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ENERGY REPORT

FOR

**86 GUILDFORD STREET,
CHERTSEY,
SURREY
KT16 9AD**

PREPARED BY

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The requirement, at this stage, is to provide at least 10% of the power required from renewable energy.

The main sources of renewable energy are:

- Solar thermal (solar water heating systems)
- Solar electric (photovoltaic)
- Heat pumps (ground source and air source)
- Wind turbines (small scale, building mounted)
- Biomass (domestic biomass) heating systems
- Hydro-electricity

1. Solar thermal (solar water heating)

Various systems are available, usually in the form of a solar thermal collector, installed at roof level. This collector absorbs the sun's energy and transforms it into a liquid. This is usually a water/antifreeze solution. The liquid is circulated through a heat exchange coil in the hot water cylinder where the heat is transferred to the cooler water at the bottom.

In the UK, at this stage of development, it is usual to have a fail-safe support system which would normally be a central heating boiler. This heats the water to a greater temperature than the solar heater water depending on the amount of sun and hot water required. The operation of most systems is controlled by an automatic electronic unit which compares the temperatures of the collector and the store.

A flat plate collector or an evacuated tube collector can be used. In essence, the flat plate collector is usually cheaper and preferred for the required 10% renewable energy for, although the evacuated tube collector is more efficient, it tends to be more expensive.

Solar heating is normally placed on the roof, preferably south facing with as little obstruction as possible. However, if this is intended for a sensitive site, then there could be planning issues which may preclude its use.

2. Solar electric (photovoltaic)

Solar electric systems use the energy from the sun to make electricity which can be utilised in any development with the excess created being fed back into the National Grid.

The solar electric panels, which incorporate the photovoltaic cells, are installed at roof level. When the sun shines onto the cells, a direct current is created and this is usually converted, by means of an inverter, into alternating current. This is then fed into the mains electrical system.

There are two principal types of photovoltaic cells: the monocrystalline cells and the thin film cells. The former are more efficient, but expensive; the latter are less efficient and therefore require a larger area to create the same amount of energy.

This form of renewable energy is too expensive at the moment for small developments and of course they can present planning difficulties in sensitive areas.

3. Heat Pumps (ground source and air source)

Heat pumps turn low temperature heat, absorbing the heat surrounding a building either from the ground or air, into higher temperature heat that can be used for both space and water heating.

If taken from the ground, this is achieved via loops in the ground, deep bore piling or from a lake if this is available. The system is generally used in conjunction with underfloor heating or radiators, but there are two main difficulties with this form of renewable energy: first, a large amount of trenching is required for a loop system and, secondly, the bore hole method and lake system are expensive.

Although this form of renewable energy is reducing in cost with its increased use, it is still expensive for smaller developments.

Air source heat pumps extract ambient heat from outside the building and require a heat pump and circulating pump. This is a low pressure, hot water system, similar to a central heating system, and uses an anti-freeze solution.

The technology for this form of renewable energy has improved in recent times, with a comparatively small unit being fixed on the external wall. The cost of producing this form of heating has also been dramatically reduced and consequently it is worth considering for small developments. Although it is still more expensive than a conventional boiler, it can provide the majority of space and water heating through renewable energy.

4. Wind turbines

This form of renewable energy has been discounted for this development for two principal reasons: first, they are unsuitable for planning reasons and secondly, the minimum wind speed, as recommended by the Energy Saving Trust, is 6 m/sec., whereas the geographical location of the site has only 4 m/sec.

5. Biomass (domestic biomass heating systems)

Biomass is the oldest form of renewable energy and is derived from biomass fuels such as trees and crops. This can be delivered from burning, fermentation or extraction to provide energy for heating.

The three main types of fuel are logs, wood chips or wood pellets and the moisture content of these fuels is important.

The disadvantage of this system is that it cannot be readily shut down with automatic restart and it has a minimum fuel burning rate. The system only becomes viable on small developments if there is a central biomass boiler installation, serving a number of dwellings, and a distribution network. This is not a practical alternative from a developer's point of view.

6. Hydro-electricity

This system is discounted as there is no suitable site for a micro-hydro plant and the total cost is likely to be high.

CONCLUSION

We give below the total consumption of this development at 86 Guildford Street, Chertsey, Surrey, and can demonstrate a saving using a single panel of solar heating to each of the flats for the hot water, and the use of four panels for the retail unit.

		Using a solar twin panel for each flat gives a saving of:
<u>Flat 1</u>		
	kWh/year	kWh/year
Main heating	780.58	
Water heating	2146.61	1000.00
Cooking	641.19	
Lighting and appliances	2202.36	
	<hr/>	
Total	5770.74 kWh/year	
 <u>Flat 2</u>		
	kWh/year	kWh/year
Main heating	836.34	
Water heating	1979.34	1000.00
Cooking	613.32	
Lighting and appliances	1867.83	
	<hr/>	
Total	5296.83 kWh/year	

Using a solar twin panel for each flat gives a saving of:

Flat 3

	kWh/year	kWh/year
Main heating	1449.66	
Water heating	1979.34	1000.00
Cooking	613.32	
Lighting and appliances	1867.83	
Total	5910.15 kWh/year	

Flat 4

	kWh/year	kWh/year
Main heating	1505.41	
Water heating	2146.61	1000.00
Cooking	641.19	
Lighting and appliances	2202.36	
Total	6495.57 kWh/year	

Retail Unit (as compiled by BRE 2005)

Taken as a small food shop

Based on "Good Practice"	Fossil fuel	80 kWh/year per m ²
	Electricity	400 kWh/year per m ²

Retail Unit net lettable area

Based on "Good Practice"

117.31 x 80	=	9384.80 kWh/year fossil fuel
117.31 x 400	=	46924.00 kWh/year electricity

Total: **56308.80 kWh/year**

Using 4 standard solar twin panels will save 4000.00 kWh/year

Therefore total saving is 8000.00 kWh/year

Percentage saved by using renewable energy:

$$\frac{8000.00}{79782.09} \times 100 = 10.03\%$$



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