Energy Statement for Planning

Client:

Nisbets

Site:

Royal College Street, Camden – Proposed retail unit

Base Energy Services Ltd
info@baseenergy.co.uk
North: 44 Canal Street, Liverpool, L20 8QU. Tel: 0151 933 0328
South: 117 Knyvett House, Watermans Business Park, The Causeway, Staines Upon Thames, TW18 3BA. Tel: 02032862016

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Appendix A: Site Plans

Report Details:

Prepared by	Checked by	Date	Job	Revision
Allan Jones MA	Peter Kinsella BSc (Hons)	16th February 2018	4314	0

1 Introduction

This Energy Statement has been prepared in support of the planning application for the refurbishment of railway arches and retail units fronting onto Royal College Street, Camden.

Section 8 of the Camden Local Plan sets out how developments should address sustainability through application of the widely recognised 'energy hierarchy'. The hierarchy forms the basis of many local plans and most prominently the London Plan energy policies (specifically Policy 5.2) and an energy assessment for each planning application, setting out how the energy policies will be met within the development. Specifically, applicants are required to set out how the proposals apply the following energy hierarchy:

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

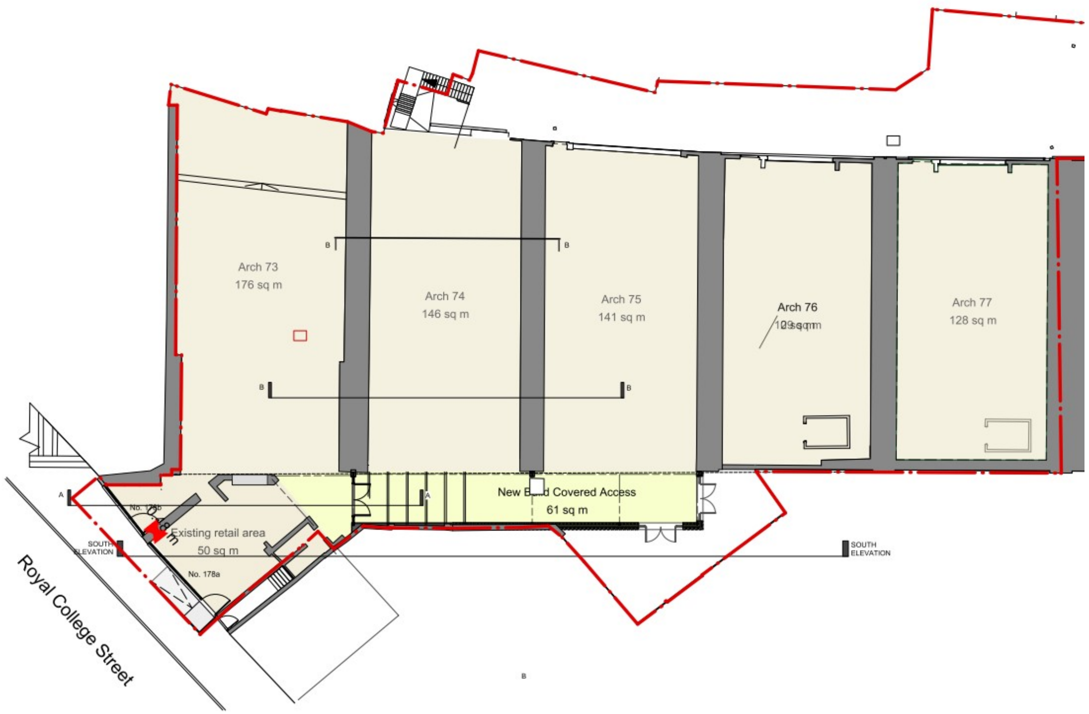
The hierarchy provides the mechanism through which the carbon dioxide (CO2) emission reduction targets are achieved. It also contributes to the implementation of strategic energy policies relating to decentralised networks and ensures opportunities for building occupants to receive efficient, secure and affordable energy.

Camden Local Plan section 8.8 states:

> ***All developments involving five or more dwellings and/or more than 500 sqm of (gross internal) any floorspace will be required to submit an energy statement demonstrating how the energy hierarchy has been applied to make the fullest contribution to CO2 reduction. All new residential development will also be required to demonstrate a 19% CO2 reduction below Part L 2013 Building Regulations (in addition to any requirements for renewable energy). This can be demonstrated through an energy statement or sustainability statement.***

Based on the above, the proposed development will need to achieve a saving in CO2 emissions of 19% compared to a 2013 Building regulations baseline, and to do so through the provision of energy efficient design and services. This report demonstrates how the building will meet current Building Regulation requirements for energy efficiency (baseline scenario) and, through an assessment of energy efficiency measures, demonstrates how the building can achieve the required saving in CO2 emissions. The analysis of the energy usage is based on the National Calculation Methodology (NCM) and SBEM (Simplified Building Energy Model) for heating, cooling, hot water, lighting and auxiliary energy, using government approved software (iSBEM) to derive the results.

2 Proposed Development



The site is located on adjacent to Royal College Street, Camden and consists of several spaces formed by arches supporting a railway plus existing structures with retail facades fronting onto the street. The total gross internal floor area is less than 1000m² and as such is not classed as major development.

The proposals are to incorporate arches 73, 74 and 75 into the existing retail space to form a larger whole, with the addition of new structures to seal the north openings of the arches and to provide a covered accessway at the southern openings. Arches 76 and 77 will be utilised for storage and will not use energy to condition the space and will only be provided with background heating for frost protection, and as such will be exempt from energy efficiency requirements.

3 SBEM 2012 and Building Regulations (2013)

The Simplified Building Energy Model (SBEM) 2012 is the UK Government methodology for assessing and calculating the energy performance of new commercial buildings in accordance with the latest Building Regulations (Approved Document Part L2A 2013).

The calculation takes into account a range of factors that contribute to energy efficiency, including:

- Materials used for the construction and the thermal insulation of building fabric (u-values[1])
- Ventilation
- Efficiency and control of heating and cooling systems
- Fuel used to provide space heating and cooling
- Lighting and lighting controls
- Heat recovery systems
- Renewable technologies

Approved Document Part L of current Building Regulations (2013) addresses the conservation of fuel and power. Part L is divided into four separate documents:

- Part L1A Newly Constructed Dwellings
- Part L1B Existing Dwellings
- Part L2A Newly Constructed Non - Dwellings
- Part L2B Existing Non - Dwellings

Approved Document Part L2B sets out the minimum energy efficiency requirements for ***existing non-domestic*** buildings and is addressed via elemental standards and/or calculations in SBEM following the NCM methodology.

To comply with Part L2B, developments can either demonstrate compliance with stipulated standards for controlled fittings, thermal elements and building services or show via SBEM calculations how the building will either meet or achieve a percentage reduction in the Building Emission Rate (DER/BER) under the required Target Emission Rate (TER) of a notional building. This latter method also provides data which can be used to demonstrate a reduction in emissions required to meet planning policy.

[1] U-values (Thermal Transmittance) - the measure of the overall rate of heat transfer by all mechanisms under standard conditions, through a particular section of a construction. Lower u-values mean better thermal insulation

4 Non-domestic Baseline Scenario (Part L2A Compliance; No Renewable Technologies)

The first step is to use SBEM to calculate the Building Regulations 2013 'Target Emission Rate' (TER) as this provides the baseline from which any additional CO2 reductions are measured in line with local planning requirements.

The proposed building is modelled in iSBEM which then calculates the TER by creating a notional building of the same geometry and with relevant standardised improvements applied to create the benchmark target appropriate for the designed dwellings. For existing building analysis the TER is derived by manually creating a notional building using the Part L2B parameters.

Table 1: Baseline SBEM Calculation Results

	SAP calculation results
Total floor area (m²) (NCM methodology)	624.3
Target Emission Rate (TER) (kg CO2/m²/year)	54.3
Total CO2 Emissions (kg/year)	33,900
Tonnes of CO2 per annum	**33.9**

The local planning requirement to improve upon the target means that a reduction of 15% is required over the Building regulations target (TER).

Table 2: Planning requirement Target

	Proposed building combining all dwellings
Required reduction of TER	19%
Improved Target Emission Rate (TER) (kg CO2/m²/year)	54.3 reduced to 43.98
Total CO2 Emissions (kg/year)	33,900 reduced to 27,459
Target Tonnes of CO2	33.9 reduced to **27.46**

A reduction of 6.44 tonnes of CO2 is required.

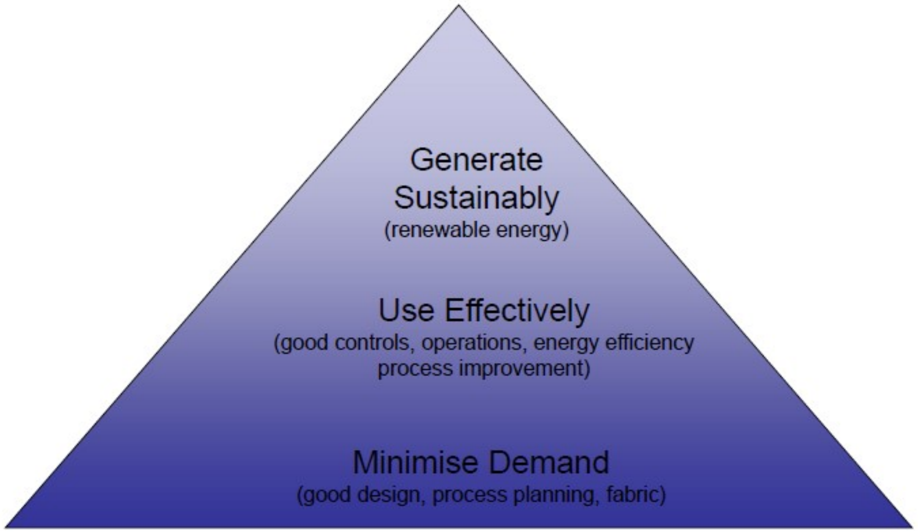
5 Non-domestic Energy Efficiency Improvement Scenario (L2A Compliance coupled with energy efficient improvements

Proposed Strategy

- Minimise demand
- Energy Efficient controls
- Generate energy

The Energy Hierarchy

Useful improvements can be made at all levels, but maximum benefits will be achieved if we focus first on minimising total energy requirements, then look at making better use of the energy we currently use, before thinking about how best to generate it.



In order to achieve the first and second steps and result in a proposed building that is well insulated and thermally efficient, as well as efficient with the energy it does use, several specification upgrades are proposed. These will help to ensure that regardless of the future circumstances surrounding the application of any renewable generation technology, the building remains intrinsically energy conservative.

- Insulation – new thermal elements to achieve good levels of insulation with u-values exceeding Part L2 requirements (see Table 3). Retaining heat by reducing transmission losses through the fabric will reduce demand for heating.

- Thermally efficient glazing with low u-values to minimise heat losses and g-values which balance the benefits of solar gain to provide a natural, passive source of heat, again minimising overheating risks in the summer months and the need to install mechanical cooling (or minimise use of any installed). Large glazed areas also help to reduce the demand for artificial light.

- High efficiency air source heat pumps with seasonal performance well in excess of the requirements of the non-domestic building services compliance guide.

- Lighting - the design of the dwelling allows for natural daylight which will reduce the energy use from internal lighting. All internal lighting will be low energy, LED lighting with a minimum luminaire-lumens per circuit watt standard approximately 60% better than building regulation minimum standard.

- Mechanical ventilation with heat recovery which provides clean air by and then recovers the heat from exhaust extract to enable a lower demand on the heating plant.

Table 1: Fabric and Services Standards

	Part L2 Limiting Parameters	Proposed Dwelling	Improvement
New External Walls	u-value 0.28 or lower	0.20	29%
Windows & Doors	u-value 2.2 or lower	1.6	27%
Lighting efficiency	60 lumens or higher	80	37%
Heating efficiency	SCoP 2.5 or higher	4.00	60%
Cooling efficiency	SEER 2.6 or higher	6.00	130%

Incorporating the above specification into the model gives a comparison to the baseline SBEM calculation; the results are summarised in Table 4 (with the baseline worksheet provided in Appendix A).

Table 2: SBEM Calculation Results following 'be lean' and 'be clean' methodology

	Regulated CO2
Baseline emissions	**33.9 Tonnes**
Proposed emissions	**27.22 Tonnes**
Target reduction	**6.44 Tonnes**
Proposed Reduction	**6.68 Tonnes**
	-19.71%

6 Renewable Technology Review

As previously detailed, in order to meet the requirements of Section 8 of the Camden Local Plan 2017, the proposed non-domestic building will need to achieve a **19%** saving in CO2 emissions over 2013 building regulations standards.

The calculations indicate that the total CO2 emissions reduction is achievable through the application of energy efficiency measures in the energy hierarchy. Any further reductions, from renewable technology, would be supplementary.

It is noted that this particular development is unconventional. Firstly, it is a redevelopment and not an entirely new build. Secondly, the redevelopment is of largely existing structures which are not buildings in the conventional sense, but railway arches. This all means that design options are constrained by the nature and setting of these existing structures and the site that they occupy. For example, above the railway arches are operational railway lines which preclude being able to site any renewable technology above this portion of the development. Above the majority of the existing conventional portion is a separate property, again curtailing the option to occupy roof space. Existing available roof space is both small and significantly overshaded.

Renewable Technology Summary:

WIND TURBINES

Wind turbines are used to produce electricity. Horizontal or vertical axis turbines are available, where they can be either pole mounted (in a suitably exposed position) or building mounted; building mounted systems need a suitable wind resource, and subsequently both a structural survey and planning permission.

The building is located in an urban area without especially beneficial topography and with limited scope for wind catchment. The close proximity to residences may have harmful noise effects which would be detrimental to the residents' enjoyment of their property. As such, wind turbines are not considered to be a suitable or feasible renewable technology for this particular development.

GROUND SOURCE HEAT PUMP (GSHP)

GSHPs use naturally occurring underground low-level heat in areas with appropriate geological features.

Heat is transferred from the ground by either extracting and discharging (re-charging) water from/to the ground directly (open loop) or circulating water through pipes buried within the ground, (closed loop). The water is passed through a heat pump in order to transfer the heat from this water into a higher temperature water circuit used for heating purposes. The loop can be fitted horizontally (laid in a shallow trench) or vertically (in a borehole).

It is important to note that GSHPs require electricity to drive the pump and is therefore not considered a completely 'renewable' technology.

For a GSHP to be installed, there needs to be suitable outdoor space for digging a trench or borehole (and the associated digging machinery) to support the ground loop.

GSHP technology is generally more appropriate where there is no mains gas connection. There is also insufficient availability for installing sufficient ground loops.

AIR SOURCE HEAT PUMP (ASHP)

ASHP systems absorb heat from outside air at a low temperature into a fluid which is then passed through a compressor where its temperature is increased. There are two main types of ASHP systems:

- Air to Water - distributes heat through the wet central heating
- Air to Air - produces warm air which is circulated by fans

Like GSHPs, ASHPs require electricity to drive the pump and therefore are not completely 'renewable' in generating energy.

For an ASHP system to be installed, there needs to be ample outdoor space for the external condensing unit; these units can also be noisy and blow out colder air to the neighbouring environment.

Based on the proposed site layout plan, there would be sufficient space for the external condensing units. As such ASHPs are considered a suitable technology and have been incorporated at the be lean/be clean stages of the energy hierarchy application.

BIOMASS

Biomass systems burn wood pellets, chips or logs to provide heat in a single room, or to power central heating and hot water boilers.

There needs to be ample space available for both the boiler and the storage of fuel. There would also be regular deliveries of fuel and therefore adequate site access is required.

In light of the nature of the development, issues relating to available storage for fuel, and recent concerns about the impact on air quality of NOX and small particle emissions, biomass is not considered an appropriate technology for this site.

COMBINED HEAT AND POWER (CHP)

Combined heat power (CHP) includes various technologies that turn fuel such as gas or bio fuel into electricity. The process of producing electricity generates heat which is captured and used to heat water. The hot water is then transported around the building or to another building by pipes. Due to the complexities inherent in successfully managing the operation of CHP, such as arrangements for selling exported electricity where it cannot be used on site, CHP applications for small and moderate developments are not practical (Energy Planning – Greater London Authority October 2011) and other solutions should be investigated.

For these reasons, the use of combined heat and power has not been considered for this development.

COMMUNITY AND DISTRICT HEATING SCHEMES

A community or district heating system is a network that provides heat to more than one dwelling or building. A site wide or community heating system enables the whole development to convert to a low carbon fuel source in the future or connect to a decentralised heating network. For larger schemes this approach also enables the heating demands across the site to be balanced throughout the day. Consultation of the London Heat Map indicates there are no existing or proposed schemes for the development to connect to. The size of development and the resultant heat density on site make other technologies more immediately feasible and practical.

As such a community heating scheme, has not been considered a suitable or feasible solution.

SOLAR PHOTOVOLTAIC (PV)

Solar PV cells (which are mounted together in panels or tiles on the roof) convert sunlight into electricity. The cells are made from layers of semi-conducting material; when the light shines on the cell, an electric field is created across the layers. Although PV cells are most effective in bright sunlight, they can still generate electricity on a cloudy day. The power of a PV cell is measured in kilowatts peak (kWp). In general, PV cells should be installed so that they are orientated in a southerly direction (to face between south-east and south-west), in an un-shaded area.

Both standard on or in-roof panels can be considered alongside slate effect solar tiles. The latter have the benefit of a more natural/traditional looking roof and have been factored into the calculations.

Based on the nature of the site and the lack of suitable roof space for siting panels, PV is not considered feasible for this development.

SOLAR HOT WATER

Solar hot water systems absorb energy from the sun and transfer this energy using heat exchangers to heat water. Systems should be roof mounted and oriented to face between a south-east and south-west direction.

There are three main types of solar heating (as defined by the Carbon Trust):

- Flat Plate Collectors - a sheet of black metal that absorbs the sun's energy encases the collector system. Water is fed through the system in pipes which conduct the heat to the water

- Evacuated Tubes - a series of parallel glass heat tubes grouped together, with each tube containing an absorber tube. Sunlight passes through the outer glass tube to heat the absorber tube which in doing so, the heat is transferred to water flowing through the tube

- Solar Matting - a range of extruded hollow sections of flexible black material that can be used for solar collection. Water passes through the hollow tubes absorbing the heat from the sun

Based on the nature of the site and the lack of suitable roof space for siting panels, PV is not considered feasible for this development.

The renewable technology review indicates that the most feasible solution to provide renewable energy is the application of air source heat pump technology. Although not truly renewable in the same sense as technology that harvests energy from solar radiation, ASHP technology represents a highly efficient form of extracting energy for heating and cooling and the only broadly viable solution given the nature of the development and site. The calculations demonstrate that, in tandem with fabric and services efficiency measures this technology can help the development meet the policy requirements of the local authority.

8 Conclusion

The proposals are for the redevelopment of existing structures on land adjacent to Royal College Street, Camden.

Under the Camden Local Plan 2017 (Section 8, Sustainability) the proposed development will need to achieve a 19% reduction in CO_2 emissions over Part L 2013 requirements, through the application of energy efficient measures and renewable technologies, following the energy hierarchy.

A review of renewable technologies indicates that ASHP would be the most feasible solution to meet the policy requirements, and this has been used for the basis of the assessment. This would be combined with a high standard of energy efficient measures ensuring a well-insulated building envelope and efficient services thus minimising energy demand and use.

The following has been used in the Energy Statement

- New thermal elements to exceed Part L requirements with u-values of 0.2 for new walls, 1.6 for windows and doors (1.5 for roller shutter doors)
- Highly efficient air source heat pumps with a seasonal heating and cooling efficiency of 4.0 and 6.00 respectively
- Mechanical ventilation with heat recovery
- Efficient LED lighting to achieve 80 luminaire lumens per circuit watt

Through the incorporation of the above this results in a **19.71%** reduction in CO_2 emissions.

Appendices

Appendix A – SBEM Calculation Outputs

Energy & CO_2 Emissions Sum

	Notional Actual
Heating + cooling demand [MJ/m²]	308.13
Primary energy* [kWh/m²]	321.41

Energy & CO_2 Emissions Sum

	Actual
Heating + cooling demand [MJ/m²]	253.54
Primary energy* [kWh/m²]	233.94

Building Global Parame

	Act
Area [m²]	624.
External area [m²]	153
Weather	LON
Infiltration [m³/hm²@ 50Pa]	10
Average conductance [W/K]	621.