ENERGY STATEMENT

Harefield Grove

Prepared for: Comer Homes Group

STROMA®
BUILT ENVIRONMENT

DOCUMENT CONTROL

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1.0 EXECUTIVE SUMMARY

This Energy Statement has been produced by Stroma Built Environment to accompany the planning application for the development at Harefield Grove.

In accordance with requirements of the London Borough of Hillingdon, this development is required to achieve 35% CO_2 savings against a 2013 Part L1a compliant baseline. The remaining regulated carbon dioxide emissions to 100% is to be offset through a cash in lieu contribution.

This statement addresses the following requirements:

- Calculation of the baseline CO_2 emissions for the development
- Details of the performance of the building
- Details predicted annual CO_2 savings against the Mayor's Energy Hierarchy: Lean, Clean, Green
- Provides calculations of the Carbon Offset payment

It must be understood that carbon dioxide emissions levels for each stage of the Mayor's Energy Hierarchy have been calculated using new Draft SAP10 carbon emission factors, rather than the current adopted factors used for Building Control purposes. This is to benchmark the development against future performance, rather than current standards. This approach is set out within the April 2020 GLA guidance, and local authorities are urged to encourage developers to assess their schemes under these new factors. This is meant to encourage a shift away from gas fired heating, towards alternative solutions such as heat pumps. This change in carbon factor has a dramatic effect on the CO_2 emissions of potential development. Where a 35% improvement over the baseline emission could previously only be practically achieved using a gas or CHP-based strategy, this approach will not even meet the baseline emissions when adjusted for the new carbon factors. Similarly, the new proposal shall be designed to exceed the requirements when assessed under these new carbon factors.

Additionally it must be understood, that whilst the reported figures should be used for planning and reporting purposes, and calculation of the carbon offset financial contribution, they cannot be used for the purposes of Building Control compliance, which must use the current adopted methodology in order to remain legally compliant.

Therefore, whilst the planning requirements and targets set by the local authority and GLA shall be assessed under the new SAP10 carbon factors, a secondary assessment, using current regulatory methods, has also been reported, in order to also ensure compliance with the current regulatory standards (Building Regulations UK Part L1a).

SAP calculations have been carried out using Government approved FSAP software in accordance with the current Building Regulations.

Results show that CO_2 targets can be achieved through a combination of high-performance building fabric, exhaust air Heat Pumps and the inclusion of a Solar Photovoltaic array.

	Regulated domestic carbon dioxide savings			
	Carbon dioxide emissions (Tonnes CO_2 per annum)	Stage savings (Tonnes CO_2 per annum)	Stage CO_2 savings (%)	Cumulative savings (%)
Baseline: Part L 2013 of the Building Regulations Compliant Development	45.52	-	-	-
Be Lean: After energy demand reduction	39.08	6.44	14.1%	14.1%
Be Clean: After network/CHP	39.08	0.00	0.0%	14.1%
Be Green: After renewable energy	14.99	24.09	52.9%	67.1%

Table 1. **Predicted site wide carbon emissions savings**

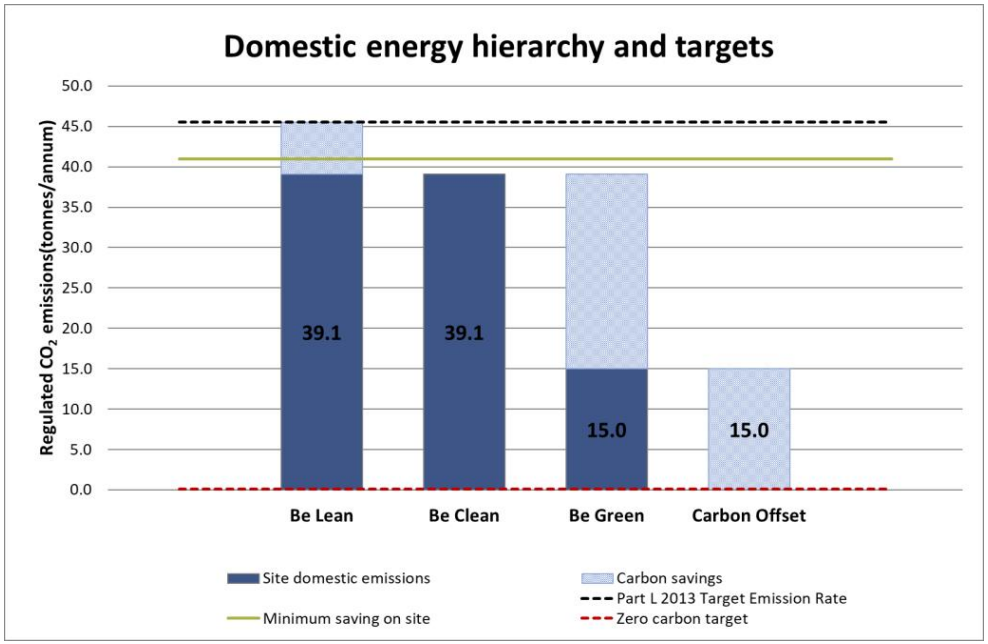

Figure 1. **Site wide carbon emissions savings**

2.0 INTRODUCTION

Stroma Built Environment have been commissioned by Comer Homes to prepare an energy statement to accompany the planning application for the proposed the development at Harefield Grove.

The proposed development is located within the London Borough of Hillingdon and will therefore need to meet the requirements of the Hillingdon Local Plan (Adopted November 2012). The document outlines the sustainable design standards for this borough, including a requirement for all new residential developments to achieve reduction in carbon dioxide emissions in line with the London Plan targets through energy efficient design and efficient use of low and zero carbon technologies

Policy BE1 Built environment of the Local Plan has been followed to show how this target can be achieved via the Mayor's Energy Hierarchy (Figure 2). The tiered approach addresses fabric performance first, before connection to district heating network and then renewable energy technology.

Carbon dioxide emissions levels for each stage of the Mayor's Energy Hierarchy have been calculated using new Draft SAP10 carbon emission factors, as set out within the April 2020 GLA Energy Assessment Guidance.

The energy strategy for the proposed development is as follows:

1. Minimal heat loss through fabric, thermal bridging and air infiltration.
2. Installation of energy efficient building services
3. Connection to the proposed District Energy Network (DEN)
4. Appropriate renewable energy technology to further reduce grid-energy demand and CO_2 emissions – Solar Photovoltaic Panels

Figure 2. **Energy Hierarchy**

3.0 DEVELOPMENT SITE

The development site is located at Harefield Grove, Hillingdon.

The proposed development comprises 3 distinct areas. The refurbishment of an existing mansion house to provide 8 apartments. The erection of a new apartment 'stable block' to provide 29 apartments and 3 new build detached houses. A further cottage house will be refurbished.

The London Plan Energy Assessment guidance requires new build dwellings to be assessed against the energy hierarchy and thus this assessment addresses the CO2 emissions associated with only these dwellings.

Figure 3. **Approximate Aerial view of the development site (https://www.google.com/maps)**

Figure 4. **Proposed site plan**

4.0 PLANNING POLICY

4.1. National Policy – England

The Department for Communities and Local Government (DCLG) released the revised National Planning Policy Framework (NPPF) in July 2018. In revising this framework, the Government's objective is to streamline the process encouraging sustainable development and promoting the needs and priorities of local communities.

This framework is to be used as the base by councils to develop their own local policy. Section 14 of the framework addresses climate change, flooding and costal change. Considerations include;

- Minimising CO_2 emissions
- Reducing greenhouse gas emissions using landform, layout, building orientation, massing and landscaping
- Vulnerability of fuel supply
- A promotion of decentralised, low carbon and renewable energy sources wherever viable
- Green infrastructure

4.2. Regional Policy – Greater London

The Spatial Development Strategy Plan for London was revised in March 2021.

Policy SI 2 Minimising Greenhouse Gas Emisisons

A

Major development should be net zero-carbon.151 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 Regulations152 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.

4.3. Local Policy – Hillingdon Development Mangment Policies

The Hillingdon Development Management Policies document (adopted 16th January 2020) outlines the sustainable design standards for this borough. The energy strategy addresses the following policy:

Policy DMEI 2: Reducing Carbon Emissions

A) All developments are required to make the fullest contribution to minimising carbon dioxide emissions in accordance with London Plan targets.

B) All major development proposals must be accompanied by an energy assessment showing how these reductions will be achieved.

C) Proposals that fail to take reasonable steps to achieve the required savings will be resisted. However, where it is clearly demonstrated that the targets for carbon emissions cannot be met onsite, the Council may approve the application and seek an off-site contribution to make up for the shortfall.

5.0 BUILDING REGULATIONS – ENGLAND

APPROVED DOCUMENT L1A - DOMESTIC

Approved document L1A – Conservation of Fuel and Power sets the standard for carbon emissions for new dwellings and was last revised in April 2014 (Part L: 2013). The properties will need to comply with the criteria set out in the document, as follows:

1. The predicted Dwelling Emission Rate of CO_2 emissions from dwellings (DER) are not greater than the Target Emission Rate (TER).
2. The performance of the building fabric and fixed building services should be no worse than the design limits set out in Table 2 of the Approved Document.
3. The dwellings will have appropriate passive control measures to limit the effect of solar gains on indoor temperatures in summer.
4. That the performance of dwellings as-built comply with the DER values achieved, including site testing of a representative sample of dwellings demonstrating that the 'air permeability' rate achieved is as per that specified, or better.
5. The necessary provisions for energy efficient operation of dwellings are put in place, including operation and maintenance instructions aimed at achieving economy in the use of fuel and power in a way that householders can understand.

5.1. Assessment Methodology

DOMESTIC (SAP)

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

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

SAP is compliant with the EU Energy Performance of Buildings Directive and is carried out using approved software. A trained and accredited Stroma Energy Assessor has used Stroma FSAP 2012 software 1.0.4.26 to assess compliance and generate the necessary results data.

SAP calculations have been undertaken for all dwellings to determine the predicted energy consumption and CO_2 emissions for the entire development. Results have been converted with draft SAP10 carbon factors using the GLA Carbon Emission Reporting Spreadsheet. SAP, TER and DER worksheets as well as the completed GLA Carbon Emission Reporting Spreadsheet have been appended to this report.

BE LEAN

USE LESS ENERGY

6.0 BE LEAN – USE LESS ENERGY

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

Fundamental to achieving energy efficiency in any new building is the specification of a thermally efficient building envelope. Passive design features such as high levels of insulation, designing to maximise solar gain and limiting heat loss through reduced air leakage and enhanced thermal bridging are all proven techniques to reduce energy consumption and associated CO_2 emissions.

6.1. Building Fabric

Table 3 shows the proposed building fabric specification applied to the SAP with respect to the upper limits stipulated by Part L: 2013. It can be seen that the values represent a significant bettering of the mandatory requirements set out in the current Building Regulations.

Element	ADL1a: 2013 Limiting U-value	Proposed U-value	Improvement (%)
Ground Floor	0.25	0.12	52%
External walls	0.30	0.18	40%
Semi Exposed walls – to unheated communal spaces	0.30	0.23	23%
Party walls	0.20	0.00	100%
Roof	0.20	0.10	50%
Windows	2.00	1.4	30%
Doors	2.00	1.4	30%
y-value (thermal bridging)	0.15	Adopted Accredited Construction Details	N/A
Air permeability ($m^3/h.m^2$ @ 50 Pa)			
All dwellings (tested separately)	10.0	3.0	70%

Table 2. **Building fabric specification**

6.2. Building Services - Residential

It is proposed that apartment space heating and domestic hot water will be provided by individual Exhaust Air Heat Pumps within each dwelling

The houses will have individual air source heat pumps providing space heating and domestic hot water.

For the purpose of calculating carbon emissions associated with the Lean stage, in line with the GLA Guidance, a communal gas boiler with 91% efficiency has been used in SAP calculations.

The heating system will include time and temperature zone control which divides the dwellings into two distinct zones allowing differing temperature setpoints and timing to be applied to bedrooms and living areas. In most cases, heating all internal spaces to the same temperature at the same time consumes energy unnecessarily.

Low energy lighting will be specified throughout. In line with the Domestic Building Services Compliance Guide this means having a luminous efficacy of greater than 45 lumens per circuit watt and an output of greater than 400 lamp lumens. Typically, this will be achieved with LEDs or compact fluorescent lights and not low voltage Halogen variants.

Element	Specification
Heating Source	JOULE Victorum HW exhaust air heat pump
Heating control	Time and temperature zone control
Domestic hot water	From main heating system: Air Source Heat Pump
Water consumption	≤125 litres/person/day
Internal fixed lighting	100% low energy
Ventilation	JOULE Victorum
Thermal bridging	Accredited Construction Details have been incorporated.
Thermal mass parameter	Calculated

Figure 5. **Building services specification**

	Regulated domestic carbon dioxide savings			
	Carbon dioxide emissions (Tonnes CO_2 per annum)	Stage savings (Tonnes CO_2 per annum)	Stage CO_2 savings (%)	Cumulative savings (%)
Baseline: Part L 2013 of the Building Regulations Compliant Development	45.52	–	–	–
Be Lean: After energy demand reduction	39.08	6.44	14.1%	14.1%
Be Clean: After network/CHP	–	–	–	–
Be Green: After renewable energy	–	–	–	–

Table 3. **Whole site CO_2 emissions after 'Be Lean' measures SAP10**

BE CLEAN

SUPPLY ENERGY EFFICIENTLY

7.0 BE CLEAN – DECENTRALISED ENERGY

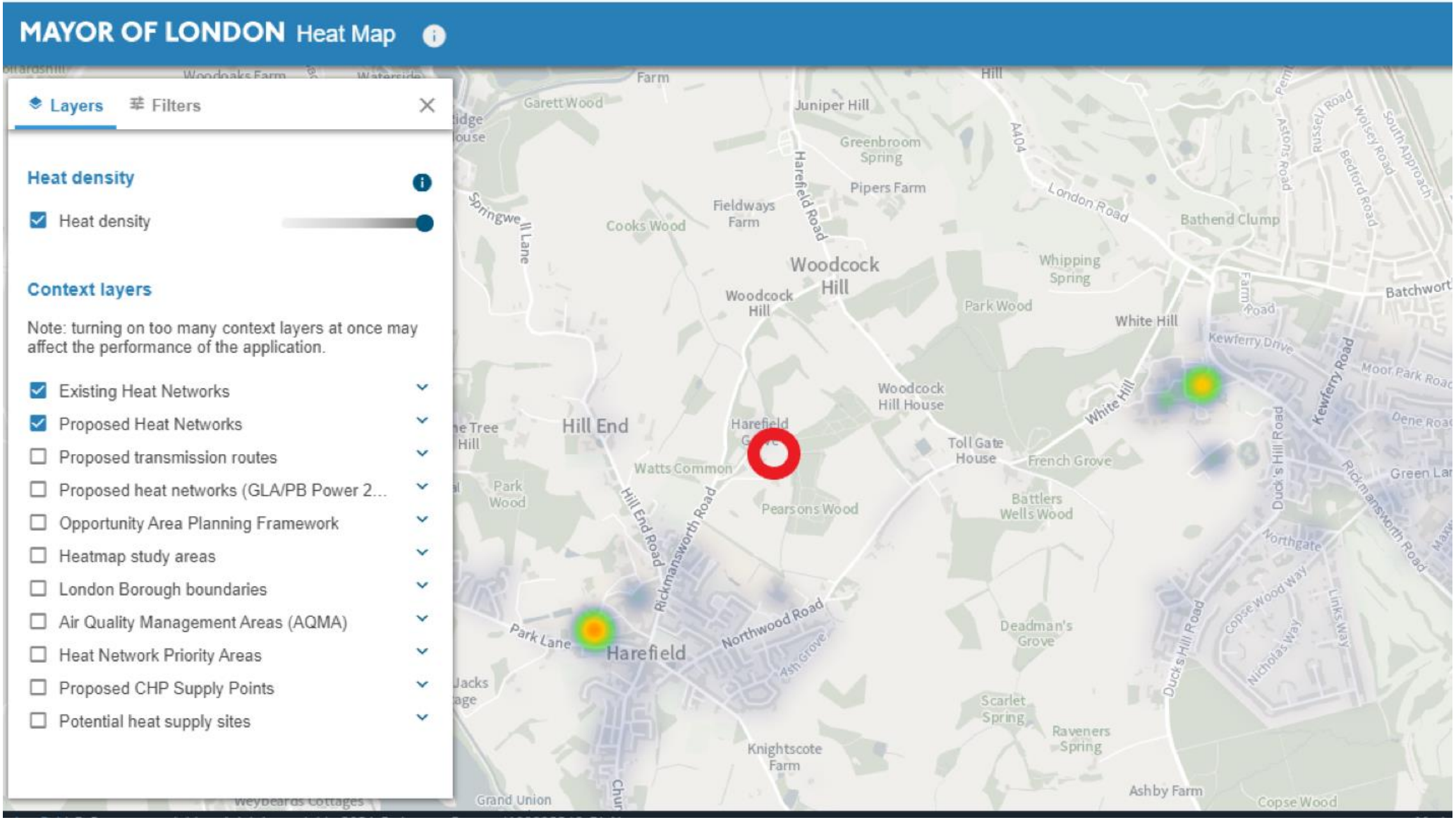

Figure 6. **London Heat Map for the site region – location of the development**

7.1. District Heating

Analysis of the London Heat Map was made to determine whether existing or proposed district heating networks are present in the vicinity of the development site. There are no proposed heat networks within the area and the heat density of the site is extremely low in this semi rural location. It is unlikely a heat network will ever reach this development and thus no on site heat network is proposed.

The applicant has elected to use individual exhaust air heat pumps to provide the space heating domestic hot water and ventilation to the new build apartments. These units will use significantly less energy during their operation and indeed their manufacture than a communal system with a central energy centre. It has therefore been determined that the benefits of the lower energy usage and carbon emissions associated with the exhaust air heat pump units outweigh those associated with providing an on site heat network for this particular site.

7.2. Combined Heat and Power

Combined Heat and Power (CHP) systems comprise a reciprocating engine, the 'prime mover' and an electrical generator. Unlike a traditional generator, CHP units recover heat from a series of heat exchanges fitted to the oil, water and exhaust circuits of the engine. This enables both the product and by-product of generation to be used and overall efficiencies in the region of 80% to be achieved.

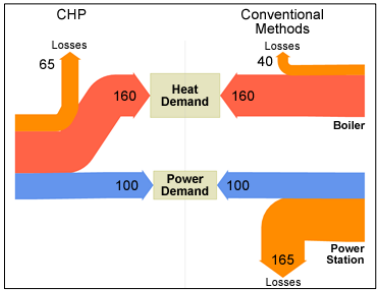

Figure 7. **Principle of CHP**

The development type and size renders CHP technology to be economically unviable due to the lack of significant base heat load. This lack of suitable base load is a result of low levels of heat loss and intermittent DHW use. As a rule of thumb, CHP engines should run for a minimum of 4000-4500 hours per year for efficient operation. Although thermal stores can be used to extend heating durations, the demand for heat must be relatively consistent. Therefore, CHP systems are best suited to buildings such as swimming pool facilities, hospitals and hotels.

	Regulated domestic carbon dioxide savings			
	Carbon dioxide emissions (Tonnes CO_2 per annum)	Stage savings (Tonnes CO_2 per annum)	Stage CO_2 savings (%)	Cumulative savings (%)
Baseline: Part L 2013 of the Building Regulations Compliant Development	45.52	–	–	–
Be Lean: After energy demand reduction	39.08	6.44	14.1%	14.1%
Be Clean: After network/CHP	39.08	0.00	0.0%	14.1%
Be Green: After renewable energy	–	–	–	–

Figure 8. **Whole site CO_2 emissions after 'Be Clean' measures SAP10**

BE GREEN

USE RENEWABLE ENERGY

8.0 BE GREEN RENEWABLE TECHNOLOGY

8.1. Exhaust Air Heat Pumps

A Exhaust Air Heat Pump (EAHP) system is for new build flat heating and ventilation. The all-in-one flat heat pump technology provides Centralised Mechanical Extract Ventilation (cMEV), central heating and domestic hot water (DHW), whilst fully complying with domestic Part L and Part F regulations. An EAHP recycles the air extracted and provides the most efficient heating solution for flats with very high COP's achieved. The EAHP gives control over the energy consumption and will be a key part of a connected lifestyle. The smart control system automatically adjusts to the indoor climate efficiently for maximum comfort.

8.2. Development Suitability

Exhaust Air Heat Pumps have been selected as there is no need to have any external units and they will be able to provide the heating, hot water and ventilation to each of the individual flats.

	Regulated domestic carbon dioxide savings			
	Carbon dioxide emissions (Tonnes CO_2 per annum)	Stage savings (Tonnes CO_2 per annum)	Stage CO_2 savings (%)	Cumulative savings (%)
Baseline: Part L 2013 of the Building Regulations Compliant Development	45.52	-	-	-
Be Lean: After energy demand reduction	39.08	6.44	14.1%	14.1%
Be Clean: After network/CHP	39.08	0.00	0.0%	14.1%
Be Green: After renewable energy	14.99	24.09	52.9%	67.1%

Figure 9. **Whole site CO_2 emissions after 'Be Green' measures SAP10**

8.3. Technology Analysis – Solar PV

The potential for CO2 savings from solar PV have been assessed using the Governments approved SAP: 2012 (Standard Assessment Procedure) methodology. This SAP methodology considers UK solar irradiance data, collector pitch, orientation and over-shading to determine the expected annual energy yield. In order to represent a semi-optimal installation, it is taken that solar PV could be installed on East/West/South roof areas to the apartments. On this basis, calculations show that a total installed PV capacity of 55 kWp (kilo-Watt peak) would be expected to generate 40,632 kWh of primary energy per annum.

It is advised that a PV specialist is appointed at the earliest opportunity to confirm the exact area required and ensure there is obtainable roof area to support this solution. The predicted total saving equates to 58,252 kWh per annum from PV.

9.0 CARBON OFFSET PAYMENT

As of the March 2021 it is a requirement of the London Plan policy SI2 that all major residential development must achieve the Zero Carbon Standard. This is done by meeting a minimum onsite CO_2 reduction of 35% against a Building Regulations L1a (2013) baseline, and then offsetting the remaining emissions via a cash in lieu contribution to the relevant borough. The calculations in table 4 indicated an offset payment of £42,722 is due.

Contributions to the Carbon Offset Fund are to be spent within the vicinity of the named development and used for retrofitting existing buildings, decentralized energy networks, renewable energy or any other programmed that achieves a calculable reduction in carbon emissions.

	Regulated domestic carbon dioxide savings			
	Carbon dioxide emissions (Tonnes CO_2 per annum)	Stage savings (Tonnes CO_2 per annum)	Stage CO_2 savings (%)	Cumulative savings (%)
Baseline: Part L 2013 of the Building Regulations Compliant Development	45.52	-	-	-
Be Lean: After energy demand reduction	39.08	6.44	14.1%	14.1%
Be Clean: After network/CHP	39.08	0.00	0.0%	14.1%
Be Green: After renewable energy	14.99	24.09	61.6%	67.1%
Carbon off-set (Tonnes CO_2)				
Cumulative on site savings	30.53			
Savings required to meet Zero Carbon requirement	14.99			
Carbon Off-set Cost Details	£/tonneCO2		Years	
	£95.00		30	
Cumulative savings for off-set payment	449.70			
Total Carbon Offset Cost (£)	£42,722.00			

Table 4. **Carbon Offset Payment calculation**

10.0 Conclusion

This Energy Statement has outlined the proposed specification for the development and the resulting savings against each stage of the energy hierarchy. A fabric-first approach realises considerable savings against the current Building Regulations baseline.

Additional energy and CO_2 savings will be achieved through the application of renewable energy technology.

10.1. Be Lean - Energy Efficiency

A high-performance building envelope has been specified comprising of low U-values, thermally efficient construction details and low air permeability. Performance values demonstrate improvement against that of the Part L1a 2013 Notional building used for comparison in compliance assessment.

10.2. Be Clean – Decentralised Energy

Analysis of the London Heat Map was made to determine whether existing or proposed district heating networks are present in the vicinity of the development site. There are no existing district heat networks, however the development site is situated in near proximity to proposed networks.

10.3. Be Green – Low and Zero Carbon Technology

Additional energy and CO_2 savings will then be achieved through the use of individual Exhaust Air Heat Pumps.

11.0 Summary

This statement has set out how the development will incorporate an energy efficient design which exceeds Part L 2013 regulations and, with exhaust air heat pumps to the apartment building and air source heat pumps to the houses can achieve a 67.1% reduction in regulated carbon dioxide emissions.

	Regulated domestic carbon dioxide savings			
	Carbon dioxide emissions (Tonnes CO_2 per annum)	Stage savings (Tonnes CO_2 per annum)	Stage CO_2 savings (%)	Cumulative savings (%)
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Table 5. **Whole site predicted CO_2 emissions**

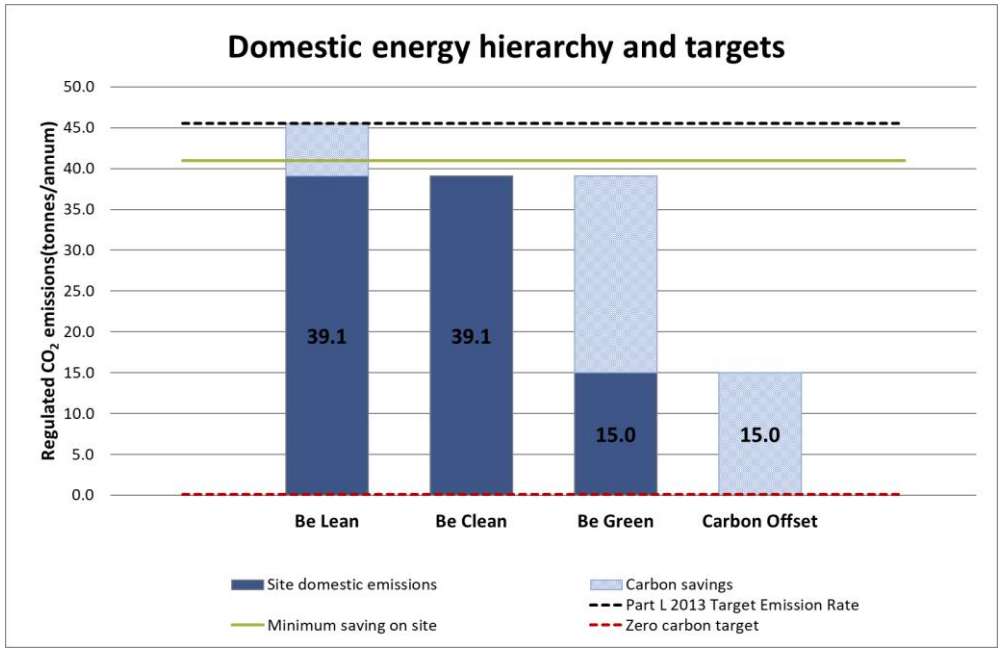

Figure 10. **Site wide carbon emissions savings**

APPENDICES