



RIDGE

Energy Strategy Report
50 Fountain Street
Manchester
Ask Real Estate
16th August 2021



**50 FOUNTAIN STREET
MANCHESTER
ASK REAL ESTATE**

16th August 2021

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ENERGY STRATEGY REPORT, 50 FOUNTAIN STREET

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ENERGY STRATEGY REPORT, 50 FOUNTAIN STREET

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1. INTRODUCTION

Ask Real Estate have commissioned Ridge & Partners LLP to undertake an Energy Strategy study and report to support the planning application for the redevelopment of the existing office block located at 50 Fountain Street in Manchester City Centre.

The brief is to target a BREEAM rating under the BREEAM New Construction 2018 Assessment Criteria.

With the focus placed on energy efficiency, the proposed design will incorporate passive design and low and zero carbon technologies in addition to best practice measures therefore exceeding the current Building Regulations Part L Requirements.

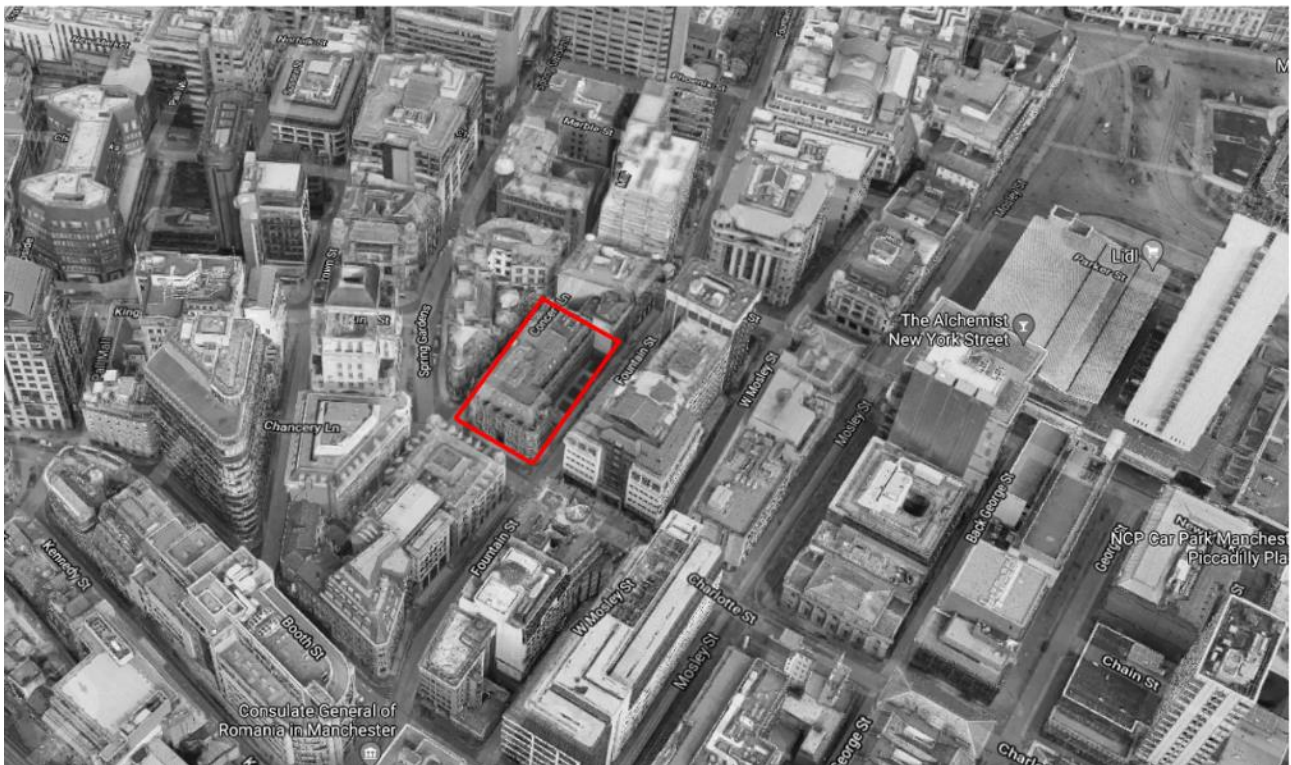
The purpose of this report is to summarise the relevant policies, both national and local, and to demonstrate the ways Ridge & Partners LLP have reviewed various options to promote policies set out in this report and subsequent design.

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2. DEVELOPMENT PROPOSALS

2.1. Description of Development Site

The site is located in Manchester and is bounded by Fountain Street to the South East, Spring Gardens to the South West, Concert Lane to the North West and existing buildings off York Street to the North East.



3D View of the site and the surrounding area

The site has all major services (gas, water, telecoms and electricity) within the surrounding roads which do not present any risk in terms of requiring diverting or disconnections to develop the project.

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2.2. Development Proposals

The proposed development is for the redevelopment of 50 Fountain Street to provide office accommodation. The majority of the building will be demolished but the front façade will be retained.

Proposed Area Schedule

Floor	Gross Internal Area (GIA) (m ²)	Net Internal Area (NIA) (m ²)
Basement	826	
Ground	1045	418
Mezzanine	94	94
1st	1045	877
2nd	1045	877
3rd	927	760
4th	918	751
5th	875	708
6th	811	644
7th	234	
Total	7820	5129

3. GOVERNMENT POLICY

3.1. Energy Hierarchy

In line with the draft definition of zero carbon, an energy hierarchy has been created (see Figure 1 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 zero carbon energy technologies and directly connected heat (not necessarily on-site).

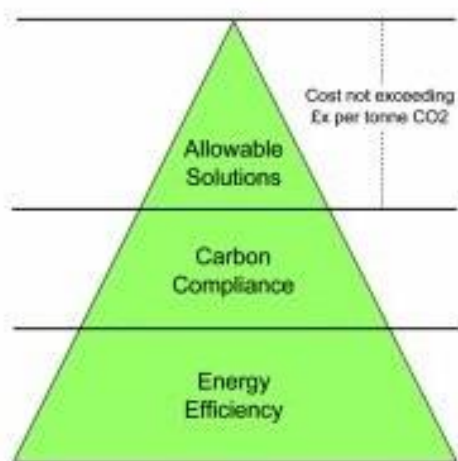


Figure 1 – Energy Hierarchy

However, in order to achieve the highest level of carbon reductions for the least cost, 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 existing 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 Government.

3.2. 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 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.

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.

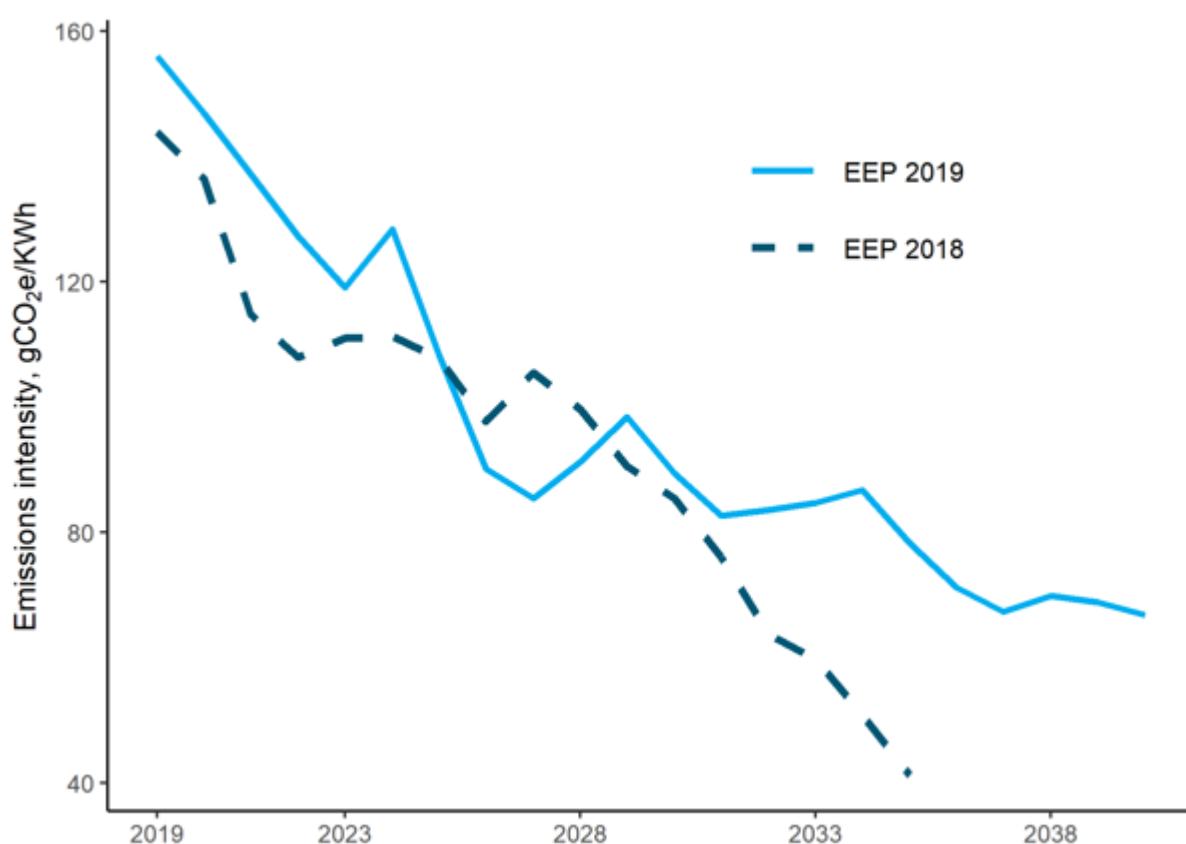


Figure 2 – Above indicates the predicted reduction in Carbon Emissions per kWh up to 2038.

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

4. POLICY REVIEW

4.1. 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 of collaboration and consultation with representatives from areas across the city region. The plan commits to action needed to achieve a reduction in direct CO₂ emissions by at least 50% between 2020-2025 and by 2038, to have zero carbon emissions.

4.2. Manchester Climate Change Framework 2020-25

In June 2019, the UK Government committed the country to a legally binding target of net zero carbon emissions by 2050. Following this, a month later, Manchester City Council (MCC) adopted a motion to declare a climate emergency which commits the Council to action to combat climate change. The Council have set out their aim of making Manchester a zero-carbon city by 2038 or before.

The Manchester Climate Change Framework 2020–25 is MCC’s high-level strategy for meeting their commitment on climate change that builds on the Draft Manchester Zero Carbon Framework 2020-38 and the declaration of a climate emergency in July 2019. This was endorsed by MCC at the Executive meeting in March 2020 and will develop over the next five years, in line with changes in policy, climate science, rate of progress and other factors. The framework has set out four objectives to facilitate this:

Objective 1 – Staying within our carbon budgets. This involves taking action in the following relevant areas:

- ‘Direct CO₂ emissions: staying within our 15 million tonne carbon budget for 2018-2100, including reducing the CO₂ emitted from our homes, workplaces and ground transport by at least 50% during 2020-25.
- Indirect CO₂ emissions: understanding and taking action on the things that we consume, and which generate greenhouse gases through their production, transportation and disposal.’

Objective 2 – Climate adaptation and resilience. This will require the adaption of ‘the city’s buildings, infrastructure and natural environment to the changing climate and increasing the climate resilience of our residents and organisations.’

Objective 3 – Health and wellbeing. This aims to improve the ‘health and wellbeing of everyone in Manchester through actions that also contribute to our objectives for CO₂ reduction and adaption and resilience’.

4.3. Manchester Core Strategy

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 developments 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.

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- 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 schemes.

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

Within these areas, new developments, 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

Application 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.

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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.

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 CO ₂ /m ²))	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 than the '% Minimum requirement', the reduction required under building regulations would apply.

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

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

Policy EN8

Adaptation to Climate Change

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

- Minimisation of flood risk by appropriate siting, drainage, and treatment of surface areas to ensure rainwater permeability.

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- Reduction in urban heat island effect through the use of Green Infrastructure such as green roofs, green walls, increased tree cover and waterways
- The need to control overheating of buildings through passive design/
- The opportunity to provide linked and diverse green space to enhance natural habitats which will assist species adaptation.

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

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4.4. Regulatory Framework

4.4.1. Building Regulations

Building Regulation, Part L – Conservation of fuel and Power sets the compliance standards for energy demand and carbon dioxide emissions from buildings.

Part L2A of the Government's 2013 Building Regulations applies to all new non-domestic buildings in England and Wales. These regulations refer to new commercial buildings including offices, restaurants, bars, storage spaces, industrial units, schools, and conference facilities.

The aim of Part L2A is to conserve fuel and power in all buildings, apart from dwellings where L1A / L1B applies instead. Typically, commercial buildings use more energy through lighting and auxiliary power than domestic properties, which is why greater emphasis is placed on reducing carbon emissions during the non-domestic building process.

Part L2A compliance involves bringing CO₂ emissions below a specific target based on the size and scope of your building. In the UK, being compliant in this area is a key factor in the design and building stages of any commercial building or outlet.

Part L2B of the Government's 2013 Building Regulations applies to all existing non-domestic buildings in England. These regulations refer to existing commercial buildings including offices, restaurants, bars, storage spaces, industrial units, schools, and conference facilities.

Part L2B features consequential improvements which apply *"to an existing building with a total useful floor area over 1000m² where the proposed building work consists of or includes:*

- a. *An extension*
- b. *The initial provision of any fixed building services*
- c. *An increase to the installed capacity of any fixed building services"*

Part L2B also provides a threshold U-value for which if elements are either at or are worse than the threshold U-value, they should be upgraded to the improved U-value.

Table 5 Upgrading retained thermal elements		
Element ¹	U-value W/(m ² .K)	
	(a) Threshold	(b) Improved
Wall – cavity insulation	0.70	0.55 ²
Wall – external or internal insulation	0.70	0.30 ³
Floors ^{4,5}	0.70	0.25
Pitched roof – Insulation at ceiling level	0.35	0.16
Pitched roof – Insulation at rafter level ⁶	0.35	0.18
Flat roof or roof with integral insulation ⁷	0.35	0.18

Building Regulations Part L2A and L2B apply to all new and existing commercial buildings in England and Wales. These regulations outline the current target CO₂ emission rate (TER) for businesses.

CO₂ emissions are calculated using a number of factors, including:

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- Building size
- Fabric energy efficiency
- Use of energy such as heating, cooling, ventilation, and lighting.

To be compliant with Part L2A, your target CO₂ emissions (based on 2010 regulations) should result in an aggregate 9% reduction in England.

4.5. BREEAM

The Building Establishment's Environmental Assessment Method (BREEAM) is the world's leading and most widely used voluntary environmental assessment method for commercial buildings that aims to quantify and reduce the environmental impact of buildings in a robust and cost effective manner.

This is achieved by the use of the scheme by clients and their project team at key stages during the design and construction process.

The performance based assessment awards credits within the following categories:

- Energy
- Water
- Transport
- Materials
- Land use and ecology
- Pollution
- Health and wellbeing
- Management
- Waste

The assessment process provides in a report that covers the areas assessed, along with a formal certification on a scale of UNCLASSIFIED, PASS, GOOD, VERY GOOD, EXCELLENT and OUTSTANDING.

The diagram below shows how the BREEAM assessment scores and rates a building:

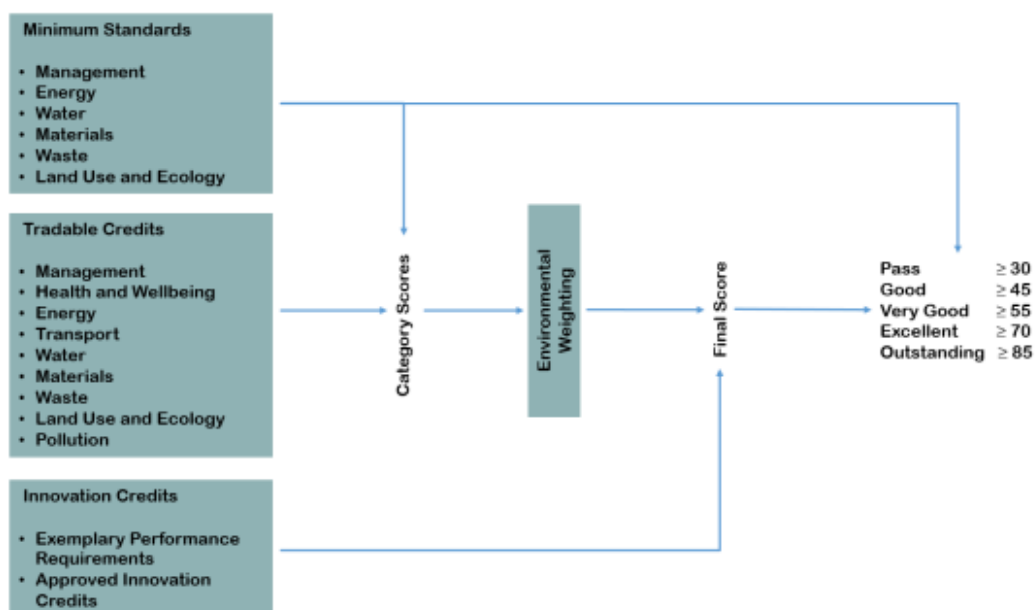


Figure 3 Process for Awarding BREEAM Ratings

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The BREEAM categories include a number of environmental elements that reflect the different options available when designing, procuring and constructing a building. Each environmental element has credits available that are awarded when compliance has been demonstrated.

For the building to meet a specific BREEAM rating, there are a series of minimum standards that must be achieved for that rating to be awarded.

In addition to the credits, there are also innovation credits available that provide additional recognition of sustainable performance that goes beyond what is currently recognised and rewarded by the standard BREEAM credits.

The innovation credits are awarded for either meeting the BREEAM exemplary level requirements or by an application to BRE to have a specific feature, system or process recognised as 'innovative'.

Each different BREEAM section has an environmental weighting applied to the scores which calculates the final BREEAM score. These factors have been derived from consensus based research with groups such as the government, suppliers and lobbyists.

The weightings are:

BREEAM SECTION	WEIGHTING (%)
Management	12.0
Health and Wellbeing	15.0
Energy	19.0
Transport	8.0
Water	6.0

BREEAM SECTION	WEIGHTING (%)
Materials	12.5
Waste	7.5
Land Use and Ecology	10.0
Pollution	10.0

Once the weightings have been applied, the score is then assigned a BREEAM rating as follows:

BREEAM RATING	SCORE (%)
UNCLASSIFIED	<30
PASS	≥30
GOOD	≥45
VERY GOOD	≥55
EXCELLENT	≥70
OUTSTANDING	≥85

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At this stage it is difficult to predict the exact number of BREEAM credits achievable by each Low and Zero Carbon Technology. These technologies will have an influence over the following:

- Ene 01 – Reduction of CO2 Emissions – Up to 15 (+5 innovation) credits are available
- Ene 04 – Low and Zero Carbon Technologies – Up to 3 (+1 innovation) credits are available
- Po12 – NOx Emissions – Up to 3 credits are available.

5. APPRAISAL OF SOLUTIONS

5.1. Summary

The strategic approach outlined follows a specific appraisal of technologies at each stage of the design and to achieve the overall goal of CO₂ reduction.

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.

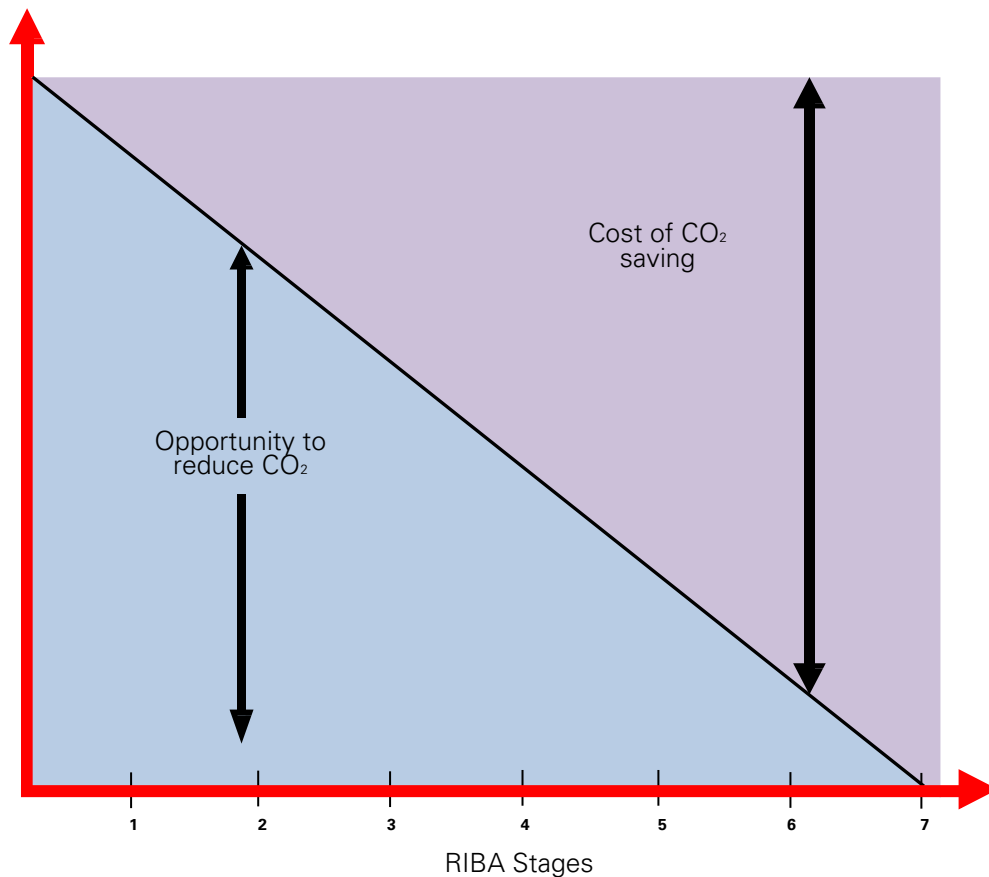
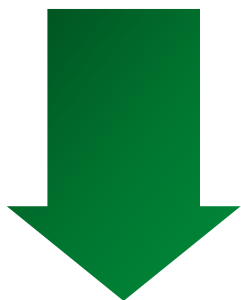


Figure 4 – Opportunity and cost of CO₂ saving against the RIBA stages.

5.2. Energy Hierarchy

Good design follows the following energy hierarchy, beginning with reducing the demand by optimising the passive measures followed by adopting 'efficient technologies' such as heat recovery to meet the demand efficiently with the final approach of applying 'renewable and low carbon' technologies accordingly.

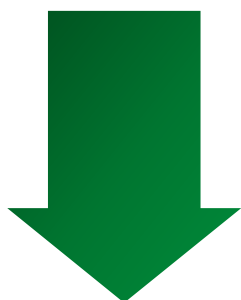
Reduce Demand



- Passive design
 - Thermal insulation
 - Natural ventilation / mixed mode
 - Natural daylight
 - Thermal mass
 - Air tightness
 - Solar shading / glass specification
- Low energy fit out



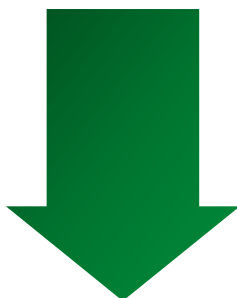
Meet demand efficiently



- Mechanical Ventilation with heat recovery
- Mixed mode ventilation
- Low energy lighting (LED)
- Power management
- Variable Speed Drives
- Demand Operated Systems (PIR)
- Low Specific Fan Power



Supply energy from low and zero carbon technology



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



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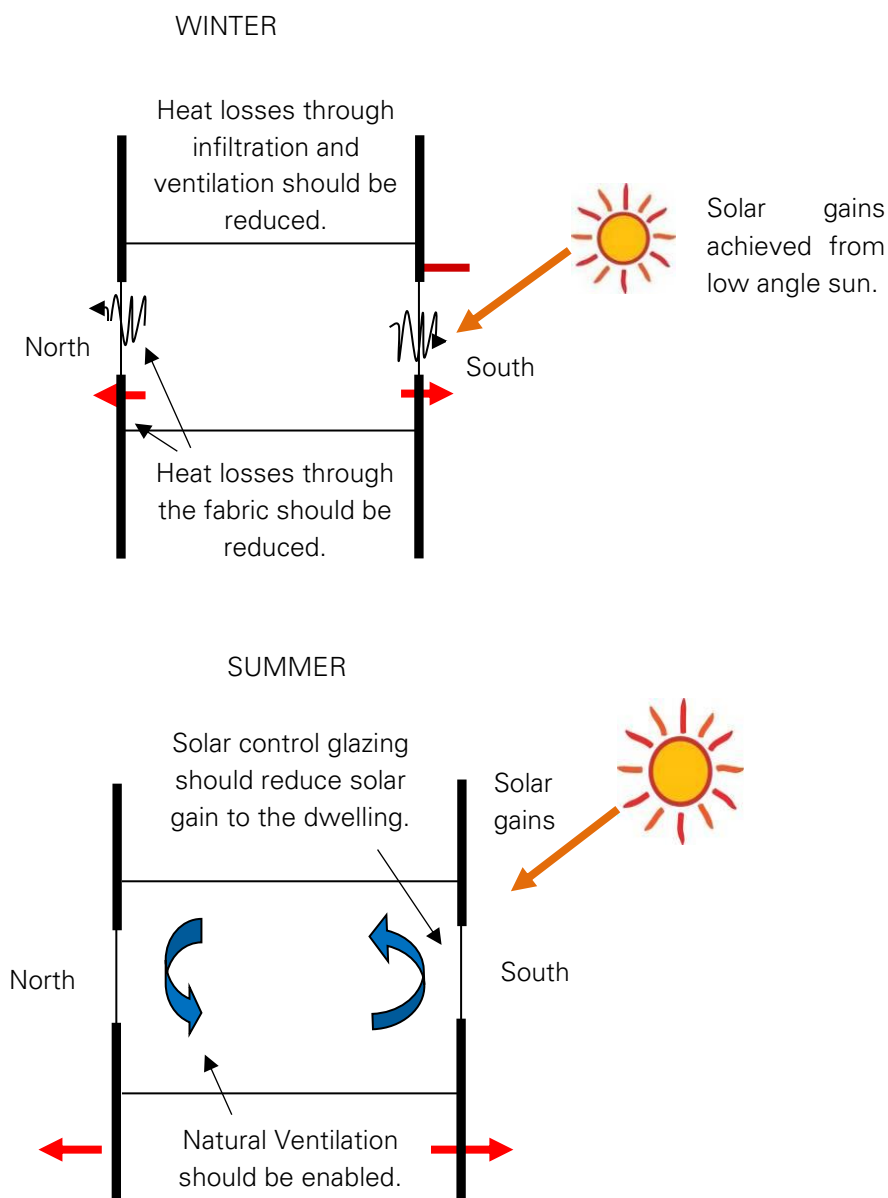
5.3. Reducing Demand (Passive Design)

Options have been reviewed for the use of passive technologies to reduce the carbon emissions from the building.

Reducing the initial demand is achieved by the adoption of passive measures which, if applied correctly, promote:

- Good natural daylight
- Avoid excessive heat losses,
- Avoid overheating,
- Good quality and controllable ventilation
- Acoustically sound environment

The aim of the passive design has been to reduce heating requirements, whilst ensuring that the units will be comfortable. The figures below illustrate the principles that have driven the design.



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Natural ventilation

Natural ventilation will be provided to promote ventilation to the spaces. This will help reduce the risk of summer overheating through passive means.

Artificial cooling will be minimised by the use of passive measures such as:

- Natural ventilation purging
- Low energy fit out,
- High performance glazing where required.



Natural daylight

Good amount of natural daylight will reduce the lighting consumption. Where access to daylight is limited, the proportion of glazing may be increased.

Proportion of glazing

Typically, the percentage of glazing should represent approximately 40%-60% of the façade area. The level reduces the excess solar gains in summer (therefore reducing overheating risks) in addition to reducing winter heat losses (therefore reducing heating consumption)

Insulation

Heat losses and heat gains through the fabric should be limited by the optimisation of the building fabric. Reducing the buildings thermal transmittance by increasing the insulation will help to significantly reduce the heating demand and will result in lower heating energy consumption.



Air Tightness

The building is to be insulated in order to reduce air infiltration rates, leading to a greater heating efficiency in winter, as a result of the lower heat losses.

The building elements are designed and built to very high standards in order to reduce air infiltration rates through the incorporation of robust building detailing and high-quality construction techniques.

Low Energy Fit Out

A major contributing factor of the energy use of the building is what is deemed as 'unregulated loads' from electrical goods, such as:

- Fridges/Freezers
- Dishwashers
- Computers
- Printers

It is intended that the highest efficiency rated goods will be installed to promote energy efficiency.

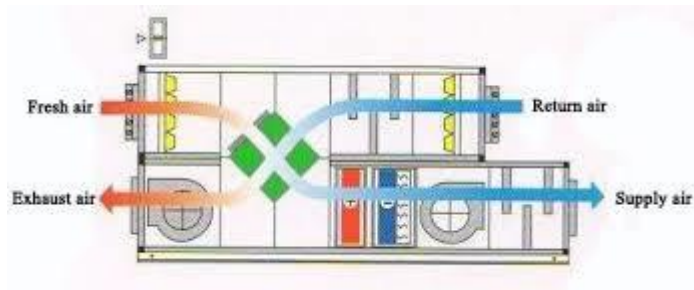
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5.4. Meeting Demand Efficiently

Air Handling Unit with Heat Recovery

Ventilation to the spaces will be provided via an Air Handling Unit fitted with Heat Recovery.

Heat Recovery in an AHU works by providing fresh filtered air into each occupied space and recovers the heat from a thermal wheel from the exhaust/return air, to avoid having to reheat the fresh air again.



This works both ways, so if the air temperature inside the building is cooler than the outside air, the cooler temperature is maintained.

Up to 85% of the heat from the extracted air is recovered to warm the incoming air. This greatly reduces heating cost compared to a natural ventilation system.

Low energy lighting (LED)

Where possible, natural light will be utilised and supplemented by artificial light when it fades.

Highly energy efficient LED lighting will be used throughout the development which are very efficient and will reduce energy use.

Demand Operated Systems

Where lighting is provided to a space that may not always be in use, occupancy sensors will be used. These will shut down the systems serving the spaces when they are not required, typically after a 20-minute period of inactivity, and turn them back on when instantly when they are required. This will utilise Passive Infrared sensors installed in the communal corridors.

Low Specific Fan Power (SFP)

The Specific Fan Power (SFP) is a ratio of power consumed to the amount of air moved by a ventilation system. The lower the SFP, the less power is consumed by the fan.

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Low to Zero Carbon Technologies

Options have been reviewed for the use of on-site Low or Zero Carbon Technology (LZT) in line with the Manchester City Council's policy aspirations.

This LZC energy statement/strategy reviews the technical and economic feasibility of the following technologies –

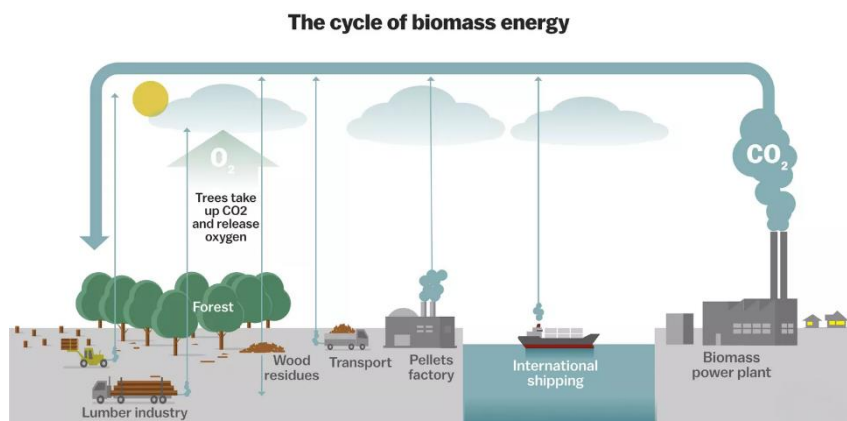
- Biomass
- Wind power
- Biogas/ Anaerobic Digestion
- Geothermal
- Ground Source Heat Pump
- Air Source Heat Pump
- Combined Heat & Power (CHP) [Natural gas and Biomass]
- Solar Hot Water
- Photovoltaic Panels

Biomass

Biomass is a generic name for any fuel produced from organic sources and falls into mainly two categories:

- Woody biomass- forest products, untreated wood products, energy crops and wood pellets
- Non-wood biomass – liquid biofuels (such as biodiesel, bioethanol) or animal waste, industrial municipal products, and high energy crops such as rape seed, sugar cane and maize.

For domestic properties, the fuel used is normally wood pellets, wood chips or wood logs. For larger applications, biomass boilers replace conventional fossil fuel boilers and come with an automated feed by screw drives from hoppers.



Biomass systems require more cleaning than gas or oil boilers and they must be capable of being taken out of service for cooling and cleaning whilst maintaining the building heating supply particularly in communal heating systems. Centralised gas boilers are therefore still required to support the biomass boiler, which would be the lead boiler. The size of the dedicated plant rooms is substantial. Fuel availability, delivery and storage are also important issues to consider.

Air quality issues are also an important factor when looking to install biomass, especially in the Manchester area.

The cost of the fuel depends on the type, delivery distances and whether it is obtained as simple waste product or from another organisation.

There is noise, transportation and delivery of fuel and air quality issues associated with biomass technology which could be problematic for a city centre development and for this reason biomass is discounted.

Wind Power

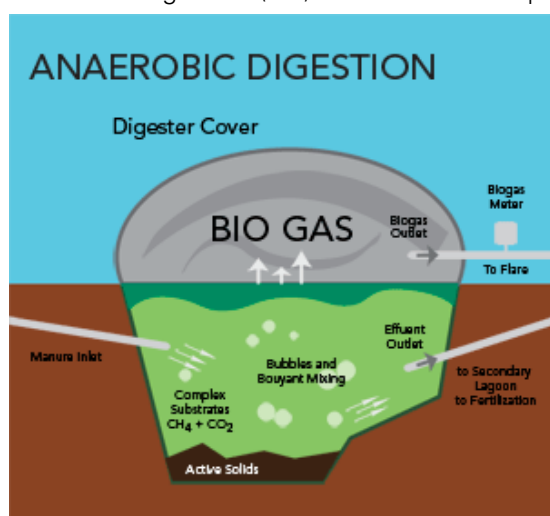
Wind power is one of the cleanest and safest methods of generating electricity. However, wind power is unfeasible due to the fact the development is in an urban area and local wind conditions would not be sufficient to provide enough power.

Furthermore, as this development is in an urban area with numerous tall buildings in close proximity, there will be obstacles which reduce wind speed. The average wind speed in this area is 2.4 m/s which is much less than the 6 m/s required. Therefore, wind is not a viable technology for this development.



Biogas / Anaerobic Digestion (AD)

Anaerobic Digestion (AD) is a collection of processes by which microorganisms break down biodegradable material in the absence of oxygen. The process is used for industrial or domestic purposes to manage waste and/or to produce fuels. Anaerobic digestion is widely used as a source of renewable energy. The process produces a biogas, consisting of methane, carbon dioxide and traces of other 'contaminant' gases. This biogas can be used directly as fuel, in combined heat and power gas engines or upgraded to natural gas-quality bio-methane. The nutrient-rich digestate also produced can be used as fertilizer.



Biogas typically refers to a mixture of different gases produced by the breakdown of organic matter in the absence of oxygen. Biogas can be produced from raw materials such as agricultural waste, manure, municipal waste, plant

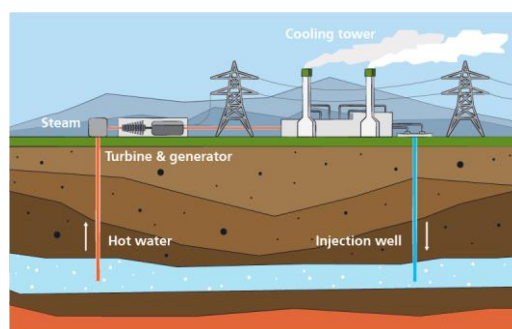
material, sewage, green waste or food waste. It is a renewable energy source and, in many cases, exerts a very small carbon footprint.

Biogas can be produced by anaerobic digestion with anaerobic bacteria, which digest material inside a closed system, or fermentation of biodegradable materials.

As the site is extremely efficient in terms of available space the anaerobic digestion solution is not deemed practical and discounted.

Geothermal

Geothermal energy is thermal energy generated and stored in the Earth. The geothermal energy of the Earth's crust originates from the original formation of the planet and from radioactive decay of materials. The geothermal gradient, which is the difference in temperature between the core of the planet and its surface, drives a continuous conduction of thermal energy in the form of heat from the core to the surface. Geothermal power is cost effective, reliable, sustainable, and environmentally friendly, but has historically been limited to areas near tectonic plate boundaries. Recent technological advances have dramatically expanded the range and size of viable resources, especially for applications such as home heating. As a result, geothermal power



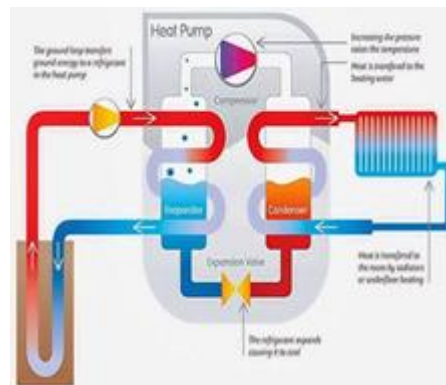
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has the potential to help mitigate global warming if widely deployed in place of fossil fuels. The geothermal energy can be used to heat homes directly or can be used to drive steam turbines to generate electricity.

Ground Source Heat Pump (GSHP)

GSHP's have been developed specifically for the housing market and are now considered to be an established reliable technology. The GSHP would be sized to cater for the heating and domestic hot water requirements. Typically, they are more suited to a centralised system with multiple bore holes to a depth of up to 150-250 metres depending on the ground conditions. GSHP's use a heat exchanger to extract heat from the earth.

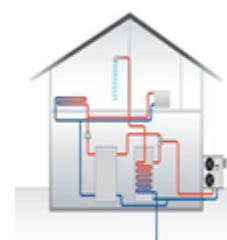
The efficiency of ground source heat pumps is measured by Co-efficient of Performance (CoP), this is the ratio of units of heat output for each unit of electricity used to drive the compressor and pump for the ground loop. Average CoP is around 3-5 although some systems may produce a greater rate of efficiency. This means that for every unit of electricity used to pump the heat, 3-5 units of heat are produced, making it an efficient way of heating a building. If grid electricity is used for the compressor and pump, then there is the opportunity to consider a range of energy suppliers to benefit from the lowest running costs, for example by choosing an economy 10 or economy 7 tariff.



Although they reduce CO₂ emissions, they rely directly on electricity for power and therefore are not fuel or energy efficient. The cost and practicalities to install GSHP's on this type of scheme is also prohibitive. GSHP are typically £20-30k per borehole. There is insufficient space at ground level to accommodate the number of boreholes to service the development, which makes this option unviable. GSHP's are not considered appropriate for this scheme.

Air Source Heat Pump (ASHP)

Air source heat pumps work in a similar way to GSHP. Air source heat pumps can be fitted, on the external façade or in the roof space. An air source heat pump uses small amounts of electricity to take in large quantities of air and extract heat. 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.



The ASHP system does offer an attractive solution in terms of the de-carbonisation of the grid and the omission of natural gas to the site.

Combined Heat & Power (CHP)

Combined heat and power (CHP) is a highly efficient process that captures and utilises the heat that is a by-product of the electricity generation process from an engine. By generating heat and power simultaneously (co-generation) CHP can reduce carbon emissions by up to 30% compared to the separate means of conventional generation via a boiler and power station. Typically, a CHP would use natural gas as the main fuel source, although other forms of fuel can also be considered.

The main components of a typical system are:

- the engine which drives the generator.

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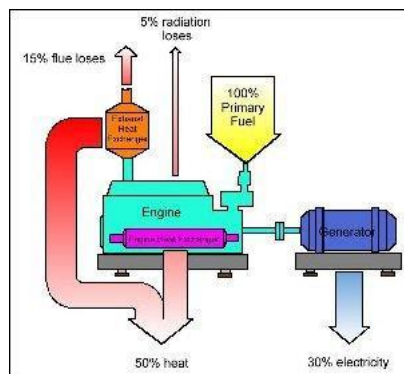
- the generator which produces electricity.
- the heat recovery system that recovers the waste heat from both the engine water cooling jacket and exhaust gases.
- the exhaust system to take away the products of combustion.
- the control panel to monitor the operation.

The heat generated during this process is supplied to an appropriately matched heat demand that would otherwise be met by a conventional boiler. CHP systems are highly efficient, making use of the heat which would otherwise be wasted when generating electrical or mechanical power. This allows heat requirements to be met that would otherwise require additional fuel to be burnt.

For many developments CHP is the measure that offers the most significant single opportunity to reduce energy costs and to improve environmental performance with existing users of CHP typically saving around 20% of their energy costs. Advantages of CHP include:

- CHP typically has an efficiency of 80-90%
- Operators typically saving around 20% on energy bills
- Significant carbon dioxide emission savings can be made
- Transmission and distribution losses are reduced
- Increases fuel supply security

However as the design intent and client brief is to have a strategy non reliant on fossil fuel and embrace the decarbonisation of the Electricity Grid, CHP is discounted.



Solar Thermal HW Panels

Solar panel heating uses the radiant energy from the sun to heat hot water, most commonly for domestic hot water needs. There are two types of collectors used for solar water heating – flat plate collectors and evacuated tubes collectors. The systems function successfully in all parts of the UK, as they can work in diffuse light conditions. The collector should be mounted on a 10-60 degrees pitch facing south, although other variations can be used, south is the most efficient.



The cost of installing the system is dependent on the distance between the solar collector and the hot water storage. The closer the collectors are to the hot water storage, the less pipe work is required. Annual maintenance checks are recommended. The solar collectors are connected to a condensing boiler via a HW cylinder with twin coil. A typical installation in the UK has a panel size of 3-5m² which is used in conjunction with a HW storage tank of 180-300litres, of which a minimum of 90-150 litres must be dedicated to solar hot water storage. For the reasons aforementioned this is not an appropriate option for this scheme.

They are a 'simple' and guaranteed technology which will act as a pre-heat for the Hot Water and Heating usage. Payback between capital cost and energy saving can normally be achieved within 12– 20 years, subject to usage and dwelling type. They work best on individual singular dwellings with a small HW cylinder. As the available roofspace for solar panels is limited and the use of photovoltaic panels is considered more effective in reducing carbon emissions, then solar thermal panels are discounted.

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Photovoltaic Panels (PV)

Photovoltaic panels use cells to convert light into electricity. A PV cell normally consists of 1 or 2 layers of a semi conducting material such as silicon. When light shines on a cell it generates energy causing electricity to flow, the higher the light intensity is, the more electricity flows.

The amount of energy PV cells generate is referred to as Kilowatt Peak (KWp). PV arrays now come in a variety of shapes and colours, ranging from grey 'solar tiles' that look like roof tiles to panels and transparent cells that you can use on conservatories and glass to provide shading as well as generating electricity. Panels can be mounted flat or on A-frames to give the optimum angle. The optimum panel inclination for solar collection is 35°, oriented due south; however panels that are inclined between 35° and 45° and oriented south of west or east are also generally suitable. If solar collectors are oriented away from due south then a larger surface area will be required to generate a set amount of energy.



The use of photovoltaic panels is considered attractive as this system offers an effective method of offsetting carbon emissions.

Hydrogen

Hydrogen is a low carbon alternative fuel source for traditional boilers, replacing gas. Hydrogen boilers would be installed in the same manner as traditional gas boilers, but it is not currently possible to purchase a 100% hydrogen ready boiler and therefore hydrogen is discounted from the development.

Battery Storage

Battery storage allows the low and zero carbon technology that can generate electricity – such as PV panels, wind turbines and CHPs – to charge the batteries if there is not sufficient demand from the development to utilise the energy.

This is more efficient than exporting the electricity to the grid, as the battery storage can 'peak lop' the peaks in the demand i.e., smoothing out the peaking and troughs in electrical demand and the onsite generation, saving the client money as the demand for higher cost and more carbon intense electricity at peak periods would be offset by the stored low cost and low carbon intensive electricity.

Battery storage is a viable solution to be adopted, but the required battery must be assessed in relation to the amount of stored electricity from the proposed PV system and the daily electricity usage.

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Low / Zero Carbon Technologies (LZT) Discounted (Summary)

- Biomass has been discounted as it poses problems in terms of air quality, delivery of fuel, storage, and transportation for deliveries etc. It would require a larger plant space for storing fuel, which is not currently included and is not conducive to city centre developments.
- Wind turbines are not seen to work particularly well on this type of development as it is an urban development and due to problems with wind turbulence and mounting of the units. The wind speeds in the area are not conducive to wind power electricity generation and there would be issues with shading, noise, and air traffic.
- Biogas/ Anaerobic Digestion (AD). Emissions are likely to cause local air pollution and compliance with the Clean Air Act is problematic. Finding a secure supply of fuel can be difficult. The environmental impact of fuel transportation can be expensive. AD used to generate gas for heat or electricity requires pollution prevention and a control permit or waste management license. Digester, storage areas and delivery areas can cause problems via escape of odour and liquids. High installation costs make the technology unviable.
- Geothermal. Availability of suitable location poses serious problem in adopting a geothermal solution. Extensive research is required prior to investing to ensure the location is suitable and sites do not 'run out of power' over a period of time. It may release harmful gases from deep within the Earth. High installation and investigation costs make the technology unviable.
- Ground Source Heat Pump's (GSHP) are not viable for this site because of spatial constraints and financial costs. There is insufficient space on the site to install GSHP vertical bores.
- Biomass CHP. As with standard biomass, this technology's problems lie in air quality, delivery of fuel, storage, and transportation for deliveries etc. It would require a larger plant space for storing fuel, which is not currently included, and it is not conducive to city centre developments.
- Gas Fired CHP – Although a viable technology in terms of cost and carbon reductions the system is discounted on the basis of the move towards the decarbonisation of the Electrical Grid and the phasing out of Fossil fuels.
- Solar Thermal – Although a viable solution, the system is discounted in favour of the adoption of Photovoltaics at roof level which after a more reliable cost-effective method of carbon emissions reduction.
- Hydrogen – Boilers that run solely on hydrogen are not currently available and will require gas to be installed instead until hydrogen is available.

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5.5. Summary of Technologies & Measures Considered & Adopted

Key:

Y – **Yes could be incorporated**

P – **Possible**

N – **Not appropriate**

REDUCE DEMAND	SUITABLE FOR CONSIDERATION	COMMENTARY
Natural ventilation / Mixed mode	Y	The acoustic report supports the use of natural ventilation to reduce the amount of energy required to cool and ventilate the building. Mechanical ventilation (as part of a mixed mode system) will be included to ensure that the ventilation requirements are achieved.
Good natural daylight	Y	Essential to reduce the reliance on artificial lighting.
Thermal mass	Y	The existing elevation which contains high thermal mass is being retained and is being incorporated into the scheme. The new building elements will be a lightweight structure, but concrete roof.
Air tightness	Y	Essential to minimise air leakage with the condition of the exposed site and reduce heat losses and exceed the minimum requirements of Part L 2013.
Solar shading/Low G Value Glass	Y	Specific solar shading not adopted but low 'G' value glass adopted to reduce unwanted solar gain on specific elevations.
Thermal Insulation that Exceeds Minimum Standards	Y	Essential to minimise heat losses. Minimum standards Building Regulation U Values exceeded.
Low 'G Value' glass specification	Y	Important to limit summertime overheating. The current G-value is 0.26.
ENERGY EFFICIENCY		
Ventilation Heat recovery	Y	Adopted on ventilation systems using a thermal wheel on AHU.
Low energy lighting	Y	Extensively adopted LED fittings throughout the scheme.
Variable speed drives	Y	Variable speed drives can be adopted on all fan and pump motors where possible to reduce energy consumption (Central Plant).
Demand Operated Systems	Y	The use of passive infra-red (PIR) for lighting, heating, ventilation where feasible. Optimise mixed mode natural ventilation operation when internal temperature criteria satisfied.
Daylight Dimming	Y	Use of photocells to dim office lights when there is sufficient daylight from outside.
Peak load cooling/Mixed Mode	Y	Use of cooling only when mixed mode cannot satisfy internal summer temperature criteria.

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RENEWABLE AND LOW CARBON TECHNOLOGY		
Solar		
Solar hot water	P	Possible but minimal roof space and low hot water demand.
Photovoltaics (PV's)	Y	Can be used to offset electrical demand subject to financial appraisal. - but minimal roof space available. Excess electricity can be exported to the grid
Water		
Small scale hydro power	N	Not feasible as no significant water source available.
Tidal power	N	Not Applicable.
Wave power	N	Not Applicable.
Wind		
Wind turbines	N	Not suitable for city centre environment.
Biomass		
Biomass single room heaters/stoves	N	Not appropriate for Application.
Biomass boilers	P	Possible but due to the air quality issues, biomass boilers have been discounted.
Biomass community heating schemes	N	No significant energy sharing in the area.
Combined Heat and Power (CHP) for use with the following fuels:		
Biofuel	N	Gasification process too large for scale of site. Biodiesel considered immature feedstock and unreliable.
Gas Fired CHP	N	Not sufficient hot water demand within building.
Sewerage gas and other biogases	N	Scale of site too small.
Heat Pumps		
Ground source heat pumps	N	There is insufficient capacity for the schemes requirements.
Water source heat pumps	N	No significant water sources to reject / absorb heat.
Geothermal heating systems	N	Not available.
Air source heat pumps	Y	This technology is feasible to generate hot water & for heating.
For heat pumps to comply, the heat source (ground or water) must be from a renewable source, for example soil, outside air, ground water, or a river.		
Other		
Fuel cells using hydrogen generated from any of the above 'renewable' sources.	N	Technologies not yet mature enough for application.
Rainwater recycling	P	Rainwater collection system could be adopted to

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		recycle rainwater for toilet flushing purposes but minimal space to provide below ground tanks.
Green roofs	P	Could be adopted
Battery Storage	P	Battery Storage could be adopted but the amount of stored electricity must be calculated to determine the size of the battery.

5.6. District Heating Network

This section outlines how consideration of energy supplied efficiently from a district heating network can be provided to the proposed redevelopment 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 CO₂ 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 are working in partnership with Vital Energi to create the Manchester Civic Quarter Heat Network.

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

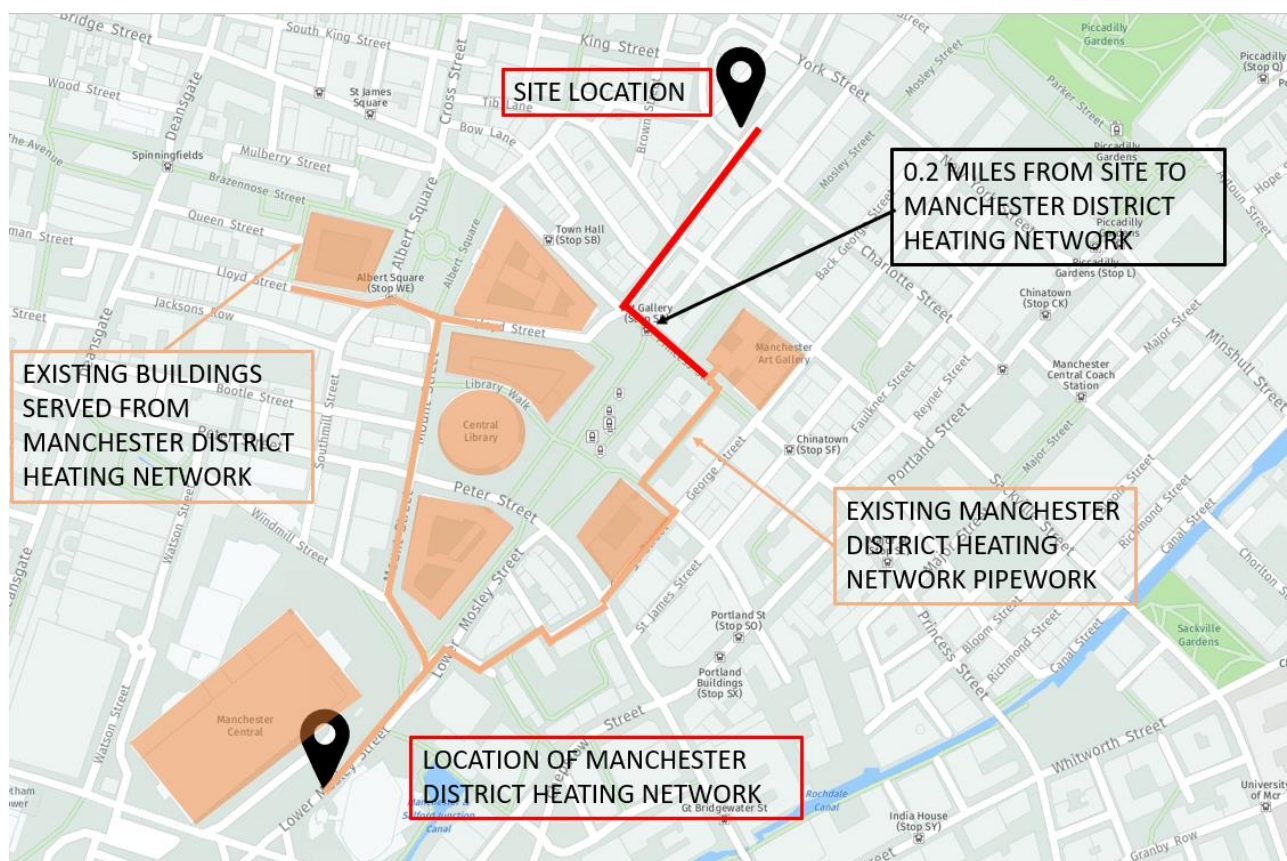
The first buildings to be connected are:

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

The network will contain power cables to distribute the electricity generated and underground pipes that deliver heat and hot water to connected buildings – one of the most cost-effective ways of reducing carbon emissions from heating. The network has been designed to enable future expansion, with efficiency and carbon savings increasing as more buildings join.

Heat will be generated from an energy centre, which is being built near to Manchester Central Convention Centre, at the junction of Great Bridgewater Street and Lower Mosley Street.

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The diagram above shows the current Manchester District Heating network and the location of the buildings that are served by it, in relation to the location of 50 Fountain Street.

50 Fountain Street is approximately 0.2 miles to the nearest point on the Manchester District Heating network. However, it is in our view that a connection into the District Heating Network would not be appropriate for the proposed redevelopment due to the relatively low heating load of the office in relation to the cost of a potential connection into the Heat Network.

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6. CARBON EMISSION CALCULATIONS

In order to benchmark the proposed development, the estimated energy demands and CO2 emissions have been calculated to be used as a guide to assess the percentage of the buildings total energy consumption and CO2 emissions that could be reduced or offset by low and zero carbon technology.

BREEAM requires these benchmark figures to be from approved Dynamic Simulation Model (DSM) software which utilises government and industry agreed National Calculation Methodology (NCM) templates that contain standard operating conditions. This is because BRE Global only accept the results from approved models when verifying the percentage reduction in CO2 emissions for the building of Ene 01 and Ene 04.

The specific inputs in the model are: -

Element	Target Values			G-Value
	Ua-Limit	Ua-Calc	Ui-calc	
Wall	0.35	0.23	0.30	
Floor	0.25	0.22	0.22	
Roof	0.25	0.18	0.18	
Windows, roof windows and rooflights	2.2	0.82	1.47	0.26
Personnel doors	2.2	0.26	0.26	
Vehicle access & similar large doors	1.5	-	-	
High usage entrance doors	3.5	-	-	

Air Permeability	Worst acceptable standard	This building
M ³ /(h.m ²) at 50 Pa	10	3

Building services

The standard values listed below are minimum values for efficiencies and maximum values for SFPs. Refer to the Non-Domestic Building Services Compliance Guide for details.

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	YES
Whole building electric power factor achieved by power factor correction	<0.9

Cleaners & Toilet Extract

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	3.44	-	0	0	-
Standard value	2.5*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES
* Standard shown is for all types >kW output, except absorption and gas engine heat pumps. For types <= 12 kW output, refer to EN 14825 for limiting standards.					

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4- pipe FCU

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	3.44	3.3	0	1.8	0.83
Standard value	2.5*	3.2	N/A	1.6^	0.5
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES
* Standard shown is for all types >kW output, except absorption and gas engine heat pumps. For types <= 12 kW output, refer to EN 14825 for limiting standards. ^ Limiting SFP may be extended by the amounts specified in the Non-Domestic Building Services Compliance Guide if the system includes additional components as listed in the Guide.					

DX

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	3.9	4.16	-	0	-
Standard value	2.5*	2.6	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES
* Standard shown is for all types >kW output, except absorption and gas engine heat pumps. For types <= 12 kW output, refer to EN 14825 for limiting standards.					

EO + Elec Panel

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	1	-	0	0	-
Standard value	N/A	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

AHU (S&E)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	3.44	3.3	0	1.8	0.75
Standard value	2.5*	3.2	N/A	1.6^	0.65
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES
* Standard shown is for all types >kW output, except absorption and gas engine heat pumps. For types <= 12 kW output, refer to EN 14825 for limiting standards. ^ Limiting SFP may be extended by the amounts specified in the Non-Domestic Building Services Compliance Guide if the system includes additional components as listed in the Guide.					

DHW

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This system	3.44	0.005
Standard value	2*	N/A
*Standard shown is for all types except absorption and gas engine heat pumps.		

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The results of the model are as follows: -

Energy Consumption by End Use (kWh/m²)

	Actual	Notional
Heating	1.74	3.34
Cooling	1.36	4.18
Auxiliary	12.38	12.43
Lighting	9.17	18.73
Hot Water	5.32	6.33
Equipment	44.68	44.68
TOTAL	29.98	45.00

There is a 33.6% improvement on the Actual building's energy consumption compared to the Notional building as a result of the passive measures, the adoption of low and zero carbon technologies in addition to the mixed mode ventilation system.

Energy Production by Technology (kWh/m²)

	Actual	Notional
Photovoltaic Systems	1.16	0

The subsequent carbon emissions saving:

Criterion 1: The Calculated CO₂ emission rate for the building should not exceed the target

CO ₂ emission rate from the notional building, kgCO ₂ /m ² . annum	22.7
Target CO ₂ emission rate (TER), kgCO ₂ /m ² . annum	22.7
Building CO ₂ emission rate (BER), kgCO ₂ /m ² . annum	15
Are emission from the building less than or equal to the target?	BER=<TER

The proposed option provides a 33.92% improvement on Part L2A baseline calculation.

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7. PREDICTED CARBON EMISSIONS

As part of the analysis of the development to determine the most appropriate Energy Strategy, it is essential to establish the Energy Characteristics in order for the technology/approaches to be matched accordingly.

The dynamic simulation modelling process can be used to model and analyse a range of sustainability factors typically arising from planning or building regulations drivers. These include energy compliance and CO2 emissions, overheating (thermal comfort) and daylighting analysis.

The dynamic thermal modelling process involves creating a 3D model of the building, assigning constructions to all the thermal elements, modelling the proposed mechanical and electrical systems and then running a simulation. This simulation models how the building fabric and systems will perform against real weather data over the course of a year and produces outputs showing the energy use of each system.

The following graphs and tables reveal the characteristics of 50 Fountain Street and highlight where energy is used, the respective typical time properties of the energy demand, and the anticipated Energy Use carbon emissions.

The SBEM calculation Building Emission Rating (BER) and the Target Emission Rating (TER) only incorporate the building energy and not the energy for connected equipment such as computers etc. It also does not allow for the actual number of occupants nor the actual hours of operation to be taken into account; this data is fixed per building type (e.g., meeting room or cellular office) to ensure comparisons can be made for all types of the same building.

The output BRUKL document breaks down the energy consumed by different end-uses, namely the heating, cooling, auxiliary, lighting and hot water.

The predicted carbon emissions do not allow for the use of ancillary equipment such as computers.

7.1. Summary of the Predicted Carbon Emissions

7.1.1. Regulated Energy Usage

AREA (M2)	TER				BER		% IMPROVE- MENT ON TER OVER PART L 2013
	(Kgco2/m2/a nn)	(kGC02/Ann um)	(TonnesCo2 /annum)	(Kgco2/m2/a nn)	(kGC02/Ann um)	(TonnesCo2 /annum)	
7725.1	22.7	175,359.77	175.36	15	115,876.50	115.88	33.92%

7.1.2. Unregulated Energy Usage

In addition to the regulated carbon emissions shown above, there will also be unregulated carbon emissions which are deemed to be the following. The estimated operational energy has been taken from the BRUKL calculations.

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UNREGULATED EMISSIONS (TONNES PER ANNUM)

345.16

7.2. Summary of estimated operational carbon emissions

The table below shows the total development operational carbon emissions associated with the regulated and unregulated energy use.

TER & UNREGULATED			BER & UNREGULATED			TOTAL RESIDUAL CARBON EMISSIONS (TONNESCO2/ ANNUM)
Regulated (TonnesCO2/ Annum)	Unregulated (TonnesCO2/ Annum)	Total (TonnesCO2/ Annum)	Regulated (TonnesCO2/ Annum)	Unregulated (TonnesCO2/ Annum)	Total (TonnesCO2/ Annum)	
175.36	345.16	520.52	115.88	345.16	461.03	461.03

7.3. Impact of the Decarbonisation of the Electricity Grid

As explained in section 3.2 of this report, the decarbonisation of the Electricity Grid will result in the further reduction in predicted carbon emissions of the development.

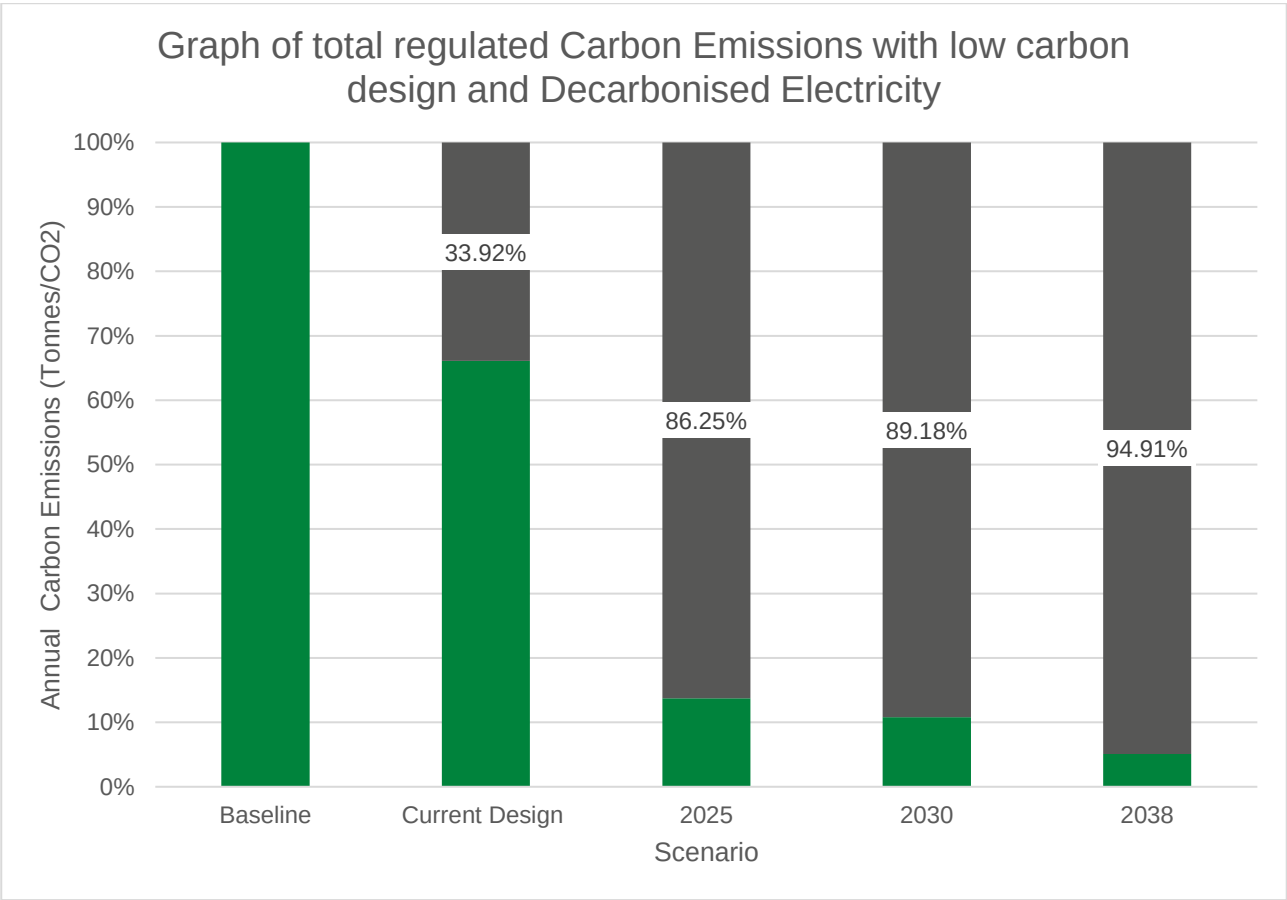
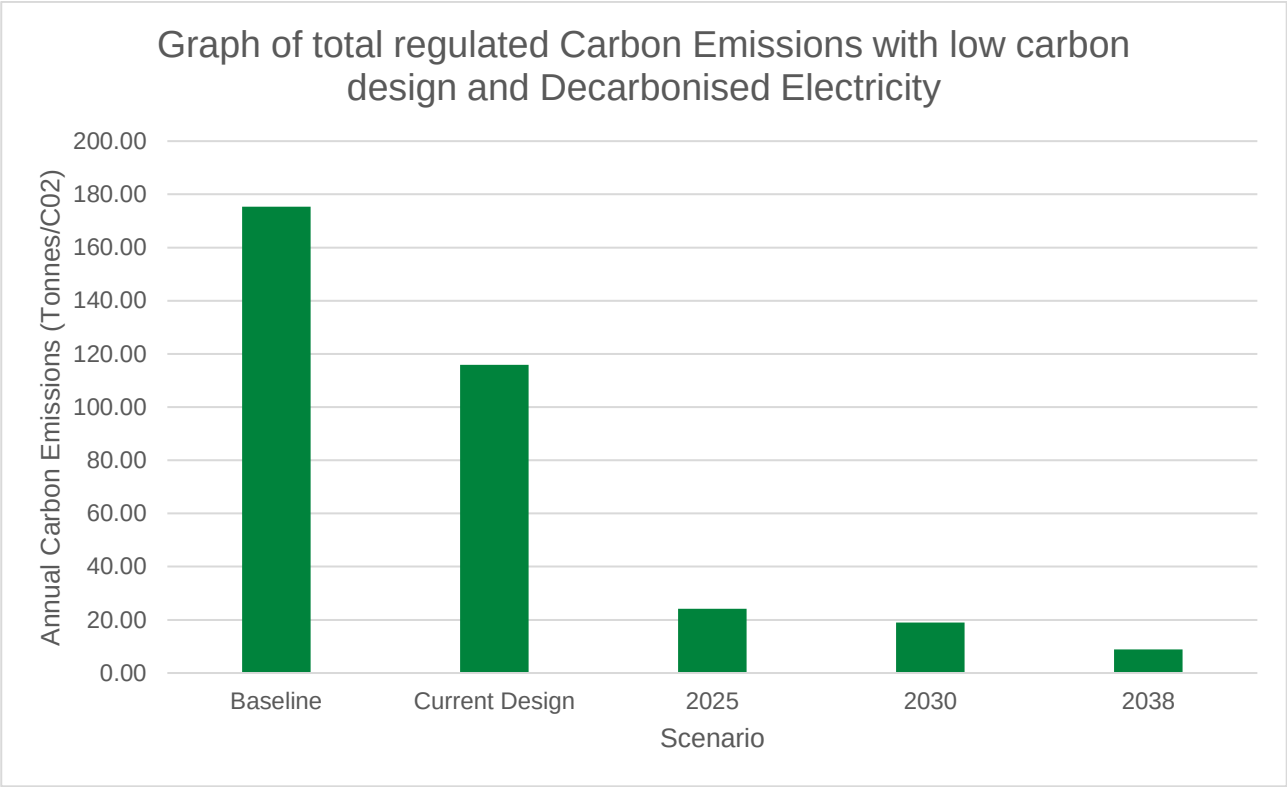
The table below sets out the anticipated reduction in carbon emissions, with the future lowering of the carbon factor of the electricity grid.

7.3.1. Regulated Carbon Emissions

SCENARIO	CARBON FACTOR (KGCO2/KWHR)	ANNUAL CARBON EMISSIONS (TONNES/CO2)	% REDUCTION ESTIMATED AGAINST CURRENT CARBON EMISSIONS
Baseline	0.519	175.36	N/A
Current Design	0.519	115.88	33.92%
2025	0.108	24.11	86.25%
2030	0.085	18.98	89.18%
2038	0.04	8.93	94.91%

The reduced carbon factors have come from the Department of Business, Energy & Industrial Strategy (BEIS) 'Updated Energy and Emissions Projections 2018'

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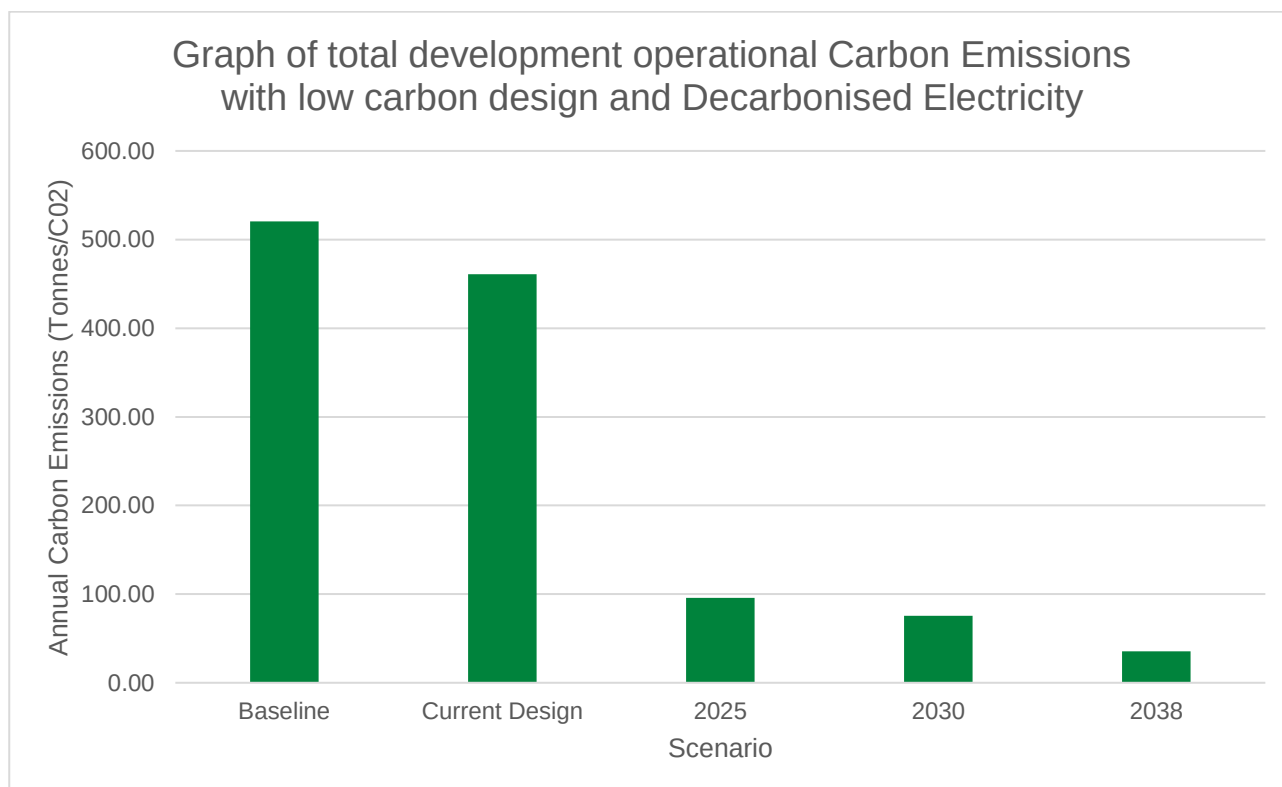


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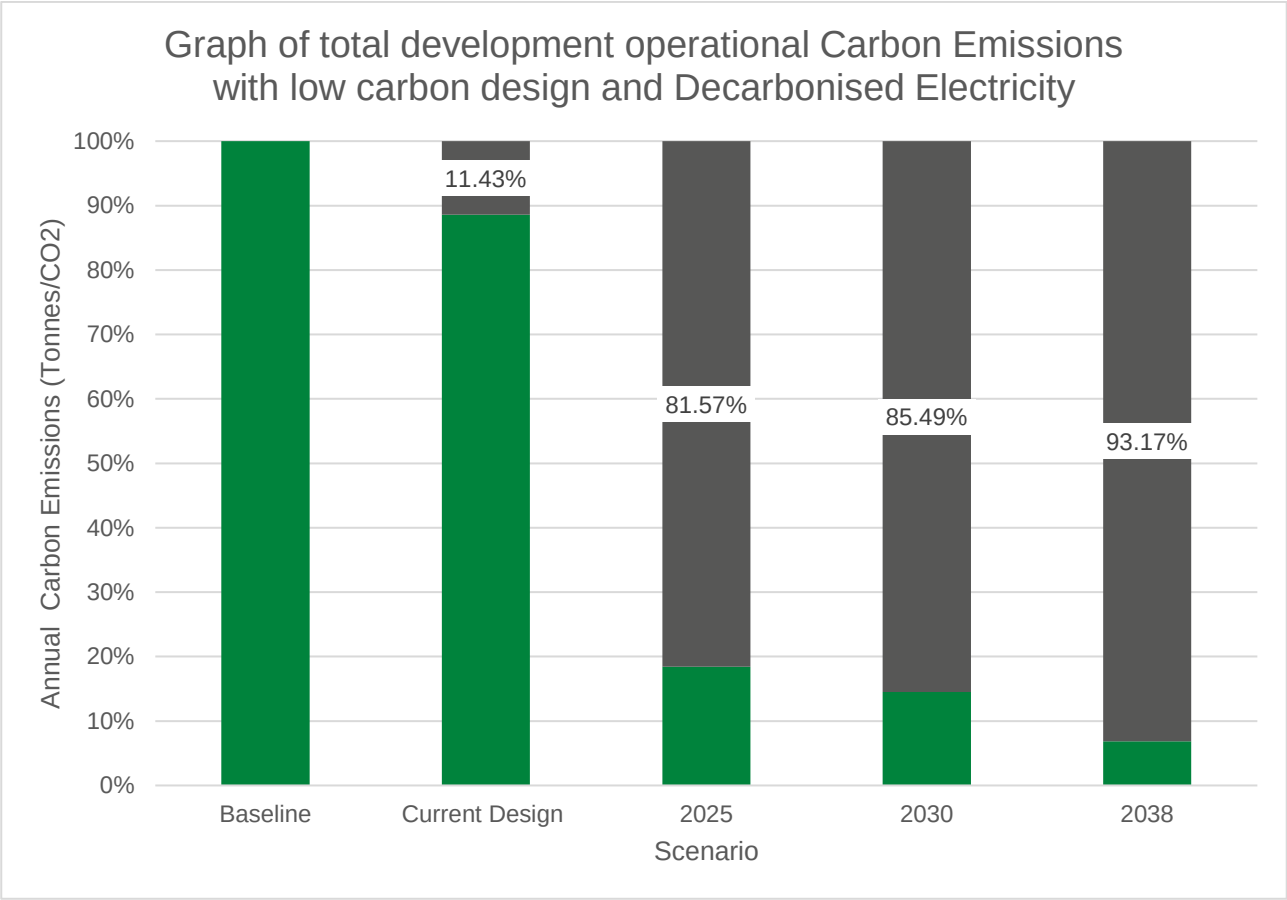
7.3.2. Operational Carbon Emissions

SCENARIO	CARBON FACTOR (KGC02/KWHR)	ANNUAL CARBON EMISSIONS (TONNES/CO2)	% REDUCTION ESTIMATED AGAINST CURRENT CARBON EMISSIONS
Baseline	0.519	520.52	N/A
Current Design	0.519	461.03	11.43%
2025	0.108	95.94	81.57%
2030	0.085	75.51	85.49%
2038	0.04	35.53	93.17%

The reduced carbon factors have come from the Department of Business, Energy & Industrial Strategy (BEIS) 'Updated Energy and Emissions Projections 2018'



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8. CONCLUSION

This report has set out the methodology in which the design team have approached the redevelopment of 50 Fountain Street and have adopted the requirements of Manchester City Council and the Government guidelines.

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 heating, cooling, and anticipated lighting loads with the following measures: -

- Appropriate glass to wall ratio
- U values that exceed minimum Building Regulation Standards as below:

Element	Target Values			G-Value
	Ua-Limit	Ua-Calc	Ui-calc	
Wall	0.35	0.23	0.3	
Floor	0.25	0.22	0.22	
Roof	0.25	0.18	0.18	
Windows, roof windows and rooflights	2.2	0.82	1.47	0.26
Personnel doors	2.2	0.26	0.26	

- Air leakage rates that exceed minimum Building Regulations as below:

Air Permeability	Worst acceptable standard	This building
M ³ /(h.m ²) at 50 Pa	10	3

- Improved glazing specification (G Value) that limits the amount of unwanted solar gain to avoid overheating.
- Exposed slabs for night-time cooling as shown in the image to the right.

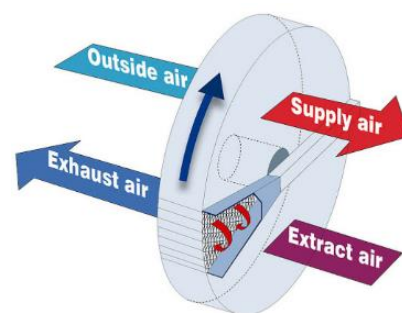


8.2. Energy Efficiency Measures - Mean

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

-

- Heat recovery on the ventilation systems via a thermal wheel, illustrated in the figure below
- Low specific fan power ratings to ventilation fans and fan coil units
- Lighting control systems such as PIR detection and daylight control
- High efficiency LED lighting throughout
- Demand operated services,
- Variable speed drives
- Automatic monitoring and targeting with alarms for out-of-range values.



ENERGY STRATEGY REPORT, 50 FOUNTAIN STREET

8.3. Renewable & Low Carbon Technologies - Green

The final aspect of the design has been to establish what renewable and low carbon technologies can be adopted with air source heat pumps (ASHP) to generate the heating and hot water to the building being selected. 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 ASHP solution will generate hot water to the development with high efficiency system where the typical 1 kWh of electricity input will generate 3 kWh of heat output (known as the co-efficient) of performance COP).

To further supplement this system with renewable technology, rooftop photovoltaic panels will be provided to generate electricity, contributing 1.16kWh/m² to the development.

The redevelopment will adopt the following renewable and Low Carbon Technologies:

- Air Source Heat Pumps, as shown in the image on the left below,
- Photovoltaic Panels, as shown in the image on the right below.



8.4. Summary

In summary, the redevelopment's building emission rate is lower than the target emissions rate and passes criterion 1 as follows:

CO ₂ emission rate from the notional building, kgCO ₂ /m ² . annum	22.7
Target CO ₂ emission rate (TER), kgCO ₂ /m ² . annum	22.7
Building CO ₂ emission rate (BER), kgCO ₂ /m ² . annum	15
Are emission from the building less than or equal to the target?	BER=<TER

The proposed option provides a 33.92% improvement on Part L2A baseline calculation.

8.5. Overall Summary

This energy strategy report for the redevelopment of 50 Fountain Street has set out the design teams approach to deliver a sustainable low carbon development that provides the ability to deliver a net zero carbon building of the operational base build carbon emissions in the future.

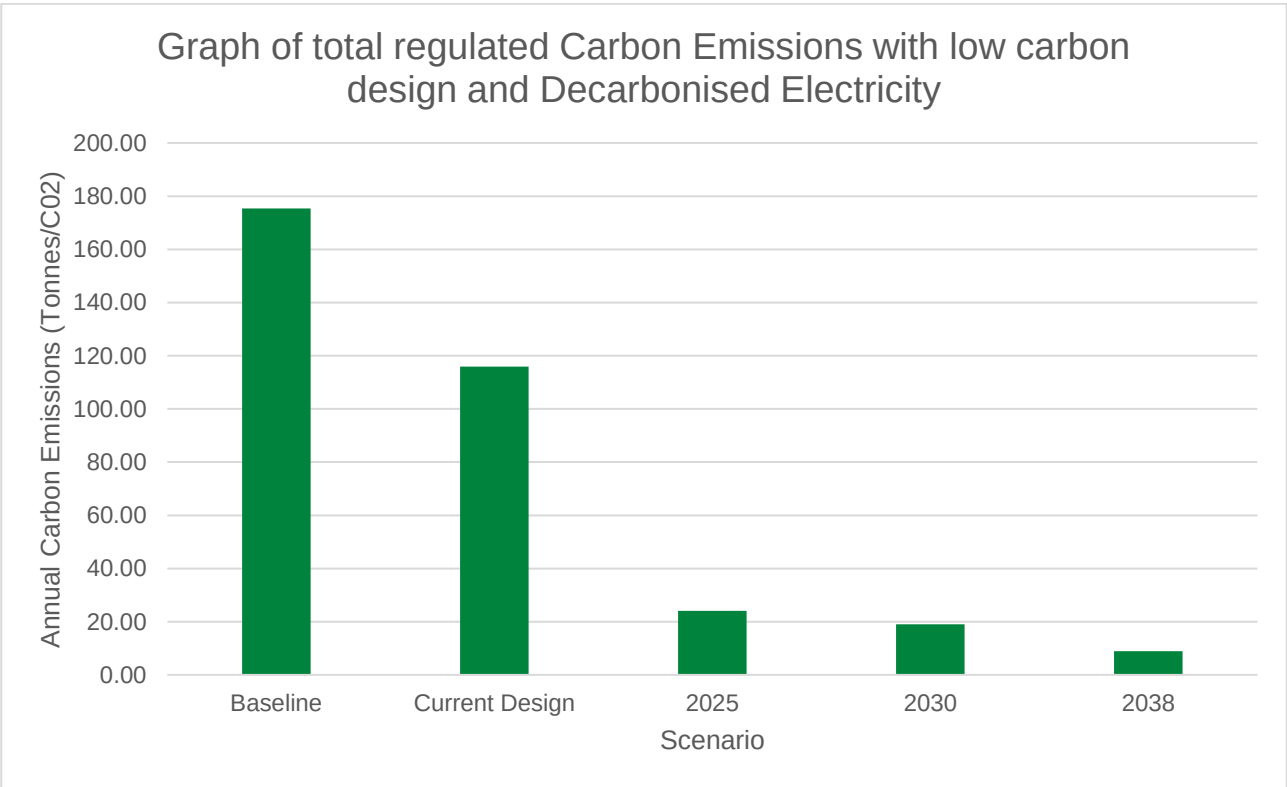
This report has discussed the energy strategy, reviewed and proposed low and zero carbon technologies, and presented the results from the thermal modelling. The results show that the redevelopment passes Part L2A by 33.92%

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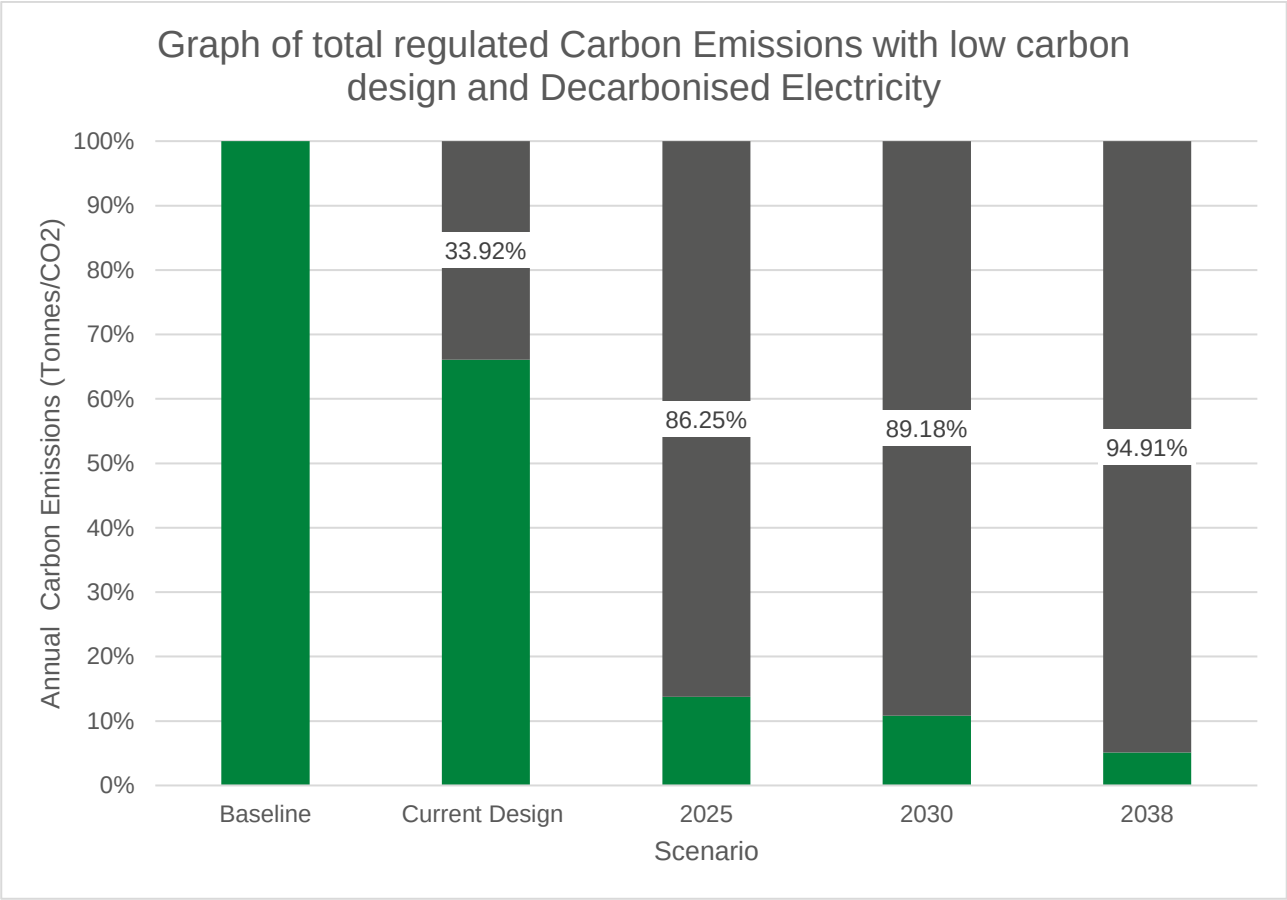
Our approach has followed the recognised strategy of fabric first followed by energy efficiency measures and then applying renewable and low carbon technologies.

The use of the existing façade in conjunction with the exposed concrete slab allows the thermal mass of those elements to be used to retain the heat gained during the day and then released overnight, thus lowering the internal temperature.

The combination of the measures discussed in this section, supporting the Governments and Local Authorities policy on phasing out fossil fuels, has significantly reduced the initial energy demand and have resulted in a predicted carbon reduction of the buildings emissions (regulated) of 33.92% based on the current carbon emission targets but we predict by 2038, given the decarbonisation of the grid, this will deliver a 94.91% reduction in the base build carbon emissions.

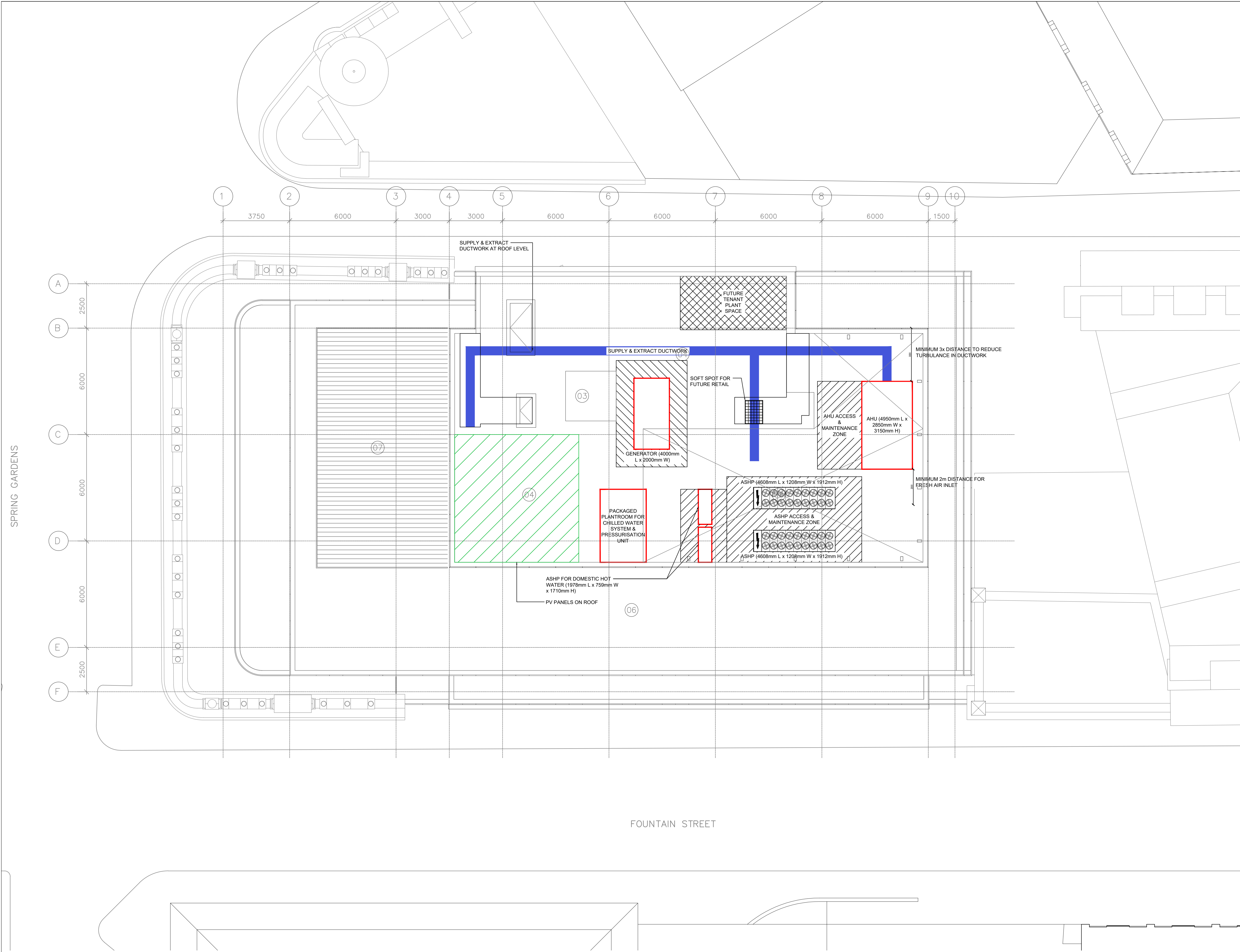


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APPENDIX 1

PLANT LAYOUT DRAWING (ROOF LEVEL)



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P2	FOR COMMENT	02/03/21	BP	CB
P1	FOR COMMENT	18/12/20	BI	CB
REV	REVISION	DATE	BY	CHKD

ORIGINATOR:



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IN ASSOCIATION WITH:

PROJECT:
50 FOUNTAIN STREET

TITLE:
**M&E SERVICES RISER LAYOUT
ROOF LEVEL**

DRAWN BY:	BI	SCALE:	1:100	@	A1
CHECKED BY:	CB	DATE:	02/03/2021		

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