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Energy Statement

Midland Crescent,
Finchley Road, Camden

On behalf of Stadium Capital Holdings

20/08/2014
Job Ref: 5171

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EXECUTIVE SUMMARY

I. This Energy Strategy has been prepared by Metropolis Green on behalf of Stadium Capital Holdings in support of the full planning application for the proposed residential development at Midland Crescent which will deliver flexible commercial space (use Classes A1/A2/A3/A4/B1/D1), 60 student bedrooms with associated communal kitchens, lounge and common areas, and 9 residential units.

II. The energy modelling demonstrates total regulated carbon emission reductions of 23.1% can be achieved for the proposed development. The development therefore falls short of meeting the London Plan Policy 5.2 requirements for a 35% regulated carbon emission reduction over Building Regulations Part L 2013. This is due to air quality issues which have meant that gas fired CHP is not suitable in this location and as such all carbon reductions are achieved through energy efficiency, and through maximising solar technologies at roof level.

III. The results of this energy strategy, in conjunction with the BREEAM 2014 pre-assessment, do however show that the development can achieve the required energy performance to ensure certification at the ‘Excellent’ level. Additionally, the Code pre-assessment indicates that the dwellings can achieve Code Level 4 in line with the London Borough of Camden’s DP22 Policy requirements.

IV. London Plan Policy 5.7 and Camden’s Planning Guidance CPG3 also target a 20% reduction in regulated carbon emissions through the specification of on-site renewable technologies. Site analysis has determined both photovoltaic (PV) panels and Solar Hot Water (SHW) panels to be the most effective renewable energy technologies at Midland Crescent. Due to site constraints however the full 20% target cannot be feasibly met. However, a significant 18.3% regulated carbon reduction has been shown to be achieved in this energy strategy through the application of onsite PV and SHW panels, contributing to overall 13.47 tCO_2/year reduction for the development.

V. As a part of the energy efficiency improvements all practical measures have been implemented to minimise the risk of overheating. SAP 2012 calculations have shown that the solar gain limits in summer have not been exceeded in the commercial or residential spaces.

VI. The achievements demonstrated in this report are the result of high fabric performance, in combination with a communal gas boiler arrangement for domestic hot water and space heating, along with roof mounted PV and Solar Thermal panels.

CONTENTS

1.0 INTRODUCTION

1.1 This Energy Strategy has been prepared to accompany the detailed planning application for the mixed-use development at Midland Crescent in the London Borough of Camden.

1.2 This report has been prepared in line with the London Plan, London Borough of Camden policy requirements, and follows the Energy Hierarchy: Be Lean, Be Clean, and Be Green. The report describes these policies, the calculation methodology used, and the measures taken to achieve policy requirements in the design of Midland Crescent. Appendix A of the report provides full details of national, regional, local policies and Building Regulations with regards to sustainability and energy conservation.

1.3 This Energy Strategy has considered the following key Planning Policies. Where these targets have not been met in full, justification has been provided:

- London Plan Policy 5.2 requirements to achieve a 40% regulation carbon reduction improvement on 2010 building regulations (London Plan Policy updated to require a 35% reduction after implementation of Part L 2013)
- Investigation of decentralised energy use on site, in line with London Plan Policy 5.6 and London Borough of Camden CS13.
- London Plan Policy 5.7 and London Borough of Camden Planning Guidance CPG3 requirements to achieve 20% carbon reduction through the specification of on-site renewable energy.
- London Borough of Camden Policy DP22 requirements for residential developments to achievement a minimum Code of Sustainable Homes Level 4 standard and non-residential development to achieve BREEAM certification at the 'Excellent' level.

1.4 In line with the Mayor's Energy Hierarchy Methodology this report assesses the energy efficiency measures of the proposed scheme and the low carbon options for supplying energy to the development before examining the potential for renewable energy technologies to reduce carbon emissions.

1.5 All energy and carbon figures have been calculated using approved Simplified Building Energy Modelling (SBEM) and Standard Assessment Procedure (SAP 2012) software, which are used to demonstrate compliance with Approved Documents L1A, L2A 2013 edition, BREEAM New Construction 2014 and Code for Sustainable Homes requirements, respectively.

1.6 Figures 1-4 below provide a summary of the 'Be Lean, Be Clean and Be Green' CO_2 reductions for the modelled solutions predicted for Midland Crescent. The results for the residential improvement over Building Regulations is presented in Figure 3 below and non-residential improvement is presented separately in Figure 4.

Figure 1 - Be Green –Regulated Carbon Emission Reductions

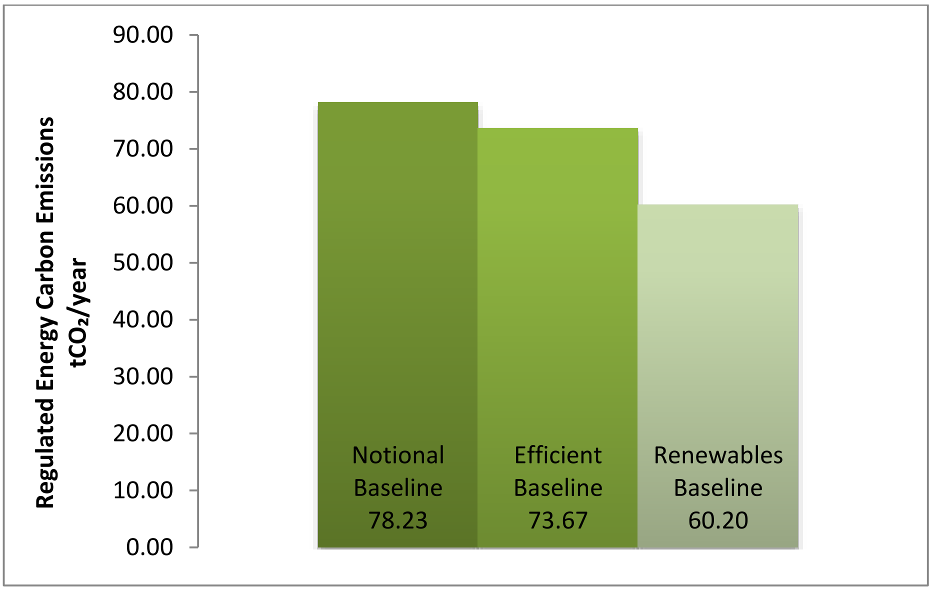


Figure 2: The Energy Hierarchy

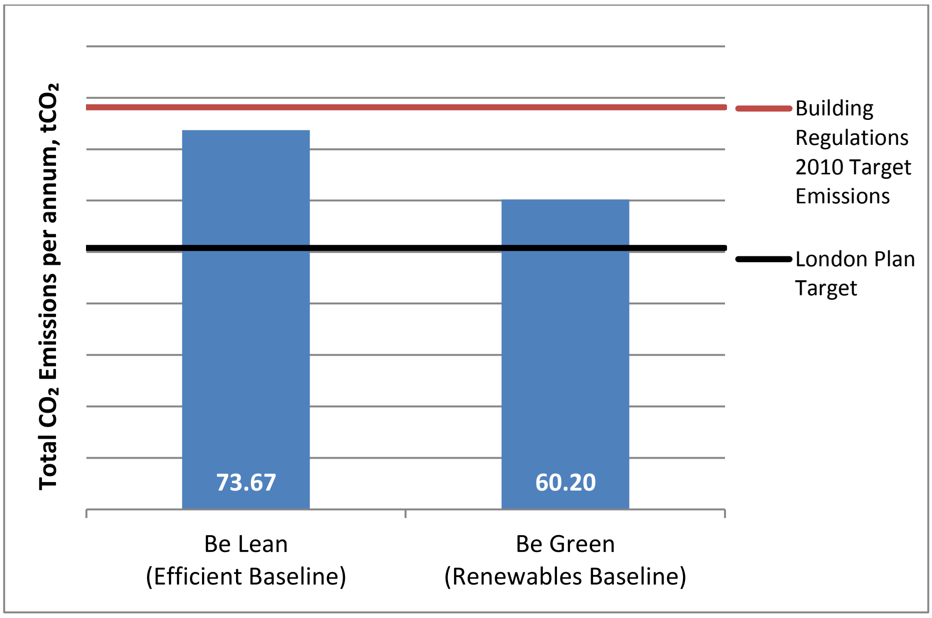


Figure 3: Residential, DER over TER improvement

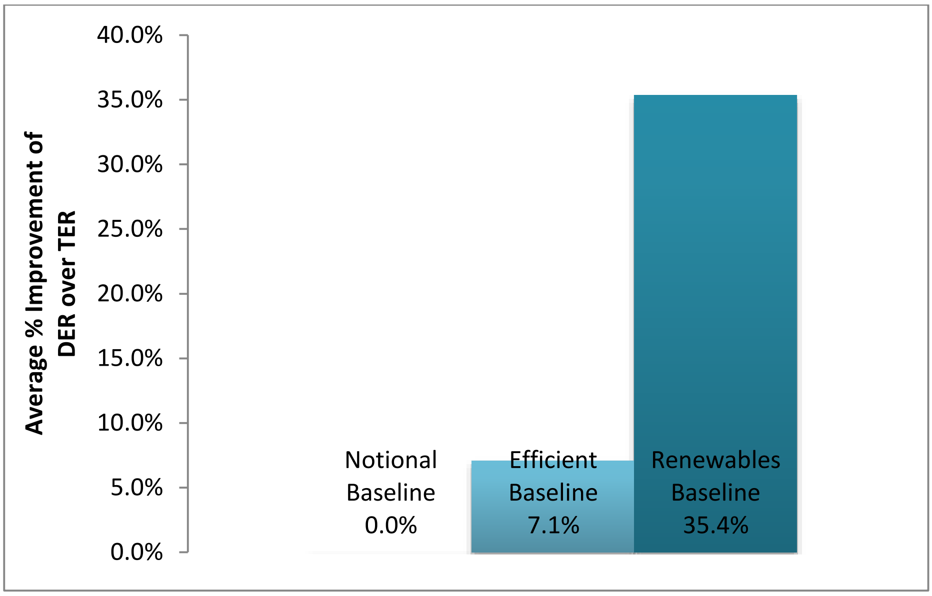
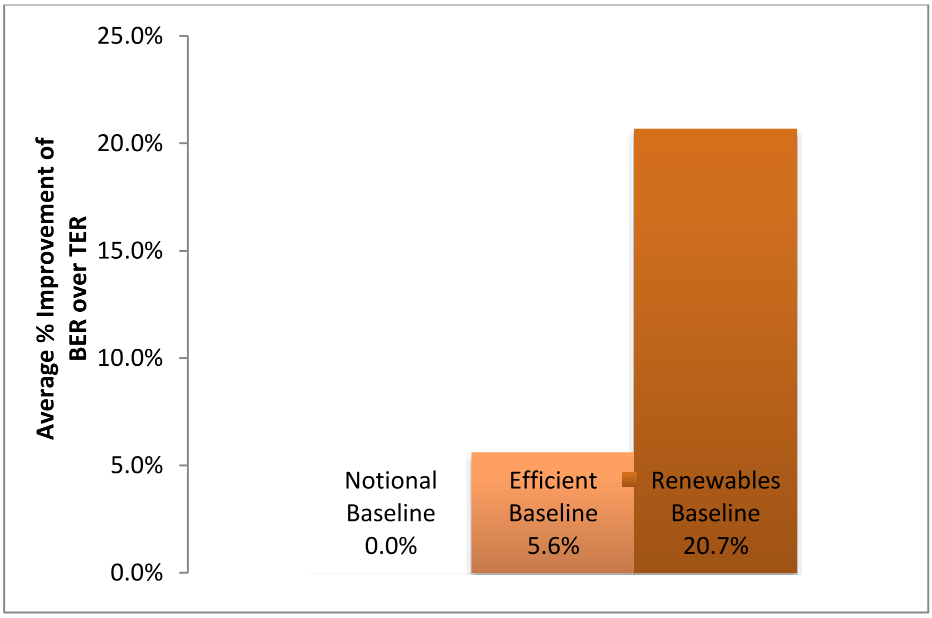


Figure 4: Non-Residential, BER over TER improvement



2.0 SITE AND PROPOSED DEVELOPMENT

2.1 Site and Surrounding Area

2.1.1 The subject site is located to the north of Regents Park on the Finchley Road (A41), a busy thoroughfare connecting Regents Park and west-end of London to the south with the A 406 North Circular road and M1 motorway to the north. See Figure 5 below for an aerial view showing the site location and approximate boundaries.

2.1.2 The site was first developed as the Finchley Road and St John Wood' station in 1868 but has remained as vacant brownfield land since 1980's, with all previous building demolished. The proposed Midland Crescent site is a previously designated site located within the West Hampstead Interchange Growth Area, recognised in the Camden Councils Core Strategy.

2.1.3 The site has a Public excellent Transport Accessibility Level (PTAL) rating of 6a, located in close proximity to a number of public transport facilities. Finchley Road Underground Station and Finchley Road and the Frognal Overground are located less than 3 minute walk of the site and provides frequent rail services. Local bus routes (13, 82, 113, 187, 268 and C11) operate near the site and provide services throughout London.

2.2 Proposed Development

2.2.1 The proposal application proposes a proposes a ground plus 4 storey building with a double level basement comprising:

- flexible commercial space (use Classes A1/A2/A3/A4/B1/D1 and D2) at lower basement and round ground floor levels,
- 60 student bedrooms with communal kitchen, lounge and common areas at upper basement to third floor levels, with communal kitchen, lounge and common room areas.
- 9 residential units, located in the first to fourth floors. A range of 1-3 bedrooms flats will be available, with a penthouse in the top level. Each flat will have its own balcony or terrace.

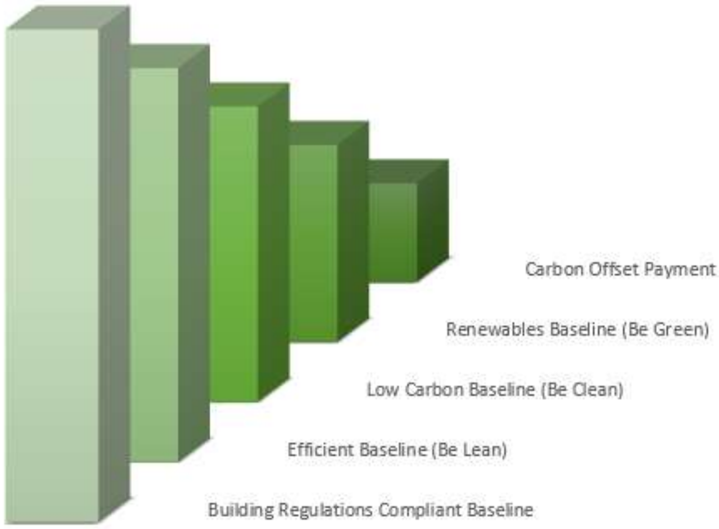
2.2.2 For more information regarding the design of the proposal, please refer to the drawings and the Design and Access Statement prepared by CZWG Architects LLP.

Figure 5 - Site Location Plan

3.0 METHODOLOGY

3.1 This document has been prepared in line with Energy Planning *GLA Guidance on preparing energy assessments (GLA, April 2014)*, and the methodology that has been applied is in line with the Mayor's energy hierarchy and national calculation methodologies. This is illustrated in Figure 6 below.

Figure 6: Energy Hierarchy



3.2 Please note that the calculations in this report are based on drawings and information provided pre-planning approval. These results are intended to provide initial assessment of the design to ensure that planning policies can be achieved at this site.

4.0 SITE ENERGY DEMAND AND NOTIONAL BASELINE

4.1 The London Plan promotes a 'regulated' energy approach to calculating the energy demand and carbon baseline of development. The baseline therefore includes the energy consumed in the operation of the space heating/cooling and hot water systems, ventilation, all internal lighting, and, reported separately is the energy demand and carbon dioxide emissions from cooking and all electrical appliances that are not covered by the Building Regulations, also called 'unregulated' energy.

4.2 The Notional Baseline for the Midland Crescent development has been modelled to comply with the current 2013 Building Regulations and the energy and carbon data has been determined using approved SAP and SBEM software.

4.3 Table 1 below provides the breakdown of the Notional Baseline results for the Midland Crescent development. Full detailed results providing the breakdown of the Notional Baseline can be found in Appendix C of this report.

Table 1 - Predicted Notional Baseline

Notional Baseline	
Regulated Carbon Emissions t/CO_2/yr	**78.23**
Un-Regulated Carbon Emssions t/CO_2/yr	**46.76**

5.0 ENERGY EFFICIENCY

5.1 The first stage in the energy hierarchy is to assess the energy performance of the building based on fabric and services improvements.

5.2 Metropolis Green have worked with CZWG Architects to determine the most efficient and feasible way to reduce the carbon emissions of the development through passive design measures. This strategy focusses on a high efficiency fabric performance specification.

5.3 Efficiency measures are considered to be the most sustainable approach to take in building design as the measures designed into the fabric of the building and the related carbon reductions will last the lifetime of the building and will outlast those of any renewables installed.

5.4 Minimising heat loss from the building fabric to avoid wasted energy is essential. Heat loss through walls, windows and surface areas of the building must be significantly lower than Building Regulations recommended values, requiring specification of building fabric with very low u-values. Heat loss through thermal bridges, where the continuity of insulation and/or the building envelope is broken, can be minimised through excellent workmanship and careful design, removal of unnecessary structural elements or insulation of structural elements.

5.5 Passive design measures such as building orientation, fabric performance, air tightness and natural ventilation will be optimised within the building to prevent overheating and avoid excessive requirements for heating and cooling.

Energy Efficiency Measures

5.6 The thermal performance of the building fabric for this baseline is significantly better than the limiting parameters of Building Regulations Part L, improving overall fabric efficiency and reducing carbon emissions for the residential and commercial parts of the development for the lifetime of the building.

5.7 Thermal bridging will be minimised in accordance with Accredited Construction Details and air permeability of 5 $m^3/hour/m^2$@50Pa and 3 m3/hour/m^2@50Pa to be achieved in non-residential and residential area respectively.

5.8 Further energy efficiency measures include utilizing 95% efficient communal gas boilers to provide space heating and hot water generation during peak demand, along with energy saving heating control measures such as time and temperature zone control.

5.9 Ventilation throughout the building will include mechanical ventilation with heat recovery (MVHR) to ensure adequate levels of ventilation and to contribute to maintaining thermal comfort levels, further improving energy efficiency.

5.10 The proposed system for providing comfort cooling to the commercial areas is highly efficient roof mounted Air Source Heat Pump (ASHP), indoor fan coil units and associated circulation pipe runs.

5.11 The design team have committed to exceeding the minimum low energy lighting requirements outlined in the Domestic and Non-Domestic Building Services Compliance Guide, with 100% low energy lighting for the residential spaces and low energy lighting with a luminous efficacy of 90lm/W for the non-residential spaces.

5.12 As a result of the above measures and improvements, a new energy baseline has been calculated and is referred to as the Efficient Baseline, completing the first stage of the energy hierarchy, to be lean and use energy efficiently. A summary of the Efficient Baseline, u-values and input parameters can be found in Table 8 of Section 9.0 of this report.

5.13 Further carbon reductions measures, such as application of the low and zero carbon technologies will be investigated in the following chapters of the report.

Energy and CO_2 Reductions

5.14 The predicted regulated carbon emission reduction for the whole development delivered through the efficiency measures detailed above equates to 5.8%, with a reduction of 4.56 tCO_2/year.

5.15 Based on SAP calculations, improvements in the residential obtains a 7.1% improvement of DER over TER as illustrated in Figure 7 below.

5.16 SBEM calculations show a 5.6% improvement of BER over TER for the commercial part of the development as illustrated in Figure 8 below.

5.17 Table 2 below sets out energy and carbon emission results for the Efficient Baseline.

Table 2 - Efficient Baseline Energy and Carbon Emissions

Efficient Baseline	
Regulated Carbon Emissions tCO_2/yr	**73.67**
Un-Reg Carbon Emissions tCO_2/yr	**46.76**
% Improvement over Notional Baseline	**5.8%**

Figure 7 - Be Lean – Predicted Efficient Baseline, Regulated Carbon Emissions

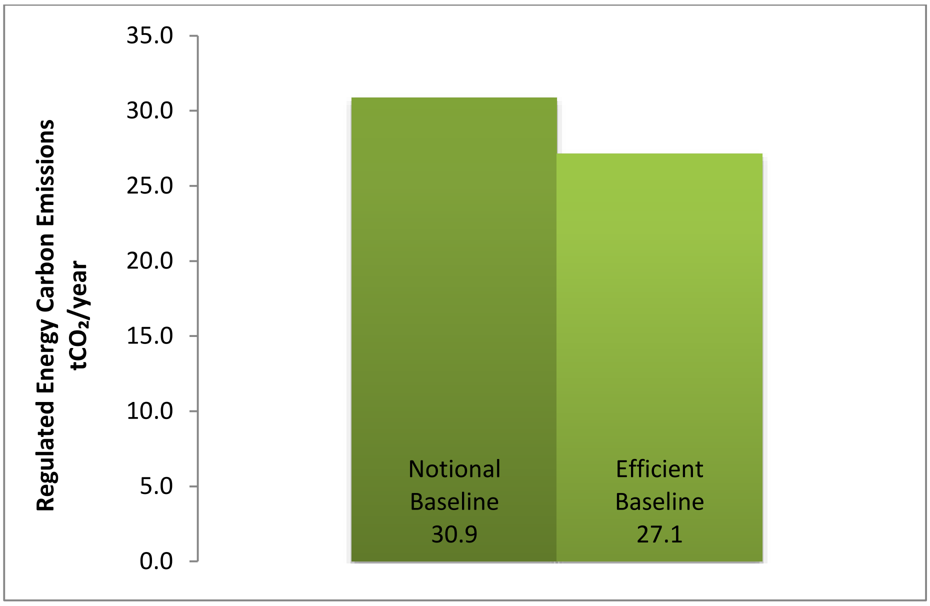


Figure 8: Residential Efficient Baseline DER over TER Improvement

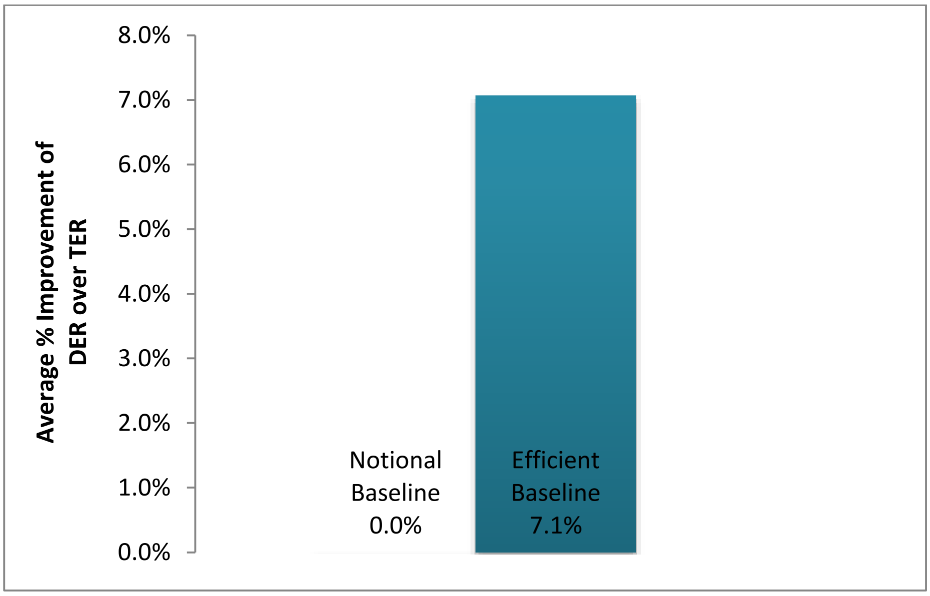
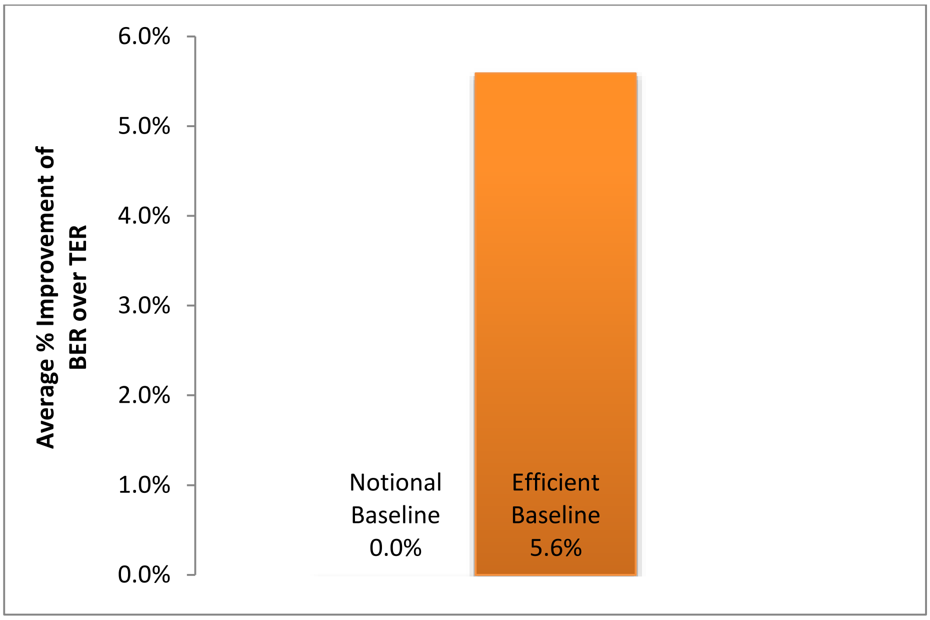


Figure 9: Non-Residential Efficient Baseline BER over TER Improvement



6.0 OVERHEATING AND COOLING

6.1 Through the application of passive design and low energy measures the design team have worked to ensure that the risk of summer overheating and reliance on mechanical cooling is minimised in line with the ‘cooling hierarchy’, London Plan Policy 5.9 and London Borough of Camden DP22.

6.2 The orientation of the building is constrained by the site location, neighbouring buildings and street orientation. Although, careful design along with low u-value glazing allows for a balance between beneficial solar gain and possible overheating.

6.3 Good natural day lighting within the development at Midland Crescent will create significant benefits in terms of reduced electrical use for lighting, solar gains to reduce winter heating consumption and a healthier, more pleasant environment.

6.4 Internal heat generation due to solar gain has been minimised through energy efficient design, reducing the building summer overheating risk. A combination of high levels of fabric performance and insulation has been implemented, resulting in low u-values.

6.5 Due to the location of the site and the impact of noise and air pollution, (as set out in the Local Air Quality Assessment produced in support of the application by Ramboll), windows will not be openable and passive ventilation cannot be provided to either the commercial spaces or the accommodation units.

6.6 Mechanical ventilation via MVHR with 70% efficiency and a specific fan power (SFP) of 0.7 W/l.s or lower, will be specified for improved energy and thermal comfort. Air intakes will be taken from the roof of the development, away from the main road in order to avoid high concentration of pollutants.

6.7 Cooling to the commercial spaces is provided via a highly efficient ASHP with a cooling seasonal energy efficiency rating (SEER) of 5.5 to ensure thermal comfort.

6.8 Suitable areas of the roof are to be biodiverse areas which contribute to natural cooling by reducing the surface temperature of the building, and surrounding air temperature through evaporation and transpiration. Furthermore, PV arrays are compatible with bio-diverse roofs and there are a range of PV fixing/mounting systems that can selected at the detailed design stage.

6.9 Initial analysis using SBEM software shows that the solar gain limit in summer have not been exceeded for the commercial spaces. SAP Appendix P, Assessment of Internal Temperature in Summer, for the residential spaces shows that the threshold of internal mean temperatures has not been exceeded on the hottest summer days. Therefore all dwellings on site satisfy Criterion 3 requirements of Building Regulations Part L.

7.0 COMMUNAL HEATING, COMBINED HEAT & POWER

7.1 The second stage in the Mayor's energy hierarchy is to investigate the application of CHP to produce energy more efficiently with the aim of reducing the carbon baseline further.

7.2 The Mayor requires that all new developments consider CHP, a decentralised energy generation technology, before renewables are applied to the site. Building up a network of mini-power stations that are far more efficient than traditional centralised power stations is an important part of the Mayor's overall strategy to move London towards its long term carbon reduction targets.

7.3 CHP is an engine which produces electricity. The process of creating the electricity produces heat as a by-product. Heat can be easily stored in a thermal storage tank and distributed across the site to provide for hot water and heating demands.

7.4 The Mayor's energy hierarchy and the London Plan Policy 5.6 require all major developments to demonstrate that the proposed energy systems have been selected in accordance with the following hierarchy:

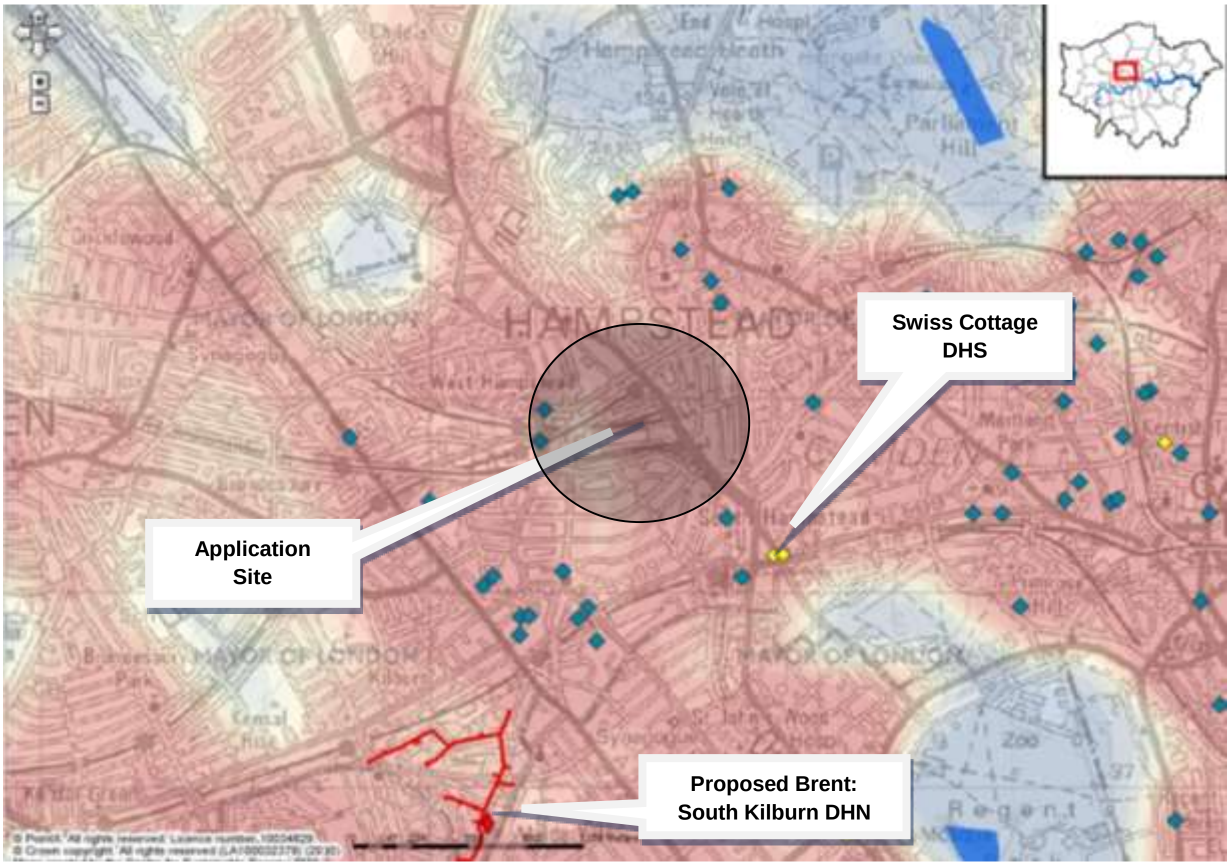
- Connection to existing heating or cooling networks
- Site wide CHP network
- Communal heating and cooling.

Local Connection

7.5 An investigation of the area was undertaken using the London Heat Map tool to determine opportunities to connect to existing heat infrastructure. Research has concluded that there is not currently any opportunity to connect to a local heat network or CHP.

7.6 Investigation into existing heat networks in the area using the London Heat Map have shown that there are not any functioning CHP installations and local heat networks within a 1000m radius of the site (as indicated by the shaded area in Figure 10). The nearest functioning CHP installation is located at Swiss Cottage DHS, in excess of 1000m from the proposed development site. It has been determined that a connection to these facilities is not feasible. For a connection to be made, the heat network sites would need to have the capacity to supply the proposed development. It is considered unlikely that either installation would have the capacity to supply enough heat for the development. Additionally, the cost involved in the infrastructure works involved in connecting the sites would be extremely high. Issues involved would not only include the costs of the digging of roads and laying pipes but would also be disruptive to the local area. In Figure 10 below, CHP sites are donated by yellow diamonds, boiler studies by blue diamonds and proposed heat networks by red lines.

Figure 10 - London Heat Map Indicating CHP Sites and District Heat Networks



Feasibility

7.7 A communal CHP solution has been investigated and found not to be the optimal technology for the new development due to the impacts such a system would have local air quality.

7.8 Initial investigations regarding the possible incorporation of a CHP unit in to the design include screening modelling of emissions to air from the unit. Results of this exercise showed that a CHP would have adverse impact on air quality. CHP was therefore not included in the proposal. For further details please see the Local Air Quality Impact report produced by Ramboll in support of the planning application for the proposal.

7.9 It has been established that the specification of highly efficient individual gas boilers providing space heating and DHW together with the fabric improvements discussed in previous section delivers the optimal carbon reductions in the most cost effective way.

8.0 RENEWABLE ENERGY

8.1 The third stage of the energy hierarchy refers to the production of renewable energy, which relates to London Plan Policy 5.7 and London Borough of Camden CPG3.

8.2 Each of the approved renewable energy technologies have been appraised, examining the suitability to the site and potential for delivering CO_2 reductions. The general feasibility of the technologies which were discounted is discussed in Appendix B in order to determine the most suitable solution for the site.

8.3 London Plan approved renewable energy technologies include:

- Photovoltaics
- Solar Water systems
- Biomass Heating
- Ground Sourced Heating / Cooling
- Wind

8.4 The choice of technology will be dependent upon a range of factors including: orientation, height, window size, surrounding buildings and environment, site size and layout, geology, conservation and biodiversity.

8.5 Site analysis and calculations have shown that a combination of PV and SHW panels are the most suitable renewable energy technologies for the site; reducing the Renewables Baseline to 60.20 tCO_2/year by a predicted 13.47 tCO_2/year from the Efficient Baseline of 73.67 tCO_2/year.

8.6 The following section sets out the energy and carbon reductions achievable and the feasibility and applicability of the applications of PV and solar thermals to the proposal.

8.1.0 **Photovoltaics and Solar Thermal**

8.1.1 Photovoltaic systems convert solar energy directly into electricity through semiconductor cells. The panels generate electricity from both direct light and diffuse light. Photovoltaic panels can either be mounted external to the building or be integrated into the building cladding (known as Building Integrated Photovoltaic or BIPV).

8.1.2 Solar hot water heating systems harvest energy from the sun to heat water. The solar heating collectors are generally positioned on the roof of a buildings, they can also be wall mounted, although with reduced efficiency. A fluid within the panels, heats up by absorbing solar radiation. The fluid is then used to heat up domestic water which is stored in a separate water cylinder.

8.1.3 PV and Thermal panels are the most feasible option for this site, offering the greatest CO_2 reduction in the space available.

Energy and CO_2 Reduction

8.1.4 The available roof space has been investigated and found to have sufficient space for a total of 49 PV panels (78.4 m^2) and 20 Solar Thermal panels (28.30 m^2). The PV array has the potential to offset the electrical consumption of the development by a total of 13,598 kWh/year and the solar thermal panels to offset the hot water consumption by 2500 litres/year, lowering the carbon emissions of the development by 13.47 tCO_2/year from the Low Carbon Baseline.

8.1.5 Results of implementing the PV and SHW panels at Midland Crescent are summarised in Table 3 below. The proposed solution will deliver an overall 23.1% CO_2 reduction for the site as shown in Figure 11. The DER over TER improvement of the residential part of the development is 35.3% and is illustrated in Figure 12 below. For the commercial element of the development the BER over TER improvement is 20.7% and is illustrated in Figure 13 below.

8.1.6 The proposed PV and SHW array will deliver an 18.3% regulated carbon emission reduction for the site as shown in Figure 11. Therefore London Plan Policy 5.7 and Camden's CPG3 target for a 20% reduction in CO2 emissions have not been met due to site constraints and limited available roof space.

Table 3: Energy and Carbon Emissions with PV

Renewables Baseline	
Regulated Carbon Emissions tCO_2/yr	**60.20**
Un-Reg Carbon Emissions tCO_2/yr	**46.76**
% Improvement over Efficient Baseline	**18.3%**

Figure 11: Be Green – Predicted Renewables Baseline, Regulated Carbon Reduction

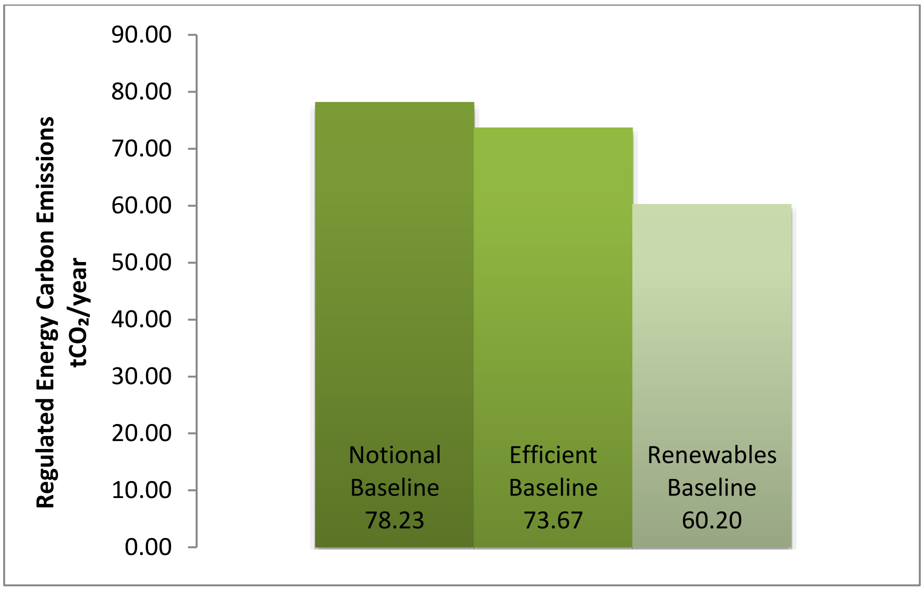


Figure 12: Residential DER over TER improvements of the development

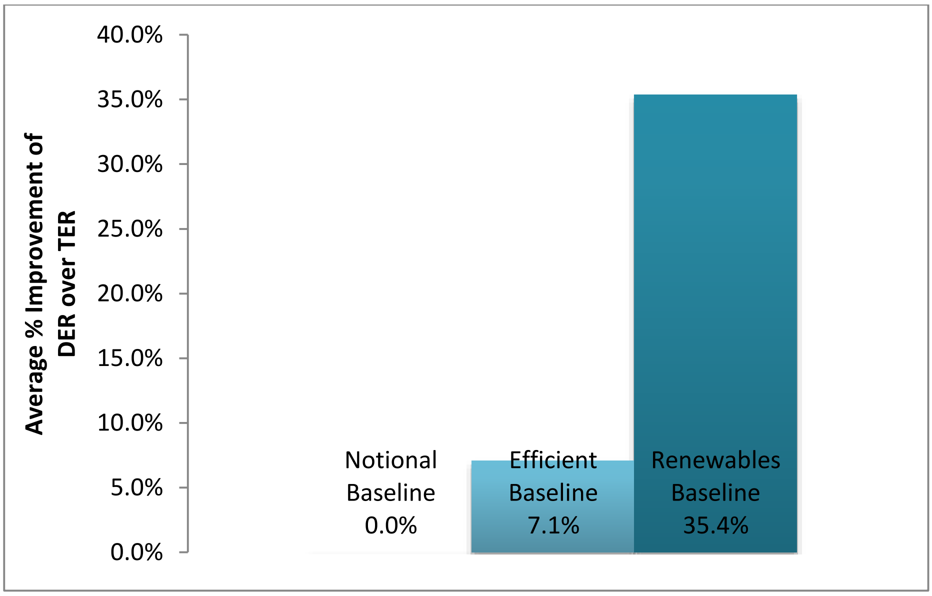
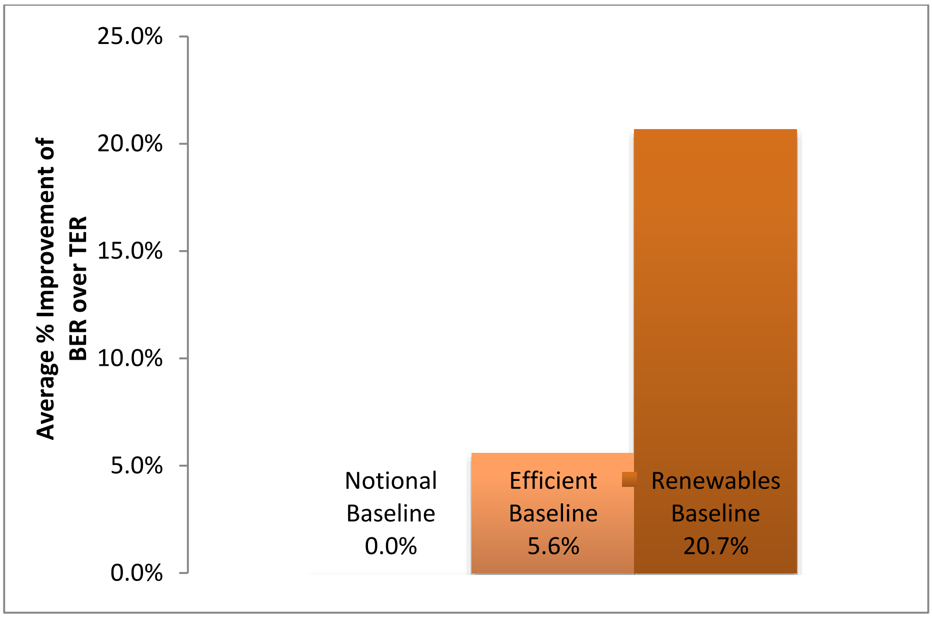


Figure 13: Non-Residential BER over TER improvements of the development



Plant Selection

8.1.7 Careful consideration has been given to maximising the use of PV and SHW to both provide renewable energy to the site and to meet London Plan and London Borough of Camden Policy targets.

8.1.8 Attention has been given to the placement of PV and SHW panels in terms of orientation and angle for optimal performance output and to reduce their visual impact. The proposed arrays will be arranged with modules facing south and at a 30° angle for optimal performance.

8.1.9 The modules will also need to be spaced approximately 800mm apart to avoid overshadowing of neighbouring modules and to provide a safe walkway for maintenance access.

8.1.10 In addition, obstructions on the roof such as lift overruns and other plant must be avoided, again to ensure panels are not shaded at any time as this significantly reduces their output performance.

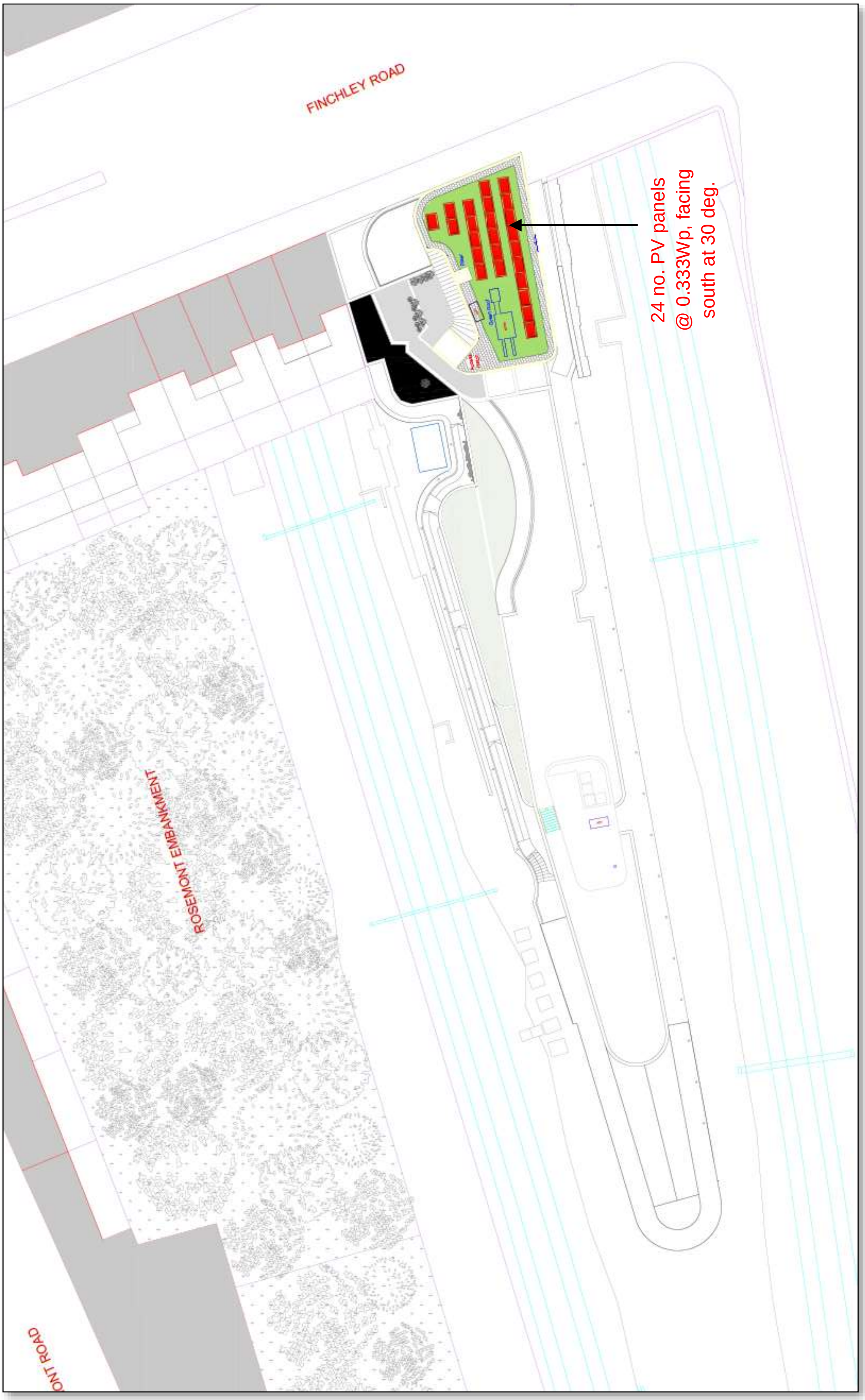
8.1.11 After careful investigation of the available roof space, it has been determined that there is enough available roof space for total 49no. (78.4 m^2) mono-crystalline silicon PV panels @ 0.333kWp and 20no. (28.30 m^2) evacuated tube solar thermal collectors. Please note, the final layout is subject to specialist sub-contractor design and may differ from the proposed array illustrated.

8.1.12 PV systems require an inverter which converts the low voltage direct current electricity produced by the array of panels into 230V 50/60Hz alternating current. Inverters along with the meters will be situated close to the panels either on the roof or in electrical cupboards within service risers. As all PV panels will be situated on the roof of the building, there is no additional land use associated with this technology.

8.1.13 Solar Thermal associated pumps, tanks will be installed in the plant room located at lower floor level 2. Details of actual service and annual maintenance requirements should be obtained from the renewable supplier based on detailed system design.

Figure 14: Proposed Third Floor Roof Plan with PV Layout

Figure 15: Proposed Fourth Floor Roof Plan with PV Layout



Exporting Electricity

8.1.14 The annual income that can be generated by the PV panels includes a Feed-In Tariff (FIT) generation tariff rate of up to 15.44p/kWh (for more information please visit www.fitariffs.co.uk). Tariffs will be linked to the Retail Price Index (RPI) which ensures that each year they follow the rate of inflation. The rate payable is set at the year of entering the FIT and the entrance rate will reduce annually. In addition to the generation tariff a micro generation export rate of 4.5p/kWh for the electricity exported to the grid, this rate is payable by the electricity provider and will also be RPI linked. The electricity export rate is collected from electricity utility provider.

8.1.15 Evacuate tube solar thermal systems are eligible technology for the Government Non-domestic Renewable Heat Incentive (RHI) scheme (subject to full eligibility criteria being met; including as MCS certification, meting requirement requirements etc.). The rate payable is set at the year of application and payment and is payable 20 years. Current non-domestic RHI tariff rates for renewable heat generated by solar thermal technologies are set at 10 p/kWh.

9.0 CARBON OFFSETTING

9.1 '*The government recognises that it will not always be cost-effective, affordable or technically feasible for house builders to reduce all carbon emissions through on-site measures.*' [1]

9.2 The total overall regulated carbon emission reduction of 23.1% does not achieve the London Plan Policy 5.2 requirement for a 35% regulated carbon emission reduction. Following the energy hierarchy, in line with the GLA guidance documents, any residual CO_2 emissions should be provided off-site, though a carbon offsetting payment, meeting the London Plan Policy 5.2 targeted CO_2 reduction requirements.

9.3 After establishing that a further reduction in carbon emission cannot be feasibly or viably met on site, the energy hierarchy allows developers to make a cash-in-lieu contribution to ensure that any shortfall in carbon emission is secured off-site.

9.4 The following guidance document referenced below establishes the framework for carbon offsetting payment.

Energy Planning GLA Guidance on preparing energy assessment, April 2014

9.5 The GLA Guidance on preparing energy assessment provides further information and guidance on the introduction of the London Plan Policy 5.2 and the changes to Part L of Building Regulations.

9.6 Section 10 of the Energy Planning GLA Guidance document addresses carbon offsetting and states in part;

> **Carbon Offsetting**
>
> Once the GLA is satisfied that the CO_2 reduction target in Policy 5.2 cannot feasibly or viably be met on-site a commitment to ensure the shortfall is met off-site using the provision established by the borough must be provided. Table 3 and the related text above provides further information on how both the annual and cumulative shortfall in tonnes of carbon dioxide savings should be calculated.
>
> Further information on carbon dioxide off setting, both through off site carbon dioxide reduction projects undertaken directly by the developer or payment in to an offsetting fund, in liaison with the

[1] Department for Communities and Local Government, *Next step to zero carbon homes – Allowable Solution Consultation Description* (August 2013),

> relevant borough is contained in the SPG. Further summary information is also contained in Appendix 4.
>
> Where boroughs do not have an established price, a figure of £60/tonne for a period of 30 years should be applied. The August 2013 consultation on allowable solution suggests possible price caps ranging from £36 to £90 per tonne of CO_2, with a central scenario of £60 per tonne of CO_2.

Sustainable Design and Construction Supplementary Planning Guidance, April 2014

9.7 The role of the GLA draft Sustainable Design and Construction SPG is to provide best practice guidance on how to meet sustainability targets set out in the London Plan and to aid implementation that cannot be covered in the London Plan. It updates the standards that were developed in the 2006 Documentation.

9.8 Section 2.6.6 - 2.5.25 addresses carbon off-setting solutions and states it part;

> 2.5.6
>
> London Plan Policy 5.2 sets out that where the target percentage improvements beyond Part L of the Building Regulations, also set in this policy, cannot be met onsite, any short fall should be provided offsite or through a cash in lieu contribution to the relevant borough. This is to be ring fenced to secure delivery of carbon dioxide savings elsewhere.
>
> 2.5.9
>
> To maximise the reduction in carbon dioxide emissions across London boroughs should establish a planning related carbon dioxide reduction fund and set a price at which the carbon dioxide short fall will be calculated. Boroughs can use the guidance in this SPG, including the suggested nationally recognised price to form the basis of their carbon off-setting fund or develop a locally specific fund. Contributions should be secured by s106 agreement.

Carbon offsetting

9.9 The Energy Strategy has demonstrated that all practical measures have been taken to maximise carbon reductions for the development at Midland Crescent, resulting in total overall regulated CO_2 reduction of 23.1%.

9.10 The lighting, heating, mechanical ventilation and cooling has been improved to the highest efficiencies with technology available in the current market. The modelled ventilation systems also utilize mechanical heat recovery for improved energy savings. Furthermore significant carbon reductions have been made through application of an air source heat pump (ASHP) for the commercial spaces and onsite PV and SHW panels.

9.11 In order to meet the 35% regulated carbon emission target on site, modelling has shown that application of a CHP would enable the site to achieve the targeted CO_2 emission reduction. However the CHP solution is not considered a suitable for the technology for the development site due to the impacts such a system would have local air quality.

9.12 Due to these reasons, carbon offsetting is the most appropriate method to further reduce carbon emissions savings to meet the 35% policy targets without compromising the quality or viability of the development.

9.13 A carbon offsetting solution agreement can provide the appropriate balance between on-site obligation and off-site opportunities leading to community infrastructure improvements and innovation within the industry.

10.0 CONCLUSION

10.1 Following the energy hierarchy has enabled significant carbon reductions to be calculated for the proposed Midland Crescent development. A total overall carbon reduction of 18.0 tCO_2/year equivalent to 23.1% can be achieved through the energy strategy defined for the site.

10.2 The results of this energy strategy, in conjunction with the Code pre-assessment indicates that the flats are on target to achieve Code Level 4.

10.3 Energy modelling demonstrates an overall regulated carbon emission reduction of 23.1%. And achieves a DER/BER over TER improvement of 35.3% and 20.7% for the residential and non-residential spaces respectively.

10.4 In accordance with the London Plan and GLA guidance the baseline energy figures derived from SAP and SBEM calculations have been used including: space heating, DHW, cooling, lighting, pumps and fans. Separately, an un-regulated energy demand have also been reported. The proposed development at Midland Crescent is calculated to have regulated carbon emissions Notional Baseline of 78.23 tCO_2/year.

10.5 In the first stage of the energy hierarchy (Be Lean), a 4.56 tCO_2/year carbon reduction associated with the proposed fabric and services energy efficiency measures has been predicted, equivalent to 5.8% reduction from the Notional to the Efficient Baseline. As a part of the energy efficiency improvements all practical measures have been implemented to minimise risks of overheating, and calculations have shown that the solar gain limits in summer have not been exceeded.

10.6 For the second stage in the hierarchy (Be Clean), investigations show that there is no opportunity to connect to a local CHP plant insulation or district heat network, and due to impact on local air quality communal CHP has been determined not be appropriate for this site.

10.7 In the third stage of the energy hierarchy (Be Green), site analysis and calculations have determined PV and Solar Thermal panels to be the most suitable renewable energy technology for the site. Providing a further 18.3% regulated carbon emission reduction equivalent to 13.47 tCO_2/year through the application of 49 PV panels (78.4 m^2) and 20 Solar Thermal panels (28.30 m^2). The London Plan Policy 5.7 and London Borough of Camden requirements for a 20% reduction in CO_2 emissions through on-site renewable have not been met. However it should also be noted that a significant 18.0 tCO_2/year overall carbon reduction can be achieved through the energy strategy demonstrated in this report.

10.8 For the final stage of the energy hierarchy (Carbon Offsetting) the development's carbon offsetting payment of £16,899 will offset the residual carbon emissions for 30 years, to meet the 35% target.

10.9 Table 4 and Table 5 below provide a summary of the CO_2 emissions, and overall carbon reductions for the modelled baselines of the development at Midland Crescent. A summary of the u-values and input parameters that have been used to achieve the optimum improvements for the proposed development are shown in Table 8 below.

Figure 16: Be Green – Predicted Renewables Baseline, Regulated Carbon Reduction

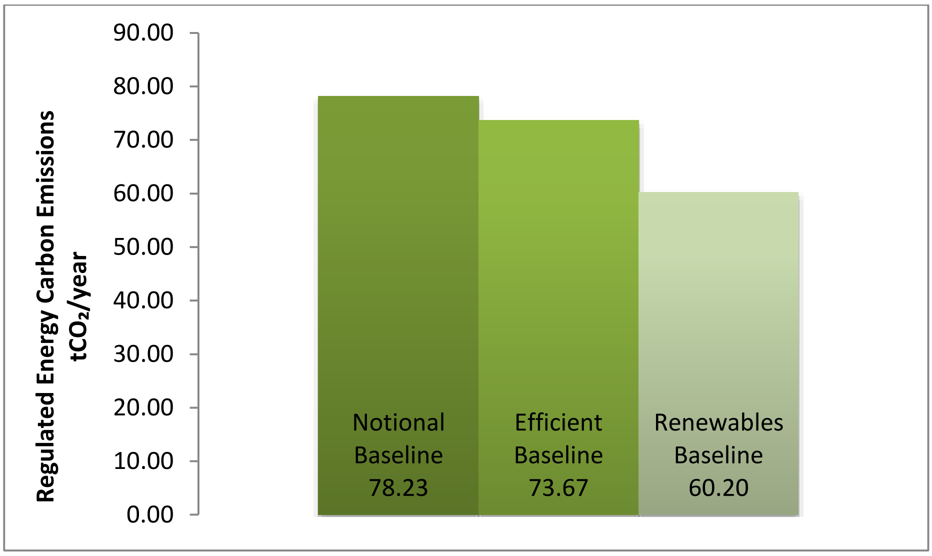


Figure 17: The Energy Hierarchy

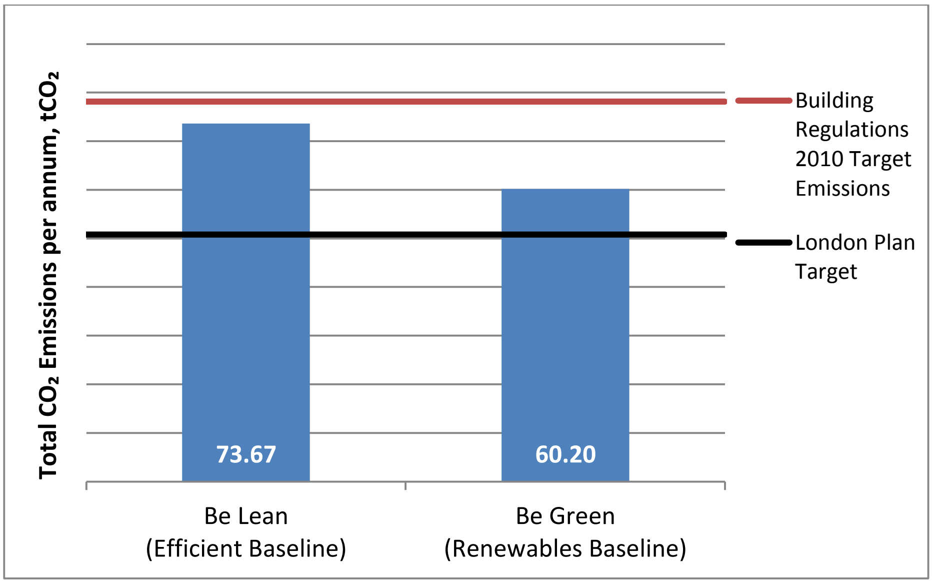


Figure 18: Residential, DER over TER improvement

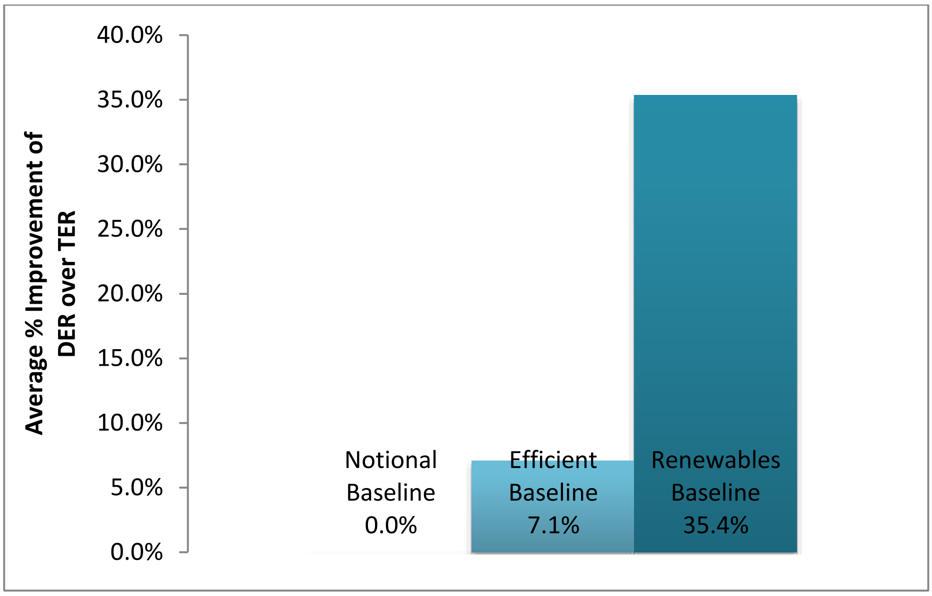


Figure 19: Non-Residential, BER over TER improvement

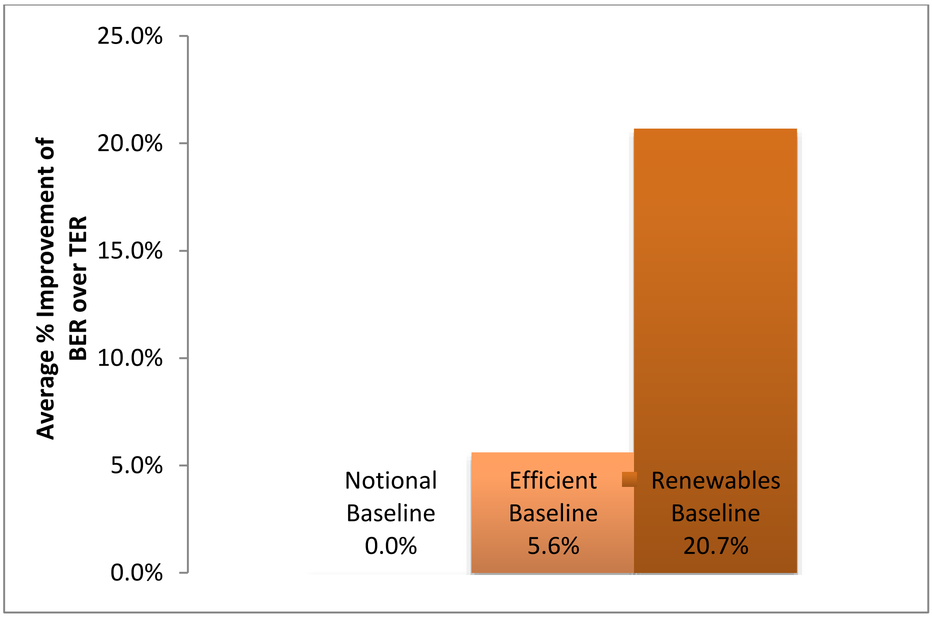


Table 4 - Carbon dioxide emissions after each stage of the Energy Hierarchy

	Carbon dioxide emissions (Tonnes CO2 per annum)	
	Regulated	Unregulated
Building Regulations 2013 Part L Compliant Development	78.2	46.5
After energy demand reduction	73.7	46.5
After renewable energy	60.2	46.5

Table 5 – Regulated Carbon dioxide emissions after each stage of the Energy Hierarchy

	Regulated Carbon dioxide savings	
	Tonnes CO_2 per annum	%
Savings from energy demand reduction	4.5	5.8%
Savings from renewable energy	13.5	18.3%
Total Cumulative Savings	**18.0**	**23.0%**
Total Target Savings	**27.4**	**35.0%**

Table 6 – Shortfall in regulated carbon dioxide savings

	Annual Shortfall (Tonnes CO_2)	Cumulative Shortfall (Tonnes CO_2)
Shortfall	9.39	281.65
Carbon Offsetting Payment	£563	£16,899

Table 7 – Summary of Input Parameters

SAP & SBEM Parameters	Notional Baseline	Efficient Baseline	Renewables Baseline
External Wall U-value	0.22	0.16	0.16
Internal heat loss walls U-value	0.22	0.20	0.20
Party-Wall U-value	0	0	0
Ground Floor / Exposed Floor U-value	0.18	0.15	0.15
Internal heat loss floor U-value	0.18	0.15	0.15
Roof U-value	0.18	0.14	0.14
Windows and doors U-values	1.40	1.40	1.40
Thermal bridging	Accredited construction details throughout Lintels with Linear heat loss coefficient (Psi-value) of 0.05 W/mK (e.g. Keystone hi therm lintels)	Accredited construction details throughout Lintels with Linear heat loss coefficient (Psi-value) of 0.05 W/mK (e.g. Keystone hi therm lintels)	Accredited construction details throughout Lintels with Linear heat loss coefficient (Psi-value) of 0.05 W/mK (e.g. Keystone hi therm lintels)
Thermal Mass Parameter	Medium (250 kJ/m2K)	Medium (250 kJ/m2K)	Medium (250 kJ/m2K)
Air Permeability (flats)	4	3	3
Air Permeability (non-residential)	5	5	5
DHW System	Communal boiler with 95% seasonal efficiency	Communal boiler with 95% seasonal efficiency	Communal boiler with 95% seasonal efficiency
Space Heating System	Communal boiler with 95% seasonal efficiency	Communal boiler with 95% seasonal efficiency	Communal boiler with 95% seasonal efficiency
Ventilation System	Communal MVHR system with 70% efficiency and SFP 0.7 W/l.s or lower	Communal MVHR system with 70% efficiency and SFP 0.7 W/l.s or lower	Communal MVHR system with 70% efficiency and SFP 0.7 W/l.s or lower
Cooling (Commercial/common areas)	Heat pump SEER 5.5	Heat pump SEER 5.5	Heat pump SEER 5.5
Energy Efficient Lighting (flats)	100%	100%	100%
Lighting luminaire efficacy (non-resi)	90 lm/W, metering with 'out of range' alarm	90 lm/W, metering with 'out of range' alarm	90 lm/W, metering with 'out of range' alarm
Solar hot water system (non-residential)			20 No SHW collectors Kingspan Thermomax DF100 with tubes rotated to south ar 30 degrees angle, 2500 litres dedicated SHW storage
PV system (non-residential)			25 No PV panels Sunpower E27 333 Wp with total output of 8.325 kWp, panels facing south at 30 deg

PV system (flats)			24 No PV panels Sunpower E27 333 Wp with total output of 7.992 kWp, panels facing south at 30 deg

APPENDIX A – POLICY CONTEXT

A.0.1 The proposed development at Midland Crescent must comply with a number of the following policies, regulations and standards which require the calculation of energy demand and carbon emissions:

- Approved Document Part L1A & L1B, 2013 edition
- London Plan and London Borough of Camden
- Code for Sustainable Homes 2014
- BREEAM New Construction 2014

A.0.1 The calculations of energy demand and carbon emissions are slightly different for each of the policies/standards; this is discussed in the sections below.

A.0.2 Increased development of renewable energy resources and improvements in energy efficiency are vital to facilitating the delivery of the European, National, Regional and Local commitments on climate change. It is also worth noting that the EU has an ever increasing focus on carbon emissions and in February 2007, EU environment ministers agreed in principle to cut greenhouse gas emissions by 20% by 2020 based on 1990 levels.

A.0.3 The key documents of relevance to this development are highlighted below.

A.1 NATIONAL POLICY

A.1.1 Sustainable development is the core principle underpinning planning. At the heart of sustainable development is the simple idea of ensuring a better quality of life for everyone, now, and for future generations. A widely used definition was drawn up by the World Commission on Environment and Development in 1987: “development that meets the needs of the present without compromising the ability of future generations to meet their own needs.”

A.1.2 Planning has a key role to play in the creation of sustainable communities: communities that will stand the test of time, where people want to live, and which will enable people to meet their aspirations and potential.

National Planning Policy Framework

A.1.3 The National Planning Policy Framework (NPPF) was published in March 2012 and sets out the Government’s planning policies for England, and how these policies are expected to be applied. The policies in the document, taken as a whole, constitute the Government’s view of what sustainable development in England means in practice for the planning system.

A.1.4 Paragraph 14 of the NPPF states that:

> At the heart of the NPPF **is a presumption in favour of sustainable development**, which should be seen as a golden thread running through both plan-making and decision-taking. For **decision-taking** this means approving development proposals that accord with the development plan without delay.

A.1.5 The NPPF outlines a set of core land-use planning principles that should underpin both plan-making and decision-taking, three of which are particularly relevant to this SDCS. Under paragraph 17, these principles are that planning should:

> - support the transition to a low carbon future in a changing climate, taking full account of flood risk and coastal change, and encourage the reuse of existing resources, including conversion of existing buildings, and encourage the use of renewable resources (for example, by the development of renewable energy);
> - contribute to conserving and enhancing the natural environment and reducing pollution. Allocations of land for development should prefer land of lesser environmental value, where consistent with other policies in this Framework; and
> - encourage the effective use of land by reusing land that has been previously developed (brownfield land), provided that it is not of high environmental value.

A.1.6 Design is addressed in section 7 of the NPPF, and paragraph 56 states:

> The Government attaches great importance to the design of the built environment. Good design is a key aspect of sustainable development, is indivisible from good planning, and should contribute positively to making places better for people.

A.1.7 Meeting the challenge of climate change is addressed in section 10 of the NPPF, and paragraph 93 states: Planning plays a key role in helping shape places to secure radical reductions in greenhouse gas emissions, minimising vulnerability and providing resilience to the impacts of climate change, and supporting the delivery of renewable and low carbon energy and associated infrastructure. This is central to the economic, social and environmental dimensions of sustainable development.

A.1.8 Further to the above, paragraph 95 addresses local plan-making and state:

> To support the move to a low carbon future, local planning authorities should:
>
> - plan for new development in locations and ways which reduce greenhouse gas emissions;
> - actively support energy efficiency improvements to existing buildings; and
> - when setting any local requirement for a building's sustainability, do so in a way consistent with the Government's zero carbon buildings policy and adopt nationally described standards.

A.1.9 Additionally, paragraph 96 discussed decision-taking and states that:

> In determining planning applications, local planning authorities should expect new development to:
>
> - comply with adopted Local Plan policies on local requirements for decentralised energy supply unless it can be demonstrated by the applicant, having regard to the type of development involved and its design, that this is not feasible or viable; and
>
> take account of landform, layout, building orientation, massing and landscaping to minimise energy consumption.

A.1.10 Lastly, it is important to note that paragraph 187 of the NPPF addresses decision-taking by local planning authorities with respect to development applications. This paragraph states that:

> Local planning authorities should look for solutions rather than problems, and decision-takers at every level should seek to approve applications for sustainable development where possible. Local planning authorities should work proactively with applicants to secure developments that improve the economic, social and environmental conditions of the area.

A.2 BUILDING REGULATIONS

A.2.1 Building Regulations exist to ensure the health, safety, welfare and convenience of people in and around buildings, and the energy efficiency of buildings. The regulations apply to most new buildings and many alterations of existing buildings in England and Wales, whether new residential, commercial or industrial.

A.2.2 The development at Midland Crescent will be constructed to be compliant with Building Regulations which are current at the time of construction. The relevant

Approved Document Part L1A "Conservation of fuel and power in new dwellings" and Part L1B "Conservation of fuel and power in existing dwellings" provides guidance on ways of complying with the energy efficiency requirements.

A.2.3 The development has been assessed for Part L compliance using approved Government Simplified Building Energy Modelling and Standard Assessment Procedures for Energy Rating of Dwellings/Buildings (SAP & SBEM software).

A.3 REGIONAL POLICY

A.3.1 The London Plan (2011) is the Spatial Development Strategy for London. Section 5 of the Plan covers the mitigation of, and adaptation to climate change and the management of natural resources. The London Plan supports the Mayor's Energy Strategy. The key policies regarding energy efficiency are summarised below.

Policy 5.2 - Minimising CO_2 Emissions

Planning decisions

A. Development proposals should make the fullest contribution to minimising carbon dioxide emissions in accordance with the following energy hierarchy:

1. Be lean: use less energy
2. Be clean: supply energy efficiently
3. Be green: use renewable energy

B. The Mayor will work with boroughs and developers to ensure that major developments meet the following targets for carbon dioxide emissions reduction in buildings. These targets are expressed as minimum improvements over the Target Emission Rate (TER) outlined in the national Building Regulations leading to zero carbon residential buildings from 2016 and zero carbon non-domestic buildings from 2019.

Residential buildings:

Year	Improvement on 2010 Building Regulations
2010 – 2013	25 per cent (Code for Sustainable Homes level 4)
2013 – 2016	40 per cent
2016 – 2031	Zero carbon

Non-domestic buildings:

Year	Improvement on 2010 Building Regulations
2010 – 2013	25 per cent

2013 – 2016	40 per cent
2016 – 2019	As per building regulations requirements
2019 – 2031	Zero carbon

C. Major development proposals should include a detailed energy assessment to demonstrate how the targets for carbon dioxide emissions reduction outlined above are to be met within the framework of the energy hierarchy.

D. As a minimum, energy assessments should include the following details:

   a. Calculation of baseline energy demand and carbon dioxide emissions on a 'whole energy' basis, showing the contribution of emissions both from uses covered by building regulations and those that are not (see paragraph 5.22)

   b. Proposals to reduce carbon dioxide emissions through the energy efficient design of the site, buildings and services

   c. Proposals to further reduce carbon dioxide emissions through the use of decentralised energy where feasible, such as district heating and cooling and combined heat and power (CHP)

   d. Proposals to further reduce carbon dioxide emissions through the use of on-site renewable energy technologies.

E. The carbon dioxide reduction targets should be met on-site. Where it is clearly demonstrated that the specific targets cannot be fully achieved on-site, any shortfall may be provided off-site or through a cash in lieu contribution to the relevant borough to be ring fenced to secure delivery of carbon dioxide savings elsewhere.

Policy 5.6 - Decentralised Energy in Development Proposals

Planning decisions

A. Development proposals should evaluate the feasibility of Combined Heat and Power (CHP) systems, and where a new CHP system is appropriate also examine opportunities to extend the system beyond the site boundary to adjacent sites.

B. Major development proposals should select energy systems in accordance with the following hierarchy:

   1. Connection to existing heating or cooling networks
   2. Site wide CHP network
   3. Communal heating and cooling.

C. Potential opportunities to meet the first priority in this hierarchy are outlined in the London Heat Map tool. Where future network opportunities are identified, proposals should be designed to connect to these networks.

Policy 5.7 - Renewable Energy

Strategic

A. The Mayor seeks to increase the proportion of energy generated from renewable sources, and expects that the projections for installed renewable energy capacity outlined in the Climate Change Mitigation and Energy Strategy and in supplementary planning guidance will be achieved in London.

Planning decisions

B. Within the framework of the energy hierarchy (see Policy 5.2), major development proposals should provide a reduction in expected carbon dioxide emissions through the use of on-site renewable energy generation, where feasible.

A.3.2 Section 5.42 of the London Plan states that:

Individual development proposals will also help to achieve these targets by applying the energy hierarchy in Policy 5.2. There is a presumption that all major development proposals will seek to reduce carbon dioxide emissions by at least 20 per cent through the use of on-site renewable energy generation wherever feasible.

Policy 5.9 – Overheating and Cooling

Strategic

A. The Mayor seeks to reduce the impact of the urban heat island effect in London and encourages the design of places and spaces to avoid overheating and excessive heat generation, and to reduce overheating due to the impacts of climate change and the urban heat island effect on an area wide basis.

Planning decisions

B. Major development proposals should reduce potential overheating and reliance on air conditioning systems and demonstrate this in accordance with the following cooling hierarchy:

1. minimise internal heat generation through energy efficient design
2. reduce the amount of heat entering a building in summer through orientation, shading, albedo, fenestration, insulation and green roofs and walls
3. manage the heat within the building through exposed internal thermal mass and high ceilings
4. passive ventilation
5. mechanical ventilation

> 6. active cooling systems (ensuring they are the lowest carbon options).
>
> C. Major development proposals should demonstrate how the design, materials, construction and operation of the development would minimise overheating and also meet its cooling needs. New development in London should also be designed to avoid the need for energy intensive air conditioning systems as much as possible. Further details and guidance regarding overheating and cooling are outlined in the London Climate Change Adaptation Strategy.

Sustainable Design and Construction, Supplementary Planning Guidance (April 2014)

A.3.3 The Mayor's Supplementary Planning Guidance (SPG) on Sustainable Design and Construction was published in May 2006, and later updated in April 2014, to provide additional information to support the implementation of the London Plan (2011).

A.3.4 Policy 5.2 of the current London Plan continues to refer to this SPG and from 6th April 2014 the major will apply a 35% carbon reduction target beyond Part L 2013 of the Building regulations. This is deemed to be broadly equivalent to the 40% target beyond Part L 2010 of the Building Regulations to the 40% target beyond Part L 2010 of Building Regulations, as specified in policy 5.2 of the London Plan.

A.3.5 Section 2.4.3 of the SPG states that:

> The Mayor began to implement his 40% carbon dioxide reduction target for major development, in line with London Plan policy 5.2 from 1st October 2013. It was thought that this would be in line with the introduction of Part L of the Building Regulations 2013. The Government has announced the improvements in carbon dioxide emissions set out in Part L 2013 will come into force on the 6th April 2014.
>
> The Part L 2013 carbon dioxide improvements are in the lower range of the options consulted and there will be different improvement targets for various building types20 to recognise the differing potential for carbon abatement between different forms of building. Part L 2013 aims to deliver an overall 6% reduction in carbon dioxide emissions from new residential buildings and an overall 9% reduction in carbon dioxide emissions from new non-residential buildings compared to 201021.
>
> To avoid complexity and extra cost for developers, the Mayor will adopt a flat carbon dioxide improvement target beyond Part L 2013 of 35% to both residential and non-residential development.

A.4 LOCAL POLICY

A.4.1 Alongside the Mayor's London Plan, the London Borough of Camden has a number of policies dedicated to environmental protection and enhancement within their Core Strategy adopted January 2011.

Camden Core Strategy 2010-2025

Policy SC13: Tackling Climate change through promoting higher environmental standards

A.4.2 Policy CS13 of the Core Strategy addresses sustainable development and is particularly relevant to this Energy Strategy. The policy states, in part:

Reducing the effect of and adapting to climate change

The Council will require all developments to take measures to minimise the effects of, and adapt to climate change and encourage all development to meet the highest feasible environmental standards that are financially viable during construction and occupations:

a. Ensuring patterns of land use that minimise the need to travel by car and help support local energy networks;

b. Promoting the efficient use of land and buildings;

c. Minimising carbon emissions from the redevelopment, construction and occupation of building by implementing, in order, all of the elements of the following energy hierarchy:

- Ensuring developments use less energy,
- Making use of energy from efficient sources, such as the King's Cross, Gower Street, Bloomsbury and proposed Euston Road decentralised energy networks:
- Generating renewable energy on-site; and

d. Ensuring buildings and spaces are designed to cope with, minimise the effects of, climate change

The Council will have regard to the cost of installing measures to tackle climate changes as well as the cumulative future cost of delaying reductions in carbon dioxide emissions.

Local energy generation

The Council will promote local energy generation and networks:

e. Working with our partner and developers to implement local energy networks in the parts of Camden most likely to support them ie. In the vicinity of

- Housing estates with community heating or potential for community heating and other uses with large heating loads;

- The growth areas of King's Cross, Euston: Tottenham Court Road; West Hampstead Interchange and Holborn;
- School to be redeveloped as part of Building Schools for the Future programme:
- Existing or approved combined heat and power/local energy networks (see Map 4); and other locations where land ownership would facilitate their implementation.

f. Protecting exiting local energy networks where possible (e.g at Gower Street and Bloomsbury) and safeguarding potential network routes (e.g. Euston Road);

Water and surface water flooding

We will make Camden a water efficient borough and minimise the potential for surface water flooding by:

g. Protecting our exiting drinking water and foul water infrastructure, including Barrow Hill reservoir, Hampstead heath reservoir, Highgate Reservoir and Kidderpore Reservoir;

h. Making sure development incorporates efficient water and foul water infrastructure;

i. Requiring development to avoid harm to water environment, water quality or drainage systems and prevents or mitigates local surface water and down-stream flooding, especially in areas up-hill from, and in, areas known to be at risk from surface water flooding such as South and West Hampstead, Gospel Oak and King's Cross (see Map 5).

Camden's carbon reduction measures

The Council will take a lead in tackling climate change by;

j. Taking measures to reduce its own carbon emissions;

k. Trialling new energy efficient technologies, where feasible; and

l. Raising awareness on mitigation and adaption measures.

Camden Development Policies 2010-2025

Policy DP22: Promoting sustainable design and construction

A.4.3 Policy DP22 of the Development Policies addresses sustainable development and is particularly relevant to this Energy Strategy. The policy states, in part:

> Reducing the effects of and adapting to climate change
>
> The Council will require development to incorporate sustainable design and construction measures. Schemes must:
>
> a. Demonstrate how sustainable development principles, including the relevant measures set out in paragraph 22.5 below, have been incorporated into the design and proposed implementations; and
>
> b. Incorporate green or brown roofs and green walls wherever suitable.
>
> The Council will promote and measure sustainable design and construction by:
>
> c. expecting new build housing to meet Code for Sustainable Homes Level 3 by 2010 and Code Level 4 by 2013 and encourage Code Level 6 (zero carbon) by 2016);
>
> d. expecting developments (except new build) of 500 sq m of residential floorspace or above or 5 more dwellings to achieve “very good” in EcoHomes assessments prior to 2013 and encourage “excellent” from 2013;
>
> e. expecting non-domestic developments of 500sqm of floorspace or above to achieve “very good” in BREEAM assessment and “excellent” from 2016 and encouraging zero carbon 2019.
>
> The Council will require development to be resilient to climate change by ensuring schemes include appropriate climate change adaptions measures, such as:
>
> a. summer shading and planting;
>
> b. limited water consumption;
>
> c. reducing air pollution; and
>
> d. not locating vulnerable uses in basements in flood-prone areas.

Camden Planning Guidance CPG3, 4th September 2013

Policy DP22: Promoting sustainable design and construction

A.4.4 The Core Strategy is supported by Supplementary Planning Documents (SPDs) which play an important role in planning decisions. SPDs provide detailed guidance on how planning strategy and policies will be implemented for specific topics, areas and sites.

A.4.5 CPG3 contains advice and guidance for developers on ways to achieve carbon reductions and more sustainable developments. It also highlights the Council's requirements and guidelines which support the relevant Local LDF policies, including CS13 and DP22 as noted above.

A.4.6 All new developments are to be designed to minimise carbon dioxide emissions by being as energy efficient as feasible and viable.

A.4.7 Where the New London Plan carbon reduction target in policy 5.2 cannot be met onsite, we may accept the provision of measures elsewhere in the borough or financial contribution which will used to secure delivery of carbon reduction measures elsewhere. This process is known as carbon offsetting.

A.4.8 All development are to target at least a 20% reduction in carbon dioxide emissions through the installation of on-site renewable energy technologies. Special consideration will be given to heritage buildings and features to ensure that their historic and architecture features are preserved.

A.4.9 When assessing the feasibility and viability of renewable energy technology, the Council will consider the overall cost of all the measures proposed and resulting carbon savings to ensure that the most cost effective carbon reduction technologies are implemented in line with the energy hierarchy.

A.4.10 A new building build dwelling will have to be designed in line with the Code for Sustainable Homes and will be expected to achieve 50% of the un-weighted credits in Energy, Water and Materials categories.

Time Period	Code Rating
2010-2013	Level 3
2016+	Level 6 'zero carbon'

A.4.11 Non-residential developments of 500 sq m floorspace will need to be design in line with BREEAM and will be expected to achieve 60% of the un-weighted credits in the Energy and Water categories and 40% in the materials categories

Time Period	BREEAM Rating
2010-2012	'very good'
2013+	'excellent'

A.5 CODE FOR SUSTAINABLE HOMES (2014)

A.5.1 As of May 2014, alterations were made to the Code in order to bring it in line with regulatory and national guidance changes which have occurred recently, in particular the introduction of Part L 2013 Building Regulations and SAP 2012 methodology. Standards have not changed.

A.5.2 No alterations have been made to the format and layout of the Code. In addition, the weightings and number of credits available for each Code category remain unchanged.

A.5.3 The element of the Code that deals with the calculation of energy and carbon dioxide emissions is the first Issue – ENE 1: Dwelling Emission Rate.

A.5.4 Credits are awarded based on the percentage improvement of the DER score over the TER as calculated by the SAP Assessments. The required percentage improvement of DER over TER increases with each Code Level, as illustrated by Table 1 below.

Table 8: Mandatory requirements for ENE 1 – Dwelling Emission Rate

Criteria		
% Improvement 2013 DER/TER England[1]	Credits*2	Mandatory Requirements
≥ 6%	1	
≥ 12%	2	
≥ 19%	**3**	**Level 4**
≥ 32%	4	
≥ 44%	5	
≥ 56%	6	
≥ 70%	7	
≥ 84%	8	
≥ 100%	**9**	**Level 5**
Zero *Net* CO_2 *Emissions*	**10**	**Level 6**
Default Cases		
None		

*1 Performance requirements are equivalent to those in previous scheme versions but are now measured using the AD L1A 2013 England TER as the baseline.

*2 Up to nine credits are awarded on a sliding scale. The scale is based on increments of 0.1 credits, distributed equally between the benchmarks defined in this table.

A.5.5 The SAP worksheets indicating the DER are necessary evidence for the Code Assessment to prove that this criterion has been met.

A.5.6 Credits are also available within the Code standard for carbon emission reduction through the use of low or zero carbon technologies in the ENE 7 issue. There is 1 credit available for carrying out a 10% reduction and 2 credits available for a 15% reduction. Credits are awarded based on the percentage reduction in total carbon emissions that result from using Low or Zero Carbon (LZC) Energy Technologies.

A.5.7 The proposed development at Midland Crescent is a mixed use development: part residential and part commercial. In order to demonstrate the ability to achieve certification at the desired level, a separate Code pre-assessment has been prepared is found as an Appendix to the Sustainability Statement produced by Metropolis Green.

A.6 BREEAM NEW CONSTRUCTION 2014

A.6.1 BREEAM is the world's leading and most widely used environmental assessment method for buildings. It sets the standard for best practice in sustainable design and is used to describe a building's environmental performance.

A.6.2 BREEAM New Construction 2014 is a performance based assessment method and certification scheme for new buildings. The primary aim of BREEAM New Construction 2014 is to mitigate the life cycle impacts of new buildings on the environment in a robust and cost effective manner.

A.6.3 The BREEAM New Construction 2014 scheme can be used to assess the environmental life cycle impacts of new non-domestic buildings at the design and construction stages. 'New Construction' is defined as development that results in a new standalone structure, or new extension to an existing structure, which will come into operation/use for the first time upon completion of the works.

A.6.4 The proposed development at Midland Crescent consists (in regards to BREEAM) of two building uses: flexible commercial space on the lower ground -2 level (use Classes A1/A2/A3/A4/B1/D1 or D2) and student accommodation units (and ancillary cycle storage, lobby, management and common room uses) on the other levels of the building. For the purposes of a BREEAM pre-assessment the student accommodation use has been defined as a multi-residential (student halls of residence) building type. In order demonstrate the ability to achieve certification at the desired rating, a BREEAM pre-assessment has been prepared under the multi-residential building type criteria, and can be found as Appendices A of the Sustainability Statement produced by Metropolis Green.

A.6.5 BREEAM credits are also awarded in 9 categories (plus an additional Innovation category) of sustainable design according to performance. These credits are then added together to produce a single overall score on a scale of Pass, Good, Very Good, Excellent and Outstanding, dependent on the total score received from achieving credits across the various categories. There are minimum standards that must be achieved in order to meet the higher rating levels under BREEAM. For more detail, please refer to the BREEAM 2014 New Construction Technical Manual.

A.6.6 A scheme can be assessed at Design Stage (DS) - leading to an Interim BREEAM Certificate and/or at the Post Construction Stage (PCS) – leading to a Final BREEAM Certificate.

APPENDIX B – OTHER APPRAISED RENEWABLE TECHNOLOGIES

B.1 WIND TURBINES

B.1.1 Wind is one of the most cost-effective methods or generating renewable electricity. However wind is more suited to low density areas where there is more space necessary for maintenance, less turbulent wind patterns, and they are less likely to be the cause of noise and vibration to nearby properties. High density areas are not ideal with current wind turbine technology.

Feasibility

B.1.2 Installation of wind turbines is neither feasible nor suitable for Midland Crescent. There are a number of concerns with wind turbines in an urban environment including; visual impact, noise, cost, maintenance and space. Although calculations for the modelled systems indicate that wind systems contribute to carbon reductions, it must be noted that under dense urban environments the energy outputs generated by wind turbines can be quite unpredictable. This is mainly due to the neighbouring buildings acting as obstructions causing turbulence to the incoming wind flow. The site would need to be evaluated appropriately (over a period of 12 months) using wind speed monitoring & recording devices in order to give an accurate prediction in terms of energy output derived by the real wind speed measurements recorded on site.

B.1.3 In addition to these concerns, the actual energy output of any turbines installed is likely to be much lower than the modelled outputs due to turbulence created in the urban environment.

B.1.4 Wind turbines have a long lifetime with relatively little maintenance required, and when considering life cycle costs, even with the feed in tariff and energy savings considered they have a longer payback time than other renewable technologies.

B.1.5 Therefore, wind turbines have been determined to be unsuitable for the development at Midland Crescent.

B.2 BIOMASS HEATING

B.2.1 Wood is the most commonly used form of biomass fuel, and can either be burned in solid fuel boilers for central heating applications, or for raising steam for power generation in large installations.

B.2.2 Typically, biomass installations are sized to meet a base heat load with peak load and load variations to be met from gas-fired boilers. Biomass boilers operate most efficiently and are therefore most cost effective when working continuously at full load, they do not respond well to rapidly fluctuating demand. When assessing the feasibility of a biomass installation, storage space and biomass delivery requirements need to be taken into account.

Feasibility

B.2.3 Although the calculations typically show that a biomass boiler could provide a higher level of carbon reductions than gas boilers, the main operational concerns are raised in relation to air quality, storage capacity and logistics of parking for delivery of wood pellets/chips etc.

B.2.4 Air quality is another major concern with biomass heating due to NOx (Nitrogen Oxides) and Particulate Matter (PM10) emissions.

B.2.5 The entire London Borough of Camden is designated as an Air Quality Management Area (AQMA) and the application site in particular, annual mean NO_2 levels are likely to exceed national objects due to the location in close proximity to the A41 Finchley road. With current technology, biomass fuelled boiler may negatively impact on air quality which is deemed inappropriate in an Air Quality Management Area unless abatement technology can provide sufficient mitigation. (For further details please see the Local Air Quality Impact report produced by Ramboll in support of the planning application for the proposal)

B.2.6 Biomass systems also require space for storage and delivery of fuel. Additionally, fuel delivery carries implications for parking, increased emissions and pressure from transport. In the context of the current layout, there is insufficient space able to be allocated for the biomass storage facility.

B.2.7 When considering life cycle costs, there are higher maintenance requirements than other forms of renewable energy, fuel costs are predicted to rise and the value of net lettable space required for storage must be considered.

B.2.8 When considering noise impact, the impact of fuel deliveries must be considered, otherwise, the impact is similar to conventional plant.

B.2.9 Therefore, it is determined that a biomass heating solution cannot be practically implemented and is not suitable for the development at Midland Crescent.

B.3 GROUND SOURCE HEAT PUMP (GSHP)

B.3.1 In the UK, soil temperatures stay at a constant temperature of around 11-12°C, throughout the year. Ground source heat pumps take this low temperature energy and concentrate it into more useful, higher temperatures, to provide space heating and water heating. The process is similar to that used in refrigerators. A fluid is circulated through pipes in the ground absorbing the heat from the soil, the fluid is passed through a heat exchanger in the pump which extracts the heat from the fluid and increases it via a compression cycle. This is then used to provide heating and heat new hot water.

Feasibility

B.3.2 It has been determined that connection to existing or installation of new Ground Source Heat Pump plant is not a feasible option for the Midland Crescent scheme. This is due to the large area required for boreholes exterior to the building.

B.3.3 Installation of a GSHP is one of the most costly options for this site and would require further detailed analysis of conflicts with existing systems, ground conditions and soil conductivity before determining whether or not the required levels of carbon savings could be achieved.

B.3.4 Land use, plant space and physical security for the ground collectors and the heat pump units also need to be taken into consideration. For horizontal collector systems, a potentially large area is required for the collector pipework. This area should be free of trees which will cause problems for installation of the pipework. It can be beneath the building but it is most effective in an open area. For borehole or vertical collectors, land requirements are reduced but still significant as the boreholes must be a minimum of five metres apart.

B.3.5 Noise impact of heat pumps is considered to be negligible although concerns have been raised where older systems are poorly maintained and become noisy.

B.3.6 Taking all of these considerations into account, it is judged that GSHP is not a suitable or affordable technology for Midland Crescent.

APPENDIX C - CALCULATION RESULTS

Notional Baseline

Floor	Unit	Dwelling Type	Floor area (m^2)	FEE ($kWh/m^2/yr$)	Space Heating from Boiler (Main 1) (kWh/an)	Space Heating (Main 2) (kWh/an)	Space Heating (Secondary) (kWh/an)	DHW from Boiler (kWh/an)	Cooling (kWh/an)	Lighting (kWh/an)	Aux (kWh/an)	Un-Reg (kWh/an)	SAP 2012 TER	SAP 2012 DER	Baseline CO_2 Emissions kgCO_2/annum	Regulated CO_2 Emissions kgCO_2/annum	Unregulated CO_2 Emissions kgCO_2/annum	% Improvement DER over TER
Residential																		
	F1-1	Apt, mid tce	53	57.94	1,798			1,946		246	153	2,081	22.58	22.39	1,197	1,187	1,080	0.8%
	F1-2	Apt, mid tce	75	49.06	2,017			2,175		329	242	2,721	18.47	18.62	1,385	1,397	1,412	-0.8%
	F1-3	Apt, mid tce	70.7	44.07	1,623			2,136		313	228	2,605	18.02	17.8	1,274	1,258	1,352	1.2%
	F2-1	Apt, mid tce	53	50.59	1,412			1,946		246	171	2,081	21.52	20.79	1,141	1,102	1,080	3.4%
	F2-2	Apt, mid tce	75	39.63	1,335			2,175		329	242	2,721	16.86	16.35	1,265	1,226	1,412	3.0%
	F2-3	Apt, mid tce	70.7	35.03	1,036			2,136		313	228	2,605	16.47	15.68	1,164	1,109	1,352	4.8%
	F3-1	Apt, mid tce	96.5	43.61	2,260			2,310		394	312	3,215	16.1	16.3	1,554	1,573	1,669	-1.2%
	F3-2	Apt, mid tce	78.5	37.17	1,326			2,203		341	253	2,811	16.27	15.7	1,277	1,232	1,459	3.5%
	F4-1	Apt, mid tce	143	57.51	5,580			2,395		492	513	3,936	16.82	17.74	2,405	2,537	2,043	-5.5%
Total / Average			715.4	46.61	18,387	0	0	19,423	0	3,003	2,342	24,778	17.70	17.64	12,662	12,621	12,860	0.3%

Floor	Description	Floor area (m2)	HLP	Space Heating (Main) (kWh/an)	Space Heating (Main 2) (kWh/an)	Space Heating (Secondary) (kWh/an)	DHW (kWh/an)	Cooling (SBEM) (kWh/an)	Lighting (kWh/an)	Aux (kWh/an)	Un-Reg (kWh/an)	SBEM 2010 TER	SBEM 2010 BER	Baseline CO_2 Emissions kgCO_2/annum	Regulated CO_2 Emissions kgCO_2/annum	Unregulated CO_2 Emissions kgCO_2/annum	% Improvement BER over TER
Non-Residential																	
	Non-residential	2640.62		54,588			125,044	5,548	33,717	12,267	64,770	24.83	24.82	65,567	65,546	33,615	0.0%
Total / Average		2640.62		54,588	0	0	125,044	5,548	33,717	12,267	64,770	24.83	24.82	65,567	65,546	33,615	0.0%

Efficient Baseline

Floor	Unit	Dwelling Type	Floor area (m^2)	FEE ($kWh/m^2/yr$)	Space Heating from Boiler (Main 1) (kWh/an)	Space Heating (Main 2) (kWh/an)	Space Heating (Secondary) (kWh/an)	DHW from Boiler (kWh/an)	Cooling (kWh/an)	Lighting (kWh/an)	Aux (kWh/an)	Un-Reg (kWh/an)	SAP 2012 TER	SAP 2012 DER	Baseline CO_2 Emissions kgCO_2/annum	Regulated CO_2 Emissions kgCO_2/annum	Unregulated CO_2 Emissions kgCO_2/annum	% Improvement DER over TER
Residential																		
	F1-1	Apt, mid tce	53	51.9	1,389			1,946		246	186	2,081	22.58	20.51	1,197	1,087	1,080	9.2%
	F1-2	Apt, mid tce	75	45.09	1,611			2,175		329	280	2,721	18.47	17.28	1,385	1,296	1,412	6.4%
	F1-3	Apt, mid tce	70.7	40.5	1,288			2,136		313	262	2,605	18.02	16.61	1,274	1,174	1,352	7.8%
	F2-1	Apt, mid tce	53	46.22	1,099			1,946		246	202	2,081	21.52	19.32	1,141	1,024	1,080	10.2%
	F2-2	Apt, mid tce	75	37.26	1,065			2,175		329	275	2,721	16.86	15.42	1,265	1,157	1,412	8.5%
	F2-3	Apt, mid tce	70.7	33.02	825			2,136		313	258	2,605	16.47	14.89	1,164	1,053	1,352	9.6%
	F3-1	Apt, mid tce	96.5	41.08	1,865			2,310		394	353	3,215	16.1	15.29	1,554	1,475	1,669	5.0%
	F3-2	Apt, mid tce	78.5	34.91	1,060			2,203		341	286	2,811	16.27	14.83	1,277	1,164	1,459	8.9%
	F4-1	Apt, mid tce	143	53.56	4,738			2,395		492	584	3,936	16.82	16.34	2,405	2,337	2,043	2.9%
Total / Average		Apt, mid tce	715.4	43.25	14,942	0	0	19,423	0	3,003	2,686	24,778	17.70	16.45	12,662	11,767	12,860	7.1%

Floor	Description	Floor area (m2)	HLP	Space Heating (Main) (kWh/an)	Space Heating (Main 2) (kWh/an)	Space Heating (Secondary) (kWh/an)	DHW (kWh/an)	Cooling (SBEM) (kWh/an)	Lighting (kWh/an)	Aux (kWh/an)	Un-Reg (kWh/an)	SBEM 2010 TER	SBEM 2010 BER	Baseline CO_2 Emissions kgCO_2/annum	Regulated CO_2 Emissions kgCO_2/annum	Unregulated CO_2 Emissions kgCO_2/annum	% Improvement BER over TER
Non-Residential																	
	Non-residential	2640.62		52,931			125,044	5,378	27,558	12,267	64,770	24.83	23.44	65,567	61,903	33,615	5.6%
Total / Average		2640.62		52,931	0	0	125,044	5,378	27,558	12,267	64,770	24.83	23.44	65,567	61,903	33,615	5.6%

Renewables Baseline

Residential													PVs		Solar Thermals		SAP 2009		Baseline CO_2 Emissions	Regulated CO_2 Emissions	Unregulated CO_2 Emissions	
Floor	Unit	Dwelling Type	Floor area (m^2)	FEE ($kWh/m^2/yr$)	Space Heating from Boiler (Main 1) (kWh/an)	Space Heating (Main 2) (kWh/an)	Space Heating (Secondary) (kWh/an)	DHW from Boiler (kWh/an)	Cooling (kWh/an)	Lighting (kWh/an)	Aux (kWh/an)	Un-Reg (kWh/an)	PVs kWp	PVs Energy Offset	SHW liters	SHW (kWh/an)	TER	DER	$kgCO_2$/annum	$kgCO_2$/annum	$kgCO_2$/annum	% Improvement DER over TER
	F1-1	Apt, mid tce	53	45.1	1,389	0	0	1,946	0	246	186	2,081	0.592	-511.33	0.00	0.00	22.58	15.50	1,197	822	1,080	31.3%
	F1-2	Apt, mid tce	75	48.9	1,611	0	0	2,175	0	329	280	2,721	0.838	-723.59	0.00	0.00	18.47	12.27	1,385	920	1,412	33.6%
	F1-3	Apt, mid tce	70.7	39.0	1,288	0	0	2,136	0	313	262	2,605	0.790	-682.10	0.00	0.00	18.02	11.60	1,274	820	1,352	35.6%
	F2-1	Apt, mid tce	53	52.7	1,099	0	0	1,946	0	246	202	2,081	0.592	-511.33	0.00	0.00	21.52	14.31	1,141	759	1,080	33.5%
	F2-2	Apt, mid tce	75	47.0	1,065	0	0	2,175	0	329	275	2,721	0.838	-723.59	0.00	0.00	16.86	10.41	1,265	781	1,412	38.2%
	F2-3	Apt, mid tce	70.7	47.1	825	0	0	2,136	0	313	258	2,605	0.790	-682.10	0.00	0.00	16.47	9.88	1,164	699	1,352	40.0%
	F3-1	Apt, mid tce	96.5	46.2	1,865	0	0	2,310	0	394	353	3,215	1.078	-931.01	0.00	0.00	16.10	10.28	1,554	992	1,669	36.1%
	F3-2	Apt, mid tce	78.5	47.2	1,060	0	0	2,203	0	341	286	2,811	0.877	-757.35	0.00	0.00	16.27	9.82	1,277	771	1,459	39.6%
	F4-1	Apt, mid tce	143	46.6	4,738	0	0	2,395	0	492	584	3,936	1.598	-1379.64	0.00	0.00	16.82	11.33	2,405	1,621	2,043	32.6%
Total / Average		Apt, mid tce	**715.4**	**46.5**	**14,942.2**	**0**	**0**	**19,423**	**0**	**3,003**	**2,686**	**24,777.6**	**7.99**	**-6,902**	**0.00**	**0.00**	**17.70**	**11.44**	**12,662**	**8,185**	**12,860**	**35.4%**

Non-Residential												PVs		Solar Thermals		SBEM 2010		Baseline CO_2 Emissions	Regulated CO_2 Emissions	Unregulated CO_2 Emissions	
Floor	Description	Floor area (m2)	HLP	Space Heating (Main) (kWh/an)	Space Heating (Main 2) (kWh/an)	Space Heating (Secondary) (kWh/an)	DHW from Boiler (kWh/an)	Cooling (SBEM) (kWh/an)	Lighting (kWh/an)	Aux (kWh/an)	Un-Reg (kWh/an)	PVs (kWp)	PVs Energy Offset	SHW (litres)	SHW (kWh/an)	TER	BER	$kgCO_2$/annum	$kgCO_2$/annum	$kgCO_2$/annum	% Improvement BER over TER
	Non-residential	2640.62		52,931			94,599	5,378	27,558	12,576	64,770	8.325	-6696.01	2500.00	30444.76	**24.83**	**19.70**	**65,567**	**52,012**	**33,615**	20.7%
Total / Average		2640.62		**52,931**	**0**	**0**	**94,599**	**5,378**	**27,558**	**12,576**	**64,770**	**8**	**-6,696**	**2500.00**	**30,445**	**24.83**	**19.70**	**65,567**	**52,012**	**33,615**	**20.7%**