4 St John's Road
Tunbridge Wells
Kent TN4 9NP

[redacted]

ENERGY STATEMENT

Proposed development at:

Gods Farm, Harts Lane, Ardleigh, CO7 7QQ

Author: H Davey
Checked: J Southworth
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4 St John's Road
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energytest

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1. Executive Summary

This Energy Statement has been prepared by Energytest in support of a full planning application for the construction of three detached bungalows at Gods Farm, Harts Lane, Ardleigh, CO7 7QQ.

The design has been developed to address the Environment and Climate Strategy requirements of Tendring District Council. Results have been calculated using Government approved SAP 10 software.

A base case has been developed, against which potential savings can be assessed. For this development the base case is the notional building developed for the Building Regulations (2021) assessment and is quantified in terms of CO_2 emissions as the Target Emission Rate (TER) for each dwelling.

This proposed development features improved insulation standards when compared against the compliance requirements of Approved Document L1 2021 of the Building Regulations. In addition, this proposed development will incorporate a mechanical and electrical specification that surpasses the requirements of Approved Document L1 2021.

Having minimised energy consumption in the first instance, the potential for remaining energy demands to be met via a decentralised energy source has been considered. It is evident this proposed development is neither within the coverage of an existing district heating network, nor is there an expectation that a district heating network will be developed at this site in the near future.

Due to its size, this development is not suitable for combined heat and power.

An assessment has been carried out to determine the potential for renewable energy systems to reduce CO_2 emissions further. It is proposed that there will be an installation of an air source heat pump and 1.2kWp photovoltaic array in order to meet the expectations of the Strategic Policy.

The total reduction in emissions resulting from energy efficiency measures and the installation of renewable technology is 67% compared to the regulated emissions from a building designed to just meet Building Regulations (2021) Part L1 This surpasses the target to achieve a 10% reduction in carbon emissions, as per Policy CSP 14.

2. Introduction

Energy use in buildings is a significant contributor to global CO_2 emissions and global warming. Designing energy efficient buildings and incorporating low and zero carbon energy generation is a vital part of ensuring this development incorporates sustainability as a core part of its design.

The purpose of the report is to assist evaluating parties to understand the energy consumption and performance of the proposed development and consider its performance against the "lean, clean, green" performance standard.

The proposed development will also be designed to fully comply with Approved Document L1 2021, which came into effect on 15 June 2022.

2.1. Overview of the proposed development

The proposed development consists of the construction of three detached bungalows.

Proposed drawings:

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3. Policies and Drivers

3.1. National and International Policy

The Climate Change Act (2008) sets a legally binding target for reducing UK carbon dioxide (CO_2) emissions to zero by 2050. It also provides for a Committee on Climate Change, which sets out carbon budgets binding on the Government for 5 year periods.

The National Planning Policy Framework (NPPF) 2021, reflects the requirements of the Climate Change Act 2008 in paragraphs 153 and 155 as follows:

"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 from rising temperatures. Policies should support appropriate measures to ensure the future 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."

"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."

"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

identify opportunities for development to draw its energy supply from decentralised, renewable or low carbon energy supply systems and for co-locating potential heat customers and suppliers."

3.2. Local Policy: Tendring District Council

Sustainability is key to Tendring District Council planning policy and should be considered with every planning application:

Policy CSP 14

Sustainable Construction

The Council will encourage all residential development (either new build or conversion) to meet Code level 3 as set out in the published Code for Sustainable Homes. Commercial* development with a floor area of 500m² or greater will be encouraged to meet the BREEAM "Very Good" standard.

All new residential development (either new build or conversion) and commercial* development with a floor area of 500m² or greater will be required to reach a minimum percentage saving in CO_2 emissions through the incorporation of on-site renewable energy (as set out in the table below). The requirement varies according to the type of development and in the case of dwellings, the size of development.

Development Type	Percentage savings in Carbon Dioxide emissions through the provision of renewable energy technologies
Dwellings (1-9 units)	10%
Dwellings (10 + units)	20%**
Commercial* (500m²+)	10%

Development over 5000m² will be expected to incorporate combined heat and power or similar technology.

Small scale renewable energy projects will be permitted except where there are overriding environmental, heritage, landscape, amenity or other constraints.

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* Commercial includes all forms of non-residential development, for example social and leisure related development.

**Only where a developer can satisfy the Council why the higher target of 20% cannot be achieved will the lower target of 10% be applied.

4. Energy hierarchy

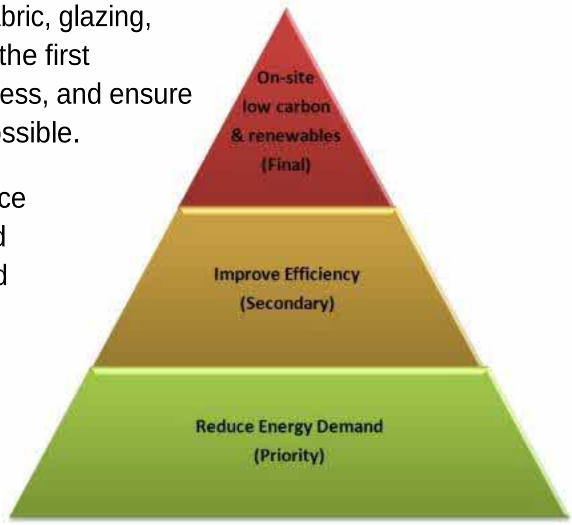
In line with best practice the proposed energy strategy for this development will f principals of the energy hierarchy.

The energy hierarchy has three priorities, seeking to reduce energy use before meeting remaining demand by the cleanest means possible:

1) Be lean – use less energy: Optimise the building fabric, glazing, and structure to minimise energy consumption in the first instance by using low U-values and good air tightness, and ensure that active systems run as energy efficiently as possible.

2) Be clean – supply energy efficiently: Further reduce carbon emissions through the use of decentralised energy where feasible, such as combined heat and power (CHP).

3) Be green – use renewable energy: When the above design elements have been reasonably exhausted, supply energy through renewable sources where practical.



5. Energy efficient design measures *("be lean")*

Enhancing the thermal performance of the building envelope helps to future-proof the structure and also yields the greatest CO_2 savings. Adding renewable technology will then yield maximum carbon reductions with lower long-term costs for the developer.

The proposed development will achieve compliance with Approved Document L1 of the Building Regulations (2021) without reliance on the contribution of renewable technology[1].

The following energy-efficient design measures are proposed:

	Proposed development	L1 2021 requirements
Ground floor U–value (W/m^{2}K)	0.10	0.18
External wall U–value (W/m^{2}K)	0.18	0.26
Roofs U– value (W/m^{2}K)	0.13	0.16
Window and fully glazed door U–value (W/m^{2}K)	1.20	1.60

[1] Under Approved Document L1 2021, the notional dwelling specification that is used to calculate the TER includes on-site renewable generation from PV. For the purpose of estimating savings from "Be Lean" measures only, the DER calculation for this stage of the energy hierarchy includes PV savings matched to the notional dwelling.

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	Proposed development	L1 2021 requirements
External door U-value (W/m²K)	1.20	1.60
Air permeability	5 m³/h.m²	8 m³/h.m²
Thermal bridging	Y=0.05	Y=0.15

Having reduced energy demand through improvements to the fabric, this development shall seek to reduce energy consumption further through the specification of mechanical and electrical systems with efficiencies that surpass the requirements of Approved Document L1 2021:

	Proposed development	L1 2021 requirements
Lighting efficacy	80 lm/W	75 lm/W
Heating controls	Time and temperature zone controls	Time and temperature zone controls.

6. Energy efficient systems *("be clean")*

6.1. Combined heat and power

Combined heat and power (CHP) systems use relatively cheap and clean fuels (such as natural gas) to generate heat and electricity on site. A typical CHP system uses combustion of natural gas to drive a turbine that produces electricity. The heat generated is captured and used to produce hot water.

As losses are minimised the carbon footprint of the energy generated is very low. However this is dependent on there being sufficient year-round local heat demand to fully utilise the heat generated by the CHP plant. An example would be developments of at least 500 dwellings, universities or hospitals.

Due to its size, this development is not suitable for combined heat and power.

6.2. District heating networks

In a district heating network heat is supplied from one or more central energy ce
multiple buildings within the network. Supply to multiple buildings guarantees high year-round local heat demand which in turn allows the use of low carbon technologies within the energy centre, such as combined heat and power systems. Large plant and aggregated demand allows systems within the energy centre to run more efficiently.

Hot water is distributed within the network via highly insulated pipes. To connect to the network individual boilers are replaced with separately metered heat exchangers.

Due to the fact this proposed development is neither within the coverage of an existing district heating network, nor is it within an area designated as having potential for a future network, district heating can be discounted as a viable option.

7. Low and zero carbon energy sources *("be green")*

7.1. Photovoltaics

Solar photovoltaics (PV) capture the sun's energy using photovoltaic cells. The cells convert sunlight into electricity, which can be utilised on site or transferred into the National Grid. PV cells are made from layers of semi-conducting material, usually silicon. When light shines on the cell it creates an electric field across the layers. The stronger the sunshine, the more electricity is produced. Groups of cells are mounted together in panels or modules that can be mounted on a roof.

The power of a PV cell is measured in kilowatts peak (kWp). This is the rate at which the cell generates energy at peak performance in full direct sunlight.

Photovoltaics offer high CO_2 savings, are simple to install and suitable for most buildings. The only limiting factor for PV is the availability of suitable roof space.

7.2. Heat Pumps

Heat pumps collect low temperature heat from renewable sources (such as the air or ground) and concentrate the heat to a usable temperature via a reverse refrigeration cycle. Useable heat is transferred to the dwelling via a heat exchanger and can be used for low temperature central heating and domestic hot water, though an immersion top-up may be required for DHW.

Heat pumps have some impact on the environment as they generally use grid supplied electricity to run the pumps. It is common for heat pumps to have a coefficient of performance of three, meaning that for every 1kWh of electricity used, over 3kWh of heat can be generated. The renewable component of the output is therefore taken as the difference between the output energy and the input energy, in this scenario the heat pump will be deemed to have delivered 2kWh of renewable energy.

Ground source heat pumps require external horizontal ground loops, or as is more likely in built-up environments, vertical loops fed into bore holes. The application of ground source heat pumps is therefore constrained by site ground conditions and available space.

Air source heat pumps have a slightly lower seasonal efficiency than ground source heat pumps, but require less space. Noise and space considerations should be assessed when determining an appropriate site for external condensing units.

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7.3. Solar thermal

Solar thermal systems, use free heat from the sun to warm domestic hot water. A conventional boiler or immersion heater can be used to make the water hotter, or to provide hot water when solar energy is unavailable.

Solar thermal systems are most appropriate for buildings with high year-round domestic hot water demand.

Although a typical solar thermal system will be able to meet half the annual domestic hot water demand for a dwelling, many will use electricity to run pumps within the system.

7.4. Wind turbines

Wind turbines use blades to catch the wind. When the wind blows, the blades are forced round, driving a turbine which generates electricity. The stronger the wind, the more electricity produced.

There are two types of domestic-sized wind turbine: Pole mounted and building mounted. Pole mounted turbines are free standing and are erected in a suitably exposed position, and are often about 5kW to 6kW in size. Building mounted turbines are smaller and can be installed on the roof of a home where there is a suitable wind resource. Often these are around 1kW to 2kW in size.

Large scale turbines, in exposed locations offer one of the best financial returns of all renewable energy systems as the payback of the system increases dramatically with the size of the turbine. However small-scale systems offer much lower levels of performance and recent studies have questioned the viability and output from such systems, particularly in urban environments.

7.5. Biomass

Biomass heating systems, burn wood pellets, chips or logs to provide warmth in a single room or to power central heating and hot water boilers. The carbon dioxide emitted when wood is burned is the same amount that was absorbed over the months and years that the plant was growing. The process is sustainable as long as new plants continue to grow in place of those used for fuel. There are some carbon emissions caused by the cultivation, manufacture and transportation of the fuel, but as long as the fuel is sourced locally, these are much lower than the emissions from fossil fuels.

When specifying biomass heating systems is important to consider the potential technical issues surrounding delivery and storage of fuel.

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Although the CO_2 savings from biomass are substantial, the high levels of NOx emissions can make biomass systems unsuitable for urban environments.

7.6. Proposed low and zero carbon energy sources

With carbon emissions within the building(s) already reduced through an enhanced fabric and energy efficient systems, it is proposed that further reduction will be achieved through installation of an air source heat pump to serve all of the heating and Domestic Hot Water requirements and a 1.2kWp photovoltaic array on each dwelling.

8. Results: Calculated CO_2 savings

Table 1: Carbon Dioxide Emissions for domestic buildings

	Carbon dioxide emissions for domestic buildings (Tonnes CO_2 per annum)
	Regulated
Baseline: Part L 2021 of the Building Regulations Compliant Development	2.3
After energy demand reduction and renewable energy	0.8

Table 2: Regulated carbon dioxide savings for domestic buildings

	Regulated domestic carbon dioxide savings	
	(Tonnes CO_2 per annum)	(%)
Cumulative on-site savings	16	67%

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9. 'Appendix A: ADL1 2021 BREL Report.