Sustainia

Energy Statement
FOR
62a Haverstock Hill, NW3 2BH

Prepared for:	Gridline Architecture	Prepared by:	Paul Parker Director - Sustainability
	Winston House, 2 Dollis Park, London, N3 1HF		Sustainia Ltd 55 New Road, West Molesey, KT8 1PX
Tel: E-mail:	0203 4415 897 eleonora@gridlinearchitecture.co.uk	Tel: E-mail:	020 8099 6601 paul.parker@sustainia.co.uk

Client Reference: Job Reference: Location:	GLINE S00657 LB Camden

Issue/revision	Issue 1			
Remarks	Draft Issue			
Date	19/4/16			
Prepared by	PP			
Signature				
Checked by	KP			

Issue/revision				
Remarks				
Date				
Prepared by				
Signature				
Checked by				

Contents

Executive summary

This energy statement describes the strategy used to reduce the overall carbon emissions within the development at 62a Haverstock Hill, NW3 2BH.

The development is a new build development of 3 dwellings in the London Borough of Camden.

The new build accommodation will be built to high standards of energy efficiency.

The energy strategy follows three main precepts:

- To reduce energy demand through energy efficient building fabric
- To use an efficient energy supply where possible
- To produce on-site generated energy

The report will show how each of these aspects is addressed by the proposed development.

The objective of this strategy is to achieve a 35% reduction in CO2 emissions as a result of energy efficiency, efficient supply and renewable technologies. The reduction is based on a comparison against Target Emission Rate (TER) and Design Emission Rate (DER) using SAP calculation tools.

The report shows that the development achieves a 36% CO2 reduction over the baseline building through energy efficiency improvements including low and zero carbon technologies, with a 19.5% reduction due to renewable energy technologies.

The renewable technology selected is roof mounted solar photovoltaic panels.

INTRODUCTION

This report will review the various options for provision of renewable energy technologies in relation to the new development at 62a Haverstock Hill, NW3 2BH.

This report will summarise the costs associated with installation. The report will be mindful of the end users requirements and the need to minimise maintenance and compare all options with a baseline scenario.

It is to be noted that all data is currently based on consumption from 'indicative' Part L calculations which are included in the appendices. Detailed consumption data will not be determined until Part L Building Regulations Calculations including SAP have been completed during the design period, and as such current figures are only estimates.

Development Details

Development type:	Residential
Site description:	Refurbishment /Change of use

Energy Hierarchy

There is an energy hierarchy whereby when developing a building, the first step is always to make the building as energy efficient as possible, as a cost effective means of reducing energy demand and as a result reducing the energy demand that is to be provided via the use of efficient supply and renewable energy sources.

It is recommended that as part of the scheme that the passive approach is fully investigated as a means of saving energy.

Part L of the building regulations aims to reduce carbon emissions from new buildings, this is achieved by improving the building fabric energy efficiency, for example provision of a structure which has been built to a very good standard of air tightness and improving the insulation levels; and heating system of the building itself.

The target in LB Camden is extended to a 35% reduction over the 2013 Target Emissions Rate (TER).

Note that this energy reduction is based on regulated energy demand which does not include electrical appliances etc. These are however included in the baseline energy calculation within this Energy Statement.

Renewable energy also aids in reducing the carbon emission of the buildings. The principal requirement for renewable provision under the terms of the LB Camden Guidance is that a 20% reduction of baseline CO2 emissions are achieved via the use of renewable energy technologies, and that this will contribute to the 35% target.

The scheme design should abide by the following energy hierarchy:

- Be lean - use less energy
- Be clean - Supply energy more efficiently, particularly through the use of decentralised energy.
- Be green - use renewable energy

Potential areas for consideration when seeking to improve the energy efficiency of buildings and thereby reducing CO_2 emissions are:-

- Increased fabric insulation
- Reduced thermal bridging
- Improved air tightness
- Controlled ventilation
- Efficient heating and hot water systems
- Responsive heating and lighting controls
- Efficient lighting and fittings that do not permit the use of non-efficient lighting
- Efficient electrical appliances

1.0 Energy Supply

The baseline site demand shows what a building built to minimum building regs. standards would require in terms of energy. The proposed site demand is the energy demand of the site as proposed. The renewable energy component is also shown. The Baseline site demand and the proposed site demand have been calculated using SAP Part L assessment software.

	Heating	*Cooling*	*Electricity*	*Heating*	*Cooling*	*Electricity*
	kWh / yr	*kWh / yr*	*kWh / yr*	*% of site*	*% of site*	*% of site*
Baseline Site Demand	14,434	0	7,451	66%	0%	34%
Proposed Site Demand	14,270	0	7,451	66%	0%	34%
Low/Zero Carbon Technology Contribution	0	0	2,632	0%	0%	12%

Table 1-1. Total site energy demand and proportions provided by Efficient Supply and renewable Energy technologies.

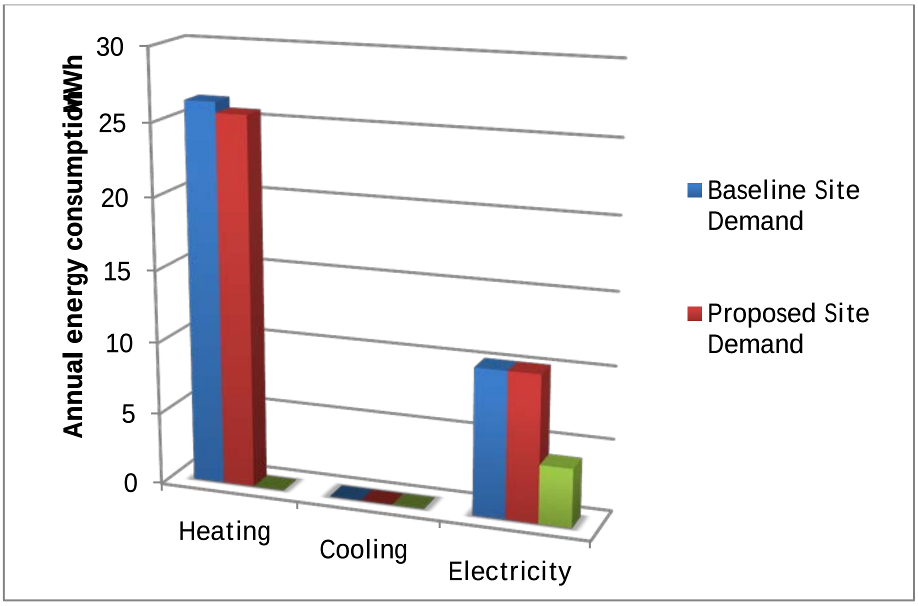


Figure 1-1. Proposed site energy supply breakdown

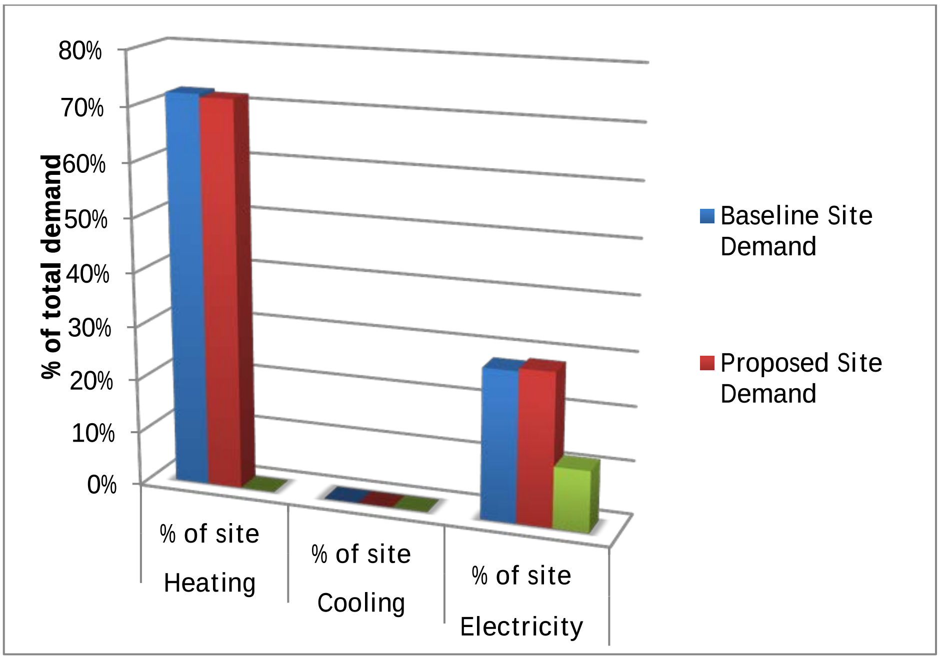


Figure 1-2. Proposed site energy supply breakdown as percentages.

1.1 CO2 Emissions

The table below shows both the CO_2 savings as a result of energy efficiency improvements, and through the use of renewable energy.

The TER and DER have been calculated using an average of the individual sample SAP's.

The contribution from renewable energy has not been included in the Energy Improvement Factor Calculation.

Table 1-2. Total site CO2 emissions and savings due to the inclusion of Efficient Supply and Renewable Energy technologies.

	TER	**DER**	**Improvement**
Energy Efficiency Improvement Factor:	19.56	12.61	**36%**

	kWh	CO2 (kg/yr)	CO2 (%)
Baseline Emissions	36,502	10,971	100%
Savings from energy efficiency	722	157	1%
Savings from Low/Zero Carbon Technology on baseline energy demand	4,060	2,107	19.5%

Contribution from Renewable Technologies			**19.5%**

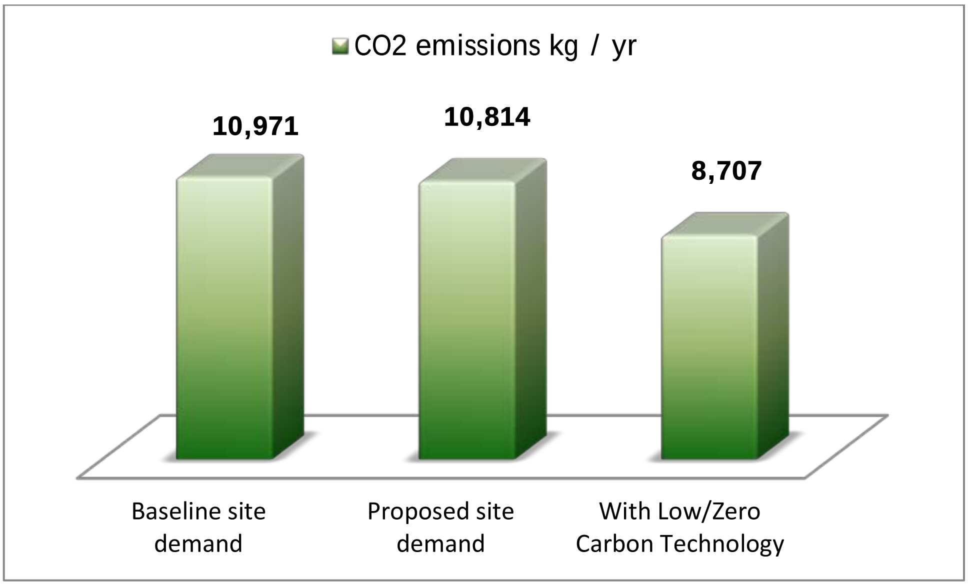


Figure 1-3. CO_2 emissions from the site at each stage of analysis

2.0 Energy Demand

Table 2-1. Total site CO_2 emissions and savings by end use.

	Baseline scheme (see assumptions and benchmarks below		Proposed scheme (including energy efficient design and technology)		Change	
	kWh/yr	CO2(kg/yr)	kWh/yr	CO2(kg/yr)	kWh/yr	CO2(kg/yr)
Heating	26,347	5,692	25,625	5,535	722	157
Cooling	0	0	0	0	0	0
Electricity	10,155	5,279	10,155	5,279	0	0

Benchmarks have been calculated in the following way:

A representative sample of dwellings was modelled using a SAP 2012 (standard assessment procedure) calculation tool.

The resulting energy loads were extrapolated for the other dwellings of the same type, based on floor areas.

Auxiliary electricity demand (cooking and appliances) is estimated at 26.012 kWh/m2 as per BREDEM 12 recommendations.

All indicative SAP reports are available.

Table 2-3. Summary of Energy Efficiency for all site loads.

Inputs				
Load number			All	
Development description:			New build	
Number of loads				3.0
Building type:			Maisonettes	
Floor area (m2):				193.5
Loads - totals				
		Baseline	Proposed	Saving
Space heating	kWh / yr	18,731	18,827	-0.51%
	kg CO2/ yr	4,046	4,067	-0.52%
Hot water	kWh / yr	7,616	6,798	10.74%
	kg CO2/ yr	1,646	1,468	10.81%
Cooling	kWh / yr	0	0	0.00%
	kg CO2/ yr	0	0	0.00%
Lighting	kWh / yr	1,297	1,297	0.00%
	kg CO2/ yr	673	673	0.00%
Building Electrical	kWh / yr	225	225	0.00%
	kg CO2/ yr	117	117	0.00%
Auxiliary Electrical	kWh / yr	8,633	8,633	0.00%
	kg CO2/ yr	4,489	4,489	0.00%
CO2 emissions				
		Baseline	Proposed	Saving
Total CO2 emissions	kg CO2 / yr	10,971	10,814	157
CO2 saving	% CO2 reduction			1.43%
		TER	DER	Improvement
Energy Efficiency Improvement Factor:		19.56	12.61	**36 %**

3.0 Energy efficient design

3.1 Passive solar design

Glazing has been maximised on the south west façade. Other passive solar design issues are constrained by site specifics and dwelling orientation.

3.2 Lighting

Energy efficiency will be better than the sample benchmarks in practice, with the use of LED lighting.

3.3 Insulation

The development will exceed the Part L1A building regulations requirements in terms of the performance of the thermal elements.

The exact construction of the building elements is not yet known but the client has agreed to work to the minimum specifications below.

The infiltration and thermal performance will be to a high standard. The following table shows the proposed u-values.

- Walls 0.17
- Roof 0.10
- Ground floor 0.10
- Windows 1.2 (maximum)

3.4 Thermal Mass

Thermal mass will be relatively high with masonry and steel frame construction

3.5 Infiltration

The infiltration rate for the new build has been assumed to be close to best practice, 5.0 m^3 / ($h.m^2$) will be the maximum target.

The accepted advice on the matter is to 'build tight – ventilate right' in order to implement an effective ventilation strategy.

Better infiltration rates are achievable through good practice the Energy Saving Trust document: GPG 224 'Improving airtightness in dwellings' which is aimed at residential development and is a useful reference on achieving low infiltration rates.

3.6 Additional measures

All appliances will be specified to A or AAA energy standards. WC's and other fittings will be low flow/low flush for water conservation. The auxiliary energy load however is pre-determined by BREDEM12 (see 2.0 above) so this is not reflected in the energy calculations shown in this report.

4.0 Building Services

4.1 Space Heating

The heating load for the development is 18.8 MWh per year.

Gas central heating has been selected for space heating. The model selected is a condensing combi boiler, using underfloor heating with time and temperature zone control

4.2 Direct Hot Water

Direct hot water will be provided by the main heating system

4.3 Cooling

There will be no cooling

4.4 Ventilation

All areas are to be naturally ventilated with opening windows. WC's, Bathrooms and kitchens will have a mechanical exhaust.

5.0 Renewable Energy

5.1 Renewable Energy – Summary

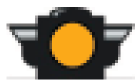
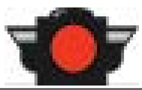
The following table lists all the systems analysed. Their contribution to the remainder of the site energy demands not met by Efficient Supply is expressed as a percentage.

Table 5-1. Summary of all Renewable Energy systems analysed showing energy outputs as a proportion of the site demands. The final column indicates if the system has been selected for inclusion on the site.

System type	Energy generated (% of proposed site demands)			Capital Cost £	Energy produced kWh/y	CO2 Saved kg CO2/yr)	CO2 Saved (% of proposed site demands)	Selected
	Heating	Cooling	Electricity					
Building Mounted Wind Turbines	0%	0%	0%	£0.00	0	0	0%	N
PV	0%	0%	40%	£6,500.00	4,060	2,107	19%	Y
Solar water heating (SWH)	0%	0%	0%	£0.00	0	0	0%	N
Solar water heating (SWH)	0%	0%	0%	£0.00	0	0	0%	N
Biomass heating systems	0%	0%	0%	£0.00	0	0	0%	N
Gas CHP	0%	0%	0%	£0.00	0	0	0%	N
Ground cooling	0%	0%	0%	£0.00	0	0	0%	N
Total (included systems)	0%	0%	40%	£6,500.00	4,060	2,107	19%	

5.2 Renewable Energy – Analysed Systems

Below is a brief overview of the available low or zero carbon technologies which are commonly used. A traffic light system is used to denote whether the systems are technically appropriate for the development.

Description	Traffic Light
Technology is technically and economically feasible with few barriers to implementation	
Technology is technically and economically feasible, but there are barriers to implementation	
Technology is technically or economically unfeasible and has been discounted	

Only those systems that are Amber or Green will be considered further.

N.B Micro hydro has not been considered as there is no potential at this site

5.2.1 Solar Photovoltaic (PV)

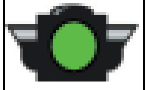
Solar photovoltaic (PV) systems use energy from the sun to convert solar radiation into electricity, which can be used directly to run appliances and lighting, sold to the national grid, or stored in batteries, in off-grid locations.

PV systems perform best in direct sunlight, but continue to perform well in reduced light conditions. Systems come in various forms including solar tiles, roof-integrated panels, and on-roof panels. PV systems are also available for cladding buildings and covering walkways.

A PV array would yield both energy and CO2 savings, while providing long term revenue via the feed in tariff, therefore a PV system is **recommended** for this site.

As an indication the feed-in tariff would be expected to provide around £172 p.a. (based on a tariff of 4.25p per kWh). In addition energy generated will displace an equivalent amount of purchased power at a rate of say £0.14 per kWh. This means the total benefit based on 4,060 kWh generated would be **£740** p.a.

At the time of writing this report, the estimated installed cost of a PV array is in the region of £2,500/KWp of array, so a peak power of 4.83 kW would come at a cost of around £12,075.



Description	
System number:	1
System name:	PV-system-1
Make and model number:	SunPower 345W, DS-X21 PV Panels
System description:	3 rows, mounted on the roof on stand-off frames, in landscape orientation. 1 row of 4 panels orientated SW, 1 row of 4 panels orientated SE, 1 row of 6 panels orientated S.
Number panels:	14

Inputs			
Installed Capital cost per m2:	556 £ / kWp		
System Lifetime:	25 Years		
PV technology:	Mono-si		
PV area:	21.7 m²		
Power capacity:	187 kWh / m²		
Panel efficiency:	4.83 kWp		
Weather data:	20%		
	London		
Outputs	Heating	Cooling	Electricity
Energy generated kWh (SAP 2012)			4,060
Proportion of total demand %			40 %

CO_2 saving	
Net CO_2 saving:	2,107 kg
CO_2 saving as a proportion of the site demand:	19.5%
Costs	
Total capital cost of systems:	£12,075

19.5

5.2.2 Wind Turbines

A wind turbine harnesses energy from the wind to produce electricity. The most common design is of three blades mounted on a horizontal axis (HAWT), which is free to rotate into the wind on a tall tower or mast. The blades drive a generator either directly or via a gearbox (generally for larger machines) to produce electricity. Wind turbines can be mounted on masts that are freestanding or tethered with wires, or on buildings. Vertical axis wind turbines (VAWT) can be up to 30% more efficient than HAWT's although the overall energy yield is lower than an 'equivalent' HAWT. The electricity can either link to the grid or, in the case of off-grid systems, charge batteries. Modern designs can be very quiet in operation.

The NOABL wind speed database gives a figure of 5.6 m/s at 25 m height for the area of the tallest part of the building, which could make a small wind turbine viable. However, in an urban infill situation such as this a wind turbine has no real practical application

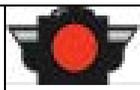
5.2.3 Combined Heat & Power (CHP)

Combined heat and power (CHP) is the on-site generation of electricity and the utilisation of the heat that is produced as a by-product of this generation.

This means that CHP systems achieve far higher fuel efficiency (around 85% on gross CV) than is possible at main line power stations (only 40% approximately). Operators with combined heat and power units as part of their plant mix can expect:

- Large savings by substituting grid electricity with their own supply.
- Compressed pay-back periods
- Reduced usage of relatively expensive back-up gas boilers.

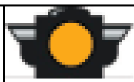
Unfortunately current technology means that CHP is not economic for smaller developments.



5.2.5 Biomass heating system

Wood burning systems, unlike other renewable energy sources emit carbon dioxide. However, as the tree is growing, it absorbs the same amount of carbon dioxide as is released when burnt. As such, it does not add to the carbon dioxide in the atmosphere and is therefore deemed carbon neutral.

Biomass heating requires a greater level of user involvement than is deemed acceptable by the developer.



5.2.6 Solar thermal hot water systems

Solar panels, also known as “collectors”, can be fitted onto or integrated into a building’s roof. They use the sun’s energy to heat water, or a heat-transfer fluid, which passes through the panel.

The fluid is fed to a heat store (for example, a hot water tank) to provide part of the hot water demand for the building. Usually another heat source will be needed to supplement collectors in winter months.

It is not usually possible cover to the whole hot water demand with solar thermal, however between 40% and 60% could be achieved with a large scale installation.

The roof area available has been dedicated to solar PV which has a bigger carbon impact and a shorter payback period than solar thermal.

6.0 Conclusions

The scheme benefits from a number of energy efficiency measures, the most notable being:

- Levels of insulation exceeding building regulations minimums for new construction and refurbishment
- Low hot water use
- Good airtightness performance

It can therefore be demonstrated that the scheme follows the energy hierarchy set out in Energy Statement guidance notes provided by LB Camden, by using less energy, supplying energy efficiently and then using renewable energy.

The combination of high levels of insulation within the building and renewable technology were calculated using SAP 2012. These measures achieve a 36% reduction in Design Emissions Rate over Target Emission Rate. The LB Camden requirement is at present 35%.

The local authority has also set down a 20% target to be fulfilled with renewable energy technology. Through the use of Solar PV a reduction of 19.5% can be achieved.

The available roof area is fully maximised by solar photovoltaic panels which have been selected on the basis that they are the highest efficiency panels available on the market at present. Within the constraints of the site and the design this is the highest renewable energy contribution available. In the context of which it is considered that the energy conditions of the London Borough of Camden are satisfied by the proposed development.