ME7

Athlone House
LONDON N6 4RU

ENERGY STATEMENT

OG: 28/09/2018

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Athlone House
LONDON N6 4RU

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 28/09/2018

ME7 Ltd
Jorand House, Bebington Close, Billericay,
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ME7 Ltd are committed to providing Sustainable and
Environmental solutions for Building Engineering Services

I N D E X

DISCLAIMER

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. This document has been prepared in line with the GLA Energy Team Guidance on Planning Energy Assessments and Camden's Planning Guidance.

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 CHP.

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

	Carbon dioxide emissions (kg CO2 per annum)		
	Regulated	Unregulated	Total
Pre-refurbishment	137,730	13,889	151,619
Notional Building (2013 Part L1B compliant)	60,301	13,889	74,190
Efficient Baseline	59,182	13,889	73,072
Low Carbon Baseline (With CHP)	48,581	13,889	62,470
Proposed scheme (With CHP and PV)	46,130	13,889	60,019

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 bringing the building to L1B standard	77,429	77,429	56.2%	51.1%
Savings from energy demand reduction	1,118	1,118	1.9%	1.5%
Savings from CHP	13,052	13,052	22.1%	17.9%
Savings from PV	2,451	2,451	5.0%	3.9%
Total Cumulative Savings (against L1B compliant)	14,171	14,171	**23.5%**	19.1%
Total Cumulative Savings (against existing)	91,600	91,600	**66.5%**	60.4%

Figure 1: The Energy Hierarchy

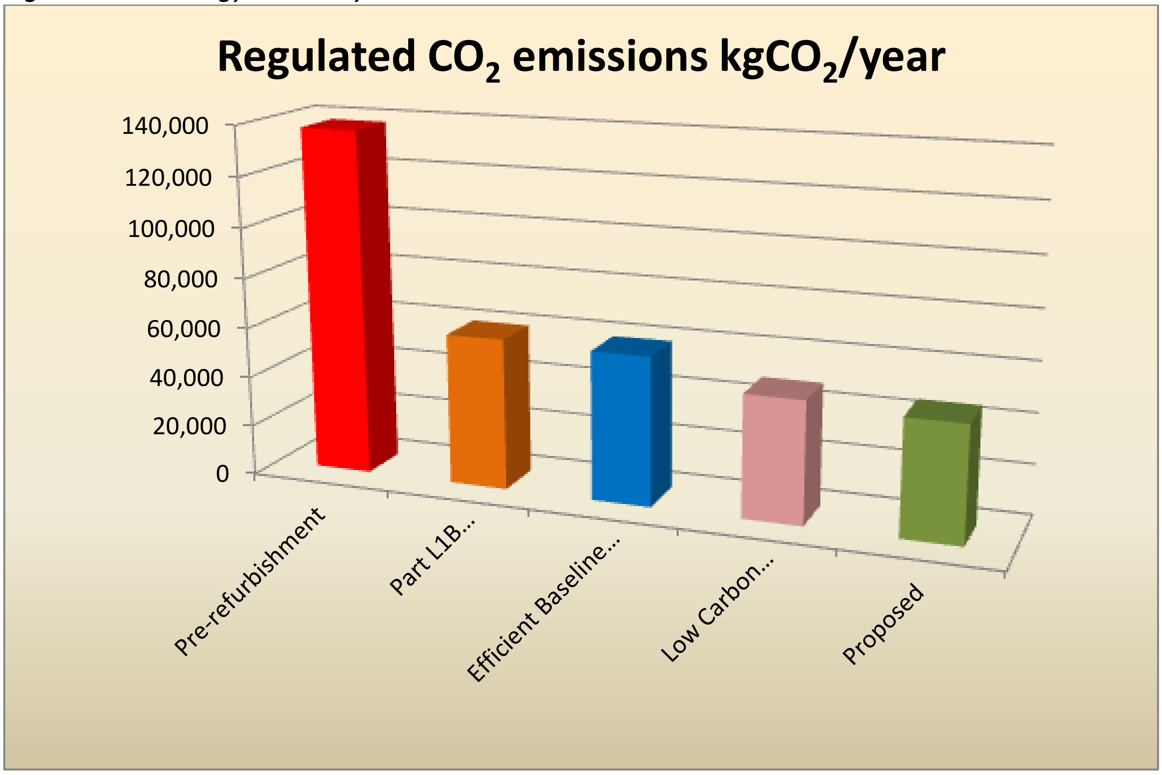


Table 3: SAP calculation specification for each stage of the energy hierarchy

Specification	Pre-refurbishment	Part L1B compliant Baseline	Efficient Baseline (enhanced fabric and M&E)	Low Carbon Baseline (After CHP)	Proposed
Existing external walls U-value	2.10	0.30	0.30	0.30	0.30
Newly constructed external walls U-value	0.28	0.28	0.18	0.18	0.18
Existing Basement and ground floor U-value	0.50	0.25	0.15	0.15	0.15
Newly constructed ground floor U-value	0.22	0.22	0.15	0.15	0.15
Existing flat roofs and pitched roofs with insulation at rafter level U-value	2.30	0.18	0.16-0.18	0.16-0.18	0.16-0.18
Newly constructed flat roofs and pitched roofs with insulation at rafter level U-value	0.18	0.18	0.14	0.14	0.14
Existing roofs with insulation at joist level U-value	2.30	0.16	0.12	0.12	0.12
Newly constructed roofs with insulation at joist level U-value	0.16	0.16	0.12	0.12	0.12
Existing windows and rooflights U-value	4.8 (single glazed)	1.60	1.50	1.50	1.50
New windows and rooflights U-value	1.60	1.60	1.50	1.50	1.50
External doors U-value	3.00	1.80	1.80	1.80	1.80
Air Permeability	15	15	15	15	15
Ventilation System	Natural	Natural	Natural	Natural	Natural
Energy Efficient Lighting	25%	75%	100%	100%	100%
Main House Space Heating	Non-condensing gas boiler, radiators, programmer, room thermostat and TRV's	Condensing gas boiler with Seasonal Efficiency of 88%, time and temperature zone control	High efficiency commercial grade condensing boiler, 95% seasonal efficiency, time and temperature zone control and weather compensator, underfloor heating	High efficiency commercial grade condensing boiler, 95% seasonal efficiency, time and temperature zone control and weather compensator, underfloor heating, 20% of heat from CHP XRGI 6	High efficiency commercial grade condensing boiler, 95% seasonal efficiency, time and temperature zone control and weather compensator, underfloor heating, 20% of heat from CHP XRGI 6
Main House DHW System	2000 L indirect DHW cylinder	2000 L indirect DHW cylinder	2000 L indirect DHW cylinder	2000 L indirect DHW cylinder, fed primarily from CHP XRGI 6 or equivalent, backed up by gas boiler	2000 L indirect DHW cylinder, fed primarily from CHP XRGI 6 or equivalent, backed up by gas boiler
Main House Space Cooling System	-	Air source multi-split system with A-rated condenser with variable speed compressor	GSHP with SEER of 7.0 or higher	GSHP with SEER of 7.0 or higher	GSHP with SEER of 7.0 or higher
Outbuildings Space Heating	Non-condensing gas boiler, radiators, programmer, room thermostat and TRV's	Condensing boiler with SEDBUK 2009 Efficiency of 88%, programmer, room thermostat and TRV's	High efficiency condensing boiler, 89% SEDBUK 2009 seasonal efficiency, time and temperature zone control and weather compensator, underfloor heating	High efficiency condensing boiler, 89% SEDBUK 2009 seasonal efficiency, time and temperature zone control and weather compensator, underfloor heating	High efficiency condensing boiler, 89% SEDBUK 2009 seasonal efficiency, time and temperature zone control and weather compensator, underfloor heating
Outbuildings Space Cooling System	-	Air source multi-split system with A-rated condenser with variable speed compressor	Air source multi-split system with A-rated condenser with variable speed compressor	Air source multi-split system with A-rated condenser with variable speed compressor	Air source multi-split system with A-rated condenser with variable speed compressor
Outbuildings DHW System	150 L indirect DHW cylinder	150 L indirect DHW cylinder	150 L indirect DHW cylinder	150 L indirect DHW cylinder	150 L indirect DHW cylinder
PV system	-	-	-	-	PV system on Caenwood Cottage comprising 18 No panels at 0.345 kWp each
Regulated CO2 emission	137,730	60,301	59,182	48,581	46,130
CO2 reduction against Pre-refurbishment	-	56%	57%	65%	67%
CO2 reduction against L1B compliant baseline	-	-	2%	19%	24%
CO2 reduction against Efficient Baseline	-	-	-	18%	22%
CO2 reduction against Low Carbon Baseline	-	-	-		5%

The following low carbon and renewable energy sources are proposed for the development:

- 1 No CHP XRGI 6 to serve as a heat source for the main house
- Ground source heat pump system to serve as the main space cooling system for the main house.
- PV system on Caenwood Cottage comprising 18 No panels at 0.345 kWp each

The above systems will achieve:

- 22% reduction in regulated CO2 emission (along with the energy efficiency measures) against 2013 Part L1B compliant development
- 5% reduction in regulated CO2 emission using on site low renewable energy sources
- 67% reduction in regulated CO2 emission against the existing buildings

Table 4: Energy consumption and CO2 emission of the proposed development

		Energy Consumption Breakdown							CHP			PVs		Gas Consumption	Electricity Consumption	Electricity Offset	SAP 2012 CO2 Emission
Unit	Floor area (m2)	Space Heating (Main) (kWh/a)	Space Heating (Secondary) (kWh/a)	DHW (kWh/a)	Cooling (kWh/a)	Lighting (kWh/a)	Aux (kWh/a)	Un-Reg (kWh/a)	CHP Fuel	CHP Thermal output	CHP electricity output	PVs kWp	PVs Energy Offset (kWh/a)	kWh/a	kWh/a	kWh/a	KgCO2/a
Main House + Pavilion	2483.6	173,767	19,307	3,420	47	2,649	1,772	19,715	22,925	4,585	14,443			172,135	23,775	-14,443	**42,024**
Caenwood Cottage	145.9	14,135	0	2,522	7	661	75	3,973				6.210	-4,723	16,657	743	-4,723	**1,533**
Gate House	89.7	8,362	0	2,402	23	380	75	3,074						10,764	478	0	**2,573**
Total / Average	2719.2	**196,263**	**19,307**	**8,344**	**47**	**3,691**	**1,922**	**26,762**	**22,925**	**4,585**	**14,443**	**6.21**	**-4,723**	**199,555**	**24,996**	**-19,165**	**46,130**

1. INTRODUCTION

1.1 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.

1.2 Description of the Site

The proposals include the refurbishment and extension of the existing main house, two ancillary houses on site and construction of new summer pavilion.

2. PLANNING FRAMEWORK

2.1 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.

2.2 The London Plan

The London Plan is the name given to the Mayor's spatial development strategy. The current version of London Plan was published in 2011 with Further Alterations to the London Plan published in March 2015. 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 the following policies:

Policy 5.2 Minimising CO2 emissions

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
3. Be green: use renewable energy

Policy 5.6 - Decentralised Energy in Development Proposals

Development proposals should evaluate the feasibility of Combined Heat and Power (CHP) systems, and where a new CHP system is appropriate also examine opportunities to extend the system beyond the site boundary to adjacent sites. Major development proposals should 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

Potential opportunities to meet the first priority in this hierarchy are outlined in the London Heat Map tool. Where future network opportunities are identified, proposals should be designed to connect to these networks.

Policy 5.7 - Renewable Energy

The Mayor seeks to increase the proportion of energy generated from renewable sources, and expects that the projections for installed renewable energy capacity outlined in the Climate Change Mitigation and Energy Strategy and in supplementary planning guidance will be achieved in London. Within the framework of the energy hierarchy (see Policy 5.2), major development proposals should provide a reduction in expected carbon dioxide emissions through the use of on-site renewable energy generation, where feasible. There is a presumption that all major development proposals will seek to reduce carbon dioxide emissions by at least 20 per cent through the use of on-site renewable energy generation wherever feasible.

Policy 5.9 – Overheating and Cooling

Major development proposals should reduce potential overheating and reliance on air conditioning systems and demonstrate this in accordance with the following 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)

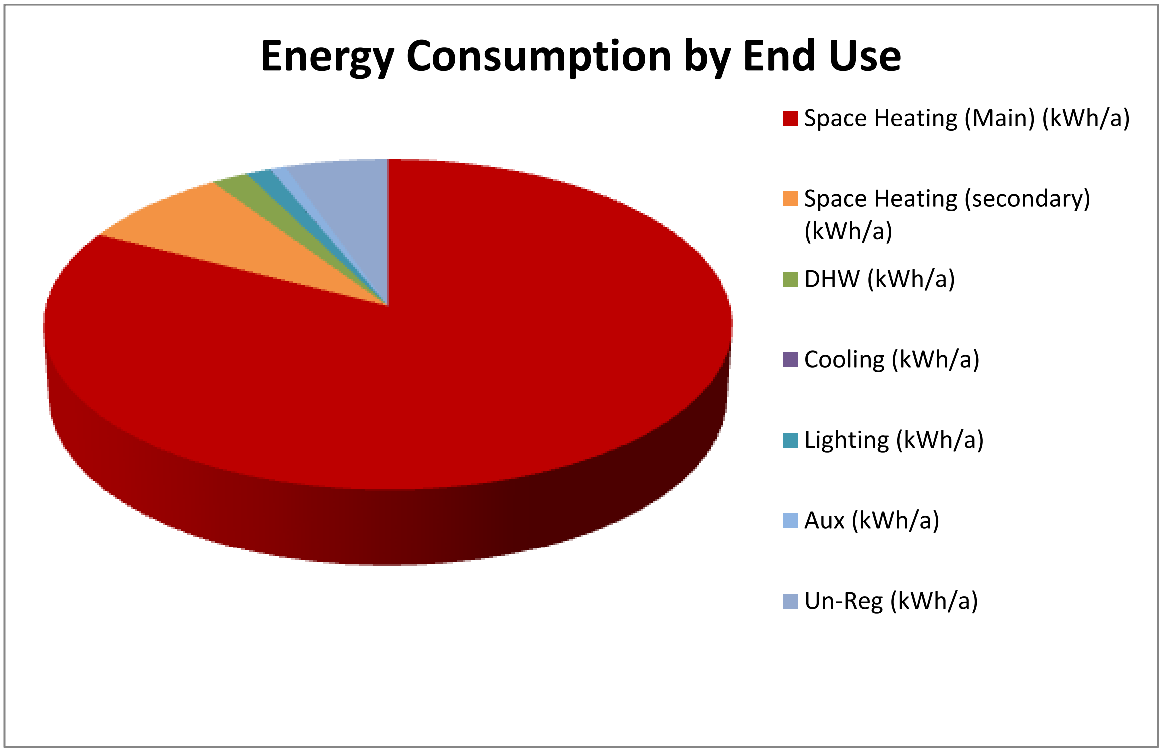
2.3 BREEAM Domestic Refurbishment

BREEAM Domestic Refurbishment is a sustainability assessment tool used by Camden to assess the sustainability of refurbishment residential projects. Energy strategy for the proposed development has been prepared to maximise the potential BREEAM energy-related credits.

3. BASELINE ENERGY CONSUMPTION AND CO_2 EMISSIONS

Energy assessment using SAP 2012 has been carried out for the pre-refurbishment house. Specification of the pre-refurbishment house is in line with BREEAM DR section Ene 01 and reflects the house before the refurbishment works. For particular specification of the fabric and M&E, refer to table 3 above.

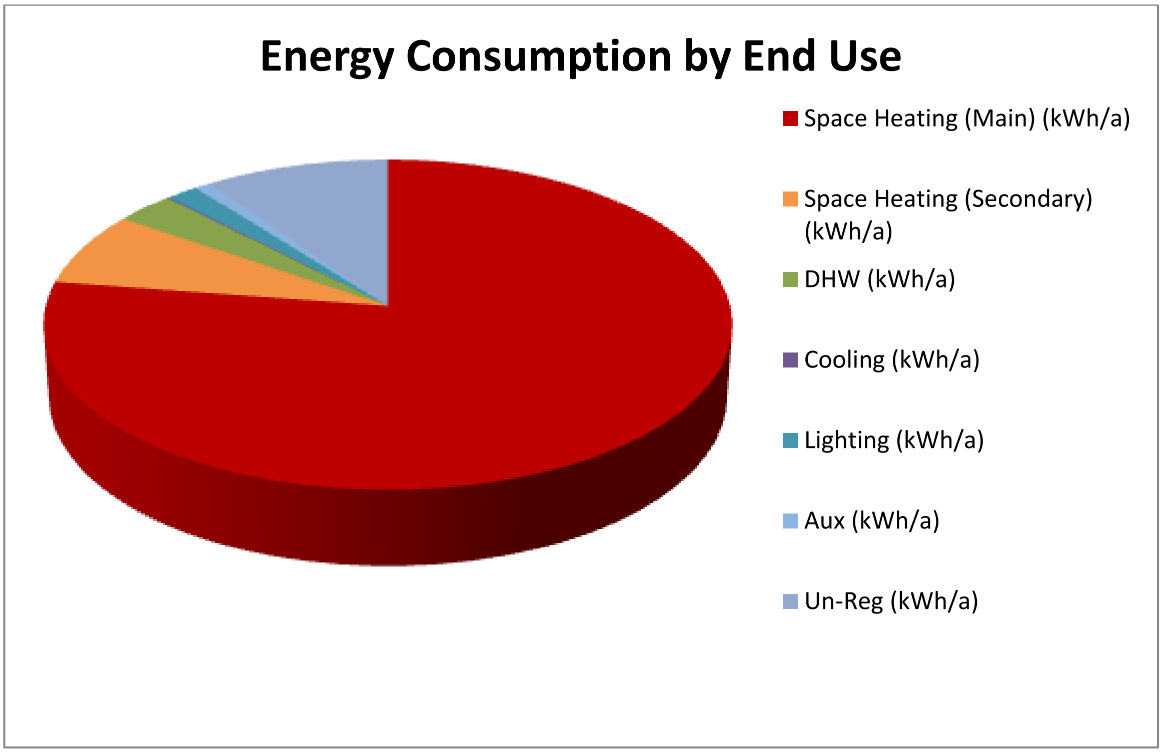
		Energy Consumption Breakdown							Gas Consumption	Regulated Electricity Consumption	Electricity Offset	SAP 2012 CO2 Emission
Unit	Floor area (m2)	Space Heating (Main) (kWh/a)	Space Heating (secondary) (kWh/a)	DHW (kWh/a)	Cooling (kWh/a)	Lighting (kWh/a)	Aux (kWh/a)	Un-Reg (kWh/a)	kWh/a	kWh/a	kWh/a	KgCO2/a
Main House + Pavilion	2483.6	390,183	39,412	3,762		4,635	3,939	19,715	414,679	47,987		**114,476**
Caenwood Cottage	145.9	59,934	0	3,065		1,142	165	3,973	62,999	1,307		**14,286**
Gate House	89.7	36,629	0	2,909		658	165	3,074	39,538	823		**8,968**
Total / Average	2719.2	**486,746**	**39,412**	**9,736**	**0**	**6,435**	**4,269**	**26,762**	**517,217**	**50,117**		**137,730**



4. 2013 Part L1B Compliant Baseline

The first step in the energy hierarchy is to apply minimum energy efficiency measures required by Part L1B. Relatively big improvement in this step is achieved mainly by replacing the existing windows and upgrading the existing uninsulated thermal elements. For full specification of the L1B compliant baseline, refer to table 3.

		Energy Consumption Breakdown							Gas Consumption	Electricity Consumption	Electricity Offset	SAP 2012 CO2 Emission
Unit	Floor area (m2)	Space Heating (Main) (kWh/a)	Space Heating (Secondary) (kWh/a)	DHW (kWh/a)	Cooling (kWh/a)	Lighting (kWh/a)	Aux (kWh/a)	Un-Reg (kWh/a)	kWh/a	kWh/a	kWh/a	KgCO2/a
Main House + Pavilion	2483.6	180,931	20,103	3,420	73	3,311	2,010	19,715	184,351	25,498		**53,053**
Caenwood Cottage	145.9	16,135	0	2,549	7	661	75	3,973	18,684	743		**4,421**
Gate House	89.7	9,511	0	2,427	22	380	75	3,074	11,938	477		**2,826**
Total / Average	2719.2	**206,577**	**20,103**	**8,396**	**73**	**4,353**	**2,160**	**26,762**	**214,973**	**26,718**		**60,301**



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

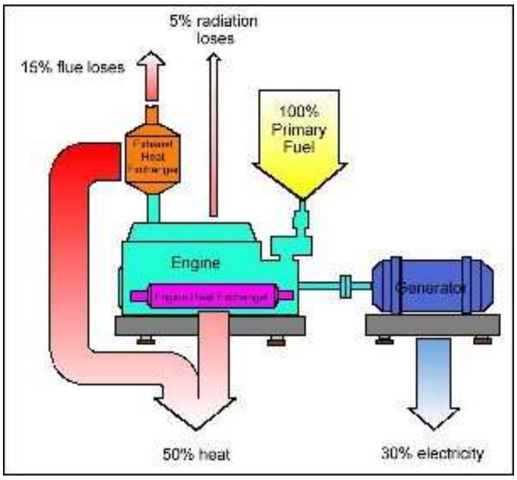
Number of passive design measures and measures improving energy efficiency of building services are proposed which go beyond the requirements of Part L1B. The following table gives an overview of results achieved by implementing these improvements.

		Energy Consumption Breakdown							Gas Consumption	Electricity Consumption	Electricity Offset	SAP 2012 CO2 Emission
Unit	Floor area (m2)	Space Heating (Main) (kWh/a)	Space Heating (Secondary) (kWh/a)	DHW (kWh/a)	Cooling (kWh/a)	Lighting (kWh/a)	Aux (kWh/a)	Un-Reg (kWh/a)	kWh/a	kWh/a	kWh/a	KgCO2/a
Main House + Pavilion	2483.6	173,767	19,307	3,420	47	2,649	1,772	19,715	186,512	23,775		52,626
Caenwood Cottage	145.9	14,135	0	2,522	7	661	75	3,973	16,657	743		3,984
Gate House	89.7	8,362	0	2,402	23	380	75	3,074	10,764	478		2,573
Total / Average	2719.2	196,263	19,307	8,344	47	3,691	1,922	26,762	213,933	24,996		59,182

6. 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 XRGI 6 or equivalent is proposed for the main house which will provide heat for space heating and DHW. It is expected to provide at least 20% of total house heat demand.

This technology alone will achieve a 17.9% reduction in regulated CO2 compared to the efficient (Be Lean) baseline.

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

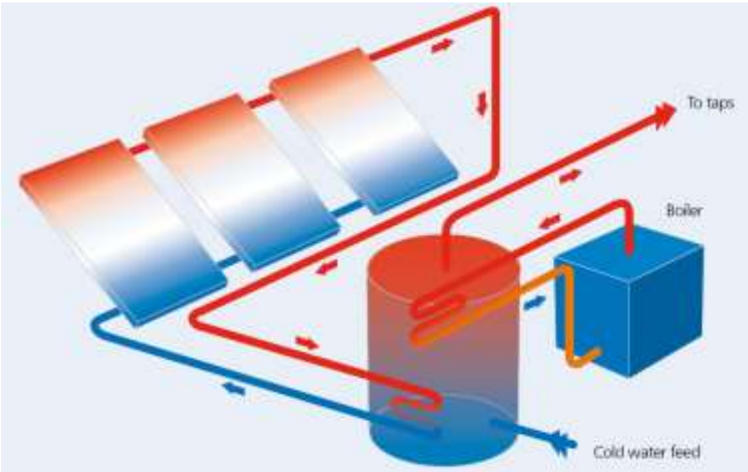
Following systems have been considered:

7.1 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 panels are not proposed. Due to hot water demand being very low compared to space heating demand, solar hot water panels would have minimum impact on the overall CO_2 saving in the main house. Other constraints are limited roof space available, overshading of the chimney stacks, roof pitches and the tower.

  .

a. 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**

  Air source heat pumps are not proposed due to their very low CO_2 saving potential compared to high efficiency gas boilers and potential noise impacts. Air source heat pumps are proposed as cooling sources for ancillary buildings, however running in cooling mode, they are not considered renewable sources.

b. 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**

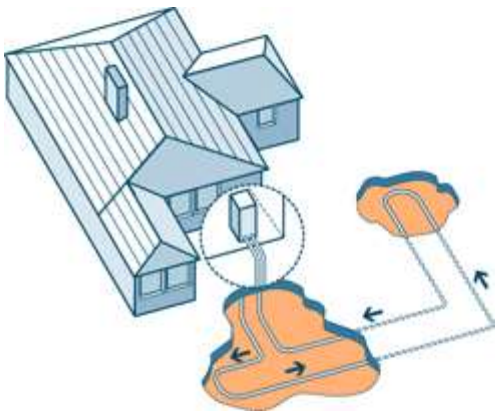
  Photovoltaic system is proposed for the flat roof at Caenwood Cottage. The system will comprise 18 No panels Sunpower 345 W with total peak output of 6.21 kWp. The system will generate 4,723 kWh electricity per year, offsetting 2,451 kg CO2 per year.

c. GROUND SOURCE HEAT PUMPS (GSHP)

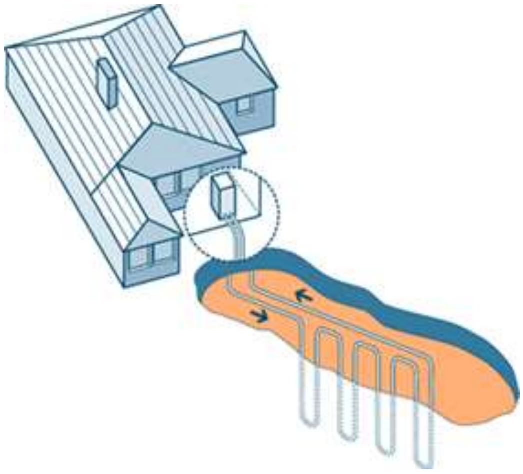
- **General information**

  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**

  Ground source heat pump is not recommended for heating due to limited heating capacity. GSHP will be installed for comfort cooling in the main house, however running in cooling mode, it is not considered as renewable sources

d. 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.

e. 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.