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ENERGY STATEMENT

Proposed development at:

21-57 Willow Way (Site A), Lewisham, London, SE26

Demolition of existing buildings and redevelopment to provide employment floorspace (Use classes E(g)(i)(ii)(iii)) and residential dwellings including affordable housing and amenity space.

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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 mixed use development of 1,401m2 of workshop / office space and sixty flats at 21-57 Willow Way (Site A), Lewisham, London, SE26.

The design has been developed to address the energy performance policy requirements of The London Plan 2021. A target CO_2 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 and SBEM 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 CO_2 emissions as the Target Emission Rate (TER) for the building(s).

This proposed development features improved insulation standards when compared against the compliance requirements of Approved Documents L1 and L2 2021 of the Building Regulations. In addition, this proposed development will incorporate a mechanical and electrical specification that surpasses the requirements of Approved Documents L1 and L2 2021. These combined energy efficiency measures lead to a reduction in CO_2 emissions equivalent to 10% of the baseline for the domestic part of the development and 17% of the baseline for the non-domestic part. These meet the target reductions of 10% and 15% respectively, 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 CO_2 emissions further. In order to meet the expectations of the planning policy, the proposal is for air source heat pumps to be installed to meet each of the dwellings heating and Domestic Hot Water demand and a photovoltaic system to be installed on the available roof area of the building. Commercial units are to be heated via air source heat pumps. This development will seek to achieve a reduction in CO_2 emissions equivalent to 57% of the baseline through the installation of air source heat pumps and a 10 kWp PV system.

The total reduction in carbon emissions resulting from energy efficiency measures and the installation of renewable technology is 68% for the domestic part of the development and 56% for the non-domestic part. This surpasses the target reduction of 35%, as required by the London Plan.

A 100% reduction in CO_2 emissions is to be achieved by way of a cash in lieu payment[2] to the London Borough of Lewisham of £61,328.

2. Introduction

Energy use in buildings is a significant contributor to global CO_2 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 CO_2 emission target of the baseline by 35% of the regulated energy consumption.

2.1. Overview of the proposed development

The existing site comprises three businesses currently operating, including a vehicle repair / garage, storage / warehouse catering business and a drinks machine repair / servicing business. The sites contain a mix of single storey and double storey buildings with areas of hardstanding, parking, yard areas and shipping containers interspersed between the buildings. The proposed

[2] Calculated based on a Carbon Offset Price of £95 per tonne for 30 years.

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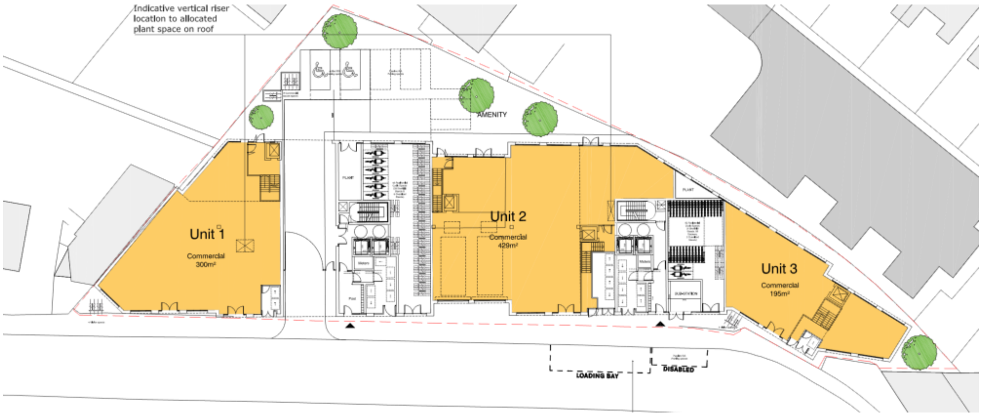
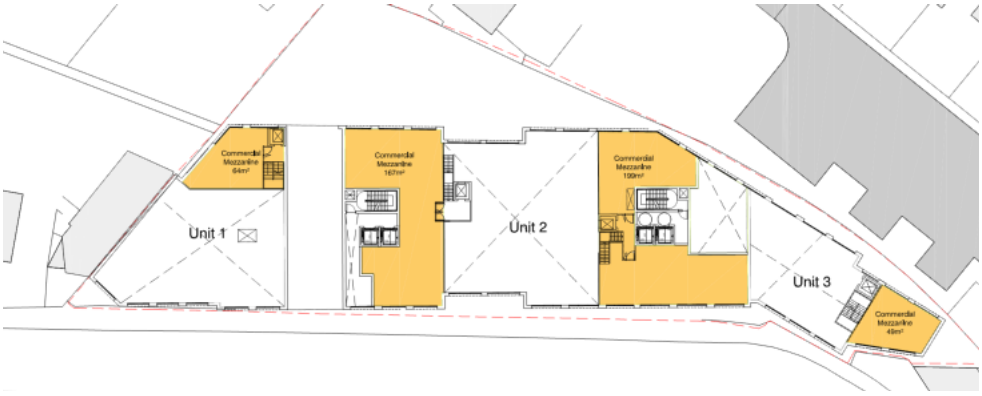
development consists of 1,401m^2 of workshop / office space and sixty flats. By virtue of its size, the proposed development is deemed to be a major development.

The proposed development is located in Upper Sydenham within the London borough of Lewisham and within the Greater London area.

Proposed ground floor plan:



Proposed mezzanine plan:



Proposed first floor plan:

Proposed fourth 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 (CO_2) 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: Lewisham Council

The London Plan is key to Lewisham 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% (for the domestic part of the development) and 15% (for the non-domestic part) 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 CO_2 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.

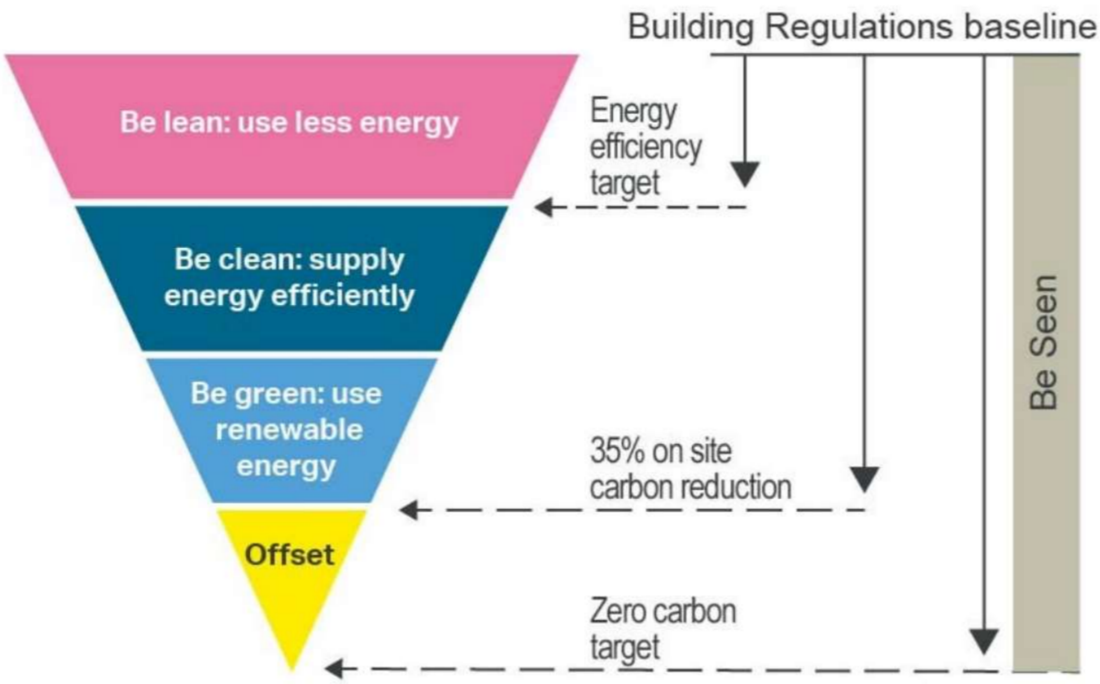
3.2.5.1. Designing for thermal comfort

All flats within the development will be designed to achieve full compliance with Approved Document O: Overheating mitigation. An assessment of overheating risk will therefore form part of the detailed design of the development.

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 buildings that are wholly new in construction, the baseline is the Target CO_2 Emission Rate (TER) from Approved Document L1 (domestic) and L2 (non-domestic).

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 CO_2 savings. Adding renewable technology will then yield maximum carbon reductions with lower long-term costs for the developer.

6.1. Domestic development

The proposed development will achieve compliance with Approved Document L1 of the Building Regulations (2021) without reliance on the contribution of renewable technology[3].

The following energy-efficient design measures are proposed:

	Proposed development	L1 2021 requirements
External wall U–value (W/m²K)	0.16	0.26
Sheltered wall U–value (W/m²K)	0.14	0.26
Roof U–value (W/m²K)	0.11	0.16
Exposed floor U–value (W/m²K)	0.11	0.18
Window U–value (W/m²K)	0.80	1.60
Air permeability	4 m³/h.m²	8 m³/h.m²
Thermal bridging	Y=0.07	Y=0.20

[3] 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.

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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
Heating controls	Time and temperature zone controls	Programmer, thermostat and TRVs.

6.1. Non-domestic development

The proposed non-domestic development will achieve compliance with Approved Document L2 2021 without reliance on the contribution of renewable technology[4].

The following energy-efficient design measures are proposed:

	Proposed development	L2 2021 requirements
Ground floor U–value (W/m²K)	0.11	0.18
External wall U–value (W/m²K)	0.17	0.26
Roof U–value (W/m²K)	0.13	0.16
Window U–value (W/m²K)	1.40	1.60
External door U–value (W/m²K)	1.20	1.60
Air permeability	3.0 $m^3/h.m^2$	8 $m^3/h.m^2$

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 L2 2021:

	Proposed development	L2 2021 requirements
Lighting efficacy	115 lm/W	80 lm/W
Lighting controls	Photoelectric dimming	Manual switching
Mechanical ventilation with heat recovery	SFP 1.0 W/l/s, heat recovery 80%	SFP 2.0 W/l/s

[4] Under Approved Document L2 2021, the notional building specification that is used to calculate the TER can include on-site renewable generation from PV. For the purpose of estimating savings from "Be Lean" measures only, the BER calculation for this stage of the energy hierarchy includes PV savings matched to the notional building.

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.

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.

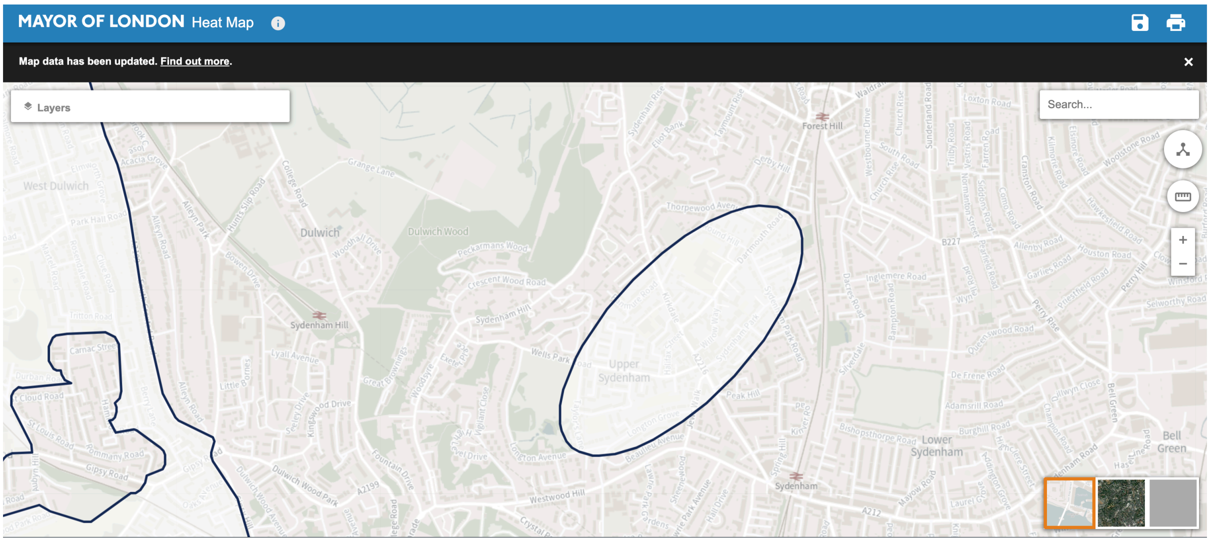
Hot water is distributed within the network via highly insulated pipes. To connect to the network individual boilers are replaced with separately metered heat exchangers.

London Plan Policy 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:



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 CO_2 savings, are simple to install and suitable for most buildings. The only limiting factor for PV is the availability of suitable roof space.

Feasibility assessment: Feasible and appropriate. There is sufficient unshaded roofspace available for a photovoltaic installation.

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.

Feasibility assessment: Feasible and appropriate for primary heating and Domestic Hot Water.

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.

Feasibility assessment: Feasible and appropriate for Domestic Hot Water.

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

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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.

Feasibility assessment: Inappropriate location.

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 CO_2 savings from biomass are substantial, the high levels of NOx emissions can make biomass systems unsuitable for urban environments.

Feasibility assessment: Feasible but inappropriate in this urban setting.

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 **air source heat pumps** to serve all of the heating and Domestic Hot Water requirements within each dwelling and the installation of **photovoltaic arrays totalling 10 kWp**. Commercial units are to be heated via air source heat pumps.

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9. Results: Calculated CO_2 savings

9.1. Domestic CO_2 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	59.4
After energy demand reduction	53.7
After heat network / CHP	53.7
After renewable energy	18.9

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	5.8	10%
Be clean: Savings from heat network / CHP	0.0	0%
Be green: Savings from renewable energy	34.8	59%
Cumulative on site savings	40.6	68%
Annual savings from off-set payment	18.9	
Cumulative savings for off-set Payment	**566**	
Cash in-lieu contribution (£)	53,726	

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9.2. Non-domestic CO_2 savings

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

	Carbon dioxide emissions for non-domestic buildings (Tonnes CO_2 per annum)
Baseline: Part L 2021 of the Building Regulations Compliant Development	6.0
After energy demand reduction	5.0
After heat network / CHP	5.0
After renewable energy	2.7

Table 4: Regulated carbon dioxide savings from each stage of the Energy Hierarchy for non-domestic buildings

	Regulated non-residential carbon dioxide savings	
	(Tonnes CO_2 per annum)	(%)
Be lean: savings from energy demand reduction	1.0	17%
Be clean: savings from heat network	0.0	0%
Be green: savings from renewable energy	2.3	39%
Total Cumulative Savings	3.3	56%
Annual savings from off-set payment	2.7	-

	(Tonnes CO_2)	
Cumulative savings for off-set payment	80	-
Cash in-lieu contribution (£)	7,602	

9.3. Site total

Table 5: Site wide regulated carbon dioxide emissions and savings

	Total regulated emissions (Tonnes CO_2 / year)	CO_2 savings (Tonnes CO_2 / year)	Percentage savings (%)
Part L 2021 baseline	65.5		
Be lean	58.7	6.8	10%
Be clean	58.7	0.0	0%
Be green	21.5	37.1	57%
Total Savings	-	43.9	67%
	-	CO_2 savings off-set (Tonnes CO_2)	-
Off-set	-	645.6	-

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