Overview of sustainable energy opportunities in Havant

Final Report ◆ August 2005 ◆

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Savills ◆ Future Energy Solutions

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One ◆ The national and regional policy context for sustainable energy use

NATIONAL ENERGY POLICY

National energy policy is set out in the Government's Energy White Paper, published in February 2003[1]. This lays out the principal issues and aspirations for change. The four principal goals of energy policy set out in the White Paper are:

- to put ourselves on a path to cut the UK's CO_2 emissions by some 60% by about 2050, with real progress by 2020;
- to maintain the reliability of energy supplies;
- to promote competitive markets in the UK and beyond, helping to raise the rate of sustainable economic growth and improve our productivity; and
- to ensure that every home is adequately and affordably heated.

PLANNING POLICY AND GUIDANCE

The White Paper is complemented by new - and significantly enhanced - proposed approaches to energy within the planning system. At present these take the form of draft national and regional guidance:

- *"Harnessing the Elements" Regional Planning Guidance for the South East – Energy Efficiency and Renewable Energy*[2] identifies regional and sub-regional targets for deployment of renewable energy electricity generating technologies. These targets are accompanied by indicative breakdowns of

[1] "Our Energy Future – Creating A Low Carbon Economy", (February 2003)

technology types and scales, based in turn on work carried out for both SEERA[3] and GOSE[4];

- *PPS1: Creating sustainable communities[5],* advises that planning policies should reflect a preference for minimising the need to consume new resources over the lifetime of a development by making best use of existing resources and by seeking to promote and encourage, rather than restrict, the development of renewable energy resources. The draft PPS notes also that consideration should be given to encouraging energy efficient buildings, community heating schemes and the use of combined heat and power in development;

- *PPS22: Renewable energy[6],* sets out a number of preferred policy approaches to renewable energy technologies and schemes, and is complemented by a Companion Guide that seeks to illustrate schemes and principles[7].

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[2] "Harnessing the Elements", RPG9 (SEERA, May 2003)
[3] "An Assessment of the South East's Renewable Energy Capacity and Potential to 2026", AEA Technology / FPDSavills, May 2002
[4] "Development of a Renewable Energy Assessment and Targets for the South East", January 2001
[5] PPS1 – Creating Sustainable Communities
[6] Planning Policy Statement 22 – Renewable Energy – August 2004
[7] "Planning for Renewable Energy – A Companion Guide to PPS22", 2004

Two ◆ Overview of sustainable energy technologies suitable for Havant

ENERGY EFFICIENCY

We have included energy efficiency as part of the 'sustainable energy menu' for Havant because:

- it is important to consider energy efficiency savings before maximising the value of renewable energy (RE) within development;

- some technologies, including combined heat and power (CHP) and ground source heat pumps, can be considered to be either 'renewable energy' or 'energy efficiency' under certain circumstances. The explicit inclusion of both ensures that nothing is missed.

Energy efficiency considerations in the Havant development context should embrace the use of energy in buildings and transport. To encourage energy efficiency in buildings, the following design measures and standards can be taken into account for new developments.

i). Passive solar design

Passive solar design (PSD) seeks to optimise the use of solar heat, daylight and natural ventilation in a development, so reducing the need to provide these requirements through the use of scarce energy resources. A key priority in PSD is to enhance occupant comfort in buildings.

In residential development, PSD requires houses to have a principal (i.e. front or rear) elevation oriented within 25 degrees of south, to collect the light and warmth of the sun for most of the day. PSD requires also that the south-facing elevation of a house is not overshadowed by adjacent buildings, trees or terrain, and that high standards of thermal insulation are used within the house.

Further energy efficiency benefits can also derived by ensuring that kitchens – a significant source of heat – are placed on the cool northern side of a dwelling, with the principal living quarters placed on the sunny southern side.

PSD methods can also be applied in non-domestic buildings to similar effect, although in some building-types such as offices the emphasis changes from heat gain and towards the achievement of appropriate daylighting and effective natural ventilation. PSD methods should be considered, with other design objectives, in all new developments in Havant.

Farnborough Grange junior school, Hampshire

Examples

- West Oxfordshire District Council's new offices in Witney, employs PSD methods to enhance energy efficiency along with photovoltaic panels to provide some of the building's electricity.

- Guildford Borough Council's Parson's Green development of seven houses and four bungalows incorporates passive solar design to reduce energy costs for tenants.

- Clerestory windows are employed at the Farnborough Grange junior school in Hampshire to minimise the need for artificial lighting on the northern side of the building even on overcast days. Overhanging eaves moderate solar gain in summer, providing a comfortable internal environment.

- Crookham Junior School in Hampshire was refurbished using a passive solar design approach – this reduced overheating in some rooms and increased the use of natural light.

ii). BREEAM ratings

The Building Research Establishment Environmental Assessment Method (BREEAM) could be used in all new developments in Havant. BREEAM assesses the environmental quality of a development under various categories – energy, transport, pollution, materials, water, land use and ecology, and health and well-being. Developments are measured on a scale of *pass*, *good*, *very good* and *excellent*. A range of different assessment schemes is available for different building types as follows.

Energy efficiency rating schemes

Building type	Rating scheme
Housing	BREEAM EcoHomes
Offices	BREEAM 98 Offices
Industrial	BREEAM 5/93
Supermarkets	BREEAM 2/91

Achieving a rating of 'excellent' for all new developments in Havant would represent significant progress towards sustainability.

iii) Combined heat and power

Combined Heat and Power (CHP), the simultaneous generation of heat and power, is a highly efficient way to use either fossil (probably gas) or renewable fuels. There might be opportunities in large new developments for installing CHP plant - effectively mini-power stations - with associated heating networks.

A private or independent electricity network (also known as 'private wires') can also be worth considering, connecting the CHP plant to all the energy users on the site along with any other generation on-site (e.g. wind turbines and PV – see below). However, this is only likely to be cost-effective where a new site is being developed – or where major refurbishment of the existing network is necessary. Also, such a scheme is probably not practicable if the network needs to be licensed as there are considerable overheads associated with a license. This limits the number of households that can be supplied from such a network, although supply to several hundred houses would still be feasible under a private wires arrangement. Most of the hundreds of independent networks in England are owned and operated by an established network operator working outside of their usual area.

Examples

- Woking Borough Council has a fuel cell CHP plant in the centre of the town, serving a leisure centre and housing. It also has a conventional (gas fuelled) CHP plant that includes a private wires network supplying electricity as well as heat and chilled water. Local customers include Holiday Inn, *Quake* nightclub, the *Big Apple* leisure complex and Metro Hotel, the HG Wells Conference and Events Centre, Victoria Way car park and Woking Borough Council's Civic Offices.

- Portsmouth City Council has a gas-fuelled CHP system that is being expanded to serve 360 homes, a school and arts centre.

- Southampton University operates a gas-fuelled CHP system serving many of the academic buildings and the sports centre.

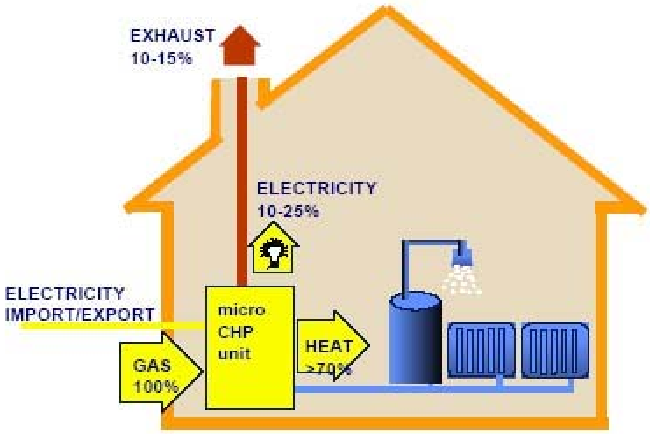
- Harwell International Business Centre in South Oxfordshire has an independent network supplying about 5MW of power to a mix of commercial and industrial customers.

- Since the major refurbishment of the Bull Ring centre in Birmingham the retail and commercial users have been supplied on private wires.

- A new housing development at Newcastle Great Park, Newcastle-upon-Tyne is supplied via an independent electricity network.

iv). Micro-CHP

Micro-gas turbines - essentially a mini-combined heat and power system that makes best use of natural gas - are now available at a size suited to domestic use. These very small gas turbines replace conventional domestic gas-fired boilers, and are approximately the same size and with similar connections. The unit responds efficiently to the varying electrical load of the property, with the waste heat utilised for household hot water and space heating.



The principle of micro CHP

Examples

- The Carbon Trust and Powergen undertook a trial of micro-CHP in England, with several hundred units installed in 2003/04. Following this, Powergen's parent company E.ON UK, committed to buying 80,000 micro-CHP units over the next five years. The initial launch was in Hull in 2004, followed by similar initiatives in Coventry and Nottingham.

- A trial of micro-CHP started recently in Northern Ireland, installing units in a mix of Housing Association and privately-owned homes. The work includes considerable monitoring and aims to test both ease of use and actual energy savings.

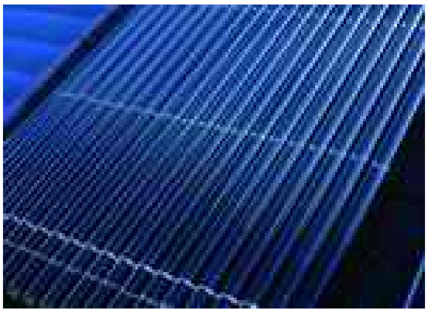
RENEWABLE ENERGY

The energy efficiency measures described in the previous section can reduce lifetime energy demand substantially, but will obviously not remove the demand for energy altogether. Further benefits can be derived if energy can be supplied from renewable sources – those occurring naturally and repeatedly in the natural environment.

The following renewable energy technologies are considered to be particularly well-suited for deployment in Havant.

i). Solar water heating systems

These systems include the familiar solar panels that collect heat by the passage of water through matt-black pipes in a shallow glazed box, mounted on buildings so as to maximise exposure to the Sun. Solar panels provide hot water, and are typically roof-mounted to achieve the best solar exposure. An emphasis on southerly orientation facilitates the effective use of this technology.



Solar water heating panel close-up (Source: The Energy Saving Trust)

Examples

- West Oxfordshire District Council's new offices at Witney include solar water heating.
- The swimming pool at Hagbourne School in Oxfordshire is partially heated by solar panels.
- The Hampshire Solar Streets project, led by SHECANe (Southern Home Energy Conservation and Action Network) has put solar water heating systems into fifteen houses (the official launch event is on 16 June 2005). The houses are owned by three housing associations in Eastleigh, Petersfield and Southampton. Energy efficiency measures have been employed at the same time and the scheme is designed to help tenants out of fuel poverty as well as demonstrating the potential of solar water heating.

ii). Photovoltaic systems

These employ solar radiation to stimulate an electrical current in photovoltaic (PV) cells. These cells can be mounted either in panels on the exterior of buildings or, increasingly, are integrated into building materials such as cladding, glass and roof tiles. The high price of PV installations will limit their uptake in the short term. However, the Building Research Establishment anticipates that costs will fall such that a widespread deployment of the technology can be anticipated. New developments, retrofitted systems or wider refurbishment, all represent potential opportunities for deployment of PV. As such, roofs on new developments (domestic, commercial and industrial) should incorporate south-facing slopes in order to facilitate the eventual future use of PV technology.

Installation of solar photovoltaic sunslates

Examples

- PV (and solar water heating) on nine new homes built for the Parchment Housing Group, a Housing Association, at New Lane in Havant.
- PV solar tiles are employed on eleven homes at Parsons Green in Slyfield, north of Guildford.
- Solar canopies on BP petrol stations, providing forecourt lighting.

- PV in 330 bus shelters in Plymouth, providing lighting and obviating the need to dig up roads to make connections to the local electricity network.
- 2.3kW of PV and solar thermal were installed in April on the visitor's centre at Lakeside Country Park, Eastleigh. The lakes are used for water sports and it is estimated that solar thermal will provide 60-70% of the hot water needed for the 8 showers and the PV around 50% of the centre's electricity needs.

iii). Wind energy

Wind energy is a mature technology capable of generating power at prices only marginally above those of fossil fuels. There are different options, depending on scale:

- large wind turbines (50kW-3.0MW).
- Small scale free standing turbines (2-15kW)
- Small scale building-mounted turbines (0.4-6kW)

To give an impression of size, a 1.5MW turbine might have a tower height of about 60 metres and a rotor diameter of around 70 metres. Large scale wind turbines might be suitable for installation on industrial estates where there is sufficient space for the turbines to be far enough away from buildings. Small scale free standing turbines, typically with a tower height of 5-10 metres and a rotor diameter of about 3.5 metres, can be suitable where there is a reasonable amount of open communal space, such as school playing fields.

Building-mounted turbines are becoming commercially available, with rotors of up to 4 metres in diameter and offering up to 6 kW in generation capacity. This is a new technology developed within the last decade that looks set to become increasingly popular. Installing building-mounted wind turbines will normally require planning permission but should not be confused with larger conventional turbines as the hub will rarely stand more than three metres above a roof apex.

Examples

- A 6kW Proven wind turbine, 12.5 metres in height, was installed in May 2005 at the High Barn visitor centre at Itchen Valley Country Park, Eastleigh. It is estimated that the turbine will provide about 40% of the visitor centre's electricity needs.

- A 250 kW turbine (30 m tower height, rotor diameter 26 m) is being installed in Swansea docks in June 2005, on an industrial site owned by Associated British Ports (ABP), in a project led by the City and County of Swansea.
- Car manufacturer Ford has installed two 1.8MW wind turbines at its Diesel Centre in Dagenham – these provide enough electricity to power the engine factory.
- Several schools have installed wind turbines – including Cassop School, Country Durham (50kW) and Brill School in Buckinghamshire (6kW).

A small-scale free standing wind turbine

iv). Biomass heating and CHP

Organic materials such as straw, wood, energy crops and agricultural waste can be used as a source of heat. The technology is well proven and has widespread applications from a domestic level through to large-scale district heating or CHP systems. The availability of large volumes of wood chips from the maintenance of woodlands, parks and roadside vegetation in Havant could provide a ready source of fuel for such systems.

Examples

(All but the final example provide heat only)

- The Sustainability Centre, East Meon, Petersfield
- Hampshire Wildlife Trust's new HQ, Botley
- Environment Centre on Holywell Mead, High Wycombe
- Norbury Park Sawmill, Surrey
- A biomass-powered CHP plant was installed at the BedZED scheme in South London. This plant uses tree surgery waste and post consumer waste from wood and paper mills.
- Warwickshire County Council is considering using a biomass CHP system at the Camp Hill Urban Village in Nuneaton. This is the largest regeneration project in Warwickshire. It involves the redevelopment of over 450 occupied houses and their replacement with 620 new homes.
- Sheffield City Council already has an extensive conventionally power CHP network and is considering extending it to serve 900 existing flats, two schools, a college, an old people's home and local shops.

v). Anaerobic digestion

This is the breakdown of organic wastes in the absence of air to produce a methane-rich biogas, which can be used for energy production either by burning in a gas boiler, or in a gas engine linked to a generator to produce electricity. A range of organic wastes can be treated in this way, including animal slurries and manures, wastes from food and drink manufacture and the organic fraction of municipal solid waste (MSW). An opportunity for this in Havant has already been exploited at Southern Water's Budd's Farm wastewater treatment works in Havant, where the methane generated from sewage sludge digestion is used to power part of the plant. This is doubly beneficial in climate change terms because methane is a greenhouse gas approximately 24 times more potent than carbon dioxide.

vi). Heat pumps

Ground warmth can be collected by circulating water through pipes embedded into the ground underneath or adjacent to a building. In Hampshire, soil temperatures only a few inches below ground are of sufficient warmth to allow energy to be abstracted and condensed, providing usable heat for space heating systems[8]. Some ground source heat pump systems are 'reverse-cycle' and so can deliver cooling in summer – using much less energy than conventional air conditioning.

The greater the depth of the embedded pipe, the greater the soil temperature and therefore the amount of heat accumulated. Buildings beside areas of open space could benefit from this technology. It is most cost-effective to install these during construction.

As well as ground source heat pumps, air source and water source heat pumps are also possible and work on the same principle.

Examples

- Ground source heat pumps are being installed to serve a group of houses in the North York Moors National Park
- Heat for the village hall in Gamblesby, a small farming community near Penrith in Cumbria, is provided by a ground source heat pump.
- Ground source heat pumps have been retrofitted to 14 old person bungalows owned by Penwith Housing Association, Ludgvan, Cornwall
- Ground source heat pumps were fitted to 6 new homes for Westlea Housing Association, in Bushton, Wiltshire
- Ground source heat pumps have been retrofitted to 18 houses in Lumphinans, Fife for Fife Special Housing Association.
- Air source heat pumps are to be installed to serve a development of up to 40 homes in Cumbria.

vii). Tidal stream

[8] Ground source heat pumps have some limitations due to the maximum hot water temperatures that they can supply. Underfloor heating systems tend to be best suited to use of GSHP.

Tidal stream energy schemes generate power by utilising the predictable movement of water due to tidal effects. Schemes work in a similar fashion to a hydroelectric plant - the moving body of water drives a turbine connected to an electrical generator. However, it is early days for tidal and tidal stream technology. Although the basic technology required to harness tidal energy is well understood and established it has tended to be expensive in comparison to other forms of generation. Hence, there are still comparatively few applications worldwide. Although active development is continuing, including the installation of some demonstration prototypes there are no commercially generating tidal schemes currently operating in the UK.

Examples

UK demonstration projects include:

- An experimental 300 kW device installed off the coast of Lynmouth in Devon. Once the device is connected to the grid, it is intended that more units will be added to create a small farm of tidal turbines with a generating capacity of up to 5 MW.

- A 1:10 scale scale system of another design - the TidEL device, has successfully completed a seven week trial programme at the New and Renewable Energy Centre (NaREC) in Blyth. The full-scale version is intended to comprise two 500kW turbines.

RENEWABLE ENERGY RESOURCES IN THE HAVANT AREA

Regional Planning Guidance for the South East[9] has identified regional and sub-regional targets for deployment of renewable energy electricity generating technologies. These targets have been accompanied by indicative breakdowns of technology types and scales, based in turn on work carried out for both SEERA[10] and GOSE[11]. These studies are not prescriptive about the technology deployment but seek instead to illustrate the possibilities based upon an appreciation of the technical, economic, social, infrastructural, environmental and other implications of renewable energy sources.

[9] "Harnessing the Elements", Energy Efficiency & Renewable Energy, May 2003
[10] "An Assessment of the South East's Renewable Energy Capacity and Potential to 2026", AEA Technology / Savills, May 2002
[11] "Development of a Renewable Energy Assessment and Targets for the South East", January 2001

Within this body of information, indicative breakdowns of the prospects for each County authority across the South East have been prepared. To show how these indicative breakdowns might be relevant to Havant BC, some of the key data for Hampshire are illustrated below.

Technology type	**Indicative number of schemes in Hampshire by 2016**
Small-medium scale biomass combustion	Up to 6
Anaerobic digestion of green wastes (e.g. municipal cuttings)	6
Single wind turbines (at different scales)	20
Domestic scale photovoltaic installations	1,280

In addition to the above, small-scale heat-producing renewable energy technologies such as solar water heating and building-installed biomass boilers are likely to figure strongly in future deployment, but were not included explicitly within the assessments above.

For Havant BC, it can be inferred that these technologies are likely to form the basis for prospects across the Borough. In particular, the strong existing context for housing and mixed developments suggest that solar technologies, small-scale biomass and – possibly – small on-site wind generators, may be considered.

SUSTAINABLE ENERGY FUTURES

The menu of available sustainable energy technologies is extensive, as has been illustrated above. This provides a wide range of possible approaches and solutions within the Havant context, which we illustrate specifically within Section 3 of this report through a discussion of particular development sites.

In considering how various forms of sustainable energy solutions may be applied within Havant, it is also appropriate to have regard to the relative economic and technical status of various technologies both now and into the future. This indeed is a key parameter identified within *PPS22: Renewable*

Energy, which highlights that developers should not be subject to undue burdens.

It is not possible to provide a definitive guide to these issues within this report, since each individual development must consider the opportunities provided by its site, nature and scale. Nevertheless some points can be made that shed light on the choices that developers should keep in mind as they approach sustainable energy solutions:

- *Size and scale of technology:* Sustainable energy technologies come in a very wide range of sizes and scales. There are technologies suitable for:

  - ***individual buildings*** (such as solar photovoltaics, micro CHP, ground source heat pumps, small wind turbines or chargers);
  - ***groups of buildings*** (for example CHP associated with heat networks, the principles of passive solar design applied to site layouts); and
  - ***generation of electricity for feeding into the electricity distribution network*** - such as wind turbines, CHP, etc.

- *Passive / active technologies:* Sustainable energy measures may be passive (in which typically they act to reduce energy demand) or active (in which they act to generate electricity, heat or both through their operation). Illustrative of these alternatives are the different forms of solar energy technology:
  - ***passive solar design*** - which optimises the use of solar heat, daylight and natural ventilation in buildings leading to reduced energy demand and enhanced occupant comfort;
  - ***solar water heating*** (which uses solar panels to collect the Sun's heat, contributing to reductions in energy demand for water heating;
  - ***solar photovoltaics*** - which uses the Sun's radiation to stimulate an electrical current in PV cells, thus generating electricity.

- *Applicability to different forms of development:* Sustainable energy technologies can be applied readily to new greenfield or in-fill development sites, and may often also be applicable in retrofit or refurbishment situations. This range of applicability makes it possible to consider solutions of this kind in almost any context.

In parallel with this wide range of applicability, sustainable energy technologies cover a very wide cost range. Some technologies are currently more expensive than conventional alternatives but others are essentially competitive in particular contexts and some may have virtually zero cost (e.g. aspects of passive solar design within estate layouts).

In most of the development circumstances considered here, the “designing-in” of sustainable technologies is a more cost- and energy-effective approach than seeking to “bolt on” technologies as an after thought. This can be seen at its starkest with passive solar design and heating networks, which can best be applied to new developments and may not entail substantial additional costs if the upfront design of these aspects is an integral part of the overall development process.

Three ◆ Energy technologies appropriate for use in Havant

INTRODUCTION

Having identified the general range of sustainable energy methods and technologies with potential for use in Havant, this chapter considers opportunities for their use on a site-specific basis.

Sites in Havant that were the subject of specific appraisal were agreed with Council planning officers at the outset. The sites are:

i). *Dunsbury Hill Farm* – a strategic employment site between Leigh Park and the A3(M);

ii). *Medium sized housing site* – There are two similar sized allocations in the Havant Borough District Wide Local Plan at Stakes Hill Road, Purbrook and Warblington School playing field, Havant for 80 and 85 dwellings respectively;

iii). *Larger housing site* – an example would be the reserve allocation in the Havant Borough District Wide Local Plan at Hampshire Farm, Emsworth for 250 dwellings;

iv). In addition, it was agreed that opportunities for *waterfront and 'gateway' renewable energy development opportunities* should also be the subject of preliminary review.

These sites and locations will be reviewed in turn. It was agreed with council planning officers that guidance on the Hampshire Farm site should assume a generic 250 home development, and that the Stakes Hill Road and Warblington

School site assessments should be considered together in view of the similar situation of the sites.

Throughout this exercise, careful regard was had to the parameters of government guidance as set out in planning policy guidance notes (PPGs) and the planning policy statements (PPSs) that are replacing them.

Critically, regard has been had to the warning in *PPS22: Renewable Energy* (para. 8 ii) to the effect that undue burdens should not be placed on developers. Havant's housing allocations reflect an assessment of local need, and it would be inconsistent with sustainable development objectives in the round to insist upon energy measures that deter the provision of new homes or the recycling of brownfield employment sites.

DUNSBURY HILL FARM – A STRATEGIC EMPLOYMENT SITE

Background

The Havant Local Plan proposed modifications allocate Dunsbury Hill Farm for 13.2 ha of mixed B1, B2 and B8 uses, of which 5 ha should be reserved for the relocation of existing local businesses. Being in a gateway location beside the A3(M), the site will play an important role in the Borough's efforts to attract inward investment, and a high quality development in a generous landscape setting is envisaged. The Local Plan proposed modifications place a high priority to developing a relationship between the development of the site and the enhanced management of adjacent countryside and watercourses.

With aspirations for prestigious high quality development and a strong environmental management theme already established for the Dunsbury Hill Farm development, a coherent sustainable energy strategy would seem to be a logical extension of the Borough Council's philosophy for the site. Simply in marketing terms, a strong commitment to energy efficiency and the use of renewables could help to differentiate this site from more humdrum offerings on the local market. If this could be done in a way that passes the Climate Change Levy exemption benefits to incoming tenants, an incentive might be provided for the desired relocation of local businesses in addition to the attraction of investment from outside the Borough.

Solar energy

The site affords good potential for solar photovoltaic and 'active' solar hot water systems, ground source heat pumps and passive solar design measures in that it:

- slopes gently downhill to the south, enjoying excellent solar access;
- is sheltered from cold north and north-easterly winds by rising terrain and surrounding woodland.

For office development, the major benefit of PSD arises less from heat gain than from the energy savings resulting from natural ventilation and an effective use of ambient daylight. The principal fenestrated elevations can thus face in a variety of directions provided that appropriate measures are in place to limit glare and overheating. A central atrium can assist in bringing daylight to the heart of an office building whilst enabling excess hot air to be ventilated and cool air drawn into the building through the external envelope.

B2 and B8 industrial and storage units can benefit from openable high level or roof-mounted clerestory windows that allow daylight to enter the building and enable excess heat to be ventilated in summer. Such fenestration can be provided in a manner compatible with security, noise attenuation and thermal insulation considerations. As a general rule, naturally lit, well-ventilated workplaces tend to be more popular and attractive than sealed sheds. Detailed guidance on the use of passive solar design techniques in warehouse and industrial sheds is published by the Building Research Establishment, which also promotes the BREEAM 5/93 standard for industrial buildings, as explained in the previous chapter.

Solar PV and active systems operate most effectively with a southerly orientation, ideally unimpeded by shadowing from adjacent trees or buildings. With a south-facing slope, the Dunsbury Hill site is well able to provide this.

Ground source heat pumps could be incorporated beneath open landscaped areas and car parks in the development. The careful design of buildings should minimise the need for cooling. However an advantage of heat pumps is that they can offer efficient cooling as well as heating.

Because the site is self-contained and not subject to any built heritage constraints, there would appear to be no architectural constraint to the incorporation of these measures.

Wind energy

The Hampshire wind energy resource map shows that wind speeds at the site are relatively low, with annual mean wind speeds of between 5.4 and 6.5 metres per second at 45 metres above ground level. This matches the physical layout of the site, which is a sheltered valley. The low wind speeds on the site are likely to limit the economic viability of wind here.

There is higher and more exposed ground to the north of the allocated employment site, although the resource map again shows estimated wind speeds of less than 6.5 m/s. This area is adjacent to the existing Dunsbury Hill Farm complex and close to housing on the eastern edge of Waterlooville. Whereas wind turbine noise should not pose a problem, being swallowed up by the much greater noise of traffic on the A3(M), anything but a modest (e.g. 50kW) wind turbine at this location might cause shadow flicker over this housing in the morning.

Small building-integrated wind turbines may be worth considering as the installation costs will be reduced by being incorporated into the original construction. While they would generate only limited energy, they would be a visible sign of the development's commitment to sustainable energy.

Biomass energy

In contrast, the use of wood fuel within the development, whether in small-scale systems supplying individual buildings or as part of a CHP district heating system for the development as a whole, is considered worthy of detailed investigation. Policy EMP1.10 of the Havant Local Plan proposed modifications seeks to forge a strong relationship between the development of the site and the management of its wider surroundings. The use of wood chips derived from the management of adjacent SNCI woodland – including Bell's Copse to the north and Bushy Lease to the south – is an obvious possibility. Local arisings of woody demolition waste might also be contemplated.

Should a medium or large scale biomass system be contemplated, it might be feasible to derive wood fuel from the management of much larger blocks of woodland within easy reach of the Dunsbury Hill site: Havant Thicket and Stansted Forest to the east and west of Rowland Castle, the band of woodland extending eastwards from the Queen Elizabeth Country Park, and Durford Wood beyond Petersfield. Havant Borough Council's own municipal tree cuttings could be a further source of supply.

Heat and electricity network

As a relatively large new-build development the site offers the opportunity to consider both a heat network, biomass or gas powered (plus potentially solar water and ground source heat) and a 'private wires' network.

The latter could connect all the users of the site as well as any sources of electricity generation – from CHP, PV and wind. This network could still be connected to the distribution network, thus allowing Renewable Obligation Certificates to be claimed for renewable electricity generated on site, providing an additional source of income. A private network provides three main advantages:

- more control of how the network is designed and operated;
- more control on charges to tenants;

- a greater choice of contractors for installation and operation with the possibility of lower costs.

The network could be managed by another company, such as a distribution network operator, on behalf of the developer and/or occupiers. However, ownership of the network would allow them to preserve greater control.

For site tenants the network could mean access to cheaper heat and electricity.

Conclusions

The Dunsbury Hill employment site affords obvious potential for building-mounted active solar and photovoltaic systems and the use of passive solar design methods. In contrast, the wind resource is much more limited.

The site is also considered to afford potential for a biomass scheme. Whether this comprises small-scale heating or CHP systems serving individual buildings or a site-wide system is a matter for further investigation. However, it is pertinent to highlight that there might be an opportunity for a CHP biomass scheme of county or regional strategic significance at the Dunsbury Hill site, serving both the employment area and neighbouring parts of the Leigh Park estate immediately to the east, and utilising fuel resources from the extensive woodlands that lay to the east of the A3(M).

The direct access that the Dunsbury Hill site enjoys from the A3(M) would make import of wood fuel from these woodlands a rapid and convenient operation. At the larger end of the development scale, local benefits might include:

- enhanced woodland habitat management;
- a further stimulus for the regeneration of Leigh Park;
- a range of new employment opportunities at various skill levels;
- a reliable on-site heat supply that might prove attractive to incoming businesses.

The development of a private wires network might also be possible, offering potentially greater control to maximise the benefit of any on-site electricity generation, a lower cost of installation and lower prices to tenants.

MEDIUM-SIZED HOUSING SITES

Background

These sites, respectively in Havant and Purbrook, are allocated for housing in policy H4 of the Havant Local Plan proposed modifications.

The Warblington School site lies close to central Havant. Hampshire County Council intends to dispose of the western portion of the school playing fields to provide funds for improvements to educational provision in the Borough. Site constraints identified in the local plan include a wooded area of landscape and nature conservation value to the west of the site and a busy railway line running along the northern boundary. A minimum of 85 dwellings are proposed for the site, access to which will be from Fairfield Road, to the west of the site.

The Stakes Hill Road site in Purbrook also comprises surplus school playing fields, the disposal of which would finance improvements at Purbrook Park School. An 80 dwelling development is envisaged, with 1.2 ha of land on the western part of the site retained for recreational use.

Solar energy

It is noteworthy that both of these sites are broadly rectangular with a long east-west orientation. As such, they are both ideally suited for the use of passive solar design methods and the use of active solar and photovoltaic systems.

To assist a review of the two sites in these terms, Havant Borough Council has provided indicative development layouts to comment on. These were plans submitted to the Council at the Local Plan Inquiry to promote the sites.

The draft layout for ***Warblington School*** was prepared without regard for the passive solar potential of the site. In a passive solar housing layout, dwellings should have a principal (i.e. front or rear) glazed elevation orientated within 25 degrees of south, in order to optimise solar heat gain and daylighting throughout the day whilst avoiding late-afternoon overheating in summer. In isolation of any other passive solar design content in a scheme, this orientation can reduce lifetime energy consumption in a dwelling by c. 10 per cent. With a strong east-west geometry, the site thus lends itself to this type of layout. However, in the layout shown, a majority of the flats and houses have an east-west orientation. This can result in increased energy demand during mornings and late-afternoon overheating, especially in summer, to the detriment of occupant comfort.

A passive solar layout for the Warblington School land might afford wider site-specific benefits. Such a layout is likely to include rows of dwellings running in parallel to the railway line that runs along the northern boundary. These form an acoustic barrier to the noise of passing trains. PSD principles require limited fenestration on the northern elevation of buildings in order to reduce exposure to cold northerly winds. This reduced fenestration could also provide a means of attenuating railway noise for the occupants of homes along the northern site boundary. Finally, the planting of a dense shelter-belt of vegetation along the northern site boundary could further limit railway noise whilst reducing energy demand. The energy savings associated with providing shelter from winds have been shown to be of the order of 5% for detached dwellings and 10% for terraced units.

The line of existing trees on along the southern site boundary would need to be considered carefully from a PSD perspective. Whereas trees could cause overshadowing that can increase energy demand, a considered spacing of housing from these trees might be used to advantage, with the tree canopy providing shelter from the hot midday sun in summer, whilst allowing desirable solar penetration through and beneath the leafless tree canopy in winter.

Being diagrammatic, the layout for the ***Stakes Hill Road*** site is more difficult to comment upon. However, the road layout shows little cognisance of passive solar design opportunities. Whereas – and this should be emphasised – PSD does not demand a rigid grid of south-facing buildings, the block layout shown would force many dwellings into an undesirable east-west orientation. A redesign of the blocks so that they have a long axis running roughly east to west – thus enabling most homes to have a front or rear glazed elevation orientated within 25 degrees of south, would be beneficial for this site and should be achievable without compromise to the urban design objectives for the site.

The indicative layout proposes tree belts on the northern and southern site boundaries. That to the north could provide beneficial shelter but might ultimately cause overshadowing for existing dwellings close to the north of the site, with adverse implications for energy demand. That to the south could likewise overshadow the proposed development, although the amenity value of introducing an avenue of trees along Stakes Road is acknowledged. It is thus recommended that the selection of tree species has regard to the overshadowing likely to be caused to homes in the long term, particularly during the winter months when direct solar access is particularly beneficial.

In summary, both sites afford excellent potential for the energy efficiencies and comforts afforded by PSD, but this will require reworking of the development layouts.

The principles of orientation discussed in this section would facilitate the use of active solar and PV systems, which operate best on a wall or roof slope facing roughly due south. Although the high cost of PV installations might militate against their widespread use in the short term, market projections suggest that PV should become affordable for many households during the next decade and thus early in the life of the dwellings provided on the two sites. It would thus be beneficial to ensure that roof design and orientation facilitates the retro-fitting of PV systems in integrated, architecturally unobtrusive manner.

Other energy technologies

Both sites would be well suited for the use of ground source heat pump systems. These are laid underground in an open area of land. Both the Warblington School and Stakes Hill sites are adjacent to land retained as open space, into which the installation of a ground heat system would be a relatively straightforward proposition.

Estimated wind speeds for both sites are relatively low at 6-6.5 m/s at 45 metres above ground level. However, small building-integrated wind turbines should be considered, and installation costs will be reduced if incorporated in the original building rather than retrofitted. The open space adjacent to both sites may offer the potential for a small stand-alone turbine. A more detailed examination would be needed to be sure that there is a site with a reasonable obstacle free wind flow that is also far enough away from residents to avoid noise and shadow flicker problems. In general, though, the scope for wind power on these sites is limited.

The viability of district CHP systems for the two developments also deserves detailed review. In view of the physically confined residential character of the sites and the envisaged scale of development, a gas-based system might be the most practicable proposition, its energy efficiencies being well worth having notwithstanding its reliance on a fossil fuel source. CHP systems could also serve the schools adjacent to the two sites.

If neither district CHP or the ground source heat pumps prove viable then micro-CHP units installed in individual houses could be considered.

LARGER HOUSING SITE

Background

This 8.4 ha site on the eastern edge of Emsworth is identified as a reserve housing site in policy H5 of the Havant Local Plan proposed modifications. The allocation of 250 houses would enable the provision of 17 ha of public open space between Emsworth and Westbourne. The development would also include a doctor's surgery and pharmacy.

Havant Borough Council requested a preliminary view of the generic sustainable energy opportunities that a development of the site could afford.

In general terms, the circumstances of the site are similar to the Warblington School and Stakes Hill Road sites considered above. There is obvious potential for the solar family of technologies and building integrated wind turbines, and the presence of adjacent open space would facilitate a ground source heat pump system and a stand-alone wind turbine. Our commentary will thus focus upon what might be done to facilitate a sustainable energy approach in advance of the site's release for development.

The development layout

The illustrative master plan for Hampshire Farm shows a conventional DB32-style road layout of culs-de-sac branching from an estate distributor road. Whilst this could be adjusted to allow a passive solar housing layout, this form of road layout is not in keeping with the 'new urbanism' as promoted in government publications such as *By Design* and *The Urban Design Compendium*. A redesign of the indicative road layout could respond to modern urban design best practice and achieve improved connectivity with the adjacent street network whilst exploiting fully the PSD potential of the site.

Site-wide opportunities

The general opportunity for a ground source heat pump system has already been noted. A further opportunity to consider for a development on this scale is a CHP district heating system, possibly with associated 'private wires' electricity network, serving both the residential component of the site and – if it were to be included - any proposed employment use. The economics of such a system would be assisted by the fact that such a proposed land use mix should result in a more balanced energy demand. Energy demand in housing tends to be highest first thing in the morning and during the evenings. During the day, businesses on any allocated employment site could 'pick up the slack', resulting in a smoothed pattern of energy demand. Natural gas would be a convenient fuel source, although Emsworth, like Dunsbury Hill, enjoys convenient access to local woodland and, via the B2148 and A3(M), to the larger woodland parcels around Rowland's Castle and Petersfield.

As for other sites, whilst wind speeds are relatively low, the large open space adjoining the development might make a medium-sized stand-alone wind turbine, of the order of 50kW generation capacity, feasible.

Conclusions

The 'reserve site' status of Hampshire Farm provides time for the feasibility of potential ground source heat pump and/or district-wide CHP systems to be investigated, should Havant Borough Council decide to pursue a 'showcase' sustainable development on the site. Hampshire County Council and SEEDA have already undertaken extensive work on wood fuel resources in the county and might be able to assist feasibility work on the biomass option.

Once the Borough Council has determined in the round what its sustainability priorities for Hampshire Farm might be, it is recommended that a design code be produced to set out these requirements and explain how they should be reconciled with urban design objectives.

'GATEWAY' AND WATERFRONT SITES

Background

Renewable energy development has the potential to reinforce the identity of towns and communities and can assist in their regeneration. In Havant, particular opportunities could exist for such initiatives along the corridors of the A3(M) and A27, and on key redevelopment sites.

Wind energy

In appropriate locations, wind turbines can serve a significant landmark role. Their height and movement, clean, green, futuristic image and abstract sculptural qualities provide a means of marking out a place and distinguishing it from its neighbours.

An opportunity for such development might exist in Langstone, on the southern edge of Havant's mainland portion. Windspeeds in this location are thought to average c. 6.5 metres per second, within the margins of viability for wind energy development. The area is close to the A27 and is dominated by industrial development and the Budd's Farm wastewater treatment works. It is suitably remote from housing to avoid amenity issues such as noise and shadow flicker. The locality includes a strategic regeneration site in which SEEDA has taken an interest.

One or two large wind turbines in this location could provide substantial marketing benefits to Havant. The town's name could appear on the turbine tower, and the potential to install a public observation gallery below the turbine nacelle could even turn the turbine into a visitor and educational attraction. A similar much-cited initiative in the Norfolk market town of Swaffham attracted considerable public support, leading to the installation of a second turbine. Other comparable schemes include:

- Blyth Harbour, Northumberland
- Royal Seaforth Dock, Liverpool
- Swansea docks (under construction)
- Ness Point, Lowestoft, Suffolk
- The Ford engine plant, Dagenham

The effects of a Havant landmark wind turbine on protected landscapes in the wider area and upon the bird communities of Langstone Harbour would obviously need to be taken into account. However, the turbine could be set back from the harbour edge by 0.5 km or more. In economic terms, the turbine would remind passers-by that they are passing through Havant (as opposed to

Greater Portsmouth), and a suitably large turbine would stand as a more practical and well-justified rejoinder to Portsmouth's own landmark statement, the Spinnaker Tower - in views from which, Havant's wind turbine could become one of the principal points of visual interest.

Biomass

As has already been noted, there is potential for biomass heat or CHP within the Borough using green waste as fuel. Facilitation of an advanced scheme of this type could help stimulate regeneration and draw positive attention to Havant.

Photovoltaic power

A large array of photovoltaic panels mounted on the northern (south-facing) verge of the A27 would provide another means of making a strong visual statement about Havant's sustainable energy focus. A modest pilot scheme can already be seen beside the M27 between Portsmouth and Southampton.

Waterside opportunities

Tidal stream technology is still in the experimental stages and national scale resource maps indicate that the resource in the Borough is poor. Future wave technology is also more likely to be deployed in more exposed locations than Havant.

However it is possible that the tidal flow at the entrance to Langstone and Chichester Harbours is sufficiently strong to enable the installation of some form of seabed-mounted power generation system in the future, although the potential for conflict with boat traffic would be likely to be a residual constraint.

Four ◆ Towards a local policy framework for sustainable energy

INTRODUCTION

This report has identified a range of renewable energy resources available in the Havant / South Hampshire area, and has considered how these resources – along with complementary energy efficiency measures – might be deployed in specific developments in Havant.

This chapter considers how these opportunities might be translated into planning and development policy and guidelines for use in Havant, having regard to the local development scheme (LDS) for the borough.

A POSITIVE POLICY CONTEXT

The Planning and Compulsory Purchase Act 2004 weds supplementary planning documents (SPD) closely to the development plan policies upon which they elaborate. The implication is that sustainable energy guidelines in Havant will work to best effect if they have sufficient policy 'hooks' in the borough's core strategy, area action plans and site-specific development allocations. The revised RPG9 and draft South East Plan already provide an ample regional policy context within which to work. Within these parameters we would recommend the following general approach for Havant.

The core strategy

With sustainable development now identified as the core purpose of the planning system, an opportunity exists to embrace the sustainable use of resources such as energy in the spatial vision and strategic objectives for Havant. The core strategy could specify targets for enhanced energy efficiency and the use of renewables, nested within those established at the regional level and fine-tuned to reflect Havant's own resource potential and preferences.

The core strategy could also *briefly* identify some of the principal technical means by which energy targets can be met. It is useful to include this in a core strategy because it provides the context for a more detailed consideration in other development plan documents. The core strategy could specify key energy indicators or benchmarks against which the success of the strategy can be monitored.

Site-specific allocations and area action plans

These elements of the local development framework will allow Havant BC to set out in detail its requirements for energy efficiency and the use of renewables, including:

- the inclusion of site-specific sustainable energy requirements for individual development sites or land uses. In keeping with current government advice, these policies can be criteria-based, perhaps as a means of offering developers options for compliance, or they could set specific targets for on-site generation along lines favoured by the London Boroughs (see appendix);

- policies promoting the physical and architectural integration of sustainable energy technologies and design methods into new development, having regard to Havant BC's wider aspiration to achieve high standards of urban design in new development;

- policies explaining how sustainable energy measures can be integrated with – or used to promote – neighbourhood regeneration and employment creation initiatives.

Supplementary planning documents

With a suitable policy framework in place, supplementary planning documents could then explain in technical detail how the various sustainable energy provisions in the Core Strategy are to be achieved in individual developments. The SPD could include modules on individual applicable energy efficiency and renewable energy methods and technologies, as outlined in this report, and could provide guidance on considerations such as siting and design integration. CHP, PSD and the integration of active solar and photovoltaic systems are obvious topics for supplementary guidance in Havant. For the largest development sites, it might be appropriate to publish site-specific sustainable energy SPD.

An important consideration with SPD is one of timeliness. The advice should be in place from the earliest stages of a site's development process in order to inform negotiations, make the council's requirements clear and influence the master-planning process. SPD can be less effective if introduced at a later stage when fundamental decisions on development form might already have been made, and when the only practicable opportunities remaining are for 'bolt-on' solutions.

DELIVERY

Consultations

In taking forward the policies of the core strategy and other development plan documents, it is recommended that the property development and construction sectors, including house builders, are the target of specific consultations with respect to Havant's sustainability targets. The technical deliverability of the targets within the timescales envisaged should be examined carefully and if necessary refined in order to ensure that they are attainable and can be defended from challenge at a later stage.

There is a steadily-growing range of exemplar projects for most types of sustainable energy application, including those identified in chapter two of this report, to provide an idea of what is feasible and to use in defence against an applicant's argument that such things cannot be done. At the same time, SPD should obviously work within the parameter set out in *PPS22: Renewable Energy* (para. 8 ii) to the effect that undue burdens should not be placed on developers.

An energy services company for Havant?

Delivery of CHP and other energy systems at a neighbourhood scale could be promoted by the establishment of an energy services company. There are several models to examine, but we would recommend close examination of the approach taken by Woking Borough Council through its wholly-owned company Thameswey Limited.

Thameswey's board members are drawn from senior council officers. The company has developed a 'sustainable energy system' providing distribution infrastructure that will last many decades, but allowed fuel sources to be changed on shorter timescales. This has meant that, whilst gas-fired CHP was the main generator in 2004, renewable sources can be brought on line at some future time. PV systems are systematically being installed, with competitive prices being negotiated for bulk purchases.

Woking has established its own 'private wire' electricity distribution network to connect its powers stations to Council office and residential properties. Energy efficiency measures have been implemented in the council's own buildings, and Thameswey also coordinates Home Energy Conservation Act (HECA) work in the Borough. Further projects are being promoted through Thameswey Energy Limited, a joint venture company 80% owned by a Danish pension fund.

A similar model to consider in Havant would be an energy services company managed by a trust of council, landowner and developer interests, funded partly through developer contributions and tasked with assisting local authorities, developers and community groups in practical ways to deliver sustainable energy targets. This could be established jointly with other member authorities in the Partnership for Urban South Hampshire (PUSH) several of which are, in our experience, giving thought to how they can respond to regional renewable energy targets through their LDFs at this time. Collaborative approaches such as this would enable a consistent approach to be taken on sites that cross municipal boundaries, including the Waterlooville MDA.

*   *   *

Appendix

London Borough of Merton Unitary Development Plan - adopted 2003

The energy-related planning policies of Merton's UDP were adopted in 2003, having successfully withstood objections heard at public inquiry.

POLICY PE.12: ENERGY GENERATION AND ENERGY SAVING

Proposals for development of facilities that generate energy locally, in particular renewable energy and those that reduce the use of energy and its transmission, will be permitted provided that:

- ***There is no demonstrable harm on visual or residential amenities or by way of pollution generation, or***
- ***It can be demonstrated that benefits contributing to diverse and sustainable energy supplies and to reducing greenhouse effects will outweigh harm arising from the development.***

4.162 The generation of renewable energy is an important contributor to reducing the overall energy use of the population. It reduces the use of primary resources and makes more efficient use of those resources. Generation of renewable energy therefore makes a valuable contribution to sustainable development goals, which are discussed in more detail in Part 1 of this Plan and outlined in Policy ST.1. The Government has set a target of generating 10% of electricity from renewable resources by 2010. The Council also has a commitment in the LA21 Action Plan to reducing energy use throughout the Borough wherever possible.

4.163 The Council will therefore encourage the development of renewable and local energy facilities, subject to their impact on local amenities. These facilities either generate energy themselves, or contribute to savings in energy consumption, or perform both functions. Examples of such facilities would be waste-energy plants, combined heat and power plants, facilities which make use of landfill gas, sewage sludge, hydroelectric power and wind energy. Active and passive solar designs are another widely used form of energy generation/conservation. Energy-saving and energy-producing facilities may have environmental impacts, such as causing noise, light, smell or air-born pollution. They may also be visually intrusive. When assessing applications, the Council will assess the energy benefits of the proposal, whilst having regard to the degree of any negative effects on local amenity and the existing character of the area.

4.164 Energy saving measures and energy generation facilities take a number of forms. The relative benefits of these and their various location and design implications are too detailed to cover in this Policy. Some of the detailed issues are outside the scope of land-use planning. The Council's Supplementary Planning Guidance Note for Sustainable Development provides further guidance on this subject.

4.165 The process of the transmission of energy may be inefficient in that it uses up some of that energy produced and entails costs in the provision of the necessary equipment. Some of the transmission equipment such as sub-stations, overhead wires and pylons also has negative effects in terms of noise, their visual impact and causes concern regarding possible effects on health. The Council therefore supports the *provision of more locally produced energy where possible. The visual impact of transmission equipment and other electrical equipment is also covered under Policies BE.34, BE.35 and BE.36. Overhead power lines are covered by Policy PE.4.*

POLICY PE.13: ENERGY EFFICIENT DESIGN AND USE OF MATERIALS

The council will encourage the energy efficient design of buildings and their layout and orientation on site. All new non-residential development above a threshold of 1,000 sq.m will be expected to incorporate renewable energy production equipment to provide at least 10% of predicted energy requirements. The use of sustainable building materials and the re-use of materials will also be encouraged, as will the use of recycled aggregates in the construction of buildings. This will be subject to the impact on the amenity of the local environment, taking into account the existing character of the area.

4.166 This policy applies to all new development, however the expectation that renewable energy production equipment will be incorporated in new developments relates only to non-residential developments (those outside the C use class). Where incorporating renewable energy production equipment is shown (by the applicant) to make the development unviable, it would not be expected. In the light of its Agenda 21 objective of reducing local reliance on non-renewable energy sources the Council is concerned to ensure that these types of development are designed to utilise renewable energy sources. For the purpose of this policy the means of generating renewable energy include photovoltaic energy, solar-powered and geo-thermal water heating, energy crops and biomass, but not energy from domestic or industrial waste. For residential developments the Council will encourage developers to achieve a 'very good' or 'excellent' rating in the BRE eco-homes standards. In future additional guidance will be given in the New Residential Development SPG.

4.167 The design of a building and its layout and orientation can have significant effect on the energy consumption of the building and is therefore an important contributor to sustainability goals of reducing energy consumption. Use of recycled materials in the construction of buildings will contribute to the efficient use of resources and help to conserve the supply of the source material. Use of materials from 'sustainable sources' such as from softwoods from sustainably farmed forests will be encouraged.

4.168 The Council has a Sustainability Checklist which outlines a number of criteria that are taken into account when assessing planning applications. Energy efficiency and use of recycled materials are two of the criteria. When assessing applications, the Council will seek to maximise energy efficiency where possible.

4.169 Variations in the orientation of buildings, pitches of roofs, large glazed areas, construction from heat-absorbing materials, or additional ventilation and a high density of development are all possible components of energy efficient developments. These can sometimes lead to differences with surrounding areas. When assessing applications, the Council will have regard to the existing character of the area and the appropriateness of the design.

4.170 Some elements of this policy are outside the control of land use planning. However, the Council wishes to encourage their development in the interests of sustainability. The Council's Supplementary Planning Guidance Note for Sustainable Development provides further guidance on this subject.