

Note on Purpose and Status

This Supplementary Planning Document (SPD) has been prepared under the terms of the Planning and Compulsory Purchase Act 2004. The draft SPD was subject to public consultation for 6 weeks from 28 October until 9 December 2005. The results of the public consultation were reported to the council's Leaders Committee on 21 March 2006. The Committee agreed a number of changes to the draft SPD and proceeded to adopt the revised document.

The SPD supplements, and conforms with, policies within the development plan for the borough, namely the Hammersmith & Fulham Unitary Development Plan which was adopted in 2003 and the London Plan. The document forms part of the planning framework for the borough and will be a material planning consideration for development control purposes.

A statement of the consultation undertaken, the representations received and the council's response to those representations, and the sustainability appraisal are also available and may be seen on the council's website (www.lbhf.gov.uk) and at the Local Development Framework information points. For further details contact spd@lbhf.gov.uk or 020 8753 3317.

This document is also available in large print or in non- print formats on request to Customer services on telephone number 0207 8753 1081.

SUPPLEMENTARY PLANNING DOCUMENT: ENERGY

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Foreword

As the demand for energy continues to rise and the main resources relied upon to supply this energy are used up, there will be an ever-growing need to generate energy more efficiently. It will also be necessary to meet at least part of our energy requirements with renewable energy sources, rather than the limited fossil fuels we currently depend upon. The Council's policies promote these objectives.

We are not acting in isolation by pursuing these improvements – the Mayor of London is setting a similar agenda through the policies in the London Plan which promote efficient energy use and use of renewables, with all London Boroughs being expected to follow this lead. The aim is to make developments more sustainable, thereby contributing to London's and the UK's targets of reducing emissions of carbon dioxide and reducing our dependence on fossil fuels. This Supplementary Planning Document provides a range of advice on how these policies on energy efficiency and renewable energy technologies can be implemented.

The impact of our past and current use of fuels such as coal, oil and gas has already caused significant changes in the global climate, with more serious impacts predicted for the next 50-100 years, or possibly even sooner. This time-scale might imply that we have plenty of time to think about how we should tackle climate change, but the fact is that we must start to make changes *now* to cut our emissions of carbon dioxide, use energy much more efficiently and generate it more sustainably.

For some time now, people have been encouraged to think about their individual actions and how they can reduce their own impacts on the environment – walking or cycling instead of driving to the shops, turning off the lights when not in use, boiling only the water they need instead of a full kettle, and so on. These actions may be small when carried out in isolation, but when many people act together, a significant improvement can be achieved. However, more can be achieved and one of the ways of doing this is through better design of the buildings we live and work in. One of the ways the council aims to do this is to encourage energy efficiency and use of renewable energy through the land use policies outlined in the development plan, supported by the information contained in this document.

Current legislation already sets out a series of standards for building works which must be complied with. However, although the Building Acts and associated regulations have been improved recently, they still only set the minimum acceptable standards. In time, it is likely to become a statutory requirement for all but the smallest developments to have renewable energy measures integrated into their design, along with a range of energy efficiency measures. We therefore expect developers to do more than the bare minimum when it comes to designing developments for a sustainable future, and to go beyond the basic legal requirements to achieve more significant benefits at only minimal extra cost. The council has taken a lead in showing what can be achieved with good design principles in relation to energy with the development of the Coningham Sure Start building, and we would like to see such building design become the norm rather than the exception in the borough.

Purpose of the Document

This Supplementary Planning Document (SPD) has been produced to provide guidance on the information the council expects developers to provide on energy efficiency and renewable energy measures when submitting a planning application. It also includes advice for smaller projects which might be carried out by individuals on their own home.

The document supplements the energy policies included in the council’s adopted UDP by identifying those measures and technologies that are the most beneficial and acceptable for use in the borough. The emphasis is on the use of small-scale measures serving local needs without causing any detrimental impacts on the environment. The council expects developers to take account of the advice in this guidance document in preparing planning applications, particularly for major schemes.

It also supplements the policies in the London Plan and in accordance with Policy 4A.8, developers are requested to submit an ‘Energy Assessment’ to the council with their application when they are seeking planning permission for a development of the type outlined below. (This list is in addition to any other type of proposed development regarded as ‘major’ by the GLA).

Development Type	Description
Major Dwellings	<u>Residential Development (not hostels, HMOs)</u> - to construct 10 or more dwellings - change of use involving creating 10 or more dwellings - residential conversions where 10 or more units are added - new dwelling development on site over 0.5ha
Major Offices	<u>B1 (offices/light industry/research) or A2 (e.g. banks, building societies)</u> - over 1000m ² of new floorspace proposed to be built - new development site over 1ha - change of use to B2/B8 from other use (floorspace over 1000m ²)
Major Retail	<u>A1 (shops), A3, A4 or A5 (e.g. restaurants, pubs) Development</u> - over 1000m ² new floorspace proposed to be built - new development site over 1ha - change of use to A1/A3/A4/A5 from other use (floorspace over 1000m ²)
Major Manufacture	<u>B2 (industry) or B8 (warehouse/storage) Development</u> - over 1000m ² of new floorspace proposed to be built - new development site over 1ha - change of use to B2/B8 from other use (floorspace over 1000m ²)
Major Other	<u>Any other development which does not fall into the above categories</u> - over 1000m ² of new floorspace proposed to be built - new development site over 1ha - change of use from another use (floorspace is over 1000m ²)

The Energy Assessment should show how the issues highlighted in the section 4 of this document on energy efficiency and renewable energy use have been considered and designed into a development, wherever appropriate. In particular, for renewable energy use, the assessment should show how the various technologies have been assessed for their feasibility on a particular site, highlighting which technology or combination of technologies is to be integrated to generate renewable energy.

The SPD provides detailed advice on how energy conservation and energy efficiency should be considered in all proposals for major new developments, including the conversion or renovation of existing buildings, as well as how to incorporate renewable energy measures wherever feasible. In order to make the best use of these measures, developers are advised to integrate them into the design of new developments at an early stage.

Advice is provided on how to determine whether or not particular developments are suitable for particular renewable energy systems, and how they can be implemented successfully. Details of available grant schemes are included as this information may be useful for any small scale private or community renovation projects. Other sources of information are also identified if more detailed guidance is required.

1. National Guidance

The Energy White Paper

1.1 The Government outlined its long-term vision in terms of energy policy in the Energy White Paper¹, 'Our energy future – creating a low carbon economy', which was published in 2003.

1.2 The White Paper sets out the challenges being faced in relation to the decline of domestic energy supplies, the environmental impacts associated with burning fossil fuels and the need to update the energy production infrastructure in the UK.

1.3 Two of the key targets are:

- to cut the UK's carbon dioxide emissions by some 60% by about 2050 with real progress by 2020
- to generate 20% of the nation's energy by renewable means by 2020

1.4 More than 100 commitments are given in the White Paper, which have been broken down into 11 over-arching work streams, including Energy Efficiency, Renewables, Climate Change, Reducing UK Emissions and Fuel Poverty.

1.5 Considerable progress towards these targets must be made over the next 10 years; under the Kyoto Protocol the UK must reduce emissions of green house gases by 12.5% from the levels recorded in 1990, in the period 2008 – 2012, and there is a Climate Change Programme in place to help meet these targets. The Government has a further goal of achieving a 20% reduction in carbon dioxide emissions by 2010. In

terms of Energy Reduction the Government has a target to reduce energy consumption by 30% by 2010, and, in addition, targets that domestic consumer's energy efficiency should be improved by 20% by 2010 and a further 20% between 2010 and 2020.

1.6 It is clear that improvements in energy conservation and efficiency as well as the development of renewable energies are necessary to achieve these goals.

Renewable Energy

1.7 Government policy on Renewable Energy is contained in Planning Policy Statement 22² (PPS22). Whilst the main purpose of the document is to provide policies for planning authorities to take into account when preparing local development documents, some policies may also be relevant to individual planning applications.

1.8 The key principles set out in PPS22 include:

- Plans and policies should promote and encourage renewable energy development
- Renewable energy should be capable of being accommodated throughout England where any potential impacts can be mitigated
- Planning authorities should set criteria against which applications will be assessed

¹ DTI, Energy White Paper: Our energy future – creating a low carbon economy, 2003.

² ODPM, Planning Policy Statement 22: Renewable Energy, 2004.

Energy Efficiency

1.9 Energy Efficiency – The Government's Plan for Action³ (2004) shows how energy efficiency measures can be used to deliver over 12 million tonnes of additional carbon savings by 2010. There is a wide range of actions, the most relevant to energy use of new/refurbished developments being the recent revisions to Part L of the Building Regulations (2006) which relate to the conservation of fuel and power in dwellings. Minimum standards for central heating boilers, the target U-value method, Carbon Index method and replacement of services/fittings have all been improved. The newly revised Regulations come into force from April 2006.

1.10 Future implementation of the Energy Performance of Buildings Directive⁴, with its requirement for energy certification and labelling of buildings, will also lead to substantial increases in investment in energy efficiency measures within all new buildings and large buildings subject to major renovations.

1.11 The Government's aim is to deliver a step-change in energy efficiency as well as renewable energy use on a scale not achieved before in the UK, and to do this in the face of increasing demand for energy.

Sustainable Development

1.12 The Government has also recently launched its new strategy for sustainable development, "Securing The

Future"⁵, in March 2005. One of the priority areas it identifies for action is 'Climate Change and Energy'. The Strategy recognises that the effects of a changing climate can already be seen and that profound changes in our everyday use of energy are vital if we are to avoid catastrophic consequences. At the same time we must prepare for the climate change that cannot now be avoided.

1.13 Many of the Government's other planning guidance documents make reference to the merits of designing developments in such a way that they can help promote sustainable development and improve the quality of the environment, as well as quality of life. E.g.:

- PPS 1 Creating Sustainable Communities⁶
- PPG 3 Housing⁷
- PPG 11 Regional Planning⁸
- PPS 12 Local Development Frameworks⁹
- (PPS 22 Renewable Energy)

1.14 It is clear that energy efficient design and the integration of renewable energy technologies are now important considerations in planning matters, and are now given greater emphasis in all of the Government's emerging guidance.

³ DEFRA, Energy Efficiency – The Government's Plan for Action, 2004.

⁴ EU Commission, Energy Performance of Buildings Directive (Directive 2002/91/EC), 2003.

⁵ DEFRA, Strategy for Sustainable Development, - Securing the Future, 2005.

⁶ ODPM, PPS 1 Creating Sustainable Communities, 2004.

⁷ ODPM, PPG 3 Housing, 2000.

⁸ ODPM, PPG 11 Regional Planning, 2000.

⁹ ODPM, PPS 12 Local Development Frameworks, 2004.

2. Regional Guidance

The Mayor of London's Strategies

2.1 The London Plan¹⁰ was published in February 2004 and sets out policies to accommodate the expected growth of the city in a sustainable way. It became part of the development plan for this borough in September 2004 when the Planning and Compulsory Purchase Act came into force. It provides the framework for the Mayor to produce more detailed strategic guidance on key issues which cannot be addressed in sufficient detail in the plan. One such Supplementary Planning Guidance has been published in draft for Sustainable Design & Construction¹¹ (March 2005), which includes advice on energy.

2.2 The Mayor also has an Energy Strategy¹² (2004) which outlines a number of detailed policies and proposals designed to reduce London's contribution to climate change by reducing greenhouse gas emissions through energy efficiency improvements and increasing the use of renewable energy. The GLA has also published a toolkit for planners, developers and consultants on "Integrating renewable energy into new developments".

The London Plan

2.3 The London Plan has an overarching policy of sustainable development which promotes the more effective use of a range of scarce resources, including energy. At the moment, London lags behind many

other cities in terms of meeting its environmental responsibilities and needs to consume fewer resources, including energy.

2.4 One of the Plan's main objectives is to make London a more attractive, well-designed and *green* city. In terms of energy use, it is recognised that radical improvements are required to make energy use in London much more sustainable. To this end, it contains a number of policies which will help to reduce London's CO₂ emissions and in particular, policies aimed at ensuring that buildings are designed to use energy and other resources more efficiently, both during and after their construction.

2.5 The key over-arching policy is **Policy 4A.7: Energy efficiency and renewable energy**, which states that "the Mayor will and Boroughs should support the Mayor's Energy Strategy and its objectives of reducing carbon dioxide emissions, improving energy efficiency and increasing the proportion of energy used generated from renewable sources by:

- requiring the inclusion of energy efficient and renewable energy technology and design, including:

- Passive solar design
- Natural ventilation
- Borehole cooling
- Combined heat and power
- Community heating
- Photovoltaics
- Solar water heating
- Wind
- Fuel cells
- Biomass fuelled electricity
- Heat generating plant

(in new developments wherever feasible)

¹⁰ GLA, The London Plan – The Mayor's Spatial Development Strategy, 2002

¹¹ GLA, Draft Supplementary Planning Guidance for Sustainable Design & Construction, 2005.

¹² GLA, The Mayor's Energy Strategy - Green light to clean power, 2004.

- facilitating and encouraging the use of all forms of renewable energy where appropriate including giving consideration to the impact of new development on existing renewable energy schemes
- improving the integration of land use and transport to reduce the need to travel by car
- minimising light lost to the sky, particularly from street lights”

2.6 **Policy 4A.8: Energy assessment**

is also relevant as it states that “the Mayor will and boroughs should request an assessment of the energy demand of proposed major developments, which should also demonstrate the steps taken to apply the Mayor’s energy hierarchy”. (The hierarchy is specified in the Energy Strategy – see below).

2.7 “The Mayor will expect all strategic referrals of commercial and residential schemes to demonstrate that the proposed heating and cooling systems have been selected in accordance with the following order of preference:

- Passive design
- Solar water heating
- Combined heat and power (preferably fuelled by renewables)
- Community heating for heating and cooling
- Heat pumps
- Gas condensing boilers and gas central heating

Boroughs are expected to apply the same criteria to major developments”.

2.8 With specific reference to renewable energy, **Policy 4A.9: Providing for renewable energy** states that “the

Mayor will and Boroughs should require major developments to show how a proportion of the site’s electricity or heat needs will be met from renewables, wherever feasible”.

2.9 The use of a range of renewable energy technologies is encouraged, which should be incorporated wherever site conditions make them feasible.

2.10 Developments not initially incorporating photovoltaics should be of a suitable design and orientation to support them later.

2.11 Although the proportion of energy needs to be provided by renewable energy is not defined in the London Plan policy, the target of at least 10% is referred to in the Mayor’s Energy Strategy (see below).

2.12 The GLA also plans to publish Supplementary Planning Guidance on renewable energy at a later date.

The Mayor’s Energy Strategy

2.13 The Energy Strategy sets out proposals which aim to change the way energy is supplied and used in London over the next 10 years. One of the main components of the Strategy is the introduction of the Energy Hierarchy, which demonstrates a set of principles to guide decisions on energy, whilst at the same time optimising economic and environmental benefits.

2.14 Essential energy needs should be met through applying the hierarchy in sequence: using less energy, using renewable energy and supplying energy efficiently. Use of the hierarchy will ensure that carbon dioxide emissions from developments are minimised during operation. Reducing energy

demand also keeps the size, cost and total environmental impact to a minimum.

2.15 The Strategy sets targets for the reduction of carbon dioxide emissions by 20 per cent relative to the 1990 level by 2010 as a first step on a long-term path to a 60 per cent reduction from the 2000 level by 2050. It also contains targets in relation to the installation of types of renewable energy schemes to increase London's generation of power and heat from renewable energy schemes up to 2020.

Diagram showing the Energy Hierarchy

1. Use less energy

“Be lean”

- reduce consumption
- improve insulation
- use passive heating/cooling
- install efficient appliances

2. Use renewable energy

“Be green”

- On site:**
 - Install renewables such as solar water heating; PV panels; turbines
- Off site:**
 - Import renewable energy generated elsewhere

3. Supply energy efficiently

“Be clean”

- Use combined heat & power and community heating
- Cut transmission losses through local generation

2.16 To help meet these targets, **Proposal 13** of the Strategy states that “developments referable to the GLA will

be expected to generate at least 10% of the sites energy needs (power and heat) from on-site renewable energy (where feasible)”. Each Borough has also been tasked with setting similar targets for the generation of renewable energy in their areas, and to facilitate this, each one has to identify at least one Energy Action Area. This is an area which will act as a showcase low-carbon community, successfully demonstrating a range of sustainable energy technologies and techniques across a number of applications. Linked to this is the requirement that each London Borough should be home to at least one zero carbon development by 2010.

2.17 Meeting the requirements of the Strategy therefore represents an opportunity to improve the sustainability and environmental performance of London's built environment. This applies to both new and existing developments.

Integrating Renewable Energy Toolkit

2.18 In order to clarify what is expected of developers in terms of the inclusion of renewable energy technology, London Renewables, commissioned by the GLA, has published a toolkit on integrating renewable energy into new developments¹³ (2004) which allows developers to assess the feasibility of different types of renewable energy installations for a range of development types, including housing. The toolkit includes information on the factors affecting the costs of renewable energy technologies, including information on how the cost of renewables may change. The toolkit will inform the GLA's SPG on renewable energy which is expected by the middle of 2006.

¹³ GLA, Integrating renewable energy into new developments: Toolkit for planners, developers and consultants, 2004.

3. Local Guidance

The Unitary Development Plan

3.1 The UDP¹⁴ and its policies embrace the principles of sustainable development. This includes the promotion of energy conservation through encouraging improved energy efficiency and renewable energy use. The UDP recognises that the planning and design of new buildings can have significant implications for energy consumption, particularly in terms of the need for power to run appliances and lighting and heat for hot water and space heating. The main policies in this area are **EN16: Energy conservation and renewable energy and EN16A Energy generation.**

Policy EN16: ENERGY CONSERVATION AND RENEWABLE ENERGY

All development should be designed to promote greater energy efficiency and encourage energy efficient forms of travel and transport such as walking, cycling and increased use of public transport.

The integration of energy generation from renewable sources in building design will also be welcomed provided there is no visual intrusion, noise disturbance or other demonstrable harm to the local environment or to the living and working conditions of neighbouring occupiers.

3.2 There is also a specific policy for energy use in residential developments, which is Policy **HO13 Energy efficiency.** These policies were adopted prior to publication of the London Plan

policies on energy, which place firmer requirements on developers of major schemes in terms of energy efficiency and renewable energy integration. Both sets of policies form part of the development plan, although the London plan policies are more recent.

3.3 All planning applications for major new developments / renovations are expected to demonstrate how the principles of energy efficient design have been incorporated. This includes consideration of more efficient layouts, built form and elevational treatments, including the design of windows, walls, roofs and conservatories.

3.4 Thermal insulation matters are covered by the Building Regulations (Part L)¹⁵, which seek to provide for a certain standard of energy efficiency in new developments. However, technological innovation and improvements to insulation are likely to occur faster than the regulations can be updated. Therefore, consideration should be given to exceeding the Building Regulations standards where possible to give greater energy efficiency gains as including such measures at the design stage is unlikely to increase building costs significantly¹⁶.

3.5 Due to space constraints, the integration of renewable energy sources into buildings, as promoted in Policy EN16, may be more appropriate than building stand-alone renewable energy installations. However, if a development site is large enough and suitable, it is possible that on-site installations such

¹⁴ LBHF, Unitary Development Plan, 2003

¹⁵ ODPM, Building Regulations, 2006.

¹⁶ BRE, Putting a price on Sustainability, 2005.

as a Combined Heat and Power plant or Ground Source Heat Pump system would be suitable.

3.6 Even the integration of small scale renewable energy technology will frequently add only 1% to the relative costs of a development¹⁷.

Policy EN16A: ENERGY GENERATION

Proposals for the development of renewable energy installations / energy from waste installations will only be permitted if there would be no demonstrable harm in terms of visual impact, people's health and safety, air quality and odour, dust, water protection, noise, access and traffic generation and nature conservation.

3.7 Whilst the council encourages the use of energy from all types of renewable sources, policy **EN16A Energy generation** recognises the importance of other environmental factors when assessing the suitability of sites for particular renewable energy installations. As outlined in the policy, developers would need to demonstrate that such an installation would not cause any detrimental impacts on the local surroundings.

3.8 Well designed systems can be integrated into new or existing developments without causing any detrimental impact to the surrounding area through visual intrusion, noise or any other type of nuisance. Further details on the suitability of renewable energy technologies are given in the next section.

¹⁷ GLA, Integrating renewable energy into new developments: Toolkit for planners, developers and consultants, 2004.

3.9 Greater energy efficiency in residential buildings will not only reduce greenhouse gas emissions but will also assist in providing affordable warmth for the occupants. Wherever possible the expectation is that the standards of the Building Regulations should be exceeded.

Policy HO13: ENERGY EFFICIENCY

All residential development, including conversions and changes of use, should be assessed in relation to its ability to maximise energy performance. The following design elements should be considered:

- Orientation and window design to capture 'passive solar' heat;
- Flats & terraced building forms to reduce external area heat loss;
- Heavy insulation of external surfaces
- Controlled ventilation and avoidance of draughts
- Combined Heat & Power schemes where appropriate
- Production of renewable energy
- High internal 'thermal mass' to store warmth/even out temperature

3.10 In its simplest form, developments can make use of renewable energy by being designed to take advantage of passive solar energy. By giving careful consideration to the layout of the site, the orientation of the buildings and the design of the windows and walls, the best use can be made of the natural heat and light from the sun.

3.11 The principles of increasing energy efficiency and renewable energy use will be fostered in the emerging Local Development Framework for the Borough. New development plan

documents (DPDs) are programmed to be adopted by the council in 2008, but until that process is completed, applications will be assessed against development plan policies including those referred to earlier, in this supplementary guidance and other relevant considerations.

4. Supplementary Guidance

4.1 As stated earlier in the document, planning applications for major developments are expected to be accompanied by an Energy Assessment outlining how energy efficiency measures have been designed into the development and how renewable energy use has been considered and integrated where feasible.

4.2 If a proposal is classified as a major development by the GLA, then in complying with the requirements of the London Plan and the Energy Strategy and their associated supporting documents, these proposals should be in a good position to comply with the council's own UDP policies on energy. For these developments, the GLA's own Supplementary Planning Guidance should be followed.

4.3 If a proposal is a major development when assessed against the criteria defined by the council, then compliance with the London Plan/UDP policies is key, particularly to show that energy efficiency measures have been designed in and, if feasible, that renewable energy technologies have also been considered. The production of an Energy Assessment will help to show how the issues highlighted in this chapter have been considered and implemented.

4.4 However, it is recognised that for certain proposals - i.e. where outline planning applications are submitted for major schemes - it might be difficult for developers to ascertain the exact technologies that could be used until the detailed design has been completed.

Improving Energy Efficiency

4.5 The provision of key services such as heating, lighting, hot water, ventilation etc account for significant amounts of energy use in a typical building. Maximising energy efficiency helps to reduce the amount of fossil fuels burned and emissions of greenhouse gases such as CO₂ and other pollutants such as NO₂ which can contribute to local air quality problems. In residential developments, improving energy efficiency also helps to reduce the cost of energy use which can play an important part in reducing fuel poverty. There are therefore sound environmental, economic and social reasons to minimise energy use and maximise energy efficiency.

4.6 The first consideration in terms of energy use when designing a new development is to consider how energy demand can be reduced. Basic design issues such as the location and layout of a development can have a significant role to play in determining the associated energy demand of buildings and also any energy use through associated transport use. Re-use of buildings instead of demolishing them to clear sites for redevelopment can also offer opportunities to reduce energy demand.

4.7 This section of the guidance shows how energy saving can be achieved in all types of development through location, site layout, building design, materials and appliances.

Development Location

4.8 A development's location can play a significant part in determining whether or not it has a high level of energy consumption as it has implications for

access to/from site and the use of passive solar gain.

4.9 Developments which locate in areas that minimise the need to travel and encourage cycling, walking and public transport use can lead to significant energy savings. UDP policies such as ***TN2 Integration of transportation and land use planning*** already recognise that the existing town centres in the borough often provide the best location for developments as they have good public transport access and access to local amenities. Mixed use developments can also be advantageous as they can remove the need to travel and therefore reduce the amount of energy used by transport.

4.10 Although it is recognised that there will be constraints on sites selected for development, sites that can be aligned so that buildings are south facing will have a greater potential for the capture of passive solar gain. Consideration should also be given to the potential impact of any nearby tall buildings as solar gain may be affected by overshadowing.

Site Layout

4.11 As well as choosing good locations, the design of the site layout should also be considered with the aim of achieving an energy efficient layout. Just as the overall location of a development can have important implications for reducing energy demand, so can site layout through reducing the need to travel and maximising solar gain.

4.12 Issues such as good pedestrian, cycle and public transport links both within and beyond the development

area to locations that generate a high number of trips should be considered at an early stage. The local landscape should also be taken into account so that good use of natural daylight and solar energy can be made across the whole development.

4.13 The orientation of individual buildings has a significant impact on the amount of passive solar gain available. However, if not well designed, too much solar gain can lead to overheating. Using a south easterly orientation is generally regarded as being preferable to south westerly as this will maximise gains in the early morning and reduce the possibility of overheating in the afternoon. Care needs to be taken in locating buildings on site to avoid overshadowing as much as possible as this will reduce solar gains. Careful layout can still maximise solar gain. For example, in mixed height developments, the taller properties should generally be sited to the north.

SUMMARY CHECKLIST

Ideal development location and layout characteristics are:

- Close to shops, amenities etc to reduce the need to travel
- Close to public transport services to reduce reliance on private car use
- South facing locations with buildings orientated south-easterly and
- Sites free of overshadowing to allow best use of solar gain

Building Design

4.14 Part L of the Building Regulations sets a minimum energy efficiency

standard that all new developments should meet. However, these standards are the minimum allowable and significant energy efficiency benefits can be gained by designing and building to a higher standard. The council therefore strongly encourages developers to work to a higher standard than the Building Regulations standard and the following design issues should all be considered as methods to conserve energy use and improve energy efficiency.

Using Natural Light & Solar Heat

4.15 One of the simplest methods of reducing energy demand and improving energy efficiency is to use passive solar design to provide light and heat through natural sunlight and solar heat gain. Following the requirements of the Building Regulations will be of significant benefit, but additional measures should be considered for implementation.

4.16 In designing and constructing developments so that the use of daylight is maximised and energy use and heat loss for lighting are minimised, the following design principles should be considered:

- Locate the main habitable rooms (e.g. living room) on the south side of buildings
- Put other rooms (e.g. toilets, kitchens etc) on the north side
- Use glazed sunspaces (e.g. conservatories) to allow in natural light and help regulate the heating of the rest of the house
- Do not use too large an area of glazing as this can cause excessive heat gain in the summer and heat loss in the winter
- Use buffer zones to reduce heat loss

- Use sun pipes to channel sunlight into appropriate rooms/hallways
- The mass of a building will affect its ability to store heat through thermal massing

4.17 Although passive solar heating is to be encouraged, excessive heat from unwanted solar gain can hinder the effective control of a building's internal temperature. External shading can be achieved through the architectural detailing and articulation of the façade, whilst internally, blinds can offer an easy method of protecting against too much heat from solar gain.

4.18 The internal environment can gain heat from a number of sources including lighting, cooking, electrical equipment, solar radiation and the building occupants themselves. If heat gains are not minimised or controlled, particularly in offices and other commercial buildings, cooling may be considered to be necessary to provide a comfortable temperature. The installation and operation of cooling plant can represent a significant energy demand and its benefits will therefore need to be weighed carefully before it is incorporated into a building design.

SUMMARY CHECKLIST

Passive solar design should be utilised by:

- Putting the main habitable rooms on the south elevation
- Using sunspaces to improve natural lighting and regulate internal temperature and sunpipes to channel light into other rooms/hallways etc
- Using materials with high thermal mass
- But not causing excessive heat gain

Ventilation

4.19 Wherever possible, passive ventilation should be used in developments as this system provides ventilation using the least amount of energy. It has no running costs and maintenance is minimal as there are no moving parts, which all help to keep energy use to a minimum. Passive stack ventilation systems can be incorporated into most types of buildings, although it is easier to design them into new buildings rather than install them as part of refurbishments.

4.20 Natural/passive ventilation may not be appropriate for all types of development however, particularly where a residential or sensitive development is planned for a site adjacent to a very busy road where high levels of noise and pollution are likely to be significant. In such cases mechanical ventilation may need to be installed, but energy efficient systems including heat recovery should be preferred to the standard set-up. Efficient fans and heat exchangers can help to reduce energy consumption and minimise heat loss. If necessary, pollutant filters can also be fitted.

SUMMARY CHECKLIST

Priorities for ventilation include:

- Using natural ventilation where possible as it is the most energy efficient option
- Designing systems into developments at an early stage
- Mechanical ventilation should only be incorporated where there are clear benefits of doing so
- Minimise heat loss of mechanical systems by using efficient fans/heat exchangers

Insulation

4.21 Heat loss from the building should be minimised in order to maximise energy efficiency. This can be achieved by using high levels of insulation to the main building fabric - the roof, walls and floors. It is advised that higher levels of insulation than the minimum specified in the Building Regulations can be used in these areas to help maintain a comfortable internal temperature and also prevent condensation and damp. Reducing the number of exposed walls by joining units together will also help to reduce heat loss. The use of double or triple glazing (in compliance with the standards set out in the Building Regulations 2006) should also be considered to reduce heat loss from windows. Another simple insulation measure is to ensure all hot water pipes are insulated, especially in unheated parts of a building. Well-insulated hot water tanks should also be installed to help maintain the water temperature.

4.22 Planted roof systems can offer both winter insulation and summer cooling benefits for buildings. A growing medium is placed on the roof surface to allow low level vegetation to grow. The vegetation usually consists of mosses, herbs, succulents or grasses that are self-sustaining and need no irrigation and minimum maintenance. An alternative, more advanced design is to install a roof garden for use by the building occupants.

4.23 In hot weather a roof of standard construction can absorb a large amount of solar radiation. Planting the roof surface and turning it into a 'green roof' can dramatically reduce this effect and reduce heat build up in the rooms below. This in turn reduces the amount of energy needed to control the indoor temperature e.g. through the use of air

conditioning. In winter time, green roofs can help insulate a building and reduce heat loss. This has the effect of reducing the amount of energy used to heat the building interior. As well as helping reduce greenhouse gas emissions through using less energy, the roof plants themselves take CO₂ out of the atmosphere as they grow. In addition to these advantages, green roofs also provide an important habitat for flora and fauna, improve rainwater management, reduce sound transmission and help improve air quality. The website www.livingroofs.org provides a resource for living/green roofs in the UK.

4.24 The conversion or refurbishment of properties offers an ideal opportunity to improve energy efficiency by installing or improving insulating material in the roof space and/or in internal wall spaces. Reglazing windows on old buildings can also allow energy savings to be made, although factors such as whether or not a building is a “listed building”, Building of Merit, or is in a Conservation Area must be taken into account when deciding whether or not particular products are suitable or not (e.g. the use of plastic uPVC windows would not usually be appropriate in such circumstances).

SUMMARY CHECKLIST

Heat loss can be reduced by:

- Insulating the main building fabric, especially exposed walls and the roof
- Installing double or triple glazing and insulating hot water pipes and tanks
- Planting a ‘green roof’ where feasible

Materials

4.25 The construction materials used in building or refurbishing properties can affect the ‘embodied energy’ of a building, which is energy used in preparing the material to be ready for use. Wherever possible, materials with low embodied energy should be used. Issues for consideration in reducing this embodied energy include:

- Using local supplies to reduce transport energy use
- Using materials that are not energy intensive to manufacture
- Using recycled materials or re-using ex-demolition material from on-site

4.26 Some materials can have direct impacts in terms of contributing to climate change and these should be avoided wherever possible. For example, foam insulation materials that use blowing agents such as HCFCs and HFCs should not be used and less environmentally damaging agents should be used instead. HCFCs and HFCs can be avoided by specifying that insulation materials should be free of these products or through proper scrutiny of the insulation product labels.

4.27 A scheme exists (the Freight Facilities Grant) to encourage the use of rail and waterways for the transportation of freight. Depending on the development site location it may be feasible to make use of this scheme to bring in construction materials etc. The Department for Transport and the Strategic Railway Authority administer the scheme and can be contacted for further details.

SUMMARY CHECKLIST

Choice of building materials can improve energy efficiency by:

- Taking advantage of local supplies of material where possible
- Using materials with low 'embodied energy' ratings and that are 'environmentally friendly'
- Recycling material on-site if buildings have been demolished to clear a site for redevelopment
- Using rail/waterway transport to bring in construction materials (dependent on scale of development and site location)

Installed Systems & Appliances

4.28 Once the demand for energy has been reduced through choice of location and site layout and design, further savings can be made by using energy efficient appliances.

4.29 All household appliances are major consumers of energy. The careful choice of appliances can therefore reduce energy demand and costs significantly. As far as possible, the most energy efficient appliances should be installed, with consideration being given to using only those appliances rated as category A or B in terms of energy (and water) efficiency.

4.30 Heating and hot water systems normally require a large amount of energy and traditionally they have been combined. However, in terms of potential energy savings and improved efficiency, their separation provides the most effective set-up. For example, the installation of a system which heats water on demand may be more appropriate for some types of development such as small flats/houses where there is unlikely to be a big

demand throughout the day. If such demand is expected then a stored water system may need to be installed, but this can still be done with regard to energy efficiency by using suitable temperature controls and timers to help reduce energy consumption.

4.31 Where gas boilers are installed as part of a development, then efficient condensing boilers with good heating and power controls should be specified. If they cannot be installed, high efficiency combination boilers should be incorporated instead in line with ODPM guidance.¹⁸

4.32 Hot water systems can also be made more energy efficient by fitting aerating taps and low-flow showerheads which can help save significant amounts of hot water (and therefore reduce the amount of energy used in heating it). Shut-off valves that stop the flow of water after a short period can also be fitted to reduce hot water use, although these are more suitable for commercial developments rather than domestic residential. Low flush toilets can also help cut energy use by reducing the amount of energy used to pump water around the system.

4.33 The installation of high efficiency lighting such as dedicated energy efficient light fittings that cannot be replaced with conventional bulbs (see parts L1A and L1B of the Building Regulations 2006) can help reduce energy use and save money, especially if installed with appropriate controls to prevent unnecessary energy use (and heat loss). Energy efficient light bulbs (such as compact fluorescent lamps) last up to 10 times as long as normal

¹⁸ ODPM, Guide to the Condensing Boiler Installation Assessment Procedure for Dwellings, 2005

bulbs and use only a quarter of the energy, yet still provide the same light output. Some developments may also be suitable for the installation of motion sensor light switches which turn lighting on/off according to whether anyone is present.

4.34 External lighting should not be neglected in terms of making energy savings. Solar powered lights can be used. These can be charged during the day for use at night. Good design can also minimise energy use by ensuring that there is zero loss of light to the sky, so that light is directed to where it is needed and that lights automatically switch off when there is enough daylight. The new Building Regulations 2006 parts L1A and L1B also includes specific guidance on external lighting.

4.35 Consideration should also be given to including energy metering and monitoring systems in developments as a method of encouraging occupants to conserve energy.

SUMMARY CHECKLIST

Consider the following to cut energy use from appliances and other systems:

- Install an efficient condensing or combination gas boiler
- Install fridges, washing machines etc that are rated 'A' or 'B' for energy/water use
- Use a separate system for heating hot water and install controls and timers
- Use aerating taps/shower fittings to cut down on energy used to heat water
- Install dedicated energy efficient light fittings and external lighting with controls (e.g. motion sensor)
- Use metering and monitoring systems to highlight energy use and encourage energy conservation

Increasing Renewable Energy Use

4.36 Just as it is important to reduce energy demand and use energy efficiently, it is also vital that, wherever possible, renewable energy is utilised for at least part of any new major development's energy needs. Although not currently widely used, there is great potential for renewable energy technologies to be used in the borough, particularly through incorporating small-scale installations into new developments.

4.37 Developers of major developments within the borough are expected to assess the feasibility of integrating renewable energy generation as part of their Energy Assessment and to show the contribution that renewable energy technologies can make in meeting the energy requirements of their proposal. If the Energy Assessment concludes that the integration of renewable energy use is not feasible, this should be justified robustly with appropriate supporting information. This will help meet the requirements of the London Plan and also show that the council's own UDP Policies on renewable energy has been given due consideration. Using renewables helps reduce the amount of fossil fuels burned and therefore the emissions of greenhouse gases such as CO₂.

4.38 This section of the guidance shows how a number of renewable energy technologies can be used to generate clean energy for a range of development types and gives a basic checklist for each which can be used to determine whether or not it may be feasible or not for use.

4.39 More detailed information on renewable energy use is contained in

the London Renewables “Integrating renewable energy into new developments” Toolkit, including information on the costs associated with installation. The costs associated with the various renewable technologies outlined in this section and their potential for carbon emission savings have been sourced from case studies presented in the Toolkit which was published in September 2004. The associated information may therefore have changed in the interim and should be checked before any decisions are made.

4.40 Frequent references are made in this section to sites being suitable for renewable energy technologies so long as they do not cause any detrimental impacts. The UDP provides further details on the design of new developments and how they need to be compatible with the scale and character of the existing surroundings etc. The UDP also includes full details of the borough’s requirements in terms of developments in conservation areas. A useful reference document in this respect is English Heritage’s ‘Building Regulations and Historic Buildings: Balancing the needs for energy conservation with those of building conservation (2002).

Solar Water Heating

4.41 As well as being used for passive heating of air inside a building to provide space heating, sunlight can also be used to heat water. The UK climate is suitable for low temperature heating applications such as water heating and solar water heating can be used to offset a large part of the hot water requirements for a building. Although they may not provide all hot water needs and should be operated in conjunction with a traditional water heating method,

such systems can be easily be installed and perform well, particularly during summer months. However, it should be borne in mind that to utilise a solar water heating system properly, it needs to be used in conjunction with a boiler that can take the pre-heated water.

4.42 As well as being suitable for new developments, solar water heating systems can often be incorporated where roofing work is taking place as part of a renovation project, thereby reducing costs. Solar water heating costs £400 per square metre of panel installed and the installation of a system to provide 50% on the annual demand for hot water for a range of developments (commercial, leisure, residential) would typically add about 0.5% to the total cost of the development. A large system could reduce carbon emissions by up to 10-15%.

SUMMARY CHECKLIST

A site may be suitable for solar water heating if there is:

- A south-east to south-west facing roof or a flat roof
- Space for hot water cylinders near to the roof mounted panels
- No detrimental visual impact on the local townscape

If yes, solar water heating may be feasible and a detailed site analysis should be carried out. Early consultation with the Environment Department Planning Division is encouraged.

Solar Power

4.43 Sunlight can also be converted directly into electricity through the use of photovoltaic (PV) cells and contrary to popular belief, the UK climate does not

present a barrier to the use of this type of technology, which has already been widely used in northern Europe, including Scandinavia.

4.44 PV cells can be connected together to form panels which can be installed onto buildings (normally the roof). Such an installation may not be suitable for all building types or areas, as the visual impact on listed buildings or in conservation areas may not be acceptable. Some cells are now available which look like normal tiles and can be incorporated or even replace tiles or cladding that would typically be used. Well designed systems therefore do not necessarily pose any visual intrusion problems.

4.45 Although the cost of PV cells is falling, they remain quite expensive compared to other renewable technologies. However, if they are used directly as tiling or cladding materials rather than being installed over the top of conventional materials, this can help to reduce the overall costs of installation. Grants are available from the Energy savings Trust which can cover up to 50% of total installation costs for homeowners and 40% for commercial organisations. Grants of 65% are available to Housing Associations. Also of benefit is the fact that any surplus energy generated can be sold to the general supply grid.

4.46 Wherever possible, developments not initially incorporating PV technology should be of a suitable design and orientation to support their use at a later date.

4.47 Rooftop PV panels cost £850 per square metre of panel installed, but PV cladding costs 1/10th of that at £85 per square metre. The % increase on the

development costs is therefore always more for roof-mounted cells. Depending on the size, both types of installation can typically save 10-15% of carbon emissions, but a cladding system will always cost substantially less.

SUMMARY CHECKLIST

A site may be suitable for photovoltaics if there is:

- A south facing roof or
- The building is a residential/office block needing large amounts of cladding material
- A roof or facade free from overshadowing

If yes, PV panels or cladding may be feasible and a detailed site analysis should be carried out. Early consultation with the Environment Department Planning Division is encouraged.

Wind Turbines

4.48 Turbines can provide emission-free energy and are now available in a range of sizes, not just the large stand-alone structures only suitable for large open space areas. Turbines do not necessarily need high wind speeds to operate, but to be efficient they do need to be located where there will be a relatively constant wind of about between 3.5m/s to 6m/s. Such conditions may not be widespread in urban settings, but sites such as industrial or leisure sites with some open space can be suitable for ground-based systems, whilst smaller turbines can be roof mounted on tall residential and commercial buildings, or even on individual properties.

4.49 The power output of turbines covers a broad range depending on the

size and number of turbines employed, but could provide all electricity needs for a small development, or just a part of the overall energy demand. Also, as with solar PV panels, if surplus energy is generated, arrangements can be made to sell this into the general supply grid.

4.50 Wind turbines cost £1000 per kilowatt capacity of the system and typically add about 1% to the total cost of a development. A large system could reduce carbon emissions by up to 10-15%. However, because of their size and appearance, consideration must be given to their visual impact, although as stated above, they can be integrated into the form and design of buildings.

SUMMARY CHECKLIST

A site may be suitable for wind turbines if there is:

- A good average wind speed
- Sufficient space for it to be built
- an area free of obstructions causing turbulence
- No detrimental visual impact on the local townscape

If yes, a turbine may be a feasible option and a detailed site analysis should be carried out. If the development is in a conservation area etc, it is especially important to discuss with the council the option of locating turbines in an unobtrusive position.

Combined Heat and Power Plant

4.51 Combined Heat and Power (CHP) plants are so called as they can generate both the heat and electricity needs for a site. They can operate at very good efficiency rates (85%) in comparison to the usual 30% efficiency found when generating electricity

through traditional means, where the heat generated is lost and wasted.

4.52 Some CHP plants run on conventional fossil fuels such as oil and gas in which case they cannot be regarded as renewable energy, but biofuels can also be used. The reuse of heat is the key element to the cost effectiveness of CHP plant, so if the heat is not required on site or nearby, then CHP would not be an appropriate option for a development. The best opportunities for CHP come from mixed use developments where heat from industrial/commercial sites can be used to provide a community heating system for nearby residential properties.

4.53 Hospitals and leisure centres (or hotels and residential developments) that have swimming pools are also well suited to CHP as heat is required throughout the year.

4.54 CHP units are also being developed on a smaller scale for single domestic use. These 'micro' CHP units are still a relatively new technology, but they have the potential to make large savings in energy use. An additional benefit, as with many on-site renewable energy technologies, is that surplus energy can be sold to the supply grid.

4.55 Although most existing CHP schemes use (non-renewable) gas as a fuel, the use of renewables such as biofuels (e.g. tree/plant waste) should be explored to establish if a viable biofuel supply can be sourced (preferably transported to site via rail or waterway to help cut associated transport emissions).

4.56 Grants are available from the Energy Savings Trust and the Carbon Trust to help with the installation costs

and use of CHP also qualifies for exemption from the Climate Change Levy, a tax paid by industrial and commercial use of energy for lighting, heating and power. As well as generating heat and power, CHP systems can also be adapted to provide cooling (known as CCHP or tri-generation). Such CCHP units may be appropriate where there is a need to provide air conditioning in commercial buildings.

4.57 A CHP system (biofuelled) costs £2720 per kilowatt, and depending on the size can provide 50% of a development's heating and hot water requirements. Such a system could substantially reduce carbon emissions by up to 25-50% for an increase in costs typically less than 5% on the total cost of the development.

SUMMARY CHECKLIST

A site may be suitable for combined heat and power if there is:

- A year-round demand for heating (or heating and cooling)
- Potential for local supply / delivery / storage of biofuel
- A reliable CHP system available

If yes, a CHP unit may be a feasible option and a detailed feasibility study should be carried out.

Ground Source Heat Pumps

4.58 Ground Source Heat Pumps (GSHPs) can be used to transfer the heat from the ground into a building to provide space heating and, in some cases, preheating of domestic hot water. In the UK, several metres below the surface, the ground maintains a constant temperature of 11 to 13°C, which, in winter will be warmer than the

surface air temperature. GSHPs can be used to extract this heat and transfer it to a building, where heat is required. If necessary, the process can be reversed in the summer with heat being drawn out of the building into the ground to help meet any cooling requirements.

4.59 GSHPs can be set up as open or closed loop systems, depending on the ground conditions. The latter is simpler as the open system relies on there being a pre-existing aquifer of groundwater to be abstracted, passed through a heat exchanger/pump and then discharged back to the aquifer. From a regulatory point of view, such open loop systems require authorisation from the Environment Agency for the abstraction and discharge process.

4.60 There may also be risks associated with installing a GSHP system into a potentially contaminated site. These need to be properly assessed as part of any feasibility study to ensure no new pathways are introduced for contaminants to move around or off site. A hydrogeological assessment should also be included to assess the impact that abstracting/discharging groundwater will have on the groundwater environment and existing abstraction licence holders.

4.61 GSHPs come in different shapes and sizes, including vertical boreholes, straight horizontal trenches and spiral horizontal (slinky) coils. Not all development sites will be suitable for the installation of a GSHP as, depending on the size, they can require deep boreholes or a large area of trenches to be set up.

4.62 Significant carbon dioxide savings can be gained from use of these

systems, especially if the energy source to run the pump is a renewable energy source or it runs on electricity provided from a renewable electricity tariff.

4.63 Water source heat pumps are also available, although these are only practical where there is an adequate supply of relatively clean water. The river and the canal could be considered if such a water-based system were to be considered for installation.

4.64 GSHP systems cost £800 per kilowatt of capacity installed and, depending on the size, could provide up to 100% of heating and hot water requirements for a development. Such an installation would typically add about 5% to the total cost of the development and could reduce carbon emissions by up to 10-25%.

SUMMARY CHECKLIST

A site may be suitable for ground source heat pumps if there is:

- Ground free from obstructions (sewers, tunnels, etc) and contamination
- Adequate space to install required pipework
- A heating system designed to accommodate low temp. circulation water

If yes, a GSHP may be feasible and a detailed study should be carried out.

5. BREEAM and EcoHomes

5.1 Although other systems are available, BREEAM (Building Research Establishment Environmental Assessment Method) is the most widely used method of assessing the environmental performance of buildings. Since its introduction in 1990, it has become increasingly accepted as showing the way forward in terms of offering best practice in environmental building design and management in the UK.

5.2 Developers are not required to submit a BREEAM assessment or to build their development to a particular BREEAM standard. However, it may be useful to consider the advice within BREEAM to help achieve an energy efficient, low carbon development.

5.3 BREEAM can be used to assess almost any type of building, including offices, retail developments, industrial buildings, schools and homes (via the EcoHomes assessment method) and covers a wide range of environmental issues, including energy. Credits are awarded in each area according to the building's performance and a series of environmental ratings are used to adjust scores which are then added together to give a single score. This is used to rate the building on a scale of: Pass; Good; Very Good or Excellent.

5.4 EcoHomes is the homes version of BREEAM which provides a method of rating new, converted or renovated houses or flats. It is revised annually to ensure that it remains representative of current best practice and takes account of technical and legislative changes.

5.5 BREEAM and EcoHomes are useful tools for developers and designers as it offers a simple way of assessing whether or not a building will meet the required level of environmental acceptability in terms of energy use (as well as other issues such as water use, pollution, material use, transport etc).

5.6 If a developer wants to use the BREEAM or EcoHomes method, they are encouraged to appoint a properly accredited assessor at an early stage to ensure that sustainable development features can be incorporated smoothly into the development design process and at little additional cost.

5.7 According to the Sustainable Homes organisation, it is possible to achieve a 'Good' EcoHomes rating at very little extra cost¹⁹.

5.8 Developers who attain a high rating under BREEAM or EcoHomes for their developments not only demonstrate their commitment to sustainability through reduced environmental impacts and improved quality of life for residents, but also help achieve the following benefits in terms of energy as well:

- Reduced running costs through improved energy efficiency;
- Reduced maintenance costs;
- Affordable warmth for residents;
- A healthy and comfortable internal environment;
- Increased levels of resident satisfaction;

5.9 The EcoHomes Assessment for energy focuses on the amount of carbon

¹⁹ Sustainable Homes, A Guide to EcoHomes, 2003.

emissions that can be saved through the design and specification of the building and through the lights, heating systems and appliances used throughout its lifetime.

5.10 Credits are awarded under the following headings:

- Reduction in carbon dioxide emissions
- Improving the fabric of the building
- Providing secure drying space
- Providing eco-labelled white goods
- Providing low energy external lighting

5.11 Maximum EcoHome ‘energy’ credits can be gained by constructing buildings with the following characteristics:

- No net carbon dioxide emissions (10)

- High standards of insulation (5)
- Provision of a secure internal or external drying area (1)
- Installation of ‘A’ rated fridges / freezers / washing machines / dish washers (2)
- Use of compact fluorescent lamps or strip lights for external space lighting and security lighting with sensor and timer controls (2)

5.12 The number of credits available for each area is shown in brackets – 20 credits in total.

5.13 Full information is available from the BRE’s dedicated websites:

- www.breeam.org
- www.ecohomes.org

Summary of EcoHome Requirements

EcoHomes Energy Issue	Credits Awarded for	Maximum Credits Awarded for
CO₂ emissions	Reducing emissions	No net emissions
Building fabric	Improving insulation	Highest standard of Insulation
Drying space	Providing a drying space	Provision of secure internal / external drying area
White goods (appliances)	Using eco-labelled appliances	Installation of ‘A’ rated appliances such as washing machines etc
External lighting	Use of low energy lighting	Use of low energy lamps for external lighting with sensor and timer controls

6. Grant Schemes

The Low Carbon Building Programme

6.1 The Government has recently announced a £30 million funding scheme known as the Low Carbon Building Programme (LCBP) which will run initially over three years, helping to fund the installation of a range of renewable energy technologies.

6.2 The LCBP initiative was introduced in April 2006 and has taken over from the previous grants schemes, (the Clear Skies and PV Grants programmes), which came to an end in March.

6.3 The new funding scheme will continue to help fund the installation of micro-generation technologies in household, community and large-scale projects. Potential community beneficiaries will include schools and leisure centres. Other projects could include housing estates or business parks.

6.4 Further information is available from the Department of Trade and Industry:
www.dti.gov.uk

7. Small Scale Projects and Sustainable Energy Use

7.1 Most of the emphasis in this document is on new build of major developments or large-scale renovations, but it is recognised that opportunities to implement the measures recommended in this document should also be encouraged for smaller developments as well.

7.2 Although not all aspects of this document are applicable in terms of small-scale renovations or home DIY projects, consideration of energy issues is relevant for many tasks, including:

- Building an extension
- Converting a loft
- Replacing a roof
- Building a conservatory
- Replacing windows
- Refitting kitchens/bathrooms
- Replacing a heating system

7.3 The installation of renewable energy systems is only likely to be considered suitable for a limited number of these projects (e.g. installing a solar water heating system as part of a heating system overhaul or PV cells as part of roof replacement work) but energy efficiency considerations are relevant for all.

7.4 For example, design considerations such as orientation should be considered when planning an extension or a conservatory to make the most of passive solar gain. Insulation improvements to increase energy efficiency can also be incorporated into all of those building projects outlined above, and wherever windows may be replaced, thought should be given to

installing high efficiency double or triple glazing.

7.5 Other benefits can be gained by installing energy efficient lighting and appliances, particularly where a kitchen is being re-fitted.

8. Case Studies

Coningham Sure Start building, Shepherd's Bush (New Build, Community Use)

8.1 The Sure Start building was constructed to be highly energy efficient and features well insulated walls, floors and roof. Part timber frame construction has been used in conjunction with high performance insulation whilst the ground floor is of masonry construction to provide good thermal mass. High efficiency under-floor heating has also been incorporated. The roof is insulated internally and externally is covered by a living green sedum blanket which helps to cut down on heat loss. To counter any problems with summer overheating in the south facing rooms, shading is incorporated into the design.

8.2 Solar gain has been put to good use as natural daylight is provided in every room from at least 2 directions through windows using low-E double-glazing. Sunpipes are also used to provide additional natural sunlight to some of the ground floor areas. Artificial lighting is provided by energy efficient light fittings and automatic sensors have also been installed to help control their use efficiently. Finally, a natural passive stack ventilation system has also been installed which helps to cut energy use as air can be circulated naturally, reducing the reliance on electric extract fans.

8.3 All of these design features enable the building to exceed the requirements of the Building Regulations in terms of energy efficiency.

Westway Beacons, Shepherd's Bush (New Build, Residential)

8.4 The Westway Beacons development is currently under construction with an expected completion date of June 2006. The scheme is designed to provide 128 affordable homes in a high density, highly sustainable "green" housing complex which maximises energy efficiency and incorporates renewable energy technologies.

8.5 As well as taking advantage of solar power by installing solar panels, the development is the UK's first geothermal social housing scheme. A Ground Source Heat Pump comprising of a 150-metre deep borehole system will be used to pump naturally heated water to the surface to heat the homes. This system will reduce both the environmental impact of the development and the energy bills of future residents.

Gallions Ecopark, Thamesmead (New Build, Residential)

8.6 The Ecopark is an affordable housing scheme of 39 houses and 8 flats which was built to high sustainable standards. A range of features were incorporated into the development to reduce energy demand, improve energy efficiency and utilise renewable energy, including the use of sunspaces in south facing houses; solar water heating systems installed on the roofs; high levels of insulation and advanced double glazing; highly efficient gas condensing boilers; energy efficient lighting and water saving devices (to reduce energy used to heat water). Under floor heating was also used and

so was a mechanical ventilation system with heat recovery.

The Beddington Zero Energy Development (New Build, Mixed Use)

8.7 The Beddington Zero Energy Development (BedZED) is one of the best examples of an environmentally friendly, energy efficient mixed use development. It is regarded as a 'Zero Energy Development' because it is so energy efficient and generates all of its energy needs on site from renewable sources. From start to finish, the scheme has been designed to cut energy use and it features south facing housing, excellent insulation and triple glazing. A CHP unit provides heat and electricity and also helps to heat water which is distributed via insulated pipes to hot water cylinders installed in each house. All of the houses are also fitted with PV panels which provide power to recharge electric vehicles and the ventilation system includes a heat exchanger which can recover a substantial amount of heat from outgoing air.

Holles House, Brixton (Refurbishment, Residential)

8.8 The Angell Town estate was designed and built in the 1970's without much regard to energy issues. In Holles House, there was a lack of insulation in walls, roof and floors, poorly fitting steel windows which created a cold building throughout most of the year.

8.9 For the refurbishment project, a full package of energy improvements to the fabric of the building and the heating and hot water systems was developed

to increase the levels of comfort for residents. Improvements included: wall and roof, double glazed timber-frame windows, passive stack ventilation, gas condensing boilers with intelligent controls and low energy light fittings. Residents now use 50% less energy than before, which means they have affordable warmth and are contributing substantially lower CO₂ emissions.

City Hall (New Build, Office)

8.10 City Hall is a good example of a single building that has been designed and constructed with energy efficiency in mind. The glazed façade of the building faces north and leans back so that the floors of each level provide natural shading for the office space below. This ensures that overheating does not occur. The building has an advanced cooling system which pumps groundwater up and round the building via boreholes in the water table below the building. This avoids the need for noisy and high-energy air conditioning units. The cooling system is supplemented by an integrated system of easily controllable vents to allow natural ventilation when required. The annual energy consumption of the building is about a quarter of that for a typical high specification air-conditioned office building.

Portcullis House (New Build, Office)

8.11 Portcullis House is the new parliamentary building opposite the Houses of Parliament in Westminster to provide offices etc for MPs. The building fabric has a high thermal mass which enables heat to be stored until it is needed. A courtyard is used to provide

the maximum amount of internal space capable of utilising natural light, reducing daytime energy needs. Highly efficient triple glazing is used on the building façade which also has blinds incorporated into it to reduce glare without reducing the amount of daylight. Although the building uses mechanical ventilation, it is not as energy intensive as a typical system as refrigeration energy is saved by using 100% fresh air drawn from the base of the building's 14 turrets. Cold water in a borehole in the basement is used for cooling as part of the air conditioning process.

**Thameswey Energy Ltd, Woking
(New Build, Mixed Use CHP scheme)**

8.12 As part of its energy efficiency programme, Woking Council has been implementing CHP systems since 1992, the latest of which are a series of private wire residential CHP systems (the only systems of their type in the UK). These systems are unique because they allow the direct sale of co-generated heat and green electricity to local customers at a lower price than electricity available from the conventional supply grid. This project is more than self-sufficient in terms of electricity production and has 25% to 30% available to export off site over public wires to other local customers. The largest concentration of solar PV cells is also installed in Woking, at more than 10% of the UK's total installed capacity.

9. Further Information

Organisation	Legislation & Policy	Grants	Further Information	Website	Telephone
Office of the Deputy Prime Minister	✓	✓	✓	www.odpm.gov.uk	020 7944 4400
Department of Trade & Industry	✓	✓	✓	www.dti.gov.uk	020 7215 5000
Department of the Environment, Food and Rural Affairs	✓	✓	✓	www.defra.gov.uk	0845 933 5577
Greater London Authority (GLA) (London Renewables)	✓	✓	✓	www.london.gov.uk	020 7983 4000
Energy Saving Trust (EST)	✓	✓	✓	www.energysavingtrust.co.uk	020 7222 0101
Carbon Trust	✓	✓	✓	www.thecarbontrust.co.uk	0800 085 2005
Building Research Establishment (BRE)			✓	www.bre.co.uk	01923 664 000
National Energy Foundation			✓	www.nef.org.uk	01908 665 555

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Organisation	Legislation & Policy	Grants	Further Information	Website	Telephone
Centre for Sustainable Energy			✓	www.cse.org.uk	0117 929 9950
Chartered Institute of Building Services Engineers (CIBSE)	✓		✓	www.cibse.org	020 8675 5211
British Photovoltaic Association			✓	www.pv-uk.org.uk	01908 442291
British Wind Energy Association			✓	www.bwea.com	020 7689 1960
Combined Heat & Power Association			✓	www.chpa.co.uk	020 7828 4077
Ground Source Heat Pump Club			✓	www.nef.org.uk/gshp	01908 665 555
Renewable Power Association			✓	www.r-p-a.org.uk	020 7747 1830
Association for the Conservation of Energy			✓	www.ukace.org	020 7359 8000
CIRIA			✓	www.ciria.org.uk	020 7549 3300

10. Glossary

Biofuel	Organic matter such as forestry/agricultural residues or purpose grown crops that can be used to produce energy.
Building Regulations (Part L)	The part of the Building Regulations that covers the conservation of energy and power within buildings. A revised version came into force in April 2006.
BREEAM	The Building Research Establishment Environmental Assessment Method (BREEAM) is an industry measure of energy and environmental performance of commercial buildings.
Carbon Dioxide	The burning of fossil fuels releases carbon dioxide (CO ₂). Although naturally occurring, its increasing concentration in the atmosphere is contributing to climate change.
Carbon Index	A method of calculating carbon dioxide emissions associated with the space and water heating requirements of a building. A building must score 8.0 out of a possible 10 to meet the requirements of Part L of the Building Regulations.
Clear Skies	The main Government grant scheme funded by the DTI and administered by the BRE which helps with costs of supplying/installing a range of renewable energy technologies.
Climate Change	A change in climate attributable directly or indirectly to human activity such as the burning of fossil fuels which alters the composition of the atmosphere and causes changes in weather patterns on a large scale. Commonly used interchangeably with "global warming" and "the greenhouse effect".
Combined Heat and Power (CHP)	The combined production of electricity and useable heat. Steam or hot water, which would otherwise be wasted if only electricity is produced, can be used for space or process heating.
Community Heating	Distribution of steam/hot water through a pipe network to heat a large area of commercial, industrial or residential buildings or for industrial processes. The steam/hot water is supplied from a central source (e.g. a combined heat and power plant).
EcoHomes	EcoHomes is the BREEAM version for homes, which aims to improve the overall environmental performance of new and existing homes.
Embodied Energy	The total life cycle energy used in the collection, manufacture, transportation, assembly, recycling and disposal of a given material or product.

Energy Efficiency	Making the best or most efficient use of energy in order to achieve a given output of goods/services or comfort and convenience.
Fossil Fuels	Coal, oil, and natural gas formed from the remains of ancient plant and animal life. Produces emissions of carbon dioxide and other pollutants when burned to produce energy.
Fuel Poverty	The condition in which people cannot afford to heat their homes to an adequate standard. Usually defined as any household where energy costs comprise more than 10% of an individual's income.
Global Warming	See 'Climate Change'.
Green Electricity	Electricity generated from renewable sources, not fossil fuels (or nuclear energy).
Green Roof	A roof of a building which is partially or completely covered with plants. It can be a properly tended garden or a more self-maintaining area of grass and mosses etc. Check www.livingroofs.org for more information.
Greenhouse Effect	See 'Climate Change'.
Greenhouse Gases	Atmospheric gases such as carbon dioxide, methane, chlorofluorocarbons (CFCs) etc that function like a "greenhouse" by trapping some of the sun's energy that reaches the earth, preventing it from being reflected back out of the earth's atmosphere, and thereby warming the earth's climate.
Ground Source Heat Pump	A heat pump that removes heat from the earth or ground water in cold weather and transfers it to the house through an underground piping system. The process can be reversed in warm weather to transfer heat into the ground.
Living Roof	See 'Green Roof'.
Low Carbon Development	A low carbon development is one that achieves a high level of reduction in carbon emissions from energy efficiency measures and renewable energy use on site, on an annual basis (see also 'zero carbon development').
Low-E Glazing	Low emissivity glazing is double glazing where the outer pane is coated with a transparent layer that reflects back radiated heat. This greatly increases the insulation levels of the window.

Major Development (GLA)	A full list is given in Parts I-IV of the Schedule to the Town & Country Planning (Mayor of London) Order 2000. Examples include: new housing development of 500 or more units or covering an area over 10 hectares; new retail, industry, office or mixed use developments over 15,000m ² (outside central London); new tall buildings (above 25m adjacent to the Thames and 30m elsewhere (75m in the City)); new bus or railway stations; large warehouse/distribution centres (use B8) occupying more than 4 hectares; developments including more than 200 (non-residential) car parking spaces.
Major Development (LBHF)	A full list is available from the council's planning division, but examples include: new residential developments of 10 or more units or where the site area is over 0.5 hectares; for other uses, where floorspace is over 1000m ² or the development site is over 1 hectare in size.
Micro-CHP	Small scale combined heat and power plant producing both electricity and useable heat.
Micro-generation	Micro-generation is the generation of low-carbon heat and power by individuals, small businesses and communities to meet their own needs.
Passive Solar Design	This refers to the use of solar energy for the heating and cooling of buildings. Using this approach, the building itself or some part of it can take advantage of the heat/light energy provided by the sun.
Passive Ventilation	By utilising the design of the building, a passive ventilation system can take advantage of the natural passage of air without the need for high energy consuming equipment. Windcatchers can aid passive ventilation by directing air in and out of buildings.
Photovoltaic (PV) Cell	Converts solar energy into electricity. Interconnected cells are encapsulated into a sealed module that produces a voltage.
Renewable Energy	Energy generated from sources that do not require the use of exhaustible materials - e.g. wind, wave, sun, water and energy from plant material, but not fossil fuels or nuclear energy. Geothermal energy is also generally regarded as a renewable energy.
Solar Water Heating	Solar water heating systems consist of a series of tubes inside an insulated box, typically mounted on the roof. The tubes absorb the sun's heat and transfer that heat to water or another liquid flowing through the tubes to heat water to be used in the home.
Standard Assessment Procedure	The Government's Standard Assessment Procedure (SAP) is used to generate the energy rating of dwellings on a scale from 0 to 120, based on the calculated annual energy requirement for space and water heating.

Sustainable Construction	The use of design and construction methods and materials that are resource efficient and that will not compromise the health or well-being of the environment or the building occupants, builders, the general public or future generations.
Sustainable Development	Development that meets the needs of the present without compromising the ability of future generations to meet their own needs.
Sustainable Energy	Energy that meets current needs without depleting the resources available to future generations. Generally refers to renewable energy sources.
Thermal Mass	Thermal mass is a property that enables building materials to absorb, store, and later release heat. Materials with a high thermal mass are energy efficient.
Tri-generation	Tri-generation is the simultaneous production of power, heat and cooling, as opposed to CHP which produces only heat and power.
U-value	The U-value (or heat loss factor) is the measurement used to express the thermal performance of a material. The lower the U-value, the better the material's insulating properties as less heat is transmitted or lost through it.
Zero Carbon Development	A development that has zero net carbon emissions. Typically these developments are highly energy efficient and generate their own power from renewable sources. Through exporting electricity to the supply grid when they are generating more than they need and importing from the grid at times when their renewables are not providing enough to meet demand, the balance as a whole across the year is designed to be at least zero non-renewable energy use, and therefore zero emissions of carbon dioxide.