JAW

109 FORTIS GREEN
Energy Strategy Report

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JAWSustainability

Contents

Executive Summary

This energy strategy has been prepared for the development at 109 Fortis Green to provide 10 new residential units made up of 4 houses and 6 flats.

This report demonstrates how the proposed development addresses local planning policies for Haringey and the London plan relating to energy and sustainability.

Following the energy hierarchy, passive design measures and energy efficient equipment have shown an improvement of 67.33% improvement over Part L. The heating and cooling hierarchies have also been followed. An offset payment of £13,823 is proposed to achieve zero carbon overall.

The design team have made all reasonable endeavours to achieve the maximum carbon savings. The fabric performs significantly than building regulations minimum standards, highly efficient systems are specified, and the PV system utilises a majority of suitable available roof space.

1 Introduction

This energy strategy has been prepared for the development at 109 Fortis Green to provide 10 new residential units comprised of 6 flats and 4 houses.

This statement summarises the sustainable design and construction measures that have been incorporated into the project in order to meet the sustainability requirements of the London Borough of Harringay and the London Plan which classes any residential development of 10 units or more as a major development.

Figure 1-1 the location of the site at 109 Fortis Green

1.1 Assessment approach

This report summarises the work undertaken to support the development of an energy strategy for the new development, following the energy hierarchy 'Be Lean, Be Clean, Be Green and be seen'.

Standard Assessment Procedure for the Energy Rating of Dwellings (SAP) calculations have been carried out. These are used to assess the impact on energy demand and CO_2 emissions of improvements through the hierarchy and demonstrate the most appropriate solution for the development to meet the relevant planning requirements.

2 Policy

2.1 Haringey Local Policy – Development Management Plan

Policy DM21 : Sustainable Design, Layout and Construction

A. All new development, including building and landscape works, will be expected to consider and implement sustainable design, layout and construction techniques. Proposals should:

   a. Apply the energy hierarchy to minimise energy use in order to meet, and if possible exceed, minimum carbon dioxide reduction requirements;
   b. Apply the cooling hierarchy to reduce the potential for overheating and limit reliance on mechanical air conditioning systems;
   c. Maximise opportunities to enhance biodiversity on-site, including through appropriate landscaping, Sustainable Drainage Systems, living roofs and green walls
   d. Wherever possible, use building materials with high environmental performance ratings; and
   e. Seek opportunities for locally sourced labour.

B. The Council will support appropriate measures to sustainably retrofit existing homes and non-residential buildings.

C. Proposals that fail to demonstrate adequate consideration for sustainable design, layout and construction techniques will be resisted.

D. Consideration will be given to the use of carbon offset payments, to be secured by planning obligations, where it can be demonstrated that proposals are unable to meet carbon dioxide emission reduction targets on-site.

2.2 The London Plan Policies on Energy

The policies referred to in order to develop this energy strategy, are those in the Intend to Publish New London Plan, which we expect to be published prior to determination of this application.

Policy SI 2 Minimising greenhouse gas emissions

A Major development should be net zero-carbon. This means reducing greenhouse gas emissions in operation and minimising both annual and peak energy demand in accordance with the following energy hierarchy:

1) be lean: use less energy and manage demand during operation
2) be clean: exploit local energy resources (such as secondary heat) and supply energy efficiently and cleanly
3) be green: maximise opportunities for renewable energy by producing, storing and using renewable energy on-site
4) be seen: monitor, verify and report on energy performance.

B Major development proposals should include a detailed energy strategy to demonstrate how the zero-carbon target will be met within the framework of the energy hierarchy.

C A minimum on-site reduction of at least 35 per cent beyond Building Regulations156 is required for major development. Residential development should achieve 10 per cent, and non-residential development should achieve 15 per cent through energy efficiency measures. Where it is clearly demonstrated that the zero-carbon target cannot be fully achieved on-site, any shortfall should be provided, in agreement with the borough, either:

1) through a cash in lieu contribution to the borough's carbon offset fund, or
2) off-site provided that an alternative proposal is identified, and delivery is certain.

D Boroughs must establish and administer a carbon offset fund. Offset fund payments must be ring-fenced to implement projects that deliver carbon reductions. The operation of offset funds should be monitored and reported on annually.

E Major development proposals should calculate and minimise carbon emissions from any other part of the development, including plant or equipment, that are not covered by Building Regulations, i.e. unregulated emissions.

F Development proposals referable to the Mayor should calculate whole life-cycle carbon emissions through a nationally recognised Whole Life-Cycle Carbon Assessment and demonstrate actions taken to reduce life-cycle carbon emissions.

Policy SI 3 Energy infrastructure

A Boroughs and developers should engage at an early stage with relevant energy companies and bodies to establish the future energy and infrastructure requirements arising from large-scale development proposals such as Opportunity Areas, Town Centres, other growth areas or clusters of significant new development.

B Energy masterplans should be developed for large-scale development locations (such as those outlined in Part A and other opportunities) which establish the most effective energy supply options. Energy masterplans should identify:

1) major heat loads (including anchor heat loads, with particular reference to sites such as universities, hospitals and social housing)
2) heat loads from existing buildings that can be connected to future phases of a heat network
3) major heat supply plant including opportunities to utilise heat from energy from waste plants
4) secondary heat sources, including both environmental and waste heat
5) opportunities for low and ambient temperature heat networks
6) possible land for energy centres and/or energy storage
7) possible heating and cooling network routes
8) opportunities for futureproofing utility infrastructure networks to minimise the impact from road works
9) infrastructure and land requirements for electricity and gas supplies
10) implementation options for delivering feasible projects, considering issues of procurement, funding and risk, and the role of the public sector
11) opportunities to maximise renewable electricity generation and incorporate demand-side response measures.

C Development Plans should:

1) identify the need for, and suitable sites for, any necessary energy infrastructure requirements including energy centres, energy storage and upgrades to existing infrastructure
2) identify existing heating and cooling networks, identify proposed locations for future heating and cooling networks and identify opportunities for expanding and inter-connecting existing networks as well as establishing new networks.

D Major development proposals within Heat Network Priority Areas should have a communal low-temperature heating system:

1) the heat source for the communal heating system should be selected in accordance with the following 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 (CHP) (only where there is a case for CHP 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 NOx gas boilers
2) CHP and ultra-low NOx gas boiler communal or district heating systems should be designed to ensure that they meet the requirements in Part B of Policy SI 1 Improving air quality

3) where a heat network is planned but not yet in existence the development should be designed to allow for the cost-effective connection at a later date.

E Heat networks should achieve good practice design and specification standards for primary, secondary and tertiary systems comparable to those set out in the CIBSE/ADE Code of Practice CP1 or equivalent.

Policy SI 4 Managing heat risk

A Development proposals should minimise adverse impacts on the urban heat island through design, layout, orientation, materials and the incorporation of green infrastructure.

B Major development proposals should demonstrate through an energy strategy how they will reduce the potential for internal overheating and reliance on air conditioning systems in accordance with the following cooling hierarchy:

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

3 Energy Strategy

An energy strategy has been developed following the energy hierarchy 'Be Lean, Be Clean, Be Green', 'Be Seen'. Energy calculations using Building Regulations approved and accredited software have been undertaken at each stage to calculate the savings associated with the measures incorporated.

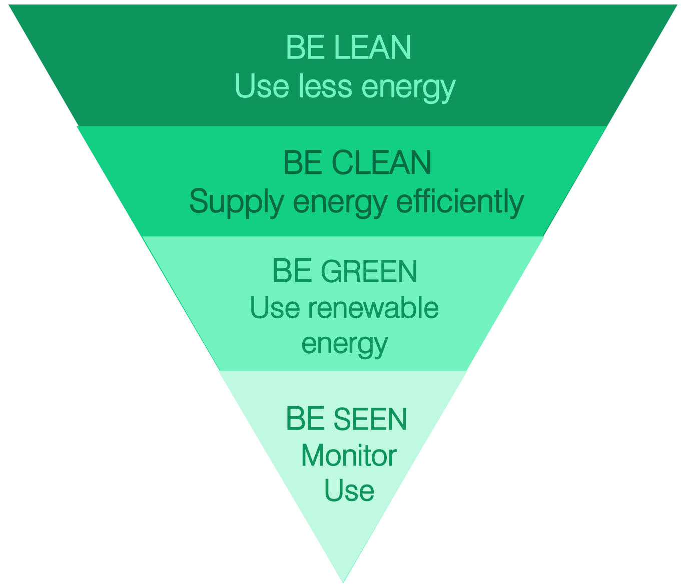


Figure 3-1 The Energy Hierarchy

The energy consumption and carbon emission figures within this report have been calculated using the approved Standard Assessment Procedure for the Energy Rating of Dwellings (SAP). SAP 10 carbon factors are used to represent the carbon intensity of mains gas and electricity.

3.1 Energy Targets

In line with the London Plan, there is a target of a 35% reduction over Part L 2013. Table 3-1 below details the energy and carbon breakdown of the Part L target emission rate.

Gas (kWh/yr)			Gas CO2 (kg/yr)	Electricity (kWh/yr)			Electricity CO_2 (kg/yr)	Total Energy (kWh/yr)	Total CO_2 (kg/yr)
Space Heating	Hot Water	Total		Pumps & Fans	Lighting	Total			
41,518	23,986	65,504	13,756	750	3,917	4,667	1,087	70,171	14,843

Table 3-1 Target regulated energy demand and carbon emissions per energy source

3.2 Be Lean

As part of the Be Lean approach, passive design measures have been considered throughout the pre-planning stage to reduce initial energy demand.

Solar Gain Control and Daylight

Solar gains are a passive form of heating from the sun's radiation and are beneficial to a building during winter months as they provide an effective source of heat and reduce internal heating requirements. However, in summer months they must be controlled in order to mitigate the risk of overheating. They can be controlled through glazing and shading design in order to allow low level winter sun to enter the building and to limit access to high level summer sun.

The glazing strategy design has carefully considered orientation and window size in order to maximise daylight while controlling excessive solar gains. Glazing will incorporate low emissivity coatings to limit overheating without compromising light transmittance.

Overheating

The impact of solar gains has been analysed as part of the SAP calculations, taking into account the ventilation strategies and the risk of solar overheating has been concluded to be medium, when measured against the Part L1A criteria.

Following the overheating checklist, and results of the SAP assessment, the risk of solar overheating is minimised. Whilst Mechanical Ventilation with Heat Recovery is provided to allow for ventilation during times when windows need to remain closed due to external elements such as noise or air quality, there is also a natural ventilation strategy possible and all units have dual aspect to allow for cross ventilation.

All windows are specified to incorporate low emissivity coatings to limit overheating while ensuring adequate daylight.

Section 1 – Site features affecting vulnerability to overheating		Yes or No
Site location	Urban – within central London or in a high density conurbation	Yes
	Peri-urban - on the suburban fringes of London	No
Air quality and/or Noise sensitivity - are any of the following in the vicinity of buildings?	Busy roads / A roads	Yes
	Railways / Overground / DLR	Yes
	Airport / Flight path	No
	Industrial uses / waste facility	No
Proposed building use	Will any buildings be occupied by vulnerable people (e.g. elderly, disabled, young children)?	Yes
	Are residents likely to be at home during the day (e.g. students)?	No
Dwelling aspect	Are there any single aspect units?	Yes
Glazing ratio	Is the glazing ratio (glazing : internal floor area) greater than 25%?	No
	If yes, is this to allow acceptable levels of daylighting?	N/A
Security - Are there any security issues that could limit opening of windows for ventilation?	Single storey ground floor units	Yes
	Vulnerable areas identified by the Police Architectural Liaison Officer	No
	Other	N/A

Table 3-2 Site features affecting vulnerability to overheating

Section 2 – Design features implemented to mitigate overheating risk		Yes or No
Landscaping	Will deciduous trees be provided for summer shading (to windows and pedestrian routes)?	No
	Will green roofs be provided?	No
	Will other green or blue infrastructure be provided around buildings for evaporative cooling?	No
Materials	Have high albedo (light colour) materials been specified?	No
Dwelling aspect	% of total units that are single aspect	0
	% single aspect with N orientation	0
	% single aspect with E orientation	0
	% single aspect with S orientation	0
	% single aspect with W orientation	0%
Glazing ratio - What is the glazing ratio (glazing : internal floor area) on each facade?	N	1.3%
	E	0.01%
	S	3.2%
	W	0.1%
Window opening	Are windows openable?	Yes
Window opening	What is the average percentage of openable area for the windows?	50%
Window opening - What is the extent of the opening?	Fully openable	Yes
	Limited (e.g. for security, safety, wind loading reasons)	Yes
Security	Where there are security issues (e.g. ground floor flats) has an alternative night time natural ventilation method been provided (e.g. ventilation grates)?	Yes
Shading	Is there any external shading?	No
	Is there any internal shading?	No
Glazing specification	Is there any solar control glazing?	Yes - low emissivity glazing is specified
Ventilation - What is the ventilation strategy?	Natural – background	Yes
	Natural – purge	No
	Mechanical – background (e.g. MVHR)	Yes
	Mechanical – purge	Yes
	What is the average design air change rate	6
Heating system	Is communal heating present?	No
	What is the flow/return temperature?	55
	Have horizontal pipe runs been minimised?	No
	Do the specifications include insulation levels in line with the London Heat Network Manual	Yes

Table 3-3 Design features implemented to mitigate overheating risk

The cooling hierarchy

The development has followed the cooling hierarchy as follows:

Requirement	Measures
Minimise internal heat generation through energy efficient design	Flats incorporate individual gas boilers, but these will be fully insulated and run at temperatures adequate for operation but not too high. Houses utilise ASHP with exterior compressors.
Reduce the amount of heat entering a building in summer through orientation, shading, albedo, fenestration, insulation and green roofs and walls	The glazing strategy is designed to balance daylight and overheating. Low emissivity coatings will be applied to windows.
Manage the heat within the building through exposed internal thermal mass and high ceilings	Floor to ceiling height is maximised within the building constraints
Passive ventilation	All the flats are dual aspect. This will provide opportunity for passive ventilation in summer.
Mechanical ventilation	MVHR is provided in order to maintain air quality and reduce noise levels so adequate ventilation can be provided at all times of day and night
Active cooling systems (ensuring they are the lowest carbon options).	The flats are cooled using natural cooling.

Table 3-4 the cooling hierarchy

Building Fabric

Designing an efficient thermal envelope will greatly reduce the need for space heating and cooling as heat transmittance through the thermal elements is reduced.

Low air permeability rates will also reduce heating and cooling energy demand by reducing the volume of air that can penetrate the building.

As part of a 'fabric first' approach, the building fabric has been carefully considered and specified to meet or exceed current Building Regulations minimum requirements, as detailed in table 3-2 below.

Fabric Component	Specification
External Walls	0.14 W/m^2K
Stairwell/Corridor/Lift Wall	0.14 W/m^2K
Roofs / Terraces	0.13 W/m^2K
Ground/ Exposed Floor	0.12 W/m^2K
Party Walls	Fully filled cavity with edge sealing
Windows	1.2 W/m^2K G-value 0.63
External Doors	1.2 W/m^2K
Air Tightness	$3m^3/m^2/h$
Thermal Bridging	Y=0.08, requires calculation at detailed design

Table 3-5 Proposed Be Lean passive design measures

With regards to party walls, to reach the required standards, these must be fully filed. Partially filled cavities will not comply.

Thermal bridging

Non-repeating thermal bridges at junctions will be designed carefully in order to ensure that they perform better than typical constructions. It is proposed that an average Y-value of 0.08 is achieved across the project. This will be achieved through a combination of Accredited Construction Details (ACDs) for more standard junctions (e.g. corners, external wall junctions with floors and party walls) and bespoke designed bridges that are then calculated using thermal modelling software. At this stage of design further information is not available but all designs will ensure the 0.08 value is achieved on construction.

Building Services

Services have been specified to maximise efficiency therefore reducing energy used to deliver services. Table 3-3 shows the proposed services strategy and energy efficiency measures for the development.

Services Component	Specification – Flats	Specification – Houses
Space Heating & hot water	Individual gas boiler, 89% efficient Charging linked to use off heat, programmer & TRVs Radiators	Individual gas boiler, 89% efficient *(assumed at be lean stage)* Charging linked to use off heat, programmer & TRVs Radiators
Heating Controls	Time and temperature zone control	Time and Temperature Zone control
Ventilation	MVHR efficiency 86%, SFP 0.6	Natural Ventilation
Lighting & Controls	100% low energy lighting	100% low energy lighting

Table 3-3 Proposed energy efficient design measures

The breakdown of carbon and energy use has been identified for the site. Table 3-4 shows the breakdown of carbon and energy use once the strategies proposed at the be lean are incorporated.

Gas (kWh/yr)			Gas CO2 (kg/yr)	Electricity (kWh/yr)			Electricity CO_2 (kg/yr)	Total Energy (kWh/yr)	Total CO_2 (kg/yr)
Space Heating	Hot Water	Total		Pumps & Fans	Lighting	Total			
32,220	22,815	55,035	11,557	750	3,916	4,666	1,087	59,701	12,645

Table 3-4 Estimated regulated energy demand and carbon emissions per energy source

Carbon Savings

Table 3-5 and figure 3-2 demonstrate the percentage improvement over the notional baseline levels for the be lean stage. The development demonstrates a 14.81% reduction in CO2 emissions over Part L from the implementation of energy efficient systems, fabric and passive design measures. This meets the 10% target set out in The London Plan. The proposed fabric specifications are the lowest possible for this development.

Energy Hierarchy stage	CO_2 Emissions (T/yr)	CO_2 Savings (T/yr)	% Saving
Building Regulations 2013 Baseline	14.84		
Be Lean	12.64	2.20	14.81%

Table 3-5 improvements over Part L

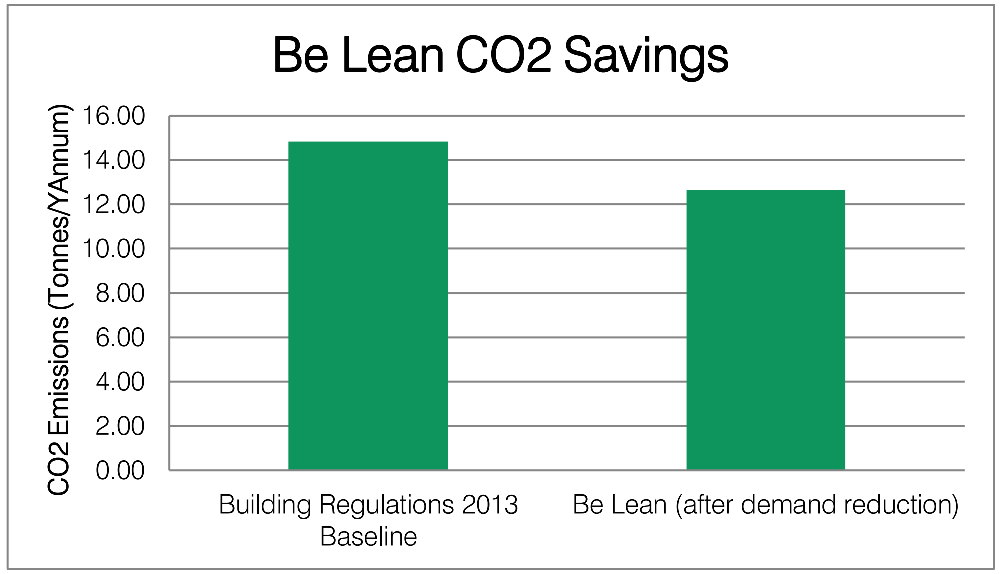


Figure 3-2 Be lean improvements over part L

3.3 Be Clean

As part of the Be Clean approach, the use of energy efficient equipment, heat networks and community heating have been considered.

District Energy Systems

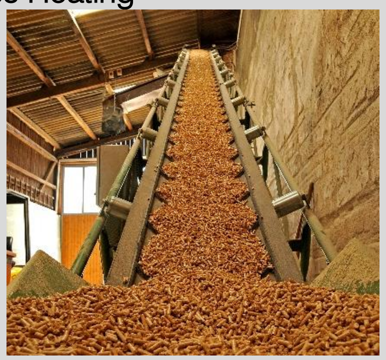
The development is not located within 500m of any existing or proposed heat network, but is within a heat network priority area as shown below in figure 3-3. As this development is small consisting of only 10 units which are spilt between houses and flats, future proofing the site through the use of a communal system for space and water heating is not technically realistic or financially viable.

As there are no additional saving to be made at the be clean stage no data is given in this section.

Figure 3-3 London Heat Map

3.4 Be Green

At the Be Green stage, renewable technologies are investigated. Table 3-3 considers the feasibility of renewable energy technologies for the scheme.

LZC Technologies	Description	Noise	Visual impact	Internal Space	External Space	Capital Cost	Maintenance	Feasibility	
Solar Thermal Collectors 	Solar thermal collectors can be used to provide hot water using the irradiation from the sun. They can generally provide approx. 50% of the hot water demand	🟢	🟡	🟢	🟡	🔴	🟡	There are areas of flat roof that can incorporate solar technologies. However, carbon savings are quite low and it is quite a high cost technology.	✗
Solar Photovoltaic Panels 	Solar PV panels generate electricity from the sun's energy. They should be installed within 90° of due south ideally at a 30° angle. The electricity can be used to supply the landlords load.	🟢	🟡	🟢	🟡	🟡	🟡	There are areas of flat and pitched roof that can incorporate solar technologies. Solar PV is ideal for making carbon savings while being a simple technology.	✓
Biomass Heating 	Solid, liquid or gaseous fuels derived from plant material can provide boiler heat for space and water heating A biomass boiler would supplement a standard gas heating system so some of the cost may be offset through money saved on using smaller traditional boilers reliability of fuel access/supply can be a problem	🟡	🟢	🔴	🟡	🔴	🔴	Biomass is not considered feasible for this development due to issues with fuel storage, access for delivery vehicles and local NO_x emissions	✗

Wind Turbines 	Vertical and horizontal axis wind turbines enable electricity to be generated using the power within the wind Not suitable for urban environments due to low wind conditions and obstructions	🔴	🔴	🟢	🔴	🔴	🟡	This development is in an urban environment and so a wind turbine will not generate much energy	×
Ground Source Heat Pumps (GSHP) 	Utilising horizontal loops or vertical boreholes, GSHP make use of the grounds almost constant temperature to provide heating and/or cooling using a heat exchanger connected to a space/water heating delivery system Optimum efficiency with underfloor heating systems	🟡	🟢	🟡	🟡	🔴	🟡	GSHP are not a feasible technology for the site since there is a limited external space available for installation of boreholes	×
Air Source Heat Pumps (ASHP) 	Air Source Heat Pumps extract latent energy from the external air in a manner similar to ground source heat pumps Optimum efficiency with underfloor heating systems	🟡	🟡	🟡	🟡	🟡	🟡	While flats lack the space required for the exterior units, ASHP will be incorporated into the houses utilising exterior garden pace.	✓

Table 3-6 Feasibility of LZC technologies for the development

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Renewable systems

The feasibility study has identified solar PV as the most appropriate technology for the development.

Services Component	Residential Specification
Photovoltaic panels	Peak Power – 12.5kWp Orientation – S/SE Angle of elevation – 30˚/40 ˚ Panel specification – Min 20% efficiency Approx. no of panels – 49
ASHP	Space heating efficiency 349% U/F heating Time and temperature zone control

Figure 3-7 Renewable and LZC technologies on site

The PV array has been calculated as the largest feasible for the site and uses available flat roof space as well as south and south east facing pitched roof space throughout the development

ASHP will be incorporated into the housing developments, for the purposes of calculation an 8.5kW Mitsubishi ECODAN unit with a space heating efficiency of 343.9 has been used. A comparable unit will be specified within the development. ASHP have not been used for the provision of space and water heating in the proposed flats as they lack the external space required to house the external unit.

3.5 Energy and Carbon Savings

Energy Use

The breakdown of carbon and energy use has been identified for the site. Table 3-8 shows the breakdown of carbon and energy use once the strategies proposed in this report are incorporated.

Heat (kWh/yr)				Electricity (kWh/yr)								
Space Heating	Hot Water	Total	Heat CO2 (kg/yr)	Space heating	Hot water	Pumps & Fans	Lighting	PV	Total	Electricity CO_2 (kg/yr)	Total Energy (kWh/yr)	Total CO_2 (kg/yr)
12,508	12,463	24,971	5,244	2,211	2,271	300	3,916	-10,389	-1,691	-394	23,280	4,850

Table 3-8 Estimated regulated energy demand and carbon emissions per energy source

Carbon Savings

Table 3-9 and Figure 3-3 demonstrate the percentage improvement over the notional baseline levels for the development.

Energy Hierarchy stage	CO_2 Emissions (T/yr)	CO_2 Savings (T/yr)	% Saving
Building Regulations 2013 Baseline	14.84		
Be Lean	12.64	2.20	14.81
Be Clean	12.64	0.00	0%
Be Green	4.85	7.79	52.51
Total Cumulative Savings		9.99	67.33

Table 3-9 Improvement over part L

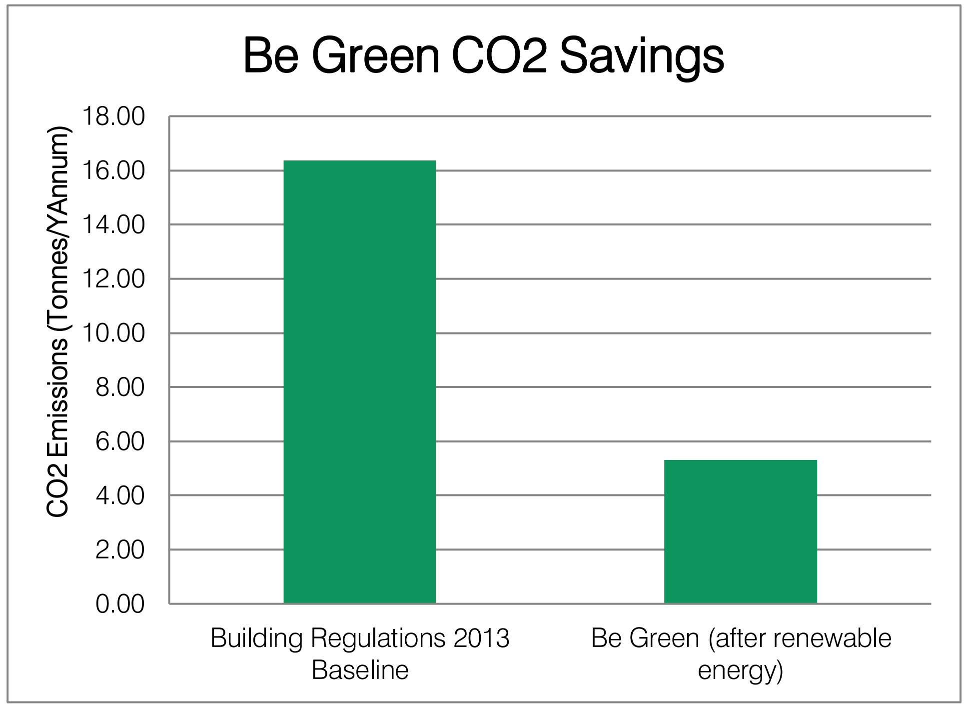

Figure 3-3 Total site wide savings over part L

Carbon Offset Payment

The development has achieved a 60.90% improvement over Part L. In line with the London Plan carbon reduction requirements, there is a target of zero carbon, which can be achieved through an offset payment when there is a shortfall on site. This calculation is detailed below.

	Shortfall on zero carbon		
	Carbon emissions (tonnes / annum)	30 year carbon emissions	Offset payment (£60/tonne)
Resi	4.85	146	£ 13,823

Table 3-10 Shortfall on zero carbon target and required carbon offset payment

3.6 Be Seen

All major plant will be fitted with meters to allow remote monitoring of energy used by the heating systems and distribution boards. A contract will be put in place to monitor the readings so that they can be compared with the predicted energy performance, and this information will be reported, as details in the GLA 'Be Seen' guidance.

4 Conclusion

The development at 109 fortis Green consists of the development of 10 new residential units. As required by the London Plan and the DMP of Haringey, the development follows the energy hierarchy, incorporating passive design measures, energy efficient equipment and renewable energy.

The development employs an efficient building fabric, including well insulated walls and highly efficient glazing, efficient systems, PV Panels and ASHP are specified to maximise carbon savings for the site.

At the be lean stage, this results in a 14.81% improvement over Part L, exceeding the 10% improvement required by the London plan. The building fabric has been specified to be very efficient, while also ensuring non-combustible insulation is used. Additionally, the reduction in heating demand is balanced against reducing overheating. The specified measures are considered the best for the development. Overall the development has significant carbon savings, well in excess of the minimum standards.

At the be green stage the overall results are a 67.33% improvement over Part L. This is in excess of the minimum requirements of 35%.

The development follows the energy hierarchy, heating hierarchy and cooling hierarchy. In addition, the PV system takes up much of the available roof space. The proposals therefore represent the best on site savings. The development will further achieve 'zero carbon' through an offset payment of £13,823 in line with the London Plan guidance.

The figures within this report are based on preliminary analysis only and further detailed studies will be required at the detailed design stage before specifying any of the proposed systems.