The PES

Energy & Sustainability Statement

17th March 2026

Mercure Hotel
Shepiston Lane
Heathrow
UB3 1LP

The PES

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Version Control

V1	17-03-26	

1.0 Executive Summary

The proposed development at Mercure Hotel, Heathrow consists of the redevelopment of the current 2 storey car parking facility to create a new hotel offering over a ground and 5 upper floors, with the retention of the existing undercroft parking. The project will deliver 43 new hotel rooms.

It has been designed to achieve the highest of environmental performance standards following the Energy Hierarchy as set down by the London Plan and the London Borough of Hillingdon's Local Plan policies.

A 'Lean, Clean, Green, Be Seen' approach to assessing energy and thermal comfort needs and appropriate solutions has been adopted following the guidance under Chapter 9 of the adopted London Plan and the latest GLA guidance on the preparation of energy statements (June 2022) the development achieves an overall improvement (BER/TER) in regulated emissions of **56.6**% over the Part L 2021 standard and a reduction in overall emissions at **47.4%** when taking into account unregulated energy use, through the adoption of high standards of insulation, super-efficient hybrid variable refrigerant flow heating/cooling, domestic hot water generated by the bespoke air to water heat pump systems and localised ventilation with heat recovery within an air tight fabric.

The above strategy is further supplemented by a 29.48kWp PV installation to the roof space, generating some **24,300kWh** per annum.

2.0 The Site & Proposal

The proposed development is located at Mercure Hotel location, and is currently an existing carparking provision over ground and basement level within the hotel

The proposed development consists of the demolition of the upper (ground floor) of the current 2 storey car parking facility to create a new hotel offering over a ground and 5 upper floors, with the retention of the existing undercroft parking. The project will deliver 43 new hotel rooms.

2.1 Local Planning Context

The site sits within the London Borough of Hillingdon

The Local Plan: Part 1 - Strategic Policies was adopted November 2012)

Section 8 Core Policies - Environmental Improvement
Policy EM1: Climate Change Adaptation and Mitigation

The Council will ensure that climate change mitigation is addressed at every stage of the development process by:

1. Prioritising higher density development in urban and town centres that are well served by sustainable forms of transport.

2. Promoting a modal shift away from private car use and requiring new development to include innovative initiatives to reduce car dependency.

3. Ensuring development meets the highest possible design standards whilst still retaining competitiveness within the market.

4. Working with developers of major schemes to identify the opportunities to help provide efficiency initiatives that can benefit the existing building stock.

5. Promoting the use of decentralised energy within large scale development whilst improving local air quality levels.

6. Targeting areas with high carbon emissions for additional reductions through low carbon strategies. These strategies will also have an objective to minimise other pollutants that impact on local air quality. Targeting areas of poor air quality for additional emissions reductions.

7. Encouraging sustainable techniques to land remediation to reduce the need to transport waste to landfill. In particular developers should consider bioremediation as part of their proposals.

8. Encouraging the installation of renewable energy for all new development in meeting the carbon reduction targets savings set out in the London Plan. Identify

opportunities for new sources of electricity generation including anaerobic digestion, hydroelectricty and a greater use of waste as a resource.

9. Promoting new development to contribute to the upgrading of existing housing stock where appropriate.

The Borough will ensure that climate change adaptation is addressed at every stage of the development process by:

10. Locating and designing development to minimise the probability and impacts of flooding.

11. Requiring major development proposals to consider the whole water cycle impact which includes flood risk management, foul and surface water drainage and water consumption.

12. Giving preference to development of previously developed land to avoid the Loss Of Further Green Areas.

13. Promoting the use of living walls and roofs, alongside sustainable forms of drainage to manage surface water run-off and increase the amount of carbon sinks.

14. Promoting the inclusion of passive design measures to reduce the impacts of urban heat effects.

Local Plan - Part 2 - Development Management Policies (Adopted 16 January 2020)

Policy DMEI 2: Reducing Carbon Emissions

A) All developments are required to make the fullest contribution to minimising carbon dioxide emissions in accordance with London Plan targets.

B) All major development proposals must be accompanied by an energy assessment showing how these reductions will be achieved.

C) Proposals that fail to take reasonable steps to achieve the required savings will be resisted. However, where it is clearly demonstrated that the targets for carbon emissions cannot be met onsite, the Council may approve the application and seek an off-site contribution to make up for the shortfall.

POLICY DMEI 3: Decentralised Energy

A) All major developments are required to be designed to be able to connect to a Decentralised Energy Network (DEN).

B) Major developments located within 500 metres of an existing DEN, and minor new-build developments located within 100 metres, will be required to connect to that network, including provision of the means to connect to that network and a reasonable financial contribution to the connection charge, unless a feasibility assessment demonstrates that connection is not reasonably possible.

C) Major developments located within 500 metres of a planned future DEN, which is considered by the Council likely to be operational within 3 years of a grant of planning permission, will be required to provide a means to connect to that network and developers shall provide a reasonable financial contribution for the future cost of connection and a commitment to connect via a legal agreement or contract, unless a feasibility assessment demonstrates that connection is not reasonably possible.

D) The Council will support the development of DENs and energy centres in principle, subject to meeting the wider policy requirements of this plan and in particular on design and air quality.

2.2 The London Plan

Chapter 9 deals with Sustainable Infrastructure:-

Policy SI2 Minimising greenhouse gas emissions

A Major development should be net zero-carbon. This means reducing carbon dioxide emissions from construction and 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 construction and operation.
2) Be clean: exploit local energy resources (such as secondary heat) and supply energy efficiently and cleanly. Development in Heat Network Priority Areas should follow the heating hierarchy in Policy SI3 Energy infrastructure.
3) Be green: generate, store and use renewable energy on-site.

B Major development should include a detailed energy strategy to demonstrate how the zero-carbon target will be met within the framework of the energy hierarchy and will be expected to monitor and report on energy performance.

C In meeting the zero-carbon target a minimum on-site reduction of at least 35 per cent beyond Building Regulations is expected. Residential development should aim to achieve 10 per cent, and non-residential development should aim to 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:

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

Policy SI3 Energy infrastructure

D Major development proposals within Heat Network Priority Areas should have a communal 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 available local secondary heat sources (in conjunction with heat pump, if required, and a lower temperature heating system)
c) generate clean heat and/or power from zero-emission sources
d) use fuel cells (if using natural gas in areas where legal air quality limits are exceeded all development proposals must provide evidence to show that any emissions related to energy generation will be equivalent or lower than those of an ultra-low NOx gas boiler)
e) use low emission combined heat and power (CHP) (in areas where legal air quality limits are exceeded all development proposals must provide evidence to show that any emissions related to energy generation will be equivalent or lower than those of an ultra-low NOx gas boiler)
f) 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 there is no significant impact on local air quality.
3) Where a heat network is planned but not yet in existence the development should be designed for connection at a later date.

Policy SI4 Managing heat risk

A Development proposal should minimise internal heat gain and the impacts of the urban heat island through design, layout, orientation and materials.

B Major development proposals should demonstrate through an energy strategy how they will reduce the potential for overheating and reliance on air conditioning systems in accordance with the following cooling hierarchy:

1) minimise internal heat generation through energy efficient design
2) reduce the amount of heat entering a building through orientation, shading, albedo, fenestration, insulation and the provision of green roofs and walls
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.

Policy SI5 Water infrastructure

C Development proposals should:

1) minimise the use of mains water in line with the Optional Requirement of the Building Regulations (residential development), achieving mains water consumption of 105 litres

or less per head per day (excluding allowance of up to five litres for external water consumption)
2) achieve at least the BREEAM excellent standard (commercial development)
3) be encouraged to incorporate measures such as smart metering, water saving and recycling measures, including retrofitting, to help to achieve lower water consumption rates and to maximise future proofing.

Policy SI12 Flood risk management

C Development proposals which require specific flood risk assessments should ensure that flood risk is minimised and mitigated, and that residual risk is addressed. This should include, where possible, making space for water and aiming for development to be set back from the banks of watercourses.

E Development proposals for utility services should be designed to remain operational under flood conditions and buildings should be designed for quick recovery following a flood.

F Development proposals adjacent to flood defences will be required to protect the integrity of flood defences and allow access for future maintenance and upgrading. Where possible, development proposals should set permanent built development back from flood defences to allow for any foreseeable future upgrades.

Policy SI13 Sustainable Drainage

A Lead Local Flood Authorities should identify – through their Local Flood Risk Management Strategies and Surface Water Management Plans – areas where there are particular surface water management issues and aim to reduce these risks.

B Development proposals should aim to achieve greenfield run-off rates and ensure that surface water run-off is managed as close to its source as possible in line with the following drainage hierarchy:

1) rainwater harvesting (including a combination of green and blue roofs)
2) infiltration techniques and green roofs
3) rainwater attenuation in open water features for gradual release
4) rainwater discharge direct to a watercourse (unless not appropriate)
5) rainwater attenuation above ground (including blue roofs)
6) rainwater attenuation below ground
7) rainwater discharge to a surface water sewer or drain
8) rainwater discharge to a combined sewer.

C Development proposals for impermeable paving should be refused where appropriate, including on small surfaces such as front gardens and driveways.

D Drainage should be designed and implemented in ways that address issues of water use efficiency, river water quality, biodiversity, amenity and recreation.

It is noted that the proposed hotel development is greater than 1,000m^2 and would be considered major development and this report will be informed accordingly.

3.0 Baseline energy results

The first stage of the Mayor's Energy Hierarchy is to consider the baseline energy model.

The following section details the baseline energy requirements for the development – the starting point when considering the energy hierarchy.

3.1 Commercial Space

The energy requirements for space heating, water heating and ventilation within the new build hotel space have been calculated using the National Calculation Method (NCM) in line with AD L2 of the Building Regulations 2021.

The Government approved assessment methodology is the Simplified Building Energy Model (SBEM), The PES Ltd use an advanced modelling software - Design Builder - which enables accurate SBEM models to be created, as well as heat loss and cooling load calculations and full M&E design to be undertaken.

To consider the subject building performance against The Building Regulations (Approved Document L2) SBEM first creates the notional reference building, the characteristics of which are defined within NCM and the minimum fabric values and fixed services efficiencies set down by AD L2.

In order to establish the baseline, the HVAC solution has been assumed as heat pump driven mechanical ventilation & cooling. Domestic Hot Water (DHW) will be supplied to the hotel from air source heat pumps via appropriately sized calorifiers and a secondary circulation loop.

Mechanical ventilation will be provided throughout.

This creates the Target Emission Rate (TER) and should be considered as stage 'zero' of the energy hierarchy as described earlier and sets the benchmark for the worst performing, but legally permissible, development against which, SBEM assesses the "actual" design, fabric values, heating lighting and ventilation systems and creates the Building Emissions Rate (BER).

Once all of the baseline emission rates have been calculated in line with the above Government approved methodologies, they are considered as stage 'zero' of the energy hierarchy as described earlier and Target Emission Rate sets the benchmark for the worst performing, but legally permissible, development.

3.2 Unregulated Energy Use

The unregulated energy use for commercial uses is obtained from the "equipment" outputs in the" energy consumption at end use" table on the rear of the BRUKL output.

Table 1 – Unregulated Energy Use

Unit	Unregulated Energy Use Kg/annum
Mercure Hotel	8,433

The un-regulated emission rates are added to the baseline regulated emission rates (as calculated under 3.1 above) in order to set the total baseline emission rates before then applying the energy hierarchy in line with The London Plan and Hillingdon' policies.

3.3 Baseline Results

The baseline building results have been calculated and are presented in Table 2 below. The Baseline BRUKL outputs are attached at **Appendix A**.

Table 2 – Baseline energy consumption and CO_2 emissions

Unit	Target Emission Rate (regulated energy use) Kg/annum	Unregulated Energy Use Kg/annum	Total baseline emissions Kg
Mercure Hotel	42,971	8,433	51,404
Development Total	**42,971**	**8,433**	**51,404**

A GLA Reporting spreadsheet for each phase is attached at **Appendix D.**

4.0 Design for energy efficiency

The first step in the Mayor's 'Energy Hierarchy' as laid out in Chapter 9 of The London Plan, requires that buildings be designed to use improved energy efficiency measures – Be Lean. This will reduce demand for heating, cooling, and lighting, and therefore reduce operational costs while also minimizing associated carbon dioxide emissions.

This section sets out the measures included within the design of the development, to reduce the demand for energy, both gas and electricity (not including energy from renewable sources). The table at the end of this section details the amount of energy used and CO_2 produced by the building after the energy efficiency measures have been included. From these figures the overall reduction in CO_2 emissions, as a result of passive design measures, can be calculated. To achieve reductions in energy demand the following measures have been included within the design and specification of the building:

4.1 Passive Design

Local and London Plan policy requires designers to introduce measures to control heat gain and deliver passive cooling.

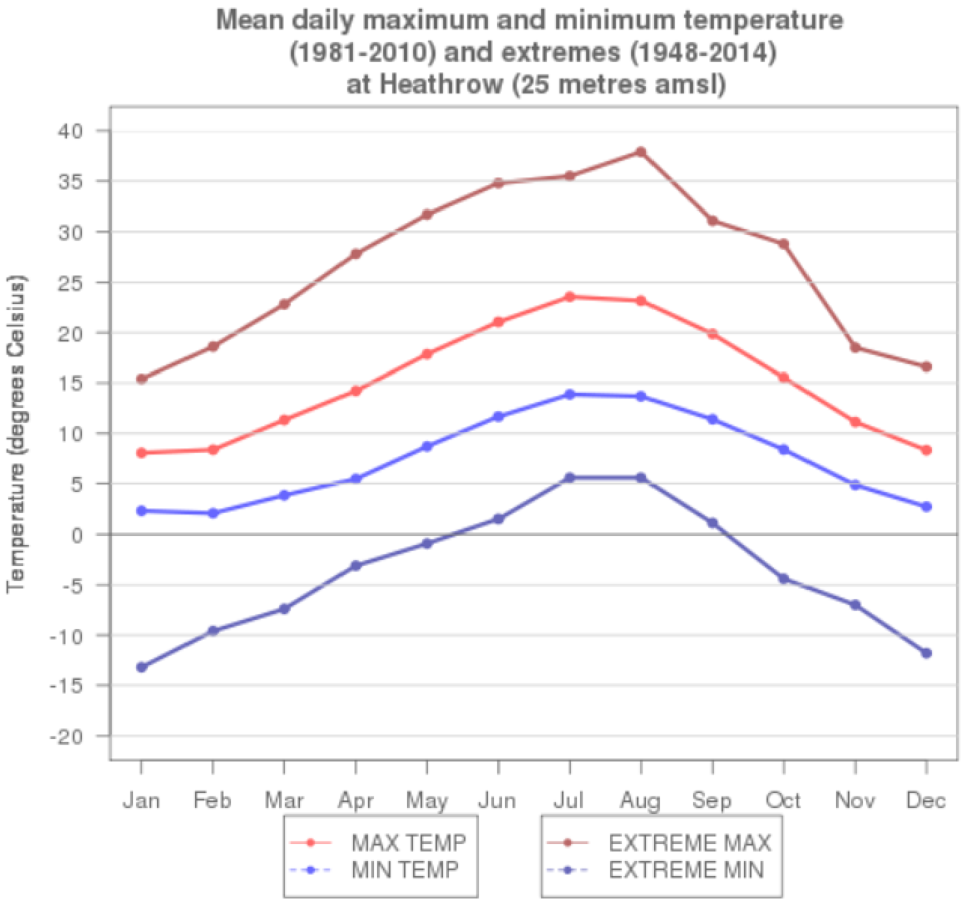
It is further explained that; "the NPPF emphasises the need to take account of climate change over the longer term and plan new developments to avoid increased vulnerability to the range of impacts arising from climate change. The UK Climate Impacts Programme 2009 projections suggest that by the 2080's the UK is likely to experience summer temperatures that are up to 4.2°C higher than they are today."

Accordingly, designers are to ensure buildings are designed and constructed to be comfortable in higher temperatures, without resorting to energy intensive air conditioning.

Accordingly, careful consideration of this issue has been undertaken as part of the application for renewal. The applicants will seek to follow the guidance within CIBSE Guide A and KS03 – Sustainable Low Energy Cooling; An Overview in order, where practical and feasible, to deliver a passive cooling strategy.

4.1.1 Local Environment

The project is located in London. Mean daily maximum temperatures range from just over 6 °C to 8 °C during the winter months and from 20 °C to 23 °C in the summer. These are comparable with typical values found in the summer in the London area which tends to be the warmest part of the UK. Thus, the area is not vulnerable to temperature extremes.



Across the region, sunshine annual averages 1600 hours in the London area, just above the UK average, while much of southern England receives less than 700 mm per year and includes some of the driest areas in the country.

The location in Hillingdon has a mix of low-rise and mid-rise accommodation, which mean that the project will not be affected by heat island effect and wind tunnels effects.

4.1.2 Passive Design

In line with current GLA Guidance, the project at the Mercure Hotel has had been designed to ensure the building is not vulnerable to overheating; to instigate consideration of the risk of overheating with the proposed development, the design team have followed the guidance within the London Plan, which consider the control of overheating using the Cooling Hierarchy:-

1. **reduce the amount of heat entering a building in summer through orientation, shading, albedo, fenestration, insulation and green roofs and wall**

The development site is based in a mid-rise to low-rise area with buildings at 3/4 storeys to the east; there will be limited topographical shading as a result.

The hotel rooms are arranged to the north, east ad west aspects, with the circulation spaces arranged to the southern aspect. The hotel rooms have very little exposure to the peak southern sun and the potential excess solar gain.

The recessed façade detail to all windows will offer an element of solar shading from the limited exposure to the peak southern sun.

Glazing specification has been considered as part of further mitigation against any overheating risk and the specified new glazing will achieve a low g-value at circa 0.35 in order to offer further solar control to the easterly and westerly aspects.

2. **minimise internal heat generation through energy efficient design**

The project will be designed to best practice thermal insulation levels as noted, full details of which are noted under 4.3 below.

Not only does good insulation assist in reducing heat losses in the winter, but it also has a significant impact on preventing heat travelling through the build fabric during the summer.

Other energy efficient design consideration include the use of LED with PIR controls; reducing internal gains and thereby potential cooling loads.

3. **manage the heat within the building through exposed internal thermal mass and high ceilings**

The new build structure is expected to be of a brick clad blockwork within a concrete frame and slab floors offering significant thermal mass able to absorb heat during the summer months, which can then be ventilated during the evening or overnight.

Exposed thermal mass within the main core will offer further thermal control

4. **passive ventilation**

All glazing is designed to have an element of opening areas to introduce natural levels of "purge" ventilation to further assist in the reduction of overheating risks.

5. **mechanical ventilation**

The project is close to the M4 and the associated poor acoustic environment precludes the potential for a purely natural ventilation strategy.

Accordingly, there is a commercial expectation that the hotel will be mechanically ventilated to ensure an acceptable internal environment.

6. **Active Cooling Systems**

It is also proposed to provide active cooling to all areas to future proof the project from the potential for overheating.

It is proposed that hybrid VRF systems will be provided for cooling. This selection of plant will be further considered through the energy hierarchy

4.1.3 Services

The team are proposing the use of localised MVHR units – induvial units in each hotel room.

The system is proposed to achieve heat recovery rates at some 85% plus.

The building will be tested for air tightness, seeking to achieve a 3 or better enables better control of the air balance into the space and optimises MVHR performance.

The design team has confirmed that the use of hybrid variable refrigerant flow heat pumps is proposed to provide heating and cooling in a superefficient manner as part of "be green" HVAC solution, whilst reducing the use of refrigerants within the building via the hybrid approach, the justification for which will be confirmed as this report progresses through the Energy Hierarchy.

Finally, a low energy lighting system – utilising linear surface mounted or suspended direct/indirect, LED luminaires in all newly created rooms and other occupied areas - controlled via reactive lighting switches and absence detectors (via key cards in the hotel rooms) - will ensure a/ minimal internal gains, b/ low energy consumption and c/ much reduced running costs.

4.2 Heating System

The "notional" heating system considered under the "be lean – use less energy" section of the Energy Hierarchy, will consist of "notional" heat pump systems providing heating and cooling with the assumption of mechanical cooling as set out in the GLA Guidance (June 2022).

The stairwells and other back of house areas with be assumed to utilise electric radiators.

Domestic hot water will also be provided by notional pumps via appropriately size calorifiers and a secondary return loop.

4.2.1 Waste Water Heat Recovery

Supplemental to the DHW system, will be the use of waste water heat recovery in the hotel showers; a heat recovery device, with the cold water supply "wrapping" around the waste water drain from the showers, recovering some 50% plus of the heat thereby reducing the hot water required at the mixer.

4.3 Fabric heat loss

Insulation measures will be utilised to ensure the calculated U-values exceed the Building Regulations minima, with specific guidance taken from the design team:-

- Wall constructions will be of highly insulated brick cladding panels and will target a U-Value of 0.15W/m^{2}k or better.
- Heavyweight roof structures will achieve a u value of 0.10W/m^{2}k via a warm roof construction.
- The newly laid floor area will achieve a minimum u value of 0.10W/m^{2}k .

Glazing

- Project glazing will be double glazed, have a u-value at 1.3 W/m^{2}k or better and will have a low g-value at 0.35 to minimise heat gains and associated cooling loads.

Air Tightness

- The completed project will be air tested to rating at circa 3m^3/hr/m^2.

4.4 Ventilation

As noted above, the proposed mechanical systems will employ heat recovery ventilation to ensure an appropriate internal environment and to maximise energy efficiency within the air tight building fabric.

The advised SFP for the localised units is to be at 0.8W/l/s or less and heat recovery in excess of 80%.

4.6 Lighting and appliances

The development will incorporate high efficiency light fittings utilising LED lamps.

Common/circulation areas will also have an absence detection system to ensure lights cannot be left on when not in occupation.

The new hotel rooms will have key-card control for electrical systems to reduce lighting and unregulated energy use.

4.7 Energy efficiency results

The above data has been used to update the SBEM models, the outputs of which are attached at **Appendix B**, which are reported within the Part L 2021 GLA reporting Spreadsheets (see **Appendix D**).The following Table 3 shows the emissions levels, as well as the overall emissions from the building.

Table 3 – Energy Efficient emission levels

Unit	Emission Rate (regulated energy use) Kg/annum	Unregulated Energy Use Kg/annum	Total emissions Kg
Mercure Hotel	27,162	8,433	35,595
Development Total	**27,162**	**8,433**	**35,595**

The results show that the energy efficiency measures introduced have resulted in the reduction in CO_2 emissions from the development by **30.8%.**

Further, the Part L 2021 reporting spreadsheet (**Appendix D**) confirms that the passive design/"Be Lean" measures have resulted in a reduction in regulated emissions at **36.8%.**

5.0 Supplying Energy Efficiently

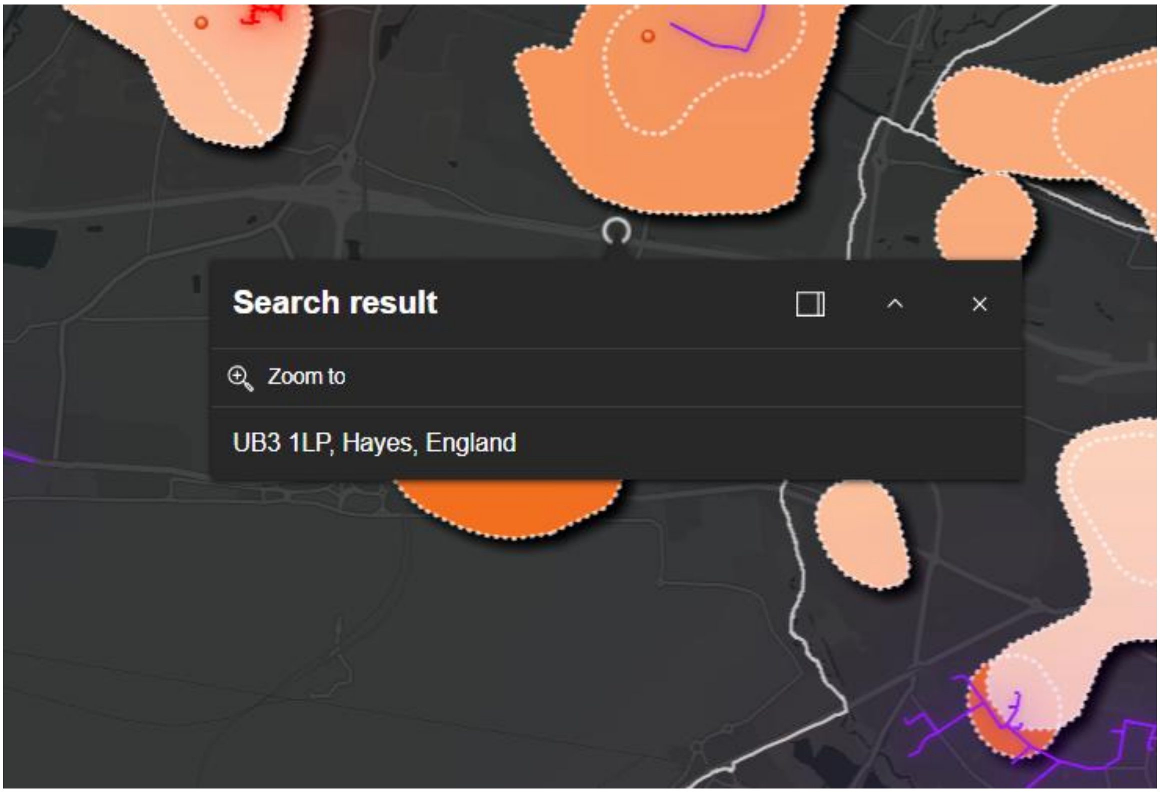
The second stage in the Mayor's 'Energy Hierarchy' is to ensure efficient and low carbon energy supply – Be Clean. In particular, this concerns provision of decentralised energy where practical and appropriate.

5.1 Community Heating/Combined Heat and Power (CHP)

The London Plan, Chapter 9, requires that major developments exploit local energy resources (such as secondary heat) and supply energy efficiently and cleanly. Development in Heat Network Priority Areas should follow the heating hierarchy in Policy SI3 Energy infrastructure.

Therefore, this report must consider the availability of heat networks in the local area

The extract from the London Heat Map (reproduced below) indicates that Mercure Hotel site is within the Heat Network Priority Area, but remote from any proposed heat network. It is also outside any area of heat network potential.



Extract from London Heat Map

As a major scheme and given the above noted location, there is an obligation to be DEN connection ready; in any hotel development in particular, the DHW demand is by far the largest of the energy loads and the calorifiers and circulation equipment will all be located at the proposed ground floor level.

Should any DEN become available to the project/hotel - then the plant space located at basement level would be available and it would be perfectly feasible to connect the hotel development to the DEN; the planning submission drawings demonstrate

- There is clearly space within the proposed grade level plant room capable of producing hot water for domestic hot water use and potentially, site wide heating distribution.
- A clear route from the plant room to the property boundary at ground floor level, roadway or similar for flow and return pipes to enable connection to a future area wide DEN.

In addition, this report demonstrates via the significant DHW proposals that: -

- Appropriate design of on-site heating systems, such as, compatible return temperatures, tees and isolation valves to facilitate the connection to a district heating heat exchanger in future.

Guidance on the design of systems to enable future connection to a DEN requires that differential temperatures (difference between flow and return temperature) in the secondary distribution networks must be kept as large as possible to minimise pipe size, enable the supply of DEN heat from various heat sources and optimise any DEN CHP output.

To ensure that low grade waste heat, and other heat sources, can be utilised on the DENs the secondary design must focus on low return temperatures.

There would also be a requirement that there is space on site for piping connecting the point at which primary piping come onto onsite with the on-site heat exchanger located in a plant room.

New developments where the detailed connection arrangement to a DEN is unknown, require physical space to be allotted for installation of heat exchangers and any other equipment required to allow connection.

The combined LTHW demand for hot water at the Mercure Hotel project can be met via a packaged skid with dimension at 1.5m x 0.5m x 2.0m (h). With an allowance for a 1m servicing area around the unit, the drawings demonstrate an allocated space where such a plant area could be developed as and when required.

Given that it would appear prudent to have the infra-structure, or at least the design to enable the infra-structure for the future inclusion of district heating, and taking into account the scale of development involved - then consideration must be given for an on-site community heating/CHP solution for the subject development.

5.3 On-site CHP/District Heating

The heat production facility for a district heating scheme is generally considered to include heat only boilers (HOB) and/or the production of both electricity and heat i.e. CHP.

In order to optimise a CHP system, "sizing" is critical to the success of the project. The aim of the process is to maximise the potential financial savings and ensure compliance with current legislation.

The most important factor is to establish the energy profiles – the site's electrical and thermal characteristics; these can be ascertained by referring to either the site's utility bills or by following dynamic design data for new build projects.

Typically, to get the full environmental and financial benefits, CHP is sized to the heat load of a site. That will recover all of the heat and give the best overall efficiency. Excess electricity generated can be exported or a shortfall in power can be met through a supplier.

To gain a good level of benefit from operating a CHP system, it is advisable that running hours are at least 4,500 hours a year, whilst having a high and constant demand for heat. However, it could still be worth exploring CHP viability for some sites with a low demand for heat if there is a high demand for electrical output, and thereby off-set peak daytime tariffs.

However, the most suitable sites for CHP generally have year-round demand for heat – domestic hot water demand - where the unit will be run as "lead boiler".

For units sized just above base load, thermal modulation is possible, where the unit is run at reduced output for short periods. In some cases, a limited amount of heat may be rejected in order to maintain the CHP unit running at full electrical output.

The key benefit from running a CHP engine is that it produces electricity, which can displace grid supplied electricity, which has significant carbon savings. It is for this reason that CHP is designed to run for as many hours of the year as possible.

A hotel scheme is usually a perfect candidate for a CHP installation - the high hot water load – present almost 24 hours a day, in combination with a low heating load (though the passive design measures already incorporated).

However, we must also consider the net carbon benefits from such a system as the de-carbonisation of national grid dilutes the benefits obtained from the higher efficiency of larger-scale CHP led system.

Reference is made to the significant CIBSE Symposium on the topic; "An operational lifetime assessment of the carbon performance of gas fired CHP led district heating" (2016).

This paper set out a calculation methodology to determine the greenhouse gas emissions associated with district heat networks which use gas fired CHP as a heat source.

At the time, Part L calculations and CHP emissions savings have been based on the grid based emission rate taken from the SAP 2012 3-year average - 519g/KwhCO2; SAP 2012 introduced a 15-year average at 381g/KwhCO2 to assist designers considering the longer term impacts.

Such a difference will markedly affect the relative calculated performance of a gas CHP engine versus a gas boiler.

The CIBSE paper further advises that "Using a typical good practice assumption of 40% thermal efficiency of the CHP, the threshold for net benefit is a grid carbon factor of around 338 gCO2/kWh. Below that threshold, CHP is found to be worse than a gas boiler and grid electricity."

DECC provides data for treating energy and emissions in their guidance; this provides projections of grid emissions factors over the next 85 years. With the rapid and recent introduction of renewable technologies to the grid – wind power and PV - DECC's "Green Book" guidance projects that grid carbon intensity will reach 338gCO2/kWh by 2017/18 and will reach 300gCO_2/kWh by 2018/19.

SAP10.2 data, introduced in 2022 and being utilised within this report uses a figure of 136gCO_2/kWh.

So it can be surmised, that by the time an CHP led communal network at Mercure Hotel has reached maturity in 2 or 3 years, the carbon benefits will already have been lost.

The use of on-site CHP can be dismissed.

6.0 Renewable Energy Options

The final element of the Mayor's 'Energy Hierarchy' requires development proposals should provide a reduction in expected carbon dioxide emissions through the use of on-site renewable energy generation, where feasible – Be Green.

Renewable energy can be defined as energy taken from naturally occurring or renewable sources, such as sunlight, wind, wave's tides, geothermal etc. Harnessing these energy sources can involve a direct use of natural energy, such as solar water heating panels, or it can be a more indirect process, such as the use of Biofuels produced from plants, which have harnessed and embodied the suns energy through photosynthesis.

The energy efficiency measures and the sourcing the energy efficiently outlined above have the most significant impact on the heating and hot water energy requirements for the development, and the associated reduction in gas consumption.

It should be noted, that when using SAP10 emission factors, each kWh of gas energy saved reduces emissions by 0.210kgCO_2/kWh, whereas, grid based electrical energy has a emissions factor of 0.136kgCO_2/kWh but a much higher cost – some 3.5 that of gas - and accordingly, emphasis will be placed upon "off-setting" grid based electricity in order to achieve the optimum use of renewable technologies, albeit, it should be noted that the emissions reduction impact of renewable technologies actually generating electricity will be considerably reduced.

This section then sets out the feasibility of implementing different energy technologies in consideration of: -

- Potential for Carbon savings
- Capital costs
- Running costs
- Payback period as a result of energy saved/Government incentives
- Maturity/availability of technology
- Reliability of the technology and need for back up or alternative systems.

6.1 Government incentives

6.1.1 Smart Export Guarantee (SEG)

Introduced in 2020, the SEG will enable solar photovoltaic (PV), wind, hydro and anaerobic digestion (AD) installations up to 5MW and micro-combined heat and power (micro-CHP) up to 50kW will be able to receive an export tariff under the policy.

The SEG is a market-led initiative, requiring electricity supply licensees to offer export tariffs to eligible generators. Suppliers are free to set their own SEG compliant tariff price (provided it is above zero pence at all times) and decide how their tariffs work.

Installation owners are able to shop around and select the Licensee of their choice based upon an offer of the most appropriate tariff.

Payment are made against metered exports only.

6.2 Wind turbines

Wind turbines come in two main types'- horizontal axis and vertical axis. The more traditional horizontal axis systems rotate around the central pivot to face into the wind, whilst vertical axis systems work with wind from all directions.

The potential application of wind energy technologies at a particular site is dependent upon a variety of factors. But mainly these are: -

- Wind speed
- Wind turbulence
- Visual impact
- Noise impact
- Impact upon ecology

The availability and consistency of wind in urban environments is largely dependent upon the proximity, scale and orientation of surrounding obstructions. The proposed development is close to Heathrow Airport, and any significant wind turbine development would be considered highly inappropriate in this location.

6.3 Solar Energy

The hotel roof space has limited areas could accommodate solar panels orientated to the south.

In general, the roofs will have an unrestricted aspect, so there is scope therefore to site solar photovoltaic (PV) or water heating equipment at roof level.

6.3.1 Solar water heating

Solar water heating panels come in two main types; flat plate collectors and evacuated tubes. Flat plate collectors feed water, or other types of fluid used specifically to carry heat, through a roof mounted collector and into a hot water storage tank. Evacuated tube collectors are slightly more advanced as they employ sealed vacuum tubes, which capture and harness the heat more effectively.

Both collector types can capture heat whether the sky is overcast or clear. Depending on location, approximately 900–1100 kWh of solar energy falls on each m^2 of unshaded UK roof surface annually. The usable energy output per m^2 of solar panel as a result of this amount of insolation ranges from between 380 – 550 kWh/yr.

Solar hot water systems are of course, displacing gas or high efficiency heat pumps for DHW provision; accordingly solar thermal systems tend to have a very poor pay back model.

Accordingly, given the limited roof space available and the strategy to off-set the electrical use, solar PV may be a stronger candidate (see below) and offer a greater return in terms of a return on investment.

Accordingly, solar thermal would not be the optimum solution for the proposed development.

6.3.2 Photovoltaics (PV)

A 1kWp (1 kilowatt peak) system in the UK could be expected to produce between 790-800kWh of electricity per year based upon a south east orientation according to SAP2005 methodology used by the Microgeneration Certification Scheme (MCS). The figure given in the London Renewables Toolkit is 783 kWh per year for a development in London.

Despite the withdrawal of the Feed in Tariff, PV panels also offer an attractive return due to the ever increasing cost of grid based electricity, some 8-9% subject to installation costs.

Accordingly, all the available roof space will be utilised for a 67 Panel/29.48kWp PV array – generating some 24,300kWh/annum.

6.3.3 Battery Storage & Demand Response

Battery storage enables the project to store electricity overnight, taking advantage of dual tariff electricity rates, and then discharging the batteries into the building once operational.

This in turn enables the part discharged batteries to capture any PV output not used in the building during the peak day time generation period.

The operation of battery storage in this manner can provide a yield in excess of 12%, whilst in their own small way, assist the national grid by storing overnight renewable energy generation from wind farms.

All of the Above measures improve the project's demand response - a reduction in peak demands for heating, cooling and ventilation, further assisted by load and weather compensation controls and the above noted battery storage facilities.

6.4 Biomass heating

Biomass is a term given to fuel derived directly from biological sources for example rapeseed oil, wood chip/pellets or gas from anaerobic digestion. It can only be considered as a renewable energy source if the carbon dioxide emitted from burning the fuel is later recaptured in reproducing the fuel source (i.e. trees that are grown to become wood fuel, capture carbon as they grow).

Biomass heating systems require space to site a boiler and fuel hopper along with a supply of fuel – which can be very bulky items. There also needs to be a local source of biomass fuel that can be delivered on a regular basis. There are also issues with fuel storage and delivery which mitigate against this technology.

Additionally, a boiler of this type would replace the need for a conventional gas boiler and therefore offset all the gas energy typically used for space and water heating. However, biomass releases high levels of NO_x emissions and particulate matters, as well as other pollutants and would therefore have to be considered carefully against the high standard of air quality requirements the London boroughs; indeed, the whole of Hillingdon is a designated air Quality Management Area. Accordingly, the use of biomass is not considered appropriate for this project.

6.6 Ground source heat pump

All heat pump technologies utilise electricity as the primary fuel source – in this case displacing gas, as such, the overall reduction in emissions when using this technology can be less effective when opposed to a technology that is actually displacing electricity.

Ground source heating or cooling requires a source of consistent ground temperature, which could be a vertical borehole or a spread of pipework loops and a 'heat pump'. The system uses a loop of fluid to collect the more constant temperature in the ground and transport it to a heat pump. In a cooling system this principle works in reverse and the heat is distributed into the ground.

The heat pump then generates increased temperatures by 'condensing' the heat taken from the ground, producing hot water temperatures in the region of 45°C. This water can then be used as pre-heated water for a conventional boiler or to provide space heating with an under floor heating system.

The use of a ground source heating/cooling system will therefore require:

- Vertical borehole or ground loop
- Use of under floor heating
- Space for heat pump unit

Clearly, there is insufficient land area to install low level collector loops, leaving deep bore GSHP as the only potential option.

Normally the boreholes would need to be 6 to 8 metres apart and a 100 metre deep borehole will only provide about 5kW of heat. The borehole should also be formed around 3m away from the perimeter of the building and most specialists don't recommend using the structural boreholes.

Clearly, in the case of the proposed Mercure Hotel project, there is no scope for the locating of the ground collector devices and as such, ground source heating cannot be considered.

6.7 Air source heat pump

Air source heating or cooling also employs the principle of a heat pump. This time either, upgrading the ambient external air temperature to provide higher temperatures for water and space heating, or taking warmth from within the building and dissipating it to the outdoor air.

Given the requirement to future proof the development against future overheating potential, the design team are considering the use of variable refrigerant (VRF) flow air-to-air heating and cooling system which incorporates inter-zone heat recovery.

VRF systems can have numerous indoor units, served by a single outdoor unit, in both heating and cooling modes simultaneously. This mixed mode operation leads to energy savings as both ends of the thermodynamic cycle are delivering useful heat exchange. If a system has a cooling COP (Coefficient of Performance) of 3, and a heating COP of 4, then heat recovery operation could yield a COP as high as 7.

VRF typical layout

It should be noted that this perfect balance of heating and cooling demand is unlikely to occur for many hours each year, but whenever mixed mode is used energy is saved. In mixed mode the energy consumption is dictated by the larger demand, heating or cooling, and the lesser demand, cooling or heating is delivered free.

Accordingly, the design team are proposing the use of a Hybrid VRF heat recovery heating and cooling to service the space conditioning at the new hotel development.

Hybrid VRF is a Heat Recovery VRF System that replaces refrigerant with water between the Hybrid Branch Circuit Controller and the indoor units, using 30-40% less refrigerant, and enables zero refrigerant in occupied spaces.

This approach will also obviate the need to utilise the fossil fuels, and in keeping with this strategy.

DHW will also be provided via twin compressor air-to-water technology - generating the hotel rooms' DHW requirements at an efficiency of 395%.

As part of the electrical only strategy – limited back of house areas will utilise electric panel radiators.

6.8 Demand Side Response

6.8.1 Peak Load Reduction

The development features new and existing building elements. The performance of the existing and new fabric has been optimised to reduce the peak heating and cooling loads; this includes the enhancement of the building fabric/air permeability.

Having worked to reduce the peak loads, highly efficient heat pumps are proposed to meet the heat/coolth loads, such that the electrical demand is reduced.

6.9 Final Emissions Calculation

Given the outcome of the feasibility study above, the developer is proposing the use of hybrid VRF heat pump technology, to provide the required heating and cooling to the new hotel, with advanced air-to-water heat pump technology providing the DHW to the hotel.

A array of 67 PV panels will finalise the renewables mix.

The final table – Table 5 – summarises the final outputs from the SBEM models; the output attached at **Appendix C.**

Table 5 – "Be Green" emission levels

Unit	Emission Rate (regulated energy use) Kg/annum	Unregulated Energy Use Kg/annum	Total emissions Kg
Mercure Hotel	18,633	8,433	27,066
Development Total	**18,633**	**8,433**	**27,066**

The data at Table 5 confirms that overall emissions – including unregulated energy use - have been reduced by **47.4%** over and above the baseline model, with a **16.6%** reduction in emissions directly from the use of energy generating and renewable technologies, i.e. over and above the energy efficient model.

Excluding the un-regulated use, i.e. considering regulated emissions controlled under ADL2, then the final reduction in equates to **56.6%.**

Further reporting requirements for referable schemes are tabulated below.

Table 6 – Energy and Heat Demands

Building Type	Energy Use Intensity (kWh/m^2/year)	Space Heating (kWh/m^2/year)
Mercure Hotel	70.4	10.2

7.0 "Be Seen"

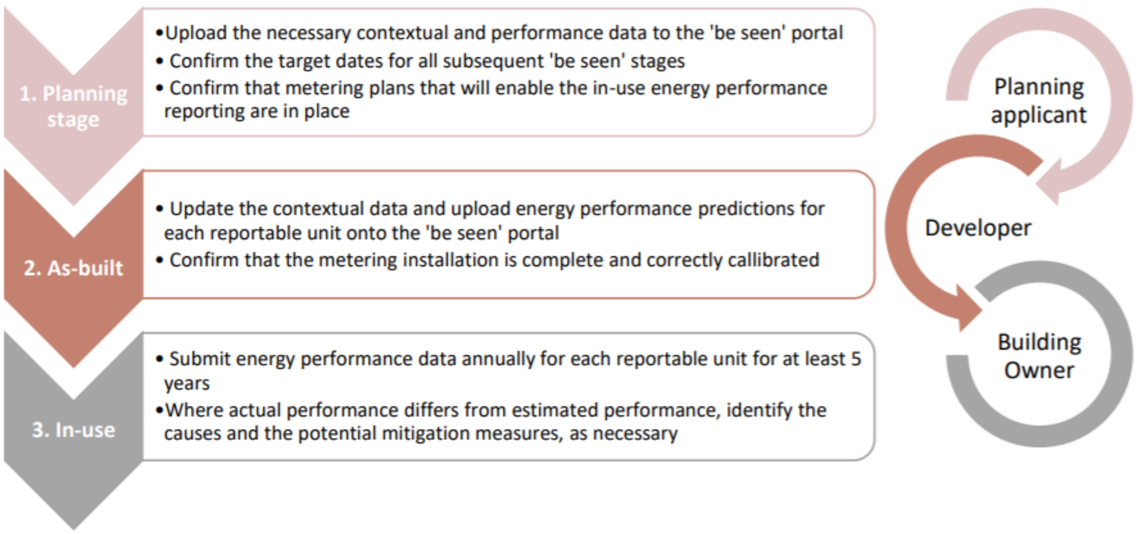
The "Be Seen" Energy Monitoring Guidance Consultation Draft was published in October 2020, adopted in September 2021.

Although Part L calculations and Energy Performance Certificates (EPCs) give an indication of the theoretical performance of buildings, it is well established that there is a 'performance gap' between design theory and measured reality.

To address this gap the London Plan Policy SI 2 'Minimising greenhouse gas emissions' introduces a fourth stage to the energy hierarchy; the 'be seen' stage, which requires monitoring and reporting of the actual operational energy performance of major developments for at least five years via the Mayor's 'be seen' monitoring portal.

The 'be seen' policy establishes post-construction monitoring as good practice, enabling developers and building owners to better understand their buildings and identify methods for improving energy performance from the project inception stage and throughout the building's lifetime.

The extract below graphically 'be seen' process through the reporting stages of a development including the parties likely to be responsible for the provision of the necessary data at each reporting stage.



The applicants make the commitment that the development will be designed to enable post construction monitoring and that the information set out in the 'be seen' guidance is submitted to the GLA's portal at the appropriate reporting stages.

It is further acknowledged that this will be secured via legal agreement.

8.0 Sustainable Design & Construction

The sustainable assessment criteria as developed by BRE are utilised within this report to confirm that the development meets with the requirements of the Hillingdon' sustainability policies

8.1 BREEAM New Construction V7

The new hotel scheme at Mercure Hotel site will be designed to achieve a rating of BREEAM Excellent.

A formal pre-assessment report is attached at **Appendix E**, demonstrating that the project can achieve a minimum score at **73.58%.**

8.1.1 Energy efficiency; vacant & underused land and buildings

For matters of Passive Design, Solar gain control & daylighting, Ventilation, Thermal Performance, Services Strategy, Low or zero carbon technologies and overall Energy Performance, all these matters have been dealt within the London Plan compliant Energy Statement within Sections 2 to 6 above.

8.1.2 Materials

The design team have put a strong focus on sustainability and durability when considering construction profiles and building materials for the development. High Green Guide ratings will be achieved wherever possible and materials will be assessed for suitability with regards to Whole Life Costs.

Insulating materials will be specified to maximise thermal performance whilst still paying attention to the environmental impact of the materials used. The use of recycled products will be pursued wherever feasible and the use of other low embodied energy products will be further investigated.

Responsible sourcing will also be pursued. All timber used on site during the construction phase and within the building will be from FSC sources or equivalent. Other materials, including insulation, will be sourced from manufacturers who employ environmental management systems such as ISO 14001 or BES 6001. Where possible, materials will be sourced locally.

Non-toxic materials will be used wherever possible, including the specification of products with low VOC content in line with European testing standards.

A Site Waste Management Plan (SWMP) will be produced for the site, which will determine how to maximise the recovery of materials from the demolition and enabling works for subsequent high-grade/value applications.

8.1.3 Air pollution

Construction site impacts

The construction site will be managed in such a way that the environmental impact is minimised. This includes following best practice policies for dust pollution by using dust sheets, covering skips and damping down where appropriate.

The contractor will be enrolled on the Considerate Constructors Scheme and achieve a best practice score of at least 35.

Plant and machinery

All plant and equipment installed in the building will be appropriately sized and selected for efficiency in order to reduce greenhouse gas emissions. All equipment will be frequently maintained to ensure it continues to run efficiently and cleanly.

Operational impacts

The use of heat pump technology for all heating systems and domestic hot water systems, confirms that the project will have a neutral impact on local air quality – emitting zero low pollutants.

As a car free development – as per the Mayor's definition, with no additional car parking provided on site - the project is also air quality neutral in respect of any transport emissions associated with the new hotel proposals.

8.1.4 Noise pollution

Construction site impacts

The construction site will be managed in such a way that the environmental impact is minimised. This includes following best practice policies to minimise noise pollution, including the use of quieter machinery where possible. Site working hours will be managed to mitigate the possibility that they will cause a nuisance to the surrounding properties.

Noise impact of the building

The development will comply with Building Regulations Part E, providing a good level of sound insulation between the proposed development and surrounding buildings. All new windows will be double glazed to minimise the transmission of noise between the building and adjacent properties.

External plant that could cause a noise nuisance will have appropriate acoustic treatment - specifically designed enclosures

8.1.5 Contaminated land

It is not thought that the site is contaminated.

The proposed building use will not involve the storage, processing or transfer of hazardous substances.

8.1.6 Water quality, saving and drainage

Flood risk and surface water drainage

The site is within an area of very low risk of flooding from rivers, sea and surface water.

However, the design team have commissioned a formal report to consider the projects risk of flooding from all sources, the projects impact on surface water run-off and appropriate attenuation measures.

Water consumption

Internal potable water use will be limited through the specification of low flow fittings and dual flush toilets. All white goods provided will have maximum water efficiency ratings.

The following specifications will be considered in order to meet the water consumption target:

- Showers - 9l/min
- Basin Taps - 5l/min
- WCs – 5/2.6 litre flush

Construction site impacts

The construction site will be managed in such a way that the environmental impact is controlled and minimised. Best practice guidelines for preventing water pollution will be followed on site.

8.1.7 Light pollution

The development is in a highly urbanised location, and therefore will significantly not contribute to increasing the effects of light pollution.

The design team will follow the appropriate ILE design guidance with a view to achieving compliance.

8.1.8 Waste and recycling

Site waste management

A construction site resource management plan will be developed and implemented to ensure that construction site waste is effectively reduced and recycled, including designing waste out from the initial stages. Material ordering control and modern construction methods will be employed to minimise the potential for waste on site.

Waste will either be segregated on site into at least 5 different streams for recycling or collected, sorted and recycled by an external recycling contractor. Re-use of construction waste will also be encouraged. The site waste management plan will also ensure that hazardous waste is properly managed.

Operational waste management

The recycling of operational waste once the building is occupied will also be encouraged through the provision of recycling facilities and dedicated internal and external storage for recyclable materials, separate to those for domestic refuse.

8.1.9 Amenity, environmental quality, daylight and sunlight

The impact on sunlight and daylight to the surrounding buildings is subject to a separate report.

There are limited opportunities to incorporate landscaping and habitat creation into the development, which is on a constrained site in a highly urbanised location. A suitably qualified ecologist will be employed to assessment the site as existing and to report on opportunities for a general enhancement of site ecology in conjunction with a long term strategy for maintenance with appropriate landscaping proposals.

The BREEAM pre-assessment documents (**Appendix E**) offer further background on all of the above elements.

9.0 Conclusions

This report has detailed the baseline energy requirements for the proposed hotel development, the reduction in energy demand as a result of energy efficiency measures and the potential to achieve further CO_2 reductions using renewable energy technologies.

Throughout the assessment against the energy hierarchy – as set out in The London Plan – SAP10.2 emissions data has been used in line with the very latest GLA guidance on the preparation of energy statements.

The baseline results have shown that if the phased development was built to a standard to meet only the minimum requirements of current building regulations, the total amount of CO_2 emissions would be **51,404Kg/year**.

Following the introduction of passive energy efficiency measures into the development, as detailed in section 4, the total amount of CO_2 emissions would be reduced to **35.595Kg/year**

There is also a requirement to reduce CO_2 emissions across the development using renewable or low-carbon energy sources. Therefore the report has considered the feasibility of the following technologies:

- Wind turbines
- Solar hot water
- Photovoltaic systems
- Biomass heating
- CHP (Combined heat and power)
- Ground & Air source heating

The results of the assessment of suitable technologies relative to the nature, locations and type of development suggest that the most suitable solution to meeting reduction in CO_2 emissions would be via the use of hybrid VRF heat pump technology to service the heat and cooling loads, as well as the use of twin compressor heat pumps to deliver the required DHW demand to the hotel.

There will also be a 67 panel/29.48kWp PV array at top floor roof level.

This has been used in the final SBEM model (reproduced at **Appendix C**) for the development which have also been detailed above in Table 5, which show a final gross emission level of **27,066Kg/year**, representing a total reduction in emissions over the baseline model, taking into account unregulated energy, of **47.4%.**

In addition, the final SBEM outputs at **Appendix C** and the associated GLA calculations at **Appendix D** demonstrate that the building achieves an overall improvement in emissions over the baseline standards for regulated emissions of minimum of **56.6%**.

Tables 7 & 8 Demonstrate how the development Mercure Hotel project complies with the London Plan requirements and the GLA guidance relating to zero carbon development.

Table 7 – Carbon Emission Reductions – Non-domestic Buildings

Key	Tonnes/annum
Baseline CO_2 emissions	43.0
CO2 emissions after energy demand reduction (be lean)	27.2
CO2 emissions after energy demand reduction (be lean) AND heat network (be clean)	27.2
CO2 emissions after energy demand reduction (be lean) AND heat network (be clean) AND renewable energy (be green)	18.6

Table 8 – Regulated Emissions Savings – Non-domestic Buildings

	Regulated Carbon Dioxide Savings	
	(Tonnes CO2 per annum)	%
Savings from energy demand reduction	15.8	37
Savings from renewable energy	8.5	20
Total Cumulative Savings	24.3	57
	(Tonnes CO_2)	
Carbon Shortfall	18.6	
Cumulative savings for off-set payment	559	
Cash-in-lieu Contribution	**£53,105**	

Appendix A

Baseline/Un-regulated Energy Use:-

SBEM BRUKL outputs – "Baseline"

Appendix B

Energy Efficient Design:-

SBEM BRUKL outputs – “Be Lean”

Appendix C

Generating energy on-site:-

SBEM BRUKL outputs – “Be Green”

Appendix D

Part L SAP2021 Emissions Calculations

Appendix E

BREEAM New Construction V7

Pre-assessment Estimator and Report