

ENERGY STATEMENT

Proposed development at:
Heathrow Garden Centre, Sipson Road, Sipson, West
Drayton, UB7 0HP



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1. Executive Summary

This Energy Statement has been prepared by Energytest in support of a full planning application for a proposed development at Heathrow Garden Centre, Sipson Road, Sipson, West Drayton, UB7 OHP. This development consists 2,376 m² of non-domestic space.

The design has been developed to address the energy performance policy requirements of the October 2018 update to the London Plan. A target CO₂ reduction has therefore been set at 35% relative to the Building Regulations 2013, through the application of the energy hierarchy.

A base case has been developed, against which potential savings can be assessed. This base case is the notional building developed for the Building Regulations (2013) assessment and is quantified in terms of CO₂ emissions as the Target Emission Rate (TER) for the building(s). For the purpose of these calculations SAP 10 carbon emission factors have been applied throughout.

This proposed development features improved insulation and air tightness standards, when compared against the compliance requirements of Approved Documents L2A 2013 of the Building Regulations. In addition, this proposed development will incorporate a mechanical and electrical specification that surpasses the requirements of the Non-Domestic Building Services Compliance Guide. These combined energy efficiency measures lead to a 0.6% reduction in CO₂ emissions equivalent to the base case.

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. There is potential for a biomass plant to be installed on the development in order to meet the expectations of the planning policy. The installation of biomass plant will lead to a reduction in CO₂ emissions equivalent to 49.4% of the base case.

The total reduction in emissions resulting from energy efficiency measures and the installation of renewable technology is 50.0% compared to the regulated emissions from a building designed to just meet Building Regulations (2013) Part L2A. This surpasses the target reduction of 35%, as required by the London Plan.

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 guidance provided in the document "Greater London Authority guidance on preparing energy assessments as part of planning applications (October 2018)."

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, in being submitted after March 2016, seeks by its design to surpass the CO₂ emission target of Approved Documents L1A and L2A 2013 by 35% of the regulated energy consumption.

2.1. Overview of the proposed development

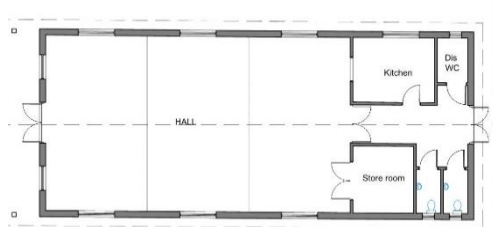
The proposed development consists of 2 non domestic units which total usable floor space of 2,376m². By virtue of its size, the proposed development is deemed to be a major development.

The proposed development is located in West Drayton within the London borough of Hillingdon and within the Greater London area.

Proposed garden centre ground floor plan:



Proposed community centre floor plan:



3. Policies and Drivers

3.1. National and International Policy

Over the past 20 years the need to reduce the growth in global greenhouse gas emissions has been gaining momentum on the international political agenda. Since the Kyoto Protocol was agreed upon in 1997, most countries have been setting targets for national carbon emissions reductions - the UK was the first to put this into legislation.

The Climate Change Act (2008) sets a legally binding target for reducing UK carbon dioxide (CO₂) by at least 80% 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 Act is the driver behind a framework of strategies and policy documents developed at national and regional levels such as The Carbon Plan (DECC 2011) and zero carbon buildings policy (DCLG), which in turn have informed the development of local planning policy.

3.2. Regional Policy: London Plan

The current GLA London Plan requires new developments to reduce their carbon emissions by 35% compared to Part L 2013 Building Regulations standard (or 40% compared to Part L 2010). While these targets are meant to be fixed it is generally sufficient to show compliance with the spirit of the policy. Generally PV would be considered the best way of achieving the Low and Zero Carbon requirements, although heat pumps could be a suitable alternative.

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 2031. 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 GLA's Energy Planning Guidance came into force from the 6th of April 2014, when the 2013 changes to Part L of the Building Regulations also came into effect. Further alterations

were published and adopted in March 2016 and are current for any Stage 1 submissions to the GLA.

Recent alterations also include amendments to the 'Housing Supplementary Planning Guidance' (SPG) and 'Energy Planning' guidance, clarifying the CO₂ emissions reduction targets that currently apply and the changes that were introduced from 1st October 2016.

The target reduction in CO₂ emissions for Residential Buildings was uplifted on the 1st October 2016 to 'Zero Carbon' for Stage 1 applications. 'Zero Carbon' is defined as a 100% reduction in regulated CO₂ emissions compared to a Part L1A 2013 baseline. The policy states that at least 35% carbon reductions should be achieved on-site, with the remainder achieved by a cash in lieu payment (currently set at £1,800 per tonne of CO₂ of remaining emissions to achieve a total reduction of 100%).

The target reduction in CO₂ emissions for 'Non-Domestic Buildings' remains at 35% over Part L2A 2013.

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

- Policy 5.2 Minimising carbon dioxide emissions
- Policy 5.6 Decentralised energy in development proposals
- Policy 5.7 Renewable energy
- Policy 5.9 Overheating and cooling

3.2.1. Policy 5.2 Minimising carbon dioxide 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
- ii. Be clean: supply energy efficiently
- iii. Be green: use renewable energy

Major developments should meet the targets for carbon dioxide emissions reduction in buildings set out in the GLA Energy Planning Guidance (currently 100% for Domestic Buildings and 35% for Non-Domestic Buildings). Where it is clearly demonstrated that the specific targets cannot be fully achieved on-site, any shortfall may be provided off-site or through a cash in lieu contribution to the relevant borough.

3.2.1.1. SAP 10

Grid supplied electricity has significantly decarbonised since the last update to Approved Documents L1 and L2 in April 2014. In July 2018 the Government published SAP 10, which includes updated carbon emission factors reflecting this change. These new emission factors will however not be incorporated into Approved Documents L1 and L2 until the Government has consulted on new Building Regulations.

The GLA has decided that from January 2019 planning applicants are encouraged to use the SAP 10 emission factors when estimating CO₂ emission performance against London Plan policies. This will ensure that the assessment of new developments better reflects the actual carbon emissions associated with their expected operation. This approach will remain in place until Government adopts new Building Regulations with updated emission factors, the timeline for which has yet to be confirmed.

3.2.2. Policy 5.6 Decentralised energy in development proposals

This policy requires development proposals to evaluate the feasibility of CHP systems and, where a new CHP system is appropriate, to examine opportunities to extend it beyond the site boundary to adjacent sites.

It requires major development proposals to select energy systems in accordance with the following hierarchy:

1. Connection to existing heating or cooling networks
2. Site-wide CHP network
3. Communal heating and cooling.

3.2.3. Policy 5.7 Renewable energy

This policy requires major development proposals to provide a reduction in expected CO₂ emissions through the use of on-site renewable energy generation, where feasible, and within the framework of the energy hierarchy set out in Policy 5.2.

3.2.4. Policy 5.9 Overheating and cooling

This policy states that major development proposals should reduce potential overheating and reliance on air conditioning systems and demonstrate this in accordance with a cooling hierarchy:

1. Minimise internal heat generation through energy efficient design
2. Reduce the amount of heat entering a building in summer through orientation, shading, albedo, fenestration, insulation and green roofs and walls

3. Manage the heat within the building through exposed internal thermal mass and high ceilings
4. Passive ventilation
5. Mechanical ventilation
6. Active cooling systems (ensuring they are the lowest carbon options). Further guidance is given in the London Climate Change Adaptation Strategy.

3.2.5. Local Policy: Hillingdon Council

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

3.2.6. Project policy

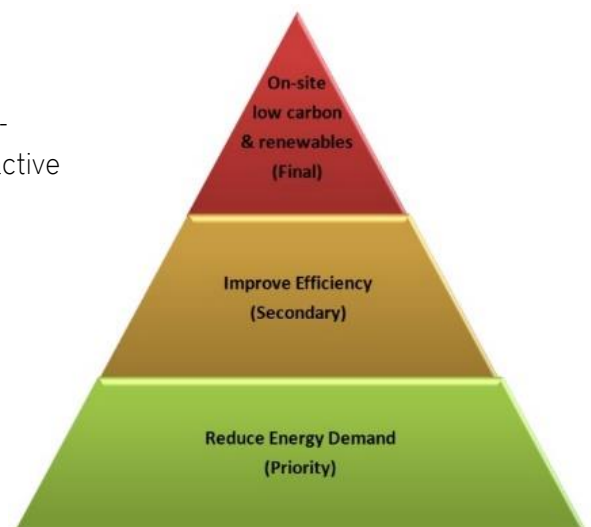
Planning policy leads to a target reduction equal to 35% of the Regulated CO₂ emissions compared to 2013 Building Regulations. Where it is clearly demonstrated that the specific targets cannot be fully achieved on-site, any shortfall will be provided off-site or through a cash in lieu contribution to the relevant borough. For the purpose of these calculations SAP 10 carbon emission factors have been applied throughout.

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. 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 L2A of the Building Regulations (2013) without reliance on the contribution of renewable technologies.

The following energy-efficient design measures are proposed:

	Proposed development	L2A 2013 requirements
Ground Floor U-value (W/m ² K)	0.18	0.25
External wall U-value (W/m ² K)	0.22/0.23	0.35
Roof U-value (W/m ² K)	0.14	0.25
Window U-value (W/m ² K)	1.20	2.20
Door U-value (W/m ² K)	1.80	2.20
Roof light U-value	2.00	2.20
Air permeability	5/15 m ³ /h.m ²	10 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 the Non-domestic Building Services Compliance Guide:

	Proposed development	L2A 2013 requirements
General lighting	1.5W/m ² at 100 Lux	> 60 luminaire lumens per circuit Watt
Heating & cooling (Sales Area)	High efficiency gas boiler SCOP >0.92 With air circulation SFP 0.3 W/l/s	Gas boiler SCOP >0.91 SFP <1.5
Heating (Community Centre)	High efficiency gas boiler SCOP >0.9	Gas boiler SCOP >0.91

Heating (All other Areas)	High efficiency gas boiler SCOP >0.92	Gas boiler SCOP >0.91
Domestic hot water	High efficiency gas boiler SCOP >0.96	Gas boiler SCOP >0.91

5.1. Overheating risk analysis

All developments are required to undertake an analysis of the risk of overheating. In accordance with Building Regulation requirements all plots within this development will pass Criterion 3 of Approved Documents L1A and L2A: limiting the effects of heat gains in summer.

In addition to Building Regulations compliance, this development will meet the following GLA overheating requirements:

GLA overheating requirements	
Domestic developments	Non-domestic developments
At pre-application stage	
Complete Section 1 of the Domestic Overheating Checklist (see Appendix A) and submit it with the preliminary energy information provided to the GLA.	Outline in the preliminary energy information how the overheating risk will be minimised (see below).
At Stage 1	
Review Section 1 and complete Section 2 of the Domestic Overheating Checklist. The full checklist should be included in the energy assessment.	Undertake dynamic overheating modelling in line with the guidance and data sets in CIBSE TM52 and TM49 respectively
Undertake dynamic overheating modelling in line with the guidance and data sets in CIBSE TM59 and TM49 respectively.	Provide evidence of how the development performs against the overheating criteria along with an outline of the assumptions made in the energy assessment.
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Stage 2 onwards	

Ensure that the results of the overheating analysis continue to be incorporated into the building design discussions as the design evolves.

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5.2. Measures to reduce overheating risk within the non-domestic development

The following measures are recommended to be incorporated at detailed design stage:

- Reduce the amount of heat entering the building in summer: For example, through use of carefully designed shading measures, including balconies, louvres, internal or external blinds, shutters, trees and vegetation.
- Use of thermal mass and high ceilings to manage the heat within the building: Increasing the amount of exposed thermal mass can help to absorb excess heat within the building.
- Introduce or increase passive ventilation: For example, through the use of openable windows, shallow floorplates, dual aspect units, designing in the 'stack effect'.
- Introduce or increase mechanical ventilation: Mechanical ventilation can be used to make use of 'free cooling' where the outside air temperature is below that in the building during summer months. This will require a by-pass on the heat recovery system for summer mode operation.
- Minimise internal heat generation through energy efficient design: For example, heat distribution infrastructure within buildings should be designed to minimise pipe lengths, particularly lateral pipework in corridors of apartment blocks, and adopting pipe configurations which minimise heat loss e.g. twin pipes.

6. Energy efficient systems (“be clean”)

6.1. 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.

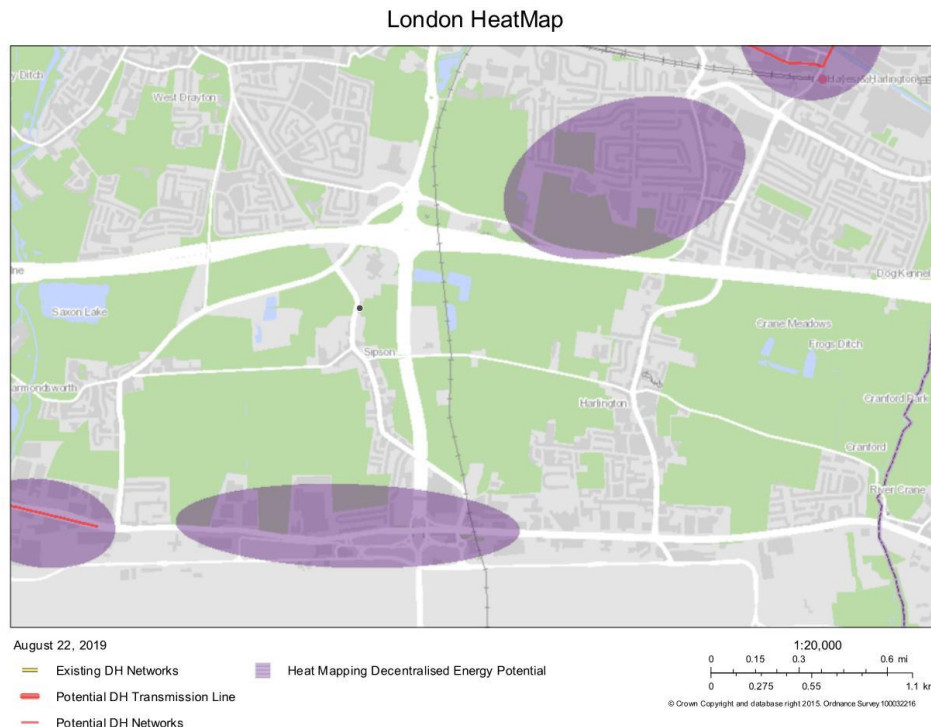
6.2. District heating networks

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 an area designated as having potential for a future network.



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

7. Low and zero carbon energy sources (*"be green"*)

7.1. 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.

7.2. 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.

Heat pumps are a very good option for sites not connected to the gas network, or as a replacement of existing electric or oil fired heating systems. When assessed against a gas

central heating system on cost verses potential CO₂ savings a heat pump will perform less favourably¹.

7.3. 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. This means the resultant CO₂ and cost savings in a home with a gas boiler will be relatively low.

7.4. 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.

7.5. 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

¹ Based on SAP 2012 carbon emission factors

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.

7.6. Proposed low and zero carbon energy sources

With emissions within the dwellings already reduced through an enhanced fabric and energy efficient systems, it is proposed that further reduction will be achieved through the installation of a biomass boiler this will save 20 tonnes of CO₂ a year.

8. Results: Calculated CO₂ savings

Table 1: 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)	
	Regulated	Unregulated
Baseline: Part L 2013 of the Building Regulations Compliant Development	41	8.7
After energy demand reduction	41	8.7
After heat network / CHP	41	8.7
After renewable energy	20	8.7

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

	Regulated non-domestic carbon dioxide savings	
	(Tonnes CO ₂ per annum)	(%)
Savings from energy demand reduction	0	0
Savings from heat network / CHP	0	0
Savings from renewable energy	20	50
Total Cumulative Savings	20	50

Table 3: Shortfall in regulated carbon dioxide savings

	Annual Shortfall (Tonnes CO ₂)	Cumulative Shortfall (Tonnes CO ₂)
Total Target Savings	14	
Shortfall	0	0

8.1. Site total

Table 4: Site wide regulated carbon dioxide emissions and savings

	Total regulated emissions (Tonnes CO ₂ /year)	CO ₂ savings (Tonnes CO ₂ /year)	Percentage saving (%)
Baseline: Part L 2013 of the Building Regulations Compliant Development	41		
After energy demand reduction	41	0	0
After heat network / CHP	41	0	0
After renewable energy	20	20	50%
		CO ₂ savings off-set (Tonnes CO ₂)	
Off-set		0	

9. Appendix A: BRUKL reports

10. Appendix B: SAP 10 carbon emissions reporting spreadsheet