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BUILDINGS AND BUILT ENVIRONMENT

Graven Hill Purchaser Ltd
Graven Hill, D1 Site, Bicester

Energy and Sustainability Statement

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Notice

EXECUTIVE SUMMARY

This Energy and Sustainability Statement has been produced in support of an outline planning application for the Proposed Development at Graven Hill, D1 Site, Bicester in accordance with Cherwell District Council's Local Plan Policies ESD 1 (Mitigating and Adapting to Climate Change), ESD 2 (Energy Hierarchy and Allowable Solutions), ESD 3 (Sustainable Construction), ESD 4 (Decentralised Energy Systems) and ESD 5 (Renewable Energy).

This Energy and Sustainability Statement sets a framework for the Energy and Sustainability Strategy for the Development Site and outlines the Proposed Development's approach to energy efficiency, renewable energy generation and sustainable development incorporating climate change resilience and carbon management measures. It summarises the key planning policies which is pertinent at the time of writing and is aimed at satisfying the energy and CO_2 related requirements.

ENERGY SUMMARY

The Proposed Development will adopt the use of an energy hierarchy and a holistic approach to sustainability in order to meet the energy and carbon emissions [CO_2] targets as set out by the National, Regional and Local Council (Cherwell District Council).

The energy hierarchy aims to reduce energy demand and CO_2 emissions through passive design measures and a 'fabric first' approach (Be Lean) before seeking to reduce the remaining demand by the cleanest means possible. This includes exploiting local energy resources/supplying energy efficiently and cleanly (Be Clean), and finally exploring the opportunities for producing, storing, and using renewable energy on-site (Be Green).

Be Lean Summary: The Proposed Development envelope and services will be specified in accordance with the current Part L2 2013 of the Building Regulations to ensure energy consumption via space heating and cooling is reduced. Passive solar consideration will form an integral part of the development design to ensure solar gains and cooling loads are reduced, hence providing a more comfortable internal environment for occupants. Consequently, it is expected that the Proposed Development will comply with Part L2 2013 of the Building Regulations. The final building fabric and services specification will be finalised as part of the detailed design planning stage and via Part L2 energy modelling of the proposal.

To reflect the significant decarbonisation of the UK electricity grid, consideration will be given to the specific Part L2 Building Regulation that is in force prior to the commencement of the development site to ensure the proposed development is 'future proofed' for the longer term and ready to meet the Future Building Standard from 2025.

Be Clean Summary: A study into the feasibility of connecting to a district heating network was undertaken. Result shows that there are no existing operational or planned district heat networks within 500m of the development site. Thus, connection to an existing heat network is not proposed at this stage in favour of a lower carbon solution. Nevertheless, the suitability of a new site-wide heat network will be assessed as part of the detailed design planning stage and will be proposed/adopted if the Applicant considers it to be the most carbon conscious, cost effective, resilient, and technologically feasible method of providing heat to the Development. All combustion processes can emit oxides of Nitrogen (NOx) and, solid or liquid

fuelled appliances (such as biomass) can also emit Particulate Matter. These pollutants contribute to poor air quality and can have negative impacts on the health of residents and occupiers of the Proposed Development. Therefore, these factors will also be considered in determining the site-wide heat network strategy for the Proposed Development.

Be Green Summary: The feasibility of renewable energy generation concluded that the most appropriate recognised on-site renewable energy technologies with high to medium opportunities for the Proposed Development Site are Solar Photovoltaic (PV); Air Source Heat Pump; and Solar Hot Water. Technologies with low opportunities such as Water Source Heat Pump, Wind Turbine, Waste Heat, Ground Source Heat Pump, Small Scale Hydro Power, Geothermal, Biomass, Transpired Solar Air Collector, Hydrogen Fuel and Wave/Tidal Power have been discounted at this stage based on a balanced consideration of the policy requirements, financial viability, and technical feasibility.

Energy storage will also be considered as part of the renewable energy strategy for optimising system performance and balancing surplus electrical/thermal energy production. The specified technology/technologies in line with the recommendations of the feasibility study will be finalised as part of the detailed design planning stage and via Part L2 2013 energy modelling of the proposal. The exact percentage reduction in terms of CO_2 and energy will be in accordance with the National and Local (Cherwell District Council) requirement/target.

SUSTAINABILITY SUMMARY

In addition to the CO_2 emissions savings opportunities identified above, the Principal Contractor shall register with the 'Considerate Constructors Scheme' (CCS) and shall seek to achieve satisfactory CCS score in all categories, including:

Material: The aim of the Proposed Development will be for its overall environmental impact to be minimised through the specification of sustainable materials. This will include using sustainable building materials and products and ensuring all timber and timber-based products used on the project are Legally harvested and traded timber. The use of products with responsible sourcing certifications such as FSC and BES 6001 will also be actively encouraged.

Waste: The Proposed Development will ensure consideration is given to sustainable waste management options in accordance with the principles of the waste hierarchy. A pre-demolition audit of any existing buildings, structures or hard surfaces being considered for demolition will be undertaken.

Sustainable Transport: The Proposed Development will ensure the principles of the sustainable transport hierarchy have been met by prioritising sustainable modes of transport ahead of cars and providing infrastructure requirement for Electric Vehicle.

There are a host of other areas of sustainability which will be considered in more detail within the **BREEAM** Assessment targeting a '**Excellent**' rating should planning be approved.

This Energy and Sustainability Statement present a vision for the Proposed Development at Graven Hill, D1 Site, Bicester to deliver a secure, sustainable, low carbon design driven by innovative technologies, enabling the Proposed Development to achieve any National and Local carbon/energy reduction targets whilst reducing its reliance on the UK National Grid.

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1. INTRODUCTION

Instruction

1.1 BWB Consulting (BWB) was instructed by Graven Hill Purchaser Ltd (the Client) to carry out an Energy and Sustainability Statement (ESS) for the Proposed Development at Graven Hill, D1 Site, Bicester in accordance with Cherwell District Council's Local Plan Policies ESD 1 - ESD 5.

Proposed Development

1.2 The redevelopment of Graven Hill, D1 Site, Bicester form part of the wider Bicester regeneration. The Proposed Development is for a B8 'Storage and Distribution' use only and offices within these units would be 'ancillary' to the B8 use.

Purpose of the document

1.3 The purpose of this ESS is to demonstrate that climate change mitigation measures will be integrated into the scheme's design and that the proposed measures are appropriate to the site environment and energy demands of the development.

1.4 This document will describe the policy context to which the Energy and Sustainability Statement responds, before demonstrating how it is proposed to reduce the sites energy demand and CO_2 emissions through a: lean energy efficient design (Be Lean); clean energy supply (Be Clean); and green on-site renewable energy generation (Be Green).

1.5 This document also identifies and highlight the key sustainable practices to be incorporated into the design and construction of the development and determine if these are in line with current national best practice guidance and local policy.

Modelling Methodology (SBEM/DSM)

1.6 Energy modelling using SBEM (Simplified Building Energy Model), or DSM (Dynamic Simulation Modelling) based on the finalised floor plans, sections and elevations will be used to model and predict the proposed development's CO_2 emissions and energy demand. These calculations are expected to be carried out as part of the detailed design planning stage.

1.7 SBEM and DSM are the Government adopted methodologies for calculating the energy performance of non-domestic buildings within the UK. Performing the calculation involves creating a three-dimensional model of the proposed development and then populating the model with the fabric and services specification.

1.8 The calculation is then run to simulate the proposed development energy consumption and resultant carbon dioxide emissions due to the predicted operation of the development over a typical year. The baseline regulated energy and CO_2 emissions are equivalent to the Building Regulations Approved Document Part L2A worst allowable Target Emissions Rate (TER) calculated within the SBEM/DSM assessments of the proposed development.

2. POLICY BACKGROUND

Introduction

2.1 This section of the Energy Statement reviews relevant policy at the international, national, regional, and local levels and then discusses key issues for the Statement.

Climate Change

2.2 Climate change is a long-term change in the average weather patterns that have come to define Earth's local, regional, and global climates. These changes have a broad range of observed effects that are synonymous with the term.

2.3 Changes observed in Earth's climate since the early 20th century are primarily driven by human activities, particularly fossil fuel burning, which increases heat-trapping greenhouse gas levels in Earth's atmosphere, raising Earth's average surface temperature. These human-produced temperature increases are commonly referred to as global warming. Natural processes can also contribute to climate change, including internal variability (e.g., cyclical ocean patterns like El Niño, La Niña, and the Pacific Decadal Oscillation) and external forcing (e.g., volcanic activity, changes in the Sun's energy output, variations in Earth's orbit).

2.4 Scientists use observations from the ground, air, and space, along with theoretical models, to monitor and study past, present and future climate change. Climate data records provide evidence of climate change key indicators, such as global land and ocean temperature increases; rising sea levels; ice loss at Earth's poles and in mountain glaciers; frequency and severity changes in extreme weather such as hurricanes, heatwaves, wildfires, droughts, floods, and precipitation; and cloud and vegetation cover changes, to name but a few.

United Nations Framework Convention on Climate Change

2.5 The international mechanism for addressing climate change is the United Nations Framework Convention on Climate Change (UNFCCC). Signed in 1992 at the United Nations Conference on Environment and Development, the Convention constitutes the foundational climate agreement that has provided the platform for most subsequent international climate agreements.

2.6 The Kyoto Protocol, which was signed in 1997 and which entered into force in 2005, was the first implementation of measures under the UNFCCC until 31 December 2020. The protocol was superseded by the Paris Agreement. Its supreme decision-making body, the Conference of the Parties (COP), meets annually to assess progress in dealing with climate change.

The Paris Agreement

2.7 The Paris Agreement is a legally binding international treaty on climate change. It was adopted by 196 Parties at the 2015 United Nations Climate Change Conference in 2015

2.8 and entered into force in 2016. The 196 Parties to the UNFCCC reached a landmark agreement to combat climate change and to accelerate and intensify the actions and investments needed for a sustainable low carbon future.

2.9 The Paris Agreement builds upon the Convention and for the first time brings all nations into a common cause to undertake ambitious efforts to combat climate change and adapt to its effects, with enhanced support to assist developing countries to do so. As such, it charts a new course in the global climate effort. Its goal is to limit global warming to well below 2, preferably to 1.5 degrees Celsius, compared to pre-industrial levels.

2.10 To achieve this long-term temperature goal, countries aim to reach global peaking of greenhouse gas emissions as soon as possible to achieve a climate neutral world by mid-century. The Paris Agreement works on a 5-year cycle of increasingly ambitious climate action carried out by countries. Countries are required to submit their plans for climate action known as nationally determined contributions (NDCs).

The Paris Agreement and Nationally Determined Contributions

2.11 Through the Paris Agreement, Parties also agreed to a long-term goal for adaptation – to increase the ability to adapt to the adverse impacts of climate change and foster climate resilience and low greenhouse gas emissions development, in a manner that does not threaten food production.

2.12 Nationally determined contributions (NDCs) are at the heart of the Paris Agreement and the achievement of these long-term goals. NDCs embody efforts by each country to reduce national emissions and adapt to the impacts of climate change.

2.13 The Paris Agreement (Article 4, paragraph 2) requires each Party to prepare, communicate and maintain successive nationally determined contributions (NDCs) that it intends to achieve. Parties shall pursue domestic mitigation measures, with the aim of achieving the objectives of such contributions.

United Kingdom's (UK's) Nationally Determined Contributions

2.14 The UK's target under the Paris Agreement of 2015, when it shared a common plan on emissions with the EU, was for a 53% cut by 2030. However, that was widely regarded as not stretching, and the UK also had a domestic carbon budget under the Climate Change Act requiring a 57% reduction on average from 2028 to 2032.

2.15 In December 2020, the UK announced that it will cut its carbon emissions by 68% compared with 1990 levels before 2030, a significant increase on the current target of about 57% reductions. This represents the UK's nationally determined contribution towards meeting the Paris Agreement.

2.16 The UK was already committed to reducing carbon emissions to zero by 2050, with an interim target of 53%. The ambitious target would see the UK cutting emissions faster than any major economy so far and follows the advice of the government's statutory advisers, the committee on climate change, which found the costs of cutting emissions had fallen rapidly in the past few years.

2.17 In April 2021 at the climate summit, the U.K. government confirmed its plan to put the U.K. on course to meet its target of reaching net zero carbon emissions by 2050.

Climate Change Act

2.18 The Climate Change Act (2008) sets a legally binding target for reducing UK CO_2 emissions.

2.19 On 20th April 2021 the UK Government announced to set place 'the world's most ambitious climate target' by cutting emissions by least 100% on 1990 levels by 2050. It established the Committee on Climate Change, which is responsible for setting binding interim carbon budgets for the Government over successive five-year periods.

2.20 To meet these targets, the government has set five-yearly carbon budgets which currently run until 2032. The carbon budgets restrict the amount of greenhouse gas the UK can legally emit in a five-year period. The UK is currently in the fifth carbon budget period (2028 to 2032).

2.21 The Climate Change Committee (CCC) has published its recommendation on the level of the Sixth Carbon Budget in December 2020. The Sixth Carbon budget limits the amount greenhouse gases emitted over a five-year period from 2033 to 2037, It sets the path to the UK's Net Zero emissions target in 2050, as the first carbon budget to be set into law following that commitment.

2.22 The CCC's annual assessment of UK progress in reducing emissions and biennial assessment of progress in adapting to climate change was published in June 2021. This double report – Progress in reducing emissions and Progress in adapting to climate change provides a comprehensive overview of the UK Government's progress to date on reducing emissions and climate change adaptation. Together, the assessment offers more than 200 policy recommendations.

Planning and Energy Act

2.23 The Planning and Energy Act (2008) allows local planning authorities' policies to impose reasonable requirements for a proportion of energy used in developments to be from renewable and low carbon sources in the locality of the development.

2.24 This means local planning authorities have the power to set local energy efficiency standards for new homes that go beyond the minimum standards set through the Building Regulations.

2.25 For example, the local council could require developers to source at least 10 per cent of any new building's energy from renewable sources, implementing the so-called 'Merton Rule', named after the sustainable planning policy, first adopted by the London Borough of Merton.

2.26 It is however expected that the new planning reforms (expected to come into force in 2025) will clarify the longer-term role of local planning authorities in determining local energy efficiency standards.

UK Sustainable Development Strategy

2.27 The UK Sustainable Development Strategy recognises that everybody has the right to a healthy, clean and safe environment. In 2005, the government published an updated strategy for implementing sustainable development across the UK.

2.28 This strategy acts as an overarching document from which a range of specific policies and legislation was derived. Although published in 2005, the strategy has taken a recently renewed focus in light of the government's definition of Sustainable Development in the National Planning Policy Framework (NPPF).

2.29 One of the keys aims of this strategy is to recognise the threats of climate change and ensure that the UK develops a strategy to mitigate and adapt to this phenomenon. The document established five key principles that will underpin the national sustainable development strategy:

i. Living within Environmental Limits;
ii. Ensuring a Strong, Healthy and Just Society;
iii. Achieving a Sustainable Economy;
iv. Promoting Good Governance; and
v. Using sound science responsibly

2.30 The strategy will be implemented at a national level through the development of more specific strategies at a government department or sector level.

2.31 With regards to planning and the built environment, this document set the basis for the development of plans and policies that promote development that mitigates and adapts to climate change.

Directive 2009/28/EC of the European Parliament and of the Council

2.32 The Directive 2009/28/EC of the European Parliament and of the Council on renewable energy, implemented by Member States by December 2010, sets ambitious targets for all Member States. The directive, which amends and repeals earlier Directives 2001/77/EC and 2003/30/EC, creates a common set of rules for the use of renewable energy in the EU so as to limit greenhouse gas (GHG) emissions.

2.33 The UK's departure from the European Union may have major implications for future UK and EU climate policy. Although the United Kingdom (UK) Government has signalled its intention to enhance its current carbon reduction commitments, it remains to be seen how the withdrawal of the United Kingdom from the European Union (Brexit) may impact this.

Building Regulations

2.34 Whilst not planning policy, the Building Regulations and specifically Approved Document Part L: Conservation of Fuel and Power has relevance to the requirements for energy efficiency and carbon emissions of new buildings.

2.35 The primary mechanism for reducing carbon emissions in new domestic and non-domestic development is progressive changes to Part L aiming to deliver zero carbon buildings. On this basis, a minimum requirement for the reduction in carbon emissions to be delivered by new buildings' is set within the Building Regulations, with each update requiring lower carbon emissions than the previous version to achieve compliance.

2.36 The update in 2014 required new residential and non-residential development to achieve an aggregated 6% and 9% reduction in carbon emissions over the 2010 Regulations.

2.37 The government has also confirmed that it will introduce an interim uplift in building standards from 2021 as a first step towards the Future Homes Standard in 2025. Buildings built to the interim standard are expected to produce 31% less carbon dioxide emissions compared to current levels.

2.38 This change aims to strike a balance between the commitment to reducing carbon emissions and improving energy efficiency and ensuring that the overall effect of regulation does not stifle growth. The government has stated that developers will continue to have flexibility in how they meet carbon reduction target.

Building Regulation Circular Letter

2.39 Whilst This letter clarifies the implementation of the requirements for nearly zero energy buildings for new buildings with respect to Regulation 25B of the Building Regulations 2010 from 31 December 2020.

2.40 Nearly zero-energy buildings in accordance with the EU Directive is defined as a building that has a very high energy performance with a significant proportion of that energy being generated from on-site or nearby renewable sources. However, it does not define a specific standard of performance (i.e., a numerical indicator) that might be considered 'nearly zero'.

2.41 Nevertheless, the circular letter sets out guidance for new buildings, which are required to meet Regulation 25B from 31 December 2020. This applies to buildings and building work in England and excludes buildings owned and occupied by public authorities.

2.42 Regulation 25B states that 'where a building is erected, it must be a nearly zero-energy building' and compliance with this requirement can be achieved by both:

i. Meeting the Target Emission Rate required under Regulation 26 and;

ii. Undertaking an analysis of the technical, environmental, and economic feasibility of using high-efficiency alternative systems, which include decentralised energy supply systems based on energy from renewable sources and taking this analysis into account as required by Regulation 25A.

2.43 The energy efficiency standards of the building regulations are currently under review. Subsequently, an interim increase to the energy efficiency standards for new homes as a first step towards the Future Homes Standard has been proposed.

The Future Buildings/Homes Standard

2.44 In the 2019 Spring Statement, the UK Government's made a commitment that by 2025 they will introduce a Future Homes Standard for new build homes to be future-proofed with low carbon heating and world-leading levels of energy efficiency. The introduction of the Future Homes Standard will achieve a considerable improvement in energy efficiency standards for new homes.

2.45 The Future Homes Standard consultation, launched in October 2019, represented a first step in incentivising these changes by providing a clear vision for implementation and setting an ambitious uplift to the energy performance requirements in the Building Regulations for new homes.

2.46 On 19 January 2021, the government published the outcome of its 2019 consultation on the Future Homes Standard. This consultation set out the government's plans for a new green Future Homes Standard and sought views on changes to building regulations in England to improve energy efficiency and cut carbon emissions in new build homes.

2.47 The government has confirmed that it will change building regulations so that from 2025 the Future Homes Standard will deliver homes that are zero-carbon ready. Homes built under the Future Homes Standard should produce 75-80% less carbon emissions compared with current levels and become net zero as the electricity grid continues to decarbonise.

2.48 The intention is that homes built to the Future Homes Standard will not need to be retrofitted with any additional measures or technology to become net zero. The Future Homes Standard should see homes fitted with low carbon forms of heating. The expectation is that heat pumps will become the main source of heating system for most new homes.

2.49 The government has also confirmed that it will introduce an interim uplift in building standards from 2021 as a first step towards the Future Homes Standard in 2025. Homes built to the interim standard should produce 31% less carbon dioxide emissions compared to current levels.

2.50 The interim uplift in standards will be delivered through an updated Part L of the Building Regulations. The final version of Part L is expected to be published in December 2021 and will come into force in June 2022. A full technical specification for the Future Homes Standard will be consulted on in 2023. Legislation will be introduced in 2024, ahead of implementation in 2025.

2.51 The government confirmed that once a new house has been built, no refurbishment will be necessary to reach zero-carbon as the electricity grid continues to decarbonise – and no new home built under the Future Homes Standard will be reliant on fossil fuels.

2.52 The government has also launched a second consultation on additional changes to Part L (conservation of fuel and power) and Part F (ventilation) of the Building Regulations, and on proposals to address overheating in residential buildings.

Forthcoming Changes to Building Regulations

2.53 The government recently published its updated Building Regulations for England which includes amendments to Approved Documents Part F (ventilation), and Part L (conservation of fuel and power), as well as the release of a new Approved Document for overheating (Part O). They are all viewed as a part of the country's journey towards net zero and are aimed at driving energy efficiency up and carbon emissions down in commercial and residential buildings.

2.54 The new regulations are set to come into force on 15 June 2022, when new homes and buildings in England will have to produce around 30% less CO_2 than current standards, and emissions from other new buildings, including offices and shops, must be reduced by 27%. This is regarded as a first step towards making all buildings 'net zero ready' from 2025 when the Future Homes Standard (FHS) comes into effect, mandating a 75% reduction in emissions.

2.55 The scope of the new regulations will affect both existing and new build properties and will change how heating and ventilation is specified. For existing homes, uplifts to both Part L and F mandate new minimum efficiency standards. This includes a new way of calculating whole house heat losses for new extensions.

2.56 All new residential buildings, including care and children's homes, and student accommodation, will have to be designed to reduce overheating under changes to Part F, and with the introduction of Part O. Higher standards of ventilation will be introduced to improve IAQ and reduce the spread of airborne viruses in new non-residential buildings, including additional standards for recirculating ventilation systems in new offices, along with the compulsory installation of CO_2 monitors.

2.57 Amendments to Part L are focused on measures that enable a building to produce less carbon emissions and will act as an interim uplift before the stricter demands of the Future Homes/Building Standard come into force in 2025.

2.58 The new edition raises the threshold for efficiency with new requirements for insulation, thermal bridging, primary energy targets and air leakage testing requirements. In addition, there has been a change in carbon factor of electricity, meaning the use of electrically powered heating systems (especially heat pumps) is especially incentivised.

Approved Document L Volume 2: Buildings other than dwellings 2021

2.59 This approved document takes effect on 15 June 2022 for use in England. It does not apply to work subject to a building notice, full plans application or initial notice submitted before that date, provided the work for each building is started before 15 June 2023.

2.60 Part L amendments introduce a new principal performance metric measuring energy efficiency. 'Primary energy' will be used in combination with CO_2 metrics to assess compliance with Part L. Primary energy calculations take into account factors such as the efficiency of the building's heating system; power station efficiency for electricity; and energy used to produce fuel and deliver it to the building.

Clean Growth Strategy

2.61 This strategy sets out the Governments proposals for de-carbonising all sectors of the UK economy through the 2020s. It provides a route for the UK to take advantage of low carbon opportunities, while meeting national and international commitments to tackle climate change.

National Design Guide (2019)

2.62 Published in October 2019 the National Design Guide prepared by the Government sets out the characteristics of well-designed places and demonstrates what good design means in practice.

2.63 Sustainability is a key theme running through the Guide, particularly in the ninth section Resources which provides guidance on the delivery of efficient and resilient development. This includes development, which is designed in accordance with the energy hierarchy, utilises sustainable materials & maximise resilience to climate change.

National Planning Policy Framework

2.64 The National Planning Policy Framework (NPPF) published 2012 and as revised from time to time sets out the Government's planning policies for England and how these should be applied. The NPPF introduced the presumption in favour of sustainable development. It states that.

2.65 *"[…] 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.*

2.66 *Achieving sustainable development means that the planning system has three overarching objectives, which are interdependent and need to be pursued in mutually supportive ways (so that opportunities can be taken to secure net gains across each of the different objectives):*

i. 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;

ii. 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 a well-designed and safe built environment, with accessible services and open spaces that reflect current and future needs and support communities' health, social and cultural well-being; and

iii. an environmental objective: to contribute to protecting and enhancing our natural, built and historic environment; including making effective use of land, helping to improve biodiversity, using natural resources prudently, minimising waste and pollution, and mitigating and adapting to climate change, including moving to a low carbon economy. […]"

2.67 The NPPF supports the transition to a low carbon future in a changing climate, taking full account of flood risk & coastal change. It helps to: shape places in ways that contribute to radical reductions in greenhouse gas emissions, minimise vulnerability & improve resilience; encourage the reuse of existing resources, including the conversion of existing buildings; & support renewable & low carbon energy & associated infrastructure.

2.68 For the NPPF to support the move to a low carbon future, the local planning authorities should ensure new developments are planned for in ways that:

i. "*[…] Avoid increased vulnerability to the range of impacts arising from climate change. When new development is brought forward in areas which are vulnerable, care should be taken to ensure that risks can be managed through suitable adaptation measures, including through the planning of green infrastructure; and*

ii. *Can help to reduce greenhouse gas emissions, such as through its location, orientation and design. Any local requirements for the sustainability of buildings should reflect the Government's policy for national technical standards. […]*"

2.69 For the NPPF to support the move to a low carbon future, the local planning authorities should ensure new developments are planned to help increase the use and supply of renewable and low carbon energy and heat by:

i. "*[…] Provide a positive strategy for energy from these sources, that maximises the potential for suitable development, while ensuring that adverse impacts are addressed satisfactorily (including cumulative landscape and visual impacts);*

ii. Consider identifying suitable areas for renewable and low carbon energy sources, and supporting infrastructure, where this would help secure their development; and

iii. *Identify opportunities for development to draw its energy supply from decentralised, renewable, or low carbon energy supply. […]*"

2.70 For the NPPF to support the move to a low carbon future, the local planning authorities should ensure new development:

i. "*[…] Comply with any development plan policies on local requirements for decentralised energy supply unless it can be demonstrated by the applicant, having regard to the type of development involved and its design, that this is not feasible or viable); and*

ii. *Take account of landform, layout, building orientation, massing, and landscaping to minimise energy consumption. […]*"

2.71 The key focus of the National Planning Policy Framework (NPPF) is to support local and regional planning authorities.

Planning Policy Guidance (The Guidance)

2.72 The National Planning Practice Guidance (NPPG) published 2014 and as revised from time to time provides further advice on various planning issues associated with development, including those linked to sustainability and renewable energy and underpins the policies within the NPPF. The PPG Guidance is an important material

consideration in planning decisions and should generally be followed unless there are clear reasons not to.

2.73 It sets out how local authorities should include polices that protect the local environment and strategies to mitigate and adapt to climate change and supports developments that are functional and adaptable for the future.

2.74 The PPG confirms Local Authorities have the option to set technical requirements exceeding the minimum requirements of the Building Regulations in respect of access, water, and space where sufficient evidence is produced to justify the target. The Guidance also states that Local Authorities can set carbon reduction targets equivalent to a 19% reduction beyond the 2013 Building Regulations and renewable energy policies for non-domestic buildings.

2.75 The Guidance states that the distribution and design of new development, and the potential for servicing sites through sustainable transport solutions, are particularly important considerations and that good design is an integral part of sustainable development to deliver a wide range of planning objectives.

Heat and Buildings strategy

2.76 Published in October 2021, this strategy sets out the Government's plans to cut emissions from the UK's 30 million homes and workplaces whilst ensuring that prices remain fair and affordable for households across the country. It will be a gradual transition which will start by incentivising consumers and driving down costs.

2.77 As well as allowing for the saving of money on energy bills and improving health standards through the reduction of carbon emissions, this strategy aims to boost the economic recovery by supporting up to 240,000 skilled green jobs by 2035.

2.78 In addition to clean heat, the strategy compiles the Government's work on energy efficiency and the requirement for better and smarter energy performance. Both will be paramount to the journey of a net zero future in the UK.

The Cherwell Local Plan 2011 - 2031

2.79 Cherwell Local Plan was adopted in July 2015 (incorporating Policy Bicester 13 re-adopted on 19 December 2016). The Plan sets out the vision and strategy for the development of Cherwell through to 2031. With regards to energy and sustainability the applicable policies are Policy ESD 1 – ESD 5. **Policy ESD 1** (Mitigating and Adapting to Climate Change) states that:

"[…] Measures will be taken to mitigate the impact of development within the District on climate change. At a strategic level, this will include:

i. Distributing growth to the most sustainable locations as defined in this Local Plan
ii. Delivering development that seeks to reduce the need to travel and which encourages sustainable travel options including walking, cycling and public transport to reduce dependence on private cars

iii. Designing developments to reduce carbon emissions and use resources more efficiently, including water (see Policy ESD 3 Sustainable Construction)

iv. Promoting the use of decentralised and renewable or low carbon energy where appropriate (see Policies ESD 4 Decentralised Energy Systems and ESD 5 Renewable Energy).

The incorporation of suitable adaptation measures in new development to ensure that development is more resilient to climate change impacts will include consideration of the following:

i. Taking into account the known physical and environmental constraints when identifying locations for development

ii. Demonstration of design approaches that are resilient to climate change impacts including the use of passive solar design for heating and cooling

iii. Minimising the risk of flooding and making use of sustainable drainage methods, and

iv. Reducing the effects of development on the microclimate (through the provision of green infrastructure including open space and water, planting, and green roofs).

Adaptation through design approaches will be considered in more locally specific detail in the Sustainable Buildings in Cherwell Supplementary Planning Document (SPD)[…]"

2.80 **Policy ESD 2** (Energy Hierarchy and Allowable Solutions) states that:

"*[…] In seeking to achieve carbon emissions reductions, we will promote an 'energy hierarchy' as follows:*

i. Reducing energy use, in particular by the use of sustainable design and construction measures

ii. Supplying energy efficiently and giving priority to decentralised energy supply

iii. Making use of renewable energy

iv. Making use of allowable solutions […]"

2.81 **Policy ESD 3** (Sustainable Construction) states that:

"*[…] All new residential development will be expected to incorporate sustainable design and construction technology to achieve zero carbon development through a combination of fabric energy efficiency, carbon compliance and allowable solutions in line with Government policy.*

Cherwell District is in an area of water stress and as such the Council will seek a higher level of water efficiency than required in the Building Regulations, with developments achieving a limit of 110 litres/person/day.

All new non-residential development will be expected to meet at least BREEAM 'Very Good' with immediate effect, subject to review over the plan period to ensure the

target remains relevant. The demonstration of the achievement of this standard should be set out in the Energy Statement.

The strategic site allocations identified in this Local Plan are expected to provide contributions to carbon emissions reductions and to wider sustainability.

All development proposals will be encouraged to reflect high quality design and high environmental standards, demonstrating sustainable construction methods including but not limited to:

i. Minimising both energy demands and energy loss
ii. Maximising passive solar lighting and natural ventilation
iii. Maximising resource efficiency
iv. Incorporating the use of recycled and energy efficient materials
v. Incorporating the use of locally sourced building materials
vi. Reducing waste and pollution and making adequate provision for the recycling of waste
vii. Making use of sustainable drainage methods
viii. Reducing the impact on the external environment and maximising opportunities for cooling and shading (by the provision of open space and water, planting, and green roofs, for example); and
ix. Making use of the embodied energy within buildings wherever possible and re-using materials where proposals involve demolition or redevelopment.

Should the promoters of development consider that individual proposals would be unviable with the above requirements, 'open-book' financial analysis of proposed developments will be expected so that an independent economic viability assessment can be undertaken. Where it is agreed that an economic viability assessment is required, the cost shall be met by the promoter. […]"

2.82 **Policy ESD 4** (Decentralised Energy Systems) states that:

"*[…] The use of decentralised energy systems, providing either heating (District Heating (DH)) or heating and power (Combined Heat and Power (CHP)) will be encouraged in all new developments.*

A feasibility assessment for DH/CHP, including consideration of biomass fuelled CHP, will be required for.

i. All residential developments for 100 dwellings or more
ii. All residential developments in off-gas areas for 50 dwellings or more
iii. All applications for non-domestic developments above 1000m^2 floorspace.

The feasibility assessment should be informed by the renewable energy map at Appendix 5 'Maps' and the national mapping of heat demand densities undertaken by the Department for Energy and Climate Change (DECC) (see Appendix 3: Evidence Base).

Where feasibility assessments demonstrate that decentralised energy systems are deliverable and viable, such systems will be required as part of the development unless an alternative solution would deliver the same or increased benefit. […]"

2.83 **Policy ESD 5** (Renewable Energy) states that:

"[…] The Council supports renewable and low carbon energy provision wherever any adverse impacts can be addressed satisfactorily. The potential local environmental, economic and community benefits of renewable energy schemes will be a material consideration in determining planning applications.

Planning applications involving renewable energy development will be encouraged provided that there is no unacceptable adverse impact, including cumulative impact, on the following issues, which are considered to be of particular local significance in Cherwell:

i. Landscape and biodiversity including designations, protected habitats and species, and Conservation Target Areas
ii. Visual impacts on local landscapes
iii. The historic environment including designated and non designated assets and their settings
iv. The Green Belt, particularly visual impacts on openness
v. Aviation activities
vi. Highways and access issues, and
vii. Residential amenity.

A feasibility assessment of the potential for significant on site renewable energy provision (above any provision required to meet national building standards) will be required for:

i. All residential developments for 100 dwellings or more
ii. All residential developments in off-gas areas for 50 dwellings or more
iii. All applications for non-domestic developments above 1000m^2 floorspace.

Where feasibility assessments demonstrate that on site renewable energy provision is deliverable and viable, this will be required as part of the development unless an alternative solution would deliver the same or increased benefit. This may include consideration of 'allowable solutions' as Government Policy evolves) […]"

Cherwell District Council Climate Emergency Declaration

2.84 The council declared a climate emergency on July 22, 2019 and aim to achieve a zero carbon district by 2030.

2.85 The Council's Climate Action Framework acknowledges that climate change is occurring, that man-made greenhouse gas emissions are a primary cause, and that climate change will continue to have far-reaching effects on people and places, the economy, society, and environment in the district, across the UK and the world.

3. GRAVEN HILL, D1 SITE'S SUSTAINABLE ENERGY STRATEGY

Introduction

3.1 The energy strategy for the Proposed Development will be established to achieve the baseline for energy consumption and CO_2 emissions. All options considered in preparation of the energy strategy and subsequent detailed development of the scheme will ensure that the baseline energy/CO_2 emissions are achieved.

3.2 The key energy/CO_2 target is for the Proposed Development to achieve Part L2 2013 compliance as a minimum. To achieve this, the Proposed Development will adopt an energy hierarchy (**Figure 3.1**) approach to meet Policies ESD 1-5 objectives for energy consumption reduction, CO_2 reduction and sustainable design and construction including waste management.

Figure 3.1: Energy Hierarchy

Step 1: Be Lean (Minimising Energy Use)

3.3 Energy saving measures following the Fabric First Approach is encouraged. The Fabric First approach (Be Lean) provides protection against fluctuations in both gas and electricity supply tariffs by inherently reducing energy consumption, energy bills and expands the number of suitable energy generation and delivery options. Further benefits include:

i. Delivered carbon savings which are 'locked-in' the building for its lifetime (60 years or more) rather than the much shorter lifespan (around 25 years) of a renewable energy technology;

ii. Virtually no maintenance and/or replacement costs to maintain carbon reductions through improved fabric; and

iii. No reliance on an occupier's behaviour to deliver carbon reductions.

3.4 Based upon the energy hierarchy, the Proposed Development proposals will aim to reduce energy/CO_2 demand through a fabric first approach. As the development progresses into detailed design planning stage, energy modelling will be undertaken to demonstrate compliance with Part L2 Building Regulations demonstrating an improved performance where technically and commercially feasible.

3.5 The fabric first stage of the energy hierarchy will seek to minimise demand for heat and power from the outset through the optimisation of the building envelope. This includes ensuring suitable levels of fabric insulation (u-values), air tightness and thermal bridging, and the provision of energy efficiency measures.

3.6 The development will target building element u-values and air tightness in accordance with Part L2 2013 of the Building Regulations standards, including high performance glazing with appropriate window u-values and g-values to reduce heat loss and optimise positive solar gain while reducing the potential for overheating.

3.7 Light and Solar Transmittance are factors that measure the amount of light and solar energy that pass through glazed openings. They are important as they affect the control of solar gains and availability of natural light into the building. Consequently, the development will target light and solar transmittance values in accordance with Part L2 2013 of the Building Regulations standards.

3.8 In addition to the Proposed Development improved envelope u-values, a key area of construction which could result in a significant reduction in heating demand are junction details where two elements of the development envelop meet (thermal bridging). Consequently, the Proposed Development will be designed to make use of best practice design to minimise thermal bridging, energy losses, and reducing CO_2 emissions.

3.9 In addition to an improved fabric specification, energy efficiency and sustainability will be maximised on the Proposed Development site at all stages, and this will include the following measures, wherever feasible:

i. Maximise reusing/recycling opportunities during demolition and construction;
ii. Maximise the adaptability of design and internal arrangements to be sympathetic towards the council's relevant building standard;
iii. Maximise thermal mass (where feasible) allowing the proposed development to store and release heat gains from the sun and internal appliances;
iv. Promotion of passive solar gains, maximising natural daylight, sunlight and ventilation whilst minimising the risk of summer overheating;
v. Proportion and distribution of glazing to ensure good levels of daylight, helping to reduce electricity consumption through artificial lighting;
vi. Incorporating 100% high efficiency LED light fittings to reduce energy consumption;
vii. Use of high efficiency heating and/or cooling systems and controls;
viii. Material selection which aims to balance the aesthetics, robustness and durability with optimal thermal benefits;
ix. Minimise pollution during the construction process;
x. Implement water conservation and recycling measures;
xi. Minimise the use of non-sustainable primary construction material;
xii. Ensuring all timber and timber-based products used on the project are Legally harvested and traded timber; and
xiii. Achieve efficiency in the use of land and reduce the need to travel by achieving densities consistent with other environmental considerations.

3.10 Through these energy efficiency measures; the Proposed Development will deliver energy & carbon savings beyond the requirements of Part L2 of the Building Regulations.

Step 2: Be Clean (Supply Energy Efficiently)

3.11 The next stage in the energy hierarchy is exploiting local energy resources (such as secondary heat) and supply energy efficiently and cleanly to reduce CO_2 emissions.

Heat Network

3.12 The growth of decentralised energy generation is a core component of decarbonising the energy supply. District heat networks are an important part of a sustainable and flexible energy system of which each building is a part, and which enables a more circular approach to energy use by storing, using, and reusing energy sources. This supports a more effective and efficient use of energy by reducing primary energy demand and minimising the amount of energy that is ultimately wasted within the system.

3.13 Heat networks (**Figure 3.2**) offer an efficient and competitive solution for heating buildings in areas with high heat density and provide the added benefit of enabling the use of secondary energy or waste heat sources. This allows useful, lower quality energy to be used and re-used within the system to meet lower quality energy demands, such as space heating and hot water, saving high quality energy sources and capacity to meet high quality energy demand. The inherent thermal storage capacity of heat networks helps to manage demand, supports balancing and the flexibility of the electricity network and the integration of renewable energy into the grid mix.

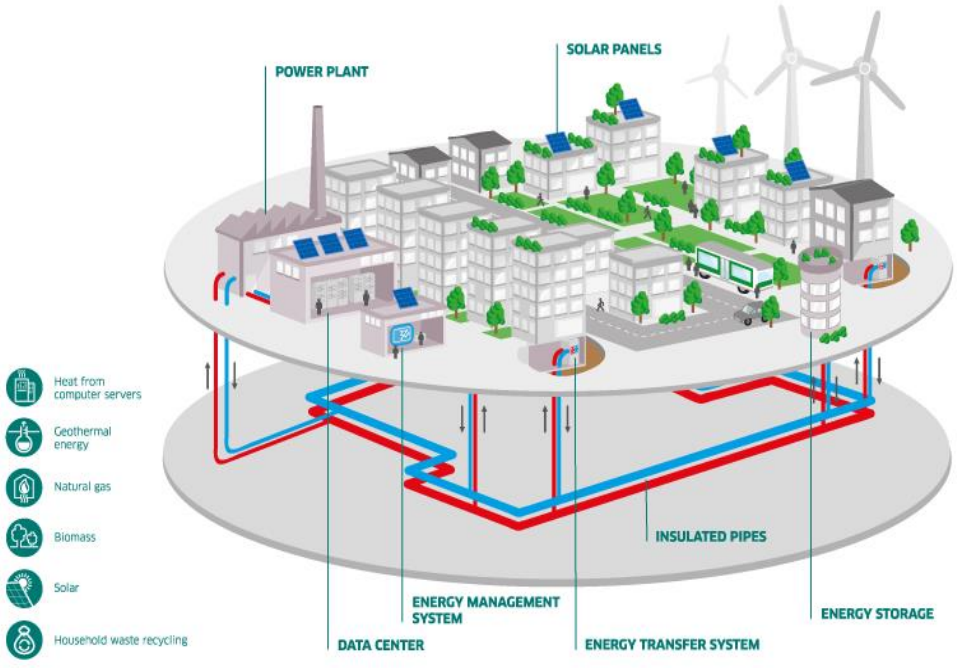

Figure 3.2: District Heating and Cooling System Schematic

3.14 By providing a system-level alternative to building-level solutions, heat networks help manage demand through their inherent storage provision whilst protecting existing capacity in the local electricity network to accommodate additional development and the integration of increasing volumes of renewable energy into the grid mix.

3.15 Heat networks also provide long-term flexibility to achieve decarbonisation. Existing carbon intensive heat sources and production technologies can be substituted at a later time with new, lower carbon and innovative technologies to support the decarbonisation of the network. This in turn is a simpler process for decarbonising heat supply to multiple consumers in one area, removing the need to retrofit individual buildings. Other benefits of heat networks include:

i. The larger energy centres forming part of heat networks allow for more effective abatement and dispersal of emissions compared to having many small individual systems in an area. These networks then provide the opportunity for buildings close to the network to replace their existing individual gas boilers with a heat interface unit (HIU) and a connection to the heat network.

ii. The size of district heat networks allows them to realise significant economies of scale, which means that they can minimise operational costs and keep heat costs fair and affordable to help alleviate fuel poverty for residents.

iii. Fuel diversity and multiple heat sources reduces exposure to fluctuations in commodity prices, and the heat network provides wider energy system benefits, such as balancing and flexibility, to the national grid as it helps to manage the network.

iv. The reduction of a network's peak demand, through the increased diversity of its heat load and the use of its thermal storage capacity, leads to less carbon intensive sources being used to generate energy.

v. There are reduced maintenance costs involved in maintaining a single system compared to many individual systems.

Existing Heat Network

3.16 Desktop study was undertaken to investigate whether an existing distribution network was in place close to the site. However, there are no existing district heating networks within 500m of the site, therefore, connection to an existing network is not feasible.

3.17 As such, whilst the Proposed Development will not rely on third parties to meet their heat or power requirement, some flexibility may be included to allow third party energy connection in the future. The Development could be left with spare valve connections, capable for connection into the future heat network, should the applicant wish.

New Heat Network

3.18 New network could be considered for the Proposed Development Site and should incorporate good practice design and specification standards. Poorly designed heat network infrastructure within a building can contribute towards internal overheating problems, especially in communal areas, and high service charges.

3.19 Thus, if deemed feasible at the detailed design planning stage, to avoid this, the applicant will work with their chosen heat network operator from pre-design and commit to designing and delivering communal heating systems in compliance with the relevant CIBSE/ADE Heat Networks Code of Practice for the UK and in partnership with energy services companies that are or are working towards being registered participants of the Heat Trust scheme. This will support the development of good quality

networks whilst helping network operators prepare for regulation and ensuring that customers are offered a reliable and cost-competitive service.

Combined Heat and Power (CHP)

3.20 CHP systems generate electricity from burning fossil fuels and capture the heat generated in the process for heating purposes. CHP can be used where there is a significant year-round need for heating, in addition to the electricity generated.

3.21 CHP requires significant capital investment in plant and resources. However, the high capital outlay is balanced by lower costs from energy bills. Though once the CHP package has been installed, it needs to be operated and maintained correctly if it is to provide the planned levels of any anticipated cost savings. Gas-engine CHP has been the primary technology for facilitating the development of district heat networks due to its high efficiency and better carbon performance compared to electrical systems utilising grid electricity. However, the rapid decarbonisation of the electricity grid means that technologies generating onsite electricity will not achieve the carbon savings they have to date.

3.22 As well as carbon dioxide emissions, all combustion processes (CHP now of particular concern) can emit oxides of Nitrogen (NOx) and, solid or liquid fuelled appliances (such as those using biomass or biodiesel) can also emit Particulate Matter. These pollutants contribute to poor air quality and can have negative impacts on the health of residents and occupiers of the Proposed Development.

3.23 To address air quality concerns and to continue to facilitate heat networks, only low-emission CHP could be suitable and only where it is facilitating an area-wide heat network. New gas-engine CHP at any scale is not considered a suitable heating solution for the Proposed Development. Though as noted above, new networks served by low emission CHP that complies with the ultra-low NOx emission standards or heat pumps could be explored as part of the detailed design stage.

Facilitating a Heat Network Connection

3.24 If deemed feasible at the detailed design stage, the communal network should allow for a single point of connection to an areawide network and, prior to this, be supplied from a single energy centre large enough for the entire site where all energy generating equipment is located. A single energy centre will facilitate the simplest connection (whether immediately, or at a later date) to an area wide district heating network as well as reduce maintenance & operating costs. Therefore, a sufficiently large energy centre that will allow for its connection to an area-wide heat network is required.

3.25 Heat network solutions usually benefit from the inclusion of thermal storage. This provides useful balancing for low-carbon technologies, the opportunity to use surplus and low-cost, low-carbon electricity at times of low demand also helps in the case of heat from renewable and secondary heat sources that may be intermittent. Therefore, the feasibility of thermal storage as part of the Proposed Development will be defined at the detailed design stage. The impacts on air quality will also be taken into account in determining the heating strategy for the Proposed Development.

Step 3: Be Green (Renewable Energy Generation)

3.26 The next stage in the energy hierarchy is investigating opportunities for producing, storing, and using renewable energy on-site. Generating low carbon energy onsite can reduce reliance on fossil fuels & minimises energy lost through transmission, contributing to security of supply and better connections between energy demand and generation.

3.27 An initial renewable energy options assessment has been undertaken using the Renewable Energy Sources Estimation Tool (RESET) – **Figure 3.3** which accompanies the CIBSE TM38 'Renewable Energy for Buildings' guidance document. This toolkit is intended for use at the earliest stages of design, when ideas are being considered and the outline direction of the design is developed, to identify the most promising renewable technology options for a given development or building. This is the key stage for some of the most important decisions relating to overall appearance, orientation, building mass and ventilation strategy, which can also influence decisions about renewable energy sources.

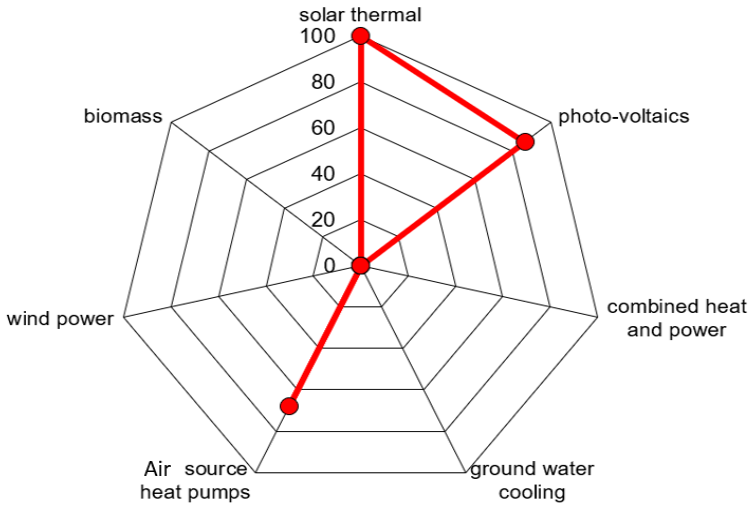

Figure 3.3: Initial Renewable Energy Feasibility

3.28 The initial assessment has been undertaken to judge the feasibility of renewable energy technologies from the outset, enabling viable technologies to be promoted and others to be ruled out from further consideration. The initial assessment demonstrates that Solar Thermal, Photovoltaic Panels and Air Source Heat Pumps (ASHP) are all feasible technologies for the Proposed Development Site.

3.29 A further detailed review (**Table 3.1**) of potential low carbon renewable energy technologies has also been carried out to determine potential technologies which could be incorporated into the Proposed Development Site.

3.30 The detailed assessment further demonstrates that renewable technologies with high to medium opportunities include Solar Thermal, Solar Photovoltaic Panels, WWHRS and Air Source Heat Pump (ASHP). Technologies such as GSHP, WSHP, Wind Turbine, Small Scale Hydro Power Geothermal, Biomass, Transpired Solar Air Collector, Hydrogen Fuel and Wave/Tidal Power have been discounted at this stage based on a balanced consideration of the policy requirements, financial viability, and technical feasibility.

Table 3.1: Renewable Energy Feasibility Matrix

TECHNOLOGY	PRE-FEASIBILITY	
TECHNOLOGY	OVERVIEW	FEASIBLE
Solar Photovoltaic	Solar Photovoltaic or Photovoltaic Panels (PV) utilise energy in the form of rays of light from the sun and are therefore required to be mounted on either a south facing unobstructed roof or wall to ensure energy output is maximised. Photovoltaic systems convert energy from the sun into electricity through semiconductor cells. Systems consist of semi-conductor cells connected and mounted into modules. Modules are connected to an inverter to turn their direct current (DC) output into alternating current (AC) electricity for use in buildings. Photovoltaics supply electricity to the building they are attached to or to any other load connected to the electricity grid. Excess electricity can be sold to the national grid when the generated power exceeds the local need. PV systems require only daylight, not sunlight to generate electricity (although more electricity is produced with more sunlight), so energy can still be produced in overcast or cloudy conditions. Ideally photovoltaics should face between south-east and south-west, at an elevation of about 30-40°. However, in the UK even flat roofs receive 90% of the energy of an optimum system. PV arrays do not create a nuisance from noise, vibration, odour, or fumes and do not impact on air quality. The effectiveness of PV can be maximised with battery technology at a community level and within an individual house. By storing the energy generated in the day rather than exporting unused electricity back to the national grid, the electricity can be used when it is needed, avoiding distribution losses. This technology is becoming more cost effective and is considered suitable for the Proposed Development Site and thus can be considered and explored further as part of the detailed design planning stage of the proposal.	Opportunity: High. Technology can be explored further as part of the detailed design planning stage
Solar Thermal	Solar Thermal or Solar Water Heating Systems use the energy from the sun to heat water, most commonly in the UK for domestic hot water needs. The systems use a heat collector, generally mounted on the roof in which a fluid is heated by the sun. This fluid is used to heat up water that is stored in either a separate hot water cylinder or a twin coil hot water cylinder inside the building. The systems work very successfully in all parts of the UK, as they can work in diffuse light conditions. Ideally the collectors should be mounted on a south-facing roof, although south-east/south-west will also function successfully, at an elevation of between 10 and 60°. The panels can be bolted onto the roof or integrated into the roof with lead flashings. Solar water heating systems are suitable for any building type that has sufficient year-round hot water needs (ideally during the day). They require small amount of maintenance and do not create a nuisance from noise, vibration, odour, or fumes and do not impact on air quality. This technology is becoming more cost effective and is considered suitable for the Proposed Development Site and thus can be considered and explored further as part of the detailed design planning stage of the proposal.	Opportunity: High. Technology can be explored further as part of the detailed design planning stage

Ground Source Heat Pump	Ground source heat pumps are used to extract heat from the ground to provide space and water heating to either individual houses or any type of non-domestic building. Heat pumps take in heat at a certain temperature and release it at a higher temperature, using the same process as a refrigerator. As the ground stays at a fairly constant temperature throughout the year heat pumps can use the ground as the source of heat. The ground temperature is not necessarily much higher than ambient air temperature in winter, but it is more stable whereas air has a vast temperature range. This makes system design more robust. The measure of efficiency of a heat pump is given by the Coefficient of Performance (CoP), which is defined as the ratio of the heat output, divided by quantity of energy put in. A CoP of 4 or more should be achievable with ground source heat pump systems, giving good energy and running cost savings. For ground source systems, the ground pipe system can be horizontal or vertical. For horizontal systems, a coiled or linear pipe network is buried at around two metres depth below ground level, thus requiring a large area of open space depending on the size of the system. For vertical systems, the pipes are placed in holes bored straight into the ground to a depth of 80 to 150 metres depending on ground conditions and size of system. Vertical systems thus require very little ground space but do require access for the drilling rig at the construction stage, though this is unlikely to be greater than for normal construction vehicles. Ground source heat pump systems can be used in almost any size of building. A particular use is where natural gas is not available making the ground source heat pump more economic. Ground source heat pumps cannot be seen from the outside of the building, so aesthetic design is not an issue. This technology will be cost prohibitive for the proposed development; thus, will not be explored further as part of the detailed design planning stage of the proposal.	Opportunity: Low. Technology will not be explored further as part of the detailed design planning stage
Air Source Heat Pump (ASHP)	Air source heat pumps (ASHP) operate in a similar manner to ground source heat pumps but use the heat in external air rather than the ground to release heat at a higher temperature. As ASHPs aren't as efficient at heating to the higher temperatures needed for domestic hot water, supplementary plant is often required. In addition, ASHP in the form of a Variable Refrigerant Flow (VRF) systems can also provide simultaneous heating & cooling to the Proposed Development at a very high efficiency. Furthermore, ASHP in the form of 'Air to water heat pumps' take heat from the outside air and transfer it to a water-based system. The created heat can be used for space heating and domestic hot water supply. Most heat pumps are electrically driven. The measure of efficiency of a heat pump is given by the CoP, which is defined as the ratio of the heat output, divided by quantity of energy put in. A CoP of 4 or more should be achievable with an ASHP systems, giving good energy and running cost savings. Heat pump can replace boiler in a dwelling but in larger non-domestic buildings it is likely to be one of several modular boilers, depending on what proportion of the heat demand it is designed to satisfy. This technology is considered suitable for the Proposed Development Site and thus can be considered and explored further as part of the detailed design planning stage of the proposal.	Opportunity: High. Technology can be explored further as part of the detailed design planning stage

Water Source Heat Pump (WSHP)	Water source heat pumps (WSHPs) move heat from a source of water into a building in an extremely efficient manner, especially if the water temperature is around 5 to 8 degrees Celsius. As such, there are numerous advantages of installing heat pumps. Depending on the type of heat pump, either the water from a river or small stream is pumped through the heat pump, or a special refrigerant fluid is pumped through pipes laid in the body of water. While both have their own advantages, the latter type requires less maintenance and an easier application process, making it a cheaper option. Water source heat pumps have been in use since the late 1940s. They use a rather constant temperature of the water as an exchange medium instead of extracting the heat from the outdoor air temperature. Thus, water source heat pumps can reach reasonably high efficiencies (300% to 600%) even on the coldest winter nights, in comparison to 175% to 250% for air-source heat pumps on cool days. However, there are no potential enough water sources on or nearby (within reasonable distance) of the Proposed Development Site. Hence, this technology is not considered feasible and thus will not be explored further as part of the detailed design planning stage of the proposal.	Opportunity: Low. Technology not suitable for the Proposed Site
Geothermal	Geothermal energy is the heat that comes from the sub-surface of the earth. It is contained in the rocks and fluids beneath the earth's crust and can be found as far down to the earth's hot molten rock, magma. To produce power from geothermal energy, wells are dug a mile deep into underground reservoirs to access the steam and hot water there, which can then be used to drive turbines connected to electricity generators. There are three types of geothermal power plants: dry steam, flash & binary. Dry steam is the oldest form of geothermal technology and takes steam out of the ground & uses it to directly drive a turbine. Flash plants use high-pressure hot water into cool, low-pressure water whilst binary plants pass hot water through a secondary liquid with a lower boiling point, which turns to vapour to drive the turbine. This technology will be cost prohibitive for the proposed development; thus, will not be explored further as part of the detailed design planning stage of the proposal.	Opportunity: Low. Technology will not be explored further as part of the detailed design planning stage
Wind Turbine	Wind turbines are an established means of capturing wind energy and converting it into usable electricity. Wind turbines come in various sizes depending on requirements. A wind turbine usually consists of a nacelle containing a generator connected, sometimes via a gearbox, to a rotor consisting of three blades. Wind turbines harness the power of the wind and use it to generate electricity. For the Proposed development Site, this would be to use to offset the energy used in the energising of equipment and lighting. Excess electricity generated from the wind turbine could be exported to the grid or could be stored in batteries and used when there is no wind. Considering the site location and provided the average wind speed in the area of the Proposed Development Site is 4.9m/s at 10m hub height (<5.0 m/s minimum required for further investigation), wind turbine will not be explored further at this stage.	Opportunity: Low. Technology not suitable for the Proposed Site

Small Scale Hydro Power	Small Scale Hydropower or hydroelectricity (typically 100 kW - 30 MW) refers to the conversion of energy from flowing water into electricity. It is considered a renewable energy source because the water cycle is constantly renewed by the sun. Historically, one of the first uses of hydro power was for mechanical milling, such as grinding grains. Today, modern hydro plants produce electricity using turbines and generators, where mechanical energy is created when moving water spins rotors on a turbine. This turbine is connected to an electromagnetic generator, which produce electricity when the turbine spins. However, there are no potential hydro resource on-site in the area of the Development Site.	Opportunity: Low. Technology not suitable for the Proposed Site
Wave and Tidal Power	Wave and tidal energy harvesting have been around for a few decades. But it has only been in recent years that it has started to become more realistic due to advance in research and technology. Some speculates that wave and tidal energy can supply at least 10 percent of the world's energy consumption. How much power can be harvested is determined mainly on the wave activity. However, the Proposed Development Site is not located within reasonable distance to a coastal location. Thus, this technology is not considered feasible and will not be explored further at this stage.	Opportunity: Low. Technology not suitable for the Proposed Site
Biomass	Biomass can be burnt directly to provide heat in buildings. Wood from forests, urban tree pruning, farmed coppices or farm and factory waste, is the most common fuel and nowadays is used commercially in the form of wood chips or pellets, although traditional logs are also used. Biomass is normally considered a carbon neutral fuel, as the carbon dioxide emitted on burning has been (relatively) recently absorbed from the atmosphere by photosynthesis and no fossil fuel is involved. The wood is a by-product of other industries and the small quantity of energy for drying, sawing, pelleting and delivery are discounted. Biomass from coppicing is likely to have some external energy inputs, for fertiliser, cutting, drying etc. and these may need to be considered in the future. Biomass heating is theoretically applicable to any building requiring heat; however practical constraints suggest that it is currently most applicable to lower density situations due to fuel supply and storage issues. The most common application of biomass is as one or more boilers in a sequenced (multi-boiler) installation particularly where there is a communal i.e., block or district heating system. There must be a local and adequate supply of appropriate biomass fuel (normally wood chips or pellets) and room for delivery and storage. Biomass boilers replace conventional boilers and have no aesthetic impact. Though issues such as fuel deliveries and the potential adverse effect on local air quality (AQMA for NOx) will have to be considered as part of the detailed design planning stage.	Opportunity: Low. Technology could be explored further as part of the detailed design planning stage

Waste Heat	Waste heat is the unused heat given to the surrounding environment (in the form of thermal energy) by a heat engine in a thermodynamic process in which it converts heat to useful work. Waste heat is inevitable for any heat engine and the amount it produces compared to the amount of input heat are factors that make up its thermal efficiency. Waste heat is often dissipated into the atmosphere, or large bodies of water like rivers, lakes and even the ocean. Since waste heat is a necessary product of heat engines, efficiencies of power plants are limited and therefore must burn more fuels in order to achieve their desired energy output. This increases greenhouse gas emissions and contributes more to global warming. Harnessing Waste Heat is mostly seen in industrial processes where more than half of the input energy is turned into waste heat. Capturing waste heat enables it to be redirected to a function that would otherwise be using energy from the grid, and this in turn prevents consumption of power used to counteract the very effects of the waste heat itself. However, at this stage, it is assumed that the use of the Proposed Development site will not involve processes which generate waste heat to be utilised in reducing fossil fuel demand.	Opportunity: Low. Technology will not be explored further as part of the detailed design planning stage
Transpired Solar Air Collectors	Transpired Solar Collectors (TSCs) are solar air heating systems made of pre-finished perforated steel skins. Treated to enhance its absorbance of solar energy, the steel skins are installed onto south-facing walls or roofs creating a cavity between the metal skin and the walls or roofs. The most common application of a TSC is for preheating ventilation air, where the ventilation air supply is heated as it passes through the TSC perforated sheet. The heated air is then generally heated further as it passes through the building's HVAC system to reach the desired delivery temperature. In summer, when there may be no requirement to heat the ventilation air supply, TSC systems have a means of bypassing the absorber. Transpired solar collectors could be used to pre-heat the building. However, due to the speculative nature of the Proposed Development, it is impossible to project whether this technology would be suitable for the occupier of the space.	Opportunity: Low. Technology will not be explored further as part of the detailed design planning stage
Hydrogen Fuel Cell	Fuel cells are electrochemical energy conversion devices that process oxygen and hydrogen to produce electricity, heat, and water. They operate much like a battery, but rather than running down and requiring re-charging or replacement, they can be refuelled. Fuel cells generate electrical power quietly and efficiently and are virtually pollution-free at the point of use. The by-products from a fuel cell system are water and heat. Whilst more traditional combustion technologies typically have an efficiency of around 35%, fuel cells can achieve double this, extracting more energy from the same amount of fuel. However, fuel cells are not necessarily 'clean' in relation to the fuel source they use. Hydrogen is an energy storage medium and environmental benefits are only found where hydrogen is generated from renewable energy sources. However, there is limited market available, high capital and maintenance costs and life expected from fuel stacks is less than 10 years. This technology may be suitable for the Proposed Development Site and could be considered and explored further as part of the detailed design planning stage of the proposal. However, at this stage, the Proposed Development Site is not expected to incorporate hydrogen fuel.	

4. SUSTANABILITY MEASURES

Adapting to Climate Change

4.1 One of the main challenges facing the UK and new development is the need to mitigate and adapt to a changing climate. The Government is committed to tackling climate change and has an ambitious long-term goal of reaching net zero carbon emissions by 2050.

4.2 Climate change will cause the UK to become warmer, winters will become wetter, and summers will become drier. Adapting to this changing climate will impact on the design, construction, location, cost and operation of all new homes and other buildings in the next few decades.

4.3 One of the NPPF's core planning principles is to encourage development to consider climate change adaptation and mitigation during the planning process.

4.4 The following sections outlines the key climate change mitigation and adaptation measures considered appropriate for this development based on the latest national guidance under the following headings:

i. Carbon Reduction;
ii. Overheating; and
iii. Water Efficiency.

Carbon Reduction

4.5 Developing energy efficient, low carbon buildings is a key objective of national/local policy, enforced through progressive changes to the Building Regulations which require the achievement of a target carbon performance for compliance.

4.6 Building performance is determined by a variety of factors including the efficiency of heating, ventilation, and lighting systems as well as building fabric performance, plant efficiencies, air permeability and the avoidance of overheating.

4.7 The Proposed Development envelope and services will be specified in accordance with Part L2 2013 of the Building Regulations, to ensure energy consumption via space heating/cooling is reduced. The final fabric specification, building services specification and provision of energy efficiency measures will be defined as part of the detailed design planning stage and via Part L2 2013 energy modelling of the proposal.

Overheating

4.8 Increasing summer temperatures increase the risk of overheating in new development, particularly in development with high standards of fabric efficiency and glazing.

4.9 To minimise the risk of overheating, the Proposed Development will utilise appropriate overheating measures, and also provide sufficient opening area in order to adequately provide the necessary ventilation required.

Water Efficiency

4.10 In the first instance, the Principal Contractor shall register with the 'Considerate Constructors Scheme' (CCS) and shall seek to achieve satisfactory CCS score in all categories.

4.11 Potable water is an increasingly important natural resource and with majority of the UK classes being in an area of moderate or severe water stress, the conservation of water is becoming a more significant sustainability metric. Water usage on the Proposed Development construction site will be identified and where water is being wasted, behaviours and/or technologies will be introduced to reduce water wastage.

4.12 The Proposed Development site will aim to reduce water consumption during occupation through a range of water efficiency measures such as:

i. Water metering, Low flow fittings and fixtures; and
ii. Provision of native planting that will reduce the need for watering other than from rainfall (where feasible).

Material

4.13 The use of materials is relevant to both the construction and operational phases of development. The aim of the Proposed Development will be for its overall environmental impact to be minimised through the specification of sustainable materials. In the first instance, the Principal Contractor shall register with the 'Considerate Constructors Scheme' (CCS) and shall seek to achieve satisfactory CCS score in all categories.

4.14 Using sustainable building materials and products promotes conservation of dwindling non-renewable resources. In addition, integrating sustainable building materials into Proposed Development can help reduce the environmental impacts associated with the extraction, transport, processing, fabrication, installation, reuse, recycling, and disposal of these source materials.

4.15 All timber and timber-based products used on the project shall be Legally harvested and traded timber. The use of products with responsible sourcing certifications such as FSC and BES 6001 shall be actively encouraged.

Waste and Recycling

4.16 The Proposed Development will ensure the minimisation of waste and maximisation of recycling of any waste generated during demolition, construction, and operation of the Proposed Development.

Construction Waste Management

4.17 The Proposed Development will ensure consideration is given to sustainable waste management options in accordance with the principles of the waste hierarchy. A pre-demolition audit of any existing buildings, structures or hard surfaces being considered for demolition will be undertaken. This will be used to determine whether refurbishment

and/or reuse is feasible and, in the case of demolition, to maximise the recovery of material for subsequent high grade or value applications.

4.18 Prior to the construction phase a Construction Environmental Management Plan (CEMP) could be developed to ensure the use of measures to minimise waste during the construction phases of the development, including the use of a scheme for recycling/disposing of waste arising from demolition and construction works.

4.19 A Site Waste Management Plan (SWMP) could also be used to encourage reuse of materials, reduction of waste and recycling. The SWMP will include targets for resource efficiency and avoidance of materials for landfill, records shall be kept throughout construction to monitor progress against these targets.

4.20 The reduction, reuse and recycling of construction waste is to be prioritised through measures such as avoidance of over-ordering, supervision of deliveries, use of secure materials storage facilities and reuse of materials onsite where feasible. In addition, the Proposed Development will be registered with the Considerate Constructors Scheme and achieve certification against the Code of Considerate Practice.

4.21 This scheme will ensure the Proposed Development construction site will be managed in an environmentally, socially considerate, responsible, and accountable manner. This is also a national scheme to raise standards in the industry and waste management is also a key consideration.

Operational Waste Management

4.22 In accordance with the principles of the waste hierarchy the Proposed Development site will make provision for the storage of non-recyclable waste and recyclable waste including dedicated storage for waste to encourage the recycling waste materials.

4.23 Full consideration will be given to the Council's waste management infrastructure and services to ensure that occupants have the necessary infrastructure to participate in any kerbside recycling services. The proposed strategy is also expected to include dedicated bin stores. Wheelie bins will be clearly marked to identify recyclable waste and general waste.

Economic Sustainability

4.24 The Proposed Development aims to provide B8 Storage and Distribution spaces with offices (as an ancillary to the B8 use) and thus will result in the promotion of jobs and employment during construction and once in operation. Whilst it is difficult to predict the total number of jobs, it is envisaged that the development shall enable enhanced employment generation in contributing to local regeneration of the area.

Culture and a Safe Community

4.25 Appropriate consideration will be paid to best practice design guidelines for the Proposed Development, ensuring that the site is appropriately lit and laid out in such a way as to discourage crime and vandalism.

Sustainable Transport:

4.26 The Proposed Development will ensure the principles of the sustainable transport hierarchy have been met by prioritising sustainable modes of transport ahead of cars and providing infrastructure requirement for Electric Vehicle.

Flooding and Pollution

4.27 The Proposed Development will not result in a significant increase in pollution (into the air, soil, or any water body) by virtue of the emissions of fumes, particles, effluent, smell, heat, light, noise, or noxious substances.

4.28 As the Proposed Development is situated in an Air Quality Management Area (AQMA) for Nitrogen dioxide (NO_2), biomass will be discouraged due to potential adverse effect on local air quality. Furthermore, the Proposed Development itself will not have any adverse effect on the AQMA and pollution resulting from the construction of the site will be carefully managed.

4.29 The Development Site also lies within Flood Zone 1 (**Figure 4.1**) of the Environment Agency's Risk Flood Map, which is defined as having a low probability of flooding.

4.30 The Flood Zones shown on the Environment Agency's Flood Map for Planning (Rivers and Sea) do not take account of the possible impacts of climate change and consequent changes in the future probability of flooding. Reference should therefore be made to the Strategic Flood Risk Assessment when considering location and potential future flood risks to developments and land uses.

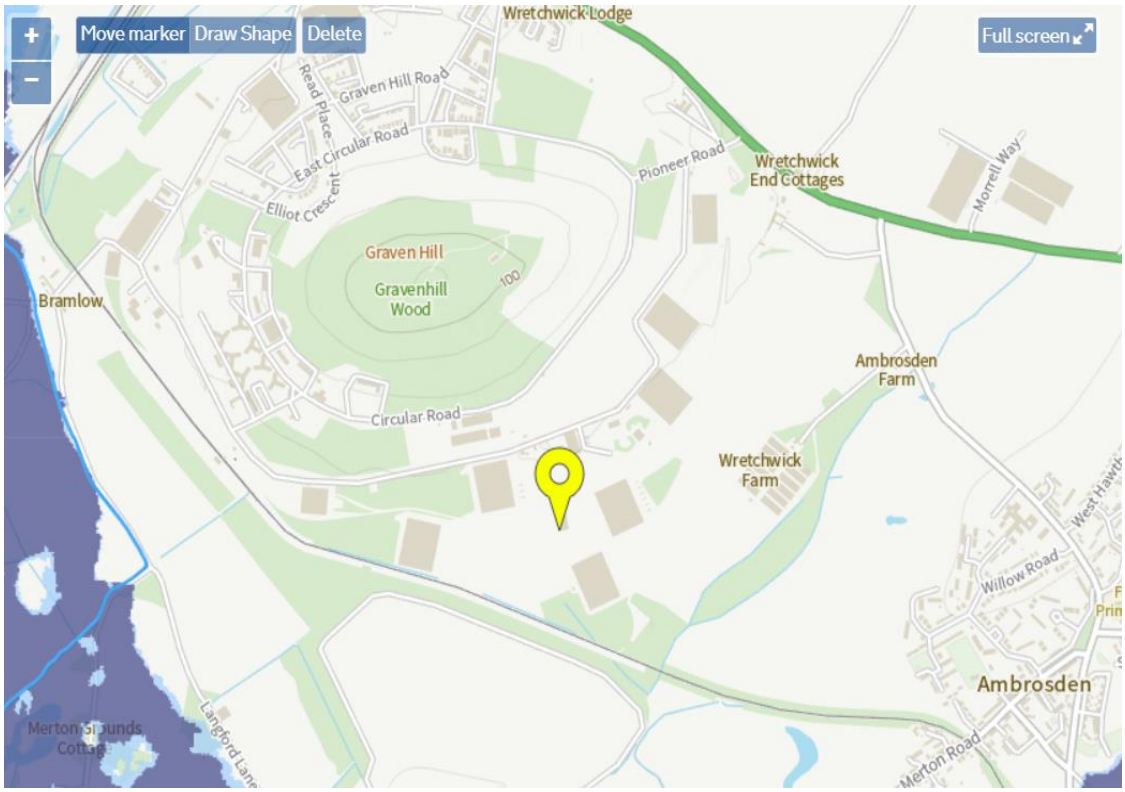

Figure 4.1: Proposed Development Site Flood Map (Flood Map for Planning)

5. CONCLUSION

5.1 This Energy and Sustainability Statement has been produced in support of an outline planning application for the Proposed Development at Graven Hill, D1 Site, Bicester in accordance with Cherwell District Council's Local Plan Policies ESD 1 - ESD 5.

5.2 This Energy and Sustainability Statement sets a framework for the Energy and Sustainability Strategy for the Development Site and outlines the Proposed Development's approach to energy efficiency, renewable energy generation and sustainable development incorporating climate change resilience and carbon management measures. It summarises the key planning policies which is pertinent at the time of writing and is aimed at satisfying the energy and CO2 related requirements.

5.3 The Proposed Development will adopt the use of an energy hierarchy and a holistic approach to sustainability in order to meet the energy and carbon emissions [CO_2] targets as set out by the National, Regional and Local Council (Cherwell District Council).

5.4 The energy hierarchy aims to reduce energy demand and CO_2 emissions through passive design measures and a 'fabric first' approach (Be Lean) before seeking to reduce the remaining demand by the cleanest means possible. This includes exploiting local energy resources/supplying energy efficiently and cleanly (Be Clean), and finally exploring the opportunities for producing, storing, and using renewable energy on-site (Be Green).

5.5 Be Lean Summary: The Proposed Development envelope and services will be specified in accordance with the current Part L2 2013 of the Building Regulations to ensure energy consumption via space heating and cooling is reduced. Passive solar consideration will form an integral part of the development design to ensure solar gains and cooling loads are reduced, hence providing a more comfortable internal environment for occupants. Consequently, it is expected that the Proposed Development will comply with Part L2 2013 of the Building Regulations. The final building fabric and services specification will be finalised as part of the detailed design planning stage and via Part L2 2013 energy modelling of the proposal.

5.6 To reflect the significant decarbonisation of the UK electricity grid, consideration will be given to the specific Part L2 Building Regulation that is in force prior to the commencement of the development site to ensure the proposed development is 'future proofed' for the longer term and ready to meet the Future Building Standard from 2025.

5.7 Be Clean Summary: A study into the feasibility of connecting to a district heating network was undertaken. Result shows that there are no existing operational or planned district heat networks within 500m of the development site. Thus, connection to an existing heat network is not proposed at this stage in favour of a lower carbon solution. Nevertheless, the suitability of a new site-wide heat network will be assessed as part of the detailed design planning stage and will be proposed/adopted if the Applicant considers it to be the most carbon conscious, cost effective, resilient, and technologically feasible method of providing heat to the Development. All combustion processes can emit oxides of Nitrogen (NOx) and, solid or liquid fuelled appliances (such as biomass) can

also emit Particulate Matter. These pollutants contribute to poor air quality and can have negative impacts on the health of residents and occupiers of the Proposed Development. Therefore, these factors will also be considered in determining the site-wide heat network strategy for the Proposed Development.

5.8 Be Green Summary: The feasibility of renewable energy generation concluded that the most appropriate recognised on-site renewable energy technologies with high to medium opportunities for the Proposed Development Site are Solar Photovoltaic (PV); Air Source Heat Pump; and Solar Hot Water. Technologies with low opportunities such as Water Source Heat Pump, Wind Turbine, Waste Heat, Ground Source Heat Pump, Small Scale Hydro Power, Geothermal, Biomass, Transpired Solar Air Collector, Hydrogen Fuel and Wave/Tidal Power have been discounted at this stage based on a balanced consideration of the policy requirements, financial viability, and technical feasibility.

5.9 Energy storage will also be considered as part of the renewable energy strategy for optimising system performance and balancing surplus electrical/thermal energy production. The specified technology/technologies in line with the recommendations of the feasibility study will be finalised as part of the detailed design planning stage and via Part L2 2013 energy modelling of the proposal. The exact percentage reduction in terms of CO_2 emissions and energy will be in accordance with the National and Local (Cherwell District Council) requirement/target.

5.10 **It is highlighted that at the time of construction, the updated Part L2 guidance shall be adopted, which is generally noted to be in excess of existing policy guidance**.

5.11 In addition to the CO_2 emissions savings opportunities identified above, there are a host of other areas of sustainability which will be considered in more detail within the **BREEAM** Assessment targeting a '**Excellent**' rating should planning be approved, including:

5.12 Material: The aim of the Proposed Development will be for its overall environmental impact to be minimised through the specification of sustainable materials. This will include using sustainable building materials and products and ensuring all timber and timber-based products used on the project are Legally harvested and traded timber. The use of products with responsible sourcing certifications such as FSC and BES 6001 will also be actively encouraged.

5.13 Waste: The Proposed Development will ensure consideration is given to sustainable waste management options in accordance with the principles of the waste hierarchy. A pre-demolition audit of any existing buildings, structures or hard surfaces being considered for demolition will be undertaken.

5.14 Sustainable Transport: The Proposed Development will ensure the principles of the sustainable transport hierarchy have been met by prioritising sustainable modes of transport ahead of cars and providing infrastructure requirement for Electric Vehicle.

5.15 This Energy and Sustainability present a vision for the Proposed Development at Graven Hill, D1 Site, Bicester to deliver a secure, sustainable, low carbon design driven by innovative technologies, enabling the Proposed Development to achieve any National and Local carbon/energy reduction targets whilst reducing its reliance on the UK National Grid.

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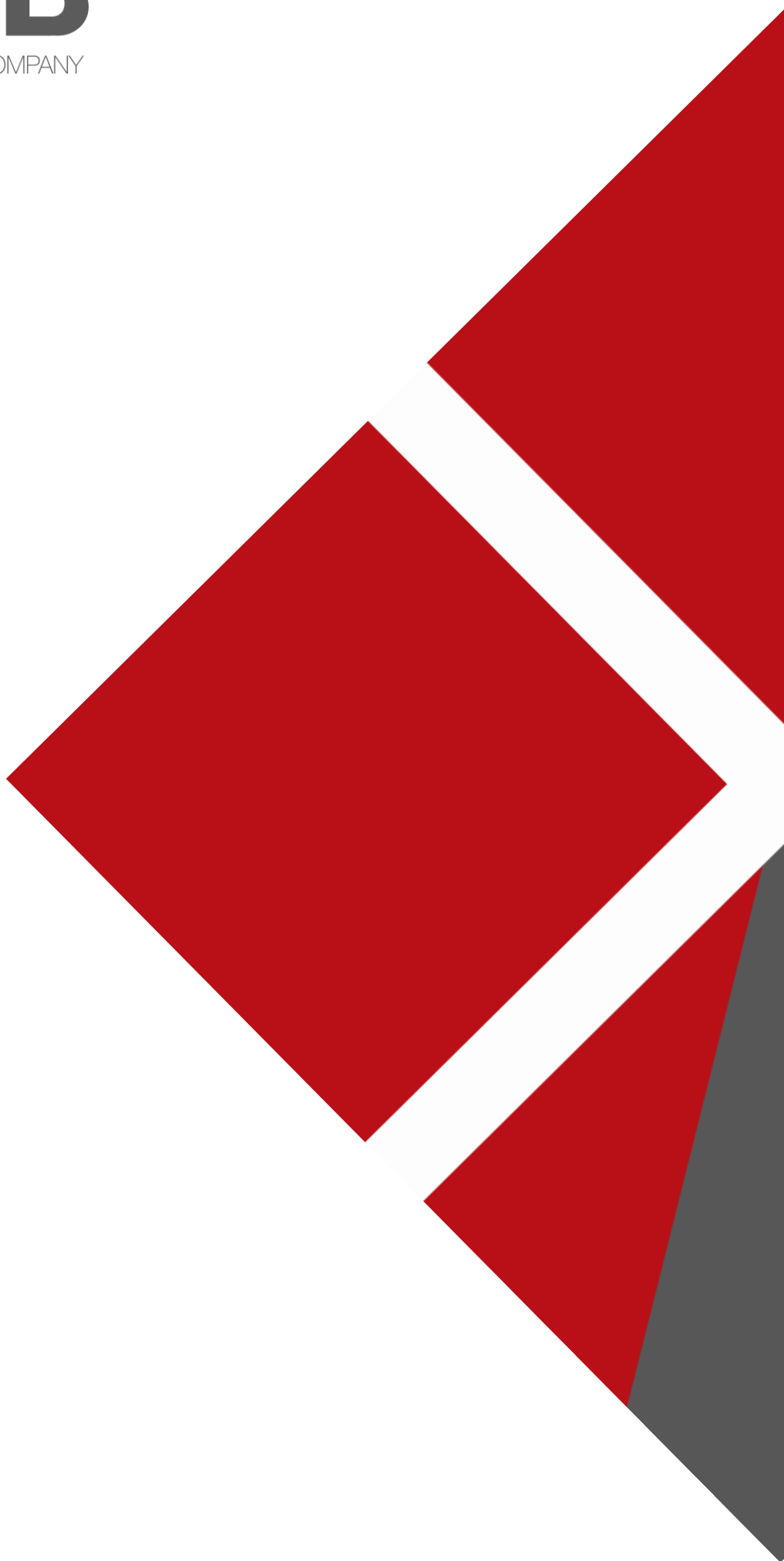

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