Energy Statement

108-109 Hatton Garden, EC1N 8NX

Listen. Consider. Apply. Deliver.

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1.0 Introduction

1.1 Executive Summary

MES have been commissioned by Green Code Architects to provide an energy statement to address the requirements of Camden Council in relation to the proposed installation of a VRF heating & cooling system in an existing office unit at 108-109 Hatton Garden, EC1N 8NX . The purpose of this energy statement is to provide an overview of how sustainability will be promoted both during and after construction and to establish the predicted energy requirements for the proposed development. It will illustrate how energy efficiency measures in conjunction with renewable generation can be used to reduce the predicted energy consumption and associated carbon dioxide emissions.

The energy and carbon reductions detailed in this report have been achieved by following the energy hierarchy, which includes:

- Calculation of estimated baseline energy consumption & CO_2 emissions using an SBEM model for the office as it is currently serviced
- Implementation of the energy hierarchy (be lean, be clean, be green)
- Assessment of the viability of connection to existing heat networks and/or the use of CHP
- Calculation of estimated energy consumption & CO_2 emissions at each stage of energy hierarchy
- Calculation of estimated final energy consumption & CO_2 emissions
- Calculation of reduction in emissions achieved

The energy modelling in this report has been undertaken using SBEM and following the 2021 Part L2 and most recent carbon factors.

Table 1a, below, shows the modelled performance based on the SBEM calculations for each stage of the Energy Hierarchy. Further details can be found in Section 3 and the appendices to this report. As can be seen below, the development as proposed achieves a 20% reduction in CO_2 emissions reduction over the existing performance of the office unit.

Table 1.1: Total reduction in energy use and carbon emissions

	Regulated Energy Consumption (kWh per annum)	Regulated CO_2 Emissions (Tonnes per annum)	Regulated CO_2 savings	
			(Tonnes per annum)	(%)
Baseline	23,143	23.1		
Be Lean, Be Clean, Be Green	11,644	11.6	11.5	**50%**
Cumulative on site savings	**9,498**		**11.5**	**50%**

1.2 Planning Policy

Policy CC1 Climate change mitigation
Camden Council requires all development (not only new-build) to minimise the effects of climate change and encourages all developments to meet the highest feasible environmental standards that are financially viable during construction and occupation.

The main policy in London Borough of Camden's Local Plan that relates to energy and carbon dioxide emissions is CC1. This has been reproduced below.

Policy CC1 Climate change mitigation

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

We will:

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

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

g. working with local organisations and developers to implement decentralised energy networks in the parts of Camden most likely to support them;
h. protecting existing decentralised energy networks (e.g. at Gower Street, Bloomsbury, King's Cross, Gospel Oak and Somers Town) and safeguarding potential network routes; and
i. requiring all major developments to assess the feasibility of connecting to an existing decentralised energy network, or where this is not possible establishing a new network.

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

2.0 Description of the Development

2.1 Location

The proposed development is located within an existing building on Hatton Garden. The site location, and the location of the specific office suite within the building, can be found in the site layout drawing below.

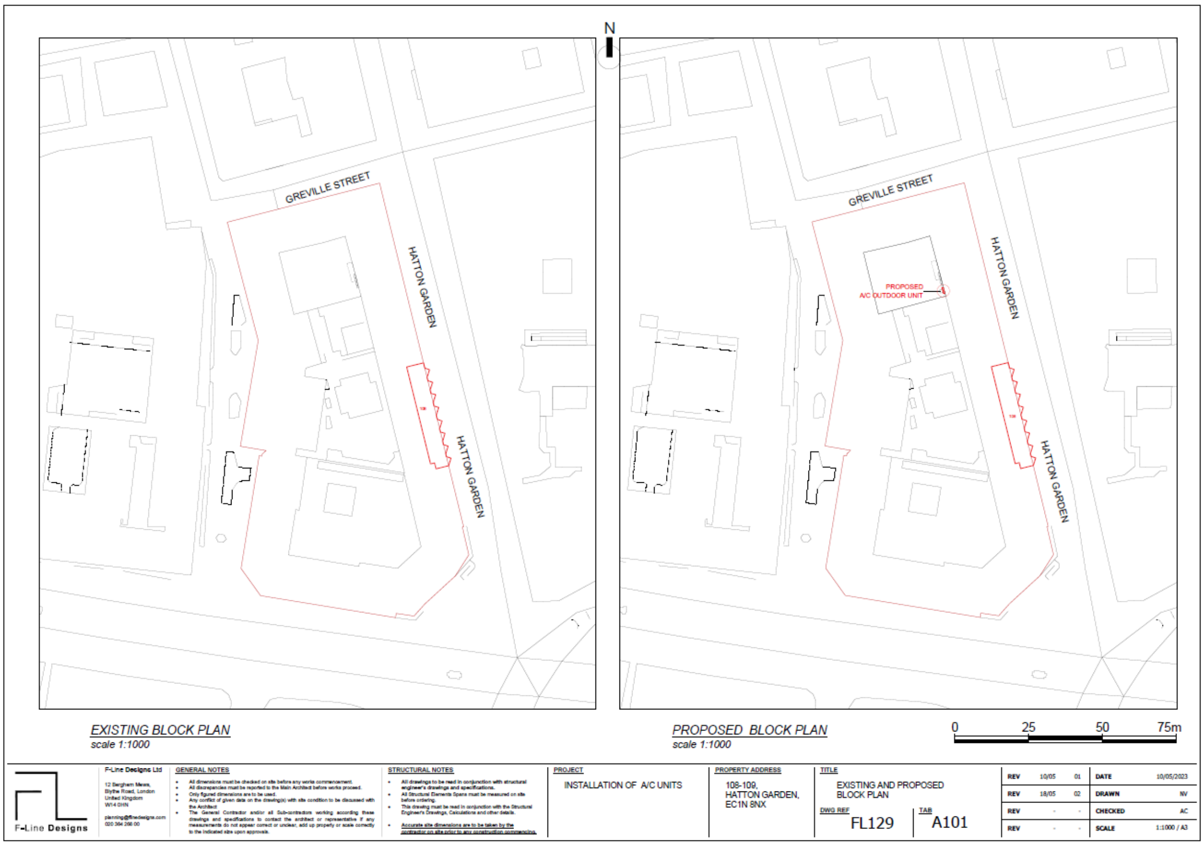

Figure 2.1: drawing showing site location

2.2 Details of the Development

The proposed development is for the installation of a VRF heating and cooling system into an existing office suite within an existing building.

The only works proposed is the replacement of the existing space heating system – which comprises of portable electric radiant heaters positions around and under desks within the office – with a VRF heating and cooling system utilising a air-to-air heat pump. No other works are proposed, either to the size and shape of the office suite, to any of the thermal elements or to any other the other M&E systems (lighting, ventilation, etc.).

The existing specification of the building, both fabric and M&E has been determined following a site visit undertaken by a Level 5 NDEA to the development on 24/05/2023.

Floor plans and elevations showing the proposed development and the locations of the internal and external elements of the VRF system can be found in Figures 2.2-2.4, below.

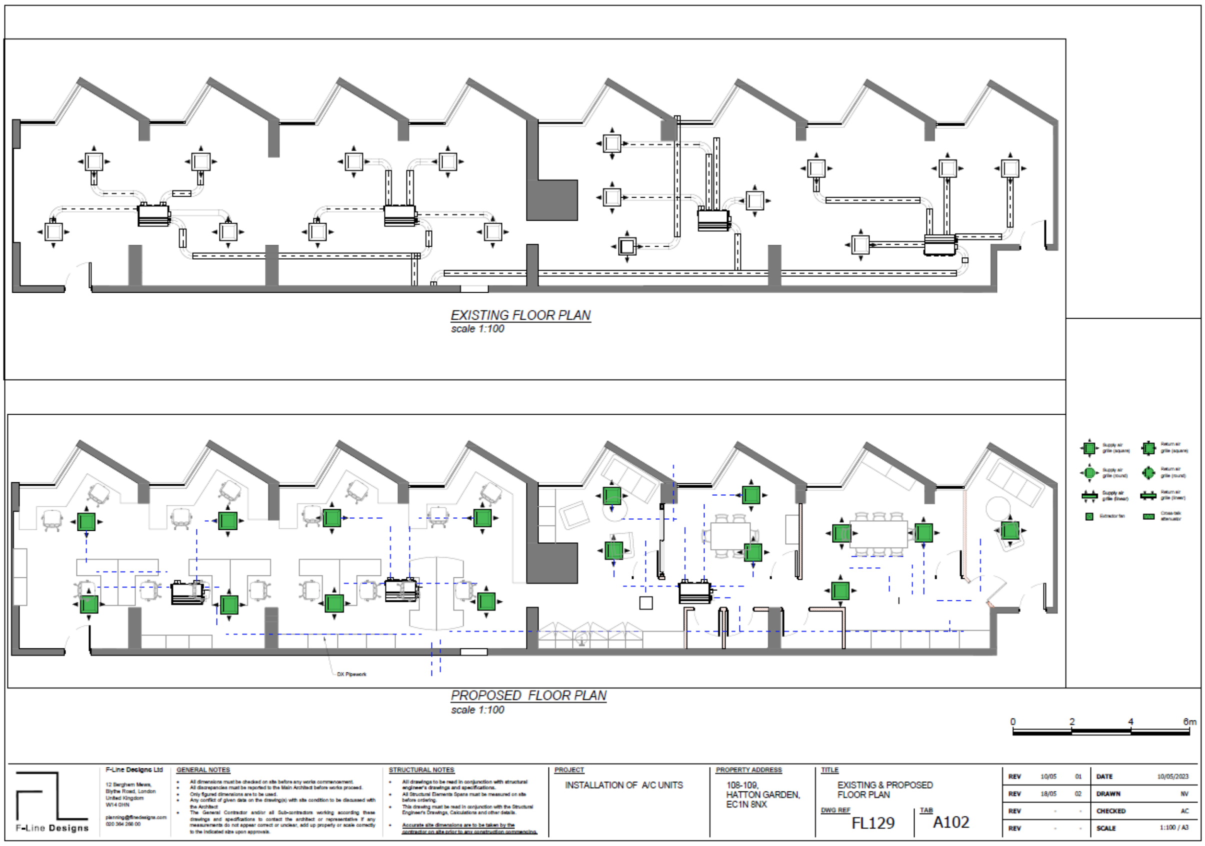

Figure 2.2 – Existing & proposed floor plan

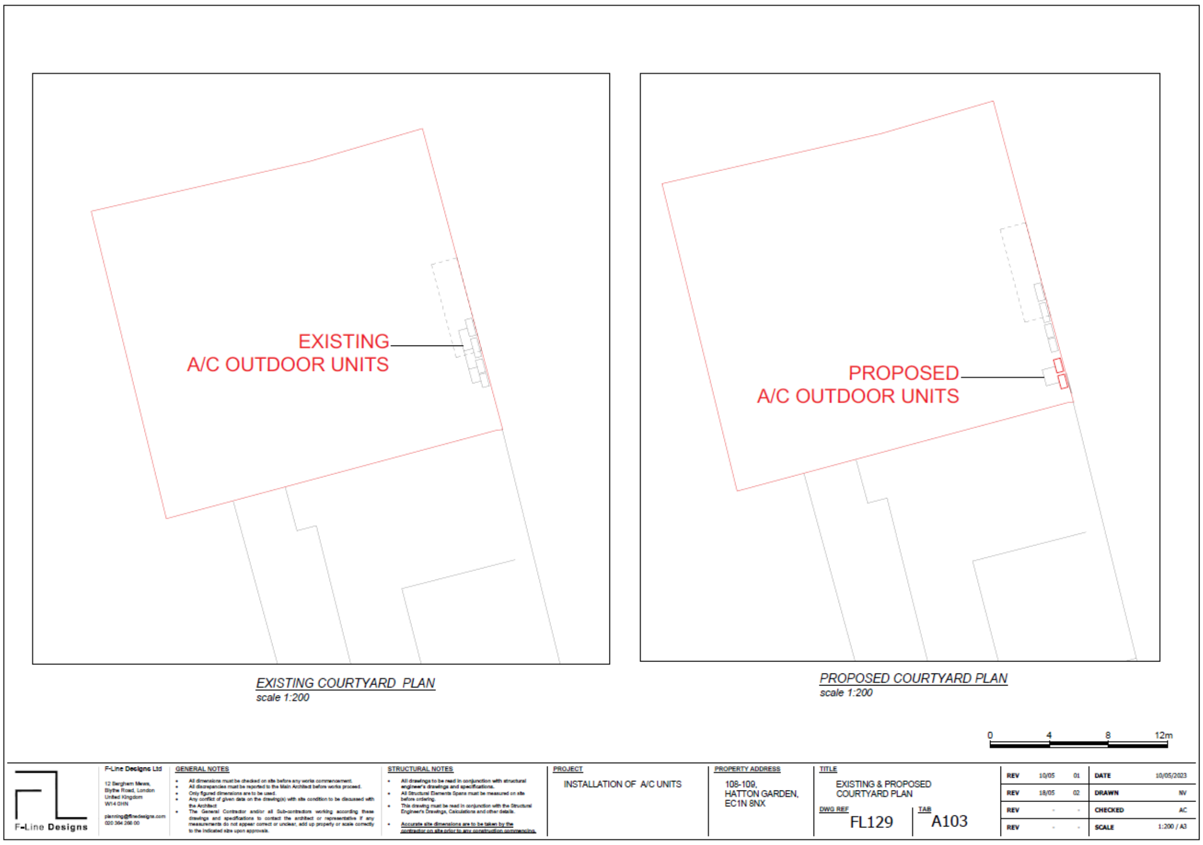

Figure 2.3 – Existing & proposed external condenser units (existing serve other office suites in the same building)

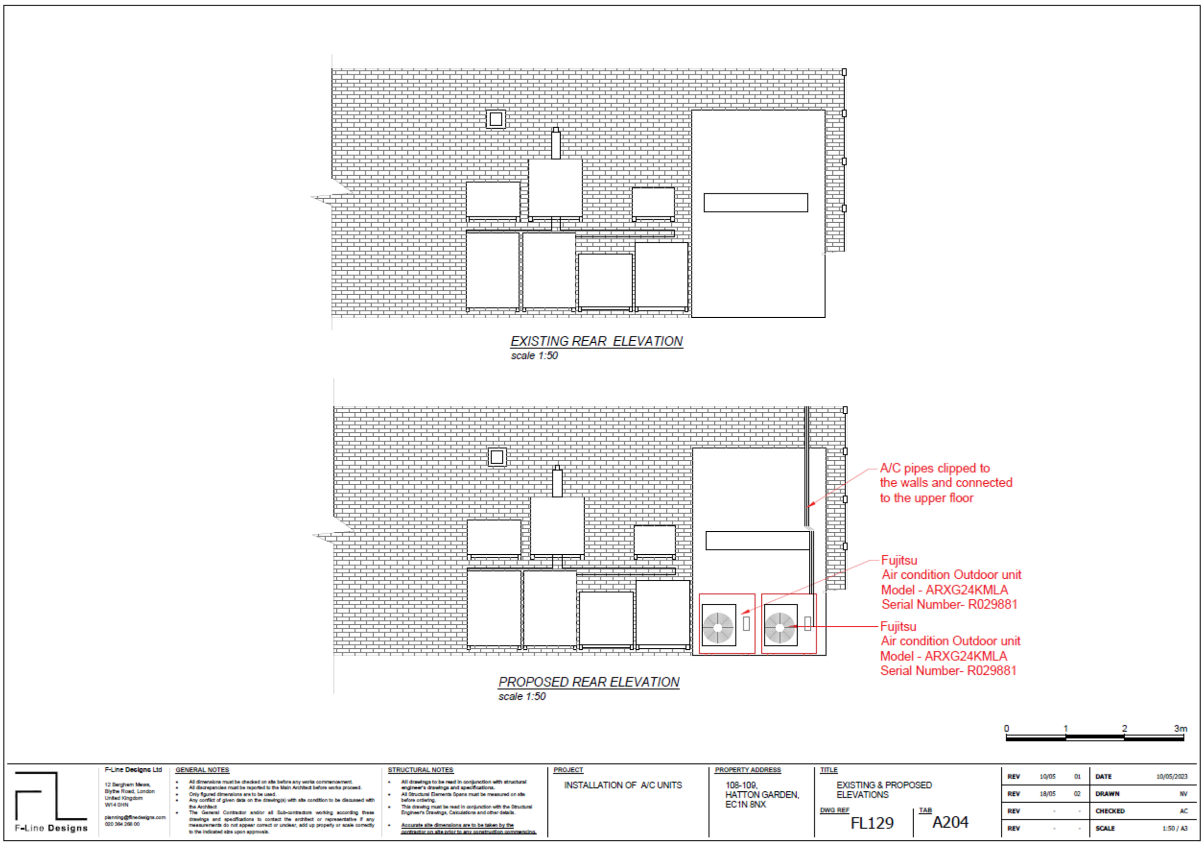

Figure 2.4 – Existing & proposed rear courtyard elevations

3.0 Energy Statement

3.1 The Energy Hierarchy

In order to address energy efficiency the design team have adopted the energy hierarchy. The energy hierarchy is generally accepted as the most effective way of reducing a buildings' carbon emissions.

1. Be lean: use less energy
2. Be clean: supply energy efficiently
3. Be green: use renewable energy

Development proposals should:

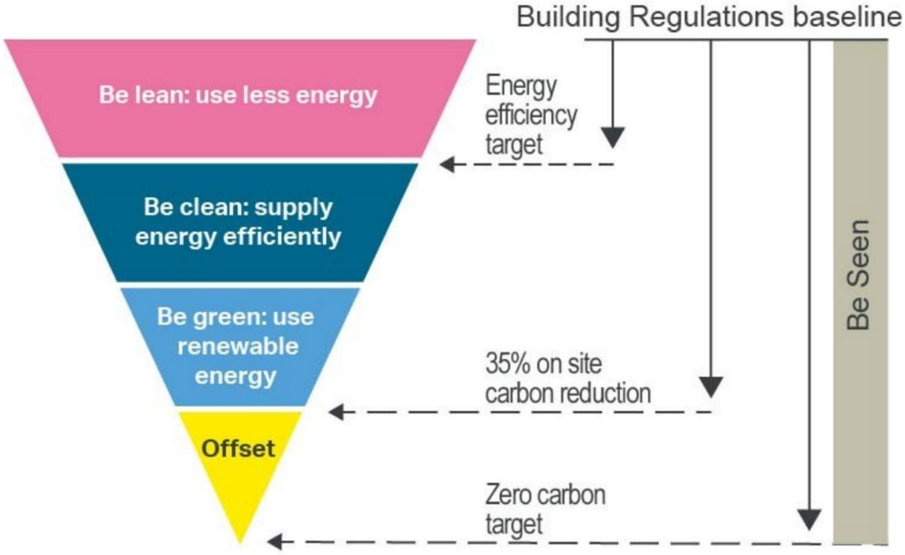

Figure 3.1: The Energy Hierarchy

- ***Reducing energy demand***
  The first step in the process of reducing the overall energy used and CO_2 produced by the building is to minimise the energy required to heat it. A well-insulated building envelope and passive design will reduce the energy requirement for heating and ventilating the building.

- ***Energy efficient systems***
  The second step is to specify services and controls, lighting and appliances that are energy efficient and which result in further reduction in energy requirements.

- ***Making use of Low or zero-carbon (LZC) technologies***
  When the energy demand has been reduced by implementing the processes of improving the fabric and energy efficiency, then LZC technologies can be employed to reduce the environmental impact of the remaining energy consumption.

3.2 Calculating Baseline Energy Demand

The first step is to calculate a specification in order to establish baseline emissions for the development. For this development energy modelling has been undertaken using the 2021 Part L version of SBEM. As this development is only for the installation of a replacement heating system into an existing office suite there would not usually be any requirement to model the energy and carbon performance using SBEM. Part L2 2021 does not set any carbon or energy performance targets for this type of development. As such the baseline performance is taken to be that of the office suite as it is currently (pre-installation of the proposed VRF system) equipped and used.

To ensure this is accurately represented MES have undertaken a full building survey carried out on 24/05/2023. This was undertaken by a Level 5 NDEA and the specification of the building fabric has been determined from the age of the building in line with the requirements of the NCM modelling guidance. To calculate the Baseline carbon emissions and energy consumption the suite has been modelled in SBEM following the NCM modelling guidance. The results are shown in Table 3.1 below and full details (in the form of the BRUKL report) can be found in Appendix 1 to this report.

Table 3.1: Baseline energy use and carbon emissions

	Regulated Energy Consumption (kWh per annum)	Regulated CO_2 Emissions (Tonnes per annum)	Regulated CO_2 savings	
			(Tonnes per annum)	(%)
Baseline	23,143	23.1		

3.3 'Be Lean' – Building Fabric Improvements

The proposed development does not include for any improvements to be made to the existing building fabric. No work is proposed to these and so Part L does not require any insulation to be added as part of the development work. As such there will be no improvement over the baseline achieved at this stage of the energy hierarchy.

3.4 'Be Clean' – Communal Heating & CHP

This stage of the energy hierarchy requires that the feasibility of connection to a decentralised energy source or District Heating Network be examined. In order to do this we have searched for both existing and proposed DHNs using the London Heat Map. The results of this can be found in Figure 3.2 below, but there is an existing heat network around 300m from the site as the crow flies, and around 500m following relevant existing roads.

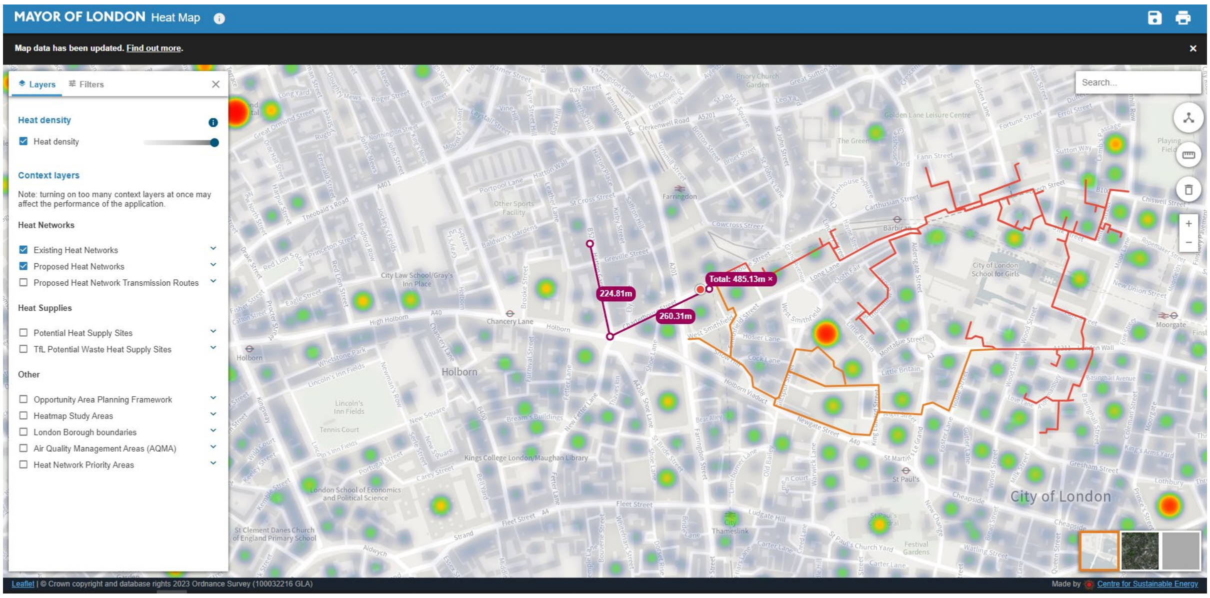

Figure 3.2: London Heat Map

However, there will be significant practical difficulties in connecting to this existing network, particularly given the scale of the development proposed. The office suite is located on the first floor of an existing building and is not provided with any existing plant area. Consequently, any connection pipework would need to run up the outside of the main elevation of the building and space would need to be found internally for a plant area to location the heat exchanger and buffer vessel(s). As around 500m of central London road would also need to be excavated to lay the relevant pipework to get the heat to the development site this is not considered to be something that can be easily achieved with limited cost and disruption. As such, connection to an existing DHN is not considered appropriate for this development.

3.5 'Be Green' – CO_2 Reduction Through the Use of LZC Technologies

This section will examine the available renewable energy generation technologies and determine which is most appropriate for the proposed development.

Available Renewable Generation Technologies

Energy resources accepted as renewable or low carbon technologies are defined by the Department of Energy and Climate Change Low Carbon Buildings Program as:

- Solar photovoltaics
- Wind turbines
- Small hydro
- Solar thermal hot water
- Ground source heat pumps
- Air source heat pumps
- Bio-energy
- Renewable CHP
- Micro CHP (Combined heat and power)

Solar Photovoltaics

Solar panel electricity systems, also known as solar photovoltaics (PV), capture the sun's energy using photovoltaic cells. These cells do not need direct sunlight to work – they can still generate some electricity on a cloudy day. The cells convert the sunlight into electricity, which can be used to run household appliances and lighting. When excess power is generated this can be sold back to the grid or stored onsite.

The office suite is located on the first floor of an existing building, which is formed of a total of seven storeys in total height. There is, therefore, no dedicated roofspace available for the specific office suite under consideration. As such, this is not considered to be a suitable technology for this development.

Wind Turbines

Wind turbines harness the power of the wind and use it to generate electricity. Forty percent of all the wind energy in Europe blows over the UK, making it an ideal country for domestic turbines. Urban sites such as the location of this development are generally unsuitable for wind turbine installations due to the interrupted turbulent wind flows caused by surrounding buildings and large obstacles. There are also possible issues with noise and 'flicker' for the neighbouring buildings.

The urban nature of the site and lack of space mean that a wind turbine cannot be recommended as a viable option for this development. There are also general issues surrounding the use of building mounted turbines with the potential for excessive noise and vibration within the building and the effect of flicker on surrounding buildings and amenity spaces.

Table 3.2: Average Wind Speeds	
45m above ground level	6.4m/s
25m above ground level	5.8m/s
10m above ground level	5.2m/s

Small Hydro Generation

Hydroelectricity generation uses running water to generate electricity, whether it is a small stream or a larger river. All streams and rivers flow downhill. Before the water flows down the hill, it has potential energy because of its height. Hydro power systems convert this potential energy into kinetic energy in a turbine, which drives a generator to produce electricity. Small, or 'micro' hydro generation requires a reliable source of flowing water with a reasonably constant flow velocity. Systems of this nature are normally installed in locations with a natural moving water source such as a river, stream or spring where part of the flow can be diverted through a generator.

There is no such source of flowing water in this case and small hydro generation is not an option for this development.

Solar Water heating

Solar water heating systems use free heat from the sun to warm domestic hot water. Solar hot water heating can generate a large proportion of a buildings annual DHW requirement. The displaced fuel would be mains gas meaning that the CO_2 savings of this type of system would be relatively low due to the low carbon intensity of the displaced fuel. However, this technology would need sufficient space on the roof for the panels and the DHW demand for an office is not high. As with photovoltaic panels there is not sufficient roofspace available – so this technology is not considered suitable for this development.

Heat Pumps

Heat pumps use similar technology as refrigerators but reversed. A refrigerant liquid is used as a medium to extract heat from a source and convert it into useful heat energy. The heat source used can be generally one of three types; the ground, the air or a body of water. Both ground and water sourced heat pumps use a long circuitous pipe through which a refrigerant is pumped. In ground sourced heat pumps this can be either a coiled pipe or 'slinky' that is buried in a series of horizontal trenches or a loop inside a vertical bore hole to depths that can be up to 200m or deeper. Water sourced heat pumps generally use a similar system to the 'slinky' used for ground sourced systems but either floated on or submerged in a body of water (either a large pool or running water source). Air source heat pumps have a refrigerant coil mounted outside the building through which is passed air so that heat can be extracted. All three types of heat pump generally use the collected heat from the source to heat water. The heated water can then be used for space heating and DHW. Heat pumps require an input of energy to drive pumps, this is usually electricity and so their renewable generation is the difference between the input and output energy. Most have very good efficiencies; energy produced by heat pumps is typically in the region of 2.5 times that which is required to run them, giving efficiencies of 250% and above.

A ground source heat pumps is likely to be difficult to integrate into this site as ground loops will most likely require more space than is available on site. As such, an air source heat pump that replaces the existing radiant panel heaters would be a much more suitable solution. As such ASHPs can be considered as suitable for this development.

Bio Energy

The Low Carbon Buildings Program (LCBP) defines biomass as follows:

"Biomass is often called 'bioenergy' or 'biofuels'. These biofuels are produced from organic materials, either directly from plants or indirectly from industrial, commercial, domestic or agricultural products. Biofuels fall into two main categories:

- *Woody biomass includes forest products, untreated wood products, energy crops, short rotation coppice (SRC), e.g. willow.*
- *Non-woody biomass includes animal waste, industrial and biodegradable municipal products from food processing and high energy crops, e.g. rape, sugar cane, maize."*

For small-scale domestic [and small scale commercial] applications of biomass the fuel usually takes the form of wood pellets, wood chips and logs. The LCBP goes on to state:

"There are two main ways of using biomass to heat a domestic property:

- *Stand-alone stoves providing space heating for a single room. These can be fuelled by logs or pellets but only pellets are suitable for automatic feed. Generally they are 5-11 kW in output, and some models can be fitted with a back boiler to provide water heating.*
- *Boilers connected to central heating and hot water systems. These are suitable for pellets, logs or chips, and are generally larger than 15 kW"*

(http://www.lowcarbonbuildings.org.uk/micro/biomass)

This technology is dismissed as the space requirements needed for the boiler and pellet store make this impractical along with complying with clean air zone requirements.

'Be Green' Modelled Performance

As identified above, ASHPs have been identified as the most suitable technology for this development. Replacement of the existing radiant panel heaters in the development with a VRF system that is able to provide both space heating and cooling will still provide a large improvement in the overall energy consumption and, therefore, carbon emissions.

The impact of a VRF system has, therefore, been modelled for the 'Be Green' stage of the energy hierarchy. This has been specified in the model as a full VRF providing both space heating and cooling – no space cooling was allowed for in the baseline model, so the final 'Be Green' model is fully reflective of the impact of using this system for both space heating and cooling. The system provides a significant reduction in the energy required for space heating but some of this is offset by an increase in energy used for space cooling. All other aspects of the building specification have been kept exactly as per the baseline – so lighting, ventilation and the building fabric performance is identical in both 'Baseline' and 'Be Green' models.

The final 'Be Green' CO_2 emissions and energy consumption figures, as taken from the SBEM model, are shown in Table 3.1 below and full details (in the form of the BRUKL report) can be found in Appendix 2 to this report.

Table 3.5: Total reduction in energy use and carbon emissions

	Regulated Energy Consumption (kWh per annum)	Regulated CO_2 Emissions (Tonnes per annum)	Regulated CO_2 savings	
			(Tonnes per annum)	(%)
Baseline	23,143	23.1		
Be Lean, Be Clean, Be Green	11,644	11.6	11.5	**50%**
Cumulative on site savings	**9,498**		**11.5**	**50%**

Appendix 1

'Baseline' SBEM BRUKL

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2021

Project name

As Existing

As built

Date: Fri Jun 02 10:49:10 2023

Administrative information

Building Details

Address: Suite 109 - - Emdico London Ltd, 100 Hatton Garden , London, EC1N 8NX

Certifier details

Name: MES Building Solutions

Telephone number: 01636 653 055

Address: Newark Beacon,Beacon Hill Office Park, Cafferatta Way, Newark, NG24 2TN

Certification tool

Calculation engine: SBEM

Calculation engine version: v6.1.e.0

Interface to calculation engine: Virtual Environment

Interface to calculation engine version: v7.0.21

BRUKL compliance module version: v6.1.e.1

Foundation area [m²]: 204.04

The CO_2 emission and primary energy rates of the building must not exceed the targets

The building does not comply with England Building Regulations Part L 2021

Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	0	
Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	17.94	
Target primary energy rate (TPER), $kWh_{PE}/m^2.annum$	0	
Building primary energy rate (BPER), $kWh_{PE}/m^2.annum$	170.58	
Do the building's emission and primary energy rates exceed the targets?	BER > TER	BPER > TPER

The performance of the building fabric and fixed building services should achieve reasonable overall standards of energy efficiency

Fabric element	$U_{a-Limit}$	U_{a-Calc}	U_{i-Calc}	First surface with maximum value
Walls*	0.26	1.7	1.7	NT000000_W0
Floors	0.18	1.4	1.4	NT000000_F
Pitched roofs	0.16	-	-	No heat loss pitched roofs
Flat roofs	0.18	-	-	No heat loss flat roofs
Windows** and roof windows	1.6	5.08	5.08	NT000000_W1_O0
Rooflights***	2.2	-	-	No external rooflights
Personnel doors^	1.6	-	-	No external personnel doors
Vehicle access & similar large doors	1.3	-	-	No external vehicle access doors
High usage entrance doors	3	-	-	No external high usage entrance doors

$U_{a-Limit}$ = Limiting area-weighted average U-values [W/(m²K)]

U_{a-Calc} = Calculated area-weighted average U-values [W/(m²K)]

U_{i-Calc} = Calculated maximum individual element U-values [W/(m²K)]

* Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for windows.

** Display windows and similar glazing are excluded from the U-value check.

*** Values for rooflights refer to the horizontal position.

^ For fire doors, limiting U-value is 1.8 W/m²K

NB: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.

Air permeability	Limiting standard	This building
m³/(h.m²) at 50 Pa	8	25

Building services

For details on the standard values listed below, system-specific guidance, and additional regulatory requirements, refer to the Approved Documents.

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	NO
Whole building electric power factor achieved by power factor correction	<0.9

1- EPH

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	1	-	-	-	-
Standard value	N/A	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO

2- Natural Gas DHW

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.81	-	-	-	-
Standard value	0.93*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO

* Standard shown is for gas single boiler systems <=2 MW output and overall for multi-boiler systems. For single boiler systems >2 MW or any individual boiler in a multi-boiler system, limiting efficiency is 0.88.

1- SYST0003-DHW

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	Hot water provided by HVAC system	0.061
Standard value	N/A	N/A

"No zones in project where local mechanical ventilation, exhaust, or terminal unit is applicable"

General lighting and display lighting	General luminaire	Display light source	
Zone name	**Efficacy [lm/W]**	**Efficacy [lm/W]**	**Power density [W/m²]**
Standard value	95	80	0.3
Z01_Open Plan Office	95	-	-
Z02_Cell Office	95	-	-
Z03_Cell Office	95	-	-
Z04_Meeting Room	95	-	-
Z05_Waiting	95	-	-
Z07_Kitchenette	95	-	-
Z08_Circulation	95	-	-
Z06_Server	95	-	-

The spaces in the building should have appropriate passive control measures to limit solar gains in summer

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
Z01_Open Plan Office	YES (+4.9%)	NO
Z02_Cell Office	YES (+17.6%)	NO
Z03_Cell Office	NO (-4.3%)	NO
Z04_Meeting Room	YES (+13.4%)	NO
Z05_Waiting	NO (-13.6%)	NO
Z07_Kitchenette	N/A	N/A

Regulation 25A: Consideration of high efficiency alternative energy systems

Were alternative energy systems considered and analysed as part of the design process?	NO
Is evidence of such assessment available as a separate submission?	NO
Are any such measures included in the proposed design?	NO

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Floor area [m²]	204.1	204.1
External area [m²]	157.7	157.7
Weather	LON	LON
Infiltration [m³/hm²@ 50Pa]	25	3
Average conductance [W/K]	395.37	90.09
Average U-value [W/m²K]	2.51	0.57
Alpha value* [%]	8.61	34.11

* Percentage of the building's average heat transfer coefficient which is due to thermal bridging

Building Use

% Area	Building Type
	Retail/Financial and Professional Services
	Restaurants and Cafes/Drinking Establishments/Takeaways
100	**Offices and Workshop Businesses**
	General Industrial and Special Industrial Groups
	Storage or Distribution
	Hotels
	Residential Institutions: Hospitals and Care Homes
	Residential Institutions: Residential Schools
	Residential Institutions: Universities and Colleges
	Secure Residential Institutions
	Residential Spaces
	Non-residential Institutions: Community/Day Centre
	Non-residential Institutions: Libraries, Museums, and Galleries
	Non-residential Institutions: Education
	Non-residential Institutions: Primary Health Care Building
	Non-residential Institutions: Crown and County Courts
	General Assembly and Leisure, Night Clubs, and Theatres
	Others: Passenger Terminals
	Others: Emergency Services
	Others: Miscellaneous 24hr Activities
	Others: Car Parks 24 hrs
	Others: Stand Alone Utility Block

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	86.49	12.89
Cooling	0	0
Auxiliary	0	0
Lighting	12.78	8.41
Hot water	14.12	2.45
Equipment*	39.99	39.99
TOTAL**	**113.39**	**23.75**

* Energy used by equipment does not count towards the total for consumption or calculating emissions.
** Total is net of any electrical energy displaced by CHP generators, if applicable.

Energy Production by Technology [kWh/m²]

	Actual	Notional
Photovoltaic systems	0	33.37
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
Displaced electricity	*0*	*33.37*

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m²]	343.54	145.89
Primary energy [kWh_{PE}/m²]	170.58	-13.31
Total emissions [kg/m²]	17.94	-0.87

HVAC Systems Performance

System Type		Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Other local room heater - unfanned, [HS] Direct or storage electric heater, [HFT] Electricity, [CFT] Electricity										
	Actual	253	83.2	87.8	0	0	0.8	0	1	0
	Notional	63.2	72.4	13.1	0	0	1.34	0	----	----
[ST] No Heating or Cooling										
	Actual	0	812	0	0	0	0	0	0	0
	Notional	0	807.6	0	0	0	0	0	----	----

Key to terms

Heat dem [MJ/m2]	= Heating energy demand
Cool dem [MJ/m2]	= Cooling energy demand
Heat con [kWh/m2]	= Heating energy consumption
Cool con [kWh/m2]	= Cooling energy consumption
Aux con [kWh/m2]	= Auxiliary energy consumption
Heat SSEFF	= Heating system seasonal efficiency (for notional building, value depends on activity glazing class)
Cool SSEER	= Cooling system seasonal energy efficiency ratio
Heat gen SSEFF	= Heating generator seasonal efficiency
Cool gen SSEER	= Cooling generator seasonal energy efficiency ratio
ST	= System type
HS	= Heat source
HFT	= Heating fuel type
CFT	= Cooling fuel type

Appendix 2

'Be Green' SBEM BRUKL

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2021

Project name

As Proposed

As built

Date: Fri Jun 02 10:55:35 2023

Administrative information

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The CO_2 emission and primary energy rates of the building must not exceed the targets

The building does not comply with England Building Regulations Part L 2021

Target CO_2 emission rate (TER), $kgCO_2/m^2annum$	2.82	
Building CO_2 emission rate (BER), $kgCO_2/m^2annum$	9.11	
Target primary energy rate (TPER), kWh_{PE}/m^2annum	30.7	
Building primary energy rate (BPER), kWh_{PE}/m^2annum	81.55	
Do the building's emission and primary energy rates exceed the targets?	BER > TER	BPER > TPER

The performance of the building fabric and fixed building services should achieve reasonable overall standards of energy efficiency

Fabric element	$U_{a-Limit}$	U_{a-Calc}	U_{i-Calc}	First surface with maximum value
Walls*	0.26	1.7	1.7	NT000000_W0
Floors	0.18	1.4	1.4	NT000000_F
Pitched roofs	0.16	-	-	No heat loss pitched roofs
Flat roofs	0.18	-	-	No heat loss flat roofs
Windows** and roof windows	1.6	5.08	5.08	NT000000_W1_O0
Rooflights***	2.2	-	-	No external rooflights
Personnel doors^	1.6	-	-	No external personnel doors
Vehicle access & similar large doors	1.3	-	-	No external vehicle access doors
High usage entrance doors	3	-	-	No external high usage entrance doors

$U_{a-Limit}$ = Limiting area-weighted average U-values [W/(m²K)]
U_{a-Calc} = Calculated area-weighted average U-values [W/(m²K)]
U_{i-Calc} = Calculated maximum individual element U-values [W/(m²K)]

* Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for windows.

** Display windows and similar glazing are excluded from the U-value check.

*** Values for rooflights refer to the horizontal position.

^ For fire doors, limiting U-value is 1.8 W/m²K

NB: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.

Air permeability	Limiting standard	This building
m³/(h.m²) at 50 Pa	8	25

Building services

For details on the standard values listed below, system-specific guidance, and additional regulatory requirements, refer to the Approved Documents.

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	NO
Whole building electric power factor achieved by power factor correction	<0.9

1- Split/Multi Split - AOYG54KBTB

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	3.73	6.55	-	-	-
Standard value	2.5*	5	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.					

2- Natural Gas DHW

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.81	-	-	-	-
Standard value	0.93*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO
* Standard shown is for gas single boiler systems <=2 MW output and overall for multi-boiler systems. For single boiler systems >2 MW or any individual boiler in a multi-boiler system, limiting efficiency is 0.88.					

1- SYST0003-DHW

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	Hot water provided by HVAC system	0.061
Standard value	N/A	N/A

Zone-level mechanical ventilation, exhaust, and terminal units

ID	System type in the Approved Documents
A	Local supply or extract ventilation units
B	Zonal supply system where the fan is remote from the zone
C	Zonal extract system where the fan is remote from the zone
D	Zonal balanced supply and extract ventilation system
E	Local balanced supply and extract ventilation units
F	Other local ventilation units
G	Fan assisted terminal variable air volume units
H	Fan coil units
I	Kitchen extract with the fan remote from the zone and a grease filter
NB: Limiting SFP may be increased by the amounts specified in the Approved Documents if the installation includes particular components.	

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	2.3	2	0.5	0.5	0.4	1	Zone	Standard
Z01_Open Plan Office	-	-	-	-	1.6	-	-	-	-	-	N/A
Z02_Cell Office	-	-	-	-	1.6	-	-	-	-	-	N/A
Z03_Cell Office	-	-	-	-	1.6	-	-	-	-	-	N/A
Z04_Meeting Room	-	-	-	-	1.6	-	-	-	-	-	N/A
Z05_Waiting	-	-	-	-	1.6	-	-	-	-	-	N/A
Z07_Kitchenette	-	-	-	-	1.6	-	-	-	-	-	N/A
Z08_Circulation	-	-	-	-	1.6	-	-	-	-	-	N/A

General lighting and display lighting	General luminaire	Display light source	
Zone name	Efficacy [lm/W]	Efficacy [lm/W]	Power density [W/m²]
Standard value	95	80	0.3
Z01_Open Plan Office	95	-	-
Z02_Cell Office	95	-	-
Z03_Cell Office	95	-	-
Z04_Meeting Room	95	-	-
Z05_Waiting	95	-	-
Z07_Kitchenette	95	-	-
Z08_Circulation	95	-	-
Z06_Server	95	-	-

The spaces in the building should have appropriate passive control measures to limit solar gains in summer

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
Z01_Open Plan Office	YES (+4.9%)	NO
Z02_Cell Office	YES (+17.6%)	NO
Z03_Cell Office	NO (-4.3%)	NO
Z04_Meeting Room	YES (+13.4%)	NO
Z05_Waiting	NO (-13.6%)	NO
Z07_Kitchenette	N/A	N/A
Z08_Circulation	N/A	N/A

Regulation 25A: Consideration of high efficiency alternative energy systems

Were alternative energy systems considered and analysed as part of the design process?	YES
Is evidence of such assessment available as a separate submission?	NO
Are any such measures included in the proposed design?	YES

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Floor area [m^2]	204.1	204.1
External area [m^2]	157.7	157.7
Weather	LON	LON
Infiltration [m^3/hm^2@ 50Pa]	25	3
Average conductance [W/K]	395.37	90.09
Average U-value [W/m^{2}K]	2.51	0.57
Alpha value* [%]	8.61	34.11

* Percentage of the building's average heat transfer coefficient which is due to thermal bridging

Building Use

% Area	Building Type
	Retail/Financial and Professional Services
	Restaurants and Cafes/Drinking Establishments/Takeaways
100	**Offices and Workshop Businesses**
	General Industrial and Special Industrial Groups
	Storage or Distribution
	Hotels
	Residential Institutions: Hospitals and Care Homes
	Residential Institutions: Residential Schools
	Residential Institutions: Universities and Colleges
	Secure Residential Institutions
	Residential Spaces
	Non-residential Institutions: Community/Day Centre
	Non-residential Institutions: Libraries, Museums, and Galleries
	Non-residential Institutions: Education
	Non-residential Institutions: Primary Health Care Building
	Non-residential Institutions: Crown and County Courts
	General Assembly and Leisure, Night Clubs, and Theatres
	Others: Passenger Terminals
	Others: Emergency Services
	Others: Miscellaneous 24hr Activities
	Others: Car Parks 24 hrs
	Others: Stand Alone Utility Block

Energy Consumption by End Use [kWh/m^2]

	Actual	Notional
Heating	19.26	3.15
Cooling	4.65	4.69
Auxiliary	6.24	2.08
Lighting	12.78	8.41
Hot water	14.12	2.45
Equipment*	39.99	39.99
TOTAL**	**57.05**	**20.78**

* Energy used by equipment does not count towards the total for consumption or calculating emissions.
** Total is net of any electrical energy displaced by CHP generators, if applicable.

Energy Production by Technology [kWh/m^2]

	Actual	Notional
Photovoltaic systems	0	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
Displaced electricity	*0*	*0*

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m^2]	348.12	116.56
Primary energy [kWh_{PE}/m^2]	81.55	30.7
Total emissions [kg/m^2]	9.11	2.82

HVAC Systems Performance

System Type		Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Split or multi-split system, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	257.6	83.2	19.6	4.7	6.3	3.66	4.89	3.73	6.55
	Notional	30.4	75.4	3.2	4.8	2.1	2.64	4.4	----	----
[ST] No Heating or Cooling										
	Actual	0	812	0	0	0	0	0	0	0
	Notional	0	807.6	0	0	0	0	0	----	----

Key to terms

Heat dem [MJ/m2]	= Heating energy demand
Cool dem [MJ/m2]	= Cooling energy demand
Heat con [kWh/m2]	= Heating energy consumption
Cool con [kWh/m2]	= Cooling energy consumption
Aux con [kWh/m2]	= Auxiliary energy consumption
Heat SSEFF	= Heating system seasonal efficiency (for notional building, value depends on activity glazing class)
Cool SSEER	= Cooling system seasonal energy efficiency ratio
Heat gen SSEFF	= Heating generator seasonal efficiency
Cool gen SSEER	= Cooling generator seasonal energy efficiency ratio
ST	= System type
HS	= Heat source
HFT	= Heating fuel type
CFT	= Cooling fuel type