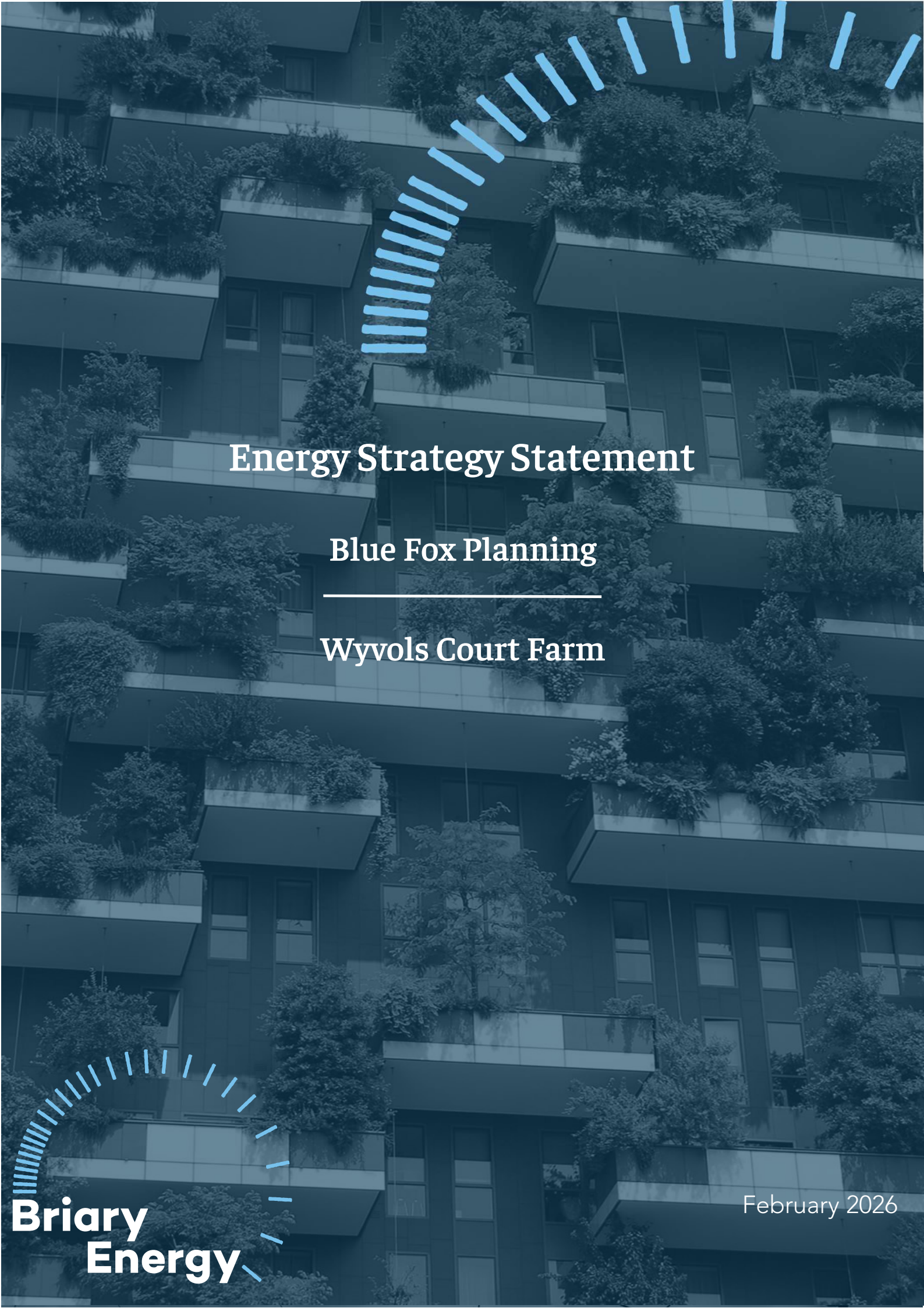




Energy Strategy Statement

Blue Fox Planning

Wyvols Court Farm

1. Executive Summary

Blue Fox Planning 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.

The Wyvols Court Farm development will comprise of 3 commercial units of B2/B8 use class. The development prioritises initial energy demand reduction through fabric efficiency measures, before assessing low carbon and renewable targets as required to meet building regulation and local planning policy targets. The energy consumption figures for the development are based on figures for each building type from the National Calculation Methodology (NCM) 2021 for buildings other than dwellings in England.

1.1. Local Policy

The Wokingham Borough Development Plan, Policy CC05: Renewable energy and decentralised energy networks, states that -

1. Local opportunities to contribute towards decentralised energy supply from renewable and low-carbon technologies will be encouraged
2. Planning permission will only be granted for proposals that deliver a minimum 10% reduction in carbon emissions through renewable energy or low carbon technology where the development is for:
 - a) Schemes of more than 10 dwellings (gross), or
 - b) Non-residential proposals of more than 1,000 sq m gross floorspace.
3. Proposals for renewable energy and decentralised energy works, including wind turbines, must demonstrate that:
 - a) They are appropriate in scale, location and technology type;
 - b) Are compatible with the surrounding area, including the impact of noise and odour;
 - c) Do not have a damaging impact on the local topography and landscape;
 - d) There is no significant impact upon heritage assets, including views important to their setting;
 - e) In the case of wind turbines, take account of their cumulative effect and properly reflect their increasing impact on the landscape and on local amenity

1.2. Policy Response

The strategy calculates the total energy demand and associated CO₂ emissions arising from the development, demonstrating that after initial demand reduction through fabric efficiency measures, a 10% carbon reduction from renewables can be achieved through applying 14.25kWp Solar PV and use of an Air Source Heat Pump (ASHP) for heating and cooling.

1.3 Site Plan

The image below provides an overview of the development that is proposed within this application



O3arch.
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Rev	Revision Details	Date
E	Plotting updated	30/01/23
D	Acoustic fence added	10/01/23
C	Updated to include SHG enhancement	14/12/22
B	Screening to unit 9 increased	04/12/22
A	Pre-planning issue for review	03/12/22
-	Preliminary Issue	20/10/22

Notes
This drawing is not to be scaled, except for the purposes of planning applications where the scale and measurement should always refer to signed dimensions. Verify dimensions on site prior to construction and report discrepancies immediately. This drawing is to be read in conjunction with all relevant documents and drawings.
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Drawing Title:
Site Plan as Proposed
Scale:
1:500 @ A3

Client's Name:
Wyvols Court Farm Ltd
Job Title:
Units 8 - 10 Wyvols Court Farm

Drawn:
Author:
Date:

Checked:
Checker:
Date:

Job No:
2506
Drawing No:
230
Status:
PLANNING

Rev:
E
30/01/2023 16:37:20

2. 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, including the provision of homes, commercial development, and supporting infrastructure in a sustainable manner. 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 needs⁴. At a similarly high level, members of the United Nations – including the United Kingdom – have agreed to pursue the 17 Global Goals for Sustainable Development in the period to 2030. These address social progress, economic well-being and environmental protection⁵.

159. The improvements to green spaces required as part of the Golden Rules should contribute positively to the landscape setting of the development, support nature recovery and meet local standards for green space provision where these exist in the development plan. Where no locally specific standards exist, development proposals should meet national standards relevant to the development (these include Natural England standards on accessible green space and urban greening factor and Green Flag criteria). Where land has been identified as having particular potential for habitat creation or nature recovery within Local Nature Recovery Strategies, proposals should contribute towards these outcomes.

161. The planning system should support the transition to net zero by 2050 and take full account of all climate impacts including overheating, water scarcity, storm and flood risks and coastal change. It should help to: shape places in ways that contribute to radical reductions in greenhouse gas emissions, minimise vulnerability and improve resilience; encourage the reuse of existing resources, including the conversion of existing buildings; and support renewable and low carbon energy and associated infrastructure.

162. Planning for climate change

Plans should take a proactive approach to mitigating and adapting to climate change, taking into account the long-term implications for flood risk, coastal change, water supply, biodiversity and landscapes, and the risk of overheating and drought from rising temperatures⁶¹. Policies should support appropriate measures to ensure the future health and resilience of communities and infrastructure to climate change impacts, such as providing space for physical protection measures, or making provision for the possible future relocation of vulnerable development and infrastructure.

164. 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 incorporating green infrastructure and sustainable drainage systems; and
- b) help to reduce greenhouse gas emissions, such as through its location, orientation and design. Any local requirements for the sustainability of buildings in plans should reflect the Government's policy for national technical standards.

167. local planning authorities should also 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.

3. Energy hierarchy through design

The Wyvols Court Farm development 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.

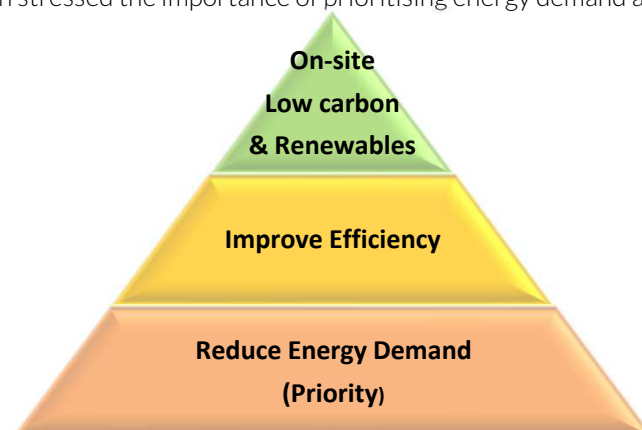
Be Lean - Reducing energy needs through improved design and construction.

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 housing, 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 homes.



Further to the above methodology, we have also looked at other steps towards achieving a low carbon solution, including:

- The incorporation of passive design solutions by considering the dwellings 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) to include both regulated and un-regulated energy use;
- Assessment of the viability of incorporating low and zero carbon energy sources.

Benefits of the Fabric First Approach	Fabric Energy Efficiency Measures	Bolt on renewable energy technologies
Energy/CO ₂ /fuel bill savings applied to all dwellings	✓	X
Savings built-in for life of dwelling	✓	X
Highly cost-effective	✓	X
Increases thermal comfort	✓	X
Potential to promote energy conservation	✓	✓
Minimal ongoing maintenance / replacement costs	✓	X
Minimal disruption to retrofit post occupation	✓	X

[1] Zero Carbon Hub, Zero Carbon Strategies for tomorrow's new homes, Feb 2013.

[2] Energy Saving Trust, Fabric first: Focus on fabric and services improvements to increase energy performance in new homes, 2010

4. Be Lean - Energy efficient design measures

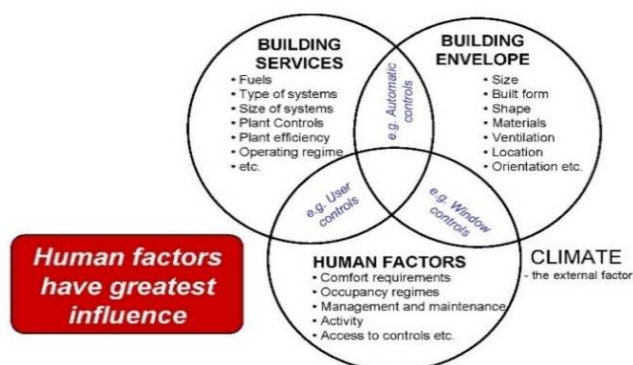
Enhancing the thermal performance of the building can be more cost effective than providing renewable energy, with more reliable CO₂ savings for the long-term life cycle of the building, without the cost of replacing mechanical or electrical components on a continual basis. Adding renewable technology will then maximise these carbon reductions, reducing the quantity required.

Element	Building Regulations	Proposed
Ground Floor	0.18 W/m ² k	0.18 W/m ² k
External Wall	0.26 W/m ² k	0.15 W/m ² k
Ins Joist	0.18 W/m ² k	N/A W/m ² k
Ins Rafter	0.16 W/m ² k	0.15 W/m ² k
Windows	1.60 W/m ² k	1.00 W/m ² k
Doors	1.60 W/m ² k	1.60 W/m ² k
Vehicle Access Door	1.30 W/m ² k	1.30 W/m ² k
Rooflights	2.20 W/m ² k	1.00 W/m ² k
Air Permeability	8.00 m ³ /hm ² (@50 Pa)	8.00 m ³ /hm ² (@50 Pa)
Thermal Bridges	0.15 ≤ Y	Calculated Constructive Details

5. 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 (efficacy $\geq 45\text{lm/W}$)	95 lm/W	95 lm/W
ASHP	SCOP: 2.50	SCOP: 2.50
Shower Save (WWHRS)	N/A	N/A
Instant Hot Water	100%	100%
Heating controls	N/A	N/A
Advanced controls	N/A	N/A
Ventilation	0.3 W/(l/s) (SFP)	0.3 W/(l/s) (SFP)

6. District Heating

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

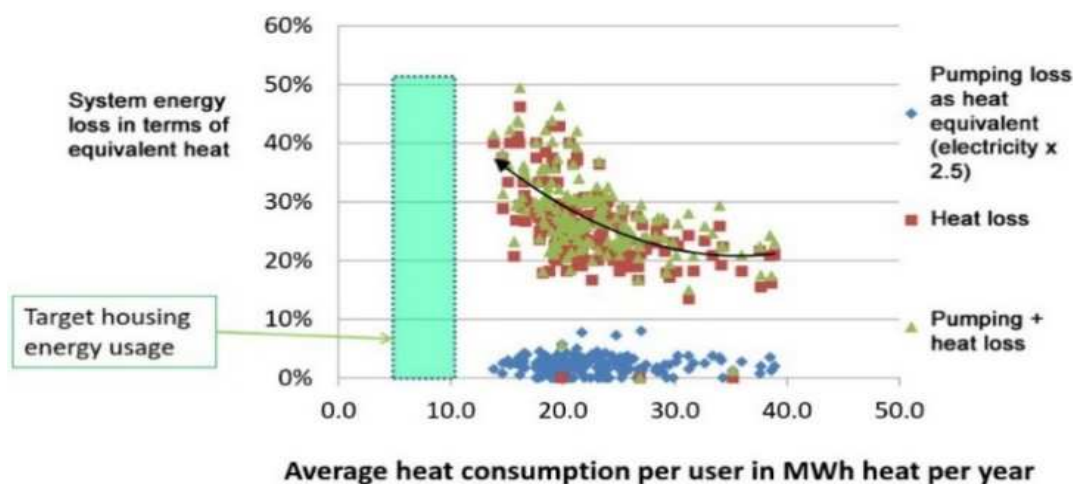
- Connection to existing heating and cooling networks;
- Site wide combined heat and power (CHP) network;
- Communal heating and cooling.

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.

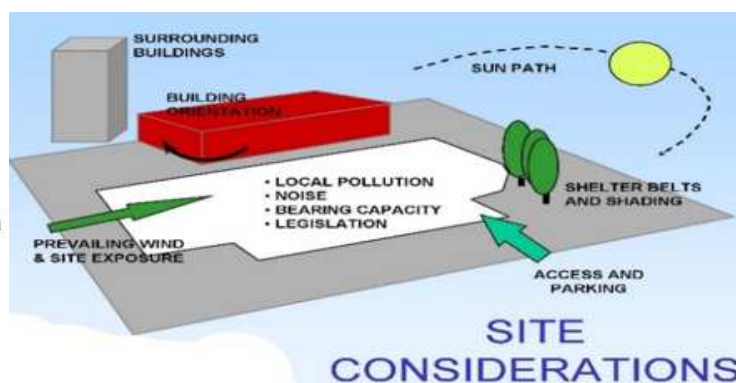
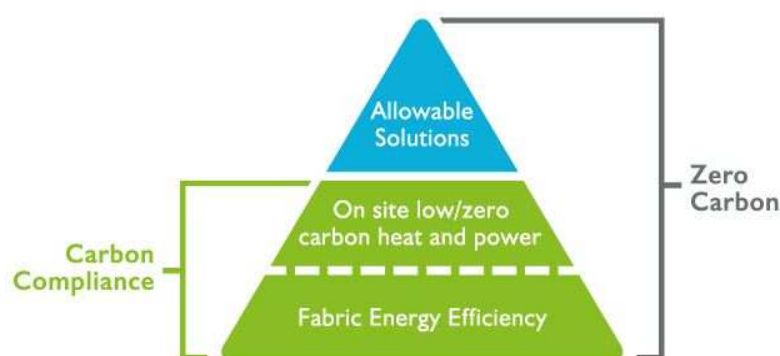
Our preference has always been a much more vigorous pursuit of heat demand reduction, principally by insulating and draught proofing existing buildings. From our observations of district heating systems we believe that the very high losses can be reduced with improved components, improved design and 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 carbon reduction and energy efficiency requirements can be achieved at a lower cost, and at a greater benefit to the occupant the 'fabric first' approach is proposed.
- the site is too far away from existing District Heat networks.
- the occupant 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.

7. 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.

7.1. 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.

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.

Proposed for this development?

No



Solar Thermal Calculation

Number of plots with panels	0
Size of Panel	4.5
Number of Panels per plot	0
Total m ²	0
Average kWh/m ²	294
Energy produced by panels	N/A
Energy% Saved From Panels	N/A
CO ₂ % Saved From Panels	N/A

Not Proposed for this development because...

Solar Thermal panels take up roof space that could be used for Photovoltaic Panels, solar PV is considered a more efficient technology available for this development -

- Solar Thermal relies on energy from the sun, therefore producing hot water only during daylight hours
- Poor servicing and badly programmed controls can make this technology operate less efficiently than a standard boiler
- Hot water storage has a heat loss linked to it, which can contribute to summer overheating and reduced efficiency
- This is not a 'fit and forget' technology, it requires regular servicing, replacement parts and optimizing of controls
- This is not suitable for poorly orientated dwellings
- Solar thermal is predominantly not feasible for dwellings with combination boilers

7.2. Photovoltaic Collectors (PV)

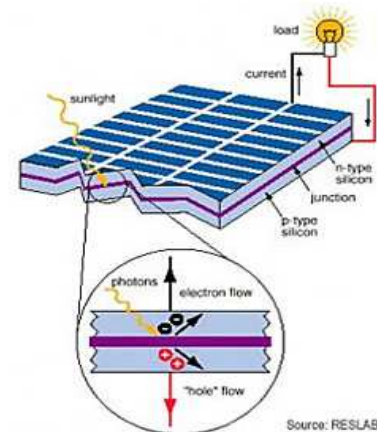
Proposed for this development?

Yes

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?

Yes

In determining the feasibility of Solar PV, the estimated energy output will be calculated based on SAP requirements, assuming an East/West orientation. In cases where other technologies have not yet been considered by the developer, and once suitably oriented PV designs are incorporated, the figures below may be subject to change to ensure compliance with relevant requirements.

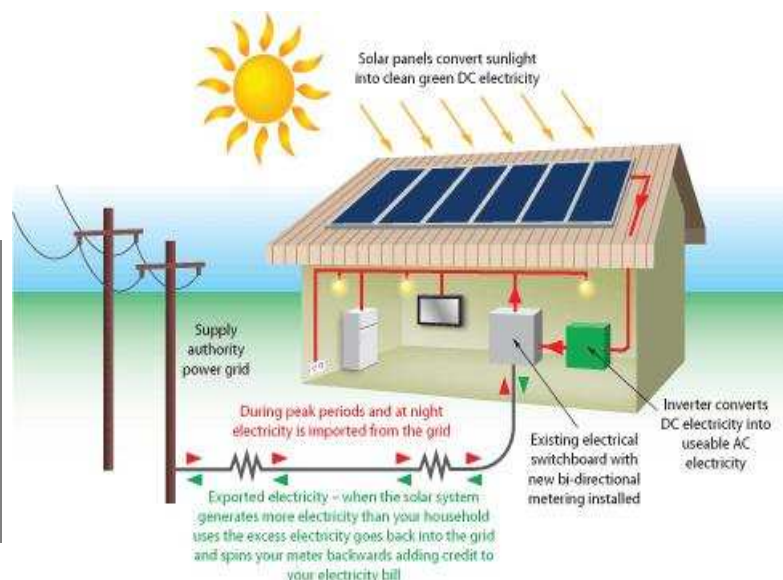
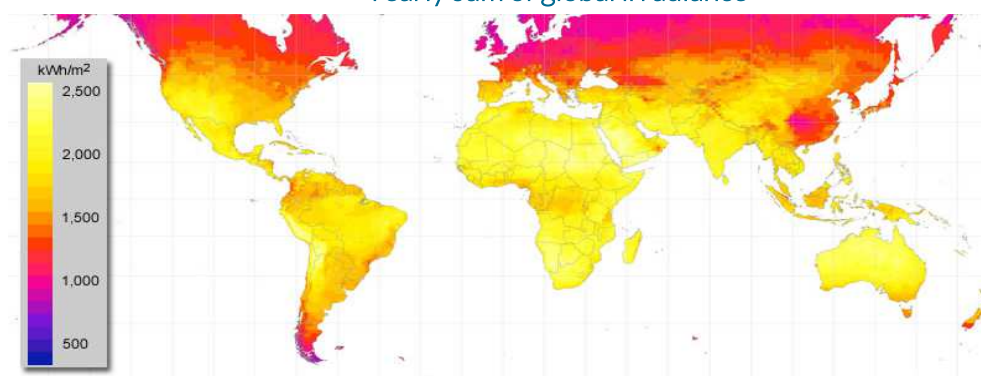
Inverter losses	4%
Temperature losses	3%
DC cables losses	1%
AC cables losses	1%
Shadings	0%
Losses weak irradiation	1%
Losses due to dust, snow	1%
Other Losses	0%

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

Orientation	Total site kWp
South	0
SE/SW	14.25
East/West	0
NE/NW	0
North	0
Total	14.25

PV Panels required to meet 14.25kWp output	
335W Panels	43 Panels Required
350W Panels	41 Panels Required
405W Panels	35 Panels Required
435W Panels	33 Panels Required
475W Panels	30 Panels Required

Yearly sum of global irradiance



Proposed for this development because...

In order to achieve a 10% carbon from renewables improvement (over part L) at Wyvols Court Farm, 14.25kWp of Solar PV will be applied, following initial demand reduction through fabric efficiency measures. The below details the viability of PV for this development -

- Clean, green energy. During electricity generation with PV panels there are no harmful greenhouse gas emissions
- PV panels have no mechanically moving parts, with good quality panels lasting up to 25 years and some inverters lasting as long as 10 years;
- There are direct cost savings to the dwelling occupier, less electricity to buy and often tax credits and other incentives.

7.3. 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 Wyvols Court Farm to be 4.7 m/s at 10m above ground level, 5.4 m/s at 25m above ground level and 5.9 m/s at 45m above ground level. This is below the level generally required for commercial investment in large wind turbines.

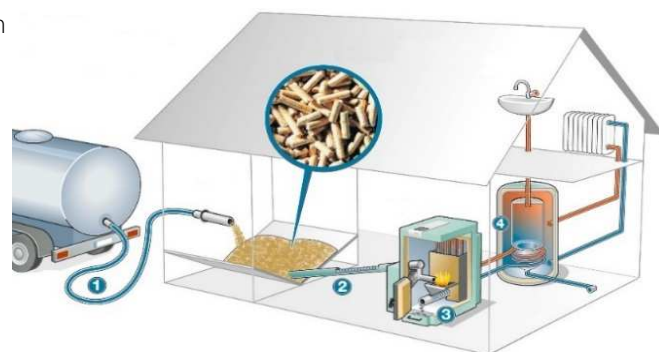
- Large potential land take, noise pollution and signal interference make a large wind turbine unsuitable for this development
- Horizontal axis micro-wind turbines only reduce carbon emissions by a small amount. High winds can cause the turbine to be stationary
- Health and safety is a factor, with 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

7.4. 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.



Proposed for this development?

No

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.

Not Proposed for this development because...

Biomass boilers and CHP engines create a large amount of pollution and carbon emissions. 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 Wyvols Court Farm development.

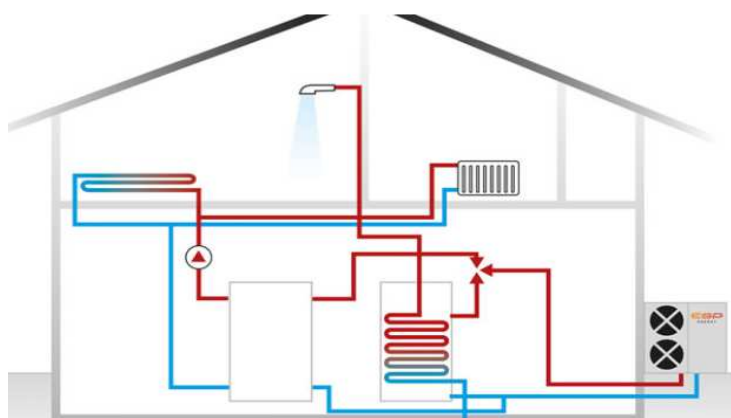
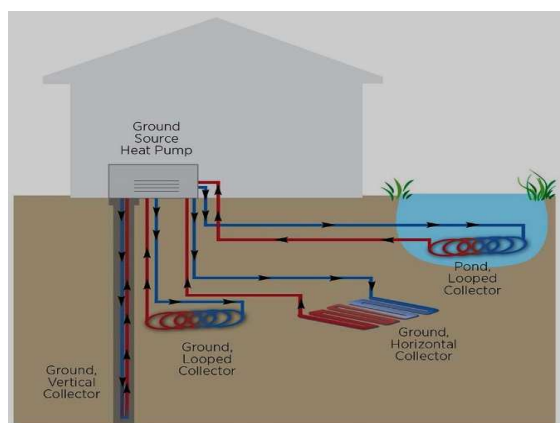
- With pollution levels consistently increasing, particulate levels in burning biomass means that it is not a clean technology
- Wood is a major source of biomass energy. Producing biomass fuel on a large scale can lead to deforestation
- Delivering the fuel can lead to additional traffic, causing pollution and delays. Supply needs to be within a 40 mile radius
- By developing crops to produce fuel for biomass energy, we are utilising land that may have been used for food sources

7.5. Heat Pumps (ASHP & GSHP)

Proposed for this development?

Yes

There are two types of heat pumps, ground source and air source. Heat pumps work in a similar way to fridges and air conditioners and absorb heat from the ground or from the air. Ground Source Heat Pumps (GSHP) and Air Source Heat Pumps (ASHP) are mainly designed to work with under floor heating systems because of the lower design temperatures of under floor systems. The Coefficient of Performance (CoP) of ground source heat pumps can range between 3.5-5.5 and air source between 2.5-4.5.



GSHPs require significantly more space to install heating coils, either in trenches or bore holes. This is often not viable within the boundary conditions of a development, nor the space constraints of an urban or suburban dwelling. ASHPs have fewer space constraints, can be more easily installed and offer a shorter payback period.

Commercial buildings and some dwellings can benefit from variable refrigerant flow systems (VRF), which are large-scale ductless HVAC systems that can perform at a high capacity. VRF systems can either be heat pump or heat recovery systems, which provide simultaneous heating and cooling. These systems function in a similar way to an ASHP and when designed correctly they can produce efficiencies in some circumstances outperforming GSHP.

Proposed for this development because...

Heat pump systems reduce carbon emissions and have an efficient conversion rate from energy to heat.

- 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
- As heat pumps are electric, they represent a perfect fit for solar applications. This makes for an effective carbon free model. Coupled with Solar PV, heat pumps can lead to a zero net energy
- 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
- Government incentives are available for most types of heat pumps

7.6. Flue Gas Heat Recovery Systems (FGHRS)

Proposed for this development?

No

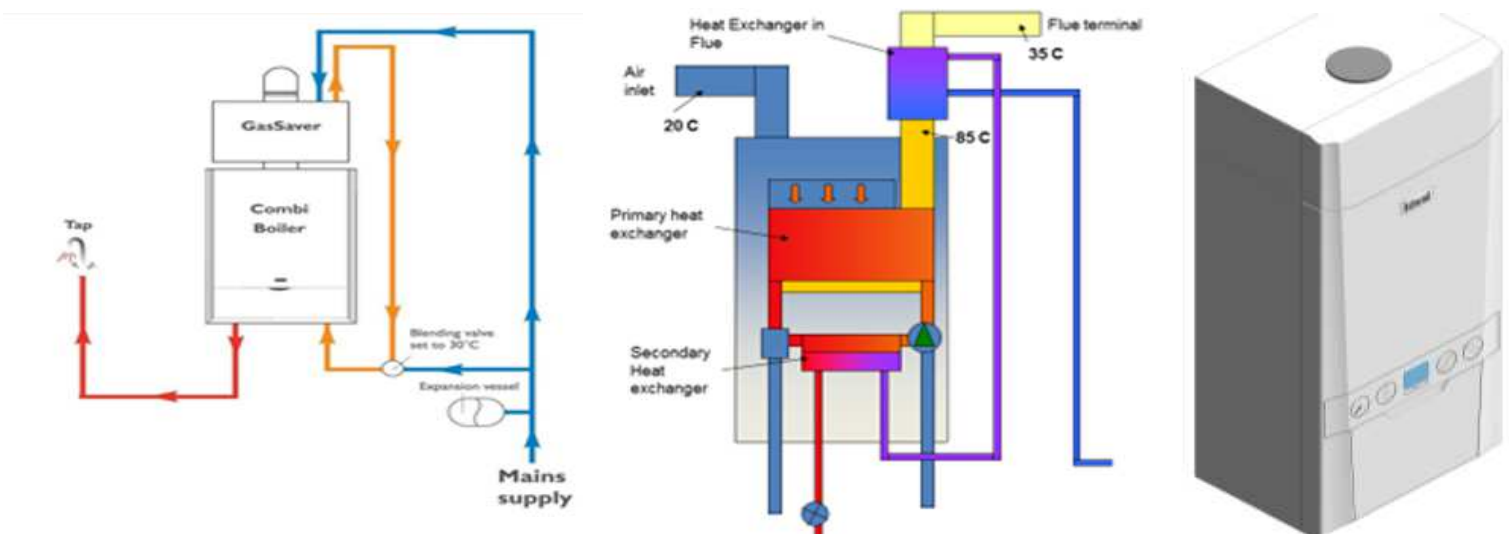
FGHRS can provide a reduction in CO₂ emissions compared to some technologies that are classified and listed as LZC technologies yet produce emissions in excess of a Natural Gas energy model.

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 Wyvols Court Farm 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. The development will utilise an Air Source Heat Pump (ASHP) to provide heating and cooling which will provide savings far in excess of a gas system with FGHR.

7.7. 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 -

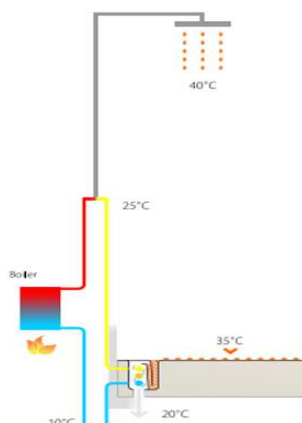
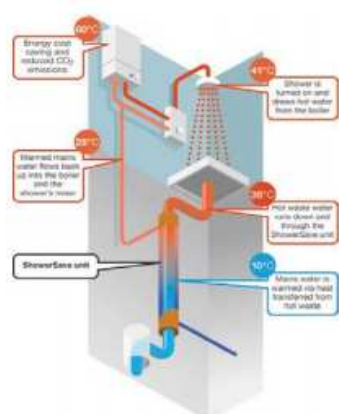
(1) 'energy from renewable sources' or 'renewable energy' means energy from renewable non-fossil sources, namely wind, solar (solar thermal and solar photovoltaic) and geothermal energy, ambient energy, tide, wave and other ocean energy, hydropower, biomass, landfill gas, sewage treatment plant gas,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

It is not viable due to construction constraints to install WWHRS to this development as there is a very low waste water demand with facilities mainly provided for hand washing.

8. Baseline Energy Calculations

A baseline total energy demand has been established for the development. Reductions in demand due to energy conservation measures are considered and form the basis of the renewable energy strategy which follows.

Total floor areas for the development have been used in conjunction with the building specification to determine total energy demand and associated carbon emissions using the methodology as set out in Part L2 2021, calculated using approved NCM/SBEM software.

Savings are measured in terms of a reduction in CO₂ emissions and kWh, which are calculated from their association with a particular fuel source. CO₂ conversion factors have been taken from the approved SAP 10.2 tables.

Activity	Fuel	Unit	Energy - Gross CV	
Electricity Generated	Electricity	kWh	0.136	kg CO ₂ e
Gaseous Fuels	Natural Gas	kWh	0.210	kg CO ₂ e
Biomass	Wood Pellets	kWh	0.028	kg CO ₂ e

Notional Energy Consumption by End Use [kWh/a]							
	Space Heating Demand	Cooling	Auxiliary	Lighting	Hot water	Equipment	Total (Excl. Equip)
Part L2 (kWh/a)	46817.28	9,623.31	0	28,319.39	9,270.97	66,306.13	94,031
CO ₂ Associated with total Energy Demand (kg/a)	13,102.67						

Proposed Energy Consumption by End Use [kWh/a]							
	Space Heating Demand	Cooling	Auxiliary	Lighting	Hot water	Equipment	Total (Excl. Equip)
Part L2 (kWh/a)	32415.35	8,302.03	0	41,223.87	9,270.97	66,306.13	91,212
CO ₂ Associated with total Energy Demand (kg/a)	11,693.31						

Baseline Emissions - Reduction through fabric and building efficiency

The carbon emissions for the development at Wyvols Court Farm is calculated to be 11,693.31 kgCO₂ per annum. This represents a carbon reduction of 10.76% over the Part L2 compliant figure of 13,102.67 kg per annum, before the addition of PV.

The total energy demand for the development at Wyvols Court Farm is calculated to be 91,212.22 kWh per annum. This represents an energy reduction of 3% over the Part L2 compliant figure of 94,030.95 kWh per annum, before the addition of PV.

9. Renewable energy technology summary

The below table summarises the proposed Low/Zero carbon technologies that will be applied to the site, following the assessment of viability of each technology.

Potentially viable energy strategies considered	Number of Dwellings Applied to	Energy Saved %	Carbon Saved %	Proposed?
Solar hot water	0	0	0	No
Solar Photovoltaic (Approx.)	3	11.83	10.76	Yes
Wind Turbines	0	0	0	No
ASHP	3	N/A*	N/A	Yes
GSHP	0	0	0	No
Flue Gas Heat Recovery ¹	0	0	0	No
Waste Water Heat Recovery	0	0	0	No

¹. Passive FGHR included in overall fabric results and does not therefore demonstrate additional savings

* Savings from ASHP included in baseline assessment as main heating system

10. Energy and Carbon Reduction Summary

This energy statement has been prepared in support of the development at Wyvols Court Farm. Local Planning Policy for the development requires that demand reduction measures are implemented to achieve an improvement of 10% carbon from renewables, over Part L2 2021 standards.

Provisional SBEM assessment of the units proposed demonstrates that baseline Part L compliant emissions for the development will be 13,102.67 kgCO₂ per annum, with an energy demand of 94,030.95 kWh per annum.

Energy demand reduction has been prioritised as part of the widely supported 'fabric first' approach. The benefits to the resident of this approach have been discussed in detail, which include an improvement in thermal comfort, lower energy bills, reducing the risk of fuel poverty and minimal 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.

Applying this approach through a combination of the fabric specification proposed, detailing to avoid thermal bridging, reducing air leakage and employing passive and active design measures, the dwellings will secure a saving in CO₂ emissions of 1,409.36 kgCO₂/year, equating to an energy demand reduction of 2,818.73 kWh/year.

A Photovoltaic array is then applied, which saves a further 10,790 kWh/yr (as calculated within the NCM), equating to an energy reduction from renewables of 11.83%, and a carbon reduction of 10.76% therefore complying with the local planning requirements.

Project name

Wyvols Court Farm

As designed

Date: Thu Feb 12 09:06:08 2026

Administrative information

Building Details

Address: Basingstoke Road, Swallowfield, Reading, RG7 1WY

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]: 2202.13The 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	6.05
Building CO ₂ emission rate (BER), kgCO ₂ /m ² annum	5.31
Target primary energy rate (TPER), kWh _{PE} /m ² annum	64.01
Building primary energy rate (BPER), kWh _{PE} /m ² annum	56.18
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	0.15	0.15	Unit 10 - Warehouse_W_7
Floors	0.18	0.18	0.18	Unit 10 - Warehouse_S_11
Pitched roofs	0.16	0.15	0.15	Unit 9 - Warehouse_R_18
Flat roofs	0.18	-	-	No heat loss flat roofs
Windows** and roof windows	1.6	1	1	Unit 10 - Warehouse_G_13
Rooflights***	2.2	-	-	No external rooflights
Personnel doors^	1.6	1.6	1.6	Unit 10 - Warehouse_D_10
Vehicle access & similar large doors	1.3	1.3	1.3	Unit 10 - Warehouse_D_9
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	8

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	2.5	5	-	-	-
Standard value	2.5*	5	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	1	-
Standard value	1	N/A

"No zones in project where local mechanical ventilation, exhaust, or terminal unit is applicable"

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
Unit 10 - Warehouse		95	-	-
Unit 9 - Warehouse		95	-	-
Unit 8 - Warehouse		95	-	-
Unit 10 Office - WC		95	-	-
Unit 10 Office - Hall		95	-	-
Unit 10 Office - Office		95	-	-
Unit 9 Office - WC		95	-	-
Unit 9 Office - Hall		95	-	-
Unit 9 Office - Office		95	-	-
Unit 8 Office - Hall		95	-	-
Unit 8 Office - WC		95	-	-
Unit 8 Office - Office		95	-	-

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?
Unit 10 - Warehouse	NO (-33.7%)	NO
Unit 9 - Warehouse	NO (-33%)	NO
Unit 8 - Warehouse	NO (-33.7%)	NO
Unit 10 Office - WC	N/A	N/A
Unit 10 Office - Hall	N/A	N/A
Unit 10 Office - Office	N/A	N/A
Unit 9 Office - WC	N/A	N/A
Unit 9 Office - Hall	N/A	N/A
Unit 9 Office - Office	N/A	N/A

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
Unit 8 Office - Hall	N/A	N/A
Unit 8 Office - WC	N/A	N/A
Unit 8 Office - Office	N/A	N/A

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?	YES

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Floor area [m ²]	2202.1	2202.1
External area [m ²]	6828.6	6828.6
Weather	SWI	SWI
Infiltration [m ³ /hm ² @ 50Pa]	8	5
Average conductance [W/K]	1625.4	2422.72
Average U-value [W/m ² K]	0.24	0.35
Alpha value* [%]	11.78	32.11

* 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
2	Offices and Workshop Businesses
98	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
	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	14.72	21.26
Cooling	3.77	4.37
Auxiliary	0	0
Lighting	18.72	12.86
Hot water	4.21	4.21
Equipment*	30.11	30.11
TOTAL **	41.41	42.7

* 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	4.9	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
Displaced electricity	4.9	0

Energy & CO₂ Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m ²]	171.59	271.25
Primary energy [kWh _{PE} /m ²]	56.18	64.01
Total emissions [kg/m ²]	5.31	6.05

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] Split or multi-split system, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	123.4	48.2	14.7	3.8	0	2.33	3.55	2.5	5
	Notional	202.1	69.2	21.3	4.4	0	2.64	4.4	----	----

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