Hydrock

Himley Village Development

Himley Site Wide Energy Strategy

For *Cala Homes*

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Contents

1. Introduction

1.1 Purpose of Report

This Energy Strategy has been prepared by Hydrock, for the proposed Himley Village development.

This document has been produced to address Schedule 11 of the S106:

> *"The Owner and Developer will submit a strategy for zero carbon generation and carbon balance to the District Council. The strategy shall show how the Development achieves zero carbon as identified in the Eco Towns PPS and referenced in the Cherwell Local Plan Policy Bicester 1."*

Throughout this report, carbon emissions are split into the following categories:

- » Regulated: Emissions associated with heating, cooling, hot water, lighting, and any other fixed building services equipment (those that are covered under Building Regulations Part L)
- » Unregulated: Emissions that are associated with small power and plug-in items and any other process or plant equipment (these are not covered by Part L).

The purpose of this document is to provide a strategy for the Himley Village Development to achieve zero carbon, and includes the following information:

- » Energy Use Intensity (EUI) targets
- » Energy reduction strategies to meet these targets
- » Energy generation strategy to offset the annual energy consumption

1.1 Project Description

The proposed Himley Village development consists of 1,700 homes, schools, retail, commercial and community facilities. The site itself is classified as an EcoTown and will seek to provide a zero-carbon-ready development on the outskirts of Bicester. The Himley Village site falls within the remit of Cherwell District Council (CDC).

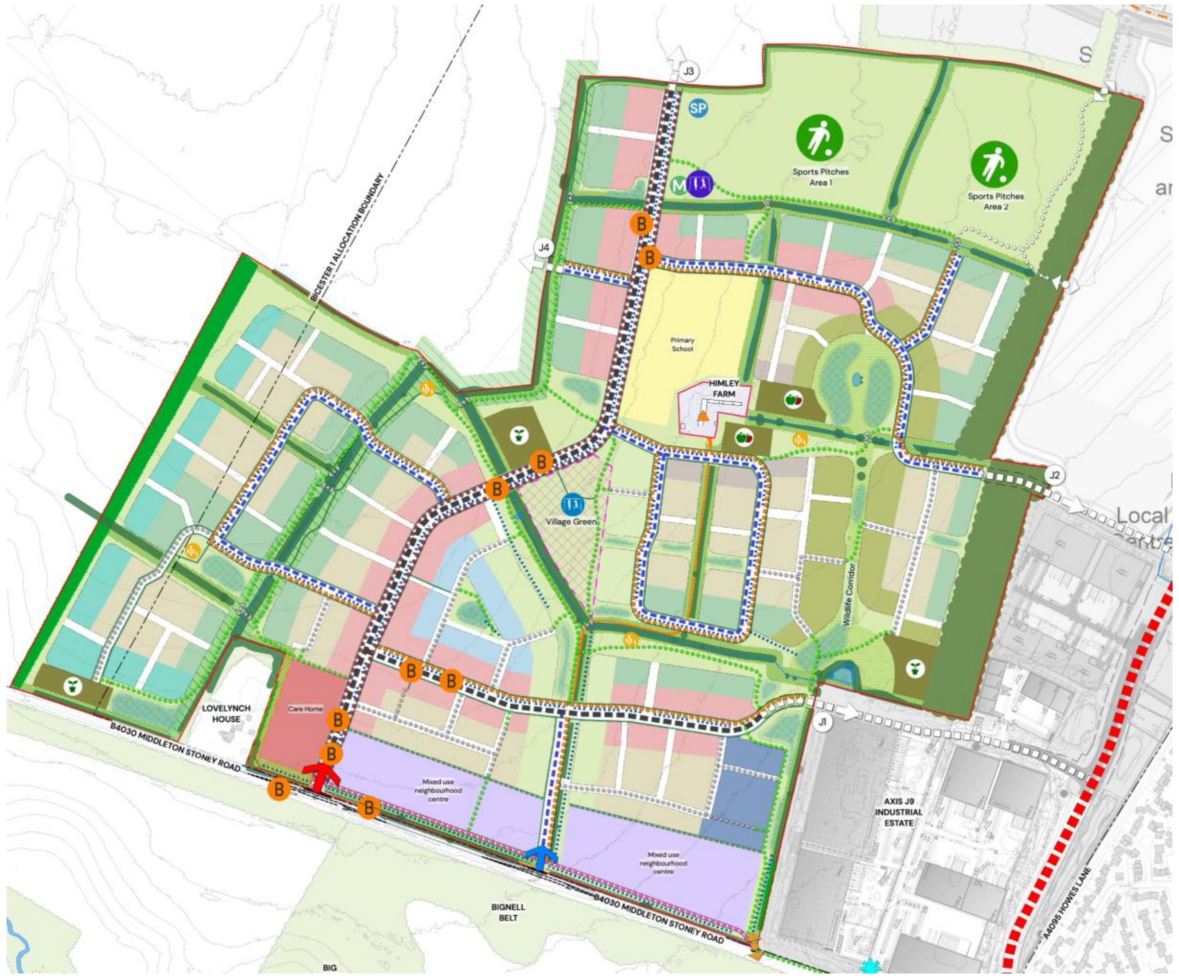

Figure 1: Site masterplan

2. Policy

As per the requirements of Schedule 11 of S106, the energy strategy for the Himley Village development must show how the development achieves zero carbon as identified in the Eco Towns PPS and referenced in the Cherwell Local Plan Policy Bicester 1.

The zero carbon requirement set out within these policies is detailed below.

2.1 Eco Towns Planning Policy Statement

Zero carbon in eco-towns ET

The definition of zero carbon in eco-towns is that over a year the net carbon dioxide emissions from all energy use within the buildings on the eco-town development as a whole are zero or below. The initial planning application and all subsequent planning applications for the development of the eco-town should demonstrate how this will be achieved.

The health and social care needs of residents, and the resulting energy demand, should be taken into account when demonstrating how this standard will be met.

This standard will take effect in accordance with a phased programme to be submitted with the planning application. It excludes embodied carbon and emissions from transport but includes all buildings – not just houses but also commercial and public sector buildings which are built as part of the eco-town development. The calculation of net emissions will take account of:

a. emissions associated with the use of locally produced energy

b. emissions associated with production of energy imported from centralised energy networks, taking account of the carbon intensity of those imports as set out in the Government's Standard Assessment Procedure, and

c. emissions displaced by exports of locally produced energy to centralised energy networks where that energy is produced from a plant whose primary purpose is to support the needs of the eco town and has a production capacity reasonably related to the overall energy requirement of the eco town.

This standard attempts to ensure that energy emissions related to the built environment in eco-towns are zero or below.

2.2 Cherwell Local Plan

Policy Bicester 1

Key site-specific design and place shaping principles for these sites including:

- » High quality exemplary development and design standards including zero carbon development, and the use of low embodied carbon in construction materials as well as promoting the use of locally sourced materials.
- » All new buildings designed to incorporate best practice on tackling overheating, taking account of the latest UKCP climate projections.
- » Proposals should enable residents to easily reduce their carbon footprint to a low level and live low carbon life styles.
- » Demonstration of climate change mitigation and adaptation measures including exemplary demonstration of compliance with the requirements of Policies ESD1-5.

This policy defines zero carbon in eco-towns to be when over a year the net carbon dioxide emissions from all energy use within the buildings on the eco-town development as a whole are zero or below.

3. Methodology and assumptions

This strategy has been created at the early stage of the design, thus details of individual buildings are not fully developed. It has been developed in conjunction with Phase 2A Himley Village Development RMA and aligns with the strategy developed for this.

This section details the assumptions utilised to develop this strategy.

3.1 Energy Use Intensity (EUI) targets

To set the targets for this development Hydrock have used industry-accepted targets for all the use types. These include but not limited to:

- LETI Climate Emergency Design Guide
- NHS Net Zero Guide
- Department for Education Technical annex 2J: sustainability

3.2 Energy reduction strategies

At this early stage the design is not fully developed. This document therefore outlines the strategies that should and could be reasonably adopted to meet the EUI targets listed. As the design is still in development the technology type and mix may change leading to increased or decreased generation requirements.

3.3 Energy generation strategy

Areas for each development use type have been based on the Land Use Schedule approved in outline planning (outlined below), as these constitute the maximum allowable areas.

Table 1: Outline Planning Land Use Schedule

Land Use	GIA (m^2)
Residential	1700 units (156,395m^2)
Hotel	2,600
Veterinary surgery	2,000
Primary School	2,750
Retirement Village	9,000
Pub/community	400
Retail	700
Health facility	1,500
Nursery	100

From the EUI targets, Hydrock have estimated the likely energy consumption of the development and thus the energy generation requirement to meet net zero.

Using assumptions of roof area and percentage of roof coverage, Hydrock has estimated the extent to which this can be provided be rooftop PV. For the residential development, it has been assumed that the layout of the units maximises solar PV generation potential, with a good mix of east, west south facing pitched roofs, as per the strategy taken for Phase 2A. We have taken a conservative option of 55% of roof space being available for PV on the dwellings.

For the other archetypes it is assumed that 50% of roof area will be available for solar PV. The number of stories assumed for each archetype is detailed below.

Table 2: Storey assumption per archetype

Archetype	No. Storeys
Flats	3.0
Houses	2.3
Hotel	6.0
Vet	2.0
Primary School	2.0
Retirement	3.0
Pub/Community	2.0
Retail	1.0
Healthcare	2.0
Nursery	2.0
Offices	3.0

Please note that due to limited design information available, the area of PV or the rooftop capacity may differ as the design develops.

Table 3 shows the assumed PV panel specification, which are based on manufacturer products and PV geographical information outputs.

Table 3: PV specification

PV	Unit
Panel Peak	0.4 kWp
PV output	360 kWh/yr
PV size	2 m^2

Site-wide Design Strategies

This section of the report sets out the high level design principles that are required for the development. Each of the building use types will be considered in more detail in the following section to provide a net zero carbon roadmap.

4. Reaching net zero

To achieve zero carbon, the development should target a low Energy Use Intensity (EUI). Renewable energy generation should then be utilised to help achieve the net zero energy balance.

This section details the strategies recommended for all building use types to ensure the delivery of the net zero requirement.

The approach taken should follow the below hierarchy of strategies, as shown in Figure 2:

1. Reduce Demand
2. Improve Efficiency
3. Low/zero carbon technologies

5. Passive Design - reducing energy demand

Passive design measures are those which utilise building form, massing and glazing ratios to exploit the natural surroundings of the site to help reduce energy demand. Energy demand reduction provides the greatest opportunity for minimising buildings' potential CO_2 emissions.

The following measures should be employed in the design of all use classes within the development, as appropriate to the construction type and end use:

» Optimising daylight through higher floor to ceiling heights or dual aspect buildings;

» Control of solar gain to benefit from heat when required without causing overheating in summer via the size and depth of windows on different elevations and the orientation of the houses;

» Increased efficiency of building fabric, particularly the roof and walls to reduce heat loss;

» Maximising air tightness to minimise the impacts of uncontrolled air infiltration; and

» Strategic planting of trees to shelter lower-level buildings from high winds and provide shading from the sun.

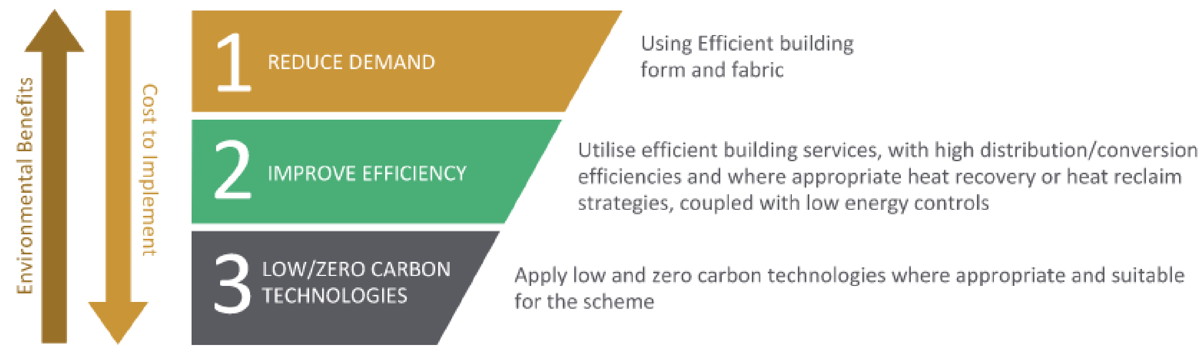

Figure 2: Energy Hierarchy

Throughout the site the building fabric should be in excess of the Part L notional value, the following building fabric values are expected to be achieved. These are in line with the LETI building archetypes on the site and the incoming Future Homes Standard.

Table 4: Recommended u-values

Building Element	U-value
Wall	0.12-0.15 W/(m²·K)
Roof	0.10-0.12 W/(m²·K)
Floor	0.08-0.12 W/(m²·K)
Glazing	1-1.20 W/(m²·K)
Air tightness	<3 (m³ /h. m2 @50Pa)

Through the above measures, development should target a maximum of 10 W/m² peak heat loss (including ventilation).

6. Active design - improve efficiency

After energy demand reduction through fabric and form design measures, energy efficiency measures (active design) should be included within the building services specification to reduce energy consumption. The following is recommended for the site:

» All services should be designed to meet the performance requirements specified in the LETI zero carbon design guide (see appendix 1);

» Ensure appropriate zoning of the heating system and segregation of internal spaces to allow effective temperature control by occupants, as appropriate;

» Install heating and cooling set point control;

» To minimise water consumption and energy consumption, high levels of insulation, coupled with efficient fittings should be prioritised for hot water delivery;

» Highly efficient mechanical ventilation with heat recovery (MVHR) to ensure a constant supply of fresh air into buildings, where required;

» All equipment should be specified to achieve a high efficiency (e.g. high thermal conversion efficiency for heating equipment) and low distribution losses (low fan and pump power, insulation in accordance with relevant standards), with pumps utilising variable speeds;

» All lighting installed should be high efficiency LED type;

» Wastewater heat recovery (WWHRS): **WWHRS** is a simple heat recovery device that recycles the heat energy from waste shower water. It uses it to preheat mains cold water and sends the preheated water to the shower and/or water heater. This can reduce the energy required per shower use by up to 55%. In particular, the residential, later living and hotel schemes should consider incorporating WWHRS.

6.1 Unregulated energy

Unregulated energy can make up a significant proportion of a building's energy balance. It is therefore important that measures are taken to reduce unregulated energy.

To reduce unregulated emissions associated with plug-in devices the buildings should be provided with a smart meter to provide real time energy use and cost data. This coupled with "in-home" energy displays devices will allow occupants to visualise their energy use in a graphical and cost format, providing instant feedback on the energy and carbon implications of day-to-day plug-in equipment, and thermostat settings.

7. Low and zero carbon energy supply

7.1 District Heat Network (DHN)

For Phase 2 Himley Village RMA Hydrock undertook feasibility studies to determine whether a DHN would be viable and beneficial for the Himley Village Development.

At outline planning, a gas powered CHP DHN was proposed. For CHP to be an efficient means of providing low carbon heat there needs to be a significant difference in the carbon intensity of gas and electricity. Due to the rapid decarbonisation of the grid, the installation of gas CHP and boilers would not result in a low carbon development.

Recent calculations and feasibility studies undertaken on sites in the UK by Hydrock indicate that connection to a DHN can result in higher carbon emissions than localised ASHP in the region of 15 – 20% depending on the losses occurred in transmission.

Hydrock also explored the feasibility of several other DHN options which utilised heat pumps. However, whilst these options did provide low carbon heating, they were not selected for a number of reasons. Firstly, the introduction of a DHN would result in a significant increase in the infrastructure at the site, resulting in a significant increase in the embodied carbon of the site which would not be offset by the operational carbon emissions reduction. Secondly, the DHN would need to be owned, operated and maintained via an ESCO/MUSCO. This arrangement will significantly restrict occupants' ability to have the freedom to procure their own energy, which can lead to increased costs to occupants.

For the above stated reasons, a DHN is not recommended for Himley Village Development. Development should instead incorporate the low and zero carbon technologies set out in the following sections.

7.2 Ambient loop system

The ambient loop system can be utilised across a whole development or at building level.

Individual buildings, flats or rooms connected to the system would generally use localised heat pumps and cooling machines, exchanging energy with the network. Each building/room makes energy deposits or withdrawals from the ambient loop system, which means that the energy demands from all the units are best balanced against each other. Energy is only added or removed from the system when off-balance occurs.

An ambient loop system is not recommended for the whole of the Himley Village masterplan, because the development is likely to be built in stages and is unlikely to have a consistent energy balance. It is, however, feasible as a localised ambient loop system for multi-use buildings. This should be explored in the future design stages.

7.3 Heat pumps:

Heat pumps provide a highly efficient method of heat production for site heating and hot water; up to 3-4x as efficient as a conventional boiler. This can significantly reduce carbon emissions associated with space heating and domestic hot water, the two biggest consumers of energy in dwellings.

Heat pumps are powered by electricity, so are considered low-carbon rather than zero-carbon/renewable, however, as the grid decarbonises, they will become more efficient.

Heat pumps are proposed for all development archetypes in the Himley Village Development. Outlined below are the different types of heat pumps that should be considered, They are specified based upon whether they utilise ground, air or water as the source of heat.

There will be no installation of gas for heating or hot water generation purposes at the site.

7.3.1 Ground Source Heat Pump

GSHPs which use shared ground loop arrays provide further energy savings, compared with ASHPs. In this, ambient water is pumped from the ground loop to individual building heat pumps, where it is converted to a higher temperature for hot water and heating. This can significantly reduce carbon emissions and operational costs for residents.

GSHPs are preferred in instances where there are space restrictions as they take up less room. They are also much quieter than ASHPs as they do not take heat from the air, they do not need a fan. semiconductor

With this technology, it is also possible to provide passive cooling with very low energy use as only the pump and compressor is consuming electricity. This offers a key adaptation benefit and would help to mitigate risk of future heat stress.

GSHPs can also be installed in shared ground arrays utilising shared boreholes with individual heat pumps in each flat or commercial building.

This should be explored particularly in any apartment led development / extra care / care homes proposed as part of the site.

7.3.2 Air Source Heat Pump

ASHPs utilise the residual heat in external air to produce usable heat for heating and domestic hot water.

These are site externally at ground or roof level and are applicable to all building types. It is expected that all development at the site will be provided with ASHPs as a minimum with exploration of GSHPs also provided.

7.4 Photovoltaic panels:

Solar PV works by converting light into electricity using a semiconductor material. PV panels don't need direct sunlight to work; electricity can still be generated on a cloudy day.

Solar irradiance, which is the power per unit area (W/m²) received from the sun is measured annually. It is anticipated that the site will receive approximately 900 kWh/m²/yr based on the UK irradiance chart, which makes a great case for installing solar.

Monthly energy output from fix-angle PV system:

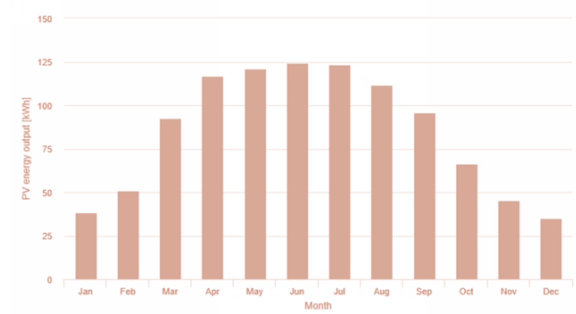

Figure 3: Monthly energy output from solar PV

Monthly in-plane irradiation for fixed-angle:

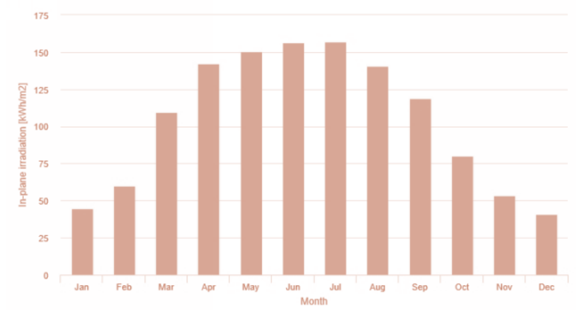

Figure 4: Monthly irradiation for solar PV

PV panels themselves vary in efficiency from 15-21% (average) to 23% (most efficient). Panels should face between SE and SW, at an elevation of about 30° – 40° for maximum output. The spacing of rows of panels should minimise over-shading of each other and also account for the maintenance space required.

In terms of location and orientation, there should be no overshadowing of the panels, as this reduces their overall efficiency. Even shading a small part of a PV panel could significantly reduce its efficiency and the efficiency of other PV panels connected in the string. Overshadowing can be caused by trees, other buildings, roofs of adjacent buildings, dormer windows, roof furniture, etc.

Photovoltaic panels are recommended across all roof spaces in the Himley Village

Development to help achieve the net zero energy balance.

If the roof capacity is not sufficient to meet the generation requirements for net zero, because for example significant roof space is needed for HVAC equipment, there may be a requirement for limited areas of ground mount PV. In this instance, the proposed energy centre site, if a site wide energy grid is not proposed as part of the development, could be considered for ground mount PV.

This could be coupled with EV charging to provide a generation and charging "hub".

7.5 Solar Thermal Panels:

Figure 5: Solar thermal hot water panels.

Solar thermal panels collect heat from the sun via a series of tubes, called collectors, that are filled with a heat transfer fluid. The warm fluid is then pumped through a coil in a water cylinder, warming the water; typically providing a 60°C output at the tap. Solar thermal is not as flexible as PV in terms of installation location; as it will require a roof. A double coiled hot water storage tank would also be required.

Typically, solar thermal is used in collaboration with a secondary heat source as it cannot provide all of a developments hot water; (typically 50-60%). A heat pump or boiler back-up would also be used to top up the temperature of the water if it isn't high enough, or to provide hot water at night.

Although heat from solar hot water collectors can be stored in hot water cylinders, during the summer, when hot water production will be at its peak, a high proportion of this can be wasted if there is not a dedicated heat sink.

Systems would be sized to meet peak summer hot water demand – for a typical dwelling this is expected to be approximately 150l/day, however, this may be increased for larger family houses.

If a pool is proposed as part of the school and/or retirement village solar thermal heating should be utilised to reduce the energy demand associated with this. The feasibility of this should be explored at a later design stage.

7.6 Battery storage

Battery storage is highly beneficial for optimising any renewable generation assets and requires a relatively small land area. It can provide smart active network management, ensuring cost savings and a resilient power supply.

The mixed use parcel should explore the potential of including battery storage within the scheme.

7.7 Microgrid

There is a potential for the mixed use scheme to operate as a microgrid. A microgrid links buildings on a common electricity system, any surplus on plot or on-site generation can be distributed to other buildings on the microgrid to optimise the balance of supply and demand across the site. A microgrid reduces the net amount of energy which needs to be imported from, or exported to the grid. This reduces energy costs across the development and ensures greater on-plot self-consumption of renewable energy, this should generally result in better payback and return on investment in renewable generation assets compared to a traditional approach.

8. Summary

The Himley Village Development will follow best practice guidance to reach net zero through the following measures:

- Fabric first approach to reduce demand through building fabric thermal efficiency - building fabric should align with LETI performance metrics
- Heat pump (no gas) energy solution
- Renewable energy generation - solar PV advised.
- Any other technology that may arise as feasible during the phasing of the scheme.

Table 5: Summary of proposed Himley Village low and zero carbon energy supply technologies

Low and zero carbon technology	Himley Village Development Proposals
GSHP	Consider for all archetypes/units where shared ground arrays are feasible. In particular, this should be explored in any apartment led development / extra care / care homes.
ASHP	Baseline heating system for all archetypes on site.
Ambient Loop	Consider for buildings with multiple uses.
Solar PV	Widespread solar PV across the development is recommended to achieve net zero energy balance.
Solar thermal hot water	To be considered particularly for hotel or development with high water use (e.g. if a pool is proposed as part of any scheme).
Battery Storage	Consider for multi-use scheme to optimise renewable energy generation.
Microgrid	Explore the potential for the mixed use scheme to operate as a microgrid. Surplus on plot can be distributed to other buildings on the microgrid to cover any shortfall.

Building Archetype Strategies

This section looks at the design principles and net zero strategies that are recommended for each building use type in the Himley Village Development.

9. Residential and the Later Living Village

The residential area of the development comprises up to 1,700 houses. The later living village comprises 9000m², based upon a 100 unit facility. For the purposes of this assessment, the later living village has been assumed to be a residential use type. This can be reviewed at a later stage.

For residential development, the space heating and domestic hot water consumption is often very high. Therefore, it is crucial to prioritise fabric performance, by targeting enhanced fabric u-values and optimising building form, to reduce heat loss and space heating demand. Development should target LETI aligned u-values (see section 5) and form factor (<0.8-1.5). To optimise solar gain, additional glazing should be incorporated on the southern facades.

In terms of active design, natural ventilation combined with highly efficient mechanical ventilation with heat recovery (MVHR) is recommended to ensure a constant supply of fresh air in dwellings.

9.1 Recommended EUI target

The recommended EUI target for the residential and later living development takes into consideration both the LETI benchmark and Phase 2A of the Himley Village Development EUI. Where possible development should work towards the LETI benchmark (35 kWh/m²/yr). However this may not be achievable depending on the level of ancillary uses.

EUI target: 50 kWh/m²/yr

10. Commercial

The area designated for commercial space (Class A1) includes for up 1,000m².

In commercial development, heating, ventilation, and air conditioning (HVAC) systems typically represent the largest energy demand. Therefore, optimising HVAC efficiency is highly important for reducing energy consumption. An air conditioning system is recommended for heating and cooling with low refrigerant charge and low global warming potential (GWP). Please see Appendix 1 for the performance requirements for services.

Additionally, to reduce cooling demand, external shading, in particular natural shading from trees and plantings, and solar control glass should be incorporated into the design. Building orientation should also be optimised to reduce the risk of overheating.

10.1 Recommended EUI target

This recommended EUI target for the commercial development, based upon LETI benchmarks is:

EUI target: 55 kWh/m²/yr

11. Retail

The area designated for retail comprises 700m².

Similar to commercial properties, the biggest energy demand comes from HVAC systems, which are crucial for maintaining comfortable indoor temperatures and air quality, especially in larger retail spaces with high foot traffic. Highly efficient HVAC systems should be specified to reduce energy consumption, as per the LETI zero carbon design guide specifications for commercial properties.

Lighting also accounts for a significant portion of energy usage in retail spaces due to the need for bright and well-lit environments. Therefore, highly energy-efficient lighting should be utilised, with lighting controls, such as sensors and timers to reduce energy usage.

The unregulated energy will form a large portion of the energy consumption with commercial freezers and display lighting large contributors. The developer will look to reduce this with green leases and other mitigation measures.

11.1 Recommended EUI target

This recommended EUI target for the retail development, based upon LETI benchmarks is:

EUI target: 45 kWh/m²/yr

12. Healthcare and veterinary surgery

The area designated for healthcare (GP surgery) and the veterinary comprises 3,500m².

Plug-ins, such as medical equipment, can be a key energy demand in healthcare facilities,. Where possible the healthcare equipment selected should be highly efficient. Highly efficient HVAC systems should be specified to reduce energy consumption (see Appendix 1).

The NHS Net Zero Guide has a number of strategies that will be adopted by the design team to reduce the energy consumption.

12.1 Recommended EUI target

The EUI target for the healthcare and veterinary facilities is based upon the NHS Net Zero Guide benchmark for 'clinical spaces containing consulting work areas which are occupied during the day only'. This was assumed to be the most appropriate for both archetypes.

EUI target: 40 kWh/m²/yr

13. Hotel

The area designated for education comprises 2,600m².

Heating and hot water demand in hotels is significant. High levels of insulation around pipes, highly efficient heat pumps and WWHRS should all be prioritised. Low flow fittings should also be utilised to reduce water demand.

13.1 Recommended EUI target

This recommended EUI target for the Hotel scheme, based upon RLAM benchmarks is:

EUI target: 55 kWh/m²/yr

14. Education (primary school and nursery)

The area designated for education comprises 2,850m².

To reduce energy consumption in educational facilities, it is important to consider the operation of the facility and behaviours, as well as the passive and active design strategies set out previously. Environmental Management System to enable tracking and management of energy use should be incorporated.

Additionally, smart heating and lighting controls should be incorporated, with motion sensors and zonal heating to help ensure energy is not wasted in unoccupied spaces and pupil comfort is not compromised.

External shading and planting should be utilised to mitigate overheating and reduce the cooling requirement.

14.1 Recommended EUI target

This recommended EUI target for the education schemes, based upon Department for Education benchmarks is:

EUI target: 52 kWh/m²/yr

15. Pub/community

The area designated for pub/community purposes is 400m².

As the end use and exact nature of this development is unknown it is not possible to highlight specific strategies. This can be explored further at a later design stage.

15.1 Recommended EUI target

This recommended EUI target for the pub/community development, based upon LETI benchmarks for offices is:

EUI target: 55 kWh/m²/yr

16. Himley Village Site Energy Use

The estimated energy use of the Himley Village development based on the EUI targets set out above is displayed in Figure 6.

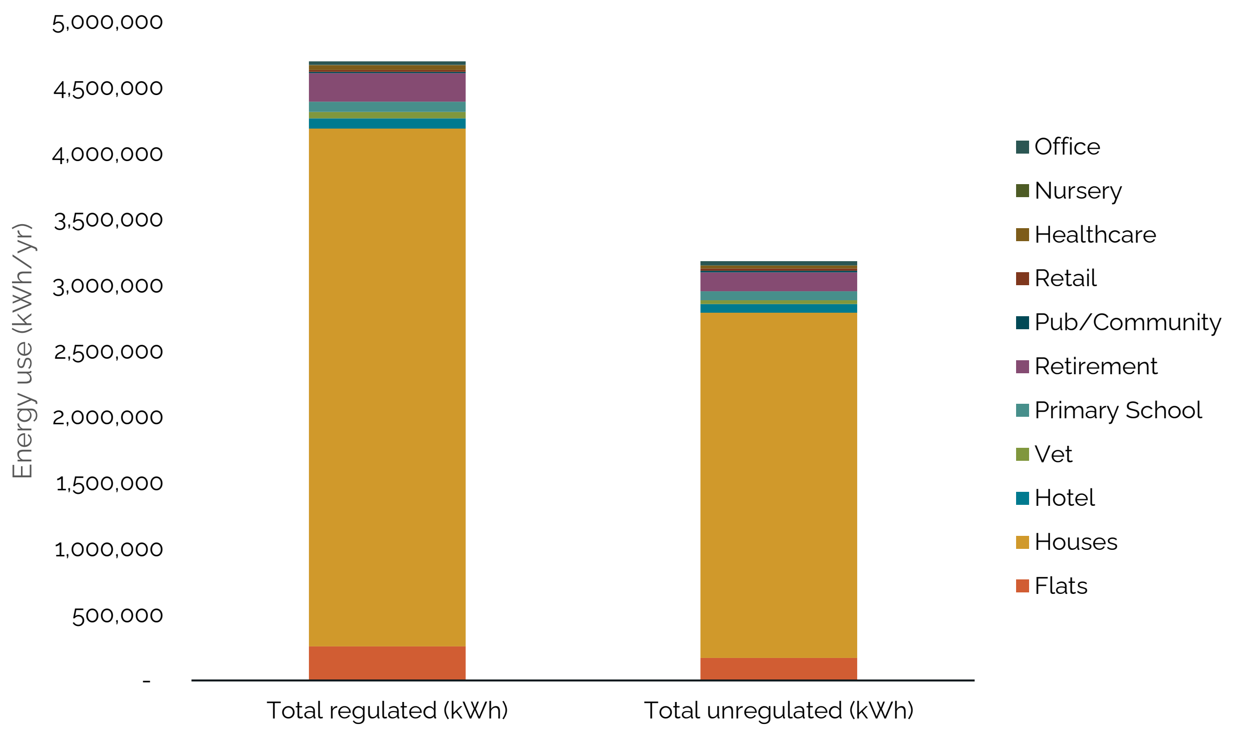

Figure 6: Himley Village anticipated solar PV generation requirement

17. Renewable Energy Generation requirement

It is recommended that roof-mounted PV is utilised to meet the site's net zero energy requirement. Table 6 provides the estimated PV energy generation required for the Himley Village development to reach net zero.

For certain archetypes, in particular the hotel and retail space, roof capacity may not be sufficient to achieve net zero. For these archetypes, any remaining carbon would need to be offset with surplus generation from other areas of the development, potentially small areas of ground mount PV or other renewable solutions, such as PV canopies in the car parks, as shown in Figure 7.

If required, one possible option would be to utilise the area designated for the energy centre for ground mounted PV to help cover any shortfall. In addition, there is potential for the mixed use scheme to operate as a microgrid, in which any surplus on plot or on-site generation can be distributed to other buildings on the microgrid to optimise the balance of supply and demand across the site.

Figure 7: Solar PV car park canopies

Use Type	PV generation required for net zero (kWh)	Active area required (m²)	Notes
Residential	6,976,500	39,000	Rooftop PV is expected to meet 100% of the PV generation needed for the residential development to achieve net zero. It's expected that the rooftop PV generation capacity will exceed the net zero requirement and could be used to offset energy shortfalls in other parts of the development. This doesn't include for additional PV capacity that could be provided from the roof spaces of garages.
Later Living	360,000	2,000	It may be feasible for the PV generation required for the Later Living Village to achieve net zero to be supplied by rooftop PV, depending on design and end use. The feasibility of this should be explored in further detail when the design and nature of the development are known. Where the PV generation requirement for net zero is not met by rooftop PV, the generation requirement could be met by surplus generation from other areas of the development or ground mount/car park canopy PV.
Commercial	55,000	300	If the PV generation requirement for net zero is not met by rooftop PV, PV canopies in the car parks could potentially be utilised to meet the shortfall.
Retail	31,500	200	The retail units are assumed to be located on the ground/lower floors of a multi-storey development, and therefore, it has been assumed there is no available roof space for roof-mounted PV. Any PV for the retail units would need to be installed on the roof of the building.
Healthcare	60,000	400	It is expected that rooftop PV will be sufficient to meet the PV generation required for net zero, and may provide additional PV generation that could be used to offset energy shortfalls in other parts of the development.
Veterinary	80,000	500	It is expected that rooftop PV will be sufficient to meet the PV generation required for net zero, and may provide additional PV generation that could be used to offset energy shortfalls in other parts of the development.
Primary School	143,000	800	It is expected that rooftop PV will be sufficient to meet the PV generation required for net zero.
Nursery	5,500	50	It is expected that rooftop PV will be sufficient to meet the PV generation required for net zero.
Hotel	143,000	800	Due to the limited roof space and high energy demand of hotels, rooftop PV will likely not be sufficient for the hotel to reach net zero. The shortfall will need to be covered by potential ground mount PV and/or by surplus generation from the rest of the Himley Village Development.
Pub/community space	22,000	150	It is expected that rooftop PV will be sufficient to meet the PV generation required for net zero.
Total	7,876,500	44,200	N/A

Table 6: Estimated Renewable energy generation requirement for Himley Village Development

**Please note that these figures are only estimates and have been rounded*

Conclusions

This report has provided strategies for the Himley Village Development to achieve zero carbon.

The development will be designed to minimise on-site energy use and carbon emissions in line with the energy hierarchy to meet the requirements of the Eco Towns PPS and the Cherwell Local Plan Policy Bicester 1.

18. Reaching Net Zero

To achieve net zero carbon the Himley Village Development will follow the below strategies:

18.1 Energy Use Intensity (EUI) targets

Development will target a low EUI, aligned where feasible with the below industry-accepted targets:

- LETI Climate Emergency Design Guide
- NHS Net Zero Guide
- Department for Education Technical annex 2J: sustainability

18.2 Energy reduction strategies

The Himley Village Development will reduce energy by reducing space heating demand and improving energy efficiency through a range of measures, including;

- Enhanced building fabric efficiency to reduce heating demand
- Optimised building orientation to maximise solar gains and reduce heating demand
- Tree planting and green infrastructure to provide shading during the summer months to mitigate overheating risk
- Highly efficient heating, cooling and ventilation systems and lighting, aligned with LETI design guide specifications
- Heat pump energy solution

18.3 Energy generation strategy

Renewable energy generation through solar PV will then be utilised to help achieve the net zero energy balance.

A total energy generation of 7,876,500 kWh/yr will be required to balance the site energy use. This can be provided in a total installed capacity of 44,200 m^2 PV panels. This will be installed across all roof spaces in the development, with a small amount of ground mount (if required) that could be provided in the location of the energy centre that was included in the Outline Application.

Appendix 1 - LETI zero carbon design guide specifications

Use type	MVHR	Heat pump SCoP	Central AHU SFP	Chiller SEER	A/C set points	Lighting power density	Lighting out of hours	Small power out of hours	ICT Loads	Tenant power density
Residential	90% (efficiency) ≤2m (duct length from unit to external wall)									
Schools	90% (efficiency)	≥ 2.8	1.5 - 1.2 W/l.s			4.5 (W/m2 peak NIA)	0.5 (W/m2 peak NIA)	2 (W/m2 peak NIA)		
Commercial Offices	90% (efficiency)	≥ 2.8	1.5 - 1.2 W/l.s	≥ 5.5	20-26oC	4.5 (W/m2 peak NIA)	0.5 (W/m2 peak NIA)	2 (W/m2 peak NIA)	0.5 (W/m2 peak NIA)	8 (W/m2 peak NIA)