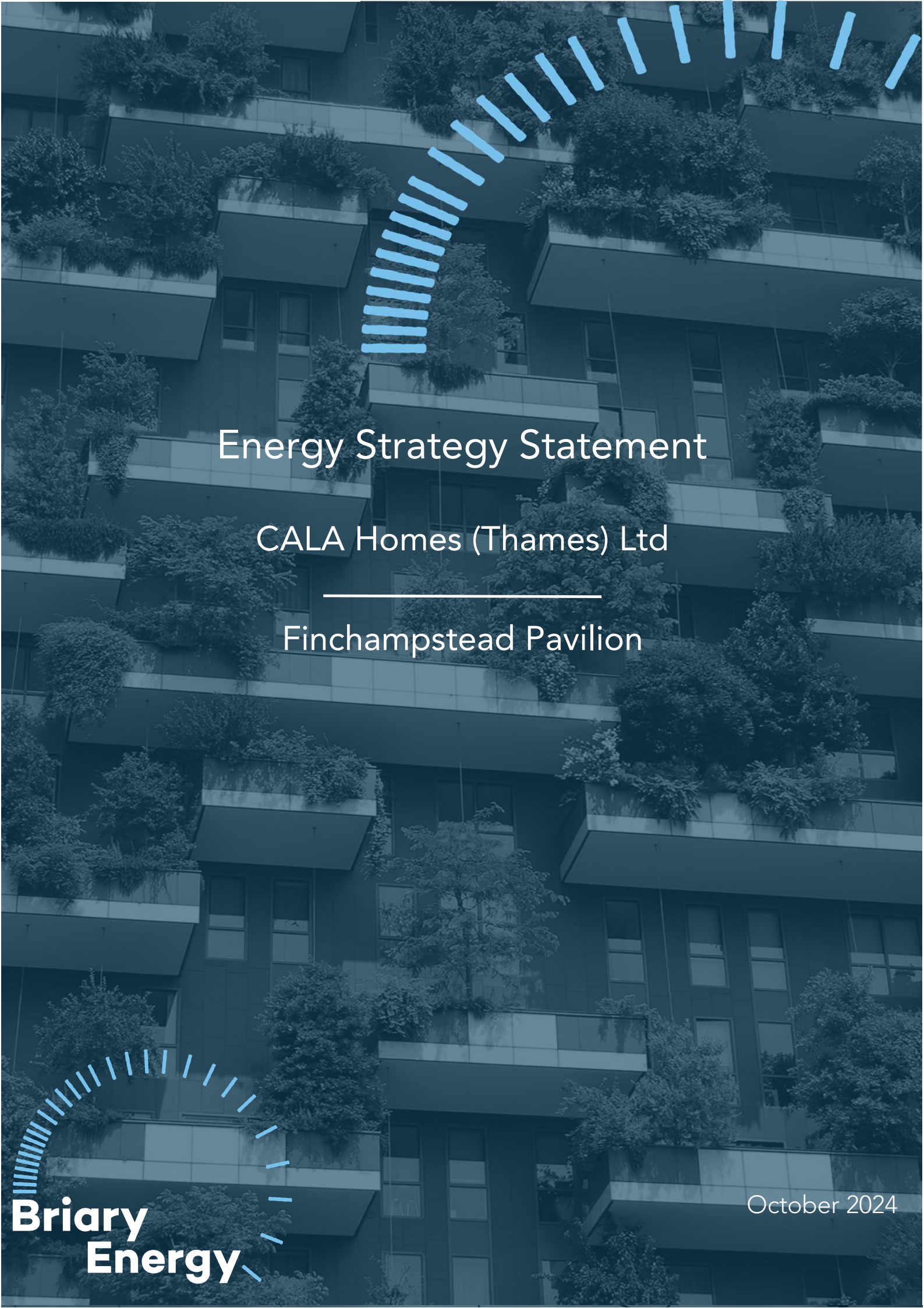




Energy Strategy Statement

CALA Homes (Thames) Ltd

Finchampstead Pavilion

1. Executive Summary

CALA Homes (Thames) Ltd has instructed Briary Energy to prepare this document, which examines the feasibility of suitable Low to Zero Carbon (LZC) sources, high-efficiency alternative systems, and low carbon energy efficiency measures required to meet local planning policy.

The Finchampstead Pavilion will consist of a - *"Reserved Matters application pursuant to Outline Planning Consent O/2014/2179, as varied by application 181194. The Reserved Matters comprise details of sports pitches, a pavilion, allotments, car parking and play areas, along with associated highways and drainage infrastructure."*

The developer will ensure a focus on minimising energy demand through fabric efficiency, before applying low-carbon heating and renewable energy.

Baseline CO₂ emissions are calculated using the Target Emission Rate (TER) of Part L 2021, Volume L: Buildings other than dwellings. The calculated TER is 35.45 kgCO₂.m².yr.

Compliance with Part L2 is achieved through U-Values exceeding target values, the specification of high efficiency lighting with suitable controls, and a renewable source of heating and hot water via an Air Source Heat Pump (ASHP) .

These achieve a Building Emission Rate (BER) of 31.56 CO₂.m².yr, a carbon reduction of 10.97%, therefore demonstrating compliance with condition 49 of outline consent ref. O/2014/2179 requiring the development to demonstrate a 10% reduction in carbon emissions beyond Part L compliance.

2. Local Policy - Wokingham Borough Local Development Framework

CP1 – Sustainable development

Planning permission will be granted for development proposals that:

- 1) Maintain or enhance the high quality of the environment;*
- 2) Minimise the emission of pollutants into the wider environment;*
- 3) Limit any adverse effects on water quality (including ground water);*
- 4) Ensure the provision of adequate drainage;*
- 5) Minimise the consumption and use of resources and provide for recycling;*
- 6) Incorporate facilities for recycling of water and waste to help reduce per capita water consumption;*
- 7) Avoid areas of best and most versatile agricultural land;*
- 8) Avoid areas where pollution (including noise) may impact upon the amenity of future occupiers;*
- 9) Avoid increasing (and where possible reduce) risks of or from all forms of flooding (including from groundwater);*
- 10) Provide attractive, functional, accessible, safe, secure and adaptable schemes;*
- 11) Demonstrate how they support opportunities for reducing the need to travel, particularly by private car in line with CP6; and*
- 12) Contribute towards the goal of reaching zero-carbon developments as soon as possible by:*

- a) Including appropriate on-site renewable energy features; and*
- b) Minimising energy and water consumption by measures including the use of appropriate layout and orientation, building form, design and construction, and design to take account of microclimate so as to minimise carbon dioxide emissions through giving careful consideration to how all aspects of development form.*

Planning Conditions

As part of demonstrating compliance with policy CP1 of the Core Strategy, the reserved matters must demonstrate compliance with the following planning condition -

Low and Zero Carbon Technologies

49. The reserved matters for each phase of the development shall include either:

- a. Details to demonstrate how the development will achieve a 10% reduction in carbon emissions beyond the minimum requirements of Part L: Building Regulations; or*
- b. An alternative strategy which can demonstrate a greater carbon saving than would be achieved by a. (above).*

3. National Planning Policy Framework (NPPF)

The latest National Planning Policy Framework (NPPF) sets out the Government's planning policies for England and how these are expected to be applied. At the heart of the NPPF is a presumption in favour of planning of sustainable development. The NPPF has guidance for developments to ensure they plan for climate change.

Achieving sustainable development

7. The purpose of the planning system is to contribute to the achievement of sustainable development. At a very high level, the objective of sustainable development can be summarised as meeting the needs of the present without compromising the ability of future generations to meet their own needs.

Planning for climate change

159. New development should be planned for in ways that:

- a) avoid increased vulnerability to the range of impacts arising from climate change. When new development is brought forward in areas which are vulnerable, care should be taken to ensure that risks can be managed through suitable adaptation measures, including through the planning of green infrastructure; and
- b) can help to reduce greenhouse gas emissions, such as through its location, orientation and design. Any local requirements for the sustainability of buildings should reflect the Government's policy for national technical standards.

160. To help increase the use and supply of renewable and low carbon energy and heat, plans should:

- a) provide a positive strategy for energy from these sources, that maximises the potential for suitable development, while ensuring that adverse impacts are addressed satisfactorily (including cumulative landscape and visual impacts);
- b) consider identifying suitable areas for renewable and low carbon energy sources, and supporting infrastructure, where this would help secure their development; and
- c) identify opportunities for development to draw its energy supply from decentralised, renewable or low carbon energy supply systems and for collocating potential heat customers and suppliers.

161. Local planning authorities should support community-led initiatives for renewable and low carbon energy, including developments outside areas identified in local plans or other strategic policies that are being taken forward through neighbourhood planning.

Paragraph 163 sets out what is expected from local authorities when considering strategies to mitigate and adapt to climate change:

163. When determining planning applications for renewable and low carbon development, local planning authorities should:

- a) not require applicants to demonstrate the overall need for renewable or low carbon energy, and recognise that even small-scale projects provide a valuable contribution to cutting greenhouse gas emissions; and
- b) approve the application if its impacts are (or can be made) acceptable. Once suitable areas for renewable and low carbon energy have been identified in plans, local planning authorities should expect subsequent applications for commercial scale projects outside these areas to demonstrate that the proposed location meets the criteria used in identifying suitable areas.

164. In determining planning applications, local planning authorities should give significant weight to the need to support energy efficiency and low carbon heating improvements to existing buildings, both domestic and non-domestic (including through installation of heat pumps and solar panels where these do not already benefit from permitted development rights). Where the proposals would affect conservation areas, listed buildings or other relevant designated heritage assets, local planning authorities should also apply the policies set out in chapter 16 of this Framework.

4. Energy hierarchy through design

The Finchampstead Pavilion will be developed with the aim of reducing annual energy consumption, whilst providing energy in the most environmentally friendly way to reduce the annual CO₂ footprint.

This strategy has been developed using established methodology (as recommended by CIBSE). It has three stages of priority, seeking to reduce energy use through the cleanest possible solutions.

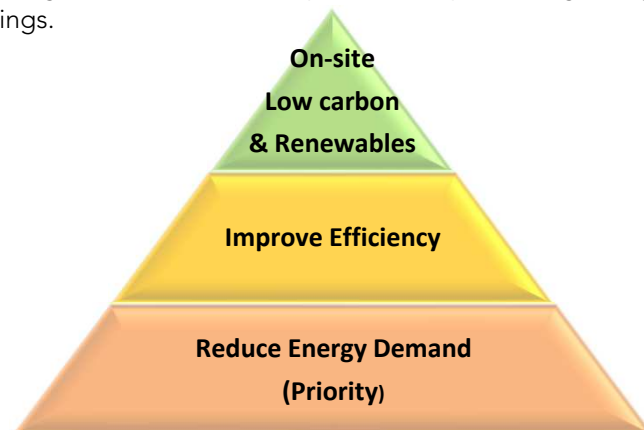
Be Lean - Reducing energy needs through improved design and construction.

Be Clean - Supply energy efficiently through the use of decentralised energy where feasible.

Be Green - Further reduce CO₂ emissions through the use of on-site renewable sources, where practical.

As this hierarchy demonstrates, designing out energy use is weighted more than the generation of low-carbon or renewable energy to offset unnecessary demand. Applied to the development of new buildings, this approach is referred to as 'fabric first' and concentrates finance and efforts on improving U-values, reducing thermal bridging, improving airtightness and installing energy efficient ventilation and heating services.

This approach has been widely supported by industry and government for some time, with previous reports from Zero Carbon Hub [1] and Energy Saving Trust [2] having both stressed the importance of prioritising energy demand as a key factor in delivering resilient, low energy buildings.



Further to the above methodology, the development looks at other steps towards achieving a low carbon solution, including:

- The incorporation of passive design solutions by considering orientation and layout solutions;
- The incorporation of energy efficiency measures through the design of services and improved fabric performance;
- Calculation of the predicted design energy consumption rates and associated annual CO₂ emissions in comparison with a 'baseline' building (using Part L Regulations compliance standards)
- Assessment of the viability of incorporating low and zero carbon energy sources.

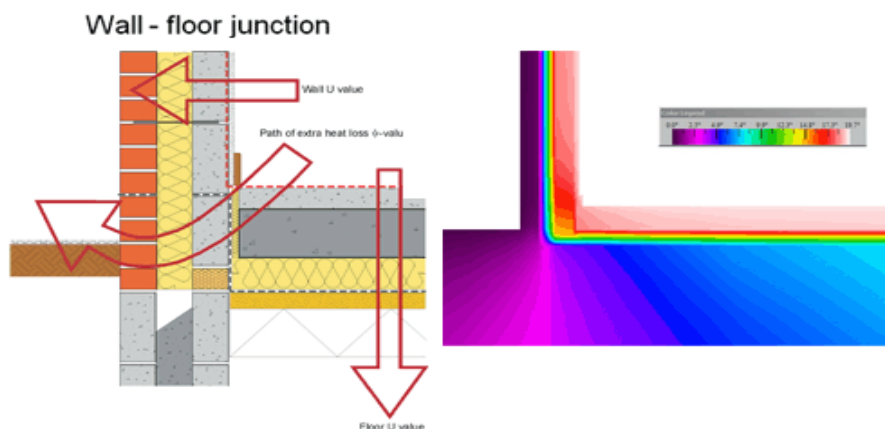
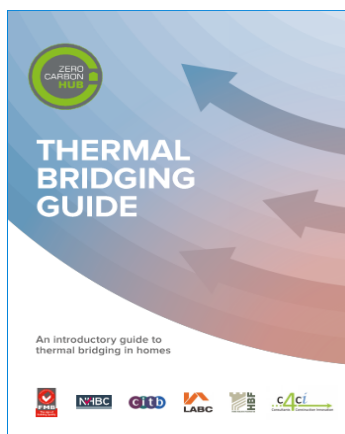
5. Be Lean - Energy efficient design measures

Enhancing the thermal performance of the building provides cost effective and reliable CO₂ savings for the long-term life cycle of the building, without the cost of replacing mechanical or electrical components on a continual basis. Adding renewable technology will then maximise these carbon reductions.

Element	Building Regulations	Proposed
Ground Floor	0.18 W/m ² k	0.16 W/m ² k
External Wall	0.26 W/m ² k	0.24 W/m ² k
Ins at Joists	0.16 W/m ² k	0.10 W/m ² k
Windows	1.60 W/m ² k	1.30 W/m ² k
Air Permeability	8.00 m ³ /hm ² (@50 Pa)	5* m ³ /hm ² (@50 Pa)

*Although non residential buildings with a floor area under 500m² can use an assumed air permeability figure of 15, the development will target a lower, actual air test figure to improve fabric efficiency and reduce heating demand.

Improving the thermal bridge constructive details can have a great impact on the heat loss of the development, in some cases using enhanced details can make as much as a 27% improvement on fabric alone.

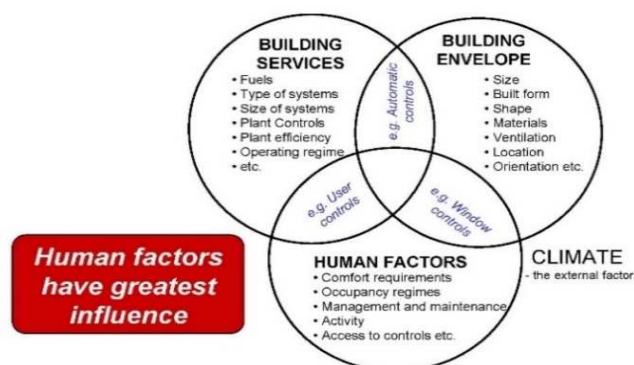


Additional improvements to thermal performance can be achieved by ensuring good practice airtightness targets are achieved. Simple measures like sealing around services (e.g. water, gas and cables), using proprietary seals and collars, ensuring blockwork is sealed and parging layer/plaster finish is applied to external walls before erecting studwork for internal partitions can all improve air tightness results.

6. Be Clean - Energy efficient M & E systems

Having reduced energy demand through the fabric first approach, we now look to specify mechanical and electrical systems with efficiencies that surpass the requirements of the Domestic and Non-domestic Building Services Compliance Guide (2013).

FACTORS THAT INFLUENCE ENERGY CONSUMPTION



The following energy efficient systems are proposed. This covers the clean mechanical and electrical systems, HVAC (heating, ventilation, air conditioning), hot water, lighting and efficient controls. Some renewable factors may be considered and included at this stage, i.e.: heat recovery, air source heat pumps or ground source heat pumps. The suitability of such technologies will be explored further within this report.

Element	Compliance	Proposed
Low energy lighting	95 lm/W	120 lm/W
Lighting Controls	None	Occupancy sensing (0.1W standby power)
Air Source Heat Pump	SCOP = 2.5	SCOP = 3.6
Mechanical Extract Ventilation (MEV)	2.0 l/W/s (SFP)	1.5 l/W/s (SFP)

7. District Heating

As part of planning, any major development proposal should evaluate feasibility of energy systems in accordance with the following hierarchy: -

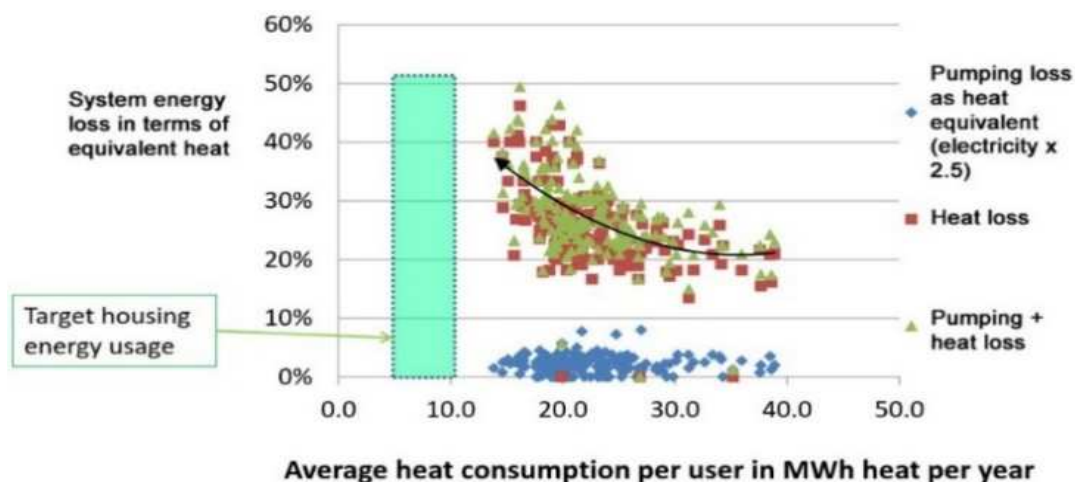
- Connection to existing heating and cooling networks;
- Site wide combined heat and power (CHP) network;
- Communal heating and cooling.

Over several years, building service engineers Max Fordham have studied the benefits and drawbacks of providing heat to buildings via hot water heat networks supplied from community scale heat sources, in particular combined heat and power (CHP). Government scenario planning includes predictions that by 2050 heat networks may supply about 20% of the UK's building heat demand [D. o. E. & C. Change, "National Energy Efficiency Data-Framework (NEED) report: Summary of analysis 2013 Part 1," DECC, 2013.]. It is clear that government policy is vigorously pursuing gas fired CHP with heat networks, but to what effect?

The issues are varied and complex, and include: consideration of the heat sources that may be in use in the future; the future strategy for national electricity generation; the difference between "as predicted" and "as measured"; the relationship to the intensity of heat demand; and the costs to the end users.

The most important aspect that Max Fordham concluded is that the heat network system heat losses are very large. They are much larger than the assumed values used in regulatory and system planning calculation methods (such as SAP). An unfortunate feature of this (district heating) debate is that good quality data from a wide range of UK installations is not available or not publishable due to its commercially sensitive nature. Clearly this situation is not helping the UK develop a low carbon heat strategy.

However, data from the Danish District Heating Association shows that from analysis of about 100 installations the heat losses in the municipal distribution pipes ranged from 15% to 45% of the heat supplied. This is only the loss up to the building site boundaries. There will be additional losses inside the buildings too. The current UK average domestic heat demand is 14MWhr/dwelling/yr. [D. o. E. a. C. Change, "National Energy Efficiency Data-Framework (NEED) Summary consumption statistics," DECC, 2011.]. At this scale the Danish data shows that a heat loss of around 35%. If the heat demand from buildings is reduced to less than 10 MWh/yr. (which is desirable) then the heat losses might represent 50% of the heat supplied.



Danish data of heat and pumping losses in district heating systems. Source: Birger Lauersen, International chef / Manager International Affairs, Dansk Fjernvarme / Danish District Heating Association

District Heating - Continued

High system heat losses (and pumping demands) mean that in many cases, gas fired CHP with heat networks will not reduce, but increase carbon emissions. This is particularly true when compared to using individual gas boilers and electricity from the current national grid. It is clear that heat networks need to be reassessed (by the UK Government) taking into account the true extent of heat losses and/or the mitigation measures required to reduce them. If this is done, we may well see quite a change in national and local policies for heat networks, with or without CHP.

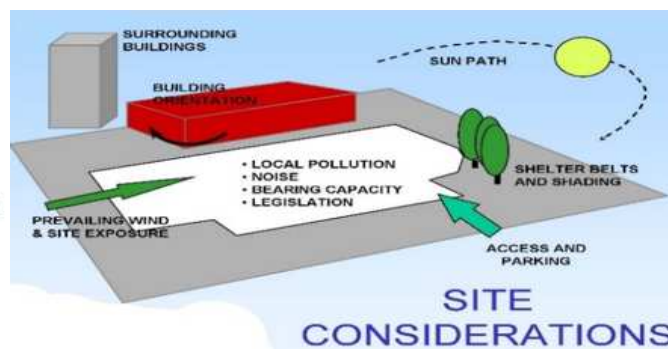
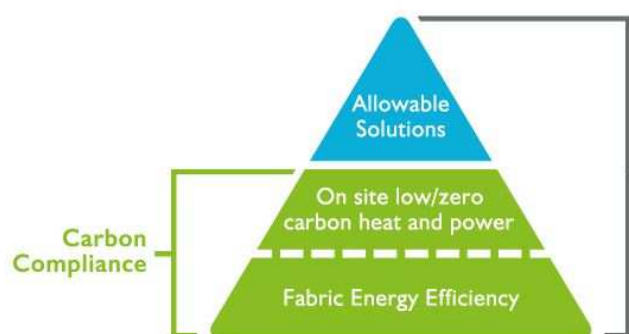
Our preference has always been a much more vigorous pursuit of heat demand reduction, principally by insulating and draught proofing existing buildings. From our observations of district heating systems we believe that the very high losses can be reduced with improved components, improved design and improved care during installation. However, it is highly unlikely that the system losses could be reduced to the levels that have informed current government policy anytime soon.

The development will not connect to any existing district heating system, nor will a new system be considered, for the following reasons:

- the site is mainly residential, with units dispersed over a large area. This will mean that a large distribution network would be required, and it is anticipated that distribution losses would be high.
- the carbon reduction and energy efficiency requirements can be achieved at a lower cost, and at a greater benefit to the homeowner the 'fabric first' approach is proposed.
- the site is too far away from existing District Heat networks.
- the home owners would be tied to the same supplier, removing choice.
- The statement on the previous page outlines why CHP and district heating systems are generally more expensive to run, consume more energy and issue more CO₂ than an equivalent "conventional" systems.

8. Low to Zero Carbon Technology Reductions

In order to satisfy local planning requirements, a detailed assessment of Low to zero carbon technologies will be carried out. Each energy efficiency measure has been considered to give a greater understanding of which solutions could be implemented at the development to provide energy and CO₂ savings beyond current building regulations. Feasibility is based on location, cost, payback for both initial payment and ongoing maintenance and suitability



Technologies Not Considered within following feasibility study -

- **Fuel Cells** : These are not yet fully commercially available
- **Hydro** : Small scale hydro would be inappropriate for integration into the proposed development due to the geographical location of the proposed site
- **CHP, Biomass and Biogas District heating**: These have been discounted under the District Heating Scheme section

Low to Zero Carbon Technology Reductions - cont.

8.1. Solar Hot Water

Solar water heating systems use heat from the sun to work alongside conventional primary water heaters. The technology is well developed with a large choice of equipment to suit many applications. There are three main components.

Solar collectors - fitted to the roof and collect heat from the sun's radiation. There are 2 main types of collector:

- Flat plate systems: comprised of an absorber plate with a transparent cover to collect the sun's heat
- Evacuated tube systems: comprised of a row of glass tubes that each contain an absorber plate feeding into a manifold which transports the heated fluid.

Heat transfer system - uses the collected heat to heat water

Hot water cylinder - stores the hot water that is heated during the day and supplies it for use later.

Proposed for this development?

No



All savings are approximate and are based on the hot water heating requirements of a 3 bed semi detached home. Solar water heating can be used in the home or for larger applications. A domestic system would typically require 3-4 square metres of southeast to southwest facing roof receiving direct sunlight for the main part of the day and space to locate an additional water cylinder.

Installation and maintenance costs - The typical installation cost for a domestic system is £3,000- £5,000. Evacuated tube systems are more advanced in design than flat plate, and so tend to be more expensive. Solar water heating systems generally come with a 5-10 year warranty. A yearly check by the householder and a more detailed check by a professional installer every 3-5 years should provide sufficient maintenance.

Not Proposed for this development because...

- While Solar Hot Water would be a viable technology, meeting hot water demand via an ASHP has been chosen as a suitable renewable technology to meet local and national policy requirements.

8.2. Photovoltaic Collectors (PV)

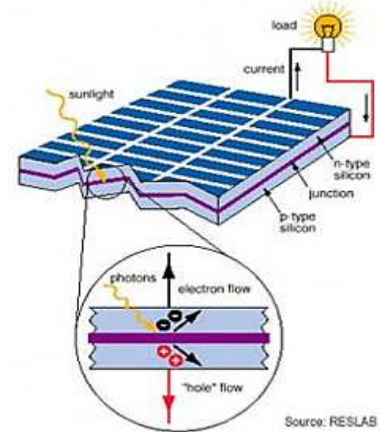
Proposed for this development?

No

Solar PV panels create electricity to run appliances and lighting from natural daylight (direct sunlight is not required) to generate electricity.

How it works

Photovoltaic cells convert solar radiation into electricity. The PV cell consists of one or two layers of a semi conducting material, usually silicon. When light shines on the cell it creates an electric field across the layers, causing electricity to flow. The greater the intensity of the light, the greater the flow of electricity. PV systems generate no greenhouse gases, saving approximately 325kg of carbon dioxide emissions per year- adding up to about 8 tonnes over a system's lifetime for each kilowatt peak (kWp). PV cells are referred to in terms of the amount of energy they generate in full sun light.



PV arrays 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. As well as enabling you to generate free electricity they can provide an interesting alternative to conventional roof tiles.

PV performs optimally with a roof or wall that faces within 90 degrees of south, as long as no other buildings or large trees overshadow it. If the roof surface is in shadow for parts of the day, the output of the system will decrease. The additional weight of PV will require the roof to be designed accordingly to carry the load. Solar PV installations should always be carried out by a trained and experienced installer. The area of PV required to provide 1kWp is around 6.5m².

Cost and maintenance

Prices for PV systems vary, depending on the size of the system to be installed, type of PV cell used and the nature of the building on which the PV is mounted. The size of the system is dictated by the amount of electricity required. For the average domestic system, costs can be around £1250-£2000 per kWp installed (energy saving trust 2017), with most domestic systems usually between 1.5 and 2 kWp. Solar tiles cost more than conventional panels, and panels that are integrated into a roof are more expensive than those that sit on top. Grid connected systems require very little maintenance, generally limited to ensuring that the panels are kept relatively clean and that shade from trees has not become a problem.

The wiring and components of the system should however be checked regularly by a qualified technician. Stand-alone systems, i.e. those not connected to the grid, need maintenance on other system components such as batteries.



Photovoltaic Collectors (PV) - continued

Proposed for this development?

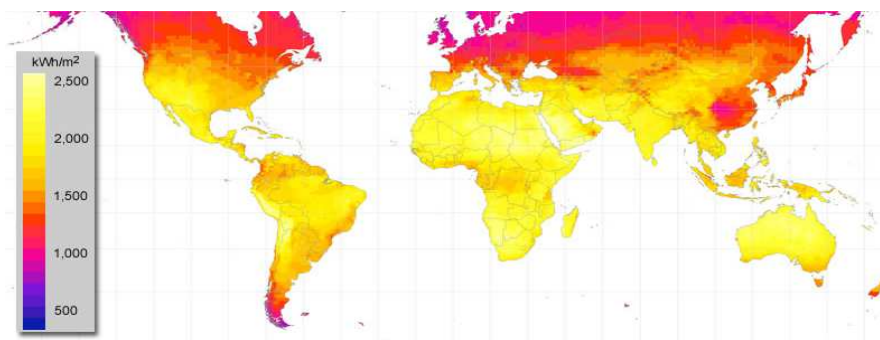
No

In determining the feasibility of Solar PV, energy output will be calculated through the equation - $E = A \times r \times H \times PR$, detailed below.

Loss details (dependent on site, technology, and sizing of the system)

Inverter losses	4%
Temperature losses	3%
DC cables losses	1%
AC cables losses	1%
Shadings	0%
Losses weak irradiation	1%
Losses due to dust, snow	1%
Other Losses	0%

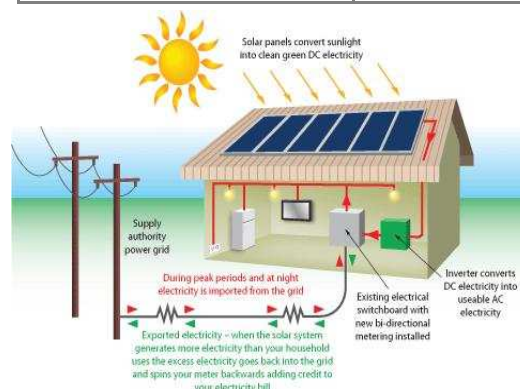
Yearly sum of global irradiance



	Total site kWp	PR = Perf Ratio	H = Annual irradiation	r=panel yield(%)	A=Panel Area(m²)	E=Energy (kWh)
South	0	0.89	1054	20%	0	0
SE/SW	0	0.89	997	20%	0	0
Horizontal	0	0.89	854	20%	0	0.00
NE/NW	0	0.89	686	20%	0	0.00
North	0	0.89	640	20%	0	0.00
	0				Total Energy kWh	0

PV Panels required to meet 0kWp output

250W Panels	0 Panels Required
300W Panels	0 Panels Required
350W Panels	0 Panels Required
400W Panels	0 Panels Required



Not Proposed for this development because...

- While Solar PV would be a viable technology, an ASHP has been chosen as a suitable renewable technology to meet local and national policy requirements.

8.3. Micro wind turbine

Proposed for this development?

No

Wind turbines use the wind's lift forces to rotate aerodynamic blades that turn a rotor which creates electricity. In the UK we have 40% of Europe's total wind energy.

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 to AC (alternating current- mains electricity). Wind systems can also be connected to the national grid. An inverter and controller convert DC electricity to AC at a quality and standard acceptable to the grid. No battery storage is required. Any unused or excess electricity may be able to be exported to the grid and sold to the local electricity supply company.

There are two types of wind turbines -

- Mast mounted - free standing and located near the building(s) that will be using the electricity.
- Roof mounted- can be installed on house roofs and other buildings



Potential Benefits

Wind power is a clean, renewable source of energy which produces no carbon dioxide emissions or waste products. Individual turbines vary in size and power output from a few hundred watts to two or three megawatts (as a guide, a typical domestic system would be 1- 6 kilowatts). Uses range from very small turbines supplying energy for battery charging systems (e.g. on boats or in homes), to turbines on wind farms supplying electricity to the grid.

Not Proposed for this development because...

The Government wind speed database predicts local wind speeds at Finchampstead Pavilion to be 4.8 m/s at 10m above ground level, 5.6 m/s at 25m above ground level and 6 m/s at 45m above ground level. This is below the level generally required for commercial investment in large wind turbines.

- Large potential land take, noise pollution and signal interference make a large wind turbine unsuitable for this development
- Horizontal axis micro-wind turbines only reduce carbon emissions by a small amount. High winds can cause the turbine to be stationary
- Health and safety is a factor, with high speed moving parts mechanical failure can be catastrophic to human life, birds and wildlife
- The turbine flicker effect means that the turbine needs to be at least 400 metres from the nearest dwelling and computer controlled to take into account the position of the sun

8.4. Biomass

Biomass is produced from organic materials, either directly from plants or indirectly from industrial, commercial, domestic or agricultural products. It is often called 'bio energy' or 'bio fuels'. It does not include fossil fuels, which have taken millions of years to be created.

Biomass falls into two main categories -

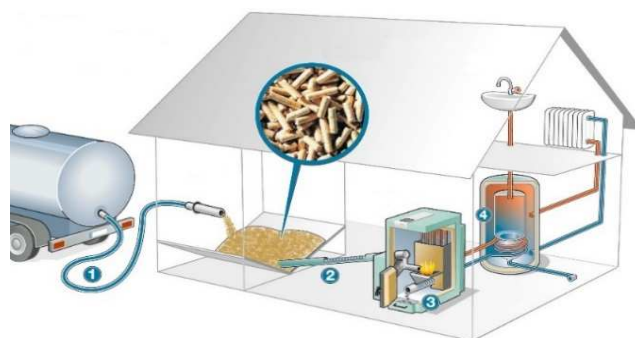
- Woody biomass: includes forest products, untreated wood products, energy crops and short rotation coppice (SRC), which are quick-growing trees like willow.
- Non-woody biomass: includes animal waste, industrial and biodegradable municipal products from food processing and high energy crops. Examples are rape, sugar cane, maize.

Planning

If the building is listed or in an area of outstanding natural beauty (AONB), then you will need to check with your Local Authority Planning Department before a flue is fitted.

Costs and savings

Stand alone room heaters generally cost £2,000 to £4,000, installed. Savings will depend on how much they are used and which fuel is being replaced. A biomass stove which provides a detached home with 10% of annual space heating requirements could save around 840kg of carbon dioxide when installed in an electrically heated home. Due to the higher cost of biomass pellets compared with other traditional heating fuels, and the relatively low efficiency of the stove compared to a central heating system it will cost more to run. The cost for boilers varies depending on the system choice; a typical 15kW (average size required for a three bedroom semi detached house) pellet boiler would cost around £5,000-£14,000, installed, including the cost of the flue and commissioning. A manual log feed system of the same size would be slightly cheaper. A wood pellet boiler could save around £750 a year in energy bills and around 6 tonnes of CO₂ per year when installed in an electrically heated home.



Proposed for this development?

No

Not Proposed for this development because...

Although it is considered that Biomass is a carbon neutral technology thanks to the CO₂ being absorbed by growing new trees, it is not viable at the Mill Court development.

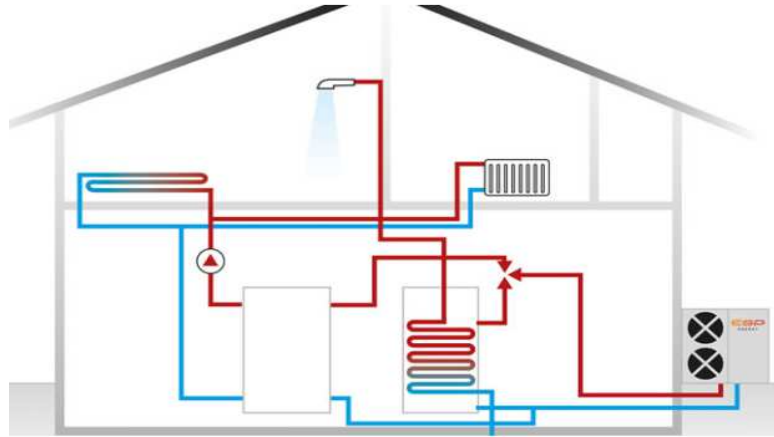
- With pollution levels consistently increasing, biomass can lead to an increase in air particulate levels.
- Wood is a major source of biomass energy. Producing biomass fuel on a large scale can lead to deforestation
- Delivering the fuel can lead to additional traffic, causing pollution and delays.

8.5. Heat Pumps (ASHP & GSHP)

Proposed for this development?

Yes

Heat pumps work in a similar way to fridges and air conditioners and absorb heat typically from the ground or from the air. Heat is transferred via the 'refrigeration cycle' using heat exchangers. Heat pumps can generate electricity with efficiencies in excess of 300%



Proposed for this development because...

Heat pump systems reduce carbon emissions and have an efficient conversion rate from energy to heat. Being coupled with low temperature radiators or under floor heating improves the heating efficiency.

- Moving away from fossil fuel heating is in line with government policy and the proposed Future Homes Standard
- Increased generation of grid electricity from renewable sources has reduced the associated carbon costs of electric heating
- Heat pumps require less maintenance than a combustion heating system. Depending on the size of the units they only require inspection by a professional every 3-5 years

8.6. Flue Gas Heat Recovery Systems (FGHRS)

Proposed for this development?

No

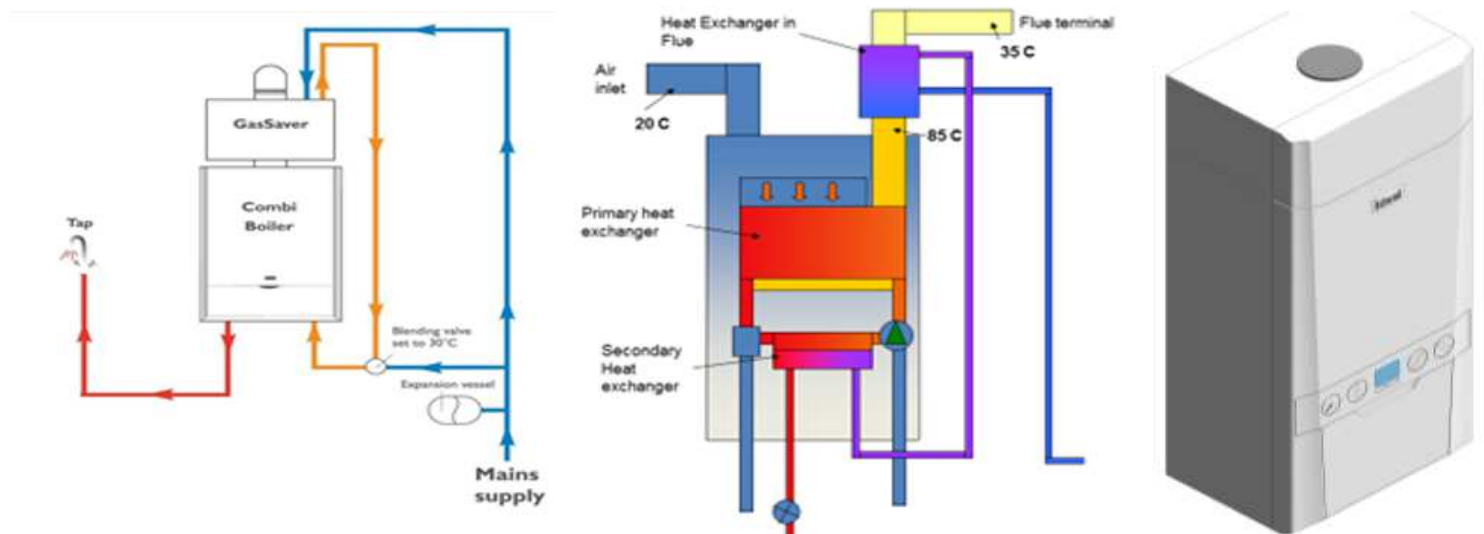
FGHRS can provide a reduction in CO₂ emissions compared to some technologies that are classified and listed as LZC technologies yet produce emissions in excess of a Natural Gas energy model.

FGHRS take advantage of the heat within the waste flue gasses resulting from the combustion of gas in the boiler. This recovered heat is used to preheat the cold water entering the boiler, thereby lowering the amount of energy needed to warm the water up to the required temperature. This principle can be applied to mains gas, LPG or oil condensing boilers.

The system requires very little maintenance, with no need for mains electricity. These systems should be planned in early as there are additional space requirements for the FGHRS. Some boilers have the system built in, and in others it takes the form of a "top box". It is important that the specific boiler and FGHRS are compatible so check this with the manufacturer or seek further advice.

FGHRS has no specific land use requirements or additional planning requirements.

FGRS can be either a "wet" or "dry" configuration



Not Proposed for this development because...

Flue Gas Heat Recovery Systems are not the most effective carbon reducing technology for the Finchampstead Pavilion development. They are better suited to small dwellings with no more than five occupants and two bathrooms, although there are some devices that are capable of providing hot water or central heating to larger dwellings and even non-domestic buildings. These types are less efficient and can often require continual servicing and calibration.

8.7. Waste Water Heat Recovery Systems

Proposed for this development?

No

Following Directive (EU) 2018/2001 of the European Parliament and of the Council, 11 December 2018, Waste Water Heat Recovery (WWHR) is defined as a source of renewable energy, stating -

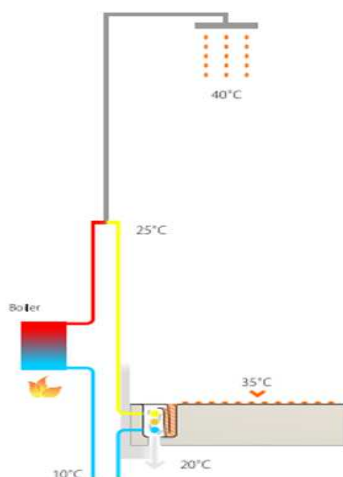
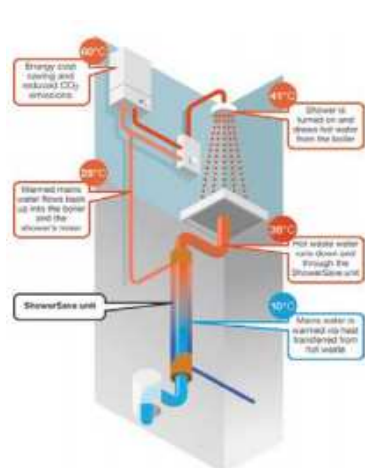
(1) 'energy from renewable sources' or 'renewable energy' means energy from renewable non-fossil sources, namely wind, solar (solar thermal and solar photovoltaic) and geothermal energy, ambient energy, tide, wave and other ocean energy, hydropower, biomass, landfill gas, sewage treatment plant gas, and biogas;

(2) 'ambient energy' means naturally occurring thermal energy and energy accumulated in the environment with constrained boundaries, which can be stored in the ambient air, excluding in exhaust air, or in surface or sewage water;

Shower Save (Figures 1 & 2) Waste Water Heat Recovery Systems (WWHRs) is a Dutch technology, where in The Netherlands, they are fitted to 20% of new dwellings. Although generically classified as a WWHRs, the Shower-Save device is primarily applicable to heat recovery from warm shower waste water.

The most common configuration known as QB-21, is applicable to upstairs showers, whilst the Linear Drain can be used in apartments, bungalows or other single storey properties. The principle of heat recovery is the same in both cases -

- Warm shower water passes through the 'grey' water side of a copper counter-flow heat exchanger
- Mains pressure water simultaneously passes through the fresh water side of the heat exchanger, where it is pre-heated before passing into both the 'cold' inlet of the mixer shower and the 'cold' inlet to the hot water cylinder, combi boiler or other water heater.
- The use of pre-heated water (orange line below) reduces the total volume of hot water required per shower, whilst also pre-heating the cold feed to the hot water heater which increases potential flow rates for combi or shortens the re-heat time of cylinders. The energy saving applies to whichever fuel is used for water heating, which is therefore not limited solely to gas boilers. Whilst technically applicable to instantaneous electric showers, these ARE NOT currently modelled by SAP, so it is not possible to apply in Appendix Q either. WWHRs does not save energy from baths, in which hot water use is in advance of grey water disposal, but it is applicable to the shower over a bath.



Not Proposed for this development because...

- While WWHR would be a viable technology, meeting hot water demand via an ASHP has been chosen as a suitable renewable technology to meet local and national policy requirements.

9. Energy Performance

The table below details the calculation of the Part L Baseline and the carbon savings that have been achieved through the application of energy efficiency measures as set out within this statement, ensuring that the energy hierarchy is followed in achieving compliance with CP1.

Part L Baseline	35.45 kgCO ₂ per sq.m. pa
Target BER: 10% reduction over Part L Baseline	31.91 kgCO ₂ per sq.m. pa
Actual BER	31.56 kgCO ₂ per sq.m. pa
Carbon reduction achieved	10.97%

10. Conclusion

This energy statement has been prepared in support of the proposals for the Finchampstead site Pavilion and associated works. Local Planning Policy for the development requires that demand reduction measures are implemented to achieve an improvement of 10% carbon over Part L2 2021 standards.

Demand reduction following the energy hierarchy has been prioritised. The benefits to the resident of this approach have been discussed in detail, which include an improvement in thermal comfort, lower energy bills, and minimising maintenance requirements. These benefits are realised alongside the crucial aspect of the long-term reduction in energy demand that is built into the lifetime of the dwellings.

The application of the energy hierarchy, including an Air Source Heat Pump to provide efficient heating and hot water achieves a 10.97% improvement over Part L 2021.

Project name

Shell and Core

Pavilion

As designed

Date: Tue Oct 22 13:58:32 2024

Administrative information

Building Details

Address:

Certifier details

Name: Gareth Thomas

Telephone number: 0330 223 6960

Address: Bishops Court 17a The Broadway, Old Hatfield,
AL9 5HZ

Certification tool

Calculation engine: SBEM

Calculation engine version: v6.1.e.0

Interface to calculation engine: DesignBuilder SBEM

Interface to calculation engine version: v7.1.4

BRUKL compliance module version: v6.1.e.0

Foundation area [m²]: 355.15The CO₂ emission and primary energy rates of the building must not exceed the targets

Target CO ₂ emission rate (TER), kgCO ₂ /m ² annum	35.45
Building CO ₂ emission rate (BER), kgCO ₂ /m ² annum	31.56
Target primary energy rate (TPER), kWh _{PE} /m ² annum	385.09
Building primary energy rate (BPER), kWh _{PE} /m ² annum	342.44
Do the building's emission and primary energy rates exceed the targets?	BER ≤ TER BPER ≤ TPER

The performance of the building fabric and fixed building services should achieve reasonable overall standards of energy efficiency

Fabric element	U _a -Limit	U _a -Calc	U _i -Calc	First surface with maximum value
Walls*	0.26	0.24	0.24	Block 1 - Kitchen_W_8
Floors	0.18	0.16	0.16	Block 1 - Kitchen_S_3
Pitched roofs	0.16	0.13	0.16	Showers wall - Showers_R_12
Flat roofs	0.18	-	-	No heat loss flat roofs
Windows** and roof windows	1.6	1.31	1.4	Changing 1 - Changing_G_7
Rooflights***	2.2	-	-	No external rooflights
Personnel doors^	1.6	1.6	1.6	WC 2 - WC_D_4
Vehicle access & similar large doors	1.3	-	-	No external vehicle access doors
High usage entrance doors	3	-	-	No external high usage entrance doors

U_a-Limit = Limiting area-weighted average U-values [W/(m²K)]U_i-Calc = Calculated maximum individual element U-values [W/(m²K)]U_a-Calc = Calculated area-weighted average U-values [W/(m²K)]

* Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for windows.

** Display windows and similar glazing are excluded from the U-value check.

*** Values for rooflights refer to the horizontal position.

^ For fire doors, limiting U-value is 1.8 W/m²K

NB: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.

Air permeability	Limiting standard	This building
m ³ /(h.m ²) at 50 Pa	8	5

Building services

For details on the standard values listed below, system-specific guidance, and additional regulatory requirements, refer to the Approved Documents.

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	NO
Whole building electric power factor achieved by power factor correction	<0.9

1- Project HVAC

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	3.6	-	-	-	-
Standard value	2.5*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.					

1- Project DHW

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	Hot water provided by HVAC system	-
Standard value	N/A	N/A

Zone-level mechanical ventilation, exhaust, and terminal units

ID	System type in the Approved Documents
A	Local supply or extract ventilation units
B	Zonal supply system where the fan is remote from the zone
C	Zonal extract system where the fan is remote from the zone
D	Zonal balanced supply and extract ventilation system
E	Local balanced supply and extract ventilation units
F	Other local ventilation units
G	Fan assisted terminal variable air volume units
H	Fan coil units
I	Kitchen extract with the fan remote from the zone and a grease filter
NB: Limiting SFP may be increased by the amounts specified in the Approved Documents if the installation includes particular components.	

Zone name	SFP [W/(l/s)]										HR efficiency	
	ID of system type	A	B	C	D	E	F	G	H	I	Zone	Standard
	Standard value	0.3	1.1	0.5	2.3	2	0.5	0.5	0.4	1		
Block 1 - Changing		-	-	-	-	1.5	-	-	-	-	-	N/A
Block 1 - WC 1		-	-	-	-	1.5	-	-	-	-	-	N/A
Block 1 - WC 2		-	-	-	-	1.5	-	-	-	-	-	N/A
Block 1 - WC		-	-	-	-	1.5	-	-	-	-	-	N/A
Showers wall - Showers		-	-	-	-	1.5	-	-	-	-	-	N/A
WC - WC		-	-	-	-	1.5	-	-	-	-	-	N/A
WC 2 - WC		-	-	-	-	1.5	-	-	-	-	-	N/A
Changing 1 - Changing		-	-	-	-	1.5	-	-	-	-	-	N/A
Changing 2 - Changing		-	-	-	-	1.5	-	-	-	-	-	N/A
WC 3 - WC		-	-	-	-	1.5	-	-	-	-	-	N/A
WC 4 - WC		-	-	-	-	1.5	-	-	-	-	-	N/A
Showers - Showers		-	-	-	-	1.5	-	-	-	-	-	N/A

Shell and core configuration

Zone	Assumed shell?
Block 1 - Kitchen	NO

Shell and core configuration

Zone	Assumed shell?
Block 1 - Changing	NO
Block 1 - Lobby	NO
Block 1 - Club Room	NO
Block 1 - Corridor	NO
Block 1 - Store	NO
Block 1 - WC 1	NO
Block 1 - WC 2	NO
Block 1 - WC	NO
Showers wall - Showers	NO
WC - WC	NO
Lobby - Lobby	NO
WC 2 - WC	NO
Lobby 1 - Lobby	NO
Store - Store	NO
Changing 1 - Changing	NO
Changing 2 - Changing	NO
Block 2 - Office	NO
Block 2 - Cleaners Store	NO
WC 3 - WC	NO
WC 4 - WC	NO
Lobby 2 - Lobby	NO
Showers - Showers	NO

General lighting and display lighting		General luminaire	Display light source	
Zone name		Efficacy [lm/W]	Efficacy [lm/W]	Power density [W/m²]
	Standard value	95	80	0.3
Block 1 - Kitchen		120	-	-
Block 1 - Changing		120	-	-
Block 1 - Lobby		120	120	1.125
Block 1 - Club Room		120	-	-
Block 1 - Corridor		120	-	-
Block 1 - Store		120	-	-
Block 1 - WC 1		120	-	-
Block 1 - WC 2		120	-	-
Block 1 - WC		120	-	-
Showers wall - Showers		120	-	-
WC - WC		120	-	-
Lobby - Lobby		120	-	-
WC 2 - WC		120	-	-
Lobby 1 - Lobby		120	-	-
Store - Store		120	-	-
Changing 1 - Changing		120	-	-
Changing 2 - Changing		120	-	-
Block 2 - Office		120	-	-
Block 2 - Cleaners Store		120	-	-

General lighting and display lighting		General luminaire	Display light source	
Zone name		Efficacy [lm/W]	Efficacy [lm/W]	Power density [W/m ²]
	Standard value	95	80	0.3
WC 3 - WC		120	-	-
WC 4 - WC		120	-	-
Lobby 2 - Lobby		120	-	-
Showers - Showers		120	-	-

The spaces in the building should have appropriate passive control measures to limit solar gains in summer

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
Block 1 - Kitchen	NO (-40.7%)	NO
Block 1 - Lobby	NO (-44.4%)	NO
Block 1 - Club Room	NO (-4.5%)	NO
Block 2 - Office	NO (-79.3%)	NO

Regulation 25A: Consideration of high efficiency alternative energy systems

Were alternative energy systems considered and analysed as part of the design process?	YES
Is evidence of such assessment available as a separate submission?	NO
Are any such measures included in the proposed design?	NO

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Floor area [m ²]	355.2	355.2
External area [m ²]	1001	1001
Weather	LON	LON
Infiltration [m ³ /hm ² @ 50Pa]	5	3
Average conductance [W/K]	234.91	261.08
Average U-value [W/m ² K]	0.23	0.26
Alpha value* [%]	7.98	21.94

* Percentage of the building's average heat transfer coefficient which is due to thermal bridging

Building Use

% Area Building Type

Retail/Financial and Professional Services
 Restaurants and Cafes/Drinking Establishments/Takeaways
 Offices and Workshop Businesses
 General Industrial and Special Industrial Groups
 Storage or Distribution
 Hotels
 Residential Institutions: Hospitals and Care Homes
 Residential Institutions: Residential Schools
 Residential Institutions: Universities and Colleges
 Secure Residential Institutions
 Residential Spaces
 Non-residential Institutions: Community/Day Centre
 Non-residential Institutions: Libraries, Museums, and Galleries
 Non-residential Institutions: Education
 Non-residential Institutions: Primary Health Care Building
 Non-residential Institutions: Crown and County Courts
100 General Assembly and Leisure, Night Clubs, and Theatres
 Others: Passenger Terminals
 Others: Emergency Services
 Others: Miscellaneous 24hr Activities
 Others: Car Parks 24 hrs
 Others: Stand Alone Utility Block

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	15.61	12.56
Cooling	0	0
Auxiliary	8.92	6.93
Lighting	11.6	10.88
Hot water	189.63	230.18
Equipment*	25.18	25.18
TOTAL **	225.76	260.54

* Energy used by equipment does not count towards the total for consumption or calculating emissions.

** Total is net of any electrical energy displaced by CHP generators, if applicable.

Energy Production by Technology [kWh/m²]

	Actual	Notional
Photovoltaic systems	0	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
<i>Displaced electricity</i>	<i>0</i>	<i>0</i>

Energy & CO₂ Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m ²]	273.63	202.77
Primary energy [kWh _{PE} /m ²]	342.44	385.09
Total emissions [kg/m ²]	31.56	35.45

HVAC Systems Performance										
System Type	Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEFF	Cool SSEER	Heat gen SEFF	Cool gen SEER	
[ST] Central heating using water: radiators, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	180.5	93.1	15.6	0	8.9	3.21	0	3.6	0
	Notional	119.4	83.4	12.6	0	4.3	2.64	0	----	----

Key to terms

- Heat dem [MJ/m2] = Heating energy demand
- Cool dem [MJ/m2] = Cooling energy demand
- Heat con [kWh/m2] = Heating energy consumption
- Cool con [kWh/m2] = Cooling energy consumption
- Aux con [kWh/m2] = Auxiliary energy consumption
- Heat SSEFF = Heating system seasonal efficiency (for notional building, value depends on activity glazing class)
- Cool SSEER = Cooling system seasonal energy efficiency ratio
- Heat gen SSEFF = Heating generator seasonal efficiency
- Cool gen SSEER = Cooling generator seasonal energy efficiency ratio
- ST = System type
- HS = Heat source
- HFT = Heating fuel type
- CFT = Cooling fuel type