Risetall Ltd

10-10a Belmont Street

Camden

Energy Statement

Submission

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1. Introduction

1.1. This Energy Statement has been prepared by Richard Hodkinson Consultancy (RHC), a specialist innovation, energy and sustainability consultancy, in support of the planning application for the proposed development at 10-12 Belmont Street, Camden.

1.2. This statement first establishes a baseline assessment of the energy demands for the development based on current Building Regulations. The report will then follow the London Plan approach of ***Be Lean***, ***Be Clean*** and ***Be Green*** to enable the maximum viable reductions in **regulated** and **total** CO_2 over the baseline.

1.3. In addition to the London Plan targets, this development will also be considered under Local Planning Policies for non-domestic buildings. Camden Borough Council requires 60% of the relevant BREEAM credits on energy to be achieved. These credits are based on **regulated** (i.e. excluding the equipment/small power) CO_2 reductions. A BREEAM Pre-Assessment for the development has been included as a separate document within the planning application.

1.4. The formulation of the energy strategy for the proposed development takes into account several important concerns and priorities. These include:

a) To achieve the maximum viable reduction in total CO_2 emissions.
b) To minimise the negative impact of the proposed development on both the local and wider climate.
c) To affordably meet the 20% reduction in total CO_2 emissions through the use of renewable energy required by the London Plan.
d) To minimise to the lowest possible extent emissions of pollutants such as nitrous oxides and particulate matter, thereby minimising the effects on local air quality. This is of particular concern in Camden which has been declared an Air Quality Management Area.

1.5. It is the recommendation of this Energy Statement that in addition to best practice energy efficient measures (*Be* Lean), that a biomass boiler system be installed as a *Be Green* renewable energy measure (reducing total CO_2 emissions by 20%). Such a strategy is able to reduce **regulated** and **total** CO_2 emissions for the development by **37%** and **28%** respectively over a Building Regulations (2006) baseline. This is significantly in excess of the reductions required by the London Plan. As such, this is a policy compliant energy strategy.

2. Development Overview

2.1. The proposal is for an 8 storey (plus 2 basement levels) student residence development at 10-10a Belmont Street, Camden. The building is proposed to contain 163 bedrooms at present, with around 10% of these suitable for access by disabled people. In addition to the bedrooms, the development will contain office space and social areas.

3. Planning Policy and Guidance

3.1. Policy 4A.1 of the London Plan requires developments to:

> *"make the fullest contribution to the mitigation of and adaptation to climate change and to minimise emissions of carbon dioxide.*
>
> *The following hierarchy will be used to assess applications:*
>
> - *Using less energy...*
> - *Supplying energy efficiently...*
> - *Using renewable energy"*

This is the *Be Lean, Be Clean, Be Green* approach required by the London Plan.

3.2. Policy 4A.7 expands on this stating that:

> *"developments will achieve a reduction in carbon dioxide emissions of 20% from on site renewable energy generation"*

3.3. It is the intention of the Applicant to satisfy the requirements of all planning policies. It will be demonstrated in this report that the London Plan requirements are fully met. The CO_2 reductions will be achieved following the *Be Lean, Be Clean and Be Green* framework.

3.4. Camden Borough Council requires that 60% of the un-weighted credits within the energy section of the BREEAM Assessment be attained. Our calculations demonstrate that this will be achieved. A BREEAM Pre-Assessment has been included as a separate document within the planning application.

4. Energy Baseline Assessment

4.1 In order that an energy assessment can be conducted, a Building Regulations baseline for energy demand first has to be calculated. The baseline will then be used as a basis to demonstrate the reductions in energy demand and associated CO_2 emissions that will result from energy efficient measures and on-site renewable energy generation. Appendix A shows the accommodation schedule for the development along with the calculated Building Regulation compliant baseline energy demands.

Method and Limitations

4.2 The estimated annual energy demand for the development has been calculated using the Simplified Building Energy Model (SBEM). SBEM provides a Target Emissions Rate (TER) for the proposed development based on 2006 Building Regulations. SBEM is the approved method within the Building Regulations. The designed Building Emissions Rate (BER) of the designed development must be below the TER for Building Regulations compliance.

4.3 SBEM calculates the **regulated** energy required for heating, cooling, lighting, auxiliary power and hot water. It also calculates the energy required for the **unregulated equipment**, which is not part of the TER or BER, but which must be included to reach the **total or whole** CO_2 emissions of the development to meet the London Plan policy requirements. Figures for the unregulated equipment for all uses within the proposed development are taken from SBEM output documents. It is these total or whole CO_2 emissions that are used with regard to the London Plan.

Building Regulation Compliant Baseline

4.4 The Building Regulations compliant baseline case provides that the development just meets the Target Emissions Rate. Table 1 shows the Building Regulations (2006) compliant Target Emissions Rate (regulated), as well as the total baseline CO_2 emissions (regulated + unregulated). Each is split into gas and electricity. The development will be naturally ventilated through the use of open-able windows in the bedrooms. As such, the development is able to limit its energy demand by not including any mechanical cooling.

Building Regulation (2006) Compliant CO_2 Emissions Baseline — **Table 1**

	Regulated CO_2 Emissions (kg/yr)		Total CO_2 Emissions (kg/yr)	
	Gas	Electricity	Gas	Electricity
Baseline (2006 TER)	127,300	98,400	127,300	168,500

5. *Be Lean*: Energy Conservation Measures

5.1. In keeping with the hierarchy of the London Plan, the following energy efficient, *Be Lean* measures are proposed to be applied to the development to significantly lower the emissions of the development below the Building Regulations compliant baseline:

- External Wall U-value of 0.21.
- Ground floor U-value of 0.22.
- Roof U-value of 0.18.
- Glazing U-value of 1.5.
- Air permeability value of 5 $m^3/hr/m^2$.
- Thermal bridge details meeting accredited details.

- HVAC system efficiency = 0.9.
- Hot Water system efficiency = 0.9.
- Reduction in hot water storage losses.
- Energy efficient lighting.

Cooling

5.2. The development will be naturally ventilated through the use of open-able windows. As such it is not proposed to install mechanical cooling. This will limit the energy requirements, and associated CO_2 emissions of the development. In addition to this, other measures from the Mayor's cooling hierarchy[1] are intended to be adopted. Thermal insulation and air tightness values, as detailed above, will be better than Building Regulations, thus limiting the heating load. There will be a green roof which will serve to cool the surrounding area by increasing the level of surface moisture (in comparison to hard surfaces). The availability of moisture allows more heat energy, which would otherwise heat the surrounding area, to be used up in evapotranspiration. There is therefore a localised cooling effect. Other benefits of a green roof include: - Surface water attenuation helping to reduce localised flooding

- Biodiversity improvements
- Increased insulation
- Breaks up the urban form

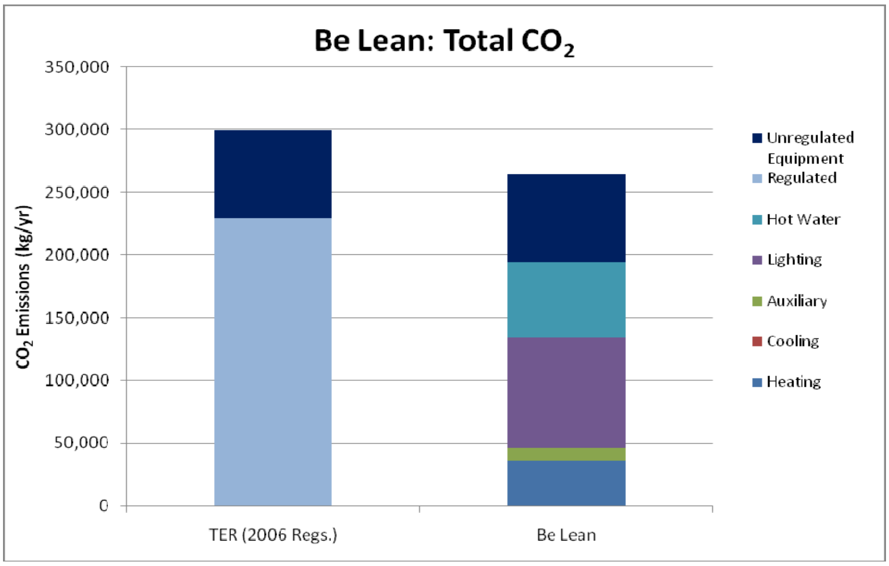
The benefits of green roofs are discussed in detail in the Sustainability Statement.

Metering

5.3. Whilst the Applicant is committed to the minimisation of energy and water use, the installation of monitoring systems in this instance is unlikely to reduce consumption. This is because in places such as student residences the occupier of each room is not responsible for the energy or water bills and therefore has no incentive to minimise their use of energy and water. However, sub-metering of substantial energy uses will be included (the ENE2 credit on both BREEAM Pre-Assessments, which are included within the Application). Additionally, guidance will be given to residents on how to minimise energy and water usage (BREEAM MAN4 credit).

5.4. The graph below illustrates that a **12%** reduction in **total** CO_2 emissions has been achieved over the TER due to the application of *Be Lean* measures. The reduction in **regulated** CO_2 is **15%**. The Be Lean column also shows the emissions profile of the proposed development.

[1] The London Climate Change Adaptation Strategy Draft Report, August 2008.



6. *Be Clean*: Combined Heat and Power (CHP)

6.1. In line with Policy 4A.6 of the London Plan, the feasibility of installing a Combined Heat and Power (CHP) engine has been evaluated. The inclusion of CHP has been studied in terms of appropriateness to this specific development, and, to be in line with our priorities for this energy strategy, whether CHP is the best technology to provide the greatest reductions in CO_2 emissions and minimisation of pollutants. As Camden has been declared an Air Quality Action Area, the pollutants of a CHP engine have been examined.

6.2. CHP is a form of decentralised energy generation that uses gas to generate electricity for local consumption, reducing the need for grid electricity and its associated high CO_2 emissions. As the CHP system is close to the point of energy demand, it is possible to use the heat that is generated during the electricity generation process. As both the electricity and heat from the generator is used, the efficiency of the system is increased above that of a conventional power plant where the heat is not utilised. CHP engines are best suited to providing the base heating load of a development (~year round hot water demand) with conventional gas boilers responding to the peak heating demand (~winter space heating). CHP engines are not able to effectively respond to peaks in demand.

6.3. It should be noted at this juncture that the installation of both a CHP engine and a biomass boiler is not feasible as they are in conflict with each other and therefore should not be installed in tandem. This is because they are both best suited to providing for the base heating load of a development. This section and the following section discuss the relative merits of each and conclude that a biomass boiler is more suitable for this development than a CHP engine.

6.4. A CHP engine is suitable where there is a high and relatively constant heat and electrical demand. This is not the case with this development which is small and basically has a single heat demand which will fluctuate through the day (offices require only a small amount of space heating and hot water). In addition to this, the heating and hot water loads of the development have been reduced through *Be Lean* energy conservation measures. Fabric improvements and reduced hot water energy losses serve to reduce further the viability of a CHP engine.

6.5. To prevent an over-generation of heat, a small CHP engine would be required. Such an engine would have high installed costs and proportionally high running costs relative to the electrical contribution that it would make. It would be unable to deliver electricity cost-effectively and RHC experience has shown that where small-scale CHP engines have been installed when the heating profile is not ideally suited to it, the result is that the CHP engine is often turned off for operational economic reasons.

6.6. A biomass boiler system will be installed to provide the specific 20% CO_2 reduction through renewable energy. It is the conclusion of this Energy Statement that a biomass boiler is more suitable for this development than a CHP engine. Sections 7 and 8 discuss the reasons for selecting a biomass boiler as the best method to produce the development's renewable energy and the reasons why other technologies are unsuitable.

6.7. As stated earlier, it is the priority of this Energy Statement to maximise the reduction in CO_2 emissions and this is best achieved through a biomass strategy rather than gas CHP. As gas CHP is not a renewable energy source, it is not able to provide the same reductions in total CO_2 that a biomass system can. The biomass strategy maximises the reductions in total CO_2 and is the only viable route to achieve the 20% reduction in total CO_2 through renewable energy required by Policy 4A.7 of the London Plan.

6.8. It is also the priority of this Energy Statement to minimise the effect of the development on local air quality. As such emissions of substances such as nitrous oxides (NO_x) will be kept to a minimum. It has been concluded that a CHP engine will have a dramatically greater impact on the local environment in terms of emissions than a biomass boiler of appropriate size would. A specially selected clean burning biomass boiler will emit, in terms of NO_x, ~80mg/kWh[2]. In contrast to this, a CHP engine of suitable size would emit ~1000mg/kWh[3] of nitrous oxides. It is clear from this that the installation of a CHP engine at Belmont Street would have a substantially greater negative effect of the local air quality than would a biomass boiler. As the Borough of Camden has been declared as an Air Quality Management Area for breaching the air quality standards for NO_2, the fact that CHP produces many times more NO_x compared to a biomass boiler had a significant effect on the formulation of this Energy Strategy.

[2] Dry NO_x at 0% O_2.
[3] Dry NO_x at 0% O_2.

6.9. It has been concluded that due to the reasons detailed in this section that the installation of a CHP engine at the proposed Belmont Street development is not feasible.

7. *Be Green*: Renewable Energy Generation

7.1. After the application of Be Lean measures the total CO_2 emissions of the development are 264,500 kg per annum. It can be calculated from this that the minimum amount of CO_2 that must be offset by the generation of on-site renewable energy is 52,900 kg/yr in order to meet the 20% reduction in total CO_2 target of the London Plan. This can be seen in Table 2.

London Plan Target	Table 2
Total CO_2 Emissions After *Be Lean* Measures (kg/yr)	264,500
London Plan 20% Reduction Target (kg/yr)	**52,900**

Biomass Boiler Installation

7.2. It is the conclusion of this Energy Statement that a biomass boiler provides the most technically and economically feasible option that will enable the proposed development to meet the target shown above. This strategy maximises the proposed development's reduction of total CO_2 emissions.

7.3. Having installed a heat distribution network, biomass boilers are the most cost effective route to delivering on-site renewable energy generation. A biomass boiler would be installed alongside the gas boilers in the plant room and sized to produce the base load heating (~year round hot water load). This would require an 85kW boiler operating for 3,800 hours per annum (~10.5 hours per day on average). A biomass boiler of this size would reduce the CO_2 emissions of the development by a sufficient amount to meet the planning policies.

7.4. Whilst the manufacturer and model have not been decided at this stage, the selected boiler will be compliant with the Clean Air Act. Additionally, as the Applicant is committed to good air quality, a high efficiency boiler (>87%) will be selected to minimise the fuel required to meet the demands of the development. In addition to the information supplied in this Energy Statement regarding the proposed biomass boiler, The Applicant will be able to provide further and more detailed information at the detailed design stage.

7.5. A Biomass Boiler system would operate year round to provide the base heating load (~year round hot water load). The boiler will have a turndown facility for times of low demand and a thermal store will help to even out peaks in demand. However, biomass boilers do not come with a large turndown facility and operate best at peak load. The flue to disperse effluent gases must be designed for full load and any turndown in the running of the boiler will have an adverse effect on the performance of the flue. Therefore conventional gas boilers will still be required for peaks in demand (~winter heating load) and for security of supply. A control system will ensure that the biomass boiler operates ahead of the gas boilers.

7.6. Biomass wood pellet boilers offer a high technology alternative to wood chip burning stoves and we recommend these as being more suitable for the development. Pellet boiler systems can be automated and are well suited to installations requiring a minimum of on-site operational support and maintenance. The specified boiler will have an automatic fuel feed system and facility for automatic de-ashing.

Wood Pellet Fuel and Fuel Delivery

7.7. Wood pellets, although being slightly more expensive than wood chips have a significantly higher calorific value, enabling a greater amount of energy to be extracted from a smaller volume of fuel. In addition to a greater output from the boiler this will also result in a smaller fuel store requirement and fewer deliveries.

7.8. The fuel store for the biomass boiler will be large so as to minimise the delivery frequency of the biomass fuel and sized to be able to hold the contents of a full delivery vehicle. Based on a delivery vehicle holding $15m^3$ of fuel, deliveries would be required every 50 days. It is possible that a larger delivery vehicle will be used and consequently deliveries will be less frequent. There is sufficient space on a quiet road outside the proposed development for the delivery vehicle to park. Therefore delivery of the fuel will be without disruption.

7.9. Burnback protection on the boiler and fuel feed system will prevent ignition of the fuel store.

7.10. Whilst a biomass wood pellet fuel supplier has not been confirmed at this stage of the development, all reasonable effort and preference will be made to secure a supply of sustainably sourced wood pellets within a reasonable distance of the development. However, if this cannot be achieved in an economically viable way in an openly competitive market, then other options may have to be considered. Although it is the preference of The Applicant that fuel is from a sustainable supply, it should be noted that even if the wood pellets are imported from Sweden, for example, only 3% of the energy contained would be embodied as transport related. Wherever the origin of the pellets they will be virtually carbon neutral and classified as a renewable fuel. In contrast, gas CHP engines run on an unsustainable finite fossil fuel. The pellets selected will have low ash, moisture and nitrogen contents.

Flues and Air Quality

7.11. Whilst a specific boiler model has not been selected at this stage of the development, a number of minimum characteristics will be adhered to in the selection process. The specified boiler will: -

- Be exempt under the Clean Air Act.
- Be a high efficiency model (>87%).
- Include a combustion air control technology e.g. lambda sensor.
- Have an automatic ignition feature.

- Include abatement technology to minimise emissions of particulate matter.
- Be considerably lower in nitrous oxide emissions than a CHP engine[4].

7.12. In addition to the requirements listed in 7.12. the specified boiler may include other pollution reduction equipment such as flue gas recirculation.

7.13. Consideration has been given to the height of the flues required. A well designed flue will ensure that any pollutants are adequately dispersed and there is no adverse impact on local air quality. The estimated flue height has been calculated using the method described in The Chimney Heights Memorandum, 1981. The emissions of the biomass boiler and gas boilers have been taken into account. As the effluents of the biomass burning will be low in sulphur dioxide and nitrous oxides the required flue height will be 1m above the roof height (providing no part of the building within a 5m radius of the flue is higher). If there is public access to areas adjacent to the flue termination then the flue must terminate at least 3m above this level.

7.14. The insulated flues will be run internally through the building to terminate as shown on the plans. Specialist flue designers will design flues that have adequate draughts to gain sufficient efflux velocities in order to effectively disperse any pollutants. Due to the height of the building and the well-designed flues that will be fitted, there will be little if any impact on air quality at ground level from the emissions of the development.

7.15. Estimated flue diameters are provided for guidance only and will be determined at a later stage by a specialist flue designer to achieve an adequate draught. These are:-

- Biomass boiler: ~200mm.
- Gas boilers: ~200mm each.

The Plant Room

7.16. The plant room will provide the heat energy for the whole of the proposed development via single site-wide heat distribution network, and as such will contain all the required equipment. Due to the presence of a central plant room and heat distribution network, all the infrastructure is in place for a future connection to a district energy network. Space has been allocated in the plant room for such a link in the future should it be viable.

7.17. In addition to the Biomass Boiler mentioned above, conventional gas boilers are required as backup and to account for peak heating demands. The gas boilers will be specified to be able to fulfil peak demand without use of the biomass system so as to ensure security of supply.

[4] Nitrous oxide emissions of a biomass boiler are ~80mg/kWh; nitrous oxide emissions of CHP engine are ~1000mg/kWh. Both dry NO_x at 0% O_2.

7.18. It is estimated that a 400kW gas boiler system is required. Two 200kW gas boilers are able to fulfil this demand.

7.19. The plant room must be large enough to accommodate the conventional gas boilers, biomass boiler, thermal store, the biomass fuel store and any necessary controls and pumps. The biomass boiler and its fuel store will be in separate rooms from the other systems and behind fire proof walls. Additionally, space will be set-aside for potential upgrades so as to 'future-proof' the development.

7.20. It is estimated that a plant room of 100-120m^2 and at least 3.5m high is required to accommodate the necessary equipment.

Biomass Generation

7.21. The biomass boiler installation will generate 100% of the development's hot water demand. A thermal store will be installed to even out peaks in demand.

7.22. Table 4 shows that the biomass boiler system enables the development to achieve a reduction in total CO_2 in excess of the 20% required by the London Plan.

London Plan *Be Green* Target	**Table 3**
Total CO_2 Emissions After *Be Lean* Measures (kg/yr)	264,500
Emissions Reduction: Biomass (kg/yr)	**53,000**
Reduction	**20.0%**

7.23. Appendix C responds specifically to Paragraph 17.43 of the Camden Planning Guidance 2006.

8. Renewable Energy Alternatives

8.1. The following alternative renewable energy technologies were considered for inclusion in this development, with a biomass boiler being selected as the most suitable and feasible.

Solar Photovoltaic Panels

8.2. Solar PV panels have changed markedly over the past few years with improved system performance. Installations work best when pitched on roofs angled at 30-45^0, oriented with 35^0 of south and free of any potential shading, which can reduce the performance of the system considerably.

8.3. No optimal south facing roofs are available so the panels would have to be installed on the flat roof. The roof is not large enough to accommodate the required amount of panels to meet the 20% target of the London Plan, as in excess of 675m^2 of panels[5] would be required. The actual roof space required to accommodate this would be ~145% of this as the panels must be installed at a minimum angle of 10 degrees to the horizontal to allow self-cleaning. This is because the panels would need to

[5] Area calculated for the most efficient panels. ~19% Efficiency. Most installed PV panels do not approach this efficiency. As a consequence of being the most efficient they will also be more expensive.

be spaced apart to prevent overshadowing and consequent loss of performance. This means that ~950m^2 of roof would be required. The available roof is only ~370m^2 and is therefore unable to accommodate the required system size. Panels installed on the roof would also prevent a green roof being included in the design and consequently decrease the albedo of the development significantly, due to the very dark colour of the panels. Both of these factors would serve to have a localised heating effect on the surrounding area. The benefits of a green roof are discussed in detail in the Sustainability Statement.

8.4. **In conclusion, the roof is too small to install sufficient solar PV panels to enable the proposed development to be policy compliant.**

Solar Thermal Panels

8.5. Solar Thermal Heating Systems contribute to the hot water demand of the building. Water is circulated to roof level where it is heated using solar energy before being returned to a thermal store in the plant room where heat is exchanged with water from the conventional system. Due to the seasonal variation in solar radiation, solar thermal panels should be scaled to provide no more than 2/3 of the hot water load.

8.6. Like solar PV panels, solar thermal panels operate optimally when placed on a south facing roof and also must be installed at a minimum angle of 10 degrees to allow the water circulation pumps to operate. Whilst ~580m^2 of solar thermal panels would satisfy the policy requirements, a roof area of in excess of 840m^2 would be required to accommodate such an installation. The roof which is ~370m^2 is unable to accommodate this. Additionally, the hot water demand of the development is not large enough to support an installation of this size.

8.7. **In conclusion, the roof is too small to install sufficient solar thermal panels to enable the proposed development to be policy compliant.**

Wind Turbines

8.8. Wind energy installations can range from small domestic turbines (1kW) to large commercial turbines (140m tall, 2MW). There are also different designs and styles (horizontal or vertical axis; 1 blade to multiple blades) to suit the location. They generate clean electricity that can be provided for use on-site, or sold directly to the local electricity network in times of excess generation.

8.9. Five 15kW horizontal axis wind turbines would be required to reduce CO_2 emissions by a sufficient amount to be policy compliant. However these generally do not operate well in urban environments where wind speeds are reduced and turbulence is increased. For effective operation horizontal axis wind turbines require an average wind speed of ~6m/s. Table 6, below, shows the wind speeds in the area[6]. Only above 45m are speeds sufficient for horizontal axis turbines. As the building is only 8 storeys high, large masts would be required. The visual impact of this would be unacceptable.

Belmont Street Wind Speed	Table 4
Height Above Ground (m)	**Wind Speed (m/s)**
10	4.9
25	5.6
45	6.1

8.10. Vertical axis turbines operate more effectively in urban environments and cope better with lower wind speeds and turbulent air. However, these are only produced in small models and as such 17 would be required to be policy compliant. Turbines should be spaced 10m apart from each other so as not to disrupt airflow to other turbines. As such, the roof is not able to accommodate the required amount of turbines.

8.11. **In conclusion, wind conditions are too poor for horizontal axis turbines and the roof is too small to install sufficient vertical axis turbines.**

9. Summary

9.1. The energy strategy outlined for the proposed development is policy compliant and has been designed to provide the maximum viable reduction in CO_2 emissions and to minimise the development's influence on the local environment and air quality.

9.2. Energy saving measures including best practice building fabric improvements have been applied to minimise energy losses and reduce the total CO_2 emissions of the development by 12% over the Target Emissions Rate (TER).

9.3. It has been concluded that CHP as a *Be Clean* measure is not appropriate for a development of this size and nature. Additionally, CHP would have a greater negative impact on local air quality and would not reduce CO_2 emissions by as much as the selected biomass strategy.

9.4. *Be Green* measures are proposed in the form of a Biomass boiler system. The biomass boiler system generates sufficient renewable energy to reduce the total CO_2 emissions of the development by in excess of 20%, thus fulfilling Policy 4A.7 of the London Plan.

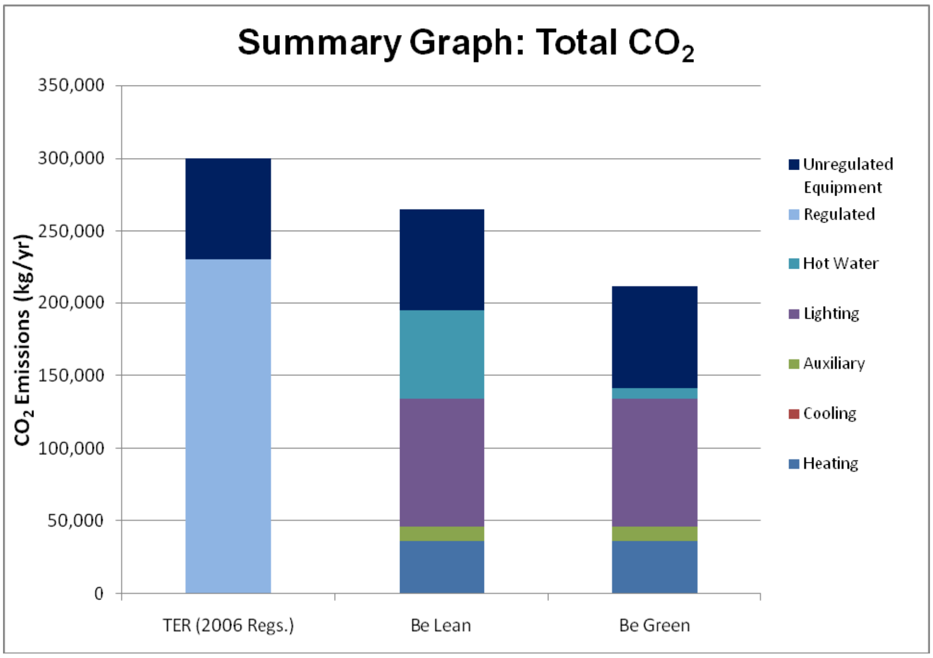
9.5. The combination of all these measures reduces **total CO_2** emissions by **28%** over the Building Regulations (2006) baseline. These can be seen in the Summary Table below.

[6] Department for Business Enterprise and Regulatory Reform (BERR) Wind Speed Database.

Summary Table				
	Regulated CO_2 Emissions (kg/yr)		Total CO_2 Emissions (kg/yr)	
	Gas	**Electricity**	**Gas**	**Electricity**
Baseline (2006 TER)	127,300	98,400	127,300	168,500
Emissions After Be Lean	96,800	97,900	96,800	167,900
Emissions After Be Green	43,900	97,900	43,900	167,900
Total	141,800		211,800	
Reduction Achieved	**37%**		**28%**	

9.6. The combination of *Be Lean* and *Be Green* measures enable the development to achieve a **37%** reduction in **regulated CO_2**. This can be seen in the Summary Table above. This, in combination with other measures, will enable the development to attain sufficient BREEAM energy credits. A BREEAM Pre-Assessment is included as a separate document.

9.7. The summary graph below shows the reductions in total CO_2 emissions over a 2006 Building Regulations baseline. The combination of *Be Lean* and *Be Green* measures enables the development to achieve reductions in **regulated** and **total** CO_2 emissions of **37%** and **28%** respectively.



Appendices

A) Accommodation Schedule, Energy Baselines and Energy Conservation Measures

B) Biomass Boiler Calculations

C) Response to Camden Planning Guidance 2006: Paragraph 17.43

APPENDIX A: ACCOMMODATION SCHEDULE, ENERGY BASELINES AND ENERGY REDUCTION MEASURES

NOTIONAL BUILDING (2002 REGULATIONS)

NOTIONAL BUILDING (2002 REGULATIONS)							
	Notional Energy Demands (kWh/m2/yr)						CO_2 (kg/m2/yr)
Room Type	Heating	Cooling	Auxiliary	Lighting	Hot Water	Total Regulated Energy	Notional
Mid-Floor Internal Bedroom	79.95	0	1.83	30.51	208.07	320.36	69.53
Top Floor Internal Bedroom	115.56	0	7.82	30.51	208.07	361.96	78.96
Mid Floor Corner Bedroom	146.26	0	7.82	26.27	208.07	388.42	83.13
Social Areas	34.03	0	2.43	33.64	141.27	211.37	49.23
Plant Room/Storage	0	0	0	6.02	0	6.02	2.54
Circulation	16.2	0	4.35	36.06	0	56.61	20.2
Office	8.73	0	3.14	88.97	9.89	110.73	42.48

NOTIONAL

Room Type	No. Units	Unit Area (m2)	Total Regulated Energy Demand (kWh/m2/yr)	CO_2 (kg/m2/yr)	Total Regulated Energy Demand per Unit (kWh/yr)	Total Regulated CO_2 per Unit (kg/yr)	Total Regulated Energy Demand for Type (kWh/yr)	Total Regulated CO_2 for Type (kg/yr)	Total Energy Demand - inc. Equipment (kWh/yr)	Total CO_2 - inc. Equipment (kg/yr)
Mid-Floor Internal Bedroom	120	17	320.36	69.53	5,446	1,182	653,534	141,841	700,454	161,641
Top Floor Internal Bedroom	14	17	361.96	78.96	6,153	1,342	86,146	18,792	91,620	21,103
Mid Floor Corner Bedroom	29	17	388.42	83.13	6,603	1,413	191,491	40,983	202,830	45,768
Social Areas	1	120	211.37	49.23	25,364	5,908	25,364	5,908	32,204	8,794
Plant Room/Storage	1	300	6.02	2.54	1,806	762	1,806	762	2,196	927
Circulation	1	650	56.61	20.2	36,797	13,130	36,797	13,130	45,247	16,696
Office	1	2164	110.73	42.48	239,620	91,927	239,620	91,927	326,180	128,455
Total	**167**						**1,234,759**	**313,343**	**1,400,732**	**383,384**

BUILDING REGULATIONS (2006) TER

BUILDING REGULATION (2006) TER								
	Energy Demands (kWh/m2/yr)						CO2 (kg/m2/yr)	
Room Type	**Heating**	**Cooling**	**Auxiliary**	**Lighting**	**Hot Water**	**Total Regulated Energy**	**BER**	**TER**
Mid-Floor Internal Bedroom						230.66	53.19	53.19
Top Floor Internal Bedroom						260.61	58.17	58.17
Mid Floor Corner Bedroom						279.66	61.31	61.31
Social Areas						152.19	37.66	37.66
Plant Room/Storage						4.33	1.83	1.83
Circulation						40.76	2.83	2.83
Office						84.5	32.5	32.5

BUILDING REGULATION (2006) TER

Room Type	No. Units	Unit Area (m2)	Total Regulated Energy Demand (kWh/m2/yr)	CO2 (kg/m2/yr)	Total Regulated Energy Demand per Unit (kWh/yr)	Total Regulated CO2 per Unit (kg/yr)	Total Regulated Energy Demand for Type (kWh/yr)	Total Regulated CO2 for Type (kg/yr)	Total Energy Demand - inc. Equipment (kWh/yr)	Total CO2 - inc. Equipment (kg/yr)
Mid-Floor Internal Bedroom	120	17	230.66	53.19	3,921	904	470,545	108,508	470,545	128,308
Top Floor Internal Bedroom	14	17	260.61	58.17	4,430	989	62,025	13,844	62,025	16,154
Mid Floor Corner Bedroom	29	17	279.66	61.31	4,754	1,042	137,874	30,226	137,874	35,011
Social Areas	1	120	152.19	37.66	18,262	4,519	18,262	4,519	18,262	7,406
Plant Room/Storage	1	300	4.33	1.83	1,300	549	1,300	549	1,300	714
Circulation	1	650	40.76	2.83	26,493	1,840	26,493	1,840	26,493	5,405
Office	1	2164	84.50	32.5	182,858	70,330	182,858	70,330	182,858	106,858
Total	**167**						**899,358**	**229,816**	**899,358**	**299,856**

BE LEAN MEASURES

BE LEAN

	Energy Demands (kWh/m2/yr)						CO2 (kg/m2/yr)	
Room Type	Heating	Cooling	Auxiliary	Lighting	Hot Water	Total Regulated Energy	BER	TER
Mid-Floor Internal Bedroom	61.91	0	2.81	24.45	104.89	194.06	43.84	53.19
Top Floor Internal Bedroom	74.59	0	2.81	24.45	104.89	206.74	46.3	58.17
Mid Floor Corner Bedroom	74.78	0	2.81	24.45	104.89	206.93	46.33	61.31
Social Areas	13.64	0	3.96	28.46	71.69	117.75	30.09	37.66
Plant Room/Storage	0	0	0	6.66	0	6.66	2.81	1.83
Circulation	1.01	0	7.02	22.66	0	30.69	12.72	15.45
Office	1.94	0	4.81	55.78	5.47	68	26.99	32.5

BE LEAN

Room Type	No. Units	Unit Area (m2)	Total Regulated Energy Demand (kWh/m2/yr)	CO2 (kg/m2/yr)	Total Regulated Energy Demand per Unit (kWh/yr)	Total Regulated CO2 per Unit (kg/yr)	Total Regulated Energy Demand for Type (kWh/yr)	Total Regulated CO2 for Type (kg/yr)	Total Energy Demand - inc. Equipment (kWh/yr)	Total CO2 - inc. Equipment (kg/yr)
Mid-Floor Internal Bedroom	120	17	194.06	43.84	3,299	745	395,882	89,434	442,802	109,234
Top Floor Internal Bedroom	14	17	206.74	46.3	3,515	787	49,204	11,019	54,678	13,329
Mid Floor Corner Bedroom	29	17	206.93	46.33	3,518	788	102,016	22,841	113,355	27,626
Social Areas	1	120	117.75	30.09	14,130	3,611	14,130	3,611	20,970	6,497
Plant Room/Storage	1	300	6.66	2.81	1,998	843	1,998	843	2,388	1,008
Circulation	1	650	30.69	12.72	19,949	8,268	19,949	8,268	28,399	11,834
Office	1	2164	68	26.99	147,152	58,406	147,152	58,406	233,712	94,935
Total	**167**						**730,332**	**194,422**	**896,305**	**264,462**

APPENDIX B: BIOMASS BOILER CALCULATIONS

London Plan 20% Target (kg/yr)	**52,892**

Biomass Boiler Size (kW)	**85**
Operating Hours	**10.5**
Biomass Delivered Energy (kWh)	325,763
Associated CO_2 Emissions (kg/yr)	8,144
Biomass Boiler Efficiency	87%
Biomass End Use Energy (kWh)	285,010
Gas Displaced by Biomass (kWh)	314,963
CO_2 Displaced (kg/yr)	61,103
CO_2 Saving (kg/yr)	**52,959**

Fuel Store Required	
Fuel Consumption (kg/hr)	20
Daily Fuel Consumption (kg)	205
Deliveries Every (days)	**49**

Flue Height Above Roofline Required	
Uncorrected Height (m)	1.0
No higher construction within (m)	**4.8**
Corrected Minimum Height (m)	**1**

Appendix C:

Response to Camden Planning Guidance 2006: Paragraph 17.43

- Camden Planning Guidance 2006: Paragraph 17.43:

  "For biomass heating systems and biomass CHP, evidence must be provided with the application to demonstrate potential suppliers, that fuels will be provided from renewable sources, and that adequate storage is provided for fuels according to the requirements of the system."

- There are multiple suppliers of biomass wood pellet fuel that could potentially be selected. These include:
  - Bioener G Ltd
  - Biojoule Ltd.
  - Biomass UK Ltd.
  - Forever Fuels Ltd.

- Wood pellet fuel will be from a sustainable renewable source.

- As detailed in Section 7 of this Energy Statement, it is recommended that a 15m^3 fuel store is installed. Such an installation is able to store ~50 days worth of fuel and is suitable for the requirements of the system.