



**FALCON
ENERGY
LIMITED**

Energy Conservation Specialists

**Penland Farm
Penland Green
Haywards Heath
RH17 5HR**

Energy Statement

Client: Brixter Construction& Developments Limited

Assessor: Neil Vanson

Tel: 01403 253439

Email: info@falconenergy.co.uk

Web: www.falconenergy.co.uk

Report By: Neil Vanson

Checked By: Neil Vanson

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Energy/ Sustainability Statement

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1. Introduction

Falcon Energy has been instructed by Brixter Construction& Developments Limited to undertake an energy/ sustainability report as part of a planning submission for the site known as Penland Farm.

The proposed works are for the construction of 4 detached dwellings.

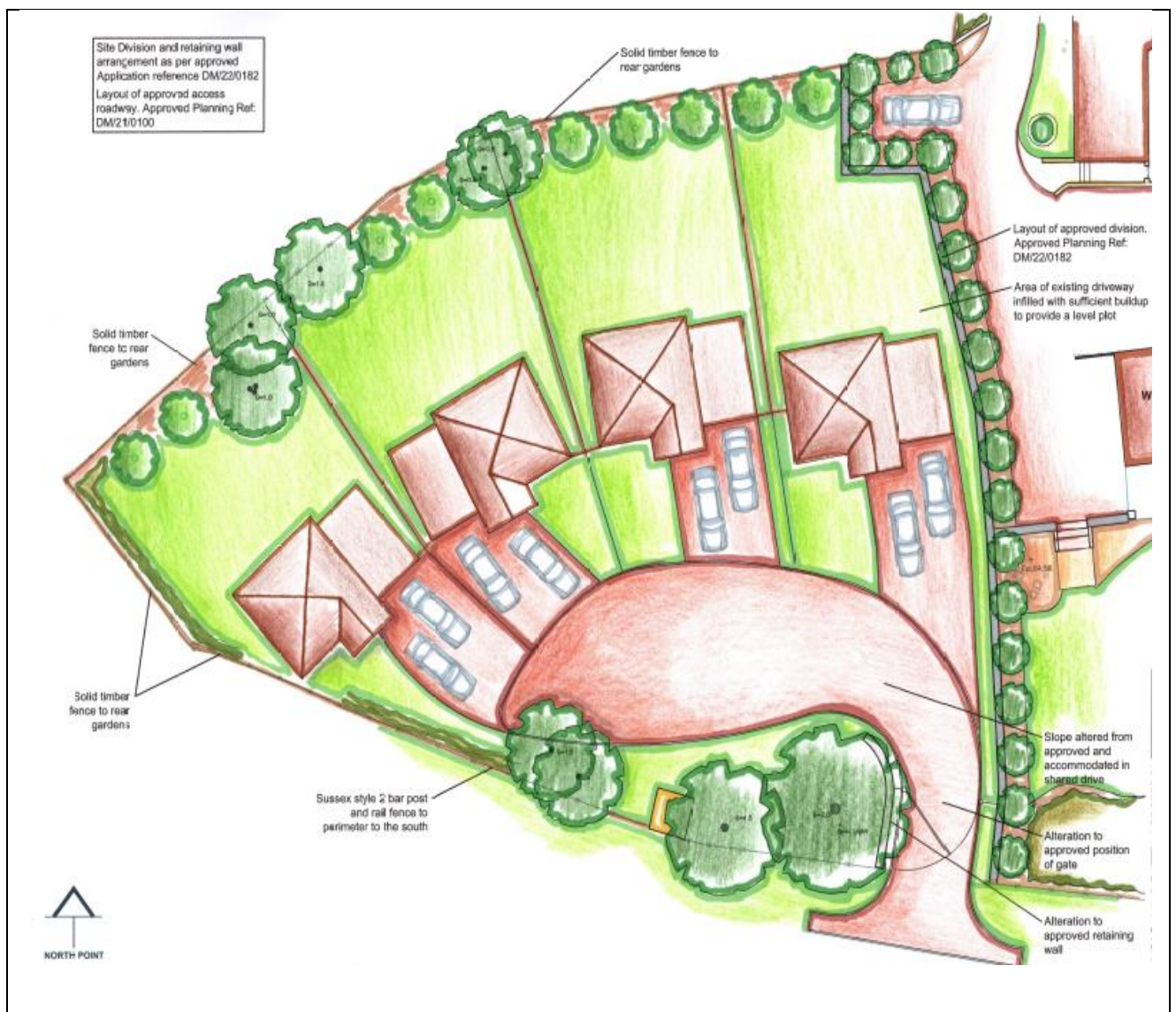


Figure 1, Site Layout

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1.0 Energy Strategy.

DP39: Sustainable Design and Construction Strategic Objectives: 1) To promote development that makes the best use of resources and increases the sustainability of communities within Mid Sussex, and its ability to adapt to climate change. Evidence Base: Gatwick Sub Region Water Cycle Study; West Sussex Sustainable Energy Study, Mid Sussex Sustainable Energy Study. All development proposals must seek to improve the sustainability of development and should where appropriate and feasible according to the type and size of development and location, incorporate the following measures:

- Minimise energy use through the design and layout of the scheme including through the use of natural lighting and ventilation.
- networks where viable and feasible.
- Use renewable sources of energy.
- Explore opportunities for efficient energy supply through the use of communal heating
Maximise efficient use of resources, including minimising waste and maximising recycling/re-use of materials through both construction and occupation.
- Limit water use to 110 litres/person/day in accordance with Policy DP42: Water Infrastructure and the Water Environment.
- Demonstrate how the risks associated with future climate change have been planned for as part of the layout of the scheme and design of its buildings to ensure its longer-term resilience.

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1.1 Energy efficient design, insulation, and ventilation.

The table below highlights the fabric first approach to the build.

Construction	Reduction Specification (U Value)
External wall	0.15
Floor	0.14
Roof	0.13
Window	1.2 Double Glazed
Door	1
Air Test	5
Boiler	ASHP
Lighting	100% low energy

1.2 Energy Efficient fixtures and fittings.

All internal lights will be 100% low energy.

All external space lighting will be dedicated energy efficient, having a luminous efficacy greater than 40 lumens per circuit watt. Lighting will be controlled either through a time witch and/or PIR.

White goods will be provided. The fridges and freezers will be A+ rated and washing machines and dishwashers will be A rated under the EU Energy Efficiency Labelling Scheme.

1.3 Renewable Energies.

A ground sourced heat pump (GSHP) is a device for extracting heat from the ground to provide space heating and domestic hot water for buildings. Water or another fluid is circulated through pipes buried in the ground and passes through a heat exchanger in the heat pump that extracts heat from the fluid. The heat pump then raises the temperature of the fluid via the compression cycle to supply hot water to the building as from a normal boiler.

Providing the space heating requirement only using ground source heat pumps would provide a 31.7% CO2 reduction. This would require approximately 42 boreholes across the site, spaced between 25m to 50m centres, or horizontal coils would require an area of approximately 14,400m².

Using GSHP for 100% of the space heating will only provide a 21.8% reduction in predicted CO2 emissions, due to the high CO2 emissions associated with grid supplied electricity. This is an expensive technology. **Therefore, this is not considered to be viable for this project.**

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Air Source Heat Pumps

Air Source Heat Pumps extracts heat from the outside air using an external condenser unit and transfers it, through refrigeration pipework to the indoor unit which then conveys that heat to the heating emitters and hot water cylinder. This system is capable of providing 100% of heating within a building. Providing air source heat pumps to the building for the space heating would reduce the carbon dioxide emissions by 19% from the Lean building. This system would require 1 condenser unit to be located external to each plot, the units proposed are the following. The Ultra Quiet Eco-dan air source heat pump 5kW with sound levels that are three times quieter than previous models, virtually eliminating planning restrictions. They have been designed specifically for residential applications, these models offer superb, market-leading energy efficiency and sound levels and enable almost any home to benefit from high performance, renewable heating. The New Ultra Quiet Eco-dan takes this to the next level with low sound and high performance which mean homeowners can now choose the most convenient location for their heat pump, giving complete flexibility on placement and still meeting Permitted Development requirements.

The 8.5 kW Ultra Quiet Eco-dan has a sound power level of only 58 dB(A) which is an 8 dB(A) drop over the model it replaces. It also has a sound pressure level of just 45 dB(A) at one metre Sound power can be thought of as the cause of a noise or the total sound energy emitted by a source in all directions, whereas sound pressure is the effect or the sound we hear and this is determined by the environment and by the distance from the source of sound. We think of this as the intensity or loudness of a sound. An ambulance registers 120 dB(A) whereas a vacuum-cleaner registers around 73 dB(A) and typical room conversation comes in at around 60 dB(A).

“With a sound pressure level of just 45 dB(A), the new Eco-dan is whisper-quiet, with levels just above that of a library, meaning it will pass the Permitted Development requirements easily and can be installed almost anywhere to suit the homeowner.

The ASHP's will be installed by an MCS accredited installer and designed to be the main heating source. Once full heat loss calculations have been carried out the final design will ensure the system is running to its optimum efficiency.

The ASHP will be offset with Solar P.V panels. As ASHP's are run by electricity this is the most efficient way to offset the carbon used to power the system.



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8.5 Kw Ecodan ASHP

OUTDOOR UNIT		PUZ-WM50VHA(-BS)
HEAT PUMP SPACE HEATER - 55°C	ErP Rating	A++
	η_s	129%
	SCOP (MCS)	3.22
HEAT PUMP SPACE HEATER - 35°C	ErP Rating	A+++
	η_s	183%
	SCOP (MCS)	4.57
HEAT PUMP COMBINATION HEATER - Large Profile ¹	ErP Rating	A+
	η_{wh}	135%
HEATING ² (A-7/W35)	Capacity (kW)	5.0
	Power Input (kW)	1.67
	COP	3.00
OPERATING AMBIENT TEMPERATURE (°C DB)		-20 ~ +35
SOUND DATA ³	Pressure Level at 1m (dBA)	52
	Power Level (dBA) ⁴	61
WATER DATA	Pipework Size (mm)	22
	Flow Rate (l/min)	14
	Water Pressure Drop (kPa)	12.0
	Width	950
DIMENSIONS (mm)	Depth	330+30 ⁷
	Height	943
	Weight	71
ELECTRICAL DATA	Electrical Supply	220-240v, 50Hz
	Phase	Single
	Nominal Running Current [MAX] (A) ⁵	4.64 [13]
	Fuse Rating - MCB Sizes (A) ⁶	16
REFRIGERANT CHARGE (kg) / CO ₂ EQUIVALENT (t)		R32 (GWP 675) 2.0 / 1.35

CYLINDER			EHPT15X-UKHLDW
NOMINAL HOT WATER VOLUME (LITRES)			150
ErP RATING			C
HEAT LOSS (kWh/24hrs)			1.40
HEAT LOSS (W)			58
WATER		Flow Rate (l/min) - WM 50 / 60 / 85	14 / 17 / 24
		Primary Circuit Pump	Grundfos UPM
		Heating Circuit Pump	Grundfos UPI
		Sanitary Hot Water Pump	Grundfos UPSO
		Connection Size (mm) Heating / DHW	22 / 22
		Charge Pressure (MPa (Bar))	0.35 (3.5)
WATER SAFETY	Water Circuit	Control Thermistor (°C)	80
	DHW Cylinder	DHW Expansion Vessel (Litres)	12
		Control Thermistor (°C)	75
		Over Temperature Cut-Out (°C)	80 ± 5
		Temp and Pressure Relief Valve (°C) / (MPa (Bar))	90 / 1.0 (10)
		Expansion Relief Valve (Cold) (MPa (Bar))	0.8 (8)
DIMENSIONS (mm)		Width	649
		Depth	646
		Height	1515
WEIGHT EMPTY / FULL (kg)			54 / 204
CYLINDER MATERIAL	Cylinder	Cylinder Material	Stainless Steel
	Insulation	Insulation Type	CFC / HCFC-free flame-retardant
		Insulation Thickness (mm)	50
		GWP of Insulation	3.1
		ODP of Insulation	0
ELECTRICAL DATA	Control Board - optionally powered by outdoor unit	Electrical Supply	220-240v, 50Hz
		Phase	Single
		Fuse Rating - MCB Sizes (A)**	16
	Immersion Heater	Electrical Supply	220-240v, 50Hz
		Phase	Single
		Capacity (kW)	3
		Max Running Current (A)	13
		Fuse Rating - MCB Sizes (A)**	16
MECHANICAL ZONES			DHW and 1 Heating Zone
OPTIONAL SIMPLIFIED WIRELESS ROOM THERMOSTAT AND WIRELESS RECEIVER			PAR-WT50-E Controller and PAR-WT50-R Receiver

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Biomass

Waste timber, in the form of wood chips and pellets, is used as fuel in boilers providing heating to buildings. Biomass generates about the same amount of carbon dioxide as fossil fuels, however, with new plant/tree growth this carbon dioxide is actually removed from the atmosphere making the Biomass system carbon neutral. Wood chips and pellets present no risk if accidentally released into the environment and there are no harmful by-products. The flue gas is smoke-free and the ash content of between 0.5% and 3% by volume (depending on material), is minimal.

When sizing biomass is standard practice the biomass boilers would meet a significant proportion of the heating load and gas condensing boilers would assist with providing load trimming to reduce the amount of on/off cycling of the biomass boilers. The provision of biomass boilers to meet all the domestic hot water demand and 30% of the annual energy demand for space heating only would reduce the carbon emissions of the building by 40%.

The provision of biomass boilers for this site would require a central energy centre to be provided sized to allow for at least one biomass boiler and gas backup boiler(s). The number of boilers would be dependent upon detailed analysis of the demand load profiles during detail design stage. Storage of the biomass fuel is required on site, sized to accommodate at least one peak month of heating. Based on the predicted domestic hot water and 30% heating requirements, this would require 30m³ storage for wood pellets or 135m³ of woodchip, depending upon the boiler selection. The store would need to be easily accessed by a large delivery vehicle, similarly, sized to a petrol tanker and therefore there may be issues surrounding vehicular access to the site.

The space and access requirements for the energy centre and biomass store **are unlikely to be viable on this site**. Furthermore, the biomass boiler(s) would require a large flue and careful consideration of its sizing, location and the potential impact of local air quality.

Solar thermal

Solar water heating systems use the energy from the sun to heat water, most commonly in the UK for hot water needs. The systems use a heat collector, generally mounted on the roof in which a fluid is heated by the sun. This fluid is passed through a heat exchanger and used to heat up water which is stored in either a separate hot water cylinder or a twin coil hot water cylinder inside the building. There are two types of collectors used for solar water heating applications - flat plate collectors and evacuated tube collectors. Evacuated tube collectors are generally more expensive due to a more complex manufacturing process (to achieve the vacuum), but manufacturers generally claim better winter performance **this was felt not viable**.

Photovoltaics

Solar photovoltaic (PV) technology is a semi-conductor-based technology that converts the energy in sunlight into electricity. The term describes a solid-state electronic cell that produces direct current electrical energy from the radiant energy of the sun. When sunlight strikes the surface of a PV cell, this electrical field provides momentum and direction to light-stimulated electrons, resulting in a

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flow of current when the solar cell is connected to an electrical load. The PV systems should be unshaded. Shading even over a small area of the panel, can significantly reduce performance. Excess energy can be exported to the grid; and feed-in tariffs are available. **This was felt most viable** as approximately 8 panels would be required totalling 13.68 sqm and providing 3.00 kWp output.



1.4 Innovative waste facilities.

Recycling storage will comply with the local authority requirements for recycling externally and internally. External storage areas will be in compliance with disabled access and volumes will be in line with BS5906.

The separation for recyclables will be provided in a fixed position in the kitchen with 30 litres to be provided for waste and minimum 30 litres for recyclables. A recycling bin with a 44-litre capacity will be provided.



1.5 Electric Vehicle Provision

The site will have 1 dedicated electric vehicle charging.

1.6 Water Saving devices

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Mains water usage shall be significantly reduced through water efficient products in line with the mandatory requirements. An indicative specification for the development is:

Shower of 6 litres/minute

Bath sizes to be 140 litres to overflow

Washbasin taps to be flow limited to 6 litres/minute

Dual Flush WCs at 6/4 litre

Low water use white goods

The above specifications will give a usage of 110 litres/person/day

1.7 Sustainable materials and construction

The design team are committed to ensuring that at least 5 elements build are A rated under the BRE Green Guide.

All concrete used within the development will have BES:6001 certification under an environmental management system (EMS) such as ISO14001. All timber used within the development will be wither PEFC or FSC certified.

Building Elements all skirting, stairs, doors and other timber finishing elements will be sourced from FSC or PEFC certified timber.

1.8 Summary of carbon reduction

Plot Number	DER	TER	% Improvement in CO2
Unit 1	1.32	8.79	84.98
Unit 2	1.32	8.77	84.94
Unit 3	1.58	8.74	81.92
Unit 4	1.59	8.80	81.93

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1.9 Reduction SAP Calculations