Energy Statement

Ruspini House
22 Parker Street
LONDON WC2B 5PH

Date: 3rd November 2022

Engineer(s): Ondrej Gajdos

Revision: 01

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1.0 INTRODUCTION

FHP Engineering Services Solutions (FHP ESS) has been commissioned, to carry out a high-level analysis of various low and zero-carbon technology options for the refurbishment of residential building projects at Ruspini House. The following report sets out the findings of the assessment and contains various energy efficiency strategies which are proposed to be incorporated into the design.

The formulation of the Energy Statement for the proposed development takes into account several important objectives.

- On-site Green House Gas emission reductions at least 35% above those set out in Part L of Building Regulations 2013
- Follow the hierarchy of energy efficiency, decentralised energy and renewable energy technologies set out in the London Plan (2021) Chapter 9 (particularly Policy SI 2) to achieve the fullest contribution to CO_2 reduction. GLA guidance on preparing energy assessments and CPG Energy Efficiency and Adaptation should be followed. In particular, improvements should be sought on the minimum building fabric targets set in Part L of the building regulations
- Achieve a 20% reduction in CO_2 emissions through renewable technologies (the 3rd stage of the energy hierarchy)

2.0 PROJECT OVERVIEW

The Project comprises refurbishment of a 4 to 5 Storey residential building located on the south-eastern side of Parker Street, in the Central London Area. It was built with Nos. 8-18 (even) Parker Street in the late 1980s as part of a mixed-use development. There are 6 self-contained residential units.

The site is situated within the Seven Dials Conservation Area, and borders the Grade II listed 36 Great Queen Street and Grade II* listed 34 and 35 Great Queen Street to the rear.

3.0 SITE WEATHER CONDITION

Weather data set used in the energy assessment (SAP calculation), is applied in line with SAP2012 technical manual appendix U for the appropriate region of the site (Thames).

Weather data set for the overheating assessment, is applied in line with CIBSE TM59 guidance.

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4.0 POLICY CONTEXT

4.1 National Policy: NPPF

The revised National Planning Policy Framework (NPPF) was published on the 20th July 2021 and sets out the Government's planning policies for England. The NPPF provides a framework for achieving sustainable development, which has been summarised as "meeting the needs of the present without compromising the ability of future generations to meet their own needs" (Resolution 42/187 of the United National General Assembly). At the heart of the framework is a presumption in favour of sustainable development.

Paragraph 8 of the NPPF advises that the planning system has three overarching objectives which are interdependent and need to be pursued in mutually supportive ways:

a. **An economic objective** – to help build a strong, responsive and competitive economy, by ensuring that sufficient land of the right types is available in the right places and at the right time to support growth, innovation and improved productivity; and by identifying and coordinating the provision of infrastructure;
b. **A social objective** – to support strong, vibrant and healthy communities, by ensuring that a sufficient number and range of homes can be provided to meet the needs of present and future generations; and by fostering a well-designed and safe built environment, with accessible services and open spaces that reflect current and future needs and support communities' health, social and cultural well-being; and
c. **An environmental objective** – to contribute to protecting and enhancing our natural, built and historic environment; including making effective use of land, helping to improve biodiversity, using natural resources prudently, minimising waste and pollution, and mitigating and adapting to climate change, including moving to a low carbon economy.

4.2 National Standards – Part L Of Building Regulations

The UK Green Building Council defines a net-zero carbon operational building as follows: "When the amount of carbon emissions associated with the building's operational energy on an annual basis is zero or negative. A net zero carbon building is highly energy efficient and powered from on-site and/or off-site renewable energy sources, with any remaining carbon balance offset."

There is a significant gap between current building standards (Part L 2013) and the standards required to become net-zero carbon by 2050. In order to achieve a net zero carbon balance across the UK housing stock, LETI found that all new development will need to be designed to achieve an Energy Use Intensity (EUI), i.e. energy use measured at the meter, of 35kWh/m2/yr. However, the current Part L average EUI is 140 kWh/m2/yr.

In the new version of SAP 10.2., the carbon factors have been changed in the TER (Target Emissions Rate) calculations and electricity now has a lower carbon factor than gas. Grid electricity is now considered by the model as producing 136 grams CO_2e/kWh; whereas gas remains unchanged at 210 grams. This has been changed in anticipation of the decarbonisation of the grid. The effect will be to make it much easier for electrically heated buildings to comply than previously.

Furthermore, Part L does not address emissions associated with unregulated equipment such as fridges, washing machines, cooking equipment, computers, etc. which can represent up to 50% of a building's operational emissions. This means that a building achieving a 100% improvement against Part L doesn't necessarily achieve net-zero carbon operational emissions.

4.3 Regional Policy: The London Plan 2021

The London Plan is the name given to the Mayor's spatial development strategy. The current version of London Plan was adopted in March 2021. The aim is to develop London as an exemplary sustainable world city, based on three interwoven themes.

- Strong, diverse long-term economic growth
- Social inclusivity to give all Londoners the opportunity to share in London's future success
- Fundamental improvements in London's environment and use of resources.

Specific requirements on development sustainability are set out in the following policies:

Policy SI 2 Minimising CO_2 emissions

A. Major development should be net zero-carbon. This means reducing greenhouse gas emissions in operation and minimising both annual and peak energy demand in accordance with the following energy hierarchy:
1) be lean: use less energy and manage demand during operation
2) be clean: exploit local energy resources (such as secondary heat) and supply energy efficiently and cleanly
3) be green: maximise opportunities for renewable energy by producing, storing and using renewable energy on-site
4) be seen: monitor, verify and report on energy performance.

B. Major development proposals should include a detailed energy strategy to demonstrate how the zero-carbon target will be met within the framework of the energy hierarchy.

C. A minimum on-site reduction of at least 35 per cent beyond Building Regulations 152 is required for major development. Residential development should achieve 10 per cent, and non-residential development should achieve 15 per cent through energy efficiency measures. Where it is clearly demonstrated that the zero-carbon target cannot be fully achieved on-site, any shortfall should be provided, in agreement with the borough, either:

1) through a cash in lieu contribution to the borough's carbon offset fund, or
2) off-site provided that an alternative proposal is identified and delivery is certain.

D. Boroughs must establish and administer a carbon offset fund. Offset fund payments must be ring-fenced to implement projects that deliver carbon reductions. The operation of offset funds should be monitored and reported on annually.

Policy SI 3 D – Energy Infrastructure

Major development proposals within Heat Network Priority Areas should have a communal low-temperature heating system:

1) the heat source for the communal heating system should be selected in accordance with the following heating hierarchy:

a) connect to local existing or planned heat networks
b) use zero-emission or local secondary heat sources (in conjunction with heat pump, if required)
c) use low-emission combined heat and power (CHP) (only where there is a case for CHP to enable the delivery of an area-wide heat network, meet the development's electricity demand and provide demand response to the local electricity network)
d) use ultra-low NOx gas boilers

2) CHP and ultra-low NOx gas boiler communal or district heating systems should be designed to ensure that they meet the requirements in Part B of Policy SI 1 Improving air quality.
3) where a heat network is planned but not yet in existence the development should be designed to allow for the cost-effective connection at a later date.

Policy SI 4 – Managing heat Risk

A. Development proposals should minimise adverse impacts on the urban heat island through design, layout, orientation, materials and the incorporation of green infrastructure.
B. Major development proposals should demonstrate through an energy strategy how they will reduce the potential for internal overheating and reliance on air conditioning systems in accordance with the following cooling hierarchy:-

1) reduce the amount of heat entering a building through orientation, shading, high albedo materials, fenestration, insulation and the provision of green infrastructure
2) minimise internal heat generation through energy efficient design
3) manage the heat within the building through exposed internal thermal mass and high ceilings
4) provide passive ventilation
5) provide mechanical ventilation
6) provide active cooling systems.

4.4 Local Policy – Camden Council Local Plan

In addition to London Plan policies, Camden Local Plan policy CC1 requires, that developments of five or more dwellings and/or more than 500 sqm of any gross internal floorspace to achieve a 20% reduction in carbon dioxide emissions from on-site renewable energy generation (which can include sources of site related decentralised renewable energy), unless it can be demonstrated that such provision is not feasible. This is in line with stage three of the energy hierarchy 'Be green'. The 20% reduction should be calculated from the regulated CO_2 emissions of the development after all proposed energy efficiency measures and any CO_2 reduction from non-renewable decentralised energy (e.g. CHP) have been incorporated.

5.0 ENERGY HIERARCHY

In line with the London Plan, developments are expected to achieve net zero-carbon by following the energy hierarchy:

- Be lean: Use less energy and manage demand during operation through fabric and servicing improvements and the incorporation of flexibility measures.
- Be clean: Exploit local energy resources (such as secondary heat) and supply energy efficiently and cleanly by connecting to district heating networks.
- Be green: Maximise opportunities for renewable energy by producing, storing and using renewable energy on-site.
- Be seen: Monitor, verify and report on energy performance through the Mayor's post construction monitoring platform.

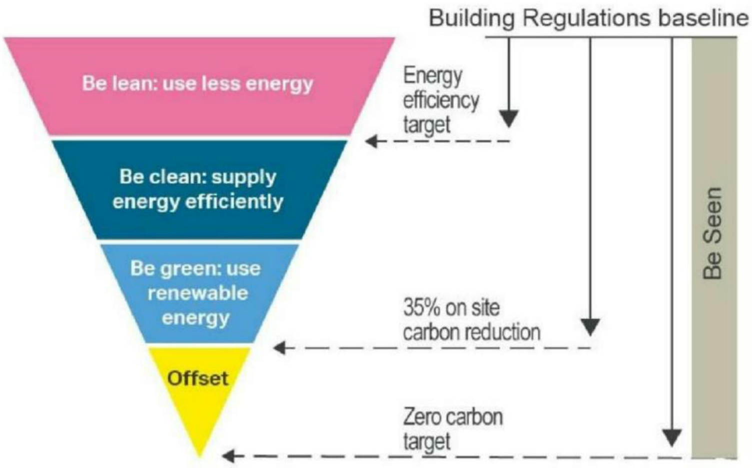

Figure 1 – London Plan Energy Hierarchy

The remaining regulated carbon dioxide emissions, to 100 per cent, are to be offset through a cash in lieu contribution to the relevant borough

Table 1: Carbon Dioxide Emissions after each stage of the Energy Hierarchy for domestic buildings

	Carbon Dioxide Emissions for domestic buildings (Tonnes CO_2 per annum)	
	Regulated	Unregulated
2013 Part L1B notional baseline	12.7	2.5
Be Lean - Energy efficiency measures	12.0	2.5
Proposed development - Be Green	1.7	2.5

Table 2: Regulated Carbon Dioxide savings from each stage of the Energy Hierarchy for domestic buildings

	Regulated domestic carbon dioxide savings	
	(Tonnes CO_2 per annum)	(%)
Savings at the Be Lean stage	0.6	5%
Further savings by renewable sources	10.3	81%
Cumulative on site savings	**11.0**	**87%**

Table 3 – SAP calculation specification for each stage of the energy hierarchy

Specification	Notional baseline (2013 Part L1B compliant development)	Efficient Baseline Be Lean	Proposed Development Be Green
Ground floor U-value	0.25	0.15	0.15
Exposed floor U-value (exposed soffit and floor above unheated spaces)	0.25	0.25	0.25
External Wall U-value, including mansard wall and dormer cheeks	0.30	0.28	0.28
Wall separating flats from unheated corridors and stair	0.30	0.19-0.29	0.19-0.29
Floor separating flats from unheated corridors and stair	0.25	0.25	0.25
Party-Wall U-value	0 (solid wall or fully filled with insulation and sealed on edges)	0 (solid wall or fully filled with insulation and sealed on edges)	0 (solid wall or fully filled with insulation and sealed on edges)
Roof U-value	0.18	0.14	0.14
Windows U-value	1.60	1.2	1.2
Space Heating and DHW System	Individual condensing combi boiler in each flat, 89% SEDBUK2009 efficiency, radiators, programmer, room thermostat and TRV's	Individual condensing combi boiler in each flat, 89% SEDBUK2009 efficiency, radiators, programmer, room thermostat and TRV's	Individual MCS certified air source heat pumps DAIKIN ERLA11DV3+EBVH16SU23D6V or equivalent, underfloor heating, time and temperature zone control
Ventilation System	MEV Nuaire MEVDC2 or equivalent	MEV Nuaire MEVDC2 or equivalent	MEV Nuaire MEVDC2 or equivalent
Energy Efficient Lighting - residential	100%	100%	100%
Solar photovoltaic	-	-	Total peak output 7 kWp, panels installed at a low angle (less than 15°0
% Improvement in CO2 over Building regulations compliant baseline	**0.0%**	**5.1%**	**87%**

Table 4 – Baseline energy consumption and CO2 emission

DOMESTIC ENERGY CONSUMPTION AND CO_2 ANALYSIS											
Unit identifier (e.g. plot number, dwelling type etc.)	Model total floor area (m^2)	REGULATED ENERGY CONSUMPTION PER UNIT (kWh p.a.) - TER WORKSHEET				REGULATED CO_2 EMISSIONS PER UNIT					
		Space Heating	Domestic Hot Water	Lighting	Auxiliary	Space Heating	Domestic Hot Water	Lighting	Auxiliary	SAP 10.2 CO_2 emissions ($kgCO_2$ p.a.)	Calculated CO2 SAP 10.2 ($kgCO_2$ / m^2)
24	112.7	10276	2549	434	245.25	2,158	535	59	33	2,785	24.7
20	100.7	8762	2509	405	221.5	1,840	527	55	30	2,452	24.4
22_1	61.6	3648	2116	279	162.2	766	444	38	22	1,270	20.6
22_2	54.3	3464	1987	261	140.88	727	417	35	19	1,199	22.1
22_3	113.2	9010	2554	435	225.36	1,892	536	59	31	2,518	22.2
22_4	114.9	8769	2559	457	227.3	1,842	537	62	31	2,472	21.5
Sum	557	43,929	14,274	2,270	1,222	9,225	2,997	309	166	12,697	22.8

6.0 BE LEAN - PASSIVE DESIGN MEASURES

As this project is a refurbishment of an existing building, several passive measures are ruled out by default:

- Location
- Landscape
- Building layout
- Building Orientation
- Building From
- Shading
- Massing
- Internal layout
- The positioning of openings to allow the penetration of solar radiation, visible lights and for ventilation

Following passive measures and efficient services have been implemented in the Be Lean stage

- Building Fabric
- Low energy lighting
- Low energy mechanical extract ventilation units

Passive measures and efficient services implemented in this project are summarised in the Be Lean column of table 3

Table 5 – "Be Lean" stage energy consumption and CO2 emission

DOMESTIC ENERGY CONSUMPTION AND CO_2 ANALYSIS											
Unit identifier (e.g. plot number, dwelling type etc.)	Model total floor area (m^2)	REGULATED ENERGY CONSUMPTION PER UNIT (kWh p.a.) - 'BE LEAN' SAP DER WORKSHEET				REGULATED CO_2 EMISSIONS PER UNIT					
		Space Heating	Domestic Hot Water (Heat Source 1)	Lighting	Auxiliary	Space Heating CO_2 emissions ($kgCO_2$ p.a.)	Domestic Hot Water CO_2 emissions ($kgCO_2$ p.a.)	Lighting CO_2 emissions ($kgCO_2$ p.a.)	Auxiliary CO_2 emissions ($kgCO_2$ p.a.)	SAP 10.2 CO_2 emissions ($kgCO_2$ p.a.)	Calculated DER SAP 10.2 ($kgCO_2$ / m^2)
24	112.7	9411	2551	434	245	1,976	536	59	33	2,604	23.1
20	100.7	7981	2512	405	222	1,676	528	55	30	2,289	22.7
22_1	61.6	3501	2117	279	162	735	445	38	22	1,240	20.1
22_2	54.3	3192	1990	261	141	670	418	35	19	1,143	21.0
22_3	113.2	8591	2556	435	225	1,804	537	59	31	2,431	21.5
22_4	114.9	8154	2562	457	227	1,712	538	62	31	2,343	20.4
Sum	557	40,829	14,288	2,270	1,222	8,574	3,001	309	166	12,050	21.6

7.0 BE CLEAN – HEAT NETWORKS AND CHP

Combine Heat and Power (CHP) units produce electricity by means of an engine powered generator, the heat created by the engine is harvested by a recovery unit and used to produce hot water or steam for heating purposes.

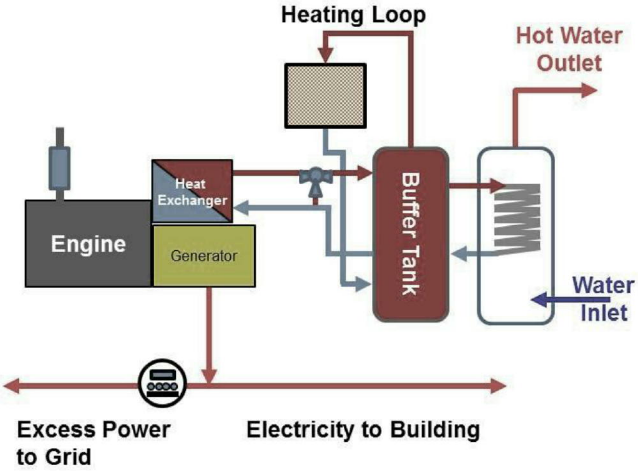

Figure 2 – A simplified Combined Heat & Power system

CHP systems can run on a few different fuel sources; biomass, liquid biofuel and natural gas, although the alternative fuel sources offer benefits such as lower CO_2 emissions they come with a number of constraints, the most prominent being availability of equipment and reliability and security of the fuel source. As it stands natural gas fired CHP systems prove the most financial, viable and have a strong track record within the UK of cost effectiveness and reliable running.

A CHP system operates most efficiently when there is a year-round demand for hot water and electricity, typical examples of buildings that benefit from CHP are swimming pools, hospitals and hotels where there is a constant demand for both hot water and electricity. As CHP systems produce electricity at the point of use or very close, the transmission losses are significantly reduced as the electricity doesn't have to be transported over large distances.

Recommendations specific to this development

Because of insufficient simultaneous heating and electricity demand, this technology has been considered as inappropriate and will not be pursued further.

8.0 BE GREEN – RENEWABLE ENERGY SOURCES

The purpose of this step in the energy hierarchy is to shift the energy grid towards non-polluting energy sources, and to encourage buildings to be self-sufficient rather than fossil-fuel intensive. There are several renewable energy technologies suited to residential buildings. Ideally the technology should reduce energy cost and carbon emissions and be mature and well-proven. Various types of Low and Zero Carbon (LZE) technologies have been explored. The selection was based on their appropriateness to the site, cost of installation, and the energy demands of the building. The technologies covered in this report are:

- Wind Turbine
- Air Source Heat Pump
- Ground Source Heat Pump
- Solar Thermal
- Solar Photovoltaic
- Biomass

8.1 Wind Turbine

Wind turbines can come in the form of both horizontal axis (HAWT) and vertical axis (VAWT). Both types are dependant of average speeds of 10m/s although VAWT's are believed to function more efficiently at low wind speeds. Typically wind turbines should be erected in areas of large open landscape to ensure clear air flow across the blades with minimum turbulence.

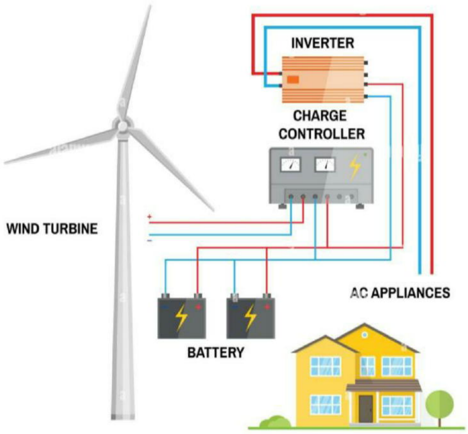

Figure 4 - Simplified schematic showing the operation of wind turbine

VAWT could be a better option because they create less noise, are omnidirectional and as such work equally well with wind from any direction. Drawbacks to the VAWT's are that by and large they are not self-starting, so a small electrical mechanism is usually used to initiate rotation, VAWT's are also susceptible to 'pulsating' during operation results in stress loads being variable across their structure, ultimately leading to components getting fatigued faster than HAWT's.

The following issues need consideration when sizing and siting a wind turbine - noise, siting of additional electrical plant equipment, flicker effect (from the blades crossing the suns path to surrounding buildings) and vibration and structural effects if it is to be building mounted.

Recommendations specific to this development

There are issues associated with the practicalities of locating a wind turbine of sufficient size to generate meaningful quantities of electricity for the site. Because of the location of the project, the wind turbine option is ruled out.

8.2 Air Source Heat Pump (ASHP)

Air source heat pumps draw heat from the external air and transfer it for use internally for space heating or hot water generation. The process involves external fan decks drawing large volumes of air over coils which form part of a refrigeration circuit, the refrigerant then runs through a compressor where the heat is transferred to an internal heating circuit.

Heat pump systems rely on electrical energy as the primary power source but have high efficiencies due to the refrigeration cycle process. The efficiency of an ASHP is given as seasonal co-efficient of performance (SCOP), if a system has a SCOP of 3.5 it means for every 1kW of electricity consumed by the ASHP system, it generates 3.5kW of heat. The efficiency can be affected by the external air temperature and the off-coil temperature that is demanded of the system, however the development of high efficiency ASHP have led to increasingly high ratios being achieved, even at negative air temperatures. A typical ASHP system consists of a fan deck/table and standalone heat pump unit, the fan decks/tables need to be mounted externally with sufficient free air movement in order to operate correctly.

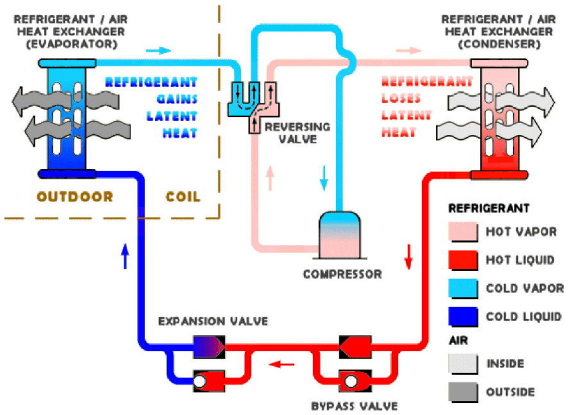

Figure 5 - Simplified schematic showing the operation of the ASHP in heating mode

Recommendations specific to this development

It is proposed to install individual air source heat pump in each flat, MCS certified DAIKIN ERLA11DV3+EBVH16SU23D6V or equivalent, which will provide all space heating through low temperature wet underfloor heating or low temperature radiators/convectors, as well as all hot water demand.

The system will comprise individual outdoor units and individual indoor unit with hot water storage in each apartment.

Figure 6 –Typical individual heat pump dimensions and schematic

The heat pump is proposed to be the sole space heating and DHW source. No secondary heating is proposed. Necessity of a secondary heating is ruled out by SAP calculation.

End-users will be supplied with regular information to control and operate the system e.g. at point of occupancy and maintenance visits.

Performance of the heat pump system will be monitored post construction to ensure it is achieving the expected performance approved during planning, in line with the be seen policy.

8.3 Ground Source Heat Pumps (GSHP)

GSHP installations can be either horizontally or vertically installed depending on the site requirements. An GSHP system operates on the same premise of an ASHP with the exception that the heat exchange is through either an open or closed loop circuit buried in the ground. These systems tend to be more efficient than the ASHP typically a SCOP of 4 can be achieved.

An open loop system consists of bore holes being dug down into the sub aquifer water reservoirs, this system type negates the need for any refrigeration fluid. Water is abstracted from one borehole and filtered through the heat pump then discharged back to another section of the water source, via a second borehole. If an open loop system is being considered for a site there are a number of points that need addressing such as, permission from the Environmental Agency for an abstraction licence and sufficient separation of boreholes to prevent 'short circuiting' the system with abstraction water being affected by discharge water. A closed loop system consists of refrigerant running in a closed flow and return loop of pipework, this can be in the form of a horizontal system such as 'slinky' layout consisting of the pipework buried in shallow trenches on open ground laid out in a looped pattern. Vertical installations comprise of multiple boreholes, the depth of which are dependent on the geological makeup of the site location and demands of the system. These systems tend to be slightly more efficient than the equivalent air source heat pump (typically heat exchange ratios of 4.5:1 or even 5:1 can be achieved).

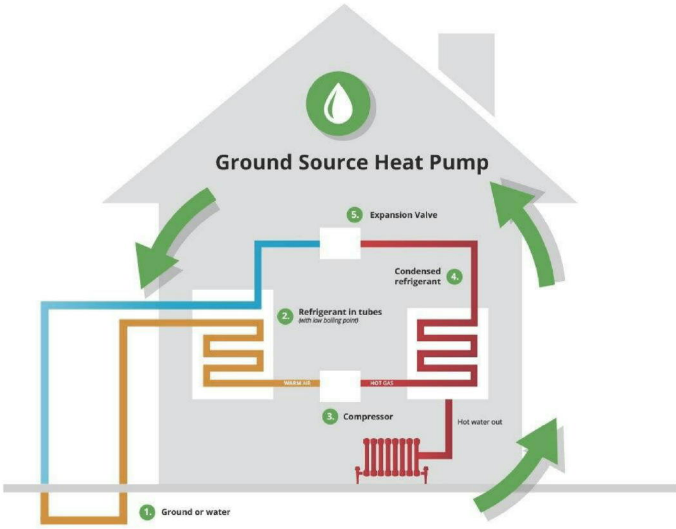

Figure 7- A simplified Ground Source Heat Pump system

Recommendations specific to this development

Ground source heat pumps are not feasible in this development (refurbishment of existing building).

8.4 Biomass

These are an alternative to gas or oil-fired boilers and are considered to be more 'environmentally friendly' because they use a sustainable fuel source rather than a fossil fuel. However, these boilers are significantly larger than conventional gas fired boilers.

Biomass and Bio Diesel boilers do not reduce the carbon production of the development. In addition, there is a fuel supply and storage issue associated with this type of equipment, whether it is biomass (wood pellets or chips) or bio diesel (rape seed oil).

Figure 8 - Typical Biomass Boiler showing adjacent fuel hopper

Recommendations specific to this development

Biofuels are ruled out due to negative impact on air quality, insufficient space for storage and environmental issues surrounding liquid biofuels supply chain.

8.5 Solar Thermal

The main application of solar thermal is for pre-heating of sanitary hot water. The solar thermal panels are called solar collectors. The solar conversion efficiency for solar-thermal technology is high. So, it can be a good option to reduce the running costs if heating water is done using electricity or other costly fuel sources. It doesn't require a huge amount of roof space. It would be reliable if installed properly.

There are limitations on this system in terms of the distance from the solar collectors to the water heater making due to heat loses through the pipework. This is proven technology and, in some cases, can be financially viable with good payback periods, this is dependent on the particular application, hours run and orientation of the building. This system does provide a reduction in CO_2 emissions from the development due to the offset of natural gas that would otherwise have been used to heat the water.

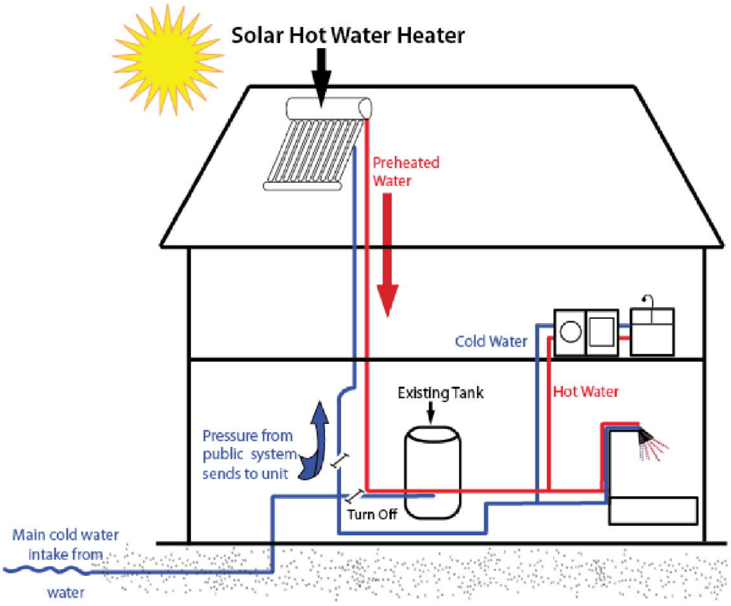

Figure 9 - Simplified schematic of solar water heating system

Recommendations specific to this development

Solar hot water systems have been ruled out due to higher capital cost, installation cost, worse return on investment and lower CO_2 saving potential compared to solar PV.

8.6 Solar Photovoltaic cells

Photovoltaic cells use the sun's energy to generate electricity which can be used by the development or fed back into the grid, reducing the amount of grid electricity used by the development and generating an income from Feed in Tariff and Export payments. The system requires large areas of photovoltaic cells to generate useful quantities of electricity, the financial viability of such a system needs close consideration as PV has a relatively high capital cost, and as such the payback period can be longer than other options.

Unlike heat pump technology, PV is entirely dependent on the sun for its energy and the quantity of energy produced is directly correlated to weather conditions. Although historical weather data allows for assumed outputs for systems of a given size, the output can never be fully guaranteed. Careful design to size a PV system correctly can lead to offsetting large quantities of the sites electrical energy demands, which in turn generates considerable savings on the annual electrical running costs of the building. This is particularly pertinent if the site is running in an 'all electric' system whereby all heating and cooling is electrically driven, as would be the case if a heat pump technology were implemented.

Monocrystalline solar panels are the most commonly used residential solar panel to date because of their power capacity and efficiency. Monocrystalline solar panels can reach efficiencies higher than 20%, making them the most efficient panel type on the market.

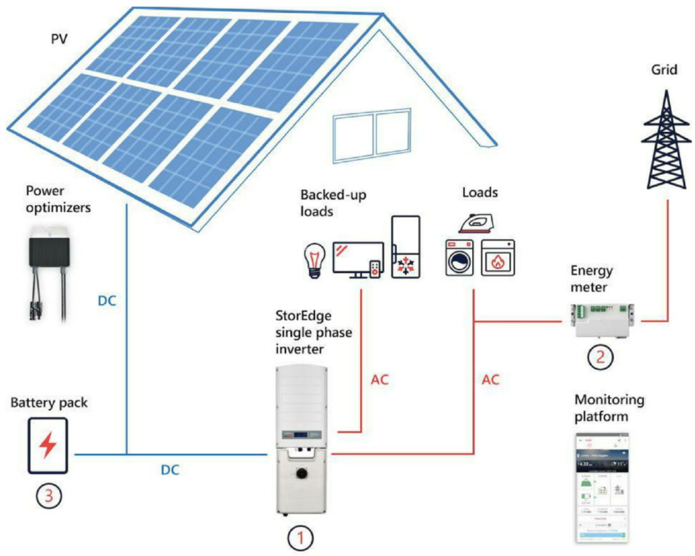

Figure 10 - Simplified solar PV system

Recommendations specific to this development

It is proposed to install a PV system with a total peak output of 7 kWp, panels mounted horizontally on the flat roof in the areas indicated on architect roof plan. Since, solar panels are mounted horizontally, there would be no overshadowing from solar panels on each other. Using architectural modelling and design analysis, they are placed on the area of the roofs to resolve any overshadowing possibilities from roof layout and construction. Modelling the solar insolation on the roof and outside the building considering adjacent buildings, there will be no overshadowing from the neighbouring buildings that affect solar panels performance. Based on these considerations, the solar panel system can operate at its peak and combined solar PV panels will produce 5,323 kWh electricity per year offsetting 724 kgCO2.

9.0 BE SEEN – ENERGY MONITORING

New London Plan Policy SI 2 sets out the 'be seen' requirement for all major development proposals to monitor and report on their actual operational energy performance. The 'be seen' policy will help to understand the performance gap and identify ways of closing it while ensuring compliance with London's net zero-carbon target.

Although this is not a major development, policy SI 2 ("be seen" requirements) will be fully addressed, going above and beyond the requirements for a development of this size and type. The development will be designed to enable post construction monitoring and the information set out in the 'be seen' guidance will be submitted to the GLA's portal at the appropriate reporting stages.

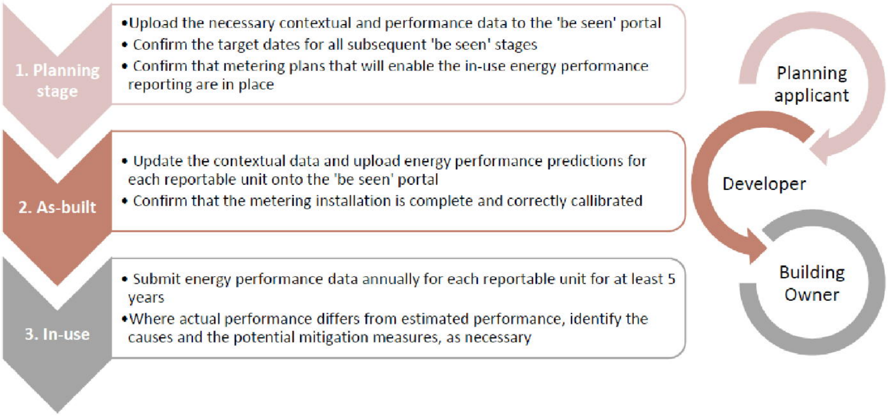

Figure 11 – Monitoring and reporting requirements for actual energy performances

10.0 OVERHEATING ASSESSMENT

Overheating assessment of all proposed flats has been carried out using SAP 2012 Appendix P calculation.
All flats in the development comply with the overheating criteria with natural ventilation through openable windows and without blinds.

New building regulation Part O (CIBSE TM59 overheating assessment using dynamic simulation) is not applicable to existing refurbished buildings.

11.0 CONCLUSION

Sustainable development principles will be considered throughout the design and implementation of the proposed project. In particular, incorporation of sustainable design and construction methods, energy and water saving measures, waste reduction techniques as well as measures to enhance the ecological value of the site, a good quality and sustainable development is proposed.

The London Plan approach of “Be lean” – “Be clean” – “Be green” is fully adopted by implementing:

- ✓ Passive measures (low U-values)
- ✓ High efficiency services, i.e. low energy lights, high efficiency ventilation
- ✓ Renewable sources: Individual air source heat pump, solar PV

Excluded renewable sources are:

- Solar hot water
- Biomass
- Wind turbines
- Ground source heat pump

The proposed development will achieve:

- ✓ 87% domestic regulated CO_2 reduction against 2013 Part L1B compliant baseline
- ✓ 81% domestic regulated CO_2 reduction by renewable sources
- ✓ 5% reduction in regulated CO_2 by energy efficiency measures (Be Lean stage)