



Brymbo Park

Renewable Feasibility Strategy

On behalf of **Brymbo Developments Limited**

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1 Executive Summary

1.1 Introduction

- 1.1.1 This Renewable Feasibility Strategy has been prepared by Stantec on behalf of Brymbo Developments Limited in support of an outline planning application for mixed use residential development (hereafter referred to as the “Proposed Development”) at the Former Brymbo Steelworks in Brymbo (hereafter referred to as “the Site”). It outlines relevant policies and targets that must be considered by the Proposed Development and investigates potential heating and renewable energy strategies. The Strategy considers opportunities to increase energy efficiency through site layout, building design and energy supply, as well as the suitability of incorporating heating, renewable and low carbon energy technologies.
- 1.1.2 This Strategy demonstrates the Proposed Development will comply with Building Regulations Part L and Policy RE1: Development and Renewable Energy/Low Carbon Technology of the emerging Wrexham Local Development Plan 2 2013-2018 (WLDP2). Note, this Local Development Plan has not yet been adopted.
- 1.1.3 The Proposed Development comprises the construction of up to 295 dwellings, provision of a primary school, a small district centre, multi-functional green infrastructure, surface water attenuation, vehicle accesses, car parking, engineering works, public footpaths and hard and soft landscaping, underground services, and all ancillary and enabling works, with all matters reserved except for access.

1.2 Feasibility Strategy

- 1.2.1 Several opportunities for incorporating renewable and low carbon energy generation technologies have been identified within the Strategy. Based on the Site location and Proposed Development, Air Source Heat Pumps (ASHPs), or Solar Photovoltaics (PV) are the most suitable .
- 1.2.2 Other technologies which are potentially suitable for the Site but require further investigation include electric battery storage and balancing plant, mechanical ventilation with heat recovery (MVHR), solar water heating, and direct electric heating and hot water.
- 1.2.3 The suitability of the various technologies will be reviewed as the detailed design progresses, allowing appropriate technologies to be delivered in response to regulatory changes, market forces and technological advances.

1.3 Energy Strategy

- 1.3.1 The Energy Strategy adopts the nationally recognised energy hierarchy of:
 - 1) Reducing energy demands in the first instance ('Be Lean');
 - 2) Before using energy efficiently and cleanly ('Be Clean'); and only then,
 - 3) Using renewable and low carbon technologies ('Be Green'), where possible.
- 1.3.2 The fabric energy efficiency of the proposed buildings and dwellings will be designed to reduce heat demand and energy needs in line with policy requirements. This includes providing high levels of insulation and low air permeability.

2 Introduction

2.1 Overview

- 2.1.1 This Renewable Feasibility Study has been prepared by Stantec on behalf of Brymbo Developments Limited ('the Applicant') in support of an outline planning application for mixed use residential development at the Former Brymbo Steelworks in Brymbo. The Proposed Development is located within the administrative boundary of Wrexham County Borough Council (WCBC).
- 2.1.2 This Strategy examines the relevant energy policies and targets that the Proposed Development needs to consider and also reviews the suitability of incorporating renewable, and/or low carbon energy generation technologies, as well as opportunities to increase energy efficiency through site layout, building design and energy supply. This Strategy demonstrates the Proposed Development will comply with Building Regulations Part L and Policy RE1: Development and Renewable Energy/Low Carbon Technology of the emerging Wrexham Local Development Plan 2 2013-2018 (WLDP2). Note, this local development plan has not yet been adopted.
- 2.1.3 Between the creation of this Strategy and construction of the Proposed Development, the UK will see a shift in terms of energy policy, technology, and consumer needs. The Strategy therefore sets out a framework for achieving energy targets whilst recognising the importance of maintaining flexibility. As part of the approval of reserved matters planning applications, detailed energy statements will be provided to confirm the performance of the specified energy efficiency measures and low carbon and renewable energy technology. This means that this Strategy will not define the final energy and heating solutions for Brymbo Park but rather this is a part of the initial planning stages which will evolve throughout the project lifecycle.

2.2 Report Structure

- 2.2.1 The Strategy is structured as follows:
- **Section 2: Introduction** – introduces the Site and the Proposed Development.
 - **Section 3: Policy and Regulation Context** - sets out a summary of national and local policy relevant to the Proposed Development.
 - **Section 4: Methodology** – outlines the approach undertaken to produce the Renewable Feasibility Strategy.
 - **Section 5: Feasibility Strategy** – evaluates the feasibility of low carbon and renewable technologies for the Proposed Development.
 - **Section 6: Energy Strategy** – introduces the energy hierarchy and explains each stage, “be lean”, “be clean” and “be green” and their relevance to building design.
 - **Section 6 - Conclusions** – summarises the report.

2.3 The Site

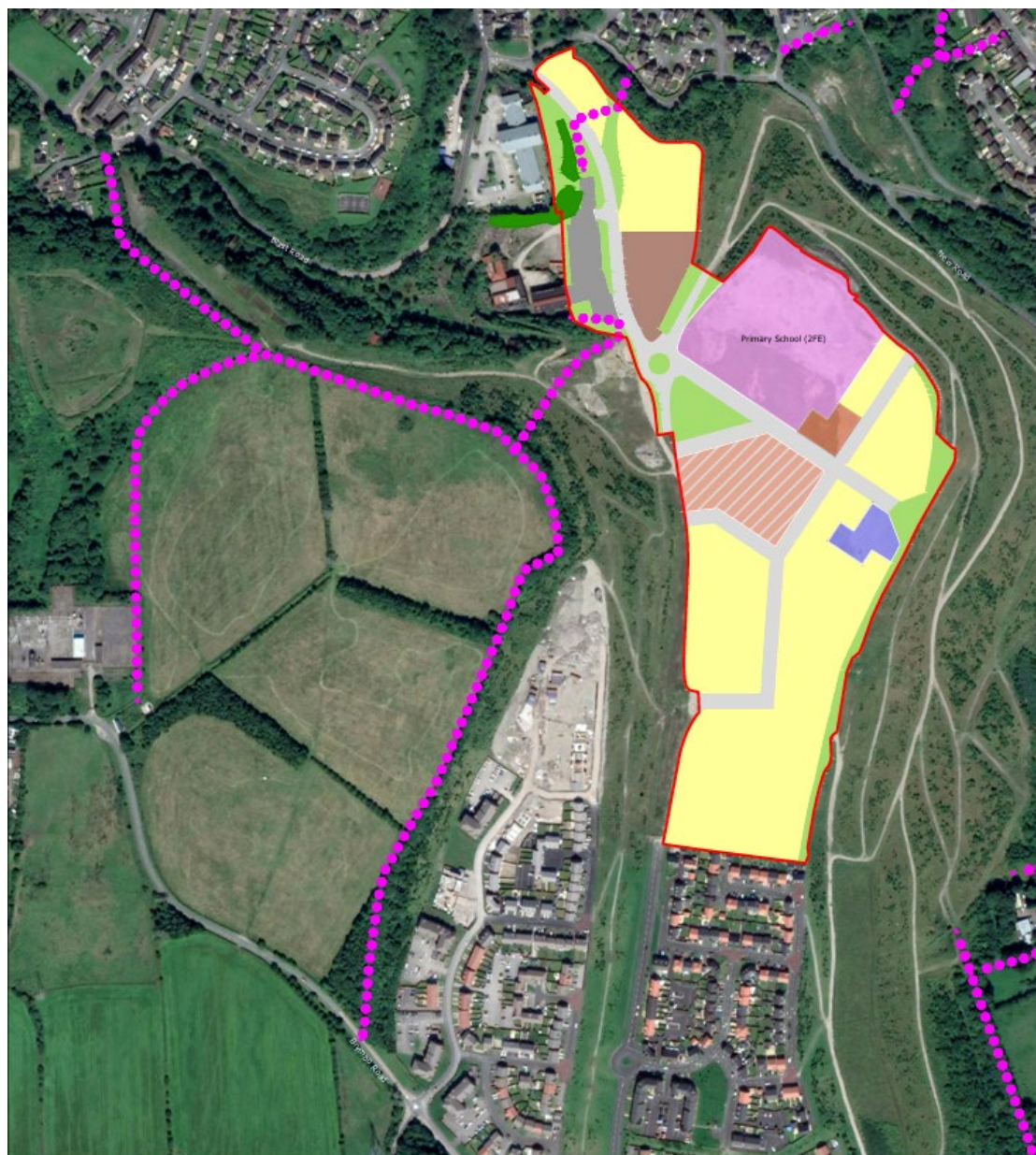
- 2.3.1 The Site comprises an area of former industrial land which is part of the wider land holding of Brymbo Steelworks. Some of this land has been redeveloped and the Site has been remediated and regraded into a plateau with some vegetative cover and a steep sloping bank separating land from the west. Phoenix Drive is located adjacent to the to the western boundary and runs north to south. Phoenix Drive is the main route into Brymbo and Wrexham to the south east.

- 2.3.2 The Site is within Brymbo village and community in Wrexham County Borough. Existing residential properties and commercial development are present to the north, south, and east and west of the Site. To the north east is the Brymbo Enterprise Centre which is adjacent to the proposed Heritage Centre. Immediately east there are trees and dense vegetation and to the west there are agricultural land and fields, a substation and farmsteads.
- 2.3.3 To the east are existing footpaths in proximity to Kent Road (B5101), and to the west there are existing footpaths running from Brymbo Road to Brake Road to the west. Footpaths are present to the north adjacent to residential property and within the site boundary in the west and north of the Site.

2.4 The Proposed Development

- 2.4.1 The Proposed Development comprises the construction of up to 295 dwellings, provision of a primary school, a small district centre, multi-functional green infrastructure, surface water attenuation, vehicle accesses, car parking, engineering works, public footpaths and hard and soft landscaping, underground services, and all ancillary and enabling works, with all matters reserved except for access.
- 2.4.2 The quantum of development is as follows:
- Up to 295 residential dwellings (Use Class A3)
 - Primary School (2FE)
 - Foodstore (up to 930 sqm) (Use Class A1)
 - Retail (up to 465 sqm) (Use Class A1)
 - Pub/Restaurant (up to 372 sqm) (Use Class A3)
 - Health Care (up to 465 sqm) (Use Class D1)
- 2.4.3 A new district centre will be located centrally to provide connections to the south and north of Brymbo as well as within the Proposed Development. The Proposed Development will incorporate active travel routes ensuring good connectivity throughout the Site and will link with the existing network. Phoenix Drive contains a footway with street lighting and existing public rights of way will be enhanced and maintained where appropriate. The new district centre, improved public transport service and provision of vehicular and cycle parking in line with minimum standards within local planning policy guidance will reduce the need for travel by car.
- 2.4.4 An extract of the Land Use Plan is shown in **Figure 2.1**, with the full version shown in **Appendix A**.

Figure 2.1: Land Use Plan



3 Legislation and Planning Policy Context

3.1 Overview

- 3.1.1 This section provides a summary of the key energy requirements for the Proposed Development, as defined by national policy, regulation, and local planning policies. More detailed policy information can be found in **Appendix A**.

3.2 National Context

- 3.2.1 The UK Government has acknowledged that climate change is a threat to our way of life and the natural world. It has also acknowledged that a "green recovery" from the coronavirus pandemic is an opportunity for the UK to boost economic growth, reduce inequality and improve our environment as well as helping to mitigate the effects of climate change. Quantitative targets have been set for reducing greenhouse gas (GHG) emissions in primary legislation, which is summarised below.

Climate Change Act 2008 and 2019 Amendment (Net Zero)¹

- 3.2.2 The Climate Change Act (2008) sets a legally binding target for reducing greenhouse gas (GHG) emissions, in particular carbon dioxide (CO₂), by at least 80% (on 1990 levels) by the year 2050 in the UK, and a requirement that domestic emissions are reduced by no less than 3% each year.
- 3.2.3 In setting these targets, the Act established the Committee for Climate Change (CCC), which is responsible for setting binding interim targets for the Government over five-year periods. In May 2019, the CCC recommend a new emissions target for the UK: a 100% reduction ('net zero') in greenhouse gases by 2050. This change in legislation mandating a 100% reduction in CO₂ emissions by 2050 was approved by the House of Commons on 24th June 2019 and the House of Lords on 26th June 2019.

Welsh Government Climate Emergency

- 3.2.4 In April 2019, the Welsh Government declared a climate emergency and in June 2019 accepted the CCC's recommendation for a new emissions target, and set an ambitious target of net zero emissions no later than 2050.

Net Zero Wales Carbon Budget 2 (October 2021)²

- 3.2.5 The Welsh Government published its second statutory decarbonisation plan (Net Zero Wales Carbon Budget 2) in October 2021. This sets out the policies and approach it intends to take to meet Wales' second Carbon Budget (2021-25).

Part L Building Regulations (2010, updated 2022 for use in Wales)³

- 3.2.6 Approved Document Part L Volume 1 - Dwellings took effect on 23rd November 2022 and Volume 2 – Buildings other than dwellings took effect on 29th March 2023. The document provides guidance for complying with the energy efficiency requirements of Building Regulations 2010 for

¹ The Climate Change Act 2008 (2050 Target Amendment) Order 2019. Available from: <https://www.legislation.gov.uk/ukdsi/2019/9780111187654>

² Net Zero Wales Carbon Budget 2 (2021 to 2025).

³ The Building Regulations 2010 Approved Document L Volume1 – Dwellings Conservation of Fuel and Power. Available from: <https://www.gov.wales/sites/default/files/publications/2022-05/approved-document-l-vol-1.pdf>

Wales (as amended). The Proposed Development is a mixed-use development therefore both volumes are applicable.

- 3.2.7 The changes to Approved Document L enhance the performance requirements for compliance. For new dwellings, 37% carbon reduction is expected for compliant buildings in contrast with Part L 2014. For new non-domestic buildings, on average, 28% carbon reduction is expected for compliant buildings in contrast with the previous Part L 2014.
- 3.2.8 The national target for energy at the Proposed Development is the Part L Building Regulations. This is subject to further amendments in the future.

Planning Policy Wales (Edition 11) (February 2021)⁴

- 3.2.9 Planning Policy Wales (PPW) edition 11 was published in February 2022 and sets out the land use planning policies of the Welsh Government. The primary objective of PPW is to ensure that the planning system contributes towards the delivery of sustainable development and improves the social, economic, environmental and cultural well-being of Wales. PPW highlights that a well-functioning planning system is fundamental for sustainable development and achieving sustainable places.
- 3.2.10 PPW outlines that the Welsh Government planning policy expects all new development to mitigate the causes of climate change in line with the Energy Hierarchy.
- 3.2.11 Development proposals should reduce carbon and greenhouse gas emissions associated with the development and incorporate features to improve climate resilience. Applications for major development should be accompanied by an Energy Report including details on renewable energy technologies and energy efficiency.
- 3.2.12 Developers should consider future requirements for reducing carbon emissions in new buildings throughout the design phase as a result of any changes to Building Regulations in Wales and making sure the design aspects of requirements are considered as early as possible.

Prosperity for All: A Low Carbon Wales (March 2019)⁵

- 3.2.13 Prosperity for All: A Low Carbon Wales is the Welsh Government's first statutory decarbonisation plan. It sets out the Welsh government's approach to cut emissions and increase efficiency in a way that maximises wider benefits for Wales, ensuring a fairer and healthier society. It sets out a hundred policies and proposals that directly reduce emissions and support the growth of the low carbon economy.

Energy Generation in Wales 2022⁶

- 3.2.14 The Welsh Government altered their existing renewable energy targets in July 2023 to the following:
- Generating the equivalent of 100% of Wales' annual electricity consumption from renewable sources by 2035;
 - Installing 580,000 heat pumps across Wales by 2035; and

⁴ Planning Policy Wales Edition 11 February 2021. Available from: https://www.gov.wales/sites/default/files/publications/2021-02/planning-policy-wales-edition-11_0.pdf

⁵ Welsh Government 2019 Prosperity for All: A Low Carbon Wales. Available from: https://www.gov.wales/sites/default/files/publications/2019-06/low-carbon-delivery-plan_1.pdf

⁶ Energy Generation in Wales 2022. Available from: <https://www.gov.wales/sites/default/files/publications/2023-11/energy-generation-in-wales-2022.pdf>

- 1.5 GW of renewable energy capacity to be locally owned by 2035.

Future Wales: the National Plan 2040 (February 2021)⁷

- 3.2.15 Future Wales is the Welsh Government's National Development Framework and is the highest tier of the Development Plan in Wales. It sets out a strategy for addressing key national priorities through the planning system, which include achieving decarbonisation, climate-resilience and achieving net zero and the benefits of renewable energy. It makes reference to climate change, with projections showing an increased chance of milder, wetter winters and hotter, drier summers, rising sea levels and an increase in the frequency and intensity of extreme weather events.

Technical Advice Note 12 Design March 2016⁸

- 3.2.16 A series of Technical Advice Notes (TANS) supplement PPW. The most relevant to energy is Technical Advice Note 12 Design March 2016. The document outlines aspects of good design including considering the orientation of the building to maximise energy efficiency, minimising the energy demand and carbon emissions through zero carbon standards or incorporating the Energy Hierarchy, and using materials with lower energy inputs.

Practice Guidance Renewable and Low Carbon Energy in Buildings⁹

- 3.2.17 The Practice Guidance Renewable and Low Carbon Energy in Buildings July 2012 has been created to provide guidance on minimising the carbon footprint of buildings through incorporating renewable and low carbon energy technologies in the design. The document states these technologies should only be considered once the energy hierarchy has been implemented.
- 3.2.18 Detail is provided on the need to incorporate renewable and low carbon technologies, the Energy Hierarchy, practical aspects of designing and delivering renewable energy technologies, key factors to consider when assessing suitability of these technologies, different renewable and low carbon energy options, the financial cost of renewable or low carbon energy systems. The document provides a guide template to assist with carrying out a renewable and low carbon feasibility strategy.

Practice Guidance Planning for Sustainable Buildings July 2014¹⁰

- 3.2.19 The Practice Guidance Planning for Sustainable Buildings July 2014 provides guidance to enhance sustainable outcomes in a development including good design quality and building performance supporting local planning authorities implementing policy and deliberating planning applications. The document advises the wider site and context is considered before detail on building form and fabric and then technologies.
- 3.2.20 Detail is provided on insulation and U-values, airtightness, thermal bridging, thermal mass, embodied energy, Combined Heat and Power, heating, cooling and ventilation, hot water, electric power and appliances and renewable energy. The document states all new buildings must comply with Part L Building Regulations and demonstrate this through Standard Assessment Procedure (SAP) calculations.

⁷ Future Wales: The National Plan 2040. Available from: <https://www.gov.wales/future-wales-national-plan-2040-0>

⁸ Technical Advice Note 12 Design March 2016. Available from: <https://www.gov.wales/sites/default/files/publications/2018-09/tan12-design.pdf>

⁹ Practice Guidance Renewable and Low Carbon Energy in Buildings. Available from: <https://www.gov.wales/sites/default/files/publications/2018-11/renewable-and-low-carbon-energy-in-buildings-practice-guidance.pdf>

¹⁰ Practice Guidance for Sustainable Buildings July 2014. Available from: <https://www.gov.wales/sites/default/files/publications/2018-09/planning-sustainable-buildings.pdf>

3.3 Local Policy

Wrexham Unitary Development Plan 1996 – 2011 (UDP)¹¹

- 3.3.1 The WUDP was adopted in February 2005 and covers the administrative area of Wrexham Borough Council from 1996-2011. The WUDP is out of date as it only covers development up to 2011. Therefore, this has reduced the weight given to the WUDP in decision making.
- 3.3.2 The plan sets out the WBC's aspiration for development in the area and provides a framework for specific proposals and policies which are justified expanding on the strategic vision for the area. Policy EC16 relates to Brymbo Steelworks which was noted as a regeneration initiative priority. Energy is not covered in detail with the only relevant policy being Policy GDP1 - All new development should *"make the best use of design techniques, siting and orientation in order to conserve energy and water resources"*.

Wrexham Local Development Plan 2 2013-2028¹² (WLDP2)

- 3.3.3 The WLDP2 was reported to the Full Council on the 19th April 2023 and at this meeting they determined not to adopt the draft local development plan. An application was submitted to Judicially Review the decision and so once again the WLDP2 was reported to Full Council on 14th June 2023 who voted not to adopt the draft local development plan. The latest update is that the Welsh Government will consider WBC's decision to not adopt the WLDP2.
- 3.3.4 Within the latest version of the WLDP2 Policy RE1: *Development and Renewable Energy/Low Carbon Technology* is the most relevant to the Proposed Development and states the following:
- *"1. The Council [...] will encourage developers of the Key Strategic Sites and major sites (100 dwellings or more or development exceeding 1000m²) to incorporate schemes which generate energy from renewable and low carbon technologies unless it is demonstrated that it would not be financially or technically viable to do so. This includes opportunities to minimise carbon emissions associated with the heating, cooling and power systems for new development.*
 - *2. An independent energy assessment investigating the financial viability and technical feasibility of incorporating such schemes will be required to support applications."*

Design – A Guide for Developers and Architects when Designing Residential Development¹³

- 3.3.5 The Local Planning Guidance Note on Design is a guide for developers and architects when designing residential development and was adopted in June 2009. The guidance note provides additional detail relating to good design and sustainable buildings regarding WUDP policies. The document states that sustainable building principles assist with reducing dependence on non-renewable energy sources and minimise the impact on the natural environment and new development should provide measures for efficient energy use.

¹¹ Wrexham Unitary Development Plan 1996-2011. Available from:
<https://www.wrexham.gov.uk/sites/default/files/2023-04/udp-statement.pdf>

¹² Wrexham Local Development Plan 2 (LDP2) 2013 to 2028. Available from:
<https://www.wrexham.gov.uk/service/development-plans-and-other-planning-policy/wrexham-local-development-plan-2-ldp2-2013-2028>

¹³ Design – A Guide for Developers and Architects when Designing Residential Developments. Available from:
<https://www.wrexham.gov.uk/sites/default/files/2023-04/lpg-30e.pdf>

4 Methodology

4.1 Introduction

- 4.1.1 According to the Practice Guidance Renewable and Low Carbon Energy in Buildings (2012)¹⁴ there are four stages for integrating renewable energy generation into building development: scoping, technology selection, financial viability, and implementation and delivery.
- 4.1.2 The scoping stage should include establishing the vision and objectives of the project to guide the technology and feasibility stages. Next, the technology selection stage should assess the feasibility of potential technologies and identify the most suitable for incorporation within the Proposed Development. The financial viability stage considers the financial aspects including investment required, operation and maintenance costs and revenue generation. Finally, in the implementation and delivery stage the technologies to be incorporated into the Proposed Development are decided and concepts should be developed into workable solutions in the detailed design phase. Planning consents, licences, permits and any other regulatory compliance measures should be obtained at the implementation and delivery stage.
- 4.1.3 The Proposed Development is at the outline planning application stage meaning information to create a baseline energy profile is not yet available. Therefore, based on the information available at this stage this Strategy covers the scoping and technology selection stages only.

4.2 Scoping

- 4.2.1 A scoping exercise has been undertaken to establish the vision and objectives of the project to guide the technology and feasibility stages.
- 4.2.2 The objectives of the Proposed Development are as follows:
- To create a new vibrant and multifunctional heart of Brymbo;
 - Provide sustainable redevelopment of a brownfield site;
 - Meet Building Regulations Requirements;
 - Reduce greenhouse gas emissions; and
 - Reduce energy costs for future residents and occupiers.
- 4.2.3 A summary of the key scoping factors is presented in **Figure 4.1** and has been considered in determining the suitability of technologies. The subsequent paragraphs will go into additional detail on these factors.

¹⁴ Practice Guidance Renewable and Low Carbon Energy in Buildings. Available from:
<https://www.gov.wales/sites/default/files/publications/2018-11/renewable-and-low-carbon-energy-in-buildings-practice-guidance.pdf>

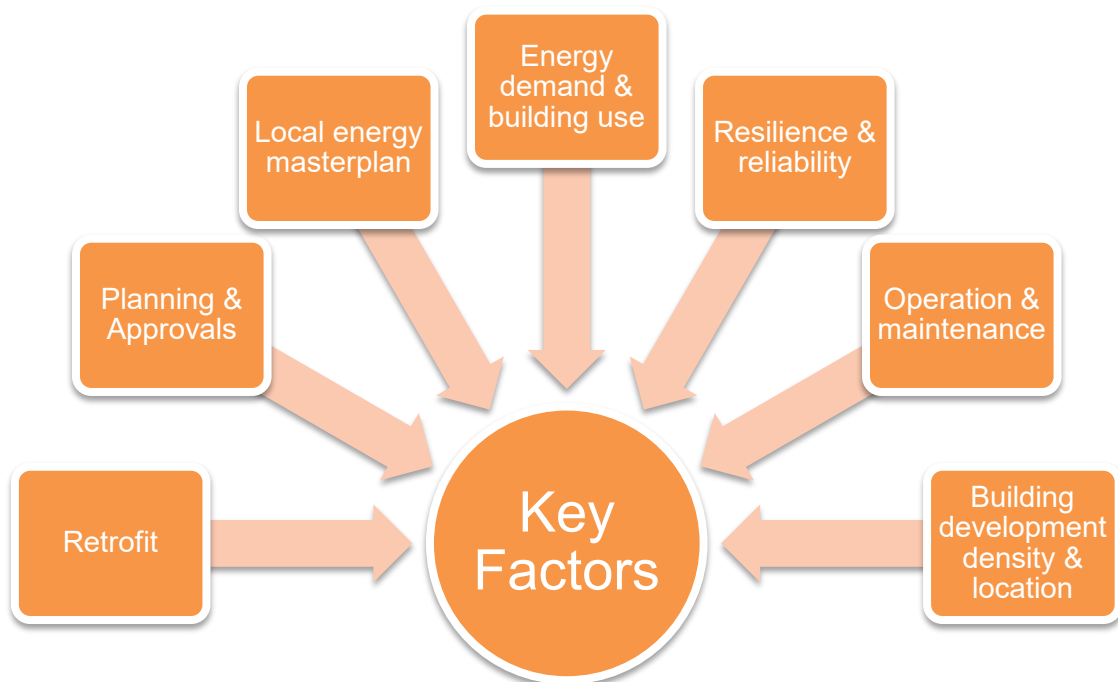


Figure 4.1: Overview of key scoping factors (Adapted from Practice Guidance Renewable and Low Carbon Energy in Buildings, 2012)

Retrofit

- There are no existing buildings on site. All buildings of the Proposed Development will be new therefore no retrofitting is considered.
- As retrofitting is not proposed it does not need to be considered at future design stages.

Planning & Approvals

- Large scale low carbon and renewable technologies may require planning permission and any licences or consents needed should be identified.
- Planning and approvals of technologies have been considered at a high level in this Strategy, further investigation is needed into the practicality and cost of any planning permissions, licences or consents needed for technologies at future design stages.

Local energy masterplan

- A local energy masterplan outlines the energy demand and supply alongside potential for combined heat and power and district heating. The evidence produced by this masterplan can help deliver energy targets, and provides information about the local needs and energy production which can assist with choosing the most suitable technologies for a development. There are no details on the local energy masterplan for the local area as at the time of writing this has not been produced.
- At future stages this should be monitored in case a local energy master plan is developed for the local area at a later date.

Energy demand & building use

- The building use of the Proposed Development is as follows:

- Up to 295 residential dwellings (Use Class A3)
- Primary School (2FE)
- Foodstore (up to 930 sqm) (Use Class A1)
- Retail (up to 465 sqm) (Use Class A1)
- Pub/Restaurant (up to 372 sqm) (Use Class A3)
- Health Care (up to 465 sqm) (Use Class D1)
- At this stage the building uses have been identified. There are no details on the heating and hot water demand requirements of the Proposed Development at this stage, further consideration of the expected occupiers heating and hot water needs should be given at future stages.

Resilience & reliability

- The selection of low carbon and renewable technologies incorporated into the Proposed Development should take into account the resilience and reliability of the technology as some technologies utilise intermittent energy sources e.g., PV and wind energy. Therefore, if these technologies are chosen a backup alternative energy supply or on site energy storage may be considered.
- The resilience and reliability of technologies have been considered at a high level in this Strategy, further investigation is needed into the resilience and reliability to determine the suitability in future design stages.

Operation & maintenance

- The ongoing costs of the technology once operational should be taken into account in addition to maintenance requirements throughout the lifetime of the technology. This will assist with identifying any technical difficulties with the technologies and identify the components of the technology.
- There are no other known operation and maintenance considerations at this stage, further consideration to the expected occupiers needs should be given at future stages.

Building development density & location

- The Site comprises an area of former industrial land which is part of the wider land holding of Brymbo Steelworks and is located within the village and community in Wrexham County Borough. Existing residential properties and commercial development are present to the north, south, and east and west of the Site. To the north east is the Brymbo Enterprise Centre which is adjacent to the Heritage Centre. Immediately east there are trees and dense vegetation and to the west there are agricultural land and fields, a substation and farmsteads.
- At this stage, the location of the Site is confirmed and type of development surrounding the Site is understood. However there are no details on the density of the Proposed Development at this stage, further consideration of the density of buildings should be given at future stages.

4.3 Technology Selection

- 4.3.1 There is no nationally agreed method for undertaking a feasibility strategy. The scoping factors above have been used to inform the outline assessment of the feasibility of low carbon and

renewable technologies. An assessment on the advantages and disadvantages of each technology has been carried out in addition to detail on the space requirements and practicality to install and maintain the technology. Based on this assessment the heating, low carbon, and renewable technologies have been categorised as most suitable, potentially suitable and not suitable technologies. It should be noted that this is an outline assessment, and the feasibility of technologies may change as the Proposed Development evolves through the planning process.

5 Feasibility Strategy

5.1 Introduction

5.1.1 A summary of the feasibility strategy of the range of heating, low carbon and renewable technologies is shown in **Table 5.1**. The feasibility strategy is based upon our current understanding of the Site, local context and technologies, but may change as the Proposed Development evolves through the planning and design process.

Table 5.1: Feasibility Strategy

Technology	Description	Energy Availability and Contribution (kW / MW)	Suitability	Space Requirement and Practicality (installation/maintenance)	Pros	Cons
Air Source Heat Pumps (ASHPS)	A heat pump extracts heat from the external air and condenses this energy to heat a smaller space within a dwelling or non-domestic building. A pump circulates a refrigerant through a coil to absorb energy from the air. This refrigerant is then compressed to raise its temperature which can then be used for space heating and domestic hot water	Baseload kW	Most Suitable	ASHPs can be fitted as either floor mounted units, wall mounted units or ceiling cassette units Outdoor units require external space as they are externally mounted but can be positioned anywhere at any orientation These options would be explored further in future detailed design phases to determine their suitability	ASHPs offer efficiencies circa 320%, compared to direct electric of 100% or gas fired boilers circa 89% ASHP offer carbon emissions savings over both direct electric heating and gas fired boilers, and operational carbon emissions continue to decrease as the national grid decarbonises ASHPs linked with indoor units can also provide cooling to	Widespread use throughout the Site will increase the total electrical demand and require larger network capacity when compared to gas boilers ASHPs require external condensers which create noise so careful consideration to their positioning is required and mitigation may be necessary to make sure that there is no undesirable effect The technology is potentially visually displeasing and consideration should be given to visual impact when positioning

Technology	Description	Energy Availability and Contribution (kW / MW)	Suitability	Space Requirement and Practicality (installation/maintenance)	Pros	Cons
					buildings in summer months	
Solar Photovoltaics Panels (PV) – roof/ground mounted	PV generates electricity through utilising energy from the sun. PV could be either implemented on roofs or as a ground mounted solar array. Excess energy can be transported to the grid.	Intermittent kW-MW	Most Suitable	Ground mounted PV would take up a large amount of flat developable area and the landscape masterplan does not show a suitable area for a ground mounted solar array; therefore it is unlikely to be a suitable technology Roof mounted PV would take up roof space which could limit space for other technologies e.g., ASHPs but it would not take up additional development area. Inverters and metering space requirements would be minimal. PV is most effective on south-facing roof space, but frame-systems can optimise performance on flat roofs Roof mounted PV is potentially a feasible solution, however the roof space available is not known at this stage and would need to be investigated in future detailed design phases	PV provides carbon savings by compensating for electricity that would otherwise be drawn from the grid, the extent of these carbon savings are subject to the size of the array If the demand for energy on site falls below the output of the PVs, the excess can be exported to the grid Roof mounted PVs are widely available, cost effective and the electricity generated can be used in a variety of applications including meeting electric vehicle (EV) charging demands	The feasibility of ground mounted PV should consider the potentially negative landscape and visual impacts The Site lacks appropriate space for the installation of a large scale ground mounted PV array due to the topography of the Site and the priority given to landscaping and green infrastructure
Electric Battery Storage and Balancing Plant	When coupled to an electrical on-site generation system, such as PVs, fuel storage solutions (an array of batteries) can	Baseload / as Required kW-MW	Potential to be Further Explored	Ventilation, and fire risk considerations should be given to large scale battery storage systems The space requirement for a reasonable battery storage capacity	Battery storage would support an electric-led heating approach and could reduce peak electrical demands	Battery technology is currently expensive with high capital costs reducing the commercial viability, and the energy storage markets are largely untested. This risk is likely

Technology	Description	Energy Availability and Contribution (kW / MW)	Suitability	Space Requirement and Practicality (installation/maintenance)	Pros	Cons
	be utilised to maximise the energy stored, and then used when the yield is low (e.g., with PVs store energy generated during daytime for use when dark)			is significant and would reduce the development area, therefore it is not suitable within the site boundary Brymbo Grid Substation is approximately 500m west of the Site and west of Ty Cerrig which is former quarry land proposed for further housing development adjacent to the site boundary. There is potential that an electric battery storage and balancing plant could be located adjacent to the substation. This is likely to be explored further as detailed design progresses	The PV generation would not align very well with the demand curve of the buildings so battery storage could provide a way of enabling more electricity generated on site to be used on site providing carbon savings	to diminish over the next five to ten years and costs may reduce
Heat Recovery (mechanical ventilation with heat recovery (MVHR))	MVHR provides fresh filtered air into a building whilst retaining most of the energy that has already been used in heating the building. This is achieved by use of heat exchange between the warm air being extracted and the fresh air being supplied. By recovering the heat that would otherwise be lost to extraction,	Baseload kW	Potential to be Further Explored	MVHR requires regular maintenance to replace filters and space is needed internally for units and ducting runs but this is not a large requirement MVHR is anticipated to be considered for dwellings when further building level information is available	This technology can recover up to 95% heat in a room, reducing heat lost means less heat is needed to maintain the temperature within a building which lessens energy demand, reduces energy bills and provides carbon emissions savings. It can also improve air quality within a building by reducing humidity	They have a high upfront cost and require regular maintenance They are more suitable in domestic settings which operate with more constant room temperatures, and which benefit from reducing humidity caused by wet rooms

Technology	Description	Energy Availability and Contribution (kW / MW)	Suitability	Space Requirement and Practicality (installation/maintenance)	Pros	Cons
	the total heat demand of the home reduces					
Heat Recovery (wastewater heat recovery (WWHR))	WWHR works by recovering the heat that would normally be lost down the drain in waste hot water from a shower. The device is attached to the drain of the shower and uses the outgoing waste warm water to pre-heat the fresh cold mains water coming into the home. This means that the water heater requires less energy to heat the cold water up	Baseload kW	Potential to be Further Explored	They typically require little maintenance with no electrical components, pumps or controllers and have a small space requirement WWHR is anticipated to be considered for dwellings when further building level information is available	This technology can recover up to 70% of energy lost to the drain, reducing energy lost which lessens energy demand, reduces energy bills and provides carbon emissions savings. It is a cost effective method to increase the SAP score assisting with compliance to Part L Building Regulations	The cost to install can be high and the system can be complex if installed with other technologies such as heat pumps WWHR is most suitable for houses with multiple wet rooms using the same soil vent pipe route which benefits the efficiency of installation This technology is only suitable for buildings with shower facilities and a high hot water demand
Solar water heating (or solar thermal)	Solar thermal panels utilise the sun's energy to heat water and are often an array of roof mounted "evacuated tubes" through which	Intermittent kW	Potential to be Further Explored	Solar thermal panels could be installed on suitable south-facing roof spaces however, this would limit space for PV so consideration is required to determine whether it	This technology lowers the carbon footprint associated with heating and hot water	Solar thermal competes with PV for roof space, and PV is more versatile as electricity can be used in a variety of applications

Technology	Description	Energy Availability and Contribution (kW / MW)	Suitability	Space Requirement and Practicality (installation/maintenance)	Pros	Cons
	a working fluid is passed, providing a heat source for hot water generation			is more beneficial to provide electricity or hot water generation A hot water storage cylinder would be needed within the building, and would have minimal impact upon usable space Solar thermal panels require more pipework and maintenance than PV Potentially a feasible solution, however PV is likely to be more beneficial due to the expected electricity demand of ASHPs, lighting, ventilation and EV charging The roof space available is not known at this stage and would need to be investigated in future detailed design phases	demands and can reduce energy bills	
Direct Electric Heating & Hot Water	Direct electric heating & hot water involves providing heating and hot water using electric panel radiators and direct electric hot water heaters	Baseload kW	Potential to be Further Explored	Direct electric panel heaters and hot water heaters are compact and therefore have low space requirements Feasibility depends on the heating and hot water demand which is not known at this stage. Therefore, this option is likely to be explored further in future detailed design phases to determine suitability	Electric radiant heaters are very cheap to install Electric heating has lower associated carbon emissions than gas boiler heating	Electric radiant heaters result in higher bills for residents and also significantly reduce the EPC score of buildings Heat pumps offer significant carbon emissions savings in comparison to direct electric heating & hot water

Technology	Description	Energy Availability and Contribution (kW / MW)	Suitability	Space Requirement and Practicality (installation/maintenance)	Pros	Cons
Ground Source Heat Pumps (GSHPs) and Water Source Heat Pumps (WSHPs)	GSHPs operate in the same way as ASHPs but extract heat from the ground, taking advantage of the moderate temperatures in the ground to boost efficiency and reduce the operational costs of heating and cooling systems WSHPs extract heat from water sources such as lakes, ponds, rivers, springs, wells, or boreholes	Baseload kW	Not Suitable	GSHPs Have a high space requirement due to the need for underground works. Whilst installation is invasive, maintenance is low once installation is completed WSHPs An appropriate body of water should be in close proximity the building and space is needed to lay underground pipes between the building and source of water in addition to space indoors for the heat pump and hot water cylinder These options are not considered suitable for the Proposed Development as there is not suitable land available for the technologies and although the hot water demand for the non-residential buildings is not known at this stage due to the building use it is not anticipated to be high which would have been more suitable for these technologies	GSHPs They are highly efficient and offer efficiencies circa 350%, compared to direct electric of 100% or gas fired circa 89%, providing carbon emissions savings WSHPs They are often more efficient than ASHPs and GSHPs meaning these highly efficient technologies can provide further carbon emissions savings	GSHPs Requirements will need to be met including groundwater investigation consent, an abstraction licence and an environmental permit to discharge water. There are exemptions to these requirements but certain conditions need to be met. This technology has a high capital cost and high space requirement and underground works come with risks that cannot be fully mitigated at this stage without costly surveys/detailed geological investigation. Feasibility is subject to investigation of geological suitability in specific areas and the mechanical and electrical (M&E) design of buildings WSHPs Permits are potentially required for installing a heat pump which requires water from a waterbody. This could include: a licence to abstract water, a water discharge permit and a flood risk activity permit. These permits may be avoided with a small surface water open-loop heat pump system but certain requirements need to be met.

¹⁵ UK CHP Development Map. Available from: [UK CHP Development Map - Department for Business, Energy and Industrial Strategy \(decc.gov.uk\)](https://www.decc.gov.uk/en/016/016_02/016_02_03/016_02_03_03_01/016_02_03_03_01_01/uk_chp_development_map.aspx)

Technology	Description	Energy Availability and Contribution (kW / MW)	Suitability	Space Requirement and Practicality (installation/maintenance)	Pros	Cons
				technology would be more appropriate as it is scalable		network in proximity to the Proposed Development The nearest energy recovery facilities are the waste to energy facility 10km south east of the Site at Tradebe and Parc Adfer combined heat and power facility 17km north of the Site. This is not feasible as there would be a high installation complexity because of pipework and infrastructure needed to connect this Site to the existing CHP
4th Generation Heat Pump Powered Community Heat Network	This is a community heat network where heat for the building is generated in one location known as an energy centre. Hot water is then distributed to homes at a medium heat around 60 - 70 degrees. Heat interface units are provided within each building for heating and hot water This technology can use ASHPs or GSHPs	Baseload kW-MW	Not Suitable	Space is required for the energy centre including the ASHPs, buffer vessels and pumps, and for the heat interface units within each dwelling or building GSHPs have a high space requirement due to the need for underground works. Whilst installation is invasive, maintenance is low once installation is completed 4th gen are more practical to install and maintain than 5th gen networks as they do not require individual WSHPs which increases maintenance	Likely lower capital cost compared to a 5th gen solution and low maintenance due to no WSHPs Heat pump technology offers carbon emissions savings over CHP or mains gas boilers	Higher operational cost compared to DHN High temperature network reduces efficiency due to heat loss during distribution Increased electrical load associated with the energy centre therefore it is likely an additional substation will be required on site GSHPs will need to meet certain requirements including groundwater investigation consent, an abstraction licence and an environmental permit to discharge water. This technology has a high capital cost and high space

Technology	Description	Energy Availability and Contribution (kW / MW)	Suitability	Space Requirement and Practicality (installation/maintenance)	Pros	Cons
				This technology tends to be viable for developments with over 1,000 dwellings, but the Proposed Development is anticipated to construct 295 dwellings making it less viable. Although the non-residential uses would help to increase demand they require only a small provision of hot water At this stage the density of the Proposed Development is not known but the technology is suitable for high density development. Therefore, building level technology would be more appropriate as it is scalable		requirement and underground works come with risks that cannot be fully mitigated at this stage without costly surveys/detailed geological investigation
5th Generation Heat Pump Powered Community Heat Network	This is a community heat network which utilises centralised ASHPs to collect heat from the air. This heat is then distributed via low-ambient temperature pipework. WSHPs in each building elevate the water temperature to heat and provide hot water to each building.	Baseload kW-MW	Not Suitable	Space is required for the centralised heat pumps, buffer vessels and pumps, and the WSHPs within each dwelling or building 5th gen are more complex to install than 4th gen due to having individual WSHPs within each dwelling or building, this may also increase maintenance costs This technology tends to be viable for developments with over 1,000 dwellings, but the Proposed Development is anticipated to	Higher efficiency than a 4th generation network Distributing heat at a lower temperature leads to lower network heat losses than 4th gen systems, improving efficiency and carbon savings Heat pump technology offers carbon emissions savings	Likely higher capital cost compared to 4th gen and higher operational cost than DHN Potential for higher maintenance costs due to individual WSHPs Increased electrical load therefore it is likely an additional substation will be required on site Centralised GSHPs will need to meet certain requirements including groundwater investigation consent, an abstraction licence and an environmental permit to discharge

Technology	Description	Energy Availability and Contribution (kW / MW)	Suitability	Space Requirement and Practicality (installation/maintenance)	Pros	Cons
	This technology can also use GSHPs as the network level technology			construct 295 dwellings making it less viable At this stage the density of the Proposed Development is not known but the technology is suitable for high density development. Therefore, building level technology would be more appropriate as it is scalable	over CHP or mains gas boilers WSHPs are often more efficient than ASHPs and GSHPs meaning these highly efficient technologies can help lower the carbon footprint	water. This technology has a high capital cost and high space requirement and underground works come with risks that cannot be fully mitigated at this stage without costly surveys/detailed geological investigation
Biomass Boilers	Biomass is material of biological origin from plant or animal matter. Biomass for boilers is typically pellets or wood chips and the fuel can be purchased from sustainable certified sources. Biomass boilers operate by combusting the biomass to produce energy which can be used for heating and hot water	Baseload kW-MW	Not Suitable	The space requirement for the biomass boiler itself is not large, however the storage and access requirements for fuel storage and delivery to the storage location is significant Operational maintenance of biomass boilers is higher than that of mains gas boilers or heat pumps due to the need to regularly remove ash and clean the combustion chamber	Biomass boilers are classified as a low carbon source, deemed as carbon neutral as the carbon produced during the growth of biomass is approximately equal to carbon emissions produced during combustion	Although carbon emissions are offset during the growth of the biomass, carbon emissions are still produced at point of combustion and associated with transportation of the pellets to the storage location. Therefore, as a low carbon option it is less viable than other technologies Biomass boilers also produce high levels of particulate matter which can affect local air quality They are expensive to run due to biomass transport costs and have a higher capital expenditure because of the need for an automated hopper system
Individual Gas Boilers	Individual gas boilers operate by combusting fossil fuels to produce	Baseload kW	Not Suitable	If a combi boiler is used these can be very compact and can provide hot water and heating on demand without need for a storage tank	Individual gas boilers in each building are cheap to install	Gas boilers emit more carbon dioxide than electric alternatives

Technology	Description	Energy Availability and Contribution (kW / MW)	Suitability	Space Requirement and Practicality (installation/maintenance)	Pros	Cons
	energy which can be used for heating and hot water			Installation and connection to the existing gas grid would be easy, however new mains gas infrastructure is required for new settlements		and are not a renewable or low carbon technology
Hydrogen Ready Gas Boilers	Hydrogen ready gas boilers operate by combusting a blend of fossil fuels and hydrogen to produce energy which can be used for heating and hot water	Baseload kW	Not Suitable	Hydrogen ready gas boilers are simple to install and are low cost	No fuel deliveries would be needed This technology produces lower carbon emissions than gas boilers as hydrogen produces no carbon emissions when burnt. In addition, hydrogen can be produced from renewable energy sources unlike fossil fuels	Hydrogen ready gas boilers are more expensive than gas boilers This technology is not widely available in the UK and is not currently viable due to hydrogen supply Operational costs are currently unknown due to the immaturity of the hydrogen supply market
Fuel Cell	A fuel cell is an electrochemical energy conversion device which generates energy through a chemical reaction combining hydrogen with air producing electricity and heat	Baseload kW	Not Suitable	Space is required for plant and for the storage of hydrogen as fuel Once installed operational and maintenance needs of fuel cells are minimal This technology is most suitable where the baseload energy demand is constant, therefore is more suitable for mixed use developments	Fuel cells are highly efficient at converting chemical energy to electrical energy This technology is reliable and can continue to operate in a variety of weather conditions Hydrogen used in the fuel cell can be	They have a high capital cost, and greater cost per unit of energy than other renewable technologies e.g., PV Hydrogen used in the fuel cell may come from fossil fuels meaning it may not be a renewable resource Operational costs are currently unknown due to the immaturity of the hydrogen supply market

Technology	Description	Energy Availability and Contribution (kW / MW)	Suitability	Space Requirement and Practicality (installation/maintenance)	Pros	Cons
					produced from renewables providing carbon savings	Transporting and storing hydrogen is complex This technology is not currently viable due to hydrogen supply
Wind Energy (Micro / Medium / Large)	Wind energy is generated by the wind which turns turbines and kinetic energy is converted into electrical energy. Excess energy can be transported to the grid	As Required kW-MW	Not Suitable	Large space requirements are needed and there is insufficient space for a wind turbine within the Site	Wind energy can provide carbon savings, the extent of these savings is subject to turbine size If the demand for energy on site falls below the output of the wind energy, the excess can be exported to the grid	Wind energy performance is dependent on turbulence and wind speed which is influenced by the height of installation and terrain, therefore it may not always be an appropriate option Visual, noise and wind-flicker issues associated with wind energy will be prominent even at a micro scale, this may adversely impact upon residents and site users There may also be challenges securing long term performance and with structural vibration issues when using building-mounted turbines It is not technically practical to install this technology given the proximity to residential areas
Hydropower	Hydropower is electricity produced through harnessing the power of moving water which drives generators.	Baseload kW-MW	Not Suitable	Extremely large space requirements would be needed for hydropower and there is insufficient space within the Site	Hydropower is a renewable energy source providing carbon emissions savings	There are no Main Rivers or Ordinary Watercourses within the site area. The nearest Main River is the River Cegidog (Afon Cegidog) located approximately 1.3km to the

Technology	Description	Energy Availability and Contribution (kW / MW)	Suitability	Space Requirement and Practicality (installation/maintenance)	Pros	Cons
						north of the Site. This is not suitable for a hydropower energy source

6 Energy Strategy

6.1 Introduction

6.1.1 This section demonstrates how principles concerning the reduction of energy consumption will be incorporated within the Proposed Development, in line with Part L Building Regulations.

6.1.2 The Proposed Development will seek to reduce energy consumption by following the nationally recognised Energy Hierarchy of:

- 1) Reducing energy demands in the first instance ('Be Lean');
- 2) Before using energy efficiently and cleanly ('Be Clean'), and only then;
- 3) Using renewable and low carbon technologies ('Be Green'), where possible.

6.1.3 The Energy Hierarchy is illustrated in more detail in **Figure 6.1**.

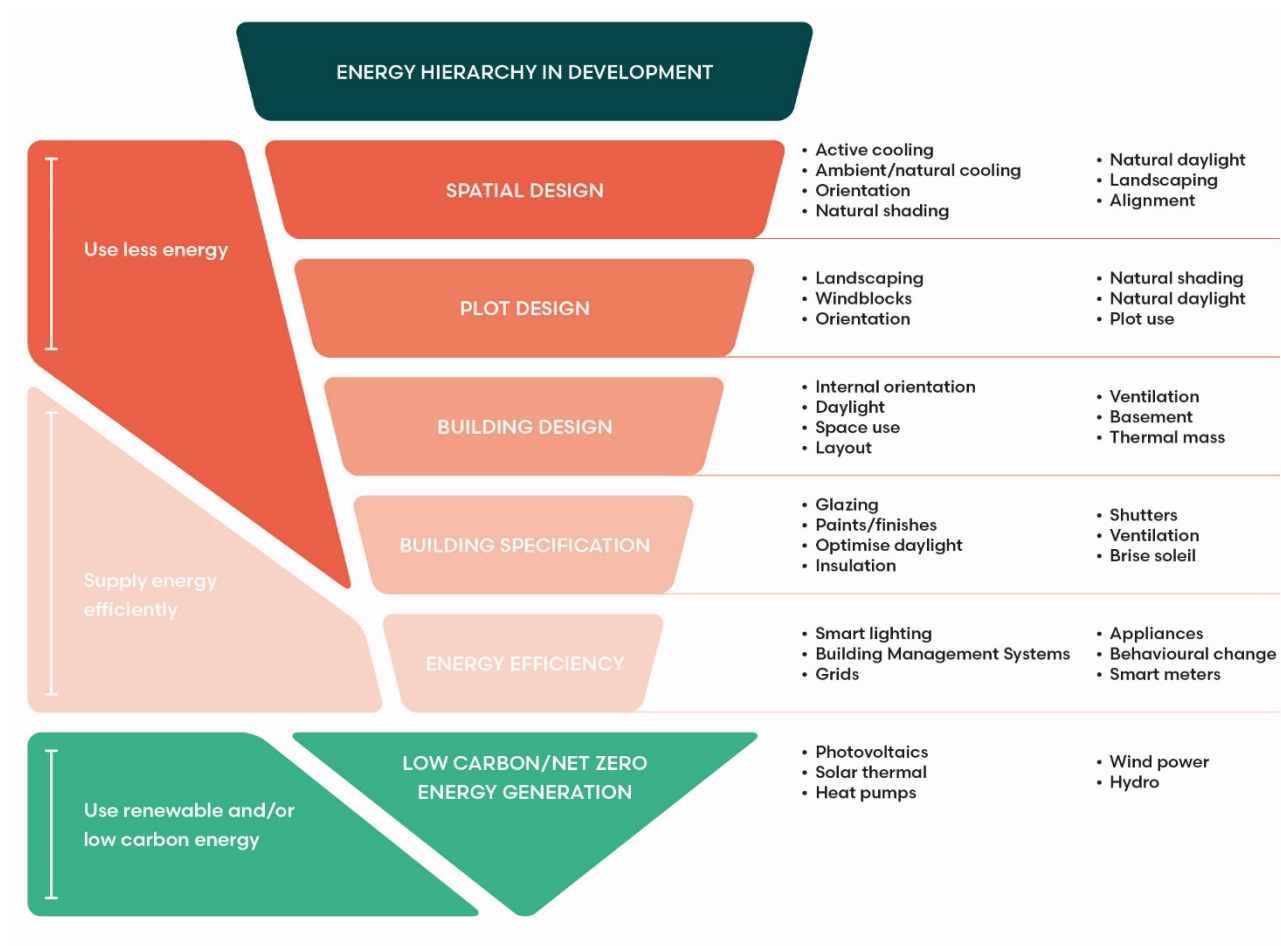


Figure 6.1: Energy Hierarchy in New Developments

6.2 Fabric-First Approach ('Be Lean')

6.2.1 Energy efficiency measures will be considered firstly for reducing energy use of buildings. A 'fabric-first' approach to building design incorporates passive measures (design features and require no energy input to improve building performance) and active measures (building services which increase energy efficiency and reduce energy demand).

- 6.2.2 Demand reduction is typically a more cost-effective means of reducing energy consumption and achieving carbon savings than providing low or zero carbon technologies. This is particularly true of passive measures, which are simpler and have greater longevity than active systems.
- 6.2.3 The fabric efficiency of the proposed buildings will be designed to reduce heat demand and energy needs. This includes providing high levels of insulation and low air permeability.

6.3 Use of Energy Efficiently ('Be Clean')

- 6.3.1 Traditional heating methods, such as mains gas boilers, will not deliver the environmental standards that the Proposed Development seeks to achieve. Instead, a range of new and innovative methods will be required. As such, the future heating strategy options are assessed in **Table 5.1**

6.4 Renewable and Low Carbon Technologies ('Be Green')

- 6.4.1 Following the incorporation of the Be Lean and Be Clean measures, a feasibility strategy has been carried out to assess potentially viable sources of low carbon technology and renewable energy under the Be Green stage of the energy hierarchy. The results are shown in **Table 5.1**.

6.5 Energy Consumption Reduction Measures

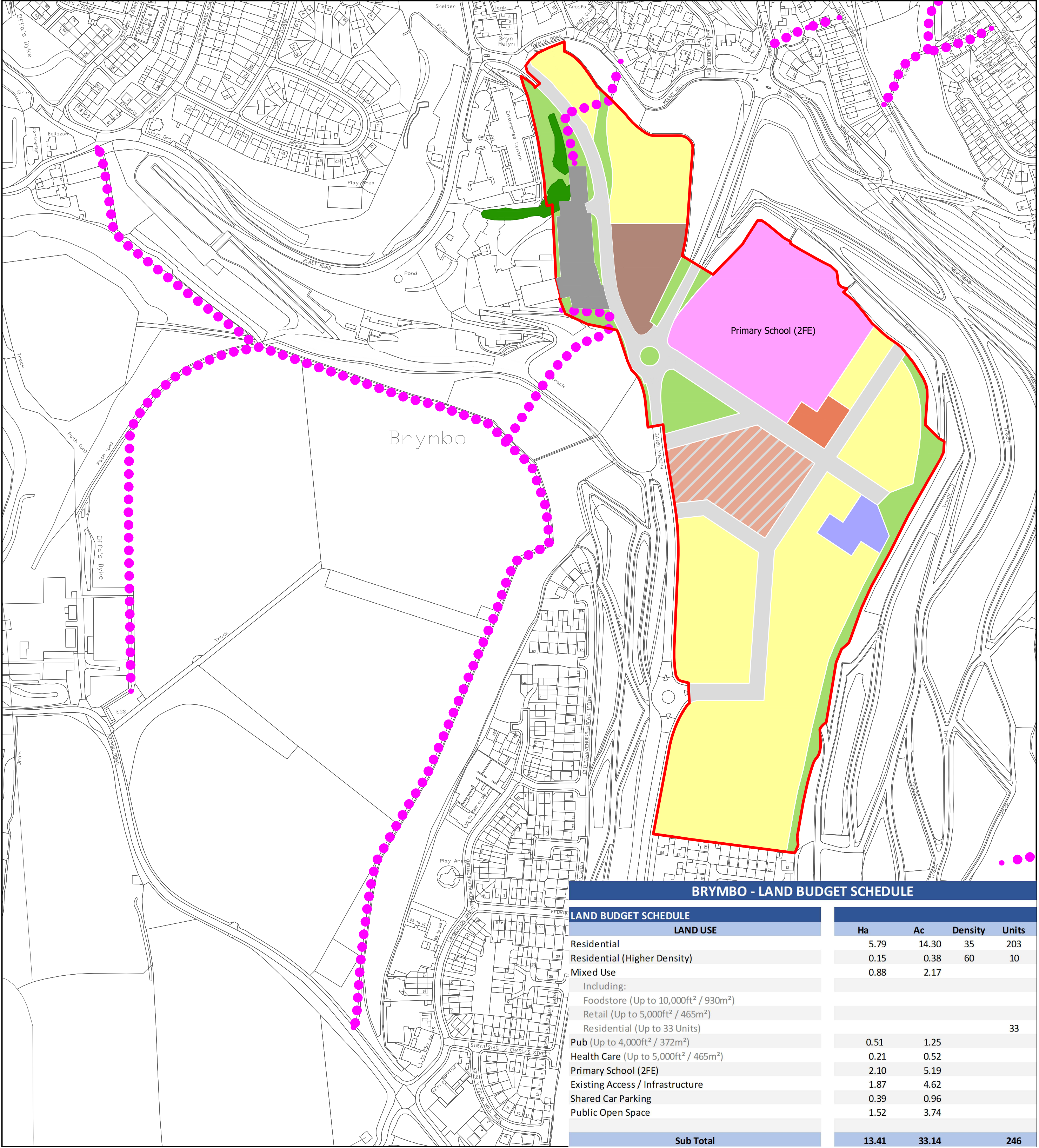
- 6.5.1 Measures will be taken to reduce energy consumption at each stage of the energy hierarchy.
- 6.5.2 The Proposed Development will incorporate energy consumption reduction measures in line with Part L Building Regulations including the following:
- Low carbon or renewable technologies including ASHPs or PV will be incorporated within the Proposed Development;
 - Highly insulated building fabric with external walls, floors and roofs of low U-Values to reduce heat loss;
 - Strong continuity of insulation at building junctions to reduce thermal bridging heat loss;
 - Efficient double glazed windows;
 - Low energy lighting;
 - Where feasible buildings will be designed to allow for cross-ventilation to reduce the risk of overheating and help them stay cool in warmer conditions; and
 - Electric Vehicle (EV) charge points are anticipated to be provided within the Proposed Development in line with the Electric Vehicle Charging Strategy for Wales 2021¹⁶.

¹⁶ Electric Vehicle Charging Strategy for Wales 2021. Available from:
<https://www.gov.wales/sites/default/files/publications/2021-03/electric-vehicle-charging-strategy-wales.pdf>

7 Conclusion

- 7.1.1 The Renewable Feasibility Study outlines relevant policies and targets that must be considered by the Proposed Development. The Strategy considers opportunities to increase energy efficiency through site layout, building design and energy supply, as well as the suitability of incorporating heating, renewable and low carbon energy technologies.
- 7.1.2 The feasibility strategy, found in **Section 5** identified several opportunities for incorporating renewable and low carbon energy generation technologies. Based on the Site location and Proposed Development, ASHPs, or PV are the most suitable for the Proposed Development to meet the requirements of Part L Building Regulations.
- 7.1.3 Other technologies which are potentially suitable for the Site but require further investigation include electric battery storage and balancing plant, MVHR, solar water heating, and direct electric heating and hot water.
- 7.1.4 The Proposed Development will follow the nationally adopted energy hierarchy detailed in **Section 6**, of reducing energy demands in the first instance, using energy efficiently, and only then, implementing low carbon and renewable energy sources where appropriate, in line with Part L Building Regulations. The hierarchy will continue to be considered throughout the design process.
- 7.1.5 This Renewable Energy Strategy has provided a preliminary appraisal of potential opportunities for renewable and low carbon technologies for the Proposed Development and adheres to Policy RE1.
- 7.1.6 The final heating and energy solution for the Proposed Development is not fixed and will evolve as the planning policy framework is developed, the local community engaged, and as new technologies emerge. The final heating and energy solution will be secured through the appropriate planning mechanism in the future to encompass the comprehensive approach that is required to deliver the environmental standards that the Proposed Development seeks to achieve.

Appendix A Land Use Plan

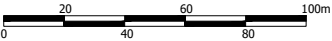


- Site Boundary Boundary
- Residential
- Residential (Higher Density)
- Pub/Restaurant
- Mixed Use
(Foodstore, retail & residential)
- Non Residential Use
- Primary School (2FE)
- Existing Access / Infrastructure
- Shared Car Parking and Public Realm
- Public Open Space
- Existing Public Right of Way

Project
Brymbo Park

Drawing Title
Land Use Plan

Date06.09.18Scale1:2500@A2Drawn byALCCheck byVADrawing NoRG-M-15-1Revision-



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Appendix B Policy Context

Introduction

- B.1.1 This appendix presents the key energy requirements for the Proposed Development, as defined by national policy, regulation, and local planning policies.

National Policy Context – Climate Change

- B.1.2 Climate change is recognised as one of the most immediate global environmental challenges. In May 2019, the Committee on Climate Change published the Net Zero Report, recommending that the UK Government introduce a target of at least a 100% reduction of greenhouse gas (GHG) emissions by 2050.
- B.1.3 In 2019, the Climate Change Act (2008) was amended to include a revision of the previous aim of an 80% reduction of GHG emissions compared to 1990 levels by 2050. The Act now mandates that “the net UK carbon account for the year 2050 is at least 100% lower than the 1990 baseline”.
- B.1.4 The UK Government’s international commitment, transposes into national and local planning policy. The Government has sought to reduce CO₂ emissions associated with new buildings through energy demand reduction and the incorporation of low and zero carbon technologies to deliver electricity and heat.

Net Zero Strategy

- B.1.5 In October 2021, the UK Government published the Net Zero Strategy, bringing forward the government’s commitment to a fully decarbonised power system. The following key policy objectives are relevant to energy:

“To take action so that by 2035, all our electricity will come from low carbon sources, subject to security of supply, bringing forward the government’s commitment to a fully decarbonised power system by 15 years.

- B.1.6 *Aiming to phase out the installation of new and replacement natural gas boilers by 2035 in line with the natural replacement cycle, once costs of low carbon alternatives have come down, including any hydrogen-ready boilers in areas not converting to hydrogen, to ensure that all heating systems used in 2050 are compatible with net zero”.*

Welsh Government Climate Emergency

- B.1.7 In April 2019, the Welsh Government declared a climate emergency and in June 2019 accepted the CCC’s recommendation for a new emissions target, and sets an ambitious target of net zero emissions no later than 2050.
- B.1.8 In March 2021, new legislation came into force in Wales, amending the 2050 emissions target¹⁷ and the interim emissions targets¹⁸. As well as amending the 2050 emissions target to net zero, the 2030 target was increased from 45% to 63% below the 1990 baseline, and the 2040 target was increased from 67% to 89% below the 1990 baseline.

¹⁷ The Environment (Wales) Act 2016 (Amendment of 2050 Emissions Target) Regulations 2021. Available from: <https://www.legislation.gov.uk/wsi/2021/333/contents/made>

¹⁸ The Climate Change (Interim Emissions Targets) (Wales) (Amendment) Regulations 2021. Available from: <https://www.legislation.gov.uk/wsi/2021/338/made>

- B.1.9 Evidence for the third UK Climate Risk Independent Assessment (CCRA) in relation to Wales¹⁹, highlights that the climate in Wales is already changing, with an increase of 0.9°C in the average annual temperature from the mid-1970s to mid-2010s; an increase of 2% in annual mean rainfall and 6.1% in sunshine hours during the same period; approximately 1.4mm of sea level rise per year since 1901; and an increase in extreme heat events.

Net Zero Wales Carbon Budget 2 (October 2021)

- B.1.10 The Welsh Government published its second statutory decarbonisation plan (Net Zero Wales Carbon Budget 2) in October 2021. This sets out the policies and approach it intends to take to meet Wales' second Carbon Budget (2021-25).
- B.1.11 In respect of energy generation, Net Zero Wales sets the following ambitions:
- By 2025, 1GW additional renewable energy capacity will be installed; and
 - From 2021 there will be no new build unabated fossil fuel generation in Wales. All current unabated gas generation removed from the system by 2035.
- B.1.12 The Plan recognises the need to maintain a secure supply of electricity for people and businesses in Wales and seeks to meet this through decarbonised sources as soon as possible and from 2035 at the latest. Two areas of action are identified for the electricity and heat emissions sector to meet Carbon Budget 2:
- Decarbonising electricity production from fossil fuels; and
 - Increasing electricity from low carbon and variable renewables.

Part L Building Regulations (2010, updated 2022 for use in Wales)

- B.1.13 Approved Document Part L Volume 1 - Dwellings took effect on 23rd November 2022 and Volume 2 – Buildings other than dwellings took effect on 29th March 2023. The document provides guidance for complying with the energy efficiency requirements of Building Regulations 2010 for Wales (as amended). The Proposed Development is a mixed-use development therefore both volumes are applicable.
- B.1.14 Part L Building Regulations Volume 1 set out the energy performance of dwellings calculations which are required to be undertaken using the SAP assessment using SAP10 methodology. Minimum energy performance requirements are in the form of a minimum energy efficiency rating, target primary energy rate, target fabric performance values and target emission rate and new dwellings must meet these requirements. A notice should be given to the building control body of the calculations before and after the assessment. Guidance is also provided on calculating the dwelling primary energy rate, dwelling emission rate and dwelling energy efficiency rating.
- B.1.15 Part L Building Regulations Volume 2 outlines the energy performance of buildings calculations which are required to be undertaken using the Simplified Building Energy Model or other software tools approved under Notice of Approval. Minimum energy performance requirements are in the form of a target primary energy rate and target emission rate and new buildings must meet these requirements. A notice should be given to the building control body of the calculations before and after the assessment. Guidance is also provided on calculating the building primary energy rate and building emission rate.
- B.1.16 Before construction of new dwellings and buildings an assessment of the technical, environmental and economic feasibility of using high-efficiency alternative systems such as

¹⁹ Evidence for the third UK Climate Change Risk Assessment (CCRA3) Summary for Wales. Available from: <https://www.ukclimaterisk.org/wp-content/uploads/2021/06/CCRA-Evidence-Report-Wales-Summary-Final.pdf>

heat pumps and decentralised energy supply systems based on energy from renewable sources. However, these along with low and zero carbon systems are not required to be installed by Building Regulations. There is mandatory air pressure testing for new dwellings and buildings.

- B.1.17 Regulation L1(a) for new dwellings and buildings will be met where the standards are met for limiting unwanted heat losses from buildings and limiting unwanted heat gains buildings are achieved.
- B.1.18 Regulation L1 (b)(i), (ii) and L2 for new dwellings and buildings will be met where fixed building services are appropriately sized and meet minimum efficiencies, controls to building services meet system specific controls and general controls for heating and hot water systems and on site electricity generations has controls and is appropriately sized.
- B.1.19 The changes to Approved Document L enhance the performance requirements for compliance. For new dwellings, 37% carbon reduction is expected for compliant buildings in contrast with Part L 2014. For new non-domestic buildings, on average, 28% carbon reduction is expected for compliant buildings in contrast with the previous Part L 2014.
- B.1.20 Therefore, the national target for energy at the Proposed Development is the Part L Building Regulations. This is subject to further amendments in the future.

Planning Policy Wales (Edition 11) (February 2021)

- B.1.21 Planning Policy Wales (PPW) edition 11 was published in February 2021 and sets out the land use planning policies of the Welsh Government. The primary objective of PPW is to ensure that the planning system contributes towards the delivery of sustainable development and improves the social, economic, environmental and cultural well-being of Wales. PPW highlights that a well-functioning planning system is fundamental for sustainable development and achieving sustainable places.
- B.1.22 Paragraph 2.27 explains the need for planning authorities to take a balanced approach to implement the Well-being of Future Generations Act and its Sustainable Development Principle. It states there may be occasions when one benefit of a development proposal outweighs others, and in such cases robust evidence should be presented to support these decisions, whilst seeking to maximise contributions against all the well-being goals. It identifies a long list of key factors to consider in the assessment process. In summary these include:
- How the proposal would support the achievement of a more prosperous, low carbon, innovative and resource efficient Wales;
 - Whether environmental risks are prevented or appropriately managed;
 - Whether the causes and impacts of climate change are fully taken into account through location, design, build, operation, decommissioning and restoration; and
 - Whether a proposal supports decarbonisation and the transition to a low carbon economy.
- B.1.23 Paragraph 3.30 states that the planning system plays a key role in tackling the climate emergency through the decarbonisation of the energy system and the sustainable management of natural resources. It also states that the transition to a low carbon economy brings opportunities for clean growth and quality jobs, together with wider benefits of enhanced places to live and work, with clean air and water and improved health outcomes.
- B.1.24 Paragraph 5.7.13 outlines that the Welsh Government planning policy expects all new development to mitigate the causes of climate change in line with the Energy Hierarchy.

- B.1.25 Key relevant extracts from Section 5 of the PPW which relate to reducing energy demand and use of energy efficiently include:

*“The Welsh Government’s policy is to secure zero carbon buildings while continuing to promote a range of low and zero carbon technologies as a means to achieve this.”
(Paragraph 5.8.2)*

“Development proposals should:

- *mitigate the causes of climate change, by minimising carbon and other greenhouse gas emissions associated with the development’s location, design, construction, use and eventual demolition; and*
- *include features that provide effective adaptation to, and resilience against, the current and predicted future effects of climate change.”
(Paragraph 5.8.3)*

“In order to further promote energy efficiency and energy conservation, planning authorities should consider including development plan policies requiring applications for major development to be accompanied by an Energy Report. “This independent report should include recommendations to the developer relating to energy efficiency and appropriate renewable energy technologies that could be incorporated into the development. A response to that report from the developer should also accompany the application.” (Paragraph 5.8.4)

“TAN 12: Design and Practice Guidance: Planning for Sustainable Buildings provide guidance on sustainable building design.” (Paragraph 5.8.6)

“Developers should take into account future requirements for carbon reduction in new buildings when designing their schemes, as a result of changes to Building Regulations in Wales; being mindful of any future changes will ensure design aspects of requirements are considered as early as possible.” (Paragraph 5.8.7)

Prosperity for All: A Low Carbon Wales (March 2019)

- B.1.26 Prosperity for All: A Low Carbon Wales is the Welsh Government’s first statutory decarbonisation plan. It sets out the Welsh government’s approach to cut emissions and increase efficiency in a way that maximises wider benefits for Wales, ensuring a fairer and healthier society. It sets out a hundred policies and proposals that directly reduce emissions and support the growth of the low carbon economy.
- B.1.27 It specifically seeks to reduce the use of fossil fuels for power generation, and promote and accelerate the deployment of renewable energy generation. The plan also recognises that energy storage and flexibility services will need to be provided to integrate with new renewable energy development as part of a whole system approach. In relation to the power sector, the plan sets a target to reduce power sector emissions by 37% from baseline levels [1990s] by the year 2030.
- B.1.28 Policy 31 (Delivery of our Renewable Energy Targets) specifically seeks to deliver the 2017 Renewable Energy Targets announced by the Welsh Government, including generating 70% of Wales’ electricity consumption from renewables by 2030.

Energy Generation in Wales 2022

- B.1.29 Energy Generation in Wales 2022 outlines the energy capacity in Wales by the end of 2022 and any changes over time aiming to support the Welsh Government’s energy policy development.

- B.1.30 The Welsh Government recently made an announcement in January 2023 that they proposed to alter their existing renewable energy targets. The Welsh Government launched a consultation on 24th January 2023-18th April 2023.

“In July 2023, following a consultation period in which broad support was received for the Welsh Government’s renewable energy ambitions, the Welsh Government adopted new energy targets for 2035. These include:

- *Generating the equivalent of 100% of Wales’ annual electricity consumption from renewable sources by 2035.*
- *Installing 580,000 heat pumps across Wales by 2035.*
- *1.5 GW of renewable energy capacity to be locally owned by 2035.*

Written Statement: Publication of Summary of Responses to the Consultation on Wales’ Renewable Energy Targets. 14 July 2023”,

Future Wales: the National Plan 2040 (February 2021)

- B.1.31 Future Wales is the Welsh Government’s National Development Framework and is the highest tier of the Development Plan in Wales. It sets out a strategy for addressing key national priorities through the planning system, which include achieving decarbonisation, climate-resilience and achieving net zero. It makes reference to climate change, with projections showing an increased chance of milder, wetter winters and hotter, drier summers, rising sea levels and an increase in the frequency and intensity of extreme weather events.

- B.1.32 Futures Wales makes explicit reference to the benefits of renewable energy, stating:

‘It is vital that we reduce our emissions to protect our own well-being and to demonstrate our global responsibility. Future Wales together with Planning Policy Wales will ensure the planning system focuses on delivering a decarbonised and resilient Wales through the places we create, the energy we generate, the natural resources and materials we use and how we live and travel.’

- B.1.33 Section 3 includes the Future Wales’ Outcomes which are described as ‘collectively a statement of where we want to be in 20 years’ time. Every part of Future Wales...is concerned with achieving the Outcomes’. The Outcome of principal relevance to the Development is:

“A Wales where people live in places which are decarbonised and climate resilient: The challenges of the climate emergency demand urgent action on carbon emissions and the planning system must help Wales lead the way in promoting and delivering a competitive, sustainable decarbonised society”

- B.1.34 Policy 16 expresses that large scale mixed use development should have a heat network with a renewable/low carbon or waste heat energy source where feasible.

- B.1.35 Policy 17 states that the Welsh Government strongly supports the principle of developing renewable and low carbon energy from all technologies and at all scales to meet future energy needs and to combat the climate emergency.

Technical Advice Note 12 Design March 2016

- B.1.36 A series of Technical Advice Notes (TANS) supplement PPW. The most relevant to energy is Technical Advice Note 12 Design March 2016.

- B.1.37 The document outlines aspects of good design including considering the orientation of the building to maximise energy efficiency, minimise the energy demand and carbon emissions

through zero carbon standards or incorporating the Energy Hierarchy, using materials with lower energy inputs. Aspects of design which contribute to the sustainability of a building are listed, for example implementation of low and zero carbon energy technologies to be incorporated to made feasible.

- B.1.38 Paragraph 5.11.3 states that “ *all residential proposals should seek to minimise energy demand, larger schemes should investigate the feasibility of a district heating scheme especially when mixed uses are proposed for the site.*”

Practice Guidance Renewable and Low Carbon Energy in Buildings July 2012

- B.1.39 The Practice Guidance Renewable and Low Carbon Energy in Buildings July 2012 has been created to provide guidance on minimising the carbon footprint of buildings through incorporating renewable and low carbon energy technologies in the design. The document states these technologies should only be considered once the energy hierarchy has been implemented.
- B.1.40 Detail is provided on the need to incorporate renewable and low carbon technologies, the Energy Hierarchy, practical aspects of designing and delivering renewable energy technologies, key factors to consider when assessing suitability of these technologies, different renewable and low carbon energy options, the financial cost of renewable or low carbon energy systems.
- B.1.41 The document provides a guide template to assist with carrying out a renewable and low carbon energy feasibility strategy. There is an emphasis that this template is only a guide and the detail will vary between projects as requirements will be different.
- B.1.42 The technologies mentioned include:
- Fuel Cell
 - Combined Heat and Power
 - Solar Thermal
 - Wind
 - Ground and Water Source Heat Pumps
 - Air Source Heat Pumps
 - Biomass
 - Biomass – Anaerobic Digestion
 - Hydro
 - District Heating

Practice Guidance Planning for Sustainable Buildings July 2014

- B.1.43 The Practice Guidance Planning for Sustainable Buildings July 2014 provides guidance to enhance sustainable outcomes in a development including good design quality and building performance supporting local planning authorities implementing policy and deliberating planning applications. The document advises the wider site and context is considered before detail on building form and fabric and then technologies.

- B.1.44 Detail is provided on insulation and U-values, airtightness, thermal bridging, thermal mass, embodied energy, Combined Heat and Power, heating, cooling and ventilation, hot water, electric power and appliances and renewable energy.
- B.1.45 On page 31 the following is written: *“The mandatory minimum analysis required for all new buildings is the assessment of Part L compliance. For domestic buildings this entails an assessment using the Standard Assessment Procedure (SAP). A Part L SAP analysis should be undertaken for new homes by an accredited assessor with knowledge of how the analysis tool works and of the relevant Part L compliance criteria.”*

Local Policy

Wrexham Unitary Development Plan 1996 – 2011

- B.1.46 The WUDP was adopted in February 2005 and covers the administrative area of Wrexham Borough Council from 1996-2011. The WUDP is out of date as it only covers development up to 2011. Therefore, this reduced the weight given to the WUDP in decision making.
- B.1.47 The plan sets out the WBC's aspiration for development in the area and provides a framework for specific proposals and policies which are justified expanding on the strategic vision for the area. The former Brymbo Steelworks site was noted as a regeneration initiative priority.
- B.1.48 Energy is not covered in detail in the plan. Relevant policies as follows:
- Policy GDP1 - All new development should *“make the best use of design techniques, siting and orientation in order to conserve energy and water resources”*.
 - Policy EC16 – Brymbo Steelworks is one of the site that will be reclaimed and restored for beneficial use for housing/employment/amenity.

Wrexham Local Development Plan 2 2013-2028

- B.1.49 The WLDP2 was reported to the Full Council on the 19th April 2023 and at this meeting they determined not to adopt the local development plan. An application was submitted to Judicially Review the decision and so once again the WLDP2 was reported to Full Council on 14th June 2023 who voted not to adopt the local development plan. The latest update is that the Welsh Government will consider WBC's decision to not adopt the WLDP2.
- B.1.50 Within the latest version of the WLDP2 Policy RE1: Development and Renewable Energy/Low Carbon Technology is the most relevant to the Proposed Development and states the following:
- *“1. The Council require will encourage developers of the Key Strategic Sites and major sites (100 dwellings or more or development exceeding 1000m²) to incorporate schemes which generate energy from renewable and low carbon technologies unless it is demonstrated that it would not be financially or technically viable to do so. This includes opportunities to minimise carbon emissions associated with the heating, cooling and power systems for new development.*
 - *2. An independent energy assessment investigating the financial viability and technical feasibility of incorporating such schemes will be required to support applications.”*

Design – A Guide for Developers and Architects when Designing Residential Development

- B.1.51 The Local Planning Guidance Note on Design is a guide for developers and architects when designing residential development and was adopted in Jun 2009 so is largely out of date. The guidance note provides additional; detail relating to good design and sustainable buildings

regarding WUDP policies. The document states that sustainable building principles assist with reducing dependence on non-renewable energy sources and minimise the impact on the natural environment and new development should provide measures for efficient energy use.

B.1.52 WBC requires:

- *“10% of the future energy production of the development be sourced from renewable energy sources.”*
- *“Renewable energy technology should form an integral part of the building and be considered and incorporated at an early stage of the design process.”*
- *“A renewable energy statement to be submitted with your application which indicates the sources from which the renewable energy is to be obtained.”*