ENERGY STATEMENT

Site West of Lytton Way, Stevenage

Prepared for:
Hill Residential

10th June 2021
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Whitecode Consulting
26-27 The Hill
Northfleet
Gravesend
Kent DA11 9EU
T: 01322 289977
W: www.whitecode.co.uk

EXECUTIVE SUMMARY

Whitecode Design Associates have been appointed by Hill Residential to produce an update to the energy statement for the proposed development at Land West of Lytton Way located in Stevenage, referencing energy requirements for the site.

The proposed development will deliver 576 dwellings across seven apartment blocks, consisting of seven to fifteen levels.

This report is an update to the previously submitted energy strategy dated July 2019. Since then, there has been a change to the carbon factor related to electricity due to the decarbonisation of the grid. Hill Residential have committed to reducing the carbon emissions associated with their developments and as a result of this, have updated the energy strategy accompanying this scheme.

The residential elements have been assessed against Part L1A 2013 of the Building Regulations using the Standard Assessment Procedure (SAP) 2012 methodology.

The Stevenage Local Plan 2011-2031 requires new development to reduce energy consumption through energy efficient measures and improve energy performance of the building.

Following the issue of the Greater London Authority Energy Assessment Guidance (March 2020) applicants are encouraged to use the updated SAP10 carbon emission factors, and it also considered an appropriate methodology for this development in Stevenage. This will be in place during the interim period before the adoption of the new Building Regulations expected in June 2022. The SAP10 carbon emission factors have been used for this assessment and the report falls in line with the March 2020 guidance.

The report follows the energy hierarchy to ensure a carbon reduction is achieved on site as follows.

- Be Lean – improved building fabric specification to exceed that of the notional building, low air permeability target, thermal bridging details and selection of energy efficient services

- Be Clean – connection to a district heat network and installation of Combined Heat and Power (CHP) have been investigated for the site and not been deemed appropriate

- Be Green – air source heat pumps to be installed and the roof area available has been maximised for photovoltaic (PV) panels, a total of 162.5kWp will be installed.

This report concludes that the proposed development will achieve a **66% improvement** over Part L1A 2013 of the Building Regulations (relating to SAP10 carbon factors).

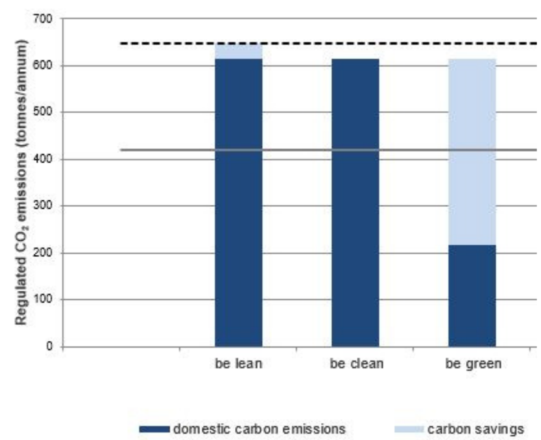
The following tables demonstrate the overall reduction in regulated carbon emissions of the development after each stage of the energy hierarchy.

	Carbon dioxide emissions for domestic buildings (tonnes CO_2 per annum)	
	Regulated	**Unregulated**
Baseline: Part L 2013	647.7	94.2
After energy demand reduction (be lean)	615.1	94.2
After heat network/CHP (be clean)	615.1	94.2
After renewable energy (be green)	217.7	94.2

Table 1: Carbon emissions after each stage of the energy hierarchy for domestic buildings

	Regulated domestic carbon dioxide savings	
	(tonnes CO_2 per annum)	**(%)**
Be lean: savings from energy demand reduction	32.6	5%
Be clean: savings from heat network/CHP	0	0%
Be green: savings from renewable energy	397.4	61%
Cumulative on-site savings	430	66%

Table 2: Regulated carbons savings after each stage of the energy hierarchy for domestic buildings



Graph 1: Regulated carbons savings after each stage of the energy hierarchy for domestic buildings

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Revision number	Date	Report completed by	Report checked by
1	10/06/2021	EH	KAV

1.0 INTRODUCTION

The purpose of this report is to show how the client can achieve a low to zero carbon development located at Land West of Lytton Way, Stevenage. These conditions are highlighted below.

1.1 National Planning Policy and Targets

The proposed development will be constructed to be compliant with Part L 2013 of the Building Regulations. The proposed development consists of new build dwellings, under Part L1A 2013 of the Building Regulations. They mandate that the design of the building demonstrably causes lower carbon dioxide (CO_2) emissions than a notional equivalent of given specifications.

The National Planning Policy Framework (NPPF) was updated in February 2019, which re-emphasises the Government's commitment to sustainable development and states the need for planning authorities to take an approach based on integrating the four aims of sustainable development. The document also refers to the Government's energy policies and objectives and sets out key principles that regional planning bodies and local planning authorities should adhere to in their approach to planning for renewable energy.

1.2 Local Planning Policies

The proposed development lies in the boundary of Stevenage Borough Council. The Stevenage Borough Local Plan 2011-2031, was adopted in May 2019. It sets out the policies and proposals for controlling and allocating development and for protecting and enhancing the environment.

- Policy FP1 – Climate Change

  Planning permission will be granted for developments that can incorporate measures to address adaptation to climate change. New development, including building extensions, refurbishments and conversions will be encouraged to include measures such as:

  - Reducing water consumption to no more than 110 litres per person per day including external water use
  - Improving energy performance of buildings
  - Reducing energy consumption through efficiency measures
  - Using or producing renewable or low carbon energy from a local source

- Policy SP2 – Sustainable Development in Stevenage

  Planning permission will be granted where proposals demonstrate (as applicable), how they will:

  - Take a proactive approach towards energy use, including renewable energy and energy efficiency measures where practicable and appropriate.

Tackling climate change will also require a move towards more sustainable energy sources and the local plan seeks to support the development of decentralised energy systems, including the use of low carbon and renewable technologies and the greater utilisation of energy generated from waste.

1.3 The London Plan 2021

Although this site is not located in London, the recent issue of the London Plan is an important step towards the low and zero carbon future of the UK as a whole. Therefore, the lower carbon factor for electricity (SAP10), which must be used in the London Plan, will be used for this report. The energy hierarchy below has been used to ensure energy efficiency is maximised at each stage.

Be Lean

- minimise energy use by implementing passive design measures, e.g. improve fabric U-values and minimise air permeability

Be Clean

- assess the feasibility of connection to district heat networks (DHN) in the local area

Be Green

- any remaining energy demand should be produced with as much low carbon and renewable technology as practically/financially possible.

1.4 The Development

The proposed development is a residential scheme to deliver 576 dwellings.

The proposed accommodation schedule is as follows:

- 20 x Studios
- 249 x 1-bedroom flats
- 257 x 2-bedroom flats
- 50 x 3-bedroom flats

All of dwellings have been modelled using the Standard Assessment Procedure (SAP) 2012 methodology.

2.0 BASELINE ENERGY CONSUMPTION AND CARBON EMISSIONS

An assessment of the sites potential energy use was conducted in compliance with the minimum requirements of Part L1A 2013 of the Building Regulations.

This baseline case represents a typical new build arrangement; where electricity for the development is imported from the grid and space and heating provided by fossil fuel sources. The baseline scheme is based on communal gas boiler heating scheme with radiators and U-values to match the notional building (TER).

Regulated carbon dioxide emissions (tonnes CO_2 per annum)	Carbon emissions (tonnes CO_2 per annum)
Baseline: Part L 2013 of the Building Regulations compliant development	647.7

Table 2.1: Baseline carbon emissions

The carbon emissions are reported against SAP10 figures as required in the GLA Energy Statement Guidance and London Plan 2021.

Approved Document L1A also includes the fabric energy efficiency (FEE) which is a measure of the amount of energy which would normally be needed to maintain comfortable internal temperatures and can be influenced by fabric U-values, thermal bridging, air permeability and thermal mass.

Fabric energy efficiency	(kWh/year)
Part L1A Target Fabric Energy Efficiency Rate (TFFE)	51.54

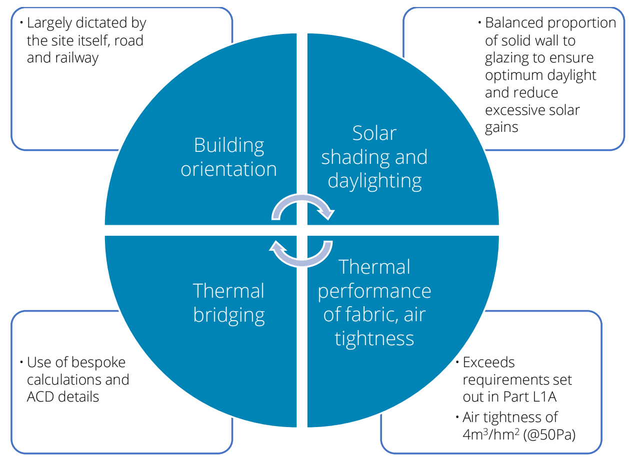
Table 2.2: Target fabric energy efficiency

3.0 'BE LEAN' – ENERGY EFFICIENT DESIGN

Local planning guidelines require a reduction in the CO_2 emissions of the proposed scheme by energy-efficient measures. A number of energy-efficient measures are considered below.

3.1 Passive design measures

Passive design measures involve adapting building massing, layout and glazing to best respond to the local climate and annual sun path in order to reduce energy demands.



The table below shows the proposed building fabric against Part L of the Building Regulations. Approximately 50% of heat is lost through the fabric of a building. This includes walls, floors, windows, roofs and the thermal bridging connecting them. The remaining 50% is lost through uncontrolled ventilation through gaps around doors, windows and any service penetrations.

Element:	Part L1A 2013 Limiting Values:	Domestic design
Floors	0.25 W/m²K	0.13 W/m²K
External Walls	0.30 W/m²K	0.18 W/m²K
Common Area Walls (unheated space)	0.30 W/m²K	0.20W/m²K
Party Walls (between dwellings)	0.20 W/m²K	0.00 W/m²K
Roofs	0.20 W/m²K	0.13 W/m²K
Front Doors	2.00 W/m²K	1.0 W/m²K
Windows	2.00 W/m²K	1.40 W/m²K
Window g-value	N/A	0.50
Air Permeability Rate	10m³/hm² (@50Pa)	4m³/hm² (@50Pa)

Table 3.1: Proposed U-values

Pipework insulation will be based on BS5422 standards for both hot and cold pipework and duct insulation, with high thermal properties.

A thermal bridge, also called a cold bridge, is an area of a building construction which has a significantly higher heat transfer than the surrounding materials. This is typically where there is either a break in the insulation, less insulation or the insulation is penetrated by an element with a higher thermal conductivity. Where the building is situated in a cold climate (such as the UK) this can result in additional heat loss at these points.

Around 30% of the total heat loss through a building's fabric can be caused by thermal bridging. Indications are that better detailing and improved air tightness can reduce a dwelling's annual CO2 emissions by up to 10%.

This development will use bespoke calculations and ACD for the psi values. The selection of thermally broken lintels and cavity closers assist with improving the thermal bridging and focusing on a fabric first building.

Looking forward to the 2022 Building Regulations where it will no longer be possible to use ACDs, this must be taken into consideration at Planning stage to ensure compliance.

3.2 Active design measures

After addressing the passive design measures the next step is to use energy efficient buildings services, lighting, and controls throughout the scheme to reduce fuel consumption.

Space heating and hot water

- A communal heating system will provide heating and hot water in the apartments using Air Source Heat Pumps (ASHP). Note that in line with the GLA March 2020 guidance, gas boilers are assumed at the Be Lean stage of the hierarchy, and as this will be a communal system, a 95% community gas boiler has been used at this stage.

Ventilation

- The dwellings will be provided with mechanical ventilation with heat recovery, this unit removes stale air from wet areas creating a permanent air path through the property through habitable rooms. The air drawn into the dwelling is routed through a high efficiency heat exchanger where warmth from the extracted air is transferred to the incoming fresh air before being supplied to habitable rooms. This lowers the heating requirements of the dwelling.

Building services insulation

All building services, tanks, pipes and ducts will be insulated to a high standard.

Lighting

- Internal lighting has a significant impact on the Dwelling Emission Rate (DER). Therefore, it is recommended that 100% of all internal light fittings will be low energy in order to reduce CO_2 emissions and the overall energy used (typical tungsten bulbs can use up to 300% more energy).

3.4 Cost to occupants

The cost to occupants has been considered. As this is a fully electric scheme the applicant is committed to protecting the consumer from high prices. The careful design based on a fabric first approach, prioritises energy efficiency and energy demand reduction before the selection of the energy system. The CIBSE Code of Practice will be followed. Occupants will have energy meters and transparent billing to aid their energy use decisions and keep their bills low.

3.3 'Be Lean' results

A sample of SAP calculations have been carried out for the proposed development using the 'Be Lean' specification.

The annual energy consumption is shown below:

	Annual Energy Consumption (MWh/year)
Application:	**Domestic**
Space & Water Heating	2,631
Cooling	0
Lighting	173.46
Fans & Pumps	94.77
Appliances and cooking (unregulated)	94.2
Total:	**2,993.43**

Table 3.2: Energy consumption

There has been a 5% reduction in domestic carbon emissions at 'Be Lean' stage due to the passive and active energy efficiency measures listed above.

Regulated carbon dioxide emissions (tonnes CO_2 per annum)	Domestic tonnes CO_2 per annum
Baseline: Part L 2013 of the Building Regulations compliant development	647.7
After energy demand reduction (be lean)	615.1
Carbon savings over baseline	32.6
Carbon reduction over baseline	5%

Table 3.3: Be Lean results

The reduction in fabric energy efficiency is 3% as the following table demonstrates:

Fabric energy efficiency	(kWh/m^2 per annum)
Part L1A Target Fabric Energy Efficiency Rate (TFEE)	51.54
Dwelling Fabric Efficiency (DFEE)	49.79
Reduction over TFEE	3%

Table 3.4: Fabric energy efficiency

4.0 COOLING DUE TO POTENTIAL SUMMER OVERHEATING

4.1 Cooling hierarchy

The cooling hierarchy has been followed in order to reduce the demand for cooling. The following categories have been considered:

1. Minimising internal heat generation through energy efficient design – minimised heat distribution infrastructure within the buildings.
2. Reducing the amount of heat entering the building during summer – the location, proportion and specification of the glazing should aim to balance natural light and 'beneficial' solar gain whilst ensuring that levels of heat gain are not excessive.
3. Use of thermal mass and high ceilings to manage heat within the building – higher thermal mass construction enables heat to be absorbed in the day and then released at night, however a balance must be struck. Lightweight structures without the energy-absorption potential are often at risk of overheating.
4. Passive ventilation – providing openable windows to allow natural ventilation and night time cooling to comply with Part F of the Building Regulations. Low temperature air from external is allowed into the building during the night, and circulates throughout the building cooling the building fabric.
5. Mechanical ventilation – this can be used to make use of free cooling when the outside air temperature is below that in the building during summer months, through the use of a summer by-pass on the MVHR.

The sample SAP calculations indicate that a majority of the dwellings have medium risk of summer overheating. This is achieved through glazing with a g-value of 0.50 and dual aspect dwellings.

5.0 'BE CLEAN' – HEATING INFRASTRUCTURE

5.1 District heating – connection to existing scheme

For the first step of the heating hierarchy, connection to an existing district heating network should be investigated. There is not one available for connection in Stevenage so this has been discounted.

5.2 Use of zero emission and/or local secondary heat sources

The second step of the heating hierarchy encourages exploitation of local energy opportunities whilst maximising primary energy demand and carbon emissions. Secondary heat includes environmental sources such as air, water and ground, or waste heat sources.

There are no suitable waste heat sources available to the Stevanage site. The most appropriate environmental source is air and therefore air source heat pumps are proposed for the space heating and hot water, as an onsite low carbon heat source.

As a result of this the following stages of the heat hierarchy have not been considered. The use of low emission combined heat and power (CHP) is not appropriate, as there is limited opportunity for the delivery of an area-wide heat network. Clearly ultra-low NOx gas boilers are also not appropriate.

5.3 'Be Clean' results

Since there are no changes proposed, the 'be clean' results are identical to those at the end of the 'be lean' stage.

	Carbon dioxide emissions (tonnes CO_2 per annum)
	Domestic
Baseline: Part L 2013 of the Building Regulations compliant development	647.7
After energy demand reduction (be lean)	615.1
After heat network/CHP (be clean)	615.1
% reduction at this stage	0

Table 2.1: Be Clean results

6.0 'BE GREEN' – RENEWABLE ENERGY

The Local Planning Policy sets no specific requirement for energy or carbon reductions, and simply encourages improvements in energy efficiency and the use of renewables. The site-specific analysis for those renewable energy technologies considered feasible will be covered below:

6.1 Heat pumps

Heat pumps collect low temperature heat from renewable sources and "concentrate" it to a usable temperature. Grid electricity is generally required to operate the pumps and the renewable component of the output is therefore by convention taken as the difference between the output energy and the input energy.

With the decarbonisation of the grid, the carbon factor associated with electricity is much lower, as we rely more heavily on renewable sources such as wind power, over fossil fuel fired power stations. This makes heat pumps a low carbon energy source.

A typical heat pump will deliver 4-5 kWh of useful energy for every 1 kWh of input energy. A heat pump operating in this way can therefore be deemed to have delivered 3-4 kWh of renewable energy.

Air source heat pumps have been identified as the most appropriate technology for the site, to provide the heating and hot water for the dwellings. The final design of the heat pump will be developed ay detailed design stage.

The plant area will likely consist of the ASHP's, water source heat pumps, thermal stores, pressurisation units and associated equipment for the network pipework before and after the water source heat pumps.

The occupants will be supplied with regular information on how to control and operate the system, at initial occupation and maintenance visits as required.

6.2 Photovoltaic panels

Photovoltaic (PV) systems convert energy from the sun into electricity via semi-conductor cells. There are a wide range of different panels available on the market, from less expensive amorphous silicon with low efficiencies to mono-crystalline silicon with much higher efficiencies (1kWp installation requires approximately 8m^2 of free roof area).

Ideally PV panels need to be positioned within 30° South and at an angle of 30° to achieve optimum performance. It is essential that PV panels are unshaded, as even a small amount of shading dramatically reduces the output of the panel.

There is sufficient space on the roof to provide an array of PV panels. Allowing space for access hatching as well as maintenance and avoiding areas of roof which are shaded by other blocks, the available roof area has been maximised. A total of 162.5kWp PV panels is proposed for the roof, which will produce around 123,594kWh per year. This can be seen on the roof plan in the appendix.

The applicant will be selecting high performance PV panels of at least 325 watts per panel.

6.3 'Be Green' results

A sample of SAP calculations for the dwellings have been completed using the 'Be Green' specification of air source heat pumps and photovoltaic panels.

	Carbon dioxide emissions (tonnes CO_2 per annum)
	Domestic
Baseline: Part L 2013 of the Building Regulations compliant development	647.7
After energy demand reduction (be lean)	615.1
After heat network/CHP (be clean)	615.1
After renewable energy (be green)	217.7
% carbon reduction	66%

Table 6.3: Be Green results

The same building fabric specification has been assumed as per the 'Be Lean' section of the energy hierarchy. When ASHP and PV panels are added to the design, there has a 66% carbon reduction compared to baseline (site wide).

7.0 CONCLUSION

This energy statement outlines the key features and strategies adopted by the design team to reduce energy use and carbon emissions for the scheme. It demonstrates that the development significantly exceeds the policy approach set out in the Stevenage Local Plan.

The strategy for reducing energy and associated carbon emission follows the energy hierarchy:

- **Be Lean** – improved building fabric specification to exceed that of the notional building, low air permeability target, thermal bridging details and selection of energy efficient services
- **Be Clean** – connection to a district heat network and installation of Combined Heat and Power (CHP) have been investigated for the site and not been deemed appropriate at this time
- **Be Green** – air source heat pumps to be installed and the roof area available has been maximised for photovoltaic (PV) panels, a total of 162.5kWp will be installed.

This report concludes that the proposed development at Land West of Lytton Way will achieve a **66% improvement** over Part L1A 2013 of the Building Regulations (relating to SAP10 carbon factors).

The final specification to meet the 66% carbon reduction on site is as follows:

	Specification
	Domestic
Heating	Reverse chiller and water to water heat pump SCOP 3
Hot water	HIUs (from above)
Emitter	Underfloor heating
Cooling	N/A
Ventilation	MVHR
Lighting	100% low energy
Photovoltaics	162.5kWp across Block 1 and 5

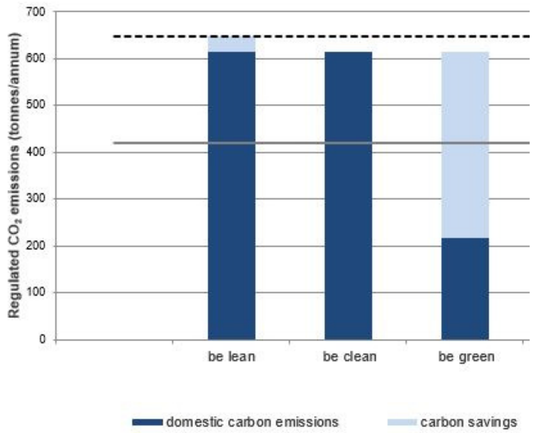
Table 7.1: Summary of specification to meet London Plan

	Carbon dioxide emissions for domestic buildings (tonnes CO_2 per annum)	
	Regulated	Unregulated
Baseline: Part L 2013	647.7	94.2
After energy demand reduction (be lean)	615.1	94.2
After heat network/CHP (be clean)	615.1	94.2
After renewable energy (be green)	217.7	94.2

Table 7.2: Carbon emissions after each stage of the energy hierarchy for domestic buildings

	Regulated domestic carbon dioxide savings	
	(tonnes CO_2 per annum)	(%)
Be lean: savings from energy demand reduction	32.6	5%
Be clean: savings from heat network/CHP	0	0%
Be green: savings from renewable energy	397.4	61%
Cumulative on-site savings	430	66%

Table 7.3: Regulated carbons savings after each stage of the energy hierarchy for domestic buildings



Graph 7.1: Regulated carbons savings after each stage of the energy hierarchy for domestic buildings

APPENDIX A – RENEWABLE ENERGY CONSIDERATIONS

Solar hot water heating

Solar water heating is an excellent renewable energy source as it can cater for almost 80% of the hot water load of a dwelling. A South facing 1m2 highly efficient evacuated tube solar array will provide approximately 520-850kWh/m2/year of hot water, saving approximately 103kgCO2 /m2/year. Depending on the system size, type and nature of installation solar water heating can cost approximately £1,000/m2.

For a block of apartments there are a number of design complications. If solar water heating systems are required to serve dwellings other than those on the top floor, there is the requirement for long runs of pipework to serve them. This results in access issues, adds to the long-term maintenance of the system and reduces efficiencies due to pipe losses.

Also, if a communal system is to be implemented, then a buffer vessel, expansion vessels and commercial pumps will be required, all of which require a large amount of plant space and maintenance. Within the dwellings themselves, a large solar hot water cylinder will be required.

There is sufficient space on the roof of the development to install solar hot water panels, however the carbon saving and overall benefit to the development is limited. Therefore, this technology has been considered as not feasible for the proposed development.

Wind turbines

Wind turbines converts the wind's kinetic energy into electrical power. They can be building mounted or free-standing. Where large wind turbines work they can deliver the best CO2 emission savings for the initial investment.

The installation of a large wind turbine at this site is practically impossible, as there is no available space to position or mount such a large piece of equipment. Opting for smaller roof-mounted turbines, such as those manufactured by Quiet Revolution (which are more aesthetically pleasing) could be an option.

A typical 6kW large turbine in a suburban environment could generate 6,765kWh/year and hence save 3,843kgCO_2/year. 6 turbines are required to achieve the 20% renewables target, and with a minimum of 10m between each turbine this would account for a significant alteration to the development. A 6kW turbine can cost between £21,000-£30,000, equating to an estimated total cost of £150,000 for the proposed development.

Due to the space required for both pole-mounted and building-mounted wind turbines this type of technology is considered as not feasible for the proposed development. They can also cause "flickering" to neighbouring buildings which can cause discomfort.

Biomass boiler

Whilst traditionally most suited to lower density situations (mainly due to the supply and storage of the fuel), more high-density developments are considering this technology. A biomass boiler is best incorporated within a district heating scheme. However, there are issues regarding fuel storage and air pollution.

A separate area would be required for the fuel store. Woodchip is the preferred fuel as opposed to pellets due to the embedded energy involved in transporting pellets from the continent – there are doubts as to whether wood pellets are in fact a carbon-neutral fuel. Woodchips can be sourced locally and therefore are more readily available, as well as being more carbon-friendly. The store would need to be adjacent to the plant room where the biomass boiler is located.

This type of technology is considered as not feasible for this site as there is not sufficient space required for the boiler and the delivery and storage of fuel and waste ash. The use of biomass fuel would also release high levels of NOx emissions, impacting on the local air quality.

Ground source heat pump

Ground Source Heat Pumps (GSHPs) absorb heat from the ground at low temperatures into a fluid inside a loop of pipe buried underground. This fluid then passes through a compressor that raises it to a higher temperature used for heating the water for the space heating and hot water circuits. GSHPs perform better when connected to heating systems that have been specifically designed for low temperature hot water.

GSHP's can provide very high efficiencies, with COP's over 5 in most applications. It also removed the need for roof plant located at roof level.

The pipe in the ground can be buried horizontally or vertically. They cannot be placed underneath the building or an impermeable area, due to heat transfer and access requirements. A 50m x 1.5m horizontal loop trench can produce 39,600kWh/year of heat, saving approximately 7,680kgCO2/year, depending on the suitability of the ground in the local area.

Vertical loop systems also require a lot of space, especially for the drilling equipment to produce the borehole. Boreholes are also very expensive costing between £16,000 to £20,000 per borehole.

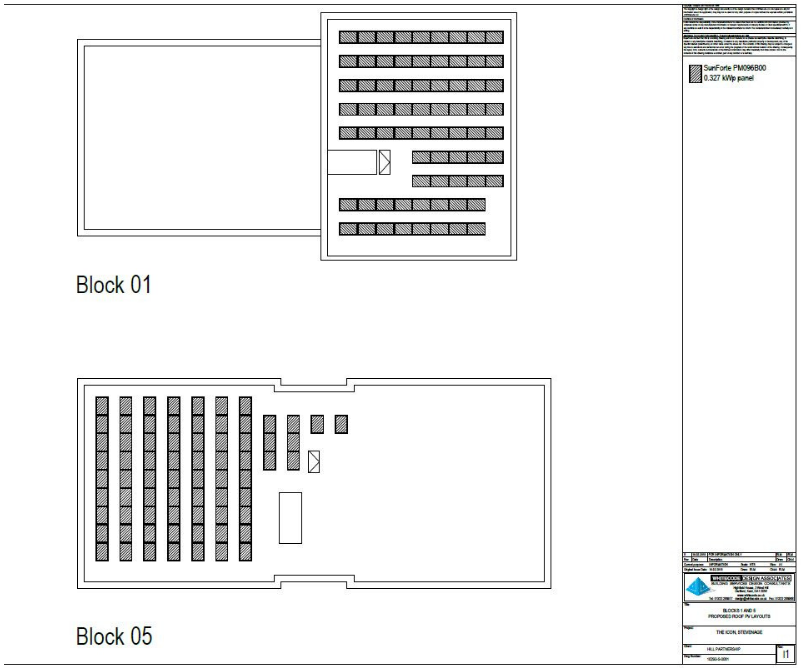
Due to the location of the proposed development and limited space required for this type of technology, GSHPs are considered as not feasible.

Some other reasons why these are not suitable for the development are as follows. Ground source heat pumps can cause energy in-balance within the ground. This basically means that if there is a local site also being developed with ground source heat pumps, then it could absorb all the heat and not allow enough heat for this site. The environmental agency could restrict the ground use at any time, meaning you cannot extract energy from the scheme. The boreholes would require significant coordination between all below ground services, landscape, structure, TFL services, etc.

The system would require specialist design to ensure the system is balanced with the environmental injection and abstraction of the ground. Very expensive dig costs, installation, equipment, and maintenance required.

Technology	Lifetime (years)	O&M impacts	Simple payback (years)	Planning – land use and noise	Aesthetic impact and land use	Site feasibility	Export potential for heat or energy	Comments
Biomass	20	High	15	Med	High	3	3	Not adopted – burning of wood pellets releases high NOx, storage and delivery limitations
PV	25	Low	7	Low	Med	5	8	Adopted
Solar thermal	25	Low	5	Low	Med	3	1	Not adopted – additional piping and hot water tanks are not viable
GSHP	20	Med	25	Low	Low	1	1	Not adopted – ground loop requires significant space, deep borehole rqd
ASHP	30	Med	20	High	Med	8	1	Adopted
Wind	25	Med	25	High	High	2	8	Not adopted – visual impact, site too enclosed
Energy storage	10	Med	>10	Low	Low	1	5	Not adopted – no compatible energy generators on site

APPENDIX B – PROPOSED ROOF LAYOUT



Total of 126.5kWp