

ENERGY STATEMENT

**Proposed development at:
6a Grange Road, London, N6 4AP**



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¹ Achieve Green and Energytest are trading names of Energytest (Commercial) Ltd, Company Registration No. 7013944



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1. Executive Summary

This Energy Statement has been prepared by Achieve Green in support of a full planning application for new-build development of a single 5-bedroom detached house at 6a Grange Road, London, N6 4AP.

The design has been developed to address the energy performance policy requirements of The London Plan 2021. A target CO₂ reduction has therefore been set at 35% relative to the Building Regulations 2021, through the application of the energy hierarchy. Results have been calculated using Government approved SAP 10 software.

A base case has been developed, against which potential savings can be assessed. For this development the base case is the notional building developed for the Building Regulations (2021) assessment and is quantified in terms of CO₂ emissions as the Target Emission Rate (TER) for the dwelling.

This proposed development features improved insulation standards when compared against the compliance requirements of Approved Document L1 2021 of the Building Regulations. In addition, this proposed development will incorporate a mechanical and electrical specification that surpasses the requirements of Approved Document L1 2021. These combined energy efficiency measures lead to a reduction in CO₂ emissions equivalent to 44% of the baseline. This surpasses the target reduction of 10%, as required by the London Plan.

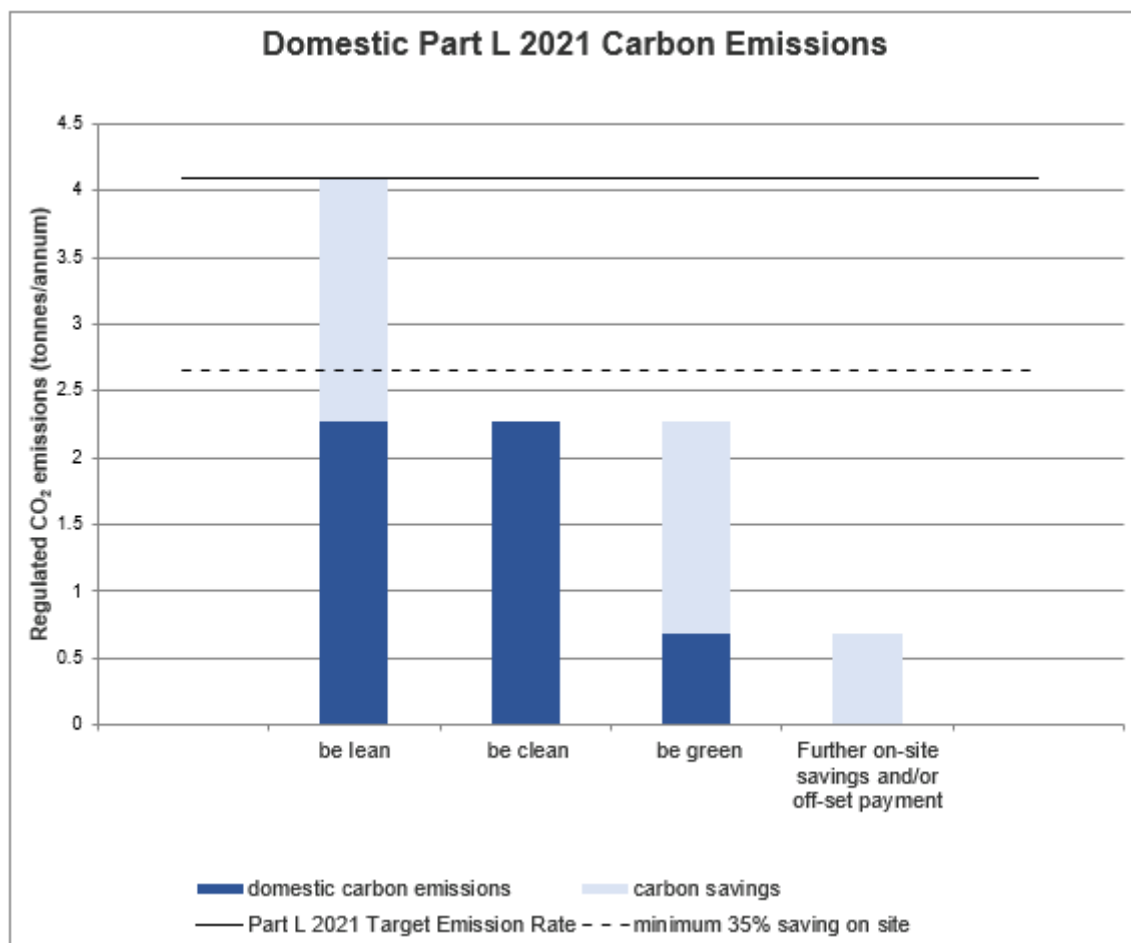
Having minimised energy consumption in the first instance, the efficient delivery of the remaining energy demands has been considered with reference to the heating and cooling hierarchy in the London Plan. Using the London Heat Map as reference it is evident this proposed development is neither within the coverage of an existing district heating network, nor is there an expectation that a district heating network will be developed at this site in the near future.

Due to its size, this development is not suitable for combined heat and power.

An assessment has been carried out to determine the potential for renewable energy systems to reduce CO₂ emissions further. In order to meet the expectations of the planning policy, there is a proposal for an air source heat pump to be installed to meet all of the heating and Domestic Hot Water demand within the dwelling. In addition to this there is a proposal for a 3.5 kWp photovoltaic system to be installed on the available roof area of the building. This development will seek to achieve a reduction in CO₂ emissions equivalent to 39% of the baseline through the installation of an air source heat pump and 3.5 kWp photovoltaic system.

The total reduction in carbon emissions resulting from energy efficiency measures and the installation of renewable technology is 83% compared to the baseline. This surpasses the target reduction of 35%, as required by the London Plan.

A 100% reduction in CO₂ emissions is to be achieved by way of a cash in lieu payment to The London Borough of Haringey Carbon Offset Fund of £1,931.



2. Introduction

Energy use in buildings is a significant contributor to global CO₂ emissions and global warming. Designing energy efficient buildings and incorporating low and zero carbon energy generation is a vital part of ensuring this development incorporates sustainability as a core part of its design.

This report is produced in line with the requirements of the document "Energy Assessment Guidance - Greater London Authority guidance on preparing energy assessments as part of planning applications (June 2022)".

The purpose of the report is to assist evaluating parties to understand the energy consumption and performance of the proposed development and consider its performance against the “lean, clean, green” performance standard.

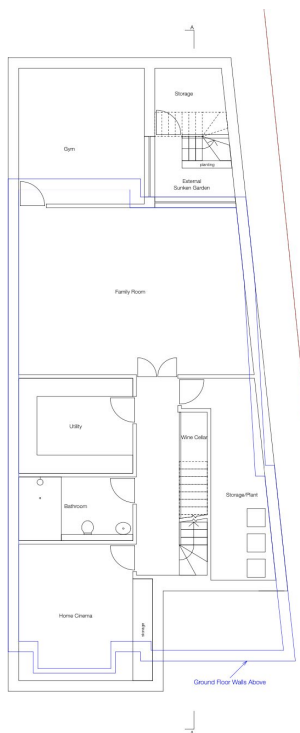
This application seeks by its design to surpass the CO₂ emission target of the baseline by 35% of the regulated energy consumption.

2.1. Overview of the proposed development

The proposed development consists of a single dwelling. By virtue of its size, the proposed development is not deemed to be a major development.

The proposed development is located in Highgate within the London borough of Haringey and within the Greater London area.

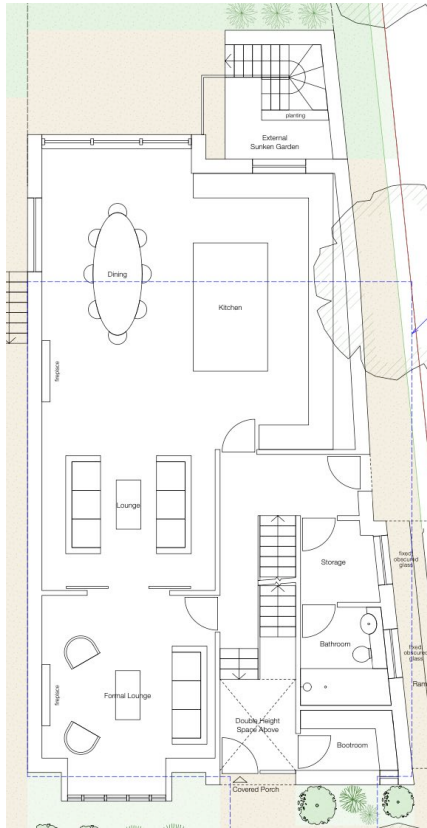
Proposed basement floor plan:



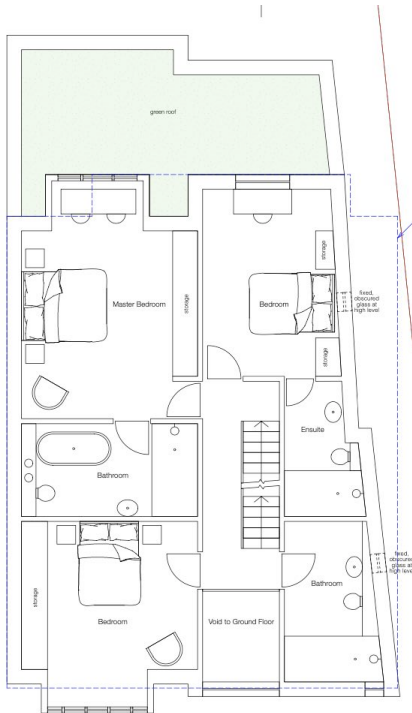
Proposed ground floor plan:

4 St John's Road
Tunbridge Wells
Kent TN4 9NP

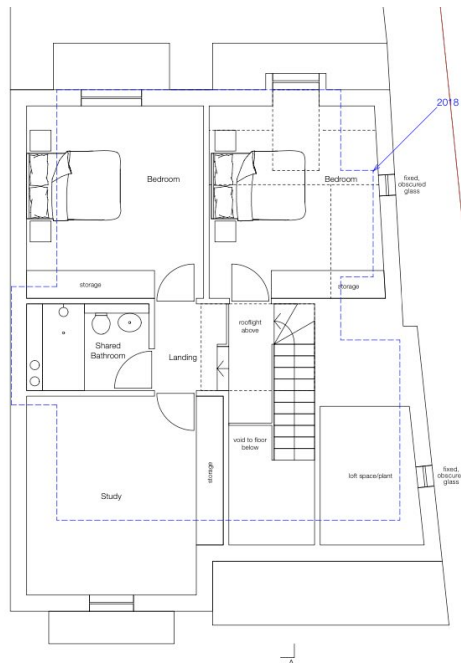
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Proposed first floor plan:



Proposed second floor plan:



3. Policies and Drivers

3.1. National and International Policy

The Climate Change Act (2008) sets a legally binding target for reducing UK carbon dioxide (CO₂) emissions to zero by 2050. It also provides for a Committee on Climate Change, which sets out carbon budgets binding on the Government for 5-year periods.

The National Planning Policy Framework (NPPF) 2021, reflects the requirements of the Climate Change Act 2008 in paragraphs 153 and 155 as follows:

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

"New development should be planned for in ways that:

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



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

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

- a) provide a positive strategy for energy from these sources, that maximises the potential for suitable development, while ensuring that adverse impacts are addressed satisfactorily (including cumulative landscape and visual impacts);
- b) consider identifying suitable areas for renewable and low carbon energy sources, and supporting infrastructure, where this would help secure their development; and

identify opportunities for development to draw its energy supply from decentralised, renewable or low carbon energy supply systems and for co-locating potential heat customers and suppliers."

3.2. Regional Policy: London Plan

The GLA London Plan requires new major developments to reduce their carbon emissions by 100% compared to Part L 2021 Building Regulations standard, with a minimum on-site target reduction of 35%, and an option for any shortfall to net-zero carbon to be offset through a carbon offset payment.

The London Plan is the overall strategic plan for London. It sets out a fully integrated economic, environmental, transport and social framework for the development of the capital to 2041. It forms part of the development plan for Greater London. London boroughs' local plans need to be in general conformity with the London Plan, and its policies guide decisions on planning applications by councils and the Mayor.

The key London Plan policies which are relevant to this energy strategy are summarised below:

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

3.2.1. Policy SI 2 Minimising greenhouse gas emissions

Development proposals should make the fullest contribution to minimising carbon dioxide emissions in accordance with the following energy hierarchy:

- i. Be lean: use less energy and manage demand during operation.



- ii. Be clean: exploit local energy resources (such as secondary heat) and supply energy efficiently and cleanly.
- iii. Be green: maximise opportunities for renewable energy by producing, storing and using renewable energy on-site.
- iv. Be seen: monitor, verify and report on energy performance.

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

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

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

3.2.2. Policy SI 3 Energy infrastructure

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

- 1) the heat source for the communal heating system should be selected in accordance with the following heating hierarchy:
 - a) connect to local existing or planned heat networks
 - b) use zero-emission or local secondary heat sources (in conjunction with heat pump, if required)
 - c) use low-emission combined heat and power (CHP) (only where there is a case for CHP to enable the delivery of an area-wide heat network, meet the development's electricity demand and provide demand response to the local electricity network)
 - d) use ultra-low NOx gas boilers
- 2) CHP and ultra-low NOx gas boiler communal or district heating systems should be designed to ensure that they meet the requirements in Part B of Policy SI 1 Improving air quality
- 3) where a heat network is planned but not yet in existence the development should be designed to allow for the cost-effective connection at a later date.

3.2.3. Policy SI 4 Managing heat risk

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

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

3.2.4. Local Policy: Haringey Council

The London Plan is key to Haringey Council planning policy and should be considered with every planning application.

3.2.5. Project policy

Planning policy leads to an on-site target reduction equal to:

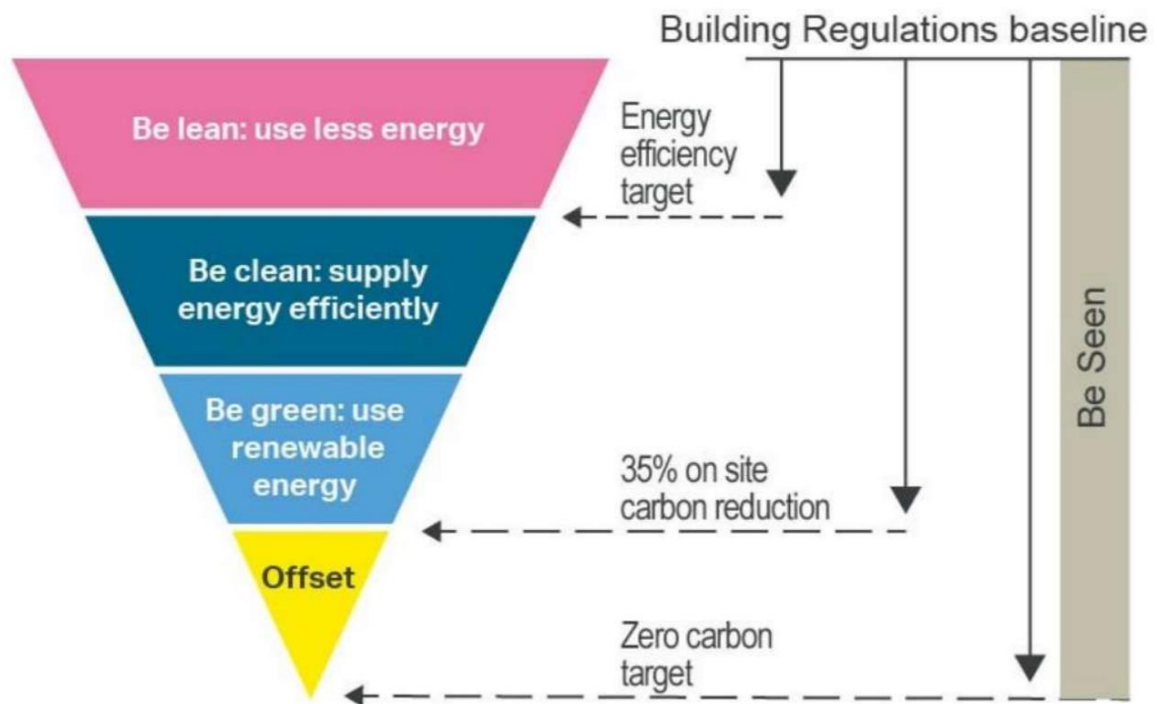
- 10% below those of a development compliant with Part L 2021 of the Building Regulations through energy efficiency measures alone ("Be Lean" stage); and
- 35% of the Regulated CO₂ emissions compared to the baseline through the application of the Energy Hierarchy.

Where it is clearly demonstrated that the specific targets cannot be fully achieved on-site, any shortfall (including to net-zero carbon, where applicable) will be provided off-site or through a cash in lieu contribution to the relevant borough.

4. Energy hierarchy

In line with best practice the proposed energy strategy for this development will follow the principals of the energy hierarchy.

The energy hierarchy has three priorities, seeking to reduce energy use before meeting remaining demand by the cleanest means possible:



- 1) Be lean – use less energy: Optimise the building fabric, glazing, and structure to minimise energy consumption in the first instance by using low U-values and good air tightness, and ensure that active systems run as energy efficiently as possible.
- 2) Be clean – supply energy efficiently: Further reduce carbon emissions through the use of decentralised energy where feasible, such as combined heat and power (CHP).
- 3) Be green – use renewable energy: When the above design elements have been reasonably exhausted, supply energy through renewable sources where practical.

5. Establishing the baseline

For dwellings that are wholly new in construction, the baseline is the Target CO₂ Emission Rate (TER) from Approved Document L1.

The baseline calculations are based on buildings that are the same size and shape as the proposed buildings and have the same exposed facades.

6. Energy efficient design measures (“be lean”)

Enhancing the thermal performance of the building envelope helps to future-proof the structure and also yields the greatest CO₂ savings. Adding renewable technology will then yield maximum carbon reductions with lower long-term costs for the developer.



The proposed development will achieve compliance with Approved Document L1 of the Building Regulations (2021) without reliance on the contribution of renewable technology².

The following energy-efficient design measures are proposed:

	Proposed development	L1 2021 requirements
External wall U-value (W/m ² K)	0.15	0.26
Roof U-value (W/m ² K)	0.10	0.16
Floor U-value (W/m ² K)	0.08	0.18
Window U-value (W/m ² K)	0.80	1.60
Rooflights U-value (W/m ² K)	0.90	1.60
Air permeability	3 m ³ /h.m ²	8 m ³ /h.m ²
Thermal bridging	Y=0.06	Y=0.20

Having reduced energy demand through improvements to the fabric, this development shall seek to reduce energy consumption further through the specification of mechanical and electrical systems with efficiencies that surpass the requirements of Approved Document L1 2021:

	Proposed development	L1 2021 requirements
Lighting efficacy	80 lm/W	75 lm/W
Mechanical ventilation with heat recovery	SFP = 0.79W/Ls ⁻¹ Efficiency = 88%	SFP < 1.5W/Ls ⁻¹ Efficiency > 80%
Waste water heat recovery	43.1% efficient Shower flow rate 7L/min	-
Heating controls	Time and temperature zone controls	Programmer, thermostat and TRVs.

7. Energy efficient systems (“be clean”)

7.1. Combined heat and power

Combined heat and power (CHP) systems use relatively cheap and clean fuels (such as natural gas) to generate heat and electricity on site. A typical CHP system uses combustion of natural gas to drive a turbine that produces electricity. The heat generated is captured and used to produce hot water.

As losses are minimised the carbon footprint of the energy generated is very low. However this is dependent on there being sufficient year-round local heat demand to fully utilise the heat generated by the CHP plant. An example would be developments of at least 500 dwellings, universities or hospitals.

² Under Approved Document L1 2021, the notional dwelling specification that is used to calculate the TER includes on-site renewable generation from PV. For the purpose of estimating savings from “Be Lean” measures only, the DER calculation for this stage of the energy hierarchy includes PV savings matched to the notional dwelling.

Due to its size, this development is not suitable for combined heat and power.

7.2. District heating networks

In a district heating network heat is supplied from one or more central energy centres to multiple buildings within the network. Supply to multiple buildings guarantees high year-round local heat demand which in turn allows the use of low carbon technologies within the energy centre, such as combined heat and power systems. Large plant and aggregated demand allows systems within the energy centre to run more efficiently.

Hot water is distributed within the network via highly insulated pipes. To connect to the network individual boilers are replaced with separately metered heat exchangers.

London Plan Policy 5.6 requires new developments to connect to an existing district heating network if one is available. Where there is no existing network, but potential for a future network has been identified, major developments should incorporate the infrastructure required to connect to the network. This may include installing centralised heating plant connected to individual heat exchangers within each dwelling.

Having reviewed the London Heat Map it is evident this proposed development is neither within the coverage of an existing district heating network, nor is it within the coverage of a proposed future district heating network. Connection to a district heating network in the short term is therefore not feasible.

This site is however in a Heat Network Priority Area. Heat Network Priority Areas identify where in London the heat density is sufficient for heat networks to provide a competitive solution for supplying heat to buildings and consumers. As there is a possibility that a district heating network will be installed in the vicinity of the site at some point during the lifetime of the building, the detailed design of the building will seek to incorporate the infrastructure required to connect to such a network.

London Heat Map showing existing and proposed district heating networks, energy centres, proposed transmission routes and the Heat Network Priority Area:



Layers shown on map

Existing Heat Networks, Proposed Heat Networks, Heat Network Priority Areas.

Due to its size and location, this development is not suitable for district heating.

8. Low and zero carbon energy sources (*“be green”*)

8.1. Photovoltaics

Solar photovoltaics (PV) capture the sun's energy using photovoltaic cells. The cells convert sunlight into electricity, which can be utilised on site or transferred into the National Grid. PV cells are made from layers of semi-conducting material, usually silicon. When light shines on the cell it creates an electric field across the layers. The stronger the sunshine, the more electricity is produced. Groups of cells are mounted together in panels or modules that can be mounted on a roof.

The power of a PV cell is measured in kilowatts peak (kWp). This is the rate at which the cell generates energy at peak performance in full direct sunlight.

Photovoltaics offer high CO₂ savings, are simple to install and suitable for most buildings. The only limiting factor for PV is the availability of suitable roof space.

8.2. Heat Pumps

Heat pumps collect low temperature heat from renewable sources (such as the air or ground) and concentrate the heat to a usable temperature via a reverse refrigeration cycle. Useable heat is transferred to the dwelling via a heat exchanger and can be used for low temperature central heating and domestic hot water, though an immersion top-up may be required for DHW.

Heat pumps have some impact on the environment as they generally use grid supplied electricity to run the pumps. It is common for heat pumps to have a coefficient of performance of three, meaning that for every 1kWh of electricity used, over 3kWh of heat can be generated. The renewable component of the output is therefore taken as the difference between the

output energy and the input energy, in this scenario the heat pump will be deemed to have delivered 2kWh of renewable energy.

Ground source heat pumps require external horizontal ground loops, or as is more likely in built-up environments, vertical loops fed into bore holes. The application of ground source heat pumps is therefore constrained by site ground conditions and available space.

Air source heat pumps have a slightly lower seasonal efficiency than ground source heat pumps, but require less space. Noise and space considerations should be assessed when determining an appropriate site for external condensing units.

8.3. Solar thermal

Solar thermal systems, use free heat from the sun to warm domestic hot water. A conventional boiler or immersion heater can be used to make the water hotter, or to provide hot water when solar energy is unavailable.

Solar thermal systems are most appropriate for buildings with high year-round domestic hot water demand.

Although a typical solar thermal system will be able to meet half the annual domestic hot water demand for a dwelling, many will use electricity to run pumps within the system.

8.4. Wind turbines

Wind turbines use blades to catch the wind. When the wind blows, the blades are forced round, driving a turbine which generates electricity. The stronger the wind, the more electricity produced.

There are two types of domestic-sized wind turbine: Pole mounted and building mounted. Pole mounted turbines are free standing and are erected in a suitably exposed position, and are often about 5kW to 6kW in size. Building mounted turbines are smaller and can be installed on the roof of a home where there is a suitable wind resource. Often these are around 1kW to 2kW in size.

Large scale turbines, in exposed locations offer one of the best financial returns of all renewable energy systems as the payback of the system increases dramatically with the size of the turbine. However small-scale systems offer much lower levels of performance and recent studies have questioned the viability and output from such systems, particularly in urban environments.

8.5. Biomass

Biomass heating systems, burn wood pellets, chips or logs to provide warmth in a single room or to power central heating and hot water boilers. The carbon dioxide emitted when wood is burned is the same amount that was absorbed over the months and years that the plant was growing. The process is sustainable as long as new plants continue to grow in place of those used for fuel. There are some carbon emissions caused by the cultivation, manufacture and transportation of the fuel, but as long as the fuel is sourced locally, these are much lower than the emissions from fossil fuels.

When specifying biomass heating systems is important to consider the potential technical issues surrounding delivery and storage of fuel.

Although the CO₂ savings from biomass are substantial, the high levels of NO_x emissions can make biomass systems unsuitable for urban environments.

8.6. Proposed low and zero carbon energy sources

With carbon emissions within the building already reduced through an enhanced fabric and energy efficient systems, it is proposed that a further reduction will be achieved through the installation of an **air source heat pump** to serve all of the heating and Domestic Hot Water requirements and the installation of **photovoltaic arrays totalling 3.5 kWp**.

9. Results: Calculated CO₂ savings

9.1. Regulated CO₂ savings

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

	Carbon dioxide emissions for domestic buildings (Tonnes CO ₂ per annum)
Baseline: Part L 2021 of the Building Regulations Compliant Development	4.1
After energy demand reduction (be lean)	2.3
After heat network connection (be clean)	2.3
After renewable energy (be green)	0.7

Table 2: Regulated carbon dioxide savings from each stage of the Energy Hierarchy for domestic buildings

	Regulated domestic carbon dioxide savings	
	(Tonnes CO ₂ per annum)	(%)
Be lean: savings from energy demand reduction	1.8	44%
Be clean: savings from heat network	0.0	0%
Be green: savings from renewable energy	1.6	39%
Cumulative on-site savings	3.4	83%
Annual savings from off-set payment	0.7	
(Tonnes CO₂)		
Cumulative savings for off-set payment	20	
Cash in-lieu contribution (£)	1,931	

10. 'Zero-carbon' homes

All developments should be net-zero carbon unless it is demonstrated this would not be feasible. The net-zero carbon outcome should be achieved on-site where feasible. Where it is demonstrated that this outcome cannot be fully achieved on-site, any shortfall may be provided through a cash in lieu contribution to The London Borough of Haringey Carbon Offset Fund which will be ring fenced to secure delivery of greenhouse gas reductions elsewhere in the borough. An offset contribution will be required unless it is demonstrated this would undermine the viability of the development.

As this development will not achieve 100% net zero carbon, an additional cash contribution of £1,931 will be required³.

³ Based on a carbon offset fee of £95 per tonne of CO₂ for a period of 30 years.

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11. Appendix A: BREL Report

12. Appendix B: Part I 2021 gla carbon emission reporting spreadsheet v2.0

Building Regulations England Part L (BREL) Compliance Report

Approved Document L1 2021 Edition, England assessed by Array SAP 10 program, Array

Date: Wed 21 Feb 2024 10:20:45

Project Information			
Assessed By	Harry Davey	Building Type	House, Detached
OCDEA Registration	EES/020345	Assessment Date	2024-02-21

Dwelling Details			
Assessment Type	As designed	Total Floor Area	406 m ²
Site Reference	7339	Plot Reference	Green
Address	6a Grange Road, London, N6 4AP		

Client Details	
Name	Client
Company	Company
Address	Address, Town, AA11 1AA

This report covers items included within the SAP calculations. It is not a complete report of regulations compliance.

1a Target emission rate and dwelling emission rate			
Fuel for main heating system	Electricity		
Target carbon dioxide emission rate	10.08 kgCO ₂ /m ²		
Dwelling carbon dioxide emission rate	1.67 kgCO ₂ /m ²		OK
1b Target primary energy rate and dwelling primary energy			
Target primary energy	53.36 kWh _{PE} /m ²		
Dwelling primary energy	19.41 kWh _{PE} /m ²		OK
1c Target fabric energy efficiency and dwelling fabric energy efficiency			
Target fabric energy efficiency	48.0 kWh/m ²		
Dwelling fabric energy efficiency	39.8 kWh/m ²		OK

2a Fabric U-values				
Element	Maximum permitted average U-Value [W/m ² K]	Dwelling average U-Value [W/m ² K]	Element with highest individual U-Value	
External walls	0.26	0.15	Walls (1) (0.15)	OK
Party walls	0.2	N/A	N/A	N/A
Curtain walls	1.6	N/A	N/A	N/A
Floors	0.18	0.1	Heatloss Floor 1 (0.1)	OK
Roofs	0.16	0.1	Roof (1) (0.1)	OK
Windows, doors, and roof windows	1.6	0.8	Opening (0.9)	OK
Rooflights	2.2	N/A	N/A	N/A

2b Envelope elements (better than typically expected values are flagged with a subsequent (!))		
Name	Net area [m ²]	U-Value [W/m ² K]
Exposed wall: Walls (1)	458.559	0.15
Ground floor: Heatloss Floor 1, Heatloss Floor 1	125.23	0.1 (!)
Ground floor: Heatloss Floor 2, Heatloss Floor 2	12.26	0.1 (!)
Exposed roof: Roof (1)	27.37	0.1 (!)
Exposed roof: Roof (2)	63.07	0.1 (!)
Exposed roof: Roof (3)	50.17	0.1 (!)

2c Openings (better than typically expected values are flagged with a subsequent (!))				
Name	Area [m ²]	Orientation	Frame factor	U-Value [W/m ² K]
Opening, window	2.112	North East	0.8	0.8 (!)
Opening, window	2.112	North East	0.8	0.8 (!)
Opening, window	2.112	North East	0.8	0.8 (!)
Opening, window	2.4	North East	0.8	0.8 (!)
Opening, window	2.4	North East	0.8	0.8 (!)
Opening, window	2.4	North East	0.8	0.8 (!)
Opening, window	2.4	North East	0.8	0.8 (!)
Opening, window	2.4	North East	0.8	0.8 (!)
Opening, window	2.4	North East	0.8	0.8 (!)
Opening, window	2.4	North East	0.8	0.8 (!)

Name	Area [m ²]	Orientation	Frame factor	U-Value [W/m ² K]
Opening, window	1.44	South West	0.8	0.8 (!)
Opening, window	1.44	South West	0.8	0.8 (!)
Opening, window	1.44	South West	0.8	0.8 (!)
Opening, window	1.44	South West	0.8	0.8 (!)
Opening, window	2.16	South West	0.8	0.8 (!)
Opening, window	2.16	South West	0.8	0.8 (!)
Opening, window	2.16	South West	0.8	0.8 (!)
Opening, window	2.16	South West	0.8	0.8 (!)
Opening, window	2.16	South West	0.8	0.8 (!)
Opening, window	4.625	South West	0.8	0.8 (!)
Opening, window	4.625	South West	0.8	0.8 (!)
Opening, window	4.625	South West	0.8	0.8 (!)
Opening, window	6.25	South West	0.8	0.8 (!)
Opening, window	0.72	North West	0.8	0.8 (!)
Opening, window	0.72	North West	0.8	0.8 (!)
Opening, window	2.73	North West	0.8	0.8 (!)
Opening, window	6.25	South East	0.8	0.8 (!)
Opening, roof win	1	North East	0.7	0.9 (!)
Opening, roof win	0.75	North West	0.7	0.9 (!)

2d Thermal bridging (better than typically expected values are flagged with a subsequent (!))

Building part 1 - Main Dwelling: Thermal bridging calculated from linear thermal transmittances for each junction

Main element	Junction detail	Source	Psi value [W/mK]	Drawing / reference
External wall	E2: Other lintels (including other steel lintels)	Calculated by person with suitable expertise	0.05	
External wall	E3: Sill	Calculated by person with suitable expertise	0.05	
External wall	E4: Jamb	Calculated by person with suitable expertise	0.05	
Roof	R1: Head of roof window	SAP table default	0.24	
Roof	R2: Sill of roof window	SAP table default	0.24	
Roof	R3: Jamb of roof window	SAP table default	0.24	
External wall	E22: Basement floor	Calculated by person with suitable expertise	0.07	
External wall	E5: Ground floor (normal)	Calculated by person with suitable expertise	0.16	
External wall	E6: Intermediate floor within a dwelling	Calculated by person with suitable expertise	0 (!)	
External wall	E24: Eaves (insulation at ceiling level - inverted)	SAP table default	0.15	
External wall	E10: Eaves (insulation at ceiling level)	Calculated by person with suitable expertise	0.06	
External wall	E11: Eaves (insulation at rafter level)	Calculated by person with suitable expertise	0.04	
External wall	E12: Gable (insulation at ceiling level)	Calculated by person with suitable expertise	0.06	
External wall	E14: Flat roof	Calculated by person with suitable expertise	0.08	
External wall	E16: Corner (normal)	Calculated by person with suitable expertise	0.09	
External wall	E17: Corner (inverted - internal area greater than external area)	Calculated by person with suitable expertise	-0.09	
Roof	R4: Ridge (vaulted ceiling)	SAP table default	0.12	
Roof	R6: Flat ceiling	SAP table default	0.12	

3 Air permeability (better than typically expected values are flagged with a subsequent (!))

Maximum permitted air permeability at 50Pa	8 m ³ /hm ²	
Dwelling air permeability at 50Pa	3 m ³ /hm ² , Design value (!)	OK
Air permeability test certificate reference		

4 Space heating		
Main heating system 1: Heat pump with radiators or underfloor heating - Electricity		
Efficiency	289.8%	
Emitter type	Both radiators and underfloor	
Flow temperature	45°C	
System type	Heat Pump	
Manufacturer	Mitsubishi Electric Europe B.V.	
Model	Ecodan 11.2 kW	
Commissioning		
Secondary heating system: N/A		
Fuel	N/A	
Efficiency	N/A	
Commissioning		
5 Hot water		
Cylinder/store - type: Cylinder		
Capacity	350 litres	
Declared heat loss	2.2 kWh/day	
Primary pipework insulated	Yes	
Manufacturer		
Model		
Commissioning		
Waste water heat recovery system 1 - type: Instantaneous		
Efficiency	43.1%	
Manufacturer	Dutch Solar Systems BV	
Model	Easyfit+	
6 Controls		
Main heating 1 - type: Time and temperature zone control by arrangement of plumbing and electrical services		
Function		
Ecodesign class		
Manufacturer		
Model		
Water heating - type: Cylinder thermostat and HW separately timed		
Manufacturer		
Model		
7 Lighting		
<i>Minimum permitted light source efficacy</i>	75 lm/W	
Lowest light source efficacy	80 lm/W	OK
External lights control	N/A	
8 Mechanical ventilation		
System type: Balanced whole-house mechanical ventilation with heat recovery		
<i>Maximum permitted specific fan power</i>	1.5 W/(l/s)	
Specific fan power	0.79 W/(l/s)	OK
<i>Minimum permitted heat recovery efficiency</i>	73%	
Heat recovery efficiency	88%	OK
Manufacturer/Model	MRXBOXAB-ECO3, MRXBOXAB-ECO3B	
Commissioning		
9 Local generation		
Technology type: Photovoltaic system (1)		
Peak power	3.5 kWp	
Orientation	Horizontal	
Pitch	Horizontal	
Overshading	None or very little	
Manufacturer		
MCS certificate		
10 Heat networks		
N/A		
11 Supporting documentary evidence		
N/A		

12 Declarations	
a. Assessor Declaration	
This declaration by the assessor is confirmation that the contents of this BREL Compliance Report are a true and accurate reflection based upon the design information submitted for this dwelling for the purpose of carrying out the "As designed" assessment, and that the supporting documentary evidence (SAP Conventions, Appendix 1 (documentary evidence) schedules the minimum documentary evidence required) has been reviewed in the course of preparing this BREL Compliance Report.	
Signed: Name:	Assessor ID: Date:
b. Client Declaration	
N/A	

The applicant should complete all the light blue cells including information on the modelled units, the area per unit, the number of units, the TER/DER/BER and the TFE/DFEE.																								
RESIDENTIAL CO ₂ ANALYSIS (PART L1)																								
Unit identifier (e.g. plot number, dwelling type etc.)	Model total floor area	Number of units	Total area represented by model	Baseline	TER	Energy saving/generation technologies (-)	'Be Lean'	'Be Clean'	'Be Green'	Fabric Energy Efficiency (FEE)	Target Fabric Energy Efficiency	Dwelling Fabric Energy Efficiency	Baseline	Part L 2021 CO ₂ emissions	Energy saving/generation technologies	Part L 2021 CO ₂ emissions	Part L 2021 CO ₂ emissions with National PV savings included	'Be Lean' savings	Part L 2021 CO ₂ emissions	Part L 2021 CO ₂ emissions with National PV savings included	'Be Clean' savings	Part L 2021 CO ₂ emissions	'Be Green' savings	
(m ²) (Row 4)			(m ²)	(kgCO ₂ / m ²) (Row 273)	(kgCO ₂ p.a.) (Row 269)	(kgCO ₂ / m ²) (Row 273 or 264)	(kgCO ₂ / m ²) (Row 273 or 264)	(kgCO ₂ / m ²) (Row 273 or 264)	(kWh/m ²) (Row 273 or 264)	(kWh/m ²) (Row 273 or 264)			(kgCO ₂ p.a.)	(kgCO ₂ p.a.)	(kgCO ₂ p.a.)	(kgCO ₂ p.a.)	(kgCO ₂ p.a.)	(kgCO ₂ p.a.)	(kgCO ₂ p.a.)	(kgCO ₂ p.a.)	(kgCO ₂ p.a.)	(kgCO ₂ p.a.)	(kgCO ₂ p.a.)	
	402.70		402.70	10.88	-400.33	7.58	7.58	7.58	1.87				4,090	-400	3,076	2,275	1,815	3,076	2,275	0	678	1,598		
Sum	0	408		10.1	-400.3	7.6	7.6	7.6	1.7		0.0	0.0	4,090	-400	3,076	2,275	1,815	3,076	2,275	0	678	1,598		
NON-RESIDENTIAL CO ₂ ANALYSIS (PART L2)																								
Building Use	Model Area	Number of units	Total area represented by model	Baseline	BRUKL TER	Displaced electricity (-)	'Be Lean'	'Be Clean'	'Be Green'				Baseline	Part L 2021 CO ₂ emissions	Energy saving/generation technologies	Part L 2021 CO ₂ emissions	Part L 2021 CO ₂ emissions with National PV savings included	'Be Lean' savings	Part L 2021 CO ₂ emissions	Part L 2021 CO ₂ emissions with National PV savings included	'Be Clean' savings	Part L 2021 CO ₂ emissions	'Be Green' savings	
(m ²)			(m ²)	(kgCO ₂ / m ²)	(kWh / m ²)	(kgCO ₂ / m ²)	(kgCO ₂ / m ²)	(kgCO ₂ / m ²)	(kgCO ₂ / m ²)				(kgCO ₂ p.a.)	(kgCO ₂ p.a.)	(kgCO ₂ p.a.)	(kgCO ₂ p.a.)	(kgCO ₂ p.a.)	(kgCO ₂ p.a.)	(kgCO ₂ p.a.)	(kgCO ₂ p.a.)	(kgCO ₂ p.a.)	(kgCO ₂ p.a.)		
Sum	0	0		0.0	0.0	0.0	0.0	0.0	0.0				0	0	0	0	0	0	0	0	0	0	0	
SITE-WIDE ENERGY CONSUMPTION AND CO ₂ ANALYSIS																								
Total Sum		408		-	-	-	-	-	-				4,090	-400	3,076	2,275	1,815	3,076	2,275	0	678	1,598		

Residential

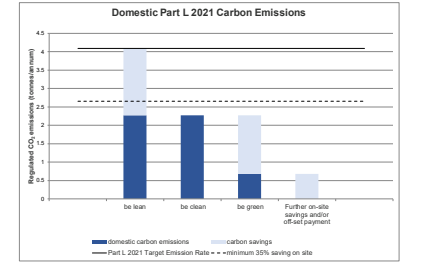
Table 1: Carbon Dioxide Emissions after each stage of the Energy Hierarchy for residential buildings

	Carbon Dioxide Emissions for residential buildings (Tonnes CO ₂ per annum)	
	Regulated	Unregulated
Baseline: Part L 2001 of the Building Regulations Constant Development	4.1	
After energy demand reduction (be lean)	2.3	
After heat network connection (be clean)	2.3	
After renewable energy (be green)	0.7	

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	1.8	44%
Be clean: savings from heat network	0.0	0%
Be green: savings from renewable energy	1.6	39%
Cumulative on site savings	3.4	83%
Annual savings from off-set payment	0.7	-
	(Tonnes CO ₂)	
Cumulative savings for off-set payment	28	-
Crack-in-New contribution (£)	1,951	

*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

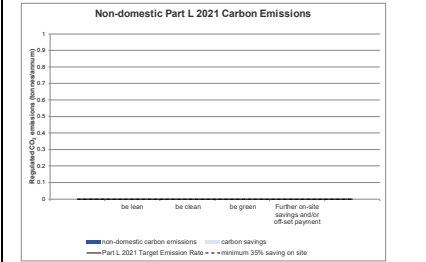
Table 3: Carbon Dioxide Emissions after each stage of the Energy Hierarchy for non-residential buildings

	Carbon Dioxide Emissions for non-residential buildings (Tonnes CO ₂ per annum)	
	Regulated	Unregulated
Baseline: Part L 2021 of the Building Regulations Consistent 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 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 (heat - savings from energy plant reduction)	0.0	0%
Be (steam - savings from heat network)	0.0	0%
Be (green - savings from renewable energy)	0.0	0%
Total Cumulative Savings	0.0	0%
Annual savings from off-ast payment	0.0	-
	(forming EO₂)	
Cumulative savings for off-ast payment	0	-
Crash to-Bio contribution (K)	0	

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



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100	100

	Total regulated emissions (Tonnes CO ₂ / year)	CO ₂ savings (Tonnes CO ₂ / year)	Percentage savings (%)
Part L 2021 baseline	4.1		
Bo lean	2.3	1.8	44%
Bo clean	2.3	0.0	0%
Bo green	0.7	1.8	39%
Total Savings	-	3.4	83%
		CO ₂ savings off-set (Tonnes CO ₂)	-
Off-set	-	20.3	-

	Target Fabric Energy Efficiency (aWh/m ²)	Dwelling Fabric Energy Efficiency (aWh/m ²)	improvement (%)
Development total	0.00	0.00	

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

	Target Fabric Energy Efficiency (kWh/m ²)	Dwelling Fabric Energy Efficiency (kWh/m ²)	Improvement (%)
Development total	0.00	0.00	

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

EUI & space heating demand (predicted energy use)

Residential

Buidling type	EU (within 7 years) (including renewable energy)	Space heating demand (within 7 years) (including renewable energy)	EU value from Table 4 of the guidance (within 7 years) (including renewable energy)	Space heating demand from Table 4 of the guidance (within 7 years) (including renewable energy)	Methodology used (e.g. 'to user' methodology) or an alternative predictive energy modelling methodology	Explanatory notes (if expected performance differs from the Table 4 values in the guidance)

Non-residential

[illegible]