Integration Ltd

The Future of Engineering

Unit A
Capital Park
Barnsley

Energy Strategy
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AMENDMENT HISTORY

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1 EXECUTIVE SUMMARY

The energy strategy adopts a hierarchical approach using passive and low energy design technologies to reduce baseline energy demand and CO_2 emissions followed by the application of low and zero carbon technologies.

The energy strategy has identified that with the provision of passive and low energy design measures being applied the regulated carbon emissions from the development will be below the Building Regulations Part L: 2013 baseline scheme, in line with the requirements of the Local Planning Authority.

2 INTRODUCTION

2.1 Purpose

The purpose of this document is to explain the energy strategy proposed for the Industrial development at Unit A Capital Park, Barnsley.

The report provides details of the energy modelling for the site explaining the energy efficiency measures together with assessment of potential low and zero carbon technologies.

This document is to be read in conjunction with the submitted application drawings and the Design and Access Statement.

The Energy Strategy has been prepared in accordance with planning guidance set out in Planning Policy Statement 22: Renewable Energy.

This Strategy demonstrates how energy efficiency measures, low and zero carbon technologies together with renewable energy sources have been addressed as part of the application.

2.2 Proposed Developments

The industrial unit development consists of a warehouse unit with associated office accommodation.

The unit is to be built as shell warehouses with the associated office space being provided with and heating and fitted out to a Category A standard.

By its speculative nature the final use of the industrial unit cannot be defined at this early stage. In terms of energy usage it is assumed for estimating energy usage that the shell warehouse areas will be unheated although this will ultimately be dependent on the future tenants bespoke needs.

The fitting out of the industrial area for a specific process, for all of the units, would require bespoke systems to suit the tenants' individual needs arising at the time of letting, which would all require assessment under ADL2B.

The servicing strategy for the industrial units will be as follows:

Description of Service	System
Warehouse heating	Unheated
Office area heating	VRF Air Conditioning from Electric Air Source Heat Pumps
Core area heating	Electric Panel Heaters
Domestic hot water	Electric Point of Use

2.3 Background Policy Documents

The following statements and regulatory guidelines form the policy background to this energy strategy:

- The Kyoto Protocol at the United Nations
- Framework Convention on Climate Change as negotiated in December 1997 has come into effect on 16 February 2005 following the ratification of the agreement by Russia on 18

November 2004. The Burden Sharing Agreement of the EU mandates a 12.5% reduction in greenhouse gas emissions for the UK by 2008 - 12.

- The Department of Transport and Industry White Paper, titled "Our Energy Future - Creating a Low Carbon Economy", spells out a target for 10% of electricity to be from renewable sources nationally by 2010 and twice this by 2020.
- National Policy Objectives in regard to renewable energy Planning Policy Statement 22: Renewable energy guidance for local governing bodies concerning implementation of renewable energy technologies through appropriate planning.
- The United Kingdom has made commitments that extend beyond this requirement. National Targets are for a reduction to 20% below 1990 CO2 levels by 2010 and a 60% reduction by 2050.
- Integrating renewable energy into new developments: Toolkit for planners, developers and consultants, September 2004.
- The Building Regulations 2013 - Approved Document L - Conservation of Fuel and Power in new buildings other than dwellings.

2.4 Reservation

This report has been prepared solely for the use of Marshall Construction and NOVO Integration Ltd accept no responsibility for its use by any third parties.

3 DESIGN PARAMETERS

NOVO Integration Ltd have used the following information to formulate the Energy Strategy.

3.1 Architectural Drawings by Building Management Services

Drawing No: M3016-02-SK4 Floor Plans
Drawing No: M3016-01-SK4 Site Layout Plan
Drawing No: M3016-03-SK4 Elevations

3.2 Construction Elements

U-values and construction details have been taken as the values as follows:

External wall 0.26 W/m^2 °C
Roof 0.18 W/m^2 °C
Floor in contact with ground 0.22 W/m^2 °C
External Glazing 1.6 W/m^2 °C
External Doors (not glazed) 2.2 W/m^2 °C

3.3 Environmental Criteria

As the Part L2A of the Building Regulations (2013) require, the environmental criteria of the occupied spaces have been set to the National Calculation Method Standards for the Energy Study.

4 LOW & ZERO CARBON TECHNOLOGIES

4.1 General

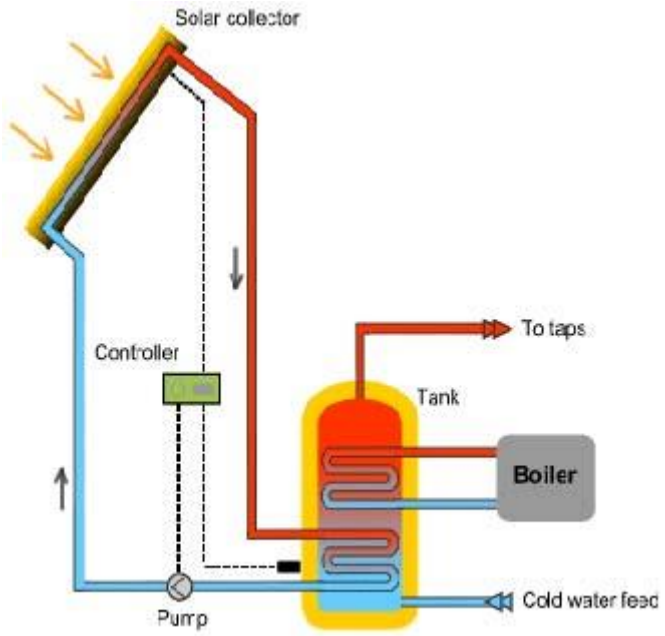
Low and zero carbon (LZC) technologies are systems that generate energy with either zero or reduced CO_2 emissions when compared against traditional energy generation methods.

The alternative LZC technologies have been assessed in relation to the development and their viability assessed. Some of the LZCs are intrinsically unsuitable due to the development type and location whereas others are potentially viable.

4.2 LZC Technologies Appraisal

4.3 Solar Water Heating

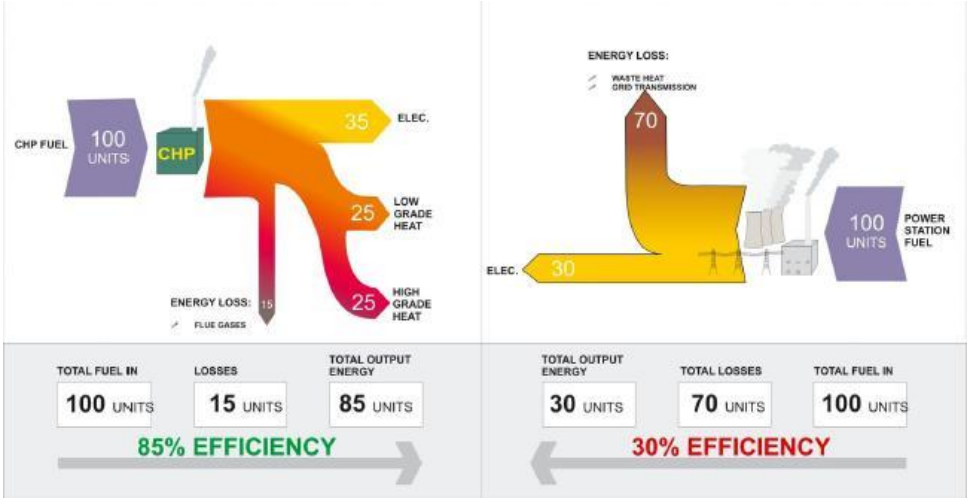
Solar thermal panels utilise the sun energy to generate hot water for use within the building. The panels are commonly provided in either flat plate or evacuated tube arrangements. The panels are ideally located facing south at an approximate 30° inclination angle in areas where they are not subjected to shade.



Each unit in the development has the potential to use solar water heating to pre-reheat the domestic hot water services. However the development has very little hot water usage, hence it is not considered viable for the development.

4.4 CHP and Trigeneration

Combined heat and power (CHP) generates electricity on site and recovers a proportion of the waste heat for use in heating and/or hot water generation for the building. This allows the overall efficiency to be significantly greater than the electricity generated via power stations feeding the National Grid. The CHP plant typically uses gas as the primary energy source and often incorporates a thermal store. Biomass fuelled CHP is possible however this is typically only for very large schemes due to operational difficulties with smaller capacity units.



Trigeneration systems effectively utilise the CHP plant with the waste heat being used to generate cooling via an absorption chiller in order to make best use of the waste heat in buildings that incorporate cooling systems.

CHP and similarly trigeneration systems are typically considered only to be viable where they are required to run for at least 5,000 hours per annum and have an appropriate year round heating demand.

The domestic hot water services (HWS) requirement to the industrial units is low along with the relatively low heating demand for the core and office areas, therefore the capital cost of this system shall provide a payback period in excess of 15 years, and is therefore not considered viable for this project.

4.5 Community Heating and Cooling

Community heating and cooling relates to a central system that provides the necessary heating and cooling water to more than one use or part of a building. For example a community heating system can comprise central boiler plant that provides heat to separate dwellings and similarly a community cooling system can comprise central refrigeration plant that provides cooling to individual retail units in a shopping centre.

Whilst there may be future development phase on the adjacent plot and/or sites, at this stage it is unclear what type of use the building(s) may have, whether they will be heated, their operational hours and indeed when they may be constructed.

For the reasons detailed connection to a community heating or cooling system is not considered viable for the development.

4.6 Wind Turbines

Wind turbines generate electrical energy derived from kinetic energy provided by the local wind resource. The performance of wind turbines depends greatly on the wind speed and turbulence that in turn is influenced by the terrain and installation height.



The use of wind turbines on the development will also have a significant visual impact as well as low frequency noise source and hence it is likely to meet opposition within the local area.

For the reasons detailed above wind turbines are not considered viable for the development.

4.7 Photovoltaic Cells

Photovoltaic (PV) panels utilise the sun's energy to generate electricity. The optimum location for PV panels is south facing at an approximate 30° inclination angle in areas where they are not subjected to shade.



As the development has utilised a fabric first approach the requirement to achieve Building Regulations has already been me as such PV has been discounted.

PV maybe considered at the fit out stage as the energy requirements for the warehouse will be known and a specific approach to amount of potential PV can be assessed.

4.8 Biomass Boiler

Biomass is considered to be a renewable fuel source as the CO_2 absorbed during the growth period is assessed as being approximately equal to the CO_2 emitted during combustion and hence deemed "carbon neutral". Biomass for boilers is typically wood either in chip or pellet form.
Biomass boilers require fuel storage together with associated transportation and delivery to the store location.



With the minimal plant areas to suit the prospective tenants use of the warehouse & office area it is not considered viable to transport wood pellets or similar to the building.

For the above reasons the use of a biomass boiler plant is not considered viable for the development.

4.9 Air and Ground Source Heating and Cooling

The Air Source Heat Pumps can be linked with indoor units to heat and cool the space. These could be either ceiling mounted cassette units, wall mounted units or floor mounted units. This would have the benefit of also providing cooling to each room in summer months.

The outdoor units can be located anywhere and are not dependant on orientation. They need to be externally mounted and in a local compound to be safe.

This is a suitable form or technology to utilise for the offices and is understood that the air source heat pump air conditioning solution will be utilised to for the heating and cooling provisions for the offices, meeting rooms and the receptions areas.

4.10 Fuel Cell

The fuel cell technology essentially converts chemical energy into both electrical and heat energy. The cell needs to be continually supplied with hydrogen (derived from either a piped or storage source) and oxygen (derived from air) that are combined and the chemical reaction produce electrical energy, heat energy and water vapour.

The fuel cell requires a hydrogen fuel source that can either be from a piped source (not currently available) or from stored gas. However the more usual approach currently in the UK is to use natural gas in order to generate the hydrogen required to operate the fuel cell.

Fuel cells have various commercial and technical limitations. There is a high initial capital cost together with there being few established suppliers and a very limited specialist design, installation and maintenance capabilities. Certain fuel cell elements require regular replacement imposing a significant on-going cost implication. The fuel cells themselves are generally large, heavy and require fresh air ventilation.

Due to the initial capital cost, space requirements and on-going maintenance costs fuel cells are not considered viable for this development.

5 CONCLUSIONS

The energy strategy for Units A at the proposed development has adopted a hierarchical approach of using passive and low energy design technologies to reduce the baseline energy demand and hence CO_2 emissions followed by the application of low and zero carbon technologies as appropriate.

The analysis has shown that by incorporating passive and low energy design measures, there is a reduction in the development annual corrected CO_2 baseline emissions utilising the IES thermal model assessment method. This is achieved by incorporation of the following elements:

- High performance glazing to reduce solar and transmission gains.
- Improved thermal transmittance U-valued.
- Low Energy Local Extract Fans
- High efficiency electric air source heat pumps supplying air conditioning systems
- High efficiency electric panel heaters
- Low building air leakage rate (5 m^3/h/m2 at a pressure differential of 50 Pa).
- Low energy LED Lighting throughout
- Low flow aerated and basin tap inserts to reduce domestic water consumption.
- Automatic lighting control system with occupancy and daylight dimming controls in common parts.
- Luminaires with Light Output Ratio (LoR) of 0.5 or above
- Lighting designs carried out to ensure that the Luminaire Efficacy is 60 W/lm or greater.

5.1.1 Unit A

The building has a reduction of CO_2 emissions of 17.5% reduction over the Notional building scheme.

This is proven by the following results from the IES energy study

Energy summary	$kgCO_2/m^2.yr$	Actual	Notional
	Heating	1.33	1.38
	DHW	2.41	1.63
	Cooling	0.13	0.27
	Aux	0.03	0.06
	Lighting	5.93	8.60
	Renewables	(0.00)	(0.00)
	Total	**9.84**	**11.93**

This is supported by the BRUKL Output Document to compliance in England with the Building Regulations Part L 2013, issued with this report