Energy Efficiency Statement

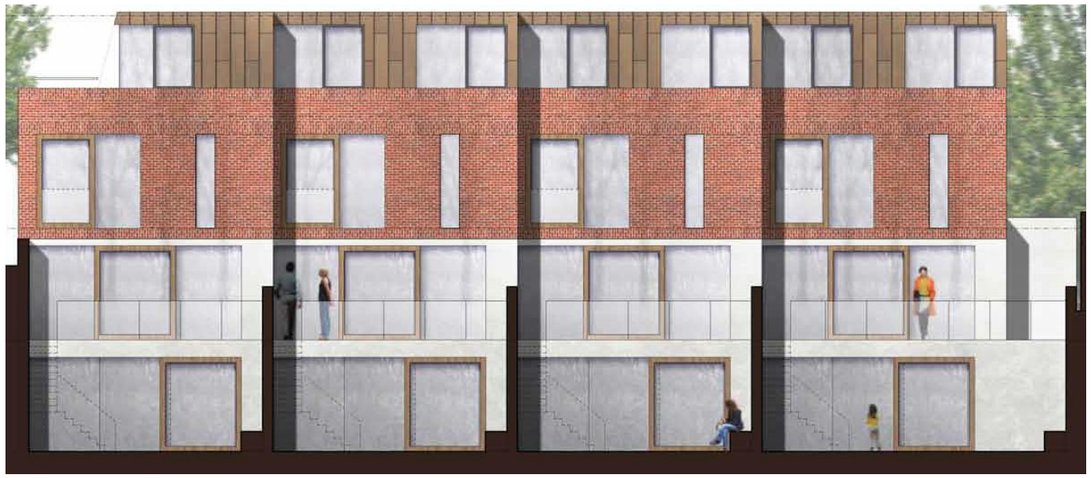
This study was completed by Syntegra Consulting to give an overview on how our proposal can incorporate low carbon and renewable technologies and how we meet Camden's and National polices. They have also completed a Pre-Assessment for Code for Sustainable Homes for our proposal.

Piercy&Company

SYNTEGRA CONSULTING
Intelligent & Green Building Solutions

Energy Strategy Report

4 North End, London, NW3 7HL



May 2012

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1. INTRODUCTION:

Syntegra Consulting Ltd has been appointed as energy consultants to produce an energy strategy for the **'Development of 4No. new-build houses'** for the scheme at **4 North End, Hampstead, London, NW3 7HL** – to support the scheme design process, demonstrate **Building regulations Part L1A compliance and compliance to the minimum code level 4 standard and a 20% reduction of CO2 emissions reduction via renewable technology planning policy requirement** and to demonstrate intent to deliver an energy efficient property in accordance with the client brief requirement.

This report will outline the following:

1) This report will assess the proposed development site's estimated energy demand & CO2 emissions. It will look into the feasibility of Low Zero Carbon technologies, examining the following aspects relative to LZC/renewable technologies:

- Energy generated by Renewable/Low Zero Carbon Technologies (LZC)
- Feasibility assessment for each Renewable/Low Zero Carbon Technologies (LZC)
- Local Planning Requirements
- Life cycle Costs & payback period for the technology investment
- Life cycle carbon emissions
- Land Use & noise issues if any
- Available Grants

2) The proposed building fabric and Low Zero Carbon (LZC) design strategy and analysis calculations, with respect to the Standard Assessment energy assessment Procedure (SAP). Demonstration of how the design is compliant against the current 2010 Part L1A buildings regulations i.e A 25% DER/TER CO2 emission reduction against BRUKL Part L1A 2010, as required to achieve code level 4 for the ENE1 category of the code for sustainable homes assessment – In accordance with the London Plan 2011 and local planning policy requirements.

3) The comparison of the development's energy consumption and CO2 emissions with the DER/TER model & standard case model in order to show a minimum target for the overall development of 20% CO2 consumption reduction requirement from LZC/Renewable technologies [In accordance with the London Plan 2011 and – In accordance with the London Plan 2011 and local planning policy requirements].

4) The Code for Sustainable Homes (CSH) pre-assessment strategy (under the current CSH Nov 2010 guide) in terms of the intent in achieving the overall minimum code level 4 strategy for the development. –In accordance with the London Plan 2011 and local planning policy requirements.

1.1 Site Description:

The proposed development comprises of a 'Development of 4No. new-build terrace houses'. The development is located in a sub-urban area in Hampstead, near to the Hampstead recreation ground. The nearest station is Hampstead Health which is about 2km south of the site. The site is within the London Borough of Camden.

1.2 Policy documents:

The development proposals have been developed with regard to the relevant national, regional and local policy guidance which is reviewed within this section. The energy strategy proposal has been produced with due regard to the following key policy guidance:

National Planning Policy Framework (March 2012)

The National Planning Policy Framework is a key part of our reforms to make the planning system less complex and more accessible, to protect the environment and to promote sustainable growth.

London Borough of Camden SBD, LDF Policies-

These outline the guidelines for developers to comply in relation to sustainable construction criteria.

The London Plan Renewable Energy Policy 2011

The Mayor will and boroughs should in their DPDs adopt a presumption that developments will achieve a reduction in carbon dioxide emissions of 20% from onsite renewable energy generation (which can include sources of decentralised renewable energy) and a 25% CO2 emission reduction DER/TER (code level 4 for ENE1) in relation to the code for sustainable homes assessment nov2010 scheme, unless it can be demonstrated that such provision is not feasible.

1.3 Embedded Renewable Energy Technology:

Embedded renewable energy technology is capable of providing a total reduction in CO2 emissions which includes emissions from space and water heating, lighting. A SAP calculation computes the CO2 produced from space & water heating, lighting, fans and pumps. Then, the contribution of the LZC technologies to the total energy and CO2 reductions is calculated. Finally, the savings are compared to the standard case energy model and the percentage savings are calculated. The SAP calculations form a major part of evidence and design intent that a dwelling achieves the desired design and compliance targets.

2. The Development configuration scheme:

The proposed development scheme consists of the following accommodation characteristics:

2.1 The Unit configuration

The following table presents the type, area and number of units to be assessed within this report:

Proposed units to be assessed for the development

Dwelling Type	Number of units	Number of bedrooms	Individual Dwelling Area m^2
House A	1	4	247.84
House B	1	5	254.55
House C	1	5	246.94
House D	1	5	276.79
Total	**4**	**19**	**1026.12**

Table 1

2.2 Specification of Building Materials

The table presented below demonstrates the material properties of the building fabric that have been proposed:

Proposed development

Building Element	Proposed Specification U-Values
External Walls	0.21
Roof	0.12
Windows	1.1
Floor	0.15

Table 2

Air Permeability m^2	3.5
Low Energy Lighting	100%

Table 3

Future retro-fit improvements made to a buildings fabric are expensive, disruptive and most of the time impractical and therefore the thermal qualities of the building fabric must be one of the main considerations for the longevity of the dwelling and overall long term CO2 reduction. Reducing the CO2 of the development by increasing the fabric specification provides the development with a high degree of longevity, by limiting the heat losses across the building envelope over the property lifetime. – This approach will have the most significant long term effect on CO2 reduction as the envelope is unlikely to be radically altered during its lifetime. It would be easier and more cost effective in the long term to retrofit LZC technology to a well constructed well insulated dwelling that has been pre-prepared for such technology than to try and increase the fabric U-values of an existing building.

3. Low & Zero Carbon Energy Systems

The following section is an overview of the LZC energy systems that are available and can be implemented to the building environment. Firstly, a brief description of the types of renewable energy (zero carbon energy) that can be harnessed with technology will be presented. In addition, the renewable energy system technologies that harness the renewable energy and convert it to electricity, heating and hot water etc, to be consumed in buildings will be presented as well.
The second part of this section will provide an indication of the available low carbon technologies that can be installed on a building to minimise carbon emissions and reduce energy costs.

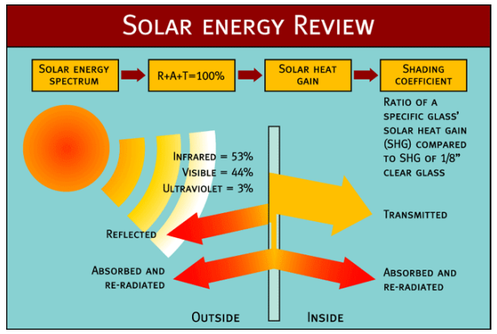
3.1. Zero Carbon (Renewable) Energy Overview.

Renewable energy is the energy that is grasped by the earth's abundant natural sources. Renewable energy can be harnessed with the appropriate use of technology to satisfy the human energy needs. Solar, wind, wave, tide and bio energy are termed as renewable. These renewable energy sources can be classified as 'active' or 'passive'. Active RES are the renewable sources which with the use of renewable energy systems technology (REST) can generate power and heat to satisfy the energy and heating demands of buildings. Passive RES are the renewable sources which with the use of static building elements can enhance the natural ventilation and the heating of a building.

Solar Energy

Solar energy is the energy of sun light. The temperature of the Sun's surface reaches to a value of approximately 5,762K. The Earth's perimeter of 40,000 km results in an intersected sun power of 174,000TW. Attenuation by the atmosphere results in a peak intensity at sea level of around 1kW/m2, giving a 24 hour annual average of 0.2kW/m2 and a 24 hour annual average power of 102,000 TW.

This commands the environment and maintains the life support system of Earth's ecosystem and all forms of renewable energy with the exception of geothermal energy. The solar energy reaching the earth's surface surpasses 10,000 times the current global energy demand.



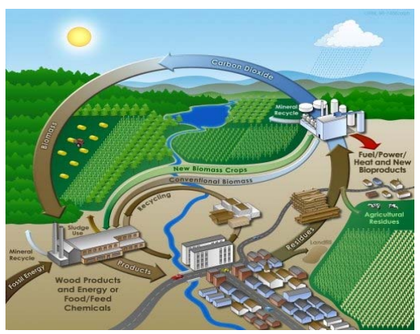
To be more specific in terms of harnessing solar energy we are interested with the irradiance. Irradiance is the energy of light incident on a solar collector. Irradiance is measured in energy per area, (W/m2). The solar irradiance received on the Earth's surface consists of three components, the beam irradiance, diffuse and ground reflected irradiance. The beam component is the irradiance that reaches the solar collector directly. The diffuse irradiance is formulated due to the sunlight reflected by the earth's ground.

Wind Energy

Wind energy is the energy found in the wind that is grasped by REST in order to generate power for human benefit. Wind turbines are the REST used to collect the wind resource and generate power. Today, wind turbines are used to generate electricity from the wind. There are two types of wind turbines, the horizontal axis turbine which is the most common one and the vertical axis turbine. The HAWT is the most efficient and cost effective. Most of the wind turbines used for electricity generation are of this type. Wind turbines can be found in many sizes and outputs, from small battery charging turbines (say a rotor diameter of 1 or 2 metres with an output of a few hundred Watts) to the largest machines used to supply electricity to the grid (Rotor diameters in excess of 70m and output powers of over two MW).

Bio-energy

Bio-energy is the energy produced from biomass. Biomass is available from materials derived from biological sources. Biomass is any organic material which has stored sunlight in the form of chemical energy. As a fuel it may include wood, wood waste, straw, manure, sugar cane, and many other by products from a variety of agricultural processes. Energy from biomass is produced by burning organic matter.

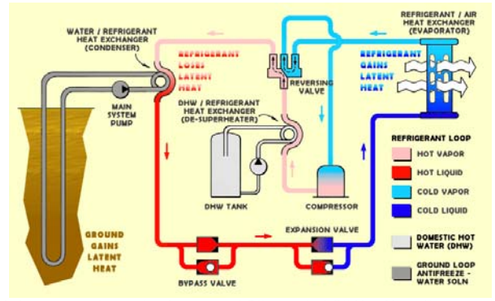


Biomass is the solid form of 'bioenergy', but liquid fuels can also be generated from plant matter and this is referred to as 'biofuel'. Biomass is carbon-based

so when used as fuel it also generates carbon emissions. However, the carbon that is released during combustion is equivalent to the amount that was absorbed during growth, and so the technology is carbon-neutral.

Geothermal Energy

Geothermal energy is the heat from the Earth. It's clean and sustainable. Resources of geothermal energy range from the shallow ground to hot water and hot rock found a few miles beneath the Earth's surface, and down even deeper to the extremely high temperatures of molten rock called magma. Almost everywhere, the shallow ground or upper 10 feet of the Earth's surface maintains a nearly constant temperature between 10° and 16°C. Geothermal heat pumps can tap into this resource to heat and cool buildings. A geothermal heat pump system consists of a heat pump, an air delivery system (ductwork), and a heat exchanger-a system of pipes buried in the shallow ground near the building. In the winter, the heat pump removes heat from the heat exchanger and pumps it into the indoor air delivery system. In the summer, the process is reversed, and the heat pump moves heat from the indoor air into the heat exchanger. The heat removed from the indoor air during the summer can also be used to provide a free source of hot water.



3.2 Zero Carbon Technologies

In this section the zero carbon technologies also known as Renewable Energy System Technologies (REST) are described.

- Photovoltaics (PV)
- Solar Water Heating
- Wind Turbines
- Small scale Hydro Power
- Biomass Heating

3.2.1 Photovoltaic Systems

Description of PV Systems

Photovoltaic systems convert energy from the sun directly into electricity. They are composed of photovoltaic cells, usually a thin wafer or strip of semiconductor material that generates a small current when sunlight strikes them. Multiple cells can be assembled into modules that can be wired in an array of any size. These flat-plate PV arrays can be mounted at a fixed angle facing south, or they can be mounted on a tracking device that follows the sun, allowing them to capture the most sunlight over the course of a day, or even in the form of a solar PV facade. Several connected PV arrays can provide enough power for a household/building.

Thin film solar cells use layers of semiconductor materials only a few micrometers thick. Thin film technology has made it possible for solar cells to now double as rooftop shingles, roof tiles, building facades, or the glazing for skylights or atria. The solar cell version of items such as shingles offer the same protection and durability as ordinary asphalt shingles.

Advantages

The PV systems are relatively simple, modular, and highly reliable due to the lack of moving parts. Moreover, PV systems do not produce any greenhouse gases, on the contrary they save approximately 325kg of CO_2 per year kWp they generate.

Best Practice Design

PV installations performance is proportional to the active area (area covered by PVs). The desirable location for PV panels is on a south facing roof or façade, as long as no other building or tall trees overshadows it, resulting in reduced PV efficiency.

PV panels are require strong structurally roofs due to their heavy weight, especially if the panels are placed on top of existing tiles.

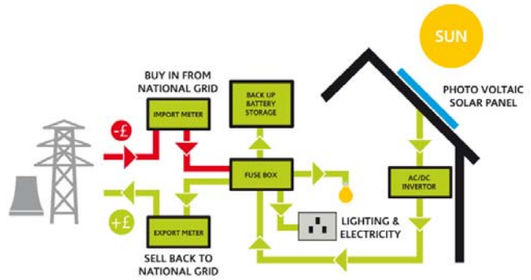
The area of PV panels required to generate 1 kWp varies but generally 6-8m^2 for mono-crystalline and 10m^2 for polycrystalline panels will generate 1kWp(kWp-energy generated at full sunlight) of electricity.

Cost & Maintenance

Prices for PV systems vary, depending on the size of the system to be installed, type of PV cell used and the nature of the actual building on which the PV is mounted. The size of a PV system depends on the buildings electricity demand. For an average domestic system, costs of a PV system can be around £4000 - £9000 per kWp installed, with most domestic systems usually between 1.5 and 2 kWp. Solar tiles cost more than conventional panels, and panels that are integrated into a roof are more expensive than those that sit on top. Grid connected systems require very little maintenance, generally limited to ensuring that the panels are kept relatively clean and that shade from trees does not obstruct the sunlight path. However, the wiring and system components should be checked regularly by a qualified technician.

Available Grants

The Feed - In – Tariffs have been introduced in order to give an incentive for PV generated electricity. The Feed-In-Tariffs scheme is based on the principle that the energy supplier pays generation tariff for every kWh the PV system generates and an export tariff for every kWh of electricity supplied back to the national grid.



Band (kW)	Current generation tariff (p/kW)
<4kW (new build)	21.0
<4kW (retrofit)	21.0
>4-10kW	16.8
>10-50kW	15.2
>50-100kW	12.9

Band (kW)	Current generation tariff (p/kW)
>100-150kW	12.9
>150-250kW	12.9
>250kW-5MW	8.5
stand alone	8.5

- Export Tariff: 3.10pence/kWh
- Tariff period duration is 25 years

3.2.2 Solar Water Heating

Description of Solar Water Heating System

Solar water heating systems use solar energy to heat water. Depending on the type of solar collector used, the weather conditions, and the hot water demand, the temperature of the water heated can vary from tepid to nearly boiling. Most solar systems are meant to furnish 20 to 85% of the annual demand for hot water, the remainder being met by conventional heating sources, which either raise the temperature of the water further or provide hot water when the solar water heating system cannot meet demand.

Solar systems can be used wherever moderately hot water is required. Off-the-shelf packages provide hot water to the bathroom and kitchen of a house; custom systems are designed for bigger loads, such as multi-unit apartments.

The most common collector is called a flat-plate collector. Mounted on the roof, it consists of a thin, flat, rectangular box with a transparent cover that faces the sun. Small tubes run through the box and carry the fluid – either water or other fluid, such as an antifreeze solution – to be heated. The tubes are attached to an absorber plate, which is painted black to absorb the heat. As heat builds up in the collector, it heats the fluid passing through the tubes.

Advantages

Solar water heating can provide about a third of a typical dwellings/business hot water needs. The average domestic system reduces CO_2 by 325 kg per year approximately and around £50 a year of hot water bills, when installed in a gas heated home.

Fuel Displaced	£ Saving per year	CO_2 saving per year kg
Gas	50	325
Electricity	80	635

Table 4

The savings presented on the previous table are approximate and are based on the hot water heating demand of a 3 bed semi detached house.

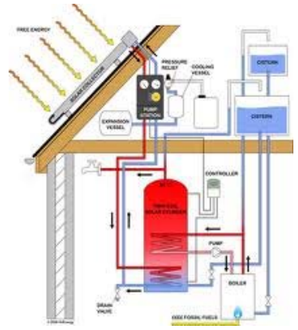
Best Design Practice

For domestic systems a 3-4 m^2 of southeast to southwest facing roof receiving direct sunlight for the main part of the day is required. Also, more space will be needed if a water cylinder is required.

Planning Issues

In England, changes to permitted development rights for micro generation technologies introduced on 6th April 2008 have lifted the requirements for planning permission for most solar water heating installations. Roof mounted and stand alone systems can now be installed in most dwellings, as long as they follow certain size criteria. Listed , English Heritage and buildings in conservation areas are exempted.

Cost & Maintenance



A typical installation cost for a domestic SHW system is £3000-£5000. Evacuated tube systems are more expensive due to their higher manufacturing cost.

SWH systems in general have a 5-10 years warranty and require little maintenance. A yearly check by the owner of the system and a more detailed maintenance check by a qualified installer every 3-5 years should be adequate.

Available Grants

In March 2011, the UK Government announced the details of their Renewable Heat Incentive (RHI).

RHI is designed to provide financial support that encourages individuals, communities and businesses to switch from using fossil fuel for heating, to renewables such as wood fuel.

There will be two phases for domestic customers:

Phase 1 (available from July 2011) - "RHI Premium Payment"

This is called the "RHI Premium Payment" and will be worth around £15m and available to 25,000 householders in Great Britain who install from July 2011.

The exact amounts available to consumers are confirmed:

* Solar Thermal - £300/unit

These are one off payments; so not annual. DECC plan to publish details of the "Phase 2 RHI Payment" and how this will apply next year. Recipients of this payment will need to ensure that:

* They have a well-insulated property based on its energy performance certificate;
* They agree to give feedback on how the equipment performs.

Phase 2 (available from October 2012) – RHI tariffs

People in receipt of the Renewable Heat Premium Payments will be able to receive long term RHI tariff support once these tariffs are introduced, as will anybody who has installed an eligible technology since 15th July 2009.
These tariff payments will start alongside the Green Deal from October 2012 to allow a more whole-house approach to heat production and energy saving.

3.2.3 Wind Turbines

Description of Wind Turbine

Wind energy systems convert the kinetic energy of moving air into electricity or mechanical power. They can be used to provide power to central grids or isolated grids, or to serve as a remote power supply or for water pumping. Wind turbines are commercially available in a vast range of sizes. The turbines used to charge batteries and pump water off-grid tend to be small, ranging from as small as 50 W up to 10 kW. For isolated grid applications, the turbines are typically larger, ranging from about 10 to 200 kW. Wind turbines are mounted on a tower to harness the most energy. At 30 meters or more aboveground, they can capture the faster and less turbulent wind in an urban environment. Turbines harness the wind's energy with their propeller-like blades. In most of the cases, two or three blades are mounted on a shaft to form a rotor.
There are two types of wind turbines that can be used for buildings:

- Mast mounted – which are free standing and located near the building that will be consuming the generated electricity.
- Roof Mounted – which can be installed on house roofs and other buildings.

Planning Issues

Planning issues such as visual impact , noise and conservation issues also have to be considered. System installation normally requires permission from the local authority.

Cost & Maintenance

- Roof mounted turbines cost from £3000. The amount of energy and carbon that roof top micro wind turbines save depends on size, location, wind speed, nearby buildings and the local landscape. At the moment there is not enough data from existing wind turbine installations to provide a figure of how much energy and CO_2 could typically be saved. The Energy saving

trust is monitoring up to 100 installations nationwide which will give ball park figures of carbon savings.

- Mast Mounted turbines in the region of 2.5kW to 6kW would cost approximately £11000-£19000. These costs are inclusive of the turbine, mast, inverters, battery storage and installation cost. It should be noted that these costs vary depending on location, size and type of system to be installed.

Turbines have an operational lifetime of up to 22.5 years but require service checks every few years to ensure efficient operation. For battery storage systems, typical battery life is around 6-10 years, depending on the type, so batteries may have to be replaced at some point in the system's life.

Available Grants

The Feed - In – Tariffs have been introduced in order to give an incentive for wind generated electricity. The Feed-In-Tariffs scheme is based on the principle that the energy supplier pays generation tariff for every kWh the wind system generates and an export tariff for every kWh of electricity supplied back to the national grid.

- Generation Tariff: 28.0 – 36.20 pence/kWh depending on installed rated output (upto 15KW)
- Export Tariff: 3.10pence/kWh
- Tariff period duration is 20 years

3.2.4 Small Scale Hydro

Description of Small scale Hydro System

Small hydro systems convert the potential and kinetic energy of moving water into electricity, by using a turbine that drives a generator. As water moves from a higher to lower elevation, such as in rivers and waterfalls, it carries energy with it; this energy can be harnessed by small hydro systems. Used for over one hundred years, small hydro systems are a reliable and well-understood technology that can be used to provide power to a central grid, an isolated grid or an off-grid load, and may be either run-of-river systems or include a water storage reservoir.
In a residential small scale hydro system the constant flow of water is critical to the success of the project. The energy available from a hydro turbine is proportional to the flow rate of the water and the head height. Since the majority of the cost of a small hydro project stems from up front expenses in construction and equipment purchase, a hydro project can generate large quantities of electricity with very low operating costs and modest maintenance expenditures for 50 years or longer.

Advantages

For houses with no mains connection but with access to a micro hydro site, a good hydro system can generate a steady, more reliable electricity supply than other renewable technologies at lower cost. Total system costs can be high but often less than the cost of a grid connection and with no electricity bills to follow.

Cost & Maintenance

Small hydro schemes are very site specific and are related to energy output. For low heat systems, costs may lie in the region of £4,000 per kW installed up to about 10kW and would drop per kW for larger schemes.

For medium heads, there is a fixed cost of about £10,000 and about £2,500 per kW up to around 10kW – so a typical 5kW domestic scheme might cost £20-£25,000.

Unit costs drop for larger schemes. Maintenance costs vary but small scale hydro systems are very reliable.

Available Grants

The Feed - In – Tariffs have been introduced in order to give an incentive for hydroelectric generated electricity. The Feed-In-Tariffs scheme is based on the principle that the energy supplier pays generation tariff for every kWh the hydroelectric system generates and an export tariff for every kWh of electricity supplied back to the national grid.

- Generation Tariff: 20.90 pence/kWh depending on installed rated output (upto 15KW)
- Export Tariff: 3.10pence/kWh
- Tariff period duration is 20 years

3.2.5 Biomass Heating

Description of Biomass Heating System

Biomass heating systems also known as biomass boilers burn organic matter—such as wood chips, agricultural residues or municipal waste—to generate heat for buildings. They are highly efficient heating systems, achieving near complete combustion of the biomass fuel through control of the fuel and air supply, and often incorporating automatic fuel handling transport systems. Biomass boilers consist of a boiler, a heat distribution system, and a fuel transportation system. The biomass heating system typically makes use of multiple heat sources, including a waste heat recovery system, a biomass combustion system, a peak load boiler, and a back-up boiler. The heat distribution system conveys hot water or steam from the heating plant to the loads that may be located within the same building as the heating plant, as in a system for a single institutional or industrial building, or, in the case of a “district heating” system, clusters of buildings located in the vicinity of the heating plant.

Biomass heating systems have higher capital costs than conventional boilers and need diligent operators. Balancing this, they can supply large quantities of heat on demand with very low fuel costs, depending on the origin of the fuel.

Best Design Practice

It’s important to have storage space for the fuel and appropriate access to the boiler for loading the fuel. A local fuel supplier should be present in order to make the scheme viable.

The vent material must be specifically designed for wood appliances and there must be sufficient air movement for proper operation of the stove. Chimneys can be fitted with a lined flue.

A Biomass heating system installation should comply with all safety and building regulations. Wood can only be burned in exempted appliances, under the Clean Air Act.

Advantages

Producing energy from Biomass has both environmental and economic advantages. Although Biomass produces CO_2 it only releases the same amount that is absorbed whilst growing, which is why it is considered to be carbon neutral. Furthermore, Biomass can contribute to waste management by harnessing energy from products that are often disposed at landfill sites.

It is most cost effective and sustainable when a local fuel source is used, which results in local investment and employment, which in addition minimizes transport emissions.

Planning Issues

If the building is listed or is in an area of outstanding natural beauty, then it is required that the Local Authority Planning department is notified before a flue is fitted.

Cost & Maintenance

Stand alone room heaters cost £2,000 to £4,000. Savings will depend on how much they are used and which fuel you are replacing. A Biomass stove which provides a detached home with 10% of annual space heating requirements could save around 840kg of CO_2 when installed in an electrically heated home. Due to the higher cost of Biomass pellets compared with other heating fuels, and the relatively low efficiency of the stove compared to a central heating system it will cost more to run.

The cost of Biomass boilers varies depending on the system choice; a typical 15kW pellet boiler would cost about £5,000-£14,000 installed, including the cost of the flue and commissioning process. A manual log feed system of the same size would be slightly cheaper. A wood pellet boiler could save around £750 a year in energy bills and around 6 tons of CO_2 per year when installed in an electrically heated home.

In terms of biomass fuel costs, they generally depend on the distance between the dwelling and the supplier and whether large quantities can be bought.

Available Grants

In March 2011, the UK Government announced the details of their Renewable Heat Incentive (RHI).

RHI is designed to provide financial support that encourages individuals, communities and businesses to switch from using fossil fuel for heating, to renewables such as wood fuel.

The RHI is in two phases:

Phase 1 (available from July 2011) - "RHI Premium Payment"
This is called the "RHI Premium Payment" and will be worth around £15m and available to 25,000 householders in Great Britain who install from July 2011.

The exact amounts available to consumers have yet to be confirmed. However the Department of Energy and Climate Change (DECC) have announced that the following amounts may be available:

* Biomass boilers - £950/unit (available only to off-gas installations)

These are one off payments; so not annual. DECC plan to publish details of the "Phase 2 RHI Payment" and how this will apply next year. Recipients of this payment will need to ensure that:

* They have a well-insulated property based on its energy performance certificate;
* They agree to give feedback on how the equipment performs.

Phase 2 (available from October 2012) – RHI tariffs

People in receipt of the Renewable Heat Premium Payments will be able to receive long term RHI tariff support once these tariffs are introduced, as will anybody who has installed an eligible technology since 15th July 2009.

These tariff payments will start alongside the Green Deal from October 2012 to allow a more whole-house approach to heat production and energy saving.

3.3 Low Carbon Technologies

In this section the low carbon technologies are described.

- Air Source Heat Pumps
- Ground Source Heat Pumps (GSHP)
- Combined Heat and Power (CHP)
- Micro CHP
- Fuel Cells

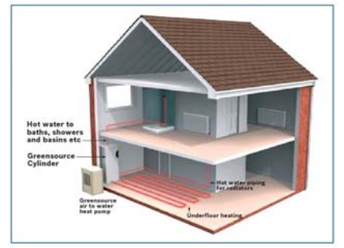
3.3.1. Air Source Heat Pumps (ASHP)

Description of Air Source Heat Pumps

Air source heat pumps work in a very similar way to fridges and air conditioners and absorb heat from the air. They are ideally suited to work with under floor heating systems because of the lower design temperatures of under floor systems. The lower the water temperature, the higher the COP. Air source heat pumps use air. They are fitted outside a house, generally perform better at slightly warmer air temperatures. The seasonal efficiencies of air source heat pumps are between 200% - 400%. Heat pumps can operate at outside temperatures down to –15 degC, although there is a drop in COP.

Advantages

- A reduction in carbon emission.
- No boiler flues and danger of carbon monoxide leakage.
- Maintenance is carried outside the premises.
- No annual boiler servicing and safety checks.
- Heat pump life expectancy about 25 years compared to a boiler of 15 years



Costs & Savings

Operating Cost Savings around 15% in comparison with a typical gas fired condensing boiler installation with HWS cylinder and an Electrically driven Community air to water heat pump.

Available Grants

In March 2011, the UK Government announced the details of their Renewable Heat Incentive (RHI).

RHI is designed to provide financial support that encourages individuals, communities and businesses to switch from using fossil fuel for heating, to renewables such as wood fuel.

The RHI is in two phases:

Phase 1 (available from July 2011) - "RHI Premium Payment"

This is called the "RHI Premium Payment" and will be worth around £15m and available to 25,000 householders in Great Britain who install from July 2011.

The exact amounts available to consumers are confirmed:

* Air Source Heat Pumps - £850/unit (available only for off-gas installations)

These are one off payments; so not annual. DECC plan to publish details of the "Phase 2 RHI Payment" and how this will apply next year. Recipients of this payment will need to ensure that:

* They have a well-insulated property based on its energy performance certificate;
* They agree to give feedback on how the equipment performs.

Phase 2 (available from October 2012) – RHI tariffs

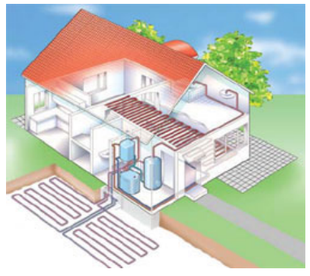
People in receipt of the Renewable Heat Premium Payments will be able to receive long term RHI tariff support once these tariffs are introduced, as will anybody who has installed an eligible technology since 15th July 2009.

Whilst Air source heat pumps will be eligible for the Renewable Premium Payment, a decision on whether or not they'll be included in the tariff payments will be based upon consumer feedback on the performance of the technologies. This should be clarified towards the end of 2011.

These tariff payments will start alongside the Green Deal from October 2012 to allow a more whole-house approach to heat production and energy saving.

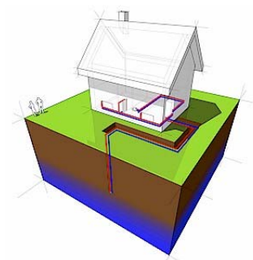
3.3.2 Ground Source Heat Pumps (GSHP)

Description of Ground Source Heat Pumps



Ground-source heat pumps provide low temperature heat by extracting it from the ground or a body of water and provide cooling by reversing this process. Their principal application is space heating and cooling, though many also supply domestic hot water. They can even be used to maintain the integrity of building foundations in permafrost conditions, by keeping them frozen through the summer.

A ground-source heat pump (GSHP) system has three major components: the earth connection, a heat pump, and the heating or cooling distribution system. The earth connection is where heat transfer occurs. One common type of earth connection comprises tubing buried in horizontal trenches or vertical boreholes, or alternatively, submerged in a lake or pond. An antifreeze mixture, water or another heat-transfer fluid is circulated from the heat pump, through the tubing, and back to the heat pump in a "closed loop." "Open loop" earth connections draw water from a well or a body of water, transfer heat to or from the water, and then return it to the ground or the body of water.



Since the energy extracted from the ground exceeds the energy used to run the heat pump, GSHP "efficiencies" can exceed 100%, and routinely average 200 to 500% over a season. Due to the stable, moderate temperature of the ground, GSHP systems are more efficient than air-source heat pumps, which exchange heat with the outside air. GSHP systems are also more efficient than conventional heating and Air-conditioning technologies, and typically have lower maintenance costs. They require less space, especially when a liquid building loop replaces voluminous air ducts, and, since the tubing is located underground, are not prone to vandalism like conventional rooftop units. Peak electricity consumption during cooling season is lower than with conventional air-conditioning, so utility demand charges may be reduced. Heat pumps typically range in cooling capacity from 3.5 to 35 kW (1 to 20 tons of Cooling). A single unit in this range is sufficient for a house or small commercial Building. The heat pump usually generates hot or cold air to be distributed locally by conventional ducts.

Advantages

The efficiency of GSHP system is measured by the coefficient of performance (COP). This is the ratio of units of heat output for each unit of electricity used to drive the compressor and pump for the ground loop. Average COP known as seasonal efficiency, is around 3-4 although some systems may produce a greater rate of efficiency. This means that for every unit of electricity used to pump the heat, 3-4 units of heat are produced, making it an efficient way of heating a building. If grid electricity is used for the compressor and pump, then a range of energy suppliers should be consulted in order to benefit from the lower running costs.

Cost & Savings

A typical 8-12kW system costs £6,000-£12,000 (not including the price of distribution system). This can vary with property and location. When installed in an electrically heated home a GSHP could save as much as £900 a year on heating bills and almost 7 tonnes of CO_2 a year. Savings will vary depending on what fuel is being replaced.

Available Grants

In March 2011, the UK Government announced the details of their Renewable Heat Incentive (RHI).

RHI is designed to provide financial support that encourages individuals, communities and businesses to switch from using fossil fuel for heating, to renewables such as wood fuel.

There will be two phases for domestic customers:

Phase 1 (available from July 2011) - "RHI Premium Payment"

This is called the "RHI Premium Payment" and will be worth around £15m and available to 25,000 householders in Great Britain who install from July 2011.

The exact amounts available to consumers are confirmed:

*Ground Source Heat Pumps - £1,250/unit (available for off-gas installations only)

These are one off payments; so not annual. DECC plan to publish details of the "Phase 2 RHI Payment" and how this will apply next year. Recipients of this payment will need to ensure that:

* They have a well-insulated property based on its energy performance certificate;
* They agree to give feedback on how the equipment performs.

Phase 2 (available from October 2012) – RHI tariffs

People in receipt of the Renewable Heat Premium Payments will be able to receive long term RHI tariff support once these tariffs are introduced, as will anybody who has installed an eligible technology since 15th July 2009.

These tariff payments will start alongside the Green Deal from October 2012 to allow a more whole-house approach to heat production and energy saving.

3.3.3 Combined Heat and Power (CHP) & Micro CHP

Description of CHP

The principle behind combined heat and power (cogeneration) is to recover the waste heat generated by the combustion of a fuel[6] in an electricity generation system. This heat is often rejected to the environment, thereby wasting a significant portion of the energy available in the fuel that can otherwise be used for space heating and cooling, water heating, and industrial process heat and cooling loads in the vicinity of the plant. This cogeneration of electricity and heat greatly increases the overall efficiency of the system, anywhere from 25-55% to 60-90% depending on the equipment used, and the application.

A CHP installation comprises four subsystems: the power plant, the heat recovery and distribution system, an optional system for satisfying heating and/or cooling loads and a control system. A wide range of equipment can be used in the power plant, with the sole restriction being that the power equipment rejects heat at a temperature high enough to be useful for the thermal loads at hand. In a CHP system, heat may be recovered and distributed as hot water, conveyed from the plant to low temperature thermal loads in pipes for domestic hot water, or for space heating.

Advantages

CHP can significantly reduce primary energy consumption, and can therefore have a major impact on CO2 emissions associated with the combustion of fossil fuels in conventional boilers. Each 1 kW of electrical capacity provided by CHP plant using fossil fuels has the potential to reduce annual CO2 emissions by around 0.6 tones compared to gas-fired boilers and fully grid-derived electricity. For plant which is fuelled by renewable energy sources the potential is much greater.

Costs & Savings

Capital costs for CHP installations are higher than for alternative systems, but this can be recovered over a relatively short period of time (typically 5–10 years) for installations where there is a demand for heat and power for 4500 hours or more each year. The cost effectiveness is very sensitive to the relative price of electricity and fossil fuel which have been subject to frequent variations since de-regulation of the energy supply industries.

Micro CHP

Micro CHP (Combined Heat & Power) is the simultaneous production of useful heat and power within the home. It works very much like the gas boiler in a central heating system and heats the home in just the same way. However, at the same time it generates electricity, some of which will be used in the dwelling and the remainder will be exported to the electricity grid. Effectively the micro CHP unit replaces the gas central heating boiler and provides heat and hot water as usual, but additionally provides the majority of the home's electricity needs. Although individual units produce, by definition, relatively small amounts of electricity, the significance of micro CHP lies in the potentially huge numbers of systems which may ultimately be installed in the millions of homes in the UK where natural gas is currently the dominant heating fuel.

Available grants

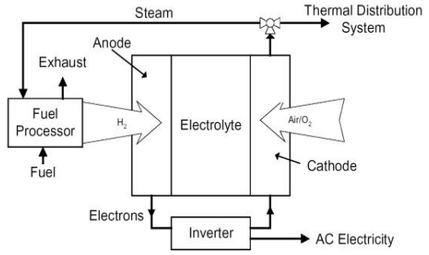
The Feed - In – Tariffs have been introduced in order to give an incentive for micro CHP generated electricity. The Feed-In-Tariffs scheme is based on the principle that the energy supplier pays generation tariff for every kWh the micro CHP system generates and an export tariff for every kWh of electricity supplied back to the national grid.

- Generation Tariff: 10.50 pence/kWh depending on installed rated output (upto 2KW)
- Export Tariff: 3.10pence/kWh
- Tariff period duration is 10 years

3.3.4 Fuel Cells

Description of Fuel Cells

A fuel cell is a device that generates electricity by a chemical reaction. Every fuel cell has two electrodes, one positive and one negative, called, respectively, the anode and cathode. The reactions that produce electricity take place at the electrodes.



Every fuel cell also has an electrolyte, which carries electrically charged particles from one electrode to the other, and a catalyst, which speeds the reactions at the electrodes. Hydrogen is the basic fuel, but fuel cells also require oxygen.

One great appeal of fuel cells is that they generate electricity with very little pollution—much of the hydrogen and oxygen used in generating electricity ultimately combine to form a harmless by product, namely water.

Fuel Cell Operation

The purpose of a fuel cell is to produce an electrical current that can be directed outside the cell to do work, such as powering an electric motor or illuminating a light bulb or a city. Because of the way electricity behaves, this current returns to the fuel cell, completing an electrical circuit. The chemical reactions that produce this current are the key to how a fuel cell works.

There are several kinds of fuel cells, and each operates a bit differently. But in general terms, hydrogen atoms enter a fuel cell at the anode where a chemical reaction strips them of their electrons. The hydrogen atoms are now “ionized,” and carry a positive electrical charge. The negatively charged electrons provide the current through wires to do work. If alternating current (AC) is needed, the DC output of the fuel cell must be routed through a conversion device called an inverter.

Advantages

Even better, since fuel cells create electricity chemically, rather than by combustion, they are not subject to the thermodynamic laws that limit a conventional power plant. Therefore, fuel cells are more efficient in extracting energy from a fuel. Waste heat from some cells can also be harnessed, boosting system efficiency still further.

Fuel Cells with Hydrogen from Renewable Sources

Fuel cells can be used as CHP systems in buildings. There are currently several different systems under development using different chemical processes, which operate at different temperatures. They currently use natural gas as the fuel, which is reformed to produce hydrogen, the required fuel for the fuel cell. When and if hydrogen becomes available from renewable energy, fuel cell CHP from renewable sources may be possible in buildings.

4. Non Feasible LZC technologies for the development

All of the LZC technologies are assessed against a number of criteria. Hence, LZC technology feasibility will be assessed according to the following criteria:

I. Renewable energy resource or fuel availability of the LZC technology on the site.
II. Space limitations due to building design and urban location of the site.
III. Capital, operating and maintenance cost.
IV. Planning Permission
V. Implementation with regards the overall M&E design strategy for building type
VI. Impact against **ENE1/2/7 categories(of the CSH) and CIBSE standard case model**

The renewable/LZC technologies which were found non feasible based on the above criteria are the following:

- Wind Turbines
- Biomass Boilers
- CHP & Micro CHP
- Hydrogen Fuel Cells
- Small scale hydro power
- Grd Source Heat Pump (GSHP)
- Solar Thermal Hot Water (SHW)

4.1 Wind Turbines

Wind turbines are not feasible for the development since it does not meet the criteria mentioned above. Since the development is located in a dense residential and commercial area; the wind resource may be restricted due to the adjacent large trees and air turbulence generated between them. The yearly average wind speed is quite low at 10 meters above ground.

Wind speed at 10m above ground level (m/s)

5.0	5.5	5.8
5.0	**5.7**	5.9
4.9	5.3	5.6

Wind speed at 25m above ground level (m/s)

5.8	6.3	6.5
5.8	6.4	6.6
5.7	6.0	6.3

Wind speed at 45m above ground level (m/s)

6.3	6.7	6.9
6.3	6.8	7.0
6.2	6.5	6.7

Squares surrounding the central square correspond to wind speeds for surrounding grid squares.

What does this mean?

Power generated is related to wind-speed by a cubic ratio. That means if you halve the wind-speed, the power goes down by a factor of 8 (which is 2 x 2 x 2). A quarter of the wind-speed gives you a 64th of the power (4 x 4 x 4).

As a rough guide, if your turbine is rated at producing 1KW at 12m/s then it will produce 125W at 6m/s and 15W at 3m/s.

Please Note!

Bear in mind that the NOABL wind-speed dataset used here is a model of wind-speeds across the country, assuming **completely flat terrain**. It isn't a database of measured wind-speeds. Other factors such as hills, houses, trees and other obstructions in your vicinity need to be considered as well as they can have a significant effect.

An actual wind-speed measurement using an anemometer has note been used for the purpose of this energy strategy report.

The central square highlighted in yellow demonstrates the average wind speed in m/s for the site. Squares surrounding the central square correspond to wind speeds for surrounding grid squares.

From the above table it is shown that the average wind speed on the development according to **NOABL database was estimated at 5.7m/s at 10m high above ground and 6.4m/s at 25m above ground.**

Wind turbine(s) have been discounted for this development scheme for the following reasons:

- A large mast horizontal axis wind turbine will not be able to generate electricity at optimal operating range since it requires higher average wind speeds. Furthermore, the installation of small scale wind turbines won't be feasible due to low average wind speed at 10 meters height, 25m & 45metre heights.
- Due to the close proximity of neighboring residential properties and trees.
- In addition, the low frequency noise generated by wind turbines might cause inconvenience to the neighboring residents. However, the level a person can be affected by low frequency noise varies from individual to individual.
- Due to the size and the required height of a potential wind turbine scheme there is also an issue with the propellers' impacting bird traffic, obtrusiveness, shadow flicker which means that generally large wind turbines need to be located at least 300m from any residential properties, which would not be possible on this site.
- Roof mounted units are limited in size due to wind induced stresses which are transmitted to the building structure. Most roof mounted turbines currently on the market are approximately 2m diameter and capable of producing 1-1.5kW each. However, the output is dependant on the surrounding obstructions and local wind speed. Thus small scale wind turbines would not make any meaningful impact on a site such as this.
- There are likely to be planning issues associated with wind turbines of a size necessary to effect any significant CO2 savings or energy savings.
- Because of the above the investment case with regards this technology solution is not viable compared to other solutions with a more attractive ROI.
- Finally, the installation of wind turbines on the development requires planning permission (and is likely to instigate neighborhood committee interest regarding its aesthetics and acoustic issues).

4.2 Biomass Boilers

Biomass boilers should not be considered for this project due to the following reasons:

- Furthermore, in common with other types of combustion appliances, biomass boilers are potentially a source of air pollution. Pollutants associated with biomass combustion include particulate matter (PM_{10}/ $PM_{2.5}$) and nitrogen oxides (NO_X) EMISSIONS. These pollution emissions can have an impact on local air quality and affect human health. Biomass has recently been rejected by many London Boroughs as means of obtaining the on-site renewable contribution (and this will soon send ripples out to other regions). This is because of their associated flue emissions (which can be significantly higher than gas fired boilers) and the difficulty of ensuring the boiler will operate at its optimum efficiency, which is often quoted by designers at the initial design stages. Biomass flue emissions are often difficult to control because the quality of fuel can vary significantly between suppliers. Given this a bio fuel system may not be acceptable to the Council on planning grounds (e.g concerns about

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associated flue emissions/impact on local 'Air Quality', increase in road traffic from pellet delivery lorries).

- Biomass fuel requires more onerous and frequent wood fuel silo (site storage issues) replenishing by delivery trucks- which in turn can cause site transportation issues that will need to be considered and addressed along with the impact on the other residents and neighborhood infrastructure.
- Restrictions on the type of fuel and appliance may apply to the development and according to studies commissioned by DEFRA the levels of particles emitted by the burning of wood chip or waste would be considered to outweigh the benefits of carbon reduction especially in an urban environment such as the proposed development site.
- Dependant on a fuel supply chain contract being confirmed.
- There is no suitable location for the plant and storage of the pellets on site at present.
- **The whole of Camden is in a smoke control zone.**

4.3 Combined Heat and Power (CHP) & Mirco CHP

Decentralised Energy & CHP has not been considered further for this project for the following reasons:

- Typically CHP is best suited for communal district heating schemes across a number of dwellings within a development. Therefore generally small scale energy generation has low efficiency compare to large scale generation.
- The opportunity to include the use of CHP as part of the development (Be Clean strategy) was considered in the context of the co-located facility and the wider indicative master plan.- Following careful consideration, it is not considered that the use of CHP would be viable for this development for a number of reasons, primarily due to the lack of heat sink outside the normal heating season as well as being a small scale development.
- The London Heat Map which can be found at http://www.londonheatmap.org.uk confirms that there are no current CHP plants or district heating networks in the vicinity of the proposed site.
- The London Heat Map is an interactive tool that allows users to identify opportunities for decentralised energy projects in London. It builds on the 2005 London Community Heating Development Study. All information has been updated and the map is now in a user friendly format using an interactive GIS system that was originally developed by LDA for www.londonbrownfieldsites.org

  The Heat Map provides spatial intelligence on factors relevant to the identification and development of DE opportunities: major energy consumers, fuel consumption and CO_2 emissions, energy supply plants, community heating networks, heat density etc;

  It is publicly accessible to anyone with an interest in DE. Local authorities can use the map as the starting point to developing detailed Energy Master Plans to inform DE policies in their

LDFs and climate change strategies. Developers can use the map to help them meet London Plan DE policies (connection into an existing network or extending their own communal heating networks beyond their site boundaries).

The London Heat Map is regularly updated and fully interactive by allowing users to upload and share energy data. It will evolve over the next three years alongside the DEMaP Programme and become more useful and sophisticated as boroughs and others start inputting real energy data into the map.

- Micro-CHP is a relatively new concept (Baxi Ecogen was made available in 2009) and issues are raised in relation to unproven technology, inefficiency for shorter run cycles and lack of technical knowledge that can limit the practical application of micro CHP at present. In addition other issues surrounding the fact that around 50% of electricity generated in domestic properties is surplus, high installation costs and estimated low life expectancy has also been taken into consideration as to its commercial un-viability for this development scheme. Mirco-CHP also has a lower FIT tariff rate and period duration and is only applicable for systems under 2kW.- **Micro CHP is more suited for flats and would not be suited for a scheme of this size.**

4.4 Hydrogen Fuel Cells

Not commercially viable yet - As a result this solution will not be assessed any further.

The BlueGen product is a ceramic fuel cell and has recently entered the UK market this year.

Using ceramic fuel cells, BlueGen® electrochemically converts natural gas into electricity at up to 60 per cent electrical efficiency. Electricity is consumed locally, with unused power being exported to the grid. When the integrated heat recovery system is connected, the waste heat from BlueGen can be used to produce hot water - which improves the total efficiency to approximately 85 per cent.

4.5 Small scale Hydro

Small scale hydro-electric will not be studied any further because of the location and the spatial limitations of the development. There is no river or lake within the development site boundaries. As a result this solution will not be assessed any further.

4.6 Grid Source Heat pump (GSHP)

GSHP will not be studied any further for the following reasons:

- If an open loop configuration was to be adopted, a test borehole would be needed to assess the available resource. The test resource process is expensive and of course does not guarantee an acceptable resource in the ground. Additionally, a closed loop borehole configuration could not be used due to spatial limitations of the site.
- There are likely to be planning issues associated with borehole excavation and drilling.

- Running costs and maintenance may be minimal. However, installation is a costly affair. A GSHP solution would represent a relatively expensive option in comparison to other renewable technologies available.
- Additional electric immersion and pumps would be required to heat the GSHP water up to suitable temperature to be used around the building and its likely a centralised plant area will also be required to house the circulation pumps.
- This technology is not recommended due to the increased plant energy consumption requirements in turn impacting the DER/TER score for the required energy strategy objectives.
- Furthermore, boreholes also destabilize the ground surface and may be considered a minus for environmentally friendly endeavours.

4.7 Solar Thermal

SWH will not be studied any further for the following reasons:

- Solar thermal arrangements can appear obtrusive on the building fabric. - A solar water heating solution will require an evacuated tube configuration for each of the individual dwellings/units on the development roofs.
- SWH could be utilized for this specific project to assist with domestic hot water generation. However, the recent cost reductions and funding incentives in other technologies, make PV and ASHP(subject to confirmation of the RHI qualifying criteria) a more attractive proposition.
- Evidence also indicates that PV installations are becoming more cost effective to install than solar thermal hot water systems especially against the current FIT scheme.
- Solar Thermal technology is also a seasonal technology and will not operate as well in winter compared to summer periods.

5. Feasible LZC Technology for the development

The LZC/renewable technologies that satisfy the criteria outlined in section 4 to be considered for integration at the proposed development:

Residential units:

- Combi boiler (90% efficiency SEDBUK2009) + 3.3kWp PV (including MVHR)
- ASHP(8.5kW) + 2.5kWp PV (including MVHR and Megaflow Eco 210litres)

The following schedule highlights some of the issues to consider for the above LZC technologies when designing, installing and managing LZC technologies. It does not represent a comprehensive design and management guide. CAPEX and OPEX costs will vary dramatically between projects and manufacturers, so these are intended as a rough guide only:

LZC technology	Resident considerations	Procurement & management	Income streams	Example costs
Solar Photovoltaics (PV)	Visible commitment to sustainability. Low maintenance requirements. Unlikely to experience tangible benefits if the system serves the communal areas [although service charges for communal electricity may be reduced].-Multi-unit developments only. Display units confirming output of system are preferable. Can be used to offset electrical demand within the proposed dwelling and would be connected into the electrical system via an inverter of series of inverters, depending on system size. Noise not an issue as it is silent in operation.Controls not required.	Ensure supplier and installers are MCS certified in order to qualify for FiTs. Include installation and all auxiliary equipment: inverters, cables, isolators, meters, fixings, A-frames. Contracts should confirm who will receive FiTs and export tariffs. Advice on registering for FiTs should be given to residents.	**Resident:** £70-£95 per kWp per annum **Owner of System:** Feed-in-Tariff: £0.36/kWh (for new-build <10kWp) Export tariff: £0.03/kWh	**Capital:** PV module: £2.5k - £3.5k per kWp Inverter:£400-£1k per kWp Auxiliary equipment: £500 - £1k per kWp Installation: £300-£700 per kWp **Maintenance:** Electrical inspection (5 years): £50 -£100 per system Inverter replacement (15 years):£900 - £1,300 per system Annual panel inspection: upto £50 per system

Air Source Heat Pumps (ASHP)	Some access to the property(plantroom) needed for pressure checks. Long-lag under floor heating systems may be unfamiliar and require behavioural change (such as greater understanding of an interaction with the time and temperature controls). Controls should be simple and avoid over-use of immersion back-up. Off-peak electricity tariffs may not be appropriate. Thermal store is required for each dwelling if based on an individual ASHP system. Visual and noise impacts should be considered.	Ensure supplier and installers are MCS certified in order to qualify for the RHI. Auxiliary equipment may include: cylinder, expansion vessel, pipes and insulation, ductwork for exhaust air systems. Contracts should confirm who will receive RHI. Metering and billing may be necessary for communal systems. Advice on registering for RHI should be given to residents.	**Resident:** Fuel bill savings may result in an increase when displacing gas. £250 - £600 per system per year (displacing electricity). **Owner of system:** Renewable Heat Incentive (RHI)	**Capital:** Collector: £150 - £225 /m2 (flat plate) £300-£400/m2 (evacuated tube) Cylinder: £500-£1,000 Auxiliary equipment (pipes and insulation, pumps, controls, collector fluid, roof fixings): £800 - £1,000 per system Installation: £1,200 - £1,800 per system. **Maintenance:** Change solar fluids (5 years): £150 -£250 per system Annual collector inspection (optional): £0-£50 per system
Grd Source Heat Pumps (GSHP)	Visible commitment to sustainability Low maintenance requirements. Will only be successful if controls are understood and boilers and immersion heaters do not override the solar thermal collectors. Display units confirming output of solar thermal collectors are preferable. Space for cylinders and expansion vessels will reduce	Ensure supplier and installers are MCS certified in order to qualify for the RHI. Ground works are a one-off cost and should be carefully schedules into the construction timetable to avoid disruption. Checks should be made to ensure ground surveys are included in the drilling price or	**Resident:** Fuel bill savings is negligible when displacing gas. £300 - £900 per system per year (displacing electricity). **Owner of system:** Renewable Heat Incentive (RHI)	**Capital:** Heat pump: £2,800-£7,000 per system Cylinder: upto £500 - £1,600 per system. Auxiliary equipment (grd loops, manifolds, expansion vessel, ground loop fluid, pipes): £1,000-£2,000 per system Installation (including boreholes): £2,000 - £6,000 per system

	storage space within the home. Plant room space required for pumps and associated equipment. Boreholes required as an option - planning, noise needs to be considered.	accounted for elsewhere. Auxiliary equipment may include: ground loops, manifolds, cylinder, expansion vessel, ground loop fluid, pipes and insulation. Contracts should confirm who will receive RHI. Metering and billing may be necessary for communal systems. Advice on registering for RHI should be given to residents.		**Maintenance:** Minimal **Running costs:** Electricity tariff.
Solar Thermal (SHW)	Some access to the property(plantroom) needed for pressure checks. Long-lag under floor heating systems may be unfamiliar and require behavioural change (such as greater understanding of an interaction with the time and temperature controls). Controls should be simple and avoid over-use of immersion back-up. Off-peak electricity tariffs may not be appropriate. Visual and noise impacts should be considered.	Ensure supplier and installers are MCS certified in order to qualify for the RHI. System must be compatible with the boler or other heating system planned for the home. Auxiliary equipment may include: cylinder, expansion vessel, pumps collector fluid, pipes and insulation, roof fixings and A-frames. Contracts should confirm who will receive RHI.	**Resident:** Fuel bill savings : £20-£60 per system per year for displacing gas. £50-£100 per system per year for displacing electricity **Owner of system:** Renewable Heat Incentive (RHI)	**Capital:** Fan unit, heat pump and cylinder (5kW): £2.5 - £4k. Cylinder: upto £700 per system. Ductwork for exhaust air heat pumps (2-3 bed house: £1k-£1.5k installed. Installation: £700 -£1k per system. **Maintenance:** Pressure check (annual) £60-70 per system. Filter cleaning for exhaust air heat pumps

		Metering and billing may be necessary for communal systems. Advice on registering for RHI should be given to residents. Access arrangements should be confirmed for leaseholders with systems on communal roofs.		(quarterly): upto £100 **Running costs:** Electricity tariff.

- **Reference: The National Housing federation – Lifetime costs of installing renewable energy technology (JUNE 2010) (www.housing.org.uk)**

5.1 Building/Dwelling Emissions Rate & Target Emissions Rate

Both the BER/DER and TER are calculated through SBEM/SAP calculations. The Dwelling Emission Rate (DER) represents the estimated carbon dioxide (CO2) emissions per m2 of the floor area of the dwelling as it is designed. The Building Emission Rate (BER) represents the estimated carbon dioxide (CO2) emissions per m2 of the floor area of the building as it is designed. The Target Emission Rate represents the maximum carbon dioxide (CO2) emission rate per m2 resulting from energy used in heating (space and water) and lighting. The BER/DER and TER are calculated using government approved SBEM/SAP simulation software.

5.2 Baseline Case

The feasibility studies for the Standard Case Models have been produced using the **SAP2009 to produce the existing building model and CIBSE standard case model for Part L1B building regulations compliance purposes**. The standard case includes the minimum space and water heating services as set out in the domestic building services compliance guides (where applicable) :
The standard case includes the minimum space and water heating services as set out in the domestic building services compliance guide 2010 :

Table Cat 1.2: Standard CO_2 Emissions Calculation - Specification Assumptions

Element or System		Value
[1]	Main heating fuel (space and water)	Mains gas
[2]	Main heating system (and second main heating system where specified)	Boiler and radiators Fully pumped circulation Water pump in heated space
[2a]	Boiler	SEDBUK (2009) 88% Room-sealed Fanned Flue On/off burner control
[2b]	Heating system controls	Programmer Room thermostats TRVs Boiler interlock
[3]	Secondary heating fuel *(where secondary heating is specified)*	Electricity
[3a]	Secondary heating system *(where secondary heating is specified)*	Panel, convector or radiant heaters
[4]	Hot water system	Stored hot water, heated by boiler only Separate time control for space and water heating
[4a]	Hot water storage	150 litre cylinder insulated with 35mm of factory applied foam
[4b]	Primary water heating losses	Primary pipework insulated Cylinder temperature controlled by thermostat
[4c]	Technologies covered by Appendix H of SAP	None specified
[5]	Technologies covered by Appendix M of SAP	None specified

5.3 Fuel

The assessment has assumed the following fuel carbon emissions factors - The fuel carbon emissions factors used are in accordance with **SAP 2009 (for Building Regs Part L1B)**.

Carbon Emissions Factor	SAP 2009 kgCO_2/kW
Grid Electricity	0.422
Grid displaced Electricity	0.568
Manufactured smokeless fuel	0.402
Coal (traditional British Coal)	0.301
Heating Oil	0.28
LPG	0.25
Natural Gas	0.198
Wood Pellets	0.028
Bio Diesel	0.098
Bio Gas	0.019

6. THE DEVELOPMENT LZC/RENEWABLE & PROPOSED STRATEGY TECHNOLOGY EMISSIONS

SAP calculations have been undertaken for numerous shortlisted energy strategies for each of the flats. The results of the SAP calculations and the comparison of the proposed scheme's Dwelling Emission Rate (DER) with the Target Emission Rate (TER) are demonstrated in the following tables. Further along the programme it is envisaged a more detailed energy feasibility report will be conducted with more definitive SAP calculations undertaken.

The development Energy strategy has adopted the following design ethos:

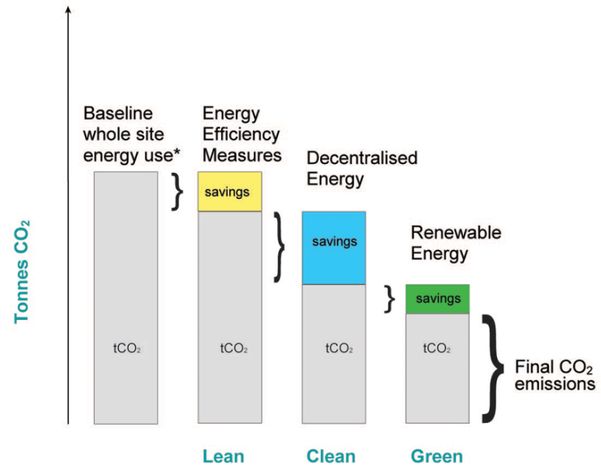
- **BE LEAN** – By using less energy and taking into account the further energy efficiency measure in comparison to the baseline building.
- **BE CLEAN** – By supplying energy efficiently. The clean building looks at further carbon dioxide emission savings over the lean building by taking into consideration the use of decentralise energy via CHP.
- **BE GREEN** – By integrating renewable energy into the scheme which can further reduce the carbon dioxide emission rate.

For the development the following strategies have been modelled:

Residential units:

- Combi boiler (90% efficiency SEDBUK2009) + 3.3kWp PV (including MVHR)
- ASHP(8.5kW) + 2.5kWp PV (including MVHR and Megaflow Eco 210litres)

The graph below shows the stages in which the building carbon dioxide emission is assessed.



6.1 The development emissions and energy demand

OPTION 1: Combi boiler (90% efficiency SEDBUK2009) + 3.3kWp PV (including MVHR)

This scheme will provide self-generating electricity which can be sold back to the grid. For the calculation of the payback period, the Feed-In-Tariffs' (FITs) has been taken into account. The PV load falls within the bracket associated with a FIT tariff applied of 21p per kWh for electricity generated and 3.1p per kWh for electricity exported back to the grid (over 25 years).

Energy	House A	House B	House C	House D
Floor area (m2)	247.84	254.55	246.94	276.79
Energy used (kWh/yr)	16976.36	15591.7	15296.11	18279.71
Energy generated by renewables (kWh/yr)	2661.04	2703.96	2703.96	2832.72
Percentage(%) renewable energy generated from energy used	15.67%	17.34%	17.68%	15.50%
Emissions	**House A**	**House B**	**House C**	**House D**
Total estimated CO_2 emissions for the dwelling (kgCO2/m2/ yr) (DER)	**10.73**	**9.31**	**9.29**	**10.42**
Total Percentage reduction of CO2 (%) improvement (DER/TER)	**29.76%** **3.4 ENE1 credits**	**28.87%** **3.4 ENE1 credits**	**29.46%** **3.4 ENE1 credits**	**28.94%** **3.4 ENE1 credits**
Total % Carbon Emissions (kgCO2 per yr) reduction against the standard case	**20.43%** **2 ENE7 credits**	**21.46%** **2 ENE7 credits**	**21.97%** **2 ENE7 credits**	**20.22%** **2 ENE7 credits**
Fabric Energy Efficiency (FEE)	**60.29** **0 ENE2 credits**	**53.63** **0 ENE2 credits**	**54.01** **0 ENE2 credits**	**58.85** **3.2 ENE2 credits**

YOUR RESULTS

Site Details

Postcode	NW3 7HL
Area available	24 sqm
Orientation	South
Roof pitch	0°
Overshading	Less than 20 percent
Building use	Domestic
Onsite usage	50%
Build type	New

SYSTEM SIZE:	**3.3 kWp**
ENERGY GENERATED PER YEAR:	**2631 kWh**
CO_2 REDUCTION PER YEAR:	**1392 kg**
FINANCIAL SAVINGS PER YEAR:	**£755**
INSTALLATION COSTS:	**£7400**
RUNNING COSTS PER YEAR:	**£74**
PAYBACK PERIOD:	**11 years**

YOUR RESULTS

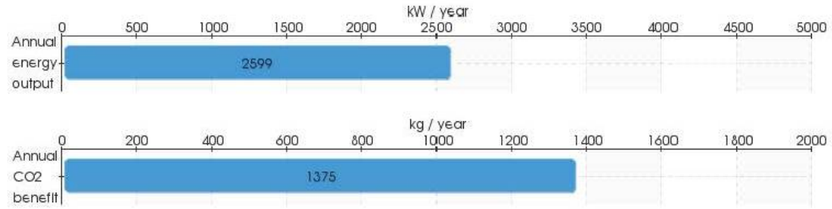
Site details

Orientation	South
Panel tilt	0°
Overshading	Less than 20 percent
Proportion exported	50%
Build type	New
Building use	Domestic

Panel details

Number of panels	13
Manufacturer	Mitsubishi
Model	PV-MLT260HC
Type	Monocrystalline
Area	1.656 m^2
Power output	260 Wp

SYSTEM SPECIFICATION:	**3.38 kWp**
TOTAL ROOF AREA REQUIRED:	**21.53 m^2**
ANNUAL ELECTRICITY OUTPUT:	**2599 kWh**
ANNUAL COST SAVING:	**£745**
ANNUAL CO_2 BENEFIT:	**1375 kg**



Annual value of energy income and savings

Energy used onsite	£159 (@ 12.27 p per kWh)
Energy exported	£40 (@ 3.10 p per kWh)
Feed-In Tariff	£546 (@ 21 p per kWh)

Electrical generation

Energy used onsite	1300 kWh
Energy exported	1300 kWh
Feed-In Tariff	2599 kWh

Greenhouse gas	Annual benefit
CO_2	1375 kg
CH_4	1 kg
N_2O	9 kg
SO_2	8 kg

In order to qualify both the installer and the equipment must be certified under the Microgeneration Certification Scheme (MCS).

PV plant location(s) – The plant would be located on the flat roof facing south for each dwelling.

The strategy would provide ***29.76% (House A), 28.87% (House B), 29.46% (House C) and 28.94% (House D) CO2 reduction saving (DER/TER) against current building regulations and therefore***

meets BRUK-L1A requirements for each house. Therefore 3.4 credits can be demonstrated for the ENE1 category under the CSHNov10 assessment for each house. Therefore achieving code level 4 for the ENE1 category for the code for sustainable homes Nov10 scheme assessment.

The Fabric Energy Efficiency (FEE) provide ***60.29(House A), 53.63(House B), 54.01(House C) and 58.85(House D). Therefore NIL credits can be demonstrated for the ENE2 category under the CSHNov10 assessment for House A, House B and House C. And 3.2 credits can be demonstrated for the ENE2 category under the CSHNov10 assessment for House D.***

The strategy would provide ***20.43%(House A), 21.46%(House B), 21.97%(House C) and 20.22%(House D) reduction in CO2 emissions against the standard case model per house. Therefore 2 credits can be demonstrated for the ENE7 category under the CSHNov10 assessment. Therefore demonstrating compliance to the London Plan 2011 requirement.***

The strategy would provide an average ***16.55% of the energy demand via self generating electricity by renewable technology per house.***

OPTION 2: ASHP(8.5kW) + 2.5kWp PV (including MVHR and Megaflow Eco 210litres)

For the purpose of this feasibility option individual ASHP system has been assumed which will meet the total space heating and hot water energy demand for each dwelling on the development. This scheme will provide self-generating electricity which can be sold back to the grid. For the calculation of the payback period, the Feed-In-Tariffs' (FITs) has been taken into account. The PV load falls within the bracket associated with a FIT tariff applied of 21p per kWh for electricity generated and 3.1p per kWh for electricity exported back to the grid (over 25 years).

Energy	**House A**	**House B**	**House C**	**House D**
Floor area (m2)	247.84	254.55	246.94	276.79
Energy used (kWh/yr)	7751.49	7302.95	7178.26	8272.39
Energy generated by renewables (kWh/yr)	2146	2146	2146	2146
Percentage(%) renewable energy generated from energy used	27.68%	29.39%	29.90%	25.94%
Emissions	**House A**	**House B**	**House C**	**House D**
Total estimated CO_2 emissions for the dwelling (kgCO2/m2/ yr) (DER)	**11.59**	**10.37**	**10.43**	**11.35**
Total Percentage reduction of CO2 (%) improvement (DER/TER)	**55.24%** **5.7 ENE1 credits**	**52.96%** **5.5 ENE1 credits**	**52.97%** **5.5 ENE1 credits**	**54.4%** **5.6 ENE1 credits**
Total % Carbon Emissions (kgCO2 per yr) reduction against the standard case	**20.43%** **2 ENE7 credits**	**19.92%** **2 ENE7 credits**	**20.08%** **2 ENE7 credits**	**19.85%** **2 ENE7 credits**
Fabric Energy Efficiency (FEE)	**60.29** **0 ENE2 credits**	**53.65** **0 ENE2 credits**	**54.01** **0 ENE2 credits**	**58.9** **3.2 ENE2 credits**

YOUR RESULTS

Site Details

Postcode	NW3 7HL
Area available	18 sqm
Orientation	South
Roof pitch	0°
Overshading	Less than 20 percent
Building use	Domestic
Onsite usage	50%
Build type	New

SYSTEM SIZE:	2.5 kWp
ENERGY GENERATED PER YEAR:	1993 kWh
CO_2 REDUCTION PER YEAR:	1054 kg
FINANCIAL SAVINGS PER YEAR:	£572
INSTALLATION COSTS:	£5800
RUNNING COSTS PER YEAR:	£56
PAYBACK PERIOD:	12 years

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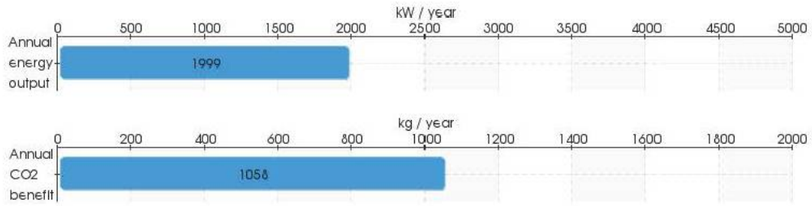
Registered Company No. 06408056 VAT Registration No. 980016044

YOUR RESULTS

Site details	
Orientation	South
Panel tilt	0°
Overshading	Less than 20 percent
Proportion exported	50%
Build type	New
Building use	Domestic

Panel details	
Number of panels	10
Manufacturer	Mitsubishi
Model	PV-MLT260HC
Type	Monocrystalline
Area	1.656 m^2
Power output	260 Wp

SYSTEM SPECIFICATION:	2.6 kWp
TOTAL ROOF AREA REQUIRED:	16.56 m^2
ANNUAL ELECTRICITY OUTPUT:	1999 kWh
ANNUAL COST SAVING:	£574
ANNUAL CO_2 BENEFIT:	1058 kg



Annual value of energy income and savings	
Energy used onsite	£123 (@ 12.27 p per kWh)
Energy exported	£31 (@ 3.10 p per kWh)
Feed-In Tariff	£420 (@ 21 p per kWh)

Electrical generation	
Energy used onsite	1000 kWh
Energy exported	1000 kWh
Feed-In Tariff	1999 kWh

Greenhouse gas	Annual benefit
CO_2	1058 kg
CH_4	0 kg
N_2O	7 kg
SO_2	6 kg

The Renewable Heating Incentive (RHI) has been launched – ASHP at the moment has been withdrawn till further notice. For note the RHI scheme has been officially started in July 2011 (for non-domestic). When this technology is included again, in order to qualify both the installer and the equipment must be certified under the Microgeneration Certification Scheme (MCS).

ASHP plant location(s) – The plant would be located at grd level at the rear of each property to require fresh air provision.

PV plant location(s) – The plant would be located on the flat roof facing south for each dwelling.

The strategy would provide ***55.24% (House A), 52.96% (House B), 52.97% (House C) and 54.4% (House D) CO2 reduction saving (DER/TER) against current building regulations and therefore meets BRUK-L1A requirements for each house. Therefore 5.7, 5.5, 5.5, 5.6 credits can be demonstrated for the ENE1 category under the CSHNov10 assessment for House A, House B, House C, and House D respectively. Therefore achieving code level 4 for the ENE1 category for the code for sustainable homes Nov10 scheme assessment.***

The Fabric Energy Efficiency (FEE) provide ***60.29(House A), 53.65(House B), 54.01(House C) and 58.9(House D). Therefore NIL credits can be demonstrated for the ENE2 category under the CSHNov10 assessment for House A, House B and House C. And 3.2 credits can be demonstrated for the ENE2 category under the CSHNov10 assessment for House D.***

The strategy would provide ***20.43%(House A), 19.92%(House B), 20.08%(House C) and 19.85%(House D) reduction in CO2 emissions against the standard case model per house. Therefore 2 credits can be demonstrated for the ENE7 category under the CSHNov10 assessment. Therefore demonstrating compliance to the London Plan 2011 requirement.***

The strategy would provide an average ***28.23% of the energy demand via self generating electricity by renewable technology per house.***

7. Conclusion

Due to the site spatial limitations, location and the other issues identified previously in the report technologies such as Grd Source Heat Pump, Combined Heat and Power, Biomass, Solar Thermal, Hydroelectricity and Wind turbines are immediately unfeasible.

The design has incorporated building fabric enhancement (above current building regs requirements) to increase the energy efficiency of the building, which in turn has positively impacted the results attained for the ENE1, ENE2 & ENE7 categories of the code for sustainable homes assessment.

Along with the latter building fabric enhancement, the overall recommendation for the proposed development is that **OPTION 1: Combi boiler (90% efficiency SEDBUK2009) + 3.3kWp PV (including MVHR)** should be progressed. This is based on the following reasons:

- PV plant location(s) – The plant would be located on the flat roof facing south.
- The strategy would provide ***29.76% (House A), 28.87% (House B), 29.46% (House C) and 28.94% (House D) CO2 reduction saving (DER/TER) against current building regulations and therefore meets BRUK-L1A requirements for each house. Therefore 3.4 credits can be demonstrated for the ENE1 category under the CSHNov10 assessment for each house. Therefore achieving code level 4 for the ENE1 category for the code for sustainable homes Nov10 scheme assessment.***
- The Fabric Energy Efficiency (FEE) provide ***60.29(House A), 53.63(House B), 54.01(House C) and 58.85(House D). Therefore NIL credits can be demonstrated for the ENE2 category under the CSHNov10 assessment for House A, House B and House C. And 3.2 credits can be demonstrated for the ENE2 category under the CSHNov10 assessment for House D.***

- The strategy would provide ***20.43%(House A), 21.46%(House B), 21.97%(House C) and 20.22%(House D) reduction in CO2 emissions against the standard case model per house. Therefore 2 credits can be demonstrated for the ENE7 category under the CSHNov10 assessment. Therefore demonstrating compliance to the London Plan 2011 requirement.***
- The strategy would provide an average ***16.55% of the energy demand via self generating electricity by renewable technology per house.***
- ***A CSH pre-assessment has also been undertaken on the development to demonstrate the minimum intent to achieve at least a code level 4 as detailed in the local authorities planning policy requirements. [See the Appendix for the CSH pre-assessment report]***

Based on the overall evaluation of renewable/LZC technologies detailed within this report, we not only can we demonstrate a 25% CO2 reduction via renewable/LZC technology but also compliance to the mandatory planning conditions and building regulations. It is therefore recommended that the client considers progressing the recommended strategy as the solution(s) moving forward and seeks to attain the necessary consent for use on the scheme.

8.0 Additional Recommendations:

The sizing of renewable energy plant

The exact sizing of any renewable energy systems that might be provided needs to be carefully considered, as plant sizing effects energy efficiency, carbon emissions and system reliability. There are two main reasons for this:

1) For example: A with conventional plant, the efficiency and reliability of renewable energy plant is at its optimum when working at, or close to, its design capacity. For example, a biomass boiler of rated capacity 500kW will not function efficiently and can be expected to give operating problems if asked to work for 75% of the time at 50kW. (i.e ideally the boiler should be working at 10% of the rated capacity).
2) The capital cost of renewable energy is generally considerably higher than that of conventional plant. Over-sizing will therefore lead to unnecessarily higher capital costs.

Additional energy saving design considerations

The following additional energy saving design measures should be reviewed further during design stage which will contribute towards the energy & carbon emissions reduction strategy of the development:

- The provision of natural ventilation wherever possible, via opening windows, roof lights and proprietary ventilation openings.
- Low energy fluorescent lighting to be implemented wherever possible.

- Variable speed drives on all pumps and fan motors to reduce the energy consumption to that required for the variable flow systems.
- Energy efficient lift motors (where applicable).
- Specification of low flow and low flush water fitting appliances where possible.
- Daylight factor of 1.5% for habitable rooms
- Drainage system: Potentially use soakaways or SUDS to reduce the burden on the sewage system. Rainwater harvesting should be considered.
- Toxicity of materials: Eliminate the use of PVC cabling to LSF. Avoid all 'C' rated materials in BRE design guide.
- Insulation materials: Use non petro-chemical based insulation materials with GWP of less than 5.
- Use of water, gas, electricity metering and sub-metering. - Energy display devices for each unit.

9. Appendix

- **Proposed BRUKL & CSH overview sheets**
- **CSH pre-assessment**

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Regulations Compliance Report

Approved Document L1A 2010 edition assessed by Stroma FSAP 2009 program, Version: 1.4.0.79
Printed on 28 May 2012 at 12:03:47

Project Information:

Assessed By: Anthony Wing-King (STRO002972) **Building Type:** End-terrace House

Dwelling Details:

NEW DWELLING DESIGN STAGE

Site Reference : House A Combi+PV **Plot Reference:** 4 North End Hampstead

Address : 4, North End, LONDON, NW3 7HL

Client Details:

Name: 4 North End Hampstead

Address : 4 North End Hampstead, London, NW3 7HL

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1 TER and DER

Fuel for main heating system: Natural gas

Target Carbon Dioxide Emission Rate (TER)	15.27 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	10.73 kg/m²	OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.21 (max. 0.30)	0.21 (max. 0.70)	OK
Floor	0.15 (max. 0.25)	0.15 (max. 0.70)	OK
Roof	0.12 (max. 0.20)	0.12 (max. 0.35)	OK
Openings	1.27 (max. 2.00)	1.60 (max. 3.30)	OK

3 Design air permeability

Design air permeability at 50 pascals	3.50	
Maximum	10.0	OK

4 Heating efficiency

Main Heating system:	Database: (rev 323, product index 009600): Boiler system with radiators or underfloor - mains gas Brand name: Worcester Model: Greenstar Model qualifier: ZWBR 11-35 HE Plus (Combi boiler) Efficiency 89.5 % SEDBUK2009 Minimum 88.0 %	 OK
Secondary heating system:	None	

5 Cylinder insulation

Hot water Storage: No cylinder

6 Controls

Space heating controls	Time and temperature zone control	OK
Hot water controls:	No cylinder	
Boiler interlock:	Yes	OK

7 Low energy lights

Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	OK

Regulations Compliance Report

8 Mechanical ventilation

Continuous supply and extract system		
Specific fan power:	1.28	
Maximum	1.5	OK
MVHR efficiency:	87%	
Minimum	70%	OK

9 Summertime temperature

Overheating risk (Thames valley):	Not significant	OK

Based on:

Overshading:	Average or unknown
Windows facing: South	6m², Overhang twice as wide as window, ratio NaN
Windows facing: West	8m², Overhang twice as wide as window, ratio NaN
Windows facing: North	14m², Overhang twice as wide as window, ratio NaN
Roof windows facing: Horizontal	5m²
Ventilation rate:	4.00
Blinds/curtains:	Dark-coloured curtain or roller blind shutter closed 30% of daylight hours

10 Key features

Design air permeablility	3.5 m³/m²h
Windows U-value	1.1 W/m²K
Doors U-value	1.4 W/m²K
Roofs U-value	0.12 W/m²K
Floors U-value	0.15 W/m²K
Photovaltaic array	

Code for Sustainable Homes Report

Assessor and House Details

Assessor Name: Anthony Wing-King
Assessor Number: STRO002972
Property Address: 4, North End
LONDON
NW3 7HL

Buiding regulation assessment

	kg/m²/year
TER	15.27
DER	10.73

The following code calculations are taken from the Code for Sustainable Homes Technical Guide (Nov 10)

Ene 1 Assessment - Dwelling Emission Rate

Total Energy Type CO2 Emissions for Codes Levels 1 - 5

	%	kg/m²/year	
DER from SAP 2009 DER Worksheet		10.73	*(ZC1)*
TER		15.27	
Residual CO2 emissions offset from biofuel CHP		0	*(ZC5)*
CO2 emissions offset from additional allowable electricty generation		0	*(ZC7)*
Total CO2 emissions offset from SAP Section 16 allowances		0	
DER accounting for SAP Section 16 allowances		10.73	
% improvement DER/TER	29.76		

Total Energy Type CO2 Emissions for Codes Levels 6

	kg/m²/year	
DER accounting for SAP Section 16 allowances	10.73	*(ZC1)*
CO2 emissions from appliances, equation (L14)	9.87	*(ZC2)*
CO2 emissions from cooking, equation (L16)	0.78	*(ZC3)*
Net CO2 emissions	21.4	*(ZC8)*

Result:

Credits awarded for Ene 1 = 3.4

Code Level = 4

Ene 2 - Fabric energy Efficiency

Fabric energy Efficiency: 60.29

Credits awarded for Ene 2 = 0

Ene 7 - Low or Zero Carbon (LZC) Technologies

Reduction in CO2 Emissions

	%	kg/m²/year
Standard Case CO2 emissions		27.9
*Actual Case CO2 emissions		22.2
Reduction in CO2 emissions	20.43	

Credits awarded for Ene 7 = 2

Regulations Compliance Report

Approved Document L1A 2010 edition assessed by Stroma FSAP 2009 program, Version: 1.4.0.79
Printed on 28 May 2012 at 12:03:47

Project Information:

Assessed By: Anthony Wing-King (STRO002972) **Building Type:** Mid-terrace House

Dwelling Details:

NEW DWELLING DESIGN STAGE

Site Reference : House B Combi+PV **Plot Reference:** 4 North End Hampstead

Address : 4, North End, LONDON, NW3 7HL

Client Details:

Name: 4 North End Hampstead

Address : 4 North End Hampstead, London, NW3 7HL

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1 TER and DER

Fuel for main heating system: Natural gas

Target Carbon Dioxide Emission Rate (TER)	13.09 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	9.31 kg/m²	OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.21 (max. 0.30)	0.21 (max. 0.70)	OK
Floor	0.15 (max. 0.25)	0.15 (max. 0.70)	OK
Roof	0.12 (max. 0.20)	0.12 (max. 0.35)	OK
Openings	1.28 (max. 2.00)	1.60 (max. 3.30)	OK

3 Design air permeability

Design air permeability at 50 pascals	3.50	
Maximum	10.0	OK

4 Heating efficiency

Main Heating system:	Database: (rev 323, product index 009600): Boiler system with radiators or underfloor - mains gas Brand name: Worcester Model: Greenstar Model qualifier: ZWBR 11-35 HE Plus (Combi boiler) Efficiency 89.5 % SEDBUK2009 Minimum 88.0 %	OK
Secondary heating system:	None	

5 Cylinder insulation

Hot water Storage:	No cylinder	

6 Controls

Space heating controls	Time and temperature zone control	OK
Hot water controls:	No cylinder	
Boiler interlock:	Yes	OK

7 Low energy lights

Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	OK

Regulations Compliance Report

8 Mechanical ventilation

Continuous supply and extract system		
Specific fan power:	1.28	
Maximum	1.5	OK
MVHR efficiency:	87%	
Minimum	70%	OK

9 Summertime temperature

Overheating risk (Thames valley):	Not significant	OK
Based on:		
Overshading:	Average or unknown	
Windows facing: South	10m², Overhang twice as wide as window, ratio NaN	
Windows facing: North	14m², Overhang twice as wide as window, ratio NaN	
Roof windows facing: Horizontal	5m²	
Ventilation rate:	4.00	
Blinds/curtains:	Dark-coloured curtain or roller blind shutter closed 30% of daylight hours	

10 Key features

Design air permeablility	3.5 m³/m²h
Windows U-value	1.1 W/m²K
Doors U-value	1.4 W/m²K
Roofs U-value	0.12 W/m²K
Floors U-value	0.15 W/m²K
Photovaltaic array	

Code for Sustainable Homes Report

Assessor and House Details

Assessor Name: Anthony Wing-King
Assessor Number: STRO002972
Property Address: 4, North End
LONDON
NW3 7HL

Buiding regulation assessment

	kg/m²/year
TER	13.09
DER	9.31

The following code calculations are taken from the Code for Sustainable Homes Technical Guide (Nov 10)

Ene 1 Assessment - Dwelling Emission Rate

Total Energy Type CO2 Emissions for Codes Levels 1 - 5

	%	kg/m²/year	
DER from SAP 2009 DER Worksheet		9.31	*(ZC1)*
TER		13.09	
Residual CO2 emissions offset from biofuel CHP		0	*(ZC5)*
CO2 emissions offset from additional allowable electricty generation		0	*(ZC7)*
Total CO2 emissions offset from SAP Section 16 allowances		0	
DER accounting for SAP Section 16 allowances		9.31	
% improvement DER/TER	28.87		

Total Energy Type CO2 Emissions for Codes Levels 6

	kg/m²/year	
DER accounting for SAP Section 16 allowances	9.31	*(ZC1)*
CO2 emissions from appliances, equation (L14)	9.75	*(ZC2)*
CO2 emissions from cooking, equation (L16)	0.76	*(ZC3)*
Net CO2 emissions	19.8	*(ZC8)*

Result:

Credits awarded for Ene 1 = 3.4

Code Level = 4

Ene 2 - Fabric energy Efficiency

Fabric energy Efficiency: 53.65

Credits awarded for Ene 2 = 0

Ene 7 - Low or Zero Carbon (LZC) Technologies

Reduction in CO2 Emissions

	%	kg/m²/year	
Standard Case CO2 emissions		26.1	
*Actual Case CO2 emissions		20.5	
Reduction in CO2 emissions	21.46		

Credits awarded for Ene 7 = 2

Regulations Compliance Report

Approved Document L1A 2010 edition assessed by Stroma FSAP 2009 program, Version: 1.4.0.79
Printed on 28 May 2012 at 12:03:47

Project Information:

Assessed By: Anthony Wing-King (STRO002972) **Building Type:** Mid-terrace House

Dwelling Details:

NEW DWELLING DESIGN STAGE

Site Reference : House C Combi+PV **Plot Reference:** 4 North End Hampstead

Address : 4, North End, LONDON, NW3 7HL

Client Details:

Name: 4 North End Hampstead

Address : 4 North End Hampstead, London, NW3 7HL

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1 TER and DER

Fuel for main heating system: Natural gas

Target Carbon Dioxide Emission Rate (TER)	13.17 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	10.30 kg/m²	OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.21 (max. 0.30)	0.21 (max. 0.70)	OK
Floor	0.15 (max. 0.25)	0.15 (max. 0.70)	OK
Roof	0.12 (max. 0.20)	0.12 (max. 0.35)	OK
Openings	1.28 (max. 2.00)	1.60 (max. 3.30)	OK

3 Design air permeability

Design air permeability at 50 pascals	3.50	
Maximum	10.0	OK

4 Heating efficiency

Main Heating system: Database: (rev 323, product index 009600):
Boiler system with radiators or underfloor - mains gas
Brand name: Worcester
Model: Greenstar
Model qualifier: ZWBR 11-35 HE Plus
(Combi boiler)
Efficiency 89.5 % SEDBUK2009
Minimum 88.0 % OK

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: No cylinder

6 Controls

Space heating controls	Time and temperature zone control	OK
Hot water controls:	No cylinder	
Boiler interlock:	Yes	OK

7 Low energy lights

Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	OK

Regulations Compliance Report

8 Mechanical ventilation

Continuous supply and extract system

Specific fan power:	1.28	
Maximum	1.5	OK
MVHR efficiency:	87%	
Minimum	70%	OK

9 Summertime temperature

Overheating risk (Thames valley):	Not significant	OK

Based on:

Overshading:	Average or unknown
Windows facing: South	10m², Overhang twice as wide as window, ratio NaN
Windows facing: North	14m², Overhang twice as wide as window, ratio NaN
Roof windows facing: Horizontal	5m²
Ventilation rate:	4.00
Blinds/curtains:	Dark-coloured curtain or roller blind shutter closed 30% of daylight hours

10 Key features

Design air permeablility	3.5 m³/m²h
Windows U-value	1.1 W/m²K
Doors U-value	1.4 W/m²K
Roofs U-value	0.12 W/m²K
Floors U-value	0.15 W/m²K
Photovaltaic array	

Code for Sustainable Homes Report

Assessor and House Details

Assessor Name: Anthony Wing-King **Assessor Number:** STRO002972
Property Address: 4, North End
LONDON
NW3 7HL

Buiding regulation assessment

	kg/m²/year
TER	13.17
DER	10.3

The following code calculations are taken from the Code for Sustainable Homes Technical Guide (Nov 10)

Ene 1 Assessment - Dwelling Emission Rate

Total Energy Type CO2 Emissions for Codes Levels 1 - 5

	%	kg/m²/year	
DER from SAP 2009 DER Worksheet		10.3	*(ZC1)*
TER		13.17	
Residual CO2 emissions offset from biofuel CHP		0	*(ZC5)*
CO2 emissions offset from additional allowable electricty generation		0	*(ZC7)*
Total CO2 emissions offset from SAP Section 16 allowances		0	
DER accounting for SAP Section 16 allowances		10.3	
% improvement DER/TER	21.78		

Total Energy Type CO2 Emissions for Codes Levels 6

	kg/m²/year	
DER accounting for SAP Section 16 allowances	10.3	*(ZC1)*
CO2 emissions from appliances, equation (L14)	9.89	*(ZC2)*
CO2 emissions from cooking, equation (L16)	0.78	*(ZC3)*
Net CO2 emissions	21	*(ZC8)*

Result:

Credits awarded for Ene 1 = 2.6

Code Level = 3

Ene 2 - Fabric energy Efficiency

Fabric energy Efficiency: 58.38

Credits awarded for Ene 2 = 0

Ene 7 - Low or Zero Carbon (LZC) Technologies

Reduction in CO2 Emissions

	%	kg/m²/year
Standard Case CO2 emissions		27.5
*Actual Case CO2 emissions		21.7
Reduction in CO2 emissions	21.09	

Credits awarded for Ene 7 = 2

Regulations Compliance Report

Approved Document L1A 2010 edition assessed by Stroma FSAP 2009 program, Version: 1.4.0.79
Printed on 28 May 2012 at 12:03:46

Project Information:

Assessed By: Anthony Wing-King (STRO002972) **Building Type:** End-terrace House

Dwelling Details:

NEW DWELLING DESIGN STAGE

Site Reference : House D Combi+PV **Plot Reference:** 4 North End Hampstead

Address : 4, North End, LONDON, NW3 7HL

Client Details:

Name: 4 North End Hampstead

Address : 4 North End Hampstead, London, NW3 7HL

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1 TER and DER

Fuel for main heating system: Natural gas

Target Carbon Dioxide Emission Rate (TER)	14.67 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	10.42 kg/m²	OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.21 (max. 0.30)	0.21 (max. 0.70)	OK
Floor	0.15 (max. 0.25)	0.15 (max. 0.70)	OK
Roof	0.12 (max. 0.20)	0.12 (max. 0.35)	OK
Openings	1.27 (max. 2.00)	1.60 (max. 3.30)	OK

3 Design air permeability

Design air permeability at 50 pascals	3.50	
Maximum	10.0	OK

4 Heating efficiency

Main Heating system:	Database: (rev 323, product index 009600): Boiler system with radiators or underfloor - mains gas Brand name: Worcester Model: Greenstar Model qualifier: ZWBR 11-35 HE Plus (Combi boiler) Efficiency 89.5 % SEDBUK2009 Minimum 88.0 %	OK
Secondary heating system:	None	

5 Cylinder insulation

Hot water Storage: No cylinder

6 Controls

Space heating controls	Time and temperature zone control	OK
Hot water controls:	No cylinder	
Boiler interlock:	Yes	OK

7 Low energy lights

Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	OK

Regulations Compliance Report

8 Mechanical ventilation

Continuous supply and extract system		
Specific fan power:	1.28	
Maximum	1.5	OK
MVHR efficiency:	87%	
Minimum	70%	OK

9 Summertime temperature

Overheating risk (Thames valley):	Not significant	OK
Based on:		
Overshading:	Average or unknown	
Windows facing: South	10m², Overhang twice as wide as window, ratio NaN	
Windows facing: North	14m², Overhang twice as wide as window, ratio NaN	
Windows facing: East	5m², Overhang twice as wide as window, ratio NaN	
Roof windows facing: Horizontal	5m²	
Ventilation rate:	4.00	
Blinds/curtains:	Dark-coloured curtain or roller blind shutter closed 30% of daylight hours	

10 Key features

Design air permeablility	3.5 m³/m²h
Windows U-value	1.1 W/m²K
Doors U-value	1.4 W/m²K
Roofs U-value	0.12 W/m²K
Floors U-value	0.15 W/m²K

Photovaltaic array

Code for Sustainable Homes Report

Assessor and House Details

Assessor Name: Anthony Wing-King
Assessor Number: STRO002972
Property Address: 4, North End
LONDON
NW3 7HL

Buiding regulation assessment

	kg/m²/year
TER	14.67
DER	10.42

The following code calculations are taken from the Code for Sustainable Homes Technical Guide (Nov 10)

Ene 1 Assessment - Dwelling Emission Rate

Total Energy Type CO2 Emissions for Codes Levels 1 - 5

	%	kg/m²/year	
DER from SAP 2009 DER Worksheet		10.42	*(ZC1)*
TER		14.67	
Residual CO2 emissions offset from biofuel CHP		0	*(ZC5)*
CO2 emissions offset from additional allowable electricty generation		0	*(ZC7)*
Total CO2 emissions offset from SAP Section 16 allowances		0	
DER accounting for SAP Section 16 allowances		10.42	
% improvement DER/TER	28.94		

Total Energy Type CO2 Emissions for Codes Levels 6

	kg/m²/year	
DER accounting for SAP Section 16 allowances	10.42	*(ZC1)*
CO2 emissions from appliances, equation (L14)	9.37	*(ZC2)*
CO2 emissions from cooking, equation (L16)	0.7	*(ZC3)*
Net CO2 emissions	20.5	*(ZC8)*

Result:

Credits awarded for Ene 1 = 3.4

Code Level = 4

Ene 2 - Fabric energy Efficiency

Fabric energy Efficiency: 58.9

Credits awarded for Ene 2 = 3.2

Ene 7 - Low or Zero Carbon (LZC) Technologies

Reduction in CO2 Emissions

	%	kg/m²/year
Standard Case CO2 emissions		26.7
*Actual Case CO2 emissions		21.3
Reduction in CO2 emissions	20.22	

Credits awarded for Ene 7 = 2

Code for Sustainable Homes
Technical Guide November 2010 - Full Technical Guide
Pre-Assessment Report

SYNTEGRA CONSULTING
Intelligent & Green Building Solutions

Report Reference: 4 North End Road
Site Registration: 003939-120530-38-1223
Site Name: 4 North End Road
Assessor Number:
Company: Syntegra Consulting Ltd
Assessor: Alan King

THE CODE FOR SUSTAINABLE HOMES
CERTIFICATION MARK

Site Details	
Site Name:	4 North End Road
Site Registration:	003939-120530-38-1223
Site Address:	4 North End Road
	Hampstead
City/Town:	London
County:	Greater London
Postcode:	NW3 7HL
No. of Dwellings:	4
No. of Dwelling Types:	1
Planning Authority:	Camden Council
Funding Body:	

Assessor Details	
Company:	Syntegra Consulting Ltd
Assessor Name:	Alan King
Cert Number:	
Address:	The Braccans Buisiness Centre
	2 The Braccans, London Rd
City/Town:	Bracknell
County:	Berkshire
Postcode:	RG12 2XH
Tel:	08450091625
Email:	alan@syntegra-epc.co.uk

Client Details	
Company:	Four North End Properties Ltd
Contact Name:	Amy Poon
Job Title:	Developer
Email:	
Tel:	
Address:	
City/Town:	
County:	
Postcode:	

Architect Details	
Company:	Piercy & Company
Contact Name:	Melanie Bax
Job Title:	Architect
Email:	melaniebax@piercyandco.com
Tel:	0207 4907546
Address:	70-74 City Road
City/Town:	London
County:	
Postcode:	EC1Y 2BJ

Developer Details	
Company:	Four North End Properties Ltd
Contact Name:	Amy Poon
Job Title:	Developer
Email:	
Tel:	
Address:	
City/Town:	
County:	
Postcode:	

Dwelling ID	Plot No.	Address	Social Unit
1	1	House A 4 North End Road Hampstead, London	No
2	2	House B 4 North End Road Hampstead, London	No
3	3	House C 4 North End Road Hampstead, London	No
4	4	House D 4 North End Road Hampstead, London	No

Development Summary & Ratings

Dwelling ID	Dwelling Type	Description	Level	Score
		House A4 North End Road	3	64.65
		House B4 North End Road	3	64.65
		House C4 North End Road	3	58.71
		House D4 North End Road	3	62.47

Deviations from Standard

No deviations from standard

Score Sheet for 4 North End Road

	ENE									WAT		MAT			SUR		WAS			POL		HEA				MAN				ECO					Summary	
Dwelling ID	1	2	3	4	5	6	7	8	9	1	2	1	2	3	1	2	1	2	3	1	2	1	2	3	4	1	2	3	4	1	2	3	4	5	Score	Level
1	3.4	0	1	1	2	2	2	1	1	3	1	10	2	0	2	2	4	3	1	1	2	3	3	1	4	3	2	2	0	0	1	1	2	2	64.65	3
2	3.4	0	1	1	2	2	2	1	1	3	1	10	2	0	2	2	4	3	1	1	2	3	3	1	4	3	2	2	0	0	1	1	2	2	64.65	3
3	3.4	0	1	1	2	2	2	1	1	3	1	10	0	0	2	2	4	3	1	1	2	3	3	1	4	3	2	2	0	0	0	0	0	2	58.71	3
4	3.4	3.2	1	1	2	2	2	1	1	3	1	10	0	0	2	2	4	3	1	1	2	3	3	1	4	3	2	2	0	0	0	0	0	2	62.47	3

Summary Score Sheet

Dwelling Type: House A 4 North End Road

Dwelling ID: 1

	Credit Score	Credits Available	Score Assessment Sub Total	Credits Available	%	Weighting Factor	Points Score
Energy & CO2 Emissions							
ENE 1 Dwelling Emission Rate	3.4	10	13.4	31	43.23	36.4	15.73
ENE 2 Fabric Energy Efficiency	0	9					
ENE 3 Energy Display Device	1	2					
ENE 4 Drying Space	1	1					
ENE 5 Energy Labelled White Goods	2	2					
ENE 6 External Lighting	2	2					
ENE 7 Low or Zero Carbon Energy Technologies	2	2					
ENE 8 Cycle Storage	1	2					
ENE 9 Home Office	1	1					
Water							
WAT 1 Internal Water Use	3	5	4	6	66.67	9	6
WAT 2 External Water Use	1	1					
Materials							
MAT 1 Environmental Impact of Materials	10	15	12	24	50	7.2	3.6
MAT 2 Responsible Sourcing (Basic Building Elements)	2	6					
MAT 3 Responsible Sourcing (Finishing Elements)	0	3					
Surface Water Run-off							
SUR 1 Management of Surface Water Run-Off from Site	2	2	4	4	100	2.2	2.2
SUR 2 Flood Risk	2	2					
Waste							
WAS 1 Household Waste Storage and Recycling Facilities	4	4	8	8	100	6.4	6.4
WAS 2 Construction Site Waste Management	3	3					
WAS 3 Composting	1	1					
Pollution							
POL 1 Global Warming Potential of Insulants	1	1	3	4	75	2.8	2.1
POL 2 NOx Emissions	2	3					
Health & Wellbeing							
HEA 1 Daylighting	3	3	11	12	91.67	14	12.83
HEA 2 Sound Insulation	3	4					
HEA 3 Private Space	1	1					
HEA 4 Lifetime Homes	4	4					
Management							
MAN 1 Home User Guide	3	3	7	9	77.78	10	7.78
MAN 2 Considerate Constructors Scheme	2	2					
MAN 3 Construction Site Impacts	2	2					
MAN 4 Security	0	2					
Ecology							
ECO 1 Ecological Value of Site	0	1	6	9	66.67	12	8
ECO 2 Ecological Enhancement	1	1					
ECO 3 Protection of Ecological Features	1	1					
ECO 4 Change of Ecological Value of Site	2	4					
ECO 5 Building Footprint	2	2					
	Level Achieved: 3		**Total Points Scored: 64.65**				

Evidence for ENE 1 (Dwelling Emission Rate)
Improvement above Part L Building Regulations 2010. 3.4 credits allocated
Evidence: Energy strategy report As per energy strategy report, based on a Combi+PV strategy with an improvement of an average of 29.76% above Part L 2010 regs can be achieved. Specialist reports required: SAP assessments and BRUKL compliance reports.
Assumptions for ENE 1

Evidence for ENE 2 (Fabric Energy Efficiency)
End Terrace 0 credits allocated
Evidence: Energy strategy report As per energy strategy report, assumed Fabric Energy Efficiency of 60.29 Specialist reports required: SAP assessments and BRUKL compliance reports.
Assumptions for ENE 2

Evidence for ENE 3 (Energy Display Device)
Correctly specified display device showing current consumption data.
It is assumed the full 1 credits are sought for this category. The following information needs to be displayed to the occupant: local time, current mains energy consumption (kW & kWh), current emissions (g/Kg/CO2), current tariff, current cost (for pre-payment customers this should be 'real time' data and for 'credit' paying customers cost should be displayed on a monthly basis, display accurate account balance info (credit/debit), visual presentation of data to allow consumers to easily identify high and low level of usage, historical consumption data..
Assumptions for ENE 3

Evidence for ENE 4 (Drying Space)
Compliant external drying space
It has been assumed that code compliant external rotary drying line will be provided in the garden area As this is a 3+ bedroom dwelling the drying equipment must have 6m+ of drying line..
Assumptions for ENE 4

Evidence for ENE 5 (Energy Labelled White Goods)
A+ rated fridge & freezers or fridge/freezer A rated washing machine and dishwasher AND B rated washer-dryers & tumbles dryers, or EU energy efficiency labelling scheme leaflet where washing machines and/or dishwashers not provided
Assumed A+ rated fridge freezer and A rated washing machine and dishwasher provided. Along with B rated washer-dryer & tumble dryers..
Assumptions for ENE 5

Evidence for ENE 6 (External Lighting)
Complaint space lighting, no security lighting installed
It is anticipated that all external space lighting is provided by dedicated energy efficient fittings with appropriate control systems. An LED lighting and control strategy would assist toward compliance to this credit(s). It is anticipated that no security lighting is installed, the security lighting credit can therefore be awarded by default..
Assumptions for ENE 6

Evidence for ENE 7 (Low or Zero Carbon Energy Technologies)
Contribution of low or zero carbon technologies greater than or equal to 15%
Evidence: Energy strategy report As per energy strategy report, based on the proposed Combi+PV strategy a CO2 emissions reduction improvement of over 20.43% can be attained agains the standard case for ENE7. Specialist reports required: SAP assessments and BRUKL compliance reports.
Assumptions for ENE 7

Evidence for ENE 8 (Cycle Storage)
4 bedrooms or more - Storage for 2 cycles per dwelling
4/5 Bedroom house therefore storage for 2 cycles required to acheive 1 credits. Assumed cycles to be stored in garage/store area (wall mounted code compliant rack to conserve space). Note CSH manual to comply with storage, security and access requirements. Note: Lighting for the cycle storage must be code compliant as per ENE 6 .
Assumptions for ENE 8

Evidence for ENE 9 (Home Office)
Compliant home office
It has been assumed that a code compliant home office location is present. Including a daylight factor of 1.5% (daylight calculation report required for justification). The room requires adequate ventilation (either ventilation system or opening window of a t least 0.5m2), 2No. double power sockets, one telephone point and broadband provision. It is assumed that the home office location will be located in the study area. Specialist reports required: Code compliant daylighting calculaitons report.
Assumptions for ENE 9

Evidence for WAT 1 (Internal Water Use)
Internal water use less than or equal to 105 litres per person per day
It is assumed the minimum code 3/4 requirement of 105litres/day will be acheived via a correct specification of low flow/flush fittings. Also that the design will be undertaken under risk assessment to avoid microbial contamination for the HWS & CWS systems as per CIBSE guidance .
Assumptions for WAT 1

Evidence for WAT 2 (External Water Use)
Compliant individual rainwater collection system
Assumed code compliant and sufficiently sized rainwaterbutt (refer to CSH guide) for external use only..
Assumptions for WAT 2

Evidence for MAT 1 (Environmental Impact of Materials)
Mandatory requirements met: At least 3 elements rated A+ to D, 10 credits scored
It is assumed that the mandatory requirement will be met in acheiving a rating of A+ to D in the 2008 version of the Green Guide for the following elements: Roof, external walls, internal walls (including seperating walls), upper and grd floors (including seperating floors), windows. In addition we assume a target of 10 credits will be achieved through correct materials specification accordingly for this category..
Assumptions for MAT 1

Evidence for MAT 2 (Responsible Sourcing (Basic Building Elements))

2 credits scored

Credits not sought

Assumptions for MAT 2

Evidence for MAT 3 (Responsible Sourcing (Finishing Elements))

Zero credits or credits not sought

Credits not sought

Assumptions for MAT 3

Evidence for SUR 1 (Management of Surface Water Run-Off from Site)

Mandatory Met: Peak rate of run-off and annual volume of run-off is no greater for the developed than for the pre-development. The system has also been designed for local drainage system failure.
No discharge to watercourse(s) for rainfall depth up to 5mm.
Run-off from all hard surfaces shall receive an appropriate level of treatment (as per the SudS manual) to minimise risk of pollution.

It has been assumed the mandatory requirements for the code are met and that no discharge to watercourse(s) for rainfall depth up to 5mm. Also run-off from all hard surfaces shall receive an appropriate level of treatment (as per SUDS manual) to minimise risk of pollution. Rainwater harvesting -SUDS strategy.

Specialist report required: Hydrology report SUR 1 & 2.

Assumptions for SUR 1

Evidence for SUR 2 (Flood Risk)

Low flood risk - zone 1

It is assumed the development is in a flood risk 1 zone and appropriate measures will be put in place.

Specialist report required: Hydrology report SUR 1 & 2.

Assumptions for SUR 2

Evidence for WAS 1 (Household Waste Storage and Recycling Facilities)

Mandatory requirements met: Adequate storage of household waste with accessibility in line with checklist WAS 1. Local authority collection: Before collection sorting with appropriate internal storage of recyclable materials

It is assumed the mandatory criteria will be met for dwelling household waste.

It has been assumed that there is a local authority recylcing collection scheme (at least fortnightly) where materials are sorted before collection in at least 3No. 7litre dedicated internal storage bins (total of 30litres minimum). Confirmation required before or after collection.

Assumptions for WAS 1

Evidence for WAS 2 (Construction Site Waste Management)

Compliant site waste management plant containing benchmarks, procedures and commitments for the minimizing and diverting 80% waste from landfill in line with the criteria and with Checklist WAS 2a, 2b & 2c

It has been assumed that the appointed contractor will have a code compliant SWMP and meet the code criteria for the following elements: minimising construction waste, diverting waste from landfill (by at least 85% of weight or volume of non-hazardous construction waste generated of the project being diverted from landfill)..

Assumptions for WAS 2

Evidence for WAS 3 (Composting)

Individual compositing facility/facilities

It has been assumed that a code compliant individual waste composting facility per dwelling will be implemented.

Assumptions for WAS 3

Evidence for POL 1 (Global Warming Potential of Insulants)

All insulants have a GWP of less than 5

It is assumed that ALL insulation will have a GWP of 5 or less site-wide..

Assumptions for POL 1

Evidence for POL 2 (NOx Emissions)

NOx emissions less than or equal to 70mg/kWh

Assumed NOx emissions are less than or equal to 70mg/kWh per dwelling..

Assumptions for POL 2

Evidence for HEA 1 (Daylighting)

Kitchen: Average daylight factor of at least 2%
Living room: Average daylight factor of at least 1.5%
Dining room: Average daylight factor of at least 1.5%
Home office: Average daylight factor of at least 1.5%
All rooms (kitchen, living, dining and where applicable the home office) have 80% of the working plane with direct light from the sky

It is assumed that all kithcens, living/dining rooms, home office areas achieve a daylight factor of 1.5% and working planes have 80% of direct light from the sky.

Specialist reports required: Code compliant daylighting calculaitons report.

Assumptions for HEA 1

Evidence for HEA 2 (Sound Insulation)

Accredited Part E sound testing has been undertaken
Robust details have been incorporated
Airborne 5dB higher, impact 5dB lower

Assumed robust details used and/or acoustic test of 5db attained.

Assumptions for HEA 2

Evidence for HEA 3 (Private Space)

Individual private space provided.

Drawings show code compliant private outdoor space with the minimum space requirements met. Outdoor space must be accessible to wheelchair users with details described of level thresholds in accordance with BS8300.

Assumptions for HEA 3

Evidence for HEA 4 (Lifetime Homes)

All criteria of Lifetime Homes in line with all 16 principals of Lifetime Homes

Assumed lifetime homes criteria will be met..

Assumptions for HEA 4

Evidence for MAN 1 (Home User Guide)

All criteria inline with checklist MAN 1 Part 1 - Operational Issues will be met
All criteria inline with checklist MAN 1 Part 2 - Site and Surroundings will be met

It is assumed a code compliant Home User Guide will be produced and made available in the appropriate formats to residents. It is assumed that the Home User Guide meets the criteria for operational issues and site & surrounds.

Specialist report required: A code compliant Home User Guide will be required to be implemented..

Assumptions for MAN 1

Evidence for MAN 2 (Considerate Constructors Scheme)
Considerate constructors scheme: Significantly beyond best practise, a score of between 32 and 40 and at least a score of 4 in every section
It is assumed a competent contractor registered on the considerate constructors scheme who acheives between 32-40 (at least a score of 4 in every section) will be appointed for the scheme..
Assumptions for MAN 2

Evidence for MAN 3 (Construction Site Impacts)
Monitor, report and set targets for CO2 production or energy use from site activities Monitor, report and set targets for water consumption from site activities Adopt best practise policies in respects to air (dust) pollution from site activities Adopt best practise policies in respects to water (ground and surface) pollution 80% of timer reclaimed, re-used or responsibly sourced
It is assumed that during site works the contractor will, as part of the live SWMP document, monitor/report/set targets for the following: Adopt best practise policies in respect to air (dust) pollution from site activites 80% of timber reclaimed, re-used or responsibly sourced Target/Monitor/Report periodically for energy/water consumption from site activities.
Assumptions for MAN 3

Evidence for MAN 4 (Security)
Credit not sought or no secure by design undertaken
Credits not sought
Assumptions for MAN 4

Evidence for ECO 1 (Ecological Value of Site)
Credit not sought
Credit not sought
Assumptions for ECO 1

Evidence for ECO 2 (Ecological Enhancement)
Key recommendations and 30% additional recommendations by a suitably qualified ecologist
Credit not sought
Assumptions for ECO 2

Evidence for ECO 3 (Protection of Ecological Features)
Ecological features will be adequately protected and maintained
Credit not sought
Assumptions for ECO 3

Evidence for ECO 4 (Change of Ecological Value of Site)
Neutral: Greater than -3 and less than or equal to +3
Credit not sought
Assumptions for ECO 4

Evidence for ECO 5 (Building Footprint)
Flats ratio of 4:1
Assumed 2 credits will be acheived due to house footprints. 4 storeys.
Assumptions for ECO 5

Summary Score Sheet

Dwelling Type: House B 4 North End Road

Dwelling ID: 2

	Credit Score	Credits Available	Score Assessment Sub Total	Credits Available	%	Weighting Factor	Points Score
Energy & CO2 Emissions							
ENE 1 Dwelling Emission Rate	3.4	10	13.4	31	43.23	36.4	15.73
ENE 2 Fabric Energy Efficiency	0	9					
ENE 3 Energy Display Device	1	2					
ENE 4 Drying Space	1	1					
ENE 5 Energy Labelled White Goods	2	2					
ENE 6 External Lighting	2	2					
ENE 7 Low or Zero Carbon Energy Technologies	2	2					
ENE 8 Cycle Storage	1	2					
ENE 9 Home Office	1	1					
Water							
WAT 1 Internal Water Use	3	5	4	6	66.67	9	6
WAT 2 External Water Use	1	1					
Materials							
MAT 1 Environmental Impact of Materials	10	15	12	24	50	7.2	3.6
MAT 2 Responsible Sourcing (Basic Building Elements)	2	6					
MAT 3 Responsible Sourcing (Finishing Elements)	0	3					
Surface Water Run-off							
SUR 1 Management of Surface Water Run-Off from Site	2	2	4	4	100	2.2	2.2
SUR 2 Flood Risk	2	2					
Waste							
WAS 1 Household Waste Storage and Recycling Facilities	4	4	8	8	100	6.4	6.4
WAS 2 Construction Site Waste Management	3	3					
WAS 3 Composting	1	1					
Pollution							
POL 1 Global Warming Potential of Insulants	1	1	3	4	75	2.8	2.1
POL 2 NOx Emissions	2	3					
Health & Wellbeing							
HEA 1 Daylighting	3	3	11	12	91.67	14	12.83
HEA 2 Sound Insulation	3	4					
HEA 3 Private Space	1	1					
HEA 4 Lifetime Homes	4	4					
Management							
MAN 1 Home User Guide	3	3	7	9	77.78	10	7.78
MAN 2 Considerate Constructors Scheme	2	2					
MAN 3 Construction Site Impacts	2	2					
MAN 4 Security	0	2					
Ecology							
ECO 1 Ecological Value of Site	0	1	6	9	66.67	12	8
ECO 2 Ecological Enhancement	1	1					
ECO 3 Protection of Ecological Features	1	1					
ECO 4 Change of Ecological Value of Site	2	4					
ECO 5 Building Footprint	2	2					
	Level Achieved: 3		**Total Points Scored: 64.65**				

Evidence for ENE 1 (Dwelling Emission Rate)

Improvement above Part L Building Regulations 2010. 3.4 credits allocated

Evidence: Energy strategy report

As per energy strategy report, based on a Combi+PV strategy with an improvement of an average of 28.87% above Part L 2010 regs can be achieved.

Specialist reports required: SAP assessments and BRUKL compliance reports.

Assumptions for ENE 1

Evidence for ENE 2 (Fabric Energy Efficiency)

Mid Terrace
0 credits allocated

Evidence: Energy strategy report

As per energy strategy report, assumed Fabric Energy Efficiency of 53.63

Specialist reports required: SAP assessments and BRUKL compliance reports.

Assumptions for ENE 2

Evidence for ENE 3 (Energy Display Device)

Correctly specified display device showing current consumption data.

It is assumed the full 1 credits are sought for this category.

The following information needs to be displayed to the occupant: local time, current mains energy consumption (kW & kWh), current emissions (g/Kg/CO2), current tariff, current cost (for pre-payment customers this should be 'real time' data and for 'credit' paying customers cost should be displayed on a monthly basis, display accurate account balance info (credit/debit), visual presentation of data to allow consumers to easily identify high and low level of usage, historical consumption data..

Assumptions for ENE 3

Evidence for ENE 4 (Drying Space)

Compliant external drying space

It has been assumed that code compliant external rotary drying line will be provided in the garden area

As this is a 3+ bedroom dwelling the drying equipment must have 6m+ of drying line..

Assumptions for ENE 4

Evidence for ENE 5 (Energy Labelled White Goods)

A+ rated fridge & freezers or fridge/freezer
A rated washing machine and dishwasher AND B rated washer-dryers & tumbles dryers, or EU energy efficiency labelling scheme leaflet where washing machines and/or dishwashers not provided

Assumed A+ rated fridge freezer and A rated washing machine and dishwasher provided. Along with B rated washer-dryer & tumble dryers..

Assumptions for ENE 5

Evidence for ENE 6 (External Lighting)

Complaint space lighting, no security lighting installed

It is anticipated that all external space lighting is provided by dedicated energy efficient fittings with appropriate control systems. An LED lighting and control strategy would assist toward compliance to this credit(s).

It is anticipated that no security lighting is installed, the security lighting credit can therefore be awarded by default..

Assumptions for ENE 6

Evidence for ENE 7 (Low or Zero Carbon Energy Technologies)

Contribution of low or zero carbon technologies greater than or equal to 15%

Evidence: Energy strategy report

As per energy strategy report, based on the proposed Combi+PV strategy a CO2 emissions reduction improvement of over 21.46% can be attained agains the standard case for ENE7.

Specialist reports required: SAP assessments and BRUKL compliance reports.

Assumptions for ENE 7

Evidence for ENE 8 (Cycle Storage)

4 bedrooms or more - Storage for 2 cycles per dwelling

4/5 Bedroom house therefore storage for 2 cycles required to acheive 1 credits. Assumed cycles to be stored in garage/store area (wall mounted code compliant rack to conserve space). Note CSH manual to comply with storage, security and access requirements.

Note: Lighting for the cycle storage must be code compliant as per ENE 6 .

Assumptions for ENE 8

Evidence for ENE 9 (Home Office)

Compliant home office

It has been assumed that a code compliant home office location is present. Including a daylight factor of 1.5% (daylight calculation report required for justification). The room requires adequate ventilation (either ventilation system or opening window of a t least 0.5m2), 2No. double power sockets, one telephone point and broadband provision.

It is assumed that the home office location will be located in the study area.

Specialist reports required: Code compliant daylighting calculaitons report.

Assumptions for ENE 9

Evidence for WAT 1 (Internal Water Use)

Internal water use less than or equal to 105 litres per person per day

It is assumed the minimum code 3/4 requirement of 105litres/day will be acheived via a correct specification of low flow/flush fittings. Also that the design will be undertaken under risk assessment to avoid microbial contamination for the HWS & CWS systems as per CIBSE guidance .

Assumptions for WAT 1

Evidence for WAT 2 (External Water Use)

Compliant individual rainwater collection system

Assumed code compliant and sufficiently sized rainwaterbutt (refer to CSH guide) for external use only..

Assumptions for WAT 2

Evidence for MAT 1 (Environmental Impact of Materials)

Mandatory requirements met: At least 3 elements rated A+ to D, 10 credits scored

It is assumed that the mandatory requirement will be met in acheiving a rating of A+ to D in the 2008 version of the Green Guide for the following elements: Roof, external walls, internal walls (including seperating walls), upper and grd floors (including seperating floors), windows.

In addition we assume a target of 10 credits will be achieved through correct materials specification accordingly for this category..

Assumptions for MAT 1

Evidence for MAT 2 (Responsible Sourcing (Basic Building Elements))

2 credits scored

Credits not sought

Assumptions for MAT 2

Evidence for MAT 3 (Responsible Sourcing (Finishing Elements))

Zero credits or credits not sought

Credits not sought

Assumptions for MAT 3

Evidence for SUR 1 (Management of Surface Water Run-Off from Site)

Mandatory Met: Peak rate of run-off and annual volume of run-off is no greater for the developed than for the pre-development. The system has also been designed for local drainage system failure.
No discharge to watercourse(s) for rainfall depth up to 5mm.
Run-off from all hard surfaces shall receive an appropriate level of treatment (as per the SudS manual) to minimise risk of pollution.

It has been assumed the mandatory requirements for the code are met and that no discharge to watercourse(s) for rainfall depth up to 5mm. Also run-off from all hard surfaces shall receive an appropriate level of treatment (as per SUDS manual) to minimise risk of pollution. Rainwater harvesting -SUDS strategy.

Specialist report required: Hydrology report SUR 1 & 2.

Assumptions for SUR 1

Evidence for SUR 2 (Flood Risk)

Low flood risk - zone 1

It is assumed the development is in a flood risk 1 zone and appropriate measures will be put in place.

Specialist report required: Hydrology report SUR 1 & 2.

Assumptions for SUR 2

Evidence for WAS 1 (Household Waste Storage and Recycling Facilities)

Mandatory requirements met: Adequate storage of household waste with accessibility in line with checklist WAS 1. Local authority collection: Before collection sorting with appropriate internal storage of recyclable materials

It is assumed the mandatory criteria will be met for dwelling household waste.

It has been assumed that there is a local authority recylcing collection scheme (at least fortnightly) where materials are sorted before collection in at least 3No. 7litre dedicated internal storage bins (total of 30litres minimum). Confirmation required before or after collection.

Assumptions for WAS 1

Evidence for WAS 2 (Construction Site Waste Management)

Compliant site waste management plant containing benchmarks, procedures and commitments for the minimizing and diverting 80% waste from landfill in line with the criteria and with Checklist WAS 2a, 2b & 2c

It has been assumed that the appointed contractor will have a code compliant SWMP and meet the code criteria for the following elements: minimising construction waste, diverting waste from landfill (by at least 85% of weight or volume of non-hazardous construction waste generated of the project being diverted from landfill)..

Assumptions for WAS 2

Evidence for WAS 3 (Composting)

Individual compositing facility/facilities

It has been assumed that a code compliant individual waste composting facility per dwelling will be implemented.

Assumptions for WAS 3

Evidence for POL 1 (Global Warming Potential of Insulants)

All insulants have a GWP of less than 5

It is assumed that ALL insulation will have a GWP of 5 or less site-wide..

Assumptions for POL 1

Evidence for POL 2 (NOx Emissions)

NOx emissions less than or equal to 70mg/kWh

Assumed NOx emissions are less than or equal to 70mg/kWh per dwelling..

Assumptions for POL 2

Evidence for HEA 1 (Daylighting)

Kitchen: Average daylight factor of at least 2%
Living room: Average daylight factor of at least 1.5%
Dining room: Average daylight factor of at least 1.5%
Home office: Average daylight factor of at least 1.5%
All rooms (kitchen, living, dining and where applicable the home office) have 80% of the working plane with direct light from the sky

It is assumed that all kithcens, living/dining rooms, home office areas achieve a daylight factor of 1.5% and working planes have 80% of direct light from the sky.

Specialist reports required: Code compliant daylighting calculaitons report.

Assumptions for HEA 1

Evidence for HEA 2 (Sound Insulation)

Accredited Part E sound testing has been undertaken
Robust details have been incorporated
Airborne 5dB higher, impact 5dB lower

Assumed robust details used and/or acoustic test of 5db attained.

Assumptions for HEA 2

Evidence for HEA 3 (Private Space)

Individual private space provided.

Drawings show code compliant private outdoor space with the minimum space requirements met. Outdoor space must be accessible to wheelchair users with details described of level thresholds in accordance with BS8300.

Assumptions for HEA 3

Evidence for HEA 4 (Lifetime Homes)

All criteria of Lifetime Homes in line with all 16 principals of Lifetime Homes

Assumed lifetime homes criteria will be met..

Assumptions for HEA 4

Evidence for MAN 1 (Home User Guide)

All criteria inline with checklist MAN 1 Part 1 - Operational Issues will be met
All criteria inline with checklist MAN 1 Part 2 - Site and Surroundings will be met

It is assumed a code compliant Home User Guide will be produced and made available in the appropriate formats to residents. It is assumed that the Home User Guide meets the criteria for operational issues and site & surrounds.

Specialist report required: A code compliant Home User Guide will be required to be implemented..

Assumptions for MAN 1

Evidence for MAN 2 (Considerate Constructors Scheme)
Considerate constructors scheme: Significantly beyond best practise, a score of between 32 and 40 and at least a score of 4 in every section
It is assumed a competent contractor registered on the considerate constructors scheme who acheives between 32-40 (at least a score of 4 in every section) will be appointed for the scheme..
Assumptions for MAN 2

Evidence for MAN 3 (Construction Site Impacts)
Monitor, report and set targets for CO2 production or energy use from site activities Monitor, report and set targets for water consumption from site activities Adopt best practise policies in respects to air (dust) pollution from site activities Adopt best practise policies in respects to water (ground and surface) pollution 80% of timer reclaimed, re-used or responsibly sourced
It is assumed that during site works the contractor will, as part of the live SWMP document, monitor/report/set targets for the following: Adopt best practise policies in respect to air (dust) pollution from site activites 80% of timber reclaimed, re-used or responsibly sourced Target/Monitor/Report periodically for energy/water consumption from site activities.
Assumptions for MAN 3

Evidence for MAN 4 (Security)
Credit not sought or no secure by design undertaken
Credits not sought
Assumptions for MAN 4

Evidence for ECO 1 (Ecological Value of Site)
Credit not sought
Credit not sought
Assumptions for ECO 1

Evidence for ECO 2 (Ecological Enhancement)
Key recommendations and 30% additional recommendations by a suitably qualified ecologist
Credit not sought
Assumptions for ECO 2

Evidence for ECO 3 (Protection of Ecological Features)
Ecological features will be adequately protected and maintained
Credit not sought
Assumptions for ECO 3

Evidence for ECO 4 (Change of Ecological Value of Site)
Neutral: Greater than -3 and less than or equal to +3
Credit not sought
Assumptions for ECO 4

Evidence for ECO 5 (Building Footprint)
Flats ratio of 4:1
Assumed 2 credits will be acheived due to house footprints. 4 storeys.
Assumptions for ECO 5

Summary Score Sheet

Dwelling Type: House C 4 North End Road

Dwelling ID: 3

	Credit Score	Credits Available	Score Assessment Sub Total	Credits Available	%	Weighting Factor	Points Score
Energy & CO2 Emissions							
ENE 1 Dwelling Emission Rate	3.4	10	13.4	31	43.23	36.4	15.73
ENE 2 Fabric Energy Efficiency	0	9					
ENE 3 Energy Display Device	1	2					
ENE 4 Drying Space	1	1					
ENE 5 Energy Labelled White Goods	2	2					
ENE 6 External Lighting	2	2					
ENE 7 Low or Zero Carbon Energy Technologies	2	2					
ENE 8 Cycle Storage	1	2					
ENE 9 Home Office	1	1					
Water							
WAT 1 Internal Water Use	3	5	4	6	66.67	9	6
WAT 2 External Water Use	1	1					
Materials							
MAT 1 Environmental Impact of Materials	10	15	10	24	41.67	7.2	3
MAT 2 Responsible Sourcing (Basic Building Elements)	0	6					
MAT 3 Responsible Sourcing (Finishing Elements)	0	3					
Surface Water Run-off							
SUR 1 Management of Surface Water Run-Off from Site	2	2	4	4	100	2.2	2.2
SUR 2 Flood Risk	2	2					
Waste							
WAS 1 Household Waste Storage and Recycling Facilities	4	4	8	8	100	6.4	6.4
WAS 2 Construction Site Waste Management	3	3					
WAS 3 Composting	1	1					
Pollution							
POL 1 Global Warming Potential of Insulants	1	1	3	4	75	2.8	2.1
POL 2 NOx Emissions	2	3					
Health & Wellbeing							
HEA 1 Daylighting	3	3	11	12	91.67	14	12.83
HEA 2 Sound Insulation	3	4					
HEA 3 Private Space	1	1					
HEA 4 Lifetime Homes	4	4					
Management							
MAN 1 Home User Guide	3	3	7	9	77.78	10	7.78
MAN 2 Considerate Constructors Scheme	2	2					
MAN 3 Construction Site Impacts	2	2					
MAN 4 Security	0	2					
Ecology							
ECO 1 Ecological Value of Site	0	1	2	9	22.22	12	2.67
ECO 2 Ecological Enhancement	0	1					
ECO 3 Protection of Ecological Features	0	1					
ECO 4 Change of Ecological Value of Site	0	4					
ECO 5 Building Footprint	2	2					
	Level Achieved: 3		**Total Points Scored: 58.71**				

Evidence for ENE 1 (Dwelling Emission Rate)

Improvement above Part L Building Regulations 2010. 3.4 credits allocated

Evidence: Energy strategy report

As per energy strategy report, based on a Combi+PV strategy with an improvement of an average of 29.76% above Part L 2010 regs can be achieved.

Specialist reports required: SAP assessments and BRUKL compliance reports.

Assumptions for ENE 1

Evidence for ENE 2 (Fabric Energy Efficiency)

Mid Terrace
0 credits allocated

Evidence: Energy strategy report

As per energy strategy report, assumed Fabric Energy Efficiency of 54.01

Specialist reports required: SAP assessments and BRUKL compliance reports.

Assumptions for ENE 2

Evidence for ENE 3 (Energy Display Device)

Correctly specified display device showing current consumption data.

It is assumed the full 1 credits are sought for this category.

The following information needs to be displayed to the occupant: local time, current mains energy consumption (kW & kWh), current emissions (g/Kg/CO2), current tariff, current cost (for pre-payment customers this should be 'real time' data and for 'credit' paying customers cost should be displayed on a monthly basis, display accurate account balance info (credit/debit), visual presentation of data to allow consumers to easily identify high and low level of usage, historical consumption data..

Assumptions for ENE 3

Evidence for ENE 4 (Drying Space)

Compliant external drying space

It has been assumed that code compliant external rotary drying line will be provided in the garden area

As this is a 3+ bedroom dwelling the drying equipment must have 6m+ of drying line..

Assumptions for ENE 4

Evidence for ENE 5 (Energy Labelled White Goods)

A+ rated fridge & freezers or fridge/freezer
A rated washing machine and dishwasher AND B rated washer-dryers & tumbles dryers, or EU energy efficiency labelling scheme leaflet where washing machines and/or dishwashers not provided

Assumed A+ rated fridge freezer and A rated washing machine and dishwasher provided. Along with B rated washer-dryer & tumble dryers..

Assumptions for ENE 5

Evidence for ENE 6 (External Lighting)

Complaint space lighting, no security lighting installed

It is anticipated that all external space lighting is provided by dedicated energy efficient fittings with appropriate control systems. An LED lighting and control strategy would assist toward compliance to this credit(s).

It is anticipated that no security lighting is installed, the security lighting credit can therefore be awarded by default..

Assumptions for ENE 6

Evidence for ENE 7 (Low or Zero Carbon Energy Technologies)

Contribution of low or zero carbon technologies greater than or equal to 15%

Evidence: Energy strategy report

As per energy strategy report, based on the proposed Combi+PV strategy a CO2 emissions reduction improvement of over 21.97% can be attained agains the standard case for ENE7.

Specialist reports required: SAP assessments and BRUKL compliance reports.

Assumptions for ENE 7

Evidence for ENE 8 (Cycle Storage)

4 bedrooms or more - Storage for 2 cycles per dwelling

4/5 Bedroom house therefore storage for 2 cycles required to acheive 1 credits. Assumed cycles to be stored in garage/store area (wall mounted code compliant rack to conserve space). Note CSH manual to comply with storage, security and access requirements.

Note: Lighting for the cycle storage must be code compliant as per ENE 6 .

Assumptions for ENE 8

Evidence for ENE 9 (Home Office)

Compliant home office

It has been assumed that a code compliant home office location is present. Including a daylight factor of 1.5% (daylight calculation report required for justification). The room requires adequate ventilation (either ventilation system or opening window of a t least 0.5m2), 2No. double power sockets, one telephone point and broadband provision.

It is assumed that the home office location will be located in the study area.

Specialist reports required: Code compliant daylighting calculaitons report.

Assumptions for ENE 9

Evidence for WAT 1 (Internal Water Use)

Internal water use less than or equal to 105 litres per person per day

It is assumed the minimum code 3/4 requirement of 105litres/day will be acheived via a correct specification of low flow/flush fittings. Also that the design will be undertaken under risk assessment to avoid microbial contamination for the HWS & CWS systems as per CIBSE guidance .

Assumptions for WAT 1

Evidence for WAT 2 (External Water Use)

Compliant individual rainwater collection system

Assumed code compliant and sufficiently sized rainwaterbutt (refer to CSH guide) for external use only..

Assumptions for WAT 2

Evidence for MAT 1 (Environmental Impact of Materials)

Mandatory requirements met: At least 3 elements rated A+ to D, 10 credits scored

It is assumed that the mandatory requirement will be met in acheiving a rating of A+ to D in the 2008 version of the Green Guide for the following elements: Roof, external walls, internal walls (including seperating walls), upper and grd floors (including seperating floors), windows.

In addition we assume a target of 10 credits will be achieved through correct materials specification accordingly for this category..

Assumptions for MAT 1

Evidence for MAT 2 (Responsible Sourcing (Basic Building Elements))

Zero credits or credits not sought

Credits not sought

Assumptions for MAT 2

Evidence for MAT 3 (Responsible Sourcing (Finishing Elements))

Zero credits or credits not sought

Credits not sought

Assumptions for MAT 3

Evidence for SUR 1 (Management of Surface Water Run-Off from Site)

Mandatory Met: Peak rate of run-off and annual volume of run-off is no greater for the developed than for the pre-development. The system has also been designed for local drainage system failure.
No discharge to watercourse(s) for rainfall depth up to 5mm.
Run-off from all hard surfaces shall receive an appropriate level of treatment (as per the SudS manual) to minimise risk of pollution.

It has been assumed the mandatory requirements for the code are met and that no discharge to watercourse(s) for rainfall depth up to 5mm. Also run-off from all hard surfaces shall receive an appropriate level of treatment (as per SUDS manual) to minimise risk of pollution. Rainwater harvesting -SUDS strategy.

Specialist report required: Hydrology report SUR 1 & 2.

Assumptions for SUR 1

Evidence for SUR 2 (Flood Risk)

Low flood risk - zone 1

It is assumed the development is in a flood risk 1 zone and appropriate measures will be put in place.

Specialist report required: Hydrology report SUR 1 & 2.

Assumptions for SUR 2

Evidence for WAS 1 (Household Waste Storage and Recycling Facilities)

Mandatory requirements met: Adequate storage of household waste with accessibility in line with checklist WAS 1. Local authority collection: Before collection sorting with appropriate internal storage of recyclable materials

It is assumed the mandatory criteria will be met for dwelling household waste.

It has been assumed that there is a local authority recylcing collection scheme (at least fortnightly) where materials are sorted before collection in at least 3No. 7litre dedicated internal storage bins (total of 30litres minimum). Confirmation required before or after collection.

Assumptions for WAS 1

Evidence for WAS 2 (Construction Site Waste Management)

Compliant site waste management plant containing benchmarks, procedures and commitments for the minimizing and diverting 80% waste from landfill in line with the criteria and with Checklist WAS 2a, 2b & 2c

It has been assumed that the appointed contractor will have a code compliant SWMP and meet the code criteria for the following elements: minimising construction waste, diverting waste from landfill (by at least 85% of weight or volume of non-hazardous construction waste generated of the project being diverted from landfill)..

Assumptions for WAS 2

Evidence for WAS 3 (Composting)

Individual compositing facility/facilities

It has been assumed that a code compliant individual waste composting facility per dwelling will be implemented.

Assumptions for WAS 3

Evidence for POL 1 (Global Warming Potential of Insulants)

All insulants have a GWP of less than 5

It is assumed that ALL insulation will have a GWP of 5 or less site-wide..

Assumptions for POL 1

Evidence for POL 2 (NOx Emissions)

NOx emissions less than or equal to 70mg/kWh

Assumed NOx emissions are less than or equal to 70mg/kWh per dwelling..

Assumptions for POL 2

Evidence for HEA 1 (Daylighting)

Kitchen: Average daylight factor of at least 2%
Living room: Average daylight factor of at least 1.5%
Dining room: Average daylight factor of at least 1.5%
Home office: Average daylight factor of at least 1.5%
All rooms (kitchen, living, dining and where applicable the home office) have 80% of the working plane with direct light from the sky

It is assumed that all kithcens, living/dining rooms, home office areas achieve a daylight factor of 1.5% and working planes have 80% of direct light from the sky.

Specialist reports required: Code compliant daylighting calculaitons report.

Assumptions for HEA 1

Evidence for HEA 2 (Sound Insulation)

Accredited Part E sound testing has been undertaken
Robust details have been incorporated
Airborne 5dB higher, impact 5dB lower

Assumed robust details used and/or acoustic test of 5db attained.

Assumptions for HEA 2

Evidence for HEA 3 (Private Space)

Individual private space provided.

Drawings show code compliant private outdoor space with the minimum space requirements met. Outdoor space must be accessible to wheelchair users with details described of level thresholds in accordance with BS8300.

Assumptions for HEA 3

Evidence for HEA 4 (Lifetime Homes)

All criteria of Lifetime Homes in line with all 16 principals of Lifetime Homes

Assumed lifetime homes criteria will be met..

Assumptions for HEA 4

Evidence for MAN 1 (Home User Guide)

All criteria inline with checklist MAN 1 Part 1 - Operational Issues will be met
All criteria inline with checklist MAN 1 Part 2 - Site and Surroundings will be met

It is assumed a code compliant Home User Guide will be produced and made available in the appropriate formats to residents. It is assumed that the Home User Guide meets the criteria for operational issues and site & surrounds.

Specialist report required: A code compliant Home User Guide will be required to be implemented..

Assumptions for MAN 1

Evidence for MAN 2 (Considerate Constructors Scheme)
Considerate constructors scheme: Significantly beyond best practise, a score of between 32 and 40 and at least a score of 4 in every section
It is assumed a competent contractor registered on the considerate constructors scheme who acheives between 32-40 (at least a score of 4 in every section) will be appointed for the scheme..
Assumptions for MAN 2

Evidence for MAN 3 (Construction Site Impacts)
Monitor, report and set targets for CO2 production or energy use from site activities Monitor, report and set targets for water consumption from site activities Adopt best practise policies in respects to air (dust) pollution from site activities Adopt best practise policies in respects to water (ground and surface) pollution 80% of timer reclaimed, re-used or responsibly sourced
It is assumed that during site works the contractor will, as part of the live SWMP document, monitor/report/set targets for the following: Adopt best practise policies in respect to air (dust) pollution from site activites 80% of timber reclaimed, re-used or responsibly sourced Target/Monitor/Report periodically for energy/water consumption from site activities.
Assumptions for MAN 3

Evidence for MAN 4 (Security)
Credit not sought or no secure by design undertaken
Credits not sought
Assumptions for MAN 4

Evidence for ECO 1 (Ecological Value of Site)
Credit not sought
Credit not sought
Assumptions for ECO 1

Evidence for ECO 2 (Ecological Enhancement)
Credit not sought
Assumptions for ECO 2

Evidence for ECO 3 (Protection of Ecological Features)
Credit not sought
Assumptions for ECO 3

Evidence for ECO 4 (Change of Ecological Value of Site)
Credit not sought
Assumptions for ECO 4

Evidence for ECO 5 (Building Footprint)
Flats ratio of 4:1
Assumed 2 credits will be acheived due to house footprints. 4 storeys.
Assumptions for ECO 5

Summary Score Sheet

Dwelling Type: House D 4 North End Road

Dwelling ID: 4

	Credit Score	Credits Available	Score Assessment Sub Total	Credits Available	%	Weighting Factor	Points Score
Energy & CO2 Emissions							
ENE 1 Dwelling Emission Rate	3.4	10	16.6	31	53.55	36.4	19.49
ENE 2 Fabric Energy Efficiency	3.2	9					
ENE 3 Energy Display Device	1	2					
ENE 4 Drying Space	1	1					
ENE 5 Energy Labelled White Goods	2	2					
ENE 6 External Lighting	2	2					
ENE 7 Low or Zero Carbon Energy Technologies	2	2					
ENE 8 Cycle Storage	1	2					
ENE 9 Home Office	1	1					
Water							
WAT 1 Internal Water Use	3	5	4	6	66.67	9	6
WAT 2 External Water Use	1	1					
Materials							
MAT 1 Environmental Impact of Materials	10	15	10	24	41.67	7.2	3
MAT 2 Responsible Sourcing (Basic Building Elements)	0	6					
MAT 3 Responsible Sourcing (Finishing Elements)	0	3					
Surface Water Run-off							
SUR 1 Management of Surface Water Run-Off from Site	2	2	4	4	100	2.2	2.2
SUR 2 Flood Risk	2	2					
Waste							
WAS 1 Household Waste Storage and Recycling Facilities	4	4	8	8	100	6.4	6.4
WAS 2 Construction Site Waste Management	3	3					
WAS 3 Composting	1	1					
Pollution							
POL 1 Global Warming Potential of Insulants	1	1	3	4	75	2.8	2.1
POL 2 NOx Emissions	2	3					
Health & Wellbeing							
HEA 1 Daylighting	3	3	11	12	91.67	14	12.83
HEA 2 Sound Insulation	3	4					
HEA 3 Private Space	1	1					
HEA 4 Lifetime Homes	4	4					
Management							
MAN 1 Home User Guide	3	3	7	9	77.78	10	7.78
MAN 2 Considerate Constructors Scheme	2	2					
MAN 3 Construction Site Impacts	2	2					
MAN 4 Security	0	2					
Ecology							
ECO 1 Ecological Value of Site	0	1	2	9	22.22	12	2.67
ECO 2 Ecological Enhancement	0	1					
ECO 3 Protection of Ecological Features	0	1					
ECO 4 Change of Ecological Value of Site	0	4					
ECO 5 Building Footprint	2	2					
	Level Achieved: 3		**Total Points Scored: 62.47**				

Evidence for ENE 1 (Dwelling Emission Rate)
Improvement above Part L Building Regulations 2010. 3.4 credits allocated
Evidence: Energy strategy report As per energy strategy report, based on a Combi+PV strategy with an improvement of an average of 28.94% above Part L 2010 regs can be achieved. Specialist reports required: SAP assessments and BRUKL compliance reports.
Assumptions for ENE 1

Evidence for ENE 2 (Fabric Energy Efficiency)
End Terrace 3.2 credits allocated
Evidence: Energy strategy report As per energy strategy report, assumed Fabric Energy Efficiency of 58.85 Specialist reports required: SAP assessments and BRUKL compliance reports.
Assumptions for ENE 2

Evidence for ENE 3 (Energy Display Device)
Correctly specified display device showing current consumption data.
It is assumed the full 1 credits are sought for this category. The following information needs to be displayed to the occupant: local time, current mains energy consumption (kW & kWh), current emissions (g/Kg/CO2), current tariff, current cost (for pre-payment customers this should be 'real time' data and for 'credit' paying customers cost should be displayed on a monthly basis, display accurate account balance info (credit/debit), visual presentation of data to allow consumers to easily identify high and low level of usage, historical consumption data..
Assumptions for ENE 3

Evidence for ENE 4 (Drying Space)
Compliant external drying space
It has been assumed that code compliant external rotary drying line will be provided in the garden area As this is a 3+ bedroom dwelling the drying equipment must have 6m+ of drying line..
Assumptions for ENE 4

Evidence for ENE 5 (Energy Labelled White Goods)
A+ rated fridge & freezers or fridge/freezer A rated washing machine and dishwasher AND B rated washer-dryers & tumbles dryers, or EU energy efficiency labelling scheme leaflet where washing machines and/or dishwashers not provided
Assumed A+ rated fridge freezer and A rated washing machine and dishwasher provided. Along with B rated washer-dryer & tumble dryers..
Assumptions for ENE 5

Evidence for ENE 6 (External Lighting)
Complaint space lighting, no security lighting installed
It is anticipated that all external space lighting is provided by dedicated energy efficient fittings with appropriate control systems. An LED lighting and control strategy would assist toward compliance to this credit(s). It is anticipated that no security lighting is installed, the security lighting credit can therefore be awarded by default..
Assumptions for ENE 6

Evidence for ENE 7 (Low or Zero Carbon Energy Technologies)
Contribution of low or zero carbon technologies greater than or equal to 15%
Evidence: Energy strategy report As per energy strategy report, based on the proposed Combi+PV strategy a CO2 emissions reduction improvement of over 21.22% can be attained agains the standard case for ENE7. Specialist reports required: SAP assessments and BRUKL compliance reports.
Assumptions for ENE 7

Evidence for ENE 8 (Cycle Storage)
4 bedrooms or more - Storage for 2 cycles per dwelling
4/5 Bedroom house therefore storage for 2 cycles required to acheive 1 credits. Assumed cycles to be stored in garage/store area (wall mounted code compliant rack to conserve space). Note CSH manual to comply with storage, security and access requirements. Note: Lighting for the cycle storage must be code compliant as per ENE 6 .
Assumptions for ENE 8

Evidence for ENE 9 (Home Office)
Compliant home office
It has been assumed that a code compliant home office location is present. Including a daylight factor of 1.5% (daylight calculation report required for justification). The room requires adequate ventilation (either ventilation system or opening window of a t least 0.5m2), 2No. double power sockets, one telephone point and broadband provision. It is assumed that the home office location will be located in the study area. Specialist reports required: Code compliant daylighting calculaitons report.
Assumptions for ENE 9

Evidence for WAT 1 (Internal Water Use)
Internal water use less than or equal to 105 litres per person per day
It is assumed the minimum code 3/4 requirement of 105litres/day will be acheived via a correct specification of low flow/flush fittings. Also that the design will be undertaken under risk assessment to avoid microbial contamination for the HWS & CWS systems as per CIBSE guidance .
Assumptions for WAT 1

Evidence for WAT 2 (External Water Use)
Compliant individual rainwater collection system
Assumed code compliant and sufficiently sized rainwaterbutt (refer to CSH guide) for external use only..
Assumptions for WAT 2

Evidence for MAT 1 (Environmental Impact of Materials)
Mandatory requirements met: At least 3 elements rated A+ to D, 10 credits scored
It is assumed that the mandatory requirement will be met in acheiving a rating of A+ to D in the 2008 version of the Green Guide for the following elements: Roof, external walls, internal walls (including seperating walls), upper and grd floors (including seperating floors), windows. In addition we assume a target of 10 credits will be achieved through correct materials specification accordingly for this category..
Assumptions for MAT 1

Evidence for MAT 2 (Responsible Sourcing (Basic Building Elements))

Zero credits or credits not sought

Credits not sought

Assumptions for MAT 2

Evidence for MAT 3 (Responsible Sourcing (Finishing Elements))

Zero credits or credits not sought

Credits not sought

Assumptions for MAT 3

Evidence for SUR 1 (Management of Surface Water Run-Off from Site)

Mandatory Met: Peak rate of run-off and annual volume of run-off is no greater for the developed than for the pre-development. The system has also been designed for local drainage system failure.
No discharge to watercourse(s) for rainfall depth up to 5mm.
Run-off from all hard surfaces shall receive an appropriate level of treatment (as per the SudS manual) to minimise risk of pollution.

It has been assumed the mandatory requirements for the code are met and that no discharge to watercourse(s) for rainfall depth up to 5mm. Also run-off from all hard surfaces shall receive an appropriate level of treatment (as per SUDS manual) to minimise risk of pollution. Rainwater harvesting -SUDS strategy.

Specialist report required: Hydrology report SUR 1 & 2.

Assumptions for SUR 1

Evidence for SUR 2 (Flood Risk)

Low flood risk - zone 1

It is assumed the development is in a flood risk 1 zone and appropriate measures will be put in place.

Specialist report required: Hydrology report SUR 1 & 2.

Assumptions for SUR 2

Evidence for WAS 1 (Household Waste Storage and Recycling Facilities)

Mandatory requirements met: Adequate storage of household waste with accessibility in line with checklist WAS 1. Local authority collection: Before collection sorting with appropriate internal storage of recyclable materials

It is assumed the mandatory criteria will be met for dwelling household waste.

It has been assumed that there is a local authority recylcing collection scheme (at least fortnightly) where materials are sorted before collection in at least 3No. 7litre dedicated internal storage bins (total of 30litres minimum). Confirmation required before or after collection.

Assumptions for WAS 1

Evidence for WAS 2 (Construction Site Waste Management)

Compliant site waste management plant containing benchmarks, procedures and commitments for the minimizing and diverting 80% waste from landfill in line with the criteria and with Checklist WAS 2a, 2b & 2c

It has been assumed that the appointed contractor will have a code compliant SWMP and meet the code criteria for the following elements: minimising construction waste, diverting waste from landfill (by at least 85% of weight or volume of non-hazardous construction waste generated of the project being diverted from landfill)..

Assumptions for WAS 2

Evidence for WAS 3 (Composting)

Individual compositing facility/facilities

It has been assumed that a code compliant individual waste composting facility per dwelling will be implemented.

Assumptions for WAS 3

Evidence for POL 1 (Global Warming Potential of Insulants)

All insulants have a GWP of less than 5

It is assumed that ALL insulation will have a GWP of 5 or less site-wide..

Assumptions for POL 1

Evidence for POL 2 (NOx Emissions)

NOx emissions less than or equal to 70mg/kWh

Assumed NOx emissions are less than or equal to 70mg/kWh per dwelling..

Assumptions for POL 2

Evidence for HEA 1 (Daylighting)

Kitchen: Average daylight factor of at least 2%
Living room: Average daylight factor of at least 1.5%
Dining room: Average daylight factor of at least 1.5%
Home office: Average daylight factor of at least 1.5%
All rooms (kitchen, living, dining and where applicable the home office) have 80% of the working plane with direct light from the sky

It is assumed that all kithcens, living/dining rooms, home office areas achieve a daylight factor of 1.5% and working planes have 80% of direct light from the sky.

Specialist reports required: Code compliant daylighting calculaitons report.

Assumptions for HEA 1

Evidence for HEA 2 (Sound Insulation)

Accredited Part E sound testing has been undertaken
Robust details have been incorporated
Airborne 5dB higher, impact 5dB lower

Assumed robust details used and/or acoustic test of 5db attained.

Assumptions for HEA 2

Evidence for HEA 3 (Private Space)

Individual private space provided.

Drawings show code compliant private outdoor space with the minimum space requirements met. Outdoor space must be accessible to wheelchair users with details described of level thresholds in accordance with BS8300.

Assumptions for HEA 3

Evidence for HEA 4 (Lifetime Homes)

All criteria of Lifetime Homes in line with all 16 principals of Lifetime Homes

Assumed lifetime homes criteria will be met..

Assumptions for HEA 4

Evidence for MAN 1 (Home User Guide)

All criteria inline with checklist MAN 1 Part 1 - Operational Issues will be met
All criteria inline with checklist MAN 1 Part 2 - Site and Surroundings will be met

It is assumed a code compliant Home User Guide will be produced and made available in the appropriate formats to residents. It is assumed that the Home User Guide meets the criteria for operational issues and site & surrounds.

Specialist report required: A code compliant Home User Guide will be required to be implemented..

Assumptions for MAN 1

Evidence for MAN 2 (Considerate Constructors Scheme)
Considerate constructors scheme: Significantly beyond best practise, a score of between 32 and 40 and at least a score of 4 in every section
It is assumed a competent contractor registered on the considerate constructors scheme who acheives between 32-40 (at least a score of 4 in every section) will be appointed for the scheme..
Assumptions for MAN 2

Evidence for MAN 3 (Construction Site Impacts)
Monitor, report and set targets for CO2 production or energy use from site activities Monitor, report and set targets for water consumption from site activities Adopt best practise policies in respects to air (dust) pollution from site activities Adopt best practise policies in respects to water (ground and surface) pollution 80% of timer reclaimed, re-used or responsibly sourced
It is assumed that during site works the contractor will, as part of the live SWMP document, monitor/report/set targets for the following: Adopt best practise policies in respect to air (dust) pollution from site activites 80% of timber reclaimed, re-used or responsibly sourced Target/Monitor/Report periodically for energy/water consumption from site activities.
Assumptions for MAN 3

Evidence for MAN 4 (Security)
Credit not sought or no secure by design undertaken
Credits not sought
Assumptions for MAN 4

Evidence for ECO 1 (Ecological Value of Site)
Credit not sought
Credit not sought
Assumptions for ECO 1

Evidence for ECO 2 (Ecological Enhancement)
Credit not sought
Assumptions for ECO 2

Evidence for ECO 3 (Protection of Ecological Features)
Credit not sought
Assumptions for ECO 3

Evidence for ECO 4 (Change of Ecological Value of Site)
Credit not sought
Assumptions for ECO 4

Evidence for ECO 5 (Building Footprint)
Flats ratio of 4:1
Assumed 2 credits will be acheived due to house footprints. 4 storeys.
Assumptions for ECO 5

Assessor Declaration

I Alan King, can confirm that I have compiled this report to the best of my ability, I have based all findings on the information that is referenced within this report, and that this report is appropriate for the registered site.

To the best of my knowledge all the information contained within this report is correct and accurate. I have within my possession all the reference material that relates to this report, which is available for inspection by the client, the clients representative or Stroma Certification for Quality Assurance monitoring.

Signed:

Alan King
Syntegra Consulting Ltd
01 June 2012

Information about Code for Sustainable Homes

The Code for Sustainable Homes (the Code) is an environmental assessment method for rating and certifying the performance of new homes. It is a national standard for use in the design and construction of new homes with a view to encouraging continuous improvement in sustainable home building. The Code is based on EcoHomes©.

It was launched in December 2006 with the publication of 'Code for Sustainable Homes: A stepchange in sustainable home building practice' (Communities and Local Government, 2006), and became operational in England from April 2007.

The Code for Sustainable Homes covers nine categories of sustainable design. Each category includes a number of environmental issues. Each issue is a source of impact on the environment which can be assessed against a performance target and awarded one or more credits. Performance targets are more demanding than the minimum standards needed to satisfy Building Regulations or other legislation. They represent good or best practice, are technically feasible, and can be delivered by the building industry. The issues and categories are as follows:

- Energy & CO2 Emissions
  - Dwelling Emission Rate
  - Building Fabric
  - Internal Lighting
  - Drying Space
  - Energy Labelled White Goods
  - External Lighting
  - Low or Zero Carbon Technologies
  - Cycle Storage
  - Home Office
- Water
  - Internal Water Use
  - External Water Use
- Materials
  - Environmental Impact of Materials
  - Responsible Sourcing of Materials - Basic Building Elements
  - Responsible Sourcing of Materials - Finishing Elements
- Surface Water Run-off
  - Management of Surface Water Run-off from the Development
  - Flood Risk
- Waste
  - Storage of Non-Recyclable Waste and Recyclable Household Waste
  - Construction Site Waste Management
  - Composting
- Pollution
  - Global Warming Potential of Insulants
  - NOx Emissions

- Health & Wellbeing
  - Daylighting
  - Sound Insulation
  - Private Space
  - Lifetime Homes
- Management
  - Home User Guide
  - Considerate Constructors Scheme
  - Construction Site Impacts
  - Security
- Ecology
  - Ecological Value of Site
  - Ecological Enhancement
  - Protection of Ecological Features
  - Change in Ecological Value of Site
  - Building Footprint

The Code assigns one or more performance requirements (assessment criteria) to all of the above environmental issues. When each performance requirement is achieved a credit is awarded (with the exception of the four mandatory requirements which have no associated credits). The total number of credits available to a category is the sum of credits available for all the issues within it.

Mandatory minimum performance standards are set for some issues. For four of these, a single mandatory requirement is set which must be met, whatever Code level rating is sought. Credits are not awarded for these issues. Confirmation that the performance requirements are met for all four is a minimum entry requirement for achieving a level 1 rating. The four un-credited issues are:

- Environmental Impacts of Materials
- Management of Surface Water Run-off from Developments
- Storage of Non-Recyclable Waste and Recyclable Household Waste
- Construction Site Waste Management

If the mandatory minimum performance standard is met for the four un-credited issues, four further mandatory issues need to be considered. These are agreed to be such important issues that separate Government policies are being pursued to mitigate their effects. For two of these, credits are awarded for every level of achievement recognised within the Code, and minimum mandatory standards increase with increasing rating levels.

The two issues with increasing mandatory minimum standards are:

- Dwelling Emission Rate
- Indoor Water Use

For one issue a mandatory requirement at Level 5 or 6:

- Fabric Energy Efficiency

The final issue with a mandatory requirement for Level 6 of the Code is:

- Lifetime Homes

Further credits are available on a free-choice or tradable basis from other issues so that the developer may choose how to add performance credits (converted through weighting to percentage points) achieve the rating which they are aiming for.

The environmental impact categories within the Code are not of equal importance. Their relative value is conveyed by applying a consensus-based environmental weighting factor (see details below) to the sum of all the raw credit scores in a category, resulting in a score expressed as percentage points. The points for each category add up to 100.

Surface Water Run-off

SUR 1: Management of Surface Water Run-off from developments
Available Credits:2
Aim: To design surface water drainage for housing developments which avoid, reduce and delay the discharge of rainfall run-off to watercourses and public sewers using SuDS techniques. This will protect receiving waters from pollution and minimise the risk of flooding and other environmental damage in watercourses.

SUR 2: Flood Risk
Available Credits:2
Aim: To promote housing development in low flood risk areas, or to take measures to reduce the impact of flooding on houses built in areas with a medium or high risk of flooding.

Waste

WAS 1: Storage of non-recyclable waste and recyclable household waste
Available Credits:4
Aim: To promote resource efficiency via the effective and appropriate management of construction site waste.

WAS 2: Construction Site Waste Management
Available Credits:3
Aim: To promote resource efficiency via the effective and appropriate management of construction site waste.

WAS 3: Composting
Available Credits:1
Aim: To promote the provision of compost facilities to reduce the amount of household waste send to landfill.

Pollution

POL 1: Global Warming Potential of Insulants
Available Credits:1
Aim: To promote the reduction of emissions of gases with high GWP associated with the manufacture, installation, use and disposal of foamed thermal and acoustic insulating materials.

POL 2:NOx Emissions
Available Credits:3
Aim: To promote the reduction of nitrogen oxide (NOX) emissions into the atmosphere.

Health & Wellbeing

HEA 1: Daylighting
Available Credits:3
Aim: To promote good daylighting and thereby improve quality of life and reduce the need for energy to light the home.

HEA 2: Sound Insulation
Available Credits:4
Aim: To promote the provision of improved sound insulation to reduce the likelihood of noise complaints from neighbours.

HEA 3: Private Space
Available Credits:1
Aim: To improve quality of life by promoting the provision of an inclusive outdoor space which is at least partially private.

HEA 4: Lifetime Homes
Available Credits:4
Aim: To encourage the construction of homes that are accessible and easily adaptable to meet the changing needs of current and future occupants.

Code for Sustainable Homes
Pre-Assessment Report (Report Reference: 4 North End Road)

Management

MAN 1: Home User Guide
Available Credits:3
Aim: To promote the provision of guidance enabling occupants to understand and operate their home efficiently and make the best use of local facilities.

MAN 2: Considerate Constructors Scheme
Available Credits:3
Aim: To promote the environmentally and socially considerate, and accountable management of construction sites.

MAN 3: Construction Site Impacts
Available Credits:2
Aim: To promote construction sites managed in a manner that mitigates environmental impacts.

MAN 4: Security
Available Credits:2
Aim: To promote the design of developments where people feel safe and secure- where crime and disorder, or the fear of crime, does not undermine quality of life or community cohesion.

Ecology

ECO 1: Ecological value of site
Available Credits:1
Aim: To promote development on land that already has a limited value to wildlife, and discourage the development of ecologically valuable sites.

ECO 2: Ecological enhancement
Available Credits:1
Aim: To enhance the ecological value of a site.

ECO 3: Protection of ecological features
Available Credits:1
Aim: To promote the protection of existing ecological features from substantial damage during the clearing of the site and the completion of construction works.

ECO 4: Change in ecological value of site
Available Credits:4
Aim: To minimise reductions and promote an improvement in ecological value.

ECO 5: Building footprint
Available Credits:2
Aim: To promote the most efficient use of a building's footprint by ensuring that land and material use is optimised across the development.

The weighting factors used in the Code have been derived from extensive studies involving a wide range of stakeholders who were asked to rank (in order of importance) a range of environmental impacts. Stakeholders included international experts and industry representatives.

It is also important to note that achieving a high performance in one category of environmental impact can sometimes result in a lower level of performance for another. For instance, if biomass is used to meet heating demands, credits will be available for performance in respect of energy supplied from a renewable source, but credits cannot be awarded for low NOX emission. It is therefore impossible to achieve a total percentage points score of 100.

The Code uses a rating system of one to six stars. A star is awarded for each level achieved. Where an assessment has taken place by where no rating is achieved, the certificate states that zero stars have been awarded:

Code Levels	Total Points Score (Equal to or Greater Than)
Level 1 ★☆☆☆☆☆	36 Points
Level 2 ★★☆☆☆☆	48 Points
Level 3 ★★★☆☆☆	57 Points
Level 4 ★★★★☆☆	68 Points
Level 5 ★★★★★☆	84 Points
Level 6 ★★★★★★	90 Points

Formal assessment of dwellings using the Code for Sustainable Homes may only be carried out using Certified assessors, who are qualified ‘competent persons’ for the purpose of carrying out Code assessments.

Energy & CO2 Emissions
ENE 1: Dwelling Emission Rate **Available Credits:**10 **Aim:**To limit CO2 emissions arising from the operation of a dwelling and its services in line with current policy on the future direction of regulations.
ENE 2: Fabric Energy Efficiency **Available Credits:**9 **Aim:**To improve fabric energy efficiency performance thus future-proofing reductions in CO2 for the life of the dwelling.
ENE 3: Energy Display Device **Available Credits:**2 **Aim:**To promote the specification of equipment to display energy consumption data, thus empowering dwelling occupants to reduce energy use.
ENE 4: Drying Space **Available Credits:**1 **Aim:**To promote a reduced energy means of drying clothes.
ENE 5: Energy Labelled White Goods **Available Credits:**2 **Aim:**To promote the provision or purchase of energy efficient white goods, thus reducing the CO2 emissions from appliance use in the dwelling.
ENE 6: External Lighting **Available Credits:**2 **Aim:**To promote the provision of energy efficient external lighting, thus reducing CO2 emissions associated with the dwelling.
ENE 7: Low or Zero Carbon Technologies **Available Credits:**2 **Aim:**To limit CO2 emissions and running costs arising from the operation of a dwelling and its services by encouraging the specification of low and zero carbon energy sources to supply a significant proportion of energy demand.
ENE 8: Cycle Storage **Available Credits:**2 **Aim:**To promote the wider use of bicycles as transport by providing adequate and secure cycle storage facilities, thus reducing the need for short car journeys and the associated CO2 emissions.
ENE 9: Home Office **Available Credits:**1 **Aim:**To promote working from home by providing occupants with the necessary space and services thus reducing the need to commute.

Water
WAT 1: Indoor Water Use **Available Credits:**5 **Aim:**To reduce the consumption of potable water in the home from all sources, including borehole well water, through the use of water efficient fittings, appliances and water recycling systems.
WAT 2: External Water Use **Available Credits:**1 **Aim:**To promote the recycling of rainwater and reduce the amount of mains potable water used for external water uses.

Materials
MAT 1: Environmental Impact of Materials **Available Credits:**15 **Aim:**To specify materials with lower environmental impacts over their life-cycle.
MAT 2: Responsible Sourcing of Materials - Basic Building Elements **Available Credits:**6 **Aim:**To promote the specification of responsibly sourced materials for the basic building elements.
MAT 3: Responsible Sourcing of Materials - Finishing Elements **Available Credits:**3 **Aim:**To promote the specification of responsibly sourced materials for the finishing elements.

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