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New Cross, Manchester

Bendix Street

Energy Statement

QA

Document ref: P6088/17.0/Reports

Document History

Issue	Issue 1 - Draft	Issue 2	Issue 3	Issue 4
Date	24th August 2018	31st August 2018	22nd February 2019	22nd November 2019
Purpose	For Comment	Planning Support	Planning Support	Planning Support
Created by	Paul S Young	Paul S Young	Paul S Young	Dave Carpenter
Signature				

Approvals

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Title	Director	Director	Director	Director
Signature				
Date of Issue	24th August 2018	31st August 2018	22nd February 2019	22nd November 2019
Version	For Comment	For Issue	For Issue	For Issue

Distribution

Document Issue	Name	Organisation	Role
Preliminary Issue			

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Section 1 – Executive Summary

This Energy Statement addresses the planning requirements of Manchester City Council as set out in Manchester's Local Development Framework, Core Strategy Development Plan Document, adopted 11th July 2012.

This report relates to Bendix Street. Reports in relation to Oldham Road and Goulden Street are submitted separately in support of the relevant planning applications.

This Energy Statement has been prepared to illustrate the environmental aspects of the proposed development highlighting the Energy/Carbon emission profile and, assess the options available for reducing energy consumption and associated CO_2 emissions in accordance with Manchester City Council's policies and guidelines.

A number of planning policies both national and local that apply to the proposed development have been reviewed together with the Building Regulations Approved document part L1A.

The baseline energy emissions have been developed, producing preliminary SAP calculations for the dwellings. Passive fabric measures across the building including improvements to the thermal performance and air tightness above Part L requirements of the Building Regulations have been incorporated.

Construction Element	Building Regulation Specification	Delevopment Specification
Floor	0.25 W/m²k	0.22 W/m²k
Wall	0.30 W/m²k	0.19 W/m²k
roof	0.20 W/m²k	0.18 W/m²k
Window	2.0 W/m²k	1.5 W/m²k
Air Permeability	10m³/h/m² @50Pa	5m³/h/m² @50Pa

In addition to the Passive design measures, Active Building Services are to be designed to minimise direct energy consumption and CO_2 emissions, with particular emphasis on the following;

- Improved Boiler Efficiencies;
- Reduced Standing Losses from Pipes and Cylinders;
- Increased Hot Water Generating Efficiencies;
- Energy Efficient LED Lighting;
- Improved Lighting Controls;
- Heat Recovery Ventilation;
- Low Energy Motors in Pumps and Fans;
- Efficient Heat Recovery in other systems and,
- Enhanced panel heater controls

Renewable and Low Carbon technologies have been considered and of the available solutions, it is recommended that the proposed scheme implements a combined heat and power system.

The inclusion of Combined Heat and Power technology (CHP) is considered to be the most appropriate for this proposed development and has been incorporated into the primary heat generation for the hot water systems. This will reduce the primary energy use requirement within the proposed development, i.e. the Domestic Hot Water generation.

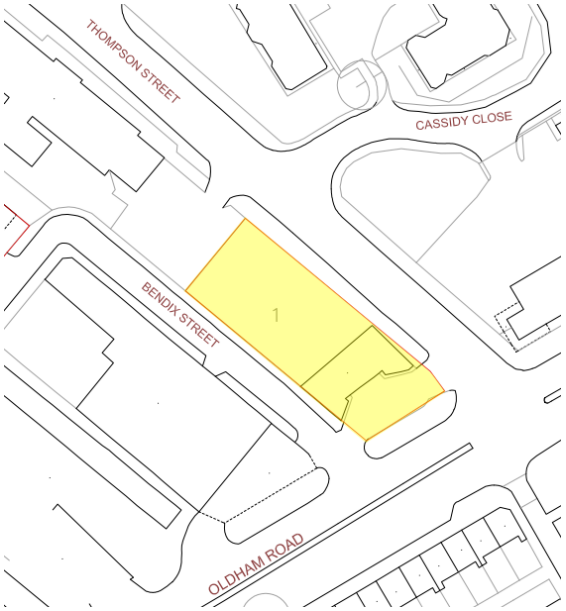
The Energy Model has been calculated to take account the selected renewable energy technologies proposed for this proposed development.

The anticipated carbon emissions for the apartments are **2128.02 kg/CO²/m².**

This is a total carbon reduction of **293.58 kg/CO²/m²** from the baseline emissions of **2421.60 kg/CO²/m².**

Therefore, the CO_2 reduction due to utilising the energy hierarchy on this proposed development has been calculated to be **21.1 %** on Part L 2010 and therefore in line with Manchester City Council Core Strategy Development Plan Document.

Section 2 – Introduction



This report relates to Bendix Street. Reports in relation to Oldham Road and Goulden Street are submitted separately in support of the relevant planning applications.

Futureserv Ltd have been appointed to produce an Energy Statement to support the planning application for a new development on Bendix Street, Manchester. The development shall consist of 161 residential apartments with a mixture of 1Bed, 2Bed and 3Bed accommodation.

The site is bound by Thompson Road and Oldham Road.

This Energy Statement addresses the planning requirements of Manchester City Council as set out in Manchester's Local Development Framework, Core Strategy Development Plan Document, adopted 11th July 2012.

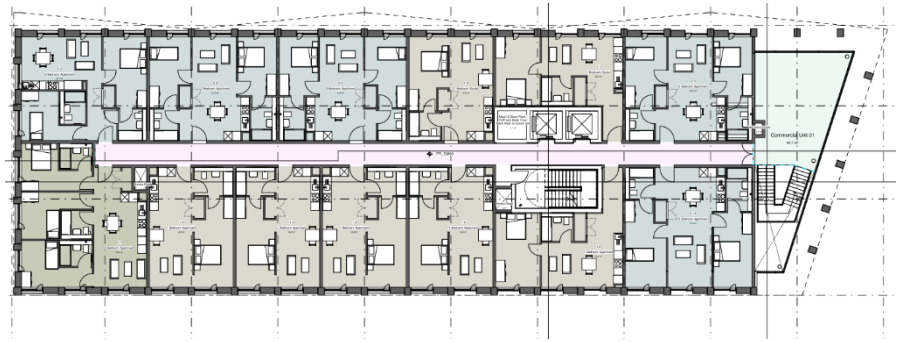
The strategy proposed for this development is the use of a Central Energy System incorporating renewable and Low Carbon techniques to meet Manchester City Council's desire for carbon reduction using Low or Zero Carbon Technology.

The strategy is essentially based on the reduction of energy consumption by use of passive construction measures, active energy efficient equipment and Low Carbon technology.

Section 3 – Development Proposals

Futureserv Ltd have been appointed by Mulbury Homes Ltd to produce an Energy Statement in support of a planning application for the construction of a high-quality new build apartment development at Bendix Street, Manchester.

The development shall consist of 161 residential apartments with a mixture of 1Bed, 2Bed and 3Bed accommodation. The building will also incorporate an element of commercial unit (Class A1/A2/A3 and B1), front of house reception, plant and refuse areas and cycle spaces.



This Energy Statement has been prepared to illustrate the environmental aspects of the proposed development highlighting the Energy/Carbon emission profile and, assess the options available for reducing energy consumption and associated CO_2 emissions in accordance with Manchester City Council's policies and guidelines.

Futureserv Consulting Engineers have collaborated with the design team in order to provide a holistic solution for the building that will provide an efficient envelope and contain intelligent building services reducing the environmental impact of the development whilst providing comfortable living accommodation.

The site is brownfield in nature and will be developed following the demolition of the existing commercial unit and car parking illustrated in the below image.

Section 4 – Policy and Legislation

There are a number of planning policies both national and local that apply to the proposed development.

The UK government has signed up to a legally binding agreement to reduce Carbon emissions by 34% based on 1990 levels before 2020 and by 80% before 2050, this responsibility is being discharged using the Climate Change Act 2008.

The National Planning Policy Framework (NPPF), offers specific guidance which highlights the UK's aspiration to support a transition to a Low Carbon future in a changing climate and in particular, to encourage the use of renewable resources such as Renewable Energy and states;

Planning authorities should ensure that development plans contribute to global sustainability by addressing the causes and effects of climate change through policies which reduce energy use and emissions, promote development of renewable energy resources, and take climate change impacts into account in the location and design of development.

Local Policies

The proposed development is located at Bendix Street within Manchester City Centre, with the local policies adopted by Manchester City Council outlined within Manchester's Local Development Framework Core Strategy Development Plan 2012 – 2027.

Within this document specific policies highlight carbon emissions reductions and the impacts of climate change. These are as follows;

Core Strategy Policy EN4 – Reducing CO^2 Emissions by Enabling Low and Zero Carbon Development

The Council will seek to reduce fuel poverty and decouple growth in the economy, growth in CO2 emissions, and rising fossil fuel prices, through the following actions:

Manchester's Local Development Framework

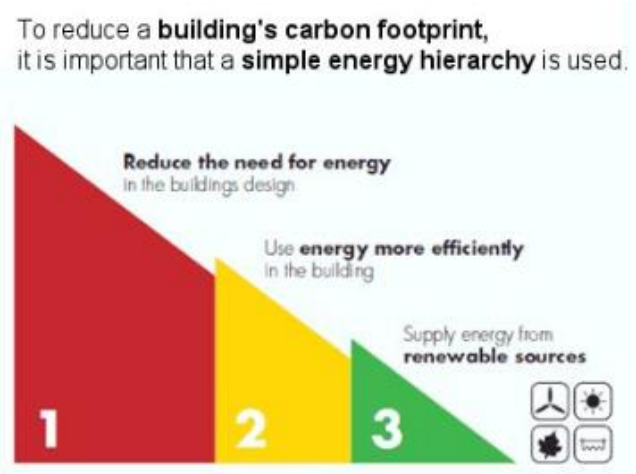
Core Strategy Development Plan Document

Adopted 11th July 2012

Published by Manchester City Council
planningstrategy@manchester.gov.uk

MANCHESTER CITY COUNCIL

- All development must follow the principle of the Energy Hierarchy, being designed:
    - to reduce the need for energy through design features that provide passive heating, natural lighting and cooling
    - to reduce the need for energy through energy efficient features such as improved insulation and glazing
    - to meet residual energy requirements through the use of low or zero carbon energy generating technologies



Reduction in CO2 emissions is seen as a major component in mitigating climate change. In this regard, areas of Government policy give rise to the following three national and regional targets:

- A national reduction in CO 2 emissions by 34% in 2020 and by 80% in 2050, (from a 1990 baseline) to which buildings will need to make a proportionately higher contribution, as set out in the Climate Change Act 2008.
- 'Zero' carbon targets for all new housing by 2016 and for all new non-residential development by 2019, for which preparation will be required (See table 12.3).
- A national increase in renewable energy capacity by 15% by 2020 as set out in the UK Renewable Energy Strategy, which will require an uplift in current levels.

Core Strategy Policy EN6 - Target Framework for CO2 reductions from low or zero carbon energy supplies

This policy requires applications for residential development of 10 or more units and all other developments over 1000sq m will be expected as a minimum, to meet the targets shown in the table below;

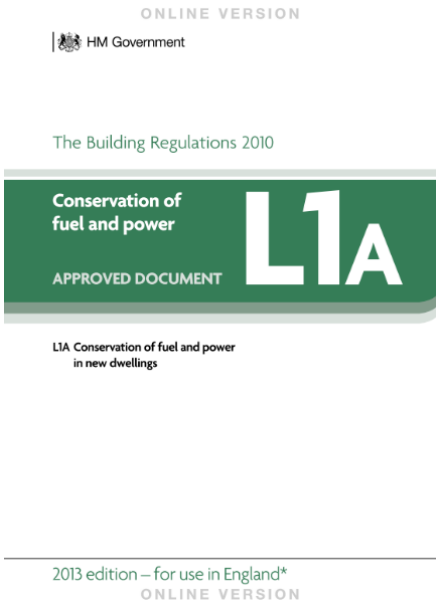
Domestic CO_2 emissions reduction targets

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

Building Regulations Part L1A (2013)

The proposed development is being designed to comply with the Building regulations approved document Part L1A, 2013 edition. This approved document takes effect from 6th April 2014.


ONLINE VERSION

HM Government

The Building Regulations 2010

Conservation of fuel and power

APPROVED DOCUMENT

L1A

L1A Conservation of fuel and power in new dwellings

2013 edition – for use in England*

ONLINE VERSION

The main changes in this approved document from the previous revision are that;

- A new requirement has been introduced that requires new dwellings to achieve or better a fabric energy efficiency target in addition to the carbon dioxide target.
- The notional dwelling used to determine carbon dioxide and fabric energy efficiency targets is the same size and shape as the actual dwelling, constructed to a concurrent specification. The Part L 2013 specifications have been strengthened to deliver 9 per cent carbon dioxide savings relative to part L 2010.

Section 5 – Energy Strategy

5.1 - Baseline Energy Assessment

Futureserv Ltd have conducted analysis for this stage of the development on a number of chosen apartments to show compliance with the Building Regulations Part L1A:2013 therefore setting a reference baseline. This was carried out in order to understand the developments Carbon emissions without any Carbon Emission mitigation measures.

This baseline energy assessment has been developed, producing preliminary SAP calculations for the dwellings. The baseline model has been created to provide Target Emission rates (TER). The SAP calculations then in turn produce Dwelling Emission rates (DER) which are equal to or lower than that of the TER.

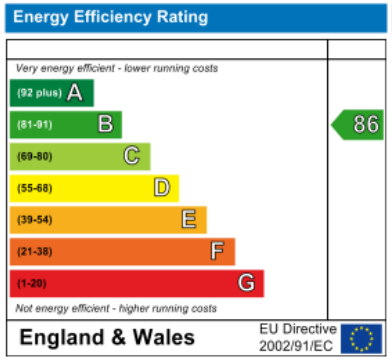
SAP is the government's standard assessment procedure for calculating the energy aspects of a dwelling. SAP is a measure of fuel costs for heating, hot water and lighting for a dwelling generated by the SAP engine within the software.

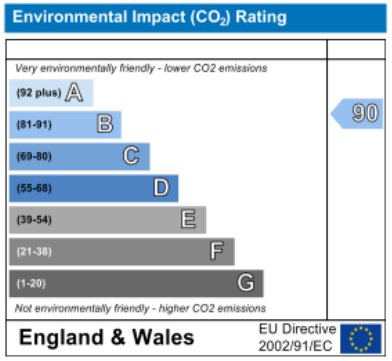
Predicted Energy Assessment

Dwelling type:	Mid floor flat
Date of assessment:	24/03/2017
Produced by:	Ryan Stocks
Total floor area:	70.2m²

This is a Predicted Energy Assessment for a property which is not yet complete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, an Energy Performance Certificate is required providing information about the energy performance of the completed property.

Energy performance has been assessed using the SAP 2012 methodology and is rated in terms of the energy use per square metre of floor area, energy efficiency based on fuel costs and environmental impact based on carbon dioxide (CO2) emissions.





The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

The environmental impact rating is a measure of a home's impact on the environment in terms of carbonn dioxide (CO2) emissions. The higher the rating the less impact it has on the environment.

5.2 - Passive Design Improvements

On the completion of the model and establishment of the Target Emission rates (TER), the dwelling emissions have been reduced through judicious passive design. This has involved an assessment of non-energy consuming design decisions to create a fabric first approach to energy efficiency. This is through;

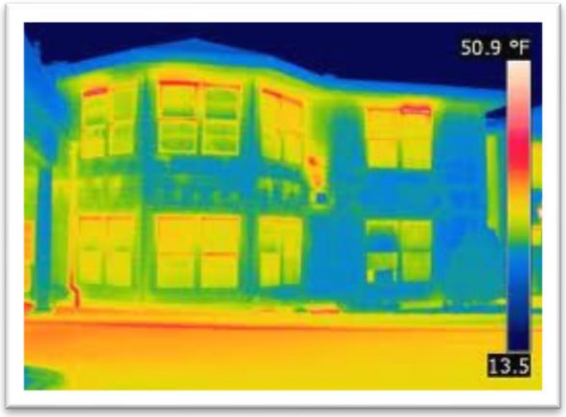
- Improved air permeability performance
- Better thermal Insulation

Passive fabric measures across all the building include improvements to the thermal performance and air tightness above Part L requirements of the Building Regulations and this effectively allows the building envelope to attenuate external conditions without recourse to active Building Services.

The table to the right presents the proposed material specification that will be incorporated within the building design to limit heat losses and ensure efficient operation of the proposed dwellings at Bendix Street.

An airtightness of 5m3/hr/m2 @50Pa is targeted for this development in order to minimise uncontrolled ventilation. An improved air tightness reduces heat losses and energy demand of the apartments.

Construction Element	Building Regulation Specification	Delevopment Specification
Floor	0.25 W/m²k	0.22 W/m²k
Wall	0.30 W/m²k	0.19 W/m²k
roof	0.20 W/m²k	0.18 W/m²k
Window	2.0 W/m²k	1.5 W/m²k
Air Permeability	10m³/h/m² @50Pa	5m³/h/m² @50Pa



5.3 - Energy Efficiency Improvements

In addition to the Passive design measures described in the preceding Section to improve the building envelope performance, the Active Building Services are to be designed to minimise direct energy consumption and CO_2 emissions, with particular emphasis on the following;

- Improved Boiler Efficiencies;
- Reduced Standing Losses from Pipes and Cylinders;
- Increased Hot Water Generating Efficiencies;
- Energy Efficient LED Lighting;
- Improved Lighting Controls;
- Heat Recovery Ventilation;
- Low Energy Motors in Pumps and Fans;
- Efficient Heat Recovery in other systems and,
- Enhanced panel heater controls

It is currently proposed for the apartments heat energy for Domestic Hot Water to be generated using gas fired centralised plant and a combined heat and power plant installation complete with metered distribution to each individual apartment.

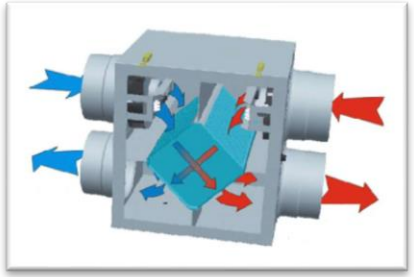
Highly efficient electric heat emitters would be provided complete with time and thermostatic control provisions, to minimise wasted energy when areas are unoccupied.

The apartment ventilation systems will be designed to operate continuously at low speed air volumes created by energy efficient fans. This will allow the construction of a tightly sealed and correctly ventilated environment reducing thermal heat loss through reduced infiltration, whilst at the same time improving air quality and reducing the occurrence of moisture and mould.

Waste heat from the apartments will be recovered by high efficiency mechanical ventilation with heat recovery (MVHR) systems. This type of ventilation will help to reduce heat demand and provide filtered air to the apartments thus promoting healthy living conditions for the occupants.

All internal lighting installations will make use of low energy technologies combined with presence and absence detection in conjunction with timed setbacks. 100% low energy lighting provision within the apartments. Photo switching and automatic dimming will be specified to the communal area of the building in order to improve the efficiency of the lighting system.

All fans, motors and pumps shall be specified to incorporate ECA accredited technology and appropriate controls.



Construction Element	Specification
Ventilation	MVHR
Lighting	100% Low Energy Fittings
Space Heating	Electric Panel Heaters
Heating Control	Programmer and room thermostats
Water Heating	Indirect Hot water cylinder fed from CHP unit

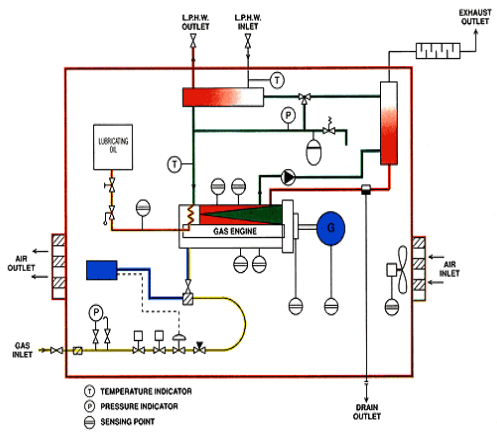
5.4 - Renewable Energy Improvements

In order to comply with Manchester's Local Development Framework Core Strategy Development Plan which requires that the development's Carbon emissions are reduced by 15% when compared to a building meeting Part L of the Building Regulations 2010, renewable and/or low or zero carbon emission systems have been targeted.

All currently acknowledged and commercially available technologies have been considered and assessed with the conclusions summarised below;

Combined Heat and Power (CHP)

On-site generation of electricity and the utilisation of waste heat from this process within a building can create a beneficial arrangement whereby the transmission losses of grid supplied electricity can be omitted. The use of CHP tends to require a steady and continuous heat demand therefore the large quantities of domestic hot water associated with apartment accommodation would satisfy this requirement.



Diagrammatic layout of small scale CHP unit

It has been established that the dominant energy requirement within apartment accommodation results from domestic hot water generation, the use of an accurately sized CHP solution can dramatically reduce the energy and Carbon intensity of this type of development.

Typical CHP Unit

Taking into account the proposed building size, usage and occupancy level, it has been determined that a CHP engine of circa **50kW$_{th}$** and **20kW$_{e}$** would contribute to a reduction in Carbon emissions.

Solar Thermal Collectors

The use of flat plate & evacuated tube thermal panels has been identified as a potential method of harnessing renewable solar energy by pre-heating domestic hot water provision.

The recent introduction of the renewable Heat Incentive may further improve the financial viability for the technology.

Example of Solar Thermal unit

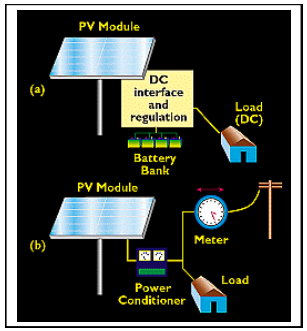
However, there is a fundamental conflict between Solar Thermal Collectors and the proposed Combined Heat and Power technology as both systems would be attempting to deliver to the same heating systems and thus would effectively de-rate each other.

For this reason, we have not considered the use of solar thermal collectors on this development.

Solar Photovoltaic Panels

The option to utilise roof mounted or Building Integrated Photovoltaic panels to generate electrical energy is a renewable energy method of generating Carbon free electrical power.

Due to the density in occupancy within apartments, there is likely to be a fairly constant base electrical load prevalent on the building which may be mitigated in part by the use of Solar PV.



PV System components

However, the flat roof areas of the building are relatively limited and payback periods for Photovoltaic panels can be onerous, for this reason we have not considered the use of Solar Photovoltaic Panels.

Wind Turbines

Wind energy can be a cost effective method of renewable power generation and turbines can produce Carbon neutral electricity with outputs ranging from watts to megawatts.

The most common design is for three blades mounted on a horizontal axis, which is free to rotate into the wind on a tall tower. The blades drive a generator either directly or via a gearbox (generally for larger machines) to produce electricity.

The electricity can either link to the grid or charge batteries. An inverter is required to convert the electricity from direct current (DC) to alternating current (AC) for feeding into the grid.

There are a variety of wind turbines on the market ranging from smaller turbines that can be attached directly to a buildings structure to larger stand-alone turbines.

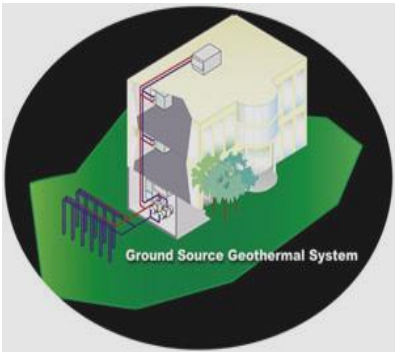
City centre and sub-urban locations generally experience poorer yields for electricity output from small and medium scale wind turbines, due to obstructions and variations in local topography.

Wind Turbine Installation

Also taking into account the visual impact and unwanted noise in an environment with sleeping accommodation the use of wind turbines is discounted from inclusion at this development.

Ground Source Heat Pumps

The ground below buildings remains at a constant temperature of around 10°C to 12°C offering the ability to extract energy in the winter and discharge energy in the summer from cooling with the energy exchange being achieved via open or closed loop systems linked to heat pumps.



Ground Source Heat Pump Installation

The footprint of the development and the surrounding site conditions do not have the potential to deliver an element of space available for closed loop heat exchange, due to this and the conflict with the CHP heat sink, the likely yield, peak load demand and cost feasibility, we have discounted Ground Source Heat Pumps at this development in favour of better performing technologies.

Air Source Heat Pumps

Air source heat pumps provide an accepted solution for using renewable energy taken from ambient air to heat a building in the winter and discharge heat from cooling in the summer.

Typical External Condenser Unit

The use of air source heat pumps in order to provide heating to the development would reduce the opportunity to deploy a centralised heating system that makes use of co-generation technology.

For this reason, we have not considered the use of air source heat pumps on this development.

Biomass

Some success on other projects has been made with the implementation of wood fuelled energy equipment forming a Carbon Neutral heat source however these projects have tended to be light density Sub-Urban or even rural in their location. The relatively constrained nature of this site, together with limited storage space and potential delivery issues due to the congestion on Oldham Road reduces the opportunity to take advantage of a Biomass solution for this development.

Plantroom Biomass Installation

In addition, flue emissions and the requirements the Clean Air Act has led to a dismissal of this technology for this particular scheme.

Total Assessments

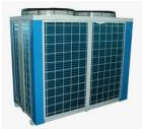
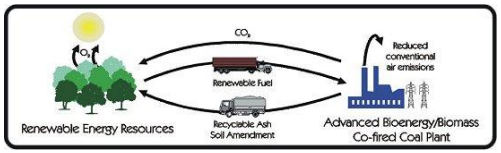
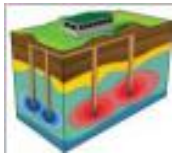
The central Building Services Systems will be supplemented by Renewable and Low Carbon technologies to further reduce the associated Carbon emissions.

Of the available solutions considered, it is therefore recommended that the proposed scheme implements the following renewable energy technology:

- Combined Heat and Power System

The inclusion of Combined Heat and Power technology (CHP) is considered to be the most appropriate for this development and has been incorporated into the primary heat generation for the hot water systems. This will reduce the primary energy use requirement within the development, i.e. the Domestic Hot Water generation.

The Energy Model has been calculated to take account the selected renewable energy technologies proposed for this development.

Renewable Technology	Image	Comments
Combined Heat and Power **SELECTED**		The integration of Combined Heat and Power technology is proposed for the new development, to provide base load domestic hot water and heat generation.
Solar Photovoltaic **DISCOUNTED**		The flat roof areas of the building are relatively limited and payback periods for Photovoltaic panels can be onerous, for this reason Solar Photovoltaic Panels have been discounted.
Air Source Heat Pumps **DISCOUNTED**		The use of Air Source Heat Pumps has been discounted as they will conflict with the implantation of CHP technology and the opportunity to utilise waste heat from the CHP engine.
Solar Thermal **DISCOUNTED**		There is potential to include flat panel solar thermal collector located at roof level serving the domestic hot water systems. However, this solution would conflict with the selected LZC for heat discharge capacity.
Biomass Boilers **DISCOUNTED**		Biomass boiler solutions have been discounted at this location due to potential clean air issues, deliverability logistics and the lack of available storage space for the required quantity of fuel.
Wind Turbines **DISCOUNTED**		Wind turbines have been discounted due to the resulting visual/noise impact from the equipment, and relatively poor performance of the solution when used within Urban and Sub-Urban locations.
Ground Source Heat Pump **DISCOUNTED**		The inclusion of Ground Source Heat Pumps has been discounted within this development due to the conflict with the selected CHP technology, system cost viability and also the site constraints.

5.4.1 - Energy Generation and Distribution Systems

The case for renewable energy systems is clear and we understand that Manchester City Councils current energy policy requires developments to make the fullest contribution to the mitigation of climate change, and to minimise Carbon Dioxide emissions.

As a consultant, Futureserv has an over-arching philosophy delivering design of truly sustainable energy systems, employing the widely recognised hierarchy;

- Be Lean - Reduce demand wherever possible utilising passive measures.
- Be Clean - Where energy is used, then it should be optimised to operate at the highest efficiencies practical.
- Be Green - Take advantage of renewable options to reduce fossil fuel energy sources.

The proposed development will be designed to be served by a Central Energy System, with Low Temperature Hot Water generated by gas fired boiler plant and CHP units located within the ground floor plant rooms, the LTHW pipework distribution shall be distributed around the Buildings within ceiling voids and service risers.

The central heating plant will be designed around a high efficiency heat generator, providing Domestic Water Heating. Pre-heat to the systems will utilise Low Carbon energy taken from a $50kW_{th}$ Combined Heat & Power system acting as lead heat source in conjunction with thermal storage.

The main Mechanical and Electrical plant systems would be located within purpose designed plant spaces incorporating adequate access for future maintenance and plant replacement.

All plant and equipment would be equipped with energy control measures incorporating variable speed drives, with low energy motors provided on ventilation fans and hydraulic pumps.

The development would be provided with a boosted cold water supply system located within the main plant rooms and all sanitary appliances are to be equipped with low water flow devices.

The proposed $20kW_e$ Combined Heat and Power system will provide a source of Low Carbon electricity to the development and where possible, redundant generation will be exported back to grid.

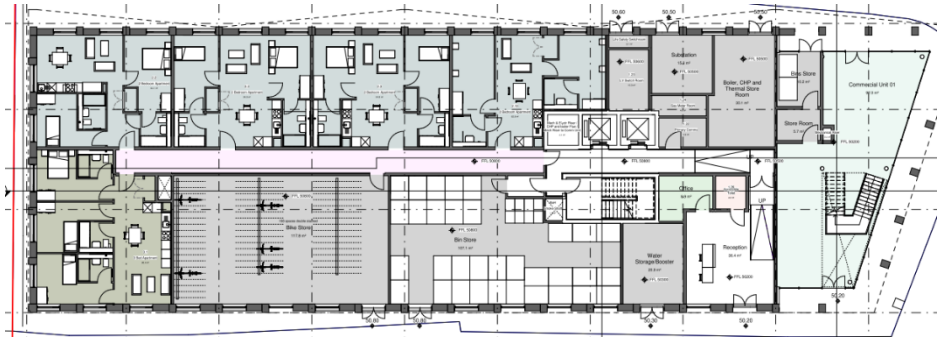
5.5 - Energy Performance Calculations

To enable demonstration that the environmental benefits associated with our energy hierarchy approach to energy demand and emission reductions at Bendix Street, approved SAP software, Stroma FSAP 2012 Version 1.0.1.21 has been used to generate energy demand calculations for typical apartments within the development.

Block compliance (multi dwelling) has been targeted to the apartment accommodation in accordance with guidance within approved document L1A.

At this stage of the development typical apartments have been selected for assessment as they are representative of the entire development in terms of their size, layout and orientation.

The below tables present baseline energy demand and emissions and actual energy demand and emissions for the typical apartments in the form of Target Emission Rates and Dwelling Emission Rates (Kg CO2/m²/annum) and Target Fabric Energy Efficiency and Dwelling Fabric Energy Efficiency (Kwh/m²/annum)



Ground Floor Layout

BLOCK COMPLIANCE
Calculation Type: New Build (As Designed)

aldrock
architecture • surveying • energy

Block Reference	Bendix	Issued on Date	
Block Name	Bendix Street		
Surveyor	Aldrock Surveyors (Unaccredited), Tel: 01254 774943	Surveyor ID	Admin
Client	Futurserv, FS		

Block Compliance Report - DER

Block Reference: Bendix		Block Name: Bendix Street		
Property-Survey Reference	Multiplier	Floor Area (m^2)	DER ($kgCO_2/m^2$)	TER ($kgCO_2/m^2$)
Bendix 01-Bendix 01	1	67.76	15.66	15.82
Bendix 02-Bendix 02	1	67.76	14.59	15.82
Bendix 03-Bendix 03	1	67.76	15.88	16.54
Bendix 05-Bendix 05	1	42.47	10.02	16.69
Bendix 06-Bendix 06	1	64.83	10.99	14.89
Bendix 07-Bendix 07	1	69.31	16.15	16.80
Bendix 08-Bendix 08	1	45.32	16.20	18.43
Bendix 09-Bendix 09	1	68.5	15.52	16.29
Bendix 04-Bendix 04	1	86.97	10.86	13.68
Totals:	9	580.68	125.87	144.97
Average DER = 13.99 $kgCO_2/m^2$			PASS	
Average TER = 15.92 $kgCO_2/m^2$				

Selected Dwelling Emissions Rate: 128.87 kg/CO²/m²
Selected Target Emissions Rate: 144.97 kg/CO²/m²
Result: Pass +12.1% increase on Part L 2013

The Part L 2013 specifications have been strengthened to deliver 9 per cent carbon dioxide savings relative to part L 2010 therefore the emissions rate is an 21.1% improvement on the Part L 2010.

Total Target Carbon Emissions for 161 Apartments	**2421.60 kg/CO2/m²**

Total Carbon Emissions for 161 Apartments	**2128.02 kg/CO2/m²**

Carbon Reduction from Target Emission Rates Part L 2010	**21.1% reduction**

Therefore, the CO_2 reduction due to utilising the energy hierarchy on this development has been calculated to be **21.1 %** and therefore in line with Manchester City Council Core Strategy Development Plan Document.

Section 6 - Conclusions

This energy statement has summarised the energy hierarchy requirements for Bendix Street to respond to emission reduction targets set out within the Manchester Core Strategy policies EN4 and EN6.

The proposed development will incorporate passive energy techniques available in the construction industry to reduce its ongoing requirement to consume energy to heat, ventilate and light the building, this is achieved by improved efficient fabric design in excess of the thermal properties set out within the Building Regulations.

The proposed development will incorporate energy efficiency measures in its Building Services to reduce the carbon footprint of the site below the passive improvement stage, using highly efficient heat generation plant, heat recovery systems and energy efficient and highly controllable lighting.

The proposed development will make use of renewable and Low Carbon energy techniques comprising a **50kW$_{th}$** Combined Heat and Power system and associated thermal storage to generate hot water. (Hot water demand being identified as the dominant energy requirement within the proposed development).

Overall, the Carbon emissions from the proposed Bendix Street proposed development shows potential for a total reduction in emissions from baseline set by current Building Regulations Part L 2010, by **20.2%**.

The strategy improves on the fundamental principles of the Building Regulations and will make a significant contribution to reducing the annual CO_2 emissions of the proposed development.