

**BEECHFIELD**  
CONSULTING ENGINEERS

*Mechanical, Electrical & Energy Consultants*

## Sustainability and Energy Statement

### Growing House, Longridge

**August 2024**

**Beechfield Consulting Engineers Ltd**

The Warehouse  
Saxon St, Denton  
Manchester  
M34 3DS  
[www.bfce.co.uk](http://www.bfce.co.uk)  
0161 337 4353

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## CONTENTS

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<b>1. Introduction</b> .....	<b>1</b>
<b>2. Development Proposals</b> .....	<b>2</b>
2.1 Development Site Description .....	2
2.2 Development Proposals.....	2
<b>3. Policy Review</b> .....	<b>5</b>
3.1 National Planning Policy .....	5
3.2 Local Planning Policy .....	6
3.2.1 Ribble Valley Borough Council – Adopted Core Strategy .....	6
3.3 South Ribble Climate Emergency .....	8
3.4 Applicable Targets .....	8
<b>4. Sustainability Statement</b> .....	<b>9</b>
4.1 Energy Performance .....	9
4.2 Flood Risk and Surface Water Management .....	9
4.2.1 Drainage Strategy.....	11
4.3 Materials .....	11
4.4 Water Efficiency .....	11
4.5 Ecology and Biodiversity.....	12
4.6 Waste Management.....	12
4.6.1 Construction Waste .....	12
4.6.2 Operational Waste .....	13
4.7 Pollution .....	13
4.8 Health and Wellbeing .....	14
4.9 Transport.....	14
4.9.1 Public transport.....	14
4.9.2 Cycling and Walking .....	14
<b>5. ENERGY STRATEGY</b> .....	<b>15</b>
5.1 First Principle – Reduce the Need for Energy .....	16
5.2 Second Principle - Use Energy More Efficiently.....	17
<b>6. PROPOSED RENEWABLE ENERGY SOLUTION</b> .....	<b>19</b>
6.1 Renewable Technology Feasibility.....	19
6.2 Third Principle – Supply energy from renewable sources. ....	21
6.2.1 Photovoltaic Array .....	21
6.2.2 Air Source Heat Pumps .....	22

6.3 Fourth Principle – All Electric Energy Strategy.....	22
6.4 Decarbonisation .....	22
<b>7. CARBON DIOXIDE EMISSIONS CALCULATIONS .....</b>	<b>24</b>
7.1 Regulated Energy Performance Calculations.....	24
7.2 Unregulated Energy Demands.....	25
<b>8. Climate Change Emergency .....</b>	<b>26</b>
<b>9. Conclusion .....</b>	<b>27</b>

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## 1. INTRODUCTION

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Beechfield Consulting Engineers has been commissioned by Graeme Luxton to review the sustainability and energy performance of the proposed new build residential property, named The Growing House.

The purpose of this statement is to summarise the relevant policy background and requirements of Ribble Valley Borough Council and to demonstrate the ways in which the developer has addressed these aims through their proposals, ensuring all practicable measures have been taken to deliver a sustainable development at this site.

Details of the design attributes, specifications and characteristics of the scheme are appraised in order to demonstrate how the proposals contribute to sustainable development in Longridge and seek to mitigate the environmental impacts of the scheme, providing a sustainability appraisal in support of the planning application.

This report is intended to support the planning application for this development and therefore, establish an approach to the delivery of this scheme which meet the criteria outlined by the council that the developer commits to implement at the site.

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## 2. DEVELOPMENT PROPOSALS

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### 2.1 Development Site Description

The site of the proposed new dwelling lies to the south of Higher Road, Longridge, in open countryside within the Forest of Bowland Area of Outstanding Natural Beauty (AONB). Higher Road separates the site from another residential property and beyond the western perimeter of the site lies mixed woodland and Cowley Brook.

The pre-development site is presented in Figure 2.1 below.

*Figure 2.1 – Site Location Plan*



### 2.2 Development Proposals

The development proposal consists of a new dwelling of exceptional design quality (paragraph 80e NPPF 2023) with associated access, landscaping, habitat restoration and change of use of land to the residential curtilage.

Figure 2.2 to 2.5 presents the proposed elevations and floor plans for The Growing House development.

Figure 2.2 – North Elevation

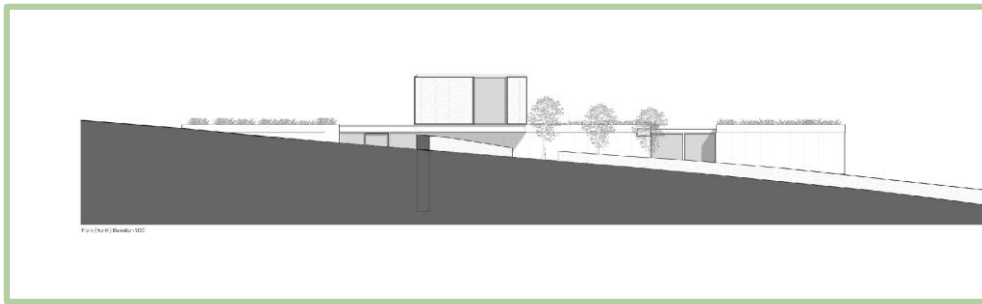


Figure 2.3 – South Elevation

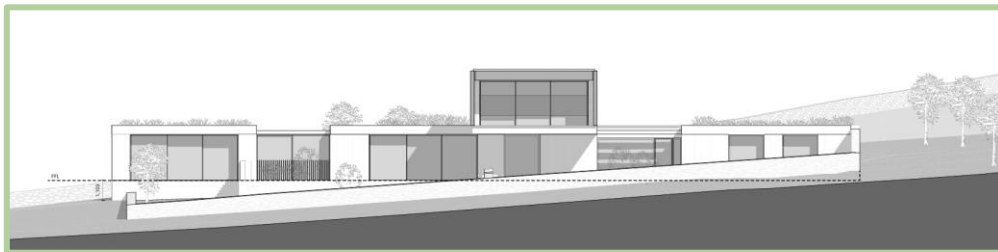


Figure 2.4 – Proposed Ground Floor

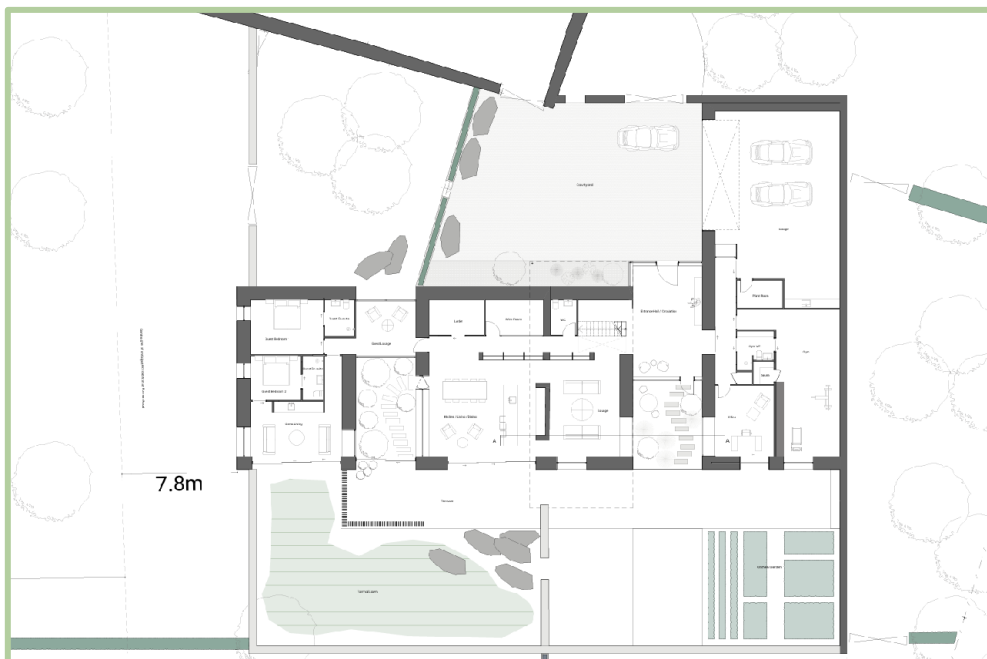
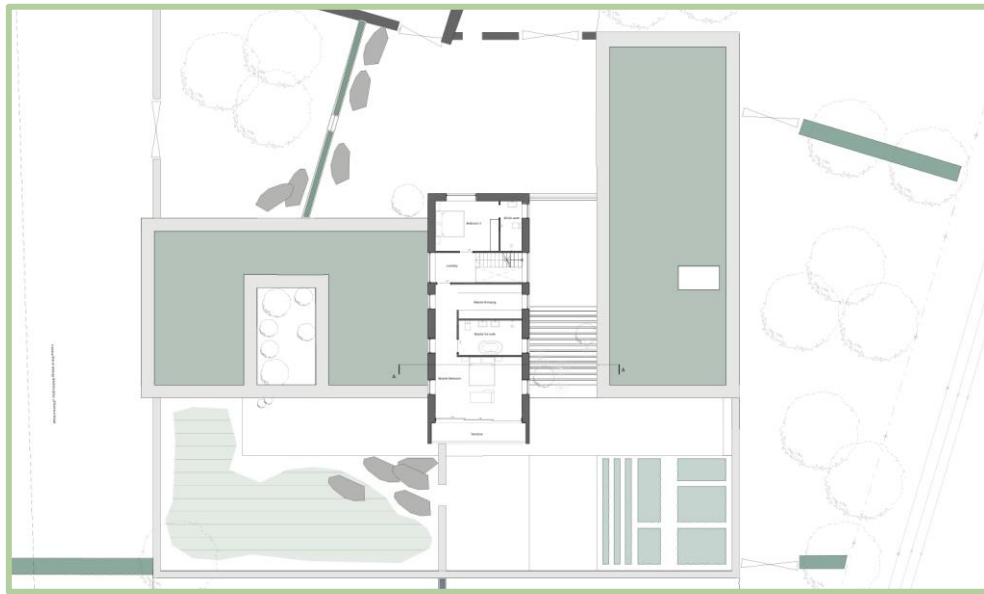


Figure 2.5 – Proposed First Floor



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## 3. POLICY REVIEW

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### 3.1 National Planning Policy

The National Planning Policy Framework was revised in response to the Levelling-up and Regeneration Bill: reforms to national planning policy consultation on 19<sup>th</sup> December 2023 and sets out the government's planning policies for England and how these are expected to be applied.

The purpose of the planning system is to contribute to achieving sustainable development. The planning system has three overarching objectives, which are interdependent and need to be pursued in mutually supportive ways, as set out below:

**An economic role** – 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;

**A social role** – to support strong, vibrant and healthy communities, by ensuring that a sufficient number and range of homes can be provided to meet the needs of present and future generations, and by fostering well-designed, beautiful and safe places, with accessible services and open spaces that reflect current and future needs and support communities' health, social and cultural well-being; and

**An environmental role** – to protect and enhance our natural, built and historic environment, including effectively using land, improving biodiversity, using natural resources prudently, minimising waste and pollution, and mitigating and adapting to climate change, including moving to a low-carbon economy.

These objectives should be delivered through the preparation and implementation of plans and the application of the policies in this Framework. Planning policies and decisions should play an active role in guiding development towards sustainable solutions, but in doing so should take local circumstances into account, to reflect the character, needs and opportunities of each area.

#### Paragraph 84

Planning policies and decisions should avoid the development of isolated homes in the countryside unless one or more of the following circumstances apply:

- a) There is an essential need for a rural worker, including those taking majority control of a farm business, to live permanently at or near their place of work in the countryside;
- b) The development would represent the optimal viable use of a heritage asset or would be appropriate enabling development to secure the future of heritage assets;
- c) The development would re-use redundant or disused buildings and enhance its immediate setting;
- d) The development would involve the subdivision of an existing residential building; or
- e) The design is of exceptional quality, in that it:
  - Is truly outstanding, reflecting the highest standards in architecture, and would help to raise standards of design more generally in rural areas; and
  - Would significantly enhance its immediate setting, and be sensitive to the defining characteristics of the local area.

## 3.2 Local Planning Policy

### 3.2.1 Ribble Valley Borough Council – Adopted Core Strategy

**Key Statement DS2 - Presumption in Favour of Sustainable Development:** When considering development proposals, the council will take a positive approach that reflects the presumption in favour of sustainable development contained in the National Planning Policy Framework. It will always work proactively with applicants jointly to find solutions which mean that proposals can be approved wherever possible, and to secure development that improves the economic, social and environmental conditions in the area.

Planning applications that accord with the policies in this Local Plan (and, where relevant, with policies in neighbourhood plans) will be approved without delay, unless material considerations indicate otherwise.

**Key Statement EN3 - Sustainable Development and Climate Change:** The council will seek to ensure that all development meets an appropriate recognised sustainable design and construction standard where viable to do so, in order to address both the causes and consequences of climate change. In particular, all development will be required to demonstrate how it will contribute towards reducing the Borough's carbon footprint.

In adapting to the effects of climate change it is expected that proposals for development will demonstrate how sustainable development principles and sustainable construction methods, such as the use of sustainable drainage systems, will be incorporated.

New development in vulnerable areas should ensure that risks can be managed through suitable measures, including through the conservation of biodiversity, improvement of ecological networks and the provision of green infrastructure.

All development should optimise energy efficiency by using new technologies and minimising the use of energy through appropriate design, layout, material and landscaping and address any potential issues relating to flood risk.

**Key Statement EN4 - Biodiversity and Geodiversity:** The council will seek wherever possible to conserve and enhance the area's biodiversity and geodiversity and to avoid the fragmentation and isolation of natural habitats and help develop green corridors.

Negative impacts on biodiversity through development proposals should be avoided. Development proposals that adversely affect a site of recognised environmental or ecological importance will only be permitted where a developer can demonstrate that the negative effects of a proposed development can be mitigated, or as a last resort, compensated for. It will be the developer's responsibility to identify and agree an acceptable scheme, accompanied by appropriate survey information, before an application is determined. There should, as a principle be a net enhancement of biodiversity.

**Policy DMG1 - General Considerations:** In determining planning applications, all development must:

- Be sympathetic to existing and proposed land uses in terms of its size, intensity and nature as well as scale, massing, style, features and building materials;
- Use sustainable construction techniques where possible and provide evidence that energy efficiency, as described within policy DME5, has been incorporated into schemes where possible;

- The code for sustainable homes and lifetime homes, or any subsequent nationally recognised equivalent standards, should be incorporated into schemes;
- Consider the environmental implications such as SSSIs, county heritage sites, local nature reserves, biodiversity action plan, habitats and species, special areas of conservation and special protected areas, protected species, green corridors and other sites of nature conservation;
- With regards to possible effects upon the natural environment, the council propose that the principles of the mitigation hierarchy be followed. this gives sequential preference to the following:
  - 1) Enhance the environment
  - 2) Avoid the impact
  - 3) Minimise the impact
  - 4) Restore the damage
  - 5) Compensate for the damage
  - 6) Offset the damage
- Achieve efficient land use and the reuse and remediation of previously developed sites where possible. previously developed sites should always be used instead of greenfield sites where possible.

**Policy DME3 - Site and Species Protection and Conservation:** Development proposals that are likely to adversely affect the following will not be granted planning permission. Exceptions will only be made where it can clearly be demonstrated that the benefits of a development at a site outweigh both the local and the wider impacts. Planning conditions or agreements will be used to secure protection or, in the case of any exceptional development as defined above, to mitigate any harm, unless arrangements can be made through planning conditions or agreements to secure their protection.

Developers are encouraged to consider incorporating measures to enhance biodiversity where appropriate that will complement priority habitats and species identified in the Lancashire bap.

**Policy DME5 - Renewable Energy:** The council will require decentralised and renewable or low carbon energy in new developments to meet national standards

Development proposals within or close to the AONB, sites of special scientific interest, special areas of conservation and special protection areas, notable habitats and species, local nature reserves, biological heritage sites or designated heritage assets and their setting will not be allowed unless:

- It can be demonstrated that the objectives of the designation of the area or site will not be compromised by the development; and,
- Any adverse environmental impacts as far as practicable have been mitigated.

**Policy DME6 - Water Management:** Development will not be permitted where the proposal would be at an unacceptable risk of flooding or exacerbate flooding elsewhere.

Applications for development should include appropriate measures for the conservation, protection and management of water such that development contributes to:

- Preventing pollution of surface and / or groundwater;
- Reducing water consumption; and,

- Reducing the risk of surface water flooding (for example the use of sustainable drainage systems (suds)).

All applications for planning permission should include details for surface water drainage and means of disposal based on sustainable drainage principles. The use of the public sewerage system is the least sustainable form of surface water drainage and therefore development proposals will be expected to investigate and identify more sustainable alternatives to help reduce the risk of surface water flooding and environmental impact.

### 3.3 South Ribble Climate Emergency

In 2019, South Ribble Borough Council declared a climate emergency, pledging to work to make the borough carbon neutral by 2030.

In order to tackle this, a Climate Emergency Working Group was formulated and a Climate Emergency Strategy was developed followed by a Climate Emergency Action Plan.

The main areas to be addressed, which will help to reduce carbon emissions within the borough include:

- Transport
- Energy and the Built Environment
- Waste and Water
- Consumption
- Offsetting

### 3.4 Applicable Targets

Based upon a review of relevant planning policy requirements, legislative drivers, and client priorities, the following list provides a brief precis of the key criteria that should be targeted for this development:

#### **NPPF Paragraph 84**

- Reflecting the highest standards in architecture, and would help to raise standards of design more generally in rural areas; and
- Would significantly enhance its immediate setting and be sensitive to the defining characteristics of the local area.

#### **Ribble Valley Borough Council – Adopted Core Strategy**

- **Key Statement DS2** - Presumption in Favour of Sustainable Development:
- **Key Statement EN3**- Sustainable Development and Climate Change
- **Key Statement EN4** - Biodiversity and Geodiversity
- **Policy DMG1** - General Considerations
- **Policy DME3** - Site and Species Protection and Conservation
- **Policy DME5** - Renewable Energy
- **Policy DME6** - Water Management

#### **South Ribble Climate Emergency**

#### **Building Regulations, Part L**

- **Approved Document Volume 1: Dwellings** (2021 edition)

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## 4. SUSTAINABILITY STATEMENT

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This section provides an appraisal of the development proposals and details the specific approach, design features and specifications which will contribute to reducing the environmental impact of this scheme. This section outlines those commitments that have been made to ensure this scheme contributes to sustainable development and meets the council's policy aims.

### 4.1 Energy Performance

In order to limit energy demand and carbon dioxide (CO<sub>2</sub>) emissions from the operation of the building, a number of design features will be integrated that will collectively contribute towards the emissions reduction target for the scheme.

Detailed measures are presented in Sections 5 & 6 of this report, but in essence, the energy strategy proposed is an enhanced 'fabric led' solution coupled with the inclusion of an energy efficient servicing provision to maximise the buildings' performance.

The reduction in energy demand to meet the carbon reduction targets will be achieved through the following design measures and low carbon technology options:

- Improved thermal insulation;
- Low air permeability;
- Photovoltaic array;
- Efficient air source heat pumps; and,
- Low energy LED lighting.

These measures will secure the carbon reduction targets sought by the local planning authority and **Building Regulations Part L: Approved Document Volume 1 (2021 edition)**.

### 4.2 Flood Risk and Surface Water Management

Data obtained from the Environment Agency was used to determine which flood zone the site is located within and the potential flood risk to the proposed development.

Figure 4.1 below presents the latest Environment Agency (EA) Flood Zone Map data which demonstrates that the site is located wholly within Flood Zone 1, demonstrating a low probability of flooding from rivers.

Figure 4.1 – Environment Agency Flood Risk Zone Map

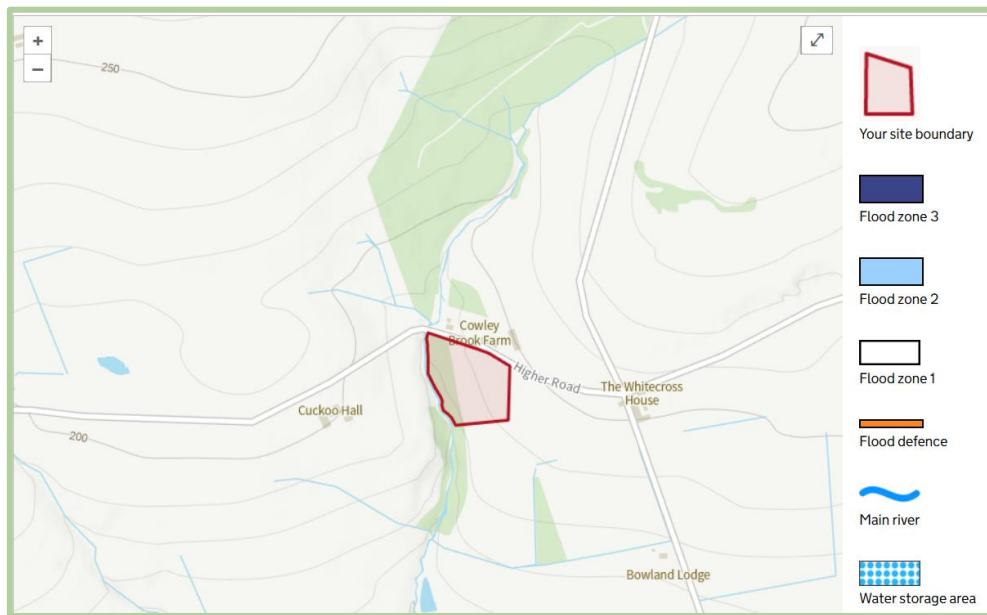
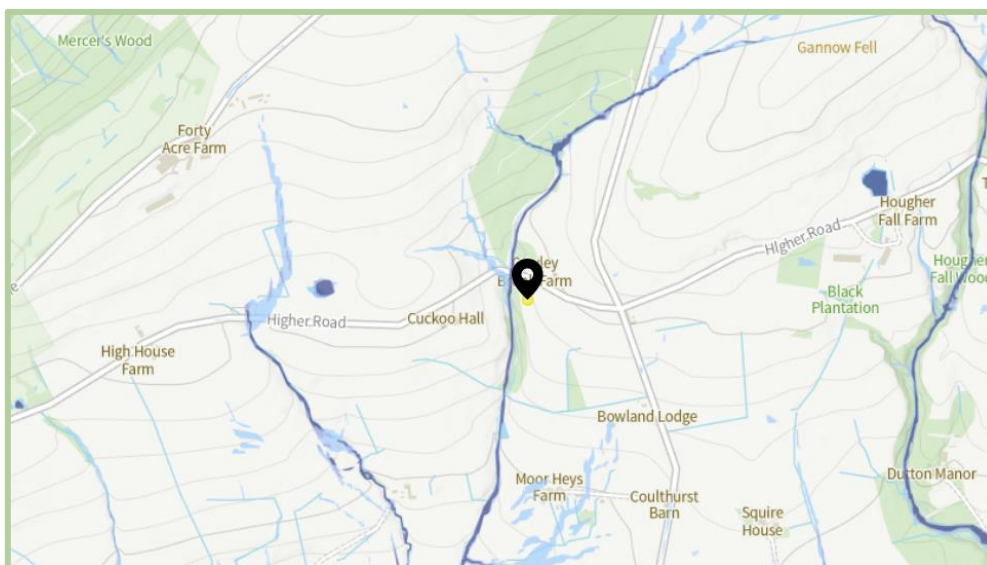


Figure 4.2 demonstrates that the area is at low risk from surface water flooding as well, with a chance of flooding of less than 0.1% each year.

Figure 4.2 – Extent of Flooding: Flood Risk from Surface Water



In accordance with **Key Statement EN3 - Sustainable Development and Climate Change** and **Policy DME6 - Water Management**, the proposed development is not considered to be within an area at high risk of flooding.

### 4.2.1 Drainage Strategy

A sustainable drainage strategy will be produced to outline the following possible drainage solutions which will be utilised to reduce the risk of surface water flood on site.

- A Klargester will be installed for the foul drainage, the outfall of which will soak away into the land beyond;
- The proposed drainage strategy will be managed to achieve greenfield run off rates.

The proposed development will manage surface water in line with the sustainable drainage principles in accordance with **Policy DME6 - Water Management**

## 4.3 Materials

The proposals will contribute towards making more efficient use of non-renewable materials resources, and to reducing the lifecycle impact of materials used in construction. This is demonstrated by:

- Materials with a low environmental impact throughout their life cycle will be prioritised. Plus, materials with associated Environmental Performance Declarations (EPDs) will be favoured;
- Responsibly sourced materials from suppliers operating an Environmental Management System and procuring timber verified by either the Forest Stewardship Council (FSC) or Programme for the Endorsement of Forest Certification standard (PEFC) will be prioritised;
- Material selection will be carefully considered to avoid the use of toxic materials, such as Volatile Organic Compounds (VOCs) and contribute towards creating a healthy indoor environment; and,
- Excavated material (such as soil and substructural elements) from construction works will be used, where practical, for landscaping purposes.

The proposed development will **prioritise sustainable construction techniques** where feasible in accordance with **Policy DMG1 – General Considerations**.

## 4.4 Water Efficiency

The proposed development will be designed to reduce mains / potable water consumption and will include the following water efficient designs and equipment:

- A water efficiency strategy will be determined for the site and will include for the provision of 'A++' rated appliances as a minimum;
- In order to reduce water demand, the sanitary fixtures will be specified to achieve a calculated daily consumption of <100 litres/person/day; and,

- A water meter on the mains water supply to the building will be specified to monitor and manage consumption.
- **Efficient water fixtures will be specified** throughout the building such as low flow taps and dual flush WCs in order to reduce water consumption.

In order to reduce potable water consumption, the **surface water on site will go into a rainwater harvesting tank in the courtyard area, which will then be used to water the vegetables** and fruit in the garden, and the vegetation inside the house and attached to the outside walls.

## 4.5 Ecology and Biodiversity

The proposed development will incorporate a range of features to enhance the ecological value of the site:

- Green roof and green wall systems;
- New planting which will prioritise native species; and,
- The proposed scheme will be sympathetic to the existing and proposed land uses in terms of its size, intensity and nature.

**In accordance with Key Statement EN3**, the proposed development will ensure that risks can be managed through suitable measures, including through the **conservation of biodiversity, improvement of ecological networks and the provision of green infrastructure**

## 4.6 Waste Management

### 4.6.1 Construction Waste

Best practice techniques to prevent and minimise waste during the design and construction phase of the development will be adopted, as follows:

- Prior to commencement of the above ground construction phase, a site waste management plan (SWMP) will be produced by the developer to limit the on and off-site environmental impacts of construction:
- The SWMP will encompass:
  - Recycled and secondary; materials;
  - Waste reduction;
  - Waste segregation;
  - Waste recovery; and,
  - Waste disposal.
- This development will promote the minimisation of waste arising and seek to maximise the use of recycled materials in construction.

- Where feasible, excavation materials will be reused to facilitate the construction of the development.
- The frame to the house and the roof will be prefabricated off site from Structurally Insulated Panels. This will reduce the amount of waste created, as nothing will be cut on the site. The off cuts in the factory are also re-cycled; and,
- The principal contractor will implement sound environmental management practices and consideration for neighbouring sites during their activities on-site.

The proposed development will look to **reduce and manage waste** in accordance with **South Ribble's Climate Emergency declaration**.

#### 4.6.2 Operational Waste

The operational waste strategy for the scheme focuses on the segregation of waste at source, in order to maximise the potential for building users to recycle. All users will be informed on collection frequency by the council, as well as guidance on local recycling facilities to assist with the management and storage of waste. The following measures will therefore be installed:

- Waste will be segregated at source with the help of split bins to receive multiple streams of waste – general, recyclables and compost; and,
- Residents will be responsible for moving their waste to an area of hardstanding to be collected by refuse operators on the designated collection day.

Recycling will be maximised to **avoid 65% of municipal waste being sent to landfill**.

#### 4.7 Pollution

To reduce the schemes impact on the surrounding communities and environments, the proposals will include the following:

- The frame to the house and the roof will be prefabricated off site from Structurally Insulated Panels. This will reduce the dust and the noise of the main frame construction and reduce the amount of waste created, as nothing will be cut on the site;
- The external lighting strategy will be designed to reduce unnecessary light pollution through effective design, energy consumption and nuisance to neighbouring properties;
- Pollution Prevention Guidance will be adhered to in respects of air (dust) and water (ground and surface) pollution during the demolition and construction phase; and,

- Dust suppression measures will also be put in place as part of the Main Contractor's Environmental Management Plan, such that any potential risks to watercourses or the neighbouring properties are minimised.

**The principal contractor will put measures in place to ensure that the surrounding area will not be polluted** as a direct result of the activities on site during the construction phase.

## 4.8 Health and Wellbeing

To enable the occupants of the proposed development to lead lower impact lifestyles and enhance their quality of life, the following measures will be delivered:

- Future residents will have direct access and views of an area of outstanding natural beauty, plus access to garden space allowing residents to interact with nature; and,
- The large areas of glazing will allow large amounts of natural daylight to enter the property, thereby reducing the need for artificial lighting.

The proposed development will foster a **well-designed, beautiful and safe place**, with accessible services and **open spaces**, and **support residents' health, social and cultural well-being in accordance with the NPPF**

## 4.9 Transport

A review of the most appropriate and sustainable modes of transport has been conducted in order to assess the feasibility of each transport option available to the future occupiers of the proposed development. The conclusions that can be drawn from this appraisal are as follows:

### 4.9.1 Public Transport

- The nearest bus stops are located on Clitheroe Road, approximately a twenty-minute walk from the site; and,
- Whalley train station is within one mile from the development, approximately a sixteen-minute drive away.

### 4.9.2 Cycling and Walking

- Both Higher Road and Forty Acre Lane are quiet lanes providing safe routes to commute by these modes of transport;
- The proposed scheme will provide adequate cycle storage space in the garage; and,
- The nearby village, Longridge, hosts a range of amenities and can be accessed within under a twenty minute cycle.

Despite the sites rural location, it is possible to **access the site, surrounding areas and public transport links via bicycle**.

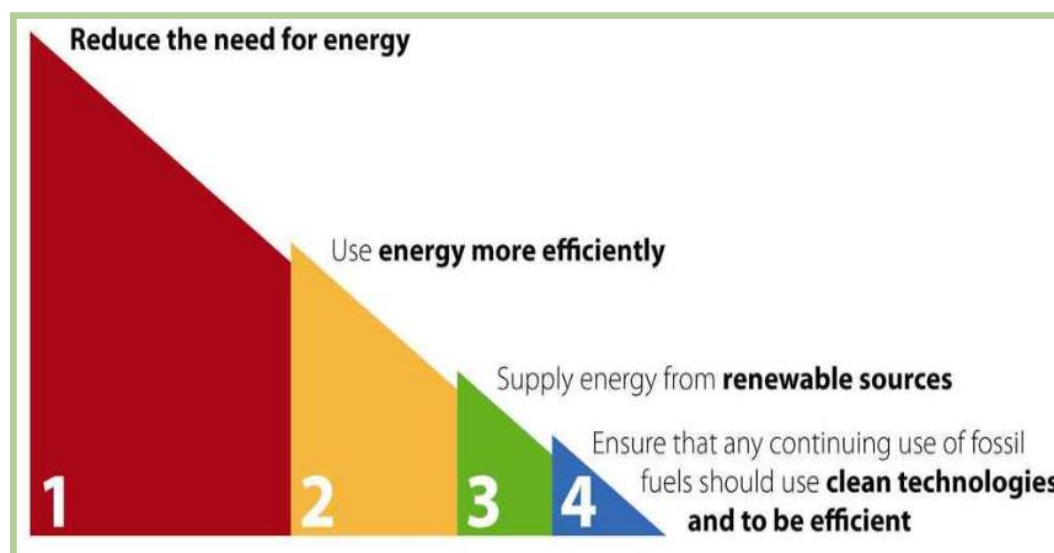
## 5. ENERGY STRATEGY

The energy strategy for this development prioritises an enhanced ‘fabric led’ solution coupled with ‘full electric’ servicing provision. An enhanced building fabric specification throughout the scheme allied to efficient servicing and controls, will achieve compliance with the new build carbon dioxide emission reduction and primary energy targets stipulated by Building Regulation, Part L Approved Document Volume 1 (2021). The dwelling will also be net zero carbon during operation for regulated energy demand.

The Energy Hierarchy (see Figure 5.1) provides a framework to guide energy policy and decision making to achieve practical and cost-effective carbon emission reductions. The energy hierarchy is built upon four principles:

- i. **First Principle**
  - o Reduce the need for energy.
- ii. **Second Principle**
  - o Use energy more efficiently.
- iii. **Third Principle**
  - o Supply energy from renewable sources.
- iv. **Fourth Principle**
  - o Ensure that any continuing use of fossil fuels should use clean technologies and be efficient.

Figure 5.1 – The Energy Hierarchy



In accordance with Ribble Valley Borough Council policies, the Energy Hierarchy has been used as a framework to guide this energy strategy to achieve practical and cost-effective carbon emission reductions. It is intended that the construction, design and specification proposed for this scheme will deliver a development that is inherently efficient and cost-effective during occupation.

## 5.1 First Principle – Reduce the Need for Energy

The standard measurement of heat transfer through a given building material or construction type is the U-value ( $W/m^2K$ ). The lower the U-value, the more slowly heat transfers and is lost out of a building. In buildings, heat loss generally occurs through the following main areas and elements of the construction:

- Ground Floor;
- External Walls;
- Roofs;
- Doors and windows;
- Thermal bridging; and,
- Uncontrolled ventilation.

The scheme will include numerous efficiency measures designed to reduce heat losses and minimise energy demand in accordance with the first principle of the energy hierarchy, including:

- ✓ High performance u - values;
- ✓ Reduced thermal bridge heat losses;
- ✓ Efficient form of construction; and,
- ✓ Low design air permeability target.

This development will benefit from a material and **design specification that is aligned with Passivhaus principles.**

This 'fabric led' approach to minimising energy demand and associated carbon dioxide emissions through the performance of the thermal envelope is aligned with the first principle of the energy hierarchy, which states that reduction in energy demand should be achieved initially by energy efficiency.

The proposed material specification that will be incorporated throughout to limit heat loss and ensure efficient operation is presented in Table 5.1.

*Table 5.1 – Proposed Fabric Specification*

Item	Proposed Specification
Ground & Exposed Floor	U=0.12 $W/m^2K$
External Wall	U=0.13 $W/m^2K$
Windows & Roof Lights	U=0.86 $W/m^2K$ – Triple glazed
Door	U=0.64 $W/m^2K$
Roof	U=0.12 $W/m^2K$
Air Permeability	0.60 $m^3/hm^2$ (@50Pa.)
Cold Bridge	Y-value of 0.05 applied

This material specification and design will however provide the following benefits:

- **Very High performance thermal insulation** will ensure low U-values for all heat loss elements and will minimise heat loss through the building's thermal envelope;
- **Thermally efficient, 'A' rated, triple glazed windows** will be specified with argon gas fill and low emissivity coatings to limit heat loss through the pane. Thermal breaks will be incorporated

within the frames of the vision panels to further limit heat loss. The glazing g value will be specified to optimise beneficial solar gains but limit the propensity for the building to overheat;

- **Thermal mass** (associated with this type of construction) helps stabilise the internal temperature and provides a largely self-regulating environment, reducing the risk of overheating and the need for mechanical cooling in summer. Furthermore, this daily cycle of absorbing and releasing heat continues on a year-round basis and can reduce the energy needed to keep a building warm during the heating season. This works through the ability of thermal mass to capture and recycle solar and incidental heat gains;
- **Extremely low air permeability** (design air permeability targeting  $0.60\text{m}^3/\text{hm}^2$ ) will minimise uncontrolled ventilation. This will reduce heat losses and provide high levels of occupant comfort; and,
- **Attention to cold bridging junctions**, including the provision of insulation to reduce heat and limit heat losses that occur at the junctions between building elements and around openings, will significantly improve the emission rate of the dwelling. A low Y-value (sum of cold bridging) of  $0.05\text{W}/\text{mK}$  has been specified in-line with the Passivhaus principle of minimising heat loss through cold bridges.

This enhanced fabric specification **will align with Passivhaus standards and will help to create a scheme which significantly exceeds the requirements stipulated within Building Regulation Part L Approved Document Volume 1 (2021) compliance criteria.** It ensures an inherently energy efficient development, focussing upon limiting demand side reductions in accordance with the energy hierarchy and **demonstrates the highest standards in architecture in response to Paragraph 84 of the NPPF.**

## 5.2 Second Principle - Use Energy More Efficiently.

As per the second principle of the energy hierarchy, the operational efficiency of the dwelling will be optimised via the use efficient mechanical and electrical systems including the use of 100% low energy and LED lighting provision and the incorporation of sophisticated control systems for the space and water heating.

The proposed building services that will be incorporated to ensure efficient servicing of the dwelling are presented in Table 5.2 below.

*Table 5.2 – Proposed Mechanical and Electrical Specification*

Item	Proposed Specification
Ventilation	Mechanical Ventilation with Heat Recovery
Lighting	100% 'Low E' / LED, 120lm/W
Space Heating	High Efficiency Air Source Heat Pump
Water Heating	From Main Heating Source (heat pump)
Heating Controls	Time and Temperature Zonal Control
Additional Renewables	Photovoltaics – See Section 6

The mechanical and electrical specification will provide the following benefits:

- **Mechanical ventilation with heat recovery (MVHR)** systems will be specified to maintain a healthy living environment and further reduce the heat losses and the energy demand of the dwelling. MVHR systems can recover up to 80% of heat from the extracted stale air from the dwelling by using a counter flow heat exchanger which 'pre-heats' cool incoming, fresh air. The outgoing and incoming air pass next to each other, but do not mix.

The design air permeability of 0.60m<sup>3</sup>/hm<sup>2</sup> (@50Pa.) for the development will virtually eliminate uncontrolled ventilation and ensure that the majority of the expelled stale air will pass across the heat exchanger, thereby boosting the energy reduction potential of these systems;

- **Air Source Heat Pumps** will provide space heating to the dwelling by extracting heat from the outside air to supply useful heat for space and water heating requirements. By applying additional energy input (in the form of electricity), it is possible to raise the temperature of the source heat to the temperature required.
- **Low energy and LED lighting** will be specified throughout the dwelling in order to maximise operational efficiencies and lifespan of the fittings. LEDs operate with an estimated energy efficiency of up to 90% when compared to traditional lighting and conventional light bulbs. This means that about c.90% of the electrical energy is converted to light, rather than wasted heat as in conventional bulbs;
- **Sophisticated heating controls** including time and temperature zonal controls will ensure the efficient delivery of heat to further reduce the dwelling's energy demand.

This mechanical and electrical specification **will significantly exceed the Building Regulation Part L Approved Document Volume 1 (2021) compliance criteria and will be net zero in operation for regulated energy.** This development will provide an **extremely efficient energy strategy** that will supplement the high standards of architecture **in support of Paragraph 84 of the NPPF.**

## 6. PROPOSED RENEWABLE ENERGY SOLUTION

The enhanced fabric specification will be supplemented by renewable energy technology as part of the site wide energy strategy to optimise the on-site building emission rate reductions.

### 6.1 Renewable Technology Feasibility

An analysis of the most appropriate renewable energy options has been undertaken to ensure compliance with Building Regulation Part L.

A number of renewable energy technologies have been considered for this site, including:

- Solar hot water;
- Photovoltaics (PV);
- Wind;
- Air source heat pumps;
- Ground source heat pumps; and,
- Biomass heating.

A review of the development proposals and site location concludes that the Photovoltaic Panels (PV) and Air Source Heat Pumps are feasible for this scheme, as detailed below in Table 6.1.

*Table 6.1 – Renewable Technologies Review*

Technology	Description	Advantages & Limitations	Feasibility
Solar Hot Water	Solar Hot Water utilises the energy in sunlight and diffuse daylight to heat water for use in buildings. The main component of any solar water heating system is the collector, which absorbs the radiant energy of the sun and converts it to heat energy.	<ul style="list-style-type: none"> <li>✓ Low maintenance.</li> <li>✓ Feasible for small scale developments.</li> </ul>	<p><b>No</b> - This technology is not considered to be a feasible option for this site as these solar thermal technologies make only a relatively limited contribution to reducing the building's emissions. Furthermore, there are potential problems associated with routing the pipework through the dwelling.</p>
		<ul style="list-style-type: none"> <li>✗ Panels ideally facing south at 30° tilt for optimum efficiency.</li> </ul>	
Photovoltaics (PV)	Photovoltaic (PV) panels harness solar thermal energy and convert it into electricity which can then be used within a building. The panels may be roof or floor mounted and orientated in a southerly direction to enable this technology to operate efficiently.	<ul style="list-style-type: none"> <li>✓ Low maintenance.</li> <li>✓ Easy to integrate into buildings design.</li> <li>✓ Cost of PV is constantly dropping.</li> </ul>	<p><b>Yes</b> – This technology is considered feasible and will be installed on the flat roof of the first floor and orientated due south to optimise efficiency.</p>
		<ul style="list-style-type: none"> <li>✗ Panels ideally facing south at 30° tilt for optimum efficiency.</li> <li>✗ Overshadowing will reduce performance.</li> <li>✗ Can require significant roof space.</li> </ul>	

Technology	Description	Advantages & Limitations	Feasibility
Wind Turbines	Wind generation equipment harness the wind to turn a propeller and in doing so, drive an alternator to generate electricity. The turbines may be pole or roof mounted.	<ul style="list-style-type: none"> <li>✓ Low maintenance.</li> <li>✓ Excess electricity can be exported to the grid.</li> <li>✓ Vertical Axis Turbines can operate at wind speeds as low as 2m/s.</li> </ul>	<p><b>No</b> – Wind turbines are considered unsuitable for this site due to a poor wind resource and lack of space to locate the turbines. Integrating these systems at height on the roof is not considered feasible due to the associated noise, vibration, and structural stresses upon the buildings. Furthermore, there are planning issues and perceived safety concerns with this technology.</p>
		<ul style="list-style-type: none"> <li>✗ A wind speed of at least 6m/s is typically required for traditional turbines to operate efficiently.</li> <li>✗ Visual and noise impact risk.</li> </ul>	
Ground Source Heat Pumps	Ground source heat pumps collect low-grade heat from the ground to supply useful heat for space and water heating requirements. By applying additional energy input (in the form of electricity), it is possible to raise the temperature of the source heat to the temperature required.	<ul style="list-style-type: none"> <li>✓ Highly tested and efficient technology</li> <li>✓ Can be used for space and water heating.</li> <li>✓ Lifespan of 20-25 years.</li> </ul>	<p><b>No</b> – This technology is considered unsuitable for this site due to an insufficient area (based upon the proposed densities) to install a horizontal ground collector and the prohibitive costs and technical constraint of installing vertical boreholes.</p>
		<ul style="list-style-type: none"> <li>✗ Excavation works required for buried piping to be installed.</li> <li>✗ Planning permission potentially required for installation.</li> </ul>	
Air Source Heat Pump	Air source heat pumps collect low-grade heat from the air to supply useful heat for space and/or water heating requirements. They operate in the same way as a ground source heat pump, by applying additional energy input (in the form of electricity), it is possible to raise the temperature of the source heat to the temperature required.	<ul style="list-style-type: none"> <li>✓ Can be used for space and water heating.</li> <li>✓ Highly tested and efficient technology</li> <li>✓ Low maintenance.</li> <li>✓ Lifespan of 20-25 years.</li> </ul>	<p><b>Yes</b> – The incorporation of ASHPs is a technically feasible option for this development. The proposed unit will provide both space heating and domestic hot water for the development.</p>
		<ul style="list-style-type: none"> <li>✗ Reduced efficiency in cold conditions.</li> <li>✗ Requires a unit on the outside of the building</li> </ul>	
Biomass Heating	Biomass boilers typically burn wood chips or pellets as fuel to provide space heating and hot water.	<ul style="list-style-type: none"> <li>✓ Almost a carbon neutral technology.</li> </ul>	<p><b>No</b> – This technology is considered inappropriate for this type of development due to the need for a large fuel storage facility and frequent, large fuel deliveries combined with regular maintenance.</p>
		<ul style="list-style-type: none"> <li>✗ Frequent and large fuel deliveries.</li> <li>✗ Large fuel store required.</li> <li>✗ Regular maintenance.</li> </ul>	

## 6.2 Third Principle – Supply energy from renewable sources.

### 6.2.1 Photovoltaic Array

Photovoltaic (PV) arrays have therefore been selected as an appropriate renewable energy technology to contribute to the CO<sub>2</sub> emission reduction target for the development. PV arrays are relatively straightforward to install, benefit from low maintenance costs and will reduce the operational cost of the building. The use of PV in general at this site would provide the following benefits:

- Reducing the buildings electrical energy grid load;
- Simple installation and commissioning;
- Low maintenance; and,
- Reliable, proven technology.

#### *Proposed System Details –*

- It is proposed that PV panels will be mounted on the flat roof orientated due south at thirty degrees to maximise the efficiency of the array.

Table 6.2 presents the indicative PV capacity proposed for the scheme on the site to support the delivery of an EPC A rated and net zero dwelling and the alignment with Passivhaus Standards:

*Table 6.2 – PV Capacity Requirement*

Development	PV Specification (kWp)
Growing House	8.50

#### *Land Use –*

- There are no land use issues associated with PV technology at this site;
- The development has sufficient roof area to accommodate the PV arrays; and,
- The PV arrays can be installed as part of the roof system in order to minimise the visual impact.

#### *Local Planning Issues –*

- There are no planning policy issues associated with this technology and this type of technology.

#### *Noise Issues –*

- PV is silent in operation.

#### *Whole life cost and lifecycle impact –*

- Current installed costs for PV are approximately £1,500 / kWp.
- Additional costs throughout the system's thirty-year lifecycle are limited to:
  - Cleaning of the arrays; and,
  - Replacement of the DC / AC inverter unit which typically have a lifespan of around ten years.

### 6.2.2 Air Source Heat Pumps

The proposed packaged system that will serve this development will be an intelligent system that provides both space heating and hot water efficiently.

The basic components of an air source heat pump package comprise a hot water cylinder, heating coil, extractor fan and a heat pump linked to the heat distribution radiators and/or underfloor emitters.

This solution would provide the following benefits:

- Highly energy efficient space and water heating system;
- This technology benefits from a low 'carbon footprint' due to the inherent efficiency of the heat pump process. It is a well-established technology with an anticipated long lifespan - with proper care they can be operational for up to 20 years;
- Omission of fossil fuel (has) connection from the scheme will enable the development to track the decarbonisations of the UK electricity grid over time and reduce operational carbon emissions as a consequence; and,
- There are no fuel storage issues associated with heat pumps.

ASHPs primarily consume grid mix electricity which is, in part (albeit diminishing) sourced from a mix of fossil fuels / LZC and nuclear.

### 6.3 Fourth Principle – All Electric Energy Strategy

The all-electric energy strategy will primarily consume grid mix electricity which is, in part sourced from a mix of fossil fuels / LZC and nuclear.

The inherent characteristics of the proposed air source heat pump will ensure that fossil fuels are consumed efficiently, in accordance with the 4<sup>th</sup> principle of energy hierarchy.

### 6.4 Decarbonisation

As the UK electricity grid's CO<sub>2</sub> footprint continues to improve, so too would the carbon dioxide emissions associated with the operational phase of the proposed scheme, which benefits from a 'full electric' energy strategy.

UK grid mix electricity carbon emissions will decrease significantly by 2035, with the carbon intensity of electricity generation falling by 93% between 2020 and 2035. This is due to the progressive shift away from fossil fuels as demonstrated in Figure 6.1.

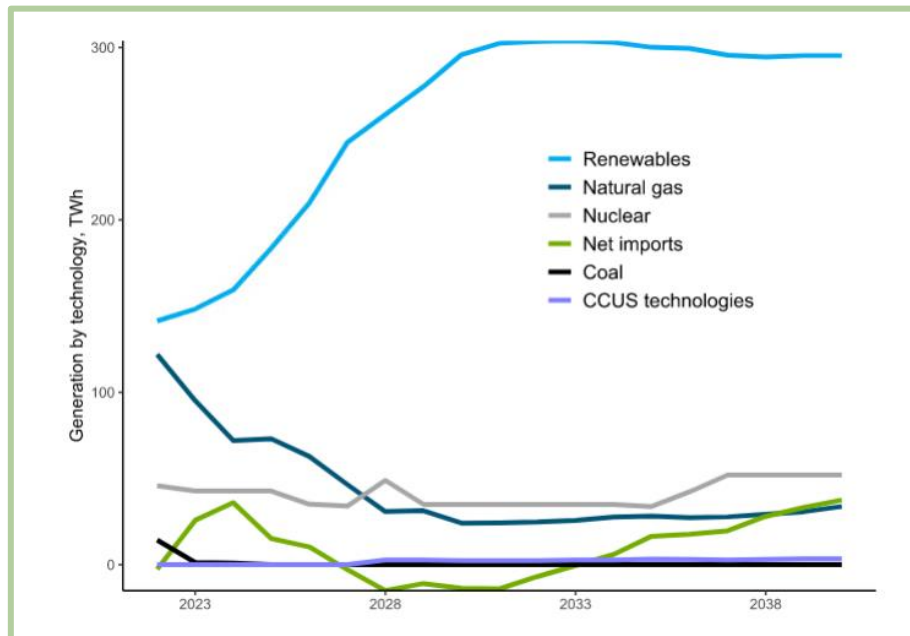
The energy strategy proposed for the scheme uses a combination of air source heat pumps and photovoltaics.

The use of heat pumps will ensure that fossil fuels converted and distributed through the National Grid as electrical energy will be consumed cleanly and efficiently.

Electricity is now recognised as a less carbon-intensive fuel source than mains gas and other fossil fuels, which is only likely to improve as the percentage of electricity generation from renewable technologies increases.

Therefore, this will further support the schemes move towards operational net zero carbon.

Figure 6.1 - Electricity generation by Fuel Source, TWh



Source – BEIS, Energy and Emissions Projections (2022)

## 7. CARBON DIOXIDE EMISSIONS CALCULATIONS

In order to demonstrate the environmental benefits associated with the energy strategy for the proposed dwelling, approved SAP 10 software has been used to generate a representative energy demand model for the development. SAP software calculates the regulated energy demand and associated carbon dioxide emissions in accordance with the requirements of Building Regulations, Part L Approved Document Volume 1 (2021) that this development will be constructed in compliance with.

### 7.1 Regulated Energy Performance Calculations

Table 7.1 below presents a summary of the results, which show the dwelling emission rate and (regulated) energy demand performance associated with the proposed energy strategy for the representative dwelling.

*Table 7.1 – Calculated Regulated Building Emission Rates*

	Growing House
Dwelling DER (kgCO <sub>2</sub> /m <sup>2</sup> /yr.)	-0.10
Dwelling TER (kgCO <sub>2</sub> /m <sup>2</sup> /yr.)	5.79
% DER Reduction over AD: Volume 1 (2021)	<b>101.73</b>
Dwelling DPER (kWh/m <sup>2</sup> /yr.)	5.76
Dwelling TPER (kWh/m <sup>2</sup> /yr.)	36.20
% DPER Reduction over AD: Volume 1 (2021)	<b>84.10</b>
Dwelling DFEE (kWh/m <sup>2</sup> /yr.)	37.14
Dwelling TFEE (kWh/m <sup>2</sup> /yr.)	51.55
% DFEE Reduction over AD: Volume 1 (2021)	<b>27.96</b>

The development will incorporate an enhanced material specification along with high quality design and construction standards, in order to improve the energy efficiency of the building through a 'fabric led' energy strategy, allied to efficient mechanical and electrical systems.

This proposed material specification will align with Passivhaus standards and will help to create a scheme which significantly exceeds the fabric targets stipulated within Building Regulation Part L Approved Document Volume 1 (2021) by a minimum of 27.96%. It ensures an inherently energy efficient development, focussing upon limiting demand side reductions in accordance with the energy hierarchy and demonstrates the highest standards in architecture in response to Paragraph 84 of the NPPF.

The proposed development **has the potential to secure a minimum carbon dioxide reduction rate of 101.73%**, thereby significantly improving upon current Part L Volume 1 (2021) requirements. Due to having over a 100% carbon dioxide reduction rate, the building will therefore be **zero carbon in terms of regulated energy demand**.

## 7.2 Unregulated Energy Demands

Unregulated emissions are emissions produced directly or indirectly by a household through use of personal energy consuming items. These might include kitchen and other electrical appliances.

The unregulated emissions associated with the use of electrical appliances are calculated in accordance with Standard Assessment Procedure 10.2 (SAP 10.2) methodology, section L2.

Section L13 provides the steps to calculate an initial value of annual energy use in kWh for appliances, achieved by multiplying the total floor area by the number of assumed occupants (calculated in accordance with SAP 10.2. Table 1b). The energy usage for any given month is then calculated within step L14, and step L15 provides the method to calculate the sum of monthly values,  $E_A$ .

Finally, step L17 calculates the annual CO<sub>2</sub> emissions in kg/m<sup>2</sup> /year associated with the use of electrical appliances by multiplying the sum of monthly values,  $E_A$ , by the emissions factor for electricity (SAP 10.2 Table 12) and dividing the result by the total floor area.

Table 7.2 below presents a summary of the annual CO<sub>2</sub> emissions associated with the development appliances.

*Table 7.2 – Calculated Unregulated Building Emission Rates – Electrical Appliances*

	Growing House
kgCO <sub>2</sub> /m <sup>2</sup> /yr.	21.73
kgCO <sub>2</sub> /yr.	9789.63

It is clear that the unregulated emissions contribute significantly towards the overall (total) emissions of the proposed scheme, and that the contribution of PV is insufficient to offset the remaining emissions for the dwelling to be classified as a net zero building. Despite this, the scheme is highly efficient, and the regulated energy demand CO<sub>2</sub> emissions will be carbon negative in operation.

It is recognized that the occupant's lifestyle requirements also have the potential to limit unregulated emissions through the following measures:

- Behavioural changes to limit impact (utilising the dwelling's appliances and systems at times of peak PV energy generation, for example);
- Specification of highly efficient (A++) rated equipment; and,
- Installation of smart control systems and powering down when not in use.

The appliances specified will be fully electric, and they too will therefore benefit from the decarbonisation of the grid over time (see Figure 6.1), ultimately further lowering the operational emissions of the proposed scheme, towards a net zero carbon dwelling.

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## 8. CLIMATE CHANGE EMERGENCY

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In 2019, South Ribble Borough Council declared a climate emergency, pledging to work to make the borough carbon neutral by 2030.

In order to tackle this, a Climate Emergency Working Group was formulated, and a Climate Emergency Strategy was developed followed by a Climate Emergency Action Plan.

The main areas to be addressed, which will help to reduce carbon emissions within the borough include:

- Transport
- Energy and the Built Environment
- Waste and Water
- Consumption
- Offsetting

In support of this, the developer wishes to highlight the following measures that will form part of the specification of this development:

- There are bus stops located within close proximity to the site, which can be accessed on foot or by bike;
- There will be space for cycle storage provision in the garage of the development
- An energy strategy that exceeds Building Regulations, Part L Approved Document Volume 1 (2021), in relation to reducing carbon emissions and minimising energy consumption;
  - The scheme will be net zero carbon in operation for regulated energy demand;
- This development will promote the minimisation of waste arising and seek to maximise the use of recycled materials in construction. Plus, the operational waste strategy for the scheme focuses on the segregation of waste at source, in order to maximise the potential for building users to recycle.
- The proposed development is not within an area at risk from flooding from rivers and it will manage surface water in line with the sustainable drainage principles.
- A water efficiency strategy will be determined for the site and will include for the provision of 'A' rated appliances as a minimum.
- The development will be designed to incorporate features that will serve to reduce energy demand, and in turn, carbon emissions arising from access to the building:
  - Air Source Heat Pump;
  - Photovoltaics; and,
  - LED lighting.

These commitments, in combination, seek to work towards the carbon reduction target of no more than 1.5°C global temperature increase and assist the council in meeting their Climate Change Emergency objectives.

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## 9. CONCLUSION

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This statement has reviewed the sustainability performance of the proposed Growing House Road development against national and local planning policies. The conclusions that may be drawn from the review are as per the following:

### Sustainability Performance –

- The scheme will be specified with **efficient water fixtures and controls**. This will achieve a calculated daily consumption of **<100 litres/person/day in line with Policy DME6 - Water Management**.
- The site is in an area at low risk from flooding, with it being **located within a Flood Risk Zone 1** in accordance with **Policy DME6 - Water Management**.
- This development will **promote the minimisation of waste** arising and seek to maximise the use of recycled materials in construction. Plus, the operational waste strategy for the scheme focuses on the segregation of waste at source, in order to **maximise** the potential for building users to **recycle**.
- The proposed development will **prioritise sustainable construction techniques** where feasible in **accordance with Policy DMG1 – General Considerations**.

### Energy Strategy –

The scheme will be designed and specified in accordance with **the principles of the energy hierarchy** and improve upon the **carbon dioxide (CO<sub>2</sub>) reduction targets and guidance set by the council**:

- The enhanced fabric specification **will align with Passivhaus standards** and will help to create a scheme which **significantly exceeds the requirements stipulated within Building Regulation Part L Approved Document Volume 1 (2021)**.
  - The proposed specification will ensure an **inherently energy efficient development**, focussing upon limiting demand side reductions in accordance with the energy hierarchy and **demonstrates the highest standards in architecture in response to Paragraph 84 of the NPPF**.
- The proposed scheme will significantly exceed the requirements stipulated within Building Regulation Part L Approved Document Volume 1 (2021) by being **net zero carbon for regulated energy** during operation with an expected **101.73% improvement over Building Regulations Part L Approved Document Volume 1(2021)**.
- The unregulated carbon emissions for the proposed scheme will **continue to reduce** in line with the decarbonisation of the national grid.
- The scheme will integrate an **efficient air source heat pump and a photovoltaic array** in order to significantly reduce the carbon emissions arising from the scheme.
- The proposed material and mechanical specification will **provide various benefits** including; **upgraded thermal insulation**, efficient mechanical servicing, and low energy lighting.

Furthermore, the proposals accord with the aims of the National Planning Policy Framework, as follows:

- The **re-use of the piece of land** will provide a development that inherently supports **sustainable accommodation space with access to local amenities and sustainable modes of transport**. The reuse of the site is also an efficient use of land and resources;
- **Construction practices that minimise adverse impacts on the environment** will be adhered to including a waste management strategy to reduce the quantity of waste generated, and to increase re-use and recycling, a commitment will be made to minimise waste and pollution; and,
- **Improving upon the regulatory Part L compliance criteria** will assist in lessening the impact of this development on the environment by way of reducing carbon emissions.

In conclusion, the proposed development will deliver a quality development of exceptional architecture, coupled with a highly efficient energy strategy which will **be net zero carbon for regulated in energy demand in accordance with Paragraph 84 of the NPPF**. This strategy has also been designed in accordance with the guidance provided by the council as well as national planning and regulatory standards.