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293 Lower Richmond Road
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Energy Statement

for NOTTING HILL HOME OWNERSHIP

Prepared by: Wessex Energy
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293 Lower Richmond Rd
Energy Statement

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Summary

This report provides a summary of the energy options for a development of 52 affordable properties and 1,018M2 of commercial floor space at 293 Lower Richmond Road. The development comprises seven 3 bed, thirty 2 bed and fifteen 1 bed flats.

There is a planning requirement to achieve a 20% reduction in building CO2 emissions, arising from the use of energy in the buildings.

The following report determines the current anticipated energy use of the buildings, based upon the current architectural proposals, examines the available renewable technology applicable to the development and calculates the potential Carbon Dioxide emission savings for each option. The report also examines the practicability of each of the available renewable technologies.

The calculated reductions in CO2 emissions for each technology have been calculated using the dwellings as designed and excludes any improvements gained through envelope improvements. In conjunction with this report, pre-assessments for both BREEAM & Code for Sustainable Homes (CFSH) have been completed and are provided as part of the overall submission.

1.0 The Site

293 Lower Richmond Road is a new development of 52 residential properties and 1,018M2 of commercial space located in three blocks, either 3 or 4 floors. The apartments offer a mixture of accommodation from 1 bed to 3 beds.

The development is located on a previously developed site. The apartments are within close proximity to good transport facilities and a range of local amenities. Cycle storage and home office facilities will be provided for each of the flats.

A number of measures have been included to address the sustainability of the building both during & post construction and to reduce the carbon footprint of the building:

- The provision a renewable energy source sources
- Use of low energy lighting, lighting controls & appliances
- Installing low water use taps, cisterns & showers
- Sustainable timber
- Land re-use
- Proximity to local transport & amenities. Providing home office space, enabling work from home
- Use of zero ODP & low GWP insulation and low NOx boilers
- Making provision for waste re-cycling

As of January 1st 2009, the Council expect all schemes including 1 or more residential units, and commercial or other developments of 100m2 or more, to be subject to the Sustainable Construction Checklist.

Items 4 and 5 of the Checklist – Designing for minimum energy use, and reducing predicted site CO2 emissions – should be addressed in an Energy statement. An Energy Statement should therefore be provided for all new build developments that meet the relevant thresholds.

The report aims to achieve the council's guidelines of using less or renewable energy or supplying energy efficiently by demonstrating that the requirement for a 20% reduction in CO2 emissions can be met using a robust solution.

In preparing this following Energy Statement reference has been made to the above paragraphs and the London Toolkit (Integrating renewable energy into new developments September 2004), plus any subsequent updates.

2.0 Statement of Energy Use

For the SAP 2006 & SBEM calculations the following U values have been assumed. These have been provided by the Architect and are designed to provide compliance with Approved Document Part L1A and Part L2A. The U

values are not providing any significant enhancement to the envelope over compliance.

- Wall U value 0.30
- Window U value 1.4
- Roof U value 0.20
- Floor U Value 0.20

Reducing carbon emissions is becoming a priority and the effects of global warming appear to be accelerating, causing world-wide temperature rises and frequent severe weather events.

In both residential & commercial buildings carbon emissions can be reduced by ensuring the design is as thermal efficient as practicable and that the adverse effects of solar gains are minimised, using low or zero carbon energy systems to provide space & water heating and reducing direct electricity consumption through the use of low energy lighting and selecting appliances with the highest available energy ratings.

From the Part L calculations the following figures have been extracted:

	kWhs	KgsCO2/yr
Energy required for Space & water heating	275,462	53,440
Energy required for cooking, lighting, pumps & fans	127,476	53,794
TOTAL	402,938	107,234

3.0 Energy systems

The following is a list of the current available, on-site, renewable technologies that can be used in both residential & commercial developments.

- Solar Thermal (solar hot water)
- Ground sourced heat pumps
- Biomass
- Combined heat & Power
- Solar PV
- Wind

Each of these has been considered to determine their suitability for this development.

4.0 Solar Hot Water

Solar thermal collectors provide hot water by using the energy present in sunlight to heat a collector; this energy is then transferred to a circulating fluid and used to heat hot water. There are two types of collector available, flat plate and vacuum tube. The efficiency of the systems differs with, on average

evacuated tube systems proving a greater annual output that flat plate collectors system. There is potential for the collectors to be in reasonable proximity to hot water tanks to minimise transmission losses.

Solar Hot water has been modelled for the dwellings, within SAP, as part of the Code for Sustainable Homes solution with the U values given the approximately area of panel/flat is 8M2, this area cannot be accommodated on the available roof space and will produce more hot water than can be reasonably used within each dwelling. A more appropriate figure is 3M2/falt at which level some 10% of CO2 emissions will be offset.

This solution is not considered appropriate for the commercial units as water heating demand is likely to be fairly low.

5.0 Ground Source Heat Pumps

Ground source heat pumps extract heat (or coolth) from the ground.
A vertical collector system is considered the most appropriate in the context of the proposed development given the limited area available or horizontal collectors. Vertical can be between 15m – 180m deep and the minimum spacing between adjacent boreholes should be maintained at 5-15m to prevent thermal interference.

A key component of this technology is the heat exchanger and larger heat exchangers deliver greater heat transfer and are therefore more efficient but have a higher capital cost.
Heat pumps are also reversible therefore there is the potential for provision of space cooling, which may be a negative feature.

Heat pumps typically provide water at 45°C. This is lower than the 60°C required for space and water heating, either increasing radiator sizes or utilising under floor heating and requiring some form of heat top up to raise the hot water temperature to 60°C for the DHW system. On this basis electric immersion heaters will be provided in the DHW storage tank to elevate the hot water temperature. With this option there would be no gas boilers provided.

GSHP better suits a communal system. Our calculations suggest that the ground source heat pumps will only achieve a 15% reduction in CO2 emissions.

For the commercial units heat pump is considered to be the most economically viable approach but will have to be linked to another technology to achieve the 20% CO2 reduction required.

6.0 Biomass Boiler

Biomass boilers replace conventionally powered boilers with a carbon neutral fuel such as wood pellets. Space would be required for these boilers and

storage of the fuel and it may be possible to source the fuel from within the local area.

However, it should be noted that fossil fuels are utilised in the production, processing and transportation of biomass fuels and therefore care should be taken when choosing the fuel supplier and the distance and method over for transportation.

Biomass would again be better as a district heating system and requires a considerable amount of space for the boiler and fuel storage.

Bio fuel boilers have not been considered as there are currently insufficient resources for both transport & home heating use, with transport being the higher value option.

There is insufficient space available on the development for a central boiler room & biomass store, without compromising the space set aside for recreation & leisure and the increase in transport required in making deliveries to site would not be a welcome addition.

7.0 Combined Heat & Power (CHP)

CHP can provide both heat and electricity use for the site. This site would require only a small CHP unit to supplement individual gas boilers. For economic viability CHP units need to operate throughout the year, usually up to 17 hours/day and, in common with most houses developments; there is insufficient summer time heat load for the system to avoid dumping significant amounts of heat during the summer period. For this reason option has not been considered further.

8.0 Photovoltaic Cells

Provision of electricity from photovoltaic (PV) roof mounted system has been considered since the development's design includes un-shaded, roof space with a potential angle of more than 30°.

PVs have the ability to replace most of the electricity use within dwellings, but require relatively large areas of panels.

A 2M2 PV panel per dwelling will reduce CO2 emission by approximately 10%. PVs being a "plug & play"system are relatively easy to install and there is the option to supply either the dwelling directly or to direct the output into the landlords services.

9.0 Rooftop Building Integrated Wind Turbines

There is no room on the site for a single 20m high wind turbine, so the only possible solution for the site would be individual roof mounted units. Wind

speeds are around 5.4/s giving an annual output of approximately 1,800 kWhs/annum for a 600w unit.

Although wind can be a useful contributor to reducing CO2 emissions it is not practical to provide multi windmills on a development of this size and there is in sufficient building height to allow a single, or even 3 or 4 larger turbines.

10.0 Summary of available technologies

10.1 Solar Thermal

Solar thermal has the ability to achieve the 20% reduction in CO2 emissions required, but with excessive large panel sizes/dwelling causing an over production of hot water. There is not sufficient available roof space to accommodate this level of panels. However a 3M2 panel /flat will reduce CO2 emission by approximately 10% and provide around 60% of the hot water requirement for "free".

10.2 Solar PV

A roof mounted array of approximately 2M2/dwelling will provide a reduction on CO2 emissions of 10%. To achieve the 20% 4M2/dwelling is required.

10.3 Biomass

Although Biomass has the potential for the greatest reduction in CO2 emissions, there is insufficient space for central plant and fuel storage. Individual biomass boilers are not an option as most of the dwellings do not have the facility for the flue arrangements required for individual plant.

This option has not been considered.

10.4 CHP

Lack of space for central plant coupled with the fact that there is insufficient demand for summer heat makes this option not viable on this site.

10.5 Heat Pumps

Although heat pumps have not been considered for the residential unit they will provide a flexible answer for the two office units.

10.6 Wind

There is no land available for large turbine and the installation of multi units is not seen as acceptable solution. This option has not been further evaluated.

These observations are summarised below:

Renewable Option	Energy Generated (kWhs/annum)
Solar thermal (3M2.dwelling)	10,800
GSHP	16,200
Biomass (40% contribution)	25,740
CHP	Insufficient heat demand
PV (2M2/dwelling)	11,900
Wind	Not evaluated

11.0 Conclusions

There is a requirement to achieve a 20% reduction from the base case Carbon Dioxide emissions, after allowing for any envelope improvements, and based upon our assessment of the viable options to reduce the CO2, the chosen approach is a combination of roof mounted solar thermal & PV panels for the residential units and heat pumps and PV for the commercial units.

These solutions are relatively low technology, require little maintenance, offer benefits including the provision of some "free" hot water to the residential units and meet the 20% reduction target. The use of PV panels allow some local on site electricity generation, which in future years may also provide a revenue stream, lowering tenants costs further.

	Total CO2 emissions (kgCO2/year)
Base line emissions	107,234
Improved emissions (after application of energy efficiency)	None
Improved emissions (after incorporation of efficiency energy supply)	None
Improved emissions (after incorporation of renewable energy technology) **Solar Thermal + PV**	22,700
% CO2 displaced in total	21.16
% CO2 displaced by renewable energy	21.16

Additionally the development is to achieve CFSH Level 3 & BREEAM excellent. Pre-assessments for both the Code & BREEAM Offices 2008 are included within the submission demonstrating how these levels will be achieved.

12.0 Calculation of CO2 Reductions

The following table demonstrate the savings in CO2 for an average 1, 2 & 3 bed plus the two office units. The calculations are based upon SAP outputs.

Roof Mounted Solar Panels + PV for Residential, Heat Pump + PV for Offices

3 Bed Flat		
Standard Case CO2 Emissions (no solar)		
Total heat and HW	1479.81	*kgs/CO2*
Total Electricity		
Pumps, fans, lights, appliances	1253.24	*kgs/CO2*
Total demand	2733.05	*kgs/CO2*
As Built CO2 Emissions (inc solar panels + PV)		
Total heat and HW	1008.41	*kgs/CO2*
Total Electricity	1167.15	*kgs/CO2*
Total demand	2175.56	*kgs/CO2*
Reduction in CO2 due to Solar/PV	20.40%	

2 Bed Flat		
Standard Case CO2 Emissions (no solar)		
Total heat and HW	877.40	*kgs/CO2*
Total Electricity		
Pumps, fans, lights, appliances	904.00	*kgs/CO2*
Total demand	1781.40	*kgs/CO2*
As Built CO2 Emissions (inc solar panels + PV)		
Total heat and HW	576.00	*kgs/CO2*
Total Electricity	834.79	*kgs/CO2*
Total demand	1410.79	*kgs/CO2*
Reduction in CO2 due to Solar/PV	20.80%	

1 Bed Flat		
Standard Case CO2 Emissions (no solar)		
Total heat and HW	844.30	*kgs/CO2*
Total Electricity		
Pumps, fans, lights, appliances	747.00	*kgs/CO2*
Total demand	1591.30	*kgs/CO2*
As Built CO2 Emissions (inc solar panels + PV)		
Total heat and HW	584.90	*kgs/CO2*
Total Electricity	677.79	*kgs/CO2*
Total demand	1262.69	*kgs/CO2*
Reduction in CO2 due to Solar/PV	20.65%	

Office units		
Standard Case CO2 Emissions (no solar)		
Total heat and HW	4094.50	*kgs/CO2*
Total Electricity		
Pumps, fans, lights, appliances	6697.00	*kgs/CO2*
Total demand	10791.50	*kgs/CO2*
As Built CO2 Emissions (Heat pump +PV)		
Total heat and HW	3500.80	*kgs/CO2*
Total Electricity	4981.00	*kgs/CO2*
Total demand	8481.80	*kgs/CO2*
Reduction in CO2 HP & PV	21.40%	