SEES

Sadler Energy and Environmental Services

Renewable Energy Study

Project Name: Buckland Road Site A, Richmond

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Client: Madlins

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1.0 Introduction

1.1 Development Details

This Energy Strategy has been commissioned by Madlins in respect of a development proposal for Buckland Road Site A in the London Borough of Richmond. The full proposals include the construction of 5 houses to respond to Richmond local planning authority, policy and guidance, all of which is promoting low carbon development.

As energy strategy has therefore been proposed for the site, consisting of significant improvements in the energy efficiency performance of the building fabric with a view to maximise the energy savings over the life of the buildings, reduce on-going operational and maintenance costs, and maximise the benefits to future residents. Overall, the energy strategy will deliver reductions in energy to achieve a minimum 35% of the predicted energy requirement over the site due to renewable technology.

The energy strategy for the consented scheme is considered an optimum solution for the site due to a number of reasons as discussed below.

- Advanced practice energy efficiency standards for new dwellings that will help to deliver alongside renewable and low carbon technologies a 35% contribution in CO_2.
- ‘Fabric first’ approach - By using a fabric first approach, the demand for fossil fuels is reduced and therefore the residents are hedged against potential increases in fuel costs. The savings from energy bills and carbon emissions are also locked in for the life of the property.
- Future proofing - By concentrating on the difficult fabric elements to reduce carbon, the residents are enabled to upgrade their homes further with simple ‘bolt-on’ measures such as solar water heating or photovoltaic. The proposed strategy also allows residents to change their heating systems to newer emerging technologies in the knowledge that they already have a robust fabric. These measures would further reduce fuel bills and the CO_2 emissions.

The purpose of this report is to set out client’s commitment to reduce energy and carbon emissions from the development by advanced practice energy efficiency standards with renewable technology with the view to achieve 35% reduction in CO_2.

1.2 Energy Efficiency

Domestic consumption of energy accounts for almost 20% of the carbon dioxide emissions in the UK with most energy being produced by the burning of fossil fuels such as coal, oil and gas. Carbon dioxide contributes to the problem of global warming as it traps energy from the sun inside the earth's atmosphere. The trapped heat acts like a blanket - or greenhouse - and is believed to be a cause of changes in our climate.

Electricity, gas, oil and coal are being consumed at an ever-increasing rate. If the use of non-renewable fuels for energy continues at the current rate then the supplies could run out during the lifetime of children born in the 1990s.

Currently, renewable forms of energy such as wind, sun and water only supply a small percentage of our requirements. So it makes sense to:

1. use as little energy as is necessary,
2. get the maximum amount of energy out of every type of fuel that is used and
3. ensure a minimum of energy is wasted

1.3 London Borough Planning Guidance

The Adopted London Plan for the Environment provides the policy context for decisions on Planning Applications and other proposals concerning development and transport in the London Borough of Richmond.

In summary, the target carbon and energy thresholds to be achieved for this development are noted as being;

2010 – 2013 25 per cent (Code for Sustainable Homes level 4)

2013 – 2016 40 per cent

2016 – 2031 Zero carbon

The total carbon reduction will therefore be 35% Carbon Reduction.

Development proposals should make the fullest contribution to minimising carbon dioxide emissions in accordance with the following energy hierarchy:

1. Be lean: use less energy
2. Be clean: supply energy efficiently
3. Be green: use renewable energy

2.0 Summary of proposals

2.1 Fabric Base Case

Since the strategy was originally developed there have been major changes to national, regional and local planning and energy policy. This has included a shift away from policies designed to stimulate the market for building integrated renewables and low carbon technologies to a more structured approach towards reducing energy demand and total carbon emissions. This growing focus on improved energy efficiency has resulted in a wider range of advanced performance building materials and products being available in the market and the previous strategy is no longer considered optimal in sustainability terms.

The Fabric Energy Efficiency has been calculated using L1A Conservation of Fuel and Power in New Dwellings (2012 edition) using SAP 2012.

Our client has designed the dwelling to improve fabric and efficiency performance thus future proofing reduction in CO_2 for the life of the dwelling. The proposed fabric specification achieves < 60kWh/m^2/year for the detached dwellings as a minimum.

Heat loss floors:	0.12 W/m^{2}K
External walls:	0.20 W/m^{2}K
Roofs:	Plane 0.09 W/m^{2}K
	Slope 0.14 W/m^{2}K
	Flat 0.15 W/m^{2}K
Windows:	1.20 W/m2K double glazed
Air leakage:	up to 5 m3/hm2 @ 50 Pa
Ventilation	MVHR
Low energy lighting	100%
Thermal Bridging	Client approved construction details
Party Walls	Fully filled with edges sealed

The developer has provided SAP calculations which have been compiled by a qualified SAP assessor and all dwellings meet building regulation compliance. Space heating for all dwellings is provided by Gas Boiler with full zone control and delayed start stat with pumped hot water system.

3.0 Proposed Technology

3.1. Photovoltaics

SAP ratings have been provided also by Sadler Energy and Environmental Services Ltd. Space heating for all dwellings is provided Gas Boiler with pumped hot water system with programmer and full zone control.

The specific energy consumption figures for space heating and hot water were then extracted from the SAP2012 results, and the Bredem-12 calculations for appliances added (Appendix 1). The results were then collated for the appropriate number of dwellings of each type and orientation to determine the overall figures for the development.

3.1.2 Description of technology

Photovoltaic panels convert energy from sunlight into electricity. They work in daylight, so do not require direct sunlight and are suitable for cloudy climate of the UK. However more energy will be produced in direct sunlight and in very shady positions on the photovoltaic panel will not function.

PV depends on the orientation of properties, roof pitch and weather on the level of efficiency achieved. The biggest barrier is cost but to offset these cost the government are offering small grants to assist with the purchasing cost of the PV system. Consideration as to the type of buildings the PV cells are put onto in view of the high initial cost and to optimise on the efficiency of the PV array. The PV systems are most efficient during the day, all year. Domestic properties do not fully benefit from this as the demand in the early morning and evening when the PV Cells are least efficient. Therefore consideration to installing the PV systems on commercial properties, and also the general design on large areas of available roof space offers good opportunity to maximise the efficiency of the PV system.

A typical domestic system would be between 1kWp to 2kWp which would have an output of 750 kWh per year per kWp. Systems would cost in the region of £6,000-£8,000.00 per kWp. The costs can vary from the type of system implemented, integrated tiles re more expensive than flat plat collectors but efficiency vary between the two systems. These factors should be taken into consideration when choosing the type of system.

3.1.3 Site Assessment

The development has been considered alongside the proposed fabric specification to establish the PV requirement to achieve the minimum 35% reduction in CO_2 consumption.

3.1.4 Assessment of Photovoltaics

SAP ratings have been provided also by Sadler Energy and Environmental Services Ltd. Space heating for all dwellings is provided Gas Boiler with pumped hot water system with programmer and full zone control.

3.2 Solar Hot Water

Description of technology

Solar Panels, also known as "collectors", can be fitted to a building's roof. They use the sun's heat to warm water, or another fluid, which passes through the panel. The panels work throughout daylight hours, even if the sky is overcast and there is no direct sunshine.

"Domestic hot water heating is perhaps the best overall potential application for active solar heating in Europe. It is a demand that continues all year round and still needs to be satisfied in the summer when there is plenty of sunshine. In the UK in 2000 it accounted for approximately 7% of the total national delivered energy use. A typical UK household uses approximately 15 kWh per day of delivered energy for this purpose." (Boyle G, 2004)

The SHW systems cannot be fully efficient on the development because the maximum benefits are derived on south facing roofs and not all dwelling will have favourable orientations. The ideal pitch of 35 degrees may also not be met which further reduces the efficiency of SHWS. Also the efficiency is affected by seasonal weather and time of the day. Demand for heating is at its highest in the winter months when the system is least efficient.

Typical costs are £874.00 per m2 (energy saving trust, excluding grants) for a domestic system. A periodical maintenance check of the system is required and the occupants of the dwelling should be made aware of the requirement to regularly check the pressure gauge on the system. This may cause issues with the occupants of the dwelling when leaving the homes for annual holidays etc.

Assessment of Solar Hot Water Panels

Using the improved specification and Solar Hot Water Panel does help reduce the CO_2 usage of the development, however it is not a feasible option due to roof space and limited space within the design to install a dedicated Solar Hot Water Cylinder.

4.0 Conclusions

The multi-faceted design approach ensures that the target carbon reduction and target onsite energy production from renewables and energy efficiency is achieved and exceeded. The development strategy for achieving this has included;

- Increased levels of building envelope insulation
- Increased levels of building air tightness
- Utilisation of energy efficient lighting throughout the common areas
- Utilisation of a whole house ventilation system incorporating heat recovery

The report demonstrates that the development proposals of using photovoltaic's are compatible with achieving 35% contribution via renewable technology and that as the design progress's there is reason to expect that compliance will be achieved.

The resultant carbon emission and annual energy for the residential component based on an analysis utilising the SAP 2012 methodology can be summarised as follows;

Carbon & Energy Statement										
	Carbon Kg/M2/yr	% improvement	Carbon Kg/M2/yr	% improvement	Carbon Kg/M2/yr	% improvement	Carbon Kg/M2/yr	% improvement	Carbon Kg/M2/yr	% improvement
	Plot 1 – 1.15 kWp		Plot 2 – 1.05 kWp		Plot 3 – 1.05 kWp		Plot 4 – 1.05 kWp		Plot 5 – 1.2 kWp	
BE LEAN Baseline (note1)	17.50	0%	15.85	0%	16.46	0%	15.85	0%	17.72	0%
BE CLEAN + energy efficiency (note2)	17.28	1.28%	15.33	3.30%	16.27	1.17%	15.33	3.30%	17.52	1.11%
BE CLEAN + energy efficiency & MVHR	16.06	8.25%	14.10	11.06%	15.01	8.83%	14.10	11.06%	16.31	7.94%
BE GREEN + energy efficiency & renewable energy PV (note3)	11.31	35.39 %	10.19	35.72%	10.65	35.31%	10.65	35.31%	11.35	35.97%

Note 1 the carbon emission is the target emission rate TER for the selected heating system identified in the SAP 2012 calculation, whereas the energy consumption is interpolated from the usage identified for the actual dwelling emission rate DER within the SAP 2012 calculation

Note 2 energy efficiency measures include improved building insulation as well as the provision of whole house ventilation with heat recovery

Note 3 the renewable energy is the implementation of a PV. These figures can be further improved by the utilisation of solar domestic hot water panels, which have yet to be factored into the analysis.

In conclusion, this project could deliver in round terms, at least the required 35% carbon reduction from the combined use of the strategies identified herein.

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