

Land east of The Common, Barwell

Redrow Homes Ltd (Harrow Estates Division)

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Table of Contents

Executive Summary	3
1.0 Introduction	5
1.1 Brief.....	5
1.2 Proposed Development	5
2.0 Regulatory Framework.....	7
2.1 National Policy	7
2.2 Local Regulations: Hinckley and Bosworth Borough Council: Core Strategy	7
2.3 Building Regulations.....	9
3.0 Energy & Carbon	11
3.1 Future Homes Standard	12
3.2 Low and Zero Carbon Technologies.....	13
4.0 Conclusions	18



EXECUTIVE SUMMARY

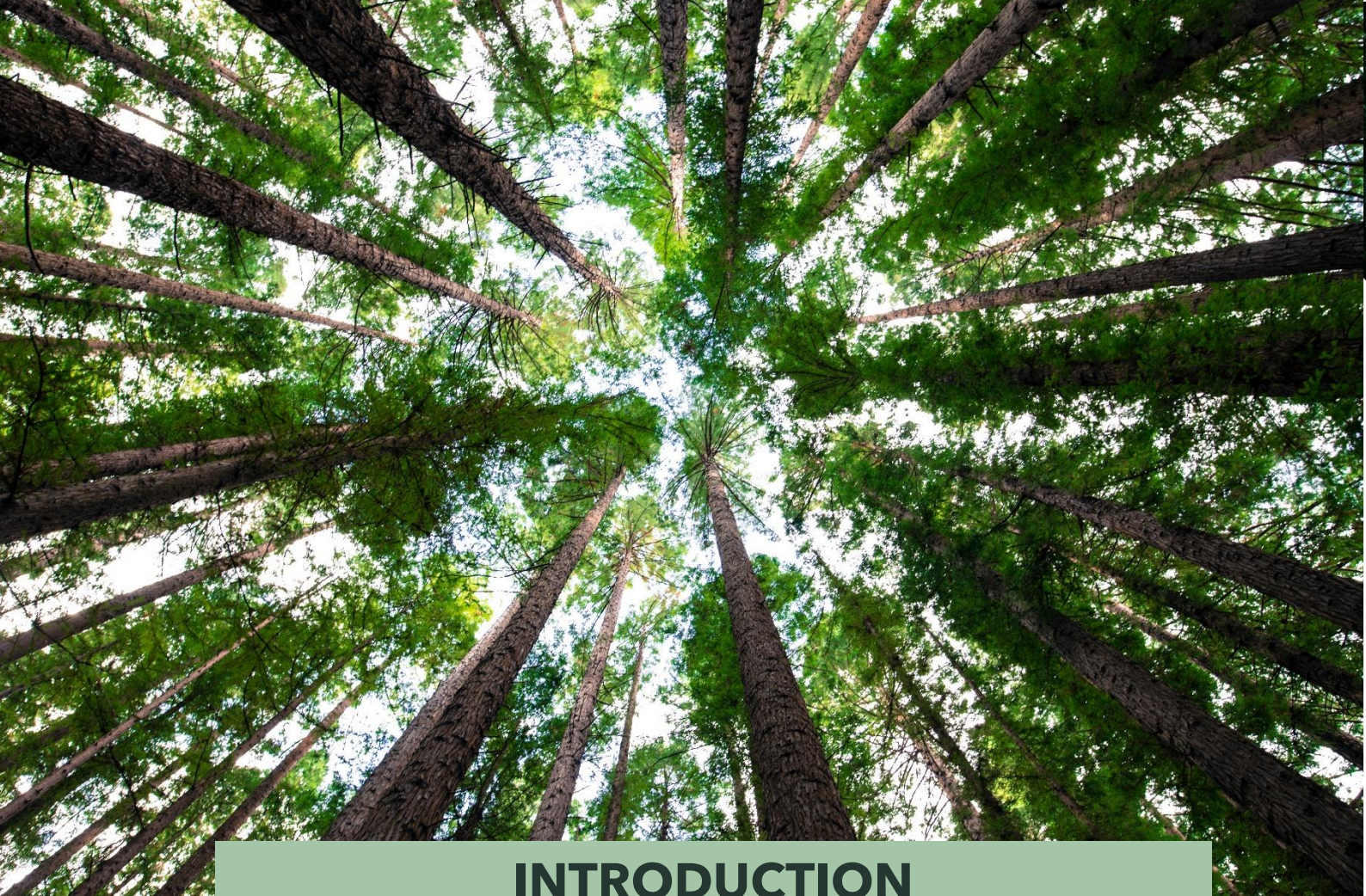
This report has been compiled to identify strategies for the reduction of energy consumption and carbon emissions at a proposed new development at Land east of The Common, Barwell.

By building the properties in line with the proposed Future Homes Standard, which adheres to a 'fabric first' approach and then employing relevant, cost effective and highly efficient LZC technologies, the proposed dwellings will be completed to a very energy efficient standard. This should ensure they offer a sustainable addition to the local housing stock.

The findings and recommendations in this report are indicative only, and careful design consideration is required to establish the implications of implementing these measures on project cost, servicing of the internal environment and the operational and maintenance requirements of the site.



Image 1.0: Development Site



INTRODUCTION



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1.0 INTRODUCTION

1.1 Brief

Mainer Associates were approached to undertake an energy statement for the proposed development at Land east of The Common, Barwell. This report has been compiled to identify strategies for the reduction of energy consumption and carbon emissions at the proposed site.

A review has been undertaken looking at the Future Homes Standard and if needed how carbon emissions and energy consumption can be further minimised via implementation of low and zero carbon energy systems.

The report finds that likely targets for renewable energy generation and carbon reduction can be met through implementation of various measures across the various dwelling types.

1.2 Proposed Development

The development will be built on an area of 10.92 hectares and is proposed to comprise of 95 residential dwellings. These will be a mix of detached, semi-detached and terraced properties with proposal for some self-build plots of differing sizes. The proposed site plan can be seen overleaf in Image 2.0.

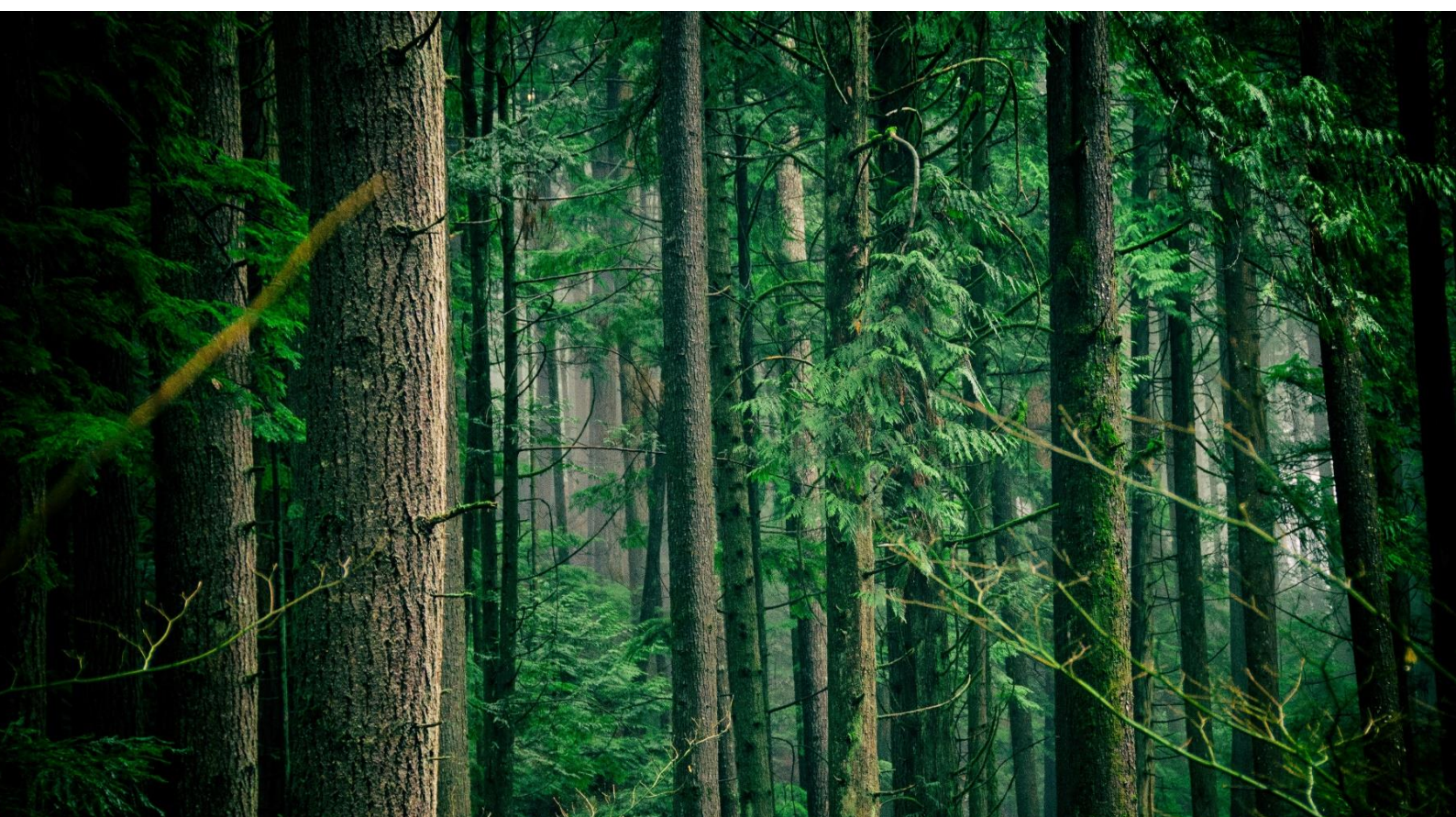




Image 2.0: Proposed Site Plan



2.0 REGULATORY FRAMEWORK

This section discusses the local and national regulations applicable for this development.

2.1 National Policy

National Planning Policy Framework (NPPF) 2023 sets out the Government's planning policies for England and guides the developers on how these are expected to be applied.

The policy argues that the purpose of the planning system is to contribute to the achievement of sustainable development. At a very high level, the objective of sustainable development can be summarised as meeting the needs of the present without compromising the ability of future generations to meet their own needs. Achieving sustainable development means that the planning system has three overarching objectives, which are interdependent and need to be pursued in mutually supportive ways:

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

2.2 Local Regulations: Hinckley and Bosworth Borough Council: Core Strategy

The Core Strategy provides a spatial interpretation of the key drivers for change in order to deliver sustainable development. It is split into a number of Spatial Objectives that set out the broad strategic direction for development in the borough. The Spatial Strategy provides an interpretation



of the specific issues that need to be addressed to tackle the key challenges being faced in the borough. The Spatial Strategy is not produced in isolation but takes account of national, regional and local planning guidance.

Spatial Objective 12: Climate Change and Resource Efficiency aims to minimise the impacts of climate change by promoting the prudent use of resources through sustainable patterns of development, investment in green infrastructure, minimising the use of resources and energy, increasing reuse and recycling of natural resources, increasing the use of renewable energy technologies and minimising pollution including greenhouse gas emissions.

Policy 24: Sustainable Design and Technology is the key driver to achieve Spatial Objective 12 and requires that all residential development in Barwell meet the following requirements, unless it would make the development unviable:

- Residential developments to meet the Code for Sustainable Homes (CSH) at the following levels:
 - Minimum of Code level 3 to 2013
 - Minimum of Code Level 4 from 2013 - 2016
 - Minimum of Code Level 6 from 2016 onwards

However, Code for Sustainable Homes (CSH) is no longer relevant for new proposals, and the standards for conservation of heat and power are contained within Part L of the Building Regulations.

The Site Allocations and Development Management Policies DPD, adopted in July 2016, also details Spatial Objective 12 and Policy 24 stating that 'An updated monitoring framework to be devised for the years beyond 2016'. There is no further guidance and the latest Authority Monitoring Report available covering April 2019 - March 2020 simply states that monitoring for the CSH requirement is no longer required by legislation to be returned.

A planned update to the Hinckley and Bosworth Local Plan gives some proposed details on what will be needed for future developments, though these are subject to change and are included here for information purposes only.

- *Supporting sustainable construction and design*
- *Integrating renewable and low carbon energy generation wherever possible*
- *Use layout, building orientation, design and materials to ensure properties are susceptible to overheating and include open space and vegetation for shading and cooling and to detain surface water run off*
- *Ensuring high levels of energy and water efficiency (Building regulations)*
- *The policy requires applicants to submit a sustainability Statement to demonstrate how the principles of climate change mitigation and adaptation have been embedded within the development proposal.*



2.3 Building Regulations

Building Regulations Part L covers the conservation of fuel and power in the building of new homes in England and establishes how energy efficient a new dwelling must be.

Approved Document L, Volume 1: Dwellings gives guidance on how to comply with Part L of Schedule 1 to the Building Regulations and the energy efficiency requirements for dwellings. The current version came into effect on 15 June 2022 and applies to work subject to a building notice, full plans application or initial notice submitted on or after this date.

- A new dwelling must be built to a minimum standard of total energy performance, which is evaluated by comparing calculations of the 'actual dwelling' against calculations of the performance of a theoretical dwelling called the 'notional dwelling'. The calculations use the following three metrics;
 - Primary energy rate (kWh_{PE}/m² per year): this is influenced by the fabric and fuel. The dwelling's primary energy rate (DPER) must be equal to or less than the target rate (TPER).
 - Emission rate (kgCO₂/m² per year): this is influenced by the fabric and fuel. The dwelling's predicted CO₂ emissions rate (DER) must be equal to or less than the target rate (TER).
 - Fabric energy efficiency rate (kWh/m² per year): this is influenced by the fabric only. The dwelling's fabric energy efficiency (DFEE) must be equal to or less than the target rate (TFEE).
- The performance of the individual fabric elements and the fixed building service of the building should achieve reasonable overall standards of energy efficiency. Table 1.0 below details the limiting standards for fabric elements and air permeability for new dwellings under Part L 2021

Table 1.0: Limiting standards for new fabric elements and air permeability in new dwellings	
Construction Element	Maximum U-value W/(m ² .K)
All roof types	0.16
External wall	0.26
Floor	0.18
Windows	1.6
Doors	1.6
Air permeability	8.0 m ³ /(h.m ²) @ 50Pa



ENERGY & CARBON



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3.0 ENERGY & CARBON

Government guidance for carbon performance suggests a hierarchy of good practice in low carbon design. Image 3.0 illustrates this hierarchy.

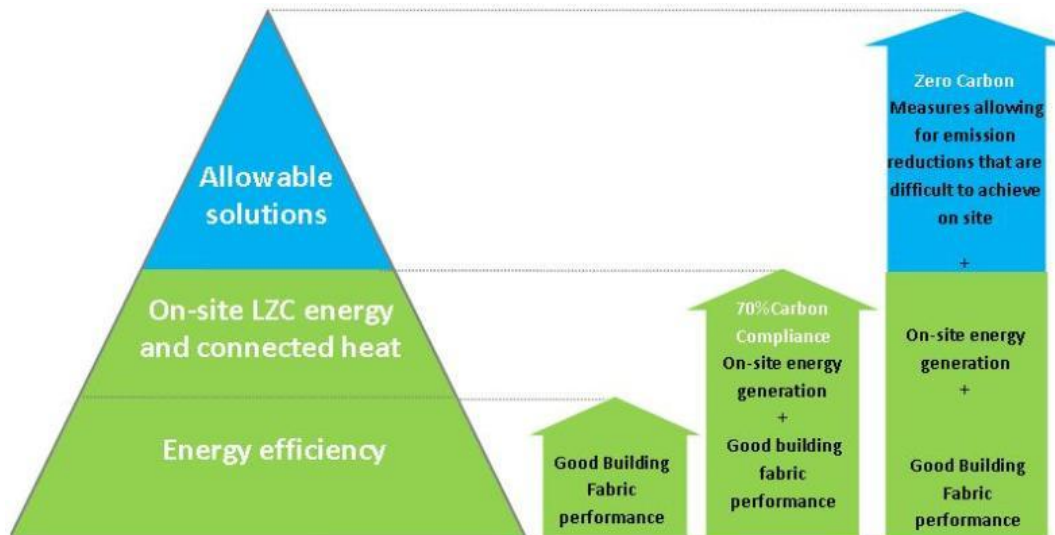


Image 3.0: Low Carbon Design Hierarchy

Energy efficiency can be achieved through the use of high-performance building materials to ensure thermal efficiency of the building envelope. This, along with the implementation of efficient fixed services design and low and zero carbon technologies, should allow designers to meet most carbon compliance requirements.

The last element of the hierarchy is the use of renewable energy solutions to generate the energy used on site. Ideally, these renewable energy sources should be installed locally. However, if this is not possible then 'Allowable Solutions' can be used to provide off-site renewable energy sources to offset carbon emissions from the site.

The development will be designed in line with the hierarchy illustrated above.



3.1 Future Homes Standard

Homes, both new and existing, account for 20% of greenhouse gas emissions in the UK, so residential dwellings will play a vital role in the UK's efforts to reach net zero carbon emissions.

New homes that are being constructed now and in the next 5 to 10 years will exist in 2050, therefore the Government consulted on a Future Homes Standard (FHS) for new-build homes to be future proofed with low carbon heating and world leading levels of energy efficiency.

Intended to be introduced in 2025, the Future Homes Standard is not current policy, however, it is proposed that the development will be completed in line with these principles and therefore offer a significant improvement over the current building regulations. By following these principles now, the properties will also be future proofed against designing based on the current regulations, which are insufficient to help with achieving net zero goals.

Benchmarks for the FHS can be found in Table 1.0 which compares the proposed standard for the notional building, used within calculations for Part L compliance, between the FHS and current Part L 2021

Table 2.0: Part L 2021 vs Future Homes Standard - Notional building specification

Element type	Part L 2021	FHS
Floor U-value (W/m ² .K)	0.13	0.11
Wall U-value (W/m ² .K)	0.18	0.15
Roof U-value (W/m ² .K)	0.11	0.11
Window U-value (W/m ² .K)	1.2	0.8
Door U-value (W/m ² .K)	1.0	1.0
Air permeability (m ³ /h.m ²) @ 50Pa	5	5
Heating appliance	Gas boiler	Low-carbon heating (e.g. heat pump)
Heat emitter type	Low temperature heating	Low temperature heating
Ventilation System type	Natural (with extract fans)	Natural (with extract fans)
Photovoltaic Panels	40% of ground floor area	None
Wastewater heat recovery (WWHR)	Yes	No
Thermal Bridging y-value (W/m ² .K)	0.05	0.05

By building homes to the proposed Future Homes Standard, on average each property should achieve over a 60% improvement in CO₂ emissions compared to building to the current Part L 2021. The proposed specification includes:



- Low u-values for all fabric elements – for external walls this could wider cavities or alternative construction like highly insulated timber frame, structurally insulated panels (SIPS) or insulated concrete framework (ICF). For windows to achieve the proposed standards would be mean triple glazing.
- Low levels of air permeability – this means high levels of attention to details on site, lower levels or air permeability also introduce the possibility of having to use mechanical ventilation.
- Low carbon heating and hot water – avoiding a mains gas connection on site will mean the properties will achieve lower carbon emissions.
- Thermal bridging – individual modelling of all junctions or using an accredited source for modelling will result in a more thermal efficient property.

As highlighted in the introduction to Section 3.0, the development will follow a fabric first approach and following the FHS will achieve this, however, additional thought and savings could be achieved by employing low and zero carbon (LZC) technologies for the building services. These are discussed and reviewed in the following section.

3.2 Low and Zero Carbon Technologies

There are various low and zero carbon technologies, such as photovoltaic panels, wind turbines and CHP etc available on the market. However, not all are feasible due to capital expenditure, pay-back periods, availability, logistics and respective CO₂ emission reduction. It is often not feasible to outlay significant capital expenditure which has high payback periods and will save limited energy and CO₂ emissions.

The following section of this report aims to identify potential technologies for more detailed analysis and justify any technologies being excluded at this stage. A traffic light system has been adopted to represent the anticipated feasibility of these measures prior to undertaking modelling of the site.

The traffic light system should be interpreted as follows:

- | | |
|-------|--|
| Red | Technology not suitable. |
| Amber | Technology may be suitable depending on building energy demands. |
| Green | Technology may be suitable subject to payback and operational constraints. |

**Table 3.0 LZC feasibility**

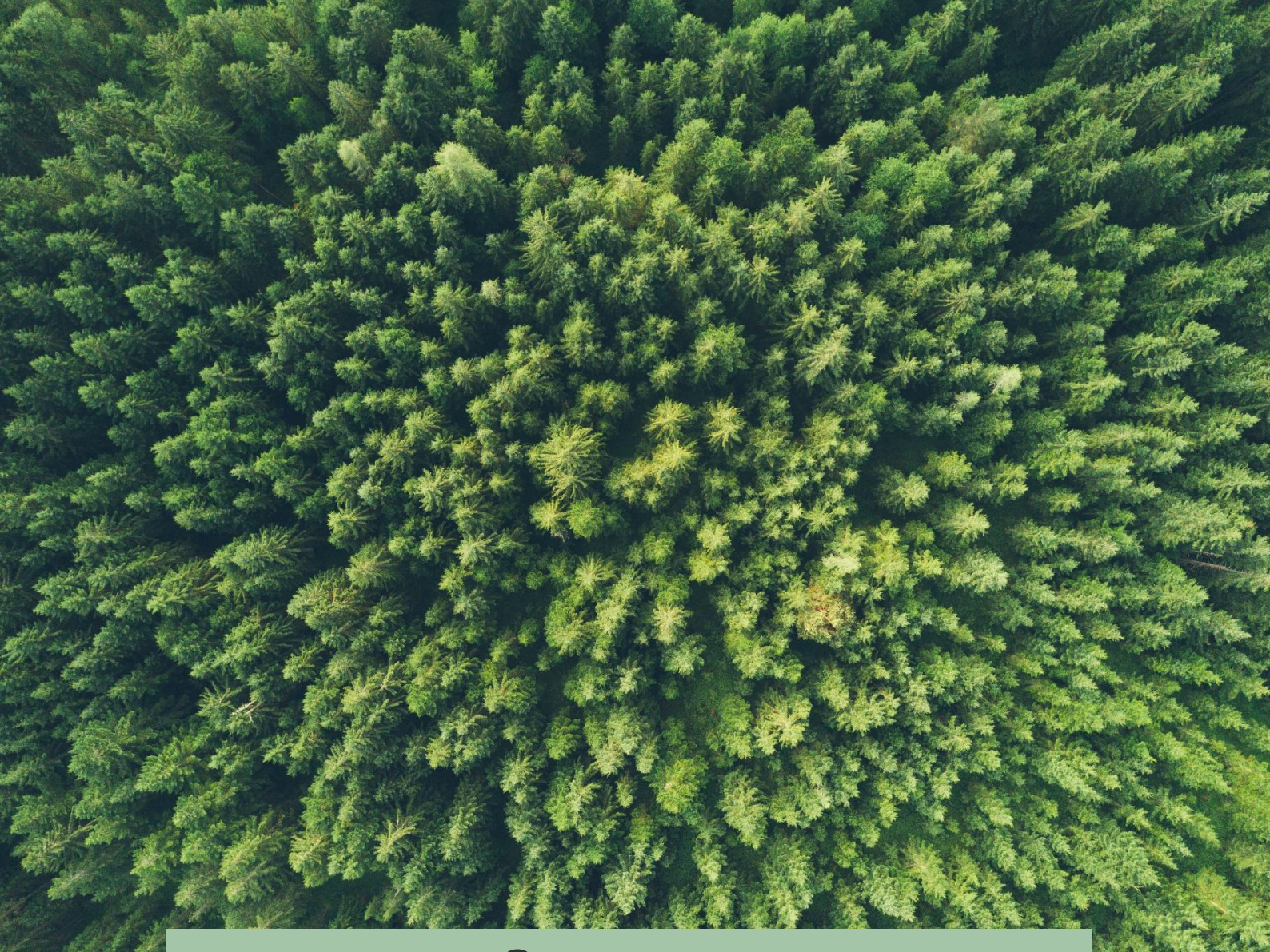
No.	Sustainable Element	Feasibility Comment	Feasible Yes/No
1	Wind Turbines	Wind Turbines generate electrical power for the earth's natural wind resource. The location of any wind turbines would need to be carefully considered as there are a number of buildings within the vicinity of this building which could prevent/block wind potential. Planning could also be a consideration. It is generally considered that wind turbines do not operate well in urban environments unless they are tall enough to be unaffected by the deflection of wind by surrounding buildings. Given that the development comprises dwellings, it would not be viable to provide either a significant number of small turbines or a smaller number of large-scale turbines to meet a significant proportion of the development's energy demand.	No
2	Photovoltaic Panels	Photovoltaic (PV) panels could be installed; however consideration should be made to the orientation of the properties, in order to maximise yield. The combination of PV and EV charging, can be an effective means of utilising generated energy.	Yes
3	Solar Collectors	Solar collectors provide a mechanism to collect heat energy from the sun and transfer this to the water supply to the building, thus reducing the primary domestic hot water demand and subsequent energy consumption. The solar collectors could be mounted on the roof of the building. The system output would be dependent on the orientation of the solar array. The hot water usage profile for the building and availability of accessible roof space for a hot water system would have to be assessed based on each building type. Individual dwellings could easily accommodate stand-alone solar hot water systems. However, such systems will make a relatively small contribution in lowering the overall energy demand.	Possible
4	CHP	Combined Heat and Power (CHP) installations require careful sizing against the base loads of the building they are to serve. In order to operate	No



		efficiently it is preferable to have a steady base load. As the proposal's energy demand is unlikely to be steady, CHP will not be viable.	
5	ASHP	Air source heat pump (ASHP) systems offer a more practical alternative to GSHP's in that, generally, they offer much greater flexibility with regards to their installation and do not require the prior geological, or ground preparation work needed by GSHP's. With a seasonal efficiency of 300% or more, they are not quite as efficient as GSHP's. They do, however, offer a renewable energy source to provide low grade hot water for suitable for domestic hot water or heating installations. Air source heating could provide heating and/or hot water to individual dwellings, apartment blocks and commercial units. Where cooling is required a combined heat pump cycle should be considered for the provision of heating to these areas.	Yes
6	GSHP	The installation of a ground source heat pump (GSHP) needs to be carefully considered. The development's location and the size of the site could require that boreholes be dug rather than a more traditional slinky arrangement. This could significantly increase the cost thus potentially making the installation economically prohibitive. Given the setting of the site, available space and likely ground works required, it is likely that some of the site could be served by ground source heat pumps.	Yes
7	Biomass Boilers	The use of a central boiler plant utilizing biofuel would mean the requirement for a biofuel storage tank and regular deliveries. Biomass boilers could be installed to provide the necessary energy for heating and domestic hot water. However, transportation and storage of fuel make the suitability of biomass highly dependent on available space. Further investigation of local planning, clean air and smoke control requirements would also be required to fully assess feasibility. Given the nature of the site and the proposed development, there are likely to be planning	No



		restrictions on the use of biomass systems for residential units. Storage requirements would be difficult to accommodate given the close proximity of development plan. In this case the use of biomass unlikely to be viable.	
8	Heat Recovery Ventilation Units	Heat recovery systems allow energy from extracted air to be transferred to incoming air before it is supplied to the occupied space. For a heat recovery system to be effective, the building in question should have a good level of air tightness, as will be the case for this scheme. Consideration should be given to the inclusion of heat recovery within ventilation systems to all residential types across the development.	Yes
9	District Energy Systems	There are no existing district heating networks in close proximity to the site. However, given the scale of the proposed development, the site could be served by a new, dedicated energy network. A district heating network could typically generate heat from large scale heat pump systems, fossil fuels or the combustion of domestic waste. Each building served by the network would include a heat exchanger (within the plant room for non-dwellings) as the interface between the building's heating system and the district heating network. Such a network would be managed by an energy provider. An agreement would typically be entered into for the energy provider to fund or contribute to the construction of the network, on the basis that this investment is recovered through the sale of energy to users across the site. Such systems can also be used to manage the power and heat demands across a site. This can reduce the infrastructure demands on wider and national distribution networks.	Possible



CONCLUSION



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4.0 CONCLUSIONS

By building the properties in line with the proposed Future Homes Standard, which adheres to a 'fabric first' approach and then employing relevant, cost effective and highly efficient LZC technologies, the proposed dwellings will be completed to a very energy efficient standard. This should ensure they offer a sustainable addition to the local housing stock.

By building homes to the proposed Future Homes Standard, on average each property should achieve over a 60% improvement in CO₂ emissions compared to building to the current Part L 2021.

If any additional LZC technologies are employed within the development then additional savings are likely to be achieved, this would contribute to the development being more sustainable from an environmental point of view as well as being affordable for each owner.

By meeting building regulations on Part L, the requirements of the current Hinckley and Bosworth Core Strategy in terms of Policy 24, subject to any additional planning conditions that may be applied. Additional documentation and evidence will be required should the proposed Local Plan be implemented.

To align with the principles summarised above, the development will commit to the following:

1. All dwellings will be designed and built in line with the requirements of the Future Homes Standard. The exact details of this are still to be determined by Government but by committing now, all dwellings will be built to a fabric first approach, future proofing towards being zero carbon ready homes in line with the current proposals.
2. Heat pumps will be installed on all dwellings providing low carbon heating and hot water. By ruling out mains gas connections, a huge step is taken to reduce the carbon impact of these new homes.
3. Aim to install Photovoltaic (PV) panels on a minimum of 70% of all dwellings on the site. This will be subject to a feasibility study depending on the orientation of the particular property but will provide renewable energy generation and lower running costs for occupants.
4. All properties will have highly water efficient fittings to achieve an average water usage of no more than 110 litres/person/day. This is in line with best practice guidelines and enables better use of water resources.
5. Electric vehicle (EV) charging points will be fitted to all dwellings to encourage the uptake of low and zero emission vehicles.