SGA Consulting Ltd
Building Services and Environmental Consulting Engineers
Unit 2, Pride Court, 80-82 White Lion Street, London, N1 9PF
www.sgaconsulting.co.uk | T: 0207 100 7197

ENERGY STRATEGY AND SUSTAINABILITY REPORT

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Headings under which content has been revised are highlighted in yellow

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1. SUMMARY & CONCLUSIONS

This report has been produced to accompany the planning application for the redevelopment proposals of 112 – 124 Camden High Street.

The energy and sustainability strategy for the redevelopment follows the three-staged priority approach by first considering measures to reduce demand (“Lean”), then selecting efficient systems to meet the remaining demand (“Clean”) and then looking at potential for low- and zero-carbon options (“Green”).

The report summarises design options for improving environmental sustainability of the redevelopment and an initial assessments of their potential applications has been carried out.

In summary:-

- Existing roofs and windows will be thermally upgraded to reduce specific energy requirements
- Services to existing areas will be renewed to current standards to improve internal conditions and to reduce specific energy requirements
- Reversible air source heat pumps will be used to provide simultaneous heating and cooling with heat recovery.
- ASHPs and Photovoltaic panels will be provided as an on-site renewable energy source. These will exceed the 20% CO_2 reduction from renewables target for both the new extension and the refurbishment of the existing building.
- Passive design (lean), efficiency upgrade (clean) and PV + ASHP (green) measures for the redevelopment will target a reduction of approximately 70% CO_2 from the existing building’s emission rate.
- Carbon emission reductions for the new extension will achieve the 35% below Part L2A baseline requirement.
- The redevelopment systems will target a number of measures to meet a BREEAM rating of Excellent.

2. OVERVIEW OF REDVELOPMENT AND DESIGN PRINCIPLES

The mixture of uses for the proposed redevelopment will be similar to the existing development. There will be two retail units on the ground floor, the upper floors will be comprised of offices. An extension on the second floor will be provide an additional 199m2 of new office.

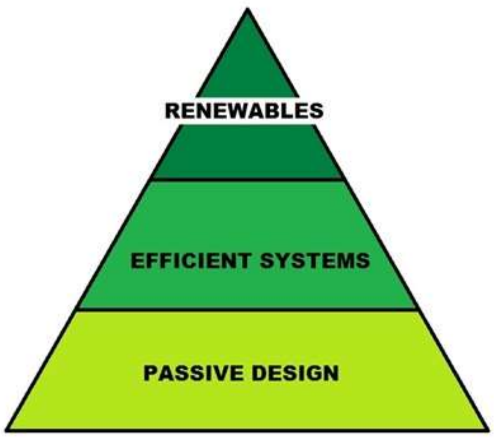
The redevelopment will target a number of measures to meet a BREEAM rating of Excellent. This report addresses the mechanical and electrical targeted measures to achieve BREEAM Excellent.

The offices will have the main mechanical ventilation, heating and cooling and electrical plant and infrastructure provided for the tenants. Final M & E distribution (e.g. indoor fan coil units, small power within the floor, kitchenette, sanitary facilities etc) will be provided or extended by the tenants from designated locations. The new redevelopment will include two showers, primarily to cater for office occupants who cycle to work, however in general hot water will not be a large portion of the redevelopment's energy use. Comfort cooling will be provided to the offices and allowed for the retail unit fit-outs. Mechanical ventilation with heat recovery will be provided to all office areas as noise and some pollution through openable windows, from Camden High Street, is not desirable.

Spatial provision and key infrastructure for mechanical ventilation with heat recovery will be provided under this contract for the ground floor retail unit fit-out. Retail units will be self-contained with provision for incoming services and space for dedicated reversible heating and cooling air source heat pumps. The plant for retail units (e.g. air handling units, air source heat pumps, branch controllers etc.) will be provided by the tenants as part of their full fit out.

The strategy for providing energy at the site has taken into account a number of unique factors namely the restrictions on space available for plant, the construction of existing areas, intended uses of the building's spaces and the site location within a Conservation Area. Taking these factors into account the design has sought to offer a solution which meets the redevelopment's requirements in a cost-effective fashion both in terms of construction and running costs.

The design of this redevelopment has followed the three tier approach, initially ensuring that the fabric of the building is improved where practical (*being lean)*. This reduces the energy consumption and is a much more efficient approach than simply applying renewable energy generation to a basically inefficient building.



Once the basic fabric of the building minimises the energy requirements, energy efficient systems were selected to provide heat and light within the building (*being clean)*.

Finally, low carbon or renewable energy systems were considered (*being green)*. Renewables and sustainable options have been appraised on their ability to reduce CO2 and running costs, ease and safety of maintenance and their visual impact on the local area.

3. PASSIVE DESIGN (BE LEAN)

SECOND FLOOR EXTENSION

The second floor extension exceeds 100m2 and U-values will meet Building Regulation Part L2A. The existing building has a *total useful floor area** greater than 1000m2 and Part L2B *Consequential Improvements*** requirements will be adhered to.

**Total Useful Floor Area*: A measure of internal floor as described in Approved Document Part L2B, used to confirm whether *Consequential Improvements* should be applied.

** *Consequential Improvements*: Actions to improve energy efficiency, which should be made according to Approved Document Part L2B, dependent upon Part L2B criteria for economic feasibility.

EXISTING ARAES OF THE BUILDING

With the exception of the second floor windows on the front façade, the existing windows will be replaced with low U-value units designed to reduce solar gains, reducing the cooling load and heat losses. Increased glazing area will increase natural daylighting.

As Part L2B *Consequential Improvements* apply to this redevelopment project, the existing second floor roof will have further insulation installed to reduce its U-value to below the acceptable level.

METERING

Tenants will be separately metered in regards to heating, cooling, electricity and water use. Energy consumption of the central plant will be check-metered and apportioned to different tenants using equipment manufacturers standard software, allowing billing to tenants according to their actual energy use within their unit(s). This is expected to reduce wastage and will allow monitoring and targeting of energy use. Water supplies will also be check-metered to the individual tenants to monitor and target water use.

LOCAL CONTROLS & MONITORING

Controls will be generally local to each area, with local areas turned on and off and central plant enabled, as required by the individual tenants. Controls within each area will allow adjustment to as required by users. Lighting will be on absence and daylighting control to automatically reduce energy consumption.

Leak detection with an alarm will be installed on the incoming water main to reduce the risk of water wastage going unnoticed (and unaddressed). Water supplies to toilets will be controlled via absence detection sensors with adjustable run-on timers to limit water wastage from faulty sanitary fittings and leaks.

Refrigerant leak detection will be installed on ASHP systems in order to reduce emission of gases with global warming potential in the event of a leak on the ASHP system.

4. EFFICIENT SYSTEMS (BE CLEAN)

As the existing building has a *total useful floor area* greater than 1000m2 the Part L2B *Consequential Improvements* requirements will be adhered to.

WATER CONSUMPTION

All sanitary fittings will be replaced as part of this redevelopment. All WCs will be low water volume cisterns and be dual flush to reduce the amount of water consumption, showers will be low water use also. This will reduce the HW load and also reduce energy for the supply of potable water, as well as the treatment of waste water.

The incorporation of rainwater harvesting is not seen as having a reasonable cost-benefit balance due to the space required, and limited space for rainwater storage and risk of contamination due to local environment.

Heating and Hot Water

The existing building has a considerable amount of on-peak electric radiator heating. New high efficiency VRF air source heat pump system will provide heating to all areas of the building via fan coil units. These will also provide comfort cooling to control internal peak summer temperatures. The controls will be local and sub-metered to each tenant for efficiency and energy conservation.

The ground floor showers will be fed from a hot water cylinder heated from the VRF heat pump system. VRF branch controllers will allow excess heat in one area to be re-used elsewhere, such as reject heat in server/IT areas being used to heat the showers' hot water cylinder. We have evaluated the option of supplying the showers' hot water from a gas boiler but there is little difference in terms of CO2 emissions. Taking into consideration the requirement for ultra-low NOx we selected the ASHP option

As is currently the case in the existing building, local electric water heaters will serve the hot water loads of basin taps and potential kitchenettes, which are located at distance from the new boiler. This reduces waiting time for hot water, uncontrolled heat losses and waste water.

Lighting

All new lighting will be high efficacy LED fittings. These will give general lighting and meet aesthetic vision for the building interiors. Task lighting will be provided occupiers if/where tasks require higher lighting levels. New roof lights in the existing second floor and an increased vertical glazing in other building areas will increase natural daylighting and reduce dependency on artificial lighting. Lighting will be controlled on absence and daylight sensors to allow efficient and practical coordination with changing levels of daylight.

5. POTENTIAL RENEWABLE AND LOW CARBON ENERGY GENERATION (BE GREEN)

Various LZC technologies were reviewed to identify those most likely to be suitable for application. From this initial review the following were identified as possible and are discussed in further detail below:-

- Photovoltaic solar collectors (PVs)
- Solar thermal solar collectors
- Air source heat pumps

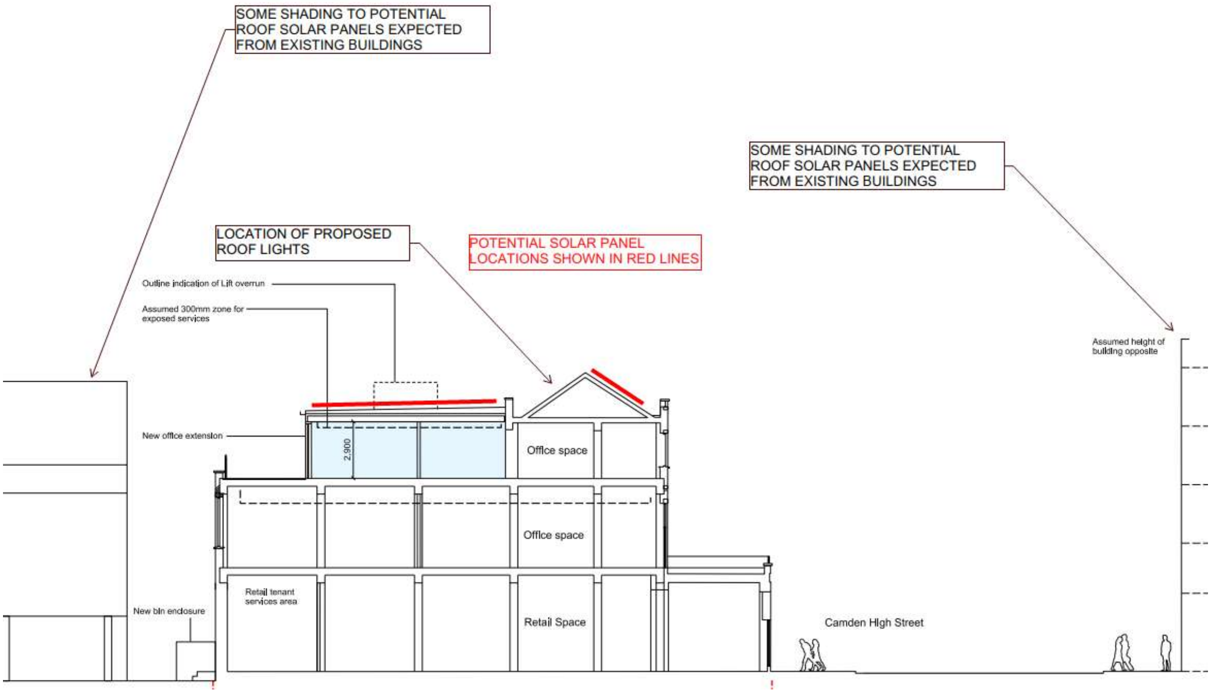
The following were identified as not applicable and are discussed only briefly:-

- Wind turbines
- Ground source heat pump (GSHP)
- Biomass
- Combined heat and power (CHP)
- District heating (DH)

5.1 SOLAR – PHOTOVOLTAIC (PV) AND THERMAL

Demonstration of an assessment of solar panel arrangement accompanies this section in **Appendix A**

Two types of solar energy uses are covered in this report, photovoltaic and thermal. A lot of factors for assessment apply equally to both, where so, these are assessed here under this heading. Factors which apply specifically to either photovoltaic or thermal are assessed in their subsequent sub-headings.



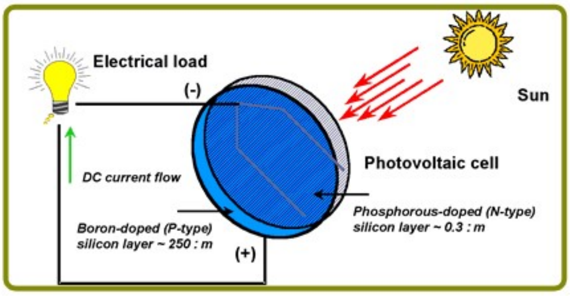
Prospective areas for solar panel location and surrounding factors for consideration.

The site has an existing pitched roof facing approximately south west and a proposed second floor flat roof. The existing south west facing pitched roof offers in principle the best orientation for solar panels. However, access for maintenance is impeded by the new rooflights and lower level flat roof, the support, integration and weatherproofing of the panels into an existing tile roof is complex, and the panels will be more visually intrusive with the established character of the site's Conservation Area. For these reasons, the new flat roof is the preferred location for the solar panels.

The buildings around the site, the existing pitched roof itself, its parapet and the lift overrun will cast some shading over proposed solar panel areas but there is scope for substantial array.

The best location for solar panels would be on the proposed flat roof construction, although there would be some shading from the lift overrun. The proposed location, extent and shading areas are demonstrated in **Appendix B.**

5.1.1 SOLAR PHOTOVOLTAICS (PV CELLS)



Solar photovoltaic schematic

DESCRIPTION

Solar photovoltaic cells are made up of a special silicone material that directly converts the energy found within sunlight into electricity. Photons found in sunlight that have enough energy will hit free electrons on the semiconductor material of the cell. This sets the electrons in motion and electricity begins to flow.

A typical cell will be approx. 100cm2. A module typically contains 28 to 36 cells. Modules connected in parallel or series make up an array.

The electricity generated can be used to power everything from household appliances, lights to commercial buildings and power plants. Solar photovoltaics can be used to benefit from the FIT scheme.

PRO'S

- Free and renewable source of electricity
- No moving parts and so very little maintenance
- Long life technology (over 20 years)
- Can be used in remote areas with no access to the electricity grid
- Noise and exhaust free
- Highly visible from outside the building
- Excess generation can be exported to the grid

CON'S

- Doesn't produce any power during the night or cloudy days
- Low efficiency. Large areas required to provide a worthwhile power output
- Very expensive form of renewable technology
- Some toxic material used in PV cell production process
- Energy output varies daily and seasonally
- Batteries (where they are integrated in to the system) are not particularly environmentally friendly

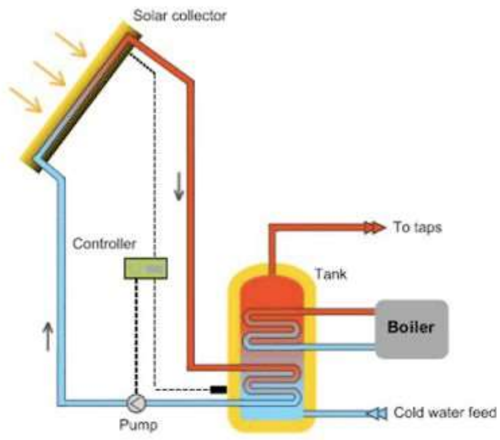
REDVELOPMENT ASSESSMENT

We propose the installation of approximately 40m2 of photovoltaic panels on the new flat roof. These will be south facing monocrystalline, high efficiency Sunpower E20/327, LG NeON2 or similar, pitched at 30 degrees. There will be some shading towards the winter time when the sun is lower, primarily from the existing apex roof (see **Appendix A**). Access for maintenance and cleaning will be available from a roof hatch within the confines of the second floor communal area with solar panels spaced to provide adequate circulation space around them for cleaning and maintenance. The proposed PV installation will be submitted to the Local Planning Authority for approval, and will include provision for maintenance and cleaning. It will also consider use of inclusion of micro-inverters or zoned inverters to address shading patterns in order to improve electricity generation. The energy output will be metered to allow monitoring. The design of the PV system will coordinate with any green roof proposed by the Architects.

The other remaining roof areas are either highly visible which could conflict with the requirements of the conservation area, can't offer practical access for cleaning and maintenance, have space available reduce by new roof lights and/or have limited exposure to direct sunlight.

The proposed installation will provide some of the building's energy use and when the electricity generated is not used on site (e.g. outside of office hours) they will contribute to reducing carbon emissions by feeding PV electricity into the grid. Using iSBEM, this proposal will offset the redevelopment's CO2 emissions per m2 by approximately 5% equating to approximately 2800 kG CO2 per year.

5.1.2 SOLAR THERMAL COLLECTORS



Solar collector within hot water system

DESCRIPTION

Solar thermal collectors absorb radiated heat from the sun and transfer it to a fluid (usually water) passing through the collector. The water from the collector continues to a heat store (hot water tank) and is used to contribute to the building hot water demand. They can also be used to contribute to heating demand which can be done most efficiently with lower temperature heating systems such as underfloor heating.

The output of the collectors will vary with the seasons, with more output available during the summer. They are most effective when facing south at an angle of approx. 45° and free from shaded areas.

The main two types of solar collectors are flat plate and evacuated tube collectors.

PRO'S

- Renewable supply of heat energy
- Few moving parts so little maintenance issues
- High visibility, community to see the building is environmentally friendly
- Low maintenance requirement
- Long life technology (minimum 25 years)

CON'S

- Fairly high capital costs
- Additional back up heating system required.
- Output mainly in the summer months
- Storage tanks and collectors must be located close to one another
- Space required both on roof for the collectors and within the property for hot water storage
- Needs a non-shaded location

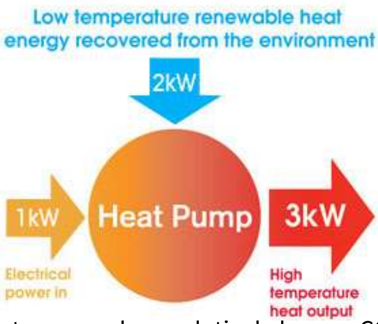
REDVELOPMENT ASSESSMENT

There will be 2 showers at the proposed site but hot water use will not be high. Heating will be from fan coil units fed from ASHPs. The expected times of office use will also mean that solar collectors would not contribute much to reduce building energy use over weekends. Suitable available roof space is limited and has been designated for the PVs which are more effective in this case.

5.2 AIR SOURCE HEAT PUMP - ASHP

DESCRIPTION

A Heat Pump is a device that extracts heat from a low temperature source and upgrades it to a higher temperature. The process of upgrading the low temperature to a high temperature requires an energy input into the heat pump.



The main feature of a heat pump is that is produces more usable energy than it consumes. This efficiency is measured by a Coefficient of Performance (COP). This is essentially its efficiency. A COP of 3 is equivalent to 300% efficiency.

ASHP are at their most efficient when they only need to raise the temperature by about 40°C, , where for every kW of electricity input into the system, up to 3 – 4 kW's of heat are produced. This means ASHP's are cheap to run and are relatively low on CO_2 emissions.. At lower external conditions, or where high internal conditions are required the COP of the ASHP will drop off to as low as about 1.6.

ASHPs are a low energy system, not a completely renewable energy technology. ASHP's are powered by electricity which in today's grid electricity generation make-up has a worse environmental footprint than gas, although development of the grid are reducing this penalty. Current nominal ratios are:-

- Electricity 0.52 kg CO2/kWh
- Gas 0.2 kg CO2/kWh

These systems can be very effective when used on the right type of project.

PRO'S

- Extremely efficient at optimum external conditions (1 electricity unit input for every 3-4 units heat output)
- Units come in a range of outputs
- Can work very efficiently with underfloor heating. As underfloor heating operates at a fairly low temperature
- Inverter driven and so not constantly switching on and off.
- Unwanted heat or "coolth" in one area can be recycled in another area where desired.
- Can be powered by renewable electricity (either on site or a green energy tariff) to reduce their carbon footprint.

CON'S

- Not usually a zero carbon system as they require electricity to power them usually from the grid. Although grid electricity is becoming greener, and green electricity tariffs are available.
- Units need to be externally located, space needed external to the building
- Units are fairly noisy. Not a problem in a city, but can be a problem in a quiet rural environment
- Huge variations in COP throughout the year. At low temperatures the COP may be close to 1
- Can only provide temperature to a maximum of 50degC, meaning that radiators may need to be uprated
- Not a very visible system, if green credentials are to be demonstrated

REDVELOPMENT ASSESSMENT

See **Appendix C** for details of some Preliminary ASHP Plant Selections

Air source heat pumps will be installed for the offices of the redevelopment as this can offer the comfort cooling capacity planned for the office spaces. Spatial accommodation and key infrastructure will also be made for the ASHP to be installed ground floor retail units tenants, it is expected tenants would also use ASHPs for heating the retail units.

The HW water for the ground floor showers will be heated from ASHPs. This will offer recover heat from other areas (offices, server rooms etc) all year round, rather than rejecting it to the atmosphere.

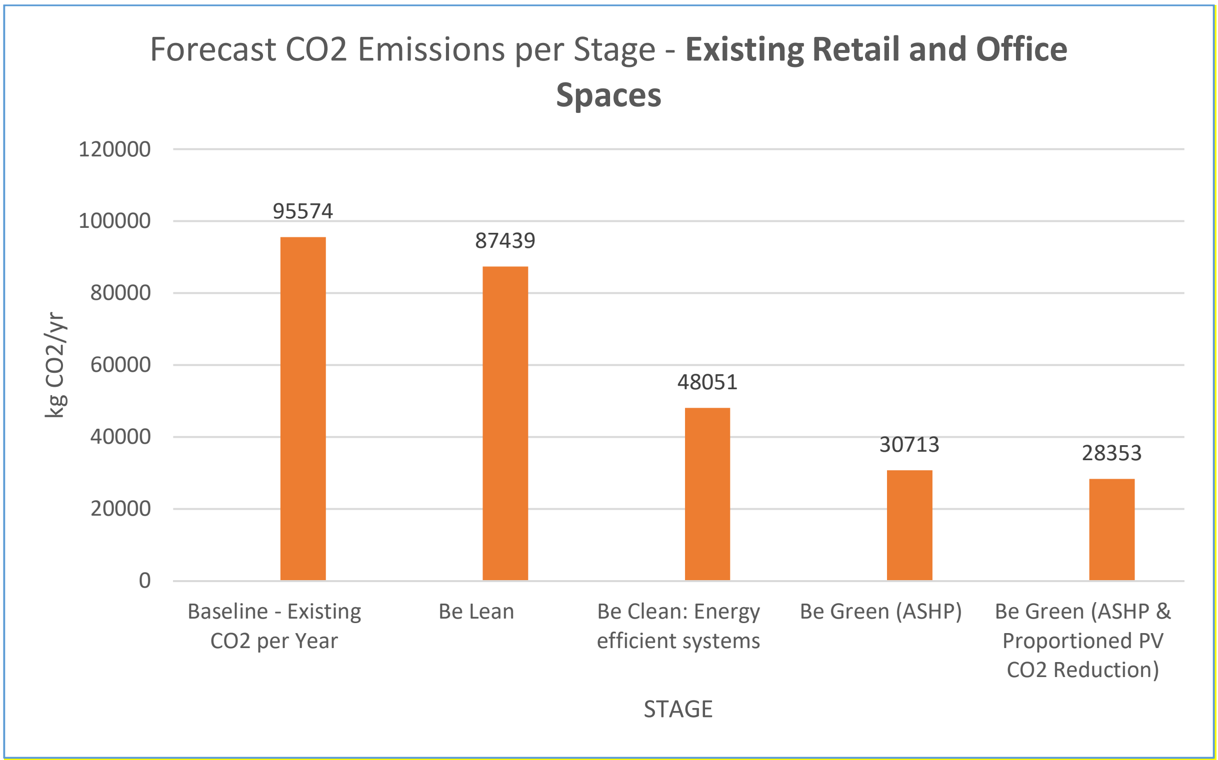
An acoustically louvered enclosure is planned for containing the outdoor ASHPs in a fashion which can reduce their negative impacts on noise and aesthetics. Plant will be mounted on anti-vibration fixings where necessary to ensure compliance with the London Borough of Camden Local Plan 2017.

6. SUMMARY OF THE SUSTAINABLE DESIGN

The charts and table below shows the forecast carbon emissions for the existing and new spaces according to the 3-stage breakdown, lean, clean and green stages. The green stage has been subdivided to illustrate the floor area-proportional allocation of PV installation CO2 reductions. Details of the floor area-proportional allocation of these forecast CO2 reductions is explained in the table of figures on the coming pages, from which these charts are derived. All figures are based on iSBEM(v5.6.a.1) calculations at preliminary design stage.

The design targets a number of measures to meet a BREEAM rating of Excellent. Input data for these calculations reflect these measures.

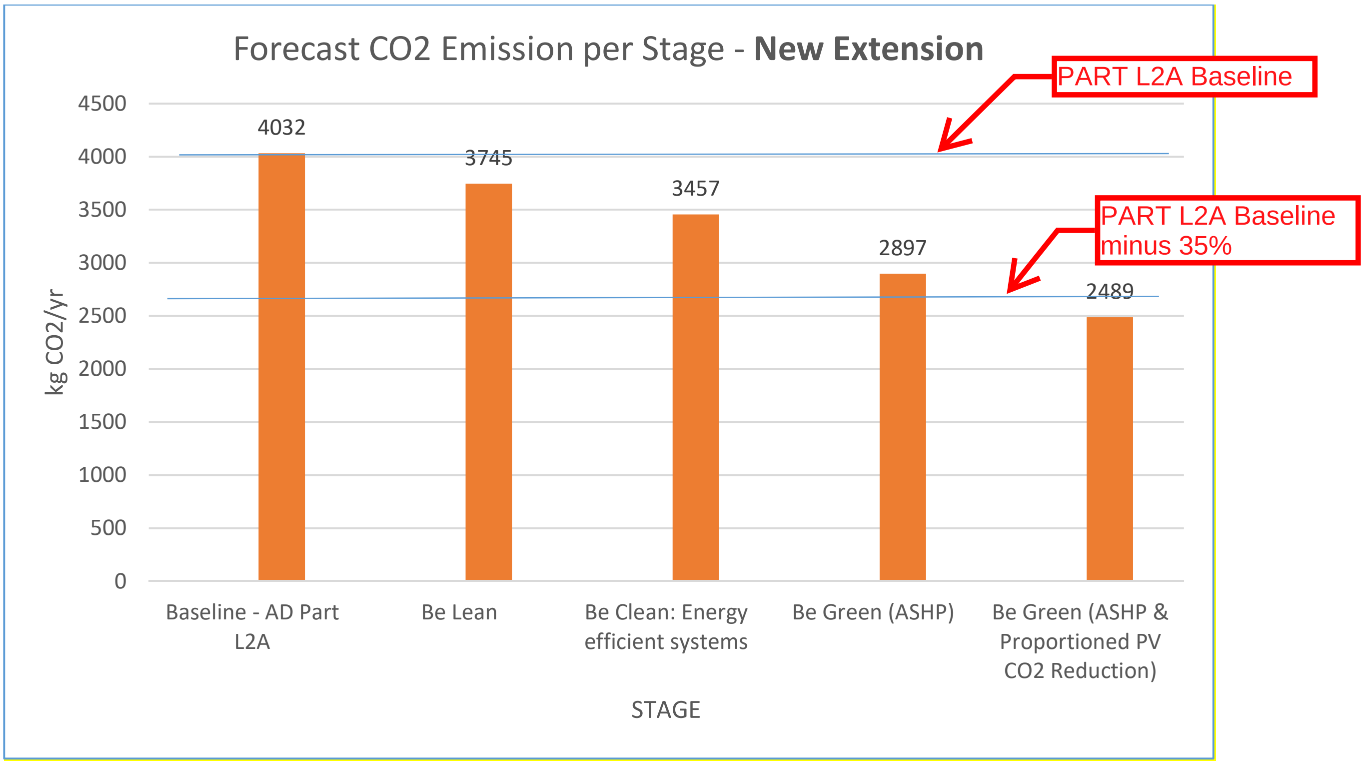
For iSBEM Main Calculation Output Documents refer to **Appendix B.**



The existing baseline has been ascertained using iSBEM and reflects assumptions made following a site survey and default values used by iSBEM where data has not been available.

The chart above shows that the *clean* measures will have the most considerable impact on improving the existing building's environmental sustainability. A considerable amount of this reduction is due to the replacement of the existing direct electric radiators, the removal of hot water storage and the introduction of energy-considerate automated controls.

Carbon emissions for the refurbished existing building are forecast to be approximately 70% below the existing building's current CO2 emissions level. Subsequent design stages to construction often reduce initial targeted savings but the proposed green measures have sufficient margin to ensure the 20% CO2 offset from renewables target required by Camden is exceeded.



Be Clean: Energy efficient systems include higher efficiency lighting and lighting controls. Scope to improve energy efficiency elsewhere was limited.

The forecast figures indicate a carbon reduction of approximately 38% from the Part L2A baseline for the new extension. Subsequent stages to construction often reduce expected savings however there is sufficient margin to ensure that the redevelopment's carbon reduction below Part L2A L will remain above 35%.

Similarly the CO2 offset from renewables (after lean and green measures) is forecast at 28% meaning there is sufficient margin to ensure the extension's CO2 offset from renewables remains above 20%.

TABLE OF iSBEM CALCULATION FIGURES FOR EACH STAGE OF THE ENERGY HIERARCHY

Existing Retail and Office Spaces

Stage	Area	Total CO2	Reduction at Each Stage
	m2	kg/year	
Baseline - Existing CO2 per Year	1149	95574	N/A
Be Lean	1149	87439	8.5%
Be Clean: Heat Network	*Connection to Heat Network not feasible*		
Be Clean: Energy efficient systems	1149	48051	45.0%
Be Green (ASHP)	1149	30713	36.1%

New Build Office Space

Stage	Area	Total CO2	Reduction at Each Stage
	m2	kg/year	%
Baseline - AD Part L2A	199	4032	N/A
Be Lean	199	3745	8%
Be Clean: Heat Network	*Connection to Heat Network not feasible*		
Be Clean: Energy efficient systems	199	3457	8%
Be Green (ASHP)	199	2897	16%

CO2 reduction attributable to proposed PV installation	2768	Kgco2/yr	The PV installation will supply renewable electricity to both Existing Space and New Build Space. Therefore the CO2 offset from the PV installation will be allocated proportionally according to the floor areas of the entire redevelopment which those spaces represent					
Existing and New Build floor areas as a % of the entire development	85%					15%		
Proposed PV installation CO2 reduction allocated to Existing and New Build Areas		2359	Kgco2/yr				409	Kgco2/yr

Stage	Area	Total CO2	Reduction at Each Stage
	m2	kg/year	%
Be Green (ASHP **& Proportioned PV CO2** Reduction)	1149	28353	41%

Stage	Area	Total CO2	Reduction at Each Stage
	m2	kg/year	%
Be Green (ASHP **& Proportioned PV CO2 Reduction**)	199	2489	28%

The figures in the table above have been generated following Camden Planning Guidance and the Mayor of London's Office Energy Assessment Office. These figure are based on iSBEM(v5.6.a.1) at the current design stage and serve as forecasts, not abiding targets.

7. OTHER LZC MEASURES IDENTIFIED AS NOT APPLICABLE

Other measures reviewed but not considered applicable in the redevelopment are discussed briefly below

7.1.1 WIND TURBINES

DESCRIPTION

Wind turbines use the kinetic energy of natural wind currents to generate electricity. The power generated by a turbine is dependent on density of air, wind speed and the area covered by the rotating blades.

They can be used in rural or urban areas. Rural environments are preferred as the undisturbed higher velocity winds are key to increasing the output from the turbine.

Wind turbines can be standalone or building integrated, with either horizontal or vertical axis types available. Wind turbines can be used to benefit from the FIT scheme mentioned previously.

Standalone vertical axis wind turbine

PRO'S

- Renewable source of electrical power
- Reliable and proven technology
- Minimal impacts on the environment
- Available in a wide range of sizes
- Very few maintenance issues, a check every few years may be required
- Electricity generation matches demand. Greater output during the evening and winter when demand for power is higher
- High visibility, community to see the building is environmentally friendly

CON'S

- Can be noisy
- Unsightly, depending on personal preference
- High capital costs
- Long lead time with large standalone turbines (not a problem with smaller building integrated turbines)
- Additional electrical supply required for back up
- Planning permission required
- Turbine and generator require regular maintenance

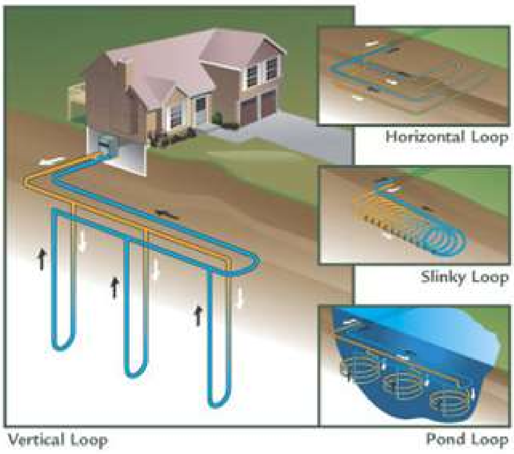
REDVELOPMENT ASSESSMENT

The location of site prevents wind turbines being installed on a large scale without an impact on the local area's aesthetic character, which makes up part of a conservation area.

The building foot print and structural make-up would limit the size and generation capacity of a wind turbine installation at the site. Without significant economies of scale to better spread capital costs and maintenance costs, a wind turbine installation at the site is unlikely to offer a cost–effective payback period for the Client.

7.1.2 GROUND SOURCE HEAT PUMP - GSHP

DESCRIPTION



Works in the same way as an ASHP, instead of extracting/dissipating energy from the air, it is taken from the ground. The benefit of this being that the ground does not vary in temperature very much through the year (10 – 15 degC) and the amount of heat energy output from the system will remain fairly constant.

The method of heat abstraction from the ground could be open loop or closed loop.

An open loop system would consist of a well abstracting water which would then be discharged to a water course or injected back below ground. A closed system would consist of water running through a network of pipes below the ground. This would abstract the heat from the ground which would then be transmitted to the heat pump inside the building.

They do not suffer as much with lowering COP figures as ASHP. This is because the temperature of the ground is fairly stable over the year.

Similar to ASHP they are a low energy system not a renewable energy technology.

PRO'S

- Can be a very efficient system. For every unit of energy input, 3 – 4 units of heat output is possible
- Reliable. Fairly constant output from heat pump all year round, even in Winter the temperature in the ground will not fall too dramatically
- Little maintenance required. Once pipes are buried there are no problems with corrosion or degradation
- Long life system, heat pump have a life expectancy of 25 years
- Completely invisible system, so the planners are usually kept happy.

CON'S

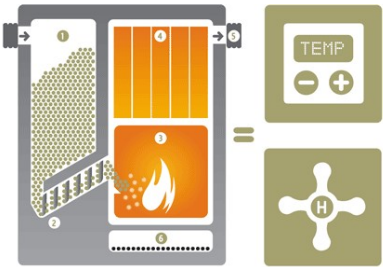
- Not a completely renewable system as they require some energy to power them.
- Expensive technology, mostly from the process of installing the loops within the ground
- Space requirement for the heat pump and storage cylinder required within the property
- If a buried pipe were to fail once installed they cannot be easily accessed for maintenance. This is usually only a slight risk
- Completely invisible system, if green credentials are to be demonstrated.

REDVELOPMENT ASSESSMENT

Ground source heat pumps will not be a cost effective method of providing heating or cooling for the proposed redevelopment.
Planned ground works, which could absorb some of the capital costs for this technology are minimal. The redevelopment area does not offer much space to install horizontal/slinky loops limiting capacity. Vertical loops would need to coordinate with potential existing below ground services as well as abandoned WW2 air raid shelters, and possibly the Northern Line underground.

7.1.3 BIOMASS

DESCRIPTION



Biomass usually refers to living or recently dead plant material that can be used for fuel purposes.

Biomass is carbon neutral as the carbon that is released in to the atmosphere by burning the fuel has recently been soaked up from the atmosphere by growing the fuel.

Biomass is part of the carbon cycle, where carbon in the air is converted into a biological matter using photosynthesis. Biomass is a renewable energy, as plants or trees specifically grown to produce biomass can be replaced, and don't take long to grow. Biomass is seen as more environmentally friendly and longer lasting than traditional fossil fuels

Biomass systems are more effective where the fuel is grown locally. If the fuel has to be transported long distances, then the carbon used in this process makes the system less sustainable.

Storage of biomass is required; it is fed into the boiler and burned to produce heat. The heat generated is used for the heating and hot water.

PRO'S

- Local source of renewable energy
- Ideal for rural or semi-rural location where biomass fuel is local, although not essential
- Can be used with a number of different fuels such as wood, straw, biofuels such as Miscanthus, Rape etc
- Reliable technology
- Supports local agriculture
- Additional back up heating system not always required
- Close to carbon neutral

CON'S

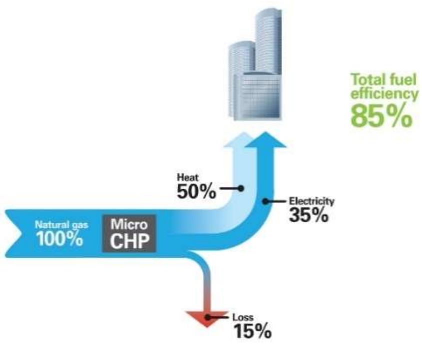
- Capital costs can be high
- Lead times can be long depending on the project
- May be reliant on infrastructure and partnerships
- Needs someone who is willing to handle and correctly store the biomass fuels and waste
- Space required to store the biomass fuels and waste local to the boiler
- Additional maintenance is required on the boiler and the fuel handling systems
- Can be difficult to control effectively

REDVELOPMENT ASSESSMENT

Biomass will not be suitable for the redevelopment as issues due to smoke emissions, delivery and supply of fuel, space for fuel storage and maintenance/operation heavily reduce its feasibility.

7.1.4 COMBINED HEAT AND POWER – CHP

DESCRIPTION



Combined heat and power (CHP) integrates the production of usable heat and power (electricity), in one single, highly efficient process.

In the process of generating electricity, heat is produced. This heat is usually wasted as the demand for this excess heat is not required at the location of generation (coal and gas power stations) leading to an overall efficiency of electricity generation of about 35%. Generating your own electricity on site allows you to capture this heat that would otherwise be wasted and use it to heat the building.

As an energy generation process, CHP is fuel neutral. This means that a CHP process can be applied to both renewable and fossil fuels. CHP provides a cost-effective means of generating low-carbon or renewable energy.

CHPs are very efficient when both the heat and the electricity is being fully used on site. They are less efficient where some of either the heat or the electricity has to be dumped.

There is a possibility CHP to benefit from FIT's.

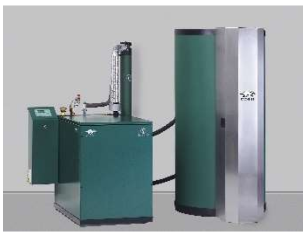
PRO'S

- Highly efficient at the point of use (up to 85%)
- Enhanced security of supply
- Could be powered by biofuel, making them even more sustainable
- Possibility to store excess heat for when it is required

CON'S

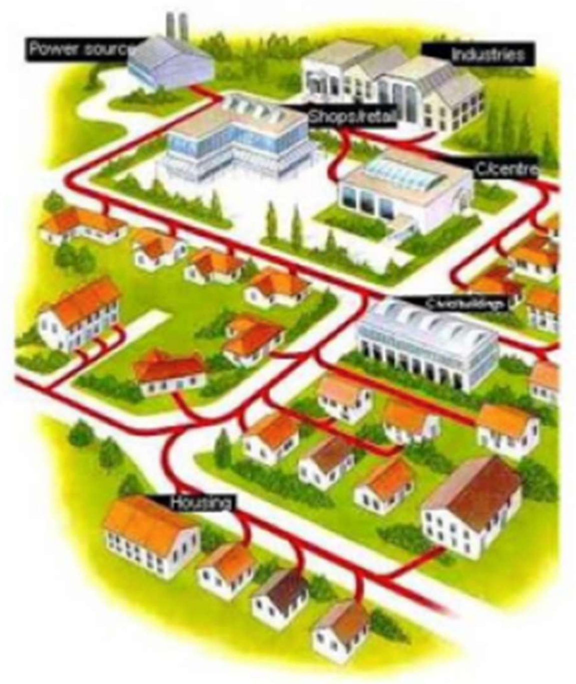
- CHP units are noisy
- Will require fairly regular maintenance
- Not completely carbon neutral
- Space requirement
- Most effective when the heat and electricity demand are required simultaneously, e.g. Swimming pool

REDVELOPMENT ASSESSMENT



The noise issues and space requirements of a CHP unit would lead to design changes and cost increases which would outweigh the benefits of ta CHP system. The system would produce unwanted heat during the summer, which unless stored until winter would be wasted. For these reasons a CHP unit is not suitable for this project.

7.1.5 DISTRICT HEATING



District heating network

DESCRIPTION

A district heating scheme consists of a centralised energy source which would then distributes to the various energy consumers on the site.

The advantage of this type of scheme is that it can be more efficient to generate energy centrally. For instance one large boiler will be more efficient than several smaller boilers. This would be partly because the central boiler would be more sophisticated and so more efficient. It would also hopefully be better run, by a dedicated trained staff, again resulting in a higher operating efficiency.

With a district heating system there is also the possibility of using waste heat from a process or a factory. This would greatly increase the overall efficiency of the entire system.

It can also allow the use of other desirable energy generation systems that would not be suitable for small scale self-contained heating systems. This is the case with Camden's Somertown Heat Network which incorporates a CHP plant to recycle residual heat from electricity generation into the district heating network.

PRO'S

- Reduced carbon emissions
- No local plant to maintain
- Allows the use of other fuels that otherwise would not be appropriate
- Can use waste heat which can be highly efficient

CON'S

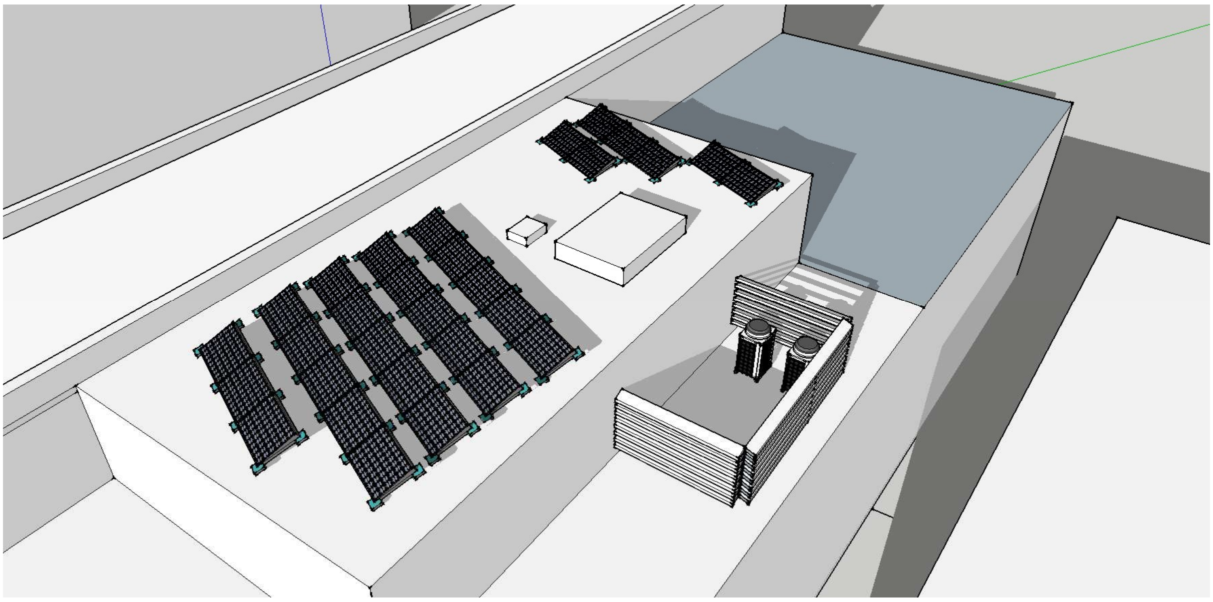
- Energy losses from transmission network around site
- Centralised energy supply requires centralised metering and management
- High capital cost
- Space required for central plant
- Only appropriate for developments of multiple units.

REDVELOPMENT ASSESSMENT

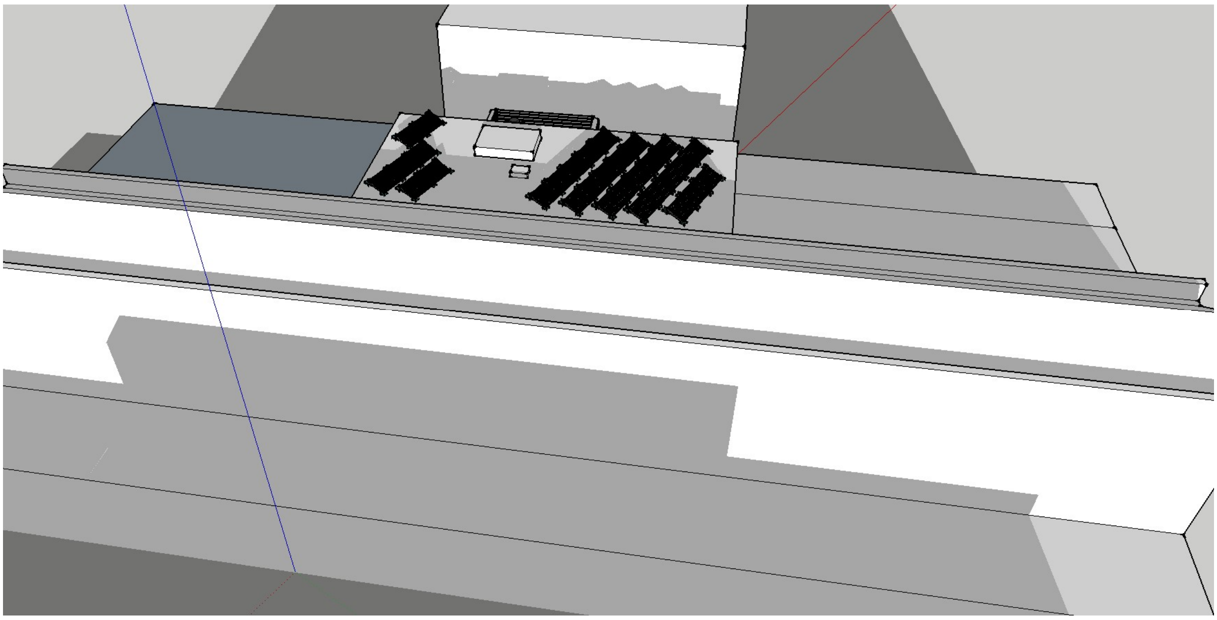
District heating will not be suitable as there is no district heating network in close proximity to the building to connect to***.

***www.london.gov.uk/what-we-do/environment/energy/london-heat-map/view-london-heat-map

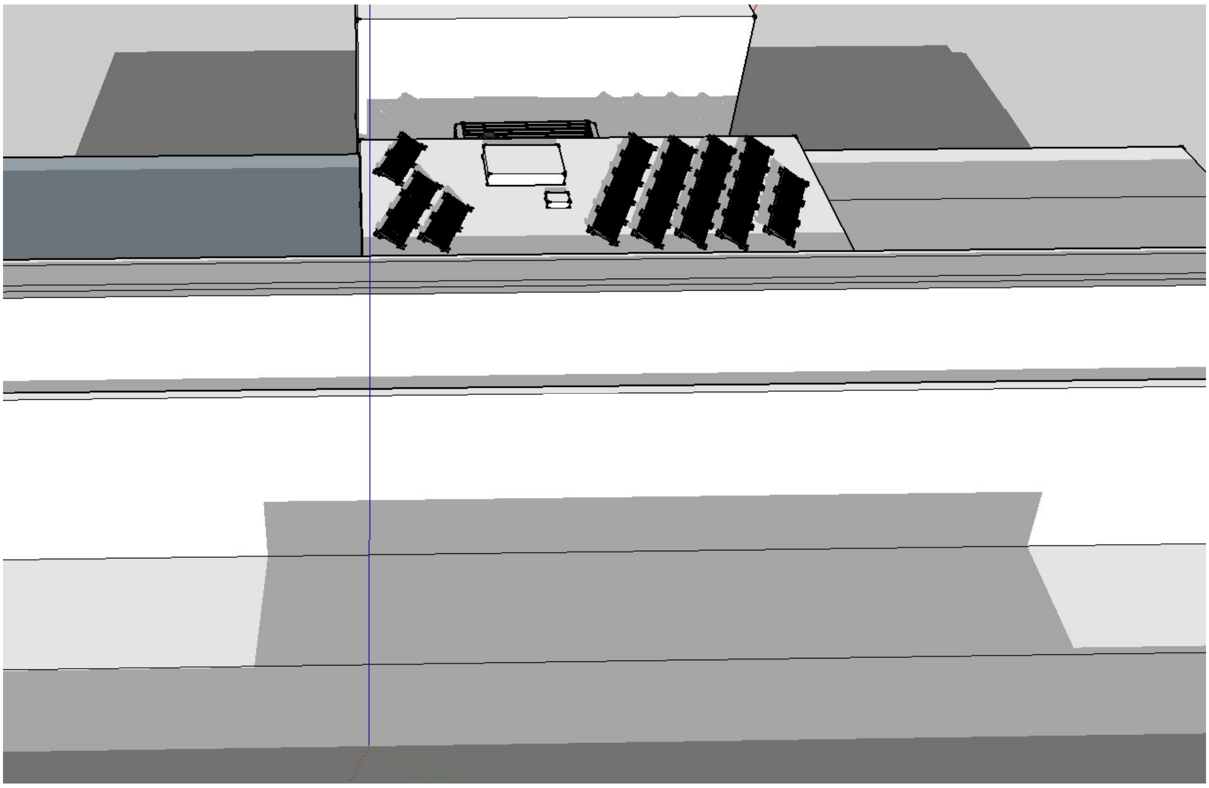
APPENDIX A – ASSESSMENT OF SOLAR PANEL ARRANGEMENTS



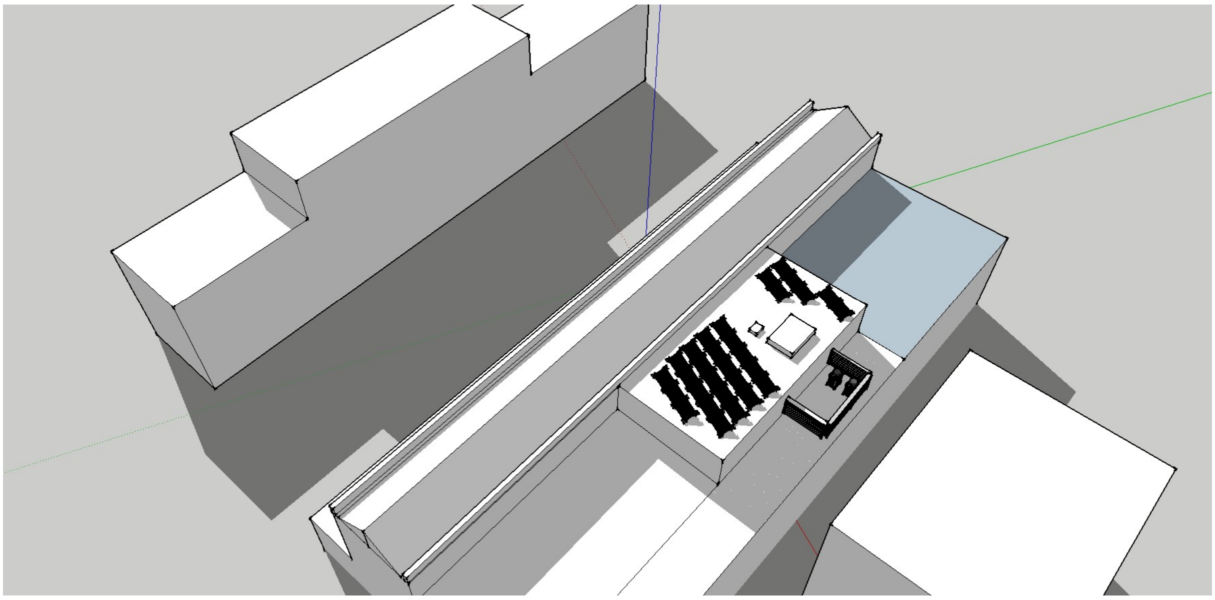
Above: Demonstration of proposed solar panel array during February at 10:00. View is looking over the rear of the building



Above: Demonstration of shading for proposed solar panel array during February at 16:00 showing considerable shading cast on the proposed array by the existing apex roof. View is looking at the front of the building.



Above: Demonstration of shading for proposed solar panel array during September at 16:00 showing some shading cast on array by the existing apex roof. View is looking at the front of the building.



Above: Demonstration of shading for proposed solar panel array during June at 16:00. High elevation view showing the shading from surrounding buildings.

APPENDIX B – SBEM CALCULATION OUTPUT DOCUMENTS

NEW EXTENSION + LEAN + CLEAN + GREEN STAGES

SBEM Main Calculation Output Document

Thu Aug 22 14:11:55 2019 v5.6.a.1

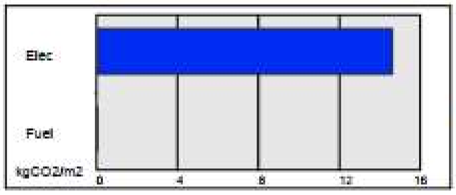
Building name

114-122 Camden HS

Building type: A1/A2 Retail and Financial/Professional services

SBEM is an energy calculation tool for the purpose of assessing and demonstrating compliance with Building Regulations (Part L for England and Wales, Section 6 for Scotland, Part F for Northern Ireland, and Building Bye-laws Jersey Part 11) and to produce Energy Performance Certificates and Building Energy Ratings. Although the data produced by the tool may be of use in the design process, **SBEM is not intended as a building design tool.**

Building Energy Performance and CO2 emissions

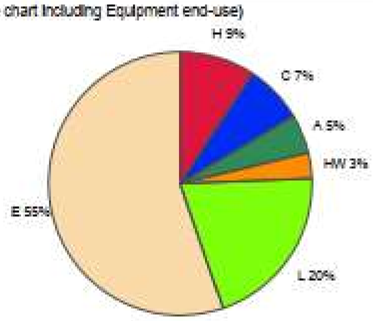


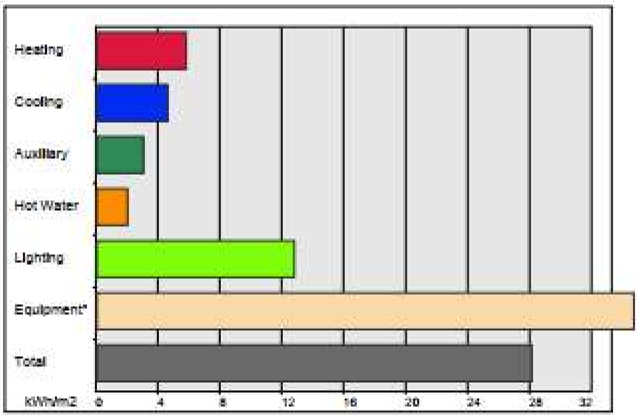
0 kgCO2/m2 displaced by the use of renewable sources.

Building area is 199 m2

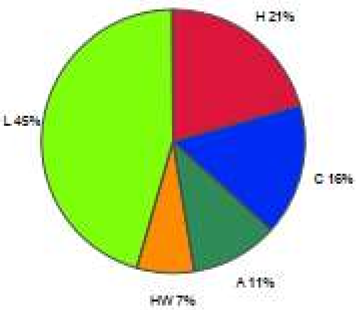
Annual Energy Consumption

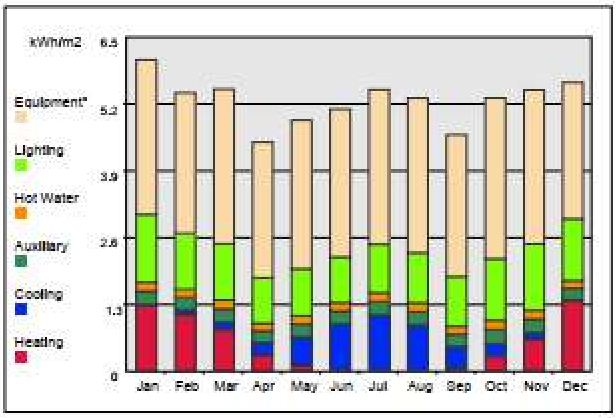
(Pie chart Including Equipment end-use)





(Pie chart excluding Equipment end-use)





(*) Although energy consumption by equipment is shown in the graphs for information, this end-use has not been included in the total results of the building or the calculation of the ratings.

Page 1 of 2

SBEM Main Calculation Output Document

Wed Aug 21 18:41:10 2019 v5.6.a.1

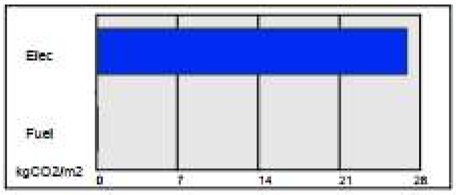
Building name

114-122 Camden HS

Building type: A1/A2 Retail and Financial/Professional services

SBEM is an energy calculation tool for the purpose of assessing and demonstrating compliance with Building Regulations (Part L for England and Wales, Section 6 for Scotland, Part F for Northern Ireland, and Building Bye-laws Jersey Part 11) and to produce Energy Performance Certificates and Building Energy Ratings. Although the data produced by the tool may be of use in the design process, **SBEM is not intended as a building design tool.**

Building Energy Performance and CO2 emissions

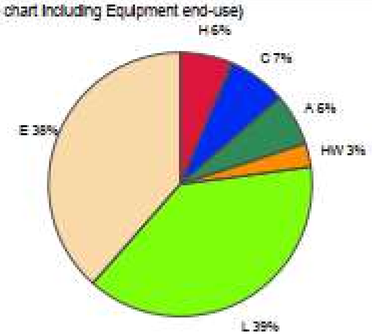


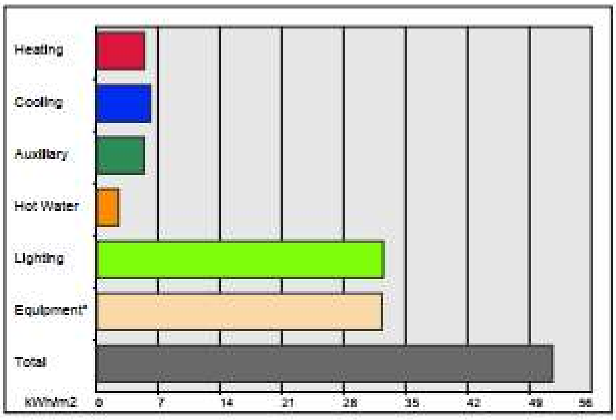
0 kgCO2/m2 displaced by the use of renewable sources.

Building area is 1109.6 m2

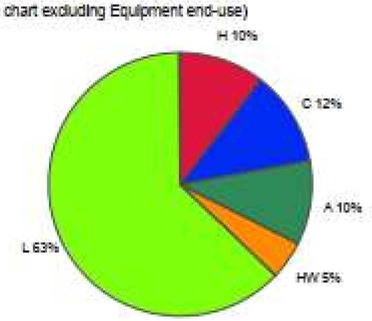
Annual Energy Consumption

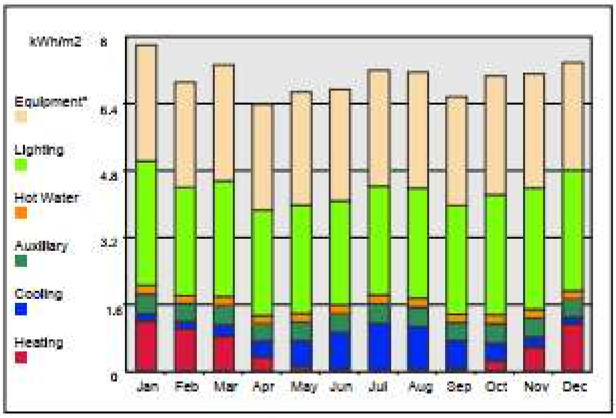
(Pie chart including Equipment end-use)





(Pie chart excluding Equipment end-use)





(*) Although energy consumption by equipment is shown in the graphs for information, this end-use has not been included in the total results of the building or the calculation of the ratings.

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APPENDIX C – SOME PRELIMINARY HEATING & COOLING PLANT SELECTIONS

Name	Model	PS	MCA	MOP	RLA	FLA	WxHxD	Weight
			A	A	A	A	mm	kg
BS 9	BS1Q10A	230V 1ph					388 x 207 x 326	12.0
BS 10	BS1Q10A	230V 1ph					388 x 207 x 326	12.0
Office units 3	REYQ14U	400V 3Nph	27.0	32.0	15.6	1.8	1,240 x 1,685 x 765	314.0
BS 1	BS1Q10A	230V 1ph					388 x 207 x 326	12.0
BS 2	BS1Q10A	230V 1ph					388 x 207 x 326	12.0
BS 3	BS1Q10A	230V 1ph					388 x 207 x 326	12.0
BS 4	BS1Q10A	230V 1ph					388 x 207 x 326	12.0
BS 5	BS1Q10A	230V 1ph					388 x 207 x 326	12.0
BS 6	BS1Q10A	230V 1ph					388 x 207 x 326	12.0
BS 7	BS1Q10A	230V 1ph					388 x 207 x 326	12.0
BS 8	BS1Q10A	230V 1ph					388 x 207 x 326	12.0
BS 9	BS1Q10A	230V 1ph					388 x 207 x 326	12.0
BS 10	BS1Q10A	230V 1ph					388 x 207 x 326	12.0
Office units 4	REYQ14U	400V 3Nph	27.0	32.0	15.6	1.8	1,240 x 1,685 x 765	314.0
BS 1	BS1Q10A	230V 1ph					388 x 207 x 326	12.0
BS 2	BS1Q10A	230V 1ph					388 x 207 x 326	12.0
BS 3	BS1Q10A	230V 1ph					388 x 207 x 326	12.0
BS 4	BS1Q10A	230V 1ph					388 x 207 x 326	12.0
BS 5	BS1Q10A	230V 1ph					388 x 207 x 326	12.0
BS 6	BS1Q10A	230V 1ph					388 x 207 x 326	12.0
BS 7	BS1Q10A	230V 1ph					388 x 207 x 326	12.0
BS 8	BS1Q10A	230V 1ph					388 x 207 x 326	12.0
BS 9	BS1Q10A	230V 1ph					388 x 207 x 326	12.0
BS 10	BS1Q10A	230V 1ph					388 x 207 x 326	12.0
Office units 5	REYQ14U	400V 3Nph	27.0	32.0	15.6	1.8	1,240 x 1,685 x 765	314.0
BS 1	BS1Q10A	230V 1ph					388 x 207 x 326	12.0
BS 2	BS1Q10A	230V 1ph					388 x 207 x 326	12.0
BS 3	BS1Q10A	230V 1ph					388 x 207 x 326	12.0
BS 4	BS1Q10A	230V 1ph					388 x 207 x 326	12.0
BS 5	BS1Q10A	230V 1ph					388 x 207 x 326	12.0
BS 6	BS1Q10A	230V 1ph					388 x 207 x 326	12.0
BS 7	BS1Q10A	230V 1ph					388 x 207 x 326	12.0
BS 8	BS1Q10A	230V 1ph					388 x 207 x 326	12.0
BS 9	BS1Q10A	230V 1ph					388 x 207 x 326	12.0
BS 10	BS1Q10A	230V 1ph					388 x 207 x 326	12.0

LOT21 - Information

Name	Model	$\eta_{s,h}$ heating	$\eta_{s,c}$ cooling	SCOP	SEER
		%	%		
Retail Unit 1	REYQ16U	243.1	167.5	4.30	6.20
Retail Unit 2	REYQ8U	286.1	165.1	4.20	7.20
Office units 1	REYQ14U	255.8	168.3	4.30	6.50
Office units 2	REYQ14U	255.8	168.3	4.30	6.50
Office units 3	REYQ14U	255.8	168.3	4.30	6.50
Office units 4	REYQ14U	255.8	168.3	4.30	6.50
Office units 5	REYQ14U	255.8	168.3	4.30	6.50

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