HIGH PATH ESTATE

Outline Planning Application
By
Clarion Housing Group Ltd

ENERGY STATEMENT

November 2017

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HIGH PATH ESTATE
ENERGY STATEMENT

Client: **Clarion Housing Group Ltd**
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Project	High Path, Wimbledon
PRP Reference	AE4586
Location	Wimbledon, London
Local Authority	London Borough of Merton
Client	Clarion Housing Group
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Date	3 November 2017

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Executive Summary

This Energy Statement has been prepared by PRP for The Applicant (please see Planning statement for further detail) in support of an outline planning application submitted to the London Borough of Merton (LBM) for the redevelopment of the High Path Estate in South Wimbledon. The application is submitted in parallel with two other outline planning applications for the redevelopment of the Ravensbury Estate, Morden and Eastfields Estate, Mitcham.

This Energy Statement should be read in conjunction with other supporting documents submitted with the planning application including the Town Planning Statement prepared by Savills, and the Design and Access Statement and Design Code prepared by PRP Architects, which explain the Proposed Development in more detail and relate it to the surrounding context and planning policy framework for the Site.

This Energy Statement supports the outline planning application (with all matters reserved, except in relation to parameter plans) for the comprehensive phased regeneration of the High Path Estate comprising the demolition of all existing buildings and structures; erection of new buildings ranging from 1 to a maximum of 10 storeys providing up to 1570 residential units (C3 Use Class); provision of up to 9,900 sqm of commercial and community floorspace (including replacement and new floorspace, comprising: up to 2,700 sqm of Use Class A1 and/or A2, and/or A3 and/or A4 floorspace, up to 4,100 sqm of Use Class B1 (Office) floorspace, up to 1,250 sqm of flexible work units (Use Class B1), up to 1,250 sqm of Use Class D1 (community) floorspace; up to 600 sqm of Use Class D2 (Gym) floorspace); provision of new neighbourhood park and other communal amenity spaces, including children's play space; new public realm, landscaping works and new lighting; cycle parking spaces (including visitor cycle parking) and car parking spaces (including within ground level podiums), together with associated highways and utilities works.

The assessment work undertaken for the redevelopment proposal takes into account the Phase 1 development, for which a separate full planning application (LBM ref: 16/P3738) to deliver 137 new homes was submitted in September 2016. This will ensure that a comprehensive site-wide strategy is developed across the site.

This Energy Statement identifies how the proposed development at High Path, Wimbledon, will address the energy and CO_2 emission reduction policies set out in the London Plan, and L B Merton In line with these policies, The non-domestic elements of the development must achieve a 35% reduction in CO_2 emissions and the domestic elements of the development must achieve zero carbon, with a minimum of 35% reduction in CO_2 emissions required on-site, over the Building Regulations Approved Document Part L1A & L2A (2013) baselines.

The Site is bounded to the north by Merton High Street; to the east by Abbey Road; to the south by High Path; and to the west by Morden Road.

The strategy is based on the Mayor of London's Energy Hierarchy, as follows:

- Use less energy (be lean)
- Supply energy efficiently (be clean) and
- Use renewable energy (be green).

The proposed energy efficiency measures include a well-insulated building fabric, high levels of air tightness and attention to thermal bridging details.

The communal and non-domestic parts of the development will have a similar fabric specification as the rest of the buildings.

The energy strategy outlined in this Energy Statement is part of a programme-level sustainability approach, where addressing energy efficiency and reduced carbon emissions is part of this approach; helping underpin long-term sustainable community objectives.

These measures are sufficient to provide a 2% site-wide improvement over Approved Document Part L (2013) Building Regulations emissions of 2,410 tonnes CO_2/yr.

The inclusion of Combined Heat and Power (CHP) engines, sized to provide ~55% of the total annual heat load, will provide a further site-wide 777 tonnes CO_2/yr (33%) improvement over Approved Document Part L1A & L2A (2013) Building Regulations emissions, with a further 3% site-wide savings from 125 kWp roof mounted solar PV, to a total CO_2 emission reduction of 36% beyond Approved Document Part L (2013) requirements (see Table 5). Additional mounted PV may be used to reduce reliance on carbon offsetting, together with other measures emerging from consultation with L B Merton.

This proposal satisfies the CO_2 emission reduction for the High Path estate development.

The following charts and tables summarise the CO_2 emission reductions for domestic, non-domestic and site-wide, following the strategy with CHP and PV installed on site:

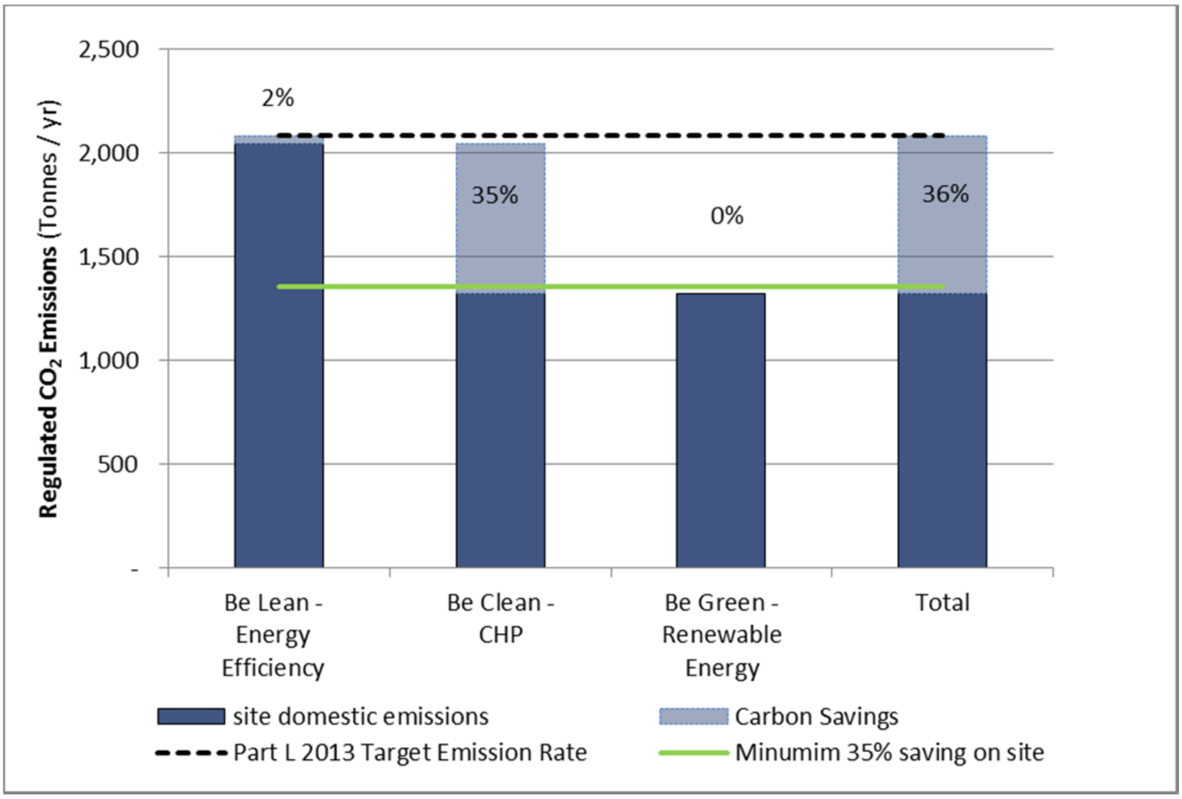


Figure 1 - *Domestic Energy Hierarchy and Targets*

Table 1 - *High Path Domestic CO_2 Emissions*

	Carbon Dioxide Emissions for Domestic buildings(Tonnes CO_2 / year)	
	Regulated	Unregulated
Baseline: Part L of the Building Regulations 2013 Compliant Development	2083	2208
After Energy Demand Reduction	2046	2208
After heat network / CHP	1325	2208
After Renewable Energy (PV)	1325	2208

Table 2 - *High Path Domestic CO2 Emissions savings*

	Dwelling Regulated Carbon Dioxide Savings	
	(tonnes CO_2 / year)	(%)
Savings from energy demand reduction	36.7	2%
Savings from heat network / CHP	721.1	35%
Savings from renewable energy	0.0	0%
Cumulative on Site Savings	757.7	36%

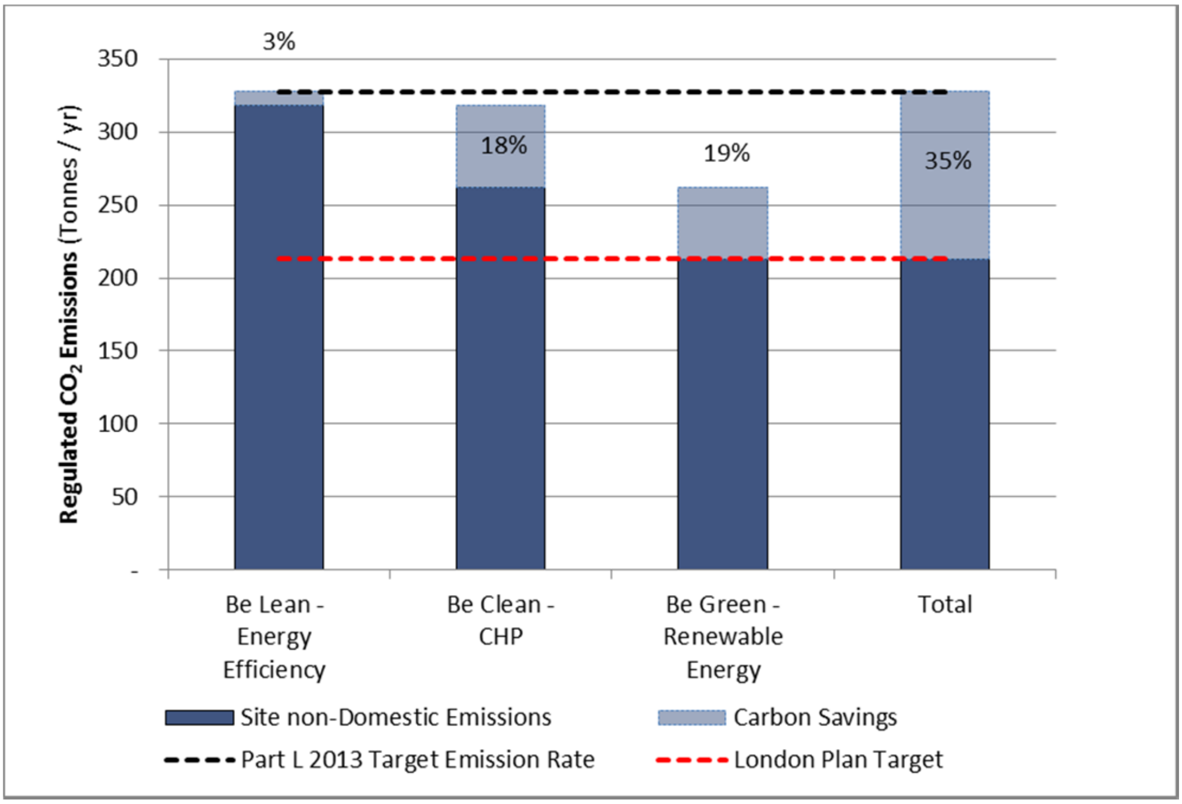


Figure 2 *- Non-domestic Energy Hierarchy and Targets*

Table 3 - *High Path Non-domestic CO2 Emissions*

	Carbon Dioxide Emissions for Non-domestic buildings (Tonnes CO_2 / year)	
	Regulated	**Unregulated**
Baseline: Part L of the Building Regulations 2013 Compliant Development	327.8	175.4
After Energy Demand Reduction	318.4	175.4
After heat network / CHP	262.2	175.4
After Renewable Energy (PV)	213.1	175.4

Table 4 - *High Path Non-domestic CO2 Emissions savings*

	Commercial Regulated Carbon Dioxide Savings	
	(tonnes CO_2 / year)	**(%)**
Savings from energy demand reduction	9.4	3%
Savings from heat network / CHP	56.2	18%
Savings from renewable energy	49.2	19%
Total Cumulative Savings	**114.7**	**35%**

Table 5 - *High Path Total CO2 Emissions and savings*

	Total regulated Emissions (Tonnes CO_2 / year)	CO_2 savings (tonnes CO_2 / year)	Percentage saving (%)
Part L 2013 baseline	2410		
Be Lean	2364	46.0	2%
Be Clean	1587	777.2	33%
Be Green	1538	49.2	3%
		872.5	**36%**

1. Introduction

1.1 This Energy Statement has been prepared by PRP for The Applicant (please see Planning statement for further detail) in support of an outline planning application submitted to the London Borough of Merton (LBM) for the redevelopment of the High Path Estate in South Wimbledon. The application is submitted in parallel with two other outline planning applications for the redevelopment of the Ravensbury Estate, Morden and Eastfields Estate, Mitcham.

1.2 This Energy Statement identifies how the proposed development at High Path, Wimbledon, will address the energy and CO_2 emission reduction policies set out in the London Plan, and L B Merton In line with these policies, The non-domestic elements of the development must achieve a 35% reduction in CO_2 emissions and the domestic elements of the development must achieve zero carbon with a minimum of 35% reduction in CO_2 emissions required on-site, over the Building Regulations Approved Document Part L1A & L2A (2013) baselines.

1.3 The strategy is based on the Energy Hierarchy, and follows the GLA energy assessment guidance (March 2016), as follows:

- Use less energy (be lean)
- Supply energy efficiently (be clean) and
- Use renewable energy (be green).

1.4 The strategy is based on information provided by the project design team, and also considers the Phase 1 development to ensure the delivery of a comprehensive site-wide strategy.

1.5 The focus will be on CO_2 emissions from delivered energy demand.

1.6 The energy strategy outlined in this Energy Statement is part of a programme-level sustainability approach, and addressing energy efficiency and reduced carbon emissions is part of this approach; helping underpin long-term sustainable community objectives.

Site Location and Development Proposal

The Site

1.7 The High Path Estate is situated in the South Wimbledon area of the Borough and is located directly adjacent to the South Wimbledon Underground Station, which is on the Northern Line.

1.8 The Estate currently comprises 608 residential dwellings in a mixture of tower blocks, flats, maisonettes and terraced houses and accommodates a mix of tenures including private ownership (as a result of right to buy) and affordable homes. The number of storeys across the site ranges from 1 to 12.

1.9 The Site is bounded to the north by Merton High Street; to the east by Abbey Road; to the south by High Path; and to the west by Morden Road.

1.10 The first phase of the regeneration comprises an area to the south east of the Site consisting of disused garages, a play area and The Old Lampworks industrial warehouse building. As noted, this phase is the subject of a separate full planning application.

1.11 The Site is located within the South Wimbledon / Colliers Wood Area of Intensification designated in the London Plan and is located within an area characterised by a mix of uses, with Merton High Street predominantly formed of commercial ground floor uses with two storeys of residential above, to the north, and predominantly comprises brick built Victorian terraced housing, to the north and east. To the south of the Estate on the opposite side of High Path is Merton Abbey Primary School; further south is Merton Industrial Park with warehouse and industrial buildings predominantly two storeys in height and to the east of the site is a Sainsbury's superstore and retail park.

Description of the Proposed Development

1.12 The description of Proposed Development for this outline planning application is set out below:

1.13 *"Outline planning application (with all matters reserved, except in relation to parameter plans) for the comprehensive phased regeneration of the High Path Estate comprising the demolition of all existing buildings and structures; erection of new buildings ranging from 1 to a maximum of 10 storeys providing up to 1570 residential units (C3 Use Class); provision of up to 9,900 sqm of commercial and community floorspace (including replacement and new floorspace, comprising: up to 2,700 sqm of Use Class A1 and/or A2, and/or A3 and/or A4 floorspace, up to 4,100 sqm of Use Class B1 (Office) floorspace, up to 1,250 sqm of flexible work units (Use Class B1), up to 1,250 sqm of Use Class D1 (community) floorspace; up to 600 sqm of Use Class D2 (Gym) floorspace); provision of new neighbourhood park and other communal amenity spaces, including children's play space; new public realm, landscaping works and new lighting; cycle parking spaces (including visitor cycle parking) and car parking spaces (including within ground level podiums), together with associated highways and utilities works."*

1.14 For the purpose of this assessment consideration has also been given to Phase 1, which will deliver 134 new homes.

1.15 More detail on the phasing strategy can be found on page 97 of the Design and Access Statement (Indicative Phasing Parameter Plan), and drawing AA4586_2013_Proposed Phasing Plan_A_For Planning

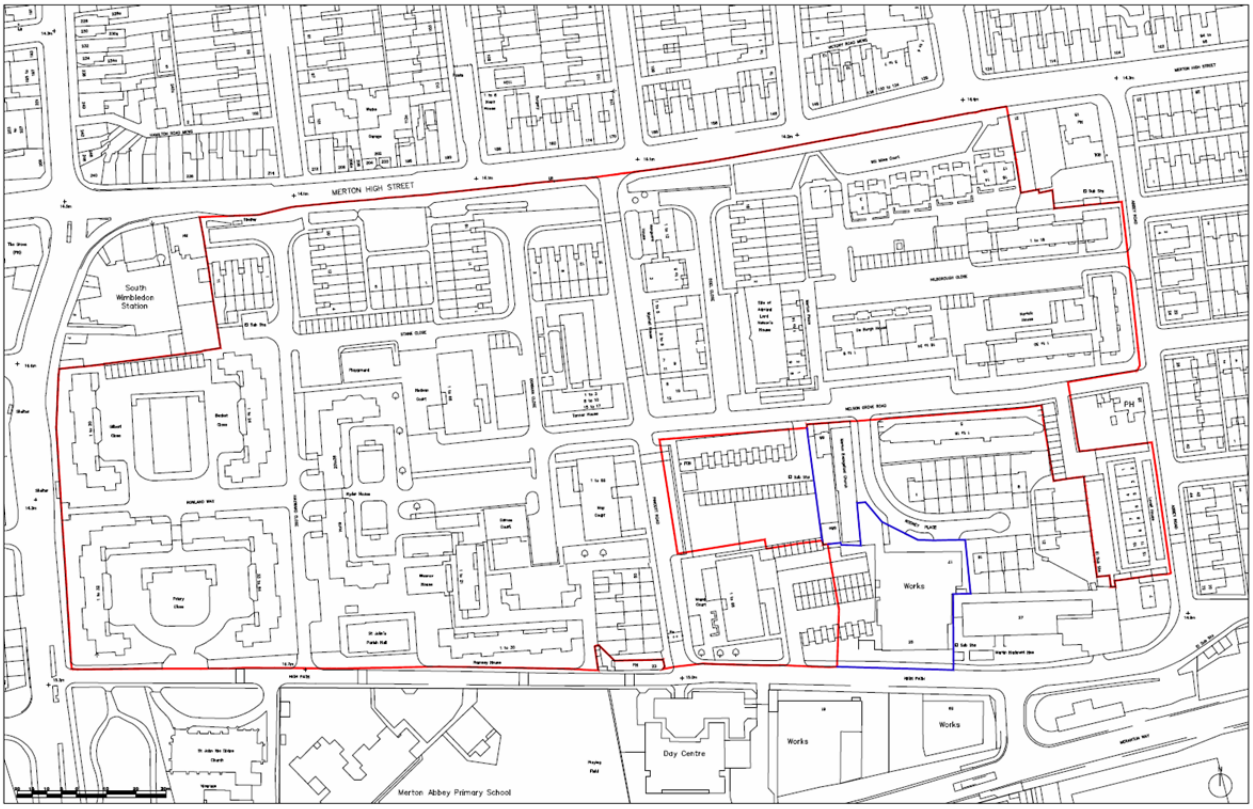


Figure 3 - *Plan view of existing site*

2. Planning Policy Guidance and Legislation

2.1 The following policies, and guidance, are relevant to the development;

National

- National Planning Policy Framework (NPPF)
- Building Regulations Part L (2013)
- Planning Policy guidance (PPG)

London Plan

- Policy 5.1 Climate change mitigation
- Policy 5.2 Minimising CO_2 emissions
  - Domestic elements of development - 100% CO_2 emission reduction over Building Regulations Part L (2013)
  - Non-domestic elements of the development - 35% CO_2 emission reduction over Building Regulations Part L (2013)
- Policy 5.3 Sustainable design and construction
- Policy 5.5 Decentralised energy networks
- Policy 5.6 Decentralised energy in development proposals
- Policy 5.7 Renewable energy
- Policy 5.9 Overheating and cooling
- Sustainable Design and Construction SPG (2014)
- GLA guidance on preparing energy assessments (2016)

London Borough of Merton

- London Borough of Merton Policy CS 15 follows GLA policy 5.2 - Minimising CO2 emissions - 35% CO2 emission reduction over Building Regulations Part L (2013)
- Development in Merton will be expected to comply with London Plan policies on renewable energy and innovative energy technologies.

The Council is at an advanced stage of preparing the Estates Local Plan, which has been published for consultation. It is anticipated that the draft Plan will be adopted by the Council in early 2018.

- Policy EP H6 - Environmental protection: (g) "The feasibility of Combined Heat and Power (CHP) and district heating must be investigated."
- Policy EP H6 - Environmental protection: (i) "All domestic solar PV installations should be considered in conjunction with on-site battery storage."

This report adheres to the guidance of Chapter 4 of the DPD.

3. Energy Modelling

Approach

3.1 Passive measures to improve the thermal performance of the building fabric focus on specifying higher levels of insulation for the roof, external walls and floor, and high performance windows and doors. Other important measures include targeting lower air permeability and minimising thermal bridges through best practice detailing. The proposed specification is provided in Section 4.10 of this report.

3.2 Efficient heat energy use and distribution is assured by specifying an efficient heating system and controls.

3.3 The development will generate a proportion of its energy needs through on-site low-carbon technologies.

Methodology

3.4 Government approved software (NHER Plan Assessor 6.2.0) has been used to calculate energy consumption and CO_2 emissions based on current Standard Assessment Procedure (SAP) methodology (2012) for all self-contained dwellings within the proposed development.

3.5 CO_2 emissions are reported according to Part L (2013), which compares CO_2 emissions from regulated energy use (DER) with those of an equivalent building built to Part L 2013 (TER). This does not include cooking or appliances.

3.6 A sample of 37 dwellings from the phase 1 detailed design were modelled and the results extrapolated to 1570 units, to provide the indicative proposed development total CO_2 emissions for following the application of energy efficiency measures (including efficient heating and hot water systems).

3.7 Non-domestic CO_2 emissions are estimated based on recent similar project experience from buildings of a similar fabric specification and usage profile.

3.8 Four stages of calculation are made:

- The base case total CO_2 emissions and energy demand for the development modelled as complying with AD L1A & L1B (2013) using SAP (2012) methodology - before the application of energy demand reduction measures.
- The proposed development total CO_2 emissions as designed following the application of the energy efficiency measures (including community heating with no CHP).
- The proposed development total CO_2 emissions as designed following the application of both the energy efficiency measures and community heating with CHP.
- The proposed development total CO_2 emissions as designed following the application of energy efficiency measures, district heating with CHP and PV, up to levels required to meet the targets.

4. Energy Hierarchy Development

Baseline Energy Demand

4.1 The baseline energy demand assessment is based on a development with identical geometry built to meet Building Regulations, thus using standard building fabric parameters and notional heating systems.

4.2 Energy modelling shows that base CO_2 emissions from the development are approximately 2,410 tonnes CO_2/year.

Energy Efficiency

4.3 Energy demand will be curbed by incorporating measures including high levels of thermal insulation, detailing to reduce air permeability and thermal bridging, and low-energy lighting. The following sections outline the energy efficiency measures adopted for High Path.

Passive Measures

4.4 The most cost-effective method of improving energy efficiency and reducing the long-term CO_2 emissions of a new development is through passive, low-energy design. Every unit of energy saved is equivalent to a unit of LZC energy generated, however passive design measures will help reduce the building's carbon footprint throughout its entire life, and thus they should be applied before LZC energy technologies are considered. High Path has been designed to accommodate these passive measures.

4.5 To minimise the requirement for space heating it is essential to minimise heat loss through the building envelope.

4.6 In addition to heat loss through conduction, it is important to reduce uncontrolled convective heat loss due to air leakage and it has been assumed that High Path will have a Design Air Permeability of no more than 4.0 $m^3/m^2/hr$ @ 50 Pa.

Heating System

4.7 Once energy demand has been addressed, the next step is to supply energy efficiently. In the case of heat, this relates to heat source efficiency, distribution losses, control system and heat emitters.

4.8 Heating and hot water provision for the energy efficient case is from a communal system with gas boilers with a seasonal efficiency of 95%.

Ventilation

4.9 It is intended that mechanical ventilation with heat recovery (MVHR) will be specified in all flats and maisonettes and distributed Mechanical Extract Ventilation (dMEV) will be specified in the houses. See Table 6 for details.

Specification

4.10 The following specification has been assumed in modelling the energy efficiency case:

Table 6 - *Energy efficient specification for the dwellings*

Element	Energy Efficiency Specification
Heat loss ground floor U-value (W/m^2K)	0.12
Semi exposed heat loss floors U-value (W/m^2K)	0.16
Roof U-value (W/m^2K)	0.12
Terrace U-value (W/m^2K)	0.15
External Wall U-value (W/m^2K)	0.16
Internal Walls next to unheated areas U-value (W/m^2K)	0.18
Party Walls U-value (W/m^2K) - fully filled and sealed	0
Whole window U-value (W/m^2K)	1.4
Front door U-value (W/m^2K)	1.5
Ventilation	Flats / maisonettes: MVHR with SFP ≤0.6 and efficiency ≥89 % Houses: dMEV with SFP ≤0.13
Air Permeability@50 Pa ($m^3/m^2/hr.$)	4 (All dwellings to be tested in the As-Built Stage.)
Thermal bridging	Accredited Construction Details (ACD) in all possible junction types; Thermal breaks for balconies.
Low energy lighting	100%
Air conditioning	No
Circulation Space	Unheated

4.11 It should be noted that the above specification is a recommendation only and may be subject to change at detailed design stage. Changes to this specification may affect the size of any Low or Zero Carbon technologies.

4.12 The above specification is drafted to comply with Part L 2013 and provide a best practice platform towards zero carbon. As such this draft specification can be considered robust against anticipated future planning or regulatory targets.

4.13 Other SAP (2012) modelling assumptions:

- 'Medium' Thermal mass has been assumed in the dwellings.
- Terrain: Dense urban.
- Exposure: average
- Overshading (glazing): average/unknown
- No flues, open fireplaces, or flueless gas fires
- Distribution heat loss factor of 1.05.

Comparison with Existing Buildings

4.14 Energy consumption figures have been compared using the Reduced Data Standard Assessment Procedure (RDSAP) for existing flats and Standard Assessment Procedure (SAP 12) methodology for the proposed flats. These do not include unregulated energy consumption from activities such as cooking and household electrical appliances.

4.15 Two building typologies are compared below; an existing corner flat and a dual aspect flat.

Figure 4 - *Existing Flat typologies*

4.16 The existing flats in the tall blocks would need ~292kWh/m²/year to provide lighting, heating and hot water, while the estimated energy consumption of the new build flats for the same needs is approximately 53kWh/m²/year. This is an 81% reduction in energy consumption

4.17 Similar to the corner flat, the dual aspect typology shows a large reduction in energy consumption in the new build vs existing scenario. While the existing flats in Will Miles would need ~200kWh/m²/year, the estimated energy consumption of the new build flats of this typology is approximately 46kWh/m²/year, which represents a reduction of 77% in energy consumption.

4.18 In addition, there is no existing centralised heating network across the estate. We are also not aware of any renewable energy strategies that have been implemented across the existing development. It is therefore considered that the proposed energy strategy will deliver additional improved energy performance over and above consumption reduction, when compared to the existing situation.

Energy Efficiency Results

4.19 The goal of assessing energy demand is to quantify building performance and to establish a basis for comparison of LZCs, in view of the CO_2 emissions reduction targets.

4.20 The calculation methodology used is similar to that for baseline energy demand and was outlined in Section 3 of this report.

4.21 The proposed development total CO_2 emissions following the application of energy efficiency measures (including nominal heating and hot water systems) are shown below:

Table 7 - *CO_2 emissions and savings after fabric measures*

	Carbon Dioxide Emissions for Domestic buildings(Tonnes CO_2 / year)	Carbon Dioxide Emissions for Non-domestic buildings (Tonnes CO_2 / year)	Total - Carbon Dioxide		
	Regulated	Regulated	Total regulated Emissions (Tonnes CO_2 /year)	CO_2 savings (tonnes CO_2 / year)	Percentage saving (%)
Baseline: Part L of the Building Regulations 2013 Compliant Development	2083	327.8	2410		
After Energy Demand Reduction	2046	318.4	2364	46.0	2%

4.22 The total CO_2 emission from the proposed development following the inclusion of energy efficiency measures is approx. 2,364 tonnes CO_2 /year.

4.23 Since demand reduction measures alone do not result in a sufficient reduction in dwelling CO_2 emissions to achieve the emissions target when measured against Part L 2013 Building Regulations, additional LZC technologies are required.

5. Overheating strategy

Summary

5.1 PRP is working closely with the design team of the High Path Regeneration Masterplan to identify the problematic areas with potential risk of overheating. This overheating strategy is based on the detailed overheating analysis of High Path Regeneration Phase 1 project submitted as a separate full planning application in September 2016.

5.2 For the detailed stage of each future phase, we suggest selecting a sample set of residential units and communal spaces to analyse the worst-case scenarios and typical unit, based on the characteristics of each analysed space including the internal gains, building fabric details, building orientation and ventilation restrictions.

5.3 GLA guidance suggests that overheating risk assessment for new developments use the new parameters and guidelines set out in CIBSE TM52:2013 'The limits of thermal comfort: avoiding overheating in European buildings', which replaces the guidelines defined under CIBSE Guide A 'Environmental Design. Additionally, results of the analysis should be checked against data sets in CIBSE TM49:2014 Design Summer Years for London.

5.4 The overheating analysis will be undertaken using dynamic simulation modelling (IES-VE - version 7.0.1.0), against current industry standards and guidelines to assess overheating in buildings.

Site Analysis

5.5 The Site is bounded by low to medium rise buildings to the West; North; East and by low-rise buildings to the South. This provides unobstructed solar access on the majority of the South facing facades during the whole year around. However, all of the proposed blocks (with height range between 1 to 10 storeys) will have a courtyard typology which creates potential for dual aspect dwellings which can be cross ventilated during hot periods of the year.

5.6 While the courtyard typology provides certain benefits for the mitigation of the overheating risks, attention must be paid to the balance between daylight/sunlight availability and potential overheating risks. Therefore, single aspect units facing the courtyard might receive lower levels of daylight/sunlight, while single aspect units on the external South/West or East facing facades might be potentially exposed to the risks of summer overheating.

Objective

5.7 Proposed development will be built to meet current Building Regulations (Part L 2013), the external fabric of the building (roofs, walls and floors) will be designed to be well-insulated and air-tight to meet the London Plan Energy and CO_2 reduction targets. In addition to this, the building will rely on a communal energy distribution system to deliver heat to the individual apartments.

Policy & Overheating Criteria

Policy 5.9 Overheating and Cooling

5.8 The London Borough of Merton follows the London Plan planning policy guidance to assess overheating in buildings. The guidance provided in Chapter 5 of the London Plan (London's response to climate change) will, therefore, be used as policy guidance for the overheating assessment.

5.9 POLICY 5.9 of the London Plan "Overheating and Cooling" 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.

5.10 In order to reduce potential overheating and reliance on air conditioning systems, the design of the High Path Regeneration development at South Wimbledon will follow the cooling hierarchy detailed in Policy 5.9 as below:

- *Minimise internal heat generation through energy efficient design*
- *Reduce the amount of heat entering a building in summer*
- *Manage the heat within the building through exposed internal thermal mass and high ceilings*
- *Passive ventilation*
- *Mechanical ventilation*
- *Active cooling systems (ensuring they are the lowest carbon options)*

Overheating criteria CIBSE TM52:2013

5.11 The overheating analysis will be undertaken against current industry standards and guidelines used to assess overheating in buildings described in paragraph 12.13 of "GLA guidance on preparing energy assessments". The methodology is based on the new criteria set out by CIBSE TM52: 2013 'The limits of thermal comfort: avoiding overheating in European buildings' that will gradually supersede CIBSE Guide A 2006 Methodology for overheating analysis .

5.12 The following guidelines define overheating in free-running buildings according to TM52, detailed explanation for the criteria are provided in Appendix 5:

- The **first criterion** sets a limit for the number of hours that the operative temperature can exceed the threshold comfort temperature by 1ºK or more during the occupied hours of a typical non-heating season (1 May to 30 September).
- The **second criterion** deals with the severity of overheating within any one day, which can be as important as its frequency, the level of which is a function of both temperature rise and its duration. This criterion sets a daily limit of acceptability.
- The **third criterion** sets an absolute maximum daily temperature for a room, beyond which the level of overheating is unacceptable.

5.13 The aforementioned criteria provide a robust and balanced assessment of the risk of overheating and in order for a room to be classified as compliant then it will need to meet at least two out of the three criteria.

5.14 New buildings and renovation project do fall under the Category II of CIBSE recommendations (Table 1).

5.15 CIBSE has suggested the applicability of the categories and their associated acceptable temperature range for free-running buildings and of PMV for mechanically ventilated buildings.

Table 8 - *CIBSE Overheating categories*

Category	Explanation	Suggested acceptable range (K)	Suggested acceptable limits PMV
I	High level of expectation only used for spaces occupied by very sensitive and fragile persons	± 2	± 0.2
II	**Normal expectation (for new buildings and renovations)**	**± 3**	**± 0.5**
III	A moderate expectation	± 4	± 0.7
IV	Values outside the criteria for the above categories (only acceptable for a limited period)	> 4	> 0.7

Weather data

5.16 According to paragraph 12.10 of the GLA guidelines (2016) dynamic modelling should be undertaken in accordance with the guidance and data sets in CIBSE TM49:2014 Design Summer Years for London. Therefore, for the current weather scenario DSY -1 file will be used.

5.17 As it is impossible to prejudge the impact of the warm weather conditions on a building in a general sense CIBSE TM49 recommends the following three years summarised below to be used to form the set of probabilistic design summer years:

- **DSY-1**: 1989 is the current DSY and represents a moderately warm summer (current weather file)
- **DSY-2**: 2003 is a year with an intense single warm spell
- **DSY-3**: 1976 is a year with a long period of persistent warmth

5.18 The nearest weather station for the proposed development is located in Heathrow airport; therefore, all three DSY weather files used in this assessment will be produced by this station.

Methodology

Desktop assessment

5.20 The initial desktop assessment will be used to identify the most representative, worst-case scenario and typical units as well as communal spaces within the proposed High Path Regeneration Masterplan, South Wimbledon.

5.21 The desktop analysis will account for the characteristics of each analysed space (living rooms/kitchens & bedrooms, communal corridor) including the internal gains, building fabric details, building orientation and external weather conditions. The selection of the spaces will provide a representative sample of the overheating risks across the entire development. Assuming that if the worst case scenario and a typical unit have a good performance, then the other units in the development will not have any overheating risk. The selection criteria will be based on the following characteristics:

- **Orientation** - South and West facing zones are exposed to a higher solar radiation.
- **Shading from surroundings elements** - non-sheltered zones will have higher solar heat gains.
- **Exposed external envelope** - zones with a high exposed walls/roof area have more heat gains and losses.
- **Insulation/air tightness** - well insulated and airtight spaces promote low fabric heat losses.
- **Reduced ventilation** - flats with single aspect are more likely to experience overheating due to the lack of cross-ventilation.
- **Security** - For the security reasons ground floor windows normally will have restrictors on them and, therefore, have a reduced area of opening resulting in a smaller proportion of gains from natural ventilation.

Mitigation measures

5.22 Based on our experience of similar projects and the detailed planning application for Phase 1, we suggest the following passive mitigation measures will need to be considered on the detailed design stages of future phases, to minimise the potential risk of overheating.

- Provide ventilation panels in all habitable rooms located on the ground floor, this should be design led in conjunction with daylight availability to avoid restricting daylight entering the rooms.
- Night time ventilation provision.
- Balconies or horizontal shading devices on the south facades including on any set back top floors.
- Minimise number of single aspect units particularly with pure East/West facing orientation. Alternatively, vertical shading devices on these facades should be considered.
- Maximise number of dual aspect units to provide cross ventilation.
- Provision of thermal mass.

5.23 Mitigation measures will be further analysed on a phase by phase basis at the reserved matters stage.

6. Heating Infrastructure and CHP

6.1 The proposed development at High Path is largely located within an identified decentralised energy potential area

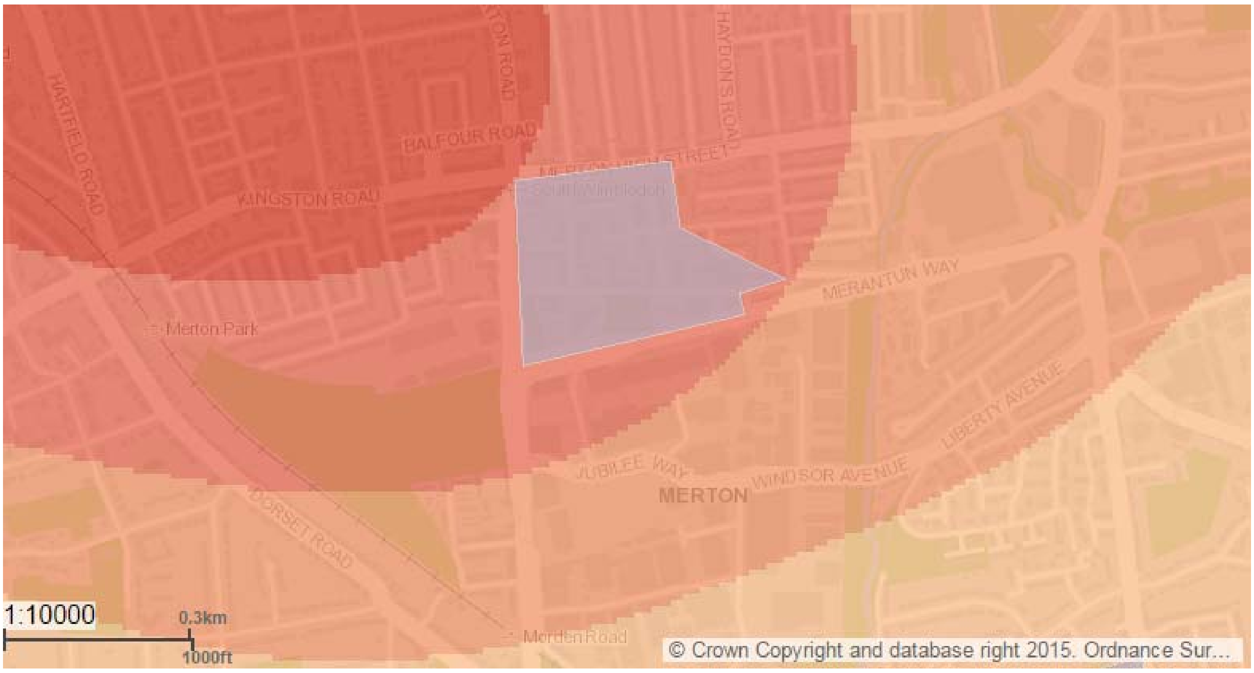


Figure 5 - *London Heat map with decentralised energy potential area highlighted over High Path site*

6.1 The design team have made contact with the London Borough of Merton Energy Officer and have been advised that the council has commissioned a strategic analysis of the potential for district heat systems in the Borough and that the findings report will be issued in early 2017. The High Path redevelopment has been identified as one area that could include a district heat system. The officer confirmed that no heat systems currently exist in the locality of High Path estate nor are any currently planned.

6.2 The modelling results are provided in the following table, wherein the fraction of heat received from the CHP is 55%, with a heat to power ratio of 1.6:1. Gas boilers with a seasonal efficiency of 95% will provide the balance of the heat.

6.3 A 90.3% efficient CHP[1] is able to deliver an additional 777 tonnes CO_2 emission reduction over the DER / BER for the proposed development, to a total CO_2 emission reduction of 823 tonnes CO_2.This is sufficient to meet the CO_2 emission reduction policy targets for the domestic elements of the proposed development. For the non-domestic elements, the additional 49.2 tonnes CO_2 emissions will need to be mitigated using renewable energy.

[1] Provisionally calculated using 2 No. ENER-G E-210 CHP Engines. Sized to include Phase 1.

6.4 The following table shows the results of SAP modelling of High Path at the 'Be Clean' stage of the Energy Hierarchy, following connection to CHP.

Table 9 - *CO_2 emissions and savings after CHP*

	Carbon Dioxide Emissions for Domestic buildings(Tonnes CO_2 / year)	Carbon Dioxide Emissions for Non-domestic buildings (Tonnes CO_2 / year)	Total - Carbon Dioxide		
	Regulated	Regulated	Total regulated Emissions (Tonnes CO_2 /year)	CO_2 savings (tonnes CO_2 / year)	Percentage saving (%)
Baseline: Part L of the Building Regulations 2013 Compliant Development	2083	327.8	2410		
After Energy Demand Reduction	2046	318.4	2364	46.0	2%
After heat network / CHP	1325	262.2	1587	777.2	33%

6.5 An indicative plant room layout can be found in Appendix 2. The indicative location of the masterplan plant room can be found in Appendix 3.

6.6 The plant room is expected to be 600m^2 and as such cannot at present incorporate additional plant to service any considerable additional load, although some capacity for extension has been built in.

6.7 Ability to connect to future wider district heating networks is incorporated and are shown in Appendix 2.

7. Renewable Energy (PV)

7.1 Following SAP (2012) methodology, it is calculated that installing PV arrays totalling approx. 125 kWp will reduce CO_2 emissions by 49.2 tonnes CO_2/yr. - sufficient to achieve the on-site 35% CO_2 emission reduction target beyond the TER of Part L (2013) for the non-domestic elements, and site-wide.

7.2 For this development, the roofs are flat; therefore PV can be mounted on any part of the roofs. The PV arrays should be mounted at a 10^{o} angle. To avoid the modules shading themselves; hence reducing their electricity generation, PV arrays will need to be spaced out and we estimate that approximately a 1,250 m^2 un-shaded roof area will be required to fit in the 125 kWp PV panels. Inspection of the roof design indicates that sufficient space should be available for this level of PV installation.

7.3 The following table shows the SAP (2012) modelling results for High Path following energy efficiency and the addition of 125 kWp PV to the development.

Table 10 - *CO_2 emissions and savings after CHP and PV*

	Carbon Dioxide Emissions for Domestic buildings(Tonnes CO_2 / year)	Carbon Dioxide Emissions for Non-domestic buildings (Tonnes CO_2 / year)	Total - Carbon Dioxide		
	Regulated	Regulated	Total regulated Emissions (Tonnes CO_2 /year)	CO_2 savings (tonnes CO_2 / year)	Percentage saving (%)
Baseline: Part L of the Building Regulations 2013 Compliant Development	2083	327.8	2410		
After Energy Demand Reduction	2046	318.4	2364	46.0	2%
After heat network / CHP	1325	262.2	1587	777.2	33%
After Renewable Energy (PV)	1325	213.1	1538	49.2	3%

7.4 Newly available domestic scale battery storage systems are not be suitable for large communal PV arrays, as they are designed for individual home PV installations. It is expected that the power generated on-site by PV will be directly used on-site, or exported to the grid.

8. Carbon offsetting

8.1 The Greater London Authority guidance on preparing energy assessments (March 2016) provides specific guidance for the event that it is not feasible that a development meets the CO_2 emission targets.

8.2 In a recent meeting the L B Merton officer has advised that they are very open to innovative approaches to carbon offset. the applicant will seek to work with L B Merton to agree the measures to be implemented, which will include investigation options using the following hierarchy:

- Further on-site reductions; and for
- Carbon reduction projects within the borough. This will be explored in conjunction with L B Merton, in particular the opportunity to undertake improvements in the applicant's existing affordable housing stock; and / or
- Financial contribution.

8.3 Additional roof mounted PV may be used to reduce reliance on carbon offsetting. Indicative potential spaces for PV are shown below. The exact level of unshaded roofspace available for PV will be calculated at detailed design stage.

Figure 6 - *Initial potential PV locations*

8.4 Any remaining shortfall in CO_2 emissions will be subject to carbon offsetting facilities.

9. Conclusion

9.1 Following the energy hierarchy, the proposed energy demand reduction measures will provide a site-wide 2% improvement over Approved Document Part L (2013) Building Regulations emissions of 2,410 tonnes CO_2/yr. This is achieved with thermal envelope improvements, as well as energy efficient systems and controls as detailed in Section 4.

9.2 The inclusion of Combined Heat and Power (CHP) engines sized to provide ~55% of the total annual heat load will provide a further site-wide 777 tonnes CO_2/yr (33%) improvement over Approved Document Part L1A & L2A(2013) Building Regulations emissions, with a further 3% site-wide savings from 125 kWp roof mounted solar PV, to a total CO_2 emission reduction of 36% beyond Approved Document Part L (2013) requirements (see Table 5) . Additional mounted PV may be used to reduce reliance on carbon offsetting, together with other measures emerging from consultation with L B Merton.

9.3 The following charts and table summarise the CO_2 emission reductions for domestic, non-domestic and site-wide, following the strategy with CHP and PV installed on site:

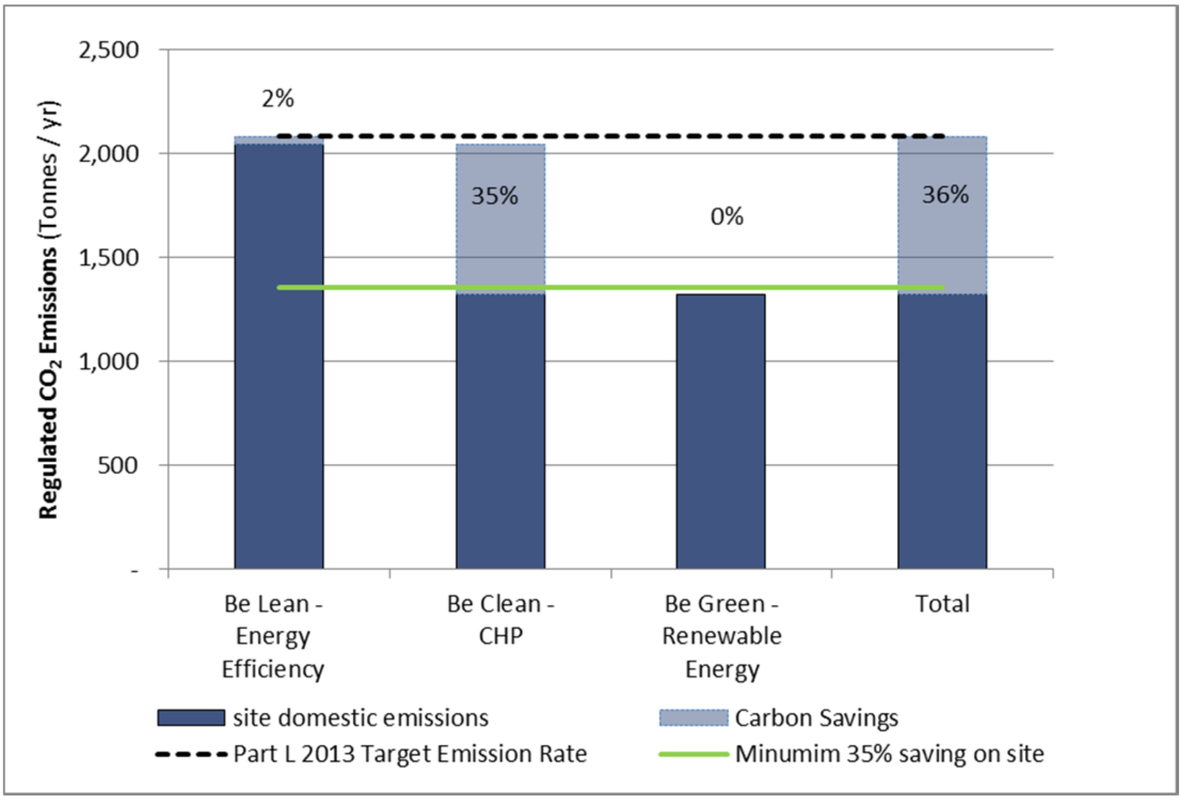


Figure 7 - *Domestic Energy Hierarchy and Targets*

Table 11 - *High Path Domestic CO_2 Emissions*

	Carbon Dioxide Emissions for Domestic buildings (Tonnes CO_2 / year)	
	Regulated	Unregulated
Baseline: Part L of the Building Regulations 2013 Compliant Development	2083	2208
After Energy Demand Reduction	2046	2208
After heat network / CHP	1325	2208
After Renewable Energy (PV)	1325	2208

Table 12 - *High Path Domestic CO_2 Emissions savings*

	Dwelling Regulated Carbon Dioxide Savings	
	(tonnes CO_2 / year)	(%)
Savings from energy demand reduction	36.7	2%
Savings from heat network / CHP	721.1	35%
Savings from renewable energy	0.0	0%
Cumulative on Site Savings	757.7	36%

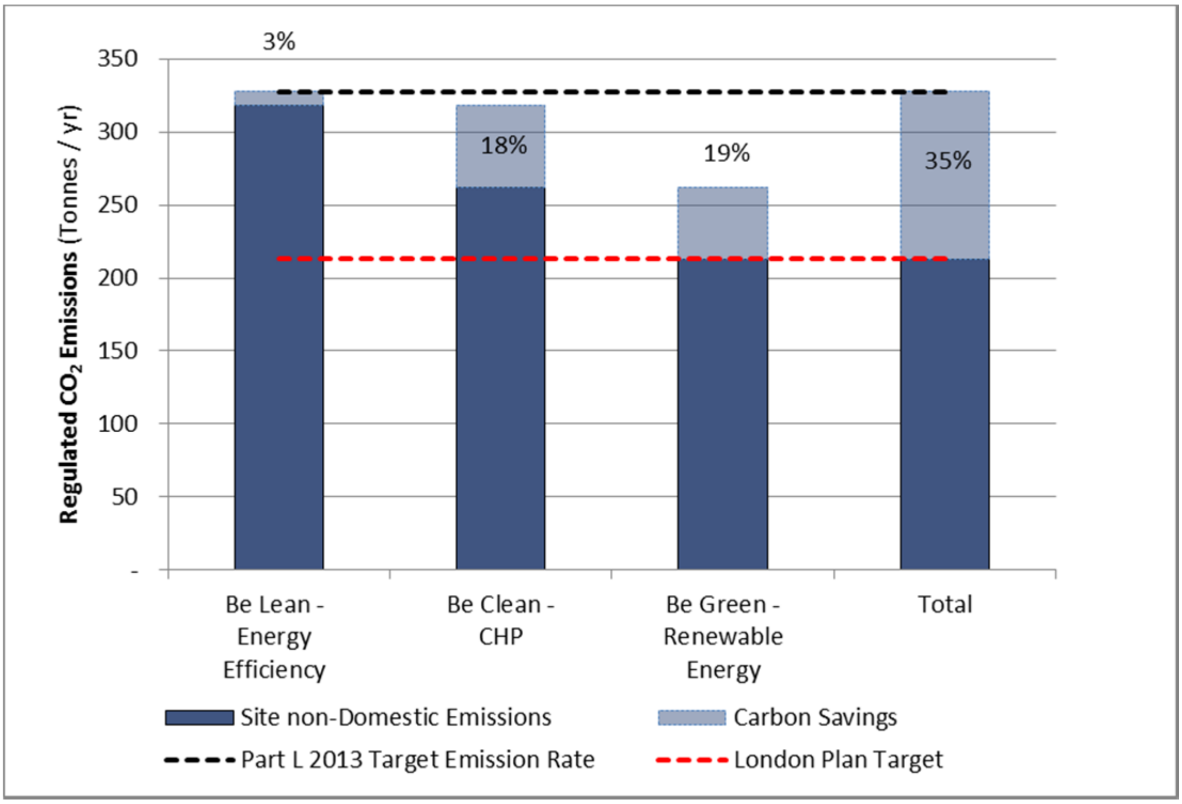


Figure 8 - *Non-domestic Energy Hierarchy and Targets*

Table 13 - *High Path Non-domestic CO_2 Emissions*

	Carbon Dioxide Emissions for Non-domestic buildings (Tonnes CO_2 / year)	
	Regulated	**Unregulated**
Baseline: Part L of the Building Regulations 2013 Compliant Development	327.8	175.4
After Energy Demand Reduction	318.4	175.4
After heat network / CHP	262.2	175.4
After Renewable Energy (PV)	213.1	175.4

Table 14 - *High Path Non-domestic CO_2 Emissions savings*

	Commercial Regulated Carbon Dioxide Savings	
	(tonnes CO_2 / year)	**(%)**
Savings from energy demand reduction	9.4	3%
Savings from heat network / CHP	56.2	18%
Savings from renewable energy	49.2	19%
Total Cumulative Savings	**114.7**	**35%**

Table 15 - *High Path Total CO_2 Emissions and savings*

	Total regulated Emissions (Tonnes CO_2 / year)	CO_2 savings (tonnes CO_2 / year)	Percentage saving (%)
Part L 2013 baseline	2410		
Be Lean	2364	46.0	2%
Be Clean	1587	777.2	33%
Be Green	1538	49.2	3%
		872.5	**36%**

9.4 The proposed development at High Path will meet the CO_2 emission reduction policy targets.

Appendix 1 GLA Overheating Checklist

DOMESTIC OVERHEATING CHECKLIST (SECTION 1)

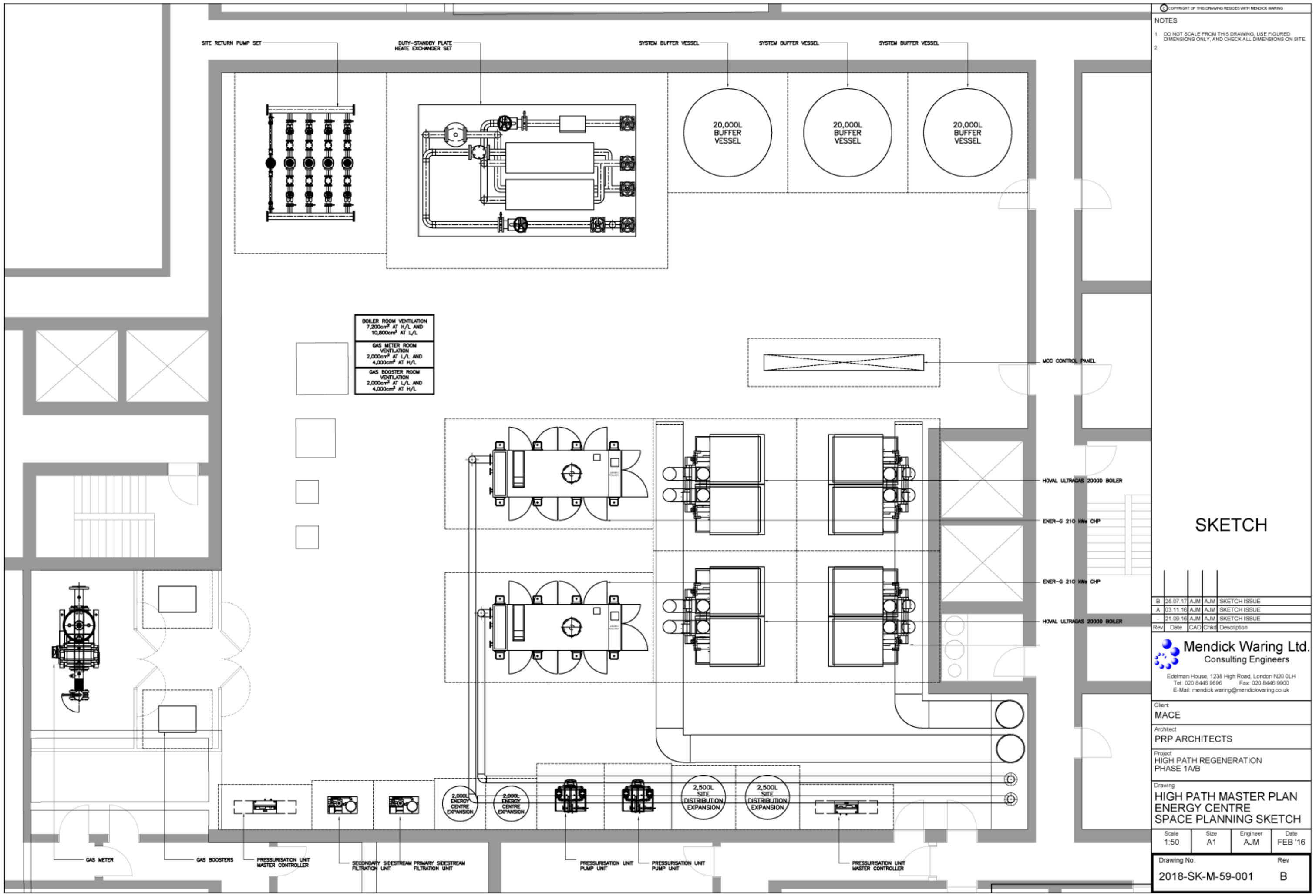
Section 1 – Site Features affecting vulnerability to overheating		Yes / No
Site location	Urban – within central London or in a high density conurbation	Yes
	Peri-urban – on the suburban fringes of London	No
Air quality and/or Noise sensitivity – are any of the following in the vicinity of buildings?	Busy roads / A roads	Yes
	Railways / Overground / DLR	No
	Airport / Flight path	No
	Industrial uses / waste facility	No
Proposed building use	Will any buildings be occupied by vulnerable people (e.g. elderly, disabled, young children)?	Potentially yes, but not the majority of the occupants
	Are residents likely to be at home during the day (e.g. students)?	Potentially yes, but not the majority of the occupants
Dwelling aspect	Are there any single aspect units?	Yes
Glazing ratio	Is the glazing ratio (glazing: internal floor area) greater than 25%?	No with minor exceptions
	If yes, is this to allow acceptable levels of daylighting?	Yes
Security - Are there any security issues that could limit opening of windows for ventilation?	Single storey ground floor units	Yes
	Vulnerable areas identified by the Police Architectural Liaison Officer	No
	Other	No

DOMESTIC OVERHEATING CHECKLIST (SECTION 2)

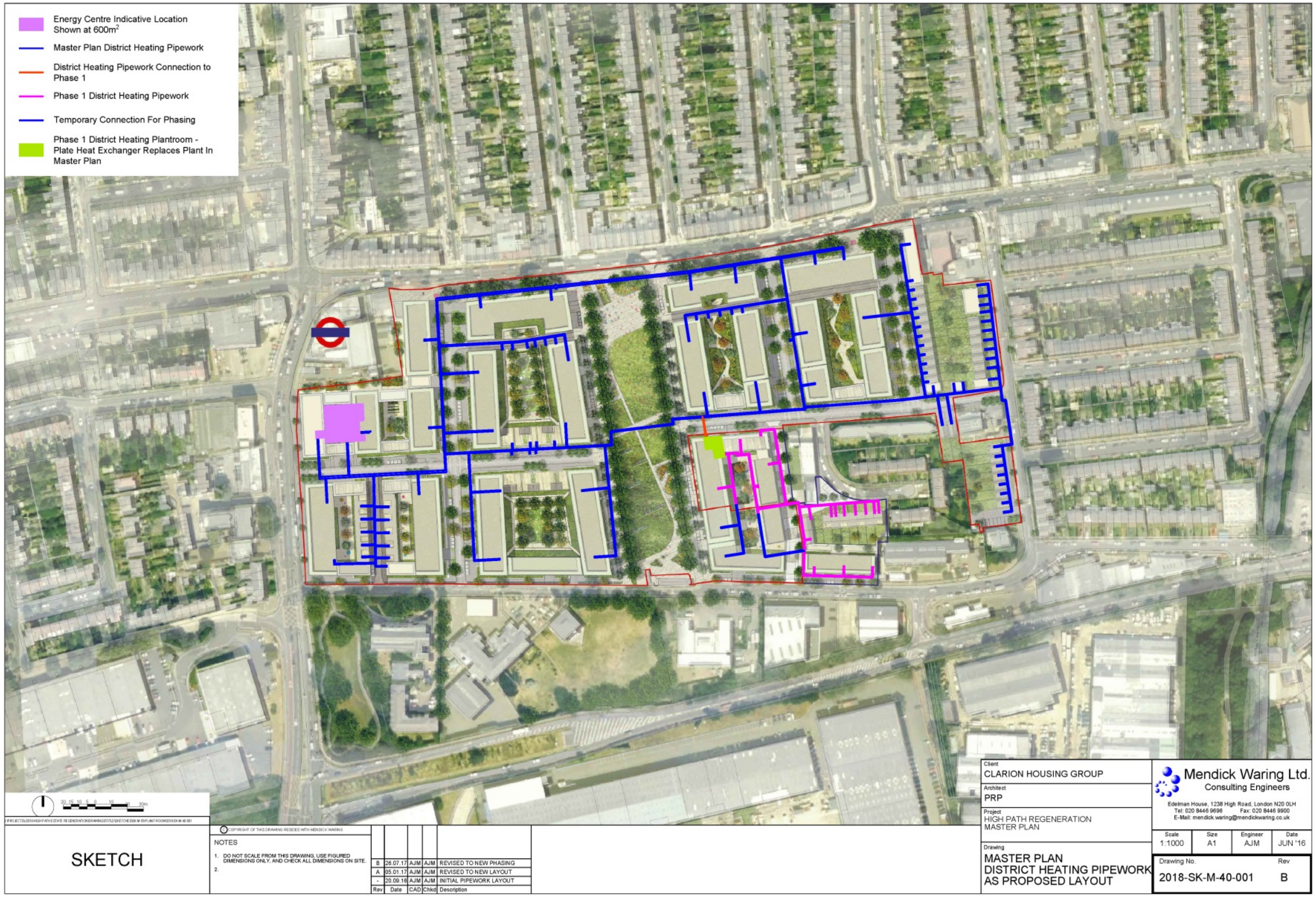
Section 2 – Design Features proposed to mitigate overheating risk		Yes
Landscaping	Will deciduous trees be provided for summer shading (to windows and pedestrian routes)?	No - on the short term, Yes on the long term
	Will green roofs be provided?	TBC on detailed design stage
	Will other green or blue infrastructure be provided around buildings for evaporative cooling?	TBC on detailed design stage
Materials	Have high albedo (light colour) materials been specified?	TBC on detailed design stage
Dwelling Aspect	% of total units that are single aspect	TBC on detailed design stage
	% single aspect with N / NE / NW orientation	
	% single aspect with E orientation	
	% single aspect with S / SE / SW orientation	
	% single aspect with W orientation	
Glazing ratio - What is the glazing ratio (glazing; internal floor area) on each facade?	N / NE / NW	TBC on detailed design stage
	E	
	S / SE / SW	
	W	
Daylighting	What is the average daylight factor range?	TBC on detailed design stage
Window Opening	Are windows openable?	Majority of windows yes
	What is the average percentage of openable area for the windows?	TBC on detailed design stage
Extent of window opening	Fully openable	TBC on detailed design stage
	Limited (e.g. for security, safety, wind loading reasons)	Ground floor windows can be opened on restrictors only

	Where there are security issues (e.g. ground floor flats) has an alternative night time natural ventilation method been provided (e.g. ventilation grates)?	Secure night vents proposed
Shading	Is there any external shading?	Balconies/overhangs vertical shading devices will be considered
	Is there any internal shading?	No
Glazing Specification	Is there any solar control glazing?	No
Ventilation - What is the ventilation strategy?	Natural - background	TBC on detailed design stage
	Natural - purge	TBC on detailed design stage
	Mechanical – background (e.g. MVHR)	TBC on detailed design stage
	Mechanical – purge	TBC on detailed design stage
	What is the average design air change rate?	TBC on detailed design stage
Heating system	Is communal heating present?	Yes
	What is the flow/ return temperature	TBC on detailed design stage
	Have horizontal pipe runs been minimised?	TBC on detailed design stage
	Do the specifications include insulation levels in line with the London Heat Network Manual?	TBC on detailed design stage

Appendix 2 Indicative Plantroom (Including CHP Engines)



Appendix 3 Indicative masterplan DHN and plantroom location



Appendix 4 Renewable Technologies

Table 16 - *Renewable Technology - initial feasibility test.*

Technology	Output				Technical Feasibility
	Electricity	Domestic hot water	Space heating	Space cooling	
Micro Hydroelectric	√				Low - Technology is unsuitable to an urban setting
Photovoltaic (PV)	√				High - Technology is highly scalable, effective in CO_2 emission reduction, and proven in urban environments
Wind turbines	√				Low - Free-standing units are not suitable for urban environments due to predominantly turbulent air flows which they cannot effectively harness.
Solar thermal		√			Low - Conflict with CHP
Biomass boiler		√	√		Low -The project is located within an Air Quality Management Area, and the increased NOx and particulate matter (PM) emissions associated with biomass are likely to be detrimental to local air quality.
Heat pump (for heating)		(√)	√	√	Low - EAHP - Relatively low COP; not appropriate for smaller dwellings Low - GSHP - Insufficient land area to service units Low - Individual systems are unsuitable for such density, communal systems are not a suitable substitute for CHP.
Biomass CHP	√	√	√	√	Low - The project is located within an Air Quality Management Area, and the increased NOx and particulate matter (PM) emissions associated with biomass are likely to be detrimental to local air quality.
Hydrogen Fuel Cell	√	√	√	√	Low - Promise superior efficiency, however they have yet to gain wide acceptance and their capital costs and specialised maintenance requirements make them impractical for this development.

Appendix 5 CIBSE TM52 Criteria

The CIBSE Overheating Task Force has decided that a new approach to the definition of overheating is necessary, particularly for buildings without mechanical cooling.

The following criteria, taken together, provide a robust yet balanced assessment of the risk of overheating of buildings in the UK and Europe. A room or building that fails any two of the three criteria is classed as overheating.

1. The first criterion sets a limit for the number of hours that the operative temperature can exceed the threshold comfort temperature (upper limit of the range of comfort temperature) by 1 K or more during the occupied hours of a typical non-heating season (1 May to 30 September).

2. The second criterion deals with the severity of overheating within any one day, which can be used as important as its frequency, the level of which is a function of both temperature rise and its duration. This criterion sets a daily limit of acceptability.

3. The third criterion sets an absolute maximum daily temperature for a room, beyond which the level of overheating is unacceptable.

CIBSE recommends that new buildings, major refurbishments and adaptation strategies should conform to Category II in BS EN 15251 (BSI, 2007) (for category definition see Table 2), which sets a maximum acceptable temperature of 3 °C above the comfort temperature for buildings in free-running mode.

Table 2 Suggested applicability of the categories and their associated acceptable temperature range for free-running buildings and of PMV for mechanically ventilated buildings (from BSI, 2007). The CIBSE suggestion is that designers should aim to remain within the Category II limits.

Category	Explanation	Suggested acceptable range (K)	Suggested acceptable limits PMV
I	High level of expectation only used for spaces occupied by very sensitive and fragile persons	± 2	± 0.2
II	Normal expectation (for new buildings and renovations)	± 3	± 0.5
III	A moderate expectation (used for existing buildings)	± 4	± 0.7
IV	Values outside the criteria for the above categories (only acceptable for a limited periods)	>4	> 0.7

For such buildings , the maximum acceptable temperature (Tmax) can be calculated from the running mean of the outdoor temperature (Tm) (see Box 2) using the formula:

$$T_{max} = 0.33\, T_m + 21.8$$

Where, Tmax is the maximum acceptable temperature (°C).

It should be noted that for buildings that have a higher level of expectation in respect to, say, spaces that are occupied by very sensitive and fragile persons, you may wish to agree with the client the more demanding standard suggested for Category I. This sets the maximum acceptable temperature (Tmax) at 1 K less than the above recommendation.

The criteria are all defined in terms of ΔT the difference between the actual operative temperature in the room at any time (Top) and Tmax the limiting maximum acceptable temperature. ΔT is calculated as:

$$\Delta T = Top - Tmax$$

ΔT is rounded to the nearest whole degree (i.e. for ΔT between 0.5 and 1.5 the value used is 1 K; for 1.5 to 2.5 the value used is 2 K, and so on).

(a) Criterion 1: Hours of exceedance (He)

The number of hours (He) during which ΔT is greater than or equal to one degree (K) during the period May to September inclusive shall not be more than 3 percent of occupied hours.

If data are not available for the whole period (or if occupancy is only for a part of the period) than 3 percent of available hours should be used.

(b) Criterion 2: Daily weighted exceedance (We)

To allow for the severity of overheating the weighted exceedance (We) shall be less than or equal to 6 in any one day where:

$$We = (\Sigma he) \times WF$$

$$= (he0 \times 0) + (he1 \times 1) + (he2 \times 2) + (he3 \times 3)$$

where the weighting factor WF = 0 if $\Delta T \leq 0$, otherwise WF = ΔT, and hey is the time (h) when WF = y.

Thus suppose we have a room where the temperature is simulated or monitored at half-hourly intervals over 8 occupied hours, so we have 16 readings, ten of them where ΔT is zero or negative (WF = 0), three readings where ΔT = 1 (WF = 1), two where ΔT = 2 (WF = 2) and one where ΔT = 3 (WF = 3) then:

$$We = \frac{1}{2} [(10 \times 0) + (3 \times 1) + (2 \times 2) + (1 \times 3)]$$

= 5 (i.e. the criterion is fulfilled)

(c) Criterion 3: Upper limit temperature (Temp)

To set an absolute maximum value for the indoor operative temperature the value of ΔT shall not exceed 4 K.

HIGH PATH ESTATE

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Outline Planning Application

CLARION
HOUSING GROUP

November 2017