malcolm hollis

Energy & Sustainability Statement
45 Holmes Road, London

Prepared for	**Tiuta Properties Limited & 160 Iverson Limited**
Prepared by	**David Watkins CEng (Hons) MCIBSE**
Date	**22 May 2015**
Reference	**43417/SL/DMW**

Malcolm Hollis LLP
5 Brooks Court, Kirtling Street, London SW8 5BP
T 020 7622 9555 **F** 020 7627 9850 **W** malcolmhollis.com

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Tiuta Properties Limited & 160 Iverson Limited

Energy Statement
45 Holmes Road, London

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Recommendation and Summary

1. Executive Summery

1.1.1 This report has been produced on behalf of Tiuta Properties Limited & 160 Iverson Limited to form part of the planning application to Camden Council for the development entitled 45 Holmes Road, London.

1.1.2 The development consists of 8 domestic units built over the existing commercial space. Malcolm Hollis have been appointed to produce an Energy & Sustainability Statement presenting how the development will comply with the requirements of the GLA London Plan, Camden Council and the new requirements of the Deregulation Act 2015 section 43. As required within these documents, a 35% improvement over Part L Building Regulation 2013 is to be evidenced. In addition, measures will be implemented to ensure the design of the new domestic units incorporates:

- Water efficiency of 110 litres per day
- Incorporation of a minimum of 20% renewable

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

- Use less energy (Be Lean)
- Supply energy efficiently (Be Clean)
- Use renewable energy (Be Green).

1.1.4 In order to minimise the use of energy by this building, a low carbon approach for the design of the building's fabric and associated engineering system has been used.

1.1.5 The building design has incorporated measures to reduce the use of artificial light and minimise/eliminate the need for cooling. Additionally, the architecture has been designed so as to maximise the use of natural light and natural ventilation within the residential buildings though use of natural ventilation openings and careful location of external shading.

1.1.6 The units will incorporate a number of water outlets and sanitaryware that have been selected to ensure that the requirement of saving 110 litres per day is achieved for all units.

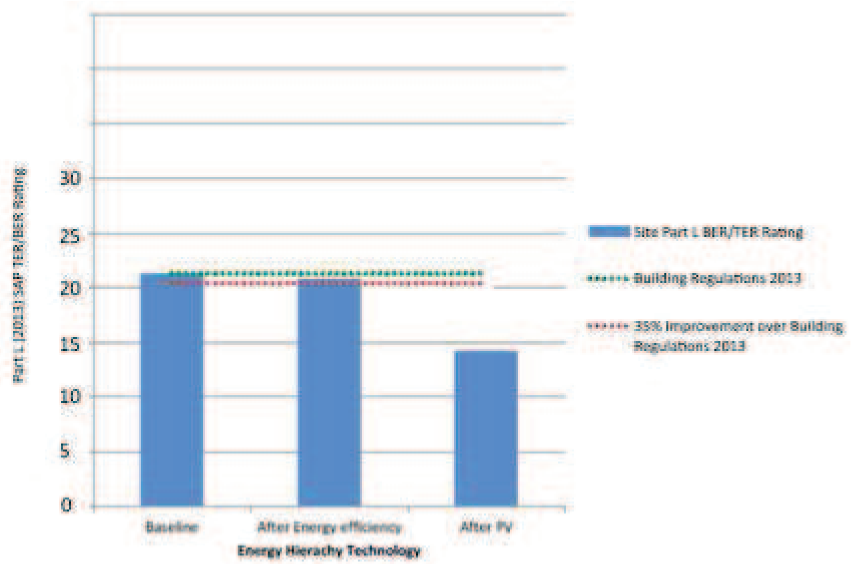
1.1.7 Heat energy to the new apartments is provided by use of gas fired combination boilers linked to underfloor heating systems. The proposal incorporates the use of whole house ventilation complete with heat exchangers to allow the pre-heating of incoming air using heat rejected by the extract ventilation system.

1.1.8 To provide further CO_2 reductions, it is proposed to install photovoltaic panels on the roof of the residential properties to further increase the amount of electrical energy generated on site. The PV panels shall be installed on the south facing roof areas of the residential units allowing for the maximisation of the PV installation without increasing the height of the building. The PV installation shall provide a total of 10.75 kWp. Final development of positioning and design will be undertaken during RIBA Stage E by a solar specialist.

1.1.9 It has been identified that these measures have resulted in a reduction in CO_2 emissions of approximately 35% when measured against Part L 2013 Building Regulations.

1.1.10 By virtue of providing compliance with the requirement of a 35% reduction in energy use against Part L 2013, the proposed scheme incorporates renewable technologies, in the form of a number of PV installations that will provide at least 34% of the required energy of the new units. Accordingly the proposed units will achieve the required minimum of incorporation of 20% renewable energy provision.

1.1.11 Further detail regarding expected CO_2 emissions as a result of the development are outlined in Figure 1 & Table 1 below.



Results of design changes to achieve 35% improvement on Part L 2013

Total Site CO_2 Emissions			
	Baseline (TER)	**After Energy Efficient Design (BER)**	**After PV (BER)**
Site SAP DERs	20.99	20.97	13.7

45 Holmes Road CO_2 Emissions Results (TER/BER)

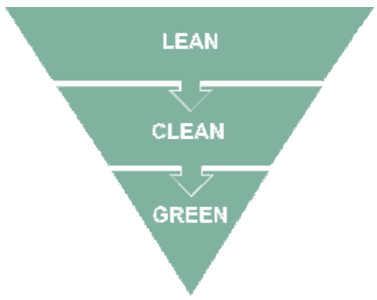
2. Introduction

2.1.1 Malcolm Hollis LLP have been appointed to produce a site-wide Energy & Sustainability Statement identifying how the development will address the policies set out by both the GLA London Plan and Camden Council. Additionally, the requirements of Section 43 of The Deregulation Act 2015 have been incorporated.

2.1.2 In line with these policies, the development must achieve the following measures of sustainability:

- 35% reduction in CO2 emissions over Part L 2013 requirements.
- Incorporate water efficiency of 110 litres per day.
- Incorporate 20% renewable energy production.

2.1.3 The strategy is based on the Energy Hierarchy, as follows:



- Use less energy (Be lean)
- Supply energy efficiently (Be clean)
- Use renewable energy (Be green)

2.1.4 The use of passive design and energy efficient features are key to reducing energy demand. The proposed energy efficiency measures include a well-insulated building fabric, alongside a ventilation strategy that maximises the use of natural ventilation. These measures will go some way towards achieving compliance, however, Low or Zero-Carbon (LZC) energy technologies will be required in order to demonstrate compliance with requirements set out under relevant planning policy. The strategy is based on information provided by the project design team.

2.1.5 The embodied energy of the development is out of the scope of this report. The focus will be on delivered energy demand.

2.2 Site Location and Development Proposal

2.2.1 The proposal seeks to retain the existing commercial floor space and 1 residential unit and provide 8 new residential units above the existing building. The existing ground floor commercial area will be retained in its current arrangement. Works will be undertaken to improve the existing external fabric however its use will not be altered. Accordingly the existing building areas do not form part of this report.

Arial photo of existing site

3. Planning Policy Guidance & Legislation

3.1.1 The following policies will apply to the development;

London Plan 2015

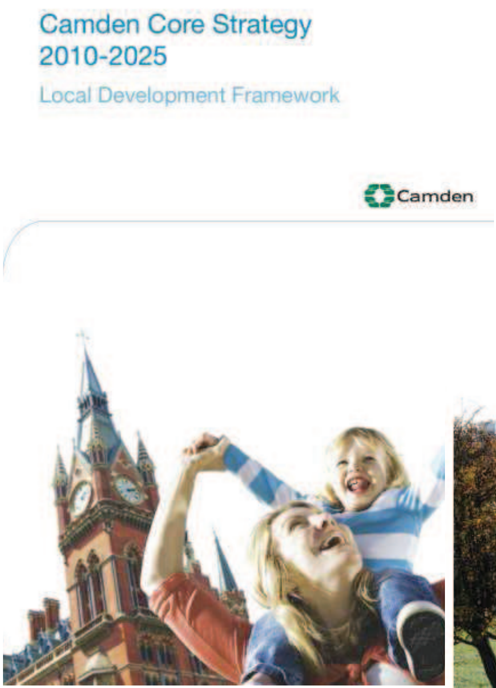
- Mayor of London SPG on Sustainable Design and Construction (2014)
- Policy 5.2 – Minimising Carbon Dioxide Emissions
- Policy 5.3 – Sustainable Design & Construction
- Policy 5.5 – Decentralised Energy Networks

Camden Council:

- Core Strategy Policy CS13

Deregulation Act 2015:

- Section 43 – Amendment of Planning & Energy Act 2008



4. Energy Strategy

4.1 Objective

4.1.1 The purpose of this energy strategy is to demonstrate that climate change mitigation measures have been fully considered and appropriately selected and specified as part of the 45 Holmes Road scheme's design.

4.1.2 In accordance with the guidance notes, after establishing the baseline energy demand and profile for the site, the strategy for Holmes Road follows the Mayor's Energy Hierarchy (Use Less Energy – 'Be Lean', Supply Energy Efficiently – 'Be Clean' and Use Renewable Energy – 'Be Green') in appraising appropriate measures to reduce carbon emissions and other climate impacts from the development.

4.1.3 The following sections provide more details on each of the steps of the Energy Strategy following the London Plan's Energy Hierarchy.

4.1.4 Within the London Plan 2015, the energy hierarchy establishes a strategy of firstly establishing the baseline energy use of the proposed development and then applying potential energy measures within the structure of the 'Energy Hierarchy'. The stages of the hierarchy are defined as follows:

Use Less Energy – 'Be Lean'	Reduce use through behaviour change Improve insulation Incorporate passive heating. Install Energy Efficient lighting and appliances
Supply Energy Efficiently – 'Be Clean'	Use efficient heating products.
Use Renewable Energy – 'Be Green'	Install renewables on site Import renewable energy

4.2 Methodology (Residential)

4.2.1 Energy demand and resultant CO_2 emissions are estimated for the base case Target Emissions Rate (TER) and the improved, through energy efficiency, Dwellings Emissions Rate (DER). Low and zero-carbon energy technology is then applied to further enhance performance to meet the target.

4.2.2 Government approved software (Plan Assessor version 6.1.1) has been used to calculate energy consumption based on current SAP methodology in version 9.90. Energy demand and resultant CO_2 emissions are estimated for the base case Target Emissions Rate (TER) and the improved, through energy efficiency, Building Emissions Rate (BER). Low and zero-carbon energy technology is then applied to further enhance performance to meet the target.

5. Energy Stratergy (Residential)

5.1 Baseline Energy Assessment

5.1.1 Before energy efficiency measures are investigated, it is important to establish the baseline energy consumption of the development, for comparison and evaluation of energy proposals for the development.

5.1.2 Energy modelling shows that the base energy consumption Target Emissions Rate (TER) for Part L compliance is 20.99. Accordingly, in order to be compliant with the requirements of The London Plan of a 35% reduction on the TER will be required.

5.1.3 Once established, achievement of the goals of the energy report utilising the energy hierarchy can be undertaken

5.2 Be Lean

5.2.1 The primary focus for providing an energy efficient development is driven through the generation of a design that takes advantage of energy use reduction through improved building fabric and engineering services.

5.2.2 The energy demand of the development will be reduced through incorporation of measures including high levels of thermal insulation, detailing to reduce air permeability and thermal bridging, and the use of low-energy lighting.

5.2.3 The use of building fabric specifications that better the minimum requirements of Part L as well as maximising daylight though the use of north facing windows and light tunnels will allow for the reduction in the need for heating and lighting though better building design.

5.3 Be Clean

5.3.1 The next step in the Energy hierarchy is the 'be clean' strategy of supplying the required energy, after all possible passive energy efficiency measures have been incorporated, as efficiently as possible.

5.3.2 Heating energy efficiency has been addressed through the proposed use of combination boilers paired with underfloor heating. Each residential dwelling will have its own combination boiler which will provide all of the heat required to serve the heating and hot water demands.

**Please note that system sizing is based on the provision of space heating and hot water requirements.*

5.3.3 Lighting to all areas will be provided via low energy lighting such as LED lighting only so as to reduce energy consumption.

5.3.4 Ventilation will be provided to each apartment via their own whole house ventilation system. Each ventilation system will provide supply and extract ventilation and will incorporate heat exchangers to allow heat from the exhaust air to be reclaimed to heat incoming air. Ventilation rates will be in line with Approved Document Part F.

5.4 Be Green

5.4.1 The third and final stage of the energy hierarchy – 'be green' by reviewing the potential of a range of renewable energy systems to serve the energy requirements of the site and thereby offset CO_2 emissions.

5.4.2 As will be seen In the Technology Consideration section of the Energy Report, a number of high efficiency or renewable technologies have been reviewed for use in this development. The review of green technologies identifies that the development will be suitable for the inclusion of photovoltaic panels.

5.5 Specification

5.5.1 Based on this review, the specification of the building has been selected to achieve or better the standards identified in the Camden Planning Guidance for Energy Efficiency: New Buildings wherever possible:

- U-value of heat-loss floors 0.10 W/m^2K
- U-value of heat-loss walls 0.11 W/m^2K
- U-value of roofs 0.10 W/m^2K
- U-value of windows 1.1 W/m^2K
- U-value of doors 1.4 W/m^2K
- Air permeability: 5.01 $m^3/m^2.h$ (100% testing)
- Whole House Ventilation with heat recovery - SFP = 0.85, heat recovery efficiency = 88%
- No cooling via air conditioning
- Underfloor heating provided by combination boiler
- Individual heating programmer and temperature control
- 100% low energy light fittings
- 10.75 kWp total Photovoltaic Installation, mounted at roof level at 10°

5.6 Energy Efficiency Results

5.6.1 By recording the baseline TER emissions for the development we are able to assess the effects of improvements detailed above on the development. These effects are detailed for the development at the end of the report.

6. Technology Consideration

6.1.1 Given the requirement to achieve a number of Building standards and requirements, design development has been undertaken as part of the RIBA Stage C process. 45 Holmes Road is required to incorporate renewable technologies that will achieve a minimum of 20% of the energy needs for the proposed units. As part of this process, a number of technologies have been considered, with feasibility / viability and practicality considered given the various design considerations.

6.1.2 In order to fully identify appropriate technologies, an initial evaluation has been undertaken based on the expected baseline energy demand. Baseline Energy is calculated on a development with identical geometry built to meet Building Regulations, thus using standard building fabric parameters and notional heating systems.

6.1.3 Energy modelling details that the base TER for the proposed development is 20.99 as detailed in Section 5.0.

6.1.4 The results of this review will be used to select appropriate technologies for use to achieve a minimum of 20% of the energy needs of the units.

6.2 PHOTOVOLTAICS

6.2.1 The PV panel should be orientated between southeast and southwest (optimally south). The optimal tilt angle (inclination of panel from horizontal) should be calculated to ensure the best possible output of the system during the year. In the UK, the angles of most pitched roofs are suitable for mounting PV panels.

6.2.2 Panels can also be mounted on A-frames on flat-roofed buildings. PV technology comes in a range of forms: PV panels that can be retrofitted to the roof of an existing building or equally, sunk to fit flush with the roof line; PV cells that are 'laminated' between sheets of glass to provide shading in a glazed area, and PV cladding.

6.2.3 PV systems are low maintenance as they have no moving parts and panels generally have 25 year warranties, although the lifetime of the panel can be expected to be beyond this time.

TECHNICAL CONSIDERATIONS

6.2.4 The PV systems should not be shaded. Shading caused by other buildings, greenery and roof 'furniture' such as chimneys or satellite dishes, even over a small area of the panel, can significantly reduce performance. Excess energy can be exported to the grid. Although the feed-in tariffs are generally not high, exporters can negotiate with their utility company.

ECONOMIC CONSIDERATIONS

6.2.5 Payback times for this technology are usually in excess of twenty years; but this is reducing year on year as the technology matures and are set to reduce further as fuel prices increase. Integrating PV into a building and replacing other building materials can further offset the cost.

APPLICABILITY

6.2.6 PV has been identified as a suitable technology for incorporation at 45 Holmes Road .

6.3 SOLAR WATER HEATING

6.3.1 A solar collector comprises the housing that contains piping through which the carrier fluid circulates and a glass panel to retain the radiation from the Sun. The temperature inside the collector increases and this heat is then transferred to a carrier fluid. In an open loop system, the hot water is heated directly.

6.3.2 Solar thermal panels are generally black in appearance for maximising energy adsorption and the glass panels have a special coating in order to retain as much heat as possible.

6.3.3 Two types of collector exist: flat plate and evacuated tube. Flat plate collector can be mounted on or flush with the roof. The air in the collection tubes can be evacuated to reduce heat losses within the frame by convection. Evacuated tube collectors need to be re-evacuated every few years. They are more difficult to install but are more efficient and allow higher temperature heating.

BENEFITS

6.3.4 Solar thermal collectors offer a good price-performance ratio. Solar hot water systems are best suited to developments with high hot water requirements, such as hotels, care homes and leisure centres. Many systems have been installed in the UK and they work well, even without direct sunlight.

TECHNICAL CONSIDERATIONS

6.3.5 Solar thermal systems should be sized to the hot water requirements of the user since any excess heat that is generated cannot be exported elsewhere. The optimal angle for mounting depends on when the water demand is greatest. Ideally, the collectors should be mounted onto a non-shaded, south-facing roof.

ECONOMIC CONSIDERATIONS

6.3.6 Solar thermal technology is a cost effective way to reduce Carbon emissions, especially if it is replacing electric water heating.

APPLICABILITY

6.3.7 Due to limited roof space, solar hot water cannot be used effectively alongside photovoltaic arrays. Accordingly it is considered preferable to install photovoltaic arrays over solar hot water where only one technology can be favoured.

6.4 AIR SOURCE HEAT PUMPS

6.4.1 Air source heat pumps work by converting the energy of the outside air into heat, creating a comfortable temperature inside the building as well as supplying energy for the hot water system. As with all heat pumps, air source models are most efficient when supplying low temperature systems such as underfloor heating.

6.4.2 An air source heat pump extracts heat from the outside air in the same way that a fridge extracts heat from its inside. It can extract heat from the air even when the outside temperature is as low as minus 15° C. Cold water or another fluid is circulated through pipes, picking up the ambient temperature and then passing through the heat exchanger (the evaporator) in the heat pump unit.

6.4.3 The heat exchanger extracts heat from the fluid, using a refrigerant compression cycle to upgrade the heat to a usable temperature (+55°C). This heat is then transferred to the heating system via another heat exchanger, the condenser of the heat pump.

6.4.4 Accordingly ASHP heating systems generally run at a lower temperature than conventional heating systems. There are two main types of air source heat pumps. An air-to-water system uses the heat to warm water. Heat pumps heat water to a lower temperature than a standard boiler system would, so they are better suited to underfloor heating systems than radiator systems.

6.4.5 An air-to-air system produces warm air, which is circulated by fans to heat the building. Whilst heat pumps are not a wholly renewable energy source due to use of electricity, the renewable component is considered as the heat extracted from the air. It is measured as the difference between heat outputs, less the primary electrical energy input. Using this heat, for every Watt of electrical energy supplied to the system, 4 Watts or more of heating energy can be supplied to a heating system. This 'Coefficient of Performance' (CoP) of 4 is effectively an 'efficiency' of 400% for the system and compares very favourably with even the best gas condensing boiler's efficiency of around 85%. The smaller the temperature difference between the source and the output temperature of the heat pump (i.e. the temperature of the distribution system) the higher the heat pump's COP.

BENEFITS

6.4.6 Unlike boilers, there is no pollution on-site and as the mix of power stations used to supply the electricity grid gets 'cleaner', with more renewable electricity generation being brought on line, so the Carbon emissions from the heat pumps system will decrease even further.

6.4.7 The key operational benefit of air source heat pumps for the user is the reduction in fuel bills. In addition, space savings can be made over other plant types as an air source heat pump unit is compact, and requires no storage space for fuel.

TECHNICAL CONSIDERATIONS

6.4.8 Since air source heat pumps produce less heat than traditional boilers, it is essential that the building where the air source heat pump is proposed is well insulated and draught proofed for the heating system to be effective. Fans and compressors integral to the air source heat pump unit generate some noise, but this is generally acceptable especially where outdoor units can be located away from windows and adjacent buildings. By selecting a heat pump with an outdoor sound rating of 7.6 dB or lower and mounting the unit on a noise-absorbing base these issues can be resolved for the site.

ECONOMIC CONSIDERATIONS

6.4.9 Costs for installing a typical system vary but they are considerably more economic to install than an equivalent capacity ground source heat system and can produce similar levels of energy and carbon savings. Actual running costs and savings for space heating will vary depending on a number of factors - including the size and use pattern of the building and how well insulated it is.

APPLICABILITY

6.4.10 ASHPs have been considered as not suitable for this site. Although they would technically be suited for the proposed heat loads, a review has indicated that there is insufficient accessible outside area to locate the outdoor units. Accordingly they have been deemed not suitable for this development.

6.5 BIOMASS HEATING

6.5.1 Biomass can be burnt directly to provide heat in buildings using wood from forests, urban tree pruning, and farmed coppices or as liquid biofuel, such as bio diesel. In non-domestic applications, biomass boilers replace conventional fossil fuel boilers and come with automated features to enable reduced user intervention.

6.5.2 With the long term availability of fossil fuels such as oil and gas, and the persistent number of price rises of oil and natural gas a growing concern in the UK, alternative heating methods such as wood burning boilers are becoming more popular.

6.5.3 Due to technical advances in wood burning technology, and improvements in the preparation of wood fuels, efficiencies of new wood pellet burning boilers have increased to around 90%, with Carbon monoxide emissions dropping dramatically.

6.5.4 There are three types of wood burning boiler - logs, woodchips and wood pellets. Wood logs are the most readily available, generally produced as a by-product from forestry and woodland from sawmills, tree surgery and wind damage.

6.5.5 Wood chips have a high moisture content which tends to restrict their efficiency to only 50% and they tend to suffer from blockages hence we would be cautious about their use on this site. Storage space requirements are also high due to the irregularity of the chips. Wood pellets are made from dry waste wood, such as used pallets and off-cuts/sawdust from furniture manufacturers. The waste wood is compressed into uniform, high density pellets that are easier to transport, handle and store than other forms of wood fuel.

TECHNICAL AND ECONOMICAL CONSIDERATIONS

6.5.6 Biomass combustion systems (BCS) are generally more mechanically complex than conventional boiler heating systems, especially when it comes to fuel delivery, storage, handling and combustion. The complexity is necessary because of the different combustion characteristics of biomass as compared to conventional fossil fuels. The increased complexity means higher capital costs than for conventional systems. BCSs typically require more frequent maintenance and greater operator attention than conventional systems. As a result, the degree of operator dedication to the system is critical to its success. They often require special attention to fire insurance premiums, air quality standards, ash disposal options and general safety issues.

APPLICABILITY

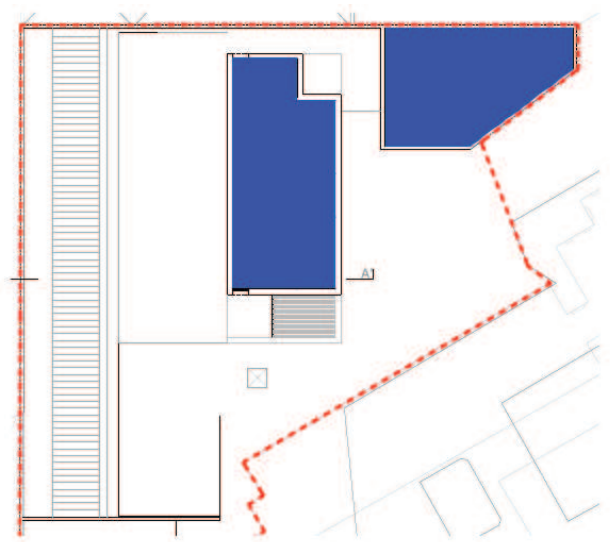
6.5.7 Due to the size of the proposed project, biomass energy has not been considered as an economically suitable technology.

7. Energy Generation, Life Cycle Costing & Funding

7.1.1 The technologies consideration section of the report identified that Photovoltaics were suitable for use in this development so consideration must be made to identify the expected energy demand and related off-set of energy use throughout the development.

7.2 Photovoltaics

7.2.1 Photovoltaics require careful consideration during design development, owing to efficiency associated with generation and presence of overshadowing. Initial studies have been undertaken to identify useable and suitable roof-space.



Roof areas available for Photovoltaic's

7.2.2 As the diagram shows, a number of roof sections were identified as suitable for installation of photovoltaic panels. From this review it was identified that a maximum area of 197m² is available for any proposed photovoltaic installation.

7.2.3 A total PV installation of 10.75 kWp is proposed, with allowances made for overshading and access. In addition, a degree of tilt has been assumed (10°) in order to prevent water build up and allow for self-cleaning. Initial estimations indicate that the PV array will be 43 m^2 in size. Accordingly, there is sufficient roof space for the PV array and access for maintenance.

7.2.4 The proposed 10.75 kWp installation generates approximately 8023 kWh of electricity per annum and is eligible for income generated funding under the Feed-in-Tariff (FiT)

7.2.5 The FiT scheme is an environmental programme introduced to promote widespread uptake of a range of small-scale renewable and low-carbon electricity generation technologies. The scheme allows people and companies to install renewable technologies, in return for a guaranteed payment from an electricity supplier of their choice for the electricity they generate and use, and any surplus energy exported back to the grid.

7.2.6 Installations of 50kW or below are eligible for the scheme and can apply through the

Microgeneration Certification Scheme (MCS). Both the installed product and installed company must be MCS certified.

7.2.7 The following underlines the process for this scheme:

- *Contact the Energy Saving Trust http://www.energysavingtrust.org.uk/*
- *Use the MCS website to search for installers and products online http://www.microgenerationcertification.org/*
- *Contact a minimum of 3 installers listed on the MCS website for quotes*
- *Choose one installation company to carry out the installation for you, making sure they are MCS credited*
- *You will receive an MCS Certificate for the installation to show it is MCS compliant*

7.2.8 It is not expected that the electricity generated will be regularly exported to the National Grid however, it is possible that there will be occasional excess electricity that could be exported. In light of this, a G59 application must be completed in order to identify with the utilities provider the expected amount of kWh exported that cannot be utilised on-site.

7.2.9 Based on initial discussions and proposals to-date, this is a feasible exercise and can provide additional levels of income to the building owner. The rate of income available should be detailed upon installation and application to the relevant utilities provider accordingly.

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8. Conclusion

8.1.1 This strategy is based on the Energy Hierarchy, as follows:

- Use less energy (Be lean)
- Supply energy efficiently (Be clean)
- Use renewable energy (Be green)

8.1.2 These measures result in a reduction in CO_2 emissions of approximately 35% when measured against Part L 2013 Building Regulations.

8.1.3 CO_2 emission savings can be sought through the use of a combination of the following proposals:

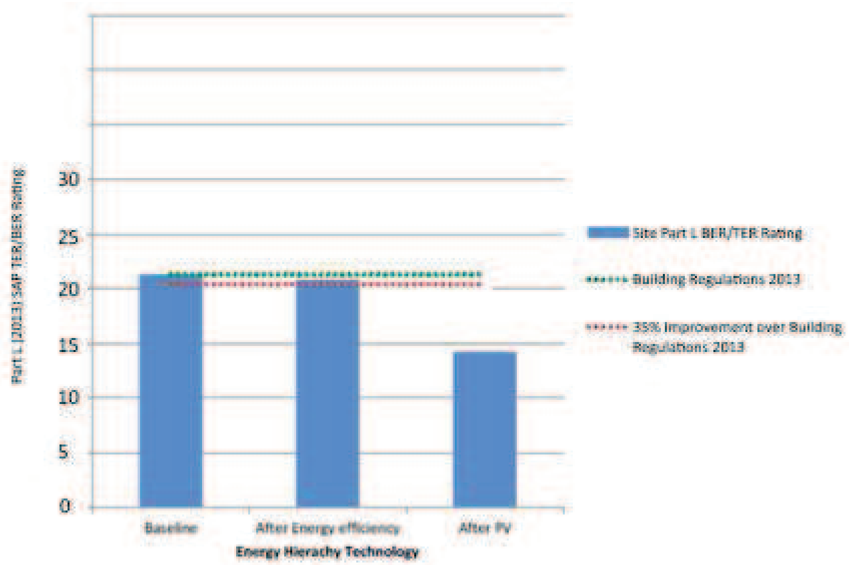
- Improved fabric U-values
- Heat recovery ventilation
- Photovoltaic panels (10.75 kWp)

8.1.4 It should be noted that the photovoltaic panels will require some degree of tilt (>10°) in order to allow for self-cleaning of panels and the avoidance of water build up.

8.1.5 As seen in the results of the SAP assessments, of the 35% reduction required for compliance with The London Plan, a minimum of 34% of this reduction is achieved by the use of renewable in the form of photovoltaic panels.

8.1.6 As detailed in the report in Appendix B, calculations have been undertaken that show that the units will achieve a minimum water efficiency of 110 litres per day.

8.1.7 The following table and chart detail the reductions in CO_2 emission reductions as a result of following the energy hierarchy.



Results of design changes to achieve 35% improvement on Part L 2013

Total Site CO_2 Emissions			
	Baseline (TER)	**After Energy Efficient Design**	**After PV**
Site SAP DERs	20.99	20.97	13.7

45 Holmes Road CO_2 Emissions Results (TER)

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Appendix A

Part L (2013) SAP Calculation Results

Homes Road

Unheated Corridoors

10.74 kWp - Southeast/west orientation, 45 Degree angle

Assumed storey heights of 2.5m, Window height - 2m

Meduim TMP

Element	Description	Performance
Roofs		
Horizontal Ceiling	Insulated to achieve	0.10W/m^{2}K
Sloping Ceiling	Insulated to achieve	0.10W/m^{2}K
Flat Roof	Insulated to achieve	0.10W/m^{2}K
Walls		
External Cavity Walls	Insulated to achieve	0.11W/m^{2}K
Wall to Common areas	Insulated to achieve	0.11W/m2K
Party Walls	Fully Filled & Sealed at Edges OR Solid	0W/m^{2}K
Floors		
Upper floor	Insulated to achieve	0.1W/m^{2}K (Not incl. shelter factor)
Windows		
uPVC double glazed - Hard low-e coating	Argon filled - 16mm Gap or more, Default g and Frame factor.	1.1W/m^{2}K
Draught proofing		
Doors		
Solid timber door	Insulated to achieve	1.0W/m^{2}K
Heating		
Combi boiler	Assumed "Logic Combi ES 35" - Efficeincy: 88.9%	
Secondary Heating		
None provided		
Heating Controls		
All Designs	Full Zone Controls, Boiler Interlock & Delayed Start Thermostat WITH WEATHER COMPENSATION	
Underfloor heating Concrete floor - Flow Temperature Unknown		
Hot Water Provision		
N/a		
Electricity Tariff		
Standard flat rate		
Internal Lighting		
100% Low Energy Internal Lighting (In accordance with Domestic Building Services Compliance Guide - Table 40)		

Ventilation	
Mechanical Ventilations with heat recovery Assumed a "Vectaire WHHRC180DC" SFP-0.85, Efficiency 88%	
Other	
Thermal Bridging	Default
Air Pressure Test	Target 5.01 unless listed on plot schedule - Every Plot to be Tested
Renewables / LZC Technologies	
PV - To meet 35% requirement. Assumed Southwest orientation, 45 degree angle, no overshading and feed in to the landlord - 10.75kWp required	

Buildings Regulations Compliance for Multiple Dwellings

This report checks compliance against criterion 1 of the Building Regulations where there are multiple dwellings in the same building. Where a building contains more than one dwelling (such as in a terrace of houses or in a block or apartments/flats), compliance with the Building Regulations is achieved if
a) EITHER every individual dwelling has a DER that is no greater than its corresponding TER
b) OR the average DER is no greater than the average TER.
The average DER is the floor-area-weighted average of all the individual DERs and is calculated in the same way as the average TER. Block averaging is permitted only across multiple dwelling in a single building, NOT across multiple buildings on a site.
The formula used is as follows:
{{TER1 x floor area1) + (TER_2 x floor $area_2$) + ... + (TERn x floor arean) } / {floor area1 + floor $area_2$ + ... + floor arean}

Assessor name	Mr Sean O'Callaghan	Assessor number	9336
		Created	22/04/2015

Results

URN	Version	Address	DER	TER	Floor Area (m^2)	DER x Floor Area	TER x Floor Area
Unit 8	1	Unit 8	17.06	17.31	103.66	1768.44	1794.35
Unit 7	1	Unit 7	27.42	26.51	72.66	1992.34	1926.22
Unit 6	1	Unit 6	27.09	26.08	65.89	1784.96	1718.41
Unit 5	1	Unit 5	21.67	21.24	78.23	1695.24	1661.61
Unit 4	1	Unit 4	21.72	21.82	58.74	1275.83	1281.71
Unit 3	1	Unit 2	20.41	20.11	90.12	1839.35	1812.31
Unit 2	1	Unit 2	16.04	17.60	77.64	1245.35	1366.46
Unit 1	1	Unit 1	19.15	19.87	71.08	1361.18	1412.36
				Total	**618.02**	**12962.69**	**12973.43**

Multiple dwelling DER = 20.97

Multiple dwelling TER = 20.99

Compliance = PASS

Plan Assessor version 6.1.1
SAP version 9.90

Buildings Regulations Compliance for Multiple Dwellings

NHER

This report checks compliance against criterion 1 of the Building Regulations where there are multiple dwellings in the same building. Where a building contains more than one dwelling (such as in a terrace of houses or in a block or apartments/flats), compliance with the Building Regulations is achieved if
a) EITHER every individual dwelling has a DER that is no greater than its corresponding TER
b) OR the average DER is no greater than the average TER.
The average DER is the floor-area-weighted average of all the individual DERs and is calculated in the same way as the average TER. Block averaging is permitted only across multiple dwelling in a single building, NOT across multiple buildings on a site.
The formula used is as follows:
{(TER1 x floor area1) + (TER$_2$ x floor area$_2$) + … + (TERn x floor arean) } / {floor area1 + floor area$_2$ + ... + floor arean}

Assessor name	Mr Sean O'Callaghan	Assessor number	9336
		Created	22/04/2015

Results

URN	Version	Address	DER	TER
Unit 8	2	Unit 8	9.82	17.31
Unit 7	2	Unit 7	20.18	26.51
Unit 6	2	Unit 6	19.84	26.08
Unit 5	2	Unit 5	14.43	21.24
Unit 4	2	Unit 4	14.48	21.82
Unit 3	2	Unit 2	13.16	20.11
Unit 2	2	Unit 2	8.80	17.60
Unit 1	2	Unit 1	11.91	19.87

Multiple dwelling DER = 13.73

Multiple dwelling TER = 20.99

Compliance = PASS

Appendix B

Water Efficiency Report