

KGA (UK) Ltd

Chartered Building Services Consulting Engineers



Energy Statement

Project

**Village Bakery
Wrexham Industrial Estate**

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1. EXECUTIVE SUMMARY

This Sustainability Statement has been prepared by KGA (UK) Ltd to accompany an application for full planning permission being submitted by the Applicant.

1.1 ENERGY AND CARBON TARGETS

Multiple layers of energy and carbon requirements apply to the development at a national, regional and local level, each of which requires different targets to be met. The development will be designed to target the most onerous requirements applicable for this proposal.

On that basis, the implications of the relevant targets for the proposed development can be summarised as follows:

- All development must meet the prevailing Building Regulations requirements. The development will be brought forward under Part L 2014, Wales and this has been used as the basis of this energy statement.

1.2 ENERGY STRATEGY

This energy statement has been structured in line with the energy hierarchy: Be Lean, Be Clean, Be Green.

The proposals for the scheme have been developed in accordance with the desire to achieve an energy efficient and sustainable development. The development will be designed to achieve optimum energy performance and will incorporate the following design features:

- Significantly exceed the minimum fabric requirements of Part L2A (2014) Wales of the Building Regulations.
- All buildings will include 100% low energy lighting and lighting control.
- All buildings will be provided with mechanical ventilation with heat recovery (MVHR) systems for ventilation within Offices.
- The open plan offices are to be heated via a high efficiency gas boiler.
- It is not possible to serve the development from a district heating network.
- Renewable and zero carbon technology such as photoelectric solar panel to achieve 5.3% minimum of the useful floor area on the unit.

2. POLICY CONTEXT

Local planning authorities should expect new development to:

- Comply with any development plan policies on local requirements for decentralised energy supply unless it can be demonstrated by the applicant, having regard to the type of development involved and its design, that this is not feasible or viable; and
- Take account of landform, layout, building orientation, massing and landscaping to minimise energy consumption.

2.1 ENERGY HIERARCHY

The following energy hierarchy has been used for this development:

1. **Be lean:** use less energy
2. **Be clean:** supply energy efficiently
3. **Be green:** use renewable energy

The commercial developments building emission rates shall comply with Part L 2014, Wales of the Building Regulations.

3. BE LEAN: REDUCE ENERGY DEMAND

The first step to achieving Building Regulations compliance and the targets outlined previously is to reduce energy demand. The measures associated with reducing demand can be termed as 'Energy Efficiency Measures'.

The Proposed Development will incorporate a number of relevant energy conservation measures the benefits of which are discussed below. In summary the following measures will be included:

- Improved air tightness;
- High performance building fabric;
- High performance glazing;
- 100% low energy lighting and controls;
- Mechanical ventilation with heat recovery.

3.1 BUILDING FABRIC

The building will be clad with a unitised curtain walling system.

At this stage it is anticipated that an overall U-value for the curtain walling system of around 1.6W/m²K or better will be achieved. For the purposes of this assessment this value has been used, though solutions will be sought to reduce the U-value further where possible in order to realise further carbon reductions.

Glazing to the units will be specified to achieve a g-value of around 0.4. This is considered to provide an appropriate year-round balance between maximising daylighting and beneficial wintertime solar gain, and minimising summertime solar gains to reduce the overheating risk and need for comfort cooling.

The current proposals for the enhanced building fabric performance for the Proposed Development are summarised in Table 3-1.

Table 3-1 Fabric performance targets

ELEMENT	MINIMUM BUILDING REGULATIONS FABRIC PERFORMANCE	ENHANCED FABRIC PERFORMANCE
External Wall U-value (W/m ² K)	0.35	0.26
Office Party wall U-value (W/m ² K)	0.35	0.26
Ground floor U-value (W/m ² K)	0.25	0.22
Roof U-value (W/m ² K)	0.25	0.18
Curtain Wall / Glazing U-value (W/m ² K)	2.2U / G0.4 / LT 0.7	1.6U / G0.4 / LT 0.7
Roof Lights / Glazing G-value	2.2U / G0.55 / LT 0.6	1.9U / G0.55 / LT 0.6
Air permeability (m ³ /hr.m ² @ 50 Pa)	10.0	5.0

3.2 BUILDING SERVICES

A high performance MEP building services is proposed for the scheme. Table 5-2 lists the general specification for the heating system, lighting, street lighting and ventilation strategy for the proposed commercial units.

Table 3-2 General heating, cooling, ventilation and lighting specification

ELEMENT	GENERAL SPECIFICATION
Ventilation	Mechanical ventilation with heat recovery (MVHR) units to achieve a specific fan power of 1.4W/l/s with a heat recovery efficiency of 70% or more.
Internal lighting	100% low energy, daylight & PIR control within warehouses and office areas where practical (i.e. perimeter zones with windows)
Primary heat source	Heating provided by High Efficiency gas boiler (96% seasonal efficiency).
Heating controls	Optimisation, including weather compensation
Heat emitters	Radiators fed from gas boiler
Overheating control / cooling	Mechanical ventilation supplemented by openable windows.

4. BE CLEAN: SUPPLY ENERGY EFFICIENTLY

After consumption has been reduced through the application of energy efficiency measures, the next step is to consider low carbon technologies in order to provide further reduction in carbon dioxide emissions.

The following low carbon technologies have been investigated for the Proposed Development.

- District heating network;
- Combined Heat and Power (CHP).

4.1 DISTRICT HEATING NETWORK

There are no existing district heating networks in the vicinity of the development.

Therefore, connection for District Heating has not been considered viable for this scheme.

4.2 COMBINED HEAT AND POWER (CHP)

On the basis that the development cannot be supplied directly from a district heating network, use of CHP led LTHW heating system has been considered. A primarily commercial development, domestic hot water consumption is likely to make up a small proportion of the total heat demand, which makes the site unsuitable for use of CHP.

LTHW heating production would be limited to hot water production in WC facilities and limited number of radiators. Therefore the use of CHP would not be viable throughout the year and has not been considered for this scheme.

5. BE GREEN: RENEWABLE ENERGY TECHNOLOGIES

Renewable Energy Technologies are those listed below which can provide a source of energy onsite that is not primarily based on the consumption of fossil fuels or grid electricity and/or utilises a heat source that is renewable such as ground source and solar thermal systems.

- Wind Power
- Biomass Heating
- Solar Thermal Hot Water Heating
- Photovoltaic Panels

We have evaluated a number of renewable energy technologies and outlined how they may be applied to the development.

5.1 WIND POWER

Harnessing the kinetic energy of wind can provide a renewable source of on-site electricity generation. Wind turbines need to be positioned where a frequent and steady source of wind is available that is not too turbulent or uneven in direction. Typically wind turbines are positioned on the roof of buildings that are significantly higher than their surroundings and or located in open areas where there is minimum disruption to prevailing winds.

Wind turbines are not considered to be appropriate in townscape and architectural terms to provide wind turbines on top of the building. On that basis they are not proposed for the development.

5.2 BIOMASS HEATING

Biomass heating has embodied environmental impacts from transport and fuel combustion which makes it less desirable in Air Quality Management Areas (AQMA's). A review of the potential impact on air quality from increased wood fuelled biomass use in London has been carried out by AEA Energy & Environment, and was published in December 2007. Whilst the development is not within a London Borough the assessment indicates that potentially increasing the contribution from small-scale wood fuelled biomass combustion may lead to a substantial increase in nitrogen dioxide and particulate matter concentrations.

However there are several technologies such as ceramic filters, electrostatic precipitators or bag filters which can all be used to significantly reduce the emissions to air and have successfully been used on biomass systems located within AQMA's. Solid biomass relies on a reliable fuel supply which must be delivered and stored on site. Sites using biomass solutions therefore require good access routes both of which are viable on this site. Biomass boilers also have weekly maintenance requirements and relatively high fuel costs compared to gas.

However, as the building is predominately heated within the office area and the warehouse will be unheated or heated for frost protection heating only, LTHW heating production would be limited to hot water production in WC facilities and limited number of radiators. Therefore the use of Biomass would not be viable throughout the year and has not been considered for this scheme.

5.3 SOLAR THERMAL

Solar thermal generation involves capturing solar radiant heat to preheat or heat domestic hot water. Correctly located and orientated, solar thermal systems can meet a proportion of a building's domestic hot water dependent on the expected demand profile and available space for locating ST collectors.

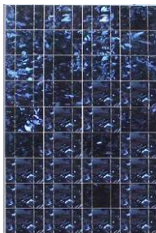
The development's centralised heating system will be served by the Boiler heating system. A solar thermal hot water system would offset some proportion of the baseline load throughout the summer months if provided. The available roof space and the steady demand for hot water throughout the day make solar thermal a potential option.

5.4 PHOTOVOLTAIC PANELS

The feasibility of providing photovoltaic (PV) panels has been assessed for this scheme. Solar PV panels located on the top roof areas can be used to provide electricity generation which can contribute to the Local Authority Targets.

Photovoltaic (PV) modules convert sunlight into DC electricity and can be integrated into buildings. PV is distinct from other renewable energy technologies since it has no moving parts to be maintained and is silent. PV systems can be incorporated into buildings in various ways; on sloped roofs and flat roofs, on facades, atria and as shading devices.

Table 5.1 Three most common types of photovoltaic cell

Property	Monocrystalline Silicon	Polycrystalline Silicon	Thin Film Amorphous Silicon
			
Cell efficiency at standard test conditions	15-20%	14-15%	8-12%
Module efficiency	13-15%	12-14%	5-7%
Advantages/Disadvantages	Most efficient but highest cost	Less expensive than monocrystalline but slightly less efficient	Considerably cheaper but approximately half the efficiency of a typical monocrystalline panel

Since PV's generate DC output, an inverter and other equipment is needed to deliver the power to a building or the grid in an acceptable AC form. The cost of the inverter and these 'balance of system' (BOS) components can approach 50% of the total cost of a PV system.

There are several issues which will need to be considered further if one or more photovoltaic arrays are to be included. Consideration must be given to any over-shading provided by surrounding buildings as well as orientation and elevation of the panels.

A particular advantage of solar PV, over other types of LZC technology, is that the running costs are very low (requires no fossil fuel for operation) and since there are no moving parts, very little maintenance is required.

The suitability of this technology for the site is dependent on space availability for panel mounting. For the warehouse building, the available area is a south facing roof.

A PV system would offset some proportion of the baseline load if provided. The available roof space and the high electrical load and percentage of electrical load attributed to lighting throughout the day.

5.5 SUITABILITY APPRAISAL

All renewable energy technologies which may be considered feasible for the scheme have been assessed and summarised in table 7-1.

Table 5-2 Renewable technology suitability appraisal

TECHNOLOGY	APPRAISAL
Wind	Not suitable at this site
Biomass	Limited all round heating
Solar Thermal	Limited to HWS demand and summertime operation
Photovoltaic Panels	Potentially suitable at this site

5.6 CARBON EMISSIONS REDUCTION

All renewable energy technologies which may be considered feasible for the scheme have been assessed, the outcomes of which are summarised above. From that exercise, it was concluded that Monocrystalline Solar PV panels were the most suitable for this scheme and would work effectively alongside the proposed HVAC services. A minimum of 5.3% of the useful floor area of PV should be applied to the development with minimum 18% panel efficiency.