Energy Statement

Green Road, Dodworth

1. Introduction

This document has been prepared following the request by Barnsley Council, for the outline planning application for residential development on land off Green Road, Dodworth to be accompanied by an Energy Statement.

The Government's energy policy, including its policy on renewable energy, is set out in the Energy White Paper. This aims to put the UK on a path to cut its carbon dioxide emissions by some 60% by 2050, with real progress by 2020, and to maintain reliable and competitive energy supplies.

The Government has already set a target to generate 10% of UK electricity from renewable energy sources by 2010. The White Paper set out the Government's aspiration to double that figure to 20% by 2020, and suggests that still more renewable energy will be needed beyond that date. The White Paper sets out policies to stimulate the development of new technologies to provide the basis for continuing growth of renewable in the longer term, to assist the UK renewable industry to become competitive in home and export markets and in doing so, provide employment.

The purpose of this report is to provide an overview of the energy issues and possible solutions afecting the development.

Energy Statement are becoming frequently required by local planning authorities, Energy Statements vary to reflect specific local concerns. They provide detailed information on how a development will address energy supply and incorporate energy efficiency and renewable energy technologies. The statements include calculations for base-line energy usage, assessments of energy efficiency measures and suggestions for on-site renewable energy generation to minimise CO2 emissions.

While criteria defined in planning guidance documents prevail, this report will address the following issues:

Assessment of Carbon Emissions: The energy consumption and carbon emissions of the proposed development can be calculated by using either a benchmarking method or a thermal calculation. The benchmarking method is most commonly used, unless there is sufficient information to undertake an energy model, such as the Simplified Building Energy Model (SBEM) calculation, which requires full details of fabric, lighting, HVAC and control design and equipment.

Location and urban design: Many new developments must use passive solar design and be oriented to optimise passive solar benefit.

Adapting to Climate Change: Air flow and cooling must be reduced using the height-to-space ratio wherever possible and by installing open water, use of ground water cooling, and mass basement construction. Borehole cooling and high mass components must also be considered.

Energy Efficiency: Maximise the use of energy-efficiency techniques and consider low-carbon equipment and local controls.

Heating and cooling: Apply a hierarchy of consideration to passive design, solar water heating, trigeneration (or combined heat and power), community heating, heat pumps, gas condensing boilers, and gas central heating.

Embedded renewables: Reduce carbon emissions from the total energy needs (heat and power) by the on-site generation of renewable energy. Check with your local authority, as some set this target as high as 20%, while other require 10% reductions. Developments that do not incorporate photovoltaics should be designed to support them later.

2. Planning Policy

Planning Policy Statement 1

The Government's aim is a set of policies that provides clarity about the framework for achieving zero carbon development. This will provide greater certainty for the development industry and other related businesses, and support cost-effective solutions without over-regulating the sector. *Planning Policy Statement 1* (PPS1): *Delivering Sustainable Development* sets out the overarching planning policies on the delivery of sustainable development through the planning system. Planning Policy Statement: Planning and Climate Change Supplement to Planning Policy Statement 1 was produced in December 2007. *Planning and Climate Change* sets out "how spatial planning, in providing for the new homes, jobs and infrastructure needed by communities, should help shape places with lower carbon emissions and resilient to the climate change now accepted as inevitable. Spatial planning, regionally and locally, provides the framework for integrating new development with other programmes that influence the nature of places and how they function."

Planning Policy Statement 22

PPS22 defines renewable energy as that which covers those energy flows that occur naturally and repeatedly in the environment – from the wind, the fall of water, the movement of the oceans, from the sun and also from biomass. Policies in this statement therefore cover technologies such as onshore wind generation, hydro, photovoltaics, passive solar, biomass and energy crops, energy from waste (but not energy from mass incineration of domestic waste), and landfill and sewage gas.

Regional Spatial Strategy

At a regional level the Yorkshire and Humber Plan (Regional Spatial Strategy to 2026) contains policies to deal with climate change and the use of resources, this is stated in policy YH2 Climate change and resource use which states:

Plans, strategies, investment decisions and programmes should:
***A** Help to meet the target set out in the RES to reduce greenhouse gas emissions in the region in 2016 by 20-25% (compared to 1990 levels) with further reductions thereafter by:*
1. Increasing population, development and activity in cities and towns
2. Encouraging better energy, resource, and water efficient buildings
3. Minimising resource demands from development
4. Reducing traffic growth through appropriate location of development, demand management, and improving public transport and facilities for walking and cycling
5. Encouraging redevelopment of previously developed land
6. Facilitating effective waste management
7. Increasing renewable energy capacity and carbon capture
***B** Plan for the successful adaptation to the predicted impacts of climate change by:*

1. Minimising threats from and impact of coastal erosion, increased flood risk, increased storminess, habitat disturbance, increased pressure on water resources, supply and drainage systems;
2. Maximising opportunities from: increased growing season; greater tourism potential; and warmer urban environments.

POLICY ENV5: Energy
The Region will maximise improvements to energy efficiency and increases in renewable energy capacity. Plans, strategies, investment decisions and programmes should:
A Reduce greenhouse gas emissions, improve energy efficiency and maximise the efficient use of power sources by:
1. Requiring the orientation and layout of development to maximise passive solar heating
2. Ensuring that publicly funded housing, and Yorkshire Forward supported development, meet high energy efficiency standards
3. Maximising the use of combined heat and power, particularly for developments with energy demands over 2MW, and incorporating renewable sources of energy where possible
4. Ensuring that development takes advantage of community heating opportunities wherever they arise in the region, including at Immingham and near Selby
5. Providing for new efficient energy generation and transmission infrastructure in keeping with local amenity and areas of demand
6. Supporting the use of clean coal technologies and abatement measures
B Maximise renewable energy capacity by:
1. Delivering at least the following Regional and Sub-Regional targets for installed grid connected renewable energy capacity:

	2010	**2021**
Humber	124MW	350MW
North Yorkshire	209MW	428MW
South Yorkshire	47MW	160MW
West Yorkshire	88MW	295MW
Offshore	240MW	630MW
Total	**708MW**	**1862MW**

2. Monitoring annually planning permissions and developments against the indicative local authority targets for 2010 and 2021 set out in Table 10.2 and taking action accordingly in order to ensure the regional and subregional targets are exceeded
3. Promoting and securing greater use of decentralised and renewable or low-carbon energy in new development, including through Development Plan Documents setting ambitious but viable proportions of the energy supply for new development to be required to come from such sources. In advance of local targets being set in DPDs, new developments of more than 10 dwellings or 1000m2 of non-residential floorspace should secure at least 10% of their energy from decentralised and renewable or low-carbon sources, unless, having regard to the type of development involved and its design, this is not feasible or viable.

Local Policy

At a local level the Barnsley Unitary Development Plan (adopted 2000) seeks to: provide land use, development and transportation policies aimed at:

i) Reducing the need to travel by car, especially by:
- Promoting development within urban areas at locations highly accessible by means other than the private car
- Locate major generators of travel demand such as shopping, in existing centers and other highly accessible locations, especially for public transport
- Strengthen existing local centres in urban and rural areas, protecting and enhancing their viability and vitality

- Encouraging public transport, cycling and walking between home and facilities people visit regularly
- Limit parking provision to discourage reliance on use of cars for work and other journeys.
ii) Using land in urban areas as fully and effectively as possible without 'town cramming'
iii) Providing enough land for all needs - homes, jobs, shops, food, transport, fuel, building materials and reclamation
iv) Protecting and enhancing high quality environments and wildlife habitats, and improving poor environments
v) Recycling land for development
vi) Conserving non-renewable resources and maximising energy generation from renewable resources
vii) Minimising pollution of land, air and water and reduction of the impact of waste disposal.
b) Complementary Transport measures aimed at :
i) Promoting modal choice by increasing the relative advantages of travelling by public transport, cycling and walking
ii) Reducing dependence on the private car
iii) Increasing the competitiveness and attractiveness of urban centres against peripheral development.
c) Provision of transport infrastructure to:
i) Support the locational policies and objectives of the Plan
ii) Protect and improve the environment
iii) Reduce accidents.

The emerging Local Development Framework, Core Strategy produced in 2005 contains Policy EN2: Including renewable energy in developments, this states: -
New buildings above the following sizes, including conversions of existing buildings to new uses, must include equipment for producing renewable energy to provide at least 10% of predicted energy needs from renewable energy sources.
a Housing development of over 20 homes
b Business development of over 1000 square metres floor space
c Community development of over 1000 square metres floor space
We will refuse planning applications that do not meet these conditions.

Although the Core Strategy carries no weight in the determination of planning applications, the revised Core Strategy, which is due for public consultation in March 2009, will contain policies relating to renewable energy.

3. Site Description

The site is situated on the south western side of the village of Dodworth, which is located approximately 3km from Barnsley town centre. The site is roughly rectangular in shape with the longer axis running north / south. The proposed site includes three existing dwellings; Hillside, Fieldside and The Old Stables, which will be incorporated within the development site. The site covers an area in excess of 2 hectares and is considered to be brownfield land according to the PPS3 definition of previously developed land (see Section 3.1).

The site border to the north is formed by the gardens of a large detached house (Stonehouse). The western borders are irregular and accommodate a range of adjoining properties including most significantly, the Travellers Inn public house and the buildings and grounds of the now unused Dodworth Church of England School. The eastern boundary of the site is formed by the rear gardens of housing located on Chatsworth Rise and Strafford Walk with trees, hedge rows and a stream forming the southern boundary.

A further stream flows along a slant line from north-west to south-east, through the approximate centre of the site, forming a small valley and terminating in a series of sinks on the eastern boundary of the site. The site ground level falls from north to south.

3. Sustainability Assessment

In support of the planning application a Sustainability Statement has been produced and is annexed in the Design and Access Statement, this to provide information on various issues relating to the sustainability of the site and justification for residential development.

4. Assessment of Carbon Emissions

The calculations for base-line energy usage and Carbon Emissions are based on Building Regulations Part L (2006) SAP calculations and data for house types whose type and area approximate to those indicated on the layout.

The Energy demands are divided into Space Heating from a Gas Condensing Boiler, Water Heating from a Gas Condensing Boiler and Electricity usage from Secondary Heating, pump operation and lighting and appliances. Carbon Dioxide emissions have been calculated from the 3 types or energy demand according to the differing carbon outputs for the differing energy types used. The results are shown on the table below:

Predicted Baseline (Part L) Energy Demand for Development of 51 Houses - approx 6250 m²		
	Energy Demand(kWh/yr)	**Emissions (KgCO2/yr)**
Space Heating (Gas)	342440	66145
Water Heating (Gas)	219050	37903
Lights & Appliances (Electric)	99490	37543
Totals	**660,980 kWh/yr**	**141,591 KgCO2/yr**

Table 1

5. Location and Urban Design

The proposed development enables the majority of house types to employ passive solar design and active solar renewable technologies to reduce energy demand.

6. Adapting to Climate Change

For this residential development it is anticipated that air flow and cooling will not be major considerations. Local control of air flow will be provided through a large number of opening windows, which along with trickle ventilation will provide adequate air change and cooling ventilation for all buildings. High fabric insulation levels, together with high thermal mass and shading provided by surrounding trees and buildings will help to ensure that overheating due to solar gain is minimised.

7. Energy Efficiency Measures

Insulation
To improve the energy efficiency and consequent carbon dioxide emission of the development, it is proposed that the insulation standard of the housing could be increased to a level above those currently required for Part L (2006) compliance. Wall insulation values could be improved through the specification of high thermal performance aerated concrete inner leaf blockwork and increasing the cavity width to accommodate a minimum of 75mm high performance foil-faced polyisocyanurate foam insulation in a partial fill cavity situation. This will improve wall U-values from 0.28 to 0.23 W/m2K and provide. Additional improvements could be made by increasing the thickness of mineral wool roof insulation from 300mm to 400mm to improve roof U-values from 0.14 to 0.10 W/m2K and specifying a ground floor construction with an improved thermal insulation value of 0.21W/m2K over the Part L compliant value of 0.27 W/m2K. The improved thermal efficiency could be achieved with a 75mm thickness high performance foil-faced polyisocyanurate foam insulation above a beam and block floor or insitu concrete slab floor.

Air Tightness
Additional energy efficiency improvements can be gained through a commitment to using Accredited Construction Details, which will minimise the effects of cold bridging and air leakage.

Energy Efficient Lighting and Appliances
The energy demand calculations (above) are based on the provision of Dedicated Energy Efficient Lighting for 30% of the total lighting in each house type. With the provision of Energy Efficient Lighting to all light fittings and the specification of 'A-rated' appliances an improvement in electrical energy demand and associated carbon dioxide emissions of approximately 10% could be achieved.

Summary
It is anticipated that with the above suggested energy efficiency measures an improvement of 10 to 15% on the total development energy demand could be achieved. This would equate to an energy saving of between 66,098 and 99,147 kWh/yr and a Carbon Dioxide emission saving of between 14,159 and 21,238 KgCO2/yr.

8. Heating and Cooling

The energy demand and carbon emission calculations (Section 4) were based on the provision of high efficiency Gas Condensing boilers with Thermostatic Radiator Valves, within a traditional 'wet' gas central heating and hot water system. This system is deemed to provide the most robust, energy efficient and cost effective solution to the heating needs of this development.

Due to the heat loss nature of housing and the inherent thermal mass of masonry cavity wall construction, it is anticipated that no additional cooling measures will be necessary for this development.

A number of renewable energy technologies have been assessed to reduce the energy demand and carbon emmissions associated with heating. These technologies are discussed in detail in Section 9.

9. Embedded Renewables

Solar Hot Water Heating

The site layout has been designed to ensure that the majority of housing (57%) has a front or rear elevation and roof orientated within 30 degrees of due south (see below image). The site also features generous spacing between housing blocks, which ensures that overshadowing does not compromise available solar gains.



A south-facing orientation provides increased solar gain through glazing which reduces energy consumption for space heating as well as providing a suitable roof mounting space for a solar hot water heating system or Photo-Voltaic panels. This 'future-proofing' for solar roof panels, where feasible, helps to provide an effective and robust future upgrade path for the utilisation of low and zero carbon technologies.

Solar Hot Water heating is considered to be a proven and robust renewable technology that can provide around a third of the average house's hot water needs, reducing the average domestic CO2 emissions by around 325kg per year (online: www.energysavingtrust.org.uk).

As can be seen from Fig 1, a total of 29 houses have a roof orientation suitable for the installation of Solar Hot Water Heating Technology. Assuming the provision of evacuated tube solar water heating panels with a panel area of 3 m^2 and an effective output of 2000 kWh/yr for all 29 suitable houses, a total output of 58000 KWh/yr will be achieved. This saving equates to 8.8% of the total energy demand of the development.

Photovoltaic Panels
The cost of Photovoltaic panel systems is still prohibitively expensive and as such, is not recommended as a source of renewable energy for the development.

Wind Turbines
The site is surrounded by housing and has a large number of mature trees on its boundary and through the centre of the development area. For these reason, wind turbines are not deemed to be a feasible source of renewable energy for this development.

Summary
It is anticipated that the estimated 8.8% of total energy demand provided by Solar Hot Water technology could be supplemented by Air-source Heat Pump technology to provide at least 10% of total energy demand via renewable energy sources. Air source heat pump technology would be employed on some or all of the house types not fitted with solar hot water heating technology, due to having an unsuitable roof orientation.

Community Heating and Combined Heat and Power

As this is a modest development on a site with pronounced level changes and a band of mature trees running directly through its centre, a community heating or Combined Heat and Power (CHP) facility would not be feasible. This is because of the challenges and subsequent costs associated with the distribution of community heating across the steeply inclined site and through the central tree band.

10. Conclusion

Based on the research and assessment conducted for this energy statement, a reduction of between 10 and 15% of total energy demand and subsequent carbon dioxide emissions is feasible through the implementation of the energy efficiency measures detailed in Section 7 of this report.

Roof-mounted solar hot water heating panels are the most suitable renewable technology for the development and when installed to all suitable houses could provide approximately 9% of total energy demand. If additional output was required to take the total renewable energy to above 10% of total energy demand this could be provided by Air-source heat pump technology, as outlined in Section 9 of this report.