	Regulated	Unregulated
Baseline	216.4	67.6
After energy demand reduction (Be Lean)	180.2	67.6
After heat network connection (Be Clean)	180.2	67.6
After renewable energy (Be Green)	120.0	67.6

Table 23 Non-Domestic Carbon Dioxide Emissions after each stage of the Energy Hierarchy

SITE WIDE DEVELOPMENT	Regulated Carbon Dioxide Savings	
	(Tonnes CO_2 per annum)	(%)
Be Lean: Savings from energy demand reduction	36.1	17%
Be Clean: Savings from heat network	0.0	0%
Be Green: Savings from renewable energy	60.2	28%
Cumulative on-site savings	96.3	45%

Table 24 Non-Domestic Regulated Carbon Dioxide Savings from each stage of the Energy Hierarchy

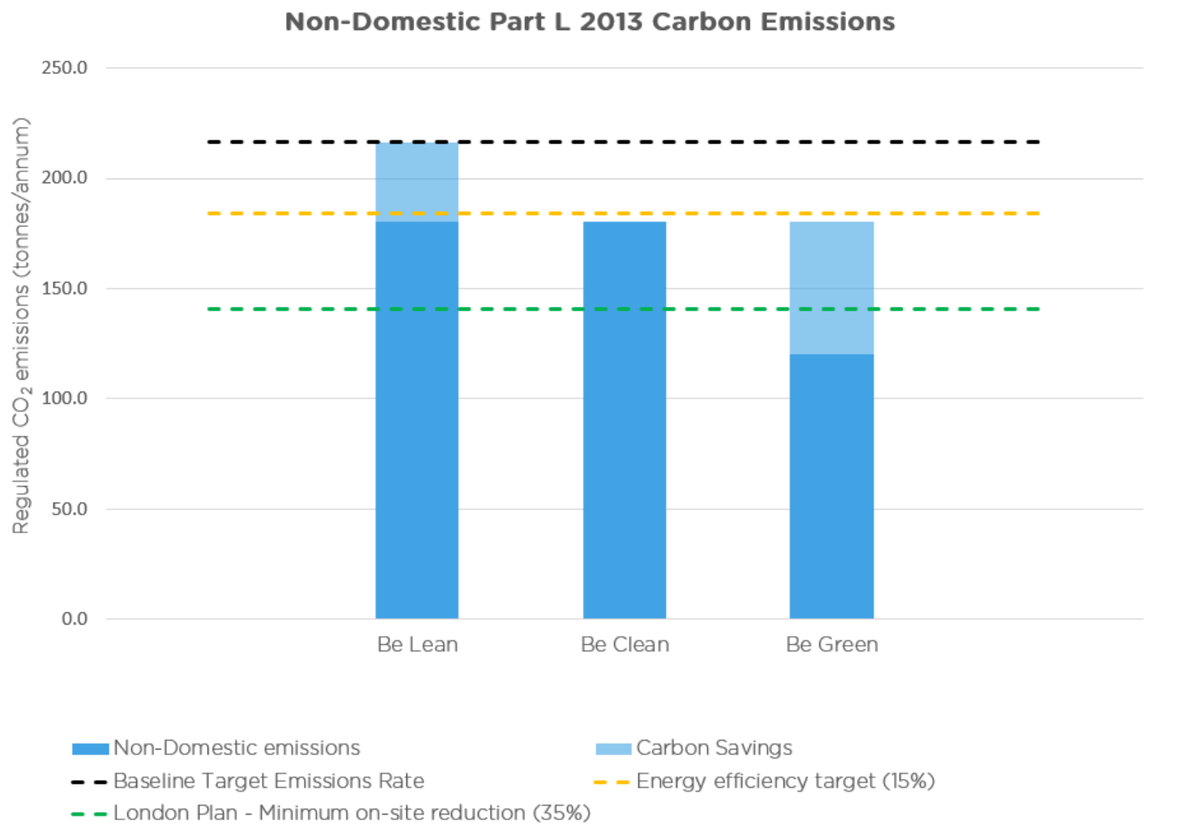

Figure 11 Non-domestic – Regulated annual CO_2 emissions after energy efficiency, energy efficient supply and renewables. Part L 2013

The results against the previous GLA methodology which uses modelling under Approved Document Part L 2013 demonstrate that:

- A **17%** carbon emissions reduction is achieved for the development through passive and energy efficiency measures alone.
- A total **45%** carbon emissions reduction is achieved (compared to a Part L2A 2013 compliant development) after demand reduction (Be Lean), energy efficient supply (Be Clean) and incorporation of renewable technologies (Be Green).

MINIMISING THE RISK OF OVERHEATING

“Development proposals should demonstrate through an energy strategy how they will reduce the potential for internal overheating and reliance on air conditioning systems” (London Plan, March 2021).

This section summarises how the development has been designed to minimise the need for cooling.

5 MINIMISING THE RISK OF OVERHEATING

This section summarises how the development has been designed to minimise the need for cooling.

5.1 APPROACH TO MINIMISING COOLING ENERGY

The development has been designed around passive measures and limiting internal heat gains to minimise the need for cooling. The approach to the design has followed the cooling hierarchy as set out in Policy SI 4 of the London Plan (March 2021). The following sets out the measures adopted against each stage of the hierarchy. See Appendix B for the full overheating assessment.

1. **Reduce the amount of heat entering the building through high albedo materials, additional openings, and the provision of green infrastructure on the roof.**
    a. New glazing has been designed to balance daylighting requirements and overheating risk.
    b. High performance low g-value (0.4) windows and glazed doors will be installed for any proposed glazing to minimise thermal losses.
    c. Urban greening is being provided, including amenity planting for the roof terrace around the winter garden rooflight.
    d. External shutters to the winter garden rooflight.
2. **Minimising internal heat generation through energy efficient design**
    a. All areas will benefit from energy efficient lighting and controls to minimise the internal gains and consequently the cooling loads.
    b. The heating distribution system will be designed to limit losses in line with the recommendations set out in the CIBSE Heat Networks: Code of Practice for the UK.
3. **Manage heat within the building through exposed internal thermal mass and high ceilings.**
    a. All occupied areas will have a floor to ceiling height of 2.85 m.
    b. Existing external walls benefit from a construction with a medium to high thermal mass.
    c. All existing ceiling will be left exposed and new floors will have exposed soffits, increasing thermal mass.
4. **Provide passive ventilation.**
    a. Openable panels are proposed for office areas, providing potential for natural ventilation during the day.
5. **Provide mechanical ventilation.**
    a. All supply/extract mechanical ventilation systems will be fitted with a summer bypass on the heat recovery system for summer mode operation.
6. **Provide active cooling systems.**
    a. Active cooling is proposed throughout the development.

5.2 COOLING DEMAND

The cooling demand of the development has been calculated using energy modelling software and compared to the notional building's cooling demands.

Table 25 shows the cooling demand of the actual and notional building as taken from the Building Regulation Part L (BRUKL) output report.

	Area weighted average non-domestic cooling demand (MJ/m^2)	Area weighted total non-domestic cooling demand (MJ/year)
Actual	14.275	108,555
Notional	25.110	190,948

Table 25 Cooling demand

The above demonstrates that the proposed development's approach to minimising cooling energy demand has resulted in a significant reduction over the notional building, achieving a reduction of **43%**.

5.3 Overheating Risk Assessment – CIBSE TM52

A CIBSE TM52 analysis has been undertaken using compliant Dynamic Thermal Simulation. The results demonstrate that:

- All areas fail to comply with the CIBSE TM52 overheating criteria for free-running buildings against the DSY-1 weather file.
- As compliance with DSY1 was not achieved, the building was not tested against DSY-2 (weather file, short, intense warm spell) and DSY-3 (weather file, long, less intense warm spell).

The overheating assessment shows that due to the design requirements for the laboratory spaces, which have very high equipment gains compared to a typical office and no openable windows (due to the requirements for a controlled environment), the spaces will not meet the overheating criteria for free-running buildings. As such, integration of active cooling is required to ensure a thermally comfortable environment for occupants and future proof the building. However, where openable windows have been provided, the risk of overheating is significantly reduced when compared to areas with a sealed façade.

It should be noted that although active cooling is required, the proposed passive measures will significantly reduce the cooling demand of the building and will contribute to the wellbeing of the occupants, as well as provide the opportunity to the occupants to take advantage of the external environmental conditions during spring, autumn and mild summer for office areas.

Further opportunities will be explored at the detailed design to assist and prompt the occupants to operate the windows and minimise the need of active cooling by utilising the proposed mixed mode ventilation system.

PART L COMPLIANCE

Approved documents L of the Building Regulations relate to the **conservation of fuel and power in dwellings and buildings other than dwellings.**

This section summarises how the development will be designed to meet the requirements set out in approved documents Part L Volume 2.

6 PART L COMPLIANCE

This section summarises how the development will be designed to meet the requirements set out in approved documents Part L Volume 2.

The development is a major refurbishment and extension of the existing office building, and will be designed to meet and exceed, where possible, all the minimum standards for existing buildings as described and defined within the relevant section of Approved Document L, Conservation of fuel and power, Volume 2: Buildings other than dwellings, 2021 edition incorporating 2023 amendments.

In respect to the proposed top floor extension of the office building and in accordance with section 10.7 of the Approved Document L, the new proposed extension does not fall under the new building definition as **it does not meet** both of the requirements regarding its total useful floor area:

a. Greater than 100m^2

b. Greater than 25% of the total useful floor area of the existing building

In that case the proposed extension is required to meet the guidance in paragraphs 10.8 to 10.11.

The new extension has been designed to meet all the requirement of the guidance; however, as the maximum area of opening for those floors exceeds 40% (as defined in table 10.1), the alternative approach in line with the paragraph 10.11 has been followed. Simulation modelling has been undertaken using government approved Dynamic Simulation Modelling software IES virtual Environment 2023 and it has been demonstrated that the building primary energy rate and the building emission rate for the building and proposed extension do not exceed those for the building plus a notional extension (see table below). The BRUKLS of the simulations are included also in Appendix F.

	Building primary energy rate (kWh_{PE}/m^2.annum)	Building CO_2 emission rate ($KgCO_2/m^2$.annum)
Actual	113.83	10.55
Actual building with notional extension	115.99	10.75

Table 26 Comparison of Building emission rate and Building primary energy rate for the new extension as defined in Approved Document L.

Note that compliance with Part L will need to be reconfirmed during detailed design stage and following completion of the construction stage.

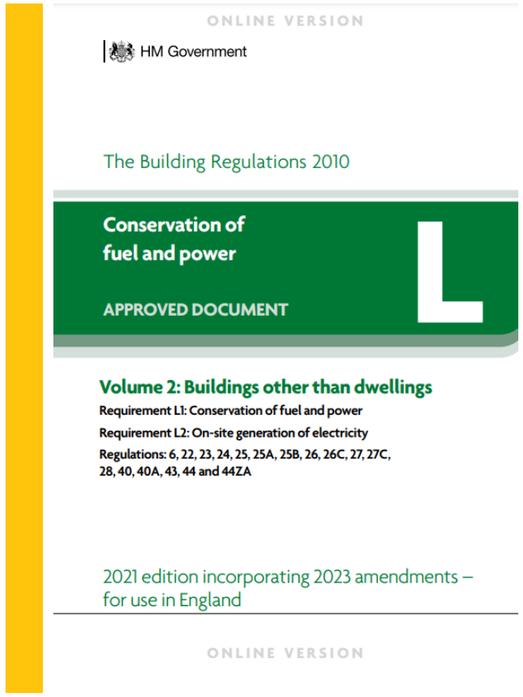

Figure 12. Approved Document L, Conservation of fuel and power, Volume 2: Buildings other than dwellings, 2021 edition incorporating 2023 amendments