Steven A. Hunt & Associates

JIGSAW HOMES

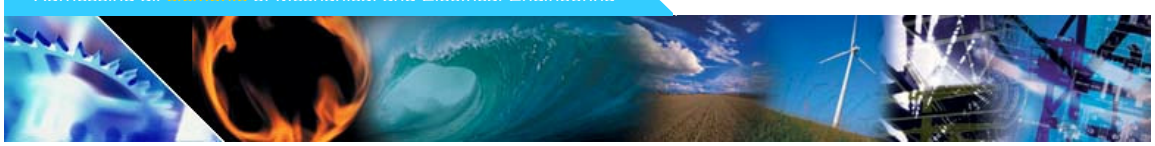
APOLLO PUB REPLACEMENT SCHEME, MILES PLATTING

ENERGY STATEMENT

3rd June 2025

Job No.4514
Prepared by N Baines – MCIBSE

Harnessing all elements of Mechanical and Electrical Engineering



Jigsaw Homes

Apollo Pub Replacement Scheme, Miles Platting

Energy Statement

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1.0 Executive Summary

The proposed redevelopment of the former Apollo Pub site aims to deliver a new residential scheme within the urban area of Miles Platting, Greater Manchester. Situated roughly 1.5 miles to the northeast of Manchester city centre, the location benefits from strong transport links via the A62, with the M60 and M67 motorways easily accessible, providing strategic regional connectivity. The scheme comprises the construction of 32 residential units housed within a four-storey apartment block.

Apollo Pub Replacement, Miles Platting - Site Location



In order to align with modern sustainability goals, the development will adopt a "fabric-first" methodology. This strategy is recognised as a practical and economical route to achieving high energy performance, specifically targeting EPC ‘A’ ratings. It is designed to meet local housing requirements while lowering carbon output over the operational lifespan of each dwelling. Recommended construction materials are chosen for their thermal efficiency, contributing to indoor comfort by moderating temperature fluctuations, acting as thermal buffers during warmer periods and minimising heat loss during colder months.

2.0 Introduction

This document evaluates the energy sustainability strategy for the Apollo Pub Replacement project, referencing Manchester's Local Development Framework Policy EN6, the National Planning Policy Framework (NPPF), and the 2022 revisions to Part L of the Building Regulations. A key finding is that employing a fabric-first approach will enable the project to exceed Jigsaw Homes' standard sustainability benchmark of EPC 'B', instead achieving EPC 'A' ratings. This construction method proves both practical and beneficial in helping to deliver energy-efficient housing within the local area and the broader community.

3.0 Sustainable Building Design

One of the most effective and economical paths toward sustainable design lies in the careful selection of construction materials that minimise energy consumption once the buildings are occupied. By considering the full lifecycle of the home, this whole-building strategy contributes positively to broader sustainability goals, helping to alleviate issues such as energy cost inflation, carbon emissions, and fuel poverty.

The design process yields the best sustainability outcomes when sustainability measures are embedded from the outset. Important elements to consider include site orientation, management of solar gain and shading, natural ventilation, improved insulation values (u-values), high thermal mass, dynamic response to thermal conditions, and features such as green roofing and energy-efficient lighting. Each of these components supports the long-term viability of low-carbon development and environmental resilience.

Planning policy and regulations—such as the Manchester Core Strategy (2012), the 2007 Supplementary Planning Document, and Part L of the 2021 Building Regulations—encourage developers to pursue carbon reduction targets that exceed regulation standards by at least 15%. These goals can be achieved through a combination of innovative design strategies and, where necessary, renewable or low-carbon technologies. The Standard Assessment Procedure (SAP) software is used to confirm compliance, producing outputs that quantify performance improvements against regulatory benchmarks.

Legislative developments such as the UK Climate Change Act 2008 (as amended in 2019), the Energy Act 2011, and the Environment Act 2021, alongside ongoing updates to Building Regulations and planning policy, are driving continuous environmental enhancement across the construction sector. These evolving requirements ensure that residential buildings are designed to reduce energy demand and carbon output, while actively promoting the use of energy-efficient systems and renewable generation technologies.

4.0 Proposed Thermal Properties & Energy Strategy

The fabric first approach directive from Jigsaw Homes is based on using the current expected criteria with the 'Future Homes Standard' which are identified below:

Floor Construction Details

Ground Floors to achieve U-Value = 0.13 W/m²K.

Exposed Floor to achieve U-Value = 0.15 W/m²K.

Wall Construction Details

External wall to achieve U-Value = 0.18 W/m²K.

Party walls to achieve U-Value = 0.00 W/m²K.

Roof Construction Details

Plane roof to achieve U-Value = 0.09 W/m²K

Flat roof to achieve U-Value = 0.13 W/m²

Openings

All windows / fully glazed patio doors are double glazed low-e windows with a soft coating to achieve:

U-Value = 1.20W/m²K

g-value = 0.50 (BS EN 410)

(Average glass and frame U-value)

Thermal Bridging

Thermal bridging value (Y-value) of 0.04 is assumed to limit the thermal bridging.

Air Pressure Test

An air permeability test will be undertaken in the new build dwellings. This will achieve a rating of 3.00 or below.

Energy Strategy

The main objective of any energy strategy should be to reduce the CO_2 emissions from the building. The strategy should also aim to reduce the use of non-renewable resources and to reduce the other emissions related to building energy use.

An initial review of the opportunities and constraints of the site have been undertaken from an engineering perspective covering issues such as:

- Sun path and shading.
- Potential biomass resource.
- Ground conditions for ground source heat pumps.
- Prevailing wind.
- Wind resource.
- Sources of noise or air pollution.
- Orientation of building.
- Building fabric.
- Avoidance of potential pollutants (refrigerants)
- Use of water.

The objective is to identify opportunities to integrate alternative and sustainable energy options when considering the whole development.

In addition to these practical issues relating to the construction, the design team are aware that sustainability extends beyond the methods used in building and considers long term operational issues such as:

- Waste management and recycling.
- Transport to and from the development.
- Materials and equipment considering the embodied lifetime environmental impacts.
- Social issues
- Health and well-being.

The objective must be to produce a design which achieves compliance with Part L of the Building Regulations and achieves Jigsaw Homes energy efficiency targets.

5.0 LZC opportunities

The opportunities for providing Low or Zero Carbon technologies on this site are as follows:

Biomass
- Biomass boilers

Combined Heat and Power (CHP)
- Biomass
- Natural gas
- Sewerage Gas and other biofuels
- Absorption Cooling

Heat Pumps
- Ground Source Heat Pumps
- Water Source Heat Pumps
- Air Source Heat Pumps

The current Part L of the Building Regulations reduces any previous penalties incurred for the use of electricity as a source of generating heating and hot water in new buildings by lowering the carbon factor of electricity. This is based on the national electricity grid using more power produced by renewable forms of electricity generation than at any point in the past and that this trend is forecasted to rise even further in the future.

The remaining opportunities for providing Low or Zero Carbon technologies on this site are as follows, and we detail the concepts in the following pages.

Solar
- Solar Hot Water
- Photovoltaics (PV)

Wind
- Wind Turbines

Water
- Small Scale Hydro Power

4.3 Solar

4.3.1 Photovoltaics (PV)

Solar energy emitted by the sun can be harnessed using specifically designed mechanical systems which use solar cells to convert sunlight in to electricity. Each cell has one or two layers of semi-conducting material which respond to light to create an electric field across its layers causing electricity to flow.

There are three basic types of solar cells and these are:

Monocrystalline: These have a typical efficiency of 15% and are the most expensive.

Polycrystalline: These have a typical efficiency of 13%

Thin Film: These are generally applied to other materials such as glass or metals and have a typical efficiency of 7%



A collection or an array of these cells are linked together and their total output is normally installed in parallel to the grid. Current glazing technologies are seeking to combine PVs within standard glazing elements which in time will become more economically viable.

To maximise output PVs are best located at an angle of 30- 40º south facing. Shaded areas will seriously reduce output and should be avoided.

A typical 5Kw system will generate 5,000kWh per year saving nearly 2.5 tonnes of CO2.

Systems are completely silent in operation and have minimal local impact but may require planning approval from a visual perspective.

In this instance they are to be considered alongside the introduction of an electrically operated heating system as a means of offsetting increased energy costs because of the increased use of electricity as a heating source.

Alongside the addition of photovoltaic cells a method of storing excess energy produced via the PV's would be beneficial. This could allow any stored energy to be used during the evening to allow the benefit of the PV installation to match the profile of the building operation. In reality the building will use the energy produced via the PV during the daytime and as such stored energy does not fit the building's operation profile.

Battery storage would need to be considered separately to this study. Typically they occupy a large area externally to the building and consist of lithium ion battery technology. The lifespan of the batteries is such that they are generally replaced in 10 to 15 year cycles and the costs of such a system including the lifespan running costs would need to be considered.

4.3.2 Solar hot water

Solar energy emitted by the sun can be harnessed using specifically designed mechanical systems which use solar collectors to absorb the suns energy and provide heat for hot water.

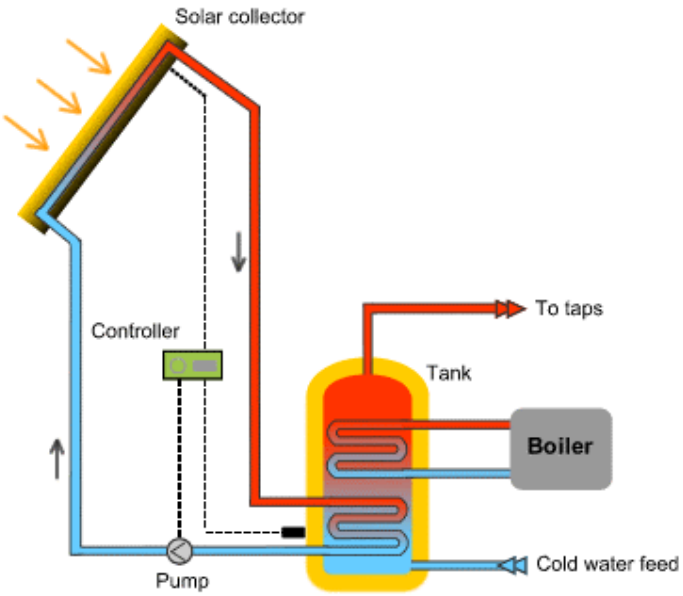
The heat energy absorbed by the collectors is transferred through interconnecting pipework linking an internal storage vessel which enables the demand to match availability.

The circulation of heat can either be by passive means i.e. relying on the natural convection to circulate the water through the system or by active means which uses a circulation pump often powered by a small built in photovoltaic collector to run the pump.

There are several types of hydronic solar collectors but the two most common are:

Flat plate collectors: These are simple but effective devices containing a dark plate within an insulated box with a glass or plastic cover.

Evacuated tube collectors: These are more sophisticated devices offering higher efficiencies under a wider range of conditions but are more expensive.



To maximise output solar collectors are best located at an angle of 45^{o} and facing south.

Systems are completely silent in operation and have minimal local impact but may require planning approval from a visual perspective.

4.4 Wind

4.4.1 Wind turbines

Wind power can be harnessed by the use of turbines which captures the wind energy which generates electricity. The electricity produced can be directly fed back in to the grid or can be stored via battery cells.

There are two basic types of turbines and these are:

Horizontal Axis: These are the more common typically seen with three evenly spaced blades rotating around a central hub.



Vertical Axis: These can be installed without a tower on to buildings and operate with a twisted blade structure rotating around a vertical axis.



In order to operate satisfactorily a minimum wind speed of 3.5 to 5m/s is required and ideally a consistent wind speed of 5 to 6m/s are typically required to generate worthwhile quantities of electricity.

The power output from a wind turbine depends upon wind speed and the swept area of the rotor. The higher the rotors the more opportunity there is to maximise the wind speed and increase the output.

Wind turbines are more suited to rural locations as the size and impact within an urban setting tends to limit outputs to an extent where they are unfeasible. Visually they are likely to require planning consent and noise generated by the rotor blades can be

considered a nuisance. Rotating turbines can also affect electromagnetic radiation and radiological surveys may be required in sensitive areas such as close to airfields.

As with the photovoltaic cells, the wind turbines are to be considered alongside the introduction of electrically operated heat pumps as a means of offsetting increased energy costs as a result of the increased use of electricity as a heating source.

4.5 Biomass

4.5.1 Biomass boilers

Heat energy is generated by the burning of organic matter such as trees, crops or animal waste which is harvested and processed to create bio-energy. Liquid fuels can also be generated from plant matter and this is referred to as biofuel.

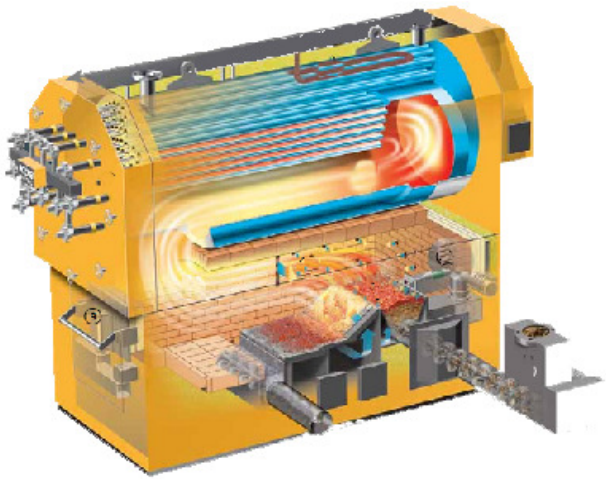
Whilst biomass produces carbon emissions when used as a fuel the carbon released during combustion is equivalent to the amount that was absorbed during growth and the technology is therefore considered to be carbon neutral. However, the availability of the fuel is important to consider as there are secondary carbon emissions generated by transport and treatment.

The main types of biomass are:

Woody Biomass: These are wood based which include forest products, short rotation coppice such as willow, hazel, poplar, miscanthus and other wood wastes such as pallets and construction timber waste. Most products require drying out as the moisture content of woody biomass affects the energy content.

Biofuel: Liquid fuel can be created from cellulose and vegetable oil crops such as palm oil and rapeseed which can be processed and used as vehicle fuel and to power engines and generating plant.

Animal Residues: Cattle, chicken and pig waste can be converted in to bio-energy by conversion to gas or other fuel types.



The use of biomass as a fuel can be used to generate heat within a specifically designed boiler which can replace traditional boilers or can be used as a lead boiler to deal with the base load in a system thus satisfying the requirement to supply a certain percentage of renewable resources and the comfort of a back up system when employing both technologies.

Ideally the use of biomass boilers is best utilised when a healthy supply of fuel is available locally. Provision should be made to store a sufficient supply of fuel and the overall design of such systems tend to be space hungry in comparison with traditional boilers. Provision must be considered for operational maintenance and the disposal of ash.

The installation of such systems may require consultation with the local authority to ensure compliance with the Clean air act if located in a smoke control area and to ensure access is available for the delivery of fuel.

4.6 Combined Heat and Power (CHP)

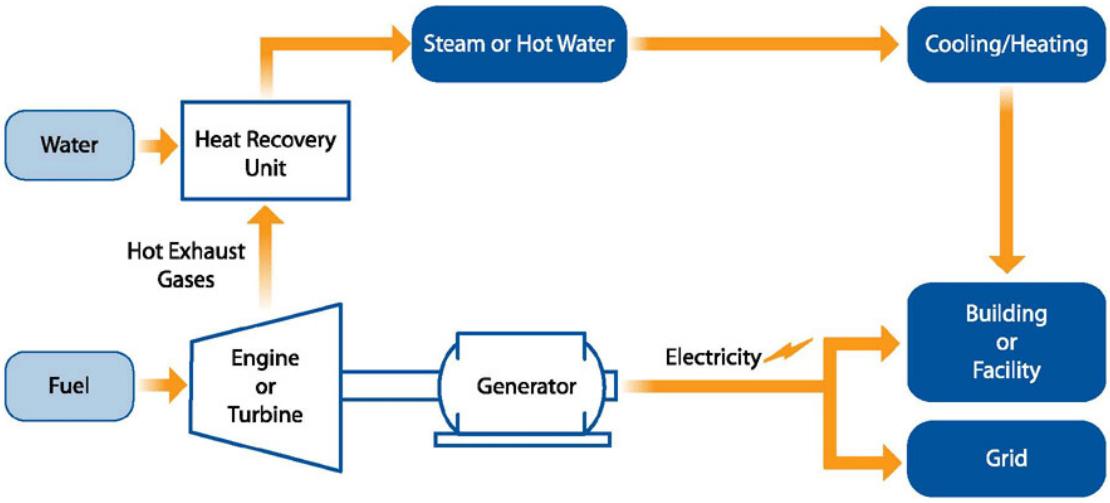
Combined heat and power (CHP) is the term used to describe the process of generating electricity whilst producing heat as a by-product. Electricity is generated using an engine and heat is recovered from the exhaust gases and cooling system.

The fuel used to produce electricity within a CHP can be:

- Biomass
- Natural gas
- Sewerage gas
- Biofuel

The process of burning gas fuel still releases carbon but the by product of heat as a result of the primary function offsets the emissions and the production of electricity on site is far more efficient than an average power station increasing from typically 40% to 80% efficiency.

The use of CHP is most appropriate to buildings which have a constant year round base load demand for heat and can operate at a minimum of 4000 to 5000 hours each year. Units are available to match any output but systems can be employed in parallel with traditional heating boilers thus satisfying the requirement to supply a certain percentage of renewable resources.



Micro CHP are now also entering the market for small systems but at present they are cost prohibitive.

The demand for heat during the summer can often diminish leaving a limited hot water requirement which may be insufficient to satisfy the economies expected to efficiently run a CHP system, but use can be made of the heat energy during summer to operate an absorption cooling system which can provide an effective medium for cooling a building during the summer period.

CHP systems like other generating systems do produce noise but can be effectively treated by use of purpose designed acoustic enclosures. The space requirements are generally larger than traditional boilers and consideration is needed in relation to the products of combustion but these are similar to those that would be required for boilers.

The advantage of the CHP is that it can produce electricity whenever the heating system is in operation. However, they generally provide water at higher temperatures than new air source heat pump systems and so it may be difficult to incorporate CHP into this building.

CHP can also be either Biomass, Biofuel or Sewerage Gas that would reduce C02 emissions further. We are aware of CHP providers that can also guarantee the provision of a biofuel based on using waste fats and greases that would help to lower C02 emissions further.

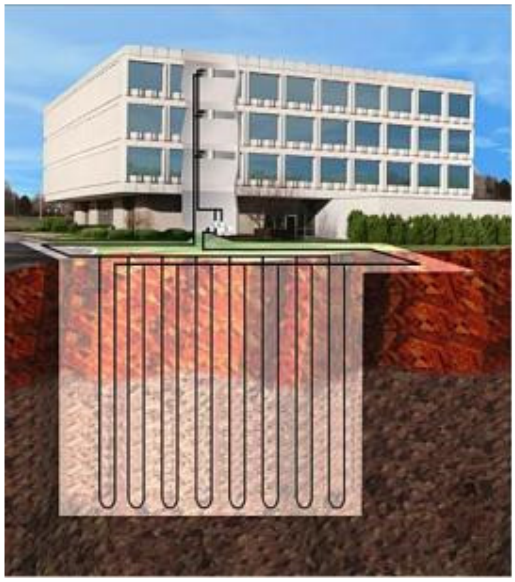
4.7 Heat Pumps

4.7.1 Ground Source Heat Pumps

The principle operation of a heat pump is the use of refrigerant gases and an electrical compressor to take heat from a source and deliver it to an output. For many years this process has been used by refrigerators to remove heat from a product and to remove heat from a building. This process can be used in reverse to add heat to a building by converting the energy available into useful energy as heat.

The ground acts as a vast solar collector and thermal store which has a relatively all year round stable temperature and a good source of energy for this process to tap in to.

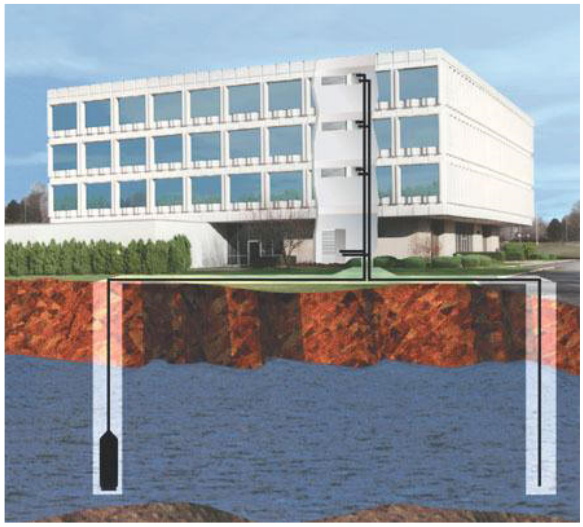
A fluid is circulated via a series of pipework buried in the ground which can either be vertically driven in to the ground or if the area permits, horizontally laid out in loops. The length of the pipework is proportional to the extent of energy required to satisfy the design conditions. The fluid is circulated through a heat pump which extracts the energy and converts this in to usable heat with temperatures in the region of 40 to 50°C which can be used to heat buildings via underfloor heating or radiant panels.



In order that the process can be considered renewable it is important that the depletion of the heat energy is matched by the rate of heat flow back in to the surrounding earth. The process can be used in the summer in reverse and buildings can be cooled by the same technology which assists in maintaining the energy balance.

4.7.2 Water Source Heat Pumps

The principles of water source heat pumps are the same as ground source but larger systems can use groundwater directly from suitable aquifers which can result in very efficient solutions.



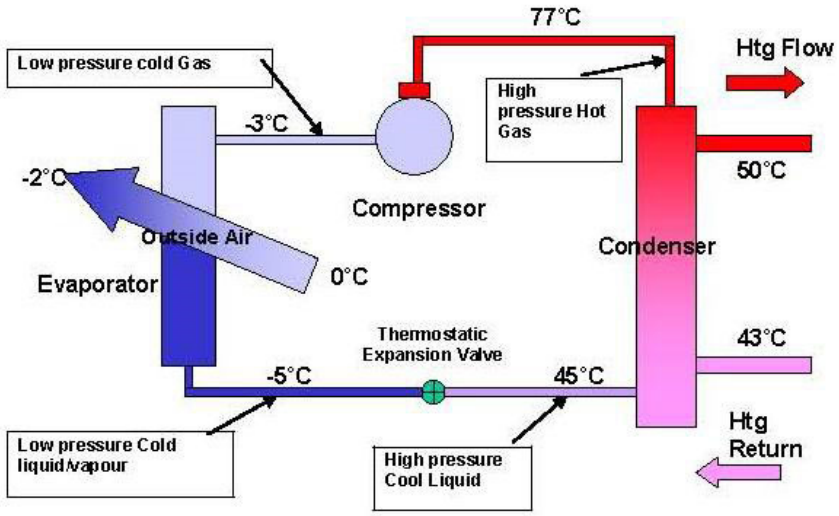
4.7.3 Air Source Heat Pumps

'Air to air' source heat pumps have been around for a long time and are used extensively to cool buildings during the summer and heat buildings during the winter.

'Air to water' source heat pumps are less prominent but use the same technology and instead of heating air within a building they are used to heat water which in turn can be circulated within a traditional low temperature heating system such as underfloor heating.

This technology has recently seen much improvement and provides a medium for servicing a conventional underfloor heating system and other low temperature heating systems without the need for boilers and yielding high efficiencies.

We are now also seeing the introduction of Air Source Heat Pump technology into hot water storage cylinders for hot water production within dwellings. These systems can make use of air intake and air exhaust connections to atmosphere or return air connections from kitchens & bathrooms that make use of the air temperature to contribute to the hot water load in a dwelling, whilst also using electric heating to make up any shortfall in the required temperature for hot water generation. They are predominantly used when electric panel heaters are installed as the primary heating system.



The choice of heat pump is very much dependent upon individual design circumstances. Whilst GSHP can offer high efficiencies its viability is very much dependent upon the geology of the site which will remain unknown until significant expenditure is committed to testing.

Water source heat pumps require careful design and tend to be more suited to larger scale schemes and can come under scrutiny of local authorities in terms of the impact on the aquifer.

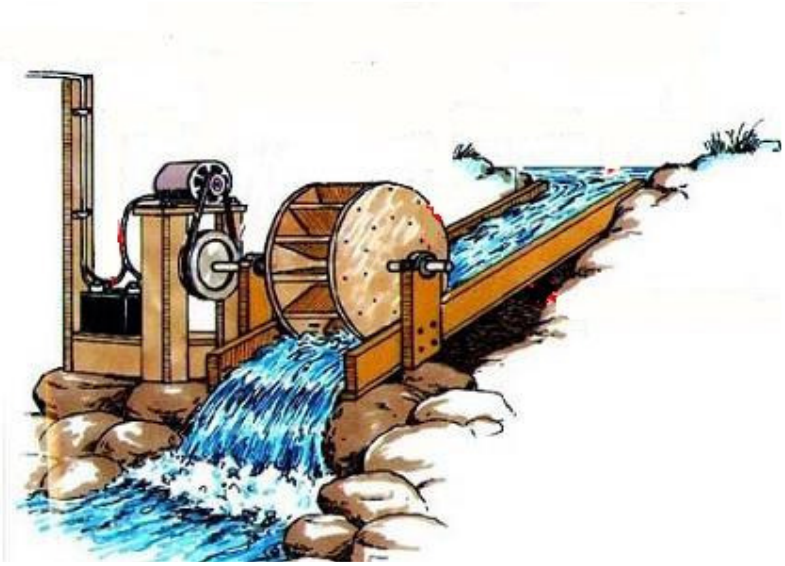
'Air to air' and 'air to water' heat pumps are more safe in terms of technology as they are not dependent upon unknowns and whilst not as efficient as the other two technologies they are still high in comparison to more traditional techniques for heating and cooling and are renewable.

Systems are quiet in operation and have minimal local impact environmentally and visually.

4.8 Water

4.8.1 Small Scale Hydro Power

Hydroelectricity systems generate electricity from running water - usually a stream or river which converts potential energy stored in water to kinetic energy. Hydro power systems use the running water to turn a turbine which generates electricity. The faster the water flows and the more water there is, the more electricity can be generated.



The amount of electricity a system actually generates depends on how efficiently it converts the power of the moving water and how much water is available. However there is considerable opportunity to generate electricity from such a resource.

Such systems are limited to specific sites with available resources but by default tend to be noisy due to the flowing water.

6.0 Suitability for Project

Having identified the various options for LZC technologies these can now be considered with respect to the project. We can summarise their suitability as detailed below.

5.1 Solar Hot Water

Whilst the use of Solar hot water systems is an option for the building they are not being proposed at this stage due to their usual long payback period

At this stage of the design it is felt that the use of photovoltaic cells for the production of electricity will offer a better contribution to energy efficiency and be a better use of available roof space rather than the provision of solar hot water.

The hot water on this scheme is to be derived via Air Source Heat Pump (ASHP) Hot Water Cylinders and therefore the design could be adapted to incorporate heating from solar collectors at a point in the future.

5.2 Solar Photovoltaics (PV)

The roof of the building could be used on this scheme to mount suitable photovoltaic cells and it would be possible to orientate these to achieve the maximum potential.

PVs are considered viable for this scheme especially when introduced alongside heat pumps as a means of providing hot water.

5.3 Small Scale Hydro Power

The use of small-scale hydro power on this scheme is not viable as there is not a water course within the vicinity of the development that would be considered suitable to generate the level of energy required to make a significant contribution.

5.4 Wind turbines

Typical micro roof mounted wind turbines provide between 300 and 2500watts output with diameters of 900mm to 2500mm. In order to contribute to a net zero carbon initiative; many of these units would be needed.

These figures are based on a minimum of 5m/s velocity however wind analysis from national database figures suggest a figure lower than this for the area and therefore the use of wind turbines is not considered viable for this scheme.

5.5 Biomass boilers

The first consideration for a biomass boiler solution is to determine if there is sufficient space for both the boiler and the fuel supply. On this scheme ground floor space is at a premium and the space required for the Biomass system is not available, we are also unsure if a reliable source of fuel supply could be provided.

To be comfortable with the use of a biomass boiler on the scheme it could only be installed in conjunction with a form of back-up heating to enable its use if the fuel supply was interrupted and to provide back-up during maintenance.

On the basis that electric panel heaters and ASHP hot water cylinders are being used as the primary means of producing heating and hot water across the development and they are an energy efficient method of providing heating / hot water then it lessens the need for Biomass boilers to be considered. When we also consider that there is no guarantee of fuel supply and the overall cost then the use of Biomass boilers as a renewable energy solution is not considered viable on this scheme.

5.6 Combined Heat and Power (CHP)

The use of CHP as a viable technology relies on a constant base load of heating / hot water requirement and a base electrical supply load.

There is not always an adequate constant base electric load in this type of building. Similarly there is not likely to be a base level thermal demand of sufficient capacity by the use of the heating system and the hot water system.

With an aspiration for the building to use a solution that doesn't use natural gas as the heat source then the fuel use for the CHP would need to be Biomass, Sewerage Gas or Bio-fuel.

The lack of a constant base load, both thermally and electrically would mean that this type of technology is excluded as a viable option.

5.7 Heat Pumps

The use of ground source heat pumps, in principle, is possible however a more detailed study at a later design stage would be required to understand if an in-ground pipework array solution or a borehole solution is best suited for this project.

There are no aquifers that the design team are aware of within the region of the site that are large enough to support the kind of heat load required and therefore the use of water source heat pumps is not considered viable for this scheme.

Air to water heat pumps are less efficient than ground and water source heat pumps but provide a technology which has less risk. The use of air to water heat pumps would provide a medium for producing low pressure hot water but at a lower temperature than traditional heating systems. Typically, electrical air to water systems can provide LPHW at 55°C to meet the requirements of Part L of the Building Regulations for heating systems.

The introduction of products for installation in dwellings that use Air Source Heat Pump technology within domestic hot water storage cylinders, to produce hot water provide opportunities for implementation on housing projects where Air Source Heat Pumps are not viable for low pressure hot water heating.

Ground Source Heat Pumps are more efficient than Air Source Heat Pumps. However, the Ground Source Heat Pumps and the associated cost of the in-ground pipework

arrangement will prove more expensive than an Air Source solution and as such Air Source Heat Pumps cannot be ruled out as a more cost-efficient alternative that can still achieve a good level of C02 reduction.

The technology of air source heat pumps is the same as that used in refrigerant based heating & cooling systems. With heating and cooling being provided to the activity areas then they will also make use of this technology.

The use of air to water heat pumps using electricity as energy fuel is potentially viable for this scheme.

7.0 Conclusion

Having examined all of the possible options for providing low or zero carbon technologies throughout the project we can provide a final summary as follows:

Opportunity	Observations	Decision
Solar Hot water	Photovoltaic panels are a better use of roof space at present.	Not considered
Photovoltaics	Viable	To be included
Hydro power	Water course insufficient	Not considered
Wind Turbine	Quantity is impractical and wind speed inadequate	Not considered
Biomass boiler	Not viable as fuel source unreliable and requirement for large plant space associated with the boiler and feeder system	Not considered
Combined heat and Power	Not viable due to inadequate base loads.	Not considered
Water source heat pumps	Water course insufficient	Not considered
Air to water heat pumps	Viable within hot water storage cylinders	To be included.

It is concluded and recommended within this report that the proposed design strategy and construction specifications will successfully meet the sustainability criteria set out in Manchester's Local Development Framework Policy EN6, as well as the 2022 updates to Part L of the Building Regulations. By integrating sustainable design principles, prioritising a fabric-first approach, and incorporating low-carbon or renewable energy technologies, the development will achieve a high level of thermal performance. This will result in reduced energy consumption, improved resistance to conductive heat loss, and the ability to maintain consistent and comfortable indoor temperatures for future occupants.