

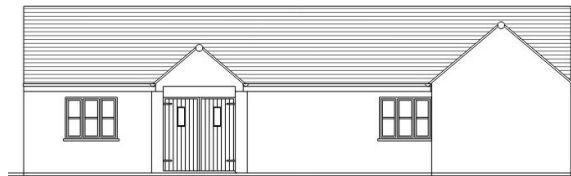
4 St John's Road
Tunbridge Wells
Kent TN4 9NP

Tel: 01892 577 572
sales@achievegreen.co.uk
www.achievegreen.co.uk



ENERGY STATEMENT

Proposed extension to: Eiling Lodge, Drivers End Lane, Codicote, Hitchin SG4 8TP



Front Elevation-South

This document has been prepared by Achieve Green¹ for the sole use of our client. Achieve Green owe no duty of care to any third parties in respect of its content. No third party may rely upon this document without the prior and express written agreement of Achieve Green. The consequences of climate change and the effects of future changes in climatic conditions cannot be accurately predicted. This report has been based solely on the specific design assumptions and criteria stated herein.

¹ Achieve Green and Energytest are trading names of Achieve Green Ltd, Company Registration No. 7013944

Contents

1.	Executive Summary.....	3
2.	Introduction	3
2.1.	Overview of the proposed development.....	3
3.	Policies and Drivers	4
3.1.	National and International Policy	4
3.1.1.	Project policy.....	5
4.	Energy hierarchy	5
5.	Establishing the baseline.....	6
6.	Energy efficient design measures (" <i>be lean</i> ").....	6
7.	Energy efficient systems (" <i>be clean</i> ")	6
7.1.	Combined heat and power	6
7.2.	District heating networks.....	7
8.	Low and zero carbon energy sources (" <i>be green</i> ").....	7
8.1.	Photovoltaics.....	7
8.2.	Heat Pumps	7
8.3.	Solar thermal.....	8
8.4.	Wind turbines	8
8.5.	Biomass	9
8.6.	Proposed low and zero carbon energy sources	9
9.	Results: Calculated CO ₂ savings	9
10.	Appendix A: SAP Worksheets.....	11



1. Executive Summary

This Energy Statement has been prepared by Achieve Green in support of a Planning Application for an extension to Eiling Lodge, Drivers End Lane, Codicote, Hitchin SG4 8TP.

The design has been developed to address the Planning Policy requirements of North Hertfordshire District Council.

A base case has been developed, against which potential savings can be assessed. This base case is established based on the notional extension as defined for compliance with Approved Document L1 of the Building Regulations (2021), and is quantified in terms of CO₂ emissions.

The proposed extension features improved insulation standards, when compared against the compliance requirements of Approved Document L1 2021 of the Building Regulations.

An assessment has been carried out to determine the potential for renewable energy systems to reduce CO₂ emissions within the home further. With carbon emissions already reduced through an enhanced fabric specification, it is proposed that a further reduction will be achieved through the installation of an air source heat pump to serve all of the heating and Domestic Hot Water demand within the dwelling.

The total reduction in carbon emissions resulting from an enhanced fabric specification within the extension, together with the installation of an air source heat pump is 37.4% compared to the regulated emissions from a development designed to just meet Building Regulations (2021) Part L1 standards.

2. Introduction

Energy use in buildings is a significant contributor to global CO₂ 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.

2.1. Overview of the proposed development

The proposed development consists of an extension at an existing house.

Proposed floor plan:



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 (CO₂) 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."

3.1.1. Project policy

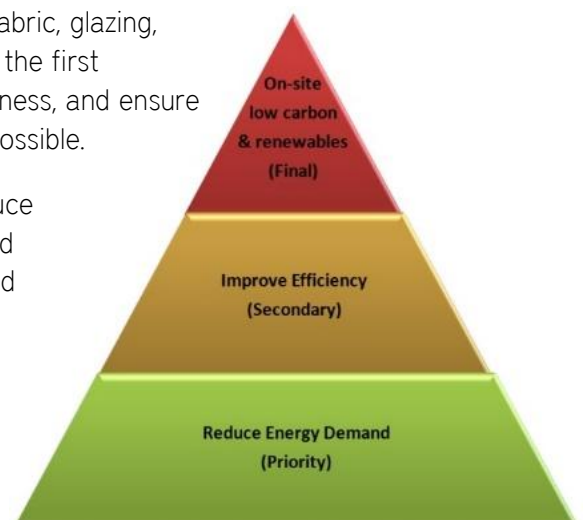
It is the intention for this development to have an extension with insulation values that surpass the minimum standards of the Building Regulations, and for the home to become "zero carbon ready", with a switch to a high efficiency heat pump for heating and Domestic Hot Water.

4. Energy hierarchy

In line with best practice the proposed energy strategy for this development will follow the 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. Establishing the baseline

For buildings that are subject to an extension, the baseline is established by applying the minimum standards of Approved Document L1.

The baseline calculations are based on buildings that are the same size and shape as the proposed building and have the same exposed facades.

6. 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 CO₂ savings. Adding renewable technology will then yield maximum carbon reductions with lower long-term costs for the developer.

The proposed domestic development will achieve compliance with Approved Document L1 2021 without reliance on the contribution of renewable technology.

The following energy-efficient design measures are proposed:

	Proposed development	L1 2021 requirements
New wall U-value (W/m ² K)	0.18	0.30
Roof U-value (W/m ² K)	0.13	0.16
New ground floor U-value (W/m ² K)	0.12	0.25
Glazed window U-value (W/m ² K)	1.40	1.40

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.

7. Energy efficient systems (“be clean”)

7.1. 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.

7.2. District heating networks

In a district heating network heat is supplied from one or more central energy centres to 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.

8. Low and zero carbon energy sources (“be green”)

8.1. 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 CO₂ savings, are simple to install and suitable for most buildings. The only limiting factor for PV is the availability of suitable roof space.

8.2. 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.

Heat pumps are a very good option for sites not connected to the gas network, or as a replacement of existing electric or oil-fired heating systems.

8.3. Solar thermal

Solar thermal systems, use free heat from the sun to warm domestic hot water. A conventional boiler, heat pump 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.

8.4. 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.

8.5. 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.

Although the CO₂ savings from biomass are substantial, the high levels of NO_x emissions can make biomass systems unsuitable for urban environments.

8.6. Proposed low and zero carbon energy sources

With carbon emissions within the home already reduced through an enhanced fabric specification for the extension, it is proposed that a further reduction will be achieved through the installation of an air source heat pump to serve all of the heating and Domestic Hot Water demand within the dwelling.

9. Results: Calculated CO₂ savings

Table 1: Carbon Dioxide Emissions after each stage of the Energy Hierarchy 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 and renewable energy	1.4



Table 2: Regulated carbon dioxide savings from each stage of the Energy Hierarchy for domestic buildings

	Regulated domestic carbon dioxide savings	
	(Tonnes CO ₂ per annum)	(%)
Total Cumulative Savings	0.9	37.4

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

Tel: 01892 577 572
sales@achievegreen.co.uk
www.achievegreen.co.uk



10. Appendix A: SAP Worksheets