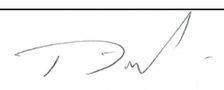
Big Yellow Staples Corner

Energy Statement

Renault/ Dacia, Staples Corner, North Circular Road, Brent Cross, NW2 1LY

.Big Yellow Self Storage Company Limited

Client	.Big Yellow Self Storage Company Limited
Revision	Final Issue
Date of issue	30/11/2023
Report production	Nicole Sedgley, MEng LCC 
QA by	Trevor Dingle, BEng (Hons, CEng, MCIBSE 

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1.0 Executive Summary

This Energy Statement has been prepared to support a planning application for the development of Big Yellow Staples Corner Self Storage Store at Staples Corner in the London Borough of Barnet, London.

The proposals are for the demolition of an existing car dealership within the neighboring Staples Corner Business Park (London Borough of Brent) and replacing this store in the London Borough of Barnet with the construction of a six-storey self-storage facility (Use Class B8), flexible office space (Use Class E(g)(i)) and larger external storage units (Use Class B8).

The proposal includes the erection of a five-storey self-storage facility (Use Class B8) operated by Big Yellow Self Storage. The facility will comprise a permanent ground floor providing 2,430m2 (GIA) of self-storage floorspace (Use Class B8). Self-storage floorspace would increase through the installation of demountable mezzanine floors across the first, second, third, fourth and fifth floors. The demountable mezzanine floors would be added under permitted development, after practical completion of the storage building. Flexible office space of 378m2 on ground floor and 160m2 of external storage units on the ground floor will be provided. The total area including demountable mezzanine floors is 18,190m2. Permanent floor space is provided on the ground floor only. The building arrangement in this report is based on that including the mezzanine floors.

This report outlines the approach taken to achieve the requirements of the relevant local and regional policies in relation to energy efficiency and consumption. Tuffin Ferraby Taylor (TFT) Ltd. have been commissioned by .Big Yellow Self Storage Company Limited to produce the Energy Statement.

The building has been reviewed using the ‘Be Lean’, ‘Be Clean’ and ‘Be Green’ steps defined in the London Plan.

The building looks to maximise on-site carbon reduction in line with the GLA energy hierarchy limiting energy use in the first instance and then selecting energy efficient plant and building services.

Overall, the building is expected to achieve a 110% reduction in regulated carbon emissions in comparison to a Part L compliant building. This total reduction is comprised of a 19% reduction from the ‘Be Lean’ step and 90% reduction from the ‘Be Green’ step.

The tables below provide a breakdown of the on-site savings

Stage of the GLA Energy Hierarchy	Carbon Dioxide (CO_2) Emissions (tCO_2/yr)		
	Regulated	Unregulated	Total
Baseline (Part L 2021 Compliant Building)	34.01	75.2	109.21
Be Lean (Demand energy reduction)	27.42	75.2	102.62
Be Clean (Efficient energy supply)	27.42	75.2	102.62
Be Green (Renewable energy supply)	-3.29	75.2	71.91

	Regulated CO_2 emissions (tCO_2/yr)	Regulated CO_2 emission savings (tCO_2/yr)	Percentage Saving
Baseline (Part L 2021 Compliant Building)	34.01	-	-
Be Lean (Demand energy reduction)	27.42	6.6	19%
Be Clean (Efficient energy supply)	27.42	0	0%
Be Green (Renewable energy supply)	-3.29	30.7	90%
Total cumulative savings		**37.3**	**110%**

2.0 Introduction

2.1 The Applicant

The Applicant is .Big Yellow Self Storage Company Limited (hereafter referred to as 'The Applicant' or 'Big Yellow'). The Applicant has appointed Tuffin Ferraby Taylor (TFT) Ltd. to generate the Energy Statement of the proposed application against relevant planning policy.

2.2 Purpose

This Energy Statement has been prepared to support the planning application for the development of Big Yellow Self Storage development at Staples Corner, London. This statement has been prepared on behalf of The Applicant by TFT. This report seeks to outline the approach taken to incorporate the required steps to achieve the relevant energy consumption reduction.

2.3 Proposed Development

The proposals are for the demolition of an existing car dealership within the neighbouring Staples Corner Business Park (London Borough of Brent) and replacing this store in the London Borough of Barnet with the construction of a six-storey self-storage facility (Use Class B8), flexible office space (Use Class E(g)(i)) and larger external storage units (Use Class B8).

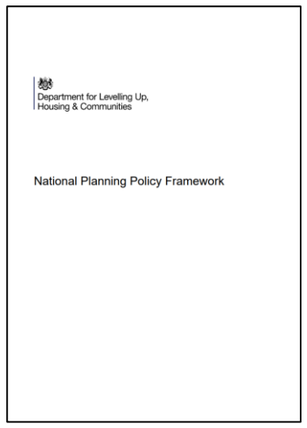
The proposal includes the erection of a five-storey self-storage facility (Use Class B8) operated by Big Yellow Self Storage. The facility will comprise a permanent ground floor providing 2,430m2 (GIA) of self-storage floorspace (Use Class B8). Self-storage floorspace would increase through the installation of demountable mezzanine floors across the first, second, third, fourth and fifth floors. The demountable mezzanine floors would be added under permitted development, after practical completion of the storage building. Flexible office space of 378m2 at ground floor and 160m2 of external storage units on the ground floor will be provided. The total area including demountable mezzanine floors is 18,190m2. Permanent floor space is provided on the ground floor only. The building arrangement in this report is based on that including the mezzanine floors.

Figure 1- Proposed Development Location

3.0 Planning Policies

The following statutory regulations relating to sustainable development and carbon efficiency have been considered as part of the planning submission for the Proposed Development:

3.1 National Planning Policy Framework (September 2023)


Department for Levelling Up, Housing & Communities

National Planning Policy Framework

Figure 2 - National Planning Policy Framework (2023)

The National Planning Policy Framework (NPPF) 2023[1] sets out the government's approach to promoting sustainable development in England through the planning system. The National Planning Policy Framework (NPPF) outlines the Government's planning policies for England and how these should be applied. The framework details that sustainable developments should consider economic, social, and environmental objectives, and outlines various aims to meet the challenges of climate change, flooding and coastal change.

The NPPF does not stipulate specific sustainability targets. The framework was revised in September 2023 and puts an emphasis on the pursuit of the 17 Global Goals for Sustainable Development.

3.2 The London Plan (2021)

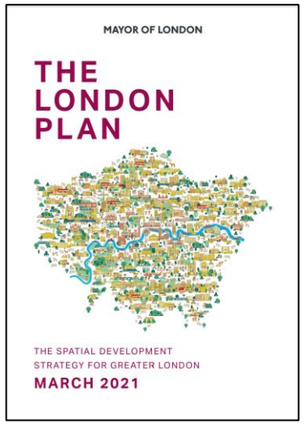


Figure 3-The London Plan (2021)

The London Plan sets out the overall strategic plan for London, providing an integrated economic, environmental, transport and social framework for the development of London over the next 20–25 years. This new London Plan presents a step change in the city's approach and serves as a blueprint for the future development and sustainable, inclusive growth of our city.

The policies detailed below have been reviewed against the Sustainability strategies for the proposed development.

- Policy SI 2 Minimising greenhouse gas emissions
- Policy SI 3 Energy infrastructure
- Policy SI 4 Managing heat risk

3.3 Barnet's Local Plan (2012)

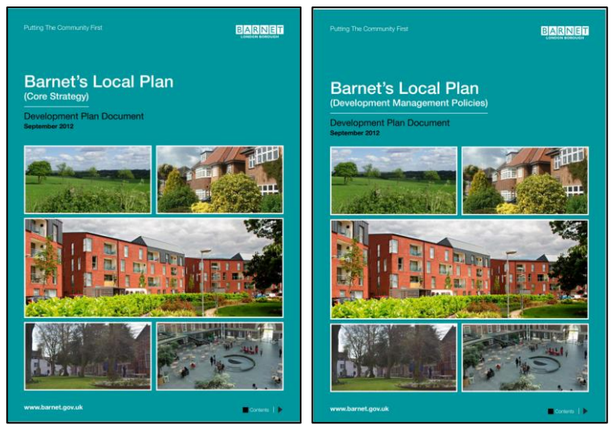


Figure 4 - Barnet's Local Plan (2012) including Barnet's Core Strategy (Left) and Barnet's Development Management Policies (Right).

Barnet's Local Plan embodies spatial planning – the practice of 'place shaping' to deliver positive social, economic and environmental outcomes and provide the overarching local policy framework for delivering sustainable development in Barnet.

The Local Plan includes Development Plan Documents (DPDs) and Supplementary Planning Documents (SPDs) and the 13 retained Unitary development Policies. The Local Plan works alongside national policy and the Mayor's London Plan to inform planning decisions.

The policies detailed below have been reviewed against the Sustainability strategies for the proposed development.

- Policy CS13 Efficient Use of Natural Resources
- Policy DM04 Environmental Considerations for the Development

3.3.1 Supplementary Planning Documents/ Guidance

The Local Plan 2012 includes a number of Supplementary Planning Documents (SPDs). These documents provide detailed relevant further guidance:

- Sustainable Design and Construction SPG (2016)
- Cricklewood, Brent Cross and West Hendon Development Framework SPG (2005)
- London Borough of Barnet Planning Obligations SPD (2013)
- Delivering Skills, Employment, Enterprise, and Training from Development through S106 (2014)

3.4 Barnet's Draft Local Plan

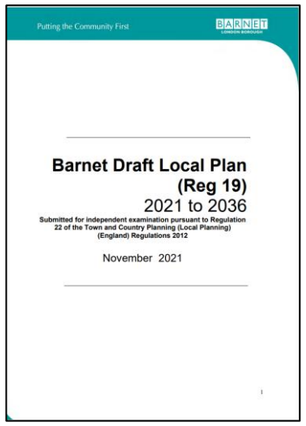


Figure 5 - Barnet's Draft Local Plan (2021-2036)

Barnet's Draft Local Plan Reg 22 Submission was approved by the Council on 19th October 2021 for submission to the Secretary of State.

The Local Plan 2012 remains the statutory development plan for Barnet until such stage as the replacement plan is adopted and as such applications should continue to be determined in accordance with the 2012 Local Plan, while noting that account needs to be taken of the policies and site proposals in the draft Local Plan and the stage that it has reached.

Barnet's Draft Local Plan[2] (2021-2036) provides a positive strategy for delivering the Council's priorities through sustainable development. It identifies areas for housing and employment growth and reflects the benefits of major investment in infrastructure that projects such as the West London Orbital will bring to the Borough.

The policy detailed below has been reviewed against the Sustainability strategies for the proposed development.

Policy CDH02 Sustainable and Inclusive Design

4.0 Baseline Emissions

4.1 Background and methodology

This section provides information on the baseline CO2 emissions or Target Emissions Rate (TER). This value defines the Building Regulations baseline from which performance against the London Plan 2021 targets can be measured.

To establish the baseline energy modelling has been undertaken using approved software, IES-VE 2023. The proposed building has been modelled with all proposed uses zoned in line with the National Calculation Methodology (NCM) to provide an accurate representation of the proposed building. Design drawings prepared by Mountford Piggot for planning submission have been used to generate the calculation model.

The baseline for the proposed building is the 'notional building' in accordance with Part L 2021 of the Building Regulations.

4.2 Baseline Information

The following building fabric performance parameters have been used to generate the baseline performance, in accordance with Part L 2021.

Building Element	Thermal Performance
External walls	0.18 W/m^{2}K
Roof	0.15 W/m^{2}K
Floor	0.15 W/m^{2}K
Windows	1.40 W/m^{2}K
Glazing g-value	0.4
Internal walls	1.8 W/m^{2}K
Internal roof	0.15 W/m^{2}K
Air permeability	8 m^3/(m^2/hr) @50Pa

The following system types and efficiencies have been used for the baseline building as defined in the NCM modelling Guide 2021

System	Type and Performance
Space heating	Electric heat pump, SCOP 2.5
DHW	Electric point of use, SCOP 1
Cooling	SEER, 5.0
Ventilation	Mechanical
Central ventilation SFP	2 W/l/s
Terminal unit SFP	0.3 W/l/s
Heat recovery	65%
Lighting efficacy	95 lm/W

4.3 Baseline Results

Utilising the information above calculations to generate a baseline value have been undertaken in line with the GLA Energy Assessment Guidance utilising SAP 10.2 carbon factors. The resulting baseline results are detailed in the table below.

Stage of the GLA Energy Hierarchy	Carbon Dioxide (CO_2) Emissions (tCO_2/yr)		
	Regulated	Unregulated	Total
Baseline (Part L 2021 Compliant Building)	34.01	75.2	109.21
Be Lean (Demand energy reduction)	-	-	-
Be Clean (Efficient energy supply)	-	-	-
Be Green (Renewable energy supply)	-	-	-

The BRUKL document relating to the baseline calculations are included in Appendix A. The GLA Carbon Emissions Reporting Spreadsheet v2.0.0 is included in Appendix D

5.0 Demand Reduction (Be Lean)

5.1 Overview

In line with the Energy Hierarchy methods of reducing energy use by incorporating passive design measures have been incorporated where possible. This methodology has been incorporated as not using energy is the best way to reduce energy consumption.

Details of the Architectural interventions incorporated within the design to facilitate passive design are detailed in the Design and Access Statement generated by Mountford Pigott to support the planning application. In summary these are:

- Big Yellow do not heat the storage space and annual heating demand is far lower compared to other users.
- The majority of the development is not heated, ventilated or cooled. Only the administration, flexi-office area and back of house areas are proposed to have heating, cooling and ventilation.
- The design will target highly efficient U-values for windows and U-values equal to or better than the limiting values for the building fabric as well as a good level of air tightness.
- The ventilation, heating and cooling systems will be designed to suit the relatively small conditioned areas:
- Natural ventilation will be prioritised wherever possible.
- Mechanical ventilation will use supply and extract ventilation systems with heat recovery devices.
- Heating will be provided via air source heat pumps to the main spaces
- Cooling will be provided via reverse cycle heat pump systems.
- Southern curtain walling will have horizontal solar shading to continually dissipate the suns heat and energy whilst not blocking vision, daylight or ventilation.
- LED luminaires will be installed throughout the site, including motion sensors and daylight compensation controls where appropriate.
- PV array will be installed at roof level to achieve 200 kWp production (this provision is included in the “Be Green” step).

5.2 Passive and Active Design Improvements

In addition to the Architectural measures noted above, the following improvements to the building fabric performance will be provided:

Building Element	Thermal Performance
External walls	0.18 W/m^{2}K
Roof	0.16 W/m^{2}K
Floor	0.18 W/m^{2}K
Windows	1.60 W/m^{2}K
Glazing g-value	0.4
Internal walls	0.18 W/m^{2}K
Internal roof	0.16 W/m^{2}K
Side-lit and Unlit Spaces Air permeability	3 m^3/(m^2/hr) @50Pa
Top-lit and Metal Clad Spaces Air Permeability	5 m^3/(m^2/hr) @50Pa

In addition to the fabric improvements noted above, improvements to system efficiencies have been incorporated within the building. The system efficiencies utilised in this step are noted in the table below:

System	Type and Performance
Space heating	Electric heat pump, SCOP 2.5
DHW	Electric point of use, SCOP 1
Cooling	SEER, 5.0
Ventilation	Mechanical
Central ventilation SFP	1 W/l/s
Terminal unit SFP	0.3 W/l/s
Heat recovery	75%
Lighting efficacy	110 lm/W

The glazing percentage for the proposed building viewed from inside to outside is detailed in the table below:

Item	Area
Glazed area	864.3 m^2
Façade area	4542.6 m^2
Glazing percentage	19 %

5.3 Be Lean Results

The improved building fabric performance and system efficiencies noted above provide the following carbon emission results following the 'Be Lean' step of the GLA Energy Hierarchy.

Stage of the GLA Energy Hierarchy	Carbon Dioxide (CO_2) Emissions (tCO_2/yr)		
	Regulated	Unregulated	Total
Baseline (Part L 2021 Compliant Building)	34.01	75.2	109.21
Be Lean (Demand energy reduction)	27.42	75.2	102.62
Be Clean (Efficient energy supply)	-	-	-
Be Green (Renewable energy supply)	-	-	-

The BRUKL document relating to the Be Lean calculations are included in Appendix B. The GLA Carbon Emissions Reporting Spreadsheet v2.0.0 is included in Appendix D.

The table below details the reduction in carbon emissions following the 'Be Lean' stage as a percentage of the baseline values.

Regulated CO_2 emissions savings	Tonnes of CO_2 per annum	%
Be lean: Savings from energy demand reduction	6.6	19%
Be clean: Savings from heat network	-	-
Be green: Savings from renewable energy	-	-
Total cumulative savings	**-**	**-**

6.0 Cooling and Overheating

6.1 The Cooling Hierarchy

As part of the drive to reduce the demand for cooling highlighted by the Mayor's Cooling Hierarchy, as detailed in the London Plan, the design of the building has considered a number of passive and active measures that assist in reducing the cooling demand of the building. The proposed approach is detailed in the table below.

London Plan Cooling Hierarchy Item	Proposed Measures
Reduce the amount of heat entering the building through orientation, shading, high albedo materials, fenestration, insulation and the provision of green infrastructure	Southern curtain walling will have horizontal solar shading to continually dissipate the suns heat and energy whilst not blocking vision, daylight or ventilation Building fabric has high levels of insulation and air tightness to limit heat ingress. Internal shading and blinds suggested to reduce solar gains.
Minimise internal heat generation through energy-efficient design	Low energy LED lighting specified throughout with the inclusion of occupancy and daylight linked controls where feasible. Availability of natural light is maximised to discourage the use of artificial lighting. Hot water is provided from local water heaters to reduce heat loss from distribution pipework.
Manage the heat within the building through exposed internal thermal mass and high ceilings	The building has incorporated these elements where appropriate for the relevant area.
Provide passive ventilation	Due to external noise levels and the configuration of the building the use of openable windows for passive ventilation is not feasible.
Provided mechanical ventilation	Adequate ventilation will be provided with heat recovery to reduce heating and cooling loads.
Provide active cooling systems	High efficiency refrigerant based air source heat pump systems will be installed to provide active cooling.

6.2 Overheating Risk

The building type is listed in section 8.18 of the guidance document as being exempt from the requirement to undertake a detailed overheating assessment. However, calculations undertaken to generate the Baseline emissions for the building include an overheating analysis. The results of the analysis when incorporating the measures detailed above indicate that the building is not at risk of overheating. Results of the relevant calculations are included in Appendix A

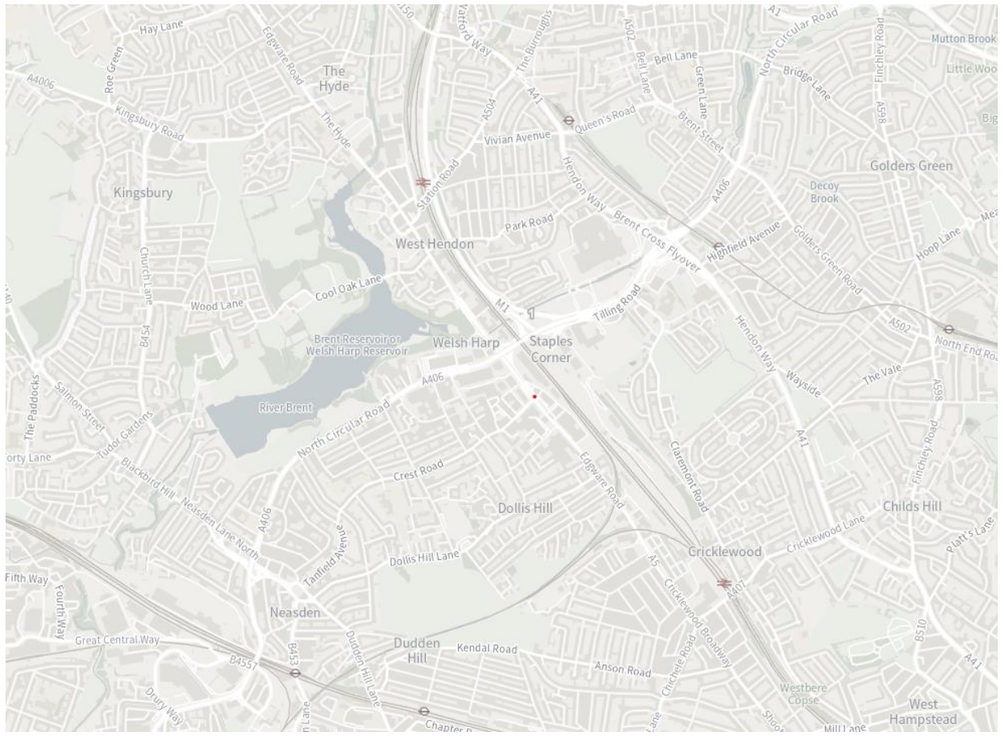
7.0 Heating Infrastructure (Be Clean)

7.1 Heating Infrastructure (Be Clean)

The London Plan 2021 encourages developments to consider connecting to a decentralized energy network, if one is available in proximity to the site.

7.2 Local District Heating Networks

A desktop study has been undertaken using the London Heat map to identify if there are any district energy networks that the proposed building can connect to. The study indicated that there are no district energy networks in the vicinity of the site.



7.3 Provision For Future District Heating Connection

Since there are no district energy networks within the vicinity of the site and the proposed systems are not suitable for connection to district energy networks no facility for connection will be provided.

7.4 Be Clean Results

The tables below indicate the carbon emission results following the ‘Be Clean’ step of the GLA Energy Hierarchy. As there is not a suitable “Be Clean” option for this building there are no opportunities for improvements at this stage.

Stage of the GLA Energy Hierarchy	Carbon Dioxide (CO_2) Emissions (tCO_2/yr)		
	Regulated	Unregulated	Total
Baseline (Part L 2021 Compliant Building)	34.01	75.2	109.21
Be Lean (Demand energy reduction)	27.42	75.2	102.62
Be Clean (Efficient energy supply)	27.42	75.2	102.62
Be Green (Renewable energy supply)	-	-	-

The table below details the reduction in carbon emissions following the ‘Be Clean’ stage as a percentage of the baseline values.

Regulated CO_2 emissions savings	Tonnes of CO_2 per annum	%
Be lean: Savings from energy demand reduction	6.6	19%
Be clean: Savings from heat network	0	0%
Be green: Savings from renewable energy	-	-
Total cumulative savings	**-**	**-**

8.0 Renewable Energy (Be Green)

Following the preceding steps in the Energy Hierarchy the inclusion of renewable energy to reduce site emissions as part of the 'Be Clean' stage is required.

A review of alternative technologies has been undertaken with the results included in Appendix E. From this review the inclusion of Air Source Heat Pumps and Photovoltaic electricity generation are suitable technologies for this building.

8.1 Air Source Heat Pumps

Due to the increased contribution of renewable energy technologies and reduction in use of fossil fuels in the generation of electricity the supply of electricity to the UK is becoming cleaner. This increase in renewable generation reduces the 'Carbon Intensity' of the electricity supply. The reduction in Carbon Intensity has been acknowledged in the Building Regulations with the carbon intensity of electricity now being lower than that of gas.

Considering the above mentioned reduction in electricity carbon intensity and high efficiencies that can be achieved a refrigerant based Air Source Heat Pump system is proposed for the building. This system is commonly known as VRV/F and comprises heat rejection/collection equipment installed externally connected to internal fan coil units with refrigerant gas circulating between components to heat or cool spaces as required.

The advantages of this type of system are:

- Combustion free, no local emissions.
- Provides a route to net zero carbon as grid supplied electricity further de-carbonises.
- Lower operational cost than alternative electric systems.
- Improved efficiency when compared to heat pump systems using water distribution.
- Allows recovery of heat between areas reducing energy consumption.

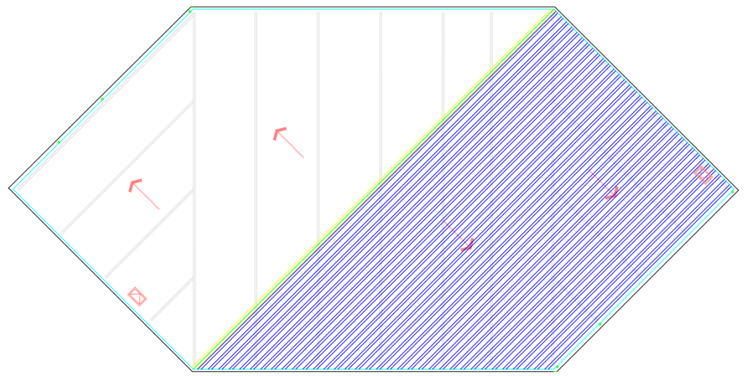
The increased efficiency of the proposed VRV/F system in comparison results in the system performance used in the calculations changing to the following:

System	Type and Performance
Space heating	Electric heat pump, SCOP 5.13
DHW	Electric point of use, SCOP 1
Cooling	SEER, 6.93
Ventilation	Mechanical
Central ventilation SFP	1 W/l/s
Terminal unit SFP	0.3 W/l/s
Heat recovery	75%
Lighting efficacy	110 lm/W

8.2 Photovoltaic Electricity Generation

Photovoltaic (PV) panels directly convert sunlight into electrical current using semiconductors. The output of a panel is directly proportional to the intensity of the light received by the active surface of the panel.

Considering the geometry and orientation of the roof and the space required for maintenance, it is suggested that a potential area of approximately 1,580m^2 is available to accommodate PV panels. This equates to an array comprising approximately 610 PV panels with a total capacity of approximately 201 kWp. The diagram below shows the roof area with the space for PV panel installation highlighted in blue:



Details of the suggested PV array are detailed in the table below:

Parameter	Value
Orientation	170 (degrees clockwise from north)
Total capacity	201 kWp
Inclination	6 degrees
Displaced electricity	-224.7 MWh/annum
Carbon emissions saving	-29,638 kgCO_2/annum

8.3 Energy Use Intensity and Space Heating Demand

The energy use intensity (EUI) and space heating demand have been calculated for the proposed building. The results of the calculations are indicated in the table below with the target values from the relevant GLA guidance document provided for comparison.

	Calculated	Target	Pass
Energy Use Intensity	0.42(kWh/m^2/yr)	55 (kWh/m^2/yr)	Yes
Space Heating Demand	0.02 (kWh/m^2/yr)	15 (kWh/m^2/yr)	Yes

8.4 Be Green Results

The tables below indicate the carbon emission results following the ‘Be Green’ step of the GLA Energy Hierarchy.

Stage of the GLA Energy Hierarchy	Carbon Dioxide (CO_2) Emissions (tCO_2/yr)		
	Regulated	Unregulated	Total
Baseline (Part L 2021 Compliant Building)	34.01	75.2	109.21
Be Lean (Demand energy reduction)	27.42	75.2	102.62
Be Clean (Efficient energy supply)	27.42	75.2	102.62
Be Green (Renewable energy supply)	-3.29	75.2	71.91

The BRUKL document relating to the Be Green calculations are included in Appendix C. The GLA Carbon Emissions Reporting Spreadsheet v2.0.0 is included in Appendix D.

The table below details the reduction in carbon emissions following the ‘Be Green’ stage as a percentage of the baseline values.

Regulated CO_2 Emissions Savings	Tonnes of CO_2 per annum	%
Be lean: Savings from energy demand reduction	6.6	19%
Be clean: Savings from heat network	0.0	0%
Be green: Savings from renewable energy	30.7	90%
Total cumulative savings	**37.3**	**110%**

9.0 Conclusion

The proposed development of Big Yellow Staples Corner Self Storage Store in Staples Corner is supported be a robust energy strategy which demonstrates a commitment to the London plan and London Borough of Barnet planning policies.

The building has been reviewed using the ‘Be Lean’, ‘Be Clean’, ‘Be Green’ and ‘Be Seen’ steps defined in the London Plan.

The building looks to maximise on-site carbon reduction in line with the GLA energy hierarchy limiting energy use in the first instance and then selecting energy efficient plant and building services.

Overall, the building is expected to achieve a 110% reduction in regulated carbon emissions in comparison to a Part L 2021 compliant building. This total reduction is comprised of a 19% reduction from the ‘Be Lean’ step and 90% reduction from the ‘Be Green’ step.

The tables below provide a breakdown of the on-site savings

	Regulated CO_2 Emissions (tCO_2/yr)	Regulated CO_2 Emission Savings (tCO_2/yr)	Percentage Saving
Baseline (Part L 2021 Compliant Building)	34.01	-	-
Be Lean (Demand energy reduction)	27.42	6.6	19%
Be Clean (Efficient energy supply)	27.42	0	0
Be Green (Renewable energy supply)	-3.29	30.7	90%
Total cumulative savings		**37.3**	**110%**

Appendix A – Baseline BRUKL Document

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2021

Project name

Big Yellow - Staples Corner_ Baseline As built

Date: Thu Nov 23 11:58:05 2023

Administrative information

Building Details

Address: Staples Corner, London, NW2 1LY

Certifier details

Name: Nicole Sedgley

Telephone number: +44 7469 903247

Address: 18 Holborn, London, EC1N 2LE

Certification tool

Calculation engine: Apache

Calculation engine version: 7.0.21

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 7.0.21

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

Foundation area [m²]: 517.32

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

Target CO_2 emission rate (TER), $kgCO_2/m^2annum$	1.86	
Building CO_2 emission rate (BER), $kgCO_2/m^2annum$	1.7	
Target primary energy rate (TPER), kWh_{PE}/m^2annum	20.3	
Building primary energy rate (BPER), kWh_{PE}/m^2annum	18.36	
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	$U_{a\text{-}Limit}$	$U_{a\text{-}Calc}$	$U_{i\text{-}Calc}$	First surface with maximum value
Walls*	0.26	0.18	0.18	GR00000F:Surf[0]
Floors	0.18	0.15	0.15	GR000017:Surf[9]
Pitched roofs	0.16	-	-	No pitched roofs in building
Flat roofs	0.18	0.15	0.15	FF000005:Surf[4]
Windows** and roof windows	1.6	1.46	1.46	GR000017:Surf[4]
Rooflights***	2.2	-	-	No roof lights in building
Personnel doors^	1.6	1.9	1.9	GR000017:Surf[0]
Vehicle access & similar large doors	1.3	-	-	No vehicle access doors in building
High usage entrance doors	3	-	-	No high usage entrance doors in building

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

$U_{a\text{-}Calc}$ = Calculated area-weighted average 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	8

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	YES
Whole building electric power factor achieved by power factor correction	<0.9

1- Part L Min: ASHP

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	2.5	5	0	2	0.65
Standard value	2.5*	N/A	N/A	2^	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO

* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.

^ Limiting SFP may be increased by the amounts specified in the Approved Documents if the installation includes particular components.

"No HWS in project, or hot water is provided by HVAC system"

"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
Fourth - Storage	95	-	-
Fifth - Storage	95	-	-
Ground - Lift Lobby	95	-	-
Ground - Lift	95	-	-
Ground Floor	95	-	-
Ground Floor - Office	95	-	-
Ground - Reception	95	-	-
Ground Floor	95	-	-
Ground - Toilet	95	-	-
Ground - Toilet	95	-	-
Ground - Core	95	-	-
Ground - Toilet	95	-	-
Ground - Stairs	95	-	-
Ground Floor	95	-	-
Ground - Flexi office	95	-	-
Ground - Flexi office	95	-	-
Ground - Flexi office	95	-	-
Fourth - Storage	95	-	-
Fourth - Storage	95	-	-
Fifth - Storage	95	-	-
Fifth - Storage	95	-	-
Fifth - Storage	95	-	-
Fifth - Storage	95	-	-
Ground Floor - Storage	95	-	-
Ground Floor- Stairs	95	-	-
Fifth - Storage	95	-	-

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
Fifth - Storage	95	-	-
Fifth - Stairs	95	-	-
Fourth - Storage	95	-	-
Fourth - Storage	95	-	-
Fourth - Stairs	95	-	-
First - Stairs	95	-	-
First - Storage	95	-	-
First - Lift	95	-	-
First - Stairs	95	-	-
First - Stairs	95	-	-
First - Stairs	95	-	-
First - Storage	95	-	-
First - Lift	95	-	-
First Storage	95	-	-
First - Stairs	95	-	-
First - Stairs	95	-	-
First - Storage	95	-	-
First - Lift	95	-	-
First Storage	95	-	-
First - Stairs	95	-	-
Second - Stairs	95	-	-
Third - Stairs	95	-	-
First Storage	95	-	-
First - Stairs	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?
Fourth - Storage	N/A	N/A
Fifth - Storage	N/A	N/A
Ground Floor	N/A	N/A
Ground Floor - Office	N/A	N/A
Ground - Reception	NO (-21.1%)	YES
Ground Floor	NO (-100%)	NO
Ground Floor	NO (-97.8%)	YES
Ground - Flexi office	NO (-22%)	YES
Ground - Flexi office	NO (-5.5%)	YES
Ground - Flexi office	NO (-41.3%)	YES
Fourth - Storage	NO (-89.6%)	YES
Fourth - Storage	NO (-99.3%)	NO
Fifth - Storage	NO (-90.2%)	YES
Fifth - Storage	N/A	N/A
Fifth - Storage	NO (-98.7%)	NO
Fifth - Storage	N/A	N/A
Ground Floor - Storage	NO (-99%)	YES

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
Fifth - Storage	NO (-92.3%)	YES
Fifth - Storage	NO (-96.5%)	NO
Fourth - Storage	NO (-91.5%)	YES
Fourth - Storage	N/A	N/A
First - Storage	N/A	N/A
First - Storage	N/A	N/A
First Storage	NO (-81.5%)	YES
First - Storage	N/A	N/A
First Storage	NO (-90.1%)	YES
First Storage	NO (-80.4%)	YES

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?	YES
Are any such measures included in the proposed design?	YES

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Floor area [m²]	18282.9	18282.9
External area [m²]	10780.2	10780.2
Weather	LON	LON
Infiltration [m³/hm²@ 50Pa]	8	4
Average conductance [W/K]	2884.88	0
Average U-value [W/m²K]	0.27	0
Alpha value* [%]	30.48	10

* 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
	Offices and Workshop Businesses
	General Industrial and Special Industrial Groups
100	**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	1.06	0.53
Cooling	0.42	0.29
Auxiliary	0.24	0.42
Lighting	6.04	8.61
Hot water	4.33	3.91
Equipment*	29.62	29.62
TOTAL**	12.08	13.75

* 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	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/m²]	13.97	10.07
Primary energy [kWh_{PE}/m²]	18.36	20.3
Total emissions [kg/m²]	1.7	1.86

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] Variable refrigerant flow, [HS] ASHP, [HFT] Electricity, [CFT] Electricity									
Actual	332.9	160.9	37.6	14.8	8.3	2.46	3.01	2.5	5
Notional	185.9	170.1	18.6	10.2	14.9	2.78	4.63	----	----
[ST] No Heating or Cooling									
Actual	0	0	0	0	0	0	0	0	0
Notional	0	0	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 B – Be Lean BRUKL Document

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2021

Project name

Big Yellow - Staples Corner_ Be Lean As built

Date: Thu Nov 23 12:07:03 2023

Administrative information

Building Details

Address: Staples Corner, London, NWS 1LY

Certifier details

Name: Nicole Sedgley

Telephone number: +44 7469 903247

Address: 18 Holborn, London, EC1N 2LE

Certification tool

Calculation engine: Apache

Calculation engine version: 7.0.21

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 7.0.21

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

Foundation area [m²]: 517.32

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

Target CO_2 emission rate (TER), kgCO_2/m²annum	1.86	
Building CO_2 emission rate (BER), kgCO_2/m²annum	1.5	
Target primary energy rate (TPER), kWh$_{PE}$/m²annum	20.3	
Building primary energy rate (BPER), kWh$_{PE}$/m²annum	16.27	
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	$U_{a\text{-}Limit}$	$U_{a\text{-}Calc}$	$U_{i\text{-}Calc}$	First surface with maximum value
Walls*	0.26	0.18	0.18	GR00000F:Surf[0]
Floors	0.18	0.18	0.18	GR000017:Surf[9]
Pitched roofs	0.16	-	-	No pitched roofs in building
Flat roofs	0.18	0.16	0.16	FF000005:Surf[4]
Windows** and roof windows	1.6	1.6	1.6	GR000017:Surf[4]
Rooflights***	2.2	-	-	No roof lights in building
Personnel doors^	1.6	1.6	1.6	GR000017:Surf[0]
Vehicle access & similar large doors	1.3	-	-	No vehicle access doors in building
High usage entrance doors	3	-	-	No high usage entrance doors in building

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

$U_{a\text{-}Calc}$ = Calculated area-weighted average 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	4.32

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	YES
Whole building electric power factor achieved by power factor correction	<0.9

1- Part L Min: ASHP (Be Lean)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	2.5	5	0	2	0.75
Standard value	2.5*	N/A	N/A	2^	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO

* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.

^ Limiting SFP may be increased by the amounts specified in the Approved Documents if the installation includes particular components.

"No HWS in project, or hot water is provided by HVAC system"

"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
Fourth - Storage	110	-	-
Fifth - Storage	110	-	-
Ground - Lift Lobby	110	-	-
Ground - Lift	110	-	-
Ground Floor	110	-	-
Ground Floor - Office	110	-	-
Ground - Reception	110	-	-
Ground Floor	110	-	-
Ground - Toilet	110	-	-
Ground - Toilet	110	-	-
Ground - Core	110	-	-
Ground - Toilet	110	-	-
Ground - Stairs	110	-	-
Ground Floor	110	-	-
Ground - Flexi office	110	-	-
Ground - Flexi office	110	-	-
Ground - Flexi office	110	-	-
Fourth - Storage	110	-	-
Fourth - Storage	110	-	-
Fifth - Storage	110	-	-
Fifth - Storage	110	-	-
Fifth - Storage	110	-	-
Fifth - Storage	110	-	-
Ground Floor - Storage	110	-	-
Ground Floor- Stairs	110	-	-
Fifth - Storage	110	-	-

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
Fifth - Storage	110	-	-
Fifth - Stairs	110	-	-
Fourth - Storage	110	-	-
Fourth - Storage	110	-	-
Fourth - Stairs	110	-	-
First - Stairs	110	-	-
First - Storage	110	-	-
First - Lift	110	-	-
First - Stairs	110	-	-
First - Stairs	110	-	-
First - Storage	110	-	-
First - Lift	110	-	-
First Storage	110	-	-
First - Stairs	110	-	-
First - Stairs	110	-	-
First - Storage	110	-	-
First - Lift	110	-	-
First - Stairs	110	-	-
First - Storage	110	-	-
First - Lift	110	-	-
First Storage	110	-	-
First - Stairs	110	-	-
Second - Stairs	110	-	-
Third - Stairs	110	-	-
First Storage	110	-	-
First - Stairs	110	-	-

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?
Fourth - Storage	N/A	N/A
Fifth - Storage	N/A	N/A
Ground Floor	N/A	N/A
Ground Floor - Office	N/A	N/A
Ground - Reception	NO (-20.7%)	YES
Ground Floor	NO (-100%)	NO
Ground Floor	NO (-97.8%)	YES
Ground - Flexi office	NO (-21.4%)	YES
Ground - Flexi office	NO (-4.9%)	YES
Ground - Flexi office	NO (-40.8%)	YES
Fourth - Storage	NO (-89.5%)	YES
Fourth - Storage	NO (-99.3%)	NO
Fifth - Storage	NO (-90.1%)	YES
Fifth - Storage	N/A	N/A
Fifth - Storage	NO (-98.7%)	NO
Fifth - Storage	N/A	N/A
Ground Floor - Storage	NO (-98.9%)	YES

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
Fifth - Storage	NO (-92.3%)	YES
Fifth - Storage	NO (-96.5%)	NO
Fourth - Storage	NO (-91.5%)	YES
Fourth - Storage	N/A	N/A
First - Storage	N/A	N/A
First - Storage	N/A	N/A
First Storage	NO (-81.3%)	YES
First - Storage	N/A	N/A
First Storage	NO (-90%)	YES
First Storage	NO (-80.2%)	YES

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?	YES
Are any such measures included in the proposed design?	YES

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Floor area [m²]	18282.9	18282.9
External area [m²]	10780.2	10780.2
Weather	LON	LON
Infiltration [m³/hm²@ 50Pa]	4	4
Average conductance [W/K]	3105.45	0
Average U-value [W/m²K]	0.29	0
Alpha value* [%]	30.62	10

* 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
	Offices and Workshop Businesses
	General Industrial and Special Industrial Groups
100	**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	0.6	0.53
Cooling	0.27	0.29
Auxiliary	0.24	0.42
Lighting	5.29	8.61
Hot water	4.33	3.91
Equipment*	29.62	29.62
TOTAL**	10.72	13.75

* 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	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/m²]	8.21	10.07
Primary energy [kWh_{PE}/m²]	16.27	20.3
Total emissions [kg/m²]	1.5	1.86

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] Variable refrigerant flow, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	187.4	102.7	21.1	9.5	8.3	2.46	3.01	2.5	5
	Notional	185.9	170.1	18.6	10.2	14.9	2.78	4.63	----	----
[ST] No Heating or Cooling										
	Actual	0	0	0	0	0	0	0	0	0
	Notional	0	0	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 C – Be Green BRUKL Document

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2021

Project name

Big Yellow - Staples Corner_ Be Green_1000m2 PVs — As built

Date: Thu Nov 23 12:14:08 2023

Administrative information

Building Details

Address: Staples Corner, London, NW2 1LY

Certifier details

Name: Nicole Sedgley

Telephone number: +44 7469 903247

Address: 18 Holborn, London, EC1N 2LE

Certification tool

Calculation engine: Apache

Calculation engine version: 7.0.21

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 7.0.21

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

Foundation area [m²]: 517.32

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

Target CO_2 emission rate (TER), kgCO_2/m²annum	1.86	
Building CO_2 emission rate (BER), kgCO_2/m²annum	-0.18	
Target primary energy rate (TPER), kWh$_{PE}$/m²annum	20.2	
Building primary energy rate (BPER), kWh$_{PE}$/m²annum	-2.62	
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	$U_{a\text{-}Limit}$	$U_{a\text{-}Calc}$	$U_{i\text{-}Calc}$	First surface with maximum value
Walls*	0.26	0.18	0.18	GR00000F:Surf[0]
Floors	0.18	0.18	0.18	GR000017:Surf[9]
Pitched roofs	0.16	-	-	No pitched roofs in building
Flat roofs	0.18	0.16	0.16	FF000005:Surf[4]
Windows** and roof windows	1.6	1.6	1.6	GR000017:Surf[4]
Rooflights***	2.2	-	-	No roof lights in building
Personnel doors^	1.6	1.6	1.6	GR000017:Surf[0]
Vehicle access & similar large doors	1.3	-	-	No vehicle access doors in building
High usage entrance doors	3	-	-	No high usage entrance doors in building

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

$U_{a\text{-}Calc}$ = Calculated area-weighted average 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	4.32

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	YES
Whole building electric power factor achieved by power factor correction	<0.9

1- Be Green: VRF and MVHR

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	5.13	6.93	0	1	0.75
Standard value	2.5*	5	N/A	2^	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO

* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.

^ Limiting SFP may be increased by the amounts specified in the Approved Documents if the installation includes particular components.

"No HWS in project, or hot water is provided by HVAC system"

"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
Fourth - Storage	110	-	-
Fifth - Storage	110	-	-
Ground - Lift Lobby	110	-	-
Ground - Lift	110	-	-
Ground Floor	110	-	-
Ground Floor - Office	110	-	-
Ground - Reception	110	-	-
Ground Floor	110	-	-
Ground - Toilet	110	-	-
Ground - Toilet	110	-	-
Ground - Core	110	-	-
Ground - Toilet	110	-	-
Ground - Stairs	110	-	-
Ground Floor	110	-	-
Ground - Flexi office	110	-	-
Ground - Flexi office	110	-	-
Ground - Flexi office	110	-	-
Fourth - Storage	110	-	-
Fourth - Storage	110	-	-
Fifth - Storage	110	-	-
Fifth - Storage	110	-	-
Fifth - Storage	110	-	-
Fifth - Storage	110	-	-
Ground Floor - Storage	110	-	-
Ground Floor- Stairs	110	-	-
Fifth - Storage	110	-	-

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
Fifth - Storage	110	-	-
Fifth - Stairs	110	-	-
Fourth - Storage	110	-	-
Fourth - Storage	110	-	-
Fourth - Stairs	110	-	-
First - Stairs	110	-	-
First - Storage	110	-	-
First - Lift	110	-	-
First - Stairs	110	-	-
First - Stairs	110	-	-
First - Storage	110	-	-
First - Lift	110	-	-
First Storage	110	-	-
First - Stairs	110	-	-
First - Stairs	110	-	-
First - Storage	110	-	-
First - Lift	110	-	-
First Storage	110	-	-
First - Stairs	110	-	-
Second - Stairs	110	-	-
Third - Stairs	110	-	-
First Storage	110	-	-
First - Stairs	110	-	-

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
Fifth - Storage	NO (-92.3%)	YES
Fifth - Storage	NO (-96.5%)	NO
Fourth - Storage	NO (-91.5%)	YES
Fourth - Storage	N/A	N/A
First - Storage	N/A	N/A
First - Storage	N/A	N/A
First Storage	NO (-81.3%)	YES
First - Storage	N/A	N/A
First Storage	NO (-90%)	YES
First Storage	NO (-80.2%)	YES

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?	YES
Are any such measures included in the proposed design?	YES

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?
Fourth - Storage	N/A	N/A
Fifth - Storage	N/A	N/A
Ground Floor	N/A	N/A
Ground Floor - Office	N/A	N/A
Ground - Reception	NO (-20.7%)	YES
Ground Floor	NO (-100%)	NO
Ground Floor	NO (-97.8%)	YES
Ground - Flexi office	NO (-21.4%)	YES
Ground - Flexi office	NO (-4.9%)	YES
Ground - Flexi office	NO (-40.8%)	YES
Fourth - Storage	NO (-89.5%)	YES
Fourth - Storage	NO (-99.3%)	NO
Fifth - Storage	NO (-90.1%)	YES
Fifth - Storage	N/A	N/A
Fifth - Storage	NO (-98.7%)	NO
Fifth - Storage	N/A	N/A
Ground Floor - Storage	NO (-98.9%)	YES

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Floor area [m²]	18282.9	18282.9
External area [m²]	10780.2	10780.2
Weather	LON	LON
Infiltration [m³/hm²@ 50Pa]	4	4
Average conductance [W/K]	3105.45	0
Average U-value [W/m²K]	0.29	0
Alpha value* [%]	30.62	10

* 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
	Offices and Workshop Businesses
	General Industrial and Special Industrial Groups
100	**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	0.51	0.87
Cooling	0.16	0.29
Auxiliary	0	0
Lighting	5.29	8.61
Hot water	4.33	3.91
Equipment*	29.62	29.62
TOTAL**	10.29	13.67

* 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	12.29	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
Displaced electricity	*12.29*	*0*

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m²]	11.65	13.47
Primary energy [kWh_{PE}/m²]	-2.62	20.2
Total emissions [kg/m²]	-0.18	1.86

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	308.9	102.8	18	5.8	0	4.78	4.92	5.13	6.93
	Notional	306	170.1	30.6	10.2	0	2.78	4.63	----	----
[ST] No Heating or Cooling										
	Actual	0	0	0	0	0	0	0	0	0
	Notional	0	0	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 D - GLA Carbon Emissions Reporting Spreadsheet v2.0.0

Appendix E - Renewable Energy Technology Review

Part L 2021 Performance

Residential

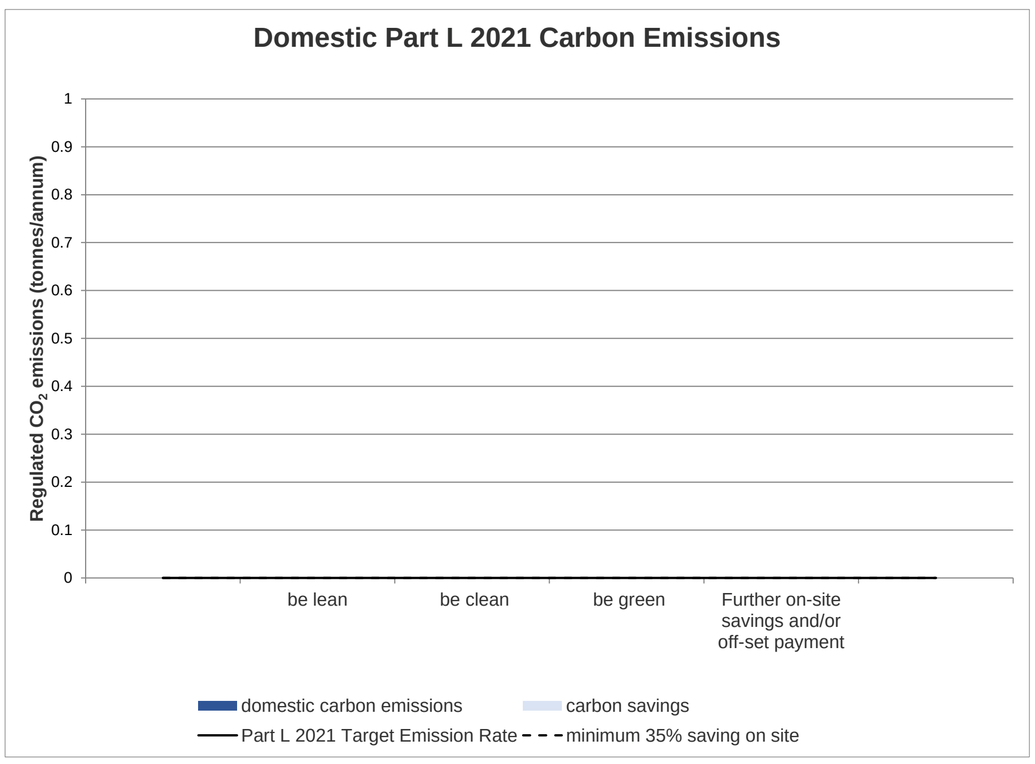
Table 1: Carbon Dioxide Emissions after each stage of the Energy Hierarchy for residential buildings

	Carbon Dioxide Emissions for residential buildings (Tonnes CO_2 per annum)	
	Regulated	**Unregulated**
Baseline: Part L 2021 of the Building Regulations Compliant Development	0.0	
After energy demand reduction (be lean)	0.0	
After heat network connection (be clean)	0.0	
After renewable energy (be green)	0.0	

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

	Regulated residential carbon dioxide savings	
	(Tonnes CO_2 per annum)	**(%)**
Be lean: savings from energy demand reduction	0.0	0%
Be clean: savings from heat network	0.0	0%
Be green: savings from renewable energy	0.0	0%
Cumulative on site savings	**0.0**	**0%**
Annual savings from off-set payment	0.0	-
	(Tonnes CO_2)	
Cumulative savings for off-set payment	**0**	-
Cash in-lieu contribution (£)	**0**	

*carbon price is based on GLA recommended price of £95 per tonne of carbon dioxide unless Local Planning Authority price is inputted in the 'Development Information' tab



Non-residential

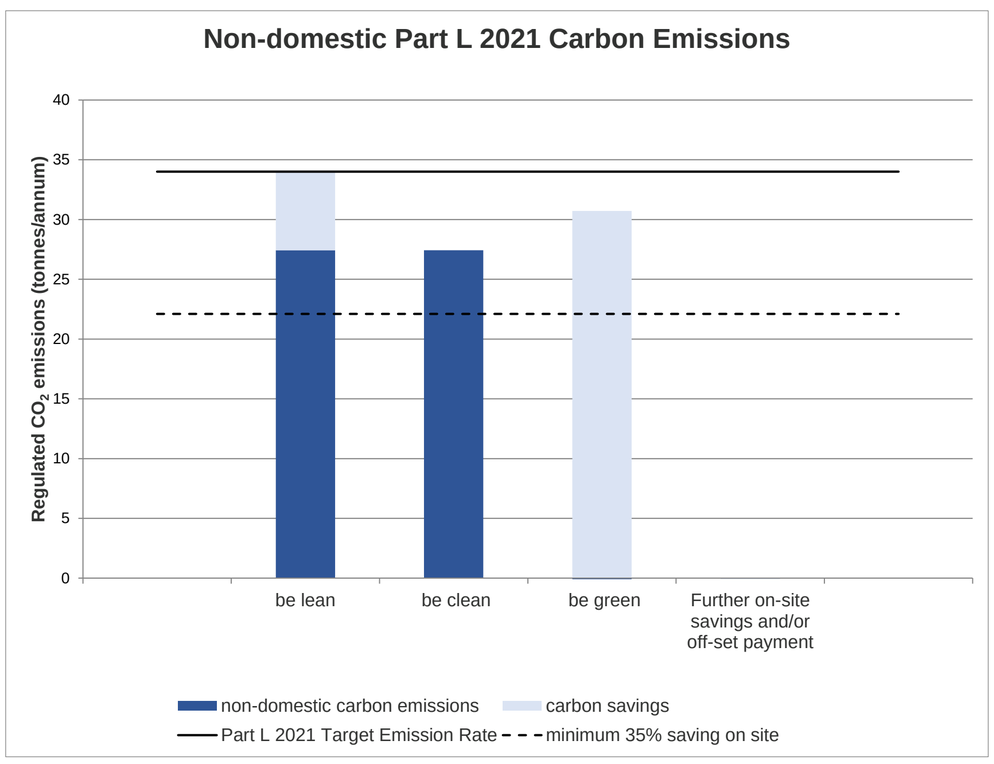
Table 3: Carbon Dioxide Emissions after each stage of the Energy Hierarchy for non-residential buildings

	Carbon Dioxide Emissions for non-residential buildings (Tonnes CO_2 per annum)	
	Regulated	**Unregulated**
Baseline: Part L 2021 of the Building Regulations Compliant Development	34.0	75.2
After energy demand reduction (be lean)	27.4	75.2
After heat network connection (be clean)	27.4	75.2
After renewable energy (be green)	-3.3	75.2

Table 4: Regulated Carbon Dioxide savings from each stage of the Energy Hierarchy for non-residential buildings

	Regulated non-residential carbon dioxide savings	
	(Tonnes CO_2 per annum)	**(%)**
Be lean: savings from energy demand reduction	6.6	19%
Be clean: savings from heat network	0.0	0%
Be green: savings from renewable energy	30.7	90%
Total Cumulative Savings	**37.3**	**110%**
Annual savings from off-set payment	-3.3	-
	(Tonnes CO_2)	
Cumulative savings for off-set payment	**-99**	-
Cash in-lieu contribution (£)	**-9,379**	

*carbon price is based on GLA recommended price of £95 per tonne of carbon dioxide unless Local Planning Authority price is inputted in the 'Development Information' tab



SITE-WIDE

	Total regulated emissions (Tonnes CO_2 / year)	CO_2 savings (Tonnes CO_2 / year)	Percentage savings (%)
Part L 2021 baseline	34.0		
Be lean	27.4	6.6	19%
Be clean	27.4	0.0	0%
Be green	-3.3	30.7	90%
Total Savings	-	37.3	110%
	-	**CO_2 savings off-set (Tonnes CO_2)**	-
Off-set	-	**-98.7**	-

	Target Fabric Energy Efficiency (kWh/m²)	Dwelling Fabric Energy Efficiency (kWh/m²)	Improvement (%)
Development total	0.00	0.00	

	Area weighted non-residential cooling demand (MJ/m^2)	Total non-residential cooling demand (MJ/year)
Actual		27648.72
Notional		19003.32

EUI & space heating demand (predicted energy use)

Residential

Building type	EUI (kWh/m^2/year) (excluding renewable energy)	Space heating demand (kWh/m^2/year) (excluding renewable energy)	EUI value from Table 4 of the guidance (kWh/m^2/year) (excluding renewable energy)	Space heating demand from Table 4 of the guidance(kWh/m^2/year) (excluding renewable energy)	Methodology used (e.g. 'be seen' methodology or an alternative predictive energy modelling methodology)	Explanatory notes (if expected performance differs from the Table 4 values in the guidance)

Non-residential

Building type	EUI (kWh/m^2/year) (excluding renewable energy)	Space heating demand (kWh/m^2/year) (excluding renewable energy)	EUI value from Table 4 of the guidance (kWh/m^2/year) (excluding renewable energy)	Space heating demand from Table 4 of the guidance(kWh/m^2/year) (excluding renewable energy)	Methodology used (e.g. 'be seen' methodology or an alternative predictive energy modelling methodology)	Explanatory notes (if expected performance differs from the Table 4 values in the guidance)
All other non-residential	0.041468711	0.018208271	55	15	Part L2 - approved DSM & Other (provide details in column T)	

Source	Low Zero Carbon Technology	Lifespan (years)	Lifecycle Carbon Savings* (t CO2/yr)	Applicable Grants	Life Cycle Cost*	Space Use	Local Planning Criteria	Noise	Feasibility of Export	Technology Appropriate to the Proposed Development	Reasons for Inclusion/Exclusion
Solar	Photovoltaics	25	Low (325 kgCO2/yr per 1 kW pel)	-	Medium	Suitable (roof spaces available)	Suitable	Suitable	Possible (export of power to the local grid)	Yes	Solar photovoltaic cells (PV) convert sunlight into usable electricity. Due to the relatively low efficiencies of this system, a large area is often required to provide reasonable quantity of power. Considering the geometry and orientation of the roof and the space required for maintenance, it is suggested that a potential area of approximately 1,580m2 is available to accommodate PV panels. This equates to an array comprising approximately 610 PV panels with a total capacity of approximately 201 kWp.
	Solar thermal	20	Low	Renewable Heat Incentive (RHI)	Low	Suitable (roof spaces available)	Suitable	Suitable	Not possible	No	Solar water heating is traditionally one of the more simplistic and affordable renewable technologies. Solar energy is concerted to heat via panels that absorb the high-frequency heat radiation emitted from the sun. Advanced technology utilizing “heat pipes” (tubes utilizing refrigerant technology) maximise useful heat extraction during cold, cloudy days. However, the carbon saving of solar hot water depends on the energy source being displaced. The installation of PV panels on available roof space is prioritized. Inconsistent load profiles will require significant solar thermal storage and associated plant space. This technology is not considered appropriate for this building.
Wind power	Wind turbines	20	Low (0.5 t/k We per yr)	-	High	Not suitable (suitable space for stand-alone of a roof-mounted wind turbine cannot be found for the scheme)	Not suitable due to height restriction, significant visual impact, flicker.	Potentially not suitable due to noise from the turbine’s generator.	Possible (export of power to the local grid)	No	Wind turbines produce electrical energy by absorbing wind energy. They are available in a vertical or horizontal axis. The quantity of energy generated is directly related to the ‘swept area’ of the blades and as such, size is of primary importance. However, smaller systems are becoming increasingly more common and have been used to power schools, sports centres and business parks. For wind turbines to operate effectively, the average wind speed for the Site needs to be above the threshold level of 6 m/s, wind speeds in built-up urban areas are not reliable and therefore this technology is not considered suitable for the scheme.
Hydro, wave & tidal	Hydro power	-	-	-	-	-	-	-	-	-	Not suitable water sources near the development
	Tidal power	-	-	-	-	-	-	-	-	-	
	Wave power	-	-	-	-	-	-	-	-	-	
Biofuels	Biomass boilers	20	Medium	RHI	Low-Medium	Not suitable (large space required for fuel storage)	Not suitable due to potential air quality issues	Vehicle noise during regular fuel deliveries and also removal of ash from combustion	Not possible	No	Biomass is an organic matter of recent origin which can be replenished at the rate at which it is used. It does not include fossil fuels, which have formed over millions of years and thus of finite supply. The CO_2 released when energy is generated from biomass is balanced by that absorbed during the fuel’s production. This is termed a carbon-neutral process, but only when the source of the fuels is renewable, as with sustainable rotation coppice woodland. Such fuels include logs, compressed sawdust pellets, vegetable oil and ethanol. On-site fuel storage requires additional space, together with regular access to the on-site fuel storage area. Biomass/Biofuel Boiler is not considered viable due to low site heat demand.
	Biomass Co-generation (CHP)	20	Medium – High	ROCs & RHI	Medium	Not suitable (large space required for fuel storage)	Not suitable due to potential air quality issues	Vehicle noise during regular fuel deliveries and also removal of ash from combustion	Not possible	No	

Source	Low Zero Carbon Technology	Lifespan (years)	Lifecycle Carbon Savings* (t CO2/yr)	Applicable Grants	Life Cycle Cost*	Space Use	Local Planning Criteria	Noise	Feasibility of Export	Technology Appropriate to the Proposed Development	Reasons for Inclusion/Exclusion
District heating & cooling	District heating and cooling (based on gas-fired CHP/CCHP)	25+	Medium – High	Renewable Heat Incentive (RHI) + possible Feed-In Tariff (FIT)	Medium	Suitable	Suitable	Suitable	n/a	No	There is no district heating network installed or planned in the vicinity of the proposed building which makes this option unviable.
Heat pumps	Ground source heat pumps (closed-loop system)	25 (50+ earth heat exchangers)	Medium (30-50% compared to a gas heating system)	Renewable Heat Incentive (RHI)	Medium – High	Not suitable (space not sufficient for a horizontal or vertical system)	Suitable	Suitable	Not possible	No	Ground source heat pumps are an established technology which operates like a refrigerator, consisting of a vapour compression cycle heat pump, linked to a heat exchanger buried in the ground. Heat pumps utilize low-grade heat from the ground as a thermal resource have been reviewed in the context of the Proposed Development. They are not considered viable for this scheme for the following key reasons: - There is insufficient space around the building for a horizontal system; - It is not considered economically or practically feasible to integrate vertical loops. Ground source heat pumps are therefore not proposed for this scheme.
	Ground source heat pups (open loop system)	25 (50+ boreholes)	Medium (40-60% compared to a gas heating system)	Renewable Heat Incentive (RHI)	Medium	Not suitable (space not sufficient to allow for required distance between boreholes)	Suitable	Suitable	Not possible	No	
	Air source heat pumps	20	Low-Medium (20-40% compared to a gas heating system)	N/A	Low	Suitable	Suitable	Suitable	Not possible	Yes	Air source heat pump systems can efficiently elevate low-grade environmental heat from the air to the level required for space heating and even domestic hot water system (albeit a low efficiency). Heat pumps work much more efficiently at low temperatures than standard boiler systems and are hence more suitable to 'low-energy' underfloor heating systems or larger low-temperature radiator and fan-coil systems that are also considered low-response systems as they give out heat at low temperatures over longer periods of time. Air source heat pumps are considered particularly suitable for the scheme for the following reasons: - They can provide space heating and cooling in a very efficient way; - Heat pumps are relatively quiet in operation and typically contained within plant spaces without any significant impact on the local environment; - Heat pump systems are inherently a renewable source of energy
Co-Generation	Gas-fired Co - generation (CHP)	15	Medium (30% CO_2 reduction compared to condensing boilers)	N/A	Low-Medium	Not suitable	Not suitable due to potential air quality issues	Not suitable	Not possible	No	A CHP engine produces both heating and electrical power for a building. The benefit of generating the electricity on-site is that the waste heat that is usually rejected at power stations can be used to serve the heating and power requirements of a building or wider community. Smaller single-site systems generally utilize fossil fuels such as gas to operate a spark-ignition engine or turbine to turn a generator. Biodiesels can be used which includes correctly processed waste vegetable oil the main vital pre-requisite of CHP system is that demand for both power and heat is required same time and a baseload exists for the CHP plant to operate efficiently and cost-effectively. CHP plant often has an impact on local air quality. The proposed Development seeks to minimize the generation of air pollution by pursuing a heat pump led heating system as such a system not only provides an efficient source of heat energy but does not contribute to local air pollution whilst in operation. In addition, the proposed building has a low heat demand making which make CHP not viable.

Source	Low Zero Carbon Technology	Lifespan (years)	Lifecycle Carbon Savings* (t CO2/yr)	Applicable Grants	Life Cycle Cost*	Space Use	Local Planning Criteria	Noise	Feasibility of Export	Technology Appropriate to the Proposed Development	Reasons for Inclusion/Exclusion
Heat recovery & energy storage	Waste heat recovery	15	Low-Medium	N/A	Low	Not suitable	Suitable	Suitable	N/A	No	Insufficient waste heat available.
	Energy storage	15 (50+ for seasonal storage)	Low-Medium (technology dependent)	N/A	Medium-High (dependent on technology)	Not suitable	Suitable	Suitable	Possible (integrator within district network)	No	Large space required, energy use such that storage is required is not applicable.

Payback Period
Low: 1.7 years
Medium: 7-15 years
High: 15+ years
*From industry standards and case studies (e.g. CIBSE, EST, Carbon Trust, etc.