

RIDGE

ENERGY STRATEGY REPORT
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MANCHESTER
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ENERGY STRATEGY REPORT, ROBERT STREET
CONTENTS

1. EXECUTIVE SUMMARY 5

1.1. Overview 5

1.2. Design Strategy 5

1.3. Results 5

2. INTRODUCTION 6

3. DEVELOPMENT PROPOSALS 7

3.1. Description of Development Site 7

3.2. Development Proposals 8

4. ENERGY HIERARCHY 9

4.1. Decarbonisation of the Electricity Grid 9

5. GOVERNMENT REVIEW POLICY 11

5.1. National Policy Framework 11

5.2. The Greater Manchester Combined Authority (GMCA) 12

5.3. Manchester Core Strategy 12

5.4. Places for everyone joint development plan document for Bolton, Bury, Manchester, Oldham, Rochdale, Salford, Tameside, Trafford and Wigan 2022 to 2039 – Adopted 21 March 2024 15

6. REGULATORY FRAMEWORK 23

6.1. Building Regulations 23

7. APPRAISAL OF SOLUTIONS 25

7.1. Summary 25

7.2. Passive Design Measures – (Reduce Demand – Be Lean) 27

7.3. Meeting Demand Efficiently - (Be Clean) 30

7.4. LZC Technology - (Be Green) 32

7.5. District Heating Network 35

8. PROPOSALS 37

8.1. Passive Measures – Lean 37

8.1.1. Target Building Fabric U-Values 37

8.1.2. Target Air Permeability 37

8.2. Energy Efficiency Measures – Mean 38

8.2.1. Mechanical Ventilation Heat Recovery 38

8.3. Further Energy Efficiency Measures 39

8.4. Renewable and Low Carbon Technologies – Green 40

9. PREDICTED CARBON EMISSIONS 41

9.1. Carbon Emissions and Operational Energy Savings 41

9.1.1. Residential Areas (SAP Results) 41

9.1.2. Amenity Areas (BRUKL Results) 41

10. OVERALL SUMMARY 42

11. APPENDIX 1 43

Residential Areas (SAP Results) 43

ENERGY STRATEGY REPORT, ROBERT STREET

1. EXECUTIVE SUMMARY

1.1. Overview

Ridge have been appointed to provide an Energy Strategy Report to align with National Planning Policy Framework (NPPF), Manchester County Council (MCC) Core Strategy and Places for Everyone Joint Development Plan. As part of this energy Strategy Report an Energy Modelling Calculation has been completed to assure compliance with Building Regulations Part L.

1.2. Design Strategy

As part of the low carbon design strategy, the following design initiatives were adopted to reduce the operational energy demand of the building as much as possible. This design strategy has been developed in line with the Energy Hierarchy which has been outlined in section 4.

Be Lean

- Improved thermal fabric performance and air permeability matching or exceeding the Part L minimum U-Values to reduce heat losses.
- Maximising natural ventilation through openable panels to reduce the reliance on mechanical ventilation.
- Passive solar control through orientation, layout, form, glazing percentages and G-Values to reduce heat gains and mitigate artificial cooling.
- Providing sufficient glazing to ensure natural daylighting targets are achieved and reduce the reliance on artificial lighting.

Be Clean

- Efficient LED lighting.
- Energy efficient plant and white good to reduce unregulated energy load.
- Integrating variable speed pumps and fans to reduce operational energy demand during off-peak hours.
- Highly efficient heat recovery on mechanical ventilation equipment to reduce fresh air heating and cooling loads.
- Occupancy controls to landlord areas on equipment to reduce off-peak energy loads.
- Smart controls of primary plant and plant within landlord areas to optimise performance and match energy usage with demand.
- Energy monitoring of landlord areas and primary plant to develop a real-life picture of energy use and carbon emissions.

Be Green

- Low carbon technologies such as Air Source Heat Pumps for heating, cooling and hot water.

1.3. Results

As a result of the design strategy implemented, the proposed Robert Street Development **complies with planning policy EN4.**

	TER	**BER /DER**	**% Betterment**
Residential Areas (SAP)	12.72	5.16	59.43%
Amenity Areas (BRUKL)	3.27	3.21	2%

The SAP and BRUKL results relate to a RIBA Stage 2 design and will be subject to design development at the next design stages in order to meet the planning requirements of Manchester City Council. The SAP and BRUKL results are shown in Appendix 1.

ENERGY STRATEGY REPORT, ROBERT STREET
2. INTRODUCTION

As Low Carbon Design Consultants Ridge and Partners have been appointed by Zerum Consult Limited to provide a statement for the purposes of submitting a full planning application on the Erection of a part 10, part 14 and part 19 storey residential building comprising 198 apartments (Use Class C3a) together with associated residents' amenity space, cycle parking, substation, servicing, and associated landscaping works following demolition of existing buildings.

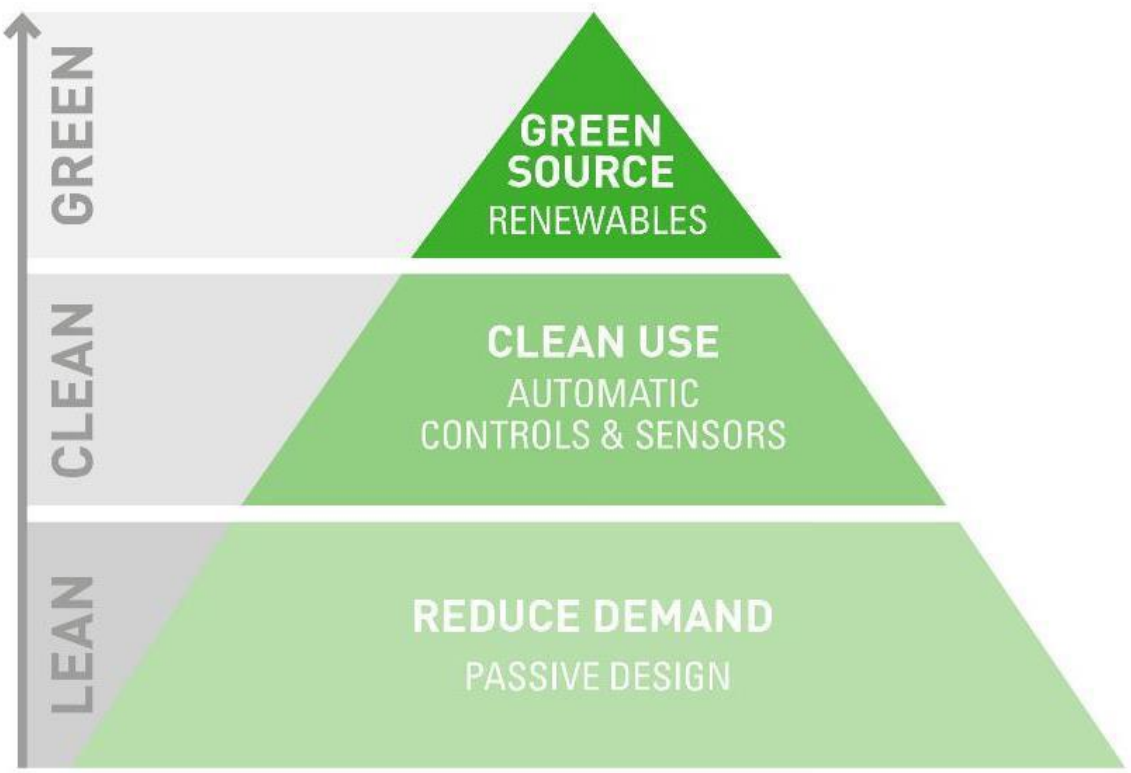
The purpose of the statement is to summarise the relevant policies both National and Local and demonstrate the ways Ridge & Partners have reviewed various options to promote policies set out in this report and subsequent design.

The document presented below outlines a preliminary low carbon design philosophy followed to develop an energy strategy for the proposed works. The "Energy Hierarchy" methodology provides a design framework which was used to develop the proposed low carbon energy strategy. The approach described by this methodology provides a staged process: LEAN, CLEAN and GREEN (Illustrated below) to assess design measures.

Each stage would focus on the following:

- Lean – Main aim is to reduce the buildings energy demand through "passive measures".
- Clean – Meet the reduced energy demand in the most efficient way possible using "active measures"
- Green – Assess the technical feasibility of incorporating a low or zero carbon technology to further reduce the CO2 emissions.

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3. DEVELOPMENT PROPOSALS

3.1. Description of Development Site

The development site is located in Robert Street, Manchester and is bounded by Carnarvon Street to the north, Robert Street to the east, Dutton Street to the south and Cheviot Street to the west

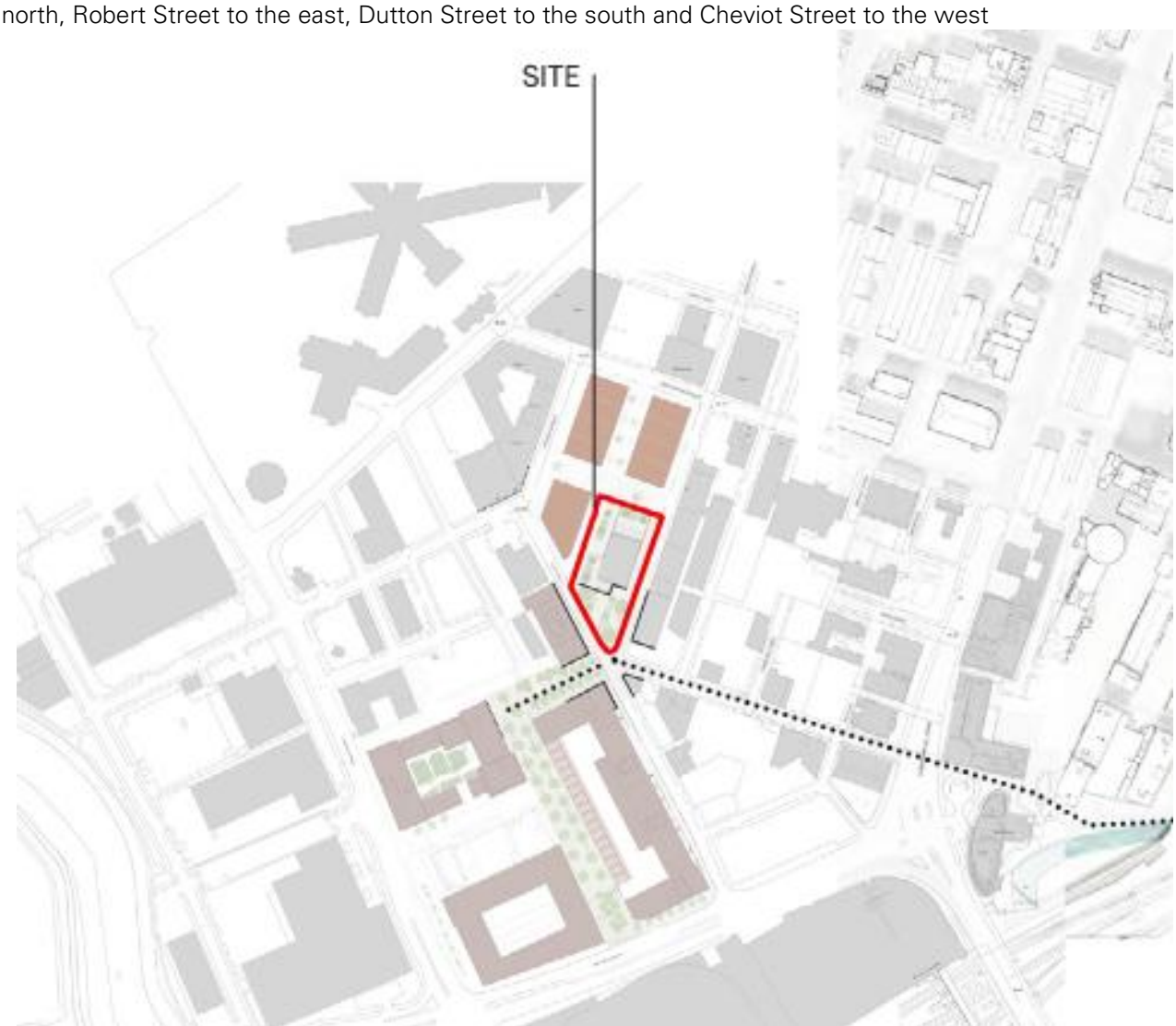


Figure 1 View of the existing site and surrounding area

3.2. Development Proposals

The brief is for Demolition of existing structures and erection of a part 10, part 11, part 14 and part 20 storey residential building comprising 189 units with associated residents' amenity space, servicing and public realm.



Figure 2 - View of the proposed site and the surrounding area

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4. ENERGY HIERARCHY

In line with the draft definition of zero carbon an energy hierarchy has been created (see figure 3 below). Under Policy EN4 developers will initially be expected to secure high levels of energy efficiency and low energy demand. This is followed by the incorporation of on-site measures where these exist, such as low or zero carbon energy technologies and directly connected heat (not necessarily on-site).

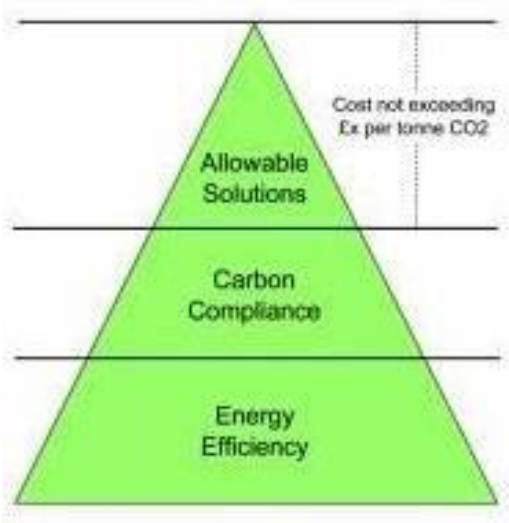


Figure 3 - Energy Hierarchy

However, in order to achieve the highest level of carbon reductions it is intended that developers will be able to contribute to or co-ordinate investment in near or off-site infrastructure. This could include, for example, the connection of buildings to district heating networks and investment in low or zero carbon technologies on buildings owned by the city or by public and community institutions. Further guidance on these 'allowable solutions', possibly in the form of a Supplementary Planning Document (SPD), will be given following further national guidance on this matter expected from the Local Planning Authority.

4.1. Decarbonisation of the Electricity Grid

The National Grid in the UK is decarbonising rapidly. This permits the electrification of heat and heralds the end to combustion of fossil fuels as the main source of heating. The attractive alternative to combustion is heat transfer using heat pumps linked to ground source or air source energy.

The carbon factor of grid electricity was 495 grams of CO2 for each kWh of electricity generated in 2014 according to Defra. This fell by 6.5% to 462 grams in 2015, and by a further 10.8% to 412 in 2016.

The Department for Business, Energy and Industrial Strategy (BEIS) published its Energy and Emissions Projection (EEP) in October 2020 showing the projected Grid Carbon Factor falling dramatically from 156 grams in 2019 to just 67 grams in 2040.

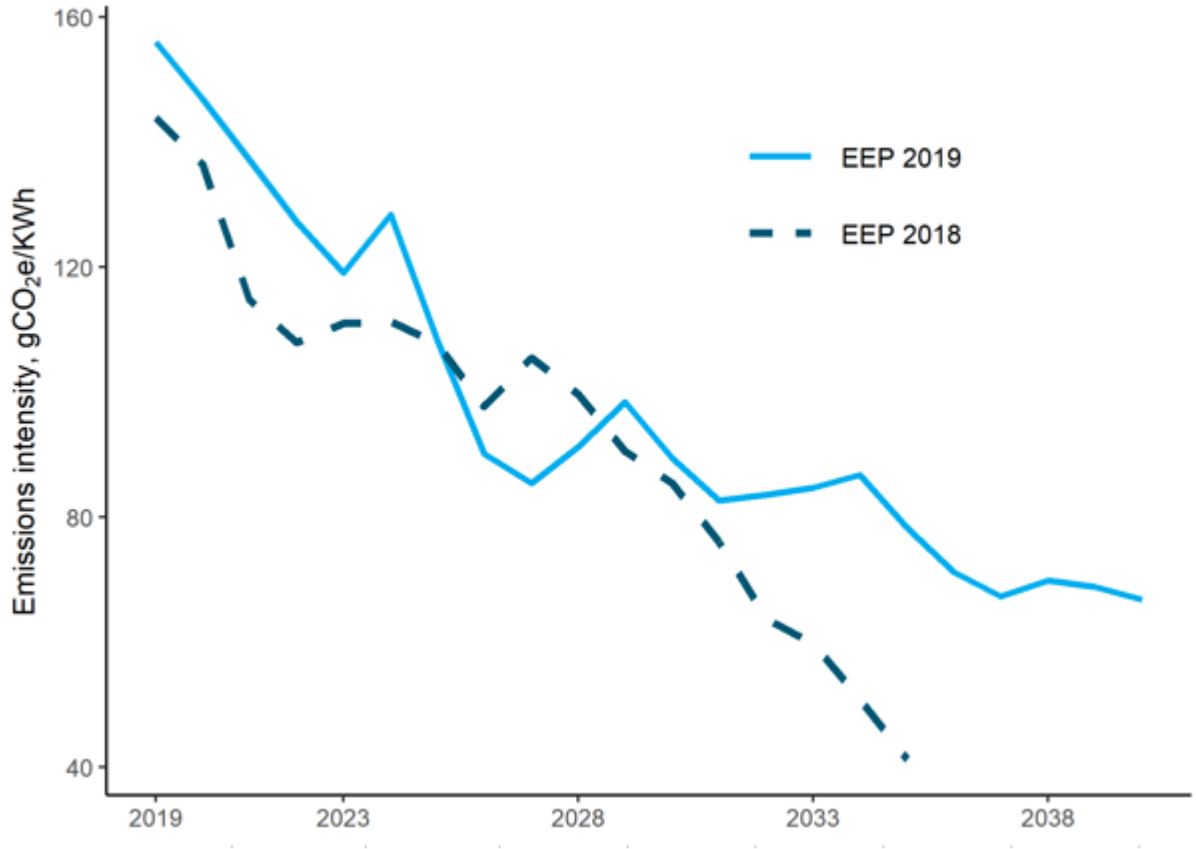


Figure 4 - Predicted Reduction in Grid Carbon Factor

Furthermore, the UK Government has passed laws that require the country to reduce all greenhouse gas emissions to net zero by 2050 and the phasing out of natural gas as a source of heating with gas heating to be banned from 2025.

ENERGY STRATEGY REPORT, ROBERT STREET
5. GOVERNMENT REVIEW POLICY

5.1. National Policy Framework

A revised National Planning Policy Framework (NPPF) was updated and published in December 2023 which sets out the Government's planning policies for England and how they are expected to be applied. This framework replaces that published in July 2021. This framework states the purpose of Sustainable development that:

> *'The purpose of the planning system is to contribute to the achievement of sustainable development.'*

This highlights sustainability as a critical issue that runs throughout all the planning policies. The National Planning Policy Framework (NPPF) defines sustainable development in agreement with the U.N. definition of "meeting the needs of the present without compromising the ability of future generations to meet their own needs." The NPPF outlines how three overarching objectives need to be pursued in mutually supportive ways to achieve sustainable development. These objectives are outlined below.

The environmental objective of this framework is to:

> *Contribute to protecting and enhancing our natural, built, and historic environment; including making effective use of land, helping to improve biodiversity, using natural resources prudently, minimising waste pollution, and mitigating and adapting to climate change, including moving to a low carbon economy.*

At the heart of the Framework is a 'presumption in favour of sustainable development.' Section 14 of the National Planning Policy Framework (NPPF) specifically addresses the challenge of climate change. It states that: 'New development should be planned for in ways that:

> *(a) Avoid increased vulnerability to the range of impacts arising from climate change. When new developments are brought forward in areas which are vulnerable, care should be taken to ensure that risks can be managed through suitable adaptation measures, including through the planning of green infrastructure; and (b) can help to reduce greenhouse gas emissions, such as through its location, orientation, and design. Any local requirements for the sustainability of buildings should reflect the government's policy for national technical standard Local Plan and supplementary guidance.'*

5.2. The Greater Manchester Combined Authority (GMCA)

The GMCA declared a climate emergency in July 2019 and launched a plan in March 2020 following 12 months collaboration and consultation with representatives from areas across the city region. The plan omits the actions needed to achieve a 50% reduction in CO_2 emissions between 2020 and 2025 and actions to support the city to be carbon neutral by 2038.

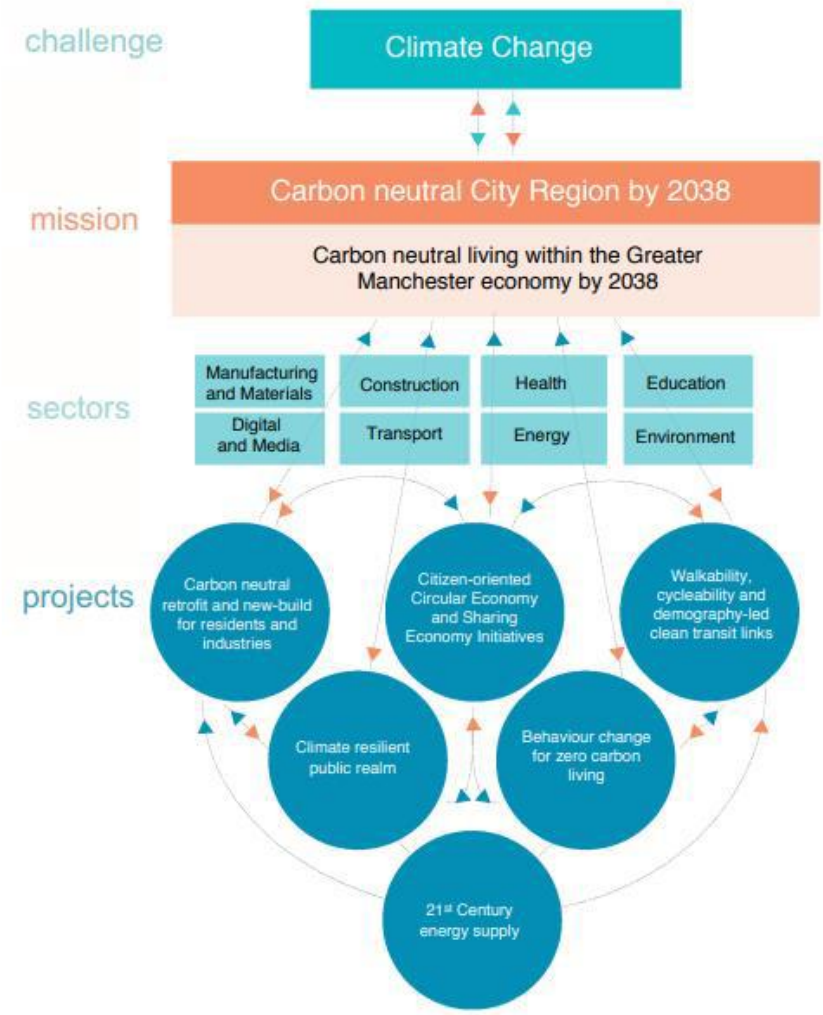


Figure 5 - Potential components of a Greater Manchester clean growth mission

5.3. Manchester Core Strategy

This is the principal document of Manchester City Council as the local planning authority's Development Plan of which the following policies are of most relevance:

- **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 principal of the Energy Hierarchy, being designed:
  - To reduce the need for energy through design features that provide passive heating, natural light 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 scheme and/or to incorporate provision to enable future connection to any existing/potential decentralised energy schemes
- The use of building material with low embodied carbon in new development and refurbishment

- **Policy EN5**

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

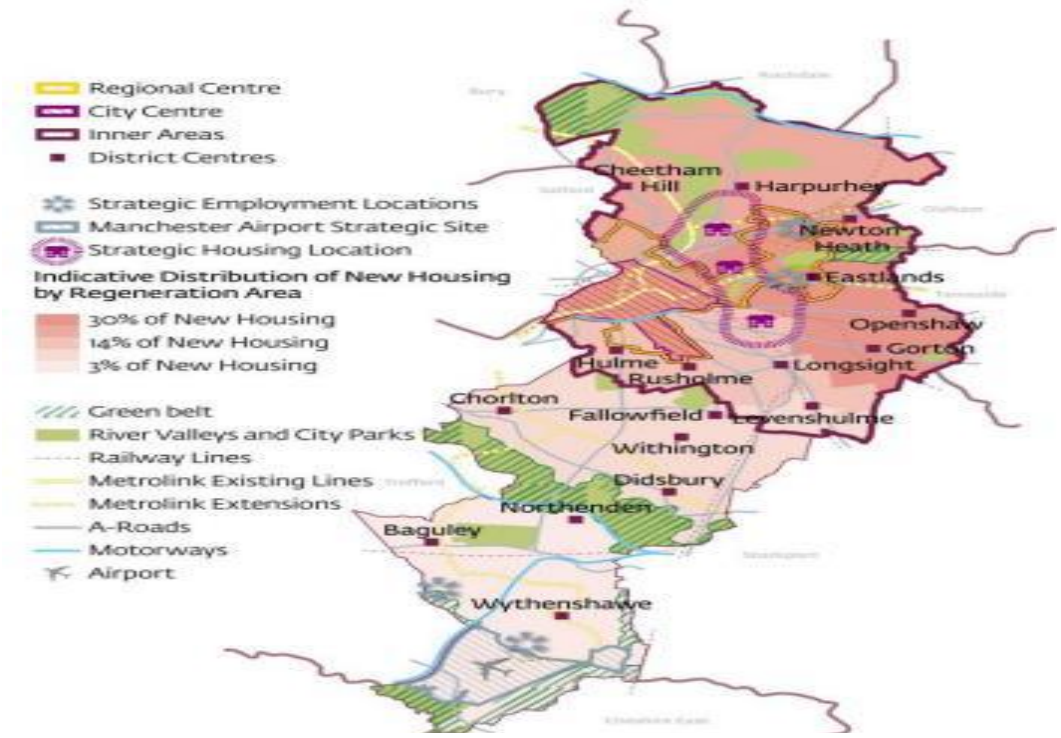


Figure 6 - Key Diagram

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 reduction 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 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: location where 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

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 buildings	+15% increase on Part L 2010
Target 3: Micro generation area	+ 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 buildings (Applies to commercial uses with high proportion of emissions from electricity use (>45 kg CO2/m2)	10% increase on Part L 2010
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 that 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 CO_2 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 of 'Manchester's Local Development Framework, Core Strategy Development Plan Document, Adopted 11th July 2012'.

- **Policy EN8**

Adaptation to Climate Change

All new development will be expected to be adaptable to climate change in terms of the design, layout, sitting 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 rainwater 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 CO_2 mitigation under Policy EN6, subject to evidence to quantify their contribution to compliance.

5.4. Places for everyone joint development plan document for Bolton, Bury, Manchester, Oldham, Rochdale, Salford, Tameside, Trafford and Wigan 2022 to 2039 – Adopted 21 March 2024

Relevant policies from this document include:

- **Policy JP-S1**

Sustainable development

To help tackle climate change, development should aim to maximise its economic, social and environmental benefits simultaneously, minimise its adverse impacts, utilise sustainable construction techniques and actively seek opportunities to secure net gains across each of the different objectives. In preparing plans, authorities should make as much use as possible of suitable previously-developed (brownfield) land and vacant buildings to meet development needs. In bringing forward previously developed sites for development, particular attention will be paid to tackling land contamination and stability issues, ensuring that appropriate mitigation and remediation is implemented to enable sites to be brought back into use effectively.

Addressing Climate Change

Greater Manchester's Vision is to be at the forefront of action on climate change and to make its fair contribution to international commitments by becoming a carbon neutral city region by 2038. In acknowledgment of climate change, by 2020, all 10 districts and the Greater Manchester Combined Authority have declared a climate emergency. To support this vision a 5 Year Environment Plan18 was launched in 2019 to identify the urgent actions that are needed to ensure Greater Manchester can follow the required pathway for carbon neutrality.

To meet our carbon commitments we will need to:

- Be carbon neutral by 2038
- Hold cumulative carbon dioxide emissions to within our carbon budget
- Initiate a programme of mitigation to reduce emissions including by:
  o Significantly upscaling solar photovoltaic energy;
  o Reducing heat demand in homes
  o Moving away from carbon intensive gas as the primary source of heat;
  o Reducing heating and cooling demand for public and commercial buildings;
  o Increasing biofuel use;
  o Enable sustainable choices for travel and decarbonise transport;
  o Significantly upscaling building retrofit; and o Increase the delivery of nature-based solutions and biodiversity net gain

In supporting our ambitions, climate change is a key theme running throughout the plan, rather than being reduced to a single policy, and it is only through this combination of actions that it can be properly addressed. In particular we set out:

- Methods to de-carbonise the city region through new and existing development, effective land management and through the provision of infrastructure and new technologies Policy JP-S2 'Carbon and Energy';
- The delivery of renewable and low carbon energy schemes Policy JP-S3 'Heat and Energy Networks';
- Water based measures to adapt and reduce the impacts of climate change Policy JP-S4 'Flood Risk and the Water Environment'; and
- Measures to help achieve a circular and zero-waste economy Policy JPS6 'Resource Efficiency'.

Carbon and Energy

The modifications to this policy following the examination do not take account of the WMS on Local Energy Efficiency Standards published on 13 December 2023 as this was after the consultation on main modifications had ended.

The vast majority of the existing homes in Greater Manchester will still be in existence in 2050. Existing domestic buildings contribute 33% of Greater Manchester's carbon dioxide emissions whilst existing non-domestic
buildings contribute 35%. Retrofitting the existing building stock therefore presents a significant opportunity to help meet the 2038 carbon neutrality target. This can also contribute to the reduction of fuel poverty when targeted appropriately.

Without any mitigation, new development is estimated to result in around a 3% increase in energy demand. However, new development also enables carbon reduction through the delivery of sustainable patterns of growth, which can support new public transport investment, the establishment of new energy centres and decentralised heat infrastructure, and nature based solutions to sequester carbon, which also provide multi-benefits, as well as opportunities to deliver high standards of energy efficiency through good design. Clean growth is essential to meet future emission targets and to avoid costly retrofit programmes at a later date.

Making this happen will require a co-ordinated approach towards carbon reductions through new and existing buildings and strategic energy infrastructure.

Local Area Energy Plans have been developed by the PfE districts in collaboration with the GMCA and Energy Systems Catapult (ESC). The Local Area Energy Plans are being funded by the government and are consistent with Government policy. They will become a critical evidence base for Local Plans in setting out possible and cost-effective options whilst highlighting where investment is needed and will inform planning decisions. It is anticipated that Local Plans will further identify geographical locations for such energy assets, as considered necessary/appropriate within individual local planning authority areas.

Meeting the 2038 carbon neutrality target will require a radical transformation across a range of sectors to drive carbon reduction. Within this, new development will have a critical role to play and all new homes and commercial/industrial buildings will need to achieve net zero carbon by 2028.The definition of net zero carbon development has been established by the UK Green Building Council. It is expected that development in the Plan area will apply a net zero carbon approach to operational emissions up until 2028, thereafter emissions in construction should be considered. Minimum carbon reduction targets will be set in line with the Future Homes Standard of 80% or until such a time this is superseded.

To provide further confidence in decision making, supporting research was commissioned to outline how the pathway to 2028 can be achieved for 'net zero in operation' by setting out critical milestones and measures that would be expected when following the energy 'hierarchy' and adopting a fabric first approach.

Part L 2021 of national Building Regulations took effect on 15 June 2022 and is a stepping stone to Future Homes and Future Building Standards (FHS), which is currently being consulted in 2024 and is expected to be introduced in 2025. In the interim, the policy will follow the trajectory of FHS in relation to carbon reduction with applicants demonstrating how savings have been maximised following the energy hierarchy. From 2025, applicants will need to demonstrate carbon reductions have been maximised with an opportunity to offset any residual carbon to a carbon offset fund. The approach will be reviewed in line with future standards as they are introduced.

As the electricity grid becomes more decarbonised the ability of renewable energy to offset carbon emissions minimises. However the contribution of such technologies to energy demand reduction and running costs become significant as services move to all electric solutions. The research has shown that in a low carbon context, the use of heat pumps alone could lead to higher running costs (as they consume energy, not generate), increasing the potential for more households being in fuel poverty, production of waste heat and an increased risk of creating local network capacity issues.

For Greater Manchester to meet its carbon neutrality commitments there has to be an increase in renewable energy generation. Community initiatives are likely to play an increasingly important role in the uptake of renewable energy and should be encouraged as a way of providing positive local benefits to wider society. The advantages of increasing renewable and low carbon energy capacity will need to be balanced against any potential impacts such as on residential amenity, local environment and landscape character, sites of conservation and heritage value, telecommunications and aviation equipment and air quality.

Based on the evidence which has informed the 5 Year Environment Plan and achieving net zero carbon in new development, this has shown that there will need to be a significant increase in photovoltaic technology. Therefore where planning applications for residential development are accompanied by an energy statement, the following best practice thresholds should be seen as the starting point in relation to reducing energy demand and onsite renewable energy generation. The thresholds set out in Table 5.1, for post 2025, are consistent with the GM Five Year Environment Plan.

Table 5.1 Best Practice Thresholds for Reducing Energy Demand and Onsite Renewable Energy Generation within residential developments

-	Space Heat Demand[25]	Hot Water Energy Demand[26]	Renewable Energy Generation Targets
2021 - 2025	Houses (30kWh/m2) Flats (25kWh/m2)	20% energy demand reduction in the total heat required for water heating	*Photovoltaic installation: 20% ground floorspace
2025 - onwards	Houses (20kWh/m2) Flats (15kWh/m2)	^20% energy demand reduction in the total heat required for water heating	*Photovoltaic installation: 40% ground floorspace
*Ground floorspace used as a proxy for available roof area.	-	-	-
^will need to be reviewed with Future Homes Standard 2025 to determine if savings already embedded.	-	-	-

In calculating carbon emissions from 2025, 'unregulated' emissions (e.g. those associated with cooking and small appliances) should be assessed, in addition to 'regulated' emissions. The only way that this can be deliverable will be through the use of onsite electricity generation or through carbon offsetting ('allowable solutions') as occupants' lifestyle choices are not pre-determined by energy efficiency measures associated with construction standards.

By following the energy hierarchy, new development will need to achieve net zero carbon through the maximisation of on-site measures first. However, in circumstances where a development has demonstrated that the hierarchy has been followed and there are no reasonable alternatives to meet the minimum carbon reductions, then payment to offset remaining emissions will also be required. Such payments should be expected to fund other carbon saving programmes within Greater Manchester to help meet the 5 Year Environment Plan targets (such as energy efficiency retrofit and renewable energy installations). The Mayor of Greater Manchester has developed the Greater Manchester Environment Fund, which will provide a mechanism for carbon offset payments to be made. Districts may also set up their own carbon off-setting

schemes and set their own carbon price. District carbon off-set funds will need to be ring-fenced and used effectively to support local carbon reduction projects and programmes (such as retrofitting existing properties with energy efficiency measures).

When considering a whole life approach for any new building, embodied emissions from construction can account for up to half of the carbon impacts associated with its lifecycle. In addition, other emissions can be attributed to the end-of-life stages such as demolition, repair or refurbishment.

It is also important that post occupancy evaluation is considered as part of a monitoring programme to ensure buildings function as they are designed and mitigation measures can be identified to address any performance gap (where a buildings modelled energy and carbon performance does not equate to actual in-use operation). Various industry initiatives are also beginning to address this issue so that this can be minimised early on as part of the design and build process. Supplementary planning guidance can also help developers and planning officers to identify the level of information required to meet these requirements as well as wider policy implementation.

Greater Manchester seeks to promote investment in new zero-carbon technologies, to reduce the reliance on carbon-based fuels to accelerate the speed at which such new technologies become financially viable and/or technically feasible.

Under amendments to the Building Regulations, the Government has introduced new requirements for installing electric vehicle charge points in new homes, new non-residential buildings, and when some buildings are renovated. New developments will need to meet the requirements set out in Part S of the Building Regulations, unless superseded by relevant Local Plan policies.

In considering the adequacy of provision of electric vehicle charging points in new development, where necessary and appropriate other factors could also be taken into account, including:

I. The type of development which will influence the EV user profiles, the vehicle dwell times and the charging behaviour all of which will determine the type of points (fast or rapid or a mix of both) and the management arrangements required.
II. The physical location and design of EV charge points within a development to ensure that they are sensitively located and do not negatively affect the street scene, pedestrian and cyclist amenity or access, particularly for people with a disability. Design should also consider the needs of disabled EV drivers.
III. Potential for EV Car Club requirements which also relates to the type of development and its location; and
IV. The management, operation and maintenance requirements of the charge points (private, workplace or publicly accessible charge points managed, operated and maintained by an EV charge point provider)

Policy JP-S2: Carbon and Energy

The aim of delivering a carbon neutral Greater Manchester no later than 2038, with a dramatic reduction in greenhouse gas emissions, will be supported through a range of measures including:

1. Promoting the retrofitting of existing buildings with measures to improve energy efficiency and generate renewable and low carbon energy, heating and cooling;
2. Promoting the use of life cycle cost and carbon assessment tools to ensure the long-term impacts from development can be captured;
3. Taking a positive approach to renewable and low carbon energy schemes, particularly schemes that are led by, or meet the needs of local communities;
4. Increasing the range of nature-based solutions including carbon sequestration through the restoration of peat-based habitats, woodland management, tree planting and natural flood management techniques;
5. An expectation that new development will, unless it can be demonstrated that it is not practicable or financially viable;
    a. Be net zero carbon which applies:
        - from adoption– to regulated operational carbon emissions;
        - from 2028 - to all emissions 'in construction'.

    From 2025 development should also calculate and minimise carbon emissions from unregulated emissions alongside regulated emissions.

    Development proposals should set out how this has been achieved in an energy statement in accordance with the energy hierarchy, which in order of importance seeks to:
        I. Minimise energy demand;
        II. Maximise energy efficiency;
        III. Use renewable energy;
        IV. Use low carbon energy; and
        V. Utilise other energy sources

From 2025 any residual carbon emissions that cannot be fully mitigated on-site should be offset, in agreement with the relevant local planning authority through a financial contribution to a carbon offset fund. As an interim measure, development should be consistent with the 2022 Part L Building Regulations unless superseded by changes to building regulations and/or national or local planning policies.

    b. Incorporate adequate electric vehicle charging points, in line with Part S of the Building Regulations, unless superseded by relevant Local Plan policies, to future proof for the likely long-term demand, taking account of the potential maximum energy demand for the site;
    c. Where practicable, prioritise connection to a renewable energy/heating/cooling network in the first instance or a low carbon energy/heating/cooling network that is adaptable to non-fossil fuels at a later date;
    d. In residential developments, achieve energy demand reductions in terms of space heat demand; hot water energy demand and the delivery of on-site renewable energy generation, in accordance with Table 5.1.

For renewable energy generation priority should be given to PV installation where technically feasible, alternative technologies will be appropriate where the equivalent generation is evidenced.

    e. For non-residential developments, achieve at least BREEAM excellent standard (or equivalent) for the 'Ene 01 – reduction of energy use and carbon emissions' category rising to 'BREEAM outstanding' equivalent for ENE 01 from 2028.

f. Include a detailed energy statement to demonstrate via site relevant evidence how the development has sought to maximize reductions in carbon emissions in line with relevant policy targets, including the minimisation of overheating risks and appropriate measures for post occupancy evaluation. Whole life cycle emissions should be considered where possible.

Districts may set out specific carbon emission reduction and energy demand targets within Local Plans.

Heat and Energy Networks

Around two-thirds of Greater Manchester's carbon emissions come from domestic and commercial buildings. Government analysis identifies heat/energy networks as a cost-effective solution to this issue within areas of high heat density, with modelling suggesting that heat networks could be an important part of the least-cost mix of technologies needed to achieve UK wide decarbonisation targets by 2050. Figure 5.1 shows the broad 'Heat and Energy Network Opportunity Areas' across the nine districts and these areas will be further refined by the districts when more local evidence becomes available.

Heat and energy networks have the potential to achieve significant emissions reductions and have significant potential for promoting regional growth in the Low Carbon sector. The shift to a low carbon economy creates the emergence of new sectors and technologies, which in turn requires new occupations, skills and expertise to be developed in the labour market. This Plan seeks to ensure that its residents will be ready for these new opportunities.

Further analysis has identified heat networks as among the technologies/systems offering the highest technical potential to contribute to the reduction in carbon emissions. The dense urban nature of some parts of Greater Manchester and the scale of development proposed in the Plan allocations means that there are opportunities for significant growth of heat networks aligned with, and building out from, strategic development sites. Analysis by Government suggests a threshold of around 26 kWh/m2 /year above which heat networks are likely to be viable (noting that this figure is one of several factors that may affect viability and is commonly used to inform early-stage analysis only). National Heat Map data suggests many of our urban areas are above this viability threshold.

The UK Clean Growth Strategy (CGS) sets out possible pathways to decarbonise the UK's economy by 2050 if the requirement of at least 100% for the reduction in greenhouse gas emissions is to be achieved.

To comply with policy JP-S3, heat and energy network assessments will be required as part of an energy statement to support planning applications for new developments within the identified "Heat and Energy Network Opportunity Areas" to demonstrate compliance with PfE energy policies. To ensure consistency of approach and to aid the decision-making process, decentralised heat/energy network assessments are required to demonstrate consideration and analysis of:

a. Identification of existing and proposed heat/energy loads;
b. Identification of heat/energy supply sources;
c. Identification of opportunities to utilise renewable and low carbon energy sources;
d. Identification of opportunities to utilise waste and secondary heat sources;
e. Impact of proposals and technology choices on local air quality;
f. Design according to national best practice in relation to efficient heat network design (e.g. CIBSE CP1 Heat Networks: Code of Practice for the UK, or equivalent); and
g. Adopting appropriate consumer protection standards (e.g. Heat Trust or equivalent).

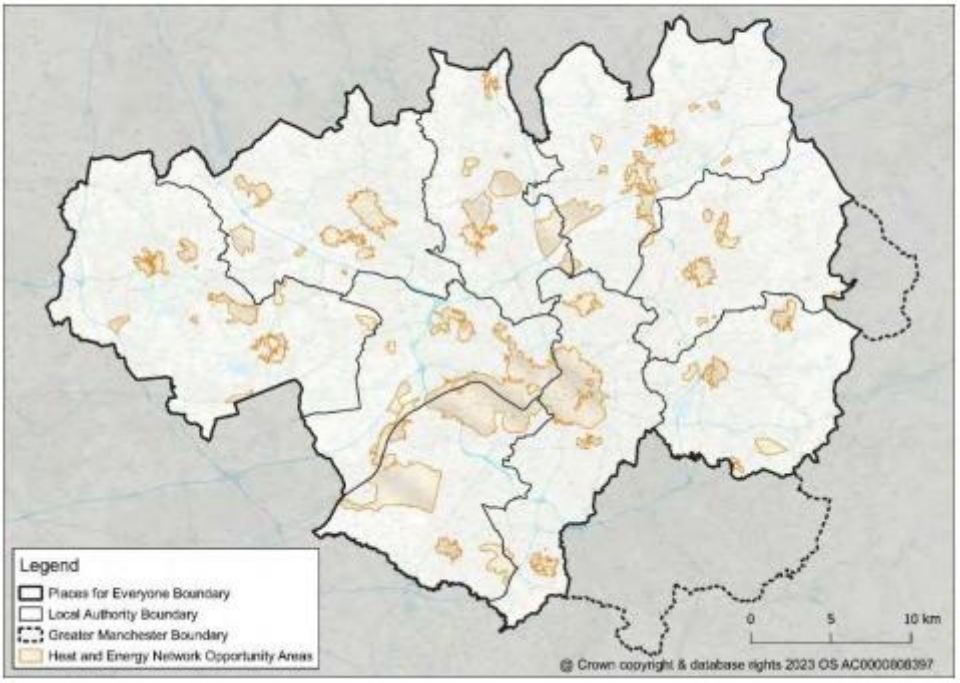
Policy JP-S3: Heat and Energy Networks

The provision of decentralised energy infrastructure is critical to the delivery of our objectives for low carbon growth, carbon reductions and an increase in local energy generation. The following measures will help to achieve this:

1. Delivery of renewable and low carbon energy schemes will be supported with particular emphasis on the use of decentralised energy networks in areas identified as "Heat and Energy Network Opportunity Areas". These have been identified where:
   a. Existing heat/energy networks are operational or have been commissioned;
   b. Proposals for new heat networks/energy networks are being progressed, or future opportunities have been identified in city-region master planning;
   c. Sufficient density of existing heat demand occurs; and
   d. Significant future development is proposed at the strategic development locations.

2. Within the identified "Heat and Energy Network Opportunity Areas", unless it can be demonstrated that there are more effective alternatives for minimising carbon emissions or such connection is not practicable or financially viable, it is expected that:
   a. New residential developments that are '10 dwellings or more' or other developments over 1,000 m2 floorspace shall:
   i. Connect to an existing or planned heat/energy network or be designed to enable future connection (where within 500m of such a network); and/or
   ii. Install a site-wide or communal heat/energy network solution.
   b. An expectation that new industrial development will demonstrate that opportunities for using waste heat locally have been fully examined, and included in proposals
   c. An expectation that where publicly-owned buildings and assets adjoin new major development sites, opportunities for these buildings and assets to connect to site-wide proposals will be considered; and
   d. An expectation that any site-wide networks will be designed so as to enable future expansion to adjoining buildings or assets as appropriate

Figure 5.1 Heat and Energy Network Opportunity Areas



6. REGULATORY FRAMEWORK

6.1. Building Regulations

Part L 2021 came into effect in June 2022 with a transitional period of 12 months and will act as an uplift to help the construction industry adapt to changing regulations and low carbon heating. Figure 7 shows the timeline for the new Part L regulations and displays that the new regulations will require a 31% and 27% reduction in CO_2 emissions compared to the previous 2013 regulations for domestic buildings and non-domestic buildings respectively.

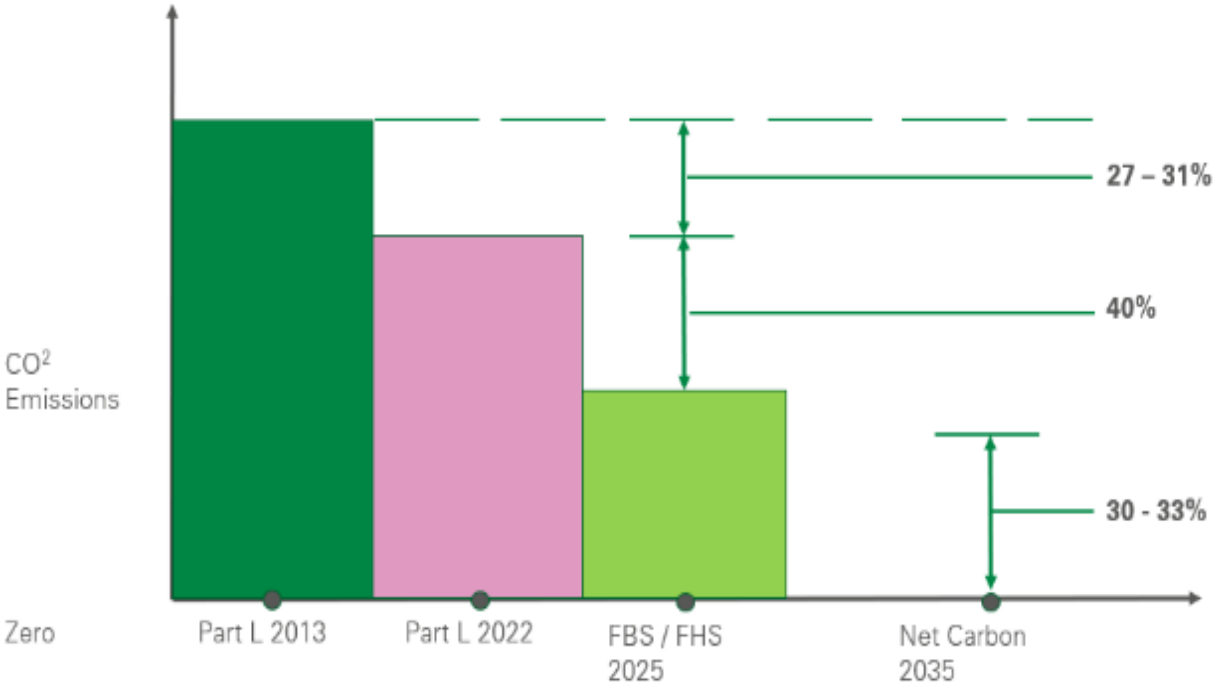


Figure 7 - Part L 2022 Changes

The future building standards which will come into effect in 2025 will require CO2 emissions to be further decreased by 40% in comparison to current figures. The timeline for the future buildings standards is displayed in figure 8:

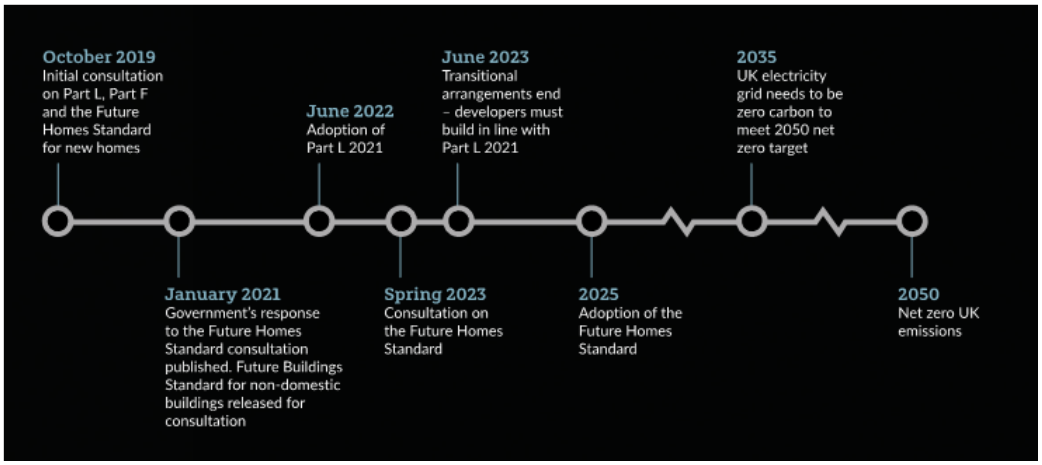


Figure 8 - Future Homes Standard

Part L volume 1 Key Changes (Domestic buildings)

- 31% less CO2 reduction compared to current regulations.
- No ban on use of gas boilers.
- Local planning authorities will retain powers to set higher energy efficiency targets than building regulations.
- All new builds to be air tightness tested and reducing unwanted air infiltration in existing dwellings.
- Improve accuracy of as built energy calculations

Part L volume 2 Key Changes (Non-Domestic buildings)

- New non-domestic buildings to be 27% less CO2 than current regulations.
- Encourage use of low carbon systems and high levels of building fabric.
- Uplift in the efficiencies of building services.
- Update to SBEM and NCM modelling guide.
- Uplift to limiting U-values and air permeability.
- Air tightness in existing buildings – reducing unwanted air filtration.
- Maximum flow temperature of 55°C in wet space heating systems.

A new performance metric has also been ushered in, primary energy will become the principle measure replacing CO_2 emissions as the main metric. CO_2 emissions will become less effective as a measure of energy performance as the electricity grid becomes decarbonised. If not addressed, this could result in a dwelling with low CO_2 emissions complying with regulations, despite having excessively high energy consumption. Consequently, the Primary Energy metric has been introduced to ensure that energy efficiency is directly measured rather than assuming it is linked to CO_2 emissions. Any plans/notices submitted after June 2022 must adhere to the new Part L standards.

7. APPRAISAL OF SOLUTIONS

7.1. Summary

The strategic approach outlined, follows a specific appraisal of technologies at each stage of design and to achieve the overall goal of CO_2 reduction.

As on the whole it becomes more expensive to implement carbon reduction measures the further along the design process as the opportunities to reduce demand diminish.

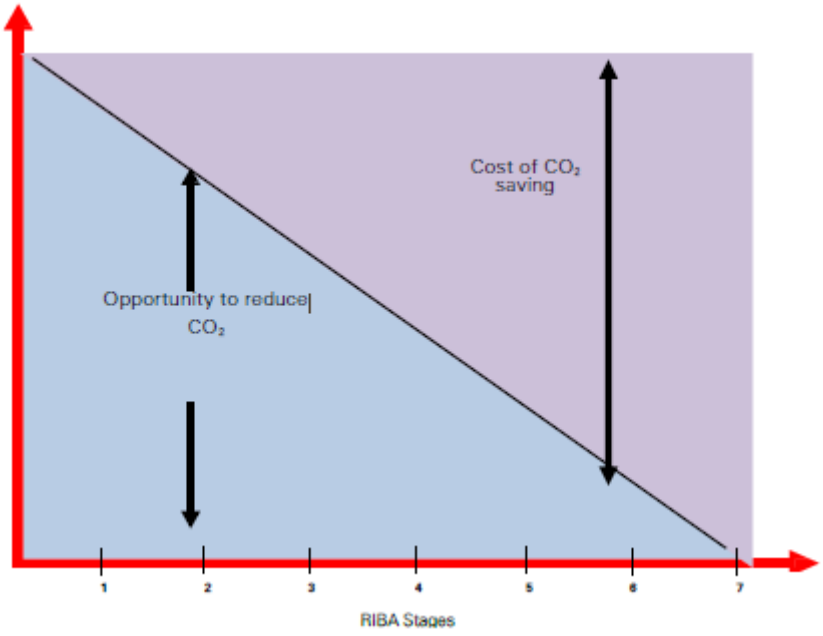


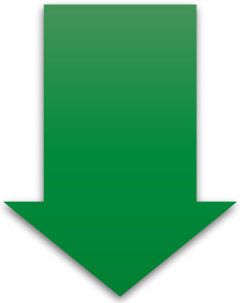
Figure 9 - Costs of implementing design measures at each RIBA Stage

In this first instance it is therefore essential that the buildings 'passive measures' are optimised and the design team work in close collaboration with the user team to consider the future fit out demands.

The next stage is to adopt 'efficient technologies' such as heat recovery and variable speed drives etc. to meet the demand efficiency with the final approach of applying 'renewable and low carbon' technologies accordingly.

Our approach has followed the following route:

Reduce Demand



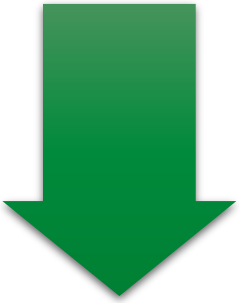
Passive design:

- Thermal insulation
- Natural ventilation
- Natural daylight
- Thermal mass
- Air tightness
- Solar shading/Glass Specification
- A Rated White Goods

LEAN

Reduce Energy Demand

Meet demand efficiently

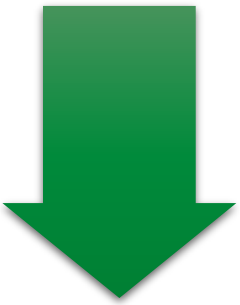


- Low energy fit out
- Heat recovery
- Mixed mode ventilation
- Low energy lighting (LED)
- Power management
- Variable speed drives
- Demand Operated Systems
- Low Specific Fan Power
- Wastewater Heat Recovery

MEAN

Supply Energy Cleanly and Efficiently

Supply energy from low and zero carbon technology



- Combined heat power/tri-generation
- Biomass/biofuels
- Solar thermal hot water
- Ground source heat pumps (GSHP)
  - Open loop
  - Closed loop
- Photovoltaics
- Fuel cells
- Air source heat pumps (ASHP)
- Wind
- Hydro

GREEN

Incorporate Renewable Energy

7.2. Passive Design Measures – (Reduce Demand – Be Lean)

This section looks at the proposed measures that will ensure the initial demand for energy in the building is low from the outset using passive measures.

The **site location** is in central Manchester, with **weather** typical of the North-west. Mild conditions are present throughout the year, with relatively high rainfall and cloud cover expected throughout the year. The **microclimate** in the centre of Manchester tends towards higher temperatures than typical in the North-west generally, due to the urban heat island effect.

In terms of expected **building occupancy**, these are expected to be typical of buildings of this type with variable usage with generally but high occupancy in the weekday evenings and weekends.

The following measures are to be incorporated in the design:

- Passive Design
  - Thermal Insulation
  - Natural Ventilation / Mixed mode
  - Natural Daylight
  - Thermal Mass
  - Air tightness
  - Solar Shading
  - Adaption to climate change

These measures promote the reduction of Energy use and carbon emission in the first instance.

The passive design features at Robert Street mean that the building is well adapted to these risks.

Firstly, the energy demand has been reduced and therefore the building will be less affected by the decreased availability of energy.

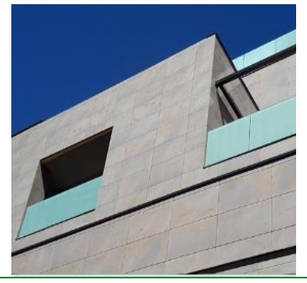
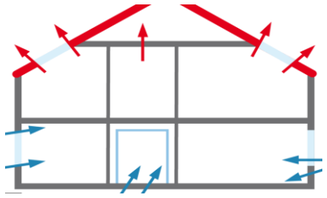
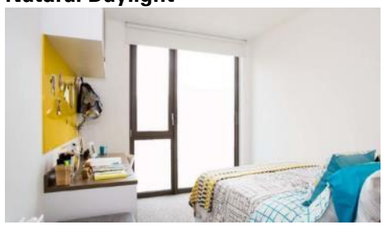
Secondly, the building will have a lower carbon footprint helping to stop the effects of climate change from increasing any further.

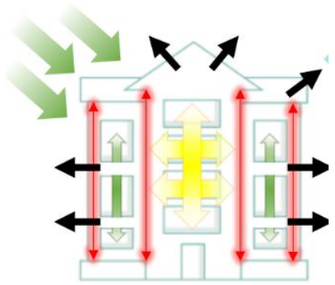
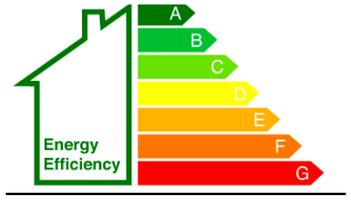
The expected increase in external temperatures could result in future overheating problems. Whilst the building cannot be relocated, by having low g-value glass, there is less solar heat gain entering the rooms.

The demand for cooling has also been reduced through the adoption of efficient building services and by matching or exceeding the u-values stated in the Building Regulations.

This combination of passive design measures act to stabilise the temperatures within the building and enable it to adapt to the likely extremes of both high and low temperatures.

Key:
Y – Yes could be incorporated
P – Possible
N – Not appropriate

Measure	Description	Suitable For Consideration	Commentary
Thermal Insulation 	Thermal insulation is the reduction of heat transfer (i.e., the transfer of thermal energy between objects of differing temperature) between objects in thermal contact or in range of radiative influence.	**Y**	Insulation is central to low energy construction to reduce unnecessary heat loss. The Part L building regulations set out limiting efficiencies U-values on which we intend to improve on, these improvements are shown in section 9. This will reduce the energy required to heat the spaces in the proposed new building. The future building standards will also need to be considered. This will come into effect in 2025 and will require CO_2 emissions to be further decreased by 40% in comparison to Part L 2021 current figures therefore careful consideration of thermal insulation must be made at design stage. The Proposed Development will adapt a high level of thermal insulation to reduce heat loss and thus reduce overall energy demand. Thermal insulation is essential to minimise heat losses and minimum standards Building Regulation U Values will be matched or exceeded.
Air Tightness 	Airtightness is the control of air leakage, i.e. the elimination of unwanted draughts through the external fabric of the building envelope. This may be achieved by the correct and proper installation of a vapour check or vapour barrier.	**Y**	The Proposed Development will target an air tightness that exceeds the minimum requirements of Part L 2021 building regulations to reduce air infiltration and unwanted draughts through the external fabric of the building envelope and so heating and cooling energy demand will be lowered. The current air tightness target for the Proposed Development is 3 $m^3/(h.m^2)$ at 50 Pa, this is a 63% improvement over the Part L minimum of 8 $m^3/(h.m^2)$ at 50 Pa.
Natural Ventilation 	Natural ventilation is a method of supplying fresh air to a building or room by means of passive forces, typically by wind speed or differences in pressure internally and externally. During design, natural ventilation is first considered before mechanical ventilation because this reduces carbon emissions.	**Y**	Natural ventilation to be used in a mixed mode approach with mechanically powered ventilation using MVHR units to counter space overheating. This will help to reduce on site carbon emissions by the avoidance of operating electrically driven ventilation fans and cooling plant. The internal planning, building geometry and external topography will be optimised to take full advantage of natural ventilation. Careful attention to the placement of openable windows and interior partitions can greatly increase the natural flow of air through a building by capturing the prevailing winds. Perforated opening panels will provide a level of natural ventilation to the rooms.
Natural Daylight 	Natural light is light that is generated naturally, the common source of which is the Sun. This is as opposed to artificial light, which is typically produced by electrical appliances such as lamps.	**Y**	To reduce the energy used for artificial lighting the natural daylight entering occupied spaces will be maximised by optimising window size and orientation. Dimmable lighting with photocells will sense if the illuminance level of the space has been met and reduce lighting levels as required. North facing windows are particularly effective at providing useful daylight and will be incorporated on the building. The buildings orientation and fenestration strategy will take advantage of passive solar gains and natural daylight to reduce heating energy and the need for artificial lighting.
Solar Shading 	Solar shading is a method by which solar radiation in the form of heat and light can be mitigated in a building. While natural heat and light are essential in most buildings and modern architecture uses it more and more there are occasions when the levels are too high. This leads to overheating and too much light. Solar shading is a general term for a range of methods used to reduce the amount of solar gain.	**Y**	Whilst maximising daylight care must be taken to ensure that direct sunlight does not cause glare in the spaces and does not cause excessive solar gains in summer which will cause spaces to overheat. This is managed by solar shading on affected windows. Some examples of solar shading are: canopies, solar control glazing, balconies, internal blinds and curtains which could be adopted on this development. Solar shading is not proposed on the scheme, however low G-Value glass will help to prevent unwanted solar gain entering the spaces of the Proposed Development

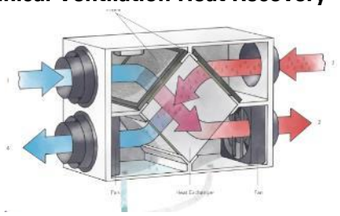
Thermal Mass 	Thermal mass describes a materials capacity to absorb, store and release heat. For example, water and concrete have a high capacity to store heat and are referred to as 'high thermal mass' materials. Insulation foam, by contrast, has very little heat storage capacity and is referred to as having 'low thermal mass'. A common analogy is thermal mass as a kind of thermal battery. Though thermal mass has always been an aspect of buildings, only in recent years has it evolved as a tool to be deployed in the conservation of energy. However thermal mass does not offer a 'one size fits all' concept.	**N**	Thermal mass such as concrete can absorb large amounts of heat energy which prevents spaces from overheating. The thermal mass can be cooled overnight when the space is not occupied to further reduce energy needed for cooling when the space is occupied. The Proposed Development will be of medium lightweight structure with a concrete roof.
Low Energy Fit Out 	A low energy fit out is an interior development of a building that is low carbon in its design, operation, and entire lifecycle.	**Y**	All goods and appliances should be highly energy efficient to reduce energy demand.
Sub-metering 	Building submetering is a meter within your building or facility for specific energy measurements.	**Y**	Power, lighting, major plant and separate tenancy areas will be metered to allow energy consumption to be pinpointed and reviewed if it is excessive. Baselines and targets will also be set to help reduce energy use. The individual apartments will be metered individually, the buildings as a whole will be bulk metered.
Adaption to climate change 	Average temperatures for central England have risen by approximately 1°C since the 1970s and this has resulted in higher temperatures, changing rain patterns, rising sea levels, in addition to unpredictable extreme weather events such as floods, droughts and freezing winters. Risks of climate change include the increased likelihood of increased external temperatures which could lead to staff illness and therefore lower productivity, damage to equipment due to the high internal building temperatures in addition to increased cooling demand.	**Y**	An uplift in fabric improvements and solar shading on a development can maximise the retention of heat in winter and reduce solar gains in summer. These actions will help combat the extremes expected as a result of climate change. G-Values will be carefully selected to maximise natural light and thus reduce reliance on artificial lighting without introducing unwanted thermal gain during the summer months.

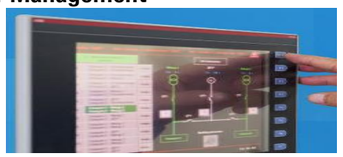
7.3. Meeting Demand Efficiently - (Be Clean)

This section looks at technologies that will be used to ensure that energy demand is further reduced and met efficiently:

- Ventilation
- Heat recovery
- Demand Operated Systems
- Variable Speed Drives on fans and pumps
- Power Management
- LED Lighting
- Waste Water Heat Recovery
- BMS

Key:
Y – Yes could be incorporated
P – Possible
N – Not appropriate

Technology	Description	Suitable For Consideration	Commentary
Mechanical Ventilation Heat Recovery (MVHR) 	MVHR provides fresh filtered air into a building whilst retaining most of the energy that has already been used in heating the building. Heat Recovery Ventilation is the solution to the ventilation needs of energy efficient buildings.	**Y**	Where fresh air is supplied, and stale warm air extracted by mechanical ventilation, heat recovery will be used to recycle up to 85% of the heat from the extracted air to warm the incoming air. The re-use of waste heat in the mechanical ventilation systems could provide a significant step towards reducing CO_2 emissions. MVHR units also work to pre-cool warm fresh air during summer months in order to reduce the cooling energy required in air-conditioned spaces. Mechanical Ventilation with Heat Recovery (MVHR) units will be installed within all apartments and communal spaces.
Demand Operated Systems 	The control of the heating, cooling, ventilation, and lighting systems is fundamental to the energy efficiency of buildings. The use of the following measures can reduce energy consumption: Zoned thermostatic control; Time control; Variable flow control; BMS (Building Management System) automated control; Lighting PIR (Passive Infra-Red Sensor) control; Daylight linked lighting control; CO_2 detection; and Energy management control	**Y**	Where ventilation, heating and cooling is provided to a space that may not always be in use, occupancy sensors will be used, this will be fundamental to the energy efficiency of each building. These will shut down the systems serving the spaces when they are not required and turn them back on instantly when they are required. The use of the following measures will be encouraged: Zoned thermostatic control; Time control; Variable flow control; BMS (Building Management System) automated control; Lighting PIR (Passive Infra-Red Sensor) control; Daylight linked lighting control; CO_2 detection; and Energy management control. The use of passive infra-red (PIR) for lighting,heating, ventilation will be adopted where feasible. Typically, this will be in the form of PIR sensors in small spaces and microwave sensors in larger areas.
Variable Speed Drives 	Variable speed drives and controls allow an energy system to modulate during periods of low demand. Using variable speed drive pumps therefore uses less energy than traditional pumps, which run at a constant speed.	**Y**	All pumps and fans would be provided with variable speed motors which will speed up and slow down as the demand increases or reduces to conserve energy. These can be used in conjunction with the demand operated systems to reduce the speed of pumps and fan motors to a minimum to conserve energy. Variable speed drives can be adopted on all fan and pump motors where possible to reduce energy consumption (Central Plant).

Power Management 	Power management is a computing device feature that allows users to control the amount of electrical power consumed by an underlying device, with minimal impact on performance. It enables the switching of devices in various power modes, each with different power usage characteristics related to device performance.	**Y**	Power factor correction can be used on the electrical supplies of a building to improve energy efficiency. Provision including allocation of spare plant space will be made for future introduction of power factor correction into the Proposed Development, this will follow a survey undertaken after 6 months of operation.
LED Lighting 	An LED lamp or LED light bulb is an electric light that produces light using light-emitting diodes. LED lamps are significantly more energy-efficient than equivalent incandescent lamps and can be significantly more efficient than most fluorescent lamps	**Y**	Extensively adopted LED fittings will be used throughout the scheme to limit the energy associated with internal and external lighting. LED lighting will be used throughout the Proposed Development.
BMS Optimisation 	A building management system is a computer-based control system installed in buildings that controls and monitors the building's mechanical and electrical equipment such as ventilation, lighting, power systems, fire systems, and security systems.	**Y**	The building may be provided with an intelligent building management system that will learn how the building operates and optimise the function of the ventilation, heating, and cooling systems within the amenity areas to minimise energy use.

7.4. LZC Technology - (Be Green)

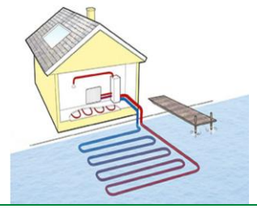
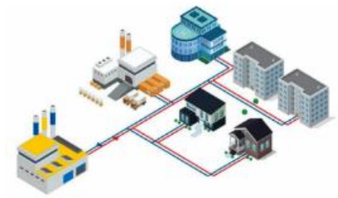
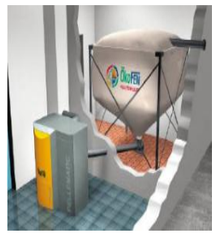
The following Low Zero Carbon (LZC) technologies have been identified and reviewed against their suitability on the Plot 10b First Street, Manchester site:

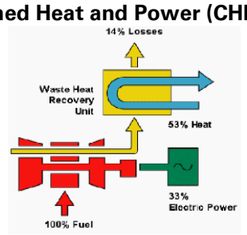
- Solar Water Heating
- Ground Source Heat Pumps
- Water Source Heat Pumps
- District Heating
- Biomass
- Wind Power
- Photovoltaic Electricity Generation
- Combined Heat and Power
- Air Source Heat Pumps
- Battery Storage

These services are described in more detail below and their suitability discussed.

Key:
Y – Yes could be incorporated
P – Possible
N – Not appropriate

Technology	Description	Suitable For Consideration	Commentary
Solar Thermal Water Heating 	Solar thermal water heating systems use heat from the sun to pre-heat domestic hot water. Solar thermal water heating systems are generally composed of solar thermal collectors and a fluid system to move the heat from the collector to a storage tank to store the heat for subsequent use. The system requires solar panels on the roof, ideally south facing, linked to hot water storage cylinders.	**N**	In the case of multi-dwelling, multi-storey blocks the available roof area, pitch and orientation is critical. The solar energy collection and pipework distribution strategy would centre on collecting and storing thermal energy in cylinders or tanks in plant rooms. Solar thermal alone will not meet the scheme's targets and would require large roof areas to make any meaningful contribution to the energy strategy. Additionally domestic hot water loads are relatively large given the development is residential based. The roof space would be better utilised for PV panels and plant equipment as such there would be limited space to utilise this technology therefore not proposed for this development.
Ground Source Heat Pumps 	Ground Source Heat Pumps (GSHP) can be used to extract heat from the ground by circulating a fluid through a system of pipes buried underground to a heat exchanger which transfers the energy to the distribution network. This can provide space heating and/or domestic hot water. Ground source heat pumps have the advantage that they can act as a source of both heating and cooling for the buildings. Ground source heat pumps are either open-loop (abstracting and rejecting water to the aquifer below the site) or closed-loop. aquifer below the site) or closed-loop using boreholes and energy piles.	**N**	Low grade heat generated, efficiency of system dependent on low distribution temperatures. Average Co-efficient of Performance (CoP) of around 4-6 meaning that for every unit of electricity used to pump the heat, 4-6 units of heat are produced, making this an efficient way of heating a building. Extensive underground boreholes/pipework difficult to install due to availability of land therefore discounted.

Water Source Heat Pumps 	Water Source Heat Pumps (WSHP) work in a similar way to GSHP, with the exception that the pipes are submerged into a river, stream, lake or the sea. The fluid is pumped through the system and absorbs energy from the surrounding water. WSHP can be either an open-loop or closed-loop system.	**N**	No suitable water courses nearby with enough volume.
District Heating 	Energy sources include heat from CHP and to a lesser extent, geothermal. Manchester City Council has a district heating scheme with the possibility of connection, however the feasibility and viability of connection to the district heating mains related to both the proximity of the network and the forecasted annual heat demand.	**N**	Low carbon emission factors. Potentially able to achieve renewable targets without other technologies. Reduced plant requirements within building. The distance of the proposed district heating mains to this development site is 1.3 miles which is considered to far to be economically viable and are therefore discounted. See Section 6 of this report for further details.
Biomass 	Biomass heating systems burn biomass material in a biomass boiler in order to heat water in the same way that gas boilers burn gas. Biomass materials include all land and water based vegetation, e.g. wood chips, wood pellets, wood waste and fast growing coppice trees such as willow. The carbon dioxide emitted from burning biomass is balanced by that absorbed during the fuel's production. Biomass heating therefore approaches a low carbon process. Biomass boilers require fuel storage for the fuel source.	**N**	Could be adopted to offset heating and hot water but high NO_X levels a concern in city centre environment Sourcing of materials, transporting large volumes into the site. Wood chips require a large storage area, usually equivalent to the plant room size. Maintenance requirements and reliability. Not considered for this site.
Wind Power 	Wind power is one of the cleanest and safest methods of generating electricity. Wind turbines use the wind's forces to turn a rotor which in turn generates electricity. Wind power is used in large scale wind farms for national electrical grids as well as in small individual turbines or building integrated turbine.	**N**	Relatively high anticipated daytime electricity demand for the building. Therefore, no potential issues with utilisation, i.e. availability will match demand. As the UK is one of the windiest countries in Europe, wind power is one of the best sources of renewable energy – dependent upon location. Wind power is unfeasible due to the fact the development is in an urban area and local wind conditions may not be sufficient to provide enough power.
Photovoltaic Electricity Generation 	Photovoltaic (PV) modules are devices or banks of devices that use the photovoltaic effect to generate electricity directly from sunlight. Until recently, their use has been limited due to high manufacturing costs. In buildings current applications include PV on the roof, PV curtain walling systems and PV louvred external shading devices. Typically, photovoltaics would be installed on a south facing roof.	**P**	Relatively high anticipated daytime electricity demand for the development. Therefore, no potential issues with utilisation, i.e. availability will match demand. The PV panels are used to generate electricity reducing CO_2 emissions. Capital cost has dropped significantly in recent years. PV panels are not proposed to be installed on this development as the building passes Part L 2021 Building Regulations without the addition of PV panels.

Combined Heat and Power (CHP) 	A CHP unit provides heating as well as electrical power. The electricity generated by the CHP plant can be distributed around a development and into the electrical network if needed. The use of this co-generation improves the overall efficiency of the primary energy delivered to the site with a corresponding reduction in the development's CO_2 emissions. The amount of thermal energy provided by the CHP unit will be dependent on the calculated thermal base load for the buildings.	**N**	Relatively low cost of CHP unit if integrated into a gas boiler and domestic water cylinder strategy. High maintenance costs result in marginal returns on small to medium sized installations Not considered as is not compatible with future de-carbonisation of the grid and reduction of use of fossil fuels
Air Source Heat Pump 	Air source heat pumps work in a similar way to GSHPs but extract thermal energy from the surrounding air and transfer it into water. Air source heat pumps can be fitted on the façade or on the roof but care should be taken when mounting the units to avoid any acoustic problems associated with operating the fans as the outdoor units typically operate with sound levels in the range 55 - 60dB(A). The efficiency of ASHP is measured by Coefficient of Performance (CoP); this is the ratio of units of heat output for each unit of electricity used to drive the system. Average CoP is around 2-4 although some systems may produce a greater rate of efficiency.	**Y**	The ASHP system offers an attractive solution in terms of the de-carbonisation of the grid and the omission of natural gas to the site. The average CoP of air source heat pumps is around 2-4 although some systems may produce a greater rate of efficiency. This means that for every kW of electric power the heat pumps use, 2-4 kW of heat energy is generated, this results in reduced carbon emissions and operational energy. Following the appraisal of the Proposed Development and site, Air Source Heat Pumps (ASHP) have been selected as the preferred low carbon technology and will be used to generate hot water to the individual apartments. ASHP's will provide space heating and cooling to the amenity areas of the proposed development via a Variable Refrigerant Flow (VRF) system.

7.5. District Heating Network

This section outlines how consideration of energy supplied efficiently from a district heating network can be provided to the dwellings in line with the Energy Hierarchy.

De-Centralised/ District Heating Networks (DHN)

The energy policy reaffirms the view that energy generated by centralised power stations and transmitted through the national grid is highly inefficient and wasteful.

One of priorities for reducing CO_2 emissions is to reduce the city's reliance on centralised power stations.

This means increasing the use of local, low-carbon energy supplies through de- centralised energy systems.

Decentralised plant generally means any heating and hot water and/or electricity generation provided on a site or district wide basis. District heating is generally provided from Combined Heat and Power equipment (CHP). CHP is an engine which, when running, generates electricity and heats water which can then be distributed around a development.

Manchester City Council have been working in partnership with Vital Energi to create the Manchester Civic Quarter Heat Network. The below image identifies the current extent of the energy network.

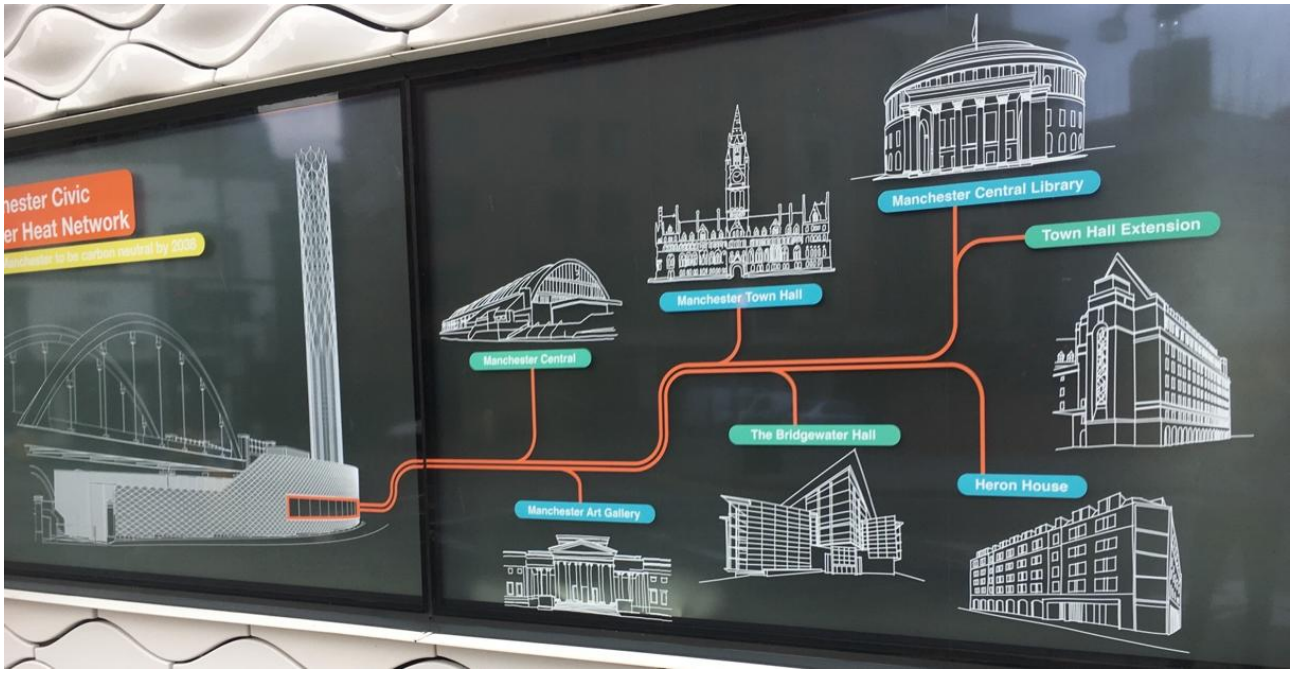


Figure 10 - Proposed Manchester Energy Network Route

The network will provide heat and power solution for a number of buildings, making significant carbon reductions.

The buildings currently connected are:

- Manchester Town Hall
- Manchester Town Hall Extension
- Manchester Central Library
- Manchester Central Convention Centre
- The Bridgewater Hall
- Heron House
- Manchester Art Gallery

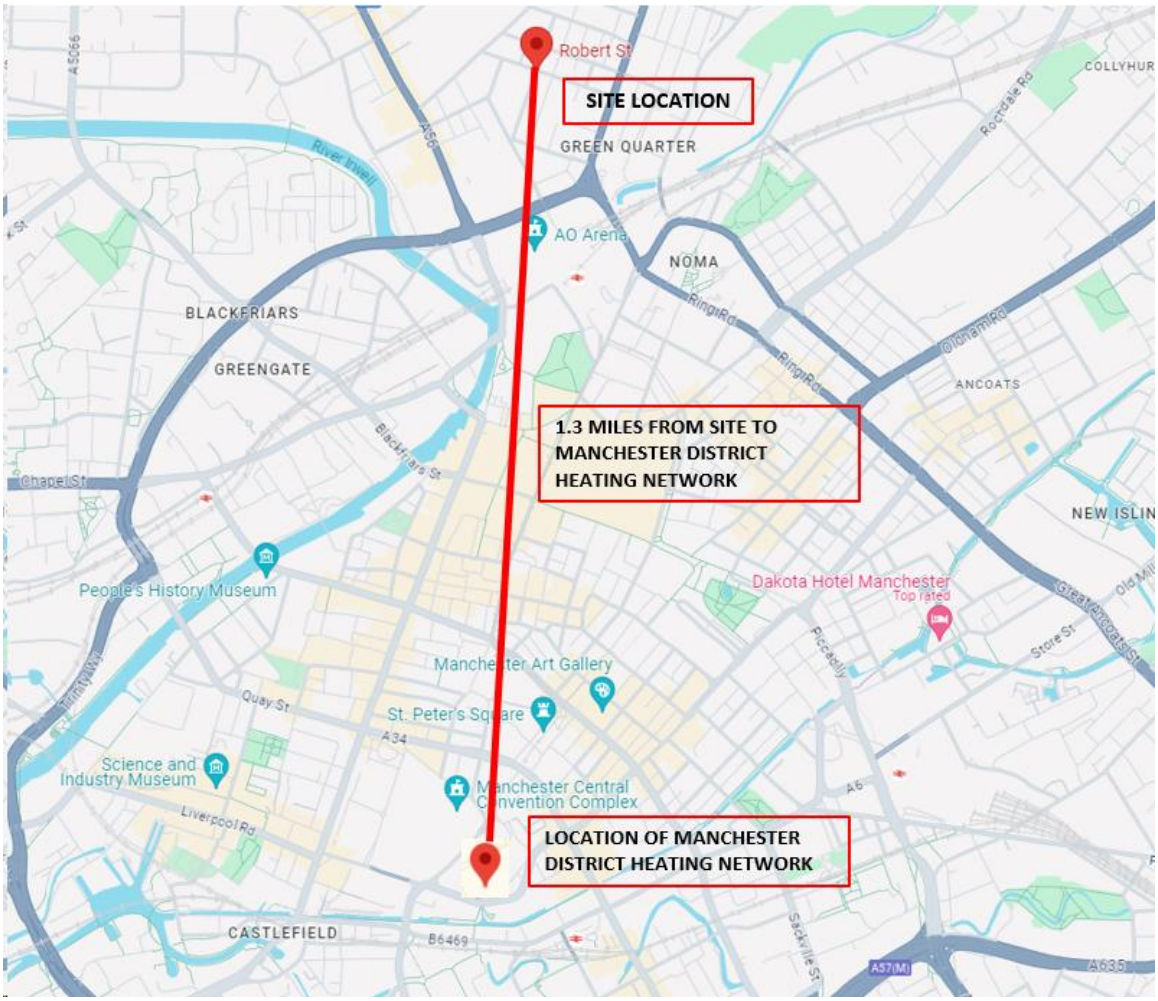


Figure 11 - Distance of District Heating Connection to Site

The network contains power cables to distribute the electricity generated and underground pipes that deliver heat and hot water to connected buildings. The network has been designed to enable future expansion, with efficiency and carbon savings increasing as more buildings join.

Heat is generated from an energy centre, which situated near to Manchester Central Convention Centre, at the junction of Great Bridgewater Street and Lower Mosley Street. The distance of the proposed district heating mains to this development site are considered too far to be economically viable and are therefore discounted.

8. PROPOSALS

Initial BRUKL and SAP assessments have been undertaken and this section outlines the inputs that have been used. Energy modelling has been carried out to reflect the RIBA planning stage, stage 2 design. The modelling has been based on:

- SAP Calculations – For residential
- Part L BRUKL – For commercial

The following BRUKL results relate to a RIBA stage 2 design and will be subject to a design development due to the next stages.

The following software's have been adopted for each of the different categories:

- SBEM – IES VE
- SAP's – Elmhurst Energy
-

8.1. Passive Measures – Lean

In the first instance, the team have maximised passive measures to reduce the initial load of the building in terms of thermal heating and artificial lighting loads with the following measures: -

8.1.1. Target Building Fabric U-Values

Residential Areas

Building Fabric Element	Limiting U-Value (w/m²K)	Target U-Value (w/m²K)	% Betterment
Walls	0.26	0.18	30.8%
Floors	0.18	N/A	-
Roofs	0.18	0.15	16.7%
Windows	1.6	1.2	25%

Amenity Areas

Building Fabric Element	Limiting U-Value (w/m²K)	Target U-Value (w/m²K)	% Betterment
Walls	0.26	0.18	30.8%
Floors	0.18	0.15	16.7%
Windows	1.6	1.2	25%
Personnel Doors	1.6	1.2	25%

8.1.2. Target Air Permeability

Residential Areas

Air Permeability	Limiting Air Permeability	Target Air Permeability	% Betterment
$M_3/(h.m_2)$ at 50 Pa	8	3	63%

Amenity Areas

Air Permeability	Limiting Air Permeability	Target Air Permeability	% Betterment
$M_3/(h.m_2)$ at 50 Pa	8	3	63%

Glazing that limits the amount of unwanted solar gain will be used to avoid habitable rooms from overheating with G-Values of 0.6.

Designing the Proposed Development with U-values and Air Permeability that match or are lower than the minimum Building Regulations values is essential to reducing the initial demand for energy in the building from the outset using passive measures.

For the Proposed Development, U-Values and Air Permeability that match or exceeds Building Regulations have been used which will result in less energy required to maintain comfortable conditions inside the buildings as well as the buildings performing better as an insulator.

Passive design measures will allow the Proposed Development to maximise the use of natural sources of cooling and ventilation to maintain comfortable conditions within the internal spaces and will also allow the heating systems of the residential blocks to perform more efficiency.

Utilising these passive measures will consequently reduce energy consumption and CO_2 emissions of the Proposed Development as less energy will be required for the space heating and space cooling requirements.

The Proposed Development will adapt the use of perforated opening panels to facilitate purge ventilation coupled with Mechanical Ventilation Heat Recovery (MVHR) with summer-by-pass and this mitigates the need for artificial cooling in the majority of residential areas. The panels are designed to be utilised for peak summer conditions with rapid ventilation with the MVHR utilised for general background ventilation. An example of perforated opening panels is shown in in the image adjacent.



Perforated Ventilation Opening Panels

8.2. Energy Efficiency Measures – Mean

The next stage of the design development was to establish energy efficiency measures to meet the demand of the Proposed Development, these being: -

8.2.1. Mechanical Ventilation Heat Recovery

Ventilation with heat recovery is a mechanical system that ensures there is minimal heat loss when ventilating a room. The system/units work by extracting the stale air inside the building and feeding it through filters whilst also extracting the heat energy so that it's not exhausted to the outside but transferred back into the building with the filtered incoming air. The main components of MVHR units are; a heat recovery cell (where the indoor heat is extracted and supplied into the outside air coming into the building), fans (pull in the air and blow out the air), and filters (filtering outside air from dust and particles inside the unit, protecting longevity and efficiency). Alongside this, units come with a summer bypass, meaning they can control the amount of

energy recovered this is controlled either manually or by an electronic sensor. Benefits of MVHR units include, filtered air, minimal heat losses, mitigates overheating, and retains heat that would usually be exhausted to the outside environment.



Typical Apartment MVHR configuration

MVHR units are proposed for all areas within the development, these units will provide fresh air and heat recovery to the individual bedrooms, bathrooms, living/kitchens and the amenity spaces. This reduces any required cooling load which can significantly reduce the CO_2 emissions of the Proposed Development and will also assist in providing comfortable living conditions.

Summer bypass mode will be used on the units during the summer periods which will reject heat instead of recovering. This will be used to avoid summer time overheating as during the warmer months of the year, heat recovery will not be required in the habitable spaces.



Typical Exposed MVHR configuration

8.3. Further Energy Efficiency Measures

- High efficiency/Low specific fan power (SFP's) ventilation fans which will used to reduce the energy consumption of the Proposed Development's air handling systems.

- High efficiency LED lighting throughout. Lights in communal spaces will be coupled with demand operated lighting where appropriate via daylight diming and absence/presence detection which turns lights off when no occupancy is detected. This reduces energy consumption and CO_2 emissions associated with lighting in the Proposed Development.





- Dedicated time & temperaure control systems to Electric panel heaters in the bedrooms of the proposed Robert Street development.
- Absence detection on lighting in corridors.
- Daylight diming of lighting in amenity spaces.
- Variable speed operation of of mechanical plant equipment to reduce regulated energy demand.
- BMS operation of amenity spaces building services systems.



8.4. Renewable and Low Carbon Technologies – Green

The final aspect of the design has been to establish what renewable and low carbon technologies can be adopted. Following the appraisal of the Proposed Development and site, Air Source Heat Pumps (ASHP) will be used to generate hot water to the individual apartments aswell as heating and cooling to the amenity areas of the proposed development.

The average CoP of air source heat pumps is around 2-4 although some systems may produce a greater rate of efficiency. This means that for every kW of electric power the heat pumps use, 2-4 kW of heat energy is generated, this results in reduced carbon emissions and operational energy.



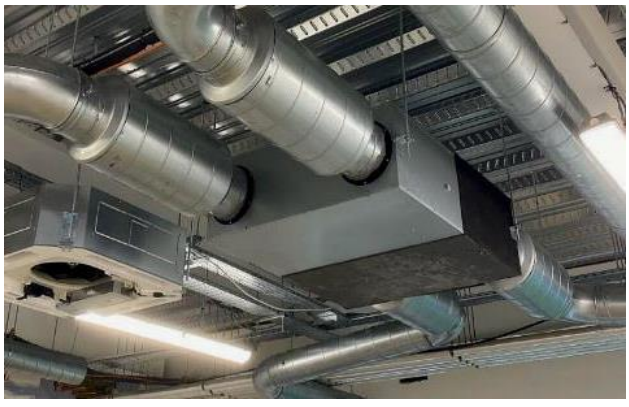
Typical ASHP roof layout arrangement

Variable Refrigerant Flow (VRF) heat pumps will also provide heating and cooling in the amenity areas of the Proposed Development. The VRF condensers will serve indoor fan coil units in a VRF refrigerant system typically providing CoPs in the region of 3-4 depending on the season and internal loads.

Fan coil units will provide heating and cooling in the amenity spaces working in conjunction with localised MVHR units



Typical VRV Fan Coil to Amenity Spaces



Typical MVHR Units to Amenity Spaces

9. PREDICTED CARBON EMISSIONS

9.1. Carbon Emissions and Operational Energy Savings

The following SAP and BRUKL results relate to a RIBA Stage 2 design and will be subject to a design development at the next stages. The SAP and BRUKL results are shown in Appendix 1.

9.1.1. Residential Areas (SAP Results)

Target dwelling CO_2 emission rate (TER), $kgCO_2/m^2$.	13.89	
Dwelling CO_2 emission rate (DER), $kgCO_2/m^2$	5.35	
Dwelling primary energy rate (TPER), $kgCO_2/m^2$.	76.3	
Target primary energy rate (BPER), $kgCO_2/m^2$	56.6	
Dwelling Fabric Energy Efficiency $kgCO_2/m^2$	31.99	
Target Fabric Energy Efficiency $kgCO_2/m^2$	29.47	
Do the buildings emission and primary energy rates exceed the targets?	YES	YES

The proposed option provides a 61.49% improvement on the target CO_2 emission rate and a 36.00% improvement on the target primary energy rate. The dwelling fabric energy efficiency is also at a 7.88 % betterment over the target fabric energy efficiency.

9.1.2. Amenity Areas (BRUKL Results)

In summary, the building emission rate is lower than the target emissions rate and the building primary energy rate is lower than the target primary energy rate.

Target CO2 emission rate (TER), $kgCO_2/m^2$. annum	3.27	
Building CO2 emission rate (BER), $kgCO_2/m^2$. annum	3.21	
Target primary energy rate (TPER), kWh/m^2.	35.45	
Building primary energy rate (BPER), $kWh/m^2/yr$	35	
Do the buildings emission and primary energy rates exceed the targets?	BER=<TER	BPER=<TPER

The proposed option provides a 2% betterment on the target CO_2 emission rate and 1% betterment on primary energy rate.

10. OVERALL SUMMARY

This report has set out the methodology in which the design team have approached the design of the proposed Robert Street development and how the strategies of Manchester City Council and the Government guidelines have been adopted. As the current proposals all pass Part L 2021 they will more than exceed the MCC Core Strategy of passing Part L 2010 by 15%

Our strategy has sought to reduce the carbon emissions for the building using a Lean, Mean & Green approach and these findings have been applied to the Proposed Development.

The Proposed Development has been designed with U-values and air permeability that match or are lower than the minimum Building Regulations U-values which is essential in reducing the initial demand for energy and associated CO_2 emissions of the building from the outset using passive measures, this will result in less energy required to maintain comfortable conditions inside the building as well as the building performing better as an insulator. Adopting this approach will also allow the Proposed Development to maximise the use of natural sources of cooling and ventilation which will assist in maintaining comfortable conditions within the internal spaces and will also allow the heating and cooling system to perform more efficiently.

Energy efficiency measures have then been evaluated to assess which measures suit the Proposed Development best. High efficiency LED lighting will be used throughout coupled with demand operated lighting where appropriate in the form of daylight diming, & absence/presence detection, this will reduce energy consumption and CO_2 emissions associated with lighting within the Proposed Development.

Mechanical Ventilation with Heat Recovery (MVHR) is proposed as the strategy for ventilation within the development. These units will provide fresh air and heat recovery to the individual bedrooms of the development as well as the amenity spaces. Heat Recovery reduces the required cooling & heating load which will in turn reduce CO_2 emissions that the development produces. Alongside this, the proposed ventilation units come with a summer bypass which allows them to bypass the heat exchanger during warmer months, helping maintain thermal comfort.

Various renewable and low zero carbon technologies have been assessed and this report has established the that are best technologies adopted to the Proposed Development are:

- Air Source Heat Pump (ASHP) to provide hot water to the residential apartments of the Proposed Development.
- VRF ASHP to provide space heating and cooling to the amenity areas.

This system was chosen to align with the government's policy on the phasing out of fossil fuels and the subsequent decarbonisation of the National Grid. The proposals presented also support the government's and local authorities' policy on phasing out fossil fuels and as the grid decarbonises will offer further carbon reductions.

In conclusion, this report demonstrates that the proposed development accords with the relevant polices (set out previously within this report). Therefore, it is considered that the proposed development is in accordance with national and local policy, and so energy should not be a material consideration that prevents the grant of planning permission.

11. APPENDIX 1

Residential Areas (SAP Results)

Block Compliance Report - DER				
Block Reference: R0153 - Robert Street v1	Block Name:			
Property-Assessment Reference	Floor area (m^2)	DER ($kgCO_2/m^2$)	TER ($kgCO_2/m^2$)	% DER/TER
TH-2B-01 - 00001	94.88	6.25	14.40	56.60 %
TH-2B-04 - 00001	102.60	5.93	13.67	56.62 %
TH-2B-02 - 00001	94.88	6.25	14.40	56.60 %
TH-2B-03 - 00001	96.42	5.63	13.41	58.02 %
2B4P - NE Corner Top Floor - 00001	70.70	6.70	16.05	58.26 %
2B4P - NE Corner 14th Floor - 00001	70.70	4.93	13.16	62.54 %
2B3P - NW Corner 14th Floor - 00001	65.60	4.45	12.76	65.13 %
2B3P - NW Corner Top Floor - 00001	65.60	6.17	15.70	60.70 %
1B2P - E facing Top Floor - 00001	50.50	5.90	16.10	63.35 %
1B2P - E facing 14th Floor - 00001	50.50	4.48	13.25	66.19 %
1B2P - W facing Top Floor - 00001	50.00	5.91	16.09	63.27 %
1B2P - W facing 14th Floor - 00001	50.00	4.49	13.20	65.98 %
2B4P - SW Corner 14th Floor - 00001	83.90	4.61	12.38	62.76 %
2B4P - SW Corner Top Floor - 00001	83.90	6.45	15.53	58.47 %
2B4P - SE Corner Top Floor - 00001	75.60	5.60	14.19	60.54 %
2B4P - SE Corner 14th Floor - 00001	75.60	3.95	11.52	65.71 %
2B4P - NE Corner 1st Floor - 00001	70.10	6.39	15.21	57.99 %
2B4P - NE Corner 2nd Floor - 00001	70.10	4.50	12.71	64.59 %
2B4P - NW Corner 1st Floor - 00001	70.80	6.34	15.36	58.72 %
2B4P - NW Corner 2nd Floor - 00001	70.80	4.42	12.74	65.31 %
2B3P - NW L9 Roof Left - 00001	68.80	6.43	16.04	59.91 %
2B3P - NW L7 Left - 00001	68.80	4.59	13.12	65.02 %

Block Compliance

elmhurst energy

2B3P - NW L8 Left - 00001	68.80	4.59	13.12	65.02 %
2B3P - SW L9 Roof Right - 00001	63.10	5.80	15.06	61.49 %
2B3P - SW L7 Right - 00001	63.10	4.21	11.77	64.23 %
2B3P - SW L8 Right - 00001	63.10	4.21	11.77	64.23 %
2B3P - NW L1 Left - 00001	68.80	6.43	15.96	59.71 %
2B3P - NW L2 Left - 00001	68.80	4.59	13.12	65.02 %
2B4P - NW Corner 4th Floor - 00001	70.80	4.42	12.74	65.31 %
2B4P - NW Corner 6th Floor - 00001	70.80	4.42	12.74	65.31 %
Totals:	2138.08	159.04	417.27	
Average DER = 5.35 kgCO$_2$/m^2	% DER/TER	PASS		
Average TER = 13.89 kgCO$_2$/m^2	61.50 %			

Block Compliance Report - DFEE

Block Reference: R0153 - Robert Street v1	Block Name:			
Property-Assessment Reference	Floor area (m^2)	DFEE (kWh/m^2/yr)	TFEE (kWh/m^2/yr)	% DFEE/TFEE
TH-2B-01 - 00001	94.88	39.44	40.05	1.51 %
TH-2B-04 - 00001	102.60	38.26	38.34	0.21 %
TH-2B-02 - 00001	94.88	39.44	40.05	1.51 %
TH-2B-03 - 00001	96.42	35.53	35.87	0.93 %
2B4P - NE Corner Top Floor - 00001	70.70	37.27	42.26	11.83 %
2B4P - NE Corner 14th Floor - 00001	70.70	26.36	29.20	9.70 %
2B3P - NW Corner 14th Floor - 00001	65.60	22.32	24.93	10.47 %
2B3P - NW Corner Top Floor - 00001	65.60	33.86	38.08	11.08 %
1B2P - E facing Top Floor - 00001	50.50	29.56	32.68	9.53 %
1B2P - E facing 14th Floor - 00001	50.50	17.39	20.04	13.23 %
1B2P - W facing Top Floor - 00001	50.00	28.88	31.99	9.72 %
1B2P - W facing 14th Floor - 00001	50.00	16.50	19.16	13.90 %
2B4P - SW Corner 14th Floor - 00001	83.90	26.68	28.56	6.59 %

Block Compliance

elmhurst energy

2B4P - SW Corner Top Floor - 00001	83.90	38.55	42.90	10.13 %
2B4P - SE Corner Top Floor - 00001	75.60	30.92	34.19	9.57 %
2B4P - SE Corner 14th Floor - 00001	75.60	19.17	22.10	13.28 %
2B4P - NE Corner 1st Floor - 00001	70.10	36.69	37.93	3.28 %
2B4P - NE Corner 2nd Floor - 00001	70.10	24.16	26.58	9.12 %
2B4P - NW Corner 1st Floor - 00001	70.80	36.30	38.40	5.49 %
2B4P - NW Corner 2nd Floor - 00001	70.80	23.54	26.57	11.43 %
2B3P - NW L9 Roof Left - 00001	68.80	35.27	40.49	12.90 %
2B3P - NW L7 Left - 00001	68.80	24.25	27.22	10.89 %
2B3P - NW L8 Left - 00001	68.80	24.25	27.22	10.89 %
2B3P - SW L9 Roof Right - 00001	63.10	30.61	34.72	11.84 %
2B3P - SW L7 Right - 00001	63.10	18.18	19.60	7.24 %
2B3P - SW L8 Right - 00001	63.10	18.18	19.60	7.24 %
2B3P - NW L1 Left - 00001	68.80	37.81	40.49	6.62 %
2B3P - NW L2 Left - 00001	68.80	24.25	27.22	10.89 %
2B4P - NW Corner 4th Floor - 00001	70.80	23.54	26.57	11.43 %
2B4P - NW Corner 6th Floor - 00001	70.80	23.54	26.57	11.43 %
Totals:	2138.08	860.70	939.58	
Average DFEE = 29.47 kWh/m²/yr	% DFEE/TFEE	PASS		
Average TFEE = 31.99 kWh/m²/yr	7.86 %			

Block Compliance Report - DPER

Block Reference: R0153 - Robert Street v1	Block Name:			
Property-Assessment Reference	Floor area (m^2)	DPER ($kWh/m^2/yr$)	TPER ($kWh/m^2/yr$)	% DPER/TPER
TH-2B-01 - 00001	94.88	65.68	78.89	16.74 %
TH-2B-04 - 00001	102.60	62.40	74.93	16.72 %
TH-2B-02 - 00001	94.88	65.68	78.89	16.74 %

Block Compliance

elmhurst energy

TH-2B-03 - 00001	96.42	59.36	73.56	19.30 %
2B4P - NE Corner Top Floor - 00001	70.70	70.44	87.78	19.75 %
2B4P - NE Corner 14th Floor - 00001	70.70	52.40	72.27	27.49 %
2B3P - NW Corner 14th Floor - 00001	65.60	47.57	70.32	32.35 %
2B3P - NW Corner Top Floor - 00001	65.60	65.10	86.16	24.44 %
1B2P - E facing Top Floor - 00001	50.50	62.65	88.70	29.37 %
1B2P - E facing 14th Floor - 00001	50.50	48.27	73.36	34.20 %
1B2P - W facing Top Floor - 00001	50.00	62.74	88.79	29.34 %
1B2P - W facing 14th Floor - 00001	50.00	48.33	73.21	33.98 %
2B4P - SW Corner 14th Floor - 00001	83.90	48.75	67.96	28.27 %
2B4P - SW Corner Top Floor - 00001	83.90	67.53	84.91	20.47 %
2B4P - SE Corner Top Floor - 00001	75.60	59.15	77.89	24.06 %
2B4P - SE Corner 14th Floor - 00001	75.60	42.38	63.55	33.31 %
2B4P - NE Corner 1st Floor - 00001	70.10	67.17	83.37	19.43 %
2B4P - NE Corner 2nd Floor - 00001	70.10	47.95	69.92	31.42 %
2B4P - NW Corner 1st Floor - 00001	70.80	66.67	84.25	20.87 %
2B4P - NW Corner 2nd Floor - 00001	70.80	47.19	70.16	32.74 %
2B3P - NW L9 Roof Left - 00001	68.80	67.72	88.00	23.05 %
2B3P - NW L7 Left - 00001	68.80	48.91	72.28	32.33 %
2B3P - NW L8 Left - 00001	68.80	48.91	72.28	32.33 %
2B3P - SW L9 Roof Right - 00001	63.10	61.29	82.58	25.78 %
2B3P - SW L7 Right - 00001	63.10	45.07	64.87	30.52 %
2B3P - SW L8 Right - 00001	63.10	45.07	64.87	30.52 %
2B3P - NW L1 Left - 00001	68.80	67.55	87.57	22.86 %
2B3P - NW L2 Left - 00001	68.80	48.91	72.28	32.33 %
2B4P - NW Corner 4th Floor - 00001	70.80	47.19	70.16	32.74 %
2B4P - NW Corner 6th Floor - 00001	70.80	47.19	70.16	32.74 %
Totals:	2138.08	1685.22	2293.92	

Block Compliance

elmhurst energy

Average DPER = 56.60 kWh/m²/yr	% DPER/TPER	PASS
Average TPER = 76.30 kWh/m²/yr	25.82 %	

BRUKL

The following BRUKL results relate to a RIBA stage 2 design and will be subject to a design development due to the next stages. The results produced are run using the new Part L 2021 building regulations.

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2021

Project name **Shell and Core**

Robert Street - Ground Floor — As designed

Date: Mon Mar 25 14:26:08 2024

Administrative information

Building Details

Address:

Certifier details

Name:

Telephone number:

Address: , ,

Certification tool

Calculation engine: Apache

Calculation engine version: 7.0.24

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 7.0.24

BRUKL compliance module version: v6.1.e.1

Foundation area [m²]: 703.49

The CO_2 emission and primary energy rates of the building must not exceed the targets

Target CO_2 emission rate (TER), $kgCO_2/m^2annum$	3.27	
Building CO_2 emission rate (BER), $kgCO_2/m^2annum$	3.21	
Target primary energy rate (TPER), kWh_{PE}/m^2annum	35.45	
Building primary energy rate (BPER), kWh_{PE}/m^2annum	35	
Do the building's emission and primary energy rates exceed the targets?	BER =< TER	BPER =< TPER

The performance of the building fabric and fixed building services should achieve reasonable overall standards of energy efficiency

Fabric element	$U_{b\text{-}Limit}$	$U_{b\text{-}Calc}$	$U_{i\text{-}Calc}$	First surface with maximum value
Walls*	0.26	0.18	0.18	SP000043:Surf[3]
Floors	0.18	0.15	0.15	SP000043:Surf[0]
Pitched roofs	0.16	-	-	No pitched roofs in building
Flat roofs	0.18	-	-	No flat roofs in building
Windows** and roof windows	1.6	1.2	1.2	SP00006F:Surf[1]
Rooflights***	2.2	-	-	No roof lights in building
Personnel doors^	1.6	1.2	1.2	SP000043:Surf[1]
Vehicle access & similar large doors	1.3	-	-	No vehicle access doors in building
High usage entrance doors	3	-	-	No high usage entrance doors in building

$U_{b\text{-}Limit}$ = Limiting area-weighted average U-values [W/(m²K)] $U_{i\text{-}Calc}$ = Calculated maximum individual element U-values [W/(m²K)]

$U_{b\text{-}Calc}$ = Calculated area-weighted average U-values [W/(m²K)]

* Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for windows.

** Display windows and similar glazing are excluded from the U-value check. *** Values for rooflights refer to the horizontal position.

^ For fire doors, limiting U-value is 1.8 W/m²K

NB: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.

Air permeability	Limiting standard	This building
$m^3/(h.m^2)$ at 50 Pa	8	3

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Floor area [m²]	705.2	705.2
External area [m²]	1444.2	1444.2
Weather	MAN	MAN
Infiltration [m³/hm²@ 50Pa]	3	3
Average conductance [W/K]	403.31	390.73
Average U-value [W/m²K]	0.28	0.27
Alpha value* [%]	25.79	10

* Percentage of the building's average heat transfer coefficient which is due to thermal bridging

Building Use

% Area	Building Type
100	**Retail/Financial and Professional Services**
	Restaurants and Cafes/Drinking Establishments/Takeaways
	Offices and Workshop Businesses
	General Industrial and Special Industrial Groups
	Storage or Distribution
	Hotels
	Residential Institutions: Hospitals and Care Homes
	Residential Institutions: Residential Schools
	Residential Institutions: Universities and Colleges
	Secure Residential Institutions
	Residential Spaces
	Non-residential Institutions: Community/Day Centre
	Non-residential Institutions: Libraries, Museums, and Galleries
	Non-residential Institutions: Education
	Non-residential Institutions: Primary Health Care Building
	Non-residential Institutions: Crown and County Courts
	General Assembly and Leisure, Night Clubs, and Theatres
	Others: Passenger Terminals
	Others: Emergency Services
	Others: Miscellaneous 24hr Activities
	Others: Car Parks 24 hrs
	Others: Stand Alone Utility Block

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	2.54	2.43
Cooling	2.56	0.37
Auxiliary	8.25	11.7
Lighting	8.91	8.64
Hot water	0.85	0.81
Equipment*	65.46	65.46
TOTAL**	**23.13**	**23.95**

* Energy used by equipment does not count towards the total for consumption or calculating emissions.
** Total is net of any electrical energy displaced by CHP generators, if applicable.

Energy Production by Technology [kWh/m²]

	Actual	Notional
Photovoltaic systems	0	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
Displaced electricity	*0*	*0*

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m²]	54.27	30.57
Primary energy [kWh_{PE}/m²]	35	35.45
Total emissions [kg/m²]	3.21	3.27

The analysis supporting this report was carried out by a competent person who is a Chartered Engineer with IMechE, Low Carbon Consultant (LCC) and Level 3,4 and 5 IES DSM qualified.

Name of Assessor: Adam Imrie



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