SUSTAINABILTY STATEMENT – Revised Proposal

23a Hampstead Hill Gardens, London, NW3.

51% Studios Architecture.

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Introduction

This revised report briefly describes studies which have been undertaken to identify an appropriate sustainable energy strategy for proposed revised development at 23a Hampstead Hill Gardens, London, NW3.
The design, as it stands at this point, has been described in the STROMA SAP2009 calculation tool. This program assesses the dwelling design's compliance with the Building Regulations Approved Document Part L1A, which were updated in England/Wales on 1st October 2010. The related drawings are as provided by 51% Studios Architecture. The development consists of 1x proposed detatched dwelling.

The feasibility studies undertaken in this report have been structured in accordance with the Mayor of London's Energy Hierarchy (Be Lean, Be Clean, Be Green). The developer and design team are committed to delivering a development with low environmental impact. Issues of sustainability will be constantly monitored and optimized throughout the design and operation of the development. The target is for the development to achieve a **25%** improvement on the Target Emission Rate (TER), to reach **Code for Sustainable Homes Level 4**

Policy context

National Policy

Planning Policy Statement 1: Delivering Sustainable Development places an emphasis on high quality, mixed use, inclusive urban design and the provision of a healthy, accessible and secure environment. The publication of the supplement to PPS 1 - Planning and Climate Change (December 2007) strengthens the emphasis on sustainable development, and requires new developments to "secure the highest viable resource and energy efficiency and reduction in emissions."

Planning Policy Statement 22: Renewable Energy calls for local authorities to actively encourage renewable energy development through local planning policies. The UK Government is also supporting renewable energy through market mechanisms, such as the Renewables Obligation. The UK Energy White Paper 'Our Clean Energy Future' has set an ambitious target for the UK to reduce its carbon emissions by 60% from 2000 levels by 2050 and to source 20% of its energy from renewable energy by 2020.

Summary of Conclusion

In order to achieve the required 25% improvement on TER on this development, construction is in the method of a highly efficient thermal envelope, and to install Solar Photovoltaics to the flat area of the roof. There is available space to install 12x Solar Panels, in order to provide a minimum 3kw of peak power.

Energy Reduction Targets and Technologies

The approach to energy usage and efficiency at this development assumes the following hierarchy:

- **Lean**
- **Clean,** and
- **Green.**

Providing **Lean** energy involves taking action to reduce the demand for energy use in the first instance, through good design practice, such as thermal mass, use of solar gains and maximisation of daylighting, as well as through efficient operational procedures. **Clean** energy provision involves specifying and designing the most energy-efficient appliances and systems for the task. **Green** energy involves the use of renewable sources and technologies, to replace the current reliance on burning fossil fuels and thereby reduce the emission of CO_2 and other greenhouse gases.

Lean: The location, massing, and orientation of buildings, and specification of construction materials, all have a bearing on how a building interacts with, and performs in response to, its environment, and therefore how much energy is needed to maintain comfortable conditions for building occupiers. Policy 122 of the Local Plan identifies the need to design for energy efficiency in this way.

Clean: The specification of low energy appliances and lighting can reduce energy demand from a development and careful specification, to meet these ends, will be used at this site.

Green: The Supplementary Planning Document (SPD) on Energy Efficiency and Conservation May 2004 lists a number of renewable energy technologies which may be appropriate for sites, including wind and solar energy and combined heat and power (CHP). The SPD notes that CHP is to be encouraged in high density, mixed use developments. Current good practice for the assessment of renewable technologies is contained within the document: London Renewables Toolkit- integrating energy into new developments (Greater London Authority. 2004).

Renewable Energy Feasibility Assessment

Introduction

This section looks at the renewable energy technologies required to satisfy the requirement of the 25% reduction to TER to meet Code Level 4.

Methodology and scope

The strategy for carbon emission reduction and renewable energy generation is based on the proposed layout and accommodation mix for the site.

Stage 1: Predict carbon emission
To calculate the required carbon reduction, it is necessary to establish baseline energy consumption, using SAP.

Stage 2: Identify appropriate renewable energy technologies.
Following the application of energy efficiency measures, the most appropriate renewable energy technologies (i.e. those which make best use of available resources) were identified. The technical, economical, practical and environmental impacts of the range of available renewable energy technologies were investigated to establish their overall feasibility

N.B. We have taken the Standard Assessment Procedure (SAP) data sheets for some of the units at this development where worst case positioning has been assumed .The Government's Renewable Obligation defines renewable energy in the UK. The identified technologies are;

- Small hydro-electric
- Landfill and sewage gas
- Onshore and offshore wind
- Biomass
- Tidal and wave power
- Geothermal power
- Combined Heat & Power
- Solar

The use of landfill or sewage gas, offshore wind or any form of hydroelectric power is not suitable for the site due to its location. The remaining technologies are considered below;

Baseline Energy Performance & Energy Efficiency Improvements

The baseline energy performance for the residential scheme has been determined using the SAP data calculations.

The following energy efficiency measures were adopted to achieve baseline target performance for development at 23a Hampstead Hill Gardens:

Air permeability rate: 6 $m^3/hr/m^2$;
External walls U values to 0.25 W/m^2K
Window U values to 1.5 W/m^2K
Door U values to 1.8 W/m^2K
Floor to 0.15 W/m^2K
Roof to 0.18 W/m^2K
89% efficient Gas Condensing Boiler
Dwelling built to Enhanced Accredited detail

We then applied the preferred Renewable Energies (Solar Photovoltaics – 3kw) to the SAP calculations, to show the TER reduction:

<u>Summary of Energy Demand incl. Renewable Energy:</u>

	Target Emission Rate (kg CO2 / m² / yr)	**Dwelling Emission Rate(kg CO2 / m² / yr)**	**% Carbon reduction**
23a Hampstead Hill Gardens	14.72	10.80	26.6%

The table above shows the reduction to the Target Emission Rate (TER), when the highly efficient thermal envelope, and Solar PV, are applied to SAP. The minimum 25% target is met, and along with credits scored in remaining sections of the Code Assessment (see pages 13 onwards), Code Level 4 can be achieved.

Analysis of Renewable Energy Technologies

Small-scale low carbon technologies suitable for installation in domestic properties (micro-generation technologies) have been assessed in terms of economic and environmental benefits.
The figure below shows the cost of carbon saved by each of the micro-generation technologies considered under 3 scenarios – current capital costs, 2015 capital cost projections and current costs with 50% grant assistance.

A range of renewable energy technologies have been considered for the site, these include:

- Photovoltaics (PV);
- Solar thermal panels;
- Wind Turbines
- Biomass;
- Ground Source Heat Pumps (GSHP);
- Air Source Heat Pumps (ASHP);
- Combined Heat and Power (CHP).

The following section provides a description of the feasibility of each;

Photovoltaics (PV)

Description
Photovoltaic systems use cells to convert sunlight into electricity. The PV cell consists of one or two layers of a semi conducting material, usually silicon. When light shines on the cell it creates an electric field across the layers causing electricity to flow. The greater the intensity of the light, the greater the flow of electricity.

Advantages
Tried and tested form of renewable energy generation with a mature supply chain and a long design life (20 - 30 years). Virtually no maintenance is required and the systems can easily be incorporated into the design of the buildings. A lot of research has been invested in the development of Thin-Film Photovoltaics (TFPV) and there is anticipation that the cost of PV will be significantly reduced if this technique comes to fruition.

Disadvantages
At present, this technology has a relatively high cost and a low efficiency, although this is coming down almost on a monthly basis. The payback period is in excess of 25 years. The high cost of installation is soon to be offset with a change in the feeding tariff making this a viable option.

Compliance analysis
PV collectors are the most viable option in order to meet 25% carbon reduction (Code 4 target). If 3kw (12 panels) are installed on the flat roof area, a carbon reduction of 26.6% is achieved.

Solar thermal

Description

Solar thermal panels produce hot water from solar energy and reduce the need for conventional water heating (i.e. gas).Typically around 40-60% of annual hot water demand can be provided through the use of solar thermal panels.

Advantages

Inexpensive, effective and straightforward technology in terms of operation and maintenance (little required).

Disadvantages

Payback period can be as long as 25 years with government grants included. Large Roof space required.

Compliance analysis

Solar Thermal Panels are not a possible sole solution, due to not enough roof space available in order to achieve Code Level 4, and the shading issue form nearby trees.

Wind turbines

Description

Wind turbines use the wind's lift forces to rotate aerodynamic blades that turn a rotor to generate electricity.

Advantages

Zero emission electricity production. The cost of the turbines is low compared to other technologies with a further reduction in prices forecast as production-lines increase in size.

Disadvantages

For optimum performance the wind speed at the site needs to be between 8-12 m/s. *The department for Business Enterprise and Regulatory Reform (BERR)* wind speed database fwww.berr.gov.uk) indicates that the wind speed at this site is approximately 4.3 m/s at 10 m (i.e. lower than ideal). Roof mounted Turbines could be used at the development to generate small but valuable amounts of renewable electricity but the small output and contribution to Total emissions means and investment would be small and purely tokenism.

Compliance analysis

Wind turbines will not be used.

Biomass

Description

Burning wood or wood products, as a fuel is considered to be a "carbon neutral" process because the $C0_2$ released during combustion is equal to that absorbed during growth of the fuel. Biomass can be used to provide energy for district heating schemes. In district heating systems more than one building or dwelling is heated from a central source. Biomass fuels are combusted in a boiler and then heat in the form of steam or hot water is transferred, via a distribution network of underground pipes to different buildings. This is then used for space heating and hot water in each home.

Advantages

Reliable, cost effective and works well in areas where there is a dense housing layout. Installation of a district heating biomass system in the block of affordable apartments, does not require a complex configuration and can easily meet the 12% site wide renewable energy requirements.

Disadvantages

There are wider planning issues to consider such as the impact of stack emissions on local air quality. Fuel delivery and storage needs to be analysed in detail. There would be implications for a district heating system based on biomass with storage, access and supply of the wood chips an issue.

Compliance analysis

Installation of a biomass heating system is not a possible solution, due to the sizeable issue with fuel supply and storage. Biomass will not be used.

Ground Source Heat Pumps (GSHP)

Description

Ground source heat pump systems (GSHP) extract constant temperatures from below ground, and convert them into temperatures which can be used for space heating. Heat can be extracted either by means of a "horizontal" system, where pipe coils are laid in trenches, or by a "vertical" system, which uses boreholes.

Advantages

The system does not require any external fuel and can be designed to heat a whole building, typically through underfloor heating. In this case it would be used as a community heating system where an ESCO would need to be formed to manage the system and heat supply.

Disadvantages

This technology uses electricity to operate the circulation pumps, and the heat pumps themselves. However the DER is considerably lower.

Compliance analysis

GSHP is not a viable option on this development. The proximity of the London Underground system running underneath rules this option out.

Air Source Heat Pumps (ASHP)

Description

Air Source Heat Pumps (ASHP) work in a similar way to the ground source system. Instead of heat being extracted from the ground it is extracted from the air by a unit that is sited outside.

Advantages

The system does not require any external fuel and can be designed to heat a whole building, typically through underfloor heating. The technology is less expensive than GSHP and has no need for ground loops. The installation of the units is straightforward. The Carbon saving is high compared to other renewable.

Disadvantages

Electricity is required to pump the heat. Typically, the efficiency and lifetime is lower than other renewables. The energy demand figure would rise if ASHP are used, although the CO2 would be lower.

Compliance analysis

ASHP will not be used.

Micro Co-Generation – Combined Heat & Power (CHP)

Description

Combined Heat and Power (CHP) sometimes known as Cogeneration is the use of a single piece of plant to generate both heat and electricity. In conventional power generation large quantities of energy in the form of heat are wasted. By using this technique, the total energy conversion efficiency can reach figures in excess of 90%.

Advantages

Micro CHP is a fairly new and upcoming concept in the lower capacity arena, having being used on an industrial scale since the 1970s. Micro CHP benefits from allowing designers to maximise the potential for generation of heat and electricity to reduce and offset CO2 generation by figures in excess of 20%. Recent technological advancements and commercialisation of these units also benefit from a similar maintenance cost to that of conventional gas condensing boilers. In addition to this, since the introduction of Feed-in-Tariffs (FiT) during 2010, there is the possibility of gaining additional financial from any excess power generated from the CHP units themselves.

Disadvantages

At present, this technology has a relatively high installation and purchase cost, furthermore efficiency is only at optimal standards when both heating and electrical generation requirements are needed. The technology is most efficient when operational for as many hours as possible per year, at as high an output as possible. A rough "rule of thumb" for this would be to operate the CHP unit for a minimum of 4,400 hours per year. This means that the system would ideally still be running at full capacity over the summer months, i.e. producing thermal energy during the hottest parts of the year, when thermal demand will be minimal.

Compliance analysis

CHP will not be used.

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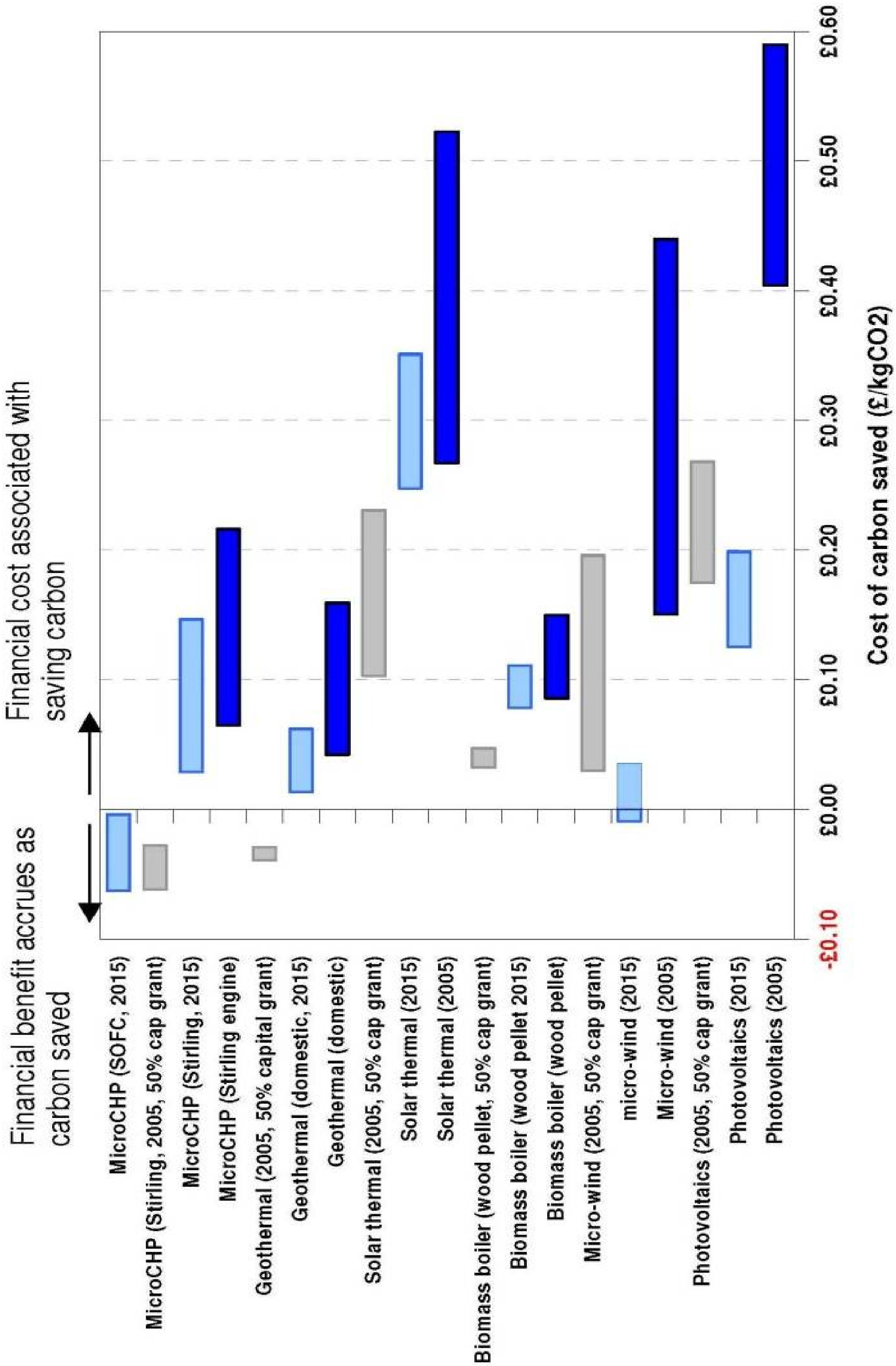
The figure below shows the cost of carbon saved by each of the microgeneration technologies considered under 3 scenarios – current capital costs, 2015 capital cost projections and current costs with 50% grant assistance.



Strategy to achieve Code level 4 of the Code for Sustainable Homes

Sections

1 and 2) Energy and water Efficiency

The CSH takes the minimum requirements in Part L of the 2010 Building Regulations as its baseline. All improvements on this minimum standard are expressed in percentages. Code level 4 on energy, requires that the dwellings achieve a 25% improvement on Part L of the 2010 Building Regulations. This has been achieved at this development, by a highly efficient thermal envelope and the use of 3kw of Solar PV. There is a substantial reduction in the DER (dwelling emission rate) over the TER (target emission rate) in respect to a dwelling built to pass the Part L of the 2010 Building Regulations.

A. The Dwelling emission rate will be 25% better that the Target emission rate for the dwelling in accordance with the Building Regulations Approved Document Part L1A, 2010. This is demonstrated by the SAP ratings (separately attached).
B. The energy efficiency measures proposed are Solar PV, and thermally efficient dwellings.
C. The dwellings will be compact and built using Modern Methods of Construction.
D. The expected water use will be 105 litres/person/day
E. There will be provision for a water butt to service the gardens.

3) Materials

To achieve code level 4 for the environmental impact of materials, requires at least three of the following five elements will be specified to achieve a BRE Green Guide 2006 rating of at least A:

- Roof structure and finishes
- External walls
- Boundary protection
- Internal walls
- Windows and doors

A. The main materials to be used for the building elements are as per the following chart and will achieve 11 CSH points

23a Hampstead Hill Gardens		
Component	Specification	U value
External Walls	70mm Kooltherm K8 insulation	0.25
Party walls	Robust detail E-WM-20 (Non parge coat full fill Isover Party Wall Roll)	4 credits
Roof - Sloping	100mm Xtratherm Thin-R XT/PR between rafters , 9mm ply and 27mm Thermaline plus under rafters	0.18
Floor	120mm Xtratherm Thin-R XT/UF	0.15
Doors	IG steel insulated doors (front and rear)	1.8
Windows	Double glazed Low E hard coat with argon fill	1.5
Design Air Permeability		6
Thermal Bridging y-value	Enhanced Accredited detail	0.04
Ventilation	System 3 – CV100 Constant running fans to wet rooms only and 2500mm2 trickle vents to habitable rooms only	
Heating	Gas Condensing Boiler	
Lighting	100% Low Energy Light bulbs and downlighters	

B. 10% of the total materials will be derived from recycled or reused content, by value

4) Surface water run-off

The minimum requirement requires that peak run-off rates and annual volumes or run-off will be no greater than the site's previous conditions.

- The run off out falling to the SUDS system will provide the necessary measures to meet the requirement
- At least 50% of the hard surfaces and conveyance systems will be permeable

5) Waste

The code level for waste is covered by two categories:

• Site waste management
• Household waste storage

The applicant will adopt a site waste management plan. This will include the monitoring of waste on site and the setting of targets to promote the efficient use of resources. The management of household waste storage requires the containment of waste for each dwelling. The CSH requires for the greater (by volume) of:

• Either accommodation of external containers provided under the local authority's refuse collection and recycling scheme
• Or at least 0.8 m3 per dwelling for waste management as required by BS 5906 – Code of Practice for Storage and On-site Treatment of Solid Waste from Buildings.
• 80% of site waste is reclaimed, reused or responsibly sourced
• The site will maintain a weekly waste movement sheet. The waste is streamed into 6 waste streams – Inert (ceramics-bricks), Timber, plaster/cement, Metal -2- (non-ferrous and ferrous), office/canteen waste and plasterboard. In addition there is an Active bin for non-recyclable waste

• Active is the waste that is not able to be recycled and represents less than 15% of all site waste.

• The site waste management plan proposed, is attached

• There will be at least 1 m2 store and sacks, blue box, compost bin. There will be dedicated storage bins in the kitchens, for recyclables

<u>**Categories – without minimum standards**</u>

6) Pollution

All insulants with little or no global warming potential or ozone depleting potential in either their manufacture or composition will be used on the site. This covers insulation materials used in walls, floors and roofs, as well as around hot water cylinders.

7) Health and well-being

Health and well-being covers comfort issues, such as daylight, sound insulation, the design of private external areas that are accessible by people with disabilities (although the CSH does not define those disabilities).

Higher standards of sound insulation than required by Part E of the Building Regulations will also earn extra points.

The CSH awards points for achieving specific daylight factors in kitchens, living rooms and studies. This will be achieved by the sizing of the glazing areas relative to the surface area of the rooms. A view of the sky is likely in most of the flats.

8) Management

Management covers both construction and post-construction management. Extra points will be gained by membership of the Considerate Constructors Scheme, and by delivering a strategy to reduce the harmful effects of construction on the site.

A Home User Guide, which is relevant to the operation, and environmental performance of the home, will be provided

9) Ecology

The ecology category covers the ecological value of the site, ecological enhancement, protection of ecological features and the total building footprint. The BRE Ecological Value Checklist requirements will be adopted. Points will be won by limiting the effects of house construction on the local flora and fauna, however, there are no ecological features as existing on this development and some points will be awarded by default.

Conclusion of Code for Sustainable Homes strategy

- The use Solar PV will be of enormous benefit to the development.
- High efficient thermal building elements and Modern Methods of Construction will reduce the energy demand.
- Reduced flow tap restrictors and dual flush WC's, flow restrictors to showers and best practice white goods will reduce water consumption.
- Porous paving to help in attenuation of the water runoff.
- Solar shading and thermal mass will negate the need for air conditioning.
- Good daylighting will reduce the need for high lighting levels
- Future proofing of the scheme has been taken into account to allow the provision of district heating pipework to serve adjacent sites.

Separately attached is a Code Pre-assessment score sheet, detailing the anticipated allocation of all credits within the full Code assessment, in order to meet the minimum requirement of 68 credits to reach Code Level 4.

Also attached is the SAP report for this dwelling.