

ENERGY STRATEGY – FOR PLANNING

FOR

HULLAVINGTON PRIMARY SCHOOL

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1. EXECUTIVE SUMMARY

This document presents the proposed energy strategy for Hullavington CofE Primary School. It has considered planning guidance and building regulations to reduce emissions and increase operational energy efficiency. This design has met the energy requirement by employing a variety of methods such as:

- Improved U-Values,
- Enhanced air tightness,
- High efficiency building services,
- LED lighting,
- Water saving technologies,
- ASHP for space heating,
- ASHP for hot water generation, and
- Solar PV panels.

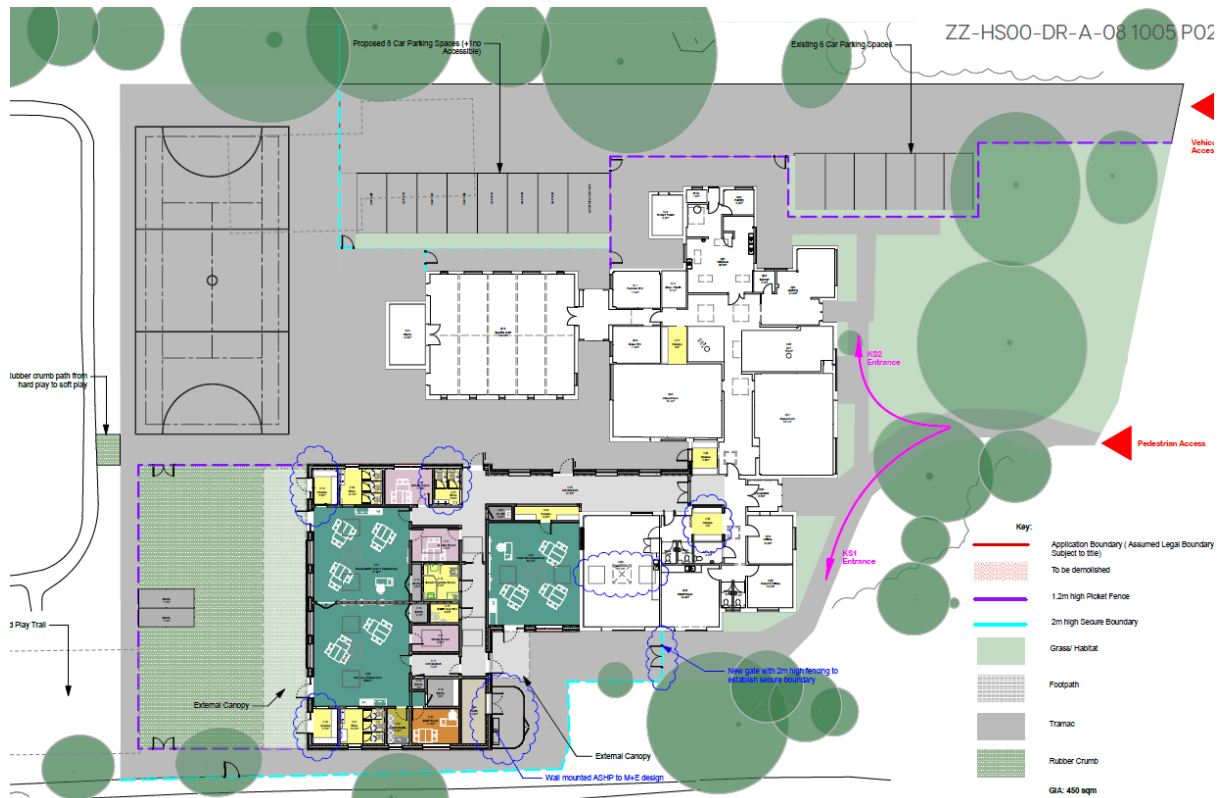
2. INTRODUCTION

Pope Consulting have been appointed by Stepnells (Southern) and Wiltshire Council to prepare an outline design stage Energy Strategy to support the Planning Application for Hullavington.

The report considers relevant national, regional and local planning policy, with particular reference to the Wiltshire Design Guide Supplementary Planning Document (SPD) and the council's wider climate objectives, including its commitment towards achieving net zero carbon emissions.

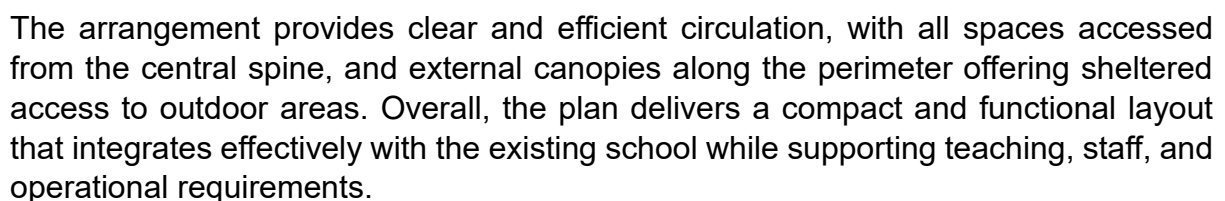
Options have been reviewed for reducing emissions through energy efficiency measures, heating, hot water services, and on-site renewable energy technologies. The local environment and proposed site have been considered throughout.

3. SITE DESCRIPTION



The site comprises an existing primary school campus with buildings arranged centrally and to the east, set within a mix of hardstanding, playing courts and landscaped areas with established mature trees along the boundaries. The proposed development is located to the southwest of the existing buildings, forming a new extension that connects directly to the current school layout and creates a more defined edge to the site. The extension provides additional teaching and support spaces with associated external areas, including soft landscaping and sheltered outdoor space.

Existing sports facilities to the west are retained, while vehicular access remains from the north, where car parking including accessible spaces is located. Pedestrian access routes connect the parking areas to the main entrances, with circulation across the site primarily via hard surfaced areas. The site is enclosed by existing boundary treatments, including fencing and vegetation, which are largely retained, and the surrounding trees contribute positively to the setting and character of the school.



4. PLANNING POLICY

This section explores some of the relevant policies which set out carbon and energy emission reductions for this project to consider and adopt.

4.1. The Climate Change Act 2008 (Amended 2019)

In the United Kingdom, the Climate Change Act 2008 was brought into law which set the commitments to reduce emissions 34% by 2020 and 80% by 2050 compared to the relative levels in 1990.

This order was amended in 2019 to increase the 2050 target from 80% to 100% reduction in CO₂ emissions against the 1990 baseline.

And further amended in 2021 to reduce emissions by 78% by 2035 compared to 1990 levels.

4.2. National Planning Policy Framework (NPPF)

The NPPF was updated in December 2023 and contains the following in relation to sustainable development practices.

4.2.1. Achieving Sustainable Development:

The purpose of the planning system is to contribute to the achievement of sustainable development. There are three main principles that guide it:

1. **Economic Objectives:** To help build a strong, responsive, and competitive economy, by ensuring that sufficient land of the right types is available in the right places and at the right time to support growth, innovation, and improved productivity; and by identifying and coordinating the provision of infrastructure.
2. **Social Objectives:** To support strong, vibrant, and healthy communities, by ensuring that a sufficient number and range of homes can be provided to meet the needs of present and future generations; and by fostering well-designed, beautiful, and safe places, with accessible services and open spaces that reflect current and future needs and support communities' health, social and cultural well-being.
3. **Environmental Objectives:** To protect and enhance our natural, built and historic environment; including making effective use of land, improving biodiversity, using natural resources prudently, minimizing waste and pollution, and mitigating and adapting to climate change, including moving to low carbon economy.

4.2.2. Presumption in Favor of Sustainable Development:

Plans and decisions should apply a presumption in favor of sustainable development. They should include promotions of a sustainable pattern of development that should seek to meet the development needs of the area. They should:

- Align growth and infrastructure.
- Improve the environment.
- Mitigate climate change (including by making effective use of land in urban areas).

- Adapt to the effects of climate change.

4.3. Local Council

The development plan for the area is set out within the adopted Wiltshire Core Strategy (January 2015), which provides the strategic planning framework for the delivery of sustainable development across the county. The Core Strategy is supported by supplementary guidance, including the Wiltshire Design Guide SPD (2024), and is currently being reviewed through the emerging Wiltshire Local Plan. The Council has also declared a climate emergency and is committed to achieving net zero carbon emissions, which is reflected in its approach to sustainable development and energy use.

4.3.1. Policy 41 (Sustainable Construction and Low-Carbon Energy)

Core Policy 41 (Sustainable Construction and Low-Carbon Energy) states that “new development should minimise its environmental impact by making the most efficient use of resources” and supports proposals that incorporate measures to reduce energy demand and increase energy efficiency. The policy encourages development to “maximise opportunities to incorporate renewable and low carbon energy generation”, where viable and appropriate

4.3.2. Policy 57 (Ensuring High Quality Design and Place Shaping)

Core Policy 57 (Ensuring High Quality Design and Place Shaping) requires that development “conserves energy, minimises waste, and makes efficient use of resources”, and that proposals respond positively to the local context while incorporating sustainable design principles.

In addition, the Wiltshire Design Guide SPD (2024) emphasises that development should respond to the climate emergency by embedding sustainability as a key design principle, promoting energy efficiency, climate resilience, and low-carbon design approaches throughout the development process.

4.4. Be Lean, Be Clean, Be Green

Developments expecting to achieve low or net zero-carbon emissions, should do so by following the energy hierarchy:

- **Be lean:** use less energy and manage demand during operation through fabric and servicing improvements and the incorporation of flexibility measures.
- **Be clean:** exploit local energy resources (such as secondary heat) and supply energy efficiently and cleanly by connecting to district heating networks.
- **Be green:** maximise opportunities for renewable energy by producing, storing, and using renewable energy on-sit.
- **Be seen:** monitor, verify and report on energy performance.

The proposed development is targeting a net zero carbon approach in operation, with the aim of minimising regulated energy use as far as practicable. A fabric-first strategy will be adopted, with the building envelope designed to exceed the minimum requirements of Building Regulations Part L.

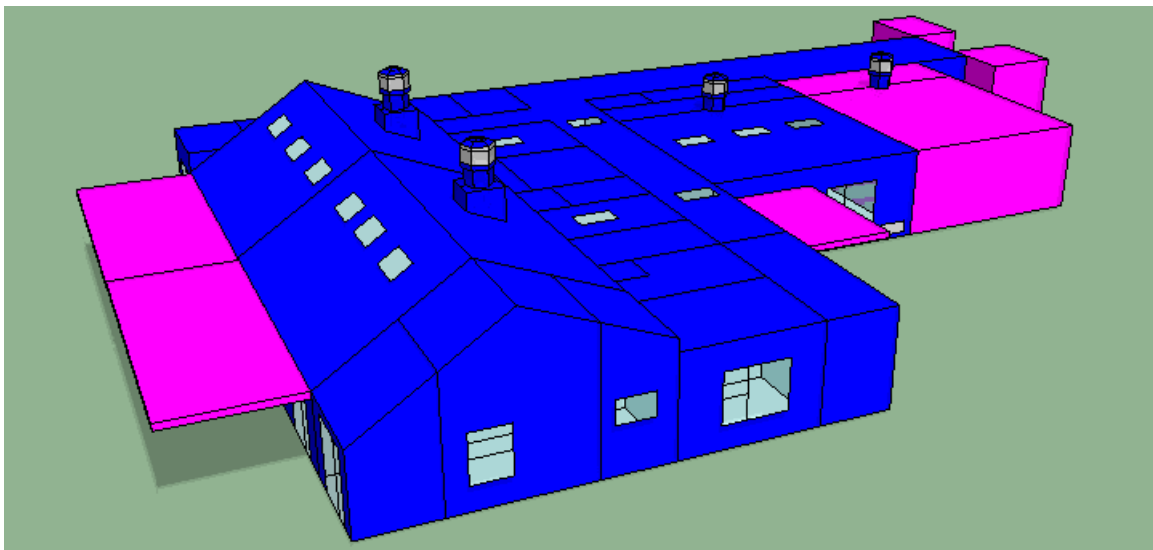


5. BUILDING ENERGY MODELLING

To assess the CO₂ emission and primary energy rates of the proposed building it was modelled using IES Virtual Environment Version 2024. This model has been produced to determine the annual energy demands and quantify the reduction in energy use and CO₂ emissions due to the energy efficiency improvements when compared to the notional building.

The software contains a construction database which defines all the construction U-values used for each of the building elements. The building services can also be defined within the model.

IES VE is accredited software to carry out Simplified Building Energy Model (SBEM) calculations to demonstrate compliance to Part L of the Building Regulations. Below is an image showing the model created in IES VE.



6. DEMAND REDUCTION – ‘BE LEAN’

To meet the planning conditions as well as Building Regulations, it is important to minimise energy requirements for the planned development. This can be achieved through passive energy efficiency measures such as improving the building's fabric performance as well as utilising sustainable building services.

Improving the building's design in these ways will result in an improvement in the building's energy reduction beyond that of the notional building, calculated using notional levels set out within Part L of the Building Regulations.

6.1. Building Fabric

The building fabric has been developed following a fabric-first approach, with area-weighted U-values targeting an improvement beyond the minimum standards set out in Building Regulations Part L where feasible. The proposed specification reflects a balanced approach that takes account of site constraints and the requirements of an extension to an existing building.

Glazing is proposed as high-performance double glazing, resulting in slightly higher U-values than those typically associated with triple glazing, while still delivering an overall improvement in thermal performance. Overall, the proposed fabric specification exceeds minimum regulatory requirements and supports the project's low-carbon and net zero aspirations.

The new building will be pressure tested upon completion. The maximum permissible air leakage set out in the Building Regulations is 8.0 m³/ (h.m²) @ 50 Pa. Therefore, it is proposed that the construction is built to improve upon this air leakage performance and achieve at least 3.0 m³/ (h.m²) @ 50 Pa. This will further improve the energy efficiency of the building.

Elements	Baseline – 2021 L2 Limiting U-Values	Proposed U-Values
Wall	0.26	0.14
Floor	0.18	0.12
Roof	0.16	0.13
Windows	1.6	1.4
Roof lights	2.2	1.3
Doors	1.6	1.4
Air Permeability	8.0	3.0

These fabric values will inform the build-up and material selection for the building's element. Through improvement of the thermal transmission values, it is envisaged that the new building will minimize its energy requirements. In particular, the heating and cooling needs, as the U-Values will aid in limiting heat transfer across building elements.

6.2. Ventilation

The building will employ a mixture of ventilation systems with passive natural ventilation incorporating heat recovery in the classrooms and mechanical ventilation with heat recovery serving the group rooms, WCs, and staff areas. All the circulation area have been designed with openable glazing to allow for natural ventilation and to help encourage cross ventilation into the school extension areas.

6.3. Heating

The building will be heated via a low-carbon system comprising underfloor heating served by a reversible air source heat pump (ASHP). The system achieves a heating efficiency of approximately 4.5, as identified within the BRUKL output, representing a highly efficient form of electric heating.

The use of a reversible heat pump also enables the potential for future cooling provision without the need for additional standalone systems, improving overall system efficiency. This approach supports the project's low-carbon and net zero objectives by significantly reducing operational emissions associated with heating.

6.4. Lighting

A lighting efficacy of 95 lumen/circuit watt has been targeted at this stage of the design. When the lighting is fully designed for these areas, this may be subject to change.

It is proposed that LED lighting be used with automatic and/or manual switching facilities. The use of photocells (daylight sensors) to control the external lighting will be provided.

6.5. Water Usage

The water usage within the new building primarily comes from the WCs and Kitchen area which will provide catering, washing, and cleaning facilities.

Measures such as selecting lower water consuming sanitaryware will be used to ensure that the water efficiency is increased. This will be ensured via the use of combination isolation and flow restricting valves on the water outlets. Flow restrictors will also help ensure that maximum water efficiency is adhered to, even if the sanitaryware items are changed later by the occupant.

The hot water will be provided via local point of use electric water heaters. There is the option to provide a central hot water cylinder heated, however this would introduce more standing heat loss to the system due to additional internal hot water pipework and having stored hot water.

A water leak detection system is proposed to monitor the extended system to automatically shut off the new extension should a leak occur.

7. DECENTRALISED ENERGY – ‘BE CLEAN’

As part of the Be Clean stage of the energy hierarchy, developments are to consider connection to an existing heat network or employing a site-side energy center.

7.1. Connection to Existing Heat Networks

From our studies we have found there are no existing heat networks within the vicinity of the site. Given the size of the proposed site and relative energy/heat requirements for the new building, the only future scenario to connect to a heat network would be feasible, if the infrastructure were ready and available in the immediate vicinity of the site to reduce connections costs.

8. RENEWABLE AND LOW/ZERO CARBON TECHNOLOGIES – ‘BE GREEN’

This section of the report will review the potential viability of the on-site installation and implementation of decentralised and renewable or low-carbon energy sources.

8.1. Solar Photovoltaics

Solar PV systems use cells to convert daylight into electricity. PV cells consist of 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. The PV Modules gather solar energy in the form of daylight and convert it into direct current (DC) electricity. The inverter converts DC power into alternating current (AC) power, which is the type of electricity used daily by the building.

As Solar PV systems do not require direct sunlight to generate power, these systems can work well in UK installations with year-round generation. Although the output of the system is dependent on the available roof space and orientation of building. Given that Solar PV is becoming a more mature technology in the UK, installation costs are coming down. However, that also means there are less export tariffs and support schemes available to offset costs. With the recent increases in fuel tariffs, on-site electrical generation will help the occupier reduce their utility bills by using less grid-supplied electricity.

Based on our review of the available roof area (circa 320 m²), it is considered that there is sufficient unencumbered space to accommodate a photovoltaic array of approximately 150 m², while maintaining appropriate access and maintenance allowances.

The sizing of this array is based off the Architectural plans which have allocated roof space for the inclusion of photovoltaics. A management plan should be implemented to ensure that the surrounding vegetation is controlled to ensure that any new PV installation output is maximised.

8.2. Solar Water Heating

Solar water heating systems use solar panels, called collectors. These collect heat from the sun and use it to heat up water stored in a hot water cylinder. A boiler or immersion heater can be used as a back-up to heat the water further to reach the required safe water storage temperature.

There are 2 types of solar water heating panels, either Evacuated tubes, or Flat plate collectors. Evacuated tube collectors are the most efficient but can cost twice as much per square metre as flat plate collectors. Each evacuated tube is a glass or metal tube containing the water or heat transfer fluid surrounded by a larger glass tube. The space between them is a vacuum, so very little heat is lost from the fluid.

Similarly, to Solar PV, Solar Water collectors are reliant on available roof space and orientation of the building to operate effectively. Commonly these are used as supplementary hot water generation systems and thus would still likely require some form of back up water heater or boiler to meet peak hot water loads. Also, given its

expected usage, the domestic hot water demand profile throughout the week would vary rather than a constant load.

The sloped roofs could accommodate solar collectors however this would also take up space otherwise utilised for Solar PV. Solar Water collectors are likely to be unsuitable for this project due to the inconsistent hot water demand, throughout the entire year within the building.

8.3. Wind Turbines

Wind is a form of solar energy and is a result of the uneven heating of the atmosphere by the sun, the irregularities of the earth's surface, and the rotation of the earth. Turbines utilise wind to make electricity. The wind turns the blades, which spins a drive shaft, the movement of this shaft spins an electricity generator via a gearbox. As the shaft turns, it helps to power the generator consisting of magnets and a conductor, such as coiled copper wire. When the magnets rotate around the copper wire, it creates voltage and a DC electric current. An inverter converts DC power into AC power.

To really benefit from wind speeds, the turbine would need to be mounted higher. Given the setting of the site, it is extremely unlikely that this would be a suitable solution.

8.4. Micro-Combined Heat and Power (CHP)

Micro-CHP technologies generate both usable heat and electricity. It was developed to increase the amount of energy harnessed when burning fuel, increasing the efficiency of the combustion process. A micro-CHP boiler typically uses mains gas or LPG, so they are not considered a renewable energy source, however due to their efficiency and productivity they can significantly lower carbon dioxide emissions. A micro-CHP boiler will typically operate like a normal gas boiler - although they usually feature an internal motor which generates electricity using the heat produced.

As grid electricity becomes more de-carbonised, the benefits from micro-CHP are expected to be lessened. Electrical production is only a small proportion of the heat output from the micro-CHP. Therefore, the installation performs best when there is a high hot water demand. Allowing the micro-CHP to run with a constant base load as opposed to inefficient short cycles of operation.

Similarly, to other technologies considered, the hot water demand and irregularity of usage for this type of building are big factors against the selection of micro-CHP, alongside the associated carbon emissions.

8.5. Air Source Heat Pump (ASHP)

An air source heat pump (ASHP) can provide efficient heating and cooling solutions in any climate by converting solar energy stored in the air into energy, providing useful heat. ASHPs transfer heat from the outside air using the refrigerant cycle. Heat from the air is absorbed at low temperature into a refrigerant. This passes through a compressor where its temperature is increased and transfers its higher temperature heat to the building.

There are two main types of ASHP:

- Air-to-air - absorbs heat from the outside air and then transfers it directly into your building via a fan system to heat a room or an indoor space.
- Air-to-water - absorbs heat from the outside air and then transfers it via your central heating system to provide both hot water and space heating.

ASHPs are increasingly being used across the UK and so the market is competitive across different sizes of schemes. As an electrically driven piece of technology, the ASHP's carbon reduction performance will increase as the UK electricity grid decarbonises in future years.

Whilst in heating only mode, ASHPs are recognised as renewable technology. But it can also operate to provide cooling where required.

The outdoor units can be noisy as well as unsightly when visible, so consideration would need to be made for external plant areas to ensure that negative impacts are mitigated. Whilst a viable solution, the proposed heating system will already be provided via LZC technology.

8.6. Ground Source Heat Pump (GSHP)

Heat from the ground is absorbed at low temperatures into a fluid inside a loop of pipe (a ground loop) buried underground. The fluid then passes through a compressor that raises it to a higher temperature, which can then heat water for the heating and hot water circuits of the building. The cooled ground-loop fluid passes back into the ground where it absorbs further energy from the ground in a continuous process if heating is required. Normally the loop is laid flat or coiled in trenches about 2m deep, but if there is not enough space in your development you can install a vertical loop down into the ground to a depth of up to 130m. Like ASHPs, Ground Source Heat pumps have some impact on the environment as they need electricity to run, but the heat they extract from the ground, the air, or water is constantly being renewed naturally.

GSHPs have a higher capital cost than ASHPs, mostly due to the increased infrastructure required to collect the heat. The installation of the ground loop will require borehole drilling for vertical loops or significant movement of earth to install the horizontal loop.

8.7. Technology Appraisal

This section summarises the suitability of the measures that would be taken as part of the development of the site to improve energy conservation.

The key aspect of this is minimising energy requirements for the building, which will be achieved through designing a building with good fabric performance and through the selection of energy efficient building services. This has been considered at the 'Be Lean' stage.

Further to this, an evaluation of low-zero carbon technologies has been carried out to assess the viability of each technology to this specific site.

Technology	Site Specific Comments	Viability
Solar PV	The site has large areas of south facing roof space suitable for PV. Management of surrounding vegetation will be required to maintain system output. The pitch and orientation will allow for the PV to offset a sizeable amount of energy from the grid.	Viable
Solar Thermal	Similarly for PV, the sloped roofs can accommodate the Solar collectors. Technology requires a top-up heat source to meet the domestic hot water peaks and for operation over non-summer months. Competes with roof space with Solar PV which is cheaper to install and works better in tandem with ASHPs.	Not Viable
Wind Generation	It is difficult to obtain permission to install wind generation turbines large enough to generate a considerable proportion of the site's energy demands. Smaller turbines mounted at roof level are unlikely to contribute enough to offset grid electricity usage. Planning implications would dissuade usage of this type of technology.	Not viable
CHP	The updates to SAP 10.2 mean that the onsite electricity produced by CHP units does not have as much of a carbon reduction for the scheme. Also, the domestic hot water profile for this kind of scheme is not large or consistent enough to fully make use of this technology.	Not viable
ASHP	An air-to-water air source heat pump (ASHP) will be utilised to provide space heating to the building via an underfloor heating system. The ASHP units are proposed to be located at ground level, with spatial requirements and potential noise impacts to be considered as part of the detailed design.	Viable
GSHP	GSHPs require large amounts of earthworks and create lots of disturbance to the surrounding area. Larger capital cost in installing ground loops or borehole drilling off-putting.	Unlikely

9. PART L RESULTS

The new proposed extension has been modelled within IES VE software to undertake SBEM calculations for Part L compliance. The tables below show the predicted improvement in primary energy usage and CO₂ emissions rates between the target building and the proposed building as calculated through the SBEM software.

TPER – BPER	Target Primary Energy Rate (kWh/m ² /annum)	Building Primary Energy Rate (kWh/m ² /annum)	Improvement
Proposed Hullavington Extension	40.47	-4.23	110.5%

TER – BER	Target Emission Rate (kgCO ₂ /m ² /annum)	Building Emission Rate (kgCO ₂ /m ² /annum)	Improvement
Proposed Hullavington Extension	3.85	-0.11	102.9%

As can be seen above, the improvements in the primary energy rate exceed the relative improvements in the building emission rate.

10. CONCLUSIONS

This energy strategy for the new proposed Hullavington extension has demonstrated throughout the sections of this report how the building will be designed in such a way as to meet local and national planning requirements as set out by Wiltshire Council.

Energy Consumption by End Use	
Heating, kWh/m ²	3.89
Cooling, kWh/m ²	0
Auxiliary, kWh/m ²	12.07
Lighting, kWh/m ²	6.22
Hot Water, kWh/m ²	10.31
Total, kWh/m ²	32.5
Onsite renewable (PV), kWh/m ²	36.44
Contribution by onsite renewable (PV)	36.44

As demonstrated by the breakdown of energy consumption by end use, derived from the Part L calculations, the development incorporates a significant on-site renewable energy contribution. This is supported by Wiltshire Core Strategy policies which encourage the integration of low-carbon and renewable energy technologies within new development. The level of on-site generation is facilitated by the availability of substantial roof area, allowing for a larger photovoltaic (PV) array to be accommodated. This approach aligns with Wiltshire Council's wider climate objectives and commitment to reducing carbon emissions, contributing positively towards the transition to a low-carbon built environment.

The development has employed the following measures to reduce CO₂ emissions beyond the Part L 2021 baseline notional building:

- Improved U-Values,
- Enhanced air tightness,
- High efficiency building services,
- LED lighting,
- Water saving technologies,
- ASHP for space heating,
- ASHP for hot water generation, and
- Solar PV panels.