



ELEMENT
SUSTAINABILITY

THE MANOR HOTEL, HEVER COURT ROAD

ENERGY STRATEGY

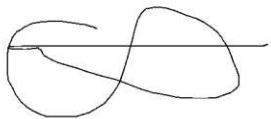
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ELEMENT SUSTAINABILITY

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1. INTRODUCTION

Element Sustainability has been commissioned by Mialex Limited to review the energy performance of the proposed new build development on Hever Court Road.

The purpose of this Energy Strategy is to summarise the relevant planning policy background and requirements of the Gravesham Borough Council and to demonstrate the ways in which these policy aims are to be met.

Having briefly described the development proposals, the relevant planning policy has been reviewed along with the requirements of the regulatory framework appropriate for this scheme. The statement details those features of the design and specification which will be integrated within the property in order to contribute to effective energy demand and carbon dioxide emissions reductions.

A technical assessment of the development proposal is included, using Standard Assessment Procedure (SAP 10; domestic energy demand model) calculations. These calculations will serve to demonstrate how the Council's energy demand and carbon dioxide emission reduction targets may be achieved.

This report is intended to support the planning application for this development and therefore, establishes an approach which meets the criteria outlined by the Council that the developer commits to implement at the site.



2. DEVELOPMENT PROPOSALS

2.1 Development Site Description

The proposed site is located off Hever Court Road, to the south of Gravesend, Kent in a built-up residential setting.

The pre-developed site comprises tarmacked car parking, and a gravel overflow car park associated with the existing hotel on site. It is enclosed by perimeter fencing and a mix of trees and shrubbery along the north, east and southern borders. The plot is bound by a cycle path and vegetation to the south, which separates the site from the A2 road. The Best Western Manor Hotel and associated car park is located to the west, with Hever Court Road and other residential properties to the north. Then beyond the eastern perimeter of the site lies further mixed vegetation, Hever Court Road and the cycle path.

This development site is not considered to be in a designated conservation area and there are no existing water courses within the proposed site boundary.

Figure 2.1 – Site Location Plan

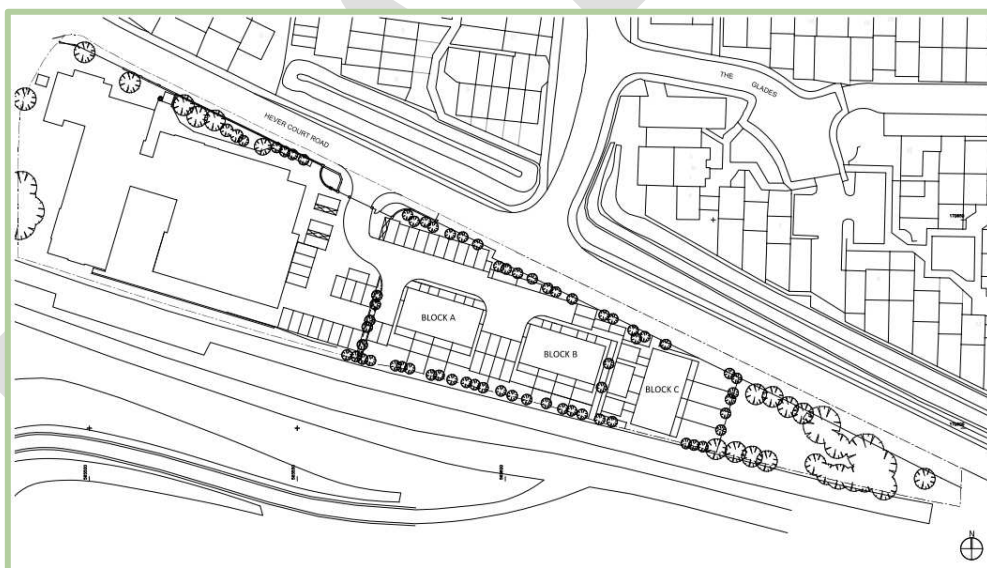


Figure 2.2 – Existing Site Plan

2.2 Development Proposals

The proposed scheme comprises the redevelopment of the site to accommodate twelve new dwellings within three terraced blocks. The dwellings will be of 2 ½ storeys.

Figures 2.3 to 2.8 present the proposed plans and elevations for the scheme.

Figure 2.3 – Proposed Ground Floor Plan

Figure 2.4 – Proposed First Floor Plan



Figure 2.5 – Proposed Roof Plan

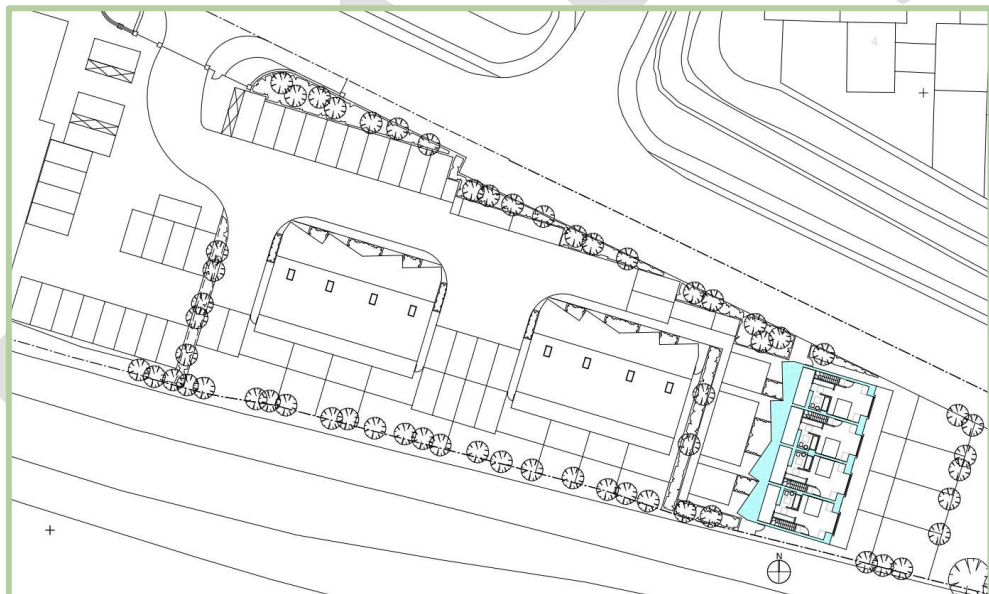


Figure 2.6 – Proposed Block A and B Plans

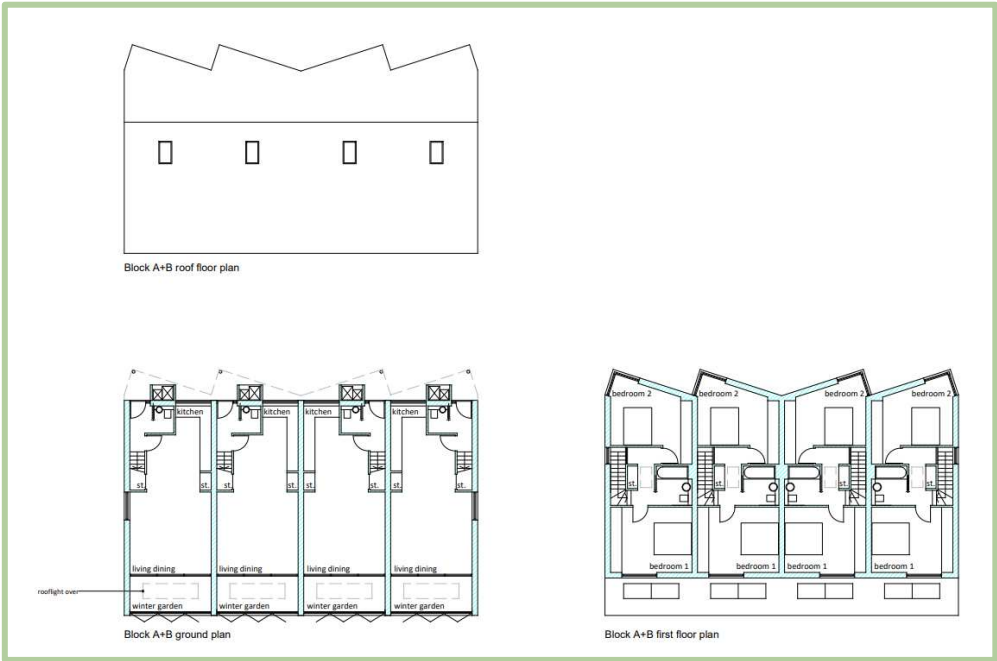


Figure 2.7 – Proposed Block C Plans



Figure 2.8 – Proposed Elevations



3. POLICY REVIEW

3.1 National Planning Policy

The National Planning Policy Framework (NPPF) 2021 states that the planning system should play an active role in guiding development to sustainable solutions. At the heart of the 2021 updated NPPF lies the 'presumption' in favour of sustainable development. There are three dimensions to sustainable development, as stated within the NPPF: economic, social, and environmental. These dimensions give rise to the need for the planning system to perform a number of roles:

An economic role – contributing to building a strong, responsive, and competitive economy, by ensuring that sufficient land of the right type is available in the right places and at the right time to support growth and innovation; and by identifying and coordinating development requirements, including the provision of infrastructure;

A social role – supporting strong, vibrant, and healthy communities, by providing the supply of housing required to meet the needs of present and future generations; and by creating beautiful and safe places, with accessible local services that reflect the community's needs and support its health, social and cultural well-being; and

An environmental role – contributing to protecting and enhancing our natural, built, and historic environment; and, as part of this, helping to improve biodiversity, use natural resources prudently, minimise waste and pollution, and mitigate and adapt to climate change including moving to a low carbon economy.

These dimensions are considered to be mutually dependent with the NPPF, in its entirety, defining sustainable development. The NPPF states that 'the purpose of the planning system is to contribute to the achievement of sustainable development'. It summarises the objective of sustainable development as meeting the needs of the present without compromising the ability of future generations to meet their needs. It goes on to state that 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 protection.

3.2 Local Planning Policy

Both Kent County Council and Gravesham Borough Council are responsible for the overall development within the county. However, Gravesham Borough Council is responsible for determining planning applications and additional housing services. Therefore, the following Core Strategy and associated policies are relevant to the proposed scheme:

3.2.1 Gravesham Local Plan Core Strategy

The Gravesham Local Plan Core Strategy was adopted by the Council in September 2014 and will be used to guide decisions on planning applications. The following policies are therefore applicable to the Hever Court scheme:



Policy CS18: Climate Change

This policy is split into various sections, including:

Carbon Reduction –

The Council will seek to reduce the overall carbon footprint of the Borough by:

- In the context of national policy and the transition to zero carbon development via amendments to Part L of the Building Regulations, requires proposals for developments throughout the Borough and other major development elsewhere in the Gravesend Town Centre Opportunity Area to consider the potential and include proposals for low carbon and renewable energy generation, including combined heat and power.
- Where choosing not to do so, applicants must submit evidence which demonstrates that compliance is not technically or financially feasible, or that improved fabric energy efficiency or an allowable solution result in improved carbon saving benefits;
- Support stand-alone decentralised, renewable or low carbon energy development where it is compatible with national policies for protecting the Green Belt; and,
- Support other proposals which lead to a reduction in carbon footprint including the retrofitting of existing homes and businesses, including local initiatives based on carbon off-setting via allowable solution.

3.3 Climate Emergency

The Borough of Gravesham declared a climate emergency in June 2019, and has committed to reducing its carbon emissions to net zero. The council also outlines the key initiatives, goals and objectives to meet this pledge including:

- Supporting the delivery of the Environment Strategy targets on using less energy and tackling climate change; and,
- The Council is also calling on the Government to provide the powers and resources to accelerate its work on becoming carbon neutral, and to take bolder steps nationally and internationally to protect the planet for future generations.

3.4 Regulatory Framework

3.4.1 Building Regulations

Building Regulations, Part L - Conservation of Fuel and Power sets the compliance standards for energy demand and carbon dioxide emissions from buildings. Guidance on how to meet the requirements of this regulation is provided within a number of approved documents.

Approved Document Volume 1 - Dwellings: Provides guidance on how to comply with Part L of Schedule 1 to the Building Regulations and the energy efficiency requirements for dwellings. These standards came into effect in June 2022 and are subject to a twelve-month transitional arrangement period. Part L 2021 standards will reduce dwelling carbon emissions by 31% in relation to the superseded Building Regulations Part L, 2013.

Minimum energy performance requirements shall be approved and expressed in accordance with the methodology for:



- a) New buildings, in the form of target CO₂ **dwelling emission rates**;
- b) New buildings, in the form of target **fabric efficiency rates**; and
- c) New buildings in the form of target **primary energy rates**.

3.5 Applicable Targets

Based upon a review of relevant planning policy requirements, legislative drivers, and client priorities, the following list provides a brief precis of the key criteria that should be targeted for this development:

Gravesham Local Plan

- Policy CS18: Climate Change

Building Regulations Part L

- Approved Document Volume 1



4. ENERGY STRATEGY

The energy strategy for this development prioritises an enhanced building fabric specification throughout the scheme, allied to efficient servicing and controls, plus renewable energy technology to achieve compliance with the targets stipulated by Building Regulation, Part L Approved Document Volume 1 and Gravesham Borough Councils adopted planning policies.

Details of the proposed energy strategy are presented below.

4.1 Build Fabric and Thermal Performance

The standard measurement of heat transfer through a given building material or construction type is the U-value ($\text{W/m}^2\text{K}$). The lower the U-value, the more slowly heat transfers and is lost out of a building. In buildings, heat loss generally occurs through the following main areas and elements of the construction:

- Ground Floor;
- External Walls;
- Roofs;
- Doors and windows;
- Thermal bridging; and,
- Uncontrolled ventilation.

The proposed material specification that will be incorporated throughout the extension to limit heat loss and ensure efficient operation of the dwellings is presented in Table 4.1.

Table 4.1 – Proposed Fabric Specification

Item	Specification
External Wall	$U=0.17 \text{ W/m}^2\text{K}$
Party Wall	$U=0.00 \text{ W/m}^2\text{K}$ (full fill & seal)
Ground Floor	$U=0.12 \text{ W/m}^2\text{K}$
Roof	$U=0.10 \text{ W/m}^2\text{K}$
Door	$U=1.00 \text{ W/m}^2\text{K}$
Windows	$U=1.20 \text{ W/m}^2\text{K}$
Air Permeability	$4.00 \text{ m}^3/\text{hm}^2$ (@50Pa.)
Cold Bridge	Bespoke Details & Psi values

This enhanced material specification and design will provide the following benefits:

- **High performance thermal insulation** will ensure low U-values for all heat loss elements and will minimise heat loss through the building's thermal envelope;
- **Thermally efficient, 'A' rated, double glazed windows** will be specified with argon gas fill and low emissivity coatings to limit heat loss through the pane. The glazing g value will be specified to optimise beneficial solar gains but limit the propensity for the dwellings to overheat;



- **Low air tightness** (design air permeability targeting 4.00m³/hm²) will minimise uncontrolled ventilation. This will reduce heat losses and provide high levels of occupant comfort;
- **Improved cold bridging junctions** will significantly improve the emission rate of the dwellings through the provision of insulation, limiting heat losses that occur at the junctions between building elements and around openings. 'Bespoke' psi values have been used to achieve a low y-value, thus minimising heat loss through cold bridge junctions; and,
- **Thermal mass** (associated with this type of construction) helps stabilise the internal temperature and provides a largely self-regulating environment, reducing the risk of overheating and the need for mechanical cooling in summer. Furthermore, this daily cycle of absorbing and releasing heat continues on a year-round basis and can reduce the energy needed to keep a building warm during the heating season. This works through the ability of thermal mass to capture and recycle heat and incidental heat gains.

This enhanced fabric specification will **deliver a Building Regulation, Part L Approved Document Volume 1 (2021) compliant scheme for all aspects of the proposed development**. It ensures an inherently energy efficient development, focussing upon limiting demand side reductions in accordance with the energy hierarchy.

4.2 Building Services

The proposed mechanical and electrical specification that will be incorporated to ensure efficient servicing of these dwellings is presented in Table 4.2.

Table 4.2 – Proposed Mechanical and Electrical Specification

Item	Specification
Lighting	100% 'Low E' / LED
Ventilation	Intermittent Extract Fans
Space Heating	Worcester Greenstar 4000 Combi Boiler
Water Heating	From Combi Boiler
Heating Controls	Time and Temperature Zone Control
Renewable Energy Systems	Photovoltaic modules – See Section 5 for details

The mechanical and electrical specification will provide the following benefits:

- **Low energy and LED lighting** will be specified throughout the site in order to maximise operational efficiencies and lifespan of the fittings. LEDs operate with an estimated energy efficiency of up to 90% when compared to traditional lighting and conventional light bulbs. This means that about c.90% of the electrical energy is converted to light, rather than wasted heat as in conventional bulbs.
- **Sophisticated heating controls** including time and temperature zonal controls will ensure the efficient delivery of heat to further reduce the homes energy demand; and,



- **Intermittent Extract Ventilation** will be specified in the houses, which will draw moisture laden, stale air out of the rooms and maintain a healthy living environment.

This mechanical and electrical specification **will deliver a Building Regulation Part L Approved Document Volume 1 (2021) compliant scheme** for all aspects of the Proposed Development.

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5. PROPOSED RENEWABLE ENERGY SOLUTION

An analysis of the most appropriate renewable energy options has been undertaken to ensure compliance with Building Regulation Part L.

A number of renewable energy technologies have been considered for this site, including:

- Solar Hot Water;
- Photovoltaics (PV);
- Wind;
- Heat Pumps; and
- Biomass heating.

A review of the development proposals and site location concludes that the Photovoltaics (PV) are feasible for this scheme, as detailed below in Table 5.1:

Table 5.1 – Renewable Technologies Review

Technology	Description	Advantages & Limitations	Feasibility
Solar Hot Water	Solar Hot Water utilises the energy in sunlight and diffuse daylight to heat water for use in buildings. The main component of any solar water heating system is the collector, which absorbs the radiant energy of the sun and converts it to heat energy.	✓ Low maintenance. ✓ Feasible for small scale developments. ✗ Panels ideally facing south at 30° tilt for optimum efficiency.	No - This technology is not considered to be a feasible option for this site as these solar thermal technologies make only a relatively limited contribution to reducing the building's energy demand and carbon dioxide emissions. Furthermore, there are potential problems associated with routing the pipework through the houses.
Photovoltaics (PV)	Photovoltaic (PV) panels harness solar thermal energy and convert it into electricity which can then be used within a building. The panels may be roof or floor mounted and orientated in a southerly direction to enable this technology to operate efficiently.	✓ Low maintenance. ✓ Easy to integrate into building design. ✓ Cost of PV is constantly dropping. ✗ Panels ideally facing south at 30° tilt for optimum efficiency. ✗ Overshadowing will reduce performance. ✗ Can require significant roof space.	Yes – This technology is considered to be a viable option for this site with sufficient roof area on each dwelling to accommodate the proposed PV arrays.



Technology	Description	Advantages & Limitations	Feasibility
Wind Turbines	Wind generation equipment harness the wind to turn a propeller and in doing so, drive an alternator to generate electricity. The turbines may be pole or roof mounted.	✓ Low maintenance. ✓ Excess electricity can be exported to the grid. ✓ Vertical Axis Turbines can operate at wind speeds as low as 2m/s. ✗ A wind speed of at least 6m/s is typically required for traditional turbines to operate efficiently. ✗ Visual and noise impact risk.	No – Wind Turbines are considered unsuitable for this site due to a poor wind resource and lack of space to locate the turbines. Integrating these systems at height on the roof is not considered feasible due to the associated noise, vibration, and structural stresses upon the buildings. Furthermore, there are planning issues and perceived safety concerns with this technology.
Ground Source Heat Pumps	Ground Source Heat Pumps collect low-grade heat from the ground to supply useful heat for space and water heating requirements. By applying additional energy input (in the form of electricity), it is possible to raise the temperature of the source heat to the temperature required.	✓ Highly tested and efficient technology ✓ Can be used for space and water heating. ✓ Lifespan of 20-25 years. ✗ Excavation works required for buried piping to be installed. ✗ Planning permission potentially required for installation.	No – This technology is considered unsuitable for this site due to an insufficient area (based upon the proposed densities) to install a horizontal ground collector and the prohibitive costs and technical constraint of installing vertical boreholes.
Air Source Heat Pump	Air Source Heat Pumps collect low-grade heat from the air to supply useful heat for space and/or water heating requirements. They operate in the same way as a ground source heat pump, by applying additional energy input (in the form of electricity), it is possible to raise the temperature of the source heat to the temperature required.	✓ Can be used for space and water heating. ✓ Highly tested and efficient technology ✓ Low maintenance. ✓ Lifespan of 20-25 years. ✗ Visual and noise impact risk. ✗ Reduced efficiency in cold conditions. ✗ Large outdoor space required for the heat pump unit.	No – The incorporation of ASHPs is a technically feasible option for this development, however, it is the design team's preference to achieve compliance using alternative technologies.
Biomass Heating	Biomass boilers typically burn wood chips or pellets as fuel to provide space heating and hot water.	✓ Almost a carbon neutral technology. ✗ Frequent and large fuel deliveries. ✗ Large fuel store required. ✗ Regular maintenance.	No – This technology is considered inappropriate for this type of development due to the need for a large fuel storage facility and frequent, large fuel deliveries combined with regular maintenance.



5.1 Photovoltaic Array

Photovoltaic (PV) arrays have therefore been selected as an appropriate renewable energy technology to contribute to the CO₂ emission reduction target for the Hever Court development. PV arrays are relatively straightforward to install, benefit from low maintenance costs and will reduce the operational cost of the building. The use of PV in general at this site would provide the following benefits:

- Reducing the buildings electrical energy grid load;
- Simple installation and commissioning;
- Low maintenance; and,
- Reliable, proven technology.

Proposed System Details -

- It is proposed that PV panels will be mounted upon the roof and orientated due southwest on the two-storey dwellings and due southeast on the two and a half storey dwellings in order to optimise the operating efficiency of the systems;

Table 5.2 presents the PV capacity required to help deliver a Building Regulation Part L Approved Document Volume 1 compliant scheme.

Table 5.2 – PV Capacity Requirement

Dwelling Type	PV Specification (kWp)
Two-Storey End-Terrace	1.90
Two-Storey Mid-Terrace	2.20
Two and a half Storey End-Terrace	1.60
Two and a half Storey Mid-Terrace	1.70

Land use -

- There are no land use issues associated with PV technology at this site;
- The dwellings have sufficient roof area to accommodate the proposed PV arrays.

Local planning issues -

- There are no planning policy issues associated with this technology.

Noise issues -

- PV is silent in operation.

Whole life cost and lifecycle impact -

- Current installed costs for PV are approximately £1,500 / kWp installed.
- Additional costs throughout the system's 30-year lifecycle are limited to:
 - Cleaning of the arrays;
 - Potential damage to the arrays; and,
 - Replacement of the DC / AC inverter unit which typically have a lifespan of around 10 years.



6. CARBON DIOXIDE EMISSIONS CALCULATIONS

In order to demonstrate the environmental benefits associated with the energy strategy for the proposed dwellings, approved SAP 10 software has been used to generate representative energy demand models for the development. SAP software calculates the regulated energy demand and associated carbon dioxide emissions in accordance with the requirements of Building Regulations, Part L Approved Document Volume 1 (2021) that this development will be constructed in compliance with.

6.1 Regulated Energy Performance Calculations

Table 6.1 below presents a summary of the results, which show the dwelling emission rate and energy demand performance associated with the proposed energy strategy for the representative dwellings.

Table 6.1 – Calculated Regulated Dwelling Emission Rates

	Two-Storey End-Terrace	Two-Storey Mid-Terrace	Two and a half Storey End-Terrace	Two and a half Storey Mid-Terrace
Dwelling DER (kgCO ₂ /m ² /yr.)	12.95	10.16	11.85	10.01
Dwelling TER (kgCO ₂ /m ² /yr.)	12.96	10.28	11.93	10.10
% DER Reduction over AD: Volume 1 (2021)	0.08	1.17	0.67	0.89
Dwelling DPER (kWh/m ² /yr.)	67.81	52.68	62.41	52.42
Dwelling TPER (kWh/m ² /yr.)	67.83	53.45	62.54	52.71
% DPER Reduction over AD: Volume 1 (2021)	0.03	1.45	0.21	0.56
Dwelling DFEE (kWh/m ² /yr.)	41.42	31.55	39.96	31.69
Dwelling TFEE (kWh/m ² /yr.)	42.20	33.23	41.5	33.56
% DFEE Reduction over AD: Volume 1 (2021)	1.85	5.04	3.70	5.58

The development will incorporate an enhanced material specification along with high quality design and construction standards, in order to improve the energy efficiency of the dwellings through a 'fabric led' energy strategy, allied to efficient mechanical and electrical systems.

This proposed material specification coupled with the proposed renewable technologies will improve upon the minimum compliance under Approved Document L (2021) Volume 1 fabric and primary energy targets by a minimum of 1.85% and 0.03% respectively.

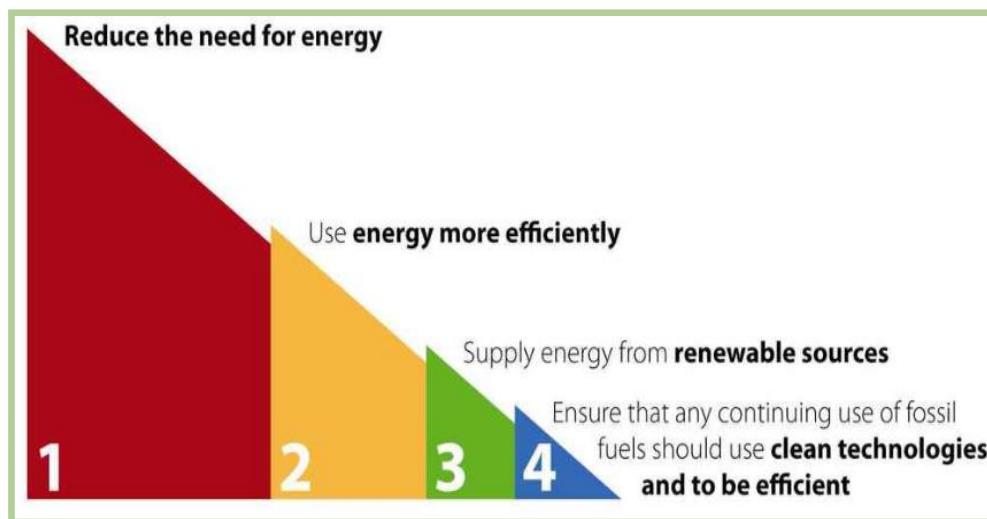
Each house type of the proposed development **will secure a minimum carbon dioxide reduction rate that exceeds the requirements stipulated withing Approved Document Volume 1.**



6.2 Energy Hierarchy

The Energy Hierarchy has been used as a framework to guide this energy strategy to achieve practical and cost-effective carbon emission reductions. It is intended that the construction, design and specification proposed for this scheme will deliver dwellings that are inherently efficient and cost-effective during occupation. The hierarchy prioritises such demand-side activities to reduce wastage and improve efficiency (see Figure 6.2).

Figure 6.2 – The Energy Hierarchy



First Principle

The development will benefit from a material and design specification that is aligned with Building Regulation standards and includes numerous efficiency measures designed to reduce heat losses and minimise energy demand, including:

- ✓ High performance u - values;
- ✓ Reduced thermal bridge heat losses;
- ✓ Efficient form of construction, limiting heat loss areas; and,
- ✓ Low design air permeability target.

This 'fabric led' approach to minimising energy demand and associated carbon dioxide emissions through the performance of the thermal envelope is aligned with the first principle of the energy hierarchy, which states that reduction in energy demand should be achieved initially by energy efficiency.

Second Principle

100% low energy and LED lighting provision and sophisticated control systems for the space and water heating will boost the operational efficiency of the dwellings as per the second principle of the Energy Hierarchy.

Third Principle

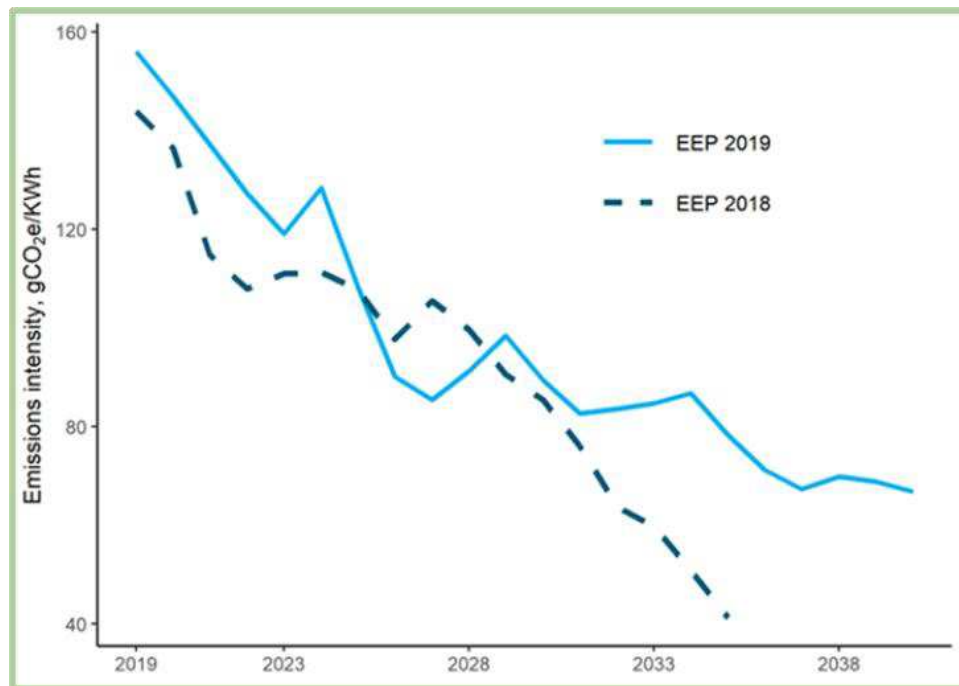
PV arrays will be installed on the roof of the proposed dwellings as per the third principle of the Energy Hierarchy.



Fourth Principle

The space and water heating demand of the scheme will be met by the combi boiler systems. This will ensure that fossil fuels consumed for heating purposes will be burnt cleanly and efficiently.

Furthermore, as the UK's electricity grid CO₂ footprint continues to improve, so too will the carbon dioxide emissions associated with the electronic appliances within the proposed scheme.



7. CLIMATE EMERGENCY

A Climate Emergency was declared by Gravesham Borough Council in June 2019, with a target to make Gravesham carbon neutral by 2030. In support of this, the developer wishes to highlight the following measures that will form part of the specification of this development:

- An energy strategy that delivers carbon dioxide emission reductions and renewable energy generation in line with the Energy Hierarchy and Core Strategy Policy CS18:
 - In securing compliance with the current, stringent building regulation Part L targets, a commitment is made to construct high quality, energy efficient residential properties which will minimise demand side energy loads – in accordance with the principles of the energy hierarchy.
 - A commitment is made to achieving:
 - A minimum 0.08% improvement in the emissions rate reduction relative to the onerous Part L Approved Document Volume 1 (2021) compliance standards.

Photovoltaic arrays will be installed to meet the renewable energy requirements of the scheme.

- The building is designed to incorporate features that will serve to reduce energy demand, and in turn, carbon emissions arising from access to the building:
 - Implementation of PVs;
 - Low energy lighting; and,
 - Sophisticated time and temperature controls.

These commitments, in combination, support the carbon reduction target of no more than 1.5°C global temperature increase and assist Gravesham Borough Council in meeting their Climate Change Emergency objectives.



8. CONCLUSION

This Statement has reviewed the energy performance of the proposed Hever Court Road Development against national and local planning policies. The conclusions that can be drawn from the review are as per the following:

Energy Strategy –

Full compliance with the key criteria of the councils Core Strategy, has been achieved by the proposed energy strategy, whilst also responding positively to the council's declaration of a Climate Emergency.

- The proposed dwellings have been designed and specified in accordance with **the principles of the energy hierarchy**.
- Approved SAP software (SAP 10) has been used to generate representative energy demand models for the new dwellings within the scheme.
- The properties will include low energy lighting, and a photovoltaic array, in accordance with **Gravesham Local Plan Policy CS18**.
- The Dwelling Emission Rate reduction for each property has been calculated to provide at least a minimum **0.08% reduction relative to Building Regulations Part L (2021) compliance** targets.
- The focus is on reducing the demand for energy by **limiting heat losses through the building fabric**, through an enhanced material specification well beyond the regulatory requirement, in accordance with **Gravesham Local Plan Policy CS18**.

Furthermore, the proposals accord with the aims of the National Planning Policy Framework, as follows:

- Exceeding the regulatory compliance criteria for Part L 2021 Regulations will assist in **reducing the environmental impact of the proposed development**.

As required by the National Planning Policy Framework (NPPF), the proposed development should “contribute to conserving and enhancing the natural environment”.

The proposals reviewed within this statement for the Hever Court Road residential scheme **will deliver a highly energy efficient and sustainable development**, that accords with the guidance provided within Gravesham Council's adopted planning policies.

