Mendick Waring Ltd
Consulting Engineers

Mendick Waring Ltd

Rex House
354 Ballards Lane.
London
N12 0DD
T: 020 8446 9696
F: 020 8446 9900

Land adjacent to 41 Ferncroft Avenue, London

Energy Strategy

Jul-12

Project	Land adjacent to 41 Ferncroft Avenue
MW Reference	J1776
Location	Hampstead, London
Local Authority	Camden Borough Council
Client	BUJ Architects
Report Scope	Energy Statement
Quantity of Residential Units	1
Other	N/A

Issue	03 For Planning
Date	25/07/2012
Author	Estefania Martos
Signature	
Checked by	Adrian Lim
Signature	

Disclaimer

The performances of renewable systems, especially wind and solar, are difficult to predict with any certainty. This is due to the variability of environmental conditions from location to location and from year to year. As such all budget/cost and figures, which are based upon the best available information, are to be taken as an estimation only and should not be considered as a guarantee. This report relates to pre-planning stage therefore final specification must be provided by an M & E consultant after stage C.

Mendick Waring Ltd disclaims any responsibility to the Client and others in respect of any matters outside the scope of this report. This report has been prepared with reasonable skill, care and diligence within the terms of the Contract with the Client and taking account of the manpower, resources, investigations and testing devoted to it by agreement with the Client. This report is confidential to the Client and Mendick Waring Ltd accepts no responsibility of whatsoever nature to third parties to whom this report or any part thereof is made known. Any such party relies upon the report at their own risk

Contents

List of Tables and Figures

Figures

Tables

Abbreviations and Acronyms

DER	Dwelling CO_2 Emission Rate
DHW	Domestic Hot Water
LZC	Low or Zero Carbon
MVHR	Mechanical Ventilation Heat Recovery
PV	Photovoltaic
SAP	Standard Assessment Procedure for Energy Rating of Dwellings
SEDBUK	Seasonal Efficiency of a Domestic Boiler in the UK
TER	Target CO_2 Emission Rate

Chemical Symbols

CO_2	Carbon Dioxide

Executive Summary

This report forms part of a planning application from BUJ Architects to London Borough of Camden for the development entitled *'land adjacent to 41 Ferncroft Avenue'*.

The proposed development will comprise a single 2 bedroom detached house.

Mendick Waring have been appointed to produce an Energy Statement identifying how the development will address the policies set out by both the GLA London Plan and Camden Borough Council. In line with these policies, Code for Sustainable Homes (CSH) 2010 Level 4 is to be achieved.

The strategy is based on the Mayor of London's Energy Hierarchy, as follows:

- Use less energy (be lean)
- Supply energy efficiently (be clean) and
- Use renewable energy (be green).

Proposed energy efficiency measures include a well-insulated building fabric. These measures result in a reduction in dwelling CO_2 emissions of 6% when measured against Part L1A 2010 Building Regulations.

Through the use of high efficiency boiler heating system, CO_2 emissions can be reduced in order to meet requirements set by the Code for Sustainable Homes Level 4 (Ene 1).

In addition to the use of a heating system, a total Photovoltaic (PV) array of 1.5kWp is proposed to provide additional CO_2 reductions. In order to minimise the height of the building profile a near horizontal placement is currently assumed, this equates to approximately 18m² of useable roofspace, however, will be subject to a full detailed design by a solar specialist.

The proposed development under outline specifications within this document, meets criteria set out under Camden Borough Councils Core Strategy 13 *'Tackling climate change through promoting higher environmental standards'*, by ensuring the proposed dwelling achieve Code for Sustainable Homes Level 4. Further detail is outlined in Figure 1 & Table 1.

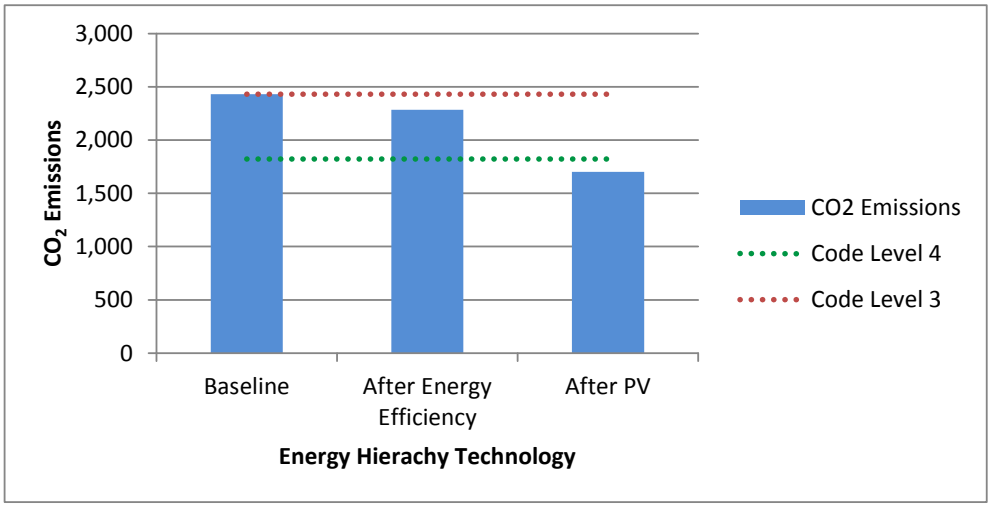

Figure 1 – *CO_2 Emissions*

	Total Site CO2 Emissions		
	Baseline	After Energy Efficiency	After PV
Ene1	2,430	2,284	1,701

Table 1 – *Land adjacent to 41 Ferncroft Avenue CO_2 Emissions*

1 Introduction

1.1 BUJ Architects is proposing to submit a planning application to Camden Borough Council for the development entitled *'Land adjacent to 41 Ferncroft Avenue'*.

1.2 Mendick Waring has been appointed to produce a site-wide Energy Statement identifying how the development will address the policies set out by Camden Borough Council. In line with these policies, the development must achieve Code for Sustainable Homes (CSH) 2010 *'Level 4'*

1.3 The strategy is based on the Energy Hierarchy, as follows:

- Use less energy (be lean)
- Supply energy efficiently (be clean) and
- Use renewable energy (be green).

1.4 Passive design and energy efficient features are considered paramount for reducing energy demand. The proposed energy efficiency measures include a well-insulated building fabric. These measures will go some way towards achieving compliance, however, Low or Zero-Carbon (LZC) energy technologies will be required.

1.5 The strategy is based on information provided by the project design team.

1.6 The embodied energy of the development is out of the scope of this report. The focus will be on delivered energy demand.

Site location and development proposal

1.7 The proposed development is located at a parcel of l*and adjacent to 41 Ferncroft Avenue'*, near Finchley Road. A single 2 bedroom detached house is proposed.

Figure 2 – ***Aerial photo of site with proposed development area***

Figure 3 – ***Proposed development (Ground Floor, First Floor and Roof Plan)***

2 Planning Policy Guidance and Legislation

2.1 The following policies will apply to the development;

London Plan 2011

- Mayor of London SPD on Sustainable Design and Construction
- Policy 5.2 – Minimising Carbon Dioxide Emissions
- Policy 5.3 – Sustainable Design & Construction
- Policy 5.5 – Decentralised Energy Networks

Camden Borough Council: Core Strategy 2010 – 2025

- London Borough of Camden Core Strategy 13 *'Tackling climate change through promoting higher environmental standards'*

Camden Borough Council: Development Policy

- DP22 Promoting sustainable design and construction

3 Energy Modelling

Approach

3.1 Passive measures to improve the thermal performance of the building fabric focus on specifying higher levels of insulation for the roof, external walls and floor, and high performance windows and doors. Other important measures include targeting lower air permeability and include the minimising of thermal bridges through best practice detailing. A full, recommended specification is provided in Section 4.12 of this report.

3.2 Efficient energy use and distribution is assured by specifying an efficient heating system and controls.

3.3 The development will generate a proportion of its energy needs through built-in low or zero-carbon technologies.

Methodology

3.4 Energy demand and resultant CO_2 emissions are estimated for the base case Target Emissions Rate (TER) and the improved, through energy efficiency, Dwelling Emissions Rate (DER). Low and zero-carbon energy technology is then applied to further enhance performance to meet the target.

3.5 CO_2 emissions are reported according to CSH Ene 1, which compares CO_2 emissions from regulated energy use (DER) with those of an equivalent dwelling built to Part L 2010 (TER). This does not include cooking or appliances.

3.6 Government approved software (NHER Plan Assessor 5.4.2) has been used to calculate energy consumption based on current SAP methodology (2009).

4 Energy Hierarchy Development

Baseline Energy Demand

4.1 Baseline energy demand assessment is based on a development with identical geometry built to meet Building Regulations, thus using standard building fabric parameters and notional heating systems.

4.2 Energy modelling shows that the base energy consumption across the development is 2,430kg CO_2/pa.

Energy Efficiency

4.3 Energy demand will be curbed by incorporating measures including high levels of thermal insulation, detailing to reduce air permeability and thermal bridging, and low-energy lighting. The following sections outline the energy efficiency measures adopted at the proposed development.

Passive Measures

4.4 The most cost-effective method of improving energy efficiency and reducing the long-term CO_2 emissions of a new development is through passive, low-energy design. Every unit of energy saved is equivalent to a unit of LZC energy generated, however passive design measures will help reduce the building's carbon footprint throughout its entire life, and thus they should be applied before LZC energy technologies are considered. The proposed development has been designed to maximise these passive measures.

4.5 To minimise the requirement for space heating it is essential to minimise heat loss through the building envelope. The following figure illustrates conductive heat loss in a typical dwelling, with thicker arrows representing a higher heat flux, highlighting areas where thermal resistance should be maximised.

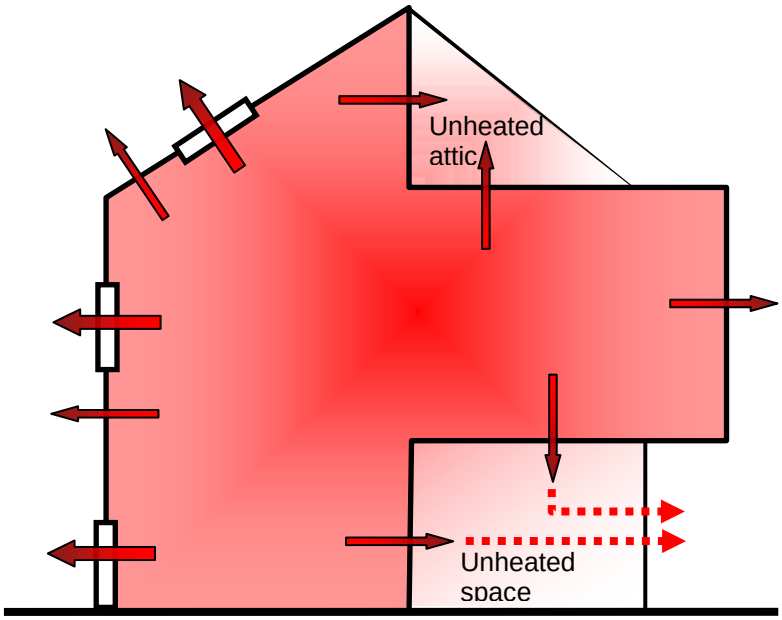

Figure 4 – *Conductive heat loss*

4.6 In addition to heat loss through conduction, it is important to reduce uncontrolled convective heat loss due to air leakage.

Heating System

4.7 Once energy demand has been addressed, the next step is to supply energy efficiently. In the case of heat, this relates to heat source efficiency, distribution losses, control system and heat emitters.

4.8 Energy efficiency has been addressed through the outline specification of high efficiency boiler with an efficiency of 89%, as defined by Seasonal Efficiency of a Domestic Boiler in the UK (SEDBUK).

4.9 The boiler will provide 100% of all space heating and hot water requirements.

Ventilation

4.10 Opportunities for cross-ventilation are to be exploited wherever possible.

4.11 Mechanical cooling is not specified.

Specification

4.12 The following specification has been assumed in modelling the energy efficiency case:

- U-value of heat-loss floors 0.11 W/m^2K
- U-value of heat-loss walls 0.16 W/m^2K
- U-value of roofs 0.11 W/m^2K
- U-value of windows 1.2 W/m2K
- G-value of glazing 63% solar transmittance
- Air permeability: 5 m^3/m^2.h
- MVHR ≥90% efficiency SFP ≤0.7 w/l
- No flues, open fireplaces, or flueless gas fires
- No air conditioning
- Heating provided via high efficiency boiler
- Individual hot water cylinders providing 210 litres of storage, insulation is spray foam to 80mm thickness
- Time and temperature zone control
- 100% low energy light fittings

4.13 It should be noted that the above specification is a recommendation only and may be subject to change at a later stage. Any change in this specification will affect the size of any LZCs and may necessitate the addition of renewable technology to ensure the building continues to meet the target.

Energy Efficiency Results

4.14 The goal of assessing energy demand is to quantify building performance, and to establish a basis for comparison of LZCs in view of the CO_2 emissions reduction targets.

4.15 The calculation methodology used is similar to that for baseline energy demand and was outlined in Section 3 of this report.

4.16 It was found that the recommended specification results in domestic CO_2 emissions being around 6% lower than the TER.

4.17 The greatest gains in energy efficiency will be achieved for space heating. Lighting requirements will be slightly higher in the efficient case since glazing units with a higher thermal resistance will have a lower light transmittance.

4.18 In order to achieve CO_2 aspired emissions for Code Level 4, further reductions must be sought to achieve a 25% reduction. Given the nature of the development, the most effective way to reduce CO_2 is through the use of a photovoltaic panel installation.

Photovoltaics

4.19 Photovoltaic (PV) panels create electricity from solar radiation with efficiency ranging between 5 and 19%.

4.20 PV modules generally require minimal maintenance. 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.

4.21 PV modules have no operating emissions and produce no noise, making them the most benign zero-carbon technology.

4.22 Projected output calculations were carried out in accordance with the SAP 2009 methodology.

4.23 A single array is assumed, with electricity feeding the main's supply. For the purposes of the CSH, solar electricity is supplied to the house in order to achieve Code Level 4

4.24 Modelling results based on energy types across the development incorporate an array with a total installed capacity of 1.5kWp array (mounted near horizontal). This provides additional reductions in CO_2 emissions aspired (Ene 1) as part of the proposals in order to meet the required target of Code Level 4 (Nov 2010).

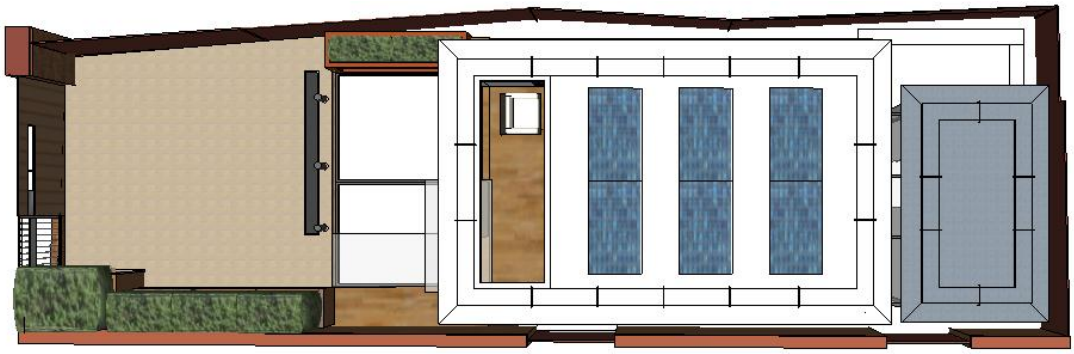

Figure 5 – ***Aerial view with proposed photovoltaic installation***

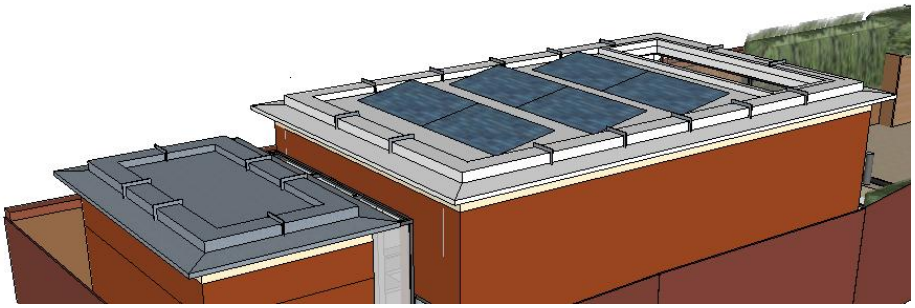

Figure 6 – ***Projected view of photovoltaic installation facing east***

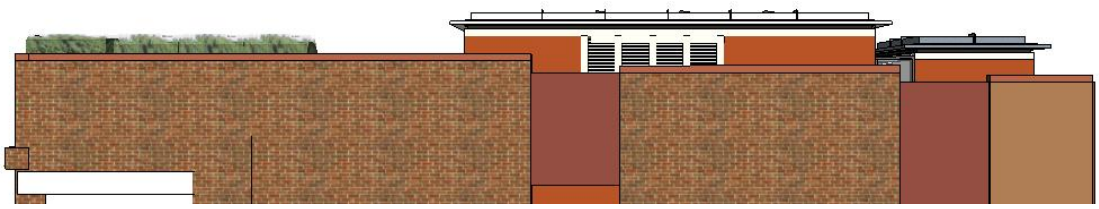

Figure 7 – *North-West elevation with photovoltaic installation*

4.25 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.

4.26 Should a PV array be mounted horizontally, a roof area of approximately 18m² (inclusive of access space) will be required. It should be noted that some degree of tilt will be required (>10°) in order to allow for self cleaning of panels and the avoidance of water build up.

5 Conclusions

5.1 This strategy is based on the Energy Hierarchy, as follows:

- Use less energy (be lean)

and

- Supply energy efficiently (be clean)

5.2 Proposed energy efficiency measures include a well-insulated building fabric. These measures result in a reduction in dwelling CO_2 emissions of 6% when measured against Part L 2010 Building Regulations.

- Use renewable energy (be green).

5.3 Further CO_2 emission savings can be sought through the use of a combination of the following proposals

- High efficiency boiler heating system, with an efficiency of 89%.
- Photovoltaic panels (1.5kWp)

5.4 Through these measures total CO_2 emissions can be reduced in order to achieve Code Level 4* (Ene 1). The proposed PV installation will require approximately 18m² of roofspace if mounted horizontally.

It should be noted that some degree of tilt will be required (>10°) in order to allow for self-cleaning of panels and the avoidance of water build up.

5.5 The following table and chart detail the reductions in CO_2 emission reductions as a result of following the energy hierarchy.

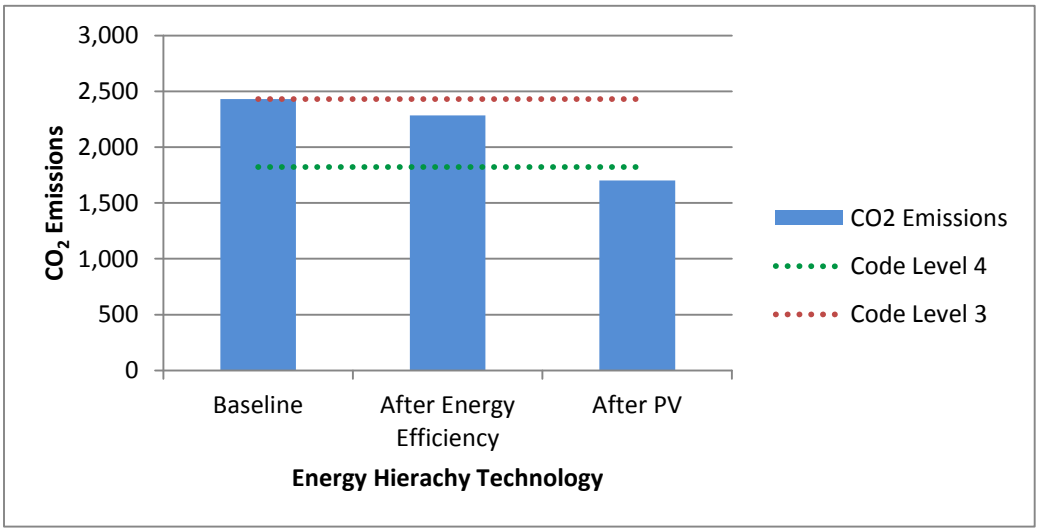

Figure 8 – *CO_2 Emissions*

	Total Site CO2 Emissions		
	Baseline	After Energy Efficiency	After PV
Ene1	2,430	2,284	1,701

Table 2 – *Land adjacent to 41 Ferncroft Avenue CO_2 Emissions*

Appendix 1 Glossary

Energy Type	A set of dwellings on a development site are of the same *'Energy Type'* if they have the same SAP output for DER, TER and HLP. They will exhibit each of the following:- • The same dwelling size, built form and construction details; • The same space heating, hot-water system and controls; • The same orientation and level of over-shading/sheltering; and • The same assumed/actual air permeability and ventilation system.
Regulated Energy	Regulated energy is the energy in a dwelling covered by PartL1A i.e. Space Heating, Domestic Hot Water, Lighting, Pumps and Fans
Unregulated Energy	Unregulated Energy is the energy in a dwelling not covered by PartL1A i.e. Appliances and Cooking
Total Energy	It the total energy use within a dwelling, both Regulated and Unregulated Energy.

Appendix 2 Code for Sustainable Homes Ene 1 – Energy and Carbon Dioxide Emissions

Aim

To limit emissions of carbon dioxide (CO_2) to the atmosphere arising from the operation of a dwelling and its services.

Assessment Criteria

Credits are awarded based on the percentage improvement in the Dwelling Emission Rate (DER), (estimated carbon dioxide emissions in kg per m^2 per annum arising from energy use for heating, hot water and lighting for the actual dwelling), below the Target Emission Rate (TER), (the maximum emission rate permitted by Building Regulations), for the *dwelling* where DER and TER are as defined in Approved Document L1A 2010 Edition of the Building Regulations. Credits are awarded in accordance with the table below. Note that to reach Level 6 (zero carbon) there are additional requirements, (see below).

Criteria		
% Improvement 2010 DER/TER*[1]	Credits*[2]	Mandatory Requirements
≥ 8%	1	
≥ 16%	2	
≥ **25%**	**3**	**Level 4**
≥ 36%	4	
≥ 47%	5	
≥ 59%	6	
≥ 72%	7	
≥ 85%	8	
≥ **100%**	**9**	**Level 5**
Zero *Net* CO_2 *Emissions*	**10**	**Level 6**
Default Cases		
None		

*[1] Performance requirements are equivalent to those in previous scheme versions but are now measured using the AD L1A 2010 TER as the baseline.

*[2] Up to nine credits are awarded on a sliding scale. The scale is based on increments of 0.1 credits, distributed equally between the benchmarks defined in this table.

DER The Dwelling Emission Rate is the estimated carbon dioxide emissions per m^2 for the building as designed, for energy in use for heating, hot water and lighting. This is calculated using the SAP method, and is defined in AD L1A of the Building Regulations.

TER The Target Emission Rate is the maximum allowable carbon dioxide emissions for energy use in heating, hot water and lighting which would meet the Building Regulations. This is calculated using the SAP 2005 method.

(Communities 2008)