160-164 Royal College Street NW1 0TA

Renewable Energy Proposals

The development comprises 600 square metres over ground floor and basement. Due to the location of the development the only source of renewable energy applicable is biomass for hot water and heating.

Renewable Energy Technologies Selection

Renewable Energy Technology	**Selected?**	**Comment**
Ground source heat pumps	No	Existing infra structure present below building will not allow for this
Ground cooling	No	Cooling system not required
Biomass heating and hot water	**Yes**	**A central heating and hot water system is to be installed and adequate space will be provided for fuel storage**
Biomass CHP*	No	
Solar water heating	No	No appropriate location for solar panels
Photovoltaics (rooftop)	No	No appropriate location for solar panels
Photovoltaics (cladding)	No	Building orientation not suitable
Wind turbines	No	Town centre development with insufficient land

*CHP (combined heat and power)

Baseline Annual Predicted Energy Demand

The base annual predicted energy demand of the development is calculate in this section. It takes account of the application of suitable energy efficiency measures and technologies (including CHP) but does not account for the integration of renewables.

Benchmarks (London Energy Partnership, 2004) for this type of development (with an additional safety factor) were used to calculate the following energy requirements for this proposal. By taking these figures we are ensuring a more conservative estimate of percentage carbon emission reductions provided by the proposed renewable energy sources.

	Benchmark energy requirement (kWh/m2/year)	**Baseline delivered energy (kWh/year)**
Gas	130	78000
Electric	30	18000

Baseline Carbon Emissions

The calculations for baseline Carbon emissions uses the following data:

Floor area of proposed flats: 600m2

Conversion factor for Carbon dioxide to Carbon: 12/44

	Benchmark energy requirement *	**Baseline delivered energy**	**CO2 emission factor #**	**Baseline CO2 emissions**	**Baseline Carbon emissions**
Units	kWh/m2/year	kWh/year	kgCO2/kWh	kgCO2/year	kgC/year
Gas	130	78000	0.194	15132	4126
Electric	30	18000	0.422	7596	2071
total		**96000**			**6197**

*Source: London Energy Partnership, 2004

#Source: Building Regulations 2000, 2006 edition

Breakdown of delivered energy by fuel and end use

	Total baseline delivered energy	**Energy end uses**	**proportion delivered**	**Delivered energy**
Units	kWh/year			kWh
Gas	78000	**Space heating gas**	**0.6**	**46800**
		Hot water and cooking gas	**0.4**	**31200**
		space heating and hot water		78000
		Other gas	0	
Electricity	18000	Space heating electric	0	
		Hot water electric	0	
		Space heating and hot water	0	
		Cooling (refrigeration) electric	0	
		fans, pumps and controls	**0.05**	**900**
		Other electricity (lighting, cooking, appliances etc.)	**0.95**	**17100**

Contribution of Biomass heating and hot water to reduced carbon emissions

The full calculations for the carbon emission reductions can be found in Appendix 1.

Renewable Energy Technology	Reduction in Carbon emission (kgC/year	Percentage Reduction in Carbon emission
Biomass heating and hot water	660	12%

References

London Energy Partnership, September 2004, Integrating renewable energy into new developments: Toolkit for Planners, developers and consultants, Greater London Authority, ISBN 1 85261 660 1

The Building Regulations 2000, 2006 edition, Conservation of fuel and power, Document L2A

Appendix 1 – Calculations for the contribution of proposed renewable energy technology to reduced carbon emissions

Biomass Heating

	Calculation	Value	Unit	Comment
Total DELIVERED gas energy in the base building for space heating and hot water (end uses to be served by biomass heating)	1	78000	kWh/year	
Heating system efficiency in base building	2	86	%	Typical seasonal efficiency of gas boilers
End use DEMAND met	3=1x2	67080	kWh/year	
Proportion of end use demand met by Biomass Heating	**4**	**16**	**%**	**System sizing**
Annual energy DEMAND met by Biomass Heating	5=3x4	10732.8	kWh/year	
Total DELIVERED gas energy in the base building	6	78000	kWh/year	
DELIVERED gas requirement substituted by Biomass heating	7=5/2	12480	kWh/year	
Remaining requirement for DELIVERED gas after application of Biomass heating	8=6-7	65520	kWh/year	
CO2 emission factor for gas		0.194	kgCO2/kWh	Source building regs 2000 doc L2A
Carbon emission factor for gas	9	0.0529091	kgC/kWh	
Carbon emission due to delivered gas in building with Biomass heating	**10=8x9**	**3467**	**kgC/year**	
Total DELIVERED electricity in base building	11	18000	kWh/year	
CO2 emission factor for electricity		0.422	kgCO2/kWh	Source building regs 2000 doc L2A
Carbon emission factor for electricity	12	0.1150909	kgC/kWh	
Carbon emission due to delivered elecricity in building with biomass heating (same as base building)	**13=11x12**	**2072**	**kgC/year**	
Total building carbon emissions in building with Biomass heating	**14=10+13**	**5538**	**kgC/year**	
Base building total carbon emissions	15=6x9+13	6199	kgC/year	
Reduction in carbon emissions due to application of biomass heating	16=15-14	660	kgC/year	
Percentage carbon emission reduction due to application of Biomass Heating	**17=16/14**	**12**	**%**	

* Typical seasonal efficiency of gas boilers

Source: Building Regulations 2000, 2006 edition