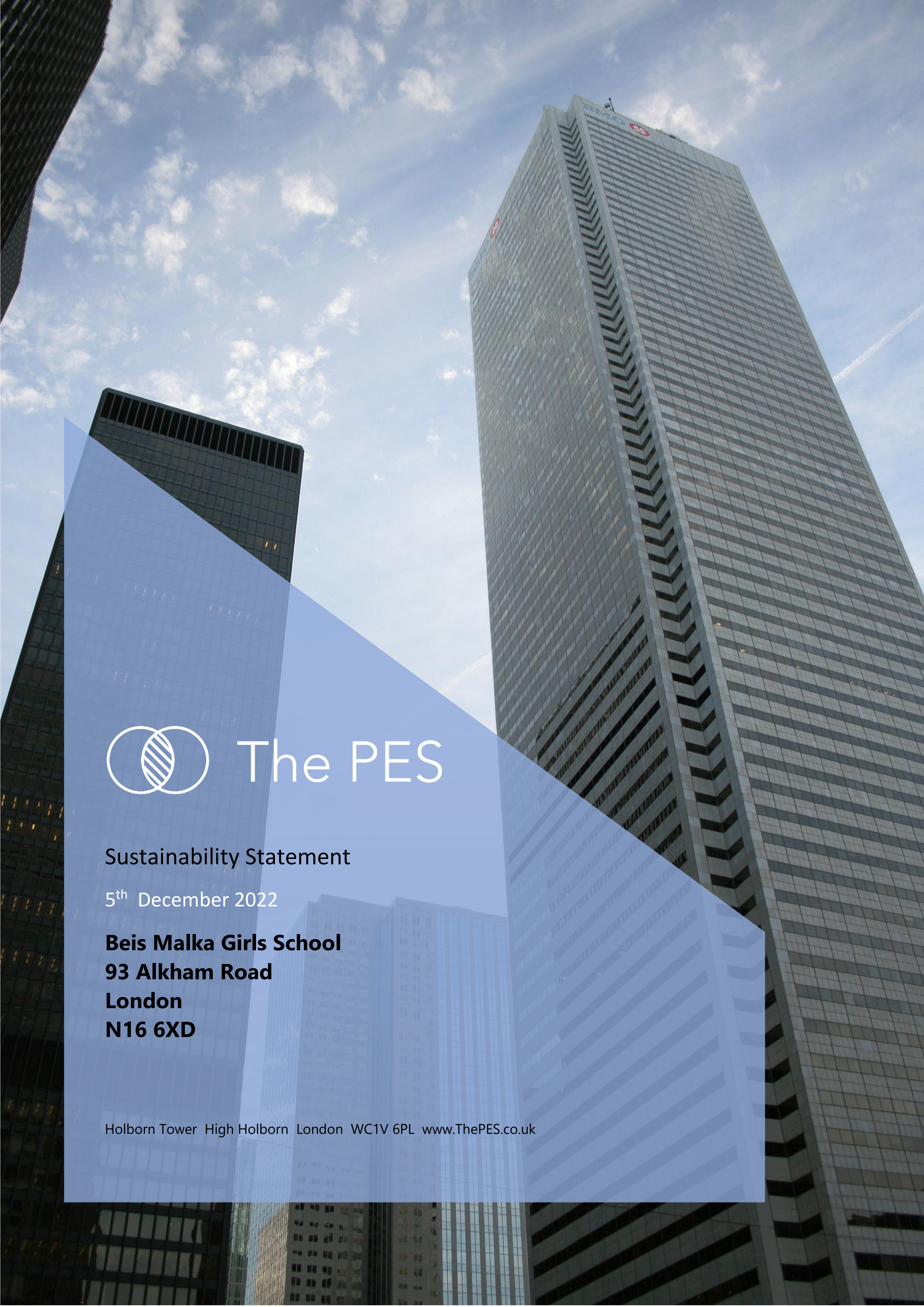

The PES

Sustainability Statement

5th December 2022

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The PES

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1.0 Executive Summary

This statement sets out the overall energy and sustainability strategy for the small extension at the Beis Malka Girls School.

The proposed small classroom extension has been designed to achieve the highest of environmental performance standards set out in Hackney's Local Plan policies.

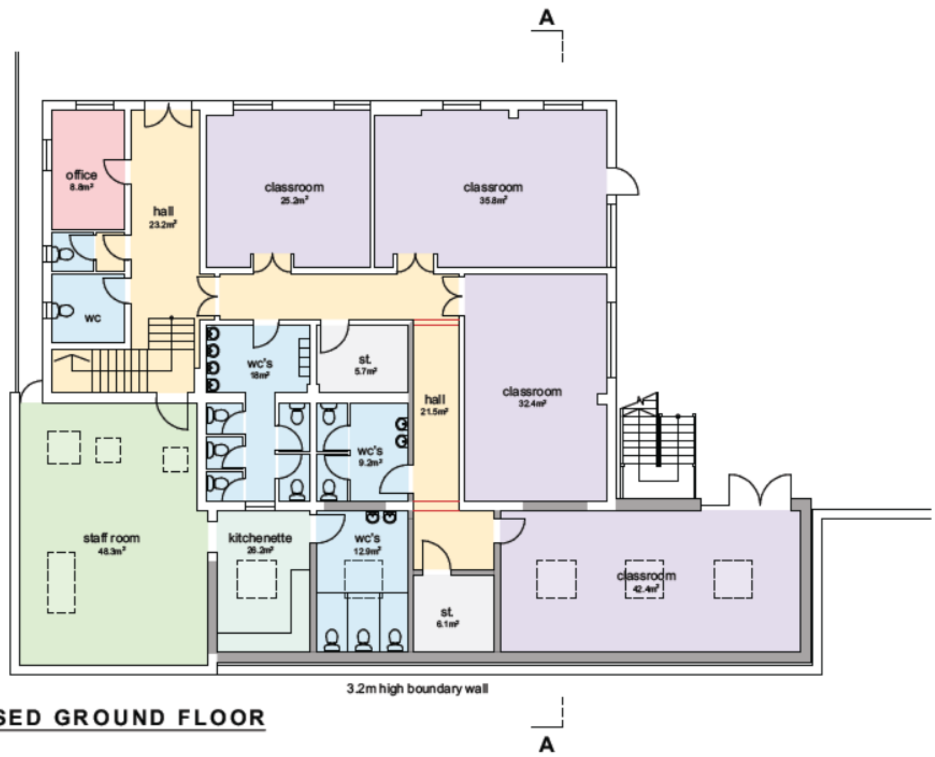
The design methodology follows the energy hierarchy has been adopted, and the project seeks to achieve an overall improvement (BER/TER) in regulated emissions through a best practice building fabric and a low-energy natural ventilation strategy.

The project will utilise sustainable construction measures guided by the BRE's environmental assessment processes.

2.0 The Site & Proposal

The project involves a small ground floor extension providing a new classroom, WCs, a kitchen area and storage.

Overall the project will deliver circa 90m^2 of new floor space



PROPOSED GROUND FLOOR

2.1 Planning Policy.

2.1.1 Local Plan

The project sits within the London Borough of Hackney.

The Hackney Local Plan 2033 Strategic Planning was adopted in July 2020

Chapter 12 deals with "Protecting the Environment and responding to Climate Change":-

LP54 Overheating and Adapting to Climate Change

A. All new development must regulate internal and external temperatures through orientation, design, materials and technologies which avoid overheating, mitigate the Urban Heat Island (UHI) effect and have regard to maximising the use of the cooling hierarchy. Measures which deliver biodiversity benefits will be strongly supported.

LP55 Mitigating Climate Change

A. All new developments in Hackney must actively seek to mitigate the impact of climate change through design which minimises exposure to the effects, and technologies which maximise sustainability.

B. All new residential development should meet a zero carbon emissions target emission rate in line with the London Plan energy hierarchy and Sustainability and the Built Environment SPD.

C. All non-residential developments must achieve the BREEAM ' Excellent' rating (or an equivalent rating under any other system which may replace it) and where possible achieve the maximum number of water credits, and must be built to be zero-carbon.

D. In reducing carbon emissions, residential development should aim to achieve 10% and non-residential development should aim to achieve 15% through energy efficiency measures alone.

E. Major commercial development should generate at least 10% of their energy needs from renewable sources onsite or in the local area, where this is consistent with the London Plan energy hierarchy and energy infrastructure policies.

F. The design, construction and operation of new buildings should be informed by the London Plan energy hierarchy.

G. Where it can be robustly demonstrated that it is not possible to reduce CO2 emissions on-site by the specified levels, carbon off-setting payments will be required and secured via legal agreement.

LP56 Decentralised Energy Networks (DEN)

A. All developments should maximise opportunities to incorporate decentralised energy to support reductions in energy use and emissions.

B. New major development should connect to an existing network; unless it is clearly demonstrated that it is not technically feasible or economically viable.

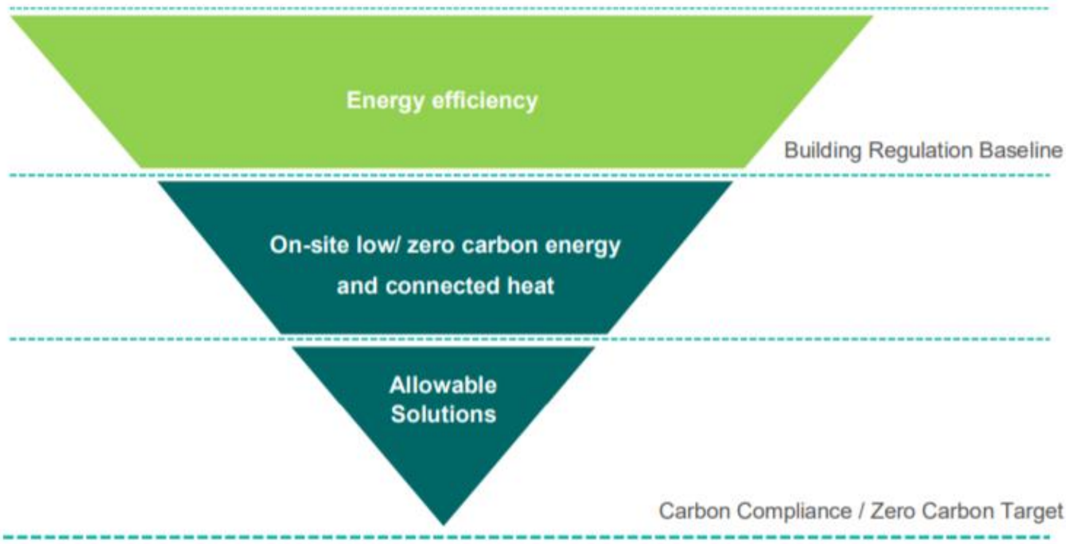
C. Only when it can be clearly demonstrated that all options to link into existing schemes have been explored should development provide on-site DEN. Developments should be designed to connect to other developments at a later date.

D. Where there is a planned Decentralised Energy Network within feasible and viable range of future connection, proposed major developments should be designed to connect to that network.

2.2 The Energy Hierarchy

In order to assess the overall efficiency of the proposed development, this report will utilise the principles of the energy hierarchy as set out below; the 3 stages being:-

- Be lean: use less energy and manage demand during construction and operation.
- Be clean: exploit local energy resources (such as secondary heat) and supply energy efficiently and cleanly.
- Be green: generate, store and use renewable energy on-site.



3.0 Baseline energy

When assessing the energy efficiency credentials of a new development against the energy hierarchy, the first stage of the Energy Hierarchy is to consider the baseline energy model.

The following section details how the baseline energy requirements for the overall development are established for each element.

3.1 Commercial Space

The energy requirements for space heating, water heating and ventilation within the proposed new extension would be assessed 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).

This provides guidance as to the minimum fabric performance for non-domestic extensions, as reproduced below.

Table 4.1 Limiting U-values for new or replacement elements in new and existing buildings and air permeability in new buildings

Element type	Maximum U-value[1] W/(m^2·K) or air permeability
Roof (flat roof)[2]	0.18
Roof (pitched roof)[2]	0.16
Wall[2][3]	0.26
Floor[4][5]	0.18
Swimming pool basin[6]	0.25
Windows in buildings similar to dwellings[7][8]	1.6 or Window Energy Rating[8] Band B
All other windows,[8][9][10] roof windows, curtain walling	1.6
Rooflights[2][11]	2.2
Pedestrian doors (including glazed doors)[9]	1.6
Vehicle access and similar large doors	1.3
High-usage entrance doors	3.0
Roof ventilators (including smoke vents)	3.0
Air permeability (for new buildings)	8.0 $m^3/(h{\cdot}m^2)$ @ 50Pa

Fig 1 – Table 4.1 – AD Part L2

4.0 Design for Energy Efficiency

The first step in the 'Energy Hierarchy' requests that buildings be designed to use improved energy efficiency measures to minimise energy requirements. 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 extension, to reduce the demand for energy, both gas and electricity (not including energy from renewable sources).

4.1 Passive Design

The national Planning Policy Framework also 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.

The single storey extension has aspects to south and north and is built to the southern boundary and thus, there are no south facing windows, so rooflights are utilised to ensure sufficient levels of internal daylight.

The roof lights in the main classroom are supplemented by large patio style doors to the northern aspect.

All glazing will have a low g-value to offer significant solar control.

The build will be of traditional brick/block with a slab floor – providing thermal mass capable of further regulating the internal temperature.

The rooflights will be capable of being opened and thus offer "stack effect" ventilation, enabling warm air to be vented to outside, with make up air drawn in a lower level from the north facing doors or from adjacent zones.

With the above strategy in place, the design are proposing a natural ventilation strategy for the extension.

4.2 Heating & DHW system

The new extension will connect to the existing LTHW heating system, providing under floor heating requiring a reduced flow and return temperature – reducing energy demand and assisting the condensing process at the boilers.

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 an insulated cavity achieving a u-value at $0.15W/m^2k$.
- New roof structures and will be of lightweight warm roof and a u-value of $0.12W/m^2k$ will be targeted.
- The new floor slab will be insulated to meet u values at circa $0.11W/m^2k$ subject to the extension P/A ratio.

Glazing

- New glazing for windows and rooflights will have area weighted average U-Values of $1.4W/m^2K$ or better.

4.4 Ventilation

The natural ventilation strategy for the new extension has been detailed under 4.1 Passive Design.

In order to progress this report through the Energy Hierarchy, this report will continue to assume this as the case.

4.5 Lighting and appliances

The extension will incorporate high efficiency light fittings utilising LED lamps with an efficacy at minimum 100lm/w and will have PIR controls in toilets, the store and corridor areas

The LED lighting in the main classroom will meet a minimum of 120l/cw, as well as having photocell controls to minimise daytime/unnecessary use.

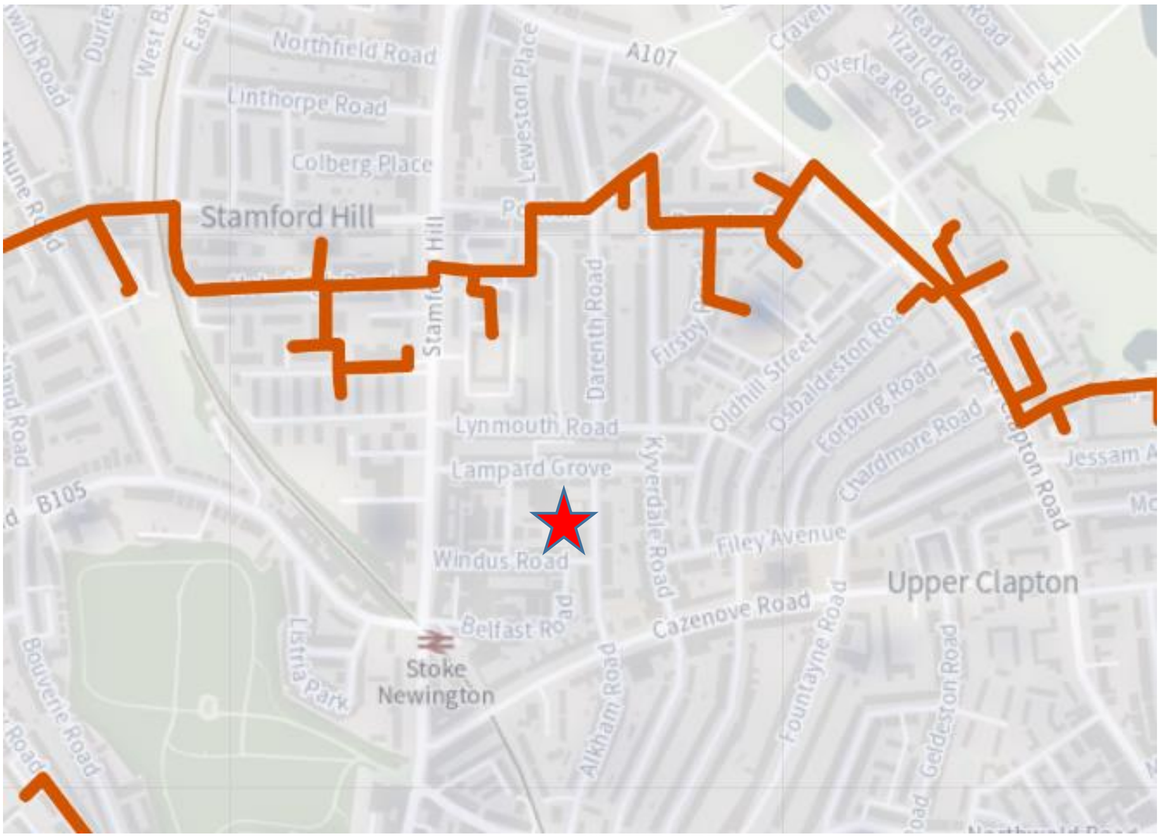
The use of LED lighting will also minimise the internal gains commonly associated with tungsten and fluorescent lighting systems as noted under 4.1 above.

5.0 Supplying Energy Efficiently

The second stage in the 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.

Clearly, a small extension connection to the existing buildings HVAC system is beyond the scope of an stand alone consideration of a DEN connection.

However, an extract from the London Heat Map reproduced below confirms that the school as close to the projected route of the Woodberry Down, Stamford Hill & Stoke Newington heat network; so there is a longer term potential for a DEN to be available to the school.



Extract from London Heat Map

6.0 Renewable Energy Options

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 energy consumption.

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.

6.1.1 Renewable Heat Incentive

The Renewable Heat Incentive (RHI) was formally withdrawn to non-domestic projects in March 2021.

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 site is clearly located in a residential location, surrounded on all sides by other buildings 2 to 3 stories in all directions - where any wind turbine would need to be considerably above these construction; such a structure is unlikely to be acceptable in this location.

6.3 Solar Energy

The proposed development has areas of roof that 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 need a constant demand for DHW to be viable – something that a small school project will not provide.

Accordingly, given the roof space available and the strategy to off-set the (expensive) 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.

PV panels also offer a much more attractive return from the savings in electrical consumption.

Accordingly, the design team are proposing the use of PV as the preferred renewable technology to reduce overall emission for the development.

However, the single storey development extension is under the shadow of the 2 storey dwellings to the south and as such, a PV installation specific to this extension project cannot be considered further.

However, given the potential reduction in energy consumption and the cost saving associated, the applicants may want to consider the potential to install PV to other more appropriate roof spaces on the school campus.

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.

Additionally, a boiler of this type would replace the need for a conventional gas boilers 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 assumed the potential impact in an area with residential accommodation surrounding the proposed development site.

6.5 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, the lack of available land area, the potential for the use of GSHP is highly limited, and given the capital costs associated with GSHP's, along with the technical & risk issues associated with having heat collection devices below ground for such a small heat demand – it is considered that a more "mainstream" solution would more appropriate.

6.6 Air source heat pump

Air source heating or cooling also employs the principle of a heat pump, but is the more "mainstream" solution with a proven track record heating and cooling offices, restaurants and public buildings for many decades - 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.

It must be remembered that heat pumps utilise grid based electricity and the associated emissions, so that the actual reduction in emissions can be limited, but this is a technology that is progressing rapidly with the development of variable refrigerant flow systems much improving efficiencies.

The accepted reduction in carbon emission from the UK electricity grid also supports the use of heat pump systems.

Assuming a seasonal system efficiency of 320% (Coefficient of Performance of 3.2) and that the air source heat pump will replace 100% of the space heating/hot water demand, then based on the latest CO_2 emission figures under SAP10.2, the system would reduce the overall CO_2 emissions by approximately 75%. The table below demonstrates, on the assumption of a demand of 1000kWh/year for heating and hot water.

ASHP Performance

Type of Array	Energy Consumption (kWh/yr.)	Emission factor ($kgCO_2$/h)	Total CO_2 emissions (kg/annum)
90% efficient gas boiler	11111	0.210	2333
320% efficient ASHP	2813	0.136	383
100% efficient immersion (back-up)	1000	0.136	136

A theoretical carbon saving of 77%

Accordingly, it is recommended that the design team consider the use of heat pump technology to service the heating and/or hot water requirements for the extension and other areas of the school campus.

6.7 Recommendations

Given the outcome of the feasibility study above, this report recommends that the applicants investigate the feasibility of a PV installation on appropriate roof space on the school campus.

In the medium to longer term, the applicants should consider the opportunity to reduce fossil fuel use and introduce heat pump technology to deliver heating and hot water to the school.

7.0 Sustainable Design & Construction

The sustainable assessment criteria as developed by BRE are utilised within this report to confirm that the development is able to advance it's sustainability credentials in line with Hackney's local plan policies.

The project that is the subject of this report is a small classroom extension, with WC, kitchen and storage areas.

However, the designers will seek to incorporate sustainability measures as set out below.

Materials

Construction techniques will be considered against the BRE Green Guide to ensure that, where practical, the most environmentally friendly construction techniques are deployed.

Construction materials will be sourced from suppliers capable of demonstrating a culture of responsible sourcing via environmental management certification, such as BES6001

Insulation materials will be selected that demonstrate the use of blowing agents with a low global warming potential, specifically, a rating of 5 or less. Additionally, all insulants used will demonstrate responsible sourcing of material and key processes.

The principle contractor with be required to produce a site waste management plan and sustainable procure plan, in line with BREEAM standards. The procurement plan will follow the waste hierarchy Reduce; Reuse & Recycle.

A Site Waste Management Plan (SWMP) will be developed prior to commencement of development stage to inform the adoption of good practice waste minimisation in design. This will set targets to minimise the generation of non-hazardous construction waste using the sustainable procurement plan to avoid over-ordering and to use just-in-time delivery policies.

Waste and recycling – the kitchen area will have appropriate internal and external storage space to ensure that it sort, store and dispose of waste and recyclable materials in line with Hackney's collection policies.

Pollution

The contractor will also monitor the use of energy and water use during the construction phase and incorporate best site practices to reduce the potential for air (dust) and ground water pollution.

The proposed heating system will use zero NOx emission electrical appliances.

Energy

The development will incorporate energy efficiency measures as noted in the main report above.

This will be further enhanced by the installation of sub-metering throughout, enabling occupants to accurately assess their energy usage and thereby, manage it.

Water

The development minimise water use as far as practicable by incorporating appropriate water efficiency and water recycling measures.

The WCs and handwash areas in the WCs and kitchen will employ dual flush toilets and low flow basin taps to reduce wholesome water use.

SuDs – the new development is on the footprint of the existing hard landscaping and there is no increase in impermeable area and thus the scheme will have a neutral impact of surface water run off.

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8.0 Conclusions

This report has detailed the baseline energy requirements for the proposed 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.

The applicant intends to introduce passive energy efficiency measures as set out under Section 4.0 and also looked to reduce CO_2 emissions across the development using renewable or low-carbon energy sources, this 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 solutions to meeting reduction in CO_2 emissions would be via the use of roof mounted photovoltaic (PV) panels and the school campus, with longer term consideration for the introduction of heat pump technology.

The above energy strategy and the incorporation of sustainable materials and construction practices set out under Section 7.0 above will ensure the new extension meets with the sustainability ambitions of the school and the local authority.

The PES