eight
associates

Sustainability Statement
11 Netherhall Gardens

Eight Associates
178 Ebury Street
London SW1W 8UP

+ (44) 020 7881 3090 Telephone
+ (44) 0845 458 1522 Fascimile

www.eightassociates.co.uk
info@eightassociates.co.uk

Prepared by:
Jean Pierre Wack
Eight Associates
The Old School House
London
SW1W 8UP

email:
jp@eightassociates.co.uk

Prepared for:
Avonhead Investments
c/o Selwyn Lowe, PKS Architects
148 Kentish Town Road
WW1 9QB

Our Ref:
E074 Energy-0908-04jp

Planning Ref:
20009/0953

Date of Issue:
11th August 2009

eight
associates

Issue Status
11 Netherhall Gardens

Renewable Energy Consultant	Jean-Pierre Wack
Company Name:	Eight Associates
Signature:	

Revision Number	Issue Date	Issued by
First Issue	28.04.09	JPW
Second Issue	06.08.09	JPW
Third Issue	11.08.09	JPW

DISCLAIMER

This report is made on behalf of Eight Associates. By receiving the report and acting on it, the client- or any third party relying on it - accepts that no individual is personally liable in contract, tort or breach of statutory duty (including negligence).

eight associates

Contents
11 Netherhall Gardens

Summary

Executive Summary....4
Introduction....6
Planning Requirements....7

Development Profile....8
Energy profile....9
Baseline Carbon Emissions....10

Energy Efficiency Measures and Options....11

Clean Energy Supply....13

Feasible Renewable Energy Technologies....15
Solar Thermal Hot Water....16
Solar Photovoltaic....18
Combined Heat and Power (CHP)....20

Summary of Carbon Savings....21
Grants and life cycle analysis....23
Conclusion....24

Appendices 1: Water Reduction Strategy....24
Appendices 2: Material Use and Waste Reduction Strategy....25
Appendices 3: Biodiversity Enhancement Plan....26

eight
associates

Executive Summary
11 Netherhall Gardens

Aim of this Study	The development project at 11 Netherhall Gardens is required to meet a minimum 20% reduction in carbon emissions through the use of on-site renewable low or zero carbon energy sources. Furthermore, this report demonstrates how the site has followed the London Plan's energy hierarchy by reducing energy demand through energy efficiency measures, generating heat in a clean and efficient system and then, using on-site renewable energy systems. The aim of this study is to assess the available options and demonstrate how the 20% target can be met. These findings are subject to detailed analysis from a services engineer and quantity surveyor. In addition, this study will also provide details on reducing water usage, minimising material usage and waste during the construction phase as well as an outline biodiversity enhancement plan.
Methodology	Energy consumption figures are based on carbon modelling data produced under NHER SAP software, Energy Consumption Guide benchmark data and the Carbon Mixer software. Data regarding renewable energy technologies and carbon saving calculations have been made using NHER SAP software and Carbon Mixer™ software.
Site description	The proposed scheme is the extensive renovation of a refurbished, late Victorian building over 4 storeys comprising 9 flats and basement with swimming pool facilities. Flats 2, 3, 4 and 5 are refurbished properties and flats 1, 6, 7, 8 and 9 are new build extensions. Externally, landscaped amenity areas from the existing building will be retained. The building is in the Fitzjohns/Netherhall conservation area.

eight associates

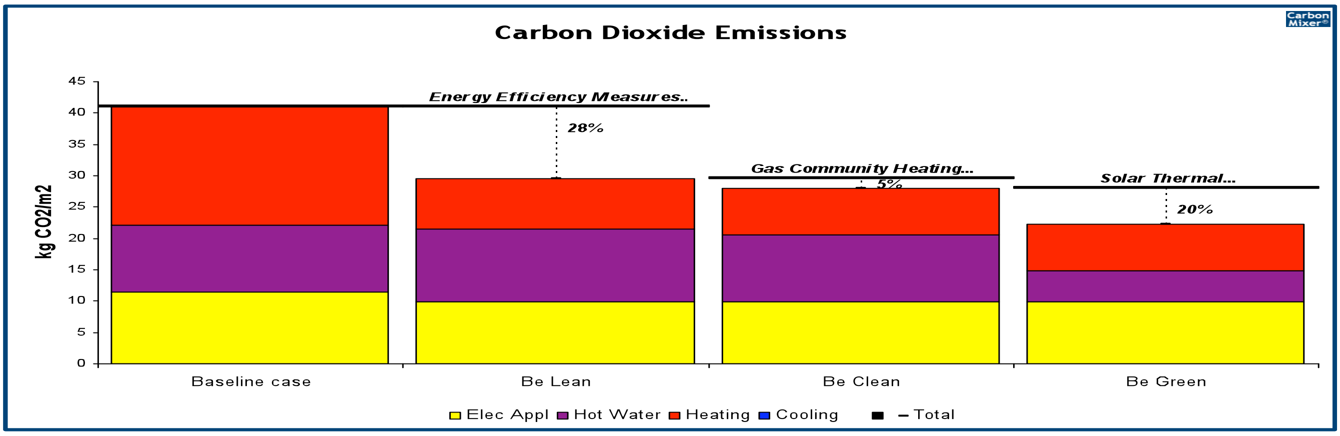
Executive Summary
11 Netherhall Gardens

Recommendations

The predicted carbon emissions for the scheme is 62,997 $kgCO_2/yr$. This includes carbon emissions modelled for heating, hot water and lighting/appliances for 9 flats and the swimming pool.

It is the suggestion of this report that the energy strategy will comprise a communal gas boiler to provide heating and hot water to be supplemented by 102 m2 of solar thermal panels providing approximately 70% of hot water needs. The system will have facilities to connect to a future district heating network. Electricity will be sourced from the grid.

Energy Hierarchy	Baseline emissions	Be Lean: Energy Efficiency Measures	Be Clean: Community Heating and Hot Water	Be Green: Renewables
Carbon emissions in $kgCO_2/yr$	62,997	45,464	42,983	34,238
Percentage reduction in carbon emissions	-	27.83%	5.46%	20.35%



eight associates

Introduction
11 Netherhall Gardens

Remit of this report

This report aims to provide cost effective options to meet 20% of the carbon emissions of the building, through low or zero carbon sources. Calculations were carried out using Carbon Mixer™ (CM™) software.

The Code for Sustainable Homes Level 3 requirement is not directly covered under this report. However, consideration has been taken in the development of the energy strategy for meeting the energy requirements of a Level 3 rating for the dwellings.

In addition, a statement is provided on:

- minimising water usage through sanitaryware, appendix 1;
- minimising material use and waste during the construction phases, appendix 2; and
- measures to enhance local biodiversity and mitigate impacts, appendix 3.

Background

Large-scale investment in research and production has brought many sustainable technologies into mainstream availability. Developers at all levels are now choosing to integrate these technologies into building projects to save money and make a positive difference to the environment in the process. In light of the wide range of choices and individual conditions of any site it is essential to make a detailed investigation of all available technologies in order to achieve optimum benefits. An uninformed choice may lead to undesirable results in terms of the savings made and power generated.

This report outlines the technologies considered for the project and describes possible ways to meet or exceed the current target. It will discuss the available technologies, evaluate their potential in this situation and suggest a suitable strategy. It focuses on those systems most suitable to the specifics of the site, building design and the views of the design team but also explains the reasons why certain technologies may or may not be suitable in this instance.

Every effort has been made to include the most up to date information available (as referenced) and where any assumptions have been made these are also referenced and detailed.

Cost information has been based on up to date manufacturers or distributor's data for specific systems, where available. All other costing is based on Carbon Mixer™ and the Greater London Authority (GLA) Renewable Energy Toolkit figures.

Planning Requirements
11 Netherhall Gardens

Planning Requirements

This report demonstrates that the following points have been met in line with the recommendations of the London Plan and comments dated 15th June 2009:

1. A statement must be provided to show how the proposal will follow the London Plan's Energy Heirarchy and incorporate energy efficiency measures, district/community heating generation and onsite energy generation from low or zero carbon technologies to provide at least 20% carbon emission reductions.

2. A statement on how the development will achieve a reduction in water usage is provided, with suggested flow rates for the sanitaryware provided.

3. A statement on how the development will lower the amount of waste generated on site will be provided, along with a summary of how a reduction in material use will be achieved.

4. In addition, to meet the requirements of Camden Council Planning Policy SD9, the development must meet a Code for Sustainable Homes Level 3, with 60% of the credits achieved in the following sections:

- Energy
- Materials
- Water

Where compliance is demonstrated

20% Carbon Emissions Reduction:	Within this report
Water Usage Reduction:	Within this report
Waste and Material use Reduction:	Within this report
% of credits under following Code for Sustainable Homes sections: - 60% Energy - 60 %Water - 50% Materials	In Code for Sustainable Homes report by others - Energy (19 / 29 credits) - Water (4 / 6 credits) - Materials (13 / 26 credits)
Code for Sustainable Homes Level 3 for flats 1, 6, 7, 8, 9	In Code for Sustainable Homes report by others
EcoHomes Excellent rating for flats 2, 3, 4, 5	In EcoHomes report by others

Development Profile
11 Netherhall Gardens

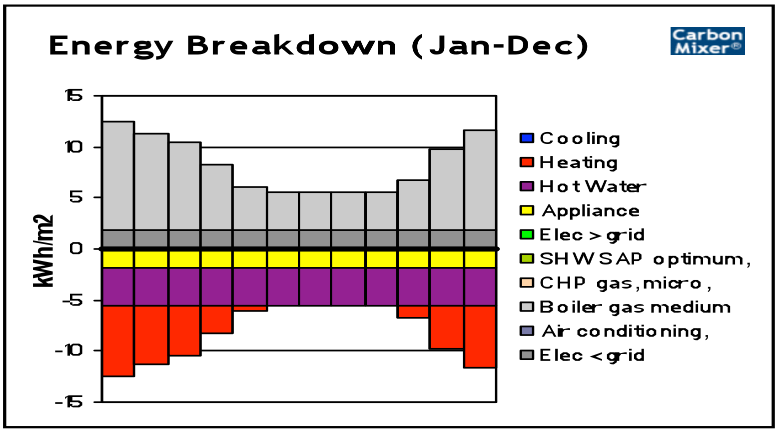
Baseline calculations	Energy modelling allows designers to explore the performance of a scheme in terms of the likely energy usage and related carbon emissions. Through this understanding it is possible to reduce energy usage, use renewable energy and supply energy efficiently. The baseline calculations provide a development profile that outlines the predicted carbon emissions per annum based on energy modelling of the scheme.
Building Fabric and Servicing Strategy for Baseline Case	The scheme is part new build and part refurbishment. Initial SAP modelling has been undertaken to estimate the likely energy demands of the existing units as well as the proposed units. Benchmark data has been gathered for the energy loads of the pool. <u>Existing:</u> The existing flats (2, 3, 4, 5) are of solid brick masonry construction with insulation to the roof and floors only. There are single glazed windows. Heating and hot water are provided by 78% efficient gas boilers. Electricity for appliances will be provided from the grid and is calculated in line with the Code for Sustainable Homes methodology. Flat 5 has been modelled and forms the basis for assumptions of energy consumption for flats 2, 3, 4. <u>New Build:</u> Standard building fabric is assumed for the new build residential units, flats (1, 6, 7, 8, 9), to meet Part L minimum requirements and is taken from the Target Emission Rate calculations. The dwellings will be serviced with 78% efficient individual boilers. Electricity for appliances will be provided from the grid and is calculated in line with the Code for Sustainable Homes methodology. Flats 6,7,8 have been modelled. <u>Swimming Pool:</u> The swimming pool is of estimated size 8m by 4m and the total area of the pool facilities is estimated to be 84m2. Benchmark data has been taken from Energy Consumption Guide 78 – " Energy use in sports and recreational buildings" Best Practice Program (ECG078). The pool is characterised by low usage and located in a Southern Location.

Energy profile
11 Netherhall Gardens

Energy profile over the year

The graph below gives an indication of the energy usage break down for the proposed development over the course of the year.

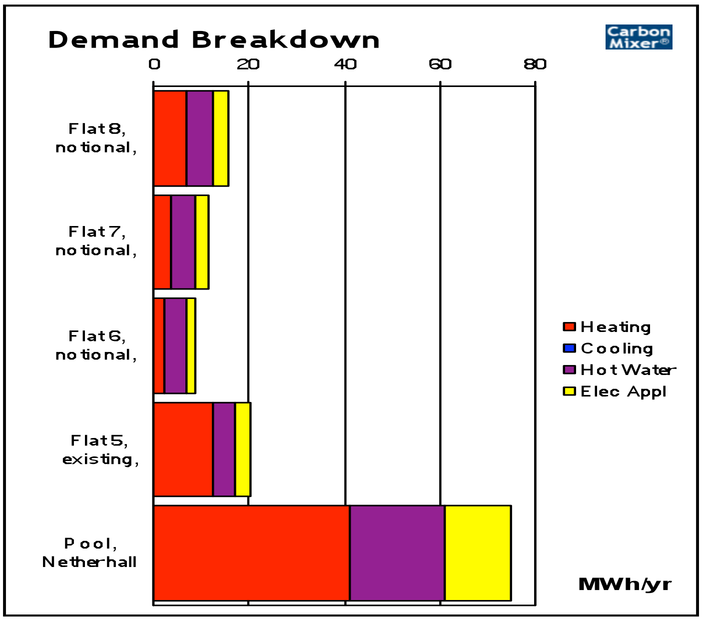
Figure 1 - Graph showing the site's energy demand and how it is met over the year. Bars below zero indicate demands - space heating, cooling, hot water and electrical demand. Bars above the zero line indicate the energy source to meet that demand. Bars from left to right represent the seasonal changes in demand on a month-by-month basis, starting in January.



Energy breakdown per m^2

The graph below indicates energy usage breakdown by unit for the housing and pool on an annual basis.

Figure 2 - Graph showing a breakdown of the site's energy demand per annum into heating, hot water and electricity



eight
associates

Baseline Carbon Emissions
11 Netherhall Gardens

Baseline Case

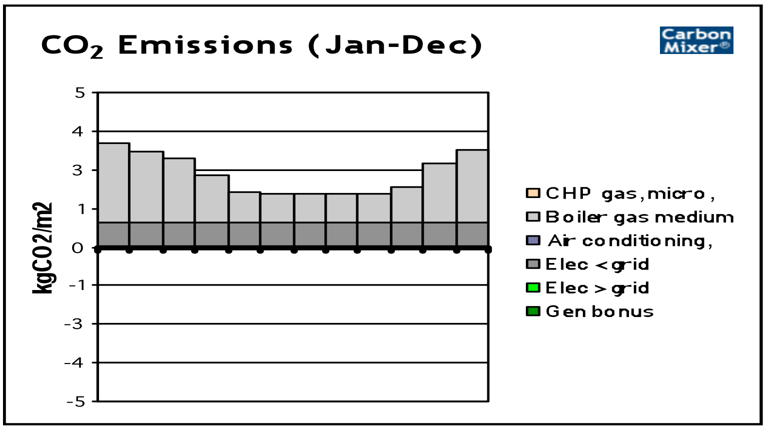
Baseline energy calculations allow the lighting, cooling, heating, hot water and power tc be modelled.

The table below indicates the predicted annual demand for energy for the proposed development at 11 Netherhall Gardens. Demand is broken down into 4 areas: heating, cooling, hot water and electrical (this is derived from the Carbon Mixer software). All figures are in kWh/yr per annum.

The carbon emissions are calculated using carbon factors under Part L relating to energy supplied by natural gas and through the grid. These carbon factors provide the carbon emissions related to the use of one unit of energy. For electricity, 1kWh of energy used will generate 0.420 $kgCO_2$. For gas, 1kWh of energy used will generate 0.192 kg CO_2. Based on these figures the carbon emissions for the scheme are given below:

Per annum energy usage	Heating	Hot Water	Electrical App.	Cooling	Total
Predicted energy usage in kWh/yr	116,079	66,189	41,751	0	224,019 kWh/yr
Development carbon emissions in $kgCO_2$/yr	28,921	16,491	17,585	0	62,997 $kgCO_2$/yr

Figure 3 – Carbon emissions per m^2 over the year as a result of heating, hot water and power



Energy Efficiency Measures and Options
11 Netherhall Gardens

Energy Efficiency Measures

Energy efficiency measures will be incorporated to reduce the energy demand of the proposed scheme. The below measures result in a per annum improvement in carbon emissions over the baseline case of 27.83% or a savings of 17,533 kgCO_2/yr.

The dwellings will be built to a high thermal performance. In line with meeting a Code for Sustainable Homes Level 3 rating, the new build portions will achieve a minimum 25% reduction in CO_2 emissions through energy efficiency and renewable energy options. The refurbished portions target an EcoHomes Excellent rating and will achieve a carbon emissions of 20 kg/m^2/yr in absolute terms.

New Build portions – Residential Units

Suggested U-Values are :

Element	Building Regulations minimum U-Value (W/m^{2}K)	Indicative U-Value (W/m^{2}K)
Roof	0.25	0.15
Walls	0.35	0.20
Floors	0.35	0.25
Window	2.2	1.7

Air Tightness level is not to exceed a level of 7 m^3/hr/m^2 at 50 pascals. This can be achieved through ensuring that sensitive areas are accounted for in the design and construction phases to ensure that a sealed building is constructed and all punctures through the seal are air-tight. In particular, attention will be paid to major openings as well as minor openings such as services and downlighters at roof level.

Ventilation will be provided by trickle vents on the windows with mechanical extract fans in the kitchen and bathroom.

Thermal bridges should also be minimised through the consultation and implementation of "Accredited Construction Details". These details cover standard build-ups and provide information on how to prevent cold bridging. They are accessible via the Planning Portal or the Energy Savings Trust.

Swimming Pool

As recommended by the Energy Consumption Guide 78 – " Energy use in sports and recreational buildings" Best Practice Program (ECG078), the following energy efficiency measures will be employed to reduce the energy demand for the swimming pool and its facilities:

- High insulation and airtightness levels to match new build portions
- Pool cover installed and used regularly
- Pool to be insulated
- Lighting to include metal halides and PIRs

Energy Efficiency Measures and Options
11 Netherhall Gardens

Refurbished portions

Suggested U-Values are :

Element	Building Regulations minimum U-Value (W/m²K)	Indicative U-Value (W/m²K)
Roof	0.70	Buildings
Walls	0.70	0.70
Floors	0.70	0.25
Window	2.52	2

The insulation to the external walls will comprise 50mm of insulated plasterboard. Conservation Area requirements mean that it would not be possible to insulate externally.

Air Tightness level is not to exceed a level of 10 $m^3/hr/m^2$ at 50 pascals. This is 5 $m^3/hr/m^2$ at 50 pascals over the Building Regulations minimum for refurbishments. Given the intricacies of refurbishments of masonry construction, it is difficult to commit to achieving further air tightness levels.

Ventilation will be provided by trickle vents on the windows with mechanical extract fans in the kitchen and bathroom.

Attention will be placed on avoiding cold bridges between the new build and refurbished portions as well as all potential thermal bridges to the refurbished portions.

Preventing the requirement for air conditioning in the future

The western elevation has been identified as an area sensitive to over-heating during the summer months given the high glazing ratio. It has been recommended that In order to reduce over heating and the likelihood of cooling systems being installed at a future date, solar shading be employed to the glazed areas.

However, the scheme is located in the Fitzjohns/Netherhall conservation area and the installation of shading structures will significantly affect the appearance of the elevation. Shading to the most extensively glazed and exposed rooms are shown on the elevation.

Clean Energy Supply
11 Netherhall Gardens

Community Heating System	Heating and hot water will be provided communally via high efficiency and low NOx emissions gas boilers supplying low temperature hot water to all 9 flats and swimming pool.
District Heating System	The site will be future-proofed for connection to the proposed Hampstead district heating system with the aim of providing low carbon and cost effective heat. This will include insulated pipework running from the plant room to the site boundary and space provision within the plant room.

Use of Combined Heat and Power

The inclusion of gas combined heat and power (CHP) within the energy strategy has been considered and not incorporated within the proposed scheme.

The base load of hot water for the residential units and the swimming pool could be provided through the CHP equating to approximately 48,296 kWh per year or 4,024 kWh per month. This would result in a saving of 2,767 $kgCO_2$/yr. Please see the following section on CHP for calculation details of the proposed system.

However, the use of CHP precludes an energy strategy incorporating solar thermal panels to provide the same hot water as the CHP. Both technologies would be effectively vying to provide the same base load hot water. The limitations of providing on-site renewable energy to the scheme entail that only solar thermal or photovoltaics (PV) are practical and feasible, as detailed in the following section on renewable energy.

The two energy systems that are therefore available include: 1) lead gas boiler to provide heating and CHP to provide hot water and PV to supply LZC energy, and 2) lead gas boilers to provide heating and a proportion of hot water and solar thermal to provide a portion of hot water and LZC energy with electricity from the grid.

Option 1 is considered non-viable and option 2 shall be chosen on the basis of :

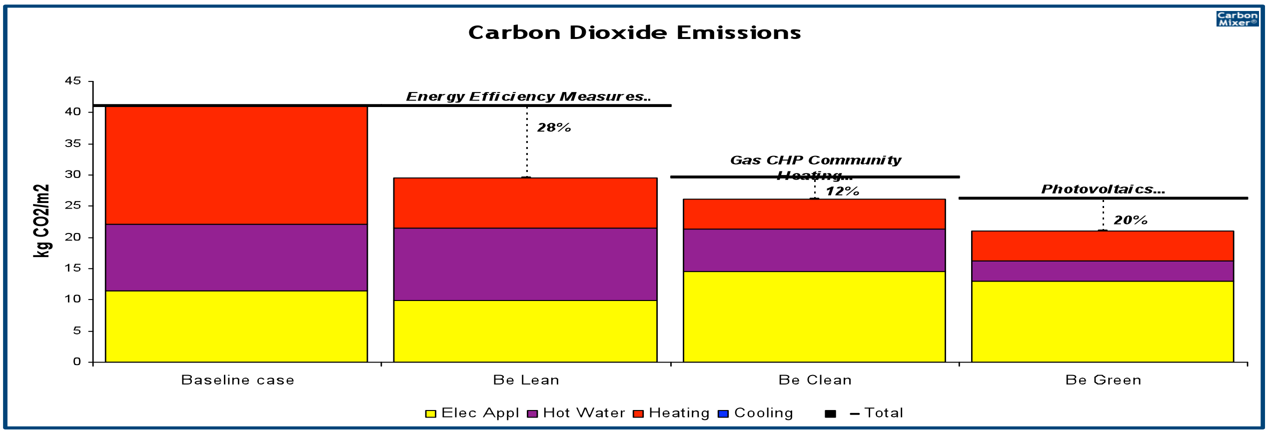
- Cost effectiveness: the capital expenditure of option 2 is significantly lower
- Energy system: gas boilers and solar thermal are two complementary systems versus three systems in option 1
- Life cycle carbon: over the life cycle, the carbon emissions of option 2 are likely to be less if embodied energy considerations are taken into account
- Maintenance: CHP units require significant maintenance and have replacement costs.

Clean Energy Supply
11 Netherhall Gardens

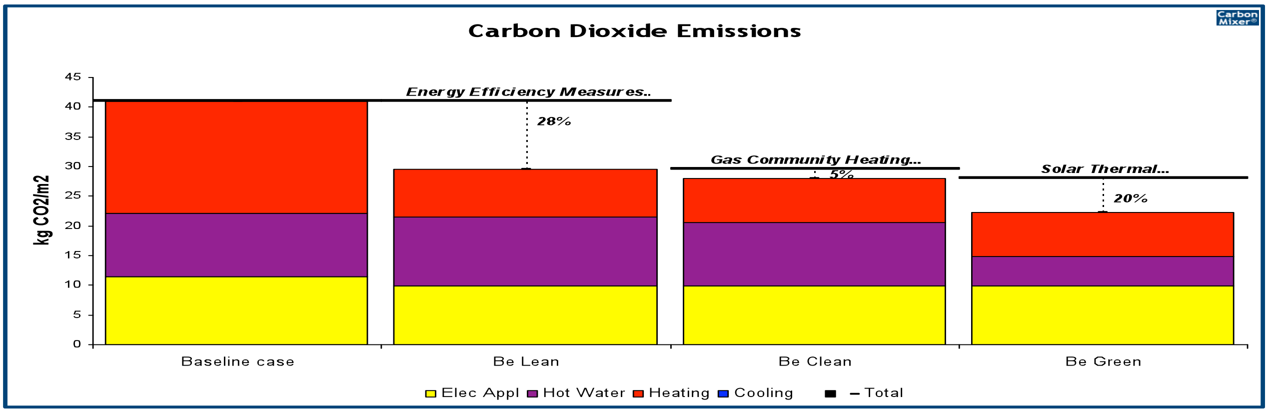
The graphs below indicates the percentage carbon emission reduction through the energy hierarchy of "Be Lean, Be Clean and Be Green". The "Be Green" portion includes 100m2 of net area for solar panels.

The graphs below demonstrate that both the solar thermal only and the gas CHP / PV system can achieve a 20% emissions reductions.

Option 1) Gas boiler and CHP Community Heating and Photovoltaics (102m^2)



Option 2) Gas Community Heating and Solar Thermal (102m^2)



eight
associates

Feasible Renewable Energy Technologies
11 Netherhall Gardens

Feasible Renewable Energy Technologies	A reduction in carbon emissions through the use of on-site renewable energy can be achieved through several technologies to generate either heat or power. Following the analysis of the carbon emissions related to the scheme, the objective of this section is to determine the feasible renewable energy options that provide cost-effective and practical emissions reductions. Considered Technologies The current, compliant renewable energy options for 11 Netherhall Gardens are provided in the table below. Each technology is also assessed as either feasible or rejected based on its implications for the scheme in terms of their implementation, cost-effectiveness, site-related constraints, planning issues or others. The following sections will explore the feasible technologies in depth and explain why certain technologies have been rejected.
20% reduction target	The predicted carbon emissions of the proposed scheme following energy efficiency measures and clean energy generation is 42,982 $kgCO_2$/yr. Therefore, the low or zero carbon technology is required to save a total of 8,597 $kgCO_2$/yr to meet the planning target of 20%.

Technology and feasibility	Rationale
Biomass Rejected	A communal heating system equipped with a large plant room and fuel store is infeasible to supply heating and hot water to the residential units. The development is situated within a dense urban area with consequent pressure on air quality and size restraints preclude the possibility of biomass pellet delivery.
Combined Heat and Power (CHP) Rejected	The viability of installing CHP plant is considered low in comparison to using solar thermal. Given that the two are mutually exclusive, it is considered that CHP is not feasible for the proposed scheme.
Ground Source Heat Pump (GSHP) for residential Rejected	A ground source heat pump is not feasible to supply heating and hot water to the residential units. Due to the presence of a rail tunnel directly beneath the site, extensive bore holing needed could not be carried out.
Photovoltaic (PV) Rejected	Roof mounted PV units are an impractical solution given the large area needed. This system is expensive in terms of £/$kgCO_2$ saved compared to solar thermal, and is therefore rejected as an option.
Solar Hot Water (SHW) Feasible	Roof mounted SHW units could provide the hot water requirements in the dwellings and meet 20% renewables.
Wind Turbine Rejected	A prevalence of surrounding trees makes this an inefficient solution and the scheme is located in a conservation area.

Solar Thermal Hot Water
11 Netherhall Gardens

Energy profile over the year

Roof mounted panels are used to harness solar thermal energy for production of hot water. The heated medium within the collector can be used to pre-heat domestic hot water systems thereby reducing the need to burn fossil fuels for water heating. There are two main types of solar thermal system

Flat Plate Collectors are simple heat exchangers which are cost effective and generally very robust. The larger units are approximately $4m^2$.

Evacuated Tube Collectors produce greater efficiencies per m^2 of panel than flat plate collectors and are therefore suited to situations where available roof space is an issue (panels tend to be around $2.6m^2$). However they are more expensive than their counterpart and there are concerns about robustness and longevity specifically in terms of the delicate nature of the tubes themselves.

Evacuated tubes perform well in both direct and diffuse solar radiation. This characteristic, combined with the fact that the vacuum minimizes heat losses to the outdoors, makes these collectors particularly useful in areas with cold, cloudy winters.

There are no noise issues with solar thermal; the only noise emitted is from a small pump. He pump will be powered by a PV to enable this to be a true zero carbon technology.

Site specific considerations

The total flat roof area available for solar hot water is 102 m2, and there are no surrounding trees or buildings at roof level. A hot water cylinder is recommended as part of a communal supply of hot water as it has the advantage of reduced heat loss and economies of scale.

Evacuated tubes laid flat in banks, are most desirable, with access hatches and a ManSafe system for ease of maintenance. There are no overshading issues associated with neighbouring trees or buildings. An arboricultural study has been carried out which confirms that there can be no interference from trees during the installation or operation of the solar panels.

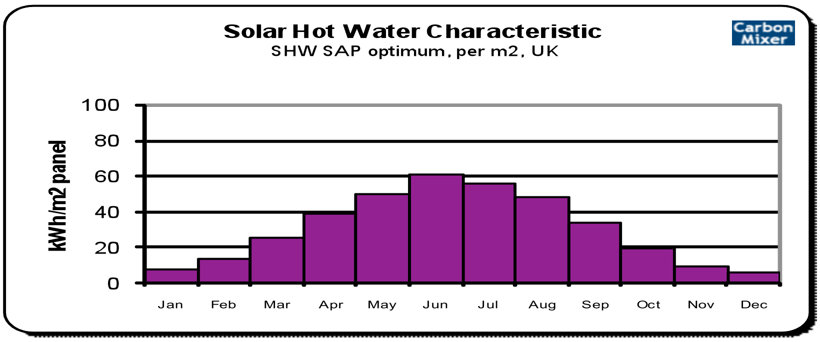
The installation of evacuated solar tubes on the roof would not cause any line of sight issues from either the ground, or from neighbouring windows, as the building is 4 storeys tall and is not overlooked by surrounding buildings.

eight associates

Solar Thermal Hot Water

11 Netherhall Gardens

Performance Calculations for Solar Thermal Hot Water Panels		SHW – 102 m^2
	Predicted Annual Energy Production (kW/h/yr)	45,000 kWh
	Annual Carbon Emissions Reductions (kgCO2/yr)	8,745 $KgCO_2$/yr
	Carbon emissions reductions	20.35%
Carbon savings	The solar thermal panels will be sized for 70% of the hot water requirement thereby generating a total of 45,000 kWh a year with solar hot water panels would reduce the carbon emissions of the scheme by 8,745 $KgCO_2$, which would yield a 20.35% carbon emissions reduction from the baseline case. This is estimated to be equivalent to 102 m^2 of solar hot water panels.	



Solar Photovoltaic
11 Netherhall Gardens

Roof mounted Solar Photovoltaic

Roof mounted panels can be used to utilise the Sun's energy for conversion to electricity. When exposed to light the cells generate electrical energy (DC current) which is conducted away to an inverter to create mains electricity (AC current).

Power would then be exported to the national grid at times of low demand in order to 'store' the unwanted 'green' energy and would be credited against the electricity bought from the grid at times of low production (i.e. at night). There are several different types of solar panel differentiated by the type of crystalline medium used. They have different efficiencies and relative merits.

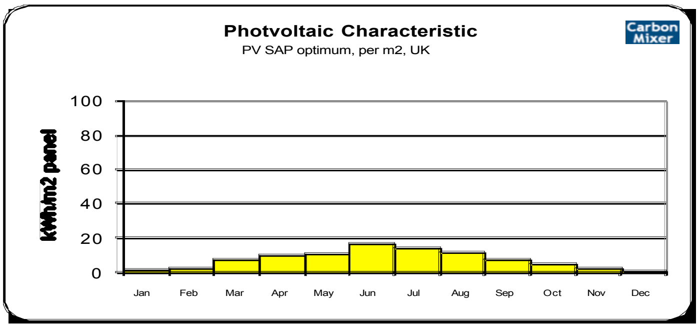
Site specific considerations

The total flat roof area available for panels is approximately 102 m². Areas would require access for maintenance.

On the flat roof, there are no planning restraints to the location of PV panels. Therefore, panels fitted to an aluminium frame can be fitted on the roof. These will however require access for maintenance and consideration must be taken for health and safety in providing a man-safe.

There are no surrounding trees or buildings at this level that could shade the panels. Please see over the page for suggested locations.

The panels will need to be connected to an inverter and then to the grid in order to sell electricity when usage on-site is low and power generation is high. The electricity could supply either the retail or the dwellings.



Solar Photovoltaic
11 Netherhall Gardens

Performance Calculations for Photovoltaic Panels		Solar PV - 102 m2
	Predicted Annual Energy Production (kW/h/yr)	9,761
	Annual Carbon Emissions Reductions (kgCO2/yr)	5,526
	CO2 Emissions Reduction	12.86%
	Estimated kWp	15 kWp
	% of electrical demand met	23.27%

Carbon savings	Generating a total of 9,761 kWh a year with a Monocrystaline Photovoltaic array would reduce the carbon emissions of the scheme by 5,526 KgCO_2 which would yield a 12.85% CO_2 reduction from the baseline case. This is estimated to be equivalent to 15 kWp or 102 m^2 of Photovoltaic Panels.
Recommended retailers	Solar Technologies - 01794 830154 http://www.solartechnologies.co.uk Southern Solar – 0845 456 9474 http://www.southernsolar.co.uk

Combined Heat and Power (CHP)
11 Netherhall Gardens

Combined Heat and Power	Combined Heat & Power (CHP) is effectively using waste heat from electricity production to provide heat for space and water heating. Technically gas fired CHP is a low carbon technology, micro generation (single dwelling CHP) burns fossil fuels to generate electricity as it provides heating and hot water for a communal heating system or for an individual dwelling. The advantage of this system is that utilisation of waste heat leads to very high system efficiencies (typically 90-95%). Also the localised production of electricity minimises the transmission losses associated with remote large scale generation. CHP is available on a variety of scales. Micro generation is in use but there are availability, maintenance and reliability issues. Large scale generation is established technology (power station sized with district heating) particularly in northern Europe where power plants supply heat via a heat main to nearby users. On medium scale (anything in between) the systems can work best when sized to meet a constant heating load.
Site specific considerations	The CHP unit could be sized to provide a proportion of the hot water for the residential units and swimming pool. This constant heat requirement would enable an efficient use of the CHP. The power generated could be used to supply the landlord's areas and a proportion of the residentials' requirements. The hot water energy requirement is 45,925 kWh following energy efficiency measures in both the pool and residential units. The CHP is therefore sized to provide this constant baseload over the year. The estimated size of the CHP unit is 14 kW thermal and 2 kWe based on an operating hours of 4000 over the year. The CHP is therefore predicted to be a micro CHP unit to provide the base load equating to approximately 48,296 kWh per year or 4,024 kWh per month. This would result in a saving of 2,767 $kgCO_2$/yr.

Performance Calculations for Photovoltaic Panels		CHP providing hot water to flats and pool
	Annual Carbon Emissions Reductions ($kgCO_2$/yr)	2,767
	CO2 Emissions Reduction	6.44%

Carbon savings	Generating 48,296 kWh of hot water and 7,208 kWh of power with a micro CHP would yield a 6.44% CO_2 reduction from the baseline case.

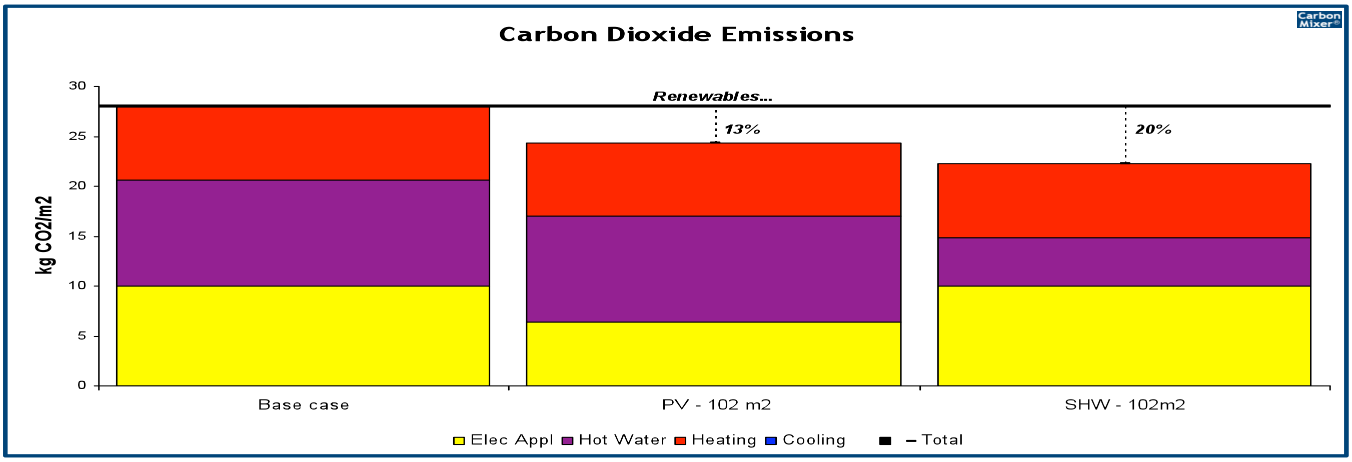
eight
associates

Summary of Carbon Savings
11 Netherhall Gardens

Carbon savings and cost calculations

The table below shows system sizes and CO_2 and energy reduction figures related to each renewable and low carbon technology applicable to this development.

	Non-Renewable energy delivered per annum		Savings per annum			Cost
Units	kWh/yr	$kgCO_2$/yr	kWh	$kgCO_2$	% carbon savings	Capital Expenditure
Development profile	178,684	42,983				
Solar Hot Water – 102 m^2	133,684	34,238	45,000	8,745	20.35%	£61,200
Photovoltaic – 102 m^2	168,969	37,457	9,716	5,526	12.86%	£64,800



eight
associates

Capital Expenditure and Payback

11 Netherhall Gardens

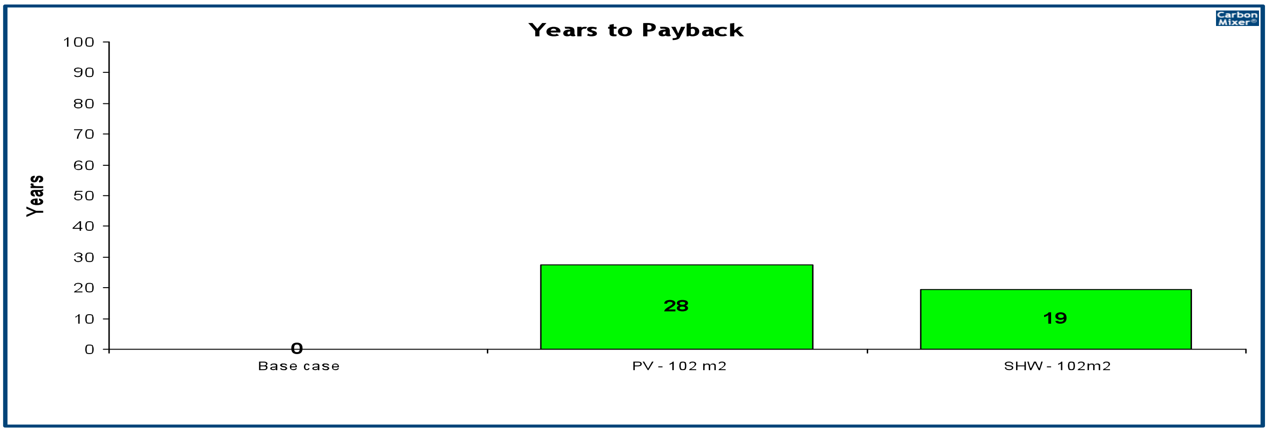
Payback

A payback period is the length of time it takes to recoup the initial capital outlay in terms of energy savings.

The solar thermal panels benefit from the lowest payback whereas the PV are the technology with the highest payback.

Note: this scenario assumes a high price increase in gas and electricity over time.

	Capital Expenditure £k	Annual Savings £k	Payback in years
Solar Hot Water – 102 m^2	£61,200	£3,162	19
Photovoltaic – 102 m^2	£64,800	£2,353	28



Grants and life cycle analysis
11 Netherhall Gardens

Renewable Energy Grants	In recent years, the government has run a number of grant funding schemes to encourage the wider use of renewable technologies. From April 1st 2008, the BERR (Department for Business, Enterprise and Regulatory Reform) launched Phase 2 of the Low Carbon Buildings Programme (LCPB2). Applications are being accepted for grants that cover up to 50% of the cost of installing approved microgeneration technologies. The grants are however only currently available to private homeowners and public buildings/schools/charities. For more information, visit http://www.lowcarbonbuildingsphase2.org.uk/ or phone 08704 232313. The scheme is managed by the BRE (Building Research Establishment).
Life cycle analysis	The maintenance and service costs of solar thermal panels should be low in comparison to other technologies such as biomass and wind turbines. This is due to the fact that they are long-lasting, require few repairs, maintenance every 8 years and have a warranty for 20 years.

Conclusion
11 Netherhall Gardens

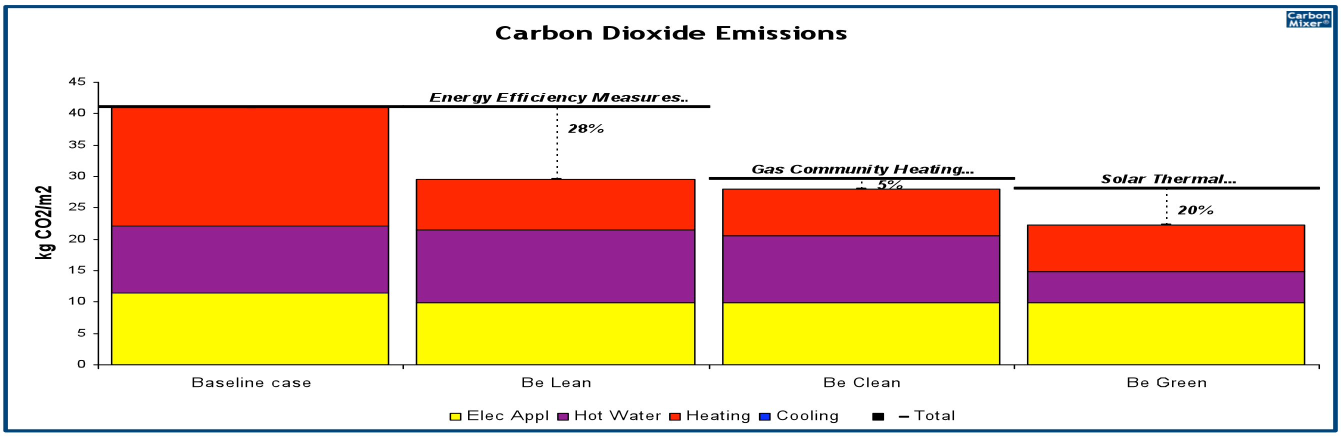
Recommendation

The predicted carbon emissions for 11 Netherhall Gardens on a per annum basis is 34,238 $kgCO_2/yr$ according to the measures outlined and the energy modelling undertaken in this report. These measures include:

- Be Lean: Energy efficiency measure to improve both the refurbished, new build and pool facilities including good airtightness and low U-values.
- Be Clean: A communal gas heating system to include a high efficiency and low NOx gas boiler with connection to a potential district heating system allowed for.
- Be Green: Solar thermal panels to provide 70% of the proposed scheme's hot water requirements.

Energy Heirarchy	Baseline emissions	Be Lean: Energy Efficiency Measures	Be Clean: Community Heating and Hot Water	Be Green: Solar Thermal
Carbon emissions in $kgCO_2/yr$	62,997	45,464	42,983	34,238
Percentage reduction in carbon emissions	-	27.83%	5.46%	20.35%

All findings are on the basis of a feasibility level study and as such are subject to detailed analysis from a services engineer and local weather investigation before committing to any specific renewable energy system.



Appendix 1 – Water Reduction Strategy
11 Netherhall Gardens

Water Reduction Strategy	In order for the development to meet Camden Council planning requirements, a strategy to reduce water consumption must be in place. To meet Code for Sustainable Homes Level Three, each unit will have water consumption levels of no more than 90 litres per person, per day. This can be achieved through the installation of the following sanitaryware specification: - 4/2.5 Dual flush WC's - 3 litres/minute spray wash hand basin taps - 6 litres/minute shower - 120 litre bath - 3 litres/minute kitchen sink taps - Best practice washing machine - Best practice dishwasher

eight
associates

Appendix 2 – Material Use and Waste Reduction Strategy
11 Netherhall Gardens

Material Use and Waste Reduction Strategy	In conjunction with the Code for Sustainable Homes report (produced by others), the following environmental considerations will be made during design and material procurement stages. Waste minimisation and reduction will be implemented at all stages of the development.
Material Use	In order to minimise material use on site, the development will retain most of the existing exterior walls and some internal structure. Although detailed carbon saving analysis of retaining this element has not been carried out, the embodied energy saved through retaining such a large proportion of the building is likely to be significant. Where new key construction elements are specified, they will achieve an A+ to D rating under the Green Guide for Housing, which in conjunction with the Code for Sustainable Homes encourages the use of materials with lower environmental impact over their cradle to grave lifecycle. In addition to this, responsible sourcing of materials will be undertaken where possible. This is likely to include FSC certification for timber elements and ISO 14001 certification for non-timber elements, such as concrete.
Waste Minimisation	Waste minimisation will be considered fully under a Site Waste Management Plan (SWMP) for the site. The SWMP will help to promote the reduction and effective management of waste generated during any demolition and construction works. Key considerations are likely to include: - Conversion of concrete rubble into high-grade recycled aggregate for use on the site. - - The use of a concrete box substructure instead of piling. This is likely to substantially reduce the embodied energy of the site. Waste Streams to be targeted during construction works - Waste target setting for concrete, timber and clay tiles to be used on site Best practice measures to be adopted: - Establishment of take-back schemes with suppliers so that unused materials are not wasted. - The removal and recycling of material packaging - Best practice measures such as reviewing likely and actual waste generated on site against Key Performance Indicators - Identification and removal of hazardous waste in line with legislation - Separation of any waste into key waste groups, to be identified on site

eight
associates

Appendix 3 – Biodiversity Enhancement Plan
11 Netherhall Gardens

Biodiversity Enhancement

The following is an outline biodiversity enhancement plan which aims to ensure that the proposed scheme promotes local biodiversity in line with the UK and local Biodiversity Action Plan.

Prior to starting works on site, a qualified ecologist will be appointed to undertake a site survey and provide recommendations. Recommendations will be followed in line with Code for Sustainable Homes requirements.

Local biodiversity

The below aerial photo of the existing site shows an area of woodland to the west of the site. This area is a habitat that could include several species of birds such as sparrows, blue tits and black redstarts as well as bats. The area could also be a potential habitat for hedgehogs.

Measures to promote local biodiversity

- 4 no. bird boxes will be positioned in trees to the external areas in line with recommendations from the ecologist.
- 2 no. bat boxes will be positioned in trees to the external areas in line with recommendations from the ecologist.
- 1 no. log pile to serve as a potential habitat for hedgehogs.
- Additional trees will be native species as recommended by the ecologist.
- 200m^2 of additional planters will be provided at terraces. These shall incorporate native or wildlife attracting species and will use peat-free mulch.