Hydrock

Alderholt Meadows

Energy and Sustainability Statement

For *Dudsbury Homes (Southern) Ltd*

Date *28 November 2022*

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Executive Summary

This statement provides the details of the proposed Carbon (CO_2) emission reductions and a summary of wider sustainability measures proposed for the Alderholt Meadows development in Dorset.

Alderholt has adopted a holistic approach to sustainable design from the outset, this has incorporated architectural, environmental and energy strategies embedded with sustainable principles to create a unique proposal. Measures include:

» Reduced energy demand through a fabric first and fully electric approach;

» Potential renewable energy generation through on-site solar PV farms combined with battery storage and multiple residential microgrids; and

» Creating a development design that is flexible and adaptable for future needs;

A circa **69%** carbon reduction on the notional Part L 2021 building could be achieved by reducing energy demand through the adoption of the recommended LETI (London Energy Transformation Initiative) Climate Emergency Design Guide.

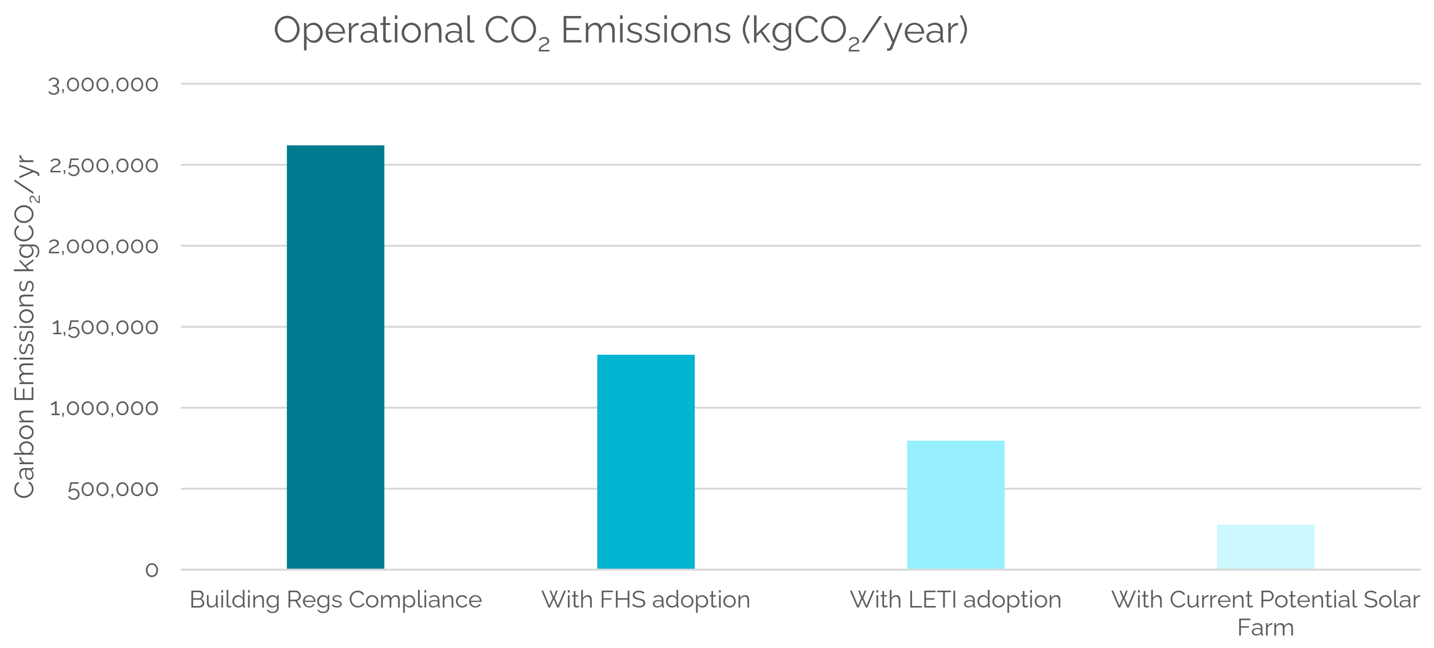


Figure 1 Potential Carbon emission savings achieved

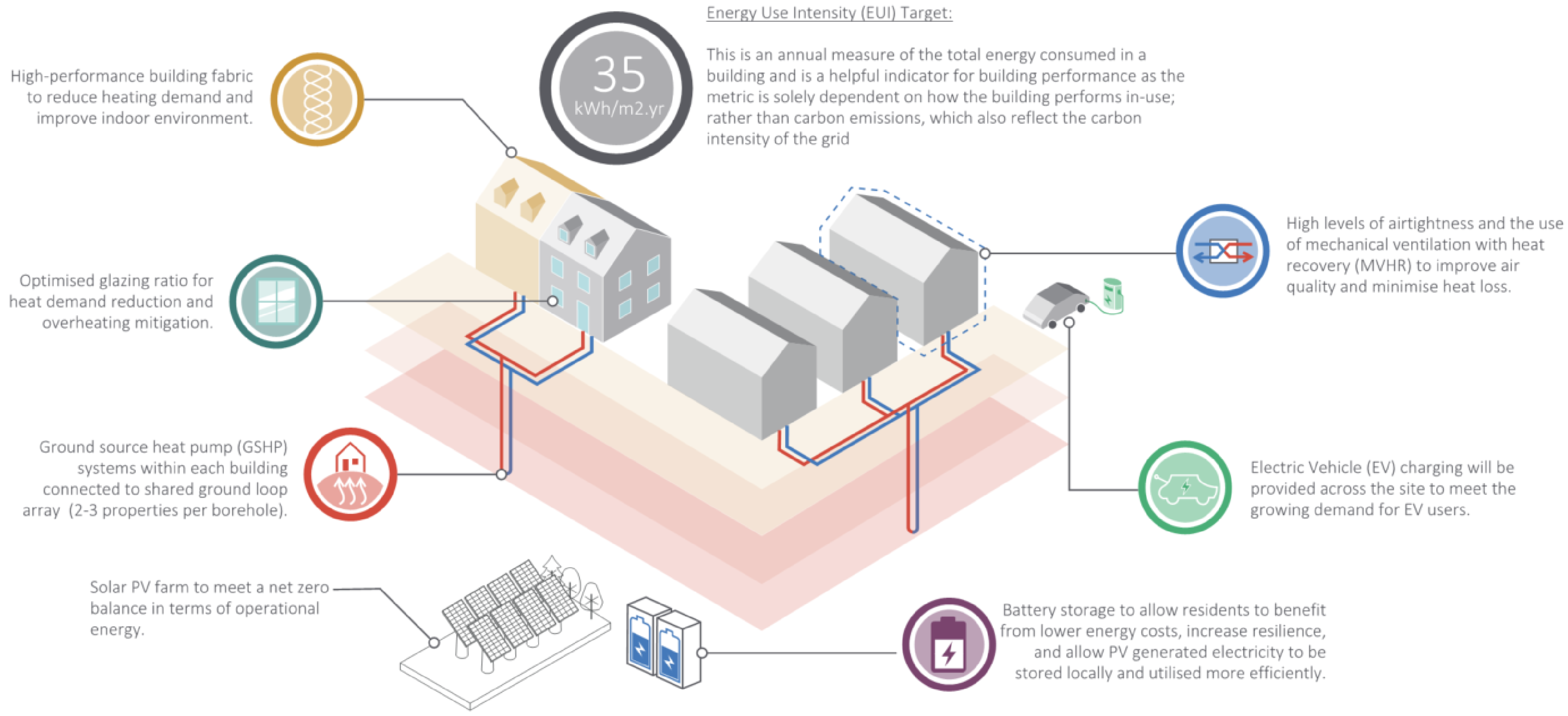


Figure 2 Aspirational achievements for Alderholt Meadows

Alderholt Meadows

This document addresses the energy and sustainability objectives required by National planning policy and the local policy for the Dorset Council authority area.

1. Introduction

Hydrock has been appointed by Dudsbury Homes (Southern) Ltd to provide planning stage energy and sustainability consultancy services with regards to a proposed new residential led development at Alderholt, located to the north-east of Dorset County.

Dudsbury Homes (Southern) Ltd is committed to the development of much needed new homes in the most sustainable locations, providing local economic, social and environmental benefits that respond to the Sustainability Objectives of the Local Plan and future community needs in the transition to a net zero and climate resilient economy

This document forms part of the outline planning application and will inform Dorset Council Planning Department of the energy and sustainability strategy for the application site.

1.1 Purpose of Report

This document addresses the energy and sustainability objectives required by National and Dorset planning policies.

Throughout this report carbon emissions are split into two 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 2021); and
- **Unregulated**: Emissions that are associated with small power and plug-in items and any other process or plant equipment (these are not covered by Building Regulations Part L 2021).

1.2 Development Details

The proposals at Alderholt Meadows aim to deliver a successful and community centric Meadows for up to 1,700 new homes set between Cranborne Chase and the New Forest. The site will also include significant non-residential elements including employment space, a school, retail and community and health facilities.

Figure 3: Indicative proposed masterplan site at Alderholt Meadows.

Regulations, Policy and Guidance

This section sets out the relevant National and Local regulations, policy and guidance relating to sustainability and energy performance requirements for the development proposals in Alderholt.

2. National Regulations and Policy

2.1 Energy Performance of Buildings Directive

The Energy Performance of Buildings Directive (Directive 2002/91/EC) has been the main policy driver for reducing energy use for heating, cooling, ventilation, hot water and lighting in buildings. The Directive requires the application of a methodological framework for calculating the energy performance of buildings.

2.2 Building Regulations Part L

The Building Regulations drive minimum energy efficiency and carbon reduction improvements in new buildings.

New development will need to meet the standards set within Building Regulations Approved Document Part L 2021 - Conservation of Fuel and Power in New Dwellings/New Buildings other than Dwellings, respectively for the residential and non-residential elements.

A minimum level for regulated carbon emissions is defined by the Target Emission Rate (TER) which relates to a 'Notional Building' automatically generated as part of the Standard Assessment Procedure (SAP) and Simplified Building Energy Model (SBEM) toolkits.

The resulting Dwelling Emission Rate (DER) or Building Emission Rate (BER) must be less than the relevant TER in order to comply. In addition, there are minimum levels of fabric efficiency set by the Target Fabric Energy Efficiency rating (TFEE) for dwellings under the SAP methodology.

It was the intention via progressive changes to Part L to require zero carbon homes by 2016. However, in July 2015 the Government Productivity Plan ("Fixing the Foundations") announced that it would not proceed with the allowable solutions carbon offsetting scheme, or the proposed 2016 increase in on-site energy efficiency standards. Part L 2013 remained 'current' for a number of years whilst the UK Government kept standards 'under review'.

In late 2020 the Government consulted on an update to Part L for new dwellings and following a substantial review of comments received, the new interim update to Part L (2021) came into effect in June 2022, requiring a circa 30% carbon reduction from Part L 2013 to achieve compliance (

The update includes improvements to the notional building fabric u values which will aid the reduction of energy demand in new homes (Table 1).'

As part of the interim update, there has also been an uplift to Part F (ventilation) as well as a new Approved Document O to mitigate the risk of overheating in new homes which includes measures such as the use of Mechanical Extract Ventilation (MEV) in buildings with improved air-tightness.

Table 1 Notional U-values

Building Element	Part L 2013 Notional Building Fabric	Part L 2021 Notional Building Fabric
Roof	0.18 W/(m²·K)	0.13 W/(m²·K)
Wall	0.26 W/(m²·K)	0.18 W/(m²·K)
Glazing	1.60 W/(m²·K) (double)	1.20 W/(m²·K) (double glazing)
Floor	0.22 W/(m²·K)	0.13 W/(m²·K)
Air Permeability	5 m³/(h·m²) @ 50 Pa	5 m³/(h·m²) @ 50 Pa

2.3 SAP 2012 vs. SAP 10.2

The carbon factor for grid supplied electricity was significantly outdated within the Building Regulations methodology and not reflective of the power sectors efforts to decarbonise through an increase in renewable generation feeding into the grid as well as the winding down of a number of fossil fuel power plants. The carbon intensity of grid electricity has reduced by circa 75% over the past decade and will continue towards net zero emissions, with plans for a net zero grid by 2030.

The carbon factors from SAP are utilised across Building Regulations Part L calculations. The latest update includes key changes to these under the new SAP 10.2 version under which natural gas has a higher carbon factor than electricity for the first time (see Table 2).

Table 2 Carbon Factors for Gas and Electricity

Fuel	SAP 2012 (Part L 2013) (kgCO2/kWh)	SAP 10.2 (Part L 2021) (kgCO2/kWh)
Gas	0.216	0.210
Electricity	0.519	0.136

2.3.1 National Planning Policy Framework

The National Planning Policy Framework (NPPF) was updated in July 2021 and sets out government planning policy for England, removing all regional level planning policy at this time in favour of 'a framework within which local people and their accountable councils can produce their own distinctive local and neighbourhood plans, which reflect the needs and priorities of their communities.'

All Local and Neighbourhood Plans must therefore align with the polices of the NPPF. The NPPF states clearly that the purpose of planning is to help deliver sustainable development and defines three mutually dependent pillars that must be equally considered in order to achieve this:

- Economic
- Social
- Environmental

The NPPF focuses on:

- Promoting high-quality design for new homes and places.
- Offering stronger protection for the environment.
- Constructing the right number of homes in the right locations.

» Focusing on greater responsibility and accountability of councils and developers for housing delivery.

In terms of the environment, the NPPF seeks to further protect biodiversity by aligning the planning system with Defra's 25-year Environment Plan. Not only does this protect habitats, it also emphasises air quality protection in relation to development proposals.

3. Local Policy

3.1 Christchurch and East Dorset Local Plan (2014)

The Core Strategy Part 1 for Christchurch and East Devon was adopted in April 2014, and sets out a 15-year planning strategy for the region until 2028. It contains the following key energy and sustainability related policy targets.

3.1.1 Policy ME3: Sustainable Development Standards for New Development

Developments will be required to incorporate carbon emissions reduction, water and energy efficiency measures and to demonstrate they have explored a range of sustainable and low carbon options.

The most appropriate range and type of measures for each development should be informed by the Code for Sustainable Homes Design Categories for residential development and BREEAM standards for non-residential (or subsequently agreed national standards for sustainable development).

3.1.2 Policy ME4: Renewable Energy Provision for Residential and Non-Residential Developments

Renewable, decentralised and low carbon energy will be encouraged in new or refurbished residential developments over 10 dwellings and in non-residential developments of 1,000m^2 or greater. Until national requirements and targets specify higher, 10% of total regulated energy should be from such sources (unless not feasible).

For large developments and new neighbourhoods/urban extensions, developers will be required to assess a range of suitable energy options, including the potential for district heating and/or micro generation.

3.1.3 Policy ME5: Sources of Renewable Energy

Sustainable energy generation from renewable/low carbon sources will be supported where any adverse social, environmental and visual impacts have been mitigated. Renewable energy apparatus will only be permitted where:

» Technology is suitable for the location and does not cause significant adverse harm;

» Would not cause interference to radar, or electronic communications networks, or highway safety;

» Includes an agreed restoration scheme, any necessary mitigation measures, and measures to ensure the removal of the installations when operations cease; and

» Avoids harm to the significance and settings of heritage assets.

3.2 Draft Dorset Local Plan (2021)

The emerging Dorset Local Plan underwent initial consultation in January 2021. The plan will cover over a 15-year period to 2038, and provides a draft document with more up to date and progressive policies than the current Christchurch and East Dorset local plan which is currently adopted.

The plan is in preparation and based upon the current version of the Local Development Scheme document (October 2022) is anticipated for adoption by the Council in 2026.This plan will be at an advanced stage of preparation when the proposed development begins construction, and it is also therefore important to consider and meet these targets and support the policy direction of the Council.

3.2.1 Policy ENV9: Achieving High Levels of Environmental Performance

For large developments, nationally recognised assessments of environmental performance (eg. BREEAM Communities) should be conducted alongside the master-planning process.

New developments should also be designed to improve resource use and energy efficiency e.g., via the use of layout, Solar PV, SuDS etc. The local plan may additionally adopt the new Future Homes Standards for energy efficiency in 2025.

3.2.2 Policy ENV12: Pollution Control

Developments should avoid harmful environmental impacts and health risks created by soil, air, water or land pollution. Impacts on the National Site Network in particular must be avoided.

Avoid impacting on Air Quality Management Areas, or mitigate impacts via the implementation of Green Infrastructure. Protect and enhance water quality, and remediate contaminated land where appropriate.

3.2.3 Policy ENV14: Sustainable Drainage Systems (SuDS)

Appropriate SuDs should be incorporated in a Surface Water Drainage Strategy and aim to:

» Reduce causes and impacts of flooding;

» Supply opportunities to treat surface water runoff;

» Be accessible for maintenance;

» Consider site characteristics and help to enhance character of the development;

» Be in line with the appearance of the surrounding area;

» Help to mitigate against the development's impact and achieve net biodiversity gain;

» SuDs should follow drainage hierarchy and not discharge runoff into sewer systems; and

» Developments should financially contribute to mitigate their impacts on local drainage and sewer systems.

3.2.4 Policy COM7: Creating a safe, efficient, and low carbon transport network

New developments should be located close to existing low carbon transport networks or provide new active travel routes.

Additionally, all new developments should:

» Be accessible and minimise the need for car travel;

» Support local services to reduce reliance on car travel;

» Be well connected to road and rail networks; and

» Minimise traffic impacts on the community, e.g., through public transport efficiency, air quality and severance.

High quality active travel networks should be designed into the development to make walking and cycling realistic options for future occupants.

3.2.5 Policy COM9: Provision of infrastructure for electric and other low emission vehicles

Developments which include parking facilities should provide infrastructure for the charging of electric (EVs) and other low emission vehicles. For residential developments of 10+ dwellings, 20% of off-street parking spaces should include charging infrastructure and the remaining 80% should have passive provision.

In developments with street parking only, infrastructure allowing for the safe charging of EVs must also be provisioned for.

At least one rapid charging point clustered with a fast-charging point should be provided per 10 parking spaces, and electric & ultra-low emission car clubs should be given their own dedicated spaces with charging infrastructure.

3.2.6 *Policy COM10: Low carbon & renewable energy development*

Generating heat or electricity through renewable energy sources (other than large scale wind energy) will be allowed wherever possible. Renewable energy infrastructure will be approved where possible providing that:

- Adverse impacts on the landscape and biodiversity can be assimilated;
- The proposal minimises noise, vibration, overshadowing, flicker and emissions during the infrastructure's lifecycle; and
- Any impact on a heritage asset is not substantial.

3.2.7 *Section 18: Alderholt*

Volume 2 of the Dorset Local Plan focuses of specific areas with potential for development, including Alderholt. It is highlighted that although the site is relatively unconstrained, therefore providing a good canvas for increasing the size of any existing developments, there are a number of issues which would need addressing prior to the construction of houses, to be integrated into any planning applications. These include:

- Growth of road network to accommodate increased traffic flow;
- Addition of employment, retail and communal facilities; and
- Addition of schooling facilities.

It is likely, however, that development to create a self-contained settlement would have impact on the adjacent New Forest District Council area, including the town of Fordingbridge.

3.3 New Forest District Local Plan (2020)

Due to the close proximity of Alderholt to the New Forest District Council boundary, the 2016-2036 Part 1 local planning policies will be reviewed here.

3.3.1 *Policy STR1: Achieving Sustainable Development*

All new developments should make positive social, economic, and environmental contributions by;

- Ensuring that housing needs are met appropriately & sustainably
- Utilising a landscape-led approach to create high quality land and townscapes
- Delivering an environmental net gain & avoiding adverse impacts on SSSI, species and habitats
- Ensure that development adds to local economy, is accessible and minimises reliance on private car travel
- Developments should be climate resilient and protected from pollution, flooding etc to ensure that residents & businesses feel safe
- Developments should be adaptable to accommodate future innovations and technology eg. EVs.

3.3.2 *Policy STR2: Protection of the countryside, Cranborne Chase Area of Outstanding Natural Beauty and the adjoining New Forest National Park*

Ensure that development does not have unacceptable impacts on the Cranborne Chase AONC. Further, plans which ensure that the quality and beauty of the Cranbourne Chase ANOC are protected and enhanced will be more favourable.

3.3.3 *Policy IMPL2: Development Standards*

New developments will be expected to meet or exceed the following standards;

- Part 36(2) (b) of the Building Regulations - higher water efficiency use standard, maximum water use of 110 litres per person per day.
- Provision for the installation of EV charging points in residential properties and car parks.

3.3.4 *Policy DM4: Renewable and Low Carbon Energy Generation*

Development proposals which include renewable energy generation will be looked upon favourably providing that they avoid unacceptable impacts on;

- Nature conservation areas and heritage assets.
- Local and wider landscapes, especially areas of national significance or beauty e.g., Cranbourne Chase AONB.
- Residential areas.
- The transport networks.

3.4 Alderholt Parish Plan (2006)

In December 2006, an Alderholt Parish Plan was released. This contains overview action plans on areas including Crime & Safety, Housing & Village Design and Footpaths, Access to the Countryside & Environment. Although likely outdated, these provide an overview of the community ideals, and can be referred to if required.

4. Voluntary Standards

Due to the lack of progressive targets and updates within the Building Regulations, several independent bodies are heading the roadmap to net zero through their own established energy targets. These standards and benchmarks were created to inform and inspire building design teams to create developments which mitigate against the climate crisis.

The following standards provide guidance on the best practise energy use intensity targets (EUI) for different building types. They further provide recommendations on whole life carbon, including embodied carbon.

4.1 LETI (London Energy Transformation Initiative) Climate Emergency Design Guide

Under LETI, the net-zero operational energy goal must fulfil the following statement:

> A new building with net zero operational carbon does not burn fossil fuels, is 100% powered by renewable energy, and achieves a level of energy performance in-use in line with our national climate change targets.

LETI believes that in order to meet the climate targets, all new buildings must operate at net zero carbon by 2030. This is established though the advanced EUI benchmark targets of:

- Residential: 35kWh/m²/yr
- Commercial: 55kWh/m²/yr
- Schools: 65kWh/m²/yr

4.2 UKGBC (UG Green Building Council) Net Zero Carbon Buildings Framework

Within the WKGBC framework, net-zero operational carbon is achieved when:

> The amount of carbon emissions associated with the building's operational energy on an annual basis is zero or negative. A net zero carbon building is highly energy efficient and powered from on-site and/or off-site renewable energy sources, with any remaining carbon balance offset.

Although UKGBC does not specify minimum energy efficiency requirements, the framework encourages both energy demand and consumption reduction.

4.4 RIBA (Royal Institute of British Architects) Sustainable Outcomes Guide

To ensure that the strong words of the declaration of a climate emergency are matched by actions, the RIBA has set RIBA Chartered Practices a challenge of reducing operational energy demand by at least 75%, before UK offsetting.

RIBA has taken a similar approach to LETI by setting interim EUI targets up to 2030, as seen in Table 3.

Table 3 RIBA building standard targets.

	kWh/m²/yr		
Building Type	**Business as usual**	**2025 target**	**2030 target**
Residential	120	<60	<35
Office	130	<75	<55
School	130	<70	<60

4.5 Future Homes Standard (FHS) Part L 2025

Following the 2021 update, the FHS will require a 75% reduction in regulated CO_2 emissions compared to the Part L 2013 requirements. It suggests a slight improvement on the building fabric values compared to Part L 2021 (Table 4). Many argue that this is still not enough to ready a net zero society.

FHS are also to implement a gas ban, favouring heat pumps as the default technology for generating heating and hot water.

Table 4 Comparison of Part L 2021 and Future Homes Standard building specifications.

Building Element	Part L 2021 Notional Building Fabric	Part L 2025 (FHS) Notional Building Fabric
Roof	0.13 W/(m²·K)	0.11 W/(m²·K)
Wall	0.18 W/(m²·K)	0.15 W/(m²·K)
Glazing	1.20 W/(m²·K) (double)	0.80 W/(m²·K)
Floor	0.13 W/(m²·K)	0.11 W/(m²·K)
Air Permeability	5 m³/(h·m²) @ 50 Pa	5 m³/(h·m²) @ 50 Pa
Heating System	Gas combi boiler	Low Carbon Heating
Ventilation System	Natural with extract	Natural with extract
PV System	40% ground floor area	None

4.6 UN Sustainable Development Goals (SDGs)

The 2030 Agenda for Sustainable Development was adopted by all United Nations Member States in 2015. At its heart are the 17 Sustainable Development Goals (see Figure 4), which are an urgent call for action in a global partnership by all countries.

The UN SDGs recognise that ending deprivation must go hand in hand with strategies that improve health and education, reduce inequality and spur economic growth, whilst tackling climate change. There are 17 Goals in total, with 169 specific targets, providing a coordinated approach to promote sustainable development in projects across the globe to 2030.

Figure 4 Summary of the UN Sustainable Development Goals

Sustainable Design and Construction

This section of the report gives an overview of the sustainable design and construction principles incorporated into the development, in response to emerging local policy requirements the aspirations of the development.

5. Sustainability at Alderholt Meadows

This section outlines the Sustainable Design and Construction Strategy for the proposed development demonstrating how the buildings will respond to both national and local planning policy, specifically the requirements of Dorset local council.

In addition, the Alderholt Meadows proposals seek to align with positive action against a number of the UN SDGs, most notably:

- Good Health and Wellbeing
- Affordable and Clean Energy
- Sustainable Cities and Communities
- Climate Action
- Life on Land

The various economic, social and environmental benefits are highlighted in this section and presented under the following headings:

» **Materials** – How the design has considered the procurement of materials which promote sustainability;

» **Waste and Recycling** – How the development incorporates waste and recycling measures;

» **Adaptation to Climate Change** - How the building incorporates adaptation measures;

» **Health and Wellbeing** – How the buildings are designed for health and wellbeing of users;

» **Transport** – How sustainable and active provisions for transport are incorporated into the development;

» **Adaptation to Future Needs** – How the development design is flexible and adaptable to future occupier needs; and

» **Biodiversity** - How the development incorporates measures that support and where possible, enhance biodiversity.

5.1 Materials

Preference will be given to materials low in embodied carbon and recycled or locally sourced to mitigate negative environmental impact of emissions during transportation and the increase the life span of materials within the scheme.

The development should aim to use a range of sustainable materials including:

» Use of sustainably sourced timber from Forest Stewardship Council (FSC or equivalent) sources;

» Materials selection with a preference for responsible and sustainable sourcing standards such as BES6001 and ISO14001;

» Use of Accredited Construction Details to minimise thermal bridging; and

» Avoidance of insulation materials containing substances known to contribute to stratospheric ozone depletion or with the potential to contribute to global warming.

A careful selection of materials combined a diverse range of vegetation and tree planting will reduce the urban heat island effect, minimise the site's albedo effect from chosen materials. Increasing the reflectivity and permeability of chosen materials will aid this.

The selected materials for the site should be of high quality with a minimal maintenance strategy, removing the need for unnecessary replacement of elements and the consequential increase in carbon emissions in the building's future lifetime.

The final design and specification of major building elements will be determined during the detailed design of the development though these will be in accordance with the baseline assumptions made with respect to U-Values.

The Sustainability Framework reflects the proposal of sustainable and considerately sourced material by assessing all proposals in the development against LETI 2020 embodied carbon targets. The embodied carbon will be reduced across all phases and verified post-construction.

5.2 Waste and Recycling

A Waste Strategy report will be undertaken for Alderholt Meadows to determine the waste strategy which will be implemented across the site.

The new development should aim to minimise waste throughout construction and reduce waste throughout operations by providing appropriate facilities for segregation and collection of recyclable waste streams, in accordance with good-practice.

Waste should also be minimised throughout the construction phase through the implementation of a waste hierarchy (Figure 5) and circular economy principles.

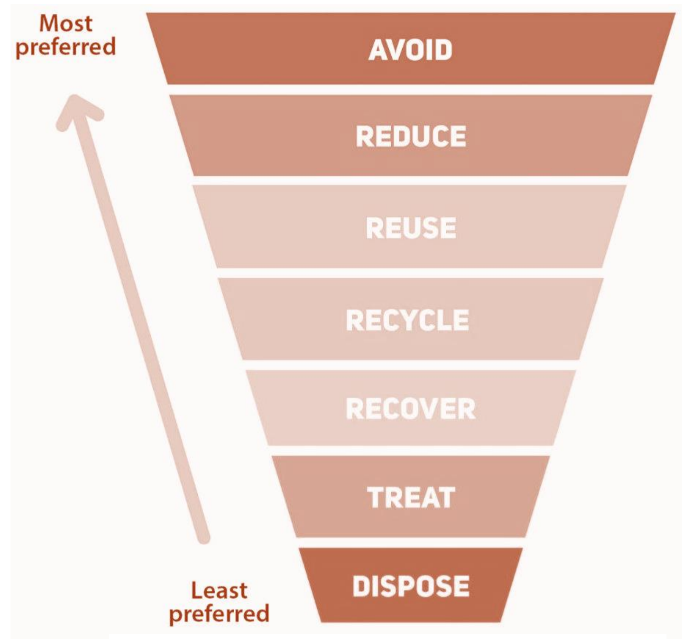


Figure 5 Waste Hierarchy

As discussed within the Sustainability Framework, it is recommended that a diversion from landfill KPI will be provided and monitored over the course of the construction period.

Within the Energy Options statement written by Hydrock, it is suggested at Anaerobic Digestion could be both a waste and energy strategy considered for the development.

Further investigation is however required to understand opportunities for local agri-crop incorporation to make this a viable option.

5.3 Adaptation to Climate Change

One of the main challenges facing the UK and new residential development is the need to mitigate and adapt to a changing climate. Climate change will cause the UK to become warmer, with increasingly wetter winters and drier summers.

Adapting to this changing climate will impact on the design, construction, location, cost and operation of all developments in the next few decades. One of the NPPF's core planning principles is to encourage developments to consider climate change adaptation.

5.3.1 *Flooding and Drainage*

A Flood Risk and Drainage Assessment will be undertaken for site, which will provide detail of any flood risks to the development. SuDS (sustainable drainage systems) features are also expected to be included with the layout as part of the future development of the masterplan design, helping to achieve Climate Resilience Sustainability Framework targets.

A preliminary assessment shows that there is a very low risk (<0.01% each year) of flooding from rivers or marine sources across the extent of the site. However, some regions of the development might be of a medium (1-3.3% each year) or high risk (>3.3% each year) of surface water flooding. Mitigation strategies for this will be highlighted within the Flood Risk and Drainage Assessment at a later stage.

5.3.2 *Water (Supply)*

Potable water is an increasingly important natural resource and with the majority of the UK classes as being in an area of moderate or severe water stress, the conservation of water is becoming an increasingly significant sustainability metric.

To reduce the consumption of potable water, efficient sanitary ware and water-saving features will be specified. This will include limiting flow rates and reducing flush levels of sanitary ware fittings.

At present, and where applicable, these measures could include:

- **Low and dual flush WCs** - Dual flush cisterns with low effective flush volume will be specified;
- **Taps** – Wash hand basins and sinks will be water efficient;
- **Showers** – Aerated or low flow showerheads will be included to help reduce water consumption; and
- **Kitchen appliances** – Low water consuming equipment to be considered.

External planting should be reliant on precipitation only, with occasional manual watering during summer months.

As per the Sustainability Framework, a maximum consumption of **95L** of water per person per day is recommended.

5.3.3 *Overheating and Thermal Comfort*

With increasing summer temperatures, the risk of overheating in buildings in the long term is increasing. The risk of new buildings overheating is becoming an increasing concern during summer months as air permeability and thermal transmittance building regulations are reduced to improve heat loss performance which is crucial over winter months.

Evaporative cooling effects can be achieved through the integration of green corridors, open spaces and podium landscapes.

An Overheating Assessment in line CIBSE TM59 will be carried out, as recommended within the Sustainability Framework, during the design development of the project which will determine to approach to mitigate overheating through both passive and active design measures.

5.4 Health and Wellbeing

Noise, light and air pollution can harm both the natural environment and the human environment and consequently can negatively influence the wellbeing of wildlife and humans.

The design of the site should be undertaken in a way which negates or reduces the impact of pollution upon the residents' health and wellbeing.

The Sustainability Framework supports the themes of social health, safety and security, with suggestions including all residents being within 300m of an open space of >1ha and delivering community allotments/gardens and orchards as part of the development.

5.4.1 *Air Quality*

An Air Quality ES Chapter has been produced which details any effects on the air quality throughout construction. It is deemed that the overall effects will be not significant.

The development will aim to reduce exposure to poor air quality, as well as reduce emissions from development, including during construction phases. Practises to prevent the generation of air pollution during these stages could include:

- **Construction** – Minimise impacts using necessary mitigation measures relating to demolition, earthworks, construction, track out, and non-road mobile machinery (NRMM), as appropriate; and
- **Operation** - Locally-generated emissions from any installed gas-fired boilers will be specified as low NO_X in line with CIBSE guidelines.

5.4.2 *Noise Pollution*

Internal noise will be controlled to provide a comfortable environment for the desired use and if required, attenuation measures will be specified at a later stage in the design process.

5.4.3 *Light Pollution*

Light pollution can result from any adverse effect of artificial lighting and includes the following:

- **Glare** – the uncomfortable brightness of a light source when viewed against a dark sky;
- **'Light trespass'** – the spread of light spillage the boundary of the property on which a light is located; and
- **'Sky glow'** – the orange glow seen around urban areas caused by a scattering of artificial light by dust particles and water droplets in the sky.

All external lighting for the site will be designed in line with current British Standards and ILP Guidelines.

5.5 Transport

A Transport Assessment has been undertaken by Paul Basham Associates to examine the transport and highway issues relating to the proposed development.

Through a selection of sustainable and active modes of transport, as highlighted in the Sustainability Framework, all buildings should be within 200m of a high-quality walking or cycling route to connect onto wider transport networks. An aim is for this development to additionally deliver the principles of a '15-minute neighbourhood', meaning residents would be able to access most, if not all, of their needs in up to a short 15-minute walk to cycle ride from their homes.

The site should consider the need of an integrated and accessible transport system, incorporating improved bus links to surrounding local areas, as well as considering the inclusion of the village hall as a mobility hub where EV charging, bike hire and car clubs could take place.

5.6 Adaptation to Future Needs

Creating a development design that is flexible and adaptable to future occupier needs requires careful consideration of how the environment and building function may alter over its lifetime.

General measures to be incorporated that facilitate future adaptation for occupants include:

- Internal and external amenity spaces and accommodation types.
- Generous floor to floor height for the ground floor allowing flexibility to change non-residential spaces to several different uses.

5.7 Biodiversity and Connection to Nature

An Ecological Assessment Report has been undertaken by ABR Ecology for the Alderholt site, to determine the current ecological importance of the land.

On site, hedgerows, mature trees and watercourses will be retained and enhanced and new habitats will be introduced. This will transform the current farmland with relatively low biodiversity into a matrix of habitats that will support a rich wildlife.

The Sustainability Framework for Alderholt supports the enhancement of biodiversity and the natural landscape throughout the planning, construction and completion of this development, by aiming to meet an overall biodiversity net gain of 12% or higher and meeting tree and shrub planting benchmarks of 25 per household.

Energy and Carbon Reduction Strategy

The energy strategy at Alderholt Meadows is based upon a technical and commercial balance of the targets within adopted and emerging Dorset local policy and the aspirations to deliver a progressive development.

6. Alderholt Energy and Carbon Targets

Energy efficiency is vital for a rapid transition to zero carbon as it reduces energy demand and therefore, the energy generation capacity required.

Alderholt Meadows aims to use best practice design on all fronts. It has been recommended that the development follows the LETI energy use intensity guidelines, which goes beyond those specifications set within Part L 2021 building regulations.

7. The Energy Hierarchy

The energy hierarchy is a classification of energy strategies, prioritised to assist progress towards a more sustainable energy system.

It has been recommended that Alderholt follows the regulations and targets quantified within the LETI Climate Emergency Design Guide for building specifications (Figure 6) across the site. Figure 6 highlights the priority of each step within the hierarchy as you progress downwards through the strata.

Energy demand reduction provides the greatest opportunity for minimising a building's potential CO_2 emissions. Design strategies typically include building form and fabric measures (passive design) and energy efficient building services (active design). Focusing on form and fabric in particular at an early stage in the build process is often the most cost-effective way to reduce energy consumption and CO_2 emissions.

Figure 7 shows the leading industry guidance on how to achieve energy demand reduction and energy efficiency measures, through the building design and fabric. Residual CO_2 emissions can be reduced through low or zero carbon technologies.

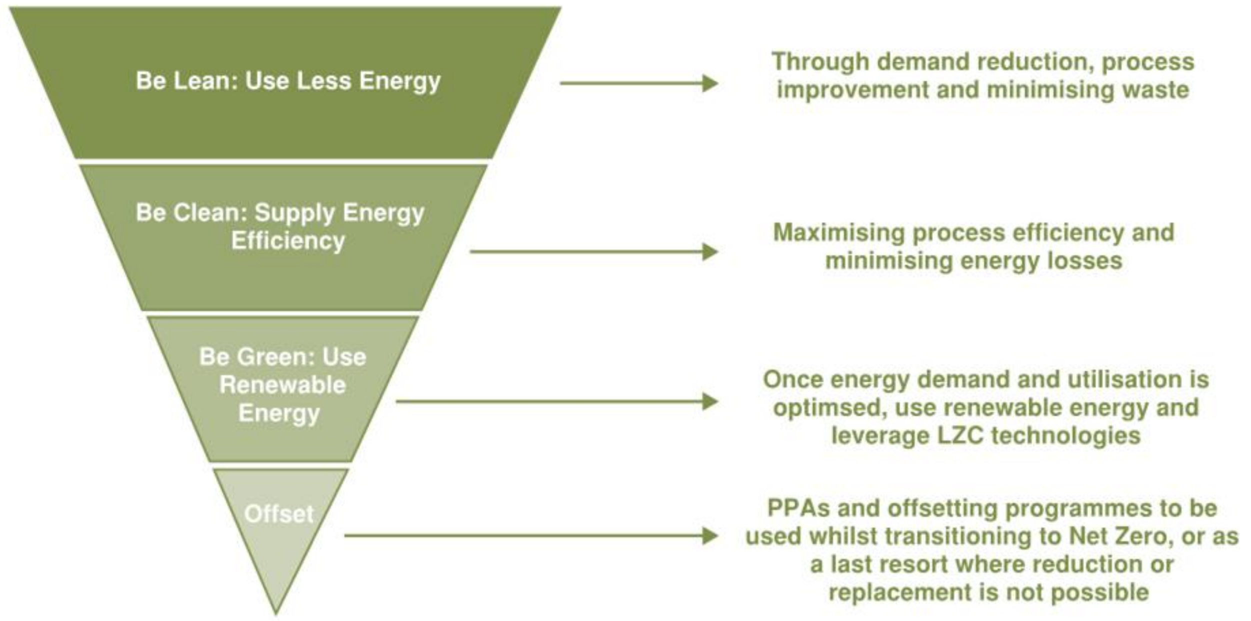


Figure 6 Energy Hierarchy

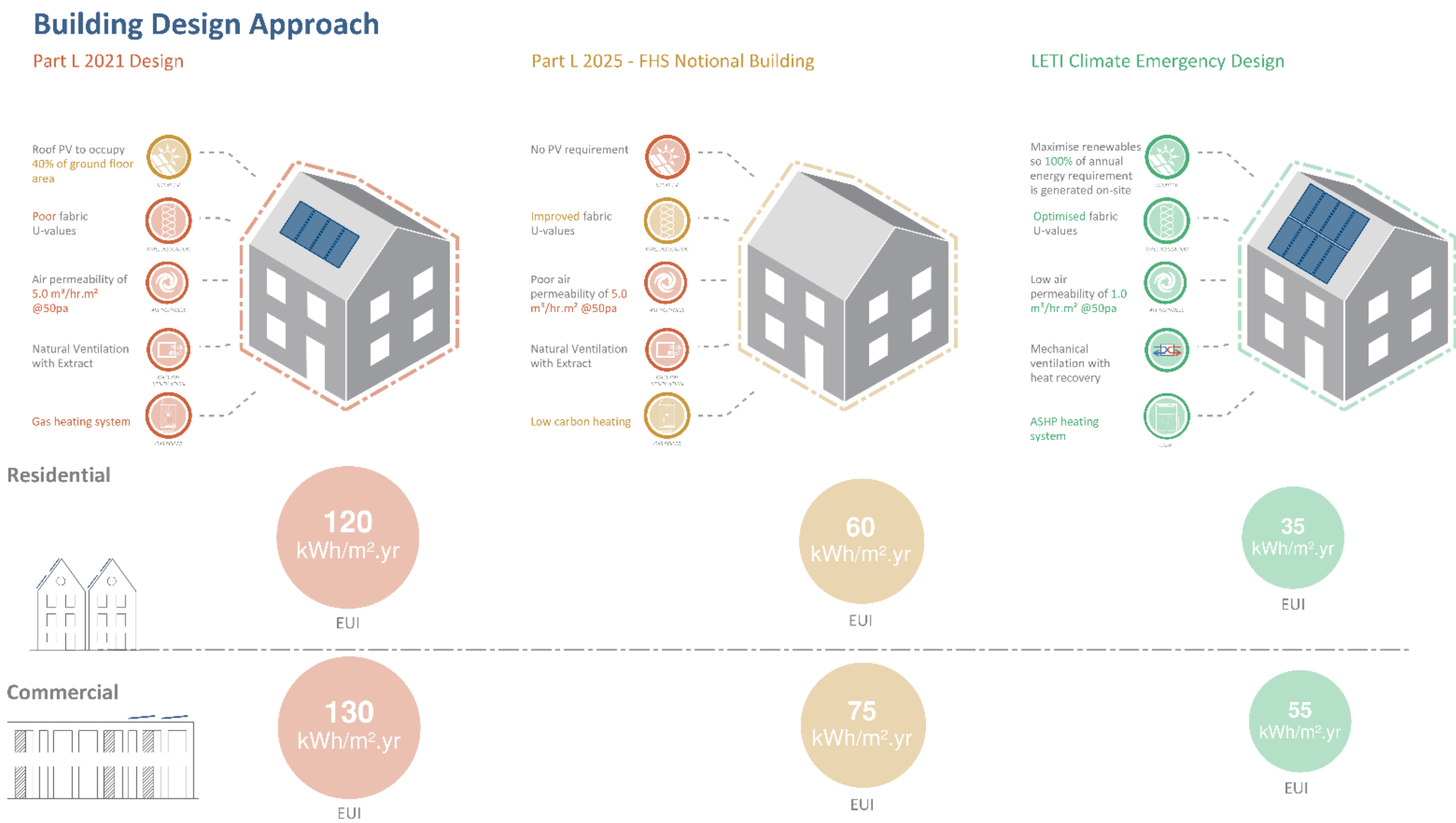


Figure 7 Energy Reduction through building design and fabric, including the recommended LETI guidelines in comparison to Part L 2021.

8. Energy Use Intensity

Currently, Building Regulations use carbon as the key metric to assess the energy efficiency and sustainability of a building; this can create a number of problems for designers, contractors and occupants.

Energy Use Intensity (EUI), measured in kilowatt hours per m² per year (kWh/m² /annum) is the total amount of energy consumed by a building over a year divided by floor area, allowing easy and direct comparison of building performance.

The EUI metric removes 'carbon intensity' which has less relevance as fossil fuels are removed for heating (see Figure 8); it is widely adopted by best practice guidance such as the LETI Climate Emergency Design Guide and the UK Green Building Council Net Zero Buildings Framework.

EUI also considers unregulated energy use which will be an important consideration for future net zero targets.

Where appropriate, the energy strategy for Alderholt utilises EUI to demonstrate the significant energy and carbon reduction commitments of the proposed scheme, in line with best practice guidance.

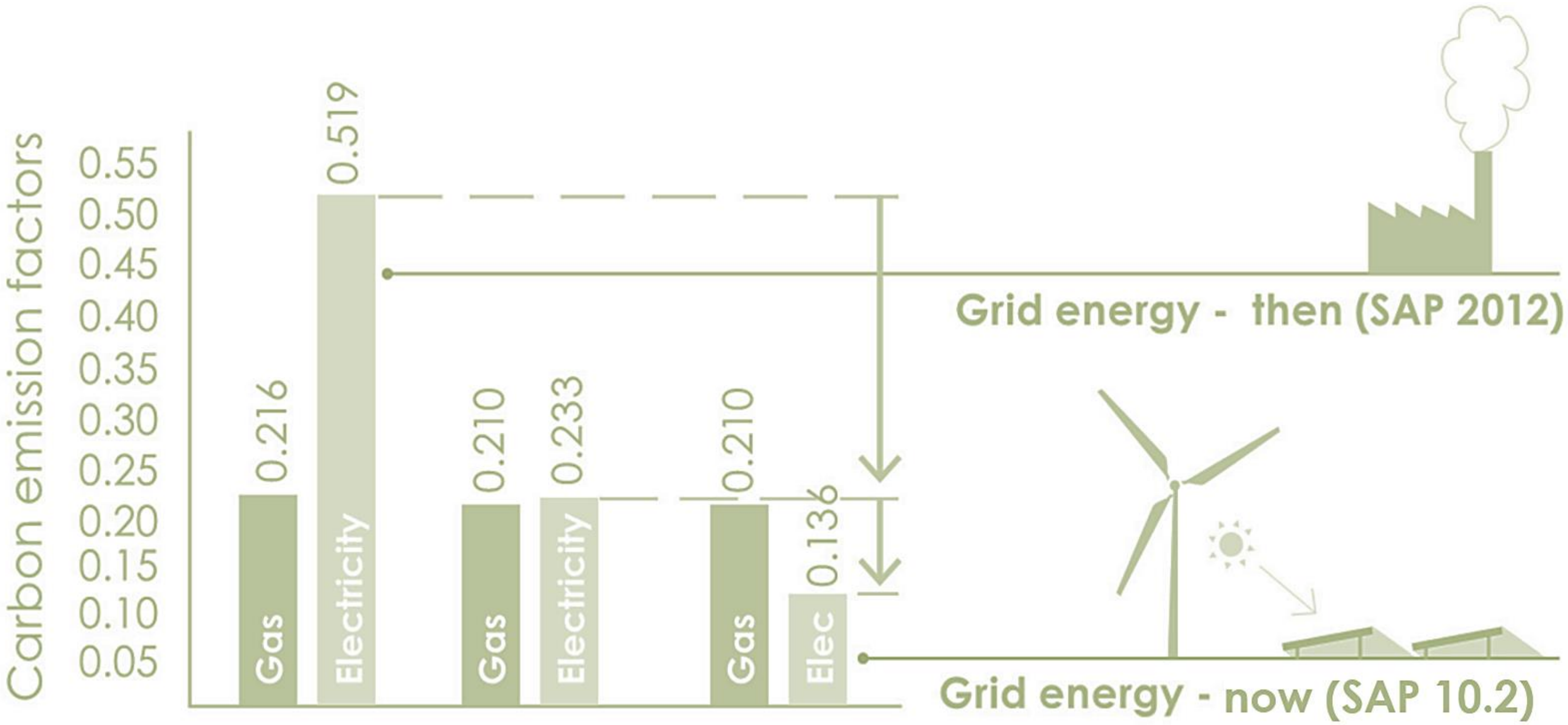
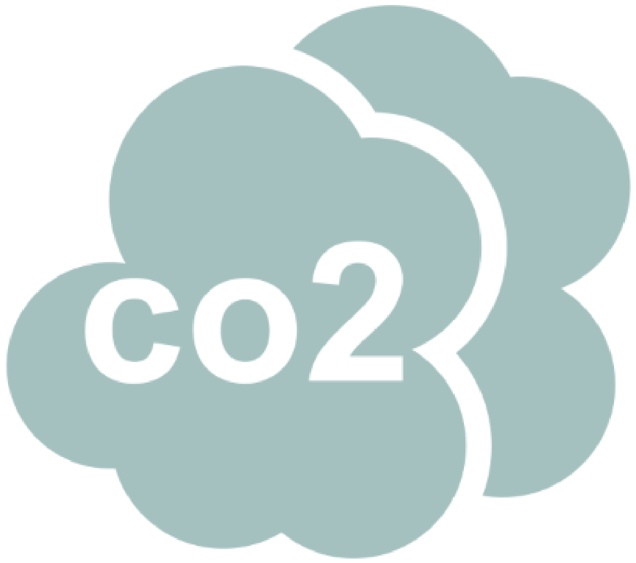


Figure 8 Impact of decarbonisation of the UK electric grid by current Part L 2021 carbon emission factors.

Energy and Carbon Baselines

This section establishes the baseline energy consumption and associated CO_2 emissions for the scheme, to ensure a robust energy and carbon reduction strategy for Alderholt Meadows.



9. Baseline CO_2 Approach

This section establishes the baseline energy consumption and associated CO 2 emissions for the scheme. The baseline carbon dioxide emissions refer to a Building Regulations 2021 Part L compliant development.

Under Part L, residential areas of the development are to be assessed under the Standard Assessment Procedure (SAP), while non -domestic areas are assessed using the Simplified Building Energy Model (SBEM) methodology.

As this is an Outline Planning Application, detailed SAP and SBEM calculations have not been carried out. Carbon emissions and potential carbon reduction has been calculated based on Hydrock's own internal SAP and SBEM database for similar projects.

For reference, details are provided below on the SAP and SBEM calculation procedures.

9.1 Standard Assessment Procedure (SAP) Energy Modelling

The dwellings on site have been assessed using Hydrock's internal database of SAP calculations carried out under Part L 2021 using the Government's Standard Assessment Procedure (SAP). Detailed calculation for different dwelling types will be carried out at the Reserved Matters application stage.

9.1.1 Baseline Internal Gains

Weather data is based on the UK average climatic data provided by SAP for the dwellings.

Solar gains are calculated automatically by the modelling software and are based on the orientation of the building, the transmission coefficients of the glazing and the solar angles. SAP further takes into account shading devices.

Gains from lighting, appliances, cooking and from the occupants are estimated from the floor area.

9.1.2 Baseline Building Fabric

All fabric attributes for the baseline case are as per the notional building. Below shows the baseline U-values for a current Part L compliant residential (L1A) and non-residential (L2A) development.

Table 5 - Part L 2021 notional building fabric

Building Element	Notional Building U-value
Roof	0.13 W/m²k
Wall	0.18 W/m²k
Floor	0.13 W/m²k
Glazing	1.20 W/m²k (double)
Air Permeability	5 m³/m²/hr (resi) 3 m³/m²/hr (non-resi)

9.2 Simplified Building Energy Modelling (SBEM)

The commercial and communal spaces on site have been assessed using Hydrock's internal database of SBEM calculation s. Each space has been assessed individually using the National Calculation Methodology (NCM) conditions for each planning use class. Detailed calculations for each commercial space will be carried out at the Reserved Matters stage.

9.2.1 Baseline Internal Gains

SBEM calculations use the same weather file as SAP, solar gains are calculated based on the orientation of the building and the properties of the glazing.

All occupancy, lighting and equipment gains are specified within the NCM internal conditions for each use class.

10. Baseline Carbon Emission and Energy Use Results

10.1 Operational Carbon Emissions

For the whole site, total baseline operational energy emissions, based on Part L 2021 are:

2,618,680 kgCO_2/yr

This can be split into both regulated and unregulated as displayed below.

10.1.1 Regulated Carbon Emissions

The total baseline regulated carbon emissions rate for the development will differ based on the chosen heating strategy. The baseline regulated carbon emission for Alderholt, based on Part L 2021, is:

2,202,907 kgCO_2/yr

10.1.2 Unregulated Carbon Emissions

Unregulated energy use is, by its nature, is more difficult to reduce as it is significantly affected by occupant behaviour. In the future, unregulated energy use and associated emissions may account for as much as 50% of the overall total for each new dwelling or building. The baseline unregulated carbon emission for Alderholt, using Part L 2021, is:

415,773 kgCO_2/yr

10.2 Energy Use Intensity (EUI)

The EUI metric includes both regulated and unregulated energy uses. The Part L 2021 baseline is considered to represent an EUI of **120 kW/m²/yr** for residential properties.

For a commercial building under Part L 2021 building regulations, the EUI should not exceed **130 kW/m²/yr**.

Reducing the Demand for Energy

Be Lean.

The first step in reduction carbon emissions from development is to reduce the demand for energy use through passive design and sustainable construction methods.

This section highlights the design commitments at this stage of design which will reduce energy demand and subsequent carbon emissions across the development.

11. Energy Demand Reduction Measures

This section looks at measures to reduce the energy consumption of the new development against the notional building baseline through a combination of passive and active design options. These options include those which utilise building form and building fabric to exploit the natural surroundings of the site to help reduce energy demand.

11.1 Passive Design Measures

Building form and fabric measures are an essential first step to demand reduction, which when combined with the selection of energy efficient building services are often the most cost-effective way to significantly reduce CO_2 emissions.

Passive design approaches are not dependent on occupier behaviour; therefore, the carbon reductions are guaranteed for the lifespan of the building (60 years or more) rather than the duration of the relevant plant item.

Possible passive design measures which could be considered for the masterplan at Alderholt include:

- Control of solar gains through low g-value glazing;
- Building orientation to maximise south-facing roof space for optimal PV generation;
- Passive cooling strategies including night cooling and curtains/blinds to achieve internal comfort criteria during all seasons;
- Strategic planting of trees to shelter low-level buildings from high winds and the sun; and
- Optimise daylight and beneficial solar gains through the size, placement and depth of windows at different elevations.

This method of reduction through improved fabric further requires low to no maintenance or replacement costs.

11.2 Future Homes Standard

A voluntary standard which could be considered for the Alderholt development is the Future Homes Standard, whose targets are mid-way between the baseline Part L 2021 and the progressive LETI Climate Guide benchmarks. The FHS building fabrics can be seen in Table 6.

Table 6 FHS building benchmarks

Building Element	Future Homes Standard
Roof	0.11 W/m²·K
Wall	0.15 W/m²·K
Glazing	0.80 W/m²·K
Floor	0.11 W/m²·K
Air Permeability	5 m³/m²/h @ 50 Pa

The EUI are reduced from the baseline Part L 2021 targets to:

- **Residential**: 60 kWh/m².yr
- **Commercial**: 75 kWh/m².yr

11.3 Adoption of LETI Building Standard

It has been recommended that the Alderholt Meadows development adopts the LETI Climate Emergency Design Guide, which significantly exceeds current Part L 2021 and the Future Homes Standard EUI and building fabric benchmarks. Using this voluntary standard as a guideline will aid achieving an operational net zero development at this site.

11.3.1 Proposed Building Fabrics

Residential

The proposed residential building fabric is recommended to be based on the LETI Climate Emergency Design Guide, which has been recommended for use in this development, shown in Table 7. These values are more progressive than the Part L 2021 notional building performance values.

Table 7 Proposed LETI residential building fabric U-values.

Building Element	U-value
Roof	0.10-0.12 W/m²k
External Wall	0.13-0.15 W/m²k
Floor	0.08-0.10 W/m²k
Glazing	0.80 W/m²k (triple)
Air Permeability	1 m³/m²/hr @ 50 Pa
Doors	1.00 W/m²k

The aspirations for these building values are high, therefore the FHS building values have also been displayed, which easier to achieve than LETI, but higher than those within Part L.

Schools

Table 8 Proposed LETI building benchmark for schools.

Building Element	U-value
Roof	0.10-0.12 W/m²k
External Wall	0.12-0.15 W/m²k
Floor	0.09-0.12 W/m²k
Glazing	1.0 W/m²k (triple)
Air Permeability	<1 m³/m²/hr @ 50 Pa
Doors	1.2 W/m²k

Commercial Offices

Table 9 LETI building benchmark for commercial offices.

Building Element	U-value
Roof	0.10-0.12 W/m²k
External Wall	0.12-0.15 W/m²k
Floor	0.10-0.12 W/m²k
Glazing	1.00 W/m²k (triple) or 1.2 W/m²k (double)
Air Permeability	<1 m³/m²/hr @ 50 Pa
Doors	1.20 W/m²k

11.3.2 *Energy Use Intensity Targets*

Under the LETI guidance, EUI targets are also reduced from Part L 2021 regulations. The LETI EUI are:

- **Residential**: 35 kWh/m².yr
- **Schools**: 65 kWh/m².yr
- **Offices**: 55 kWh/m².y

11.3.3 *Carbon Emission Reduction Adopting LETI Targets*

If the recommended LETI building and energy use guidelines are adopted into the Alderholt development, the operational carbon emissions could be reduced by up to 69% by employing the stricter EUI targets as seen in Table 10. The reductions from the FHS are also included for reference.

Table 10 Percentage reduction in carbon dioxide operational energy emissions from Part L 2021 to LETI.

	Total Operational CO_2 emissions (kgCO2)	% Reduction
Part L 2021	2,618,680	-
FHS	1,327,346	**49.3%**
LETI	794,543	**69.7%**

11.4 Active Design Measures

Active design relates to energy efficiency measures that can be included within the building services specification to reduce energy consumption.

The following are a list of key suggestions which should be considered within the masterplan strategy for Alderholt Meadows:

11.4.1 *Lighting*

All lighting installed should be a high-efficiency LED light to ensure a good quality of illumination with minimum energy consumption and low internal heat gains.

11.4.2 *Ventilation*

Ventilation is currently assumed to be via openable windows for all building types, though consideration during the design development may switch to a 'mixed mode' strategy with mechanical ventilation with heat recovery (MVHR) used during the winter months to reduce heat losses and maintain good indoor air quality.

Any specified ventilation systems will be confirmed at later stages of design and selected to ensure high efficiencies so as not to significantly impact energy use.

11.4.3 *Space Heating and Hot Water*

Heat pumps have been strongly recommended for heating and hot water, which with the rapidly decarbonising electricity grid, this technology is highly compatible with reaching a net-zero operational carbon position.

Heat pumps have the added benefit of being able to provide cooling in the summer months, as well as heat in winter.

More on the chosen heating and hot water heat pump system recommendation can be found in Section 14.1.

12. Alderholt's Recommended Route for Energy Demand Reduction

It is recommended that Alderholt follows LETI guidance, where possible, to achieve a high energy demand reduction through the 'be lean' phase of the energy hierarchy.

As the proposed development plans to start its construction phase in 5 years from now, exact specifications cannot be given at this stage. These will be given during detailed design, when there is a better understanding of what will be available when the construction phase begins.

Supplying Energy Efficiently

Be Clean.

This section explores ways in which heating and hot water could be provided via heat pumps, establishing a heating system across the site.

13. Energy Infrastructure

Several different energy infrastructure technologies have been considered for supplying clean heating and hot water to Aderholt Meadows, as displayed in Table 11.

13.1 Heating and Hot Water Proposal for Alderholt

Table 9 on the right displays some of the considered technologies to provide clean hot water and heating to the development at this site. The recommended technology for the residential portion of Alderholt is a shared ground loop array, which is discussed in more detail below.

13.2 Heat Pumps

Heat pumps work by extracting thermal energy from a low-grade source (air, soil or water) to a heating element with a higher temperature. Heat pumps use a liquid refrigerant which is pumped into pipes that absorbs heat, later passing through a compressor where it's further heated and moved to heating and hot water circuits.

Heat pumps operate with a typical Seasonal Coefficient of Performance (SCoP) of 2.5:1 to 5:1 (depending on heat source/sink); meaning that for every 1kW of electric in, 2.5kW of heat is generated (for air source heat pumps) and up to 5kW (for some ground or water source heat pumps). This efficiency of a heat pump is governed by both the temperatures of the heat source and the heat emitter, where a larger flow temperature is attributed to a lower COP.

Heat pumps are suited to individual buildings as well as within an energy centre to form part of a wider strategy. Heat pumps are powered by electricity, so are considered low-carbon rather than zero-carbon/renewable, however, they can be powered by electricity from renewable sources – PV, wind etc.

Heat pumps also have the added benefit of being able to provide cooling in the summer months, as well as heat in winter.

Table 11: Summary of recommended energy efficiency hot water and heating technologies.

	Technology	System Description	Key Opportunities & Risks	Typical scale of implementation	Recommendation
Heat	**Deep Geothermal (4th Gen DHN)**	Boreholes access warm water at 0.5km, using energy to heat homes in district heat network.	Very low-cost energy source delivering >45˚C water to homes. Geotechnical study required to determine if technology is possible at site.	City - region	Not recommended.
	Shared Ground Loop Array (Residential only)	Individual dwellings GSHP which connect to a shared ambient temperature ground loop array (typically 40-50 properties per array),	High efficiency heating and hot water. Delivers high heat pump COPs. Benefits from passive summer cooling and inter-seasonal thermal storage.	2-3 properties +	**Recommended** (Provides a unique approach to heating/cooling while increasing heat pump COP).
	Asphalt Solar Collectors	Pipes within asphalt roads that harness any solar energy absorbed within road surface,	Utilises road infrastructure and harnesses waste heat from an urban heat island effect. Wide spread use within UK has not been adopted.	Not clear	Not recommended.
	Ambient Loop (5th Gen DHN) + Seasonal storage	Shared underground district energy network of heat pumps operating at 10-25˚C (ambient) to provide heating/cooling.	Affordable energy as distribution costs is minimal. Requires balance of heating-dominant and cooling-dominant buildings in order for no external plant requirement.	Community	Not recommended.

13.2.1 *Ground Source Heat Pumps*

GSHP work by taking advantage of the relatively constant temperature of the ground at depth throughout all seasons. This type of system requires the installation of ground loop systems over large areas or via drilling boreholes, as displayed in figure below.

These ground loop systems can be either vertical boreholes up to 100m in depth, or horizontal trenches between 1.5-2m deep. A water or refrigerant fluid is circulated through the ground loops, absorbing the thermal energy and circulating it back to the heat pump at the surface where the compressor passes it through to the hot water cylinders and radiators,

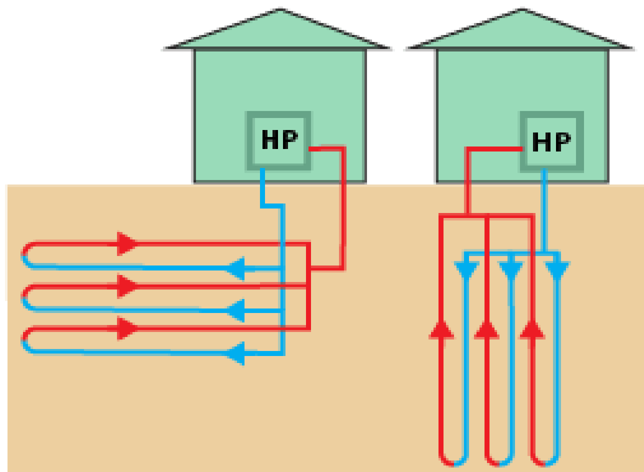


Figure 9 Vertical and Horizontal GSHP loop systems.

13.2.2 Air Source Heat Pumps

Air source heat pumps are an additional heat pump technology, whereby ambient air is used as their heat source. This heat pump system is sited externally; either on external walls, in external compounds or within a ventilated plant room, allowing air to be drawn over the evaporator part of the unit.

ASHP units would need to sit in either an acoustically treated external plant enclosure or within a well-ventilated internal plantroom.

Although air source heat pumps are a cheaper option in comparison to ground source heat pumps, it will require a higher energy consumption to operate at the same level during the winter months.

14. Alderholt's Recommended Route for Low to Zero Carbon Heating and Hot Water

Ground source heat pumps (GSHP) are recommended for uses as the primary form of heat delivery across the Alderholt site for residential buildings. The electrification of heating in this way provides the most realistic pathway towards net-zero emissions for new buildings due to the increasingly rapid decarbonisation of the electricity grid.

Individual dwellings would be provided with a GSHP which would be connected with others to a shared ambient temperature ground loop array, typically 40-50 properties per array. This would provide a low carbon and highly efficient heating across the development. This heating method can deliver a high coefficient of performance (COP) while being able to benefit from passive summer cooling and inter-seasonal thermal storage.

To avoid high CAPEX, funding and ownership model such as the formation of an energy service company (ESCo) are recommended,

See the Energy Options Report for further information.

Renewable Energy Options

Be Green.

This section of the report provides a summary of the potential and viable renewable technologies that could be installed at Alderholts Meadows to optimise renewable energy generation.

15. Potential Renewable Energy

The following pages provide an initial options appraisal and highlight the potential renewable technologies to be included within the Alderholt development.

15.1 Residual Carbon Emissions

The residual carbon emissions refer to the site wide CO_2 emissions rate, after the implementation of energy efficiency measures.

Following LETI guidance energy efficiency measures, the developments carbon emissions are **794,500 $kgCO_2$/yr.**

On this basis, whilst a final design decision on renewables has not been made at this stage, a number of potential low and zero carbon technologies have been appraised against the development proposals for their technical feasibility to satisfy the aspiration of an operational zero-carbon development.

15.2 Potential Renewable Technologies

An initial desktop study of a wide variety of technologies has been carried out and for clarity, a summary of potential renewable technologies is shown in Table 12.

Table 12: Summary of potential low or zero carbon technology waste and power options.

	Technology	System Description	Key Opportunities & Risks	Typical scale of implementation	Recommendation
Waste	**Incineration Plant**	Direct combustion plant (municipal solid waste) with steam power via turbine.	Reliable and non-intermittent source of energy. Could incorporate waste from off-site. May be a barrier to circular economy, can reduce recycling and air quality.	City - region	Not recommended.
Waste	**Anaerobic Digestion**	Produces biogas used for combustion within a CHP engine (power generation and waste heat utilisation).	Reliable and non-intermittent source of energy which could be exported. Could incorporate waste from off-site. Organic bio-fertiliser by-product. Requires collection/processing of food and human waste and green biomass import for adequate calorific value.	Community	**Further investigation required** to understand opportunities for local agri-crop incorporation.
Power	**Residential Microgrids**	Multiple private networks (owned, operated and maintained by Client/third party) including batteries and smart controls.	Revenue opportunity (long-term) for Client. Could integrate strategic ground mounted PV to maximise on-site consumption. Regulatory requirements must be met (relaxed in future to form single site-wide microgrid).	100 properties +	**Recommended** (Enables smart functionality for the site whilst delivering truly green electricity to residents, maximising various on-site generations).
Power	**FTM Battery Storage**	In-front of the meter (FTM) battery used for electricity market arbitrage and grid ancillary services.	Used for applications required by grid system operators e.g., ancillary services or network load relief, offering long term revenue through fixed contracts with energy suppliers.	N/A	**Recommended** (For revenue generation).
Power	**Green Hydrogen Production**	Electrolyser system, powered by on-site solar PV capable of producing green hydrogen.	Local distribution centres may require Hydrogen for HGV fuel in the future. Hydrogen fuelling stations could also act as off-takers. Market for hydrogen not yet well established with significant cost uncertainties.	1MW+ electrolyser	Not recommended.
Power	**Photovoltaic Panels (PV)**	Crystalline silicon PV, mounted to roof facing east to west or as solar farm at 30° pitch.	Aesthetics of roof-mounted PV vs. ground solar farm reviewed by client. To maximise potential, need to consider orientation, pitch and location of panels.	Any	**Recommended** (Able to offset remaining sites energy usage to achieve operational net-zero development.)
Power	**Wind Power**	Converts wind energy into electric energy, site average of 7m/s considered excellent for generation.	Number of sensitivities and planning issues that must be considered with wind turbines that could make the technology unsuitable at scale.	1,500 homes	Not recommended.

16. Alderholt's Recommended Routes to a Net-Zero Operational Development

Due to the location of the Alderholt Site, there are 2 key potentially viable renewable or low carbon energy options that could be included at the development to provide heat and hot water. These options have been reviewed in more detail as summarised below.

A more detailed description and review of each viable technology can be seen in Appendix 1.

16.1 Option 1: Photovoltaic (PV) Farms with Battery Storage

Crystalline silicon PV as the primary on-site generation has been recommended as it will produce the highest performance level.

The Client has reviewed the aesthetics of PV on-site and it is understood that Dudsbury Homes wish to avoid roof mounted PV installation where possible.

Two areas with the potential for PV have been identified within the illustrative site layout (see Figure 10), and listed below in Table 13. One of the two areas, the Potential Solar Array, is included within this application, therefore the approach to renewable energy can only draw upon this allocation of PV land. The Potential PV Farm has been identified as a plausible for the location of a solar farm while simultaneously enhancing biodiversity.

Table 13 Potential PV Farm on-site and the possible future PV Farm areas and installation capacity.

PV Area	Area (Acres)	Estimated Installed Capacity (MWp)
Current Potential PV Farm	12.8	3.2
Future potential PV Farm	16.4	4.1

There is the potential of securing a second PV field (Future potential PV Farm), however this will require negotiations between the Dudsbury Homes and the current landowner. This piece of land sits outside of the red line boundary (see Figure 10). If secured, up to 16.4 acres of PV can be added with an estimated additional capacity of 4.1 MWp, significantly helping to decarbonise operational energy on site.

Table 14 The potential supply of renewable solar energy as a percentage of the estimated energy use intensity for Part L baseline, FHS and LETI guidelines.

Solar Farm Supply	% of Part L Operational Energy	% of FHS Operational Energy	% of LETI Operational Energy
Potential PV Farm	17.6%	34.7%	57.9%
Total with both Solar Farms	40.1%	79.1%	132.2%

In-front of the meter (FTM) Li-ion batteries are currently further recommended alongside the PV Farm for revenue generation and storage of surplus energy from the PV.

16.2 Option 2: Site-wise Smart Microgrid

Multiple residential private site-wise microgrids are recommended for implantation on site, as this enables smart functionality at Alderholt whilst delivering green electricity to residents,

This can provide a long-term revenue opportunity for Dudsbury Homes with the ability to integrate the strategic ground mounted PV and maximise on-site consumption. Regulatory requirements must be met but could be relaxed in the future to create a single site-wide microgrid.

The operational model can be tailored to suit Dudsburys Homes goals. The establishment of a ESCo to deliver this zero-carbon distribution is proposed for the site.

A combination of both options should be considered for the most effective route to achieve operational net-zero at Alderholt Meadows.

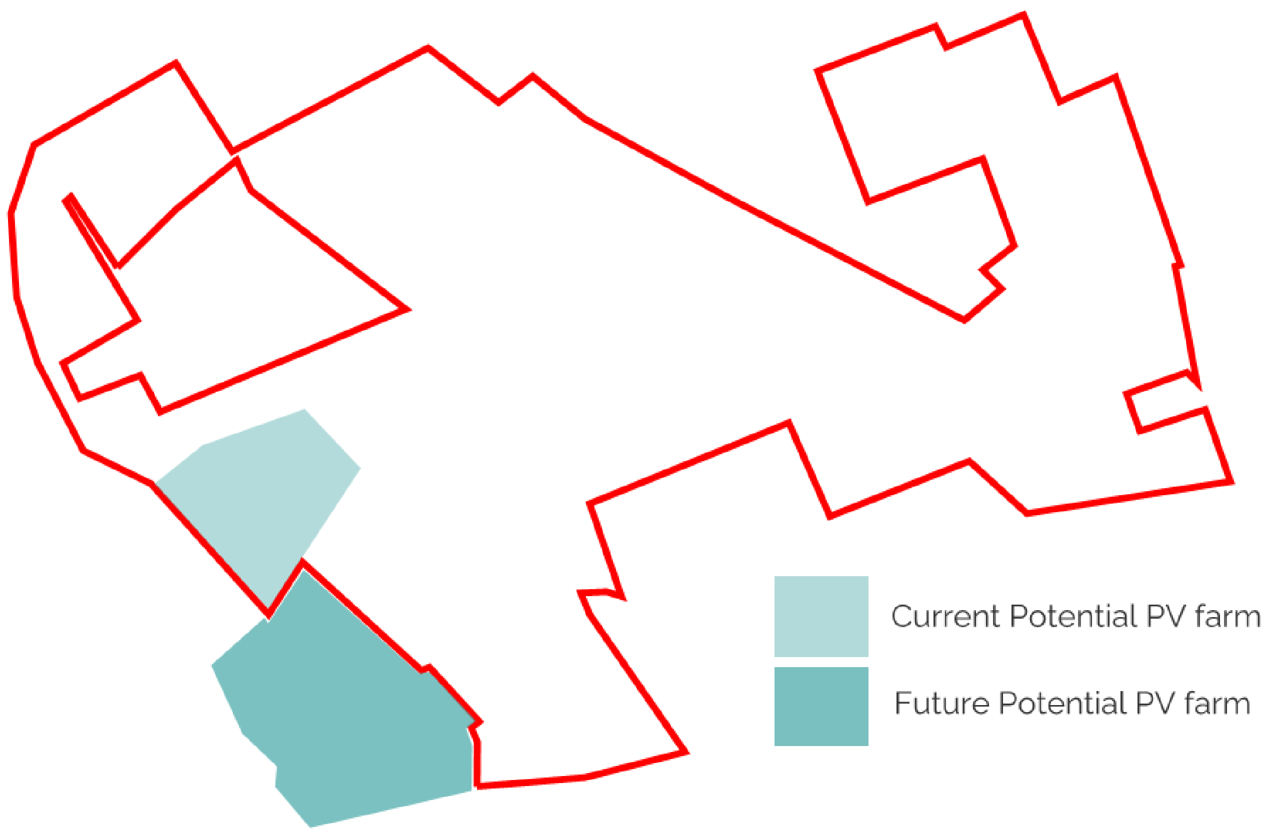


Figure 10 - Marked up drawing of potential solar farms

Energy and Sustainability Strategy Summary

This report has detailed the measures to improve sustainability and reduce energy & carbon emissions at the proposed Alderholt Meadows development in Dorset.

The recommendations include GSHP, a PV Farm, a Smart Microgrid and the adoption of the LETI building regulations to significantly reduce site wide carbon emissions and provide on-site energy generation.

17. Energy Summary and Conclusion

The schemes within this Energy and Sustainability report have been designed to respond positively to all emerging national and local sustainability policies, as well as the progressive ambitions of the Dudsbury Homes. The objectives of both the emerging local policy combined with the clients' aspirations for an operational net-zero development are to deliver significant carbon reductions and increase energy generation on the new development.

Alderholt Meadows has followed best practice guidance through the following measures:

- **Fabric first** approach;
- **All electric** energy solution;
- Potential **renewable energy** generation through on-site solar PV farms;
- Potential FTM **battery storage**;
- Potential residential **microgrids**;
- **SuDS** included to reduce flooding;
- **Reduce water** usage;
- Design to **reduce overheating**;
- Promote **sustainable travel**;
- Creating a development design that is **flexible and adaptable** for future needs;
- **Reduce waste** and promote recycling and circular economy measures;
- On site, hedgerows, mature trees and watercourses will be retained and enhanced; and
- New habitats will be introduced to **increase biodiversity**

The measures significantly exceed the emerging Local Plan requirements set by Dorset Council and national guidelines.

By adopting the recommended LETI Climate Emergency Design Guide, which significantly exceeds current Part L 2021 and the Future Homes Standard benchmarks, the development can achieve net-zero operational energy through the electrification of heat using a ground source heat pump shared ground loop array technology.

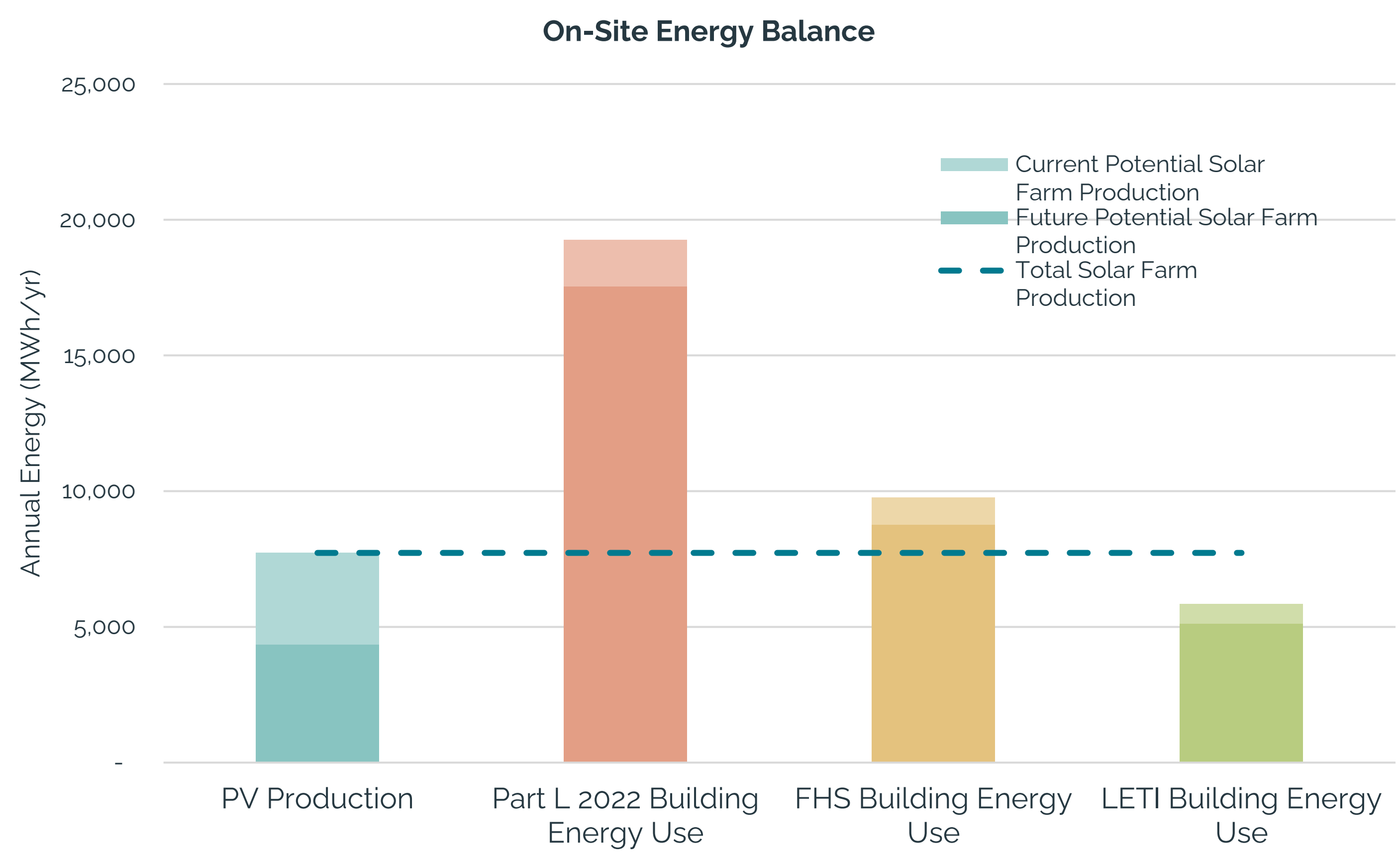


Figure 11 Maximum annual energy reductions following FHS or LETI benchmark targets compared to baseline Part L, with the potential energy generation from PV Farms.

Additionally, renewable energy generation is proposed via the installation of a 12.8-acre PV farm in the west of the site, as per the preference from Dudsbury Homes compared to roof-mounted PV. It is recommended this should be combined with the installation of FTM battery storage and multiple residential microgrids with the potential for an ESCo.

Figure 11 displays a summary of the annual energy reductions after implementation of either the Future Homes Standard for LETI Climate Guide in comparison to the Building Regulations Part L 2021 baseline. A total carbon emission and energy use **reduction of up to 69% from baseline Part L** compliance can be achieved through following the recommendations in this Energy and Sustainability statement.

Appendix 1

Recommended Renewable Technologies

18. Photovoltaic Panels

Solar PV works by converting light into electricity using a semi-conductor 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. Monthly irradiation and energy output are shown in the following figures:

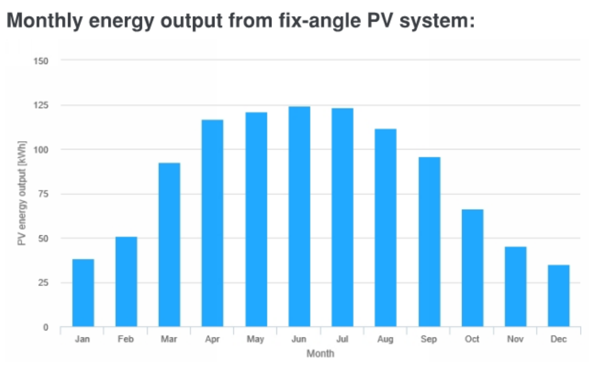


Figure 12 Monthly energy output from solar PV.

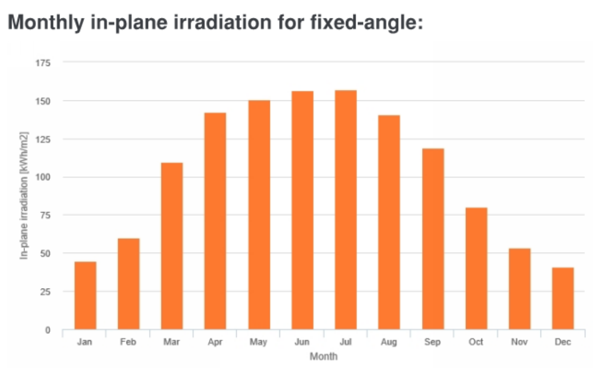


Figure 13 Monthly irradiation for solar PV.

PV panels themselves vary in efficiency from 15-18% (average) to 21% (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 maintenance space required. Taking into account over-shading, maintenance space and the frames, the area allocated should be approximately 2.5 times the active panel area 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.

19. FTM Battery

In-front of the battery storage, also known as utility scale or grid-scale battery storage, connects to distribution/transmission networks or power generation assets like renewable generators.

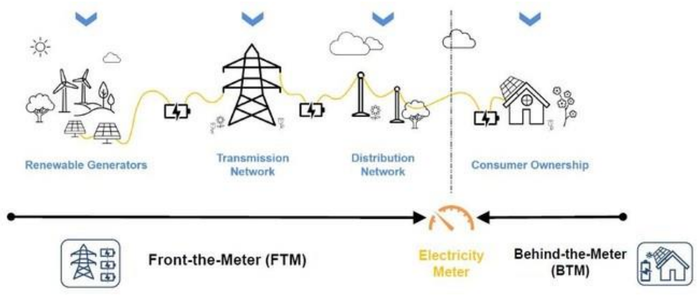


Figure 14 Front of the meter battery system.

Utility-scale storage capacity ranges from several megawatt-hours to hundreds. Typically, lithium-ion batteries are used, as the most prevalent technology.

By installing batteries, this increases the flexibility of a power system, enabling the use of intermittent supply sources such as the solar PV which will be used at this development.

20. Smart Microgrid

Microgrids are a smaller-scale site-contained electricity system that generates and manages its own power. A microgrid is therefore a local power network that uses distributed energy resources, such as solar PV, wind turbines, backup generators and battery storage systems, to manage local energy supply and demand.

The physical infrastructure of a microgrid is largely dictated by the licence exemption criteria of the

Electricity Act (1989), which allows distribution on-site to domestic consumers, not exceeding 1MW (approx.

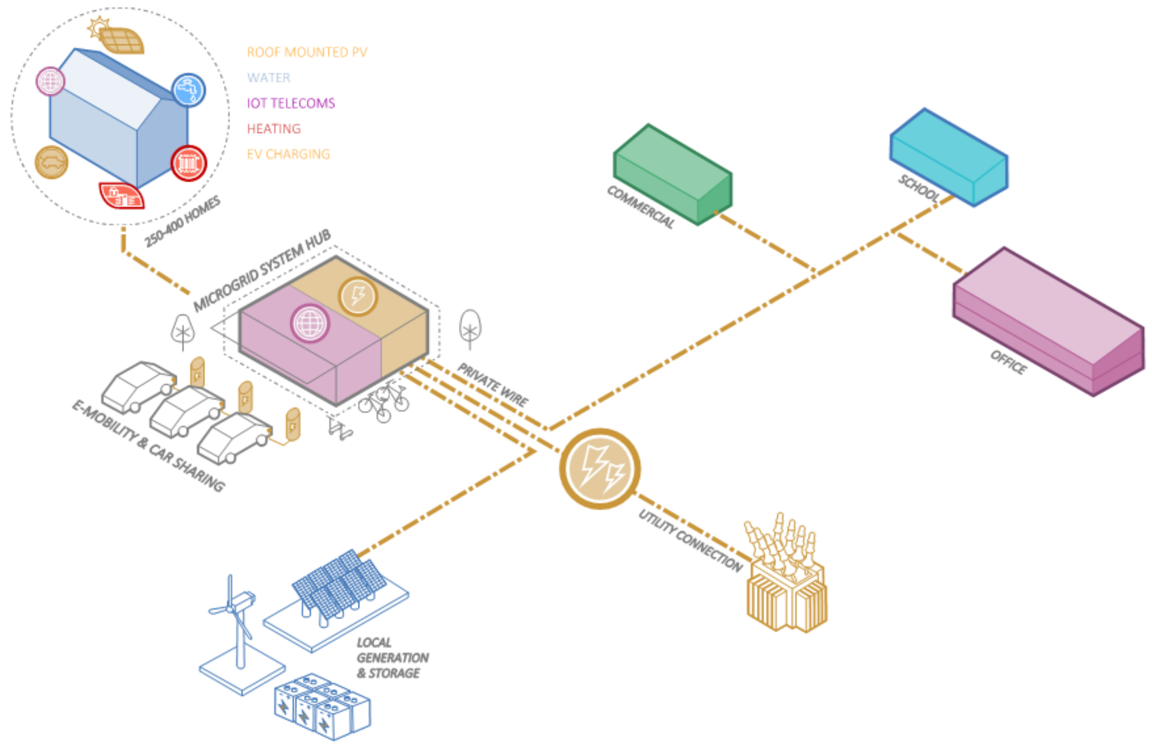


Figure 15 Example layout of a microgrid in a residential development

400 homes). Therefore, more than one microgrid would be required for +400 homes.

Connection of a microgrid to the main grid will still require a formal connection application and agreement process, and the utility network will still require visibility of the microgrid and all its components, including the generation.

21. Anaerobic Digestion

Anaerobic digestion operates by processing organic matter such as food or human waste or being 'fed' with purpose-grown energy crops like maize, breaking this material down to produce biogas and biofertilizers. This process is often used for domestic or industrial purposes to manage waste which producing fuels.

When integrated into a waste management system, anaerobic digestion is able to reduce the emission of landfill gas being released into the atmosphere. The biogas can be used directly as a fuel in a combined heat and power gas engine, or refined to a natural gas-quality biomethane.