VISION
ENERGY

ENERGY STATEMENT

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Document Version

Rev	Date	Description	Prepared	Proofed
1	20/01/2022	First Draft V1	A.C	D.B

This report has been prepared for the client only and expressly for the purposes set out in January 2022 and we owe no duty of care to any third parties in respect of its content. Therefore, unless expressly agreed by us in signed writing, we hereby exclude all liability to third parties, including liability for negligence, save only for liabilities that cannot be so excluded by operation of applicable law. The consequences of climate change and the effects of future changes in climatic conditions cannot be accurately predicted. This report has been based solely on the specific design assumptions and criteria stated herein.

Contents

1.Executive Summary

1.1 Introduction

This energy strategy has been prepared on behalf of Mr F Amankwah, hereafter referred to as the Applicant, in support of a full planning application for the development known as '62 Clements Road, Chorleywood, WD3 5JT', hereafter referred to as the Development.

1.2 Policies and Requirements

This statement summaries the relevant policies and requirements in relation to Energy and Carbon emissions, the below document is to determine the $C0^2$ reductions in light of the proposed planning application. A net zero carbon target with a minimum reduction of 35% to be adopted on site, to meet the local authority requirements.

1. **Three Rivers District Council Planning Policy**
2. **Policy DM4, Development Management Policies**

1.3 Energy Efficiency Measures

The proposed development incorporates several energy efficiency measure and designs to ensure compliance & $C0^2$ reduction including:

- Fabric Insulation improvements on Building Regulations Part L1a minimum standards,
- Air permeability improvements on Building Regulations Part L1a minimum standards,
- Improved U & G Values for the development,
- Accredited thermal bridging scheme adopted for cold bridging to minimise heat loss.
- Low Energy lighting scheme adopted on site.

1.4 Low Carbon Energy Supply

The proposed development does not have a significant thermal demand and is not within an area of which allows for a decentralised energy network to be utilised, therefore this option will not be explored further within this energy statement. It is recommended that the site is development in a manner that will allow to connection to a district heating system in the future is one is to become feasible.

1.5 On-site renewable technologies

The proposed design of the development incorporates the use of **Solar PV** and **Air Source Heat Pump** to meet the requirements of the local authority. Further options have been reviewed to provide further carbon reductions; the use of on-site renewable technologies has been reviewed in further details within this statement.

1.6 Site Description

The proposed development is set at '62 Clements Road, Chorleywood, WD3 5JT', the proposed works to the site is the construction of 1 new residential unit. The proposed development is to incorporate a high level of thermal performance and incorporate on-site renewable technologies to ensure the new development achieve the local policy requirements.

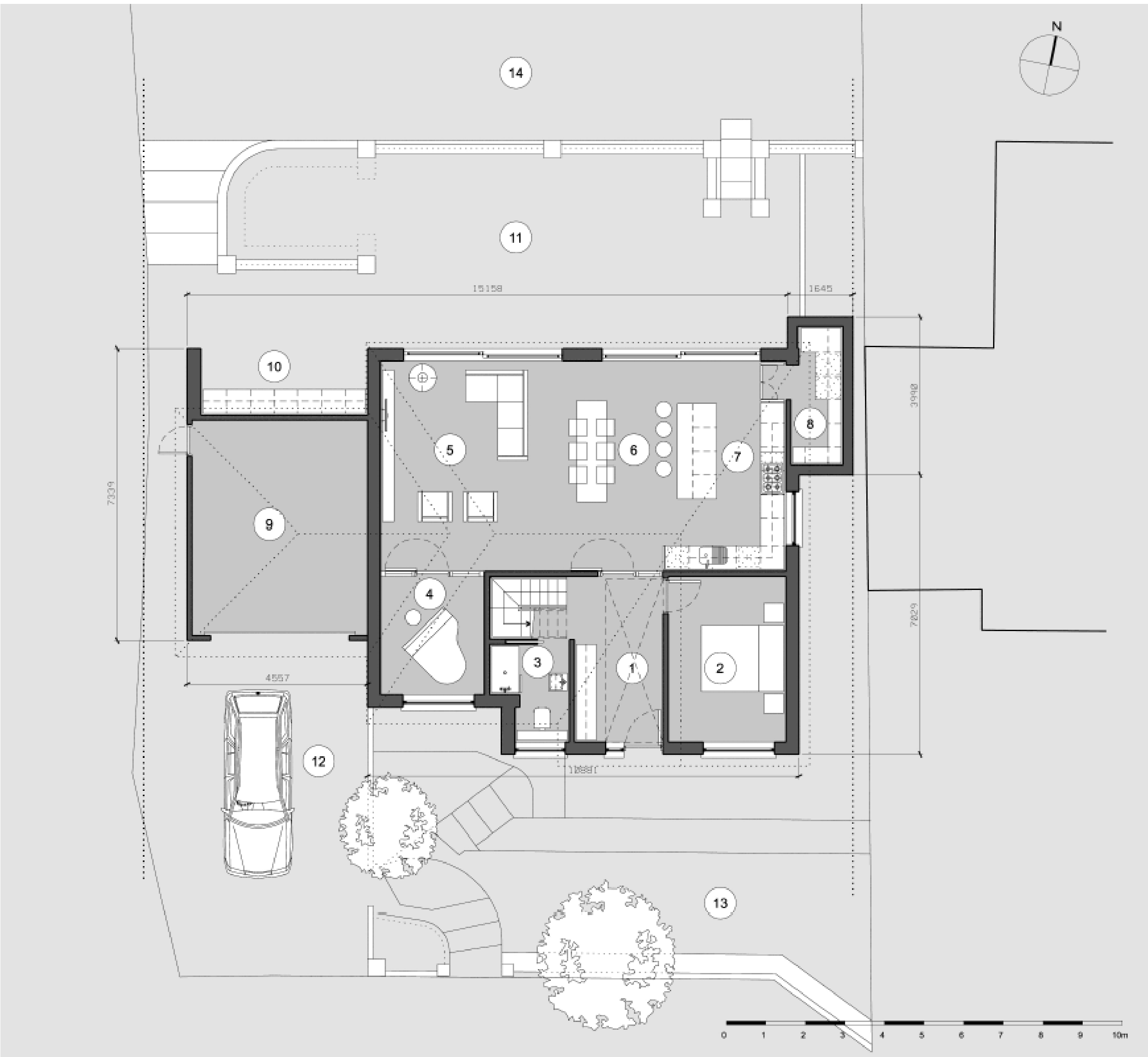
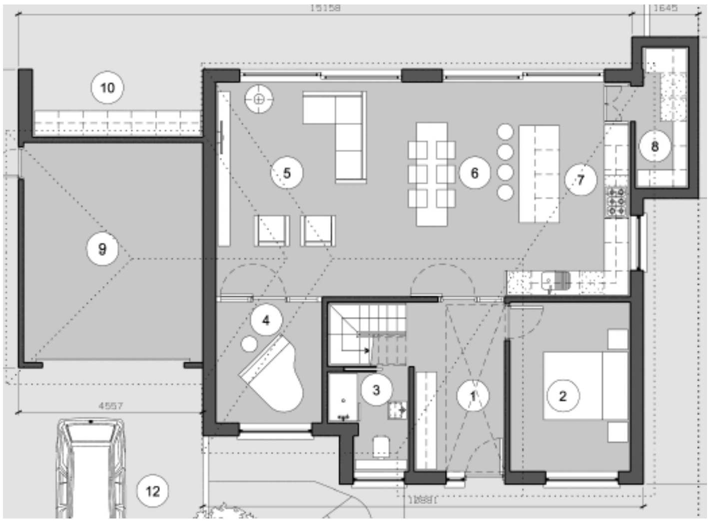
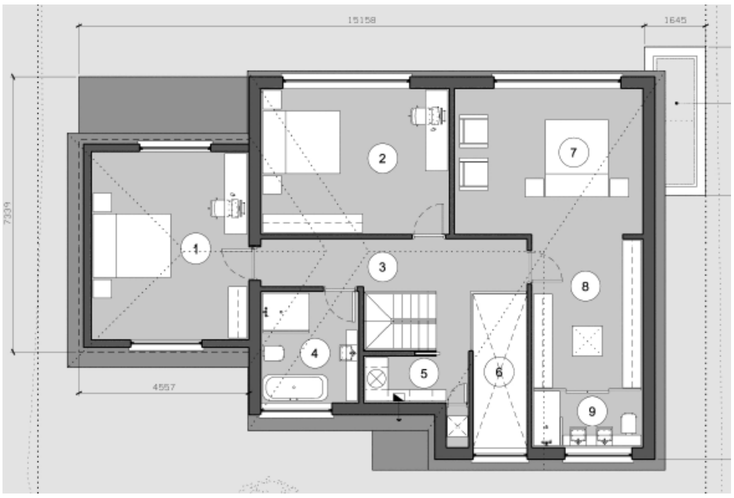


Fig.1 Site Plan





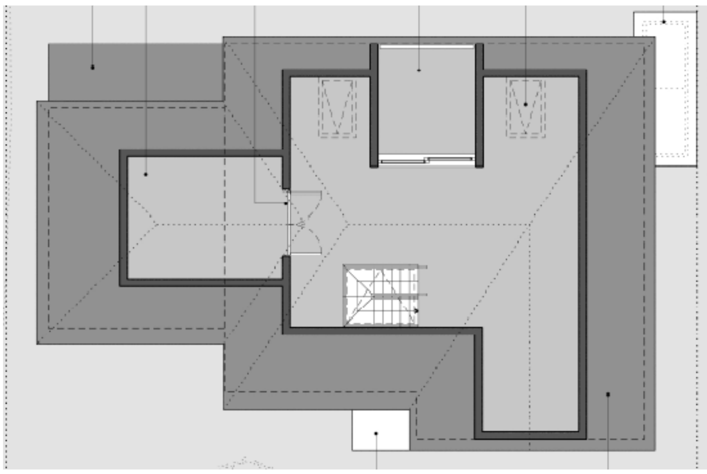


Fig 2. Proposed development

1.7 Renewable and Low Carbon Energy

Overall, **78%** of the predicted energy requirements is to be produced utilising Renewable or Low Carbon technologies as shown below, totalling a reduction of 78% site wide.

	Regulated domestic carbon dioxide savings	
	(Tonnes CO_2 per annum)	(%)
Be lean: Savings from energy demand reduction	0.0	0%
Be clean: Savings from heat network	0.0	0%
Be green: Savings from renewable energy	3.0	78%
Cumulative on site savings	3.1	78%
Annual savings from off-set payment	0.8	-
	(Tonnes CO_2)	
Cumulative savings for off-set payment	25	-
Cash in-lieu contribution (£)	1,521	

2. Methodology

2.1 Limitations

The calculations and figures utilised within this energy statement are based on Building regulations Part L methodology and should not be understood as a predictive assessment of likely future energy requirements. Other external factors will be present such as occupant system operation patterns and weather patterns.

2.2 Energy Hierarchy

The assessment has been carried out in accordance to the energy hierarchy method in line with GLA policy/s. The energy hierarchy method has been utilised to ensure the design of the development has reduced the demand for energy as far as reasonably practicable prior to the consideration of integrating Low or Zero Carbon technologies.

2.3 Carbon Factors

The below emissions factors were used to convert the energy requirement figures into $C0^{2}$ emissions; figures taken from Building Regulations Part L 2013. In Accordance with approved document guidance the below SAP 10 emission factors have been used within the calculations.

Fuel	Emission Factor ($kgC0^{2}/KWh$)
Gas	0.210
Electricity	0.233

3. Be Lean Measures

The following sections details the design measures that have been considered/to be implemented at the development.

3.1 Thermal insulation

In order to reduce the overall heating and cooling requirements for the development it is imperative that the development incorporates an efficient thermal envelope. The below elements have been considered for the development.

- Fabric Insulation improvements on Building Regulations Part L1a minimum standards,
- Air permeability improvements on Building Regulations Part L1a minimum standards,
- Improved U & G Values for the development,
- Accredited thermal bridging scheme adopted for cold bridging to minimise heat loss.
- Low Energy lighting scheme adopted on site.

The table below outlines the u-value targets for the development in comparison to the limiting factor set out in Building regulations Part L.

Element	U-Value (W/m2K)	
	Part L1 Limiting Factor	Development
Ground Floor	0.25	0.14
External Façade	0.30	0.2
Exposed Floor	0.25	0.14
Dormer & Ashlar Wall	0.30	0.2
Flat Roof	0.20	0.15
Ceilings	0.20	0.11
Sloped Roof	0.20	0.15
Glazing	2.0	1.3
Doors	1.8	1
Air Permeability	10	4.8
Low Energy Lighting	75%	100%

3.2 Fabric Air Permeability

Fabric air permeability is a measure of the volume of air that can penetrate through the fabric of a building leading to ventilation heat loss and gain. An improved air permeability rate has been included within the development to reduce the heat loss and gain and therefore reduce the heating and cooling requirements.

3.3 Improved Glazing Elements

Improvement measures have been made to the glazed elements of the development, the u-values for the glazing whole units are to achieve 1.3 W/m2k. Additional attention should be taken to the solar (G) values for the glazing to control solar gains and overheating.

3.4 Thermal/Cold Bridging Details

A combination of Accredited and bespoke details are to be used within the development to minimise the heat loss through the junction details, these details will be determine based on suitability to accredited details and bespoke details calculated where necessary.

3.5 Summary of Be Lean Measures

Element	U-Value (W/m2K)	
	Part L1 Limiting Factor	Development
Ground Floor	0.25	0.14
External Façade	0.30	0.2
Exposed Floor	0.25	0.14
Dormer & Ashlar Wall	0.30	0.2
Flat Roof	0.20	0.15
Ceilings	0.20	0.11
Sloped Roof	0.20	0.15
Glazing	2.0	1.3
Doors	1.8	1
Air Permeability	10	4.8
Low Energy Lighting	75%	100%

	Target Fabric Energy Efficiency (kWh/m²)	**Dwelling Fabric Energy Efficiency (kWh/m²)**	**Improvement (%)**
Development total	63.7	55.2	13.34%

4. Be Clean Measures

1.4 Low Carbon Energy Supply

The proposed development does not have a significant thermal demand and is not within an area of which allows for a decentralised energy network to be utilised, therefore this option will not be explored further within this energy statement.

5. Be Green Measures

The following sections discuss the renewable energy generation measures that have been considered, and those which will be implemented at the Development.

Renewable technologies harness energy from the environment and convert this to a useful form. Many renewable technologies are available. However, not all these are commercially viable, suitable for city-centre locations or appropriate for the Development.

Technologies considered for the Development include:

- Solar Hot Water Panels (Solar Thermal)
- Photovoltaic (PV) Cells
- Combined Heat and Power (CHP) and Micro-CHP (mCHP)
- Ground Source Heat Pumps (GSHP)
- Air Source Heat Pumps (ASHP)
- Wind Turbines

5.1 Solar Hot Water Panels

Solar Hot Water Panels or, Solar Panels as they are commonly known, are used to supplement the energy required for the domestic hot water requirement. The system will collect and absorb solar radiation and transfer the heat directly to the storage tank. The circulation may then be either ‘passive’ thus relying on the natural convection or ‘active’ using a pump which increases a system’s efficiency but has additional costs for the controls and energy requirement.

There are two main types of solar panel collector available to the UK market. The first is Flat Plate Collectors which consist of a dark absorber sheet with pipes built into the sheet encased in a weatherproof box. This will pump the collected solar radiation to the storage device to heat the water for use. The second main system is Evacuated Tube Collectors. These devices are more efficient and are effective under a “...wider range of conditions...” (TM38:2006) due to the energy being drawn from “...light rather than outside temperature...” This therefore allows this type of system to adapt to cooler climes.

Solar Hot Water Panels have been deemed viable for this development due to the available roof space and DHW demand, however an alternative technology has been selected to further reduce the carbon emissions on site and to meet the financial and on-site feasibility.

5.2 Photovoltaic (PV) Cells

Solar panel electricity systems, also known as solar Photovoltaics' (PV), capture the sun's energy using photovoltaic cells. These cells do not need direct sunlight to work - they can still generate some electricity on a cloudy day. The cells convert the sunlight into electricity, which can be used to run household appliances and lighting.

PV cells are made from layers of semi-conducting material, usually silicon. When light shines on the cell it creates an electric field across the layers. The stronger the sunshine, the more electricity is produced. Groups of cells are mounted together in panels or modules that can be mounted on your roof.

The power of a PV cell is measured in kilowatts peak (kWp). That is the rate at which it generates energy at peak performance in full direct sunlight during the summer. PV cells come in a variety of shapes and sizes. Most PV systems are made up of panels that fit on top of an existing roof, but you can also fit solar tiles.

Photovoltaic (PV) Cells have been considered and have been deemed viable for the required carbon reductions, the roof space to the South of the property shows approximately 10no. PV panels. An assumption has been made of 350W per PV panel and therefore a total kWp System of 3.5KW has been utilised in the design. This Solar PV system is to be used in addition with the air source heat pump if financially feasible.

5.3 Combined Heat and Power (CHP) and Micro-CHP (mCHP)

Micro-CHP' stands for micro combined heat and power. This technology generates heat and electricity simultaneously, from the same energy source, in individual homes or buildings. The main output of a micro-CHP system is heat, with some electricity generation, at a typical ratio of about 6:1 for domestic appliances.

A typical domestic system will generate up to 1kW of electricity once warmed up: the amount of electricity generated over a year depends on how long the system is able to run. Any electricity you generate and don't use can be sold back to the grid.

Domestic micro-CHP systems are currently powered by mains gas or LPG; in the future there may be models powered by oil or bio-liquids. Although gas and LPG are fossil fuels rather than renewable energy sources, the technology is still considered to be a 'low carbon technology' because it can be more efficient than just burning a fossil fuel for heat and getting electricity from the national grid. Micro-CHP systems are similar in size and shape to ordinary, domestic boilers and like them can be wall hung or floor standing. The only difference to a standard boiler is that they are able to generate electricity while they are heating water.

For the householder, there is little difference between a micro-CHP installation and a standard boiler. If the dwelling already has a conventional boiler then a micro-CHP unit should be able to replace it as it's roughly the same size. However, the installer must be approved under the Micro generation Certification Scheme. Servicing costs and maintenance are estimated to be similar to a standard boiler – although a specialist will be required.

CHP and mCHP have been considered for the project, in order to house the system, an external additional plant area would be required and therefore the feasibility of the CHP has not been deemed acceptable or viable due to planning restrictions. Additionally the carbon reductions for the mCHP system does not meet the Local Authority requirements due to the low heat demand.

5.4 Ground Source Heat Pumps (GSHP)

Ground source heat pumps use pipes which are buried in the garden to extract heat from the ground. This heat can then be used to heat radiators, underfloor or warm air heating systems and hot water in the home.

A ground source heat pump circulates a mixture of water and antifreeze around a loop of pipe - called a ground loop - which is buried in the garden. Heat from the ground is absorbed into the fluid and then passes through a heat exchanger into the heat pump. The ground stays at a constant temperature under the surface, so the heat pump can be used throughout the year - even in the middle of winter.

The length of the ground loop depends on the size of the home and the amount of heat needed. Longer loops can draw more heat from the ground, but need more space to be buried in. If space is limited, a vertical borehole can be drilled instead. Running costs will depend on several factors - including the size of the dwelling and how well insulated it is.

Ground Source Heat Pump has been considered for this project and has not been deemed viable due to the available external space. A more suitable technology has been selected to reduce the carbon emissions as well as financial and on-site feasibility.

5.5 Air Source Heat Pumps (ASHP)

Air source heat pumps absorb heat from the outside air. This heat can then be used to heat radiators, underfloor heating systems, or warm air convectors and hot water in dwellings.

An air source heat pump extracts heat from the outside air in the same way that a fridge extracts heat from its inside. It can get heat from the air even when the temperature is as low as -15° C. Heat pumps have some impact on the environment as they need electricity to run, but the heat they extract from the ground, air, or water is constantly being renewed naturally.

Running costs will vary depending on several factors - including the size of the home, and how well insulated it is, and what room temperatures are achieved.

Air Source Heat Pump has been considered for the project and deemed a viable option for the project, the carbon reductions of the installation of a ASHP exceed the council requirements in carbon emissions. This option has been adopted within the design.

5.6 Wind Turbines

Wind turbines harness the power of the wind and use it to generate electricity. Forty percent of all the wind energy in Europe blows over the UK, making it an ideal country for domestic turbines (known as 'microwind' or 'small-wind' turbines). A typical system in an exposed site could easily generate more power than a dwelling's lights and electrical appliances use.

Wind turbines use large blades to catch the wind. When the wind blows, the blades are forced round, driving a turbine which generates electricity. The stronger the wind, the more electricity produced. There are two types of domestic-sized wind turbine:

Pole mounted: these are free standing and are erected in a suitably exposed position, often around 5kW to 6Kw

Building mounted: these are smaller than mast mounted systems and can be installed on the roof of a home where there is a suitable wind resource. Often these are around 1kW to 2kW in size. Wind turbines are eligible for the UK government's Feed-in-Tariffs which means money can be earned from the electricity generated by the turbine. Payments for the electricity not use and export to the local grid are available as well. To be eligible, the installer and wind turbine product must be certified under the Microgeneration Certification Scheme (MCS). If the turbine is not connected to the local electricity grid (known as off grid), unused electricity can be stored in a battery for use when there is no wind. Please note that the Feed-in Tariffs scheme is not available in Northern Ireland.

Wind Turbines have been considered for this project, Pole mounted wind turbine has been excluded due to nature of the development and building mounted would not achieve the required reductions on site to meet the local requirements, therefore this has not been explored further.

5.7 Biomass

Energy from Biomass is produced by burning organic matter. Biomass fuel sources include trees, crops or animal dung are "...harvested and processed to create energy in the form of Electricity, Heat and Steam." (TM38:2006) Biomass is carbon based and when used as a fuel, produces carbon emissions. However, the carbon emitted during the combustion process is "...equivalent to the amount absorbed during growth..." (TM38:2006) The only carbon emissions associated with this energy source is treatment and transportation costs of the fuel to the end user.

Carbon savings that can be attributed to this technology type are significant. Biomass boiler installation can "...deliver all of the heating requirements for a building...using an almost carbon neutral fuel source." (TM38:2005) Biomass can be cost effective when directly compared to convention as oil and electricity heating sources. The benefit can be increased when the biomass source, for example wood chips, is diverted from the waste stream. However, maintenance requirements of a biomass system are higher and should be taken into account when installing one. Additionally, the UK introduced the Clean Air Act (1993) (www.uksmokecontrolareas.co.uk) to control the smoke pollution in areas caused by burning of smoky fuels.

Biomass been considered for the project, in order to house the system, an external additional plant area would be required and therefore the feasibility of the CHP has not been deemed acceptable or viable due to planning restrictions. If planning restrictions are limited on Biomass it is recommended to review the financial feasibility as the Biomass option exceeds the planning requirements.

5.8 Summary of Be Green Measures

Technology	**Deemed Viable**	**Adopted on site**
Solar Hot Water Panels (Solar Thermal)	✓	✗
Photovoltaic (PV) Cells	✓	✓
Combined Heat and Power (CHP) and Micro-CHP (mCHP)	✗	✗
Ground Source Heat Pumps (GSHP)	✗	✗
Air Source Heat Pumps (ASHP)	✓	✓
Wind Turbines	✗	✗
Biomass	✗	✗

As mentioned in the above statements, a number of options have been deemed viable for this development, the Air source heat pump and Solar PV has been adopted at this stage due to financial and on-site feasibility.

	Regulated domestic carbon dioxide savings	
	(Tonnes CO_2 per annum)	(%)
Be lean: Savings from energy demand reduction	0.0	0%
Be clean: Savings from heat network	0.0	0%
Be green: Savings from renewable energy	3.0	78%
Cumulative on site savings	3.1	78%
Annual savings from off-set payment	0.8	-

6. Sustainability Policies

The following section will outline the sustainability measures to be adopted on-site during and after completion, these points may recommend further investigative action if any additional risk is identified.

6.1 Overheating

Overheating analysis has been completed via the simplified method within SAP Calculations based on openings being fully openable, this displays a **NOT SIGNIFICANT** overheating risk. If any further alterations are made that show the overheating risk to be high, further analysis must be undertaken,

6.2 Internal Water Use

The applicant will reduce the consumption of potable water within the proposed dwelling/s from all sources to be in use, this will be achieved by design and selection of sanitaryware and flow restrictors where required. Water efficiency calculations are to be completed in accordance to Building Regulations Part G and are set to achieve requirements set by the Local Authority

6.3 Additional Policies to be considered with this development

Flood Risk, Drought & Surface Run-off

Waste & Recycling

Minimising Site Waste

Pollution

Biodiversity

Sustainable Transport

Building Regulations M4 (2) / (3)

7. Conclusion

After reviewing the above renewable technologies, Air source heat pump and Solar PV has been identified as the most viable option to achieve the criteria set out by the local authority. The development has been deemed viable for additional measures and therefore it is recommended to explore the financial feasibility of these options to maximise the reduction in carbon emissions on site.

7.1 Policies and Requirements

This statement summaries the relevant policies and requirements in relation to Energy and Carbon emissions, the below document is to determine the $C0^2$ reductions in light of the proposed planning application. . A net zero carbon target with a minimum reduction of 35% to be adopted on site, to meet the local authority requirements.

1. **Three Rivers District Council Planning Policy**
2. **Policy DM4, Development Management Policies**

7.2 Summary of energy efficient measures

Element	U-Value (W/m2K)	
	Part L1 Limiting Factor	Development
Ground Floor	0.25	0.14
External Façade	0.30	0.2
Exposed Floor	0.25	0.14
Dormer & Ashlar Wall	0.30	0.2
Flat Roof	0.20	0.15
Ceilings	0.20	0.11
Sloped Roof	0.20	0.15
Glazing	2.0	1.3
Doors	1.8	1
Air Permeability	10	4.8
Low Energy Lighting	75%	100%

7.3 Summary of renewable or Low Carbon measures

Element	
Main Heating System	Vaillant Geotherm or equivalent (sizing and suitability to be confirmed with MEP Consultant/Contractor)
Hot Water System	Provided via Main Heating System with 300L storage facilities.
Renewable Technologies	3.5kWp Solar PV on South Facing Roof, Overshading none or very little

7.4. Summary of Carbon Emissions reductions

	Regulated domestic carbon dioxide savings	
	(Tonnes CO_2 per annum)	(%)
Be lean: Savings from energy demand reduction	0.0	0%
Be clean: Savings from heat network	0.0	0%
Be green: Savings from renewable energy	3.0	78%
Cumulative on site savings	3.1	78%
Annual savings from off-set payment	0.8	-
	(Tonnes CO_2)	
Cumulative savings for off-set payment	25	-
Cash in-lieu contribution (£)	1,521	

SAP documentation has been included in a separate folder and is to be used in conjunction with this document to validate figures and reductions.

Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.50
Printed on 20 January 2022 at 15:54:37

Project Information:

Assessed By: () **Building Type:** Detached House

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 278.03m²
Site Reference : New Project **Plot Reference:** House 1 - Be Green - Solar pv +
Address :

Client Details:

Name:
Address :

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating system: Electricity		
Fuel factor: 1.55 (electricity)		
Target Carbon Dioxide Emission Rate (TER)	22.77 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	6.77 kg/m²	OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	63.7 kWh/m²	
Dwelling Fabric Energy Efficiency (DFEE)	55.2 kWh/m²	
		OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.20 (max. 0.30)	0.20 (max. 0.70)	OK
Floor	0.14 (max. 0.25)	0.14 (max. 0.70)	OK
Roof	0.13 (max. 0.20)	0.15 (max. 0.35)	OK
Openings	1.29 (max. 2.00)	1.30 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	4.80 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main Heating system:
Heat pumps with radiators or underfloor heating - electric
Vaillant geoTHERM 10 kW

Secondary heating system: None

5 Cylinder insulation

Hot water Storage:	Measured cylinder loss: 2.27 kWh/day	
	Permitted by DBSCG: 2.86 kWh/day	OK
Primary pipework insulated:	Yes	OK