Appendix A: Energy Strategy

Addendum

2562 / Gondar Gardens, London Borough of Camden

For

Linden Wates West Hampstead Ltd

January 2014

Revisions schedule		
Issue Date: 7th February 2014		
Original Report prepared by: Charles Bagshaw, Senior Sustainability Consultant		**Date:** 6th February 2014
Checked by: Alan Calcott, Senior Sustainability Consultant		**Date:** 6th February 2014
Status	**Final for issue**	
Revision	**Date**	**Changes**
Addendum		

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1.0 Executive Summary

This document has been prepared for Linden Wates West Hampstead Limited to present the revised results of an early stage analysis of potential Low and Zero Carbon (LZC) technologies for the proposed new development at Gondar Gardens, in order to satisfy the Local and Regional Planning Policy requirements relating to energy and CO_2 emissions as noted in this document.

The site consists of the redevelopment of the reservoir street frontage to provide 28 residential units (Class C3 use) in two blocks from lower ground to third floors with basement parking, following substantial demolition of the roof and internal structure of the reservoir and its subsequent re-landscaping. The development is situated in the London Borough of Camden and, as such, should comply with the energy requirement of the Camden Core Strategy 2010, London Plan 2011 and Part L1A2010 of Building Regulations.

An energy strategy was submitted in November 2013. In response the Council requested the following in an email dated 13th January 2014 with reference to the draft London Plan Early Alterations released in October 2013:

- *"Camden is prepared to be flexible on the target if we consider that the applicant has pushed the fabric efficiency element of the energy proposal as far as possible."*
- *"Camden's CPG3 para 3.23 recognises that a carbon offsetting financial contribution could satisfy any % shortfall once all other physical measures are explored. A figure could be discussed once the improved % is assessed."*

The specification outlined in this revised report are now more than compliant with Camden CP3 in the specification guidance and provides a further 8% reduction in CO_2 emissions (now ~34% reduction in regulated CO_2 emissions) **with improvements to guidance specifications including improved Glazing, Floor insulation and implementation of energy efficient services with heat capture.**

Implementing the high performance building fabric specified and the associated energy efficiency measures, combined with Photovoltaic (PV) Panels will deliver a highly efficient development in line with the Energy Hierarchy. The final strategy however will be confirmed during detailed design and this report outlines other technologies that may be suited to the scheme.

The strategy proposed reflects the Government's trajectory to set future building regulations by the building fabric (Section 3) and follows the energy hierarchy methodology outlined in the Mayor's London Plan.

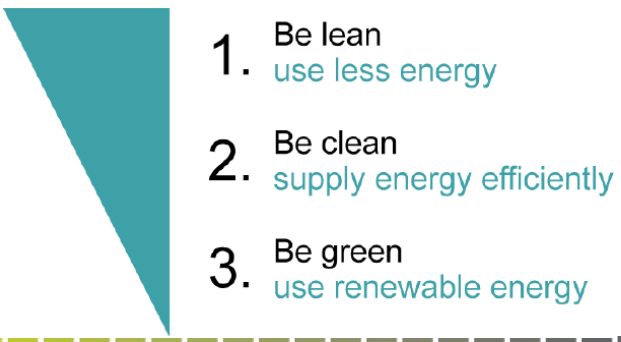


Figure 1: Energy Hierarchy

Step 1 and 2 have been addressed in Section 3 improved insulation, air tightness and accredited construction details have been proposed to improve the energy efficiency of the building fabric.

The baseline energy demands for the site have been calculated using indicative SAP 2009 calculations from similar schemes with the chosen SAPs from dwellings of a similar form and size to provide an estimation of the energy demands at this stage of the project. However, actual SAP modelling will be carried out when full detailed design is completed. The SAP analysis has provided the following targets for the development:

2.0 Baseline Energy Demands and CO_2 Emissions

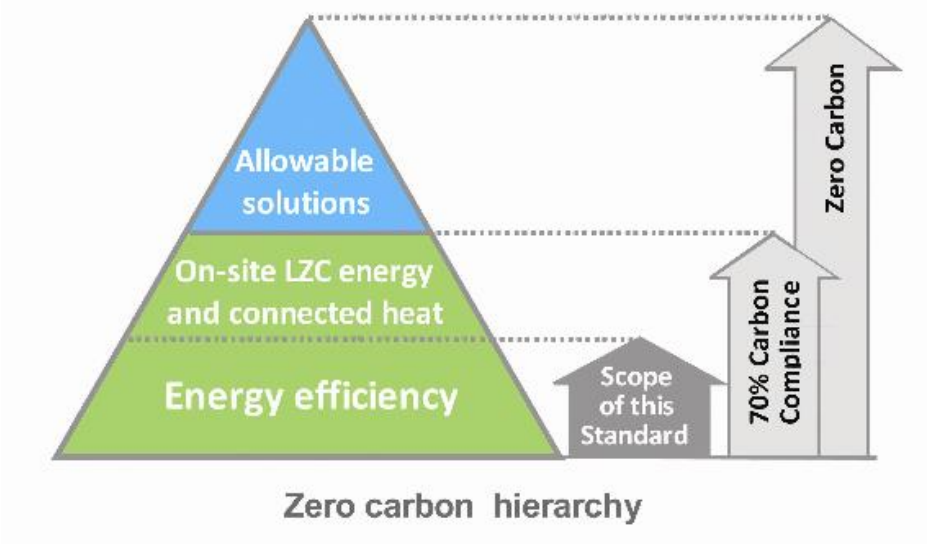
2.1 Context to Approach

The recommendations in this Energy Strategy are proposed as they embrace the themes outlined in the Mayor's energy hierarchy outlined in the London Plan 2011, as well as following the current Zero Carbon trajectory:

- **Be lean:** use less energy
- **Be clean:** supply energy efficiently
- **Be green:** use renewable energy

The Zero Carbon Hub is an independent workgroup that advise the UK Government on optimal solutions with the aim of achieving carbon neutral homes by 2016. As shown in the diagram below, the Zero Carbon Hub identified the "*energy efficiency improvement first*" approach as the most appropriate way to drive the new house toward carbon neutrality.

Zero carbon Hub recommended approach to carbon neutral housing

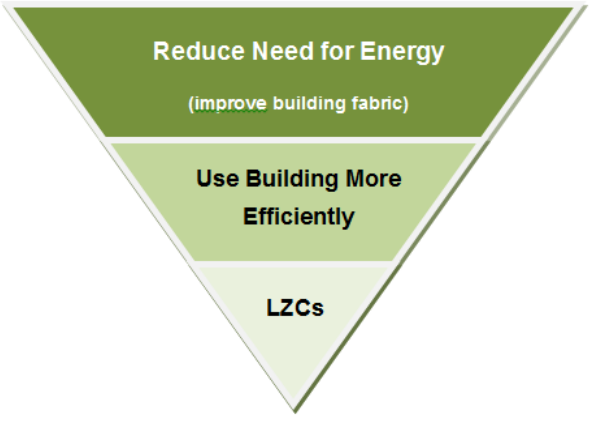


This approach consists of reducing the energy demand and CO_2 emissions by improving the energy efficiency of the building envelope and the mechanical and electrical services first. The Camden CP3 requirements also follow this approach and the development exceed many of the requirements of this document.

Once the energy demand of the building has been reduced from energy efficiency improvements then Low and Zero Carbon (LZC) technologies can be considered. It is widely accepted that the most effective way to reduce energy consumption (and therefore carbon emissions) is to follow the energy hierarchy (shown overleaf). This approach is the most appropriate because energy efficiency improvements are more cost effective than LZC systems and can provide significant energy and CO_2 savings. In addition, energy efficiency improvements reduce the energy demand of the building and therefore contribute to reducing the size of LZC systems required to achieve low carbon buildings.

The energy efficiency of the dwellings can be improved by adopting low cost passive design measures, such as enhancing the building fabric or designing the dwellings so as to improve passive solar gains through windows.

Energy Hierarchy:



Therefore, improving the energy efficiency of the development before implementing Low or Zero Carbon technologies is considered a preferred strategy as this follows the Mayor's energy hierarchy.

2.2 Specifications

As the design for the development has not been finalised at this early stage, the baseline energy demands for the site have been modelled using sample SAPs from similar developments. When permission has been granted, the findings in this report will be confirmed by actual calculations at a later stage once detailed design is undertaken.

This early stage energy modelling is based on the following specifications which may be subject to change during detailed design and is therefore provided to show that compliance is achievable.

The enhanced specifications below are those that have been modelled for the site and are shown to illustrate that the scheme can satisfy the Energy Planning requirements:

- Highly efficient gas-fired boilers
- Air permeability standard of $3m^3/hr/m^2$
- Accredited Construction details
- 100% Low Energy Light fittings
- Mechanical ventilation with space heat recovery (MVHR)
- Flue Gas Heat Recovery (FGHR)
- Weather / Load Compensator as appropriate

Table 3.2: U-Values of building elements

Element	Modelled U-Values (W/m^2K)	Part L1A 2010 Limiting U-Values (W/m^2K)	%age improvement on Part L1A 2010	CP3 Limiting U-Values (W/m^2K)	CP3 compliant
Walls	**0.20**	0.30	33%	0.20	**Compliant**
Floors	**0.15**	0.25	40%	0.20	**Improvement**
Exposed Roof	**0.13**	0.20	35%	0.13	**Compliant**
Windows / Doors	**1.40 / 1.0**	2.00	30%	1.5 / 1.0	**Improvement**

Achieving Part L 2010 specification in the apartments through Building Fabric Specifications and Energy Efficiency Measures alone follows the Energy Hierarchy of ***"being lean"***.

One of the primary aims of Part L1A 2010 was to reduce the resultant CO_2 emissions of a dwelling by 25% compared to Part L1A 2006, as depicted in the target levels set for the Code for Sustainable Homes Level 3 and was expected to roughly reflect a 40% improvement over dwellings built to 2002 standards. Achieving this requirement through an enhanced specification without the reliance on Low or Zero Carbon Technologies will ensure that the dwellings have low energy demands, helping towards the protection of occupants in the future from energy price rises.

Additionally, high efficiency heat recovery units are being implemented in order to re-use heat that would otherwise be lost. This follows the Energy Hierarchy of ***"being clean"*** and increases the overall efficiency of the building.

2.3 Baseline CO_2 emissions

Using these specifications, the following baseline CO_2 emissions have been calculated for the development:

Table 3.3.2: Baseline CO_2 emissions before the implementation of LZC technologies or heat recovery units

Description	Total
Total Regulated emissions (tCO_2/yr)	44.14
Total Part L 2010 Baseline (tCO_2/yr)	47.64
%age Reduction Part L 2010 Baseline	**7.34%**

Table 3.3.2: Improved CO_2 emissions with Heat recovery units before the implementation of LZC technologies

Description	Total
Total Regulated emissions (tCO_2/yr)	38.34
Total Part L 2010 Baseline (tCO_2/yr)	47.64
%age Reduction Part L 2010 Baseline	**19.51%**

2.4 Setting the targets

2.4.1 Code for Sustainable Homes Level 4

There is a planning requirement that all dwellings on site achieve Level 4 of the Code for Sustainable Homes as a minimum, which requires an improvement in regulated CO_2 emissions of at least 25% over the Part L 2010 Target Emissions Rate (TER) baseline. This improvement can either be achieved by passive design measures, such as building fabric improvement, or through the implementation of on-site Low and Zero Carbon technologies. Table 3.4.1 shows how the calculation is undertaken.

Table 3.4.1: Code for Sustainable Homes target after building fabric improvement and energy efficiency services

Description	tCO_2/yr	Equation
Residential Units – Target Emissions Rate (TER) As measured by SAP 2009	47.64	A
Residential Units – Dwelling Emissions Rate (DER) As measured by SAP 2009	38.34	B
Residential Units - Target DER	35.73	C = (1- 25%) x A
Residential Units – CSH Level 4 target Additional CO_2 offset required from LZC	2.61	D = B - C
Additional CO_2 offset required from LZC	**2.61**	**tCO_2/yr**

Achieving the mandatory energy requirements for the Level 4 of the Code for Sustainable Homes requires an additional offset of 2.61 tCO_2/yr through the implementation of on-site Low and Zero Carbon technologies. As a result, complying with the CSH Level 4 target will ensure the London Plan target is satisfied.

2.4.2 Policy CS13 target

In addition to the London Plan 2011, the development is to aim to satisfy Policy CS13 from the Core Strategy, which states that: *"Developments are to target a 20% reduction in carbon dioxide emissions from on-site renewable energy generation."* ***Core Strategy policy CS13, Paragraph 13.11***

Table 3.3: Setting the Policy CS13 target

Target type & description	tCO_2/yr	Equation
Total Dwelling Emission Rate after energy efficiency measures As measured by SAP2009	**38.36**	A
20% CS13 target	**7.67**	**A x 20%**

3.0 Proposed Solution

The proposed solution for the development embraces the energy hierarchy and is outlined below:

- **Be lean:** use less energy. The development has been designed with an enhanced building fabric to reduce the energy consumption of the dwellings.
- **Be clean:** supply energy efficiently. The proposal is to incorporate highly efficient heat recovery units to recycle the heat in the dwellings to reduce heat demands from fossil fuels.
- **Be green:** use renewable energy. The development also incorporates a solar Photovoltaic (PV) array utilising all appropriate roof space to further minimise the demands of the development from the grid.

A summary of the proposed solution and the resultant CO_2 savings are shown below:

Proposed solution

Technology	Details	tCO_2 Saved	Meets Both targets?
Enhanced Building Fabric	Highly energy efficient building fabric and services with additional energy saving devices	9.30	**NO**
Photovoltaic Panels (PV)	Circa 15.9 kWp PV System* (e.g. 60 x 265 Wp PV panels)	8.48*	**NO**
TOTAL		**17.7**	**YES**

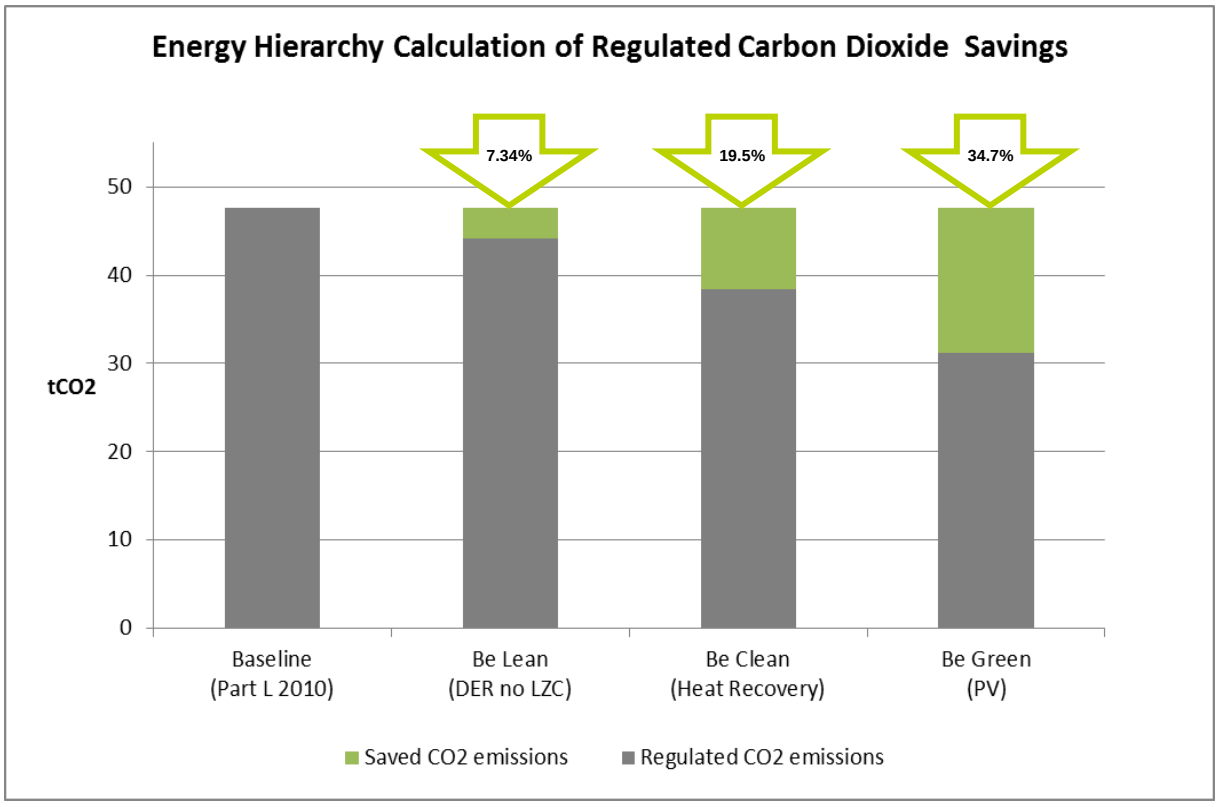
*Note that the PV requirements are given for indicative purposes and should be reviewed once the final specifications have been agreed. SAP 2009 methodology accounting for actual orientation, pitch and local irradiance.

Modelling the scenario presented in the table above with the indicative SAP calculations shows that this solution will deliver the following savings:

		Be Lean	Be Clean	Be Green	
Regulated CO_2 Emissions	**Baseline (Part L 2010 TER)**	**Proposed Gas Baseline (DER)** **no LZC or Energy Efficiency Measures**	**Proposed Building (DER)** **With Heat Recovery Systems (HR)**	**Proposed Building (DER)** **With HR & PV**	**Final %age Reduction over Part L 2010 Baseline**
Total Regulated (tCO_2/yr)	47.64	44.14	38.34	31.12	**34.67%**
%age Reduction over Part L 2010	N/A	**7.34%**	**19.51%**	**34.67%**	N/A
% age Reduction from Energy Efficiency Services & LZC	N/A	N/A	**13.14%**	**22.11%***	N/A

*SAP 2009 methodology accounting for actual orientation, pitch and local irradiance.

As shown in the table above, the implementation of enhanced building fabric specification and energy efficiency measures in conjunction with a Photovoltaic system will ensure the London Plan 2011 and the CS13 target are met for the development. All of the unshaded PV space has been utilised.



In summary, the presented strategy offers the following savings from enhanced building fabric specifications and Low and Zero Carbon Technologies:

- A 34.67% reduction in regulated CO_2 emissions over the Part L compliant baseline (TER) from fabric specifications, energy efficiency measures and the implementation of Low & Zero Carbon technologies (LZC).
- A 22.1% reduction in regulated CO_2 emissions from Low & Zero Carbon technologies (LZC) accounting for orientation, pitch and local irradiance
- A 13.25% reduction in all site CO_2 emissions from the Part L compliance baseline (TER) from enhanced building fabric specifications, energy efficient services and Low & Zero Carbon technologies (LZC). This includes both regulated CO_2 emissions (measured for Part L) and the unregulated CO_2 emissions (attributed to cooking & appliances as calculated by SAP)
- A 9.33% reduction in all site CO_2 emissions from Low & Zero Carbon technologies (LZC) compared to the proposed total dwelling emission rates (regulated & unregulated).

As this analysis is based on indicative SAP calculations the outcomes should be confirmed at later stage, once the detailed design has been finalised, by actual SAP calculations. As such, the findings should be taken as indicative and are presented for illustrative purposes to show how the scheme can satisfy the planning requirements.

Additionally, the implementation of the proposed PV system is subject to a detailed roof design analysis to ensure there is enough space to fit the system. An indicative Solar design has been carried out and can be found in the Appendix.

Appendix A: Solar Analysis

The indicative drawing below identifies the number of PV Panels that could be accommodated on the top roof of the building.