Mendick Waring Limited

Francis Gardner House, London

Energy and Sustainability Statement

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1.0 Executive Summary

This report has been prepared by MWL to describe the energy & sustainability strategy for a refurbishment proposal, called Francis Gardner House, in order to be used as part of a planning application to Camden Borough Council.

The scheme comprises of a non-domestic student accommodation development in West Hampstead, London. The proposals aim to reconfigure the existing cluster flats into higher quality studios, as well as add an additional storey.

This document seeks to address the proposed implementation of measures to improve the energy performance of the site as part of the refurbishment.

Requirements, Energy Efficient Features and Approach

In accordance with Building Regulations Part L2B (2010 edition with 2010, 2011, 2013 and 2016 amendments) consideration must be taken when renovating an existing building.

The refurbished building is not required to achieve a Dwelling CO_2 Emission Rate (BER) below the notional Target CO_2 Emission Rate (TER), however must comply with the minimum fabric & system requirements as set up in Part L2B.

Developments should be assessed for their potential to contribute to the local community, and to ensure that they provide a sufficient and balanced contribution across each of the social, economic and environmental sectors.

The proposed strategy follows a best practice approach, based on the following Energy Hierarchy:

- Use less energy 'Be Lean'
- Supply energy efficiently 'Be Clean'
- Use Renewable Energy 'Be Green'

The fabric will be ensured to meet the requirements of Part L2B, in terms of both retained and new thermal elements.

Active design measures have then been incorporated via energy efficient building services.

Efficient energy use and distribution is assured by upgrading the existing outdated heating and hot water systems with an all electric system for heating and hot water. Space heating will be provided via panel heaters to the studios, with comfort heating and cooling for the communal spaces.

The student accommodation will benefit by using a LTHW communal Air Source Heat Pumps (ASHPs) system along with a thermal buffer vessel, which will provide space heating and hot water to the studios (with the use of plate heat exchangers).

Ventilation requirements will be met via MVHR (Mechanical Ventilation Heat Recovery) to all internal rooms and dMEV (Destabilised Mechanical Extract Ventilation) for all wet rooms.

The provision of the afore mentioned services constitutes a significant upgrade the mechanical and electrical performance of the development.

The proposed improvements will modernise and future proof the building, comprising of a gas free future forward system in line with the direction of emerging energy policy.

2.0 Site Location and Development Proposal

The Francis Gardner House site is located at 89-91 West End Lane, London, and falls within the jurisdiction of London Borough of Camden. The site is approximately 940 m^2 in area.

The site is located in a predominantly residential area, between the large King's Gardens Mansion building and smaller residential properties. The building effectively presents two elevations to the street.

Beyond the site boundaries the site is predominantly surrounded by relatively dense residential blocks, with other uses such as commercial also present that in combination form the London Borough of Camden.

The proposed scheme improves and increases the student accommodation provision on the site. The existing building has 67 bedspaces shared over a mixture of cluster apartments and a limited number of studios. In the proposed scheme the internal layouts are reconfigured to provide 72 total bedspaces for students.

The existing lounge, gym and entertainment area in the lower ground floor level are to be refurbished. A new lounge area is proposed on the upper floor level to promote space for students to connect and socialise.

Other amenities have also been improved with a secure internal bicycle store and bin store at ground floor level. A study room is provided on each floor level from 1st -4th providing students with extra break-out space for studying.

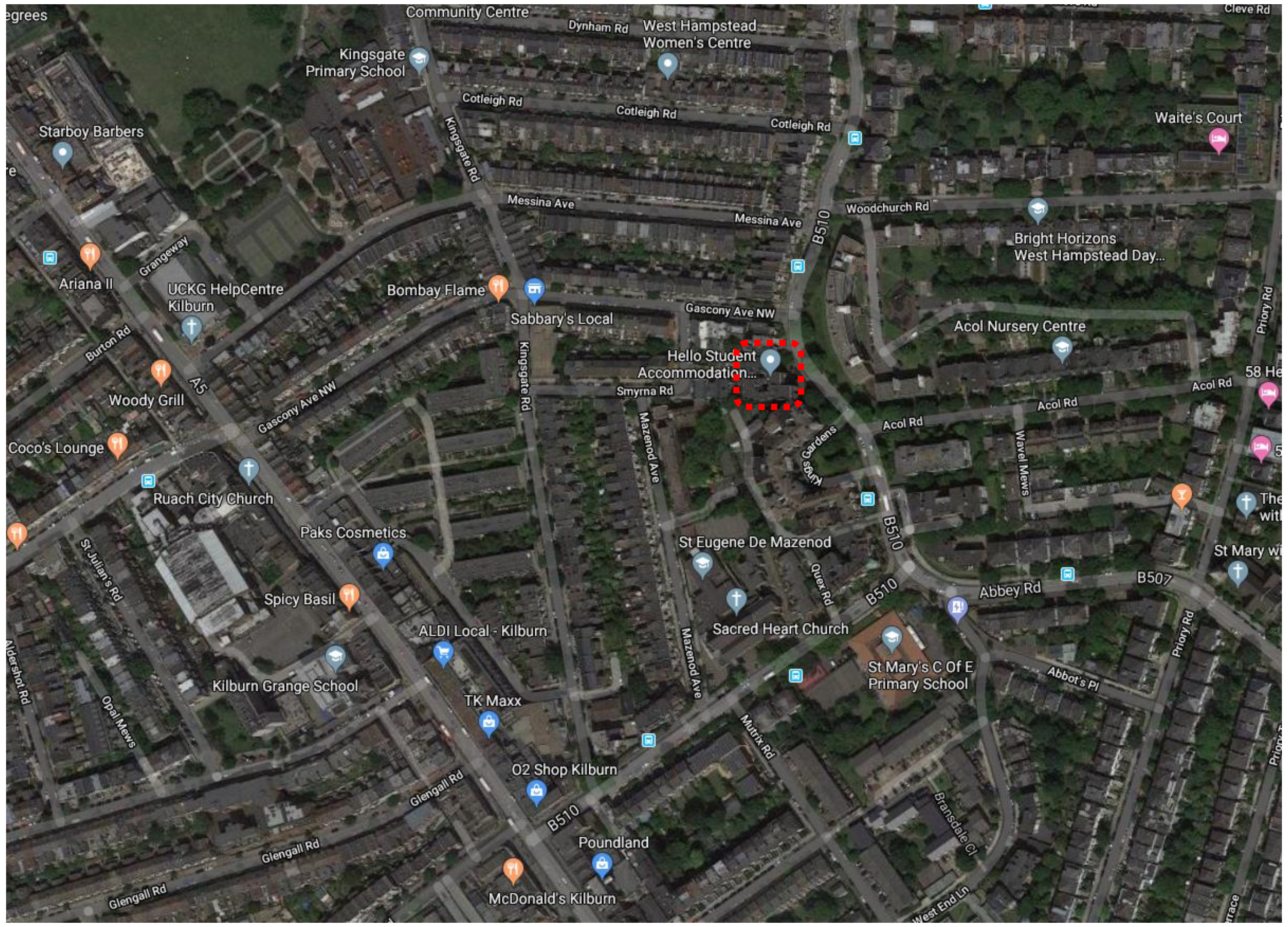


Figure 1: Site Location

3.0 Policy Context

In this section of the report, National, Regional and Local planning policies and requirements are presented.

The following policies apply in the local area:

National Planning Policy Framework (July 2021)

Policy 14. Meeting the challenge of climate change, flooding and coastal change:

151. 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
>
> c) 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.

152. Local planning authorities should support community-led initiatives for renewable and low carbon energy, including developments outside areas identified in local plans or other strategic policies that are being taken forward through neighbourhood planning.

153. In determining planning applications, local planning authorities should expect new development to:

> a) comply with any development plan policies on local requirements for decentralised energy supply unless it can be demonstrated by the applicant, having regard to the type of development involved and its design, that this is not feasible or viable; and
>
> b) take account of landform, layout, building orientation, massing and landscaping to minimise energy consumption.

London Plan (March 2021)

After a rigorous process of consultation and Examination in Public, the up to date London Plan has been published in March 2021.

Policy SI 2: Minimising greenhouse gas emission

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

1. Be lean: use less energy.
2. Be clean: supply energy efficiently and cleanly, exploit local energy resource.
3. Be green: maximise use of renewable energy.

Camden Borough Council Requirements (Camden Local Plan, Camden CPG documents and Camden Student Housing Guidance)

With specific regards to the energy & sustainability requirements, the following policies of Camden Borough Council apply in this development:

The draft Camden Student Housing Guidance (November 2018) refers to new build student housing as falling under Part M2 of the building regulations for "buildings other than dwellings", which means that the proposed Francis Gardner House development should comply with Part L2B of Building Regulations.

According to Camden Borough Council's policies, for new-build major non-residential developments, applicants must submit an energy statement showing how the development will meet the following policy requirements:

- Policy CC1 (Climate Change Mitigation) requires all major developments to assess the feasibility of connecting to an existing decentralised energy network, or where this is not possible establishing a new network.
- Policy CC1 (Climate Change Mitigation) also expect all developments to optimise resource efficiency.

Policy CC2 (Adapting to Climate Change) requires all development should adopt appropriate climate change adaptation measures such as:

- The protection of existing green spaces and promoting new appropriate green infrastructure;
- Not increasing, and wherever possible reducing, surface water runoff through increasing permeable surfaces and use of Sustainable Drainage Systems;

- Incorporating bio-diverse roofs, combination green and blue roofs and green walls where appropriate; and

As part of Policy CC2, applicants are also expected to submit a sustainability statement - the detail of which to be commensurate with the scale of the development ensuring that:

- The developments will demonstrate how adaptation measures and sustainable development principles have been incorporated into the design and proposed implementation.

In addition to the above, based on Energy Efficiency and Adaptation CPG document:

- Natural 'passive' measures should be prioritised over active measures to reduce energy.

- All new major developments in Camden are expected to assess the feasibility of decentralised energy network growth.

- All developments should seek opportunities to make a positive contribution to green space provision or greening.

- Active cooling (such as air conditioning) is discouraged, unless the applicant can demonstrate exceptional circumstances where opportunities for cooling are unable to be controlled through passive measures alone.

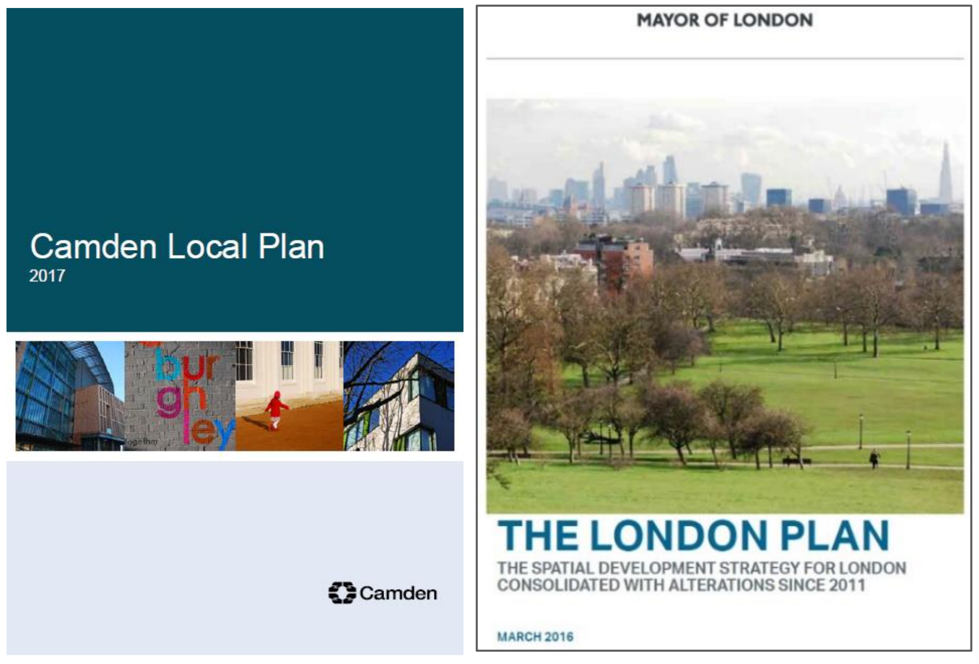


Figure 2: Camden and London Plan Policies

Approved Document Part L2B

The proposed refurbishment will be designed with regard to the requirements set out in the Approved Document Part L2B, which provides:

- Guidance for both new and retained thermal elements in the case of existing buildings. There are standard fabric parameters which should be considered.

- Guidance for the proposed building services in the case of existing buildings. There are standard requirements in terms of performance and controls, which should be considered.

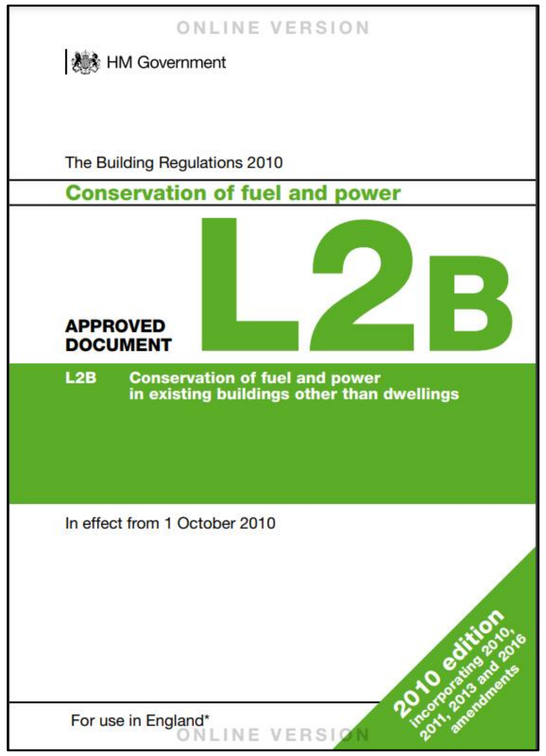


Figure 3: Approved Document Part L2A of Building Regulations

Future Part L Policy

The changes to the electricity related carbon emissions may be the most significant factor of the new policy, reducing from 0.519 kgCO2/kWh to 0.233 kgCO2/kWh, now only slightly higher than mains gas (0.210 kgCO2/kWh). Current policy assumes that electricity used produces 2.4 times the carbon emissions of mains gas. Electricity CO2 emissions factor in the new policy falls by 55% which means homes heated by direct electric systems will produce virtually the same CO2 emissions as gas, while heat pumps will produce even less. This will prompt a rethink of the approach to heat networks and could weaken the case for using gas-fired combined heat and power (CHP). Heat pumps will have a huge benefit of this change and their use will be increased. All the above reflects the rapid decarbonisation of the National Grid.

The proposed internal refurbishment works fall within permitted development (PD), and as such the development is not considered to be subject to any targets regarding carbon emissions or energy performance.

The site will follow relevant Part L2B guidance and provide services in line with current direction of energy policy.

4.0 Energy Efficient Design

Carbon reduction and energy performance have been addressed through measures developed in line with the energy hierarchy. This includes:

Passive Design: Facades retained and enhanced, as well as the provision of new windows.

Efficient Ventilation Systems: The main communal occupied areas and studios will have Mechanical Ventilation system with Heat Recovery (MVHR). MVHR is able recoup heat from exhaust air that would otherwise be wasted.

The wet rooms will have Decentralised Mechanical Extra System (dMEV) with a low Specific Fan Power.

Energy Efficient Lighting: All lighting will be low energy and efficient.

Low and Zero Carbon Technologies: The development will benefit from renewable energy through the use of efficient Air Source Heat Pump system for providing hot water.

5.0 Design Specifications

Passive Design

New thermal elements:

Thermal Element	Standards for New Thermal Elements by Part L2B	Proposed Fabric Parameters
External Wall	0.28 W/m²K	0.28 W/m²K
Roof	0.18 W/m²K	0.18 W/m²K
Windows to studios	1.60 W/m²K	1.60 W/m²K
Other Windows	1.80 W/m²K	1.80 W/m²K
High Usage Entrance Doors	3.50 W/m²K	3.50 W/m²K
Other Doors	1.80 W/m²K	1.80 W/m²K

The above table includes the proposed specification for any new thermal elements.

All the retained thermal elements have to follow the improved U-Values of the table below (table 5 of Part L2B Building Regulations), if their current existing U-Value is above the threshold U-Values (of the table below).

Table 5 **Upgrading retained thermal elements**

Element[1]	**U-value W/(m².K)**	
	(a) Threshold	**(b) Improved**
Wall – cavity insulation	0.70	0.55[2]
Wall – external or internal insulation	0.70	0.30[3]
Floors[4,5]	0.70	0.25
Pitched roof – insulation at ceiling level	0.35	0.16
Pitched roof – insulation at rafter level[6]	0.35	0.18
Flat roof or roof with integral insulation[7]	0.35	0.18

Active Design

All Services:

Services	Proposals
Space Heating	Electric Panels Heaters for the studio accommodation Comfort heating and cooling to communal areas
Hot Water	Air Source Heat Pump System
Cooling	Comfort heating and cooling to communal areas plus separate cooling unit for comms area
Ventilation	MVHR (Mechanical Ventilation Heat Recovery) to all internal rooms dMEV (Destabilised Mechanical Extract Ventilation) for all wet rooms
Lighting	Low Energy Lights

The above specifications meet the relevant current regulatory requirements, whilst also providing a gas free development, in line with future energy policy and to take advantage of the decarbonisation of mains electricity.

6.0 Low and Zero Carbon Technologies

This section of the report defines all LZC technologies and identifies the ones which are considered feasible.

Wind Energy

Although wind turbines can generate up to 3MW of electricity, smaller units are available generating between 0.5 kW to 6.0 kW. The area would need to be accessed to establish the practicality of installing a wind turbine. Electricity is generated in DC and requires an inverter to convert to AC to operate domestic appliances. Where electricity is generated but not required, it can be sold to the local electricity company.

Given the location and the wind speed available provides minimal feasible electrical generation and as such has been discounted. It should also be noted there are a number of considerations with regards to daylight impact on the surrounding buildings, further providing rational for discounting wind technology.

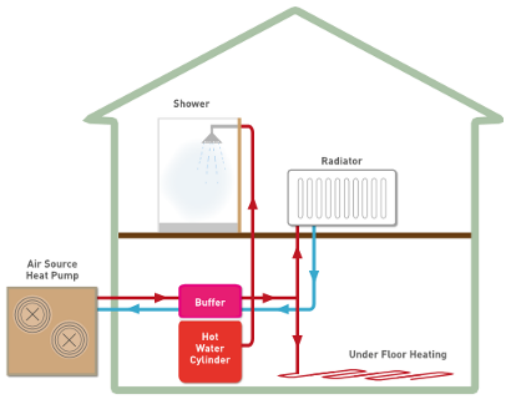
<u>This technology is not considered feasible for the development.</u>

Air Source Heat Pump

Air Source Heat Pumps (ASHP) provide an efficient method of providing space heating and cooling requirements. Heat is absorbed from the air into liquid via a heat exchanger where 'useful' heat is extracted and absorbed. Low grade heat is then extracted by a refrigeration system, compressed and concentrated to temperatures suitable for space heating and hot water requirements.

While ASHP utilise electricity to generate this process, the heat gained is taken directly from the available air and produces fewer greenhouse gases when compared to a conventional gas system.

ASHP have been classified as a renewable system under the European Directive on 'Promotion of Renewable Energy Sources' and Policy SI of the London Plan 2021.

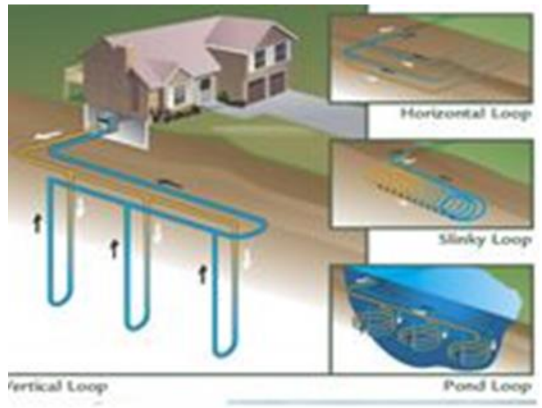


ASHP and associated plant require annual maintenance and adequate space for condensing units. Expected lifetimes range from 7-10 years.

<u>Air Source Heat Pump has been considered as a viable option to provide hot water to the development.</u>

Ground Source Heat Pump

A Ground Source Heat Pump (GSHP) transfers energy from the ground to the building to provide space heating or pre-heating of domestic hot water. Unlike wind and solar heating, it requires an electrical input, however, the heat recovered is three to four times the required electrical input. Heat is transferred from the ground using a ground loop, which can either be within a vertical borehole arrangement or laid as coils in a horizontal trench. The heat pump works in the same way as a domestic refrigerator in reverse, by extracting heat from the borehole/trench to evaporate the refrigerant on the heat pump circuit. Heat is then input to the building as the refrigerant condenses.

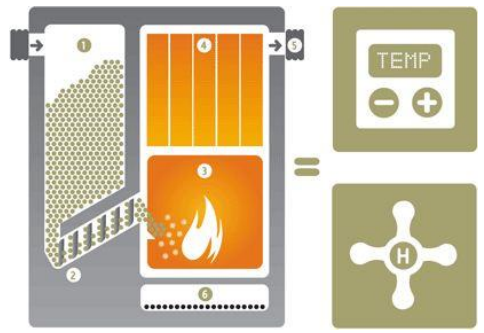


Any proposed GSHP would require the use of a large number of vertical boreholes across the site. Given the site's size, the piling of the foundations and the network pipes that run below ground, this has been discounted owing to practical constraints associated with GSHP.

<u>This technology is not feasible for the development.</u>

Biomass

Biomass boilers burn renewable fuel to generate hot water for direct use, or for heating purposes. The fuel they burn is renewable because it is in a constant carbon cycle. There are three main forms of biomass boilers available, namely those using wood chips as fuel, those using wood pellets as fuel and those using wood logs.



The operation and installation of Biomass requires additional plant space for the storage of solid fuel and design of access routes for delivery of fuel. Given the location of the development, this has been discounted owing to practical constraints associated with Biomass.

<u>This technology is considered not feasible for this scheme.</u>

Combined Heat & Power (CHP)

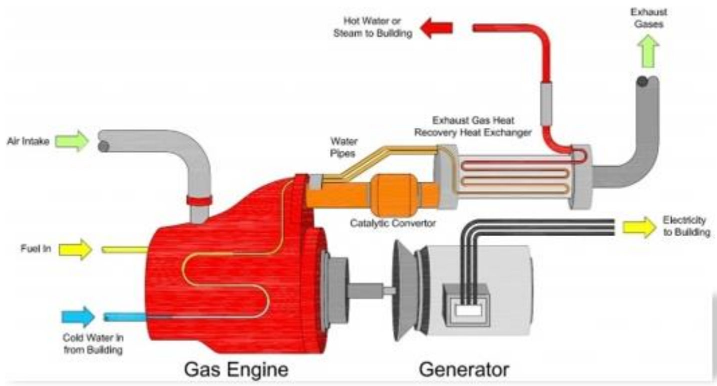
CHP effectively uses waste heat from the electricity generation process to provide useful heat for space and water heating; the advantage of this system is that it leads to higher system efficiencies when compared to a typical supply arrangement of grid-imported electricity and conventional boilers. A further advantage is that because electricity is generated close to the point of use, the losses incurred in High Voltage (HV) transmission are avoided. CHP is considered as a low carbon technology when fired by gas or fuel oil to generate electricity and provide heating and hot water. At this scale, a gas-fired reciprocating engine CHP is the preferred technology due to efficiency, maintenance and plant space considerations, and is well-proven with many successful installations in UK. CHP systems offer optimum carbon and cost savings when matched to the site electricity and heat load profiles such that the units see a high utilisation and make a significant contribution to the site's annual energy demands.

CHP units should be replaced every 15-17 years, with replacement timeframes subject to alteration pending regular maintenance and part failure.

Once an understanding of the site's heat and electricity demand profile has been established the designer is then faced with the task of deciding on the size of the CHP. There is no straightforward way to size a CHP. Some guidance recommends sizing only to meet the lowest demand that occurs — the base-load that will result in the longest running hours and the shortest payback period. However, this is not necessarily the most economically advantageous approach and certainly would limit the amount of CO_2 savings that could be achieved on a given site.

The most accurate models are hourly models simulated over a whole year with occupancy, heat, DHW and electricity demand profiles representing an average year. This is the recommended approach for new buildings where dynamic simulation modelling can be carried out.

Whereas in most engineering calculations it is possible to make simplifications that result in a conservative or a worst-case scenario, simplifying a CHP model generally will result in a more optimistic result (best case scenario) with respect to the CHP operating hours and hence the economic payback and efficiency, which is usually not the case.



<u>A CHP unit is considered not feasible due to the ongoing decarbonisation of mains electricity and upcoming Part L changes making ASHP a more viable option.</u>

Photovoltaics (PV Panels)

Photovoltaic (PV) panels create electricity from solar radiation with efficiency ranging between 5 and 19%. PV modules generally require minimal maintenance, usually consisting of a visual inspection and associated electrical testing. They have no moving parts and an expected lifetime of over 30-40 years. Manufacturers typically offer a warranty on power output of 20-25 years. PV modules have no operating emissions and produce no noise, making them the most benign zero-carbon technology.

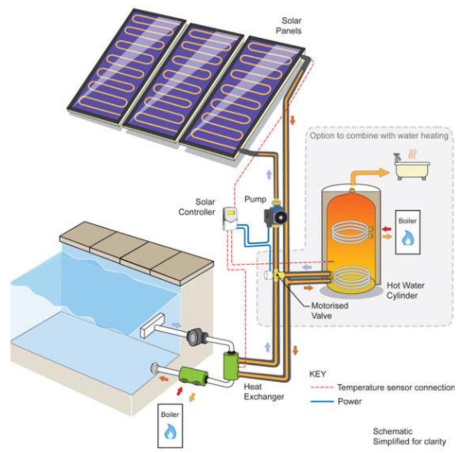
<u>Given that the proposed development already has renewables in the form of ASHP and there is a limit to roof space available in terms of space, weight loading and amenity provision, PV is not considered viable.</u>

Solar Thermal Collectors

Solar thermal collectors utilise solar radiation to heat water for use in water heating of a building. The radiation is converted using a solar collector, of which there are two main types available: Flat Plate and Evacuated Tube collectors. Evacuated tube systems occupy a smaller area and are more efficient, but also generally more expensive. Flat plate systems are cheaper to install but generally less efficient.

The solar coverage indicates what percentage of the annual domestic hot water energy requirement can be covered by a solar water heating system. The higher the solar coverage, the more conventional energy usage can be offset, but can cause excess heat generation in the peak summer months and generally lower the average collector efficiency. Therefore, solar coverage of 40-70% are recommended for most domestic applications and up to 40% in non-domestic buildings.

Solar thermal systems in the UK normally operate with a back-up fuel source, such as gas or electricity. The solar system pre-heats the water up to a maximum hot water temperature. If there is not enough solar power available to fully meet the required hot water load, then the back-up fuel system fires up to meet this short fall. The optimum orientation for a solar collector in the UK is a south facing surface, tilted at an angle of 30º from the horizontal. However, orientation is not critical, with azimuths of +/-30o from South and angles of +/-20o from 30o still achieve reasonable outputs.



For the solar water heating system to run safely and efficiently, a series of temperature sensors are connected to a digital solar controller to switch the system on or off according to the solar energy available. The roof area required depends on the efficiency of the modules specified and will vary depending on the product selected. This will be determined by the relevant contractor.

Given that ASHP have already been identified as the preferred option for providing hot water, solar thermal is considered a non-viable option for the development.

Summary of LZC feasibility study

The table, below, presents the result of the feasibility study carried out for the scheme.

Technology	End Use	Result
Wind Turbine	Electricity	NOT Feasible
Ground Source Heat Pumps (GSHP)	Thermal Energy	NOT Feasible
Air Source Heat Pumps (ASHP)	**Thermal Energy**	**FEASIBLE**
Biomass	Thermal Energy	NOT Feasible
Combined Heat & Power (CHP)	Electricity and Thermal Energy	NOT Feasible
Solar Hot Water	Thermal Energy	NOT Feasible
Photovoltaics	Electricity	NOT Feasible

Table 1: Summary of LZC Technologies

Connection to District Heating

As detailed under Policy SI 3 of the London Plan and the Camden Borough Council's policy, consideration should be made to provision of a Decentralised Energy (DE) Network, including specifically:

• Require developers to prioritise connection to existing or planned decentralised energy networks where feasible.

Having reviewed the London Heat Map, current proposals identify that the proposed development, does not lie within an area of opportunity.

A review of documentation at the time of writing has been undertaken with reports reviewed as follows:

• London Heat Map https://maps.london.gov.uk/heatmap

Figure 5: Site location in London heat map

The proposed Francis Gardner House development is located far from both existing and future potential District Heating Networks in London Borough of Camden (751 meters from the closest potential district heating network as per figure 5).

As such, the connection to any existing or potential district heating network **is not feasible.**

7.0 Conclusion

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