

**Sunlight House
Office Refurbishment**

**Energy Statement
For Planning**



2nd Floor, Queens Chambers

5 John Dalton Street

Manchester

M2 6ET

Web: www.kingassociates.uk

Submitted and Prepared by: Matt Hakes

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Approvals

This document requires the following approvals.
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Name	Signature	Title	Date of Issue	Version
Rich Hart		Director	23/01/2023	P1
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Distribution

Name	Organisation	Role
Jay Patel	Savills	Planning Consultant
Ed Spencer	Colliers	Project Manager
Liam Spencer	Anomaly	Architect
Kilian Kleine	Kinrise	Client



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1.0 Executive Summary

This Energy statement is intended to support the planning applications for the refurbishment works to the Grade 2 listed Sunlight House. In line with Manchester City Council guidance documents our approach to design follows the Energy hierarchy of Be Lean, Be Clean, Be Green as described herewith.

The listed building will utilise passive design techniques the principles of a 'Fabric First' approach, whereby the construction budget is invested wherever feasible in the building fabric and smart systems rather than simply relying on renewable energy bolt-on technologies to offset energy consumption.

Our fabric improvements include:

- Glazing Upgrades inc. secondary glazing to the majority of sash windows to be respectful of the building's heritage status
- Improved air leakage

The design team have approached the development in a holistic manner ensuring that the building services installations compliment the fabric and structure and to ensure that energy used within the buildings is used efficiently

The building will be served by:

- New Ambient Loop Air Source Heat Pump Installation
- Point of Use Hot Water system (No standing or circulation losses)
- High Efficiency LED Lighting – circa 160LL/cw

Photovoltaics (PV) are proposed on the roof which will be respectful of the buildings heritage status.

This forward-thinking development is all-electric as this will take advantage of the reducing electricity grid CO₂ emissions intensity as the national electricity grid decarbonises in the future.

It also will reduce the combustion of fossil fuels in city centres contributing to better air quality for the city

The impact of the works outlined is an improvement in the EPC rating from an E to a B and a 65% reduction carbon emissions equating to 458 tons of carbon saved.

2.0 Introduction

This outline statement has been prepared to outline the energy strategy for Sunlight House with a view to futureproofing the development and to reduce the reliance on fossil fuels in Manchester city centre.

The Statement supports two sets of applications that are being submitted to Manchester City Council:

- Planning and Listed Building Consent for relocation of MEP Plant from the adjacent car park to the roof space of Sunlight House and the installation of PVs on the roof; and,
- Listed Building Consent of the internal refurbishment of the office and ground floor reception area.

Consideration will be given to the opportunities for passive design measures, energy efficiency measures and feasible low and zero carbon technologies, in keeping with an 'Energy Hierarchy' approach across both sets of applications.

This report will also establish the most appropriate recognized local (on-site or near-site) low or zero carbon (LZC) energy source(s).

This study covers:

- All technologies appropriate to the site and energy demand of the development
- Reasons for excluding other technologies
- Energy performance

Suitable technologies are analyzed in greater detail and their contributory energy and carbon emission savings were calculated and provided.

3.0 Energy Hierarchy

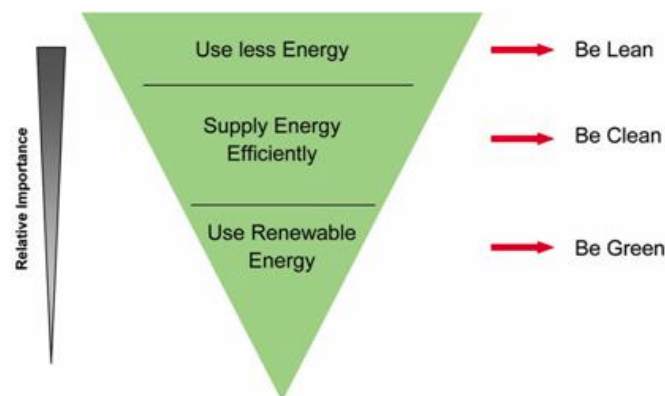
The development of the design will adopt a hierarchy approach to the design by looking at passive design methods to reduce energy and provide a high level of energy efficiency.

The Energy Hierarchy states that, in order to design an energy efficient development, the development must first be designed to use less energy through passive measures, such as improved fabric and glazing and improved air tightness.

The second stage is to use 'Clean' energy, such as Air Source Heat Pumps and low energy LED lighting etc.

The third and final stage is to assess whether other Low and Zero Carbon (LZC) technologies can be incorporated, such as photovoltaic panels, solar thermal heating or wind turbines.

This design process will be followed throughout the design development.



3.1 Be Lean - Thermal Elements

To facilitate the development, the following elements have been considered through the design process from both an energy efficiency and thermal comfort perspective:

- Fabric insulation levels – balancing thermal performance and internal temperatures.
- Building air permeability – this is a constraint due to the nature of the building.
- Thermal mass – exploiting the properties of the constructions to benefit the internal environment.
- Glazing strategy – optimised to provide natural ventilation
- Ventilation strategy – introducing heat recovery ventilation systems wherever feasible

Fabric	
Floor	Existing floor – no works proposed
Roof	Vaulted ceiling makes an upgrade technically very difficult
Wall	Thermal upgrade via external insulation not feasible due to Heritage constraints. Internal insulation (re-lining) technically difficult and impacts on heritage features such as window reveals.
Windows	Existing sash windows are to be retained with office areas to benefit from Secondary Glazing

Air Leakage	An air leakage specialist will be employed to reduce the air permeability and associated heating loss
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There are three key criteria when considering the glazing strategy for the development. These are energy efficiency, daylighting and summertime internal temperatures. They are intrinsically linked and will be considered holistically to determine the optimum strategy to achieve a comfortable, productive and healthy environment in all weather conditions, whilst making best use of the sun as a natural heating source.

3.2 Be Clean - Efficient Use of Power

Once the initial heating and cooling demand has been reduced through implementing the 'Be Lean' stage of the Energy Hierarchy, the remaining energy demand should be served in an efficient way, further reducing energy consumption and carbon emissions.

Proposed Systems	
Heating & Cooling	Highly efficient Ambient Loop and VRF solution to be provided
Hot Water	Local Elec Water Heaters
Water Usage	Low Flow Sanitaryware to be specified
Ventilation	Existing Natural Ventilation to be retained due to constraints of existing building and Heritage status
BMS	Smart BMS controls to optimise energy performance and occupant comfort levels
Lighting	High efficacy LED lighting inc. Presence and daylight controls

3.3 Be Green- Sustainable Design Options

The following table outlines the sustainable design options that have been considered and the technologies most appropriate are highlighted as suitable:

TECHNOLOGY	TYPICAL PAY BACK PERIOD	LIFE EXPECTANCY	SPATIAL REQUIREMENTS	PLANNING REQUIREMENTS	NOISE / SHADOWING IMPACT	FURTHER COMMENTS
HYDRO-POWER	N/A	N/A	N/A	N/A	N/A	This site is not suitable.
COMBINED HEAT & POWER	15-20 years	10 -15 years	Large plant space required for heavy plant.	King Associates are unaware of any planning requirement which would preclude the use of this technology. However, the impact of such large plant on the character and fabric of the listed building would need to be considered.	A CHP to serve this building would need significant noise treatment to meet the requirements.	For the proposed scheme the heating and electrical loads of the building are not suitable to support this technology. To be considered if pool retained.
GROUND / WATER SOURCE HEAT PUMPS	6 – 10 years (with cooling demand)	15-20 years	Deep boreholes or Large external area (e.g. Sports field) required.	King Associates are unaware of any planning requirement which would preclude the use of this technology. However, the impact of such large plant on the character and fabric of the listed building would need to be considered.	N/A	Low end of payback can only be achieved with High Cooling load. High Capital cost involved, and extensive ground works required. Economically unfeasible
AIR SOURCE HEAT PUMPS	15 – 20 years	15-20 years	External plant area required.	Discussion required with planners.	The plant space may need to be acoustically shielded to meet noise criteria.	Lower end of payback achieved with high cooling load. Limited space for located externally and internal plant.

TECHNOLOGY	TYPICAL PAY BACK PERIOD	LIFE EXPECTANCY	SPATIAL REQUIREMENTS	PLANNING REQUIREMENTS	NOISE / SHADOWING IMPACT	FURTHER COMMENTS
WIND POWER	20 years	12 – 15 years	Large base or supporting structure.	Unlikely to be acceptable on the character and appearance of the listed building and due to the proximity of surrounding buildings.	This technology is likely to cause shadowing and flicker, to the surrounding buildings.	The site wind speeds are unlikely to support a substantial Wind powered installation. Technically unfeasible
BIOMASS	10-15 years	15-20 years	Large plant and fuel storage space required at ground level.	King Associates are unaware of any planning requirement which would preclude the use of this technology. . However, the impact of such large plant on the character and fabric of the listed building would need to be considered.	N/A	The site layout requires considerations for dedicated fuel delivery routes and storage. These Logistic issues make this technology unfeasible.
PHOTOVOLTAICS	8 - 12 years	15 - 20 years	Structurally supported roof space required with maintained access.	Discussion required with planners. Could be designed to minimise impact on the character and fabric of the listed building.	N/A	Whilst feed in tariffs make this technology commercially viable significant energy and carbon reductions require large areas for plant.
SOLAR THERMAL	15 – 20 years	15 years	Structurally supported roof space required with maintained access.	Discussion required with planners.	N/A	Roof space better utilised for PV.
RAINWATER HARVESTING	TBC	20-30 years	Water storage required at or below ground	King Associates are unaware of any planning requirement which would preclude the use of this technology. However, the impact of such large plant on the character and fabric of the listed building would need to be considered.	N/A	Storage technically very difficult. The building's WC / grey water load profile is unlikely to result in a worthwhile investment.

The table below demonstrates whether a technology is accepted as feasible or dismissed, with reasons given. If a technology is accepted, it shall be reviewed in further detail in Section 5:

LOW OR ZERO CARBON TECHNOLOGY	ACCEPTED/DISMISSED AS BEING FEASIBLE	PRIMARY REASON(S) FOR DISMISSAL
HYDRO-POWER	Dismissed	The site is geographically unsuitable for this technology.
COMBINED HEAT & POWER	Dismissed	To be considered during Leisure refurbishment (future phase)
GROUND / WATER SOURCE HEAT PUMPS	Dismissed	The site is too restricted, and boreholes are cost prohibitive
AIR SOURCE HEAT PUMPS	Accepted	High efficiency air source heat pumps shall be installed to provide the thermal energy to the centralised ambient loop water system.
WIND POWER	Dismissed	The site is geographically unsuitable for this technology.
BIOMASS	Dismissed	The logistics of fuel deliveries and ongoing maintenance uplift make this option unfeasible
PHOTOVOLTAICS	Accepted	Final configuration will be subject to confirmation of the panel type and linear performance efficiency
SOLAR THERMAL	Dismissed	Roof space was determined to be better used to house Photovoltaic (PV) panels.
RAINWATER HARVESTING	Dismissed	Deemed to be economically unfeasible

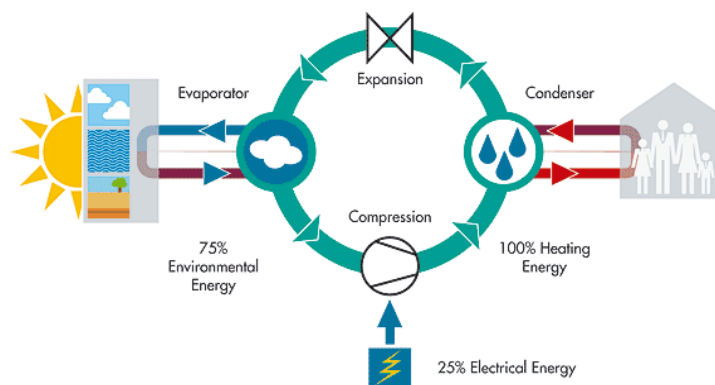
4.0 Renewable Technologies Overview

Air Source Heat Pump

System Description

Air source heat pumps transfer the renewable heat stored in the air into a building to provide space heating and/or domestic hot water demand. Although the air temperature fluctuates throughout the year modern compressor technology allows ASHPs to work down to -25°C.

Utilising the heat energy from the air as a heat source and passing this through the refrigeration cycle, this heat energy can be upgraded to a flow temperature of 25°C and is suitable for an Ambient Loop system which can then serve VRF Heating & Cooling fan-coils.



Advantages

- Cost effective installation
- The system has a good seasonal efficiency, operating up to the 3.5:1 level of performance (35kW of heat output for every 10kW of electricity used in the generation of this heat).
- Large expanses of land are not required
- Higher efficiencies can be achieved in warmer ambient conditions
- If operating using renewable electricity, it can be considered completely clean energy

Disadvantages

- Lower efficiencies and COP's than ground source as the air temperature can go lower than ground making it more difficult to extract useful energy

- External plant would be required.
- External plant requires acoustic consideration

Suitability of the site

The assessment of the site has shown that this technology is suitable for generation of hot water as a centralised system.

Typical image of heating/cooling chiller that would be suitable for large scale loads utilising ASHP technologies serving hydronic systems.



Solar PV

System Description

Photovoltaic cells convert sunlight directly into electricity with no waste and no emissions. When the light from the sun hits the silicon in the PV cell direct current electricity (DC) is created. The DC is collected in a central location and converted to alternating current (AC) so that it can be used to supply household appliances.

During daylight hours electricity produced from PV panels would be supplemented by the local distribution network operator (DNO). If, however, excess electricity is produced then electricity can be fed back into the electricity grid.

This type of system depends on the roof area available facing predominantly south with a horizontal angle of up to 40°. Roofing products that can replace conventional roof tiles or framed systems attached to the roof can be installed.

Alternatively, PV cells can be mounted on vertical façades of the building or mounted horizontally on solar shading elements of the building structure such as brise soleil, or set inside glazing elements of windows to act as a solar shading frit as well as an electricity generator.

The electricity generated by the PV cell can be stored or used in one of the two following manners.

Battery storage

The electricity generated by the PV cells is produced as direct current (DC) electricity. This can be taken from the cells and stored directly into batteries. The batteries can then be discharged as and when required through a DC to AC convertor unit and the AC electricity can then be used to power standard equipment.

Typically the peak daily supply from the PV array will be during the middle of the daytime whilst the peak daily demand of the building occurs either early in the morning or in the evening. This results in energy being imported or exported unnecessarily and the full commercial benefits of the PV are not realised. A battery solution assists by storing the peak excess and holding it to be released later in the evening when the demand is at a peak.

Life Expectancy and Maintenance

PV cells are a relatively new technology and therefore there is no firm and proven research into the maximum life expectancy of the cells. The cells themselves have no mechanical parts and are therefore not susceptible to any wear and tear that limits the life expectancy of such systems as fans and pumps etc. However the current estimated advised by PV cell manufacturers is that the operating efficiency of the cells will decrease to 90% after the first ten years followed by a further decrease to 80% output after 25 years.

With regard to maintenance, the systems can be regarded as low maintenance items that only require periodic cleaning of the panels to ensure maximum sunlight is getting through to the panels. The individual cells embedded within the glass are wired in series circuits therefore any failure of a single cell would render the whole pane non operative.

Individual panes are best cabled in parallel circuits however, to ensure that the loss of one PV/Glass panel would not affect the operation of the other units.

Advantages

- The system is simple to operate with very low maintenance requirements;
- Contributes to offsetting the electrical consumption of the building and therefore offsets the highest carbon emitting energy source;
- The use of PV cells within the glazing as a frit arrangement can be utilised as an option to provide solar shading into the internal building area behind, potentially removing the need for the brise soleil on the external surface of a glass wall. The cost of the PV cells can then be offset against the cost of the brise soleil which it could potentially fully replace. The level of solar shading will be dependent on the quantity/density of coverage of the PV cells.

Disadvantages

- Plant space requirements can be large for a storage system;
- System does not operate at night;
- The installation may require planning consent;
- Life expectancy of the PV cells are unproven;
- The cost of PV cells is high.

Suitability of the site

Due to the constraints of the existing roof a relatively modest 19kWp can be accommodated on Sunlight House.

It is important to note that agreement will need to be reached with the District Network Operator (DNO) to export electricity to the grid. If the DNO does not wish to accept and contribute towards the energy export then this option may not be viable.

5.0 Energy Performance

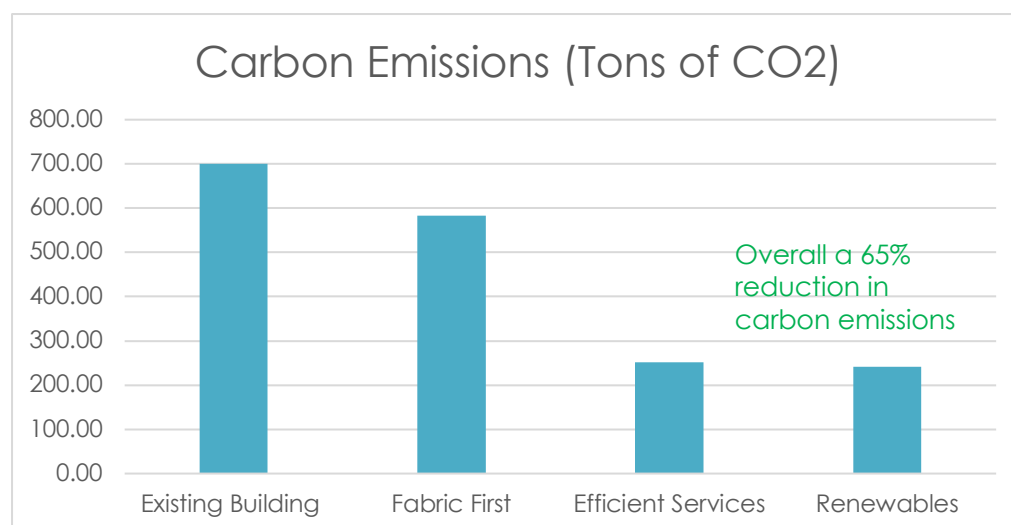
Although not strictly a requirement of refurbished buildings, Sunlight House has been modelled and assessed against the requirements of Part L 2021 to establish a before and after EPC rating. The purpose of the assessment is to benchmark the proposed refurbishment works against the building as it is currently.

Given the constraints of the existing building the scope of works has been limited however secondary glazing upgrades will reduce Heating demand & consumption considerably.

The proposed MEP / building services upgrade will include many features to provide an energy efficient building, with both affordable capital and ongoing costs.

Element	EXISTING	PROPOSED
Glazing	Single Glazed Sash Windows	Secondary Glazing introduced
Heating	Single Pipe Heating system fed via Gas Boilers	VRF fan-coils fed via new Ambient Loop Heat Pump installation
Cooling	VRF fancoils	VRF Fan-coils retained but fed via new Ambient Loop
Hot Water	Centralised Hot Water system fed via Gas Boilers	Localised Electric Water Heaters
BMS	Limited functionality – basic control panel	Comprehensive BMS and controls provided throughout
Ventilation	Natural Ventilation	Retained
Lighting	Fluorescent Lighting generally	High efficiency LED Lighting

The impact of the works outlined is an improvement in the EPC rating from an E to a B and reduces carbon emissions by 458 tons or 65%.



Overall the fabric upgrades including secondary glazing provides a 17% reduction in operational energy consumption & carbon emissions over current operations.

The renewal/upgrade of the building services identified delivers a further 47.5% reduction with the relatively modestly sized PV array contributing 1%.

Copies of the existing & proposed EPC's are provided in the appendix.

6.0 Conclusion

The energy statement and approach to the design follows the Energy hierarchy of Be Lean, Be Clean, Be Green and has identified an appropriate and effective energy strategy. It supports two sets of applications which together include proposals such as rationalising the plant into the roof space, new PV on the inside faces of the mansard roof and the installation of secondary glazing.

The listed building will utilise passive design techniques the principles of a 'Fabric First' approach, whereby the construction budget is invested wherever feasible in the building fabric and smart systems rather than simply relying on renewable energy bolt-on technologies to offset energy consumption.

Our fabric improvements include:

- Glazing Upgrades – Secondary Glazing
- Improved air leakage

The design team have approached the development in a holistic manner ensuring that the building services installations compliment the fabric and structure and to ensure that energy used within the buildings is used efficiently. The proposed solutions are considered to provide the greatest benefit and the most effective, given the Grade II Listed status of the building.

The building will be served by:

- New Ambient Loop Air Source Heat Pump Installation
- Point of Use Hot Water system (No standing or circulation losses)
- High Efficiency LED Lighting – circa 160LL/cw

A 19KW Peak array of Photovoltaics (PV) are proposed on the roof which will be respectful of the building's heritage status.

Although not strictly a requirement of refurbished buildings, Sunlight House has been modelled and assessed against the requirements of Part L 2021 to establish a before and after EPC rating.

The impact of the works outlined is an improvement in the EPC rating from an E to a B and a 65% reduction in carbon emissions equating to 458 tons of carbon saved.

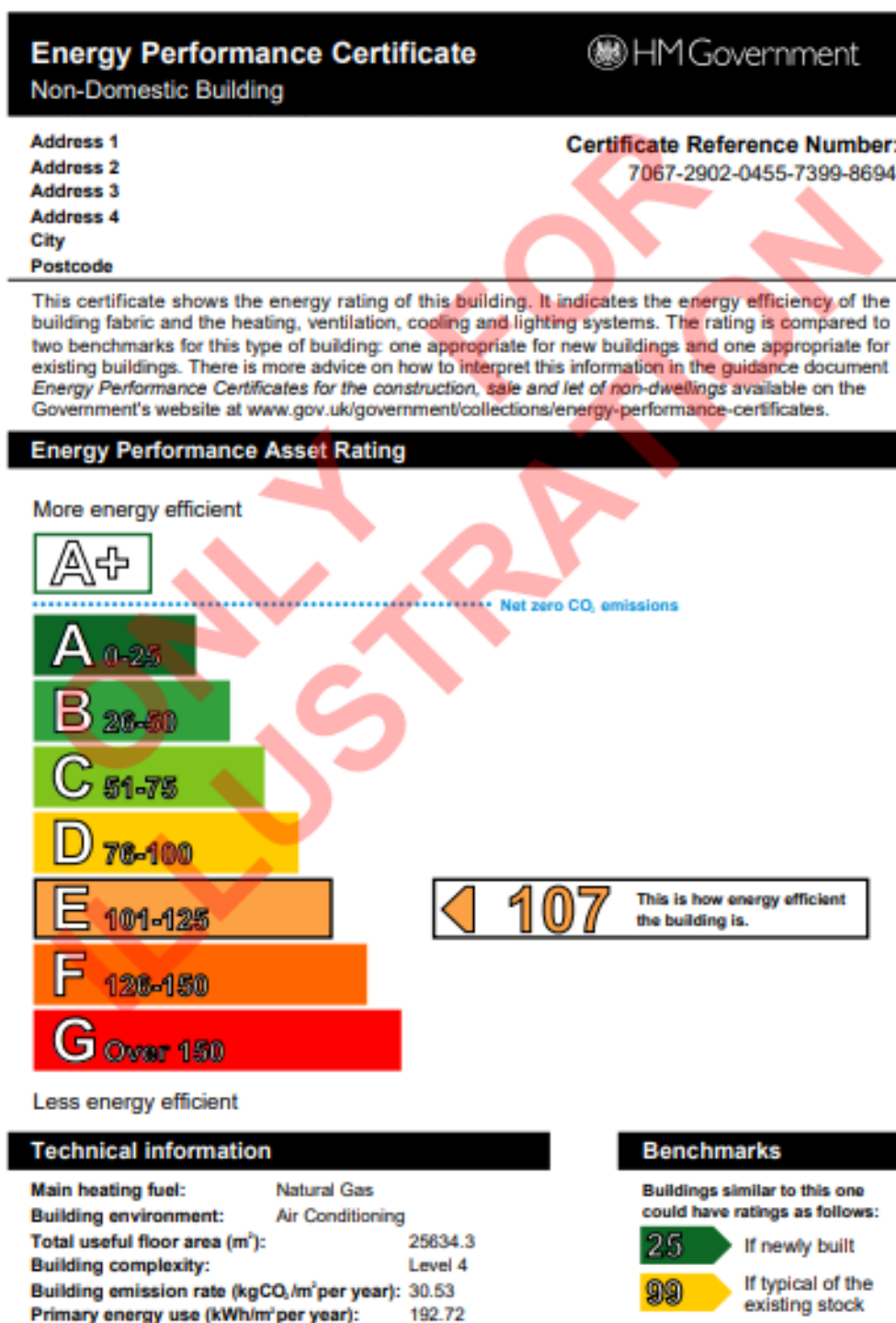
Road to Net Zero

The national grid which supplies electricity to buildings has been decarbonising in recent years as more renewables come online and this is set to continue.

Forward thinking developments would generally favour an all-electric solution as this will take advantage of the reducing electricity grid CO₂ emissions intensity and will remove the combustion of fossil fuels in city centres. The added benefit being a reduction in localised carbon emissions should result in improved air quality also.

The proposals for Sunlight House only use electricity so as the grid decarbonises so will Sunlight House. The building also has its own electricity generation through solar PV which will help speed up the journey to net zero.

7.0 Appendix 1 – Existing EPC ‘E107’



8.0 Appendix 2 – Proposed EPC 'B 35'

Energy Performance Certificate
Non-Domestic Building

HM Government

Address 1
Address 2
Address 3
Address 4
City
Postcode

Certificate Reference Number:
0306-4137-1124-7172-6219

This certificate shows the energy rating of this building. It indicates the energy efficiency of the building fabric and the heating, ventilation, cooling and lighting systems. The rating is compared to two benchmarks for this type of building: one appropriate for new buildings and one appropriate for existing buildings. There is more advice on how to interpret this information in the guidance document *Energy Performance Certificates for the construction, sale and let of non-dwellings* available on the Government's website at www.gov.uk/government/collections/energy-performance-certificates.

Energy Performance Asset Rating

More energy efficient

A+

A 0-25

B 26-50

C 51-75

D 76-100

E 101-125

F 126-150

G Over 150

Net zero CO₂ emissions

35

This is how energy efficient the building is.

Less energy efficient

Technical information

Main heating fuel:	Grid Supplied Electricity
Building environment:	Air Conditioning
Total useful floor area (m ²):	25467.1
Building complexity:	Level 4
Building emission rate (kgCO ₂ /m ² per year):	9.5
Primary energy use (kWh/m ² per year):	81.63

Benchmarks

Buildings similar to this one could have ratings as follows:

16

If newly built

66

If typical of the existing stock