

**Energy and Climate Change
Adaption Statement
Ref: Z60871**

**12No New Build Dwellings with
ancillary Worker Space**

at

**Hornby Street,
Heywood**

for

**Cornerstone Place &
Rochdale Borough Council**



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Document Status – Final

Reference: Z60871 revA			Date:
Produced by:		Daniel Smith OCDEA	13 th December 2023
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Executive Summary

This Energy & Climate Change Adaption Statement has been developed in support of the planning application for the proposed 12No. dwellings at Hornby Street in Heywood for Cornerstone Place and Rochdale Borough Council. The proposed development consists of 12No. new build apartments and an ancillary workers accommodation. This statement will evaluate the technical and economic feasibility of using both passive and low and zero carbon technologies and will assess the practical levels of CO₂ reduction possible for this development to comply with the following planning requirements:

- Rochdale Core Strategy (2016)
- National Planning Policy Framework (2021)

The following low and zero carbon technologies have been evaluated:

- | | |
|-------------------------|-------------------------------|
| • Biomass | • Geothermal |
| • Wind | • Combined Heat & Power (CHP) |
| • Biogas | • Solar Hot Water |
| • Air Source Heat Pumps | • Solar Photovoltaic |

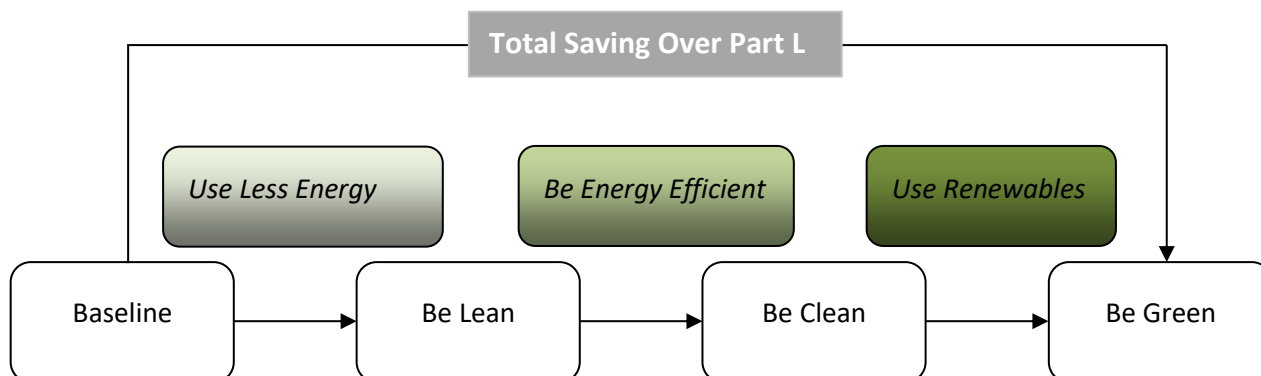
The approach for the proposed development is to embed sustainability into the heart of the development through a range of design measures based on the 'Be Lean, Be Clean, Be Green' design hierarchy. Measures will include:

- 1) Client aspiration to meet a zero carbon development
- 2) Enhanced building fabric to meet the new Building Regulations ADL1 2021 (15/06/2022)
- 3) Enhanced air tightness and thermal bridging
- 4) Efficient decentralised extract ventilation system
- 5) Hot water will be provided by individual high efficiency hot water heat pumps
- 6) Heating to be provided by direct high efficiency electric heaters
- 7) Efficient lighting strategy using LED type fittings
- 8) Photovoltaic panels to be installed into each apartment excl the ancillary workers accommodation.

For the purpose of the assessment, we have evaluated the prospective dwelling in SAP 10 (Standard Assessment Procedure) to provide an accurate estimate of predicted energy/ CO₂ emissions. We have completed SAP calculations based on the proposed design layouts to provide an estimation of the total energy/emissions on site.

Summary

The development has been provided with energy savings through the use of passive improvement measures such as improved energy efficiency. This passive approach to compliance will complement the integrated approach to the sustainable energy objectives of the national and local policies. In addition, a hot water heat pump has been provided to the dwellings to achieve further carbon reductions.



The principles of a Be Lean, Be Clean, Be Green design philosophy have been applied, which results in a 101% carbon emissions improvement and 80% primary energy improvement over Building Regulations Part L1 2021, as indicated in Table 1. A full design specification that confirms inputs used within the SAP calculations is provided within the Appendices of this report.

Table 1 - Proposed development CO₂ emissions against Building Regulations Part L1 2021

	Total CO₂ Emissions (kgCO₂/yr)	Total Primary Energy (kWh/yr)
Part L Target Site Performance	8,139	43,084
Part L Proposed Site Performance	-127	8,715
Total CO₂ & Primary Energy Reduction	8,266	34,369
Percentage Improvement (above ADL1 2021)	101%	80%

1. Introduction

The Hornby Street development consists of 12No. apartments and ancillary workers accommodation, located at Hornby Street, Heywood. The development is required to achieve compliance under Building Regulations Approved Document Part L1 (2021).

Supporting information is provided within this report for the proposed energy strategy to be considered on site in accordance with the following planning policies:

- Rochdale Core Strategy Plan (2016)
- Rochdale Supplementary Planning Document – Residential Design Guide
- National Planning Policy Framework (2023)

Throughout this report, passive design techniques, energy efficient equipment and appropriate low carbon technologies will be appraised in line with the 'Be Lean, Be Clean, Be Green' philosophy of relevant planning documents and the Energy Hierarchy.

An assessment of CO₂ emissions will be made based on the calculation methodology dictated by the Standard Assessment Procedure (SAP) and in line with the requirements of Rochdale Council Planning Policies.

1.1. Location

The area for the proposed development in Heywood is highlighted by the red line boundary shown in Figure 1.

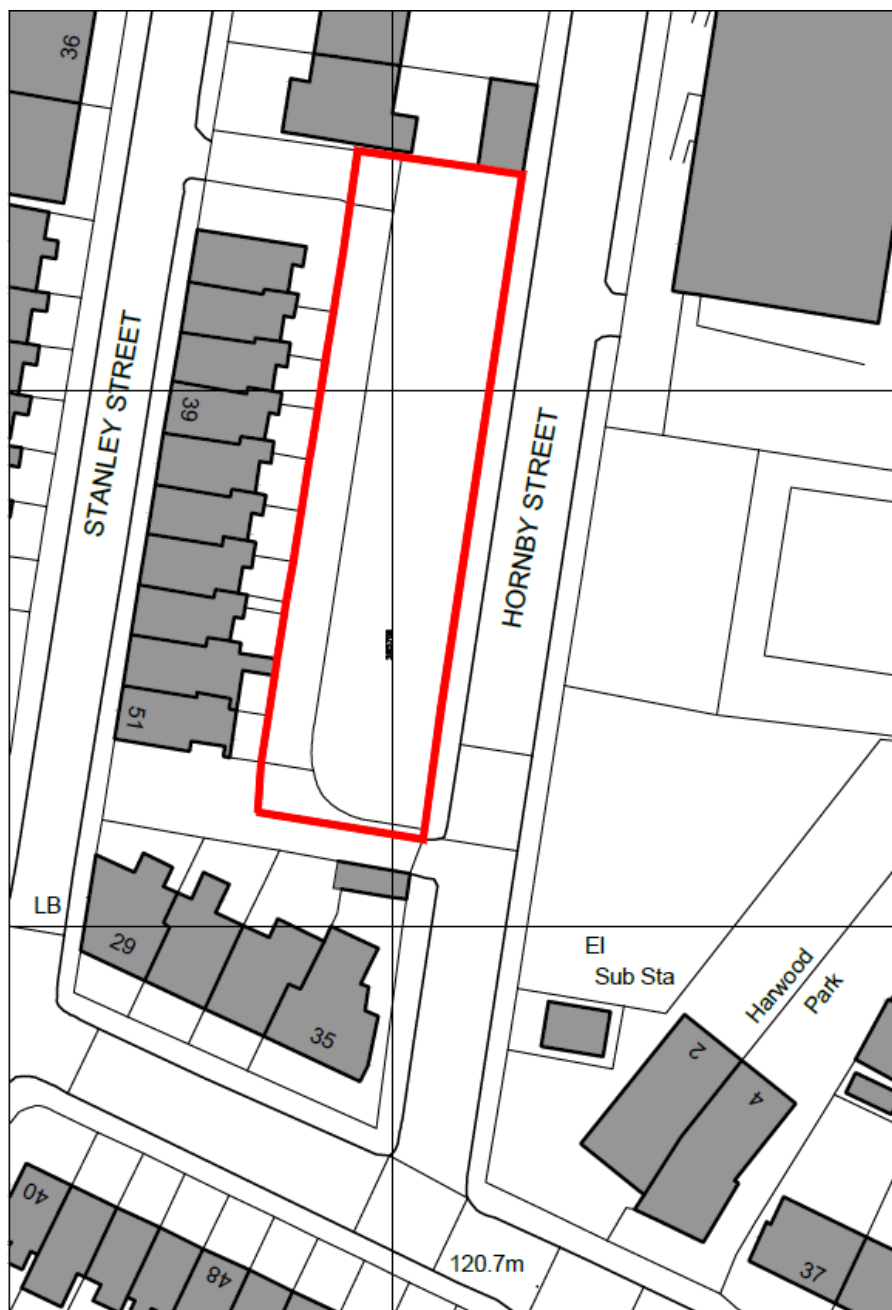


Figure 1 - Location and surrounding area of proposed Hornby Street development

The site is accessed off Hornby Street. Just Northeast of the site is Harwood Park Primary School, with the surrounding area being residential properties.



Figure 2 – Architectural site plan for the proposed Hornby Street development

The proposed development consists of 12No. apartments and ancillary workers accommodation located at Hornby Street, Heywood as indicated in Figure 2 above. The site is constrained by a Hornby Street on the East side and existing residential dwellings on the West side.

1.2. Floor Plans

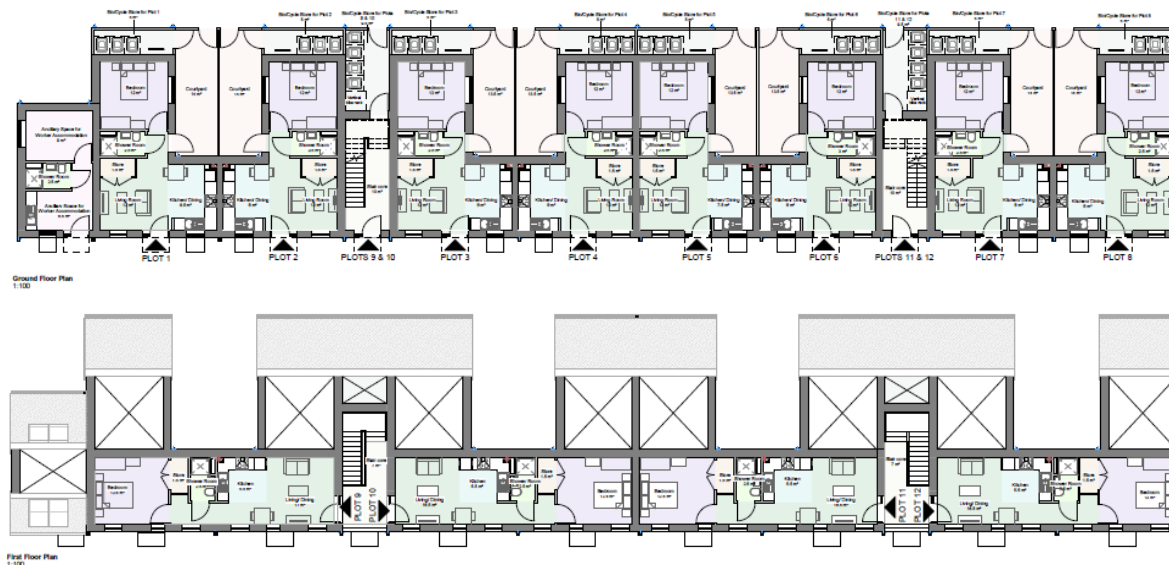


Figure 3 – Typical Floor plans for the proposed Hornby Street development

Typical floor plans are shown in Figure 3 above. The development consists of a variation of 1-bed apartments for 18-25 independent living, accommodation mix as below:

Our Ref	Dwelling Type	No. of Dwellings
Z60871	Flat Type A – Plots 1-8	8
Z60872	Flat Type B – Plots 9-12	4
Z60873	Small Workers accommodation	1
Total		12 Apartments 1 workers accommodation

2. Policy Drivers for Energy Efficiency and Renewable Energy

This section presents a range of planning policy that is applicable to the Hornby Street development, at both a national and a local level.

2.1. National Policy

The National Planning Policy Framework was published in Sept 2023 and sets out the government's planning policies for England and they should be applied. Table 2 sets out the relevant energy standards for new developments and provides an indication of the design response to be provided.

Table 2 – Key National Planning Policy Requirements and Design Responses

Section	Policy Requirements	Design Response
14. Meeting the challenge of climate change, flooding and coastal change	The planning system should support the transition to a low carbon future in a changing climate, taking full account of flood risk and coastal change. It should help to: Shape places in ways that contribute to radical reductions in greenhouse gas emissions, minimise vulnerability and improve resilience; encourage the reuse of existing resources, including the conversion of existing buildings; and support renewable and low carbon energy and associated infrastructure.	This development will follow the principles set out in the Rochdale Core Strategy (2016) using a 'Be Lean, Be Clean, Be Green' approach in reducing operational carbon emissions. An overview of current decentralised energy schemes in Rochdale and an assessment on the potential for future schemes in relation to this development is provided in Section 6 of this report. This Energy & Climate Change Adaption Statement appraises site specific information to determine the most appropriate approach to minimise energy consumption.

2.2. Local Policy

The Adopted Rochdale Core Strategy (2016) provides a set of guidelines for new development within the local area. All relevant energy policy within these documents is provided within this section together with a design response.

Table 3 – Key Local Planning Policy Requirements and Design Responses

Rochdale Core Strategy (2016)		
Section	Policy Requirements	Design Response
G2 – Energy and New Development	All new development will be expected to adhere to the following energy hierarchy to the extent that policy G2 reflects national policy, targets and requirements for that type of development: 1. Demand Reduction – Achieve the maximum possible reduction in demand for energy through building design (i.e. the use of passive systems). At the design stage of new developments, every effort should be made to ensure that buildings use as little energy as possible throughout their lifetimes, using siting, orientation, layout, construction and landscaping to optimise use of natural passive systems such as solar gain and natural lighting, shading, ventilation and cooling to minimise heating, cooling and lighting demands. Green roofs and green walls should be incorporated into developments wherever feasible. 2. Energy efficiency and low / zero carbon technologies and networks – Design to maximize energy efficiency, and use on-site or linked low or zero carbon technologies or direct connection to a low or zero carbon heat source (not necessarily on-site). 3. ‘Allowable solutions’ – use wider energy efficiency / CO₂ reduction measures, which could include developer contributions, to compensate for ‘residual emissions’ not addressed by 1 or 2 above	The proposed development will follow the principles of the Energy Hierarchy by adopting a passive fabric-first approach to design and adopting the use of renewable technologies. The servicing strategy consists of an energy efficient Hot water heat pump system to provide low carbon heating and hot water to the dwellings with a coefficient of performance of >300+% Enhanced thermal fabric and low air leakage is proposed to ensure the energy demand is reduced before considering any low/zero carbon technologies. The proposed development aims to look attractive whilst keeping the local identity and character of the area. An overview of current decentralised energy schemes in Rochdale and an assessment

		on the potential for future schemes in relation to this development is provided in Section 6 of this report.
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3. Methodology

The first step of the full energy strategy assessment has been to undertake a baseline energy assessment. The baseline energy assessment consists of calculating the total CO₂ emissions of the development to meet Building Regulations and then compare the proposed improvement measures against this baseline. Building Regulations Part L1 2021 (SAP) applies to the proposed dwellings and provides carbon emissions from regulated energy.

The building can then be benchmarked/ thermally modelled using the energy hierarchy:

1. Be Lean <i>A reduction in energy use as a result of passive design and energy efficiency</i>
Thermal performance of envelope (U values) Glazing design Airtight construction Efficient mechanical ventilation Variable speed fans and pumps Efficient lighting
2. Be Clean <i>A focus on supplying energy to the development through efficient means</i>
Connect to low carbon heat networks Develop site wide heat network from single energy centre On site CHP Provide energy efficient individual heating
3. Be Green <i>The installation of renewable technologies to meet energy demand where possible</i>
Consider the feasibility of renewable energy technologies Assess the integration of renewable technologies based on the above measures

The development must be provided with energy savings through the use of thermal improvements to fabric (a 'fabric first' approach), followed by other clean energy solutions (energy efficiency

improvements, district heating, etc.) and finally the use of renewable energy technologies, where practical. This hierarchy complements the integrated approach to the sustainable energy objectives of Rochdale Council.

The planning policies require a full review of the technical and economic feasibility of the following renewable technologies:

- Biomass heating
- Biomass combined heat and power
- Solar hot water
- Solar photovoltaic
- Ground source heat pumps
- Air source heat pumps / exhaust air heat pumps
- Wind power

To achieve the targets set the development must achieve a balance between fabric, heating and control, ventilation and air leakage improvements, the amount of zero or low carbon technology installed and the capital, life cycle and running costs, maintenance and operation, etc.

Feasible renewable energy technologies have been considered during the assessment to ensure the most suitable renewable energy is chosen for the demands of this scheme. The pros and cons of each technology with respect to this site are considered as part of this statement.

4. Baseline Energy Assessment

Energy Counsel have based the analysis on current Building Regulations ADL1 2021 (SAP 10), taking into account solutions that must not only be energy efficient but also practical, reliable and user friendly.

Energy Counsel have carried out preliminary SAP 10 calculations for the dwellings. To meet compliance with Building Regulations Part L1 2021, the Dwelling Emissions Rate (DER) must be lower than or equal to the Target Emissions Rate (TER). SAP 10 is the Governments Standard Assessment Procedure (SAP) for calculating the energy aspects of a dwelling. SAP is a measure of fuel costs for heating, hot water and lighting for a dwelling. SAP 10 can also be used to ascertain the energy requirements of a development.

To assess the baseline energy, we must make an estimation of the energy demands based on current Building Regulations in order to set a target upon which the actual development can be compared.

4.1. Predicted Baseline Energy Requirements

The predicted baseline CO₂ emission demands for the development:

Table 4 - Baseline dwelling carbon emissions

Our Ref	Dwelling Type	No. of Type	Floor Area m ²	TER (Kg CO ₂ / yr/m ²)	TPER (kWh/yr/m ²)	Total Target Carbon Emissions (Kg CO ₂ /yr)	Total Target Primary Energy (kWh/yr)
Z60871	Flat Type A	8	37.5	17.6	93.24	5,280	27,972
Z60872	Flat Type B	4	40	14.57	76.80	2,331	12,288
Z60873	Worker accomm	1	21	25.14	134.49	528	2,824
Total		13				8,139	43,084

The baseline carbon emissions are **8,139 KgCO₂/yr** and the baseline primary energy rate is **43,084 kWh/yr**.

5. Passive Design and Energy Efficiency

The approach of the development is to embed sustainability into the heart of the design from the outset of the project design process. The design will be developed with sustainable solutions, taking into account the relevant policies and strategies of Rochdale Council.

The development will seek to consider all aspects and principles of sustainable development, taking into account environmental, social and economic impacts.

5.1. Passive Design Measures

The philosophy for the site is to achieve as much of the necessary reduction in carbon emissions through the use of passive design techniques and energy efficient measures as possible, before resorting to the use of LZCs. This ensures that the highest standards of building fabric and energy efficiency are achieved, rather than offsetting a poorer performance with LZC contributions.



Figure 4 - Architectural representation of Hornby Street Dwellings elevations

This will be undertaken through a fabric first energy efficient design approach with high levels of thermal efficiency and a reduction in energy demand through efficient lighting design.

5.2. Energy Efficient Systems

Options have been reviewed for improving the energy efficiency of the development by installing an efficient heating system. The scheme will benefit from a hot water heat pump for hot water and direct electric panel heaters for heating.

A low energy high efficiency whole dwelling supply and extract Mechanical Ventilation with Heat Recovery (MVHR) system will serve each apartment. The MVHR systems proposed have an overall specific fan power (SFP) of 0.59W/l/s and heat recovery of 95+%, in line with the requirements of Building Regulations Part F (2021). This system operates constantly supplies air and extracts air and boosts when the wet room is in use. MVHR also includes for summer bypass for purge ventilation. Natural ventilation will also be provided throughout the dwelling by openable windows.

6. District & Communal Heating Networks

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

6.1. Decentralised Heating Networks

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 district wide (DHN) or site wide (CHN) basis. DHN and CHN can typically include 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.

A number of heat network opportunities across the city region are at various stages of development. Benefits of district heating networks can include:

- Provision of low carbon / lower cost heat to domestic and commercial customers
- Diversification of the energy mix
- Reductions in region-wide carbon emissions
- Targeting and reduction of fuel poverty
- Potential long term revenue streams for local authorities
- Alignment with regeneration programmes
- Driving the growth of the low carbon services sector

There are currently no existing district heating networks within proximity to the site, the nearest district heating network is located at St Mary's Estate, Oldham, around seven miles Southeast of the site.

7. Renewable Energy Technologies

Energy Counsel have reviewed options for the use of on-site renewable energy/ Low or Zero Carbon Technology (LZT) in line with Rochdale Council policy aspirations.

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

- Solar Photovoltaic
- Solar Hot Water
- Ground Source Heat Pumps
- Air Source Heat Pumps / Exhaust Air Heat Pumps
- Micro Wind Power
- Biomass

7.1. Photovoltaics (PV)

Photovoltaic panels convert sunlight into electricity to run lights and appliances. 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. Solar panels are not light and the roof must be strong enough to take their weight, especially if the panel is placed on top of existing tiles. For flat roofs the panels can be mounted 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 generally suitable. If solar

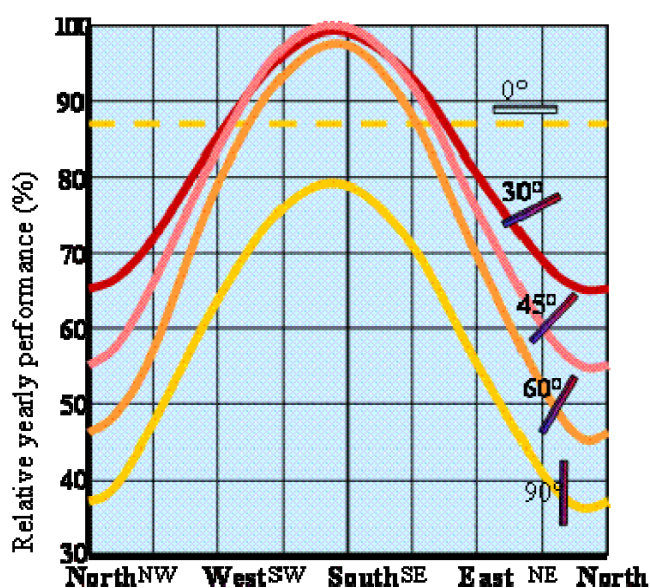


Figure 5 - Performance of photovoltaic panel orientation

collectors are oriented away from due south then a larger surface area will be required to generate a set amount of energy. The effect of non-optimal orientation is illustrated by the graph above:

The cost to install PV is typically £1,000 - £1,500 per kWp for 'on-roof' panel systems.

The existing roof should be able to support the addition of photovoltaic panels with space for an inverter within the roof. A rooftop PV array is considered to be the most renewable solution to reduce carbon emissions. PV has been installed in the dwellings achieve over and above the requirements in ADL1A (excl workers accommodation).



Figure 6 - Photovoltaic array on a pitched roof

7.2. 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.

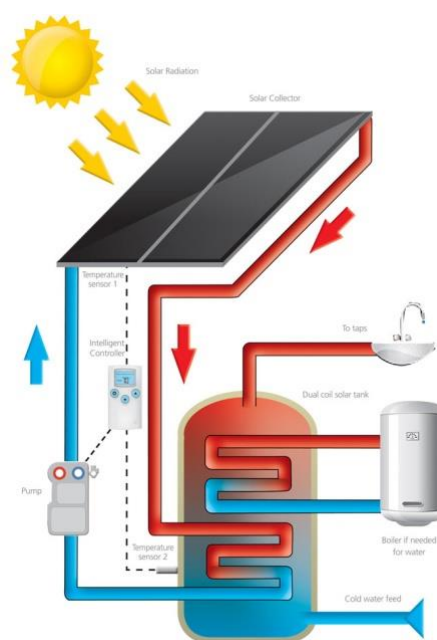


Figure 7 - The principles of a solar thermal system

The cost of installing the system is dependent on the distance between the solar collector and the hot water storage and therefore costs vary. 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.

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.

The use of solar thermal panels, work best in conjunction with individual heating systems for each dwelling. The orientation of the development is fine for the utilisation of solar water heating to provide domestic hot water however it will not achieve significant carbon savings. Carbon savings of approximately 4-5% are achievable with this technology. A solar thermal array could work for the proposed development due to the likely hot water consumption, however a Hot Water Heat Pump is preferred in this instance.

7.3. Ground Source Heat Pump (GSHP)

GSHPs 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

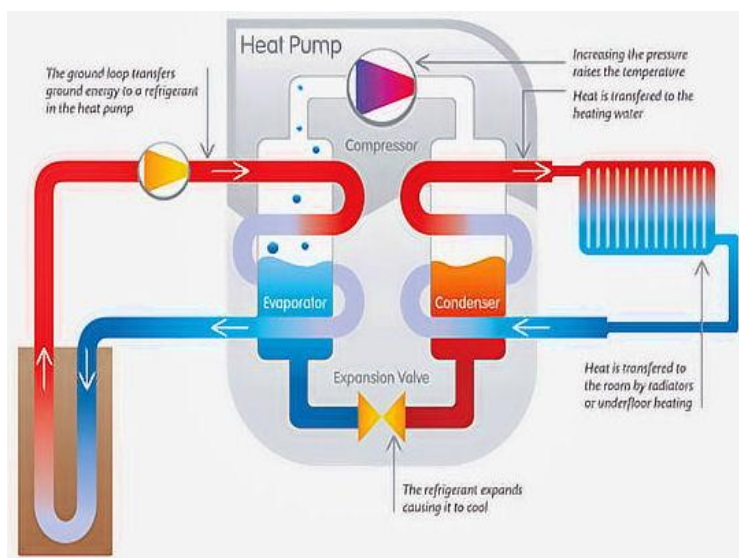


Figure 8 - Principles of a GSHP system

water requirements. Typically, they are more suited to apartments as a centralised system would be installed with multiple bore holes to a depth of up to 125 metres depending on the ground conditions. GSHPs 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 2-4 although some systems may produce a greater rate of efficiency. This means that for every unit of electricity used to pump the heat, 2-4 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.

GSHPs have been considered due to the dwelling scale and the requirement for a system to meet both heating and hot water demand as efficiently as possible. However, there isn't significant area of land available for boreholes or coils to be installed, and therefore hot water heat pumps are the preferred option.

7.4. Air Source Heat Pump/Exhaust Air Heat Pump

Air source heat pumps (ASHP) and exhaust air heat pumps (EAHP) 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.

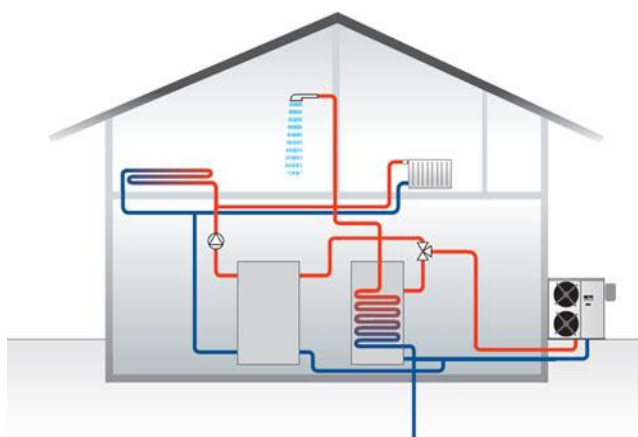


Figure 9 - Principles of an ASHP system

Exhaust air heat pumps such as the NIBE F370 work in a similar manner to ASHP units but have only indoor units (no outdoor compressors) and in addition they also recover heat from their integral exhaust air ventilation system. These units work well on apartment blocks and dwellings where mains gas is unavailable or unsuitable for a development. They are expensive in terms of capital cost of the equipment, installation and the enhanced structural requirements.

HWHPs are considered an appropriate technology for this scheme, due to their high COPs. Each dwelling will have its heating delivered by direct electric panel heaters and hot water served by an individual HWHP.

7.5. Micro Wind Power

Wind power is one of the cleanest and safest methods of generating electricity. However, wind power is not feasible due to the fact the development is not in a windy and rural area located off a hillside. Most small wind turbines generate Direct Current (DC) electricity. Systems that are not connected to

the national grid require battery storage and an inverter to convert DC electricity into Alternating Current (AC) which is mains electricity.

There are two types of wind turbine available:

- Roof mounted – These are mounted on the roof of dwellings
- Mast mounted – Which are free standing

Important issues to consider when using wind turbines are:

- Wind speed increases with height so it's best to have the turbine high on a mast or tower.
- Generally speaking the ideal site is a smooth top hill with a flat, clear exposure, free from excessive turbulence and obstructions such as large trees, dwellings or other buildings.
- Small scale wind power is particularly suitable for remote off grid locations where conventional methods of supply are expensive or impractical.
- Where the local annual average wind speed is 6 m/s or more.
- Where there are no significant nearby obstacles such as buildings, trees or hills that are likely to reduce the wind speed or increase turbulence



Figure 10 - Mounted wind turbine

The average wind speed in this area is 4.3 m/s at a height of 10 metres, which is below the 6 m/s recommended. Therefore, micro wind would not be a viable technology for this development.

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. The cost of the fuel depends on the type, delivery distances and whether it is obtained as simple waste product or from another organisation. The cost of wood pellets is currently a little more expensive than mains gas, and woodchip is approx. 30% cheaper, however prices are fluctuating rapidly in the bio-fuel market at the present time creating uncertainty over their take up.



Figure 11 - Biomass boiler and hopper

Biomass CHP is still relatively new to the UK market and is more suitable to large developments where energy demand does not require significant modulation. There are technical issues with small scale Biomass CHP and until these can be resolved and proven the take up of these systems in the UK and Europe has been slow.

Overall carbon savings of 40%+ are achievable with biomass technology. Biomass is more suited to a communal heating system; there is insufficient space to accommodate the equipment and fuel storage to facilitate a biomass boiler. Furthermore, there are noise and air quality issues associated with this type of technology. For this reason biomass is discounted.

8. Energy Assessment of Proposed Scheme

The Hornby Street development will adopt the principles of the 'Be Lean, Be Clean, Be Green' energy hierarchy.

The most practical and economically feasible solution for the development is a good quality thermally insulated fabric, airtight envelope, passive improvements and the use of highly efficient heating and hot water systems supported by an efficient mechanical ventilation with heat recovery system.

Table 5 - Proposed carbon emissions from the Hornby Street development

Ref	Dwelling Type	No.	TER	DER	TPER	DPER	Total Carbon Emissions (Kg CO2/yr)	Total Primary Energy (kWh/yr)
Z60871	Flat Type A	8	17.6	-1.19	93.24	15.76	-357	4,728
			106.76%		83.10%			
Z60872	Flat Type B	4	14.57	-1.86	76.8	7.27	-298	1,163
			112.77%		90.53%			
Z60873	Workers accomm	1	25.14	25.14	134.49	134.49	528	2,824
			0%		0%			
Total		13					-127	8,715

The carbon emissions are -127 Kg/CO₂/yr. This is a total carbon reduction of 8,266 Kg/CO₂/yr from the baseline emissions of 8,139 Kg/CO₂/yr this equates to a 101.5% carbon reduction.

The primary energy rate is 8,715 kWh/yr. This is a primary energy reduction of 34,369 kWh/yr from the baseline of 43,084 kWh/yr. This equates to an 80% primary energy reduction.

The development proposal meets local policy through a highly efficient thermal fabric, energy efficient lighting and ventilation, low air leakage, a highly efficient electric heaters and integral heat pump for the water heating.

9. Conclusion

Following the 'Be Lean, Be Clean, Be Green' hierarchy, the proposed design solutions are predicted to reduce the total carbon emissions by 8,266 Kg/CO₂/yr from the baseline emissions of 8,139 Kg/CO₂/yr this equates to a 101.5% carbon reduction. The target of a zero-carbon development has been achieved with the proposed measures.

The approach for the Hornby Road development is to embed sustainability into the heart of the development through a range of design measures based on the 'Be Lean, Be Clean, Be Green' design hierarchy. Measures will include:

- 1) Client aspiration to meet a zero carbon development
- 2) Enhanced building fabric to meet the new Building Regulations ADL1 2021 (15/06/2022)
- 3) Enhanced air tightness and thermal bridging
- 4) Efficient decentralised extract ventilation system
- 5) Hot water will be provided by individual hot water heat pumps
- 6) Heating to be provided by direct electric panel heaters
- 7) Efficient lighting strategy using LED type fittings
- 9) Photovoltaic panels to be installed into each apartment excl the ancillary workers accommodation.

9.1. Low and Zero Carbon Technology Review

- Solar Thermal Hot Water has not been proposed as an option as an hot water heat pump is proposed and the majority of hot water demand will be provided through this system.
- PV has been included within the preliminary SAP calculations as it is currently needed to comply with ADL1A and local planning policies as it is considered the most appropriate route to achieving the lower carbon emission reductions.
- 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 centralised larger plant space for storing fuel, which on this constrained site is not viable.
- A micro wind-turbine would not provide significant levels of energy generation as the wind speeds in the area are not high enough generate electricity. Due to the layout of the site, there could be issues with turbulence, wind shading and noise, therefore this hasn't been included within the initial calculations.
- GSHPs are not considered for this development, due to the availability of land around the property for boreholes. There would need to be some plant room space required, and a full

review of ground conditions and financial viability should be undertaken by a ground source heat pump manufacturer to ensure any unit is sized correctly.

- HWHP are considered for this development with each individual dwelling having its own system. The HWHP will provide the hot water demand for all dwellings.
- Site constraints and viability for District Heating Network (DHN) and Communal Heating Network (CHN) have been reviewed. Existing DHN is not sufficiently close to connect into. In addition to this, the scheme's heating and hot water (HW) demand is too small to justify connection to DHN or CHN.

A more detailed overview of LZT technologies is provided in the appendices of this report.

9.2. Summary Headlines

- The proposed development will achieve a net zero carbon target.
- A fabric-first approach has been undertaken for the Hornby Street development, as defined within the 'Be Lean, Be Clean, Be Green' energy hierarchy. The proposed design significantly exceeds compliance with Building Regulations ADL1 2021.
- The use of high-efficiency hot water heat pumps and Photovoltaic panels reduces carbon emissions by 101.5% and provides a primary energy reduction of 80% when compared to new building regulations Part L 2021.

An overall 101.5% improvement in CO2 emissions and 80% improvement in primary energy above the Building Regulations baseline is proposed to support our application and to meet policy requirements

	Total CO ₂ Emissions (kgCO ₂ /yr)	Total Primary Energy (kWh/yr)
Target Part L Performance	8,139	43,084
Proposed Part L Performance	-127	8,715
Total Reduction in CO2 and Primary Energy	8,266	34,369
Percentage Improvement (above ADL1 2021)	101%	80%

10. Appendices

10.1. LZT Feasibility Table

Technology	Technical Feasibility	Carbon Savings	Estimated Costs	Financial Viability
Solar photovoltaics	A solar photovoltaic array to be provided on the pitched roofs to ensure carbon emissions reductions.	A 1kWp system could save around 427 kg of CO ₂ / year per dwelling.	Average cost for such a system is around £1.5K/kWp per dwelling.	A fuel cost saving of around £180 / year per kWp. Any unused energy can be sold back to the grid at an agreed price via energy supplier.
Wind	Average wind speeds on the site according to the <u>NOABL</u> Wind Speed Database are 4.3m/s. To be technically feasible a minimum of 6m/s is required, therefore there is no potential for installation.	TBC by wind turbine installer / manufacturer following a review of the proposed site and confirmation on grid connection.	TBC by wind turbine installer / manufacturer following a review of the proposed site and confirmation on grid connection.	TBC
Micro Hydro	Micro hydro generation has not been considered for this development.	N/A	N/A	N/A
District Heating	There are no existing or planned district heating networks to facilitate connection at this stage.	N/A	N/A	N/A
Solar Hot Water	This technology has been discounted as hot water generation will predominantly be met by the ASHP.	N/A	N/A	N/A
Heat Pumps	GSHP: Ground conditions on site are unknown, HWHP is the preferred technology for this development.	GSHP: 1400 kg CO ₂ / year per dwelling ASHP: 1,700 to 2,700 kg CO ₂ per year per dwelling.	GSHP @ £15-20K per dwelling. ASHP: £7-11K per dwelling	GSHP: Fuel saving of £930 / year minimum based on SAP calculations. ASHP: £920 minimum annual RHI income generation per dwelling with fuel saving of £335 per year minimum per dwelling
Biomass	The development would not facilitate the installation of biomass boilers due to the space required for pellet storage. There are also air quality issues with this technology.	N/A	N/A	N/A

10.2. Specification for Energy Assessments (ADL1 2021 - SAP)

Item	Brief Description	Notes	Confirm
	The following information is required for the design submission (as per requirements of approved doc L1).	Please note submission is now in two stages. A) Design , B) As installed	
1. Dwelling Type			
1.1	Building Regulations Part L1 2021 apply.		
1.2	Post code of site is OL10		
1.3	Electricity is supplied by standard tariff rather than economy 7, 10 or 24.		
1.4	It is assumed that the dwelling has a medium thermal mass parameter.		
2. Floor Construction Details			
2.1	Ground floor is to achieve the U-value stated opposite.	U-Value = 0.10 W/m ² K	
3. Wall Construction Details			
3.1	Main external walls are insulated to achieve the U-value stated opposite.	U-Value = 0.15 W/m ² K	
3.2	Timber stud wall to warm roof void (as item 4.2) to achieve the U-Value stated opposite.	U-Value = 0.08 W/m ² K incl. shelter factor as per ADL1A guidance	
3.3	Corridor walls are insulated to achieve the U-Value stated opposite.	U-Value = 0.20 W/m ² K Unheated circulation space	
3.4	Party walls are fully filled and sealed to achieve the U-value stated opposite.	U-Value = 0.00 W/m ² K	
4. Roof Construction Details			
4.1	Cold conventional roof to achieve the U-value indicated opposite – 500mm mineral wool quilt.	U-Value = 0.10 W/m ² K	
4.2	Pitched warm roof system to be extended down to eaves to achieve the U-value indicated opposite.	U-Value = 0.10 W/m ² K	
5. Openings			
5.1	External doors are installed to achieve the U-value stated opposite.	U-Value = 1.20 W/m ² K	
5.2	All BFRC triple-glazed windows and patio type doors/windows with Low-e glass soft coating to achieve the U-Value stated opposite.	U-value = 1.00 W/m ² K. g-value 0.44	
6. Ventilation			
6.1	Design SAP calculation presumes an air permeability aspirational target of 1.5 to 3m ³ /m ² /hr at 50pa will be achieved.	<i>Air leakage sealing and testing is required to all plots</i>	
6.2	System 4 MVHR installed into every dwelling incl for summer bypass facility	Zehnder ComfoAir Flex 350 or equivalent Efficiency = 95% SFP = 0.59 W/l/s	
7. Space Heating			
7.1	There is only one main heating system installed to each dwelling.		
7.2	Heating is provided by individual direct electric panels.	programmer and appliance thermostats.	
8. Water Heating			
8.1	Hot water is provided from the hot water heat pump.	Dimplex EDL 200L or equal and approved	
8.2	Water usage per person per day is ≤105 Litres.	To exceed Part G. Requires good specification of flow rates on all	

		water consuming appliances – taps, showers, etc	
8.3	Showers will be supplied from the hot water heat pump system	Flow regulated to 8l/min @3bar	
9. Renewables			
9.1	PV is installed in the following quantities per dwelling type:	Flat Type A = 3.6kWp (8x450W) Flat Type B = 3.6kWp (8x450W)	
9.2	PV: All equipment to provide a fully functional PV system – this will include but is not limited to Include inverter, isolators, distribution board, generation meters, all power wiring and controls. PV system located on the elevations facing East-West. PV Export smart meter for SEG. Mini inverters should be installed if there be any issues with solar shading that may impact a PV array's electrical generation, when compared to an equivalent array that has no shading issues.		
10. Other			
10.1	Low energy (LE) lights are installed throughout.	All lighting must be specified with efficacy of 100 lumens/circuit watt or more. Corridors/Stairwells to have presence detectors and	
10.2	No cooling is installed to the dwelling.		
10.3	Thermal Bridging inputted with the Y-Value set to 0.05, specialist thermal bridging to be adopted to enhance fabric performance.	Specialist Psi values will be adopted. Thermal bridging calcs are required	

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