ME7

17 BRANCH HILL,
HAMPSTEAD, LONDON, NW3 7NA

RENEWABLE ENERGY STATEMENT AND SUSTAINABILITY REPORT FOR THE M&E SERVICES

JB/594 : October 2014

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INTRODUCTION

Our client is applying for planning permission to re-construct this family home and as part of the process; he is taking the opportunity to significantly enhance the sustainability of the rest of the house; including the potential for renewable technologies. 17 Branch Hill is proposed to be a new residential building which is to be constructed as a sustainable low carbon residential development, finished to a high quality and standard.

This report has been prepared by ME7 Ltd, to demonstrate how the development will achieve a low carbon status and covers the proposed sustainable design measures related to the building fabric and mechanical and electrical services.

The proposed building has been modelled using an accredited calculation methodology (SAP2012) and by an accredited energy assessor. Through use of appropriate passive and building fabric design as key points/measures below and energy saving measures, it is shown that the building will release lower net annual CO_2 emissions against baseline levels and satisfies the current Building Regulation Part L 2013, The London Plan requirements and Camden's Development Control DPD Policies; DP22 and DP23 plus Core Strategy document CS13 and CPG3.

Key points/measures proposed:

- A CO_2 reduction of 34.0% (Cumulative), for the site over the baseline; confirming that the proposed dwelling exceeds the requirements of Camden: Strategic Policies, The London Plan 2011 and the National Planning Policy Framework.
- A 37.0% DER/TER improvement over the minimum Part L 2013 Building Regulations (Regulated).
- 51.8 KW/Hr/M2 FEE – Fabric Energy Efficiency rating.
- Corresponding NOx emission reduction and inclusion of new efficient heating plant.
- A Code Sustainable Homes score of 68.56% - achieving Level 4 Design Stage certification from BRE; confirming the proposed house is a very sustainable dwelling.
- Reusing/recycling and salvage existing materials where possible.
- Greater than 50% reduction in surface water runoff from the site to the local sewer.
- Reducing water consumption through rainwater harvesting and flow restrictors.
- Utilisation of natural shading, orientation and planting.
- Fully insulating the building and providing double glazed windows to all windows – low U values.
- CO2 reduction – CHP for heat and power production.
- 87% of the space heating and hot water production to be provided by a low CO2 emitting CHP.
- Increase in air tightness to the building fabric – figure of 5M3/M2/Hr@50Pa.
- Heat recovery ventilation to some basement areas – 90% efficiency.
- New materials to be responsibly sourced and life cycle reviewed.
- Inclusion of a renewable energy system.
- Data logging/internal digital metering/control for efficient management of the building.

Owing to the above improvements over the minimum Part L requirements, the PEA (Predicted Energy Assessment – Outline EPC), the efficiency rating is Grade B (89) and the CO_2 impact rating is Grade B (90).

Included within the report is an appraisal of various renewable technologies, demonstrating their viability and appropriateness to the environment and nature of the development.

It is proposed that a gas fired CHP system will be suitable for providing lead heating and electricity to the occupied areas/hot water production, with gas boilers for back up and domestic hot water production/ main load. This combination will significantly reduce CO2 emissions and be well matched to the building, other renewable sources are not effective or suitable for the building.

The CHP system will reduce the CO_2 emissions, thereby increasing the PEA. All renewable and heat technologies are eligible for government backed FIT (Feed In Tariffs) payments for a period of 20 years. RHI details TBC for CHP.

Cooling is proposed to some parts of the house and only at peak ties, this will be provided by high efficiency ASHP (Air Source Heat Pump) with minimum efficiencies of 4.23 COP/3.57 EER.

A detailed description of the proposed electrical and mechanical systems is also included within the report, detailing the energy efficient and sustainable design measures to be incorporated.

Full assessment modelling/calculations/reports demonstrating compliance, including energy statement, SAP L1A and PEA (Pre-EPC); can be found in the main sections and appendices of this report.

The M&E proposals outlined in this report are in line with the London Plan Plan 2011, the National Planning Policy Framework, Camden's Development Control DPD Policies; DP22 and DP23, Core Strategy document CS13 and CPG3. The proposals also have regard to the guidance contained within CPG Sustainability (April 2011) and Building Regulations.

Section 1.0

RENEWABLE ENERGY STATEMENT

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ENERGY STATEMENT

OG: October 2014

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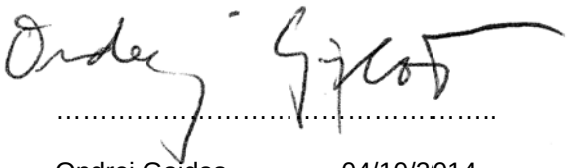
ENERGY STATEMENT

This Document has been prepared to confirm the Energy and Sustainability solutions for the related M&E Building Services.

For details of the proposed Development refer to Architect drawings and details.



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Ondrej Gajdos 04/10/2014

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I N D E X

DISCLAIMER

The findings, conclusions and recommendations of this report are based on the information supplied. ME7 Ltd disclaims responsibility in respect of incorrect information imparted to them or for the actual performance of any of the building services installations.

This Report is prepared for the use of 17 Branch Hill; a duty of care is not owed to other parties.

EXECUTIVE SUMMARY

ME7 Ltd have been appointed to provide an Energy Statement for the proposed development.

This statement covers possible active and passive measures including renewable energy sources to make this development sustainable and environmentally friendly.

Specific requirements of London Plan on Energy Efficiency and Renewable Energy will be met through a combination of passive design features, energy efficient building services and low carbon energy sources. The target is to achieve reduction in regulated CO2 emissions of at least 35%. This is to comply fully with the London Plan Policies, to meet mandatory credits for CSH Level 4 and to ensure, that the "Energy Hierarchy" is followed. This document has been prepared in line with the GLA Energy Team Guidance on Planning Energy Assessments.

Baseline and all estimated energy consumptions have been calculated using full SAP 2012 assessment of the development in accordance with Part L procedures.

The table below shows a summary of energy requirements for baseline scheme and reduction proposed to be achieved by passive measures, efficient services and on-site renewable energy sources.

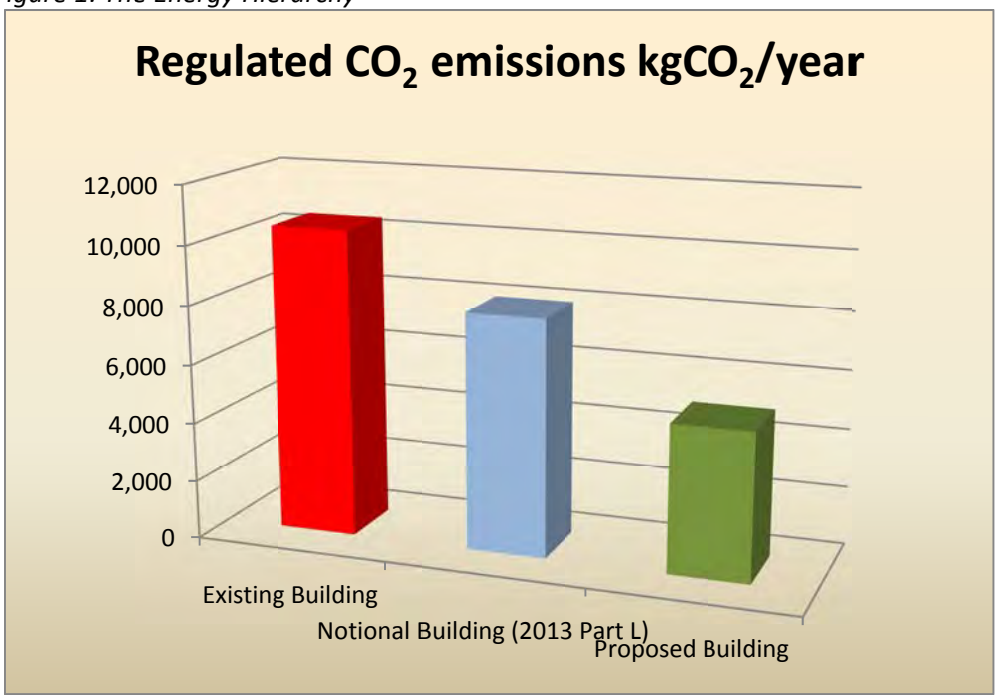
Table 1: Carbon Dioxide Emissions after each stage of the Energy Hierarchy

	Carbon dioxide emissions (kg CO2 per annum)		
	Regulated	Unregulated	Total
Existing Building	10,458	3,495	13,953
Notional Building (2013 Part L compliant)	8,031	4,180	12,212
Proposed Building	5,023	4,180	9,203

Table 2: Carbon Dioxide Savings from each stage of the Energy Hierarchy

	Carbon dioxide savings (kg CO2 per annum)		Carbon dioxide savings (%)	
	Regulated	Total	Regulated	Total
Savings from energy demand reduction	2,426	1,741	23.2	12.5
Savings from CHP	3,009	3,009	37.5	24.6
Total Cumulative Savings	5,435	4,750	52.0	34.0

Figure 1: The Energy Hierarchy



Recommended passive design measures and energy efficiency measures to reduce CO_2 emissions will include:

- Enhanced fabric and materials of exposed thermal elements. The thermal efficiency of the building is a major consideration by the applicants and designers. It is intended that the U-values of the external thermal elements shall be targeted toward following values:

  External walls: 0.16 W/m^{2}K

  Basement walls: 0.16 W/m^{2}K

  Roofs: 0.13 W/m^{2}K

  Basement floor: 0.13 W/m^{2}K

  Windows and rooflights: 1.3 W/m^{2}K

  Entrance doors: 1.0 W/m^{2}K

  Air Permeability Rate: 5 m^3/h/m^2 (@50 Pa)

  Accredited construction details where applicable, lintels with linear heat loss coefficient (Psi value) of 0.05 W/mK (e.g. Keystone Hi-Therm lintels or similar)

- Efficient services, including:

  Heat recovery ventilation with demand control, where applicable (PIR and CO2 sensors)

  High efficiency condensing boilers, minimum 89% SEDBUK 2009 seasonal efficiency

  Heating with time and temperature zone control and weather compensation control

Further reduction in CO2 emissions will be achieved by CHP (1 No Viessmann Vitobloc EM-5/13). The above specification will achieve 37% reduction in DER against TER under 2013 Part L1A.

1. INTRODUCTION

1.0 Background

ME7 Ltd have been appointed to provide an Energy Statement for the proposed development.

This statement covers possible active and passive measures including renewable energy sources to make this development sustainable and environmentally friendly.

1.1 Description of the Site

The proposals include the demolition of the existing house on site, and the erection of a new, high quality single family 6-bedroom dwelling with basement, lower ground, ground, first and second floor.

2. PLANNING FRAMEWORK

3.1 National Policy

Joining over 170 other nations the UK has committed to reduction of carbon dioxide emissions, with consequent constraints to its energy policy. The UK produced four percent of the world's greenhouse gases as of 2003. The long term reduction goal for carbon emissions is 60 percent decrease by the year 2050. According to Energy Review issued by Government in 2002 it was recommended that renewable sources should contribute 20% of energy generation by 2020. These figures were incorporated in Planning Policy Statement Note 22: Renewable Energy (2004) which became a base for local planning policies.

3.2 The London Plan

The London Plan is the name given to the Mayor's spatial development strategy. The aim is to develop London as an exemplary sustainable world city, based on three interwoven themes.

- Strong, diverse long term economic growth
- Social inclusivity to give all Londoners the opportunity to share in London's future success
- Fundamental improvements in London's environment and use of resources.

Specific requirements on development sustainability are set out in policy 5.2 of the London Plan :

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

Be lean: use less energy
Be clean: supply energy efficiently
Be green: use renewable energy

From 2013 it is required that new developments achieve 35% reduction in emission rates against the 2013 building regulations TER (target emission rate)

3. BASELINE ENERGY CONSUMPTION AND CO_2 EMISSIONS

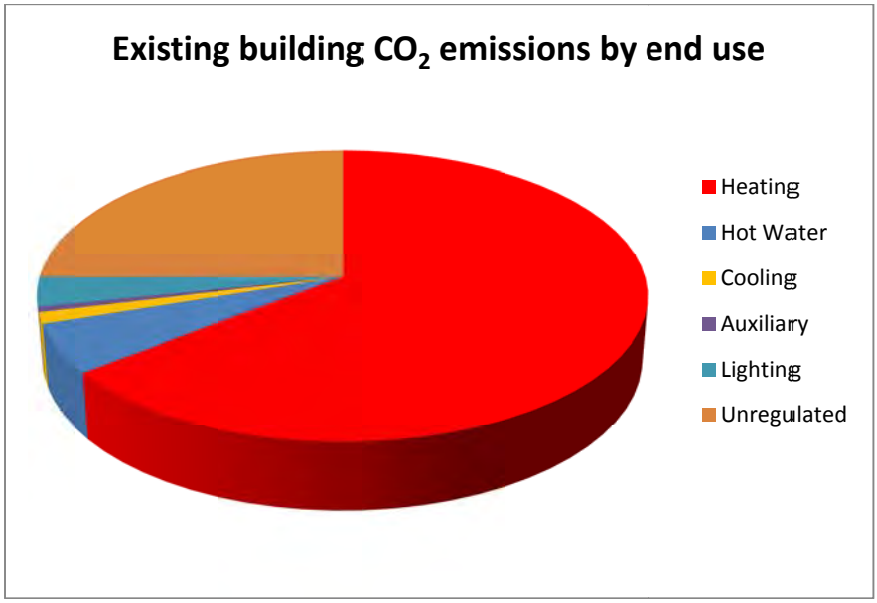
Energy assessment using SAP 2012 has been carried out for the existing house with the following input data (values are typical for a house built under 2002 building regulations)

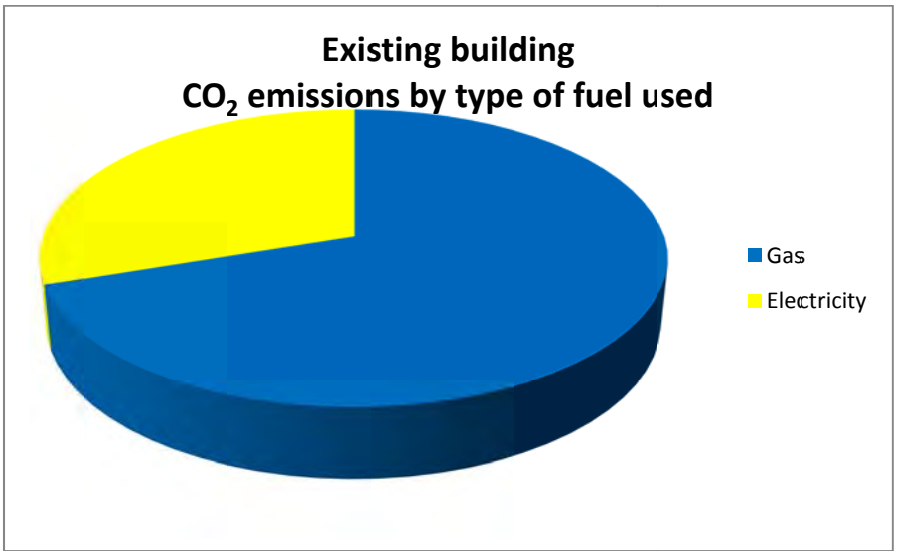
External walls:	0.35
Basement walls:	0.35
Roofs:	0.25
Basement floor:	0.25
Windows, rooflights and external doors:	2.00
Enhanced and Accredited construction details where applicable	No
Air Permeability	10
Main Space Heating	Gas boiler with 88% seasonal efficiency, programmer, room thermostat and TRV's
DHW System	500 L indirect DHW cylinder
Space Cooling System	A-rated multi-split ASHP with variable speed compressor
Ventilation System	Natural
Energy Efficient Lighting	25%

As a result of the existing house assessment, the following values of energy and CO_2 emissions have been obtained. SAP 2012 carbon emission factors have been used for CO_2 emissions calculation.

Existing building energy consumption and CO_2 emissions by end use

	Delivered Energy		Emissions
	kWh/annum	Fuel	kgCO_2/annum
Heating	41,614	Gas	8,989
Hot Water	3,501	Gas	756
Cooling	333	Electricity	173
Auxiliary	165	Electricity	86
Lighting	876	Electricity	455
Unregulated	6,734	Electricity	3,495
Total:	53,222		13,953


Existing building CO_2 emissions by end use
Heating
Hot Water
Cooling
Auxiliary
Lighting
Unregulated


Existing building
CO_2 emissions by type of fuel used
Gas
Electricity

4. PASSIVE DESIGN MEASURES AND EFFICIENT SERVICES (BE LEAN)

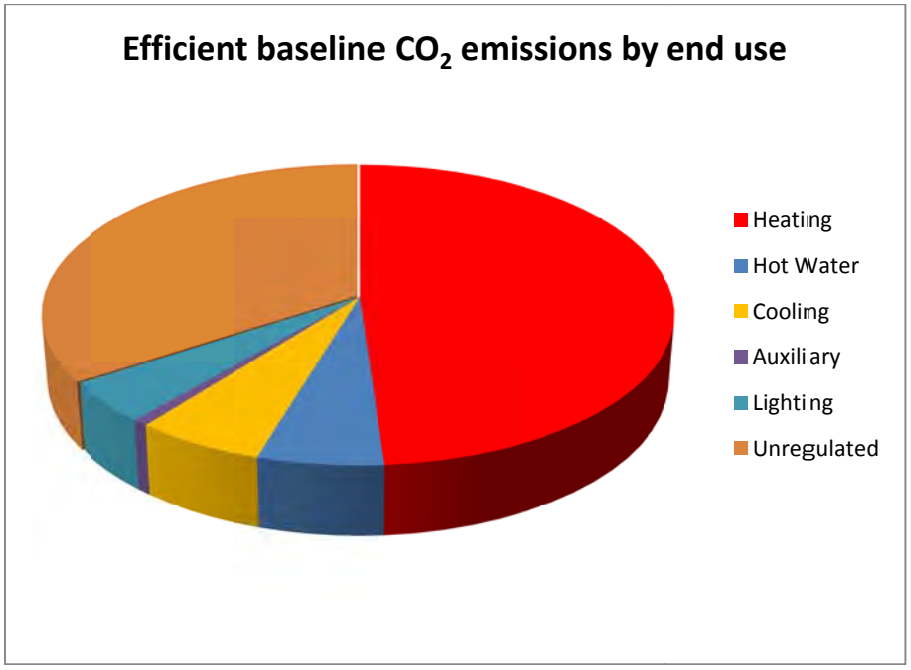
Number of passive design measures and measures improving energy efficiency of building services are proposed for the newly constructed house to help to reduce the CO2 emissions:

External walls:	0.16
Basement walls:	0.16
Roofs:	0.13
Basement floor:	0.13
Windows, rooflights and external doors:	1.40
Enhanced and Accredited construction details where applicable	Yes, Lintels with linear heat loss coefficient Psi-value of 0.05 W/mK
Air Permeability	5
Main Space Heating	High efficiency condensing boilers, minimum 90% seasonal efficiency, time and temperature zone control and weather compensation control
DHW System	500 L indirect DHW cylinder
Space Cooling System	A-rated multi-split ASHP with variable speed compressor
Ventilation System	Natural
Energy Efficient Lighting	100%

Following figures have been obtained as a result of modelling the building with all the above mesures incorporated. The building with the above specification complies with 2013 Part L1A.

Efficient Baseline energy consumption and CO_2 emissions by end use

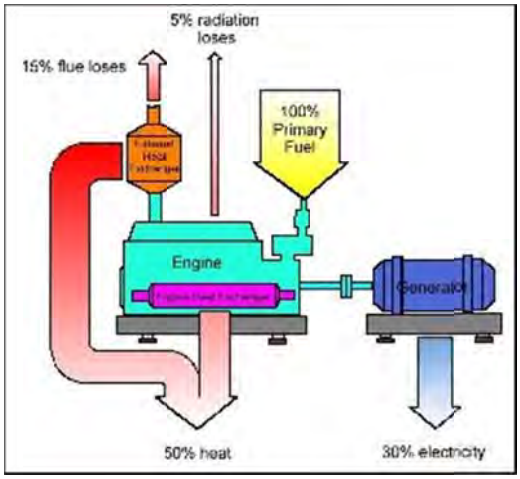
	Delivered Energy		Emissions
	kWh/annum	Fuel	kgCO_2/annum
Heating	27,640	Gas	5,970
Hot Water	3,254	Gas	703
Cooling	1,395	Electricity	724
Auxiliary	165	Electricity	86
Lighting	1,057	Electricity	548
Unregulated	8,055	Electricity	4,180
Total:	41,566		12,212



5. COMBINED HEAT AND POWER (BE CLEAN)

- **General information**

Although not using any renewable energy source, gas CHP helps to reduce CO2 emissions by delivering heat and electricity locally and reducing the losses that normally occur by conventional power plants. Produced electricity can be exported to grid if the on-site demand is lower than production.



Ceramic fuel cells deliver the same benefit as CHP's, i.e. decentralised low carbon electricity. However, they work on a different principle than gas engine CHP's and achieve significantly higher electrical efficiency.

- **Recommendations specific to this development**

A head led micro CHP Viessmann Vitobloc EM-5/13 (alternatively LoadTracker XRGi6) which will provide heat for space heating and DHW will represent the best solution to reduce the CO2 emissions. 1 No CHP unit will be capable of providing 87% of the annual space heating and DHW energy demand.

This solution will achieve a 37% reduction in regulated CO2 compared to 2013 Building Regulations TER.

Proposed building energy consumption and CO_2 emissions by end use

	Delivered Energy		Emissions
	kWh/annum	Fuel	$kgCO_2$/annum
Heating	38,968	Gas	8,417
Hot Water	4,397	Gas	950
Cooling	1,395	Electricity	724
Lighting	1,057	Electricity	548
Unregulated	8,055	Electricity	4,180
CHP Electricity offset	-10,618	Electricity	-5,617
Total:	53,872		9,203

6. ON-SITE RENEWABLE ENERGY SOURCES (BE GREEN)

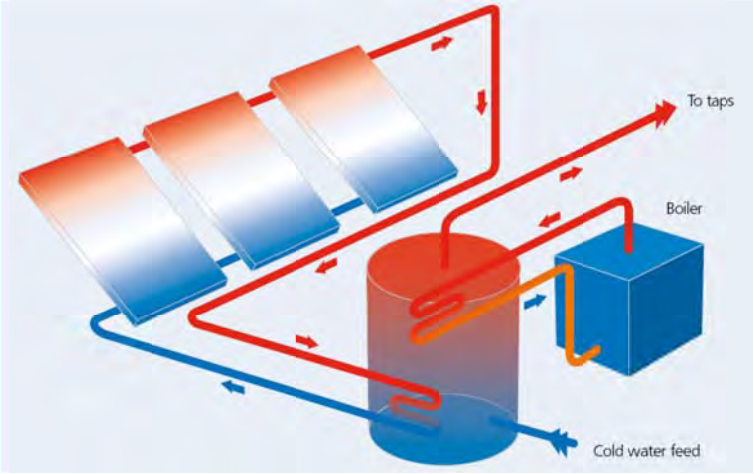
Following systems have been considered:

a. SOLAR HOT WATER (SHW)

- **General information**

  Solar hot water systems for dwellings use collector which provides a separate heating circuit for hot water cylinder. This is usually backed up by electric immersion heater or other source of heat.
  Two types of collectors are available:

  - Flat Plate – less expensive, less efficient
  - Evacuated Tube – more expensive and more efficient



- **Recommendations specific to this development**

Solar hot water panels are not possible due to overshading of the surrounding trees.

b. AIR SOURCE HEAT PUMPS (ASHP)

- **General information**

An air source heat pump extracts heat from the outside air in the same way that a fridge extracts heat from its inside. It can extract heat from the air even when the outside temperature is as low as minus 15° C.

On 17 December 2008, the European Parliament adopted the EU Directive on promoting the use of energy from renewable sources. For the first time however, in addition to geothermal energy, aerothermal and hydrothermal energy are also recognised as renewable energy sources.

There are two main types of ASHP:

- **Air-to-water system** uses the heat to warm water. Heat pumps heat water to a lower temperature than a standard boiler system would, so they are more suitable for underfloor heating systems than radiator systems. Although some ASHP systems are capable of heating the water to the higher temperature, the efficiency is higher when using low temperature underfloor heating or low temperature fan convectors.

- **Air-to-air system** uses the heat to warm the indoor air. The air is heated through individual fan-coils or centrally and then distributed to rooms via ductwork

- **Recommendations specific to this development**

It is not advisable to use heat pumps along with CHP as these two low carbon technologies would "compete". The proposed CHP unit will achieve higher CO2 savings than potential air source heat pump.

c. SOLAR PHOTOVOLTAICS (PV)

- **General information**

This system uses semi-conductor cells to convert solar energy into electricity. Two main types of PV panels are available:

- Monocrystalline – More expensive and more efficient
- Polycrystalline – Less expensive and less efficient

Depending on type, the output of 1 kWp (kilowatt peak) can be achieved by panels with area between 8 and 20 m^2.
The use of PV panels generally requires relatively large unshaded roof area where they can be mounted facing south, ideally having between 30° and 40° inclination.
The cost per tonne of CO_2 saved would be between £550 and £1,100

- **Recommendations specific to this development**

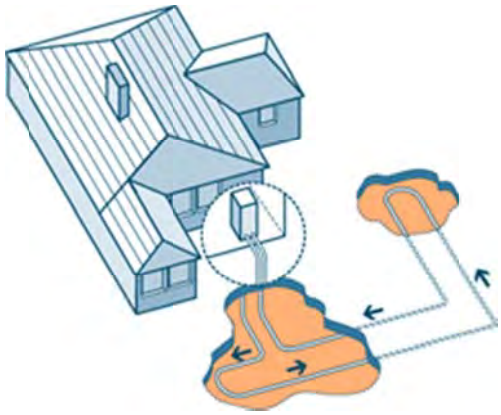
Photovoltaic system is not feasible due to overshading from the surrounding trees.

d. GROUND SOURCE HEAT PUMPS (GSHP)

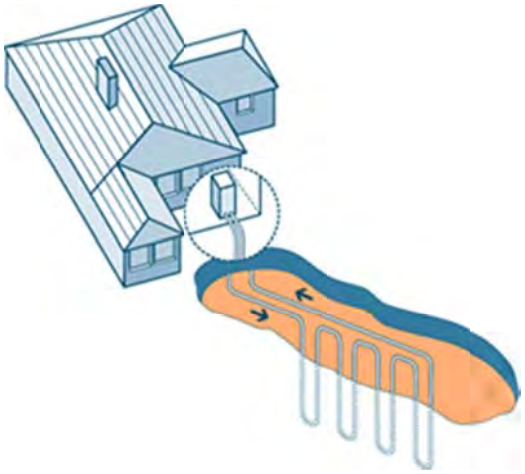
- **General information**

Ground source heat pumps use a buried ground loop which transfers heat from the ground into the building through heating distribution system. GSHP technology can be used both for heating and cooling. Two main types of GSHP are available:

- Horizontal loop is suitable for applications where sufficient area is available to accommodate horizontally buried pipes.



- Vertical loop system can be used where ground space is limited, but will require boreholes typically 15-150m deep, and is consequently more expensive to install than horizontal systems.



- **Recommendations specific to this development**

  It is not advisable to use heat pumps along with CHP for heating as these two low carbon technologies would “compete”. CHP will achieve higher CO2 savings than potential ground source heat pump.

e. BIOMASS / BIOFUELS

- **General information**

  Producing energy from biomass has both environmental and economic advantages. It is a carbon neutral process as the CO_2 released when energy is generated from biomass is balanced by that absorbed during the fuel's production.
  There are two main ways of using biomass to heat a domestic property:
  - Stand alone stoves providing space heating for a room. These can be fuelled by logs or pellets but only pellets are suitable for automatic feed. Generally they are 6-12 kW in output, and some models can be fitted with a back boiler to provide water heating.
  - Boilers connected to central heating and hot water systems. These are suitable for pellets, logs or chips, and are generally larger than 15 kW.

- **Recommendations specific to this development**

Biofuels have been considered, but are ruled out due to negative impact on air quality and environmental issues surrounding liquid biofuels as currently there are no established standards relating to the sustainability of biofuels.

f. WIND ENERGY

- **General information**

  Wind power is a clean, renewable source of energy which produces no carbon dioxide emissions or waste products. The turbines can have horizontal or vertical axis (Darrieus type). Wind turbines use the wind's lift forces to rotate aerodynamic blades that turn a rotor which creates electricity. Most small wind turbines generate direct current (DC) electricity and are not connected to the national grid. A special inverter and controller is required to convert DC electricity to AC at a quality and standard acceptable to the grid if the turbine is to be connected to national grid.

- **Recommendations specific to this development**

  Wind energy systems will not be considered due to negative visual effects, interference, flicker and noise risk. Exposure to wind would be limited by surrounding buildings.

Section 2.0

MECHANICAL SERVICES

2.0 MECHANICAL SERVICES

2.1 Incoming Utility Services

New gas and water utility supplies/meters will be provided to the building. The gas meter will be external to the building in a ventilated space and the water meter externally in an underground pit. (Soil conditions will confirm the water pipe material).

These will be sized to meet the demands of the building.

An additional KW/Hr gas sub-meter will be provided with a remote visual display installed to assist in energy monitoring and management as part of the audio visual system.

An additional water flow meter (L/S) will be provided with a remote visual display installed to assist in water monitoring and management as part of the audio visual system.

2.2 Design Conditions

External temperatures:

Winter	-8°C saturated
Summer	32°C (DB) 20°C (WB)

Internal Temperatures:

Living Rooms	22°C
Kitchen/Dining	21°C
Bedrooms	19°C
Bathrooms	22°C
Hall/Circulation	19°C
Stores/Plant	16°C

2.3 Building Regulations Part L1A (2013)

The current part 'L1A' of the Building Regulations (2013), consists of minimum requirements for dwellings, briefly consisting of the following:

- Walls, roofs and ceilings need to have adequate resistance to loss of heat.
- Sufficient control needs to be provided for occupants to vary lighting levels, to avoid unnecessary energy use and maximise natural daylight.
- Adequate user control should be available for heating and cooling to avoid unnecessary energy use and maximise passive measures.

Part 'L1A' of the Building Regulations (2013), is also concerned with the conservation of fuel and power and its aim is to maximum the possible contribution that can be made to the Government's target for reducing CO_2 production whilst allowing flexibility for designers. This philosophy will be followed in our designs.

The measures to be implemented/ investigated to reduce energy consumption are:

- Specifying an efficient heating system and if gas boilers utilised, these are to be high efficiency condensing boilers with very low NOX levels.
- Optimising the boiler selection for the building occupancy and reducing energy consumption through controls and management.
- Installing responsive controls and sub-zoning of the building to allow the part load, low energy and economical use of the system. (Adaptive to user occupancy).
- Review of thermal insulation techniques, limits and air tightness.
- Review of renewable energy sources to comply with the limits dictated by The Local Planning Authority and The London Plan.
- Minimising the effect of solar gain in a passive manner, to provide comfort conditions.
- Limiting fan power usage to noted requirements.

- Reviewing extract fan systems and utilising heat recovery and passive natural ventilation where possible.
- If cooling is utilised, to provide through a very efficient system and utilised only at peak times.

2.4 Heating
The main lead space heating system will be a gas fired CHP unit with buffer tank.
The secondary system will be high efficiency condensing boilers with ultra low NOX levels (eg Broag Remeha Quinta Pro).

The CHP/boiler system will serve LTHW pressurised supplies to the majority of underfloor heating systems in the principal living and bedroom areas (High thermal mass floors) and the pool heat sink. Radiators to secondary areas and towel rails to bathrooms will be served a separate summer circuit. LTHW supplies will also provide the secondary backup heating medium for the HWS system (Initial primary source is via the CHP unit. The CHP will provide 87.0% of the yearly space heating and HWS requirements.

The CHP will be the lead unit – ensuring maximum run time and electricity production, with the boilers being arranged on a load sharing/part duty basis to ensure efficient use of fuel (eg. one boiler will be fully utilised for demand before another boiler is energised, thus ensuring optimum performance and condensing action with limited boiler starts). Controls will also be weather compensated and user occupation closely programmed and managed. Valved connections will be included for a future heat network.

All pipework to be copper insulated and pex to underfloor systems.

All flues to pass directly to roof level by balanced flues/ separate flues.
Fresh air and plantroom cooling via louvers at basement level.

All heating zones/spaces will be provided with zone valves, re-heaters, thermostat control or TRV's (Thermostatic radiator valves), to ensure efficient energy use.

All heating zones/spaces will also be controlled by user interface controls to programme occupancy, holiday periods and set back times; again to ensure efficient energy use.

2.5 Water Services
A fully pressurised water system will be provided throughout the property to ensure continuity of supply. If after testing a mains water pressure system is acceptable; this will be adopted. The system is to be installed in copper pipework to the sanitary/kitchen appliances.

The general pressure available throughout the system will be approximately 3 bar at the mixers/taps with flow rates accommodated to the sanitary appliances and shower mixer valves in accordance with the Part 'G' calculator and Code for Sustainable Homes; low flow/restrictors.

The system will operate on a variable speed pump principle to maintain a constant pressure throughout the system and limit energy use. Pressure regulating devices will be required to some areas. All sanitary fittings/plant will be individually and zone valved. All pipework to be copper insulated.

Consideration will be given to a leak detection system to provide early warning of any leaks in the systems, to minimise any water loss.

2.6 Domestic Cold Water
Sufficient cold water will be stored and boosted to provide continuity of supply. Filtered mains drinking water will be provided to the main kitchens and the basins within each principle en-suite bathroom.

Back up cold water mains supplies will be provided to the plantrooms for general swimming pool filter back washing and filling, primary source via rainwater recovery.

A full base exchange water softener will be provided within the main basement plantroom providing softened water to the hot water generator/cylinder, as well as all the baths and shower