C80 solutions
Straightforward Building Compliance

PROPOSED RESIDENTIAL DEVELOPMENT

HAWSHAW BANK

BARNSLEY

S74 9ND

ENERGY STATEMENT

May 2024

Project no. 18565

C80 solutions
Straightforward Building Compliance

PROPOSED RESIDENTIAL DEVELOPMENT

HAWSHAW BANK

BARNSLEY

S74 9ND

ENERGY STATEMENT

REVISION	DATE	PREPARED BY	REVIEWED BY	COMMENTS
0	31/05/2024	JM	HH	For Comment

The current report provides a brief overview of the wide range of opportunities for renewable energy and is not intended as detailed design advice. As such data and information should only be treated as INDICATIVE at this stage of the process. Further investigation can be undertaken when more accurate and detailed information is required on specific measures.

C80 Solutions Ltd
2nd Floor Suite
Sanderson House
22 Station Road
Horsforth
LS18 5NT
www.c80solutions.co.uk

Contents

1.0 Introduction

1.1 About C80 Solutions Ltd

C80 Solutions are independent Sustainability and Energy Consultants providing carbon reduction solutions to help the UK achieve its carbon emission reduction target of 100% by 2050.
Our range of affordable but comprehensive solutions for the construction industry are broken down into two sectors; i) Building Compliance and ii) Consultancy.

Building Compliance:

Our Building Compliance services include; Code for Sustainable Homes Assessments, SAP Calculations, On Construction Energy Performance Certificates, Water Efficiency Calculations, SBEM Calculations, Commercial EPCs, BREEAM assessments and Air Tightness Testing.

Consultancy:

Our experience and exposure to building compliance combined with previous experience and IEMA accredited training means we have built up a vast amount of knowledge which enables us to provide our clients with invaluable advice. Our Consultancy services include; Renewable Energy Feasibility Reports, Energy Statements for planning, Sustainability Statements and Building Compliance Advisory Reports.

1.2 Introduction to Developments

C80 Solutions have been instructed to prepare a sustainability statement by JC Planning to undertake an energy statement on the proposed development at Hawshaw Bank. The proposed development comprises the creation of 14 new residential homes.

The plan of the proposed development can be seen in Figure 1 below.

Figure : Proposed site plan

This statement will demonstrate how different design measures incorporated would affect the sustainability of the new development, and how the energy strategy ensures that the predicted carbon emissions of the dwelling will be reduced.

2.0 Energy

2.1 Methodology

The methodology that has been applied in this report is as follows:

1. Prepare baseline energy calculations for the site based on a Part L 2021 compliant construction specification designed for the development.

2. From the baseline energy calculations, the predicted energy demand for the development in kWh/year and the predicted CO2 emissions in kgCO2/year for the site can be established.

3. **BE LEAN**: Apply energy efficient design principles (improved fabric spec) in order to reduce the energy demand and CO2 emissions of the site. Prepare energy calculations using the improved fabric specification.

4. **BE CLEAN:** Explore opportunities to improve the building services and increase the efficiency in which energy can be delivered to the dwelling.

5. **BE GREEN**: Carry out a renewable energy feasibility study to ascertain which LZC technologies would be suitable for the development, and ascertain the impact of introducing different technologies.

6. Establish the sizing of suitable renewable technologies to ensure the CO2 emission reduction target is met.

2.2 Predicted Annual Carbon Emissions

Baseline SAP 10 calculations were prepared based on the construction specification shown in table 1 below. This specification is as outline in Approved Document Part L;

Aspect		L1A
	External Walls	0.18 W/m²K
	Communal Walls	N/A
	Insulated Roofs	0.11 W/m²K
	Ground floors	0.13 W/m²K
	Windows (All)	1.6 W/m²K
	External Doors	1.6 W/m²K
	Thermal Bridging	N/A
Ventilation	**Airtightness m3/(hr.m²)**	5
Heating	**Heating**	Gas Boiler
	Hot Water	As Per Heating
	Controls	TTZC
Low energy lighting		100%
Ventilation		Natural ventilation with extracts
Renewables / LZC	**None**	PV (40% of GF Area/6.5)

Part L compliant construction specifications

The conducted SAP calculations have shown the proposed baseline development will generate **137.97 kgCO2/year/m²**.

2.3 Predicted Annual Energy Demand

Based on using the specification outlined in table 1 above, this would create a total predicted energy demand for the development of **12,199.94 kWh/year**. The breakdown of this predicted energy demand can be seen in table 2 below. The figures quoted have been derived from the Design Stage SAP 10 Calculations for the development.

			Total Predicted Energy Requirement (kWh/yr)			
			Space Heating	Water Heating	Lighting, Pumps, Fans	Total Predicted Energy Requirement (kWh/yr)
Plot	No.	Units	Electric	Electric	Electric	
House 1	1	kWh/yr	5,930.76	3,005.13	292.11	9,228.00
House 2			3,997.77	2,989.93	257.66	7,245.36
House 3			3,239.29	2,998.84	257.66	6,495.79
House 4			3,997.77	2,989.93	257.66	7,245.36
House 5			5,930.76	3,005.13	292.11	9,228.00
House 6			5,930.76	3,005.13	292.11	9,228.00
House 7			5,451.39	3,009.76	291.32	8,752.47
House 8			5,451.39	3,009.76	291.32	8,752.47
House 9			3,659.25	2,998.09	262.64	6,919.98
House 10			3,659.25	2,998.09	262.64	6,919.98
House 11			3,659.25	2,998.09	262.64	6,919.98
House 12			3,659.25	2,998.09	262.64	6,919.98
House 13			5,451.39	3,009.76	291.32	8,752.47
House 14			5,451.39	3,009.76	291.32	8,752.47
Total						111,360.31

Baseline Predicated Annual Energy Demand

2.4 Reducing Carbon Emissions through Energy Reduction

The Energy Hierarchy sets out the most effective way to reduce a dwelling's CO_2 emissions. Firstly by reducing energy demand, then by using energy efficiently and lastly by incorporating LZC/Renewable technologies.

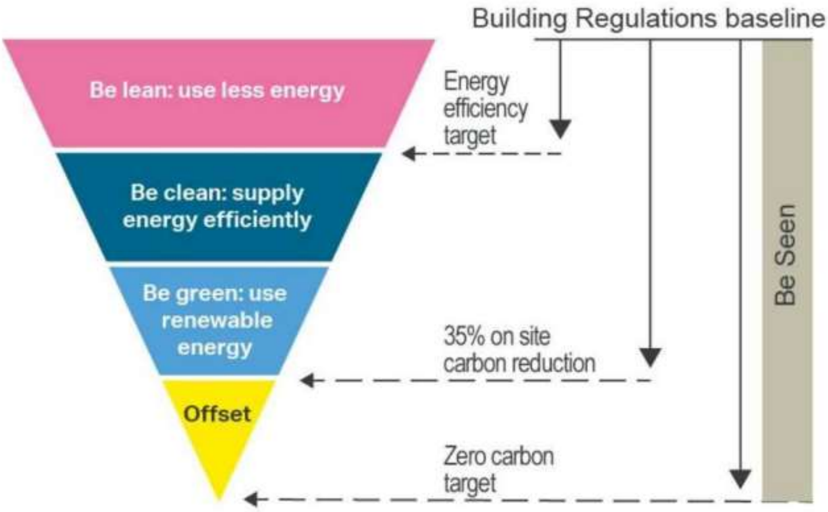

Figure 3: The Energy Hierarchy

Reducing the need for energy usage in the dwelling's design:

The first and most cost beneficial action is to reduce the amount of energy needed by the occupants of the dwelling whilst still maintaining or even improving the comfort conditions. A lot can be achieved through passive design, improving the dwelling's external fabric and following principles to reduce air infiltration.

The developer is attempting to reduce the energy demand and CO2 emissions of the development by making the following fabric and energy efficiency improvements to their standard Part L 2021 building specification:

Energy reduction strategies include:

- Adopting enhanced fabric specifications
- Installing high efficiency heating systems
- Incorporating energy-efficient lighting: 100% of all new lighting to be energy efficient
- Adopting principles of airtight construction
- All new windows will be double -glazed
- Passive Solar Design – Solar gain, solar shading, thermal mass
- Natural / Passive Ventilation strategy

2.5 Feasibility Study of Renewable Technologies

This section will assess the technical viability of the following renewable energy technologies for the site in order to rule out unfeasible options:

- Mast mounted wind turbines
- Roof mounted wind turbines
- Solar PV (Photovoltaic) Panels
- Solar Thermal Panels
- ASHP (Air Source Heat Pump)
- GSHP (Ground Source Heat Pump)
- Biomass
- CHP

The following observations have been made with regard to the technical feasibility of integrating renewable energy technologies into this development.

Renewable Technology	Feasible	Reasons
Mast Mounted Wind Turbine	No	There is no sufficient open land for a mast mounted wind turbine to be installed on site.
		The site is situated in a densely populated area. Surrounding properties aren't far enough away to be unaffected by turbine noise, reflected light and shadow flicker.
		The site area is surrounded by buildings and other obstructions that could cause uneven and turbulent wind patterns. Turbulent air conditions may reduce lifespan of components.
		Currently the BWEA suggests a large wind turbine to be viable where wind speed is 7m/s or above. According to the NOABL database the average wind speeds for the site is: 5 m/s at 10m, 5.7 m/s at 25m and 6.2 m/s at 45m height for the property postcode. Therefore, the wind speeds are not sufficient for a mast mounted wind turbine to be viable.
Roof Mounted Wind Turbine	No	The site area is surrounded by buildings and other structures that could cause uneven and turbulent wind patterns. Turbulent air conditions may reduce lifespan of components.
		Roof mounted wind turbines are not yet a proven technology and a number of technical problems have been identified by manufacturers which are being investigated to rectify these issues. Vibration that can be transmitted to the building structure. Noise from a turbine may cause irritation to

		occupants of the dwelling and adjacent buildings. Noise may also adversely affect ventilation strategy.
		Currently the BWEA suggests a large wind turbine to be viable where wind speed is 7m/s or above. According to the NOABL database the average wind speeds for the site is: 5 m/s at 10m, 5.7 m/s at 25m and 6.2 m/s at 45m height for the property postcode. Therefore, the wind speeds are not sufficient for a roof mounted wind turbine to be viable
Solar PV (Photovoltaic) Panels/Tiles	Yes	The proposed development does have sufficient roof area for solar panels accommodation.
		Most of the roof should be free from overshadowing for most of the day from other buildings, structures or trees.
		The site is located in the region with high level of global horizontal irradiation (1,000-1050 kWh/m2/year)
Solar Thermal Collectors	No	The proposed development has sufficient flat roof area that can accommodate solar thermal panels.
		Most of the roofs should be free from overshadowing for most of the day from other buildings, structures or trees.
		The site is located in the region with high level of global horizontal irradiation (1,000-1050 kWh/m2/year)
		Solar thermal collectors would be compatible with the planned heating system.
		There will be a year round hot water demand.
		In practical domestic solar hot water systems, the solar hot water system is usually run in conjunction with, rather than instead of, a backup conventional boiler and as a result the carbon intensity of the combined system is high relative to other renewables. Moreover the high efficiency of modern condensing boilers, which can convert over 90% of means that the carbon intensity of these heat sources is relatively low at 200-300 gCO2/kWhth. As a result domestic solar water heating systems are a relatively expensive way of mitigating carbon emissions when they replace heat from efficient modern boilers. For this reason they are not recommended.
ASHP (Air Source Heat Pump)	Yes	The proposed development has been designed to accommodate the space for a hot water cylinder.

		The building is suitable for a low-grade heat distribution system (e.g. underfloor water system, oversized radiators).
		Condenser units can be noisy and also blow out colder air to the immediate environment causing nuisance to the residents. Furthermore the noise generated could cause disruption, as plant equipment will need to be fitted to external walls near bedroom and windows.
		There is sufficient outdoor space to locate a condenser away from bedroom spaces
GSHP (Ground Source Heat Pump)	No	It will not be possible to drill a limited number of vertical or horizontal boreholes for GSHP on the site.
		It is possible for developments to accommodate a low-grade heat distribution system (e.g. underfloor water system, oversized radiators).
		The site and neighbourhood contain mature trees. Drilling boreholes on the site create the risk of damaging their roots.
		There is not sufficient space inside the proposed plant room that can service the main dwelling and all outbuildings/annexes.
Biomass Boiler	No	There is an established fuel supply chain for the area.
		There isn't sufficient space for a delivery vehicle (vehicular access to fuel storage, turning circle etc)
		There isn't sufficient space in the proposed buildings for a wood-fuel boiler and associated auxiliary equipment.
		There isn't sufficient space for fuel storage to allow a reasonable number of deliveries.
		Biomass systems are management intensive (fuel sourcing, transport, storage) and require adequate expertise from users.
CHP	No	Given the proposed building use there won't be a high demand for heat for most of the year, therefore CHP won't be suitable.
		A CHP unit only generates economic and environmental savings when it is running at least 4,500 hours per year. This equates to an average heat demand of about 17 hours a day for five days a week throughout the year. The proposed development energy and heat demand profile does not match this requirement.

		CHP is typically utilized on buildings with high electricity and heating demand for most of the year such as local authority buildings, leisure centres, universities, hotels, and district heating schemes where CHP is used to provide electricity, space and water heating.
		CHP should be considered wherever there is demand for electricity and an appropriate demand for heat in the near vicinity.
Hot Water Heat Pump	No	Dwelling has been designed to include space for a water immersion cylinder.
		The is sufficient external wall area to provide intake and exhaust vents to the external air.
		There is a too high of a predicted hot water demand to allow a system of this nature to run efficiently.
		Cost of these systems are a fraction of traditional heat pumps and they provide the same level of efficient delivery to all dwellings.

Feasibility Study of Renewable Technologies

Based on the feasibility study in table 4 above, the following technologies have been identified as being feasible for the proposed development:

- Solar PV

2.6 Improvements to Provide 20% CO_2 Reduction

The developer is proposing the following measures to improve the energy performance of the building:

Be Lean;
Improved Fabric U-values to-

- Walls: 0.18 W/m²K
- Floors: 0.13 W/m²K
- Roofs: 0.16 W/m²K
- Double Glazed Windows: 1.4 W/m²K
- Use of government approved Recognised Construction Details (www.recognisedconstructiondetails.co.uk) to limit effects of linear thermal bridging.

Be Clean;
Improved Space & DHW Heating System-

Be Green
Renewable Energy Sources-

- Installation of a 24 kwp of Solar PV across all dwellings

Table 5 below shows the percentage reduction in energy usage following the proposed heating and fabric improvements. This has been extracted from the SAP results and will be submitted along with this report.

	Carbon Emissions (kgCO2/m²/yr)
Baseline	**137.97**
Be Green	**135.82**
Total Reduction	**1.57%**

As can be seen from the results above, the proposed development exceeds the requirements for reduction in CO_2 emissions, by achieving a 1.57% reduction with the recommendations above. With its fabric first approach and use of LZC technologies, this proposed development promotes the goals, in its ability to reduce heat demand, and then meet that demand by the most efficient means. The concentration on improving the fabric of the design to exceed best practice for the current times will not only help in the short term by reducing energy demands and CO_2 emissions now, but also allows the building to be future proofed and net-zero ready to meet further targets and needs that may be required in years to come.