RYB:KONSULT

RYB Konsult
10 Lindsey Street
London EC1A 9HP
United Kingdom

T +44 (0)20 7809 1800
F +44 (0)20 7809 1801
info@rybkonsult.com
www.rybkonsult.com

19 EAST HEATH ROAD

Energy Strategy

REVISIONS

Date	Revision	Status	Comment	Q/A
10/04/08	-	Preliminary	For comment	MP
25/04/08	A	Final	For issue	MP
25/08/09	B	Final	For issue	CB

CONTENTS

1 EXECUTIVE SUMMARY

This document responds to planning policy in respect of energy consumption and carbon emissions. The methodology used herein is consistent with the London Renewables Toolkit (LRT) and Part L of the Building Regulations.

The Proposed Development features the following energy-saving measures:

- Accredited construction details (to minimise thermal bridging);
- Air permeability of $8m^3/h/m^2$;
- Improved U values:
    - walls 0.32 W/m^2K;
    - Ground floor 0.22 W/m^2K;
    - Glazing and Frame 1.9 W/m^2K;
    - Rooflight 1.8 W/m^2K and
    - Roof 0.22 W/m^2K.
- Mechanical Ventilation With Heat Recovery
    - Kitchen + 4 additional wet Rooms;
    - Insulated Rigid Ductwork;
    - SFP 0.9 W/l/s and
    - Heat efficiency 90%.
- Energy efficient lighting throughout. and

The energy saving measures reduce the Proposed Development's carbon dioxide emissions to exceed Part L1A requirements.

There is not a district heating system close to the Site, and therefore the Proposed Development would not be connected to a district heating scheme.

The Proposed Development is a single detached dwelling, and therefore community heating is not appropriate to the Site.

The Proposed Development would incorporate a Ground Source Heat Pumps which would reduce the Site CO_2 emissions by approximately 10%.

The predicted carbon dioxide emissions for the site are shown in Figure 1.

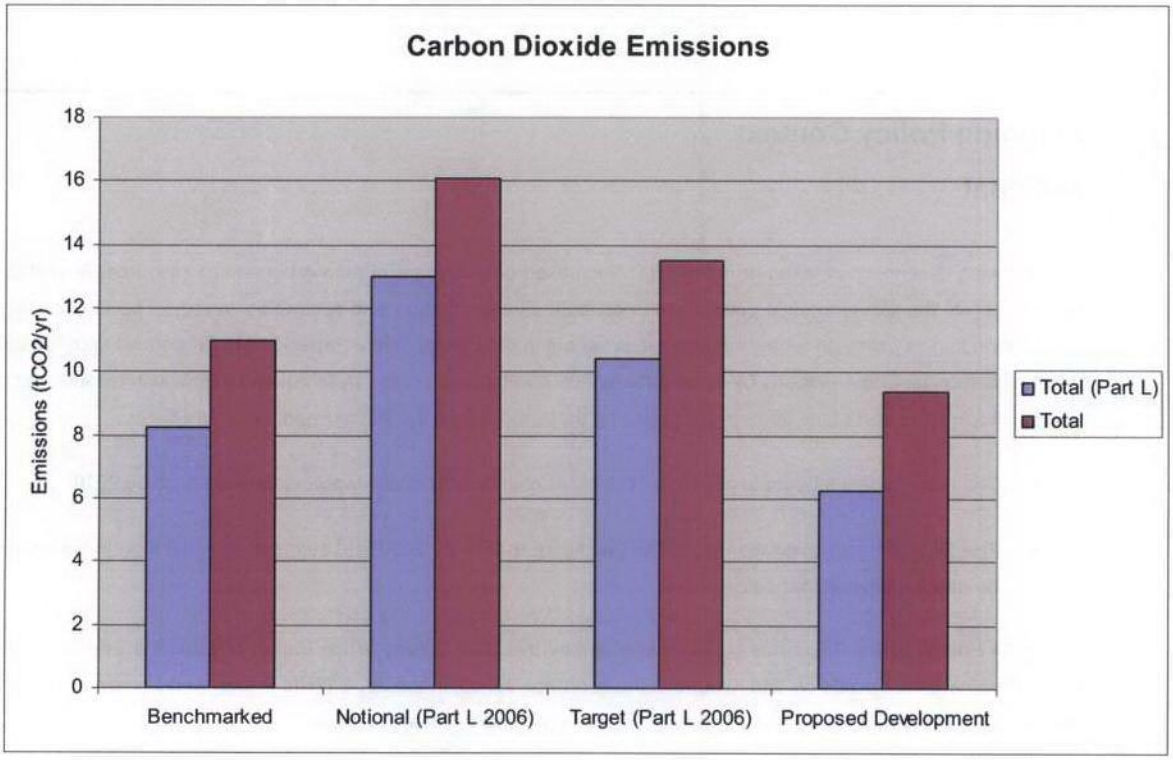


Figure 1 – Predicted carbon dioxide emissions: Option 1 Ground Source Heat Pump

2 INTRODUCTION

Planning Policy Context

National

The following description is taken from the LRT: "Increased development of renewable energy resources is vital to facilitating the delivery of the Government's commitments on both climate change and renewable energy. The Government's Energy Policy, including its policy on renewable energy, is set out in the Energy White Paper [2004]. This aims to put the UK on a path to cut its carbon dioxide emissions by some 60% by 2050, with real progress by 2020, and to maintain reliable and competitive energy supplies. As part of the strategy for achieving these reductions the White Paper sets out:

- The Government's target to generate 10% of UK electricity from renewable energy sources by 2010
- The Government's aspiration to double that figure to 20% by 2020 and suggests that still more renewable energy will be needed beyond that date.

The 2004 Energy White Paper has been superseded by the 2007 Energy White Paper; Meeting the Energy Challenge. This paper to some extent builds on and reinforces the approach set out in the 2004 White Paper, whilst placing more emphasis on the UK's role within a global context: Two long-term energy challenges are identified:

- tackling climate change by reducing carbon dioxide emissions both within the UK and abroad; and
- ensuring secure, clean and affordable energy as we become increasingly dependent on imported fuel.

The energy strategy that the government has adopted to respond to these challenges is summarized by four energy policy goals:

- "to put ourselves on a path to cutting CO2 emissions by some 60% by about 2050, with real progress by 2020;
- to maintain the reliability of energy supplies;
- to promote competitive markets in the UK and beyond; and
- to ensure that every home is adequately and affordably heated."

Planning Policy Statement 22 (PPS 22) sets out the Government's national policy for renewable energy, in terms of both dedicated renewable generation projects (e.g. wind farms) and 'embedded' generation. It states that "local planning authorities may include policies in local development documents that require a percentage of the energy to be used in new residential, commercial or industrial developments to come from on-site renewable energy developments. Such policies:

(i) Should ensure that requirement to generate on-site renewable energy is only applied to developments where the installation of renewable energy generation equipment is viable given the type of development proposed, its location, and design;

(ii) Should not be framed in such a way as to place an undue burden on developers, for example, by specifying that all energy to be used in a development should come from on-site renewable generation.

Regional

In London, the Mayor has established policies and strategies relating to renewable energy use throughout London.

"The Energy Strategy is one of a series dealing with environmental issues in London [and]…sets out the Mayor's proposal for change in the way energy is supplied and used within London over the next 10 years and beyond. The Strategy aims to improve London's environment, reduce the capital's contribution to climate change, tackle fuel poverty and promote economic development."

Energy Strategy proposal 132 states, "To contribute to meeting London's targets for the generation of renewable energy, the Mayor will expect applications referable to him to generate at least ten per cent of the site's energy needs (power and heat) from renewable energy on the site where feasible. Boroughs should develop appropriate planning policies to reflect this strategic policy." Since the publication of the Mayor's Energy Strategy in 2004, revisions have been made to the London Plan, and the ten per cent requirement has been superseded, as detailed in Policy 4A.7, below.

Section 4A of the revised London Plan, *London Plan, Consolidated with Alterations Since 2004* (published February 2008), covers 'Climate Change and London's Metabolism". The key policies in respect of energy consumption and the design of buildings are summarised below.

- **Policy 4A.3, Sustainable design and construction** The Mayor will, and boroughs should, ensure future developments meet the highest standards of sustainable design and construction and reflect this principle in DPD policies. This includes the following measures related to energy use:
    - reduce carbon dioxide and other emissions that contribute to climate change
    - avoid internal overheating and excessive heat generation
    - minimise energy use, including by passive solar design, natural ventilation, and vegetation on buildings
    - supply energy efficiently and incorporate decentralised energy systems (Policy 4A.6), and use renewable energy where feasible (Policy 4A.7)
    - minimise light lost to the sky, particularly from street lights
    - ensure designs make the most of natural systems both within and around the building
- **Policy 4A.4, Energy assessment** The Mayor will, and boroughs should, support the Mayor's Energy Strategy and its objectives of improving energy efficiency and increasing the proportion of energy used generated from renewable sources. The Mayor will, and boroughs should, require an assessment of the energy demand and carbon dioxide emissions from proposed major developments, which should demonstrate the expected energy and carbon dioxide emission savings from the energy efficiency and renewable energy measures incorporated in the development, including the feasibility of CHP/CCHP and community heating systems. The assessment should include:
    - calculation of baseline energy demand and carbon dioxide emissions
    - proposals for the reduction of energy demand and carbon dioxide emissions from heating, cooling and electrical power (Policy 4A.6)

- proposals for meeting residual energy demands through sustainable energy measures (Policies 4A.7 and 4A.8)
- calculation of the remaining energy demand and carbon dioxide emissions.

All development should contribute to improving the integration of land use and transport policy and reducing the need to travel, especially by car.

- **Policy 4A.5, Provision of heating and cooling networks** Boroughs should ensure that all DPDs identify and safeguard existing heating and cooling networks and maximise the opportunities for providing new networks that are supplied by decentralised energy. Boroughs should ensure that all new development is designed to connect to the heating and cooling network.

- **Policy 4A.6 Decentralised Energy: Heating, Cooling and Power** The Mayor will and boroughs should in their DPDs require all developments to demonstrate that their heating, cooling and power systems have been selected to minimise carbon dioxide emissions. The need for active cooling systems should be reduced as far as possible through passive design including ventilation, appropriate use of thermal mass, external summer shading and vegetation on and adjacent to developments. The heating and cooling infrastructure should be designed to allow the use of decentralised energy (including renewable generation) and for it to be maximised in the future. Developments should evaluate combined cooling, heat, and power (CCHP) and combined heat and power (CHP) systems and where a new CCHP/CHP system is installed as part of a new development, examine opportunities to extend the scheme beyond the site boundary to adjacent areas. The Mayor will expect all major developments to demonstrate that the proposed heating and cooling systems have been selected in accordance with the following order of preference:
  - connection to existing CCHP/CHP distribution networks
  - site-wide CCHP/CHP powered by renewable energy
  - gas-fired CCHP/CHP or hydrogen fuel cells, both accompanied by renewables
  - communal heating and cooling fuelled by renewable sources of energy
  - gas fired communal heating and cooling.

- **Policy 4A.7 Renewable Energy** The Mayor will, and boroughs should, in their DPDs adopt a presumption that developments will achieve a reduction in carbon dioxide emissions of 20% from on site renewable energy generation (which can include sources of decentralised renewable energy) unless it can be demonstrated that such provision is not feasible. This will support the Mayor's Climate Change Mitigation and Energy Strategy and its objectives of increasing the proportion of energy used generated from renewable sources by:
  - requiring the inclusion of renewable energy technology and design, including: biomass fuelled heating, cooling and electricity generating plant, biomass heating, renewable energy from waste (Policy 4A.21) photovoltaics, solar water heating, wind, hydrogen fuel cells, and ground coupled heating and cooling in new developments wherever feasible
  - facilitating and encouraging the use of all forms of renewable energy where appropriate, and giving consideration to the impact of new development on existing renewable energy schemes.

Local

The London Borough of Camden's Unitary Development Plan (UDP) was adopted as the council's statutory development plan in June 2006, and replaces the UDP adopted in 2000. The revised UDP sets out the Council's policies and proposals for the development and use of land. This document will remain in place until it is superseded by the Local Development Framework (LDF), following changes in planning policy at a regional and national level.

The document incorporates a number of policies to address environmental sustainability, of which policy SD9, Resources and Energy, is the most relevant to this Energy Strategy.

Section C of Policy SD9 places an emphasis on CO_2 emissions and states that:

- "The Council will seek developments that conserve energy and resources through:

a) designs for energy efficiency;

b) renewable energy use;

c) optimising energy supply; and

d) the use of recycled and renewable building materials.

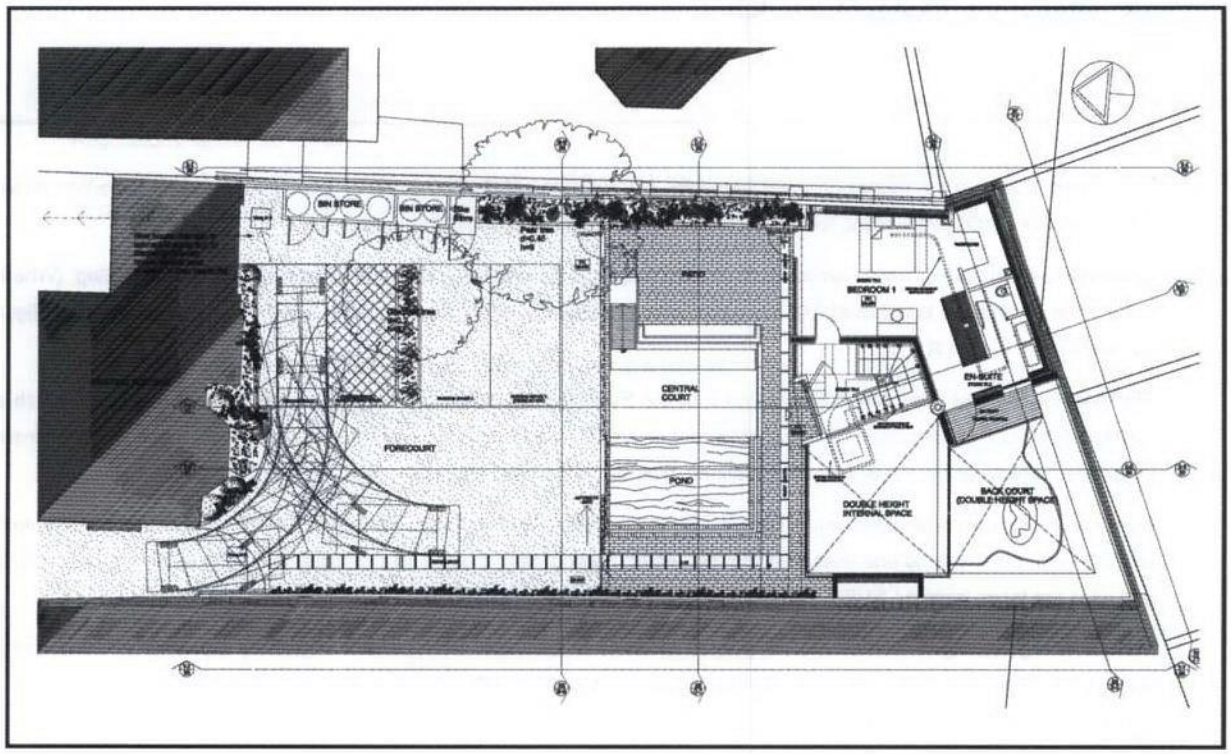
The Council will require major developments to demonstrate the energy demand of their proposals and how they would generate a proportion of the site's electricity and heating needs from renewables wherever feasible. The Council may use conditions or planning obligations to secure recycling of materials."

Further "the Council expects major developments of 1000m^2 or 10 housing units or more to incorporate renewable energy production equipment to provide at least 10% of predicted energy requirements. The most likely sources of renewable energy for developments in Camden are solar water heating, photovoltaic cells, smallscale wind turbines, passive solar energy, natural ventilation and borehole cooling."

East Heath Road

Proposal Description

The proposal is for a private home in Hampstead. The design comprises a two storey dwelling with expansive basement accommodation including a swimming pool and gym.



Planning Status

The GLA are not a statutory consultee due to the scale of the development. The Proposed Development falls under the jurisdiction of the London Plan as well as the London Borough of Camden's planning policy, as detailed above. The scale of the development means that it is necessary to consider energy conservation, but there is no legislative obligation to meet at least 10% of the total Site energy requirement through renewable technology.

5 COMMUNITY HEATING

The Mayor's Energy Strategy favours community heating systems because they offer:

- Potential economies of scale in respect of efficiency and therefore reduced carbon emissions; and
- Greater potential for future replacement with Low or Zero Carbon (LZC) technologies.

However, there is not a district heating system close to the Site.

Community heating is not considered suitable, as the Proposed Development is a detached dwelling.

6 RENEWABLES

Preliminary Assessment

The LRT provides benchmark sizing and cost data for "renewable energy technologies suitable for London". It therefore provides information to assess the various technologies at an early design stage, with initial measurements of the impact of using each technology on the building's carbon dioxide emissions. Table 2 (below) outlines these technologies and the variations proposed in the LRT used in this assessment.

Table 2 Renewable Options

Technology	End Use Demand Met
Wind	Electricity
PV Cells - rooftop	Electricity
PV Cells - cladding	Electricity
Solar Water Heating	Annual DHW (50 %)
Biomass heating (a)	Annual Space Heating +Domestic Hot Water (33%)
Biomass heating (b)	Annual Space Heating +Domestic Hot Water (50%)
Biomass heating (c)	Annual Space Heating +Domestic Hot Water (100%)
Biomass CHP (a)	Annual Space Heating +Domestic Hot Water (33%)
Biomass CHP (b)	Annual Space Heating +Domestic Hot Water (50%)
Ground sourced heat pumps (a)	Annual Space Heating +Domestic Hot Water (50%)
Ground sourced heat pumps (b)	Annual Space Heating +Domestic Hot Water (100%)
Ground sourced heat pumps (c)	Peak Space Heating (50 %) Annual Space Heating + Domestic Hot Water (85 %)
Ground cooling (a)	Annual Cooling (50%)
Ground cooling (b)	Annual Cooling (100%)

Ground cooling is understood to refer to open-loop GSHPs which, like closed-loop GSHPs, can be arranged to deliver both heating and cooling. It would not be appropriate for residential properties without comfort cooling.

The following other "acceptable renewable energy technologies" are considered to be not typically appropriate in London:

- Fuel cells using hydrogen from renewable sources;
- Gas from anaerobic digestion;
- Geothermal;
- Ground cooling air systems;

- Micro hydro; and
- Solar air collectors.

On the basis of this preliminary analysis, and a review of the general advantages and disadvantages of the different technologies relative to the Proposed Development, the following preferred option was short-listed:

- Ground Source Heat Pumps

The following technologies were not considered to be appropriate to the Proposed Development:

- Wind, on the basis of visual impact, and the sheltered location; and
- PV cells, on the basis of insufficient area being available and cost.
- Biomass: on the basis of concerns over air quality issues from flue discharge; concerns over transport issues relating to regular deliveries of biomass; security and cost of fuel supply; concerns over disposal of ash; and relatively high maintenance;
- Biomass CHP: on the basis of embodied impacts; high maintenance; concerns over air quality issues from flue discharge; concerns over transport issues relating to regular deliveries of biomass; lack of micro-scale units on the market to suit this scale of development; and it being an immature technology; and
- Solar water heating, on the basis of potential for over shading.

Detailed Appraisal

Ground Source Heat Pumps

This technology makes use of the energy stored beneath the earth's surface and uses the Earth's thermal properties in conjunction with (usually) electricity to drive a pump and compressor. The technology can be used to provide space heating, cooling and hot water. Depending on the temperature difference, ground source heat pumps can be used for heating or cooling using the same mechanical equipment. In this analysis GSHP would provide both the heating and cooling, as opposed to being split into two systems outlined in Figure 4 below. There are three types of GSHP system:

- Closed loop – Water stays in the pipe work and is cycled between the building and the ground (Figure 5)
- Open loop – Water is pumped from underground water such as an aquifer through the building and released from an outgoing pipe a suitable distance from the original pipe. An open loop system would not be appropriate for this Site due to the scale of the development.
- Hybrid – Use a closed loop system, possibly using the building piles and an open loop system (Figure 4)

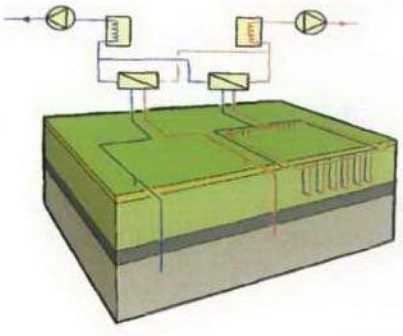


Figure 5: Closed loop ground source heat pump

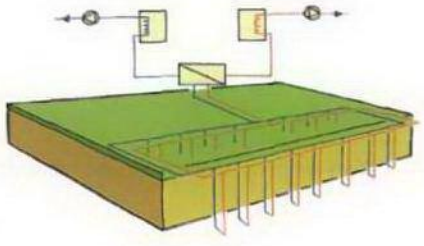


Figure 4: Hybrid ground source heat pump

It is calculated using SAP software (which assumes an efficiency of 3.5%) that a GSHP would provide a 14% reduction in Part L CO_2 emissions and a 10% reduction in total dwelling CO_2 emissions (including cooking, appliances etc.). The GSHP meets over 40% of the total dwelling annual energy demand.

7 CONCLUSION

From an analysis of the proposed development following the hierarchy detailed in the LRT, the following strategy is proposed:

Energy saving measures would be used to make the building comply with Part L1A of the building regulations. These measures would provide a 30.1% reduction in site CO_2 emissions, compared with the target Part L figure.

Ground Source Heat Pumps are proposed as the most appropriate renewable technology on the basis of there being no visual impact, and that it can independently provide the largest renewable contribution: it would provide a 14% reduction in Part L CO_2 emissions and a 10% rediction in total dwelling CO_2 emissions (including cooking, appliances etc.). The GSHP meets over 40% of the total dwelling annual energy demand.

As a result the final Part L dwelling emission rate would be 39.7% below the Part L target CO_2 emission rate.

The Ground Source Heat Pumps will be designed to provide the energy for the heating of the pool as well as the space heating to the proposed development. For Part L1A, there is no software template available to calculate the energy consumption of private swimming pools. However, as the energy consumed for the swimming pool heating will be provided entirely by the GSHP, reduction in the overall site CO_2 emissions stated above would increase.

The swimming pool should incorporate the following energy efficiency measures to the swimming pool energy consumption;

- Building fabric improved with high insulation levels and detailing to avoid air leakage;
- Ventilation systems improved with reduced fan power out of hours, include heat recovery or desiccant dehumidification;
- Pool water pumps and treatment improved energy efficiency with minimised pump rates and multi-speed demand-controlled pumps;
- Pool cover installed and used regularly with reduced night ventilation;
- Lighting improved standards – metal halide lighting in pool hall with daylight and presence detection. High-efficiency fluorescents or compact fluorescents in ancillary areas; and
- Operation and scheduling improved for ancillary heating and lighting, with switching for use only.