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Kilburn High Road, 254, London

Energy Strategy Report

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Project number: 22408

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Contents

Executive Summary

This report details the proposed energy strategy for the Kilburn High Road scheme, which involves the demolition of the current buildings and redevelopment of the site for a mixed-use building. The mixed-use development will comprise a commercial space at ground level and 62 residential units above up to 6 storeys.

The proposed development addresses national planning policies on energy; in particular, mitigation of climate change and energy security through energy efficiency enhancements and use of alternative energy technologies. In order to reduce the carbon footprint of the building beyond the requirements of current regulatory and market standards, the development will benefit from the following integrated systems:

- Passive design features (Be Lean)
- Energy efficiency measures (Be Clean)
- Low and zero carbon technologies (Be Green)

The building fabric performance will meet or exceed the Part L 2013 requirements where applicable.

The London Plan and the Code for Sustainable Homes (CSH) are currently still based on the Target Emission Rate (TER) for the 2010 Part L, rather than the new 2013 version. An energy assessment has been carried out based on design information to identify the most appropriate renewable strategy. The proposed strategy has the potential to provide a 43.9% improvement over the Part L 2010 minimum target; through passive design measures, energy efficient equipment and renewable technologies.

The scheme incorporates appropriate LZC technologies in accordance with the use of space and therefore the development does achieve the policy for a 40% total reduction through a combination of measures, which also demonstrates the scheme's compliance with the London Plan Policy 5.2.

Based on the proposed energy strategy, 4 credits can also be achieved in Ene 1 of the Code for Sustainable Homes assessment, with a further 7 credits in Ene 2, helping to achieve a Code Level 4 on the scheme in residential units. In addition, 12 credits can be achieved in Ene 01 of the BREEAM 2011 assessment. Further details can be found in the Price & Myers Code for Sustainable Homes Pre-assessment report and BREEAM Pre-assessment report.

1. Introduction

1.1 Site Analysis

The Kilburn High Road development is located in the London Borough of Camden.

The new mixed-use development will comprise a commercial part on the ground floor and 62 residential units above up to sixth floor. The units at top level of the building will be constructed with different levels of sloped roofs as shown in the Figure below.

Figure 1: 254 Kilburn high Road

1.2 Objective

This report summarises the work undertaken to support the development of an energy strategy for the Kilburn High Road scheme. This work has resulted in a strategy that requires design, technical and commercial decisions in order to continue the design development and ultimately select the final solution for ensuring a low carbon development.

This report outlines the energy strategy for the development, including passive design, energy and CO_2 footprint of the proposed scheme, and renewable energy options.

The final proposed strategy would allow the scheme to demonstrate compliance with the guidelines set out by the London Borough of Camden and the London Plan in demonstrating a positive commitment to sustainability through providing environmental improvements.

2. Policy

2.1 London Borough of Camden Policies on Energy

Policy DP22 – Promoting sustainable design and construction

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 (Camden Development Policies – Section 3, paragraph 22.5), have been incorporated into the design and proposed implementation; 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 encouraging Code Level 6 (zero carbon) by 2016.;

d) Expecting developments (except new build) of 500 sq m of residential floor space or above or 5 or more dwellings to achieve "very good" in EcoHomes assessments prior to 2013 and encouraging "excellent" from 2013;

e) Expecting non-domestic developments of 500 sqm of floor space or above to achieve "very good" in BREEAM assessments and "excellent" from 2016 and encouraging zero carbon from 2019.

The Council will require development to be resilient to climate change by ensuring schemes include appropriate climate change adaptation measures, such as:

f) Summer shading and planting;

g) Limiting run-off;

h) Reducing water consumption;

i) Reducing air pollution; and

j) Not locating vulnerable uses in basements in flood-prone areas.

Policy CS13 Reducing the effects of and adapting to climate change

The Council will require all development 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 occupation by:

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 buildings by implementing, in order, all of the elements of the following energy hierarchy:

   1. ensuring developments use less energy,

   2. making use of energy from efficient sources, such as the King's Cross, Gower Street, Bloomsbury and proposed Euston Road decentralised energy networks;

3. generating renewable energy on-site; and

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

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

2.2 The London Plan Policies on Energy

Policy 5.2: Minimising Carbon Dioxide Emissions

Planning Decisions

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

The mayor will work with boroughs and developers to ensure that major developments meet the following targets for carbon dioxide emission reductions in buildings:

2010 - 2013: 25% improvement over Part L 2010

2013 - 2016: 40% improvement over Part L 2010

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. This report contains a detailed energy assessment in line with the requirements of Policy 5.2.

Policy 5.6: Decentralised Energy in Development Proposals

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.

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.

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

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.

There is a presumption that all major development proposals will seek to reduce carbon dioxide emissions by at least 20% through the use of on-site renewable energy generation wherever feasible. Development proposals should seek to utilise renewable energy technologies such as: biomass heating; cooling and electricity; renewable energy from waste; photovoltaic; solar water heating; wind and heat pumps. The Mayor encourages the use of a full range of renewable energy technologies, which should be incorporated wherever site conditions make them feasible and where they contribute to the highest overall and most cost effective carbon dioxide emissions savings for a development proposal.

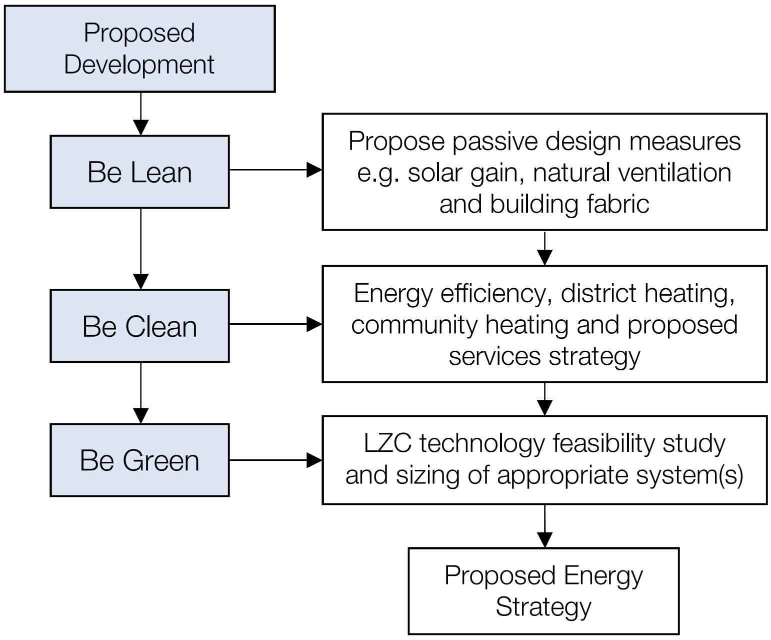
3. Approach

The approach to achieving the planning policy energy objectives has been to consider strategies and technologies to achieve a low energy and carbon footprint for the scheme.

The development will adopt the following energy hierarchy:

- Use less energy through passive design measures (Be Lean)
- Supply and consume energy efficiently (Be Clean)
- Utilise renewable energy sources to reduce carbon emissions (Be Green)

This energy strategy examines the energy performance of the proposed Kilburn High Road development based on the following methodology:



The performance of the development in terms of energy consumption and carbon emissions is calculated at each stage of the assessment, ensuring that both regulated and unregulated energy is considered when determining the performance of the proposed energy strategy.

3.1 Accredited Energy Assessor

This report has been checked and reviewed by Jessica Gray who is an On Construction Domestic Energy Assessor (OCDEA) & Vidhi Gupta who is a Low Carbon Energy Assessor (LCEA) Level 5. The energy consumption and carbon emission figures within this report have been calculated using the approved Standard Assessment Procedure for the Energy Rating of Dwellings (SAP) and the approved EDSL Tas Dynamic Simulation Modelling (DSM) software.

4. Passive Design

As part of the Be Lean approach, passive design measures have been considered throughout the pre-planning stage to reduce energy demand.

4.1 Solar Gain Control and Daylighting

Consideration where feasible has been given to the orientation of the development, the size and orientation of external windows and shading to balance the positive and negative effects of solar gains.

Where possible, windows and natural daylight have been provided to ensure appropriate daylighting levels throughout the development and reduce the lighting demand.

4.2 Building Fabric Efficiency

To further improve the passive design of the development, the thermal fabric has been specified to meet or exceed current Building Regulations targets. Table 4.1 shows the proposed U-values that will be considered for the development and have been assumed for the energy strategy analysis at this stage.

Table 4.1: Proposed Be Lean passive design measures

Element	Measure	
	Commercial	Flats
External Walls	0.11 W/m^{2}K	
Windows	1.2 W/m^{2}K	
External Doors	1.5 W/m^{2}K	
Roof	N/A	0.11 W/m^{2}K
Ground	0.15 W/m^{2}K	N/A
Air Tightness	4 m^3/m^2/h	

5. Energy Efficiency

As part of the Be Clean approach, the use of heat networks, community heating and cooling and energy efficient equipment has been considered for this development.

5.1 District Energy Systems

District energy systems produce steam, hot water or chilled water at a central energy centre. The steam or water is distributed in pre-insulated pipework to individual buildings for space heating, domestic hot water and air conditioning. As a result, individual buildings served by a district energy system don't required their own boilers or chillers.

According to the London Heat Map Study, a potential heat network is located close to the site. Figure 5.1 shows the South Kilburn potential network. At present it is understood that construction of this network has not begun. During the detailed design stages of the project, the developer will seek to communicate with the provider of the heat network to ascertain the possibility of connecting in the future. It is however thought that it may be too far away.

Fig 5.1: Mapping Decentralised Energy Potential for the proposed site

As this network is not yet available, it is not possible to connect at this time. The development will utilise community heating, which will provide the necessary infrastructure to connect in the future should this, or another network, be realised. This includes the provision of pipework to the site boundary to facilitate future connection.

5.2 Community Heating

Community heating involves distributing space and water heating services throughout the development served from a central plant, making use of higher efficiencies available from larger systems.

This is quite a large development, with 62 units. At this scale, community heating is a viable solution. This provides a greater efficiency than individual systems. This solution also allows the opportunity to consider larger scale technologies and future proofs the development for potential connection to a district heating system.

5.3 Services Strategy

In addition to the passive design measures identified in Section 4, energy efficient equipment has been proposed where possible to support the services strategy. Table 5.1 shows the proposed services strategy and energy efficiency measures for the development.

Table 5.1: Proposed energy efficient design measures

Services	Commercial		Residential
Ventilation	Mechanical ventilation with heat recovery – 90% efficient SFP 0.5w/l/s		
Lighting	Lighting efficacy	90 lumens /circuit Watt	100% low energy lighting
	Daylight control	Photocell Dimming	
	Auto-presence detection	Manual On /Auto Off	

5.4 Improvement Over Part L

Based on the performance of the passive design and energy efficient measures proposed in Sections 4 and 5, Figure 5.2 demonstrates the percentage improvement as calculated using SAP 2009 for residential units and TAS for commercial space. The figures show over the notional baseline levels for the development before any low or zero carbon technologies have been considered.

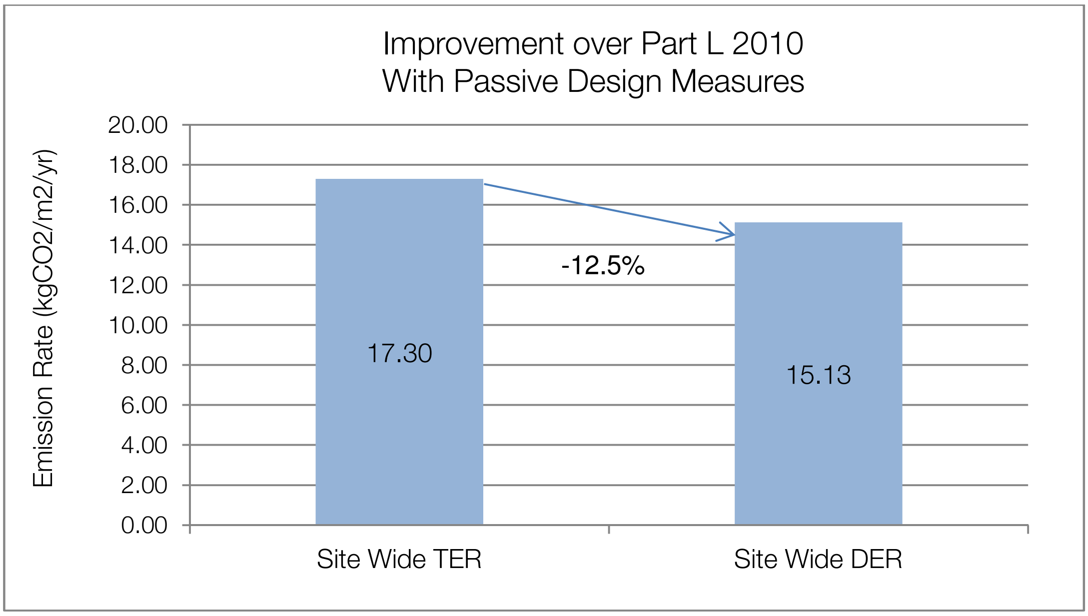


Fig 5.2: Improvement over Building Regulations Part L 2010 before LZCs

6. Estimated Energy Use and Carbon Footprint

Calculations have been carried out to determine the estimated energy demand and carbon footprint of the proposed development, taking into account the passive design and energy efficiency measures identified in Sections 4 and 5. This will form a base case for the development using gas as the baseline fuel.

The energy consumption includes regulated energy (space and water heating, lighting, pumps and fans) derived from outputs of the SAP &TAS modelling for the site and unregulated energy (household appliances and equipment) based on the BRE methodology or TAS predictions. Full details of assumptions are included in Appendix A and Table 6.1 details the energy demand for the site taking into account the regulated and unregulated energy.

Table 6.1: Estimated regulated and unregulated energy demand and carbon emissions per energy source

Energy & CO_2												
	Gas Demand				Electricity Demand						Total Energy (kWh/yr)	Total CO_2 (kg/yr)
Type	Space Heating (kWh/yr)	Hot Water (kWh/yr)	Total (kWh/yr)	Gas CO_2 (kg/yr)	Pumps & Fans (kWh/yr)	Lighting (kWh/yr)	Cooling (kWh/yr)	Appliances (kWh/yr)	Total (kWh/yr)	Electricity CO_2 (kgCO2/yr)		
Flats	83,603	149,005	232,608	46,056	10,675	20,241	0	156,413	187,329	96,849	419,937	142,905
Commercial	6,061	2,990	9,051	1,792	6,000	13,506	5,461	42,582	67,549	34,923	76,600	36,715
Total	89,665	151,995	241,659	47,849	16,675	33,747	5,461	198,994	254,878	131,772	496,537	179,620

7. Low and Zero Carbon (LZC) Technologies Feasibility Study

The final level of the energy hierarchy is to Be Green, therefore the following table discusses the options for on-site low and zero carbon technologies and their feasibility on this development to contribute to meeting the relevant London Plan and Borough's sustainability targets.

LZC Technologies	Description	Advantages	Disadvantages	Feasibility	
Solar Thermal Collectors	Solar thermal collectors can be used to provide hot water using the irradiation from the sun They can generally provide approx. 50% of the hot water demand	No noise issues associated with Solar thermal collectors No additional land use from the installation of solar thermal collectors Low maintenance and easy to manage Favourable payback periods	The hot water cylinder will need to be larger than a traditional cylinder Needs unobstructed space on roof Low efficiencies Often not compatible with other LZC technologies Saves less carbon when offsetting gas systems	There is a significant area of pitched roof which could incorporate solar technologies. However, the carbon savings that can be achieved through the use of solar thermal would not be great enough to meet the targets for the site.	✗
Solar Photovoltaic Panels (PV)	Solar PV panels provide noiseless, low-maintenance, carbon free electricity	Can have significant impact on carbon emissions by offsetting grid electricity (which has a high carbon footprint) Low maintenance No noise issues No additional land use from the installation of PV panels Bolt on technology that does not need significant amounts of auxiliary equipment Favourable payback periods	Needs unobstructed space on roof Low efficiencies per unit area of PV Often used to supplement landlord's electricity so savings not always transferred to individual properties	There is a significant area of pitched roof which could incorporate solar technologies. Solar PV panels would be a suitable technology to contribute to the electricity demand of the building as the development has enough space for the installation.	✓

CHP (Combined Heat & Power)	CHP systems use an engine driven alternator to generate electricity while using the waste heat from the engine, jacket and exhaust to provide heating and hot water Economic viability relies on at least 4,000 hours running time per annum	Mature technology High CO_2 savings	Cost of the system is relatively high for small schemes Only appropriate for large development with high heat loads	CHP is technically feasible for the development helping to balance the heating demand as the 62 residential units will have reasonable hot water demand.	✓
Biomass Heating	Solid, liquid or gaseous fuels derived from plant material can provide boiler heat for space and water heating	Potential to reduce large component of the total CO_2 A biomass boiler would supplement a standard gas heating system so some of the cost may be offset through money saved on using smaller traditional boilers	Regular maintenance is required Reliability of fuel access/supply can be a problem The noise generated by a biomass boiler is similar to that of a gas boiler. It is advisable not to locate next to particularly sensitive areas such as bedrooms A plant room and fuel store will be required which may take additional land from the proposed development or surroundings Biomass is often not a favoured technology in new development due to the potential local impacts of NO_x emissions and delivery vehicles for the fuel	Biomass is not considered feasible for this development due to issues with fuel storage, access for delivery vehicles and local NO_x emissions	✗

Wind Turbines	Vertical and horizontal axis wind turbines enable electricity to be generated using the power within the wind	Low noise Bolt on technology that does not need significant amounts of auxiliary equipment	Not suitable for urban environments due to low wind conditions and obstructions High visual impact Noise impact (45-65dB at 3m) High capital cost and only achieve good paybacks in locations with strong wind profiles Requires foundations or vibration supports for building installations (generally not recommended)	This development is in an urban environment and so a wind turbine will not generate much energy	×
Ground Source Heat Pumps (GSHP)	Utilising horizontal loops or vertical boreholes, GSHP make use of the grounds almost constant temperature to provide heating and/or cooling using a heat exchanger connected to a space/water heating delivery system	Low maintenance and easy to manage High COP (ratio of energy output per energy input) Optimum efficiency with underfloor heating systems As heat pumps would replace standard heating systems, some of the cost may offset through savings on a traditional boiler	The heat pump has a noise level around 35-60dB so some attenuation may be required and it should be sensibly located Relatively high capital cost Requires electricity to run the pump, therefore limited carbon savings in some cases For communal systems a plant room is required which may take additional land from the proposed development/surroundings	GSHP are not a feasible technology for the site since there is a no external space available for installation of boreholes	×

Air Source Heat Pumps (ASHP)	Air Source Heat Pumps extract latent energy from the external air in a manner similar to ground source heat pumps	ASHP systems are generally cheaper than GSHP as there is no requirement for long lengths of buried piping or boreholes Low maintenance and easy to manage Optimum efficiency with underfloor heating systems As heat pumps would replace standard heating systems, some of the cost may offset through savings on a traditional boiler	The ASHP unit has a noise level around 50-60dB so some attenuation may be required and it should be sensibly located The potential noise from the external unit may mean there is local opposition to their installation Requires electricity to run the pump, therefore limited carbon savings in some cases For communal systems a plant room is required which may take additional land from the proposed development/surroundings	The use of ASHP is technically feasible for the development and could be used to provide heating and cooling to the commercial spaces.	✓

Table 7.1: Feasibility of LZC technologies for the development

Having reviewed potential LZC technologies for the development, a CHP system coupled with solar PV panels have been identified that can be used for the development, with ASHP to provide the heating for the commercial units. The ASHP units will be installed by the tenants, with minimum efficiency stated in the lease agreement. Incorporating suggested LZC technologies will enable the development to meet the London Plan and Borough's target for on-site renewables to reduce carbon emissions by 40%. The chosen system should be accurately sized during the detailed design stages and MCS (Microgeneration Certification Scheme) approved equipment and installers used.

The details of proposed systems can be found within Appendix A and SAP calculations.

8. Summary of CO_2 Emission Savings

It is anticipated that 192 PV panels will be installed on the roof of the development and for the residential units, the CHP will provide 25% of the heating and hot water demand, supplemented by gas boiler in order to ensure efficient operation by its sizing to meet the base rather than peak load. For the commercial spaces, Air Source Heat Pump (AHSP) can be incorporated supplemented by grid electricity.

Table 8.1 shows the proposed systems size and the estimated energy and carbon emissions savings and financial feasibility for this development.

The benefits of using different types of LZC technologies for the development have been confirmed that it would be able to reduce on-site carbon emissions by 16.70% in total. A preliminary layout has been provided in the Appendix to confirm that this system will fit in the available space within the development.

Table 8.1: Energy, carbon and financial performance of the proposed LZC technologies

	Energy & CO_2				Life Cycle Carbon and Cost Analysis		
Proposed LZC Technologies	Energy Generated (kWh/yr)	% site energy demand met	CO_2 saved by system ($kgCO_2$/yr)	% reduction in site CO_2 emissions	25 year CO_2 saving ($kgCO_2$)	Estimated capital cost	Payback period
Total Solar PV = 48 kWp 30 deg, South facing 192 panels Approx gross array area = 315m^2	41,203	8.30%	21,796	12.13%	544,912	£0.00	0
Combined Heat and Power (CHP) To meet 25% of heating demand Electrical efficiency = 30% Thermal efficiency = 60%	86,356	17.39%	7,676	4.27%	191,911	£0.00	0
Air Source Heat Pump (ASHP) ASHP COP = 4.2 Distribution efficiency:100%	6,783	1.37%	517	0.29%	12,915	£0.00	0
TOTAL	134,342	27.06%	29,990	16.70%	749,739	£0	0

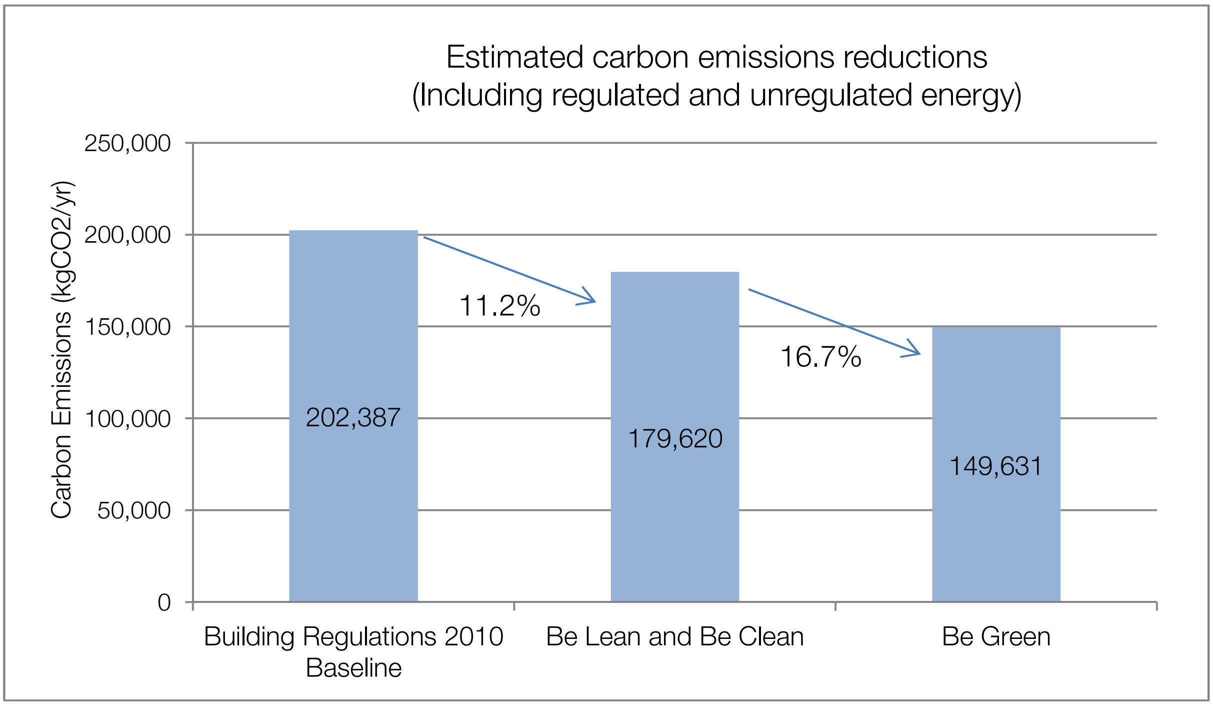


Figure 8.1: Estimated carbon emissions reductions throughout the energy hierarchy

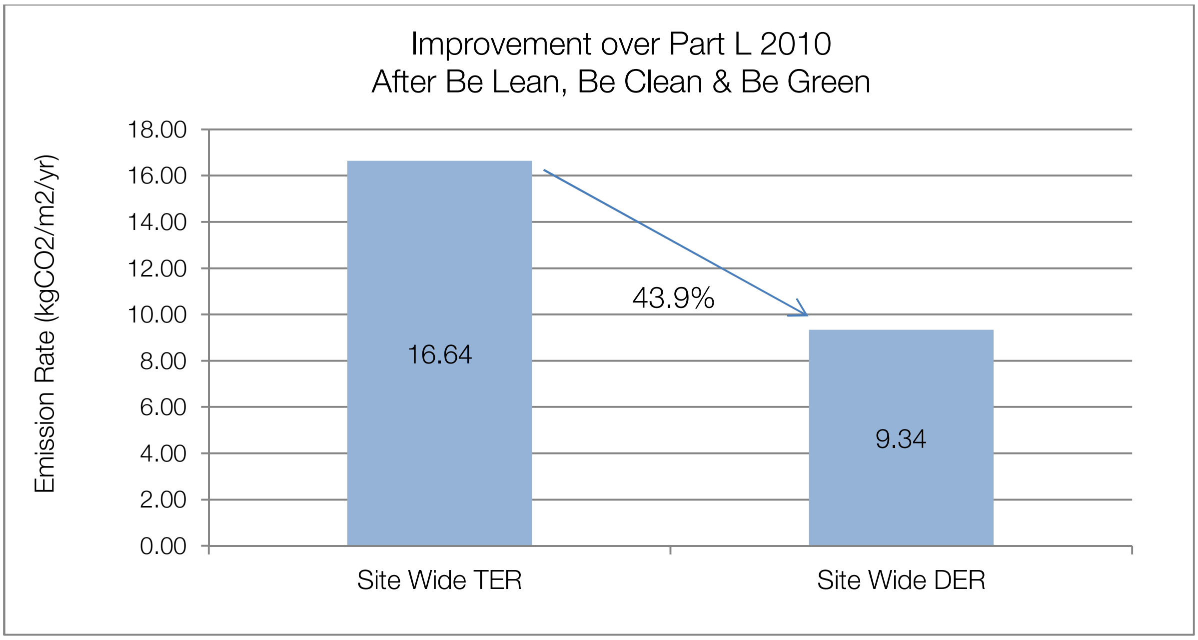


Figure 8.2: Development improvement over Building Regulations 2010

8.1 Code for Sustainable Homes

Code for Sustainable Homes (CfSH) has set out Energy and CO2 criteria for the residential units and the numbers of credits are available under Ene1: Dwelling Emission Rate and Ene2: Fabric Energy Efficiency. These credits are dependent upon the SAP calculation.

According to the SAP results, residential units can achieve 4 credits under Ene 1 and 7 credits under Ene 2 in the Energy and CO2 category of Code for Sustainable Homes 2010.

8.2 BREEAM

BREEAM 2011 has set out Energy criteria for the non-residential/communal occupied spaces and the numbers of credits are available under Ene01: Reduction of emissions in the Energy section.

According to the EPC produced by TAS, commercial spaces can achieve 12 credits under Ene 01 in the Energy category of the BREEAM 2011 scheme.

9. Conclusion

Following the Be Lean, Be Clean and Be Green energy hierarchy, passive design measures, energy efficient equipment and LZC technologies have been shown to provide a 43.9% improvement over the Building Regulations 2010 Target Emissions Rate (TER), as well as an overall 16.7% saving in carbon emissions from renewable technologies.

The achievements are in line with the requirements of the London Borough of Camden and the London Plan.

Based on the results of the assessment, the development can achieve 11 credits under the Code for Sustainable homes assessment and 12 credit under the BREEAM assessment methodologies in Energy section.

The figures within this report are based on preliminary analysis only and further detailed studies will be required at the detailed design stage before specifying any of the proposed systems.

Appendix A

The following table shows the energy assumptions used for the energy and CO_2 calculations within this report. Calculations for residential areas are based on Standard Assessment Procedure (SAP) results with an inclusion for unregulated energy appliance use not covered by SAP (based on BRE methodology).

The appliances figure is based on the BRE calculation formula for appliances and cooking, taken from the Code for Sustainable Homes in Ene 7 table 1.4, as below.

$kgCO_2$/year from appliances and cooking. See Ene 1:

$$99.9 \times (TFA \times N)^{0.4714} - (3.267 \times TFA) + (32.23 \times N) + 72.6$$

Where:

TFA = Total Floor Area

N = Number of Occupants

For TFA < $43m^2$; N = 1.46
For TFA ≥ $43m^2$; N = $2.844 \times (1 - \exp(-0.000391 \times TFA^2))$

Residential		
Energy Demands		Source
Use Type	Demand (kWh/m²)	
Space Heating	17.66	SAP Calculations
DHW	31.47	
Fans/Pumps/Controls	2.25	
Lighting	4.27	
Appliances	33.03	BRE Methodology

Commercial		
Energy Demands		Source
Use Type	Demand (kWh/m²)	
Space Heating	5.96	TAS
DHW	2.94	
Cooling	5.37	
Fans/Pumps/Controls	5.9	
Lighting	13.28	
Appliances	41.87	

Appendix B

The following tables show figures used in the energy and CO_2 calculations to estimate energy produced and CO_2 savings from LZC technologies. These figures can be used to validate the results.

CO_2 Intensity Values	
Gas Intensity	0.198 $kgCO_2/kWh$
Electricity Intensity	0.517 $kgCO_2/kWh$
Oil Intensity	0.266 $kgCO_2/kWh$
Grid Displaced Electricity Intensity	0.529 $kgCO_2/kWh$
Biodiesel Intensity	0.025 $kgCO_2/kWh$

Energy & Renewable Technology Outputs	
PV energy produced per kWp	858.4 kWh/kWp
PV kWp per m^2 panel	0.152 kWp/m^2
Electricity efficiency	100%
Gas boiler efficiency	90%

Fuel Prices (as of Feb 2012)	
Natural Gas	4.37 p/kWh
Electricity (Grid)	13.7 p/kWh

Appendix C

The following grants may be available with the use of renewable technologies on this development.

Grant	
Feed-in Tariff	By generating your own renewable electricity your energy supplier may pay you money, called a 'Feed-in Tariff' (FIT). Using an MCS certified installer, the system could entitle you to a rate for each unit (kilowatt hour or kWh) of electricity you generate. As well as the FIT, you can sell any excess electricity back to your electricity supplier through an 'Export Tariff'. To qualify, the installation must be less than 5 MW, with the following technologies covered: • Solar photovoltaic (PV) panels • Wind turbines • Water (Hydro) turbines • Anaerobic digestion (biogas energy) • Micro combined heat and power (micro-CHP) https://www.gov.uk/feed-in-tariffs
Renewable Heat Incentive (RHI)	The RHI is a scheme for the non-domestic sector that provides payments to industry, business and public sector organisations that use renewable energy to heat their buildings. Payments are made to the owner of the heat installation over a 20-year period, for the following technologies: • Biomass boilers (including CHP biomass boilers) • Ground source heat pumps (GSHP) • Water source heat pumps • Deep geothermal heat pumps • All solar thermal collectors • Biomethane and biogas There are plans to extend support to the following in 2013: • Air source heat pumps (ASHP) • Biomass direct air heating • Biomass combustion over 200kW There are also plans to launch a domestic RHI scheme in summer 2013. http://www.ofgem.gov.uk/e-serve/RHI/Pages/RHI.aspx
Green Deal	The Green Deal is a Government backed initiative to promote the installation of energy efficiency measures in households in order to reduce energy consumption and bills. There will be no upfront costs, instead consumers will pay through their household energy bills. Consumers can see the Green Deal charge alongside the reductions in energy use which generate savings on their bill. It also means that if they move out (and cease to be the bill payer) the financial obligation remains at the property for the next bill payer: the charge is only paid where/whilst the benefits are enjoyed. https://www.gov.uk/green-deal-energy-saving-measures/how-the-green-deal-works

ECO (Energy Company Obligation)	ECO is a requirement for all large gas and electricity suppliers to fund energy efficiency improvements to dwellings in the UK. Energy suppliers have specific carbon reduction targets to achieve, and therefore must buy ECO 'credits' of CO_2 on a free market, either from installers (and home owners) or from other energy suppliers. Therefore the price of ECO 'credits' is not fixed. The installer (home owner or private renter with owner's permission) can claim back the money for the installation of the improvement measures from the energy suppliers (full payback or partial refund depending on type of improvement(s) and value of ECO 'credits'). The scheme can be used to fund a number of domestic energy efficiency improvements. If householders are applying for the Green Deal and are eligible for ECO, they will receive a lower quote from their Green Deal Provider and will benefit from lower repayments. The scheme runs until 31st March 2015, however there are certain Eligibility requirements. See https://www.gov.uk/energy-company-obligation for more information. Energy Companies Obligation - Guidance for suppliers

Table C: A selection of available grants as of 1st March 2012

Appendix D

Figure Proposed PV panel installation by Architects