



Renewable Energy Statement

Land off Bangor Road, Johnstown,
Wrexham

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1. INTRODUCTION

1.1 Introduction

- 1.1.1 This Renewable Energy Statement relates to the proposed development at land off Bangor Road, Wrexham which is to comprise of up to 300 residential units, 1 small A1 commercial/retail units (235sqm), 465sqm of B2/B8 industrial/ storage/distribution space.
- 1.1.2 The development is subject to the planning requirements of Wrexham County Borough Council. This report addresses the policies relevant to energy strategy as set out in National and Local policy.
- 1.1.3 This report also provides additional detail on the proposed approach to meet specific targets relating to the Code for Sustainable Homes and energy use on site.

2. PLANNING POLICY

The sustainability strategy for the proposed development at Johnstown has been developed in line with the following relevant planning policy.

2.1 National Policy

2.1.1 **Planning Policy Wales Edition 5 – November 2012**, has a number of sections regarding sustainability in relation to energy consumption and renewable energy generation;

- **Section 4.11: Promoting sustainability through good design** places emphasis on good design to ensure that development contributes to tackling the causes of climate change (by reducing greenhouse gas emissions) and to effective adaptation to the consequences of climate change.
- **Section 4.12: Planning for sustainable buildings states;** Development proposals should mitigate the causes of climate change by minimising carbon and other greenhouse gas emissions associated with their design, construction, use and eventual demolition. The overall aspiration is to secure zero carbon buildings while continuing to promote a range of low and zero carbon (LZC) technologies as a means to achieve this. To move towards more sustainable and zero carbon buildings in Wales, the Welsh Government expects that the following standards will be met:

Applications for 5 or more dwellings received on or after 1st September 2009 to meet Code for Sustainable Homes Level 3 and obtain 6 credits under issue Ene1- Dwelling Emission Rate.

Applications received on or after 1st September 2009 for non residential development which will either have a floorspace of 1,000 m² or more, or will be carried out on a site having an area of one hectare or more, to meet the Building Research Establishment Environmental Assessment Method (BREEAM) 'Very Good' standard and achieve the mandatory credits for 'Excellent' under issue Ene1 - Reduction of CO₂ Emissions.

2.1.2 The Code for Sustainable Homes ("The Code") is the Governments adopted approach for assessing the sustainability of new residential developments. It

is based on a scoring system to achieve ratings between level zero and level 6 (the highest).

2.2 Local Policy

2.2.1 There are no specific policies relating to renewable energy generation or carbon reduction targets within the Wrexham UPD for new developments.

2.2 Code for Sustainable Homes

2.3.1 The Code for Sustainable Homes (the Code) is an environmental assessment method for rating and certifying the performance of new homes. It is a national standard for use in the design and construction of new homes with a view to encouraging continuous improvement in sustainable home building. The Code measures the sustainability of a new home against nine categories of sustainable design. Two of these categories, CO₂ emissions and water consumption, have mandatory standards. The Code uses a one to six star rating system to communicate the overall sustainability performance of a new home. The Code sets minimum standards for energy and water use at each level in addition to some mandatory elements that need to be met before any rating can be achieved. Within England and Wales the Code replaced the EcoHomes scheme, developed by the Building Research Establishment (BRE). The Code supports the government target that all new homes will be zero carbon from 2016 and the step changes in Building Regulations Part L leading to this.

2.3.2 The table below summarises the minimum energy standards at Level 1, 3 and 4 which exist under the Code;

Table 1: Minimum standards for Dwelling Emissions Rate (estimated carbon dioxide emissions in kg/m² per annum arising from energy use from heating, hot water & lighting for the dwelling) at CSH1, CSH3 & CSH4

	Code Level 1	Code Level 3	Code Level 4
Energy	10% improvement over Target Emission Rate (TER)	25% improvement over Target Emission Rate (TER)	44% improvement over Target Emission Rate (TER)

Source: Code for Sustainable Homes: A step-change in sustainable home building practice, CLG, 2006

- 2.3.3 The Code became operational in April 2007 and was updated Nov 2010 and a rating against the Code has been mandatory since 1 May 2008. Whilst it's true to say that it's mandatory, new developments don't actually need to reach any of the six levels as whilst all new homes must be supplied with a Code rating, this can be a rating of 0. Achieving a particular level, such as Code Level 4, is not mandatory at the national level, nor is it planned to be so unless specified by planning policy. The confusion on this issue stems from the Buildings Regulations Part L, which addresses the conservation of fuel and power in dwellings and is used to calculate carbon efficiency. In the Government's consultation paper 'Building a Greener Future: Towards Zero Carbon Development' and subsequently 'Proposed Changes to Part L and Part F of the Building Regulations: a Consultation Paper' it proposed revised building regulations aimed at improving energy efficiency standards by 25% for all new homes in 2010, effectively making Code 3 mandatory.
- 2.3.4 The Building Regulations were updated in 2010 and further updates are due in 2013 and 2016 and it is expected that the energy performance requirements will be made equivalent to the existing Code Levels 4 and 6 respectively. Some people have taken this as meaning that the Code levels *themselves* will be mandatory but this is not the case, it's just the CO₂ emission requirements of each Code level that will effectively be made mandatory through the Buildings Regulations
- 2.3.5 Any new homes constructed from 2013 are likely to need to achieve Code Level 4 CO₂ emissions level as a minimum when the Building Regulations change.
- 2.3.6 Consultation documents for the next version of the Building Regulations were released at the end of January 2012 with proposals to increase the energy efficiency of buildings further to take the next step towards 'zero carbon' standards. The overall impacts of the proposed changes are expected to;
1. Strengthen new-build standards to pave the way towards zero carbon
 2. Introduce a separate fabric efficiency (FEE) target for new dwellings (kWh/m².year)
 3. Propose changes to the calculation tools, Standard Assessment Procedure (SAP)

4. Introduce measures to incentivise improved compliance and as built performance

2.3.7 The preferred approach for new homes is to meet the standards with improvements to the building fabric with the targets tailored to the size and shape of the actual building.

2.3.8 Final regulations have yet to be released but given the timescales for this development it is likely that the proposed scheme at Johnstown will have to be constructed in line with the new tighter carbon dioxide emissions standards.

2.4 Conclusions

2.4.1 Following consideration of the National and Local policies that relate to the proposed scheme, the targets for the development at Johnstown are:

- For the domestic units to be compliant with Level 3 of the Code for Sustainable Homes and obtain 6 credits under issue Ene1- Dwelling Emission Rate. Full details of how the scheme will achieve Code Level 3 can only be determined at detailed planning stage.
- Meet Building Regulations Part L 2010
- In order to meet the Building Regulations consider incorporating renewable energy or low carbon generation options that will provide a reduction of 10% of the developments predicted annual carbon emissions.
- Due to the limited size of the non residential units achievement of a 'very good' Breeam standard does not apply.

3. ENERGY STRATEGY & RENEWABLE ENERGY OPTIONS

3.1 Energy Demand

The most cost effective solution is always specific to the development in question, i.e. the energy profile of what is being built and its location. This chapter looks at the baseline energy demand of what is proposed and then provides a strategy to address the requirement to provide some of the predicted energy consumption on site from renewable or low carbon energy solutions and therefore show a reduction of 10% of the developments predicted annual carbon emissions.

3.1.1 At the outline design stage there is not enough design information available (i.e. dimensions, layout, fabric type etc) to precisely predict the baseline energy demand for the dwellings or other units. For the purpose of estimating the energy demands for residential properties, the Energy Saving Trust's (EST) guide "Meeting the 10 Per Cent Target for Renewable Energy in Housing, 2006" has been used. These figures have been adjusted to incorporate a 25% CO₂ reduction in line with the changes to Building Regulations introduced in October 2010. The estimated energy demand calculations and associated carbon emissions are shown in Tables 2, 3 & 4.

3.1.2 The final strategy for the site will be based on the following information but may require to be amended slightly to suit individual building design. This would involve the inclusion or exclusion of energy efficient measures, or an increased or decreased capacity of renewable energy technologies, as applicable.

3.2 Energy Demand for Housing Units

Table 2: Proposed Housing Mix

Total Housing		300
2 Bed		30
3 Bed		105
4 Bed		165

Table 3: Estimated Energy Demands per Dwelling Type (kWh/yr) adjusted for 25% reduction in line with 2010 Building Regs

Dwelling Type		2 Bed	3 Bed	4 Bed
Floor Area m2		78.8	88.8	104
Energy Requirement kWh/yr	Space Heating	2170	2567	3338
	Water	2421	2559	2822
	L&A	2039	2293	2726
	Cooking	948	986	1040
	Total	7578	8405	9926

(Original information from Energy Saving Trust - Meeting the 10% target for renewable energy housing)

Table 4: Total Estimated Energy Demand per Dwelling Type (MWh/yr) Johnstown

Energy demands Johnstown - adjusted for 25% reduction in line with 2010 Building Regs

Dwelling Type		2 Bed	3 Bed	4 Bed	Whole Site
No. of dwellings		30	105	165	300
Floor Area m2		2364	9324	17160	28848
Energy Requirement MWh/yr	Space Heating	65	270	551	885
	Water	73	269	466	807
	L&A	61	241	450	752
	Cooking	28	104	172	304
	Total	227	883	1638	2748
Carbon emissions kg/yr		15719	61220	113790	190729

3.2.1 Total predicted energy consumption for the residential element of the site is 2748MWh/yr with an estimated carbon emission of 190,729kgC/yr.

3.3 Low and zero carbon technologies – Housing Units

3.3.1 This section reviews the feasibility of a range of Low and Zero Carbon (LZC) technologies that could be used to achieve a reduction of 10% in predicted annual carbon emissions.

3.3.1 The LZC technologies considered for use at Johnstown are:

- Photovoltaics
- Solar thermal panels
- Ground & air source heat pumps
- Biomass Boiler

- 3.3.2 Given the size of the proposed scheme, this development could be suitable for a Combined Heat and Power (CHP) plant or district heating (DH). This type of technology is best suited to developments which have a high and constant demand for thermal energy allowing the CHP/DH engines to operate at maximum efficiency for as long as possible throughout the year. Ideal situations include mixed development sites with over 400 domestic dwellings and those including leisure centres with swimming pools, hospital, school or hotel. However, in order to assess the viability of this a detailed build programme would need to be available together with consideration of the ownership and operation of the communal system. At this stage of the planning process this information is not available and so will not be considered further at this time.
- 3.3.3 Small scale, roof mounted turbines are not proposed for a number of reasons. The visual impact of up to 300 turbines across the development would be significant and unlikely to be acceptable. More significantly, studies by independent bodies such as Energy Saving Trust have shown that these turbines are not effective in generating power.
- 3.3.4 An alternative solution could be the installation of a single, medium to large scale turbine. Wind speed from the DTI Wind Speed Database (www.berr.gov.uk) for the site indicates an average wind speed at 45m above ground level of 5.8m/s across the site. For this type of technology to be effective, an average wind speed of at least 6.0m/s is required. It therefore not a viable solution and it is proposed that the energy targets for these domestic properties be met through the use of alternative technology.

3.4 Photovoltaics

- 3.4.1 Photovoltaic (PV) panels use sunlight to produce electricity; the cells convert the sunlight into electricity which can be used to run household appliances and lighting. PV cells don't need direct sunlight to work and some electricity will be generated on a cloudy day.
- 3.4.1 Historically a hindrance to the use of PV was the cost. Although it is still relatively expensive to install panels initially, this has been helped with the introduction of the Feed in Tariff (FIT) which provides a payment to building

owners for the generation of renewable electricity where applicable. Although the level of FiT payments has recently been reduced it may still prove to be a financially viable option for this scheme.

- 3.4.2 Further advantages of PV systems are in their low maintenance requirements and reliability.
- 3.4.3 The Johnstown scheme has been modelled with PV panels rated at 2.1kWp with an area of 12.8m², consisting of 10x 210Wp modules per property and assumes there would be sufficient number of properties with suitable south facing roofs on which to mount the panels. The expected annual generation from each system is 1890kWh. To achieve a nominal 10% reduction target the development would require 89 PV systems of this scale, a total roof area of 1139m². This would save 19,073kgC/yr, equivalent to 10% of total emissions from the development. (Assumes space and water heating, and cooking fuel is mains gas for all dwellings)

3.5 Solar Thermal

- 3.5.1 An alternative use of solar energy would be the installation of solar thermal panels for the generation of hot water; solar water heating systems use heat from the sun to warm domestic hot water. A conventional boiler or immersion heater is then used to make the water hotter or to provide hot water when solar energy is unavailable. Solar thermal panels are a tried and tested technology that offers good paybacks. However for optimum performance they need to be located on roofs with an orientation of $\pm 40^\circ$ of south.
- 3.5.1 A typical solar thermal panel can provide approximately 900kWh per year and will require around 2.5m² of roof area. The downside of this technology is that their contribution to carbon reduction can be less than other LZC technologies as they negate a gas demand instead of an electrical one. (The carbon emissions from gas are approximately 3 times lower than those associated with electricity).
- 3.5.2 In order to meet a nominal 10% carbon reduction target the JOhnstown development would need to incorporate 399 solar thermal panels. Effectively, every house in the development will need to have a suitable south facing roof

which could be fitted with a solar thermal panel and a third of the houses would require two panels. The practicalities of this proposal are likely to rule out this solution and would need to be reviewed at detailed design stage considering the site layout.

- 3.5.3 The system proposed above would save an estimated 19,032kgC per annum, equivalent to approximately 10% of total emissions from the development.

3.6 Ground source heat pumps

3.6.1 Ground source heat pumps (GSHP) circulate a mixture of water and antifreeze around a loop of a pipe which is buried externally. Heat from the ground is absorbed into this fluid and is pumped through a heat exchanger in the heat pump. Low grade heat passes through the heat pump compressor and is concentrated into a higher temperature; this useful heat is capable of heating water for the heating and hot water circuits of the house. However the pumps do use electricity to distribute this heat around the home; therefore they can result in higher carbon emissions than the use of gas heating in an efficiently designed home.

3.6.1 In addition, although relatively low, the density of the proposed layout is unlikely to allow for pipework to be laid in trenches, and would require the more costly approach of using boreholes. Feasibility work would be required to determine whether the site is suitable for the use of the boreholes, and whether the ground conditions would be adversely affected by the number of boreholes required.

3.7 Air Source Heat Pumps

3.7.1 Air source heat pumps reclaim the heat available in ambient air and convert it to higher temperatures to heat the home. As with ground source heat pumps, they use electricity to distribute heat. Air source systems do not require ground works and are therefore less costly than ground source systems; however this also means they are less efficient as the temperature of the air varies significantly more than the temperature of the ground throughout the year. Although this system is an efficient way of providing heating and hot

water using electricity, the carbon emissions will still be significantly higher than if gas were used.

- 3.7.2 The Energy Saving Trust does not recommend heat pumps for properties supplied by an existing gas network. Therefore, given the complexity of the necessary site investigations and system design and that the proposed development can be fed by the existing National Grid Gas network, it is not proposed that heat pumps are used at the Johnstown development.

3.8 Biomass Boilers

- 3.8.1 Biomass fuelled heating systems generally burn wood pellets, chips or logs to power central heating and hot water boilers or to provide warmth in a single room. Other fuel types are available but the energy density of wood chips or pellets means it is typically the most appropriate solution for applications within the built environment. Although savings on carbon emissions are significant, other implications need to be considered, especially the requirement for regular deliveries of fuel which would result in unacceptable volumes of traffic around the site. Also for most urban UK dwellings built with a high thermal performance level, the output of even the smallest high performance boiler on the market (5-10kW) is completely excessive, making both the capital costs and ongoing running costs uneconomic.
- 3.8.2 An alternative approach would be the provision of a centralised boiler system with a district heating system, linked to each home via a network of underground pipework providing space and water heating. However similar disadvantages with regard to traffic requirements would need to be considered together with on site plant and storage capacity and location, and issues relating to ownership and stewardship of a communal system.
- 3.8.3 Given that the other technologies present fewer operational, environmental and practical concerns, the use of biomass heating has not been considered further.

3.9 Summary of LZC Feasibility for Housing

- 3.9.1 At this stage of the design process there are two possible renewable energy options available to the developers of the Johnstown site which would allow them to reach a nominal 10% reduction in predicted annual carbon emissions.
- 3.9.2 The most suitable at this stage would be a solar photovoltaic system installed on 89 houses within the development. However, there may be a considerable cost implication which would need to be reviewed at detailed design stage together with a review of the Feed in Tariff levels available at the time of the development.
- 3.9.3 Installation of a solar thermal panel on every one of the dwellings would not appear to be as practical at this stage and cost implications would need to be reviewed at detailed design stage together with an assessment of the orientation of the properties.

4 CONCLUSIONS

- 4.1 The proposed development of up to 300 residential units, 4 small commercial units, and a small retail unit at Johnstown is subject to the planning requirements of Wrexham County Borough Council. This report has addressed National and Local policies relevant to the energy strategy for proposed new developments.
- 4.2 The proposed strategy is based on an initial improvement in standard energy efficiency which meets the energy targets for Level 3 of the Code for Sustainable Homes and current Building Regulations Part L 2010.
- 4.3 In addition, an energy strategy for the site has been proposed which would provide a reduction in predicted annual Carbon emission levels via the installation of renewable or low carbon technologies and therefore support the requirement to obtain 6 credits under Ene 1- Dwelling Emission Rate of the Code for Sustainable Homes.
- 4.4 The overall energy strategy for the site will need to be developed in more detail as further design information becomes available.