Indicative CGI image of the proposed scheme

Energy Statement – Stage 2
Space House

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1. Issue Register

Rev	Reason for Issue	Date	Issued By	Checked By
1.0	Draft for Comment	30/10/2017	KH	ND
2.0	Draft for Comment	13/09/2018	KH	MOG
3.0	Stage 2 DRAFT	05/04/2019	KH	MOG
4.0	Stage 2	12/04/2019	KH	MOG
5.0	Stage 2 – updated following comments	18/04/2019	KH	MOG
6.0	Stage 2 – updated following comments	14/05/2019	KH	MOG
7.0	Stage 2 – updated following comments	16/05/2019	KH	MOG
8.0	Stage 2 – updated following comments	20/05/2019	KH	MOG
9.0	Stage 2 – updated following comments	21/05/2019	KH	MOG
10.0	Stage 2 – updated following comments	22/05/2019	KH	MOG
11.0	Stage 2 – updated following comments	17/09/2019	MOG	KH

This document was produced by

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Michael O'Gorman, Sustainability Consultant

2. Contents

Introduction

This Energy Statement has been prepared to support the applications for planning permission and listed building consent for the proposed Space House development and this document details the schemes response to planning policy in respect of the reduction of carbon emissions at Stage 2.

The proposed development consists of the removal of existing roof plant equipment at 1 Kemble Street and erection of a single storey facsimile floor plus one setback floor; removal of roof plant from 43-59 Kingsway and erection of a single storey set-back extension; enclosure of the southern external stair at ground floor level on Kingsway with slim line glazing replacement windows and new glazing at ground floor level across the site; enclosing the redundant petrol filling station area with slim line glazing; façade cleaning; new landscaping and public realm works and internal alterations to both buildings in connection with their refurbishment and change of use from Class B1 offices to Class A1/A3 and flexible Class B1/B1 and events space (sui generis) at part ground and basement levels

This report sets out the approach that the Space House development design team will employ to reduce energy and carbon emissions following the path of 'Be Lean, Be Clean, and Be Green'. This will ensure carbon emissions are realised in a sensible and efficient manner.

The development is located within the London Borough of Camden and is required to adhere to the methodology and requirements outlined in the National Planning Policy Framework, London Plan and Camden policies CC1, CC2 and CC3, and Camden Planning Guidance Energy Efficiency and Adaptation (March 2019) have been implemented and incorporated into the designs

2.1 Summary of Results

The carbon emissions of the building are calculated using the Part L (2013) calculation method (with 2013 amendments). The proposed development consists of both existing areas to be refurbished and new extension areas. This report will detail both the overall carbon emissions of the building as a whole and the separated emissions of the existing and extension areas.

'Base Case'

For a new build development, carbon dioxide emissions would be compared against an energy performance compliant with Part L of the Building Regulations, called the Target Emission Rate (TER), as dictated by the London Plan. However, for an existing building utilising the TER as the Base Case is not appropriate as the TER is intended for use as a target against which a new build is compared and would not be achievable for an existing building. For the existing Space House, a more appropriate target is to calculate the energy consumption and carbon emissions for the existing building. The information used for extensions is to be based on minimum Part L2B 2013 (with 2016 amendments) requirements as the extensions are not considered as a "large extension" under Part L2B.

Section 6 details the information used to calculate the Base Case carbon dioxide emissions.

Base Case = 2,281,522 kgCO_2/year

'Be Lean'

'Be Lean' refers to all the energy efficiency measures employed to improve the energy performance of the development. The development features the following energy-saving measures to reduce the development's energy requirements:

- Improved U-values and g-Values as detailed within Section 7
- Improved air permeability
- Improved ventilation performance
- Improved lighting and lighting controls
- Improved system efficiencies

Section 7 details the information used to calculate the Be Lean carbon dioxide emissions.

BER at "Be Lean" stage = 957,988 kgCO_2/year

58.01% Reduction from Base Case

'Be Clean'

'Be Clean' refers to community heating, CHP or CCHP incorporated into the building design to improve the development's energy performance, and the use of efficient 'conventional' equipment.

The proposed development does not include any Be Clean Design measures as detailed in Section 8.

BER at "Be Clean" stage = 957,988 kgCO_2/year

58.01% Reduction from Base Case

'Be Green'

'Be Green' refers to the renewable technologies incorporated into the building design to improve the development's energy performance. This report proposed ASHP to the flexible retail units at ground and basement levels. This is discussed in Section 9.

BER at "Be Green" stage = 956,690 kgCO_2/year

58.07 % Reduction from Base Case

Summary of Carbon Emission Performance for the Whole Development:

	Emissions (kg CO_2/year)	Carbon reduction to previous stage (kg CO_2)	% carbon reduction compared to previous stage
Base Case	2,281,522	0	N/A
Be Lean stage	957,988	1,323,534	58.01%
Be Clean stage	957,988	0	0.00%
Be Green stage	956,690	1,298	0.14%
Renewable contribution	0.14%		
Overall reduction	58.07%		

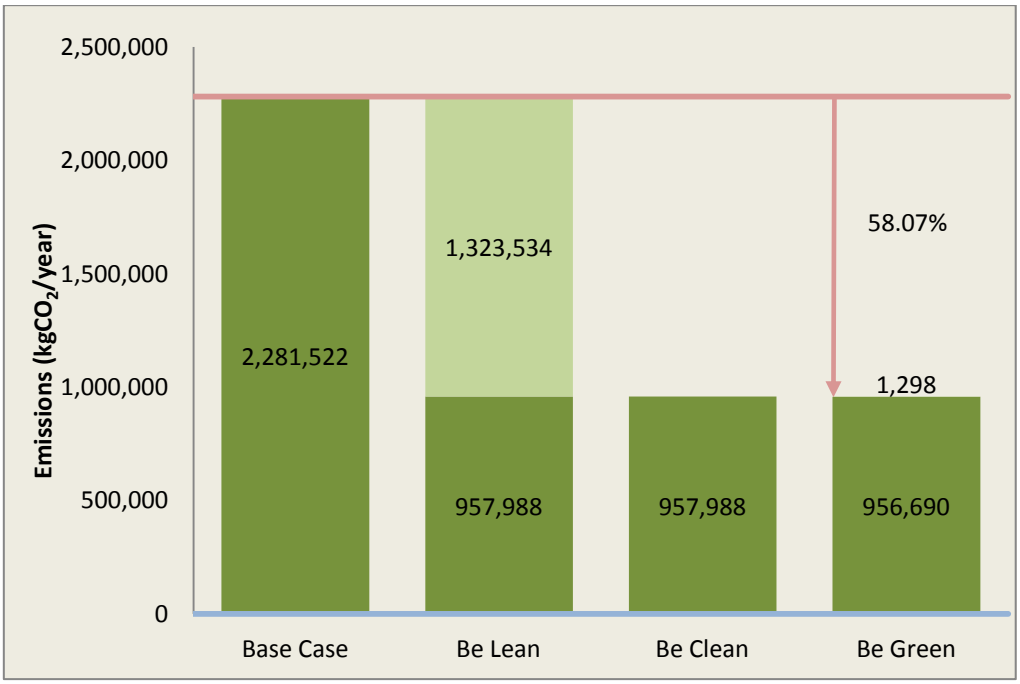


Figure 1 - Summary of Regulated Carbon Emissions for the Whole Development

The results above demonstrate that at this stage the annual CO_2 emissions are 58.07% below the Base Case. Results including regulated and unregulated loads are included in Section 10.2. This reduction in carbon emissions and the methodologies used to calculate it are in line with the relevant sections contained in London Plan policies 5.2, 5.3 and 5.4 as well as Camden Planning Guidance 3, Camden Local Plan and Camden Planning guidance "Energy Efficiency and Adaptation (March 2019).

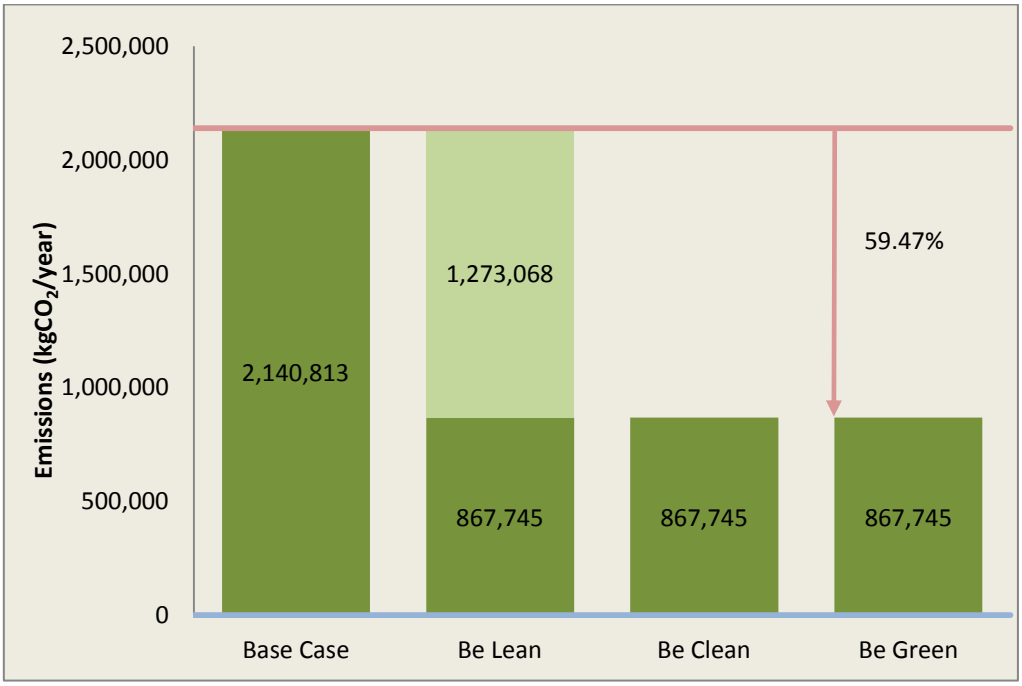


Figure 2 - Summary of Regulated Carbon Emissions for the Existing Areas

Following discussion with Camden, the new extension areas are to achieve a 35% reduction in carbon emissions over the Part L 2013 baseline emissions. This has been achieved as shown in the graph below.

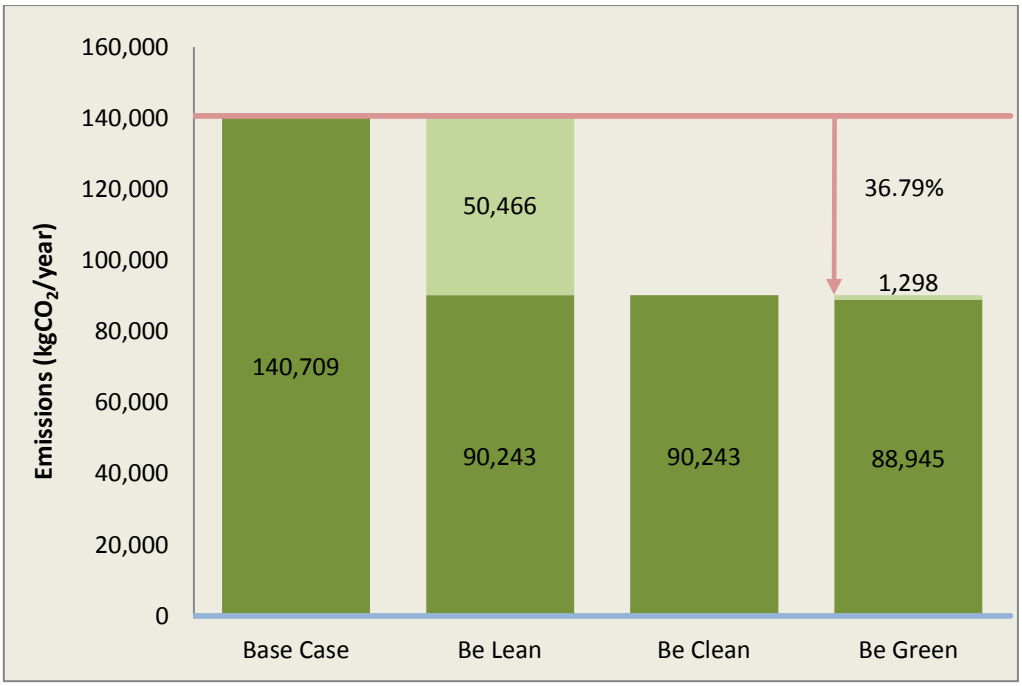


Figure 3- Summary of Regulated Carbon Emissions for the Extension Areas

3. Introduction

3.1 Aim of the Analysis

This report has been prepared to support the applications for planning permission and listed building consent at the site. Its aim is to document the design considerations and process undertaken during RIBA Stage 2 design regarding the Energy Strategy for the development.

The analysis looks to assess feasibility and incorporate passive design measures, efficient conditioning strategy and Low and Zero Carbon (LZC) technologies.

This is within the context of current building regulations, planning requirements and BREEAM targets.

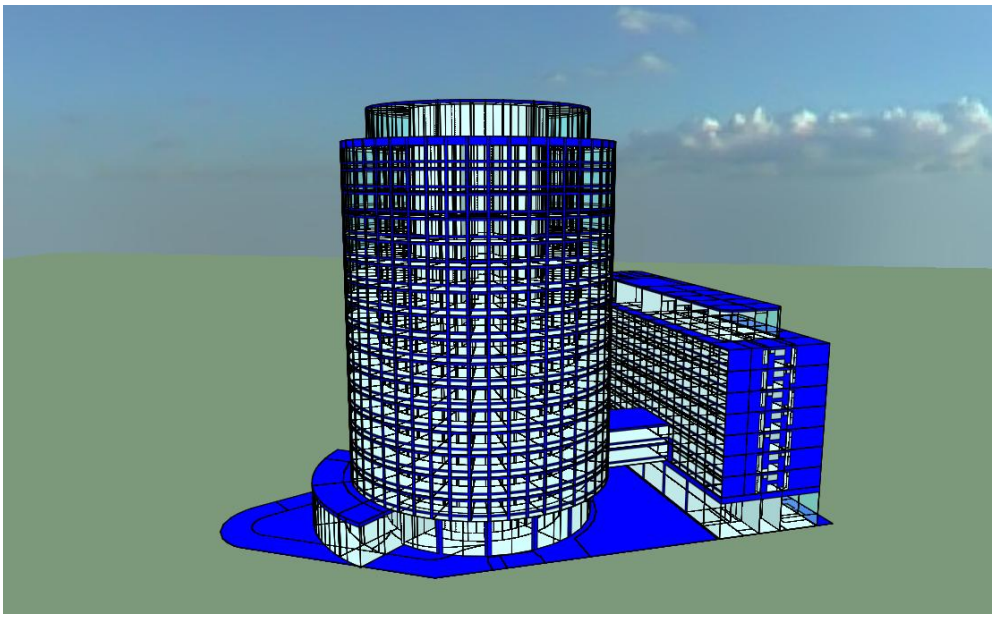
3.2 The Development

The existing tower building comprises ground plus 16 storeys with the Kingsway block comprising ground plus seven storeys, both sharing 2 levels of basement. The proposed extension design to the tower seeks to add two new storeys, one a full storey and one a setback storey of office (B1) accommodation. The proposed extension to the Kingsway building seeks to add one setback storey of office (B1) accommodation. The proposed land uses of the development are predominantly office space with auxiliary areas (WC, lift lobbies etc.) with flexible retail (A1/A3) to Ground level and flexible B1/B1 and events space (sui generis) use at part ground and basement levels. The basements have parking facilities and space is also allocated to plant.

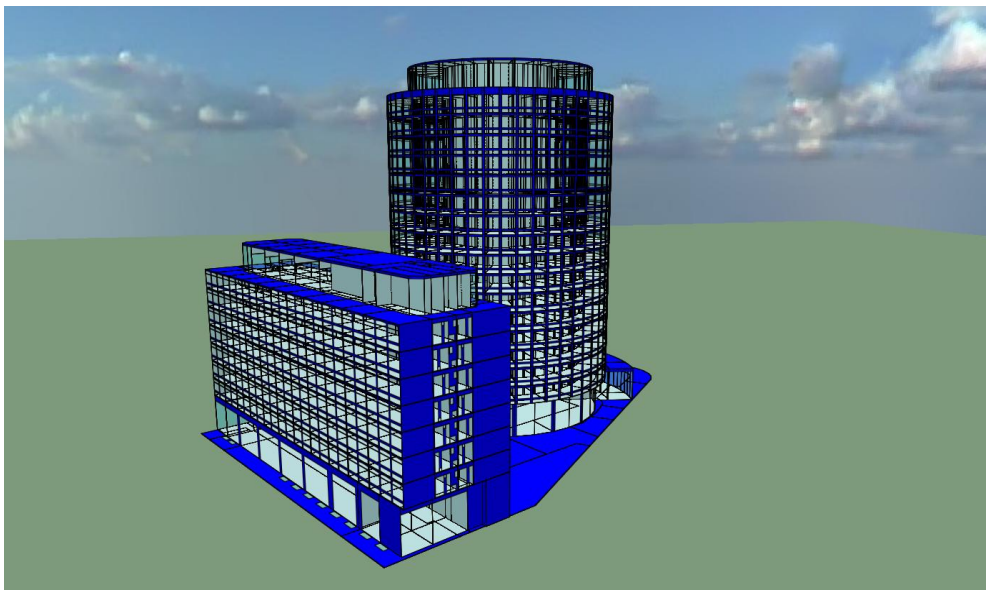
Opportunities to reduce the energy consumption of the existing building have been incorporated where possible via improved thermal performance of the building envelope, improved HVAC and lighting efficiencies and enhanced controls.

This energy strategy report will demonstrate how carbon dioxide emissions will be reduced in line with the national, regional and local requirements.

Below are images of the Part L2A Dynamic Thermal Model:



IES Thermal Model of Proposed Development: Tower Building



IES Thermal Model of Proposed Development: Kingsway Building

3.3 Planning Policy Context

3.3.1 National Policy Climate Change Act 2008

The Climate Change Bill was introduced into Parliament on 14 November 2007 and became law on 26 November 2008.

The two key aims of the Act are as follows:

- Improve carbon management, helping the transition towards a low-carbon economy in the UK.
- Demonstrate UK leadership internationally, signalling we are committed to taking our share of responsibility for reducing global emissions in the context of developing negotiations on a post-2012 global agreement at Copenhagen in December 2009.

The key provision of the Act is a legally binding target of at least an 80% cut in greenhouse gas emissions by 2050 to be achieved through action in the UK and abroad, including a reduction in emissions of at least 34% by 2020. Both targets are against a 1990 baseline. This provision is to be achieved via a carbon budgeting system that caps emissions over five-year periods, with three budgets set at a time, to help us stay on track for our 2050 target. The first three Carbon budgets will run from 2008-12, 2013-17 and 2018-22, and were set in May 2009.

The Government must report to Parliament its policies and proposals to meet the budgets. This requirement is fulfilled by the UK Low Carbon Transition Plan.

National Planning Policy Framework (NPPF)

The NPPF requires local planning authorities to transition to a low carbon future in a changing climate and provides the following paragraphs in the “planning for Climate Change Section” as guidance for doing so:

149. Plans should take a proactive approach to mitigating and adapting to climate change, taking into account the long-term implications for flood risk, coastal change, water supply, biodiversity and landscapes, and the risk of overheating from rising temperatures. Policies should support appropriate measures to ensure the future resilience of communities and infrastructure to climate change impacts, such as providing space for physical protection measures, or making provision for the possible future relocation of vulnerable development and infrastructure.

150. New development should be planned for in ways that:

a) avoid increased vulnerability to the range of impacts arising from climate change. When new development is brought forward in areas which are vulnerable, care should be taken to ensure that risks can be managed through suitable adaptation measures, including through the planning of green infrastructure; and

b) can help to reduce greenhouse gas emissions, such as through its location, orientation and design. Any local requirements for the sustainability of buildings should reflect the Government’s policy for national technical standards.

151. To help increase the use and supply of renewable and low carbon energy and heat, plans should:

a) provide a positive strategy for energy from these sources, that maximises the potential for suitable development, while ensuring that adverse impacts are addressed satisfactorily (including cumulative landscape and visual impacts);

b) consider identifying suitable areas for renewable and low carbon energy sources, and supporting infrastructure, where this would help secure their development; and

c) identify opportunities for development to draw its energy supply from decentralised, renewable or low carbon energy supply systems and for colocating potential heat customers and suppliers.

152. Local planning authorities should support community-led initiatives for renewable and low carbon energy, including developments outside areas identified in local plans or other strategic policies that are being taken forward through neighbourhood planning.

153. In determining planning applications, local planning authorities should expect new development to:

a) comply with any development plan policies on local requirements for decentralised energy supply unless it can be demonstrated by the applicant, having regard to the type of development involved and its design, that this is not feasible or viable; and

b) take account of landform, layout, building orientation, massing and landscaping to minimise energy consumption.

154. When determining planning applications for renewable and low carbon development, local planning authorities should:

a) not require applicants to demonstrate the overall need for renewable or low carbon energy, and recognise that even small-scale projects provide a valuable contribution to cutting greenhouse gas emissions; and

b) approve the application if its impacts are (or can be made) acceptable. Once suitable areas for renewable and low carbon energy have been identified in plans, local planning authorities should expect subsequent applications for commercial scale projects outside these areas to demonstrate that the proposed location meets the criteria used in identifying suitable areas."

3.3.2 Regional Policy

The London Plan 2016 (with 2017 corrections) defines the future spatial development strategy for Greater London. The main policies of the London Plan relevant to the energy strategy are the following:

Policy 5.1 Climate Change Mitigation:

The Mayor seeks to achieve an overall reduction in London's carbon dioxide emissions of 60 per cent (below 1990 levels) by 2025. It is expected that the GLA Group, London boroughs and other organizations will contribute to meeting this strategic reduction target, and the GLA will monitor progress towards its achievement annually.

Policy 5.2 Minimizing carbon dioxide emissions:

Major development proposals, defined as developments of 1,000 m^2 or more, should include a detailed energy assessment to demonstrate how the targets for carbon dioxide emissions reduction outlined above are to be met within the framework of the energy hierarchy.

Whilst the Local Authority may include Space House within the London Plan definition of a major development and should be contacted with regards to how they require this policy to be enacted. Based on other developments it is unlikely that the proposed development, given its existing and listed status, will be required to adhere to the zero carbon requirement for dwellings and 35% reduction in emissions for non-residential areas although the development will be expected to demonstrate efforts have been made to reduce carbon emissions in line with the Mayors Energy Hierarchy:

- Be Lean: Proposals to reduce carbon dioxide emissions through the energy efficient design of the site, buildings and services
- Be Clean: Proposals to further reduce carbon dioxide emissions through the use of decentralized energy where feasible, such as district heating and cooling and combined heat and power (CHP)
- Be Green: Proposals to further reduce carbon dioxide emissions through the use of on-site renewable energy technologies.

Some developments (such as offices, industrial units and hospitals) have significant carbon dioxide emissions related to energy consumption from electrical equipment and portable appliances that are not accounted for in Building Regulations, and therefore are not included within the calculations for the Target Emissions Rate. These loads are called unregulated emissions. While planning decisions and monitoring requirements will be based on regulated emissions, there is a requirement in the London Plan to calculate and present the unregulated emissions in an energy assessment.

Policy 5.3 Sustainable Design and Construction:

The London Plan requires that the highest standards of sustainable design and construction should be achieved in London to improve the environmental performance of new developments and to adapt to the effects of climate change over their lifetime.

Proposals are required to demonstrate that sustainable design standards are integral to the proposal, including its construction and operation, and to ensure that they are considered at the beginning of the design process.

Major development proposals should meet the minimum standards outlined in the Mayor's supplementary planning guidance and this should be clearly demonstrated within a design and access statement. The standards include measures to achieve other policies in the London Plan and include the following sustainable design principles:

- minimising carbon dioxide emissions across the site, including the building and services
- avoiding internal overheating and contributing to the urban heat island effect
- Efficient use of natural resources (including water), including making the most of natural systems both within and around buildings
- minimising pollution (including noise, air and urban runoff)
- minimising the generation of waste and maximising reuse or recycling
- avoiding impacts from natural hazards (including flooding)
- ensuring developments are comfortable and secure for users, including avoiding the creation of adverse local climatic conditions
- securing sustainable procurement of materials, using local supplies where feasible, and
- promoting and protecting biodiversity and green infrastructure.

Policy 5.4 Retrofitting

The environmental impact of existing urban areas should be reduced through policies and programmes that bring existing buildings up to the Mayor's standards on sustainable design and construction. In particular, programmes should reduce carbon dioxide emissions, improve the efficiency of resource use (such as water) and minimise the generation of pollution and waste from existing building stock.

Retrofitting buildings can make a significant contribution to the climate change and resource management aims of the London Plan. London's existing domestic buildings contribute 36 per cent of the region's carbon dioxide emissions alone. Along with other non-domestic buildings, retrofitting the existing building stock presents a significant opportunity to help meet the strategic carbon dioxide reduction target of 60 per cent by 2025.

Policy 5.4 applies the principles in Policy 5.3 to existing building stock where retrofit opportunities arise (for example, large estate refurbishments). The Mayor supports an integrated, multi-agency approach, to promote the retrofitting of existing buildings. T his includes, where possible, policies and programmes supporting zero carbon development and deployment of decentralised energy to existing buildings. The Mayor will support measures through the Building Regulations and other regulatory and funding mechanisms to improve the performance of London's existing buildings, increase energy and water efficiency, and to make full use of technologies such as decentralised energy and renewable energy.

Other London Plan policies relevant to the sustainability in the built environment are presented below:

- Policy 5.5 Decentralised energy networks
- Policy 5.6 Decentralised energy in development proposals

Major development proposals should select energy systems in accordance with the following hierarchy:

- Connection to existing heating or cooling networks
- Site wide CHP network
- Communal heating and cooling

Policy 5.7 Renewable Energy:

Within the framework of Policy 5.2, major development proposals should provide a reduction in expected carbon dioxide emissions through the use of on-site renewable energy generation, where feasible.

Development proposals should seek to utilize renewable energy technologies such as: biomass heating, cooling and electricity (CCHP), renewable energy from waste, photovoltaics, solar water heating, wind and heat pumps.

There is a presumption that, where feasible, all major development proposals will seek to reduce carbon dioxide emissions by at least 20 per cent through the use of on-site renewable energy generation.

Policy 5.8 Innovative Energy Technologies:

The Mayor supports and encourages the more widespread use of innovative energy technologies such as hydrogen fuel cells, anaerobic digestion, gasification and pyrolysis.

3.3.3 London Borough of Camden

The development is located within the London Borough of Camden and is required to adhere to the methodology and requirements outlined in the National Planning Policy Framework, London Plan and Camden policies CC1, CC2 and CC3, and Camden Planning Guidance Energy Efficiency and Adaptation (March 2019) have been implemented and incorporated into the designs

These documents follow the Be Lean, Be Clean and Be Green approach of the London Plan by requiring that energy efficient façade design is firstly used to minimise energy consumption by considering the effect that items such as passive solar gain, external shading, daylight and natural ventilation have on both occupancy comfort and on the reduction of energy consumption. The design of the building envelope should also utilise high levels of thermal efficiency, low thermal bridging and low air permeability to minimise energy consumption. Other measures such as low energy lighting, lighting control and mechanical ventilation heat recovery should also be considered.

Following Be Lean design measures, the mechanical design should be undertaken to further reduce energy consumption. The preference is to connect to a local district heat network with an onsite community heating system, possibly containing CHP, being an additional consideration.

Finally, on-site renewable are to be included where feasible.

Following discussion with Camden, the new extension areas are to achieve a 35% reduction in carbon emissions over the Part L 2013 baseline emissions.

3.3.4 Part L Building Regulations

Part L 2013 with 2016 amendments of the Building Regulations refers to the Conservation of Fuel and Power. Part L1 relates to residential development and Part L2 to non-domestic. The suffix A relates to new construction and B to existing buildings. The proposed development contains existing non-domestic areas and therefore is required to adhere to Part L2B:2013 with 2016 amendments.

4. Methodology

4.1 Energy Hierarchy

This report sets out the approach the design of the development is to take in terms of energy efficiency. In order to prioritise energy efficiency and passive design measures to reduce carbon, the development will be designed according to a three stage process of "Be Lean, Be Clean, and Be Green".

The aim of the report is carbon dioxide reduction, first by reduction of energy consumption through passive measures and good architectural design, then through employing efficient plant and equipment to provide for the energy demands, and finally by employing Low or Zero Carbon Technologies for energy generation.

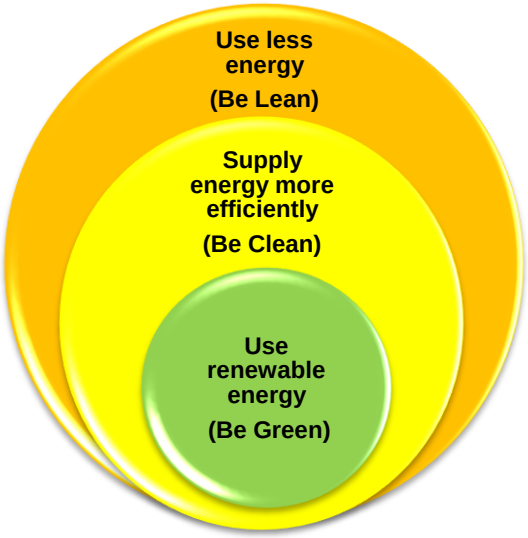


Figure 4 - The Energy Hierarchy

'Base Case'

For a new build development, carbon dioxide emissions would be compared against an energy performance compliant with Part L of the Building Regulations, called the Target Emission Rate (TER), as dictated by the London Plan. However, for an existing building utilising the TER as the Base Case is not appropriate as the TER is intended for use as a target against which a new build is compared and would not be achievable for an existing building. For Space House, a more appropriate target is to calculate the energy consumption and carbon emissions for the existing building. The information used for extensions is to be based on minimum Part L2B 2013 requirements as the extensions are not considered as a "large extension" under Part L2B.

Further Information can be found in Section 5.0.

‘Be Lean’

Various energy-saving measures are considered in terms of technical feasibility and their effect on energy usage in Section 5. A package of energy-saving measures is proposed without reliance on the contribution of renewable or low carbon technologies.

Further Information can be found in Section 6.0.

‘Be Clean’

Be Clean is the consideration of district heating, a site wide centralised wet heating system with a combined heat and power (CHP) system or a combined cooling, heat and power (CCHP) system.

Additional information presented in Section 7.0.

‘Be Green’

A renewable energy assessment will be undertaken based upon the results of the Dynamic Thermal Modelling process and renewable technology data from manufacturers. The strategic issues relating to each technology will also be considered in the context of the proposed development, and preferred options short-listed. These are then considered in more detail in terms of technical feasibility and its effect on energy reduction.

Further information is presented in Section 8.0.

5. Base Case

This section presents the information for the existing building and extension for the calculation of carbon emissions for the "Base Case" stage.

The information below is for the existing building is based on a mixture of on-site survey and minimum Building Regulations performance requirements. The building was refurbished in 2004 and so the minimum performance requirements from the Part L 2002 documentation has been utilised below where appropriate. The information used for extensions is to be based on minimum Part L2B 2013 requirements as the extensions are not considered as a “large extension” under Part L2B.

5.1 Base Case Specification – Existing Building

Data	Unit	Value
Construction		
Wall U-Value	W/m^2.K	1.90
Basement Wall U-Value	W/m^2.K	2.60
Roof U-Value	W/m^2.K	3.45
Ground Floor U-Value	W/m^2.K	0.25
Exposed Floor Heated to unheated/external spaces	W/m^2.K	1.42
Glazing U-Value (glass and frame)	W/m^2.K	3.25
Glazing G-Value	%	71
Glazing Light Transmittance	%	80
Ventilation		
Air Permeability	m^3/m^2.h	25 In accordance with EPC guidance for buildings built before 1995
Type of Ventilation	-	Tower: Mechanical Ventilation Kingsway: Natural Ventilation
Central System SFP	W/l/s	3.0
Terminal Unit SFP	W/l/s	0.8
WC Extract SFP	W/l/s	0.50
Heat Recovery	%	50%
Primary Heating		
Heating Source	-	Oil Boiler
Heat emitters	-	Tower: Perimeter Rads internal FCU Kingsway: Perimeter Radiators
Boiler seasonal efficiency	%	81.3
Primary Cooling		
Cooling System	-	Air Cooled Chillers
Cooling Emitters	-	Tower: Internal FCU Kingsway: FCU

EER/SEER	-	2.25/2.25
Hot Water		
DHW Type	-	Electric POU
Lighting		
Lighting efficiency	W/m^2/100 lux	Efficacy from NCM Inference Method Tower: LED in core spaces, T5 for offices, T8 in plant spaces Kingsway: T5 for offices, T8 in plant, compact fluorescent in WC/lobbies
Display Lighting	-	N/A
Controls		Tower: PIR Kingsway: Switches
Other		
Power Correction Factor	-	<0.9
Metering		None

5.2 Base Case Results

The results from the "Base Case" Stage 2 calculation are presented in the graph below:

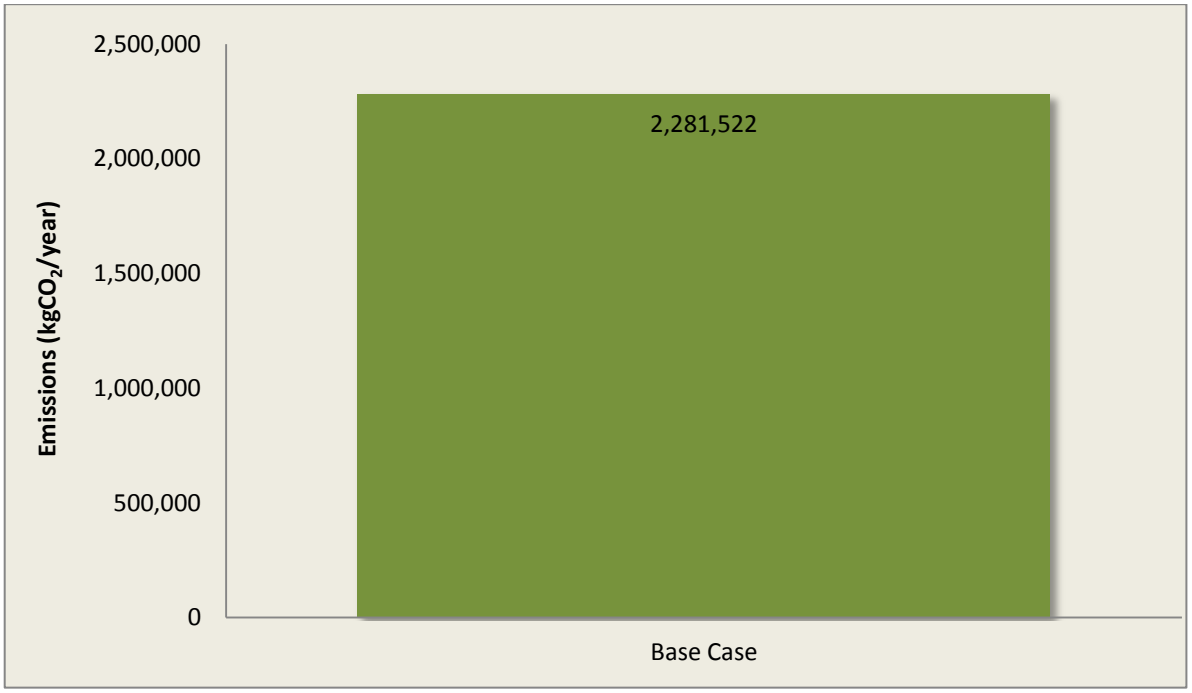


Figure 5 - Base Case Emissions for the whole development

The Base Case emissions for the development are **2,281,522 kgCO$_2$/year**.

6. Be Lean

This section presents the potential efficiency measures that will be assessed for suitability and may be applied to the Space House development as part of the "Be Lean" stage.

Consideration will be given to glazing and building fabric performance during design to minimise heat gains and losses to reduce energy consumption.

During the design of the developments' plant, consideration will be given to:

- a community heating system supplying the office heating
- high efficiency heating and cooling plant
- heat recovery systems
- high efficiency fans and pumps
- highly efficient LED lighting with presence detection and daylight management
- power factor correction

It is currently proposed that glazing is upgraded, external walls are insulated and that the roof is stripped and re-insulated and waterproofed. The U-Value table shows the proposed U-Values for retained and upgraded facades as well as for new build elements.

6.1 'Be Lean' Specification

Data	Unit	Value
Construction		
Wall U-Value	W/m^2.K	Retained (Upgraded): 0.30 New: 0.28
Basement Wall U-Value	W/m^2.K	Walls bounding heated areas: 0.30 Walls bounding unheated areas: 2.6
Roof U-Value	W/m^2.K	Main Roofs: 0.18 Retail Canopy Roof (Listed): 3.45
Ground Floor U-Value	W/m^2.K	Existing: 0.25
Exposed Floor Heated to unheated/external spaces	W/m^2.K	0.25
Glazing U-Value (glass and frame)	W/m^2.K	1.6
Glazing G-Value	%	35
Glazing Light Transmittance	%	62
Ventilation		
Air Permeability	m^3/m^2.h	10
Type of Ventilation	-	Mechanical Ventilation
Central System SFP	W/l/s	2.6
Terminal Unit SFP	W/l/s	Assumed Retail Fit Out FCU: 0.5
WC Extract SFP	W/l/s	0.50

Heat Recovery	%	73%
Primary Heating		
Heating Source	-	Gas Boiler
Heat emitters	-	Office/Reception: Mechanical Ventilation via Radiant Panels Circulation/WC: Radiators Showers: Mechanical Ventilation Assumed Retail Fit Out: FCU
Boiler seasonal efficiency	%	95.6
Primary Cooling		
Cooling System	-	Air Cooled Chillers
Cooling Emitters	-	Office/Reception: Radiant Panels Assumed Retail Fit Out: FCU WC: Mechanical Ventilation
EER/SEER	-	Kingsway Building: 2.96/5.23 Tower Building: 3.03/5.33. Retail: 2.60/2.60
Hot Water		
Storage Volume	Litres	Offices: 100 litres/floor/building Retail: 300 litres/unit
Insulation Thickness	Mm	60
Fuel	-	Direct Electric
Lighting		
Lighting efficiency	W/m^2/100 lux	Office/Reception/Retail = 2.5 Lift Lobby/Circulation/Stairs/Plant = 3.0 Stores = 3.5
Display Lighting to Retail	Lamp-lumens/ circuit-watt	40
Controls		PIR to all spaces Daylight management to office perimeter
Other		
Power Correction Factor	-	<0.9
Metering		All items metered

6.2 Be Lean Results

The results from the "Be Lean" Stage 2 calculation are presented in the graph below:

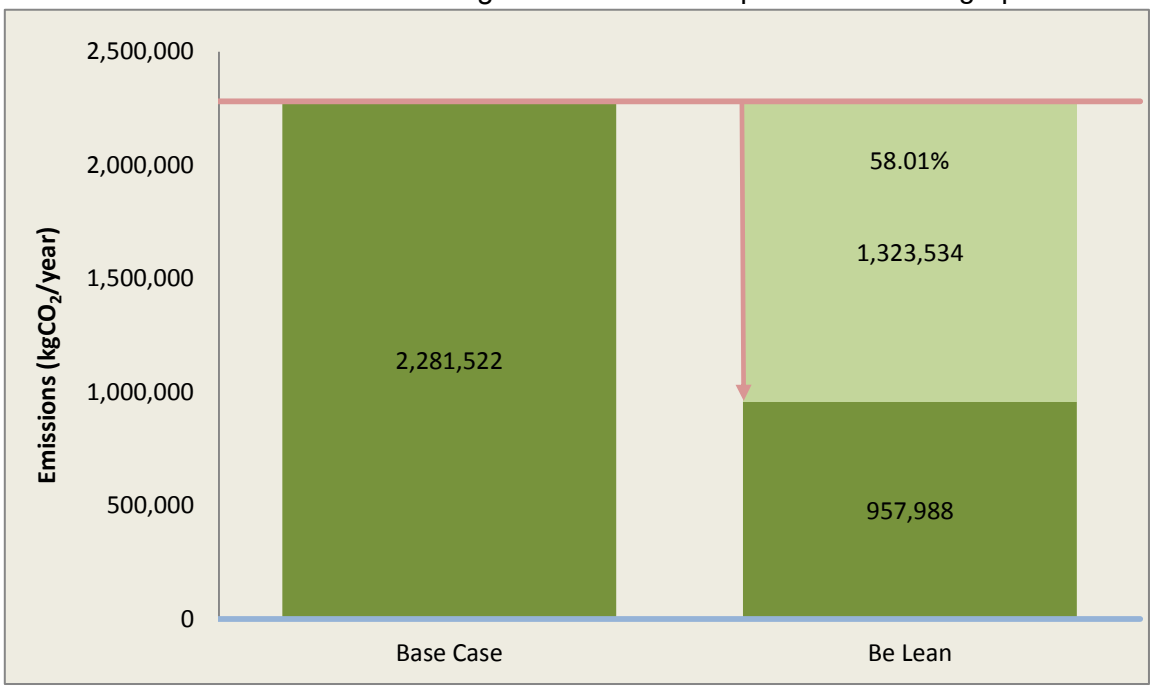


Figure 6 - Be Lean stage

The 'Base Case' for the development is **2,281,522 kg CO_2/year**.

The 'Be Lean' Building Emission Rate (BER) for the development is **957,988 kg CO_2/year**.

The development at the 'Be Lean' stage improves on the Base Case with an overall reduction of 58.01% against the Base Case for the development.

7. Be Clean

7.1 District Heat Networks

The London Plan and London Borough of Camden policies prioritise connecting to existing heating or cooling networks.

Using the London Heat Map, the potential for this has been assessed:

I. Any existing District Heat Networks are highlighted in yellow
II. Any potential District Heat Networks are highlighted in Red
III. Areas with potential for Heat Networks are highlighted in purple
IV. Opportunity Area Planning Framework (OAPF) regions are greyed-over.

The proposed development is located in the green circle. As can be seen, there are no existing or proposed District Heat schemes in the vicinity of the Space House development at present.

Thus whilst there are no current local networks, the development will make provision for future connection to a district heat network via a soft punch point in the structure to allow easy connection in the future.

7.2 Centralised Energy Solution

The operation of a site wide decentralised energy generation plant should be based on the presence of a base heating or cooling load on site. Domestic Hot Water (DHW) demand is considered an optimal base load for such an operation since it is stable, relatively constant through the year, and largely independent of weather variations.

Centralised energy solutions generally operate with either Combined Heating or Power (CHP); or as Combined Cooling Heating and Power (CCHP).

7.3 Combined Heating and Power (CHP)

Combined Heat and Power (CHP) is an efficient form of power generation since the transmission losses are lower providing greater efficiency.

Combined Heat & Power (CHP) converts a fuel into both electricity and heat within a single unit at the point of use and can deliver a number of positive financial, operational and environmental benefits. A CHP unit utilises an engine, often fuelled by natural gas, linked to an alternator to produce electricity. Heat is recovered from the engine by removal from the exhaust, water jacket and oil cooling circuits.

The operation of a site wide decentralised energy generation plant with CHP should be based on the presence of a base heating or cooling load on site. Domestic Hot Water (DHW) demand is considered an optimal base load for such an operation since it is stable, relatively constant through the year, and largely independent of weather variations.

The Space House development contains offices and flexible retail and flexible B1/B1 and events space, neither of which requires a large enough DHW provision in comparison to the GLA guidance that CHP is only viable for developments containing 500 or more dwellings or for developments with an equivalent DHW baseload and as such the heating and DHW loads at the proposed Space House development are too small for a CHP to be efficiently operated. Therefore CHP will not be implemented for this development.

7.4 Combined Cooling, Heat and Power (CCHP)

As per Section 6.3, a site wide Combined Cooling Heat and Power plant should be based on the presence of a base heating load on site. Domestic Hot Water (DHW) demand is considered an optimal base load for such an operation since it is stable, relatively constant through the year, and largely independent of weather variations.

As with the CHP, the development may be too small to maintain a reasonably sized base heating load to allow CCHP to operate effectively and efficiently meaning that the installation of the absorption chiller would not be technically or financially feasible.

7.5 Be Clean Results

Since the heating and DHW loads at the Space House development are too small for a CHP or CCHP to be efficiently operated, the proposed development at Space House will not contain any Be Clean systems and therefore would not achieve savings for this section of the Energy Hierarchy.

8. Be Green

8.1 Preliminary Assessment

The first step of the analysis examines the suitability of all the renewable technologies in terms of technical feasibility.

Renewable Technology		Applicability	Conclusion
Wind turbine		Situated in an urban environment, the site is surrounded by other buildings and as such the wind yield will be turbulent and non continuous. Since the electricity production is proportionate to the cube of the wind speed, thus a lower and turbulent wind speed will diminish the electricity production and increase the payback period. The inclusion of wind turbines will also affect the height restrictions and visual impact of the development and would also harm the character and appearance of the listed building. In addition a wind turbine will generate noise and, potentially, vibrations which would prove detrimental to the development and surrounding areas.	Not Applicable
Solar Water Heating		The site has a greater electrical demand in comparison to DHW and as a result allocating the roof space to PV would provide a greater benefit to the development. However, whilst PV could be installed to the roof of the main Tower, the silhouette and height of the new extension has been subject to thorough pre-application discussions with Camden and as such the proposed appearance and height cannot be amended. Therefore it is not proposed to install SHW or PV to the Tower building. It is not proposed to site SHW or PV on the roof of the Kingsway Building due to the shading from the Tower Building.	Not Applicable

Ground Source Heat Pump (GSHP)		The proposed development would need to be investigated for the presence of considerations that may limit boring and will include utility pipes/cables/tunnels and any transport links. The creation of borehole would be extremely difficult within the existing basement and the number of boreholes would be limited due to the available area. The proposed development would need also to be investigated with regards to the heating and cooling balance as GSHP systems require a balance between summer cooling load and winter heating load in order to maintain a stable ground temperature in the midterm. The output of a GSHP is dependent on the local geology and the results of a test borehole. Since these tests would need to be undertaken at a later point in the development timeline, inappropriate geology or a low output from the test borehole would mean that any proposed GSHP would have to be removed and an alternative found at a late stage of design causing time and financial issues.	Not Applicable
Air Source Heat Pump (ASHP)		The practicalities of Air Source Heat Pump technology would likely see units providing for the commercial units with energy exchangers to each unit. Heating COPs reduce significantly in winter, with cold temperature reducing the temperature differentials used to drive the heat pump cycle. For the same reasons, the CoP also reduces significantly when used for to deliver domestic hot water at >60^{o}C. This technology is not considered a suitable alternative to community heating for the main development due to the number of outdoor units required and spatial issues in locating them. However, the use of ASHP is suitable for the proposed flexible retail (A1/A3) units at ground and basement levels	Applicable

Biodiesel		Biodiesel can potentially offer higher CO_2 savings compared to other renewable technologies. However, this option comes with considerable issues: I. Frequent deliveries are required. II. A biodiesel storage tank is required. III. Air quality to be assessed and filtration considered.	Not Applicable
Photovoltaics		Whilst PV could be installed to the roof of the main Tower, the silhouette and height of the new extension has been subject to thorough pre-application discussions with Camden and as such the proposed appearance and height cannot be amended. Therefore it is not proposed to install PV to the Tower building. It is not proposed to site PV on the roof of the Kingsway Building due to the shading from the Tower Building.	Not Applicable
Biomass		Biomass can potentially offer higher CO_2 savings compared to other renewable technologies. However, this option comes with considerable issues: I. Frequent deliveries are required II. A fuel storage tank is required. III. Air quality to be assessed and filtration considered.	Not Applicable

The next stage of design is to assess all the proposed technologies in detail through the 'Be Green' stage of the carbon emissions hierarchy. This will cover all the information required to form a Low Zero Carbon (LZC) feasibility study in accordance with BRE:

- Energy generated from LZC energy source per year
- Payback period
- Land use
- Local planning requirements
- Noise assessment
- Feasibility of exporting heat/electricity from the system
- Life cycle cost/life cycle impact of the potential specification in carbon emissions
- Information on financial assistance such as grants
- All technologies appropriate to the site and energy demand of the development.
- Reasons for excluding other technologies.

8.2 Detailed Feasibility Analysis - ASHP

Description

Air source heat pumps (ASHP) is a system which transfers heat from outside to inside a building. Using vapour compression refrigeration, an ASHP uses a system involving a compressor and a condenser to absorb heat at one place and release it at another.

ASHP are to be installed to serve the proposed flexible retail units (A1/A3) at ground and basement levels

Technical Information

Heating SCOP of ASHP	2.6
Life span (years)	25
Noise	Minimal to Moderate dependant on location
Visual Impact	Minimal – this technology is normal low profile.
Land of use	Roof mounted
General cost (Estimation)	
Capital cost (£)	£0[1]
Annual Fuel Saving (£)	-£2,200[2]
Maintenance (£)	TBC
Payback period (years)	-

[1] Based on there being no cost difference in the Base Case ASHP cooling system also being able to provide heating.

[2] Based on government utility costs (https://www.gov.uk/government/statistical-data-sets/gas-and-electricity-prices-in-the-non-domestic-sector)

Carbon Dioxide Savings

Annual carbon dioxide saving (kg CO_2)	1,298
Total Renewable contribution (%)	0.06

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8.3 Be Green Results

The results from the 'Be Green' Stage 2 calculation are presented in the Graph below:

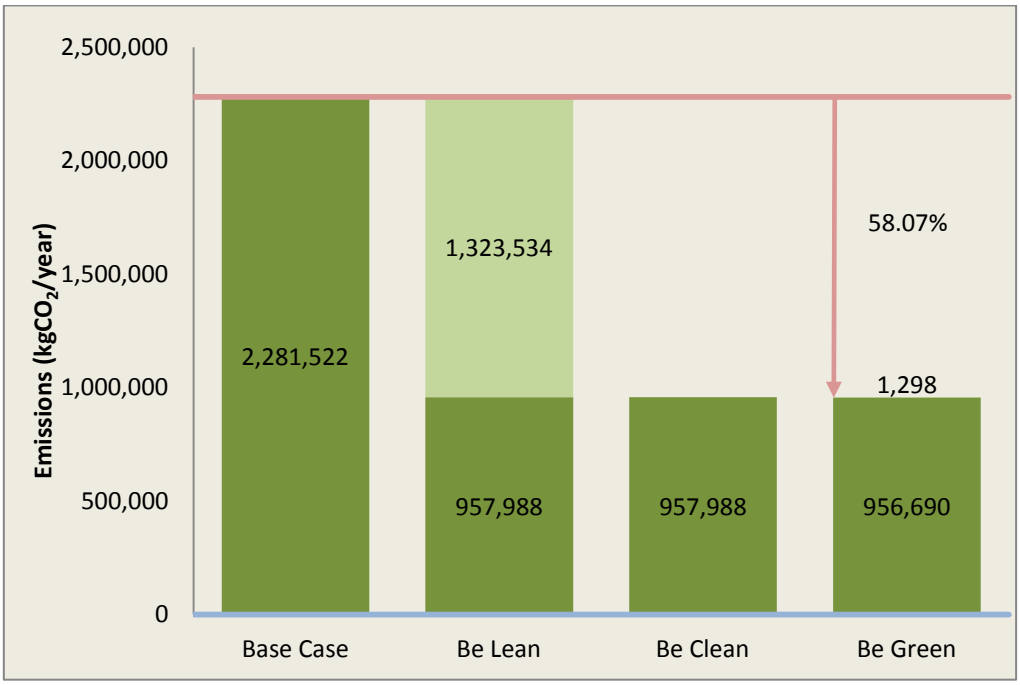

Figure 7 - Be Green stage

The Base Case for the development is **2,281,522 kg CO_2/year**.

The 'Be Green' DER for the development is **956,690 kg CO_2/year**.

This shows an overall reduction of **58.07%** against the Base Case for the total development.

9. Conclusion

This report highlights the Energy Strategy proposed for Space House development.

The main points of this report are summarised below:

'Be Lean'

Initially, the development prioritises reducing the energy consumption of the development by using early stage intelligent design principles. This is set out in Section 6.

I. Improved U-Values
II. Improved glazing design
III. Reduced air permeability
IV. Improved systems performance
V. Improved lighting efficiency and controls

'Be Clean'

I. Space heating for the offices is to be provided by a site based community system consisting of high efficiency communal boilers will be utilised to provide peak heating and backup

'Be Green'

I. ASHP to the flexible retail units at ground and basement levels

The results contained in this report demonstrate that at this stage the annual CO_2 emissions are 58.07% below the Base Case. Results including regulated and unregulated loads are included in Section 10.2.

The development is located within the London Borough of Camden and is required to adhere to the methodology and requirements outlined in the National Planning Policy Framework, London Plan and Camden policies CC1, CC2 and CC3, and Camden Planning Guidance Energy Efficiency and Adaptation (March 2019). These policies have been implemented and incorporated into the design for the proposed development.

The above results are in compliance with the requirements of both policies 5.2, 5.4 and 5.7 of the London Plan and Camden's' CPG3 as the proposed design for the refurbishment of the building reduces the energy consumption and therefore carbon emissions of the existing building using the Mayors Energy Hierarchy. The separately submitted BREEAM report also demonstrates that policy 5.3 of the London Plan is adhered to as, in addition to reducing carbon emissions, the development makes efficient use of natural resources, minimises pollution, minimises waste, ensures safety and security and ensures sustainable procurement of material as well as other measures.

9.1 Regulated Load Performance Summary

The table below summarises the total regulated CO_2 emissions performance for each stage for the development as a whole:

	Emissions (kg CO_2/year)	Carbon reduction to previous stage (kg CO_2)	% carbon reduction compared to previous stage
Base Case	2,281,522	0	N/A
Be Lean stage	957,988	1,323,534	58.01%
Be Clean stage	957,988	0	0.00%
Be Green stage	956,690	1,298	0.14%
Renewable contribution	0.14%		
Overall reduction compared to Part L 2013 target	58.07%		

A summary of the above results is presented in the Graph below:

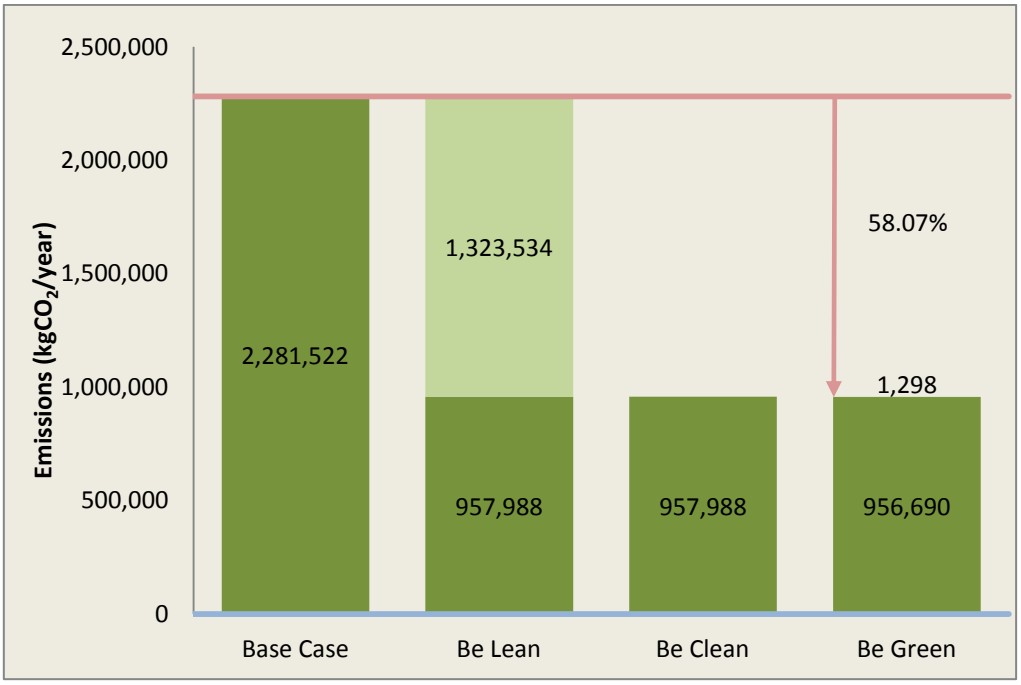

Figure 8 - Summary of Regulated Carbon Emissions

The results above demonstrate that at this stage the annual CO_2 emissions are 58.07% below the regulated Base Case.

9.2 Regulated and Unregulated Load Performance Summary

The table below summarises the total regulated and unregulated CO_2 emissions performance for each stage for the development as a whole:

	Emissions (kg CO_2/year)	Carbon reduction to previous stage (kg CO_2)	% carbon reduction compared to previous stage
Base Case	3,230,773	N/A	N/A
Be Lean stage	1,907,239	1,323,534	40.97%
Be Clean stage	1,907,239	0	0.00%
Be Green stage	1,905,941	1,298	0.07%
Renewable contribution	0.07%		
Overall reduction compared to Part L 2013 target	41.01%		

A summary of the above results for each part of the development are presented in the graphs below:

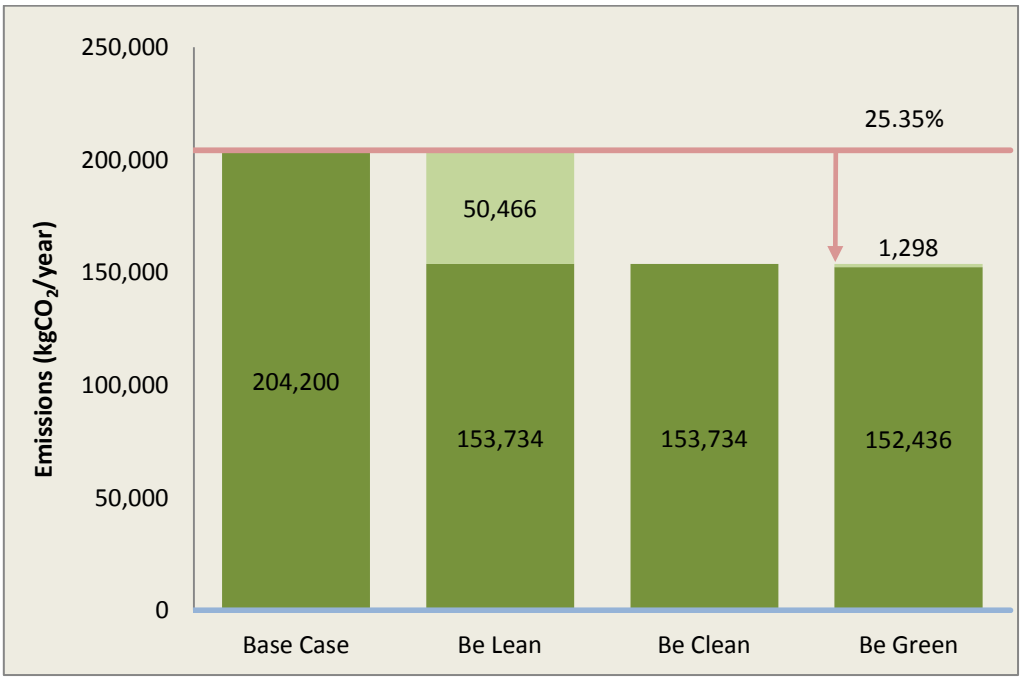

Figure 9 – Regulated and unregulated Carbon dioxide emissions for the extension parts of the building

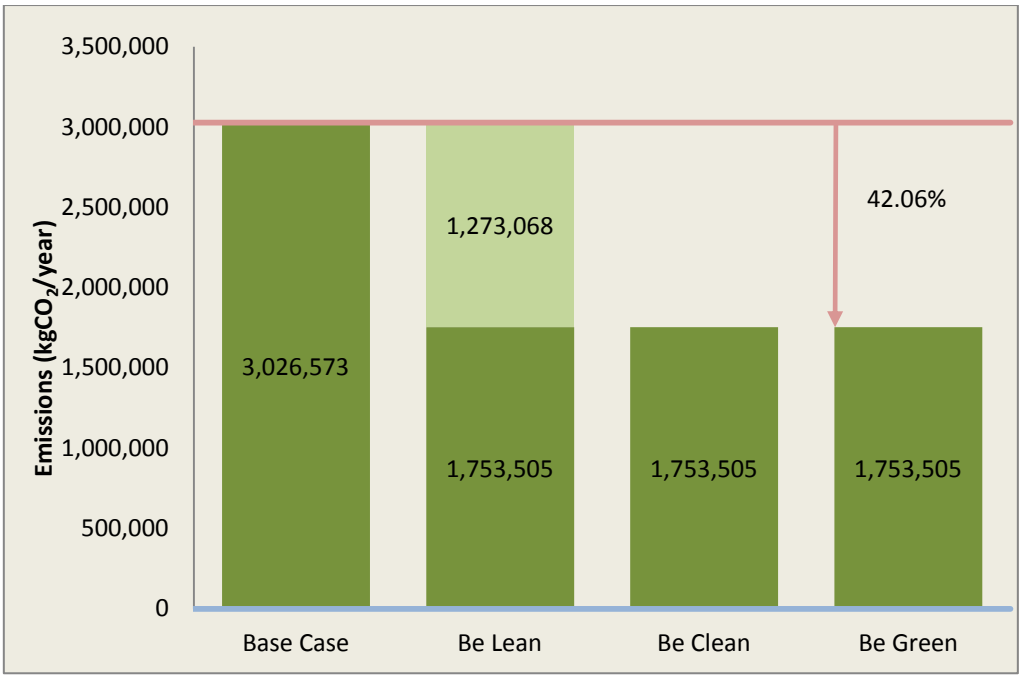

Figure 10 - Regulated and unregulated Carbon dioxide emissions for the existing parts of the building

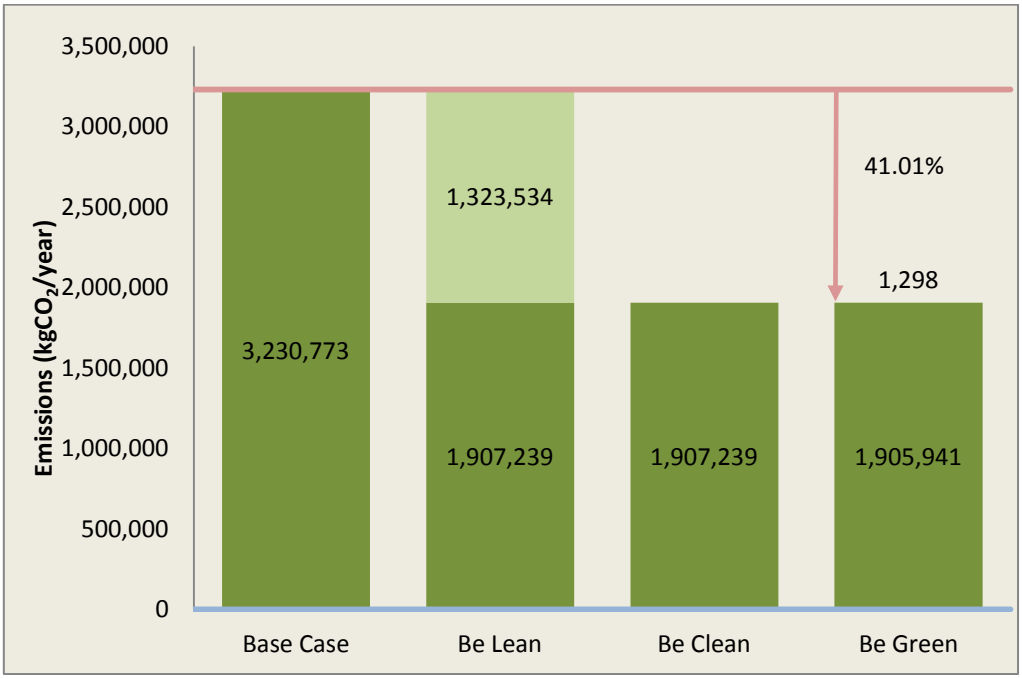

Figure 11 – Regulated and unregulated carbon dioxide emissions for the whole building

The results above demonstrate that at this stage the annual CO_2 emissions are 41.01% below the regulated and unregulated Base Case.

Appendix A – SAP 10

SAP 2012 PERFORMANCE

Table 1: Carbon Dioxide Emissions after each stage of the Energy Hierarchy for non-domestic buildings

	Carbon Dioxide Emissions for non-domestic buildings (Tonnes CO2 per annum)	
	Regulated	Unregulated
Baseline: Part L 2013 of the Building Regulations Compliant Development	2,282	949
After energy demand reduction	957	949
After heat network / CHP	957	949
After renewable energy	955	949

Table 2: Regulated Carbon Dioxide savings from each stage of the Energy Hierarchy for non-domestic buildings

	Regulated non-domestic carbon dioxide savings	
	(Tonnes CO_2 per annum)	(%)
Savings from energy demand reduction	1,325	58%
Savings from heat network / CHP	0	0%
Savings from renewable energy	2	0%
Total Cumulative Savings	**1,327**	**58%**

Table 3: Shortfall in regulated carbon dioxide savings

	Annual Shortfall (Tonnes CO_2)	Cumulative Shortfall (Tonnes CO_2)
Total Target Savings	**799**	-
Shortfall	-528	-15,850
Cash in-lieu contribution (£)	**-951,030**	-

SAP10 PERFORMANCE

Table 1: Carbon Dioxide Emissions after each stage of the Energy Hierarchy for non-domestic buildings

	Carbon Dioxide Emissions for non-domestic buildings (Tonnes CO2 per annum)	
	Regulated	Unregulated
Baseline: Part L 2013 of the Building Regulations Compliant Development	1,025	426
After energy demand reduction	473	426
After heat network / CHP	473	426
After renewable energy	467	426

Table 2: Regulated Carbon Dioxide savings from each stage of the Energy Hierarchy for non-domestic buildings

	Regulated non-domestic carbon dioxide savings	
	(Tonnes CO_2 per annum)	(%)
Savings from energy demand reduction	552	54%
Savings from heat network / CHP	0	0%
Savings from renewable energy	7	1%
Total Cumulative Savings	**558**	**54%**

Table 3: Shortfall in regulated carbon dioxide savings

	Annual Shortfall (Tonnes CO_2)	Cumulative Shortfall (Tonnes CO_2)
Total Target Savings	359	-
Shortfall	-200	-5,988
Cash in-lieu contribution* (£)	**-359,303**	-

*The cash-in-lieu contribution is calculated by the GLA as though the building is entirely new build.

These SAP 10 calculations have been undertaken with the most recent GLA calculation spreadsheet, from January 2019.

Appendix B – BRUKL Documents

The BRUKL documents for each stage of the energy hierarchy, for both existing and extension parts of the development, are omitted from this report as they total 228 pages, making them impractical to display in this appendix. A list of the BRUKL documents sent in conjunction with this report is below:

- Caa House - Base Case - Existing_brukl
- Caa House - Base Case - Extension_brukl
- Caa House - Be Lean - Existing_brukl
- Caa House - Be Lean - Extension_brukl
- Caa House - Be Green - Existing_brukl
- Caa House - Be Green - Extension_brukl