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Energy Standards Statement

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Energy Standards Statement: St Gabriel's

1. Executive Summary

This energy standards statement has been compiled to demonstrate how the proposed development will comply with Manchester City Council's Core Strategy 2012-2027, and in particular, Planning Policies EN4 and EN6 relating to reducing CO_2 emissions and the use of low and zero carbon energy generation. The strategy detailed in the subsequent sections has followed the recommended hierarchy detailed within policy EN4 including de-centralized energy and met the CO_2 emissions reduction target of 15% under Part L (2010) regulations.

The proposed development at St Gabriel's Hall, Manchester comprises a student accommodation development arranged over a total of 4 separate blocks, consisting of new build development and existing building refurbishment. The development will be complete with ancillary areas including communal amenity spaces. The total development is intended to comprise approximately 9,389m² Gross Internal Area (GIA).

The proposed development is also targeting a minimum 'Very Good' rating under the Building Research Establishment Environmental Assessment Method (BREEAM).

In accordance with Manchester City Council's planning policies the proposed energy strategy has been developed with the 3 steps detailed with Policy EN 4. For the purposes of this statement, however, an adapted hierarchy has been used. Predicted energy consumption and CO_2 emissions have been reported at each stage of the following hierarchy:

- Be Lean – Reduce the need for energy demand through design and energy efficiency features
- Be Clean – Supply energy through efficient means (De-Centralized Energy)
- Be Green – Utilise low or zero carbon energy generation

This statement, firstly, demonstrates how energy has been reduced as far as possible through the incorporation of passive and active measures including improving elemental U-values compared against current building regulations, improving air permeability compared against current building regulations, effective solar control, LED lighting throughout, heat recovery in ventilation systems, etc.

Following the energy demand reduction process, an appraisal has been undertaken to assess the feasibility of supplying energy efficiently through heat networks. Initial investigations through discussion with Vital Energi have highlighted a de-centralized heat network within the Civic Quarter, however, it will be a number of years before any connection to that existing network became feasible. It was ultimately determined, following assessment of appropriate technologies, that the use of air source heat pumps as means of a low carbon heat network could be used to provide hot water to the site centrally.

The final stage of the hierarchy considers installations of renewable and low carbon energy technologies. Through appraisal detailed in section 8 of this statement it was determined significant energy and carbon emission reductions could be realized through the use of air source heat pumps.

In accordance with Policy EN 6 of Manchester City Council's Core Strategy 2012-2027 the development is required to achieve a 15% reduction in CO_2 emissions compared against Part L (2010) regulations. It has been recognized, by the council, that the current Part L (2013) regulations provides a 6% improvement over the previous 2010 version and it is therefore stipulated that proposed developments should target a 9% reduction of CO_2 emissions when compared against the current Part L (2013) regulations.

2. Introduction

CPW have been appointed by McLaren Property Limited to provide the following Energy Standards Statement in order to inform the energy credentials of the proposed residential development of student accommodation across 4 No. blocks at the existing St Gabriel's Hall site on Oxford Place, Manchester, M14 5RP.

It is intended that the report will demonstrate and demonstrate compliance with Manchester City Council's Core Strategy 2012-2027 in relation to:

- Policy EN 4: Reducing CO_2 Emissions by Enabling Low and Zero Carbon Development
- Policy EN 6: Target Framework for CO_2 Reductions from Low or Zero Carbon Energy Supplies

In addition, the design intention is to develop a scheme that targets a BREEAM 'Very Good' rating under the New Construction 2018 criteria.

The planned development, totalling some 9,389m² Gross Internal Area (GIA), is arranged over 4No. separate blocks consisting of:

- (Building 1) St. Gabriel's Hall/Chapel – 4 storey existing building to be refurbished/remodelled totalling approximately 1390m²
- (Building 2) Woodthorpe Hall – 2 storey existing building to be refurbished/remodelled totalling approximately 1108m²
- (Building 3) 5 storey new build west of Woodthorpe Hall totalling approximately 3489m²
- (Building 4) 4 storey new build east of St. Gabriel's Hall/Chapel totalling approximately 3403m²

Figure 1 – Existing and Proposed Site Layout

With the current emphasis placed on energy conservation and the use of Low or Zero Carbon (LZC) technologies, the applicant is keen to enhance the development's sustainability credentials.

To this end, the proposed design will promote reduced CO_2 emissions from delivered energy consumption by minimising operational energy demand through passive and best-practice measures.

LZC technologies will be incorporated into the design, as deemed appropriate, as part of an integrated services strategy as opposed to a 'bolt-on' approach.

This report has been compiled to discharge the energy reduction requirements as set out by Manchester City Council, in terms of demonstrating an exemplar sustainability strategy for the proposed development.

Separate regulatory requirements apply to the new build elements of the scheme versus the existing refurbished buildings. Therefore, from a calculation of CO_2 emissions perspective the primary focus of this statement shall be on the new buildings (3 and 4) with energy demand and CO_2 emissions detailed within the main sections of the report. An additional section is provided to summarise improvements intended for the refurbished elements (buildings 1 and 2) of the development.

3. Planning Policies

Developments seeking to gain planning permission within the city are required to demonstrate compliance with the Local Development Framework provided in accordance with the National Planning Policy Framework and Planning Practice Guidance. The Manchester Core Strategy 2012-2027 is the key document within Manchester's Local Development Framework and contains a number of energy and environmental policies. The key policies pertinent to this Energy Standards Statement are detailed below.

3.1 Policy EN 4 – Reducing CO_2 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.

It should be noted that the following Energy Standards Statement does not address the final element of EN 4.

3.2 Policy EN 6 – Target Framework for CO_2 reductions from low or zero carbon energy supplies

Applications for residential development of 10 or more units and all other development over 1,000 sq m 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 CO_2 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.

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Domestic CO2 emissions reduction targets

Table 12.1

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 areas	+15% increase on Part L 2010
Target 3: Micro-generation areas	+15% increase on Part L 2010

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 areas (Applies to commercial uses with a high proportion of emissions from electricity use (>45 kg CO2/m2))	+10% increase on Part L 2010
Target 3: Micro-generation areas	+15% increase on Part L 2010

4. Methodology

The Client should avoid, and the team would wish to avoid, a proposal coming forward whereby poor energy efficiency is employed but renewable technologies included, only to satisfy regulatory requirements. Consideration should be given to potential increased inefficiency at part load conditions and at times when renewable energy generation is not available in this respect.

The proposed new buildings (3 and 4) are required to demonstrate compliance with Part L2A (2013) of the building regulations, whereas the existing buildings to be refurbished (1 and 2) will comply with Part L2B (2013) regulations. As CO_2 emissions calculations for compliance against a notional building are not required under L2B of the regulations, this energy standards statement will focus primarily on the achievable reductions for the new buildings. however, the strategy for energy demand and CO_2 emissions reduction will be detailed in a separate section within this statement.

The predicted energy demand for the new construction elements of the development has been based upon a similar student residential development modelled in detail in IES software. 'Benchmark' Energy data has been derived from this model to provide a basis for carrying out options analysis.

4.1 Grid Decarbonisation

It is widely accepted, now, that the current edition of Part L of the building regulations (2013) uses out of date carbon emissions factors relating to different fuel types. None more impacted by this is electrical fuel which now takes greater contribution to its production from renewable sources, rather than relying so heavily on the burning of fossil fuels. An updated version of Part L of the building regulations, incorporating new emissions factors for gas and electricity in particular, was released this past December which is intended to come into force June 2022 recognising the ongoing decarbonisation of the electrical grid. It will therefore be that providing the option of electrically driven systems are far more attractive, in CO_2 emissions terms, than previously experienced.

Institutions such as the BRE (for BREEAM purposes) and the Greater London Authority energy team have been recognising the impact of decarbonisation of the grid within the last couple of years. In fact, any planning application within the GLA jurisdiction must provide it's CO_2 emissions for the development in line with updated carbon emissions factors. For the purposes of this Energy Statement, carbon emissions factors as detailed within SAP 10.2 of 0.21kgCo_2/kWh and 0.136kgCO_2/kWh, for gas and electricity respectively, shall be used to calculate the proposed developments predicted CO_2 emissions.

Summation of the building's predicted energy demand provides the annual energy demand for the development that is the basis of the analysis in this statement.

Predicted CO_2 emissions have been reported at each stage of the following hierarchy:

- Be Lean – Reduce the need for energy demand through design and energy efficiency features
- Be Clean – Supply energy through efficient means (heat networks)
- Be Green – Utilise low or zero carbon energy generation

5. Energy Benchmarking

5.1 Estimated Energy Demands & CO_2 Emissions

In order to benchmark the proposed new development, estimated energy demands and CO_2 emissions data have been calculated. These estimated energy consumptions are indicative only at this stage. They will, however, be used as a guideline to assess the percentage of the building's total energy consumption and CO_2 emissions that could be reduced or offset by applying best practice energy efficiency measures and/or LZC technology solutions.

The baseline newly constructed development for comparison is represented by the notional development as defined in building regulations and the NCM modelling guide for a similar student residential development previously modelled. 'Benchmark' data has been derived from this model to provide the basis for a suitable baseline building.

For the purposes of BREEAM, it is prudent for this report to reflect the benchmark data derived from approved Dynamic Simulation Model (DSM) software which uses government and industry agreed National Calculation Method (NCM) room templates containing standard operating conditions. This is due to the fact that BRE Global will only accept results from the approved models when verifying the percentage reduction in CO_2 emissions from the building for credits Ene 01 and Ene 04 (BREEAM 2018).

To assist with the formulation of an energy strategy, the estimated regulated notional energy consumption and CO2 emissions for the proposed buildings 3 and 4 have been derived from approved DSM software (IES), converted in line with SAP 10.2 emissions factors, and shown in the table below:

	Regulated Annual Energy Demand (kWh/yr)	Regulated Annual Emissions ($kgCO_2/yr$)
Baseline Development (Buildings 3 & 4)	1,240,629	251,454

6. 'Be Lean': Reduce the need for energy demand through design and energy efficiency features

Reducing energy usage is the priority in the energy hierarchy. It is often the measure with the least cost implications, an any reduction will, in turn, reduce the requirement for on-site generation from renewable energy sources.

Achieving an optimum use of energy throughout a building's life requires the implementation of passive design to reduce the need for energy associated with controlling the environment and efficient controls to assist in occupant's use of energy.

The calculated energy demand is based on the following specification:

- Maximising daylighting in all areas. The glazing specification shall be carefully considered, aiming to provide an optimum balance between passive solar heating, limiting summertime overheating and maximising the potential for natural daylight transmission.
- Passive solar control to assist in avoiding the requirement for mechanical cooling systems.
- HVAC and lighting systems to operate 'on demand' where practical
- The use of natural ventilation maximised where appropriate
- Practical zoning of HVAC systems
- Where mechanical supply ventilation is adopted, it will be delivered by high efficiency heat recovery ventilation units with low energy fans.
- Occupancy detection control strategies linked to mechanical ventilation systems, resulting in 'on demand' ventilation control, lower delivered fan power and increased flexibility in building usage.
- Variable speed pumping on pipework systems such that the energy consumed matches the actual demand.
- LED lighting to be adopted throughout
- An air permeability of **3m³/hr/m² @ 50Pa** will be targeted
- The following 'U' values are proposed for the building fabric of the new building:

Element	Part L 2013 Limiting 'U' Value (W/m²k)	Proposed 'U' Value (W/m²k)	% Betterment
External Wall	0.35	0.20	42
Ground Floor	0.25	0.15	40
Roof	0.25	0.13	48
Glazing	2.20	1.4	36

The estimated regulated energy consumption and CO_2 emissions for the 'Be Lean' Buildings 3 and 4 are taken from the IES software model, converted in line with SAP 10.2 emissions factors and shown in the table below:

	Regulated Annual Energy Demand (kWh/yr)	Regulated Annual Emissions (kgCO2/yr)
Proposed 'Be Lean' Development (Buildings 3 and 4)	1,034,834	207,956
Reduction over Notional	16%	17%

7. 'Be Clean': Supply energy through efficient means (De-Centralized Energy)

A heat and power network is in operation within the 'Civic Quarter' of Manchester which is relatively local to the development site. The scheme will benefit the environment by providing lower carbon heat which will be cheaper than heat from traditional gas boilers, providing reduced energy costs and providing reduction in CO_2 Emissions.

In accordance with Manchester City Council Policy and guidance a heat network appraisal has been undertaken for the proposed development.

Through initial investigations and liaison with Vital Energi, who provide management of the network, it has been determined that the site of the proposed development is not situated for a connection to the current network installations but is local to potential extensions to the network. However, due to planned highways and infrastructure works in the area it has been confirmed that any planned extension to serve the development area cannot be accommodated for a number of years. Therefore, at this time it is not deemed feasible to connect to the de-centralized heat or power network.

Priority could then be given to on-site heat networks utilising CHP engines or low/zero carbon fuel technologies for wet heating systems. Given the ongoing decarbonisation of the electrical grid it is sensible to prioritise electrically driven solutions. Traditionally heat pumps have been very effective in providing highly efficient solutions for low temperature heating applications such as underfloor heating, maximising carbon emissions reduction, rather than temperatures suitable for sanitary use. However, more recently developed heat pumps utilising CO_2 based refrigerant are proving to be an efficient, low carbon means of providing suitable temperatures for the production of domestic hot water which can be considered for any building type and in conjunction with other technologies to provide low temperature space heating.

However, as detailed in section 4 of this statement, the client should avoid employing an energy strategy whereby priority is given to systems purely on regulatory or policy requirement. It is understood that in student residential developments, hot water demand takes a large share of the building's total energy consumption which places high priority on maximising energy efficiency in hot water service. Space heating energy demand can be drastically reduced through prioritising building fabric standards and providing an 'on demand' solution allowing increased levels of control on an individual dwelling basis. In order to match the level of individual control of heating with a wet system, more complex control systems and routines would need to be accommodated when compared with direct electric panel heating which can be controlled individually and automatically. It is therefore proposed to use individual electric emitters which also take benefit from the de-carbonizing grid. Hot water demand, however, should be met with stored elements on a central basis to maximise the ability for low carbon heating.

In light of the above, it is proposed that a central site energy centre shall be utilized to meet 100% of the hot water demand for the building. Providing hot water centrally for the site will allow increased flexibility in usage and minimize the redundancy required to provide a reliable system into one source rather than several systems. Hot water to each block is generated locally via plate heat exchangers supplied on the primary side via a site wide heat network. Also, the development incorporates a large enough internal plantroom to facilitate a connection to a district heat network should one come available by the end of the service life to the proposed plant. To maximize energy efficiency and CO_2 emissions reduction it is proposed to use highly efficient air-to-water heat pumps to supply the hot water demand for the site.

For the purpose of this assessment, and until such time that a district heat network connection is deemed feasible, estimated regulated energy consumption and carbon emissions for the 'Be Clean' Buildings 3 and 4 do not demonstrate any further savings than those detailed for the 'Be Lean' stage, as detailed in the table below:

	Regulated Annual Energy Demand (kWh/yr)	Regulated Annual Emissions (kgCO2/yr)
Proposed 'Be Clean' Development	1,034,834	207,956
Reduction over 'Be Lean'	0%	0%
Reduction over Notional	16%	17%

8. 'Be Green': Utilize low or zero carbon energy generation

The third stage of the energy hierarchy refers to the production of low or zero carbon and renewable energy, relating to the reduction in carbon emissions from on-site or near site renewable.

A range of approved renewable technologies have been appraised, considering the suitability, feasibility, size and capital cost of each system required to meet the target. This is summarised as below:

Technology	Brief Description	Benefits	Issues / Limitations	Feasible for Site?
Solar Photovoltaic	Solar photovoltaic panels convert solar radiation into electrical energy through semi-conductor cells.	• Low maintenance / no moving parts • Easily integrated into building design • No ongoing costs	• Any overshadowing affects panel performance • Panels ideally inclined at 30° to the horizontal facing a southerly direction • Site of conservation area and heritage interest require sensitivity of building aesthetic	Potentially
Solar Thermal	Solar thermal energy can be used to contribute towards space heating and hot water demand. The two most common forms of collector are panel and evacuated tube.	• Low maintenance • Little on going maintenance costs	• Must be sized for building DHW requirements. However, local policy encourages communal heat networks • Doesn't suit occupancy profile of a student residential development as likely to be unoccupied over summer months	No
Ground Source Heat Pump (GSHP)	GSHP systems tap into the earth's considerable energy store to provide heating and cooling to buildings. Installs include horizontal trench and vertical borehole	• Minimal maintenance • Unobtrusive technology (once implemented) • Flexible installation options to meet available site footprint • Decarbonisation of the grid promoting electrically driven heat pumps.	• Large area required for horizontal pipes and no available space on this project • Full ground survey required to determine geology • More beneficial if cooling req • Integration with piled foundations must be done at early stage	No
Air Source Heat Pump (ASHP)	As an alternative to GSHPs, ASHP systems draw energy from the air to provide heating and cooling to buildings. Installation	• Limited plant space requirements • Efficient when supporting both heating and cooling	• External plant area required	Yes – considering grid de-carbonisation for low carbon hot

	methods include air-to-water and direct refrigerant (VRF)	• Decarbonisation of the grid promoting electrically driven heat pumps.		water generation.
Wind Turbine ***(Roof Mounted)***	Wind generation equipment operates on the basis of wind turning a propeller, used to drive an alternator to generate electricity. Small scale (1kW – 15kW) turbines can be pole or roof mounted	• Low maintenance / on going costs • Local wind speed is sufficient *(www.bwea.com)* • Excess electrical generation can be exported to grid	• Planning issues • Aesthetic impact and background noise • Structural / vibration impact on building to be assessed • Potential for downstream turbulence due to proximity to other buildings	No
Gas Fired Combined Heat & Power (CHP)	A CHP installation is effectively a mini on-site power plant providing both electric power and thermal heat. CHP is strictly an energy efficient measure rather than a renewable energy technology	• Potential high CO2 saving available • Efficient use of fuel • Excess electrical generation can be exported to grid • Benefits from being part of an energy centre / district heating scheme	• Maintenance intensive • Sufficient base thermal and electrical demand required • Some additional plant space required	No – does not take benefit from grid de-carbonisation.
Bio-Renewable Energy Sources ***(Automated feed wood-fuel boiler plant)***	Modern wood-fuel boilers are highly efficient, clean and almost carbon neutral (the tree growing process effectively absorbs the CO2 that is emitted during combustion). Automated systems require mechanical fuel handling and a large storage silo	• Stable long term running costs • Potentially good CO2 savings	• Large area needed for fuel delivery and storage, no available space on this project. • Reliable fuel supply chain required • Regular maintenance required • Significant plant space required	No
Fuel Cells	Fuel cells convert chemical energy directly into electricity by combining hydrogen and oxygen in a controlled reaction	• Virtually no pollution • High electrical efficiency	• Expensive • Early stages of commercialisation • High technology risk	No

The current and forecasted grid decarbonisation, outlined in Section 3 above, promotes electrically driven solutions in lieu of gas-fired considering the realistic and actual carbon emissions compared with those predicted within current Part L modelling software. Air-to-water source heat pump technology has improved greatly over recent years and as such there are now technologies utilising more environmentally friendly CO_2 based refrigerants to provide improved energy efficiency at high temperatures, generating heat suitable for hot water consumption at efficiencies greater than 300%. It is therefore proposed for this stage of the hierarchy that the development utilise air-to-water Source Heat Pumps to meet the entirety of the hot water demand of the development.

It is proposed that the areas with the need for cooling provision such as some amenity elements of the development is met by the installation of air source heat pumps in the form of VRF plant.

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The estimated regulated energy consumption and CO_2 emissions for the 'Be Green' Buildings 3 and 4 are taken from the IES software model, converted in line with SAP 10.2 emissions factors and shown in the table below:

	Regulated Annual Energy Demand (kWh/yr)	Regulated Annual Emissions (kgCO2/yr)
Proposed 'Be Green' Development	478,167	65,031
Reduction over 'Be Clean'	43%	69%
Reduction over 'Be Lean'	43%	69%
Reduction over Notional	61%	74%

9. Refurbishment Energy Strategy

As set out within previous sections of this statement, Buildings 1 and 2 of the development are existing buildings to be refurbished and therefore the regulatory requirements associated with Buildings 3 and 4 (in terms of emissions calculations, energy standards, etc.) do not apply. However, it is the client's intention to maximize energy and CO_2 emissions reduction as far as practicable. With this in mind the energy hierarchy followed for Buildings 3 and 4, in previous sections of this statement, has also been applied to Buildings 1 and 2 as follows.

9.1 'Be Lean' Reduce the need for energy demand through design and energy efficiency features

The following measures to reduce energy demand through design and energy efficiency features will be applied:

- Maximising daylighting in all areas as far as practicable with due consideration to passive solar control.
- HVAC and lighting systems to operate 'on demand' where practical with appropriate zoning.
- The use of natural ventilation maximised where appropriate.
- Mechanical extract ventilation to be delivered by low energy fans.
- Occupancy detection control strategies linked to mechanical ventilation systems, resulting in 'on demand' ventilation control, lower delivered fan power and increased flexibility in building usage.
- Variable speed pumping on pipework systems such that the energy consumed matches the actual demand.
- LED lighting to be adopted throughout
- Fabric improvements where feasible to meet the requirements of ADL2B tables 3, 4 and 5 or better.

9.2 'Be Clean': Supply energy through efficient means (De-Centralized Energy)

The benefits of the intended heating and hot water strategy for the development are detailed within section 7.0 of this statement. It is therefore proposed that the existing buildings benefit from energy savings and CO_2 emissions reduction associated with utilizing the site wide energy centre for hot water generation.

9.3 'Be Green': Utilize low or zero carbon energy generation

The existing Buildings 1 and 2 shall benefit from their supply of hot water generated by highly efficient heat pumps. Any areas with a cooling requirement shall also be provided with heat pump technology in the form of VRF.

10. Recommendations and Conclusion

In order to demonstrate that the sustainable planning requirements of Manchester City Council can be met by the proposed development consisting of student accommodation, the well-structured energy hierarchy has been followed.

The energy hierarchy has enabled significant carbon reductions to be made to the proposed development at St Gabriel's. The total carbon reduction calculated for Buildings 3 and 4 is approximately 19% over current building regulations, when compared against the notional benchmark development utilising the current 2013 Part L CO_2 emission factors.

The total predicted carbon reduction for Buildings 3 and 4, considering the proposal above for air source heat pumps is 74%, utilising SAP 10.2 emissions factors, and the total calculated energy usage reduction is 61% when compared against the Notional Benchmark Development.

In the first stage of the energy hierarchy (Be Lean) a number of passive and high efficiency measures have been applied to contribute to reducing the energy consumption of the proposed new development through improving the thermal envelop, system efficiencies etc. These elements are generally less expensive to implement and require very little on-going maintenance, thus providing good value for money. Calculations have demonstrated that the 'Lean' measures alone contribute a 14% and 17% CO_2 reduction, for the proposed Buildings 3 and 4, under the current CO_2 emissions factors and SAP 10.2 emissions factors respectively. It has therefore been demonstrated that the development has maximised energy demand reduction as far as practicable whilst considering a balance against potential air quality constraints, noise, etc with servicing choices.

Importantly, in order to assist with reducing both the energy loads of the development, along with potential summertime overheating, there are several factors influencing the specification of the proposed glazing. These include architectural aesthetics, maximising daylighting, and minimising the potential for glare and solar gain. The outputs of the dynamic model have been utilised to inform and ensure a balance is struck when specifying the final window and glazing specification, design and subsequent sizing.

In the second stage of the energy hierarchy (Be Clean), it has been determined that connection onto Heat Networks within Manchester is not yet feasible for this particular development, and therefore has not been considered within this statement. It should be noted, however, that a site wide heat network is to be installed to enable separate hot water generation for each block. Furthermore, the proposed air source heat pump strategy could accept future connection to a DHN with minimal remedial works to the plant installation and the end of the service life of proposed plant.

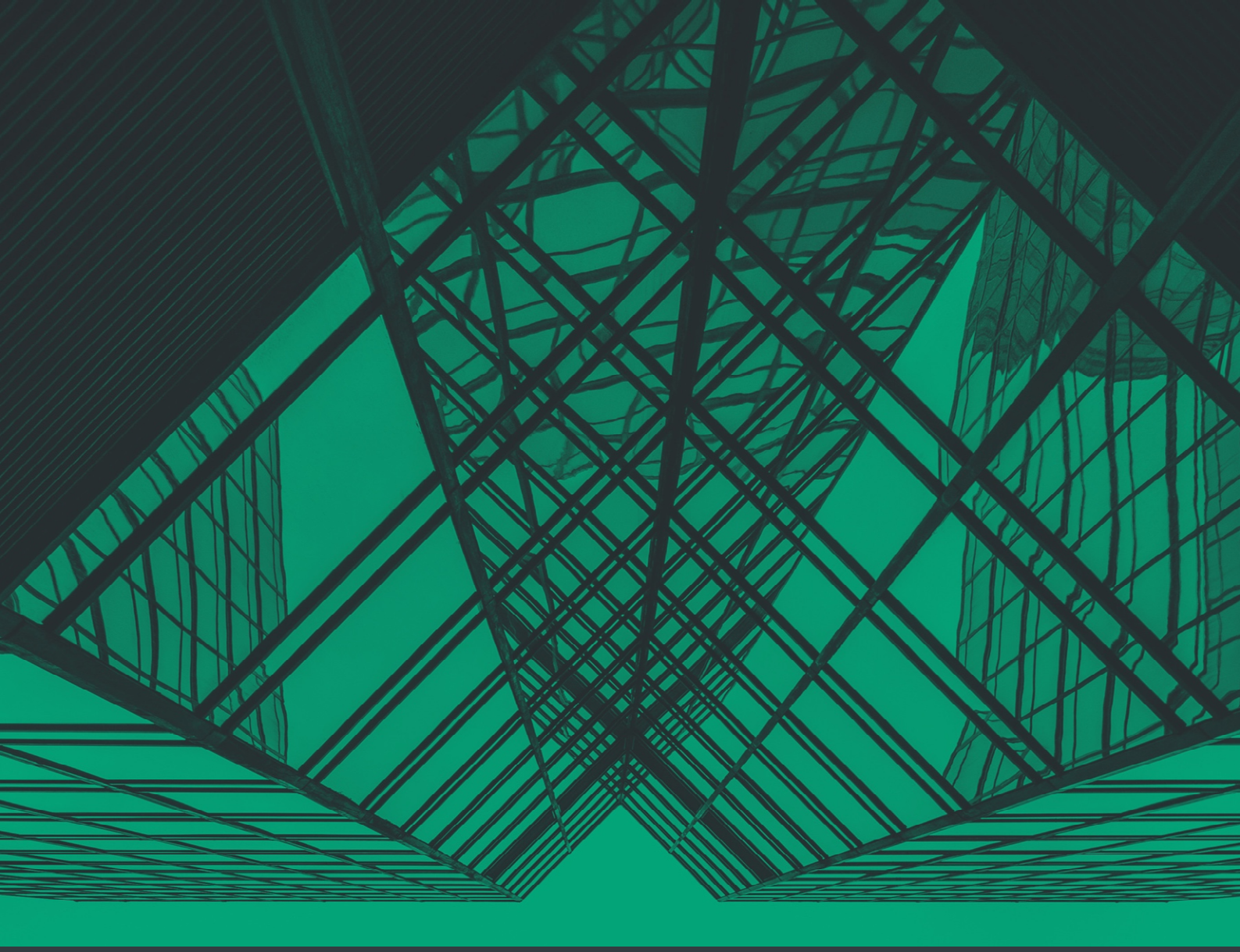
In the third stage of the energy hierarchy (Be Green) it is considered that utilising air source heat pump (ASHP) technology to meet the entire hot water demand for the development via air-to-water heat pumps, and in the form of VRF to provide the heating (and cooling) demand of some amenity spaces, will further demonstrate the sustainable credentials of the development. Air source heat pump technology is classified as low carbon technology with Manchester City Council's energy guidance.

As well as a 63% reduction in energy usage for the proposed Buildings 3 and 4 when compared to the Notional Building, it is also anticipated that following the above proposed strategies will enable at least 4 No. Ene01 credits to be achieved when tested against BREEAM New Construction 2018. Calculations have also demonstrated that the incorporation of air source heat pump technology alone has contributed a 43% and 69% reduction, in energy consumption and CO_2 emissions (considering SAP 10.2 emissions factors) respectively, for Buildings 3 and 4.

Whilst not specifically quantified for Buildings 1 and 2, considering the nature of development is refurbishment only, it is expected that energy demands and CO_2 emissions will be significantly reduced through the proposed energy strategy compared to its previous usage.

In addition to the energy measures outlined within this report, the development will conserve water usage through the following measures in accordance with the water (Wat) credits of BREEAM:

- Specification of low flow water outlets
- Major leak detection system installed on the incoming water main to the development
- Sanitary supply shut off valves fitted to the cold water service connections to WCs within student amenity spaces.



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