ENERGY STATEMENT

FOR

13 + 13A West Hampstead Mews
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ENERGY STATEMENT

1.0 EXECUTIVE SUMMARY

This Report has been produced by Johns Slater and Haward in response to Condition 12 of the London Borough of Camden. Full Planning Permission dated 4th April 2014. Ref 2014/1182/P

To meet the planning requirement and achieve compliance under Part L of the Building Regulations 2010 the energy strategy for 13 + 13A West Hampstead Mews should demonstrate:

i. a reduction in carbon dioxide emmisions of 20% from on-site renewable energy generation.

This Report demonstrates that the strategy proposed for 13 + 13A West Hampstead Mews can not practically meet the required CO_2 emmissions reduction target by renewable sources due to the constraints of the site and the existing building that is to be converted to a dwelling.

Due to the lack of available roof, PV cells and solar thermal solutions are physically not practical.

The dwelling is not suitable for micro CHP and wind is not appropriate.

ASHP appears a suitable solution for both the commercial element and the domestic element.

In accordance with the London Plan toolkit the reduction in CO_2 emissions have been estimated as 21%.

By utilising ASHPs to provide the energy for the residential and commercial elements, an on-site renewable energy contribution of 28% can be demonstrated.

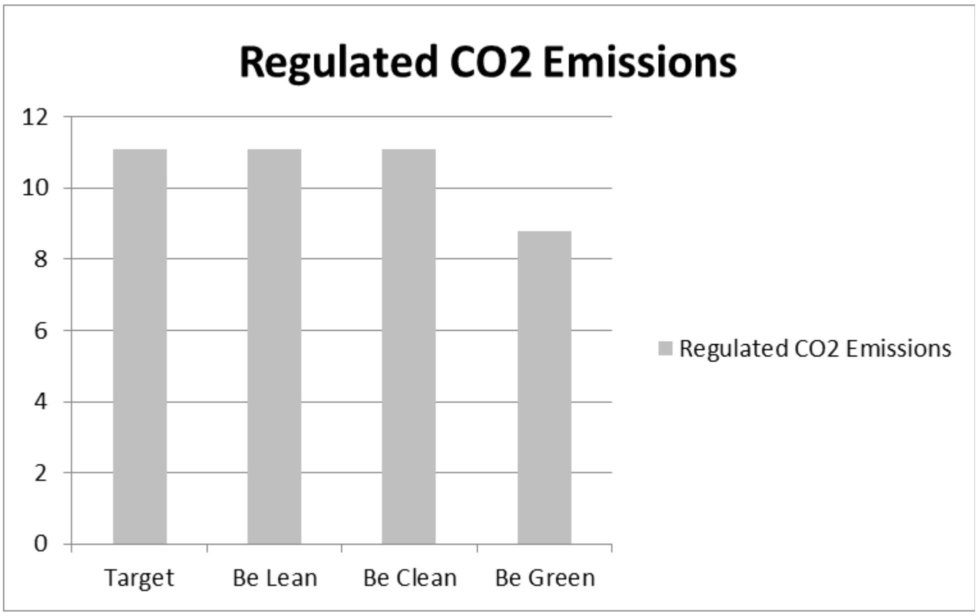


Fig. 1 - Carbon Dioxide Emissions after each stage of the Energy Hierarchy as proposed by Johns Slater and Haward.

	Carbon dioxide emissions (Tonnes CO_2 per annum)	
	Regulated	Unregulated
Baseline: Part L of the Building Regulations Compliant Development	11.1	7.82
After energy demand reduction	11.1	7.82

After CHP	11.1	7.82
After renewable energy	8.8	7.82

Table 1 – CO_2 Emissions Summary

	Regulated Carbon dioxide savings	
	(Tonnes CO_2 per annum)	
Savings from energy demand reduction	0	0
Savings from CHP	0	0
Savings from renewable energy	2.3	21%
Total Cumulative Savings	**2.3**	**21%**
Total Target Savings	3.89	35%

Table 2 - CO_2 Savings

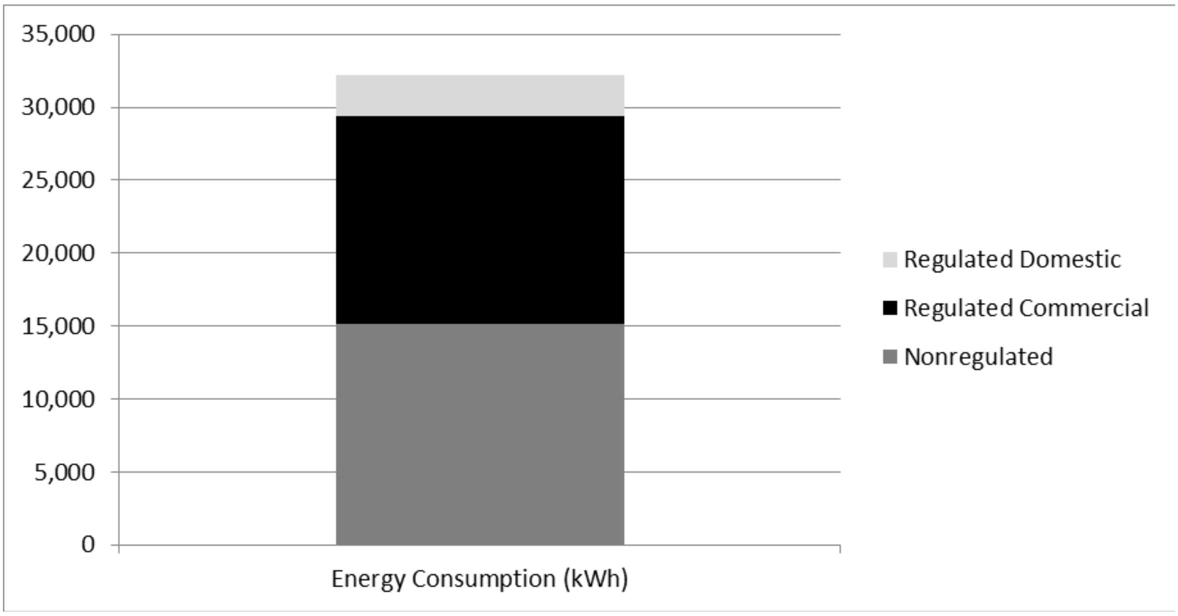


Fig. 2 - Energy Consumption for Baseline Building Total kWh per annum

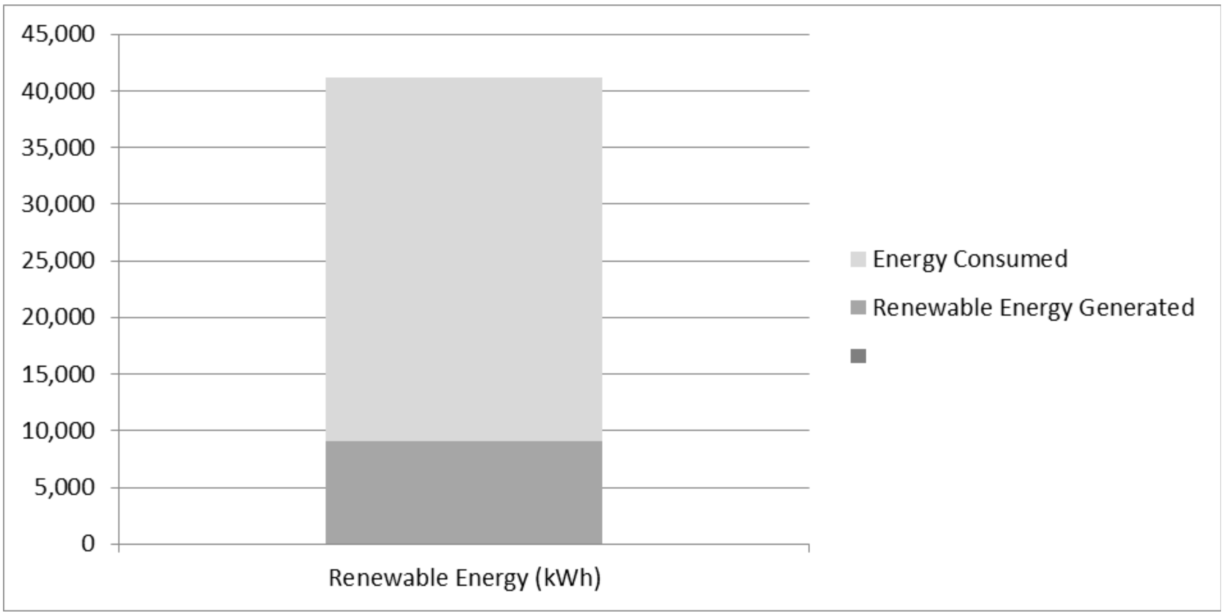


Fig. 3 - Renewable Energy Generation kWh Per Annum

2.0 INTRODUCTION

2.1 About Us

Johns Slater and Haward are Building Services Consultants with expertise in Mechanical and Electrical installations for buildings with particular emphasis on energy installations. Johns Slater and Haward are accredited CIBSE Low Carbon Consultants.

2.2 The Development

The development at 13+ 13A West Hampstead Mews compises the conversion and refurbishment of an existing 2 story building fronting the road into a 2 bedroom house with attic space. The rear of the site which formerly was used as a vehicle workshop is to be rebuilt as new to provide office accomodation on ground, first and second floor

2.3 The Criteria

Clause 12 of the Full Planning permission granted by Camden Regeneration and Planning Development Management ref 2014/1182/P dated 4th April 2014 states:

'Before the development commences, an energy statement shall be submitted to the Council specifying how the proposed development follows the steps of the energy hierarchy and minimises its energy needs during both construction and occupation'

This Report outlines the expected energy performance of the residential and commercial elements of the development and the energy efficient measures that will be adopted.

It demonstrates how the development fulfils the relevant energy policies of the Camden Council

This Report also addresses the relevant energy policies contained within the London Plan:

- Policy 5.2 - Minimising Carbon Dioxide Emissions
- Policy 5.3 - Sustainable Design and Construction
- Policy 5.5 - Decentralised Energy Networks

- Policy 5.6 – Decentralised Energy in Development Proposals
- Policy 5.7 – Renewable Energy where feasible

The methodology employed to determine the potential CO_2 savings for this development is in accordance with the three step Energy Hierarchy outlined in the London Plan and Camden Council's Planning Guidance on Sustainability CPG 3 September 2013:

- **Be Lean** – uses less energy - improve the energy efficiency of the scheme
- **Be Clean** – use energy efficiently - supply as much of the remaining energy requirement efficiently using district networks or site wide networks and technology such as combined heat and power (CHP)
- **Be Green** – use renewable energy - offset a proportion of the remaining carbon dioxide emission by using renewable technologies.

Policy SC2.3 Passive Solar Design Maximising the efficient use of energy through passive solar design.

European Directive 2009/28/EC of 23rd April 2009 includes energy generated from 'aerothermal' sources, i.e. Air Source Heat Pumps (ASHP) as renewable energy technology.

It is noted that Camden Council's Planning Guidance on sustainability CPG 3 includes Air Source Heat Pumps (ASHP) as renewable energy technology.

It should be noted that the April 2014 Greater London Authority guidance on preparing energy assessments Clause 9.2 states:

> "Detailed requirements for different types of renewable energy
>
> Appendix 3 provides further guidance in relation to particular types of renewable energy systems. Where a particular type of renewable energy system is proposed, the relevant section should be consulted and required information provided as part of the energy assessment.
>
> For the avoidance of doubt, heat pumps are categorised under this third and final element of the energy hierarchy (not the first element, 'be lean')".

2.4 Basis of Report

The residential unit has been assessed using SAP calculated by Elmhurst Energy Systems Software.

Full SAP worksheets for the residential unit are included in Appendix 1 of this Report.

The figures obtained from the completed SAP) have been used to generate the figures in this Report.

The commercial element of the building has been thermally modelled using dynamic software developed by TAS and incorporating standard weather data to provide thermal loads.

The resulting BRUKL output document is included in Appendix 2 of this report.

The following technologies have been appraised, in terms of technical, physical and financial feasibility, as potential low and zero carbon (LZC) systems for use on the Project:

- Gas fired combined heat and power (CHP)
- Photovoltaics
- Solar Thermal

- Air Source Heat Pumps (ASHP)
- Ground Source Heat Pumps
- Biomass CHP
- Biomass heating systems
- Wind turbines

3.0 BASELINE CALCULATIONS

For the purpose of this study the energy consumption and carbon dioxide emissions for the development have been estimated for different parts of the development using both preliminary design stage SAP calculation and preliminary SBEM calculations.

The baseline energy requirements (commercial) will be compliant with Part L2 2013. The baseline for the residential part is not compliant as it is an existing dwelling. We have however taken the residential baseline as gas fired boilers and the default air permeability ($15m^3/hr.m^2$).

Notional	KWh/yr	Tonnes/CO_2/yr
Domestic Regulated Energy Use		
Total	11,269	3,730
Non Domestic Regulated Energy Use		
Offices	14,256	7,370
Regulated Energy Use		
Total	25,525	11,100

Table 3 – Total Regulated Energy Use and CO_2 Emissions Baseline Building

4.0 DEMAND REDUCTION

4.1 Passive Design Measures

The development has been conceived initially to comply with Building Regulations Approved Document L. To meet the Regulations, the building has been optimised before any low or zero carbon (LZC) technologies are considered.

In optimising the proposal's energy efficiency at the outset, the benefits of any additional LZC technologies could also be fully recognised, rather than used to mask an otherwise low quality and energy intensive proposal. Further, the relatively low cost uplift in improving the basic build specification will reduce the requirement placed on any proposed LZC technology. As such, a generally superior benchmark construction would allow smaller installatons of particular technologies to be considered, making them inherently more economically viable.

4.1.1 General

The following passive design measures will be considered for incorporation into the scheme design to limit the building's baseline energy consumption.

- Façade treatment/solar shading

- Thermal mass/thermal insulation
- Passive solar heating
- Measures to maximise natural daylighting

Whilst every measure that can be incorporated, within the normal commerical constraints, to minimise the effect of the solar gain it is not practically possible to totally prevent the solar gain from affecting the internal environment adversly with higher temperatures than would be normally comfortable.

4.1.2 Enhanced Building Fabric

The heat loss of different building elements is dependant upon their U value. A building with low U values provides better levels of insulation and reduced heating demand during the cooler months.

The proposed development at West Hampstead Mews will incorporate high levels of insulation and high performance glazing where possible to reduce the demand for space heating.

4.1.3 U values (W/m^2K)

The U value of most components will be better than the minimum required for compliance under Part L 2013 of the Building Regulations. Some elements do not meet compliance as the building is part existing.

4.1.4 Air Tightness

Heat loss also occurs due to air infiltration. Although this cannot be eliminated altogether good construction detailing and the use of best practice construction techniques can minimise the amount of air infiltration.

Previous Part L Building Regulations (2013) sets a maximum air permeability of $10m^3/m^2$ at 50Pa.

The West Hampstead Mews development is likely to improve upon this to achieve $8m^3/m^2/hr$ at 50Pa through the application of best practice construction techniques for the residential unit and $3m^3/m^2/hr$ at 50 Pa for the commercial unit.

By improving the air tightness the natural air infiltration is reduced..

4.1.5 Orientation and Site Layout

Passive solar gain reduces the amount of energy required for space heating during the winter months.

The site is a confined one with the proposed development occupying nearly all of the site.

There is therefore little that can be done to affect the orientation of the buildings which naturally utilise the full extent of the site.

4.1.6 Lighting

The development has been designed where possible to improve daylighting in habitable spaces as a way of improving the health and wellbeing of its occupants.

4.2 Active Design Measures

4.2.1 High Efficiency Lighting

The development intends to incorporate low energy lighting fittings throughout. All light fittings will be specified as low energy lighting and will accommodate compact fluorescent (CFLs), fluorescent luminaires or LED luminaires.

Internal areas which are not frequently used will be fitted with occupany sensors whereas daylight areas will be fitted with daylight sensors.

4.2.2 Controls

The development will include good, simple to use controls for heating/cooling and domestic hot water in all apartments by dedicated room thermostats and programmable time clocks.

4.2.3 Energy Efficient Plant

All central plant will incorporate variable speed motors and controls to minimize energy consumption and optimize efficiency.

5.0 ENERGY DEMAND (BE LEAN)

The first step addresses reductions in energy use through the adoption of sustainable design and construction measures.

In accordance with this strategy, the proposed development will incorporate a range of energy efficiency measures including levels of insulation exceeding current Building Regulations and the installation of high performance glazing for both the residential and commercial units. The implementation of these measures would potentially reduce regulated CO_2 emissions when compared to a notional building.

The dwelling energy and CO_2 figures for the buildings have been drawn from the preliminary SAP assessments together with information from preliminary SBEM assessement for the non-domestic areas of the building.

Lean measures are expected to achieve a regulated CO_2 emission over Part L Building Regulation (baseline).

Actual	KWh/yr	Tonnes/CO_2/yr
Domestic Regulated Energy Use		
Total	2,802.2	1,454.35
Non-Domestic Regulated Energy Use		
Total	14,256	7,370
Regulated Energy Use		
Total	17,058.20	8,824.35

Table 4 – Total Regulated Energy Use and CO_2 Emissions after Be Lean

6.0 HEATING AND COOLING INFRASTRUCTURE (BE CLEAN)

6.1 Energy System Hierarchy

The second strategy takes into account the efficient supply of energy by prioritising decentralised energy generation.

Local heat and power sources minimise distribution losses and achieve greater efficiencies when compared to individual energy systems, thus reducing CO_2 emissions.

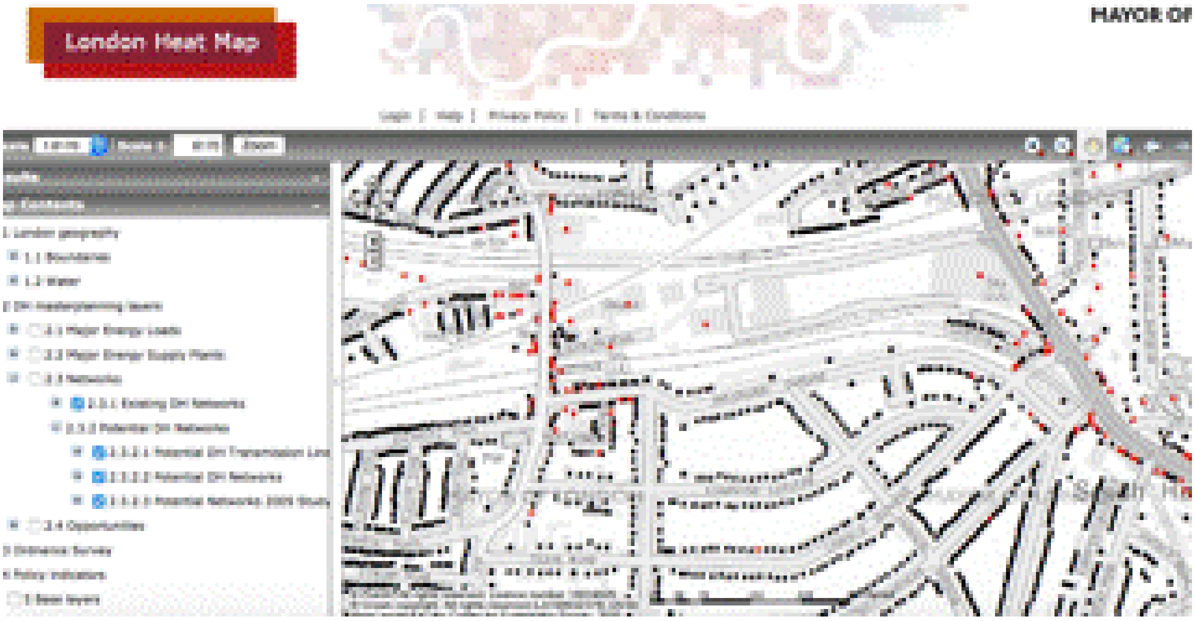
In accordance with the development at 13+13A West Hampstead Mews has been assesed in accordance with Section 5 of the Camden Planning Guidance on Sustainability CPG 3 with respect to Decentralised Energy have been determined in accordance with the following hierarchy as detailed in Fig 3 Decentralised Energy Flow Chart:

1. Is there a heat demand- YES
2. Is there an existing network in the vicinity- NO
3. Is there a network proposed in the next 3 years- NO
4. Can onsite CHP be provided- NO

6.2 Connnection to Existing Low Carbon Heat Distribution Networks

The London Heat Map identifies existing and potential opportunites for decentralised energy projects in London.

An excerpt from the London Heat Map below shows that there are district heating mains in the vicinity of the site.



It can be seen that the proposed development at 13+13A West Hampstead Mews is not in the vicinity of an existing Decentralised Energy network (1000m) or a proposed network within the next 3 years (500m)

6.3 Gas Fired Combined Heat and Power (CHP)

Combined heat and power (CHP), also known as cogeneration, is the generation of heat and power (usually electricity) at the same time.

In its simplest form a CHP system comprises a gas turbine, engine or steam turbine to drive an alternator. The resulting electricity is used primarily on site. The waste heat, in the form of steam or hot water, is collected and can be used to provide heat for industrial processes, for community heating and for space heating. It can also provide cooling using advanced absorption cooling technology. Not only does CHP enable the conversion of a high proportion of otherwise waste heat to usable heat, but it is very efficient because power is generated close to where it is being used (and thus electricity transmission lossed are minimised).

However, absorbtion cooling is significantly less efficient that cooling using compressor technology.

The predominate fuel used for CHP schemes is natural gas. Other fuels include oil, coal or even renewables (such as municipal and industrial waste, sewage gases, biogases, from anaerboic digestion, biodiesel, gasification, etc. and wood).

A total of around 70 – 80% (Gross Calorific Value) of the energy value of the gas is converted into heat, principally in the form of hot water which is used for space heating and domestic hot water, as in a normal central heating system. Between 10 – 25% is converted into electricity and the remainder(5 – 10%) is lost in the flue gases. This compares with a conventional gas central heating boiler where 85% of the energy in the gas in converted into heat and the remaining 15% is lost in the flue gases.

CHP or Cogeneration is the production of electricity and useful heat from a single plant, improving the overall energy conversion efficiency from between 25 – 35% to around 80%. For a wide range of buildings, CHP can offer an economical method of providing heat and power which is less environmentally harmful than conventional methods. However, the economic viability of CHP is dependant on a consistent demand for heat and power.

Within the residential environment electricity demand is relatively consistent throughout the year. However, the heat load is weighted to the winter months when there is a space heating demand. A CHP engine would therefore be sized to meet the hot water load of the building, which stays relatively consistent throughout the year.

Unfortunately to provide hot water in summer requires the continous circulation via hot water at 75ºC to provide local domestic hot water. These internal mains have both a significant energy loss and tend to lead to significant problems of overheating in internal corridors and also within the apartments.

It should be noted that the Greater London Authority guidance on preparing energy assessments April 2014 states:

> **"By way of general guidance, it is not expected that small purely residential developments (for example, less than 300 dwellings) include on-site CHP.** Due to the small landlord electricity supplies, CHP installed to meet the base heat load would require the export of electricity to the grid. It is recognised that the administrative burden of managing CHP electricity sales at this small scale, where energy service companies (ESCOs) are generally not active, is too great for operators of residential developments to bear. If CHP is installed but does not operate because arrangement for CHP electricity sales are not concluded, the projected CO_2 savings will not materialise".

The residential element of this scheme relates to only 1 dwelling.

If CHP is not suitable for small residential schemes it is even less suited to small commercial schemes since they have no base load as the hot water demand is minimal.

It is therefore concluded that gas fired CHP is a totally inappropriate solution for this development.

7.0 RENEWABLE ENERGY (BE GREEN)

7.1 General

The Report has so far assessed the Lean and Clean measures which are appropriate at West Hampstead Mews The Report has identified that the proposed development will benefit from a high performing building fabric.

The third step in the London Plan assesses the feasibility of on-site renewable energy (Green) once Lean and Clean measures have been taken into account.

A range of renewable technologies were assessed to determine the most suitable technology for this development. Details for each renewable technology are outlined in the following sections. These included:

- Photovoltaic Panels
- Solar Thermal
- Ground Source Heat Pumps (GSHP)

- Air Source Heat Pumps
- Biomass Heating
- Wind Turbines

In determining the most appropriate renewable technology for the site, the following factors were considered:

- CO_2 savings achieved
- the site constraints
- payback and maintenance costs
- any potential visual impacts

The analysis identified ASHP as the most suitable renewable technology for this development.

7.2 Photovoltaic Panels

Photovoltaic (PV) generates electricity from sunlight. Small scale PV modules are available as roof mounted panels, roof tiles and conservatory or atrium roof systems. A typical PV cell consists of two or more thin layers of semi-conducting material, which is most commonly silicone. The electrical charge is generated when the silicon is exposed to light and is conducted away by metal contacts as direct current (DC).

Although the electrical output from a single cell is small, when coupled together a useful electrical output can be achieved. Therefore, PV cells are connected together and encapsulated, usually behind glass, to form a module or panel and any number of modules can be connected together.

The PV system generates no greenhouse gases and save approximatley 325kg of CO_2 per year or about 8 tonnes over the system's lifetime – for each kWp. A typical 1.5 – 2kWp system will produce enough electricity to supply almost half of an average family's annual demand, assuming that the heating is fuelled by gas and that the house has no other energy efficiency savings.

Photovoltaics are potentially a suitable renewable technology for most projects since:

- the installation of photovoltaics is relatively simple when compared to other renewable technologies
- photovoltaics are less visually instrusive when compared to other technologies such as wind turbines

Assesment of both the roof of the dwelling and the commercial unit indicate that it is impractical to provide a PV array due to the form and shape of the roof.

PV panels are therefore considered inappropriate for this development.

7.3 Solar Thermal

Solar thermal is one of the most commonly installed form of solar renewable is use today. Solar water heating can typically provided almost all of a domestic dwelling's hot water requirements during the summer months and about 50% year round.

There are three main components for domestic hot water systems – solar panels, a heat transfer system (pump) and a hot water cylinder. The solar panels (collectors) are usually fitted to the roof and collect heat from the sun's radiation. This heat is used to raise the temperature of the household water and is delivered by the heat transfer system which takes the heated water to the hot water cylinder for storage until use.

Solar thermal arrays have similar requirements as PV arrays in terms of their orientation and inclination.

The most effective use of solar thermal arrays would be to orientate them to the south at an inclination of about 30º.

Solar thermal arrays are available as evacuated tubes and flat plate collectors. Evacuated tubes are more efficient, produce higher temperatures and are more suited to the UK climate in general when compared to flat plate collectors.

The installation of solar thermal would not achieve a significant CO_2 savings as demonstrated by the SAP. In addition, solar thermal requires additional plumbing and space for hot water storage and the collector which is not available in the dwelling.

The hot water load for the commercial element is too small for solar thermal to be viable.

Solar thermal is therefore not considered inappropriate for this development.

7.4 Ground Source Heat Pumps

A heat pump works against natural flows to move heat energy betweem environments with different temperatures. An example of a commonly known heat pump is a domestic refrigerator.

Where heat pumps are used for heating applications, heat is removed from the source (ambient air, water, soil or earth) and then discharged where the heat is needed. Where cooling is required, the reverse happens and heat is removed and discharged into air, water, soil or earth.

A heat pump absorbs energy from one source, upgrades it in the compressor and then delivers this higher-grade energy to the desired location. It is this ability to absorb surrounding energy that makes a heat pump a renewable energy device. Heat pumps of the size required by this site generally have a reverse cycle, in which they reject heat into the ground, air or water, thus providing a low level of cooling that could be incorporated with careful design.

Heat pump efficiency is measured by what is called the Coefficient of Performance (COP). The COP is a measure of the amount of energy delivered (in kW), divided by the amount of energy needed to run the compressor and pumps (also in kW).

A ground source heat pump, as the name implies, extracts energy from the ground and has a COP of around 4. The high COP is due to the stable temperature found within the ground.

Ground source heat pumps would deliver space heating through a low temperature efficient distribution such as underfloor heating.

Ground loops each 100m deep, would be required to meet the peak load. This would require a significant amount of space on site and increase the amount of construction time. In addition, the capital cost of installing these ground loops would be very high.

Ground loops need to be seperated by a sufficient distance to avoid problems of interference between boreholes.

GSHPs are therefore considered to be totally inappropriate for this development.

7.5 Air Source Heat Pumps

Air source heat pumps (ASHPs) employ the same technology as ground source heat pumps (GSHPs). However, instead of using heat exchangers buried in the ground, heat is extracted from the external ambient air.

An advantage of heat pumps is that they can be used to provide cooling as well as heating. Due to the high levels of thermal insulation provided to new buildings and the internal gains from the occupants, equipment such as computers and artificial lighting commercial areas used as offices will generally have a cooling requirement rather than a heating requirement.

ASHP's are considered appropriate for this development due to the renewable 'portion' of energy they supply, which meets the councils Carbon Dioxide reduction targets.

A high temperature heat pump giving a COP of 3.44 has been assumed for the residential part of the development due to the use of radiators as heat emitters in some rooms.

7.6 Biomass Heating

Biomass heating usually involves the use of commercial energy crops in the form of fast growing trees such as willow or poplar for woodchips or waste wood products such as sawdust, pallets or untreated recylced wood for pellets.

These fuels are burned in either pellet stoves or larger scale boilers to provide heating and/or water heating. Man has been producing energy from biomass for centuries, and in many parts of the world it is still the principle source of heat. However, modern technologies are far more efficient that open fires and an increasing range of fuels are now being utilized.

Biomass is often called 'bioenergy' or 'biofuels'. These biofuels are produced from organic materials, either directly from plants or indirectly from industrial, commercial, domestic or agricultural products.

A biomass system designed for this development would be fuelled by wood pellets which have a high energy content. Wood pellets require less volume of storage than other biomass fuels. Pellet boilers also required less maintenance and produce considerably less ash residue.

A biomass boiler could supply the space heating and hot water demand to a communal heating scheme.

A biomass system, however, would not be an appropriate low carbon technology for the site for the following reasons:

- There is insufficient space onsite to accommodate a biomass installation.
- the burning of wood pellets releases substanially more NO_2 emissions when compared to high condensing gas boilers. As the development is situated within an urban area, the installation of a biomass boiler would reduce the air quality in this area
- the storage and delivery of wood pellets would be difficult. Due to the very constricted nature of the site delivery of the fuel would be a substanial problem.
- pellets would need to be transported from other sites within the UK or abroad due to the lack of local pellet suppliers

The height of the flue to be taken to the top of the building with the corresponding high cost to ensure the products of combustion for the biomass boiler do not pollute the atmosphere to the detrimental effect on the residents and neighbours. The Clean Air Act prevents discharge of solid fuel flues in central London.

Whilst the use of biomass in the form of wood pellets is accepted as 'renewable' energy as trees can be planted to replace the trees that are used to make the pellets this is not always the case.

However, for a City centre site where the biomass will be obtained using commercial criteria (lowest price) it is highly unlikely that the origin of the timber is known or even traceable and extremely unlikely that any replacement planting of trees will be undertaken.

Indeed it is highly likely that the timber will have orginated from a distance, possibly abroad.

Accordingly, the associated energy use and CO_2 emissions due to the delivery of the fuel to the site will far exceed any theoretical considerations used to substaniate the use.

Biomass is therefore considered totally inappropriate for this development.

7.7 Wind Turbines

Wind turbines harness the wind to produce electrical power. The efficiency of a domestic system will depend on factors such as location and surrounding environment, and the electricity output is usually between 2.5 and 6kWs, but can be as low as 1kW. Calculating electricity generation from a wind turbine requires consideration of the characteristics of wind. Wind power is proportional to the cube of the wind's speed which mean that large changes in potential output can result from relatively minor increases in wind speed. Since wind speed increases with height, a typical wind turbine is mounted high on a mast or tower and a ideal location is on a smooth top hill with a flat, clear exposure and is free from obstructions such as buildings, forests or other large trees that can cause excessive turbulance.

Wind turbines were not considered appropriate for this development due to the low CO_2 savings achieved, the significant impact on the roof space and proximity of the adjacent buildings. The installation of wind turbines also has a significant visual impact on the building.

It is generally acknowledged that urban wind turbines do not, in practice, achieve anything like the theroretical output generated by desk top studies.

The use of wind turbines in urban locations can also generate problems related to noise, flicker and vibration.

There is insufficient space on the site for a wind turbine installation.

Wind turbines are therefore considered to be totally inappropriate for this development.

8.0 RENEWABLE ENERGY SUMMARY

The factors taken into account in determining the appropriate renewable technology for this Project included carbon reduction capability, renewable energy produced estimated capital cost, simple payback, lifetime, level of maintenance and level of impact on external appearance.

The feasibilty study demonstrates that ASHPs would be the most feasible option for the proposed development at West Hampstead Mews.

By using ASHP's on this development to heat the office, a saving of 707kgCO_2/annum can be saved by not using gas.

9.0 CONCLUSIONS

9.1 CO_2 Emissions

In line with the London Plan three step energy hierarchy, the regulated CO_2 emissions for the development at West Hampstead Mews have been reduced once energy efficiency measures and on-site renewable energy generation are taken into account.

i. Be Lean - use less energy

In accordance with this strategy, the development will incorporate a range of energy efficient measures including levels of insulation exceeding Building Regulations, efficient light fittings and the installation of high performance glazing.

ii. Be Clean – supply energy efficiently

Both CHP and district systems have been considered for West Hampstead Mews and have both been rejected since they both use significantly more energy and the estimated CO_2 emissions are significantly better than if CHP were used and of the same order as using the district mains.

To impliment CHP or use the district systems would require a central heat network through the building using low temperature hot water which would cause the communal areas to overheat.

The West Hampstead Mews Development is below the recognised threshold applicable to CHP of 300 units.

iii. **Be Green – use renewable energy**

The feasibility study undertaken determined the most appropriate renewable technology for this development was the use of ASHPs.

ASHPs were considered to be best suited to this development due to:

- the amount of CO_2 savings achieved at 21% over the notional building
- the significant on site renewable energy generation at 28%
- The ease of installation compared to other renewable technologies

The solutions proposed by Johns Slater and Howard will ensure that a high quality internal environment will be provided for all the residents from renewable and efficient energy sources.

The figures show a significant CO_2 reduction in regulated emissions when compared to a baseline scheme). This illustrates that the Energy Strategy proposed for West Hampstead Mews achieves a significant CO_2 saving.

The total percentage saving in CO_2 emissions afforded by the 3 step hierarchy for West Hampstead Mews is estimated as 10%.

	Energy Element	Tonnes CO_2 emissions per annum	Comments
1.	Baseline Part L (2013) (Regulated)	11.1	Derived from target emission rates from both SAP and SBEM (regulated energy)
2.	**Domestic (Regulated)**	**1.454**	
3.	Offices	7.37	
4.	**Regulated Emissions Total (2+3)**	**8.8**	
5.	CO_2 savings	2.30	
6.	**Non Regulated Emissions Total**	**7.82 equipment**	
7.	**Total Building Emissions (4+6)**	**16.62**	
8.	Total Baseline CO_2 Emissions	11.1	Estimated for basic building
9.	20% Carbon Emissions Target	3.32	

Table 5 – CO_2 Emissions

9.2 On Site Renewable Generation

The use of ASHPs for the generation of heat for space heating will lead to a significant on-site renewables generation.

	Energy Element	KWh/y	Comments
1.	**Domestic (Dwelling) (Regulated)**	**2,802.2**	Based on SAP Data.
2.	Offices (Grd / 2nd)	14,256	Based on SBEM Data.
3.	**Regulated Energy Total (1+2)**	**17,058.20**	
4.	**Non Regulated Energy Total**	**15,123**	Refer to notes titled 'Non Regulated Energy'
5.	**Total Building Energy (3+4)**	**32,181.20**	
6.	10% Renewables Requirement	3,218.12	
7.	Renewable Energy Generated	9,025.09	Equates to 28% renewable energy contribution (Total energy) 3,570.00 kWh commercial 5,455.00 kWh residential

Table 6 – Renewable Energy

APPENDIX 1

13+13A WEST HAMPSTEAD MEWS

SAP WORKSHEET FOR RESIDENTIAL UNIT

APPENDIX 2

13+13A WEST HAMPSTEAD MEWS

BRUKL REPORTS FOR COMMERCIAL UNIT