kyoob

Bicester Gateway, Oxfordshire

Energy Statement

Your Project: Bicester Gateway, Oxfordshire

Energy Statement

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Contents

Executive Summary

Executive Summary

This statement summarises and highlights the potential sustainable design measures for the reduction of CO_2 emissions and energy demand for the proposed developments.

The purpose of the energy statement is to provide an outline appraisal of sustainable design measures that can be taken on the proposed development to assist in the grant of outline planning consent.

The Cherwell District Council committee meeting held on 22nd July 2019 motioned the desire and target for the Cherwell district to support and implement carbon emission reductions to minimise the effects of climate change. It states Oxfordshire is already doing its bit however further calls have been made to declare a climate emergency as well as pledges to national government to enable powers and resources to make the 2030 target emissions possible.

The project is the development of seven new buildings including car park facilities, landscaping and a new MUGA. The site is currently a greenfield site located adjacent the A41.

The principles of the Oxfordshire Energy Strategy Plan have been considered against each technology or technique in relation to their applicability to each principle.

A more detailed analysis should be undertaken when a during the detailed design stages with particular consideration relating to the technical feasibility of including and installing low and zero carbon systems as well as meeting the Cherwell Local Plan Policies; Bicester 10, ESD 2 and ESD 3.

1.0 Introduction

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Kyoob have been appointed to prepare an energy statement to appraise sustainable design measures in relation to energy for the proposed Bicester Gateway development in Oxfordshire.

The appraisal will involve the following categories:

- Passive Design
- System Efficiencies
- Low Carbon Heating / Cooling Sources
- Zero Carbon Renewable Energy Technologies
- Water Conservation
- Transport
- Materials and Waste
- Community Related

The purpose of the appraisal is to demonstrate that energy conservation has been considered.

2.0 Background Information

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2.1 Proposed Development

The project is the development of seven new buildings including car park facilities, landscaping and a new MUGA.

The site is currently a greenfield site located adjacent the A41.

Figure 2.1 shows the proposed site location.

Figure 2.1: Site location plan

Figure 2.2 shows the proposed development.

The proposed development consists of a mix of commercial, residential and retail use including car park facilities.

Figure 2.2: Site Plan of Proposed Development

2.2 Oxfordshire Energy Strategy Plan

The Oxford Local Enterprise Partnership (OxLEP) has recently released an Oxfordshire Energy Strategy Plan which details an ambitious framework for achieving energy innovation and clean growth. The proposed plan is aimed to provide the building blocks to lead the UK to consume energy more efficiently as well as meeting the carbon reduction targets locally and nationally.

The Energy Strategy Plan has three main principles.

2.2.1 Principle 1 – To secure a smart, modern, clean energy infrastructure

Led by the strategy's vision, a modern infrastructure will include increased electricity grid capacity. This will support planned housing, industrial and commercial growth and our changing energy requirements.

2.2.2 Principle 2 – To reduce countywide emissions by 50% by 2030 (compared with 2008 levels) and set a pathway to achieve zero carbon growth by 2050

Realise the economic benefits of a low carbon transition by supporting:

- Ambitious and innovative, clean generation projects across the county both in urban and rural areas as well as growth locations.
- Projects that reduce energy demand and increase energy efficiency for domestic, industrial, commercial buildings and transport.

2.2.3 Principle 3 – To enhance energy networking and partnership working

The strategy will focus on galvanising pioneers in clean growth, leading influencers and thinkers and those with a passion for low carbon initiatives across Oxfordshire to leverage their collective activities to support the scaling-up of future solutions and accelerate delivery towards a net zero-carbon county.

2.2.4 Relation to the development

As the proposed development is within the Oxfordshire county, the recently released Energy Strategy Plan will be required to be considered when appraising sustainable energy techniques and technologies ensuring the key principles are being implemented and considered.

2.3 The Cherwell Local Plan 2011 – 2031

The Cherwell Local Plan is a document produced to set out and define the vision and strategy for the Cherwell district through to 2031. Three central themes are provided:

- Theme One – Policies for developing a sustainable local economy
- Theme Two – Policies for building sustainable communities
- Theme Three – Policies for ensuring sustainable development

2.3.1 Policy 10 – Bicester Gateway

Bicester Gateway has been identified within the document as high potential for building and reinforcing a modern knowledge economy as well as being a statement to the surrounding area.

Policy Bicester 10 outlines the key targets Cherwell local council aim to achieve in relation to employment, infrastructure, build quality, conservation of heritage sites, transport and ecological protection and enhancement.

2.3.2 Policy ESD 2 – Energy Hierarchy and Allowable Solutions

Policy ESD 2 promotes the use of an energy hierarchy to develop a sustainable and energy conserving strategy to minimise wasted heat through inefficiency and achieve carbon emissions reductions.

The energy hierarchy is set out as follows:

- Reducing energy use, in particular by the use of sustainable design and construction measures
- Supplying energy efficiently and giving priority to decentralised energy supply
- Making use of renewable energy
- Making use of allowable solutions

This document provides an outline appraisal of the potential sustainable energy techniques and technologies available to the development. During detailed design development, the techniques and technologies considered to be taken forward must follow the energy hierarchy set out above.

2.3.3 Policy ESD 3 – Sustainable Construction

Policy ESD 3 sets out the Council's approach to implementing the first step of the energy hierarchy, reducing energy use, specifically for the use of sustainable design and construction measures.

All new residential developments will achieve zero carbon development through a combination of fabric energy efficiency, carbon compliance and allowable solutions in line with Government policy.

All new non-residential developments will achieve BREEAM 'Very Good' with immediate effect, subject to review over the plan period to ensure the target remains relevant.

This policy is applied flexibly where exceptions may be made if the policy contradicts the application of other policy's' objectives or where the standards are not feasible or financially viable undermining the delivery of the development. Robust evidence is required to be provided where these requirements cannot be met.

This document provides an outline appraisal of the potential sustainable energy techniques and technologies available to the development to aid the application of achieving zero carbon for residential development and BREEAM 'Very Good' for non-residential developments on the site.

During detailed design development, the requirements to achieve Policy ESD 3 will need to be considered.

3.0 Passive Design Options

3.0 Passive Design Options

The following sections provide a high level description of the passive design methods considered within the appraisal.

3.1 Orientation

The orientation of the building can have significant impacts on energy efficiency. Optimising the orientation will benefit each building to maximise daylight, minimise summer heat gain and winter heat loss as well as utilising wind direction in order to enhance the potential for natural ventilation and minimise comfort cooling.

North facing glazed elements will see less solar gain than the any other orientation due to the annual sun angle.

East and west facing glazed elements are harder to shade from direct sunlight as the sun angles are low.

South facing glazed elements receive both direct and diffuse solar radiation and relatively easy to shade.

3.2 Solar Control

The control of solar can have an impact on the energy required within the building in relation to daylighting, solar heat gains.

Maximising daylight will reduce the necessity for artificial lighting during daylight hours. This is typically achieved via increased glazed elements.

Increasing the glazed elements however will adversely affect the building via increased solar heat gains. Solar heat gains will have a direct impact on thermal comfort as well as increasing the requirement for comfort cooling.

Optimising the façade glazed elements will maximise both daylight and minimise the solar heat gains. Measures can be provided to assist in the optimisation through shading. These can be in the form of the following:

- Active shading (blinds)
- Overhangs
- Solar control glass
- Horizontal or vertical louvres
- Shutters
- Recessed Windows

3.3 Daylighting

Maximising daylight will reduce the necessity for artificial lighting during daylight hours.

This is typically achieved via increased glazed elements which will have a direct impact on the built form and sizing and positioning of glazed elements.

Good lighting should maximise the use of natural daylight, minimise the use of artificial lighting and hence lighting energy consumption as well as internal heat gains associated.

Good daylighting should consider the reduction of glare when being designed to reduce the discomfort on occupants.

3.4 Building Envelope

The building envelope provides a barrier between external and internal environment conditions thus enabling services to maintain thermal comfort within the building.

Optimising the building envelope by insulation and air tightness to reduce the thermal transmittance will reduce the heating demand required in the building.

Improving the insulation will minimise the amount of heat lost through the building to the external environment.

Minimising infiltration of air from external to the internal space via the building structure will reduce the amount of untempered air entering the building. This air will have an effect on the performance of the heating / cooling system increasing the installed capacity and energy consumption.

3.5 Natural Ventilation

Natural ventilation can be a proven solution to sustain indoor air quality and thermal comfort through the natural movement of air. This movement can be provided via buoyancy driven, wind driven or both.

Good natural ventilation design should reflect the requirements during the winter and summer without causing draughts.

In winter, excess ventilation should be minimised. Background ventilation should be provided to maintain occupants' health and comfort.

In summer, ventilation rates may need to exceed the background ventilation for moisture and odour removal to satisfy occupants' needs to avoid overheating.

Natural ventilation can be provided in the form of the following:

- Trickle ventilators
- Single-sided ventilation
- Cross flow ventilation
- Stack ventilation
- Night purge ventilation

3.6 Thermal Mass

The use of thermal mass via the selection of construction materials such as concrete can keep the building cool during peak summertime temperature by stabilising and reducing peak internal temperatures.

In the design of a heavyweight building, the thermal mass can act as a heat/cool store and can peak lop this stored energy.

The use of this stabilises and smooths out transients in the heating and cooling loads.

During summertime, when a heavyweight building is subject to high heat gains, the building may require a night-time purge ventilation to assist. During the occupied day, the structure will absorb the high heat gains minimising the cooling load and peak temperature. During nighttime, the structure will exhaust this heat into the internal space. Night-time purge ventilation may be required to exhaust the heat from the structure to atmosphere and cool the structure down.

3.7 Green Roof / Walls

Green roofs or walls are structures purposely fitted with vegetation. These structures impact on energy efficiency by controlling the thermal performance of the building.

During cooler months, the green structure can act as a thermal barrier similar to Section 3.4 Building Envelope. This reduces the need for heating demand within the building.

During the warmer months, the vegetation utilises the solar energy for evapotranspiration and reduces the amount of energy available to be absorbed by the structure. This leads to a reduced cooling load.

Green roofs and walls have very different evaporative, thermal and albedo qualities from conventional constructions. These properties reduce the impact of the urban heat island effect when compared against these conventional constructions.

4.0 System Efficiency Options

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The following sections provide a high level description of the system efficiency methods considered within the appraisal.

4.1 Plant Efficiency

Selecting the most appropriate and energy efficient plant to provide heating, cooling and ventilation is fundamental to the energy efficiency of the building and minimise unnecessary losses.

Plant efficiency measures would include elements such as heat recovery devices and consideration of utilising low grade heat from natural sources e.g. ground, air.

4.2 Regenerative Lift Braking

Regenerative lift braking produces electricity whilst the lifts are braking.

Lifts need to dissipate energy from the system either as waste heat into banks of resistors or be regeneration. Regeneration returns the energy back to the electrical supply.

4.3 Lighting Efficiency

Selecting the most appropriate and energy efficient light bulbs and fittings which spread light effectively can have large impacts on the energy efficiency of the building.

More efficient lighting such as light emitting diodes (LEDs) will produce a higher light output from less power required. This has a direct relation to the energy demand to have the lighting operating.

The power the lighting used is all typically converted into heat energy. This heat forms an internal heat gain in the building which increases the cooling demand. By utilising energy efficient lighting, the heat gain produced will be reduced and hence reduce the cooling energy expended.

4.4 Lighting Controls

Effective control of lighting can impact significant on energy consumption via the use of daylight sensing and occupancy sensing controls.

Daylight sensing controls can automatically control the lighting to either switch on/off or dim up/down depending on the available daylight available.

Occupancy sensing can automatically switch on/off the lighting depending on the presence or absence detection of occupants’ movement through the building.

Well positioned manual switches to control lighting in localised positions can offer significant energy savings as occupants’ will only select the luminaires they require.

The control of lighting in this manner can also be controlled in zones to meet the building operational demand and create further energy savings. This will reduce the number of luminaires switch on unnecessarily.

4.5 Seasonal Commissioning

Commissioning plant for winter, summer and mid-season conditions can ensure the plant will run to meet the demands around the seasonal variations.

This will ensure the efficient operation throughout the year and minimising energy being wasted due to a set up.

4.6 Thermal Zoning

Providing separate circuits and zoning of the heating and cooling systems can minimise warming / cooling spaces which are either unoccupied or do not necessarily any demand.

This can be implemented in various forms and selection of systems. Decentralised systems can be provided which are provided local to the served areas. Centralised systems can be provided via individual zonal circuits.

It is important to consider the function of each zone and time of use to limit warming/cooling the spaces unnecessarily. For example, a school may be zoned between classrooms and the assembly hall.

4.7 Underfloor Heating

Underfloor heating is a method of heating the space using the useful floor area. This suggests the floor itself becomes the emitter.

Energy consumption can be reduced using this method of heating as the water temperature is lower than a conventional wet heating system e.g. typically 50°C rather than 80°C flow temperature.

4.8 Chilled Beams

Chilled beams are a method of cooling the space. They hang from, or are integrated into, the ceiling and operate similarly to a radiator but with cold water rather than hot.

Their use dramatically reduces the amount of fan and pump energy required to cool a room and can help to reduce capital and running cost as well as improving occupant comfort.

4.9 Computer Power Down

A computer power down is an energy reduction technique which will hibernate or shut down computers after a period of inactivity.

This reduces computer equipment to be running at full load when occupants’ do not necessarily require the use of the computer.

5.0 Low Carbon Heating / Cooling Sources

5.0 Low Carbon Heating / Cooling Sources

The following sections provide a high level description of the low carbon heating / cooling sources considered within the appraisal.

5.1 Combined Heat and Power (CHP)

Combined heat and power is a generator which burns fuel to produce heat and electrical energy.

CHP utilises the heat which is normally rejected to the atmosphere from central generating stations and reduces network distribution losses due to local generation and use.

Most systems replace (or run in parallel to) the domestic sized boiler and will be linked directly into the building electricity distribution system.

Heat generated will be used for space and water heating and additional heat storage may be used to lengthen use periods, to assist in warm-up and to improve overall energy efficiency.

5.2 Combined Cooling, Heat and Power (CCHP)

Combined cooling, heat and power are CHP units combined with an absorption chiller which provides space cooling from high grade waste heat.

CHP generators are described in Section 5.1.

Absorption chillers rely on heat to drive the cycle as opposed to vapour compression chillers which utilise electrical energy. This makes them suitable to be coupled with a CHP unit to utilise the waste heat generated from the CHP unit.

5.3 Ground Source Heat Pumps (GSHP)

Ground source heat pumps have diverse applications which include space heating, water heating, heat recovery, space cooling and dehumidification in both residential and commercial buildings.

The technology makes use of the energy stored in the Earth's crust coming mainly from solar radiation.

Heat pumps take up heat at a certain temperature and release it at a higher temperature. This is achieved by means of ground collectors (coils), in which a heat exchange fluid circulates and transfers heat via a heat exchanger to the heat pump. The cycle is driven by the temperature difference between the ground and the circulating fluid.

Ground source heat pumps can be categorised as having closed loops. Closed loops can be installed in three ways: horizontally, vertically, or in an underground aquifer. The type chosen depends on the building load, available land areas and the soil and rock type at the installation site. These factors will help determine the most economical choice for installation of the ground loop.

5.4 Air Source Heat Pumps (ASHP)

Air Source Heat Pumps (ASHP) operate via the use of external condenser(s) extracting heat from the external air into a refrigerant gas and passing this 'low grade heat' into a secondary circulating liquid or air stream for use within the internal heating or cooling systems of the building.

Outside air, at any temperature above absolute zero, contains some heat. An air-source heat pump moves some of this heat to provide hot water or space heating. This can be done in either direction, to cool or heat the interior of a building.

The heat pump mainly consists of an outdoor heat exchanger to extract the heat and an indoor heat exchanger to transfer the generated heat into a water tank of indoor heating system.

A high efficiency heat pump can provide up to four times as much heat as an electric heater using the same energy. In comparison to gas as a primary heat source, the lifetime cost of an air source heat pump may be affected by the high price of electricity versus gas (where available).

5.5 Water Source Heat Pumps (WSHP)

Water source heat pumps operate in a similar manner as described for GSHP in Section 5.3 however they can be categorised as having open loops.

Ground water is pumped in the secondary loop through the heat exchanger in the heat pump and released at a lower temperature back into the ground. It may be suitable where there is a source of relatively clean water, and all local codes and regulations regarding groundwater discharge are met.

5.6 Hydrogen Fuel Cells

Hydrogen fuel cells produce useful electricity and heat.

They combine hydrogen with oxygen within an electrical cell to produce DC electricity. Water is produced during this process as the waste product.

Hydrogen can be produced by either reforming natural gas (which produces CO_2) or by electrolysing water with renewable electricity.

High electrical efficiencies can be achieved through this technology. Although CO_2 emissions are produced during the reforming process, NO_X emissions are close to zero.

5.7 Biomass Boiler

Biomass is an alternative solid fuel to the conventional fossil fuels and has close to neutral carbon emissions impact providing it is sourced locally.

Biomass is converted into a manageable form that can be directly fed to the heat or power generation plant thus replacing fossil fuel.

Supply and storage of the biomass fuel should be carefully considered especially for larger plants.

The typical applications are:

- Biomass boilers replacing standard gas-fired boilers for space heating and hot water (for individual buildings or district heating systems)
- Stand-alone room heaters for space heating
- Stoves with back boilers supplying domestic hot water
- Biomass CHP for heat and electricity generation – for additional information about this application refer to the CHP section of this document.

An integrated hot water storage tank or an accumulator can enable the supply of heat to be decoupled from the actual combustion of the fuel.

6.0 Zero Carbon Renewable Energy Technologies

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The following sections provide a high level description of the zero carbon renewable energy technologies considered within the appraisal.

6.1 Wind Turbines (WT)

Wind turbines utilise prevailing winds to generate electricity. Wind technology is currently one of the most cost-effective renewable energy technologies.

Individual building or community wind projects have the advantage of feeding electricity directly into the buildings electricity circuit, thus sparing costly distribution network development and avoiding distribution losses.

Wind turbines are connected to the electrical grid and all generated energy is used regardless of the building demand fluctuations. The output largely depends on the wind speed.

Most turbines operate continuously throughout the year and generation and supply of electricity is fully automatic. Users have access to the metering devices showing output and export levels for which guidance is available from the turbine installers.

6.2 Photovoltaic Panels (PV)

Photovoltaic modules convert sunlight directly into DC electricity and can be integrated into buildings.

PV is distinct from other renewable energy technologies since it has no moving parts to be maintained and is silent.

PV systems can be incorporated into buildings in various ways; on sloped roofs and flat roofs, in facades, atria and as shading devices.

Since PV generates DC output inverter and ancillary equipment is needed to deliver the power to a building or the grid in an acceptable AC form.

6.3 Solar Thermal Water Heating

Solar thermal water heating utilises the solar radiation from the sun to produce heat.

Solar thermal or active solar water heating is a well-established renewable energy system in many countries outside the UK.

Solar hot water can be applied in a number of building types which have high demands for hot water.

The solar system pre-heats the water up to the maximum hot water supply temperature. If there is not enough solar power available to fully heat the water it is heated up to the desired temperature by a back-up heat source.

There are four main types of solar collector, which can be used in solar water systems. These are:

- Evacuated tubes
- Selective surfaced flat plate
- Non-selective surfaced flat plate
- Unglazed plastic collectors (mostly use for swimming pool heating)

6.4 Solar Wall

Solar wall technology is an air heating system that uses the power of the sun to heat your building’s ventilation air.

This system minimises energy consumption, heating costs and consequently greenhouse gas emissions throughout the heating season.

The system is used as a façade wall across the building. The sun’s radiation heats the surface of the solar wall façade.

The adjacent air between the building and solar wall is then heated from the wall to be utilised within the ventilation system.

This reduces energy consumption required to heat the fresh air to acceptable indoor conditions.

6.5 Ground Duct

Ground duct technology is an air heating system that uses the earth’s ground temperature to heat your building’s ventilation air.

This system minimises energy consumption, heating costs and consequently greenhouse gas emissions throughout the heating season.

The system is used a duct beneath the ground. The temperature of the ground below a certain depth is not affected by large seasonal variations. Fresh outside air is circulated through the duct and will precondition the air that is going to heat or cool the building.

This reduces energy consumption required to heat the fresh air to acceptable indoor conditions.

6.6 Battery Storage

Battery storage coupled with renewable energy technologies are becoming a fast growing trend.

Batteries are used to store electrical energy in an electrochemical composition. This allows for electrical energy to be utilised at any period of time and can fully utilise renewable electrical energy generation.

For example, it is particularly useful when coupled with technologies such as photovoltaics or wind turbines as the electrical energy generated from these systems are instantaneous.

Battery storage allows for the electrical energy generated to be stored and utilised when the building profile dictates demand rather than exporting or wasting the electrical energy.

The use of battery storage also reduces network distribution losses due to local generation and use.

7.0 Water Conservation Options

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7.0 Water Conservation Options

The following sections provide a high level description of the water conservation technologies considered within the appraisal.

7.1 Water Saving Appliances

Selecting the most appropriate and water saving appliances for taps and WC flush controls reduces the required water from mains infrastructure and minimises distribution losses.

Water saving appliances can provide a regulated amount of water to reduce the use of wasted water. These can be in the form of the following:

- Non concussive taps
- Sensor operated taps, WC flush controls and urinals e.g. PIR
- Single touch button/handle operated taps
- Aerated taps

7.2 Waterless Urinals

Waterless urinals do not require any water or flushing mechanism to dispose of urine.

Waterless urines operate via an oil based fluid which is used as a sealing liquid between the waste and urinal. The foul waste passes through the oil fluid. As the oil is less dense than the foul, the oil floats above the foul waste creating a seal. The foul waste is then disposed through the drainage system alike a conventional system.

Waterless urinals can be provided either with a cartridge for easy replacement of the sealing liquid or without a cartridge where the oil based fluid is introduced directly into the drain.

7.3 Major Leak Detection

Leak detection is a system which is used to detect a water leak across the distribution pipework.

The system, when a leak is detected, will raise an alarm to indicate a leak is present and prevent prolonged water loss.

The system generally consists of a detection tape or cable which links back to a control panel. The control panel can then link to either sounder alarms, building management systems and fascia mounted lights.

7.4 Sanitary Water Shut Off

Sanitary water shut off is a system which automatically isolates the water supply to sanitary appliances using a sensor.

The sensor is typically a proximity detection which will detect if occupants are present within the toilet facility.

A solenoid valve will be installed on the water supply pipework to the toilet.

When occupants are undetected, the solenoid valve will close and isolate the water supply to that served area.

The benefit of this system is that it reduces water loss through minor leaks and failure of cisterns serving urinals and WCs.

7.5 Rainwater Harvesting

Rainwater harvesting is a system which collects rain water from building roofs/ surfaces to be used within the building.

Rainwater is collected from the building surfaces into a storage tank. The tank water can then be distributed throughout the building to serve non-wholesome water supplies e.g. WC flushing and irrigation.

The use of rainwater reduces the requirement for water from the mains infrastructure and minimises distribution losses.

7.6 Greywater Recycling

Greywater recycling is a system which recycles used water from sinks and other sources to be used on other functions in the building.

Greywater is collected from the sinks to a storage tank. The tank water can then be distributed throughout the building to serve non-wholesome water supplies e.g. WC flushing and irrigation.

The use of recycling the water reduces the requirement for water from the mains infrastructure and minimises distribution losses.

8.0 Transport Options

8.0 Transport Options

The following sections provide a high level description of the transport methods considered within the appraisal.

8.1 Cyclist Facilities

Cycling facilities provided on site for users to freely use can reduce the use of fossil fuelled vehicles being used to commute to the development.

Cycling facilities are usually provided in the form of safe, secure cycle racks or enclosure.

8.2 Travel Information Point

The use of providing travel information points can promote the use of occupants' commuting to/from the development via public transport.

Live electronic displays will update occupants' of timescales and routes for public transport.

This method is aimed to reduce the use of individual vehicular commuting e.g. cars and to use public transport. This will reduce the number of vehicle being used and hence the use of fossil fuel and energy being expended.

8.3 Electric Vehicle Charging Points (EVC)

Electric vehicles are almost certainly going to be a growing necessity and market for transport. With this, the requirement to provide infrastructure to support electric vehicles should be considered.

With the de-carbonisation of the electricity grid, the use of electric vehicles has inherent benefits when compared against conventional petrol and diesel burning vehicles in relation to carbon emissions.

Charging points can be provided for electric vehicles in parking areas to recharge their cars.

9.0 Materials and Waste Options

9.0 Materials and Waste Options

The following sections provide a high level description of the materials and waste methods considered within the appraisal.

9.1 Responsibly Sourced Materials

Responsibly sourcing materials provides a holistic and sustainable approach to managing a product from the point at which a material is extracted in its raw state through manufacture and processing.

Locally sourcing materials to be used reduces the required transport for these materials to site. This then reduces energy consumption and carbon emissions.

9.2 Modern Methods of Construction

Modern methods of construction include technologies and processes such as prefabrication and off-site assembly.

These methods can improve quality, reduce time spent on site, improve on-site safety and overcome skills shortages in the construction industry.

By doing this, buildings can ensure they are built to achieve the design intent and installed services are not affected by adverse/ unknown defects.

9.3 Rapidly Renewable Materials

Short cycle renewable materials can be grown again or never run out within a short period of time.

This promotes a sustainable method of construction and minimises the use of fossil fuel and man-made materials being required to be used e.g. plastics.

Short cycle renewable materials are generally bamboo, wool, cotton insulation, agrifiber, linoleum, strawboard, cork, etc.

9.4 Low Embodied Carbon Materials

Low embodied carbon refers to materials where there are low levels of carbon dioxide emitted during the manufacturer, transport and construction.

This reduces the life cycle impacts on the development.

9.5 High Recycled Content

High recycled content refers to materials which have been recycled and repurposed to be used within construction and development.

Using materials with high recycled content reduces the need to source and manufacture new materials. The process of sourcing and manufacturing has subsequent energy and carbon consumption which can be avoided by using these materials.

9.6 Composting

Composting is the use of organic waste to create a soil based material.

Composting reduces waste being deposited to landfill sites during building operation.

The compost product can also be repurposed to be used on gardening, landscaping and planting.

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10.0 Community Related Options

10.0 Community Related Options

The following sections provide a high level description of the community related methods considered within the appraisal.

10.1 Community Cycle Facilities

Cycling facilities provided on the perimeter of the site for users to freely use can reduce the use of fossil fuelled vehicles being used by the public to commute to the development.

Cycling facilities are usually provided in the form of safe, secure cycle racks or enclosure.

10.2 Community Services

The use of community services provided a community link to the development as well as services for the community to use.

This can be provided by incorporating retail or child care opportunities within buildings.

10.3 Stakeholder Engagement Strategy

Develop a Stakeholder Engagement Strategy to enable engagement with appropriate Stakeholders.

The strategy will identify and understand the needs, expectations and perceptions of internal and external stakeholders and will draw on stakeholder knowledge and insights to align design, construction, operation and proposed programmes with sustainability and energy aspirations and societal expectations.

A Stakeholder Map will be developed to ensure relevant Stakeholders are contacted and appropriate responsibility designated.

10.4 Energy Awareness Strategy

Develop an Energy Awareness Strategy to promote sound environmental behaviour within the workplace and community, focusing on energy elements of the design and community initiatives.

The strategy should promote the efficient ongoing operation of the building by enabling employees, visitors and the local community to appreciate understand and contribute to responsible resource use.

The strategy should also include the building user guide and should align with relevant sections of the Stakeholder Engagement Strategy.

10.5 Employment and Apprenticeship Initiatives

Work with current employment / apprenticeship initiatives to create local jobs, provide apprenticeships and enhance skills.

Also, link into local employment programmes, back to work initiatives and third sector / charity initiatives.

10.6 Implement Local (Energy) Procurement Policy

Develop a procurement policy which encourages locally sourced and sustainable products.

The OxLEP have already released a framework developed to promote the energy reductions called the Oxfordshire Energy Strategy Plan.

10.7 Community Connectivity

Community connectivity is directly related to providing indoor and outdoor space for employee and / or community use.

This will promote the opportunity for green space, a healthy lifestyle, social interaction. All of these factors have an impact on physiological and psychological well being.

11.0 Sustainability Options Appraisal Matrix

11.0 Energy Options Appraisal Matrix

The following table summarises some of the currently available sustainable techniques for the proposed development.

Table 11.1 is provided to give an overall appreciation of the potential techniques which could be incorporated in the design, but in no way precludes the application of any, should there be a particular requirement.

The most appropriate and viable techniques and technologies for the scheme have been highlighted in the table below. This is a live document and should be updated as the scheme design develops.

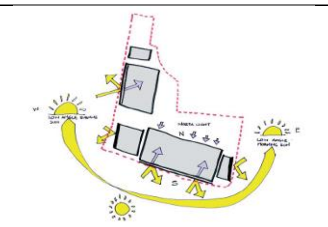
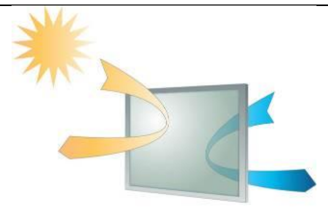
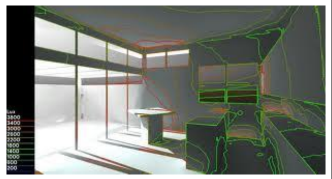
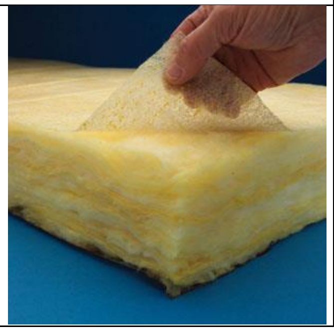
The appraisal is not based upon specific building form, thermal modelling, calculation, consumption estimates, utilisation profile or payback analysis at this stage.

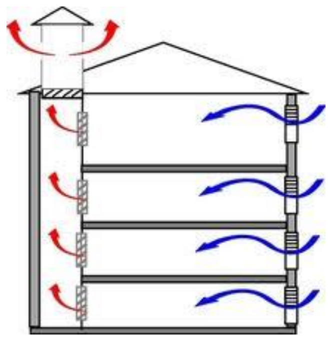
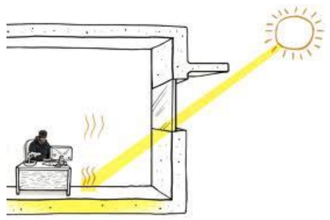
The following key highlights the traffic light system within the document:

Feasibility Key

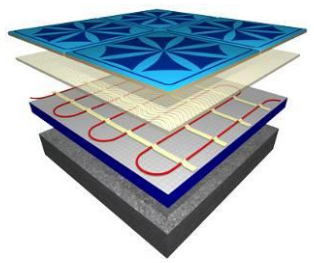
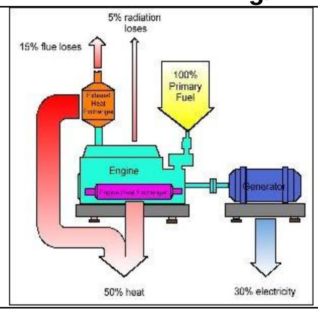
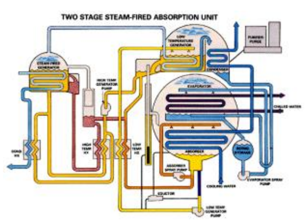
(green)	Potentially applicable to the site. Will be further evaluated during the design development.
(amber)	Could be feasible for the site, although potential site / design / cost constraints have been identified. Further investigation required as the design progresses.
(red)	Unlikely to be feasible on site due to site / design / cost constraints.

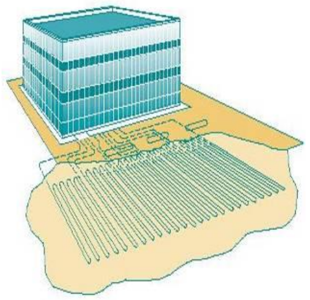
Table 11.1: Sustainability Options Appraisal Matrix

Ref	Image	Advantages	Disadvantages	Suitability	Oxfordshire Energy Strategy Plan			Feasibility
					Principle 1	Principle 2	Principle 3	
1.0	**Passive Design Options**							
1.1 Orientation		• Low cost method of reducing energy consumption significantly. • Makes solar control and daylighting easier to optimise.	• May conflict with architectural vision (although this can be overcome). • May conflict with functionality (although this can be overcome).	This should be considered by the design team to optimise the development in relation to the specific site constraints. Dynamic thermal modelling should be undertaken to optimise the envelope performance parameters.		X		
1.2 Solar Control		• Improves thermal comfort. • Controls glare. • Reduces cooling energy consumption. • Can be integrated into the architecture.	• Additional capital cost. • May conflict with architectural vision (although this can be overcome).	This should be considered by the design team to optimise the building in relation to the specific site constraints. Dynamic thermal modelling should be undertaken to optimise the envelope performance parameters.		X		
1.3 Daylighting		• Reduces the lighting energy consumption. • Provide high quality natural light for building occupants. • Creates a link between social and habitable spaces.	• May conflict with architectural vision (although this can be overcome).	This should be considered by the design team to optimise the building in relation to the specific site constraints. Building modelling should be undertaken to optimise the window design.		X		
1.4 Building Envelope		• Reduces the heating energy consumption. • Improves the thermal comfort for the occupants.	• Very high level of air tightness may lead to the requirement for mechanical ventilation. • Cooling loads or risk of overheating can be increased. • Excessive insulation and air tightness may raise the risk of overheating in summer.	This is applicable to all buildings and so is good design practise. Dynamic thermal modelling should be undertaken to optimise the envelope performance parameters.		X		

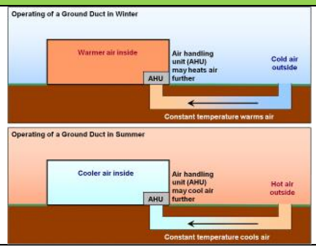
Ref	Image	Advantages	Disadvantages	Suitability	Oxfordshire Energy Strategy Plan			Feasibility
					Principle 1	Principle 2	Principle 3	
1.5 Natural Ventilation		• Low running cost and low energy ventilation strategy. • No mechanical ventilation equipment to maintain and clean. • Full user control of the environment. • Low capital cost.	• Noise and pollution from adjacent roads may prohibit this option. • Can be difficult to manage thermal comfort, and may be potential for overheating at certain times of the year. • Air quality issues must be carefully managed (CO_2, NOx, dust, etc). • Open windows may present a security risk in some instances. • Care must be taken to prevent draughts. • Potentially increased heating demand. However all of these can be overcome through careful façade design.	The choice of ventilation strategy will be highly dependent on the client's and planners' requirements for air quality and thermal comfort. The site is currently situated adjacent a main A road which could encounter noise and air pollution. The design approach should seek to use the following order of preference: • Natural Ventilation • Mixed Mode Ventilation • Mechanical Ventilation • Cooling		X		
1.6 Thermal Mass		• Reduces extremes in internal temperatures. • Helps maintaining an average moderate internal temperature year round. • Can reduce heating and cooling energy requirements. • Can improve thermal comfort in location with hot summers.	• Night operation of the building will impede the ability to provide night cooling. • Hard internal surfaces may hamper acoustic performance of rooms. • Higher embodied carbon in structure.	Thermal mass is only of benefit when carefully integrated into the building concept. Analyses should be undertaken in order to establish whether its use is appropriate in the case of each building and area.		X		
1.7 Green Roof		• Good aesthetics may help buildings merge into the landscape and improve planning submission. • Reduction of cooling energy / risk of overheating. • Reduces heat island effect. • Enhances site ecology. • Attenuates surface water run-off. • Improves acoustic performance. • Reduces fire risk. • Protects against electromagnetic radiation. • Improves air quality.	• Increased capital cost. • Implication for the building structure.	Green roofs can be installed at minimal cost elevation when included in the design from an early stage. Consideration should be given to the use of the roof, for example the mounting of photovoltaic panels or plant.		X		
1.8 Green Wall		• Good aesthetics may help buildings merge into the landscape and improve planning submission. • Reduction of cooling energy / risk of overheating. • Reduces heat island effect. • Enhances site ecology. • Façade Protection. • Revaluation of existing structure. • Improves acoustic performance. • Reduces fire risk. • Protects against electromagnetic radiation. • Improves air quality.	• Increased capital cost. • Maintenance requirement (depends on plants specified and speed of growth). • Potential damage to building fabric (unlikely to be an issue with a new build). • Implication for the building structure.	Green walls can make a very effective 'green statement', although have a greater cost premium than green roofs. A low cost alternative which achieves many of the same benefits is to trail climbing plants over facades (although careful maintenance will be required). Alternatively, where gabions are to be used, they can be cheaply enhanced to include soil and planting to radically improve their visual impact.		X		

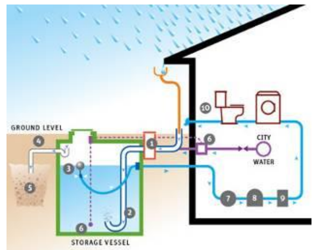
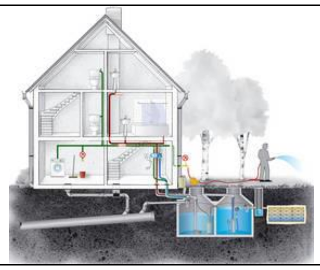
Ref	Image	Advantages	Disadvantages	Suitability	Oxfordshire Energy Strategy Plan			Feasibility
					Principle 1	Principle 2	Principle 3	
2.0	**System Efficiency Options**							
2.1 Plant Efficiency		• Reduction in operation energy cost. • Efficient plant is often of a higher quality and so requires less maintenance. • Reduced energy consumption and carbon emissions. • Often low capital cost.	• May require large air handling units and ceiling voids. • More expensive plant equipment.	The specification of efficient plant is good practise; however care should be taken to ensure that the performance specification pays careful attention to cost / benefit analyses / life cycle costing.	X	X		
2.2 Regenerative Lift Braking		• Produces zero carbon electricity. • Reduces energy use and carbon emissions.	• Small increase in maintenance cost. • High capital cost increase.	The inclusion of regenerative lifts in the building will only be appropriate if the lifts will be used frequently. It is unknown if lifts will be proposed for the buildings in their entirety.	X	X		
2.3 Lighting Efficiency		• Substantially reduced energy running cost especially for areas which operate 24/7. • May reduce the number of fitting to achieve the required LUX level. • More efficient lamps generally have a longer operational life. • Lower maintenance cost / replacement rate.	• May conflict with architectural vision (although this can be overcome). • High capital cost.	The specification of efficient lighting is good practise; however care should be taken to ensure that the performance specification takes account of cost benefit analyses. Furthermore specialist lighting design advice should be sought to ensure that light quality is maintained.		X		
2.4 Lighting Controls		• Reduces the lighting energy consumption. • Reduces carbon emissions and running costs. • Avoids over illuminating spaces. • Low capital cost. • Reduces risk of overheating in summer.	• Poor commissioning could result in worse control, (this can be easily overcome).	The inclusion of automatic lighting controls is becoming standard practise on a wide range of projects. This measure has only a small capital cost implication. Careful design is required to ensure control is appropriate to suit user requirements.		X		
2.5 Seasonal Commissioning		• Ensures correct and efficient operation throughout the year. • Reduced risk of failures. • Ensures correct installation. • Will reduce energy consumption, running cost and carbon emissions.	• Increasing commissioning. • Might cause disruption to building operation (although this can be overcome through careful planning – please refer to the soft landings document).	Seasonal commissioning should be carried out on all projects. The marginal cost increase is generally recouped through energy savings. Seasonal commissioning will ensure optimal performance under real operational conditions.		X		
2.6 Thermal Zoning		• Reduce energy consumption, carbon emissions and running cost. • User customisable internal conditions for higher thermal comfort.	• Slightly higher system complexity. • Slightly higher capital cost.	Discussions with the client will be necessary in order to establish the size and geometry of appropriate thermal control zones.		X		

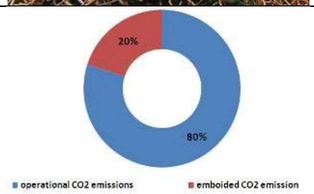
Ref	Image	Advantages	Disadvantages	Suitability	Oxfordshire Energy Strategy Plan			Feasibility
					Principle 1	Principle 2	Principle 3	
2.7 Underfloor Heating		• Reduces energy consumption as the water used is at a lower temperature (typically 50°C rather than 80°C plus). • Higher thermal comfort for the occupants. • Heat is distributed more efficiently. • No need for wall mounted emitters with increasing of useful floor area. • Less 'dust traps' so the rooms are easier to keep dust free. • In wet areas, (bath, shower rooms, kitchen etc.) the floors will dry quicker.	• Slower response time depending on the floor thermal mass • Delayed response to heating system may challenge building control strategy. • Higher installation costs.	This technology provides a clean internal appearance and improves the functionality of each room. It is unknown how each of the buildings is to be serviced at this stage. Development of the design should consider the use of underfloor heating.		X		
2.8 Chilled Beams		• Reduced operational energy consumption and capital cost. • Improved occupant comfort. • Lower maintenance costs. • Can be integrated into building service ceiling 'rafts' for an integrated approach.	• Limited cooling capacity. • Maybe more visible than air cooling systems.	These should be considered on all commercial buildings as they provide an effective way of reducing the operational cost of the buildings and improving occupant comfort. It is unknown how each of the buildings is to be serviced at this stage. Development of the design should consider a chilled beam if cooling is necessary.		X		
2.9 Computer Power Down		• Low cost measure to save significant amounts of energy. • Reduces the risk of overheating in summer. • May increase security of information as computers lock down when unattended.	• Care must be taken to ensure that this does not lose any data.	As the design develops, detailed consultation between the client, the design team and the IT managers for the building to ensure that this measure is effectively implemented. Energy efficient IT systems can result in significantly reduced energy consumption, thus reducing carbon emissions.		X	X	
3.0	**Low Carbon Heating/Cooling Sources**							
3.1 Combined Heat and Power		• Potential for large reduction in carbon emissions. • Provides on-site generated electricity. • Could double up as emergency generator.	• Higher capital cost. • Higher system complexity. • Requirement for a buffer vessel (hot water tank). • Larger space requirement. • Higher maintenance cost. • Higher noise emissions than conventional plant	This technology requires extended running hours of the site however the base load in summer is not expected to be great. Additional space will be required for a larger hot water tank. The economics of CHP should be analysed carefully to ensure that financial savings are made.	X	X		
3.2 Combined Cooling, Heat and Power		• Potential for large reduction in carbon emissions. • Provides on-site generated electricity. • Could double up as emergency generator.	• Higher capital cost. • Higher system complexity. • Requirement for a buffer vessel (hot water tank). • Larger space requirement. • Higher maintenance cost. • Higher noise emissions than conventional plant	This technology requires extended running hours of the site and the cooling load in summer will help to provide a larger base-load to increase plant operating hours. Additional space will be required for a larger hot water tank. The economics of CCHP should be analysed carefully to ensure that financial savings are made. The key issue with this technology is the high maintenance cost.	X	X		

Ref	Image	Advantages	Disadvantages	Suitability	Oxfordshire Energy Strategy Plan Principle 1	Principle 2	Principle 3	Feasibility
3.3 Ground Source Heat Pumps		• Technology that reduces the site carbon emissions. • Versatile technology that can provide low carbon heating and cooling.	• Very high capital cost. • Higher system complexity. • Less efficient when providing hot water for taps and showers than when providing space heating. • Performance is highly dependent on ground conditions which are currently unknown and expensive to investigate.	The ground conditions would need to be investigated by drilling trial bore holes before a final decision is taken to include a GSHP. There is no guarantee that ground conditions will be suitable for this technology. GSHP technology is best utilised when combined with low temperature heating and cooling systems such as underfloor heating, radiators or chilled beams.	X	X		
3.4 Air Source Heat Pumps		• Technology that reduces the site carbon emission. • Versatile technology that can provide low carbon heating and cooling.	• Less efficient when providing hot water for taps and showers than when providing space heating. • Higher noise output than conventional plant	This technology can be installed on most sites. The plant emits more noise than conventional plant and is best utilised when combined with low temperature heating and cooling systems such as underfloor heating, radiators or chilled beams.	X	X		
3.5 Water Source Heat Pumps		• Technology that reduces the site carbon emission. • Versatile technology that can provide low carbon heating and cooling. • Similar performance to GSHP but with lower capital cost.	• Only possible where there is a body of water of sufficient size. • Higher capital cost. • Higher system complexity. • Less efficient when providing hot water for taps and showers than when providing space heating.	There are no adjacent water reservoirs to use as a heat sink/source for the development.	X	X		
3.6 Hydrogen Fuel Cells		• Innovative technology for flagship site. • Potential to make the site zero carbon when combined with large wind turbines and / or photovoltaics (see below). • Potential to make site run independently from the national grid. • On-site energy storage. • Potential to provide fuel to hydrogen-powered vehicles.	• Very high capital cost. • Very high maintenance costs. • Emerging technology. • Large energy centre space requirement.	Fuel cells have a very high capital and maintenance cost associated with them at the moment although prices will fall in future. The technology has only recently become market ready. Fuel cell should be fuelled by hydrogen from electrolysis of water with the energy from wind turbines or PV to be a true renewable.	X	X		
3.7 Biomass Boiler		• Reduces the building carbon emission related to heating and hot water for taps and showers. • Small increase in capital cost for large carbon savings.	• Requirement for a buffer vessel (hot water tank). • Larger space requirement for boiler. • Space also required for fuel storage. • Higher maintenance cost. • Regular site access required by large vehicles for fuel delivery. • Fuel supply chain reliability. • Higher NOx emissions. • Requires planning approval for smoke free	Local fuel supplies should be identified in order to ensure the sustainability of this technology. Fuel delivery vehicle movements should be planned. Fuel storage space must be identified. The running cost of this technology is likely to be similar to that of conventional gas boilers. Through the process of combustion of biofuel,		X		

Ref	Image	Advantages	Disadvantages	Suitability	Oxfordshire Energy Strategy Plan Principle 1	Principle 2	Principle 3	Feasibility
			areas. • High flue is likely to be required.	flue gases and particulate can be unsightly and create air pollution to the local environment.				
4.0	**Zero Carbon Renewable Energy Technologies**							
4.1 Wind Turbines		• Provides a renewable zero carbon source of electricity. • Reduces building carbon emissions, energy use and running cost. • Iconic visual statement of sustainability.	• Needs careful assessment of the wind resource. • May be difficult to get planning permission in some areas. • Requires annual maintenance. • Possible annoyance from shadow flicker and background noise.	A wind resource analysis should be undertaken as well as consulting with a planning consultant. Ideally wind speed monitoring should be undertaken onsite. Care should also be taken to ensure that turbines do not interfere with airborne vehicles (flightpath).	X	X		
4.2 Photovoltaic Panels		• Easy to install. • Low maintenance as there are no moving parts. • Silent operation. • Reduces building carbon emissions, energy consumption and running cost. • Iconic visual statement of sustainability. • Can be integrated into standing seam roof panels.	• Requires a well oriented and un-shaded installation area. • The PV array must be cleaned periodically. • Increased capital cost. • The solar collector should be cleaned annually.	If photovoltaics are to be included then they should be integrated into the architecture by providing a suitable location for their installation in terms of orientation and elevation without shading. Panels must not experience significant amounts of shading in order to maintain performance.	X	X		
4.3 Solar Thermal Water Heating		• Reduces building carbon emissions, energy consumption and running cost. • Low maintenance. • Silent operation. • Visual statement of sustainability.	• Increases the complexity of the hot water system. • Requirement for a buffer vessel (hot water tank). • Requires a well oriented and un-shaded installation area. • The solar collector should be cleaned annually.	If solar thermal panels are to be included then they should be integrated into the architecture by providing a suitable location for their installation in terms of orientation and elevation without shading. The size of the annual hot water requirement should also be identified when establishing the viability of this technology. The location of the panels should also be close to the plant room in order to minimise pipe-work heat loss.		X		
4.4 Solar Wall		• Reduces heating energy consumption, carbon emissions and running cost. • Low maintenance. • Quiet running.	• Require a wide south-facing external wall where to be installed. • May conflict with architectural vision (although this can be overcome). • Requires mechanical ventilation.	A large south facing elevation should be identified. The appearance is similar to a warehouse panelled wall, and so the architect should be included in the decision making process with regard to this technology. Solar wall is only appropriate where mechanical ventilation is to be included.		X		

Ref	Image	Advantages	Disadvantages	Suitability	Oxfordshire Energy Strategy Plan			Feasibility
					Principle 1	Principle 2	Principle 3	
4.5 Ground Duct		• Reduces heating energy consumption and carbon emissions. • Provides auxiliary heating and cooling.	• Very high installation cost. • Requires a very large installation area. • Requires mechanical ventilation to facilitate the air circulation through the ground duct. • Care must be taken to avoid a risk of legionella.	The cost effectiveness of this technology is often low and the space requirement large. Ground ducts are generally only appropriate where mechanical ventilation is to be included.		X		
4.6 Battery Storage		• Electrical energy can be utilised at any time. • Can be used as a backup supply • Useful when coupled with PV or wind where electrical generation and use is instantaneous • Reduces wasted electrical energy • Reduces grid network distribution losses	• High capital cost • Higher system complexity • Requires an area on site to install	This can be highly effective when coupled with renewable technologies. This system should be considered during the design process as well as considering the additional cost and complexity associated with the equipment.	X	X		
5.0	**Water Conservation Options**							
5.1 Water Saving Appliances		• 40-70% savings on cold water use. • Infection control as limited physical contact with appliances.	• Electrical supply required. • Cost increase over conventional taps.	This is a highly effective measure in reducing water consumption; however the capital cost may be prohibitive. This is a relatively low cost measure with high impact and so is recommended.		X		
5.2 Waterless Urinals		• Saving on potable water for sewage conveyance.	• Maintenance requirements. • Potential odour issues if maintenance regime is interrupted.	This is a highly effective technique in reducing water consumption. The decision to select the technology is likely to be influenced by client preference.		X		
5.3 Major Leak Detection		• Reduces impact of major water leaks that may otherwise go undetected.	• Additional installation costs. • May be challenging to detect leaks between the building and building boundary depending on the metering setup.	This measure is advisable, although the precise location of the site water meters will need to be established to determine whether it is possible to detect water leaks between the building and the building boundary.		X		
5.4 Sanitary Water Shut Off		• Reduces impact of minor leaks in toilet areas.	• Additional installation costs.	Minor leaks in toilet areas can result in a significant loss of potable water, so it is advised that a sanitary ware shutoff system is considered. The proximity detection can be effectively achieved by linking PIR lighting controls to the cold water supply in toilet areas.		X		

Ref	Image	Advantages	Disadvantages	Suitability	Oxfordshire Energy Strategy Plan Principle 1	Principle 2	Principle 3	Feasibility
5.5 Rainwater Harvesting		• Savings on potable water costs. • Captures rainwater so can reduce runoff.	• External excavation required for tank. • Additional plant and equipment to maintain. • Additional energy required for pumping rainwater from the tank, for distribution around the building (could be overcome with a gravity-fed system).	This technology is likely to be highly applicable terms of rainfall availability, roof size and potential to use non-potable water for toilet flushing etc. The size of the tank and potential for positioning of the tank on the site is likely to be a key determining factor on whether this technology is taken forward.		X		
5.6 Greywater Harvesting		• Savings on potable water costs. • Reducing sewage discharge.	• The potential for pollution and undesirable health and environmental effects if the greywater is not reused correctly. • Initial cost of a greywater system and plumbing requirements. • Ongoing maintenance.	A review of greywater availability (from sinks etc) will need to be undertaken to ascertain the potential for greywater recycling on each site. As a technology it may not provide significant potable water savings.		X		
6.0	**Transport Options**							
6.1 Cyclist Facilties		• Encourages 'green travel', and reduces car dependence. • Potential to designate a cycle storage area for local residents. • Potential to link site into existing cycle routes.	• External location and structure required. • Associated facilities required to encourage use: lockers, showers, etc. • Need to provide safe cyclist access routes onto sites.	Cycle racks are low cost and simple to incorporate into most building designs.		X	X	
6.2 Travel Information Point		• Provides accurate, and up-to date public transport information thus encouraging that mode of travel.	• May not be relevant where there are no existing public transport links within the vicinity of the building.	Travel information points would provide useful information to visitors to the site. This can be provided with access to data from travel network providers. This would usually form part of the Local Authority's/transport providers work.		X	X	
6.3 Electric Vehicle Charging Points		• The initiative could significantly reduce the transport emissions associated with staff travel. • The facility will be ready for electric vehicles in the fleet.	• Car park spaces will be taken to be designated charging areas.	Electric car charging points are a relatively low cost measure requiring minor electrical infrastructure and space. The projected use of these charging points will be a key factor in determining their suitability, however public bodies often lead the way in this area.	X	X		

Ref	Image	Advantages	Disadvantages	Suitability	Oxfordshire Energy Strategy Plan Principle 1	 Principle 2	 Principle 3	Feasibility
7.0	**Materials and Waste Options**							
7.1 Responsibly Sourced Materials		• Establishing project requirements for responsibly sourcing at an early stage in the project can have a positive impact on greening the supply chain and promoting product stewardship. • Responsible sourcing of materials encompasses social, economic and environmental dimensions.	• May preclude certain suppliers from the supply chain if they do not have and EMS system (or equivalent) for their products. • Difficult to obtain evidence of responsible sourcing from extraction (chain of custody certificates etc.).	Opportunities for maximising the % of responsibly sourced materials should be considered during the design stages and then further reviewed through the procurement process / supply chain. Consideration will, however, need to be given to the time investment for liaising with manufacturers and suppliers to obtain the necessary paperwork as evidence of responsibly sourcing.		X		
7.2 Modern Methods of Construction		• Speeds up delivery thus reducing construction times. • Facilitates consistently high standards of construction quality (high quality wall panels, pre-insulated). • Can help to reduce resource consumption by making more effective use of materials. • Reduces transport impacts as flat-packs can be highly efficient for transport.	• May reduce the potential for different architectural solutions / iconic design. • Still need to be assembled on site – may require training for construction team. • Potential robustness and resilience issues in certain applications. • Integration of services and FF&E may be more challenging. • May be easily demountable, with potential for recyclability end use.	The use of MMC significantly shortens the build time of projects and can therefore provide cost savings. This approach should be considered at an early stage in the design process in order to ensure an integrated design which harnesses the potential benefits.		X		
7.3 Rapidly Renewable Materials		• Reduces the depletion of finite raw resources and long cycle renewable materials.	• May not be appropriate to the scheme, as rapidly renewable materials are likely to be less durable / robust than other material types.	Rapidly renewable materials are traditionally lightweight. The use of renewable materials should be considered during the design process to harness the potential benefits.		X		
7.4 Low Embodied Carbon Materials		• Reduced carbon emissions over lifetime of material.	• Low embodied carbon materials tend to be thermally light, which could be a disadvantage. • Quantifying the embodied carbon of a material can be challenging– there is no standard methodology established for this.	The selection of materials should be considered at an early stage in the design process in order to ensure an integrated design which harnesses each material to its full potential.		X		
7.5 High Recycled Content		• Reduces demand on virgin materials / natural resources. • Uses products as a 'resource' that would otherwise be treated as 'waste', and potentially sent to landfill.	• May be issues with the structural integrity if reused / recycled. • Depending on the material in question, may be less durable.	The opportunity for maximising recycled content should be investigated, although this should be balanced with the need to provide robust and highly durable materials to suit the building functions.		X		
7.6 Composting		• Reduces waste to landfill. • Can provide a useful horticultural resource.	• Only feasible with a sufficient supply of organic waste. • Can be issues with odour. • Provision for delivery needs to be made if compost cannot be utilised on site.	Recycling facilities should be provided. Further investigation is required into the feasibility of composting – both in terms of the supply of organic waste, and the potential to utilise the compost on site.		X	X	

Ref	Image	Advantages	Disadvantages	Suitability	Oxfordshire Energy Strategy Plan Principle 1	Principle 2	Principle 3	Feasibility
8.0	**Community Related Options**							
8.1 Community Cycle Facilities		• Promotes community links. • Provides a service to the public.	• Additional cost of providing additional cyclist facilities and associated CCTV etc.	Cycle racks are low cost and simple to incorporate into most building designs. This could encourage visitors to the site and should be considered in the design process		X	X	
8.2 Community Services		• Promotes community links. • Provides a service to the public. • Economic benefits to community.	• May cause unwanted disturbance / people flow within the building.	Community facilities have currently been proposed in the form of a MUGA.			X	
8.3 Stakeholder Engagement Strategy		• Collects employee and community opinions, enables community outreach and encourage social inclusion. • Also allows design and operation to respond to local distinctiveness / opportunities / constraints and / or instil local identity.	• Important to manage expectations, may be limited on the amount of engagement / implementation and there may be issues related to confidentiality and / or security.	Strong likelihood of taking this forward, very beneficial exercise.			X	
8.4 Energy Awareness Strategy		• Encourages environmental responsibility and behaviour such as sustainable resource use, low energy and protection of biodiversity. • Increases cost savings, improves efficiency and staff morale. • Increases environmental knowledge and promotes personal well being which extends to the home and into the community.	• If the wrong people are charged with responsibility for delivering the Strategy the benefits will not be seen, there will also be a risk of fatigue related to the environment and any current / future initiatives.	Strong likelihood of taking this forward, very beneficial exercise.			X	
8.5 Employment and Apprenticeship Initiatives		• Provide local employment opportunities as well as provide facilities that will attract and retain skilled employees. • Look for innovative employment opportunities, such as a third sector organisation or local community group starting up and running a canteen for construction workers which then remains onsite when in operation. • Opportunity to up skill the workforce in environmental technologies / procedures (e.g. solar installation or micro generation schemes).	• Current initiatives tend to focus on construction. It is important to provide long term jobs and / or up skill individuals in order for them to secure future work. • Also important to provide facilities to attract and retain staff.	Strong likelihood of taking this forward.			X	
8.6 Implement Local (Energy) Procurement Policy		• Will help to increase the diversity of local businesses, stimulate local economy, enhance the viability of existing businesses and reduce carbon emissions.	• The supply chain may not be developed, may be more costly, and may conflict with any central procurement procedures / policy.	Strong likelihood of taking this forward. Oxfordshire county already has an Energy Strategy Plan in place.			X	

Ref	Image	Advantages	Disadvantages	Suitability	Oxfordshire Energy Strategy Plan			Feasibility
					Principle 1	Principle 2	Principle 3	
8.7 Community Connectivity		• Provides opportunity for green-space promotes a healthy lifestyle and encourages social interaction, all of which have a physiological and psychological well being.	• Will have to consider issues with safety, security and privacy which may increase costs.	Dependent on issues of safety, security and privacy.			X	

12.0 Conclusion

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This statement summarises and highlights the potential sustainable design measures for the reduction of CO_2 emissions and energy demand for the proposed developments.

A more detailed analysis should be undertaken when a during the detailed design stages with particular consideration relating to the technical feasibility of including and installing LZC systems as well as meeting the Cherwell Local Plan Policies; Bicester 10, ESD 2 and ESD 3.