



The PES

Energy & Sustainability Statement

22nd November 2022

**Former Retail Park Reliance
Reliance Street
Manchester M40 3AG**

Holborn Tower High Holborn London WC1V 6PL www.ThePES.co.uk

Contents

1	Executive Summary	2
2	Site, Proposal & Planning Policy	3
3	Baseline Energy results	8
4	Passive Design	10
5	Design for Energy Efficiently	12
6	Low Carbon & Renewable Energy Options	14
7	Sustainable Design and Construction	22
8	Conclusions	25

Appendices

A	BRUKL TER Outputs – Baseline Energy Use
B	BRUKL BER Outputs - Low Carbon Energy

1.0 Executive Summary

The proposed development project at Reliance Street involves the re-development of the existing vacant site to create a EV car charging facilities with a new convenience store/retail outlet.

It has been designed to achieve the highest of environmental performance standards following the principles of the energy hierarchy in order to meet the sustainability policies of Manchester City Council.

The PES Ltd have been appointed to develop a strategy and advise how the proposed development of new build apartments will comply with these requirements.

The Energy Hierarchy - as set out in local policy EN4 - has been adopted and the development achieves an overall improvement (DER/TER) in regulated emissions at over **10.81%** above the latest Part L 2021 standard.

This has been achieved through best practise passive design, the adoption of high standards of insulation and heat pump driven heating systems supplemented by a small PV array and battery storage to reduce overall running costs.

The balance of the projects energy needs are to be met via a certified green energy supplier to deliver a truly net zero carbon development.

2.0 The Site & Proposal

The proposed site at Reliance Street is located on the corner of Oldham Road.

The site is currently vacant and is understood to formally have had retail use.

The proposal seeks to redevelop the site for a bespoke EV car charging facility for 16 vehicles, including van-suitable spaces, accessible spaces, staff parking and cycle parking.

As part of the proposals, the project will include a circa 175m² commercial space for retail/coffee shop.

Given that this units will be the element governed by the Building Regulations (Part L) and as such will be the principle subject of this report, whilst considering the wider sustainability benefits.

2.1 Local Planning Context

The project is located within the City of Manchester.

Manchester's Local Development Framework Core Strategy Development Plan Document was adopted in July 2012.

Policy EN 1

Design Principles and Strategic Character Areas

All development in Manchester will be expected to follow the seven principles of urban design, as identified in national planning guidance and listed above and have regard to the strategic character area in which the development is located. Opportunities for good design to enhance the overall image of the City should be fully realised, particularly on major radial and orbital road and rail routes.

Design and Access Statements submitted with proposals for new development must clearly detail how the proposed development addresses the design principles, reinforces and enhances the local character of that part of the City and supports the achievement of the Core Strategy Strategic Objectives.

1. City Centre Character Area

The City Centre contains a rich legacy which reflects its urban evolution to the current day and includes listed buildings, conservation areas, archaeological remains and an historic street pattern. Its core area presents a particularly dense environment that accommodates a wide and closely integrated range of uses including commercial, civic and residential activities.

Relative to the amount of development there is limited open space and this includes a range of civic and less formal green spaces and waterways. Outside the core and associated with the Inner Relief Route there are less active and less densely developed areas with significant elements of cleared land. The City Centre is the focus of the City's transport routes.

- Developers will be expected to consider the City's heritage and continue the rich pattern of activity in the core area.
- While there will be opportunities to create landmark buildings, developments should also contribute positively to the experience of all at street level.
- Wherever possible the opportunity should be realised to enhance existing and provide new areas of meaningful open space, and the maintenance and improvement of the City's permeability should be considered in all proposals.

Policy EN 4

Reducing CO2 Emissions by Enabling Low and Zero Carbon Development The Council will seek to reduce fuel poverty and decouple growth in the economy, growth in CO2 emissions, and rising fossil fuel prices, through the following actions:

All development must follow the principle of the Energy Hierarchy, being designed:

- to reduce the need for energy through design features that provide passive heating, natural lighting and cooling.
- to reduce the need for energy through energy efficient features such as improved insulation and glazing.
- to meet residual energy requirements through the use of low or zero carbon energy generating technologies.

Wherever possible new development and retrofit projects, including energy generation plant, must be located and designed in a manner that allows advantage to be taken of opportunities for low and zero carbon energy supplies.

Where possible new development and retrofit projects will be used as a mechanism to help improve energy efficiency and provide low and zero carbon energy supplies to existing buildings.

Where appropriate new development and retrofit projects will be required to connect to and/or make contributions to low or zero carbon energy schemes and/or to incorporate provision to enable future connection to any existing / potential decentralised energy schemes.

The use of building materials with low embodied carbon in new development and refurbishment schemes.

Policy EN 5

Strategic Areas for low and zero carbon decentralised energy infrastructure Within Manchester it is considered that the following strategic areas, indicated on the key diagram, will have a major role to play in achieving an increase in the level of decentralised, low and zero carbon energy supplies available:

- The Regional Centre, which also includes the Oxford Road Corridor and Eastlands
- District Centres and associated major development sites
- Airport Strategic Site
- Strategic housing location
- Strategic employment locations

Within these areas new development, regeneration and retrofit projects, will be expected to take place in the context of more detailed proposals for decentralised low and zero carbon energy infrastructure in the form of energy proposals plans. The Council will work with all relevant stakeholders, which may include developers, landowners, residents, community groups, private sector partners, utilities companies, neighbouring authorities and other public sector bodies, as appropriate, to bring forward such plans.

Where investment or development is being undertaken into or adjacent to a public building/asset or district heating network, full consideration shall be given to the potential role that these can have in providing an anchor load within a decentralised energy network or in creating opportunities for CO2 reduction funded by contributions.

Policy EN 6

Target Framework for CO2 reductions from low or zero carbon energy supplies

Applications for residential development of 10 or more units and all other development over 1,000 sqm will be expected as a minimum to meet the target shown in Tables 12.1 or 12.2, unless this can be shown not to be viable.

This should be demonstrated through an energy statement, submitted as part of the Design and Access Statement. Such a statement will be expected to set out the projected regulated energy demand and associated CO2 emissions for all phases of the development.

Developments smaller than the above threshold, but involving the erection of a building or substantial improvement to an existing building will also be expected to meet the minimum target, where viable, but will not be expected to submit an energy statement.

The target framework relates to three broad development locations and their potential for low and zero carbon, decentralised energy. The areas are defined as follows

Target 1 Network development areas: Locations where the proximity of new and existing buildings, the mix of uses and density of development provide the right conditions to support district heating (and cooling).

Target 2 Electricity intense areas: Locations where the predominant building type has an all electric fit-out such as retail units and leisure complexes.

Target 3 Micro-generation areas: Locations where lower densities and a fragmented mix of uses tend to mean that only building scale solutions are practical.

Non-Domestic CO2 emissions reduction targets

Table 12.2

Target	% Minimum requirement
Target 1: Network development area	CHP/district heating anchor or connection or where not feasible a 15% increase on Part L 2010
Target 2: Electricity intense buildings	+10%increase on Part L 2010 (Applies to commercial uses with a high proportion of emissions from electricity use (>45 kg CO2/m2))
Target 3: Micro generation area	+15%increase on Part L 2010

Where the CO2 emissions reduction required under any future revision to Part L of the building regulations becomes greater than the '% Minimum requirement', the reduction required under building regulations would apply.

Where the Council identifies an 'allowable solution', for example within an energy proposals plan, that would produce higher carbon reductions at no extra cost than that of achieving the '% Minimum requirement' (or required under building regulations if greater) the higher percentage reduction will be required. The cost comparison is based on the cost of incorporating the 'allowable solution' at design stage.

The energy statement will be required to be submitted at the outset of any proposed development (outline application or before). Developers will be permitted to use green infrastructure elements such as green roofs, green walls, street trees and waterways to contribute to compliance with CO2 mitigation, subject to the energy statement incorporating evidence such as modelling to demonstrate compliance.

Guidance on what the energy statement should contain and how to decide which target applies to a development proposal is given in Appendix A.

In the case of the proposals for Reliance Street, Target Area 3 is considered most appropriate as the project is a single use (retail) and remote from any proposed district energy network.

It should be noted that the project at Reliance Street would be considered non-major.

Policy EN 7

Energy Infrastructure opportunities

There will be a general presumption in favour of low and zero carbon decentralised energy schemes, subject to the following considerations:

- That any new generating plant capable of producing heat and cooling as well as electricity should be located in a way that facilitates future connection to a local distributed energy system.
- That any energy centre, including generating plant, standby/boiler plant and substations, shall be located and designed to a high quality so as to integrate with and contribute to the townscape.

Policy EN 8

Adaptation to Climate Change

All new development will be expected to be adaptable to climate change in terms of the design, layout, siting and function of both buildings and associated external spaces. In achieving developments which are adaptable to climate change developers should have regard to the following, although this is not an exhaustive list:

Minimisation of flood risk by appropriate siting, drainage, and treatment of surface areas to ensure rain water permeability Reduction in urban heat island effect through the use of Green Infrastructure such as green roofs, green walls, increased tree cover and waterways

The need to control overheating of buildings through passive design The opportunity to provide linked and diverse green space to enhance natural habitats which will assist species adaptation

Developers will be permitted to use green infrastructure elements such as green roofs, green walls, street trees and waterways to contribute to compliance with CO2 mitigation under Policy EN6, subject to sufficient evidence to quantify their contribution to compliance.

2.2 Guide to Development in Manchester Supplementary Planning Document and Planning Guidance - Adopted April 2007

This additional design guidance document has further commentary on energy efficiency and sustainable design – but it is considered “dated” and the energy efficiency measures relate to the 2006 building regulations.

3.0 Baseline energy results

The first stage of the Energy Hierarchy as set out in policy Ene 4 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 Non-Domestic Buildings

The energy requirements for space heating, water heating and ventilation within the proposed new build commercial spaces have been calculated using the National Calculation Method (NCM) in line with AD L2 of the Building Regulations 2021 and the Non-Domestic Heating Compliance Guide.

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 in within NCM and the minimum fabric values and fixed services efficiencies set down by AD L2 and the Non-domestic Compliance Guide.

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).

The retail unit at Reliance Street will take the form of a Shell & Core delivery for fit-out by 3rd Party tenants – reasonable assumptions as to the proposed fit out will be made in line with the latest AD Part L 2021.

3.3 Baseline Results

The baseline building results have been calculated and are presented in Table 1 below.

The Baseline SAP BRUKL outputs (which summarise the key data) are attached at **Appendix A**.

Table 1 – Baseline energy consumption and CO2 emissions

Unit	Target Emission Rate (regulated energy use) Kg/sqm	Total baseline emissions Kg
Reliance Street	4.5	748.73
Development Total		749

4.0 Passive Design

The first step in the 'Energy Hierarchy' requires that buildings utilise passive design techniques to reduce heating and in particular cooling loads in a warming environment; therefore reduce operational costs while also minimizing associated carbon dioxide emissions.

4.1 Passive Design

The National Planning Policy Framework 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 project at Reliance Street has had been designed to ensure the building is not vulnerable to overheating; the design team have considered the control of overheating utilising the recognised Cooling Hierarchy:-

1. 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 3.3 below.

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

Other energy efficiency measures will include the use of LED lighting and low energy/energy star electrical goods – such as room TVs – all of which will reduce internal gains and therefore, cooling demand.

2. 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 relatively built up area in central Manchester, which gives rise to an expectation of issues associated with the heat island effect associated with more dense urban areas, which can add 1.0 - 1.5°C to the local temperatures.

The project is located in an area with relatively low rise buildings, especially to the southern aspect – and thus, there is very little by way of topographical shading.

The main glazed area to the retail space has an easterly aspect and is protected by the canopy of the main car charging facility to minimise the impact of solar gain on cooling loads.

In addition, glazing specification; the has been considered as part of the passive design approach and the specified new glazing will achieve a g-value of 0.50 or better in order to further assist in reducing overheating risk from excessive solar gain.

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

The retail space has a floor to ceiling height at circa 3.1m enabling the use of destratification fans if required.

The new build structure is expected to be of a clad steel frame and a cast in-situ concrete floor offering significant thermal mass able to absorb heat during the summer months, which can then be ventilated during the evening or overnight to regulate the internal temperature.

4. passive ventilation

The project will utilise opening windows and background ventilation in order to avoid the use of energy intensive natural ventilation systems.

5. mechanical ventilation

Given the strategy as noted above, the design team are proposing a passive ventilation strategy to minimise the energy requirements for the proposed retail use.

5.0 Design for Energy Efficiently

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 CO₂ produced by the building after the energy efficiency measures have been included. From these figures the overall reduction in CO₂ emissions.

To achieve reductions in energy demand the following measures have been included within the design and specification of the building:

5.1 Heating System

The “notional” heating system considered under the “energy efficient” section of the Energy Hierarchy, will consist of high efficiency condensing gas boilers providing under floor heating and domestic hot water to the retail unit.

- A Rated boiler systems – (96%+ SEDBUK efficiency) & load compensation.
- Insulated primary pipework

To increase the efficiency in the use of the heating system, the following controls will be used to eliminate needless firing of the boilers.

- Boilers fitted with weather compensation systems

5.2 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:-

- New wall constructions will be of a highly insulated cladding within the main steel structure and will target a U-Value of 0.20W/m²k or better.
- The new flat roof constructions are to be a warm/green roof construction achieving a U-Value of 0.15W/m²k will be targeted.
- The new heat loss floors will achieve a minimum U value of 0.12W/m²k subject to perimeter/area ratios

Glazing

- The new glazing for windows and doors will be double glazed with an area weighted average U-Value of 1.4W/m²K or better.

Air Tightness

- The building will be tested to 5m³/hr/m² in line with best practice for naturally ventilated commercial buildings.

Construction Details

- Heat loss via non-repeating thermal bridging within the new build elements will be minimised by the use of Accredited Construction Details for these new build units. An overall Y-Value <0.07 is targeted.

5.3 Ventilation

As noted above, the retail space is to be naturally ventilated in line with the natural ventilation strategy set out above.

5.4 Lighting and appliances

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

Back of House and WC areas will also have an absence detection system to ensure lights cannot be left on when not in occupation.

5.0 Low Carbon & Renewable Energy Options

The final stage in Manchester's 'Energy Hierarchy' is to seek low carbon and renewable energy supply. In particular.

5.1 Low Carbon Energy

The provision of low carbon energy primarily concerns provision of decentralised energy where practical and appropriate.

5.1.1 Community Heating/Combined Heat and Power (CHP)

Heat network feasibility studies were completed by Arup for three areas of Manchester: the Manchester Corridor, the Manchester Civic Quarter Phase 2 (NOMA), and an expansion of an existing heat network at Salford's MediaCityUK).

The reporting is enabling Manchester and Salford City Councils to make an informed decision on the future of heat networks within each city area. Energy master-planning, stakeholder engagement and detailed technical and economic analysis was undertaken to provide robust and credible proposals for heat network solutions.

Manchester Oxford Road Corridor

The Manchester Oxford Road Corridor is a leading UK location for knowledge-based businesses, covering 243 hectares and home to a 55,000 strong workforce. Taking an innovative approach, Arup proposed a solution whereby multiple potential heat producers provide heat to a transmission network in addition to supplying their own heat needs.

The benefits for Corridor stakeholders wishing to become heat customers or heat producers were clearly defined in our approach, and careful consideration was given to infrastructure constraints to develop a long-term solution for investment by the local authority. The economic case was presented in the form of a Special Purpose Vehicle (SPV) setup to build, own and operate the transmission network.

Manchester Civic Quarter Phase 2 (NOMA)

The main focus for this area of Greater Manchester was on the existing and proposed buildings at the NOMA development. The Arup team investigated opportunities to expand beyond the development, to both existing and proposed heat loads in order to maximise potential revenues from heat and electricity generation.

MediaCityUK

The third project focussed on the existing heat network system at MediaCityUK (Salford). Arup investigated the technical and economic feasibility of extending the existing heat network to proposed MediaCityUK phases, and also beyond the development boundary into existing and planned developments.

Manchester's Civic Quarter Heat Network (CQHN) is now being progressed and will provide a highly efficient source of heat and power for some of Manchester's most iconic buildings, acting as an enabler and facilitating a significant step towards the council's goals of becoming carbon-neutral by 2038.

The new network technologies consist of a 2km district heating network and an energy centre containing a 3.3MWe CHP engine and two 12MW gas boilers that will generate energy for landmarks including Manchester Town Hall and Town Hall Extension, Central Library, Manchester Central Convention Centre, The Bridgewater Hall, Heron House and the Manchester Art Gallery.

The Reliance Street project based some 4.5km along the Oldham Road, and would be beyond the reach of the above networks, so in the medium term, the project should consider the use of on-site community heating/CHP.

5.1.2 On-site CHP/District Heating

A community heating network comprises a series of insulated pipes used to deliver heat, in the form of hot water or steam, to a number of different locations or dwellings. They range from small, providing heat to a house and a couple of holiday cottages for example, to large scale systems supplying housing estates or blocks of flats.

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

CHP systems are essentially biomass or fossil fuel fired electricity generators that use the heat by-product to provide space and water heating. The electricity generated can be used directly within the host buildings or sold to electricity suppliers on the national grid.

CHP is, as a rule of thumb, is only operated as a base load as, depending on the technology, it may be difficult and/or inefficient to operate according to daily variations in demand. In a well-designed district heating network heat from CHP will provide between 60% and 80% of the annual baseline heat (heating and hot water) requirement with heat-only boiler plants providing the peak load and back-up. To maximise efficiency of the engine it needs to run for at least 17 hours a day; therefore, the heat load needs to be present for this period.

Clearly, as a small scale retail development, this is clearly no practical potential for the use of CHP.

6.2 Renewable Energy

The final element of the '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.

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 sun's 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.

6.2.1 Government incentives

6.2.1.1 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.

6.2.1.2 Renewable Heat Incentive

The Renewable Heat Incentive (RHI) was formally withdrawn to all projects in March 2022.

6.2.2 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. To receive practical amounts of non-turbulent wind, the blades of a wind turbine would need to be placed significantly above the roof level of the proposed project at Reliance Street itself.

It is inconceivable that any wind turbines of this size would be considered acceptable in this location.

6.2.3 Solar Energy

The proposed retail development has areas of flat 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.

6.2.3.1 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 m² of unshaded UK roof surface annually. The usable energy output per m² 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 for DHW provision (as noted above), and due to the low cost of electrically heat pumps as a source of energy, 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.

6.2.3.2 Photovoltaics (PV)

A 1kWp (1 kilowatt peak) system in the UK could be expected to produce between 800-900kWh of electricity per year based upon a southerly orientation according to SAP2005 methodology used by the Microgeneration Certification Scheme (MCS).

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.

Typically, the PV installation would take the form of 4 x 440w panels at top floor roof level

The above arrays would generate some 1,753.73kWh/annum, further reducing building energy demand.

6.2.3.3 Battery Storage

To further supplement the above noted all electrical strategy, the design team are proposing the use of battery storage, to enable the tenants of the new retail space to be able to harvest cheaper overnight electricity for use during the day, enable the spare battery capacity delivered to capture any excess PV output and in it's own small part, enable the Reliance Street project to contribute to the local mitigation of the local energy network's peak demand.

6.2.4 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 within urban conurbations. Accordingly, the use of biomass is not considered appropriate for this project.

6.2.5 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, 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 small development, there is no scope for the locating of the ground collector devices and nor would the significant capital cost be justifiable for such a small seasonal heat load; as such, ground source heating cannot be considered.

6.2.6 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.

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.

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 the system would reduce the overall CO₂ emissions by approximately 75%.

The table below demonstrates, on the assumption of a demand of 1000Kwh/year for heating and hot water.

Table 2 – Air Source Heat Pump 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, the design team are proposing the use of air to water heat pumps to deliver the retail units heat demand via an under floor heating system and destratification fans to optimise the systems output at occupied levels.

Domestic hot water in the WC areas would be provided by point of use water heaters

The use of these highly efficient electrically driven HVAC systems also offer the benefit of having a zero contribution to local environment's nitrous oxide and particulate levels; this is considered to be a significant advantage.

6.2.7 Renewable Energy From the Grid

The applicants for the Reliance Street project have a strategic policy to meet the balance of the energy requirements via the purchase of 100% renewable energy for the remaining energy required in the operation of the site.

Electricity will be sourced from providers able to demonstrate and verify "Additionality"

The principle of additionality applies when an organisation/consumer installs, self-generates and consumes renewable energy from their own facilities, or closes an electricity purchasing contract that contributes to the construction of new renewable energy facilities.

Projects that comply with the principle of additionality result in real and verifiable emission reduction or emission avoidance for the organisation / consumer, as their direct effect is to increase renewable energy generation.

At the time of publication, the applicants are in a dialogue with Octopus energy for the delivery of "green" energy for the site

The supplier has been shown to provide additionality to an extent that is materially greater than that which is bought about as a result of subsidies, obligations or other

6.2.8 Final Emissions Calculation

Given the outcome of the feasibility study above, the developer is proposing the use the above noted air source heat pump system for the heating requirements of the retail unit, supplemented by a roof top PV array.

The final table – Table 3 – summarises the final outputs from the BRUKL models; attached at **Appendix B**.

Table 3 – “Be Green” emission levels

Unit	Emission Rate (regulated energy use) Kg/sqm	Total emissions Kg
Reliance Street	4.0	668.33
Development Total		668

The data at Table 3 confirms that overall emissions have been reduced by **10.81%** over and above the baseline model/Part L 2021. The project thereby is fully compliant with Manchester Policy EN6.

7.0 Sustainable Design & Construction

New development within Manchester must comply with the highest standards of sustainable design and construction possible.

The Sustainability credentials of the proposed residential development are set out below; based on the commonly used assessment criteria developed by the Building Research Establishment.

Materials

New build construction techniques and materials will be considered for their life cycle impact 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; ideally, able to provide an environmental product declaration.

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 will be required to produce a site waste management plan and sustainable procure plan, in line with BREEAM guidance – this will include a pre-demolition audit to identify demolition materials to reuse on-site or salvage appropriate materials to enable their reuse or recycling off-site. 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.

Operational waste and recycling – appropriate internal and external storage space will be provided to the overall project to ensure that tenants and site users alike can sort, store and dispose of waste and recyclable materials in line with Manchester'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 completed building will use zero emission heat pump and electrical systems for heating and hot water.

The main contractor will be required to register the site with the Considerate Constructors Scheme and achieve a best practice score of 25 or more.

To void the issue of noise pollution, the development will comply with Building Regulations Part E, providing a good level of sound insulation between the proposed development and surrounding buildings.

Energy

The project will incorporate renewables technologies as noted in the main report above.

The facilities management team will also be supplied with a Building User Guide offering practical advice on how to use the building economically and efficiently, including specific advice on how to reduce unregulated energy uses.

This will be further enhanced by the installation of smart energy metering, 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 applicants will ensure that the development meets excellent standards in limiting the use of wholesome water via the incorporation of low flow taps and dual flush WCs.

A pulsed water meter and leak detection system will be part of the specification.

Sustainable Urban Drainage (SuDs)

The existing site is currently made up entirely hard surfaces. Accordingly, the project will be able as a minimum to deliver a neutral impact on surface water run-off

A formal flood risk assessment and SuDs strategy is submitted under separate cover and will include strategies such as permeable paving, a significant tree planting strategy, a green roof structure to the retail unit and attenuation measures– including the potential for rainwater harvesting techniques for the ongoing upkeep

Ecology and Biodiversity

Clearly, the existing site is 100% brownfield, so any improvement on this situation would increase biodiversity.

The development has employed an ecologist to consider the planting regime and overall landscaping strategy to achieve an overall improvement in the levels of fauna and flora utilising indigenous species where possible and appropriate.

Strategies include:-

- Sedum roof to the main canopy
- Biodiverse roof to the retail unit
- Wildflower planting
- A regime of significant tree planting.

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 CO₂ reductions using renewable energy technologies.

The baseline results have shown that if the development was built to a standard to meet only the minimum requirements of current building regulations 2021, the total amount of CO₂ emissions would be **749Kg/year**.

This report set out the introduction of passive & energy efficiency measures into the development, as detailed in sections 3 & 4, to further reduce CO₂ emissions.

There is also a requirement to reduce CO₂ 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 CO₂ emissions would be via the use of heat pump technology for the generation of heating and roof mounted PV array all as set out within this report, as well as battery storage and the use of green electricity tariffs.

This has been used in the final BRUKL models (reproduced at **Appendix B**) for the development which have also been detailed above in Table 3, which show a final gross emission level of **668Kg/year**, representing a total reduction in emission over the baseline model of **10.81%**.

The above energy is all supplemented by a significant emphasis on sustainable development techniques to tackle the issues of the construction phase, ecology, waste and water quality – as set out under Section 7.0 and reported upon in detail under separate cover.

Appendix A

Baseline Energy Use:-

BRUKL Outputs & Target Emission Rates

Appendix B

Passive Design/Low Carbon and Renewable Energy Sources:-

Final BRUKL Outputs & Final Emission Rates